

Inflation expectations, ECB opinions, and central bank communications: Experimental evidence ^{*}

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Abstract

A single supra-national organization, the European Central Bank (ECB), has a particularly challenging job as it must communicate complex policy information to over 300 million citizens living across 19 member states in the Eurozone. It must also do so despite waning trust for the institution by the public at large. Embedding survey vignette experiments into three waves of a panel survey of German citizens, we examine ways in which individuals' support for the ECB affects their information uptake as well as their inflation expectations. We use a novel approach to measure inflation expectations, leveraging the fact that it is difficult for respondents to translate price changes into annual inflation rates. Our experiments show that public approval (or not) of the ECB's policies matters for receptivity to central bank messaging. We also show that short and clear snippets of ECB 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.

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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.¹

Given the public’s relatively new exposure to central bank communications, it remains unclear whether or not citizens actually benefit from an increase in central bank communications targeted towards them or not. 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). Another concern is that 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. Most recently, scholars show that an individual’s inaccurate historical memory may also pose strong effects on their inflation expectations (Hafert, Redeker, and Rommel 2019). Yet most of this literature ignores the influence of growing mistrust in central banks. For example, 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 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 predis-

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positions 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 Twigg 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, as affecting 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. Importantly, trust in the ECB amongst Germans was at its lowest in 20 years (Jonung and Roth 2020) throughout this time period. 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. 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 changing occupations 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 its public opinions rather than 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. Our findings 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 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); 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 unfolding 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), a willingness of the central bank to share its own assumptions about future policy increases the predictability of 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. In a world of uncertainty, informing the public about the central bank’s objectives, plans, and outlook can affect behavior and 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.² 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. 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).³ Empirically, researchers have measured central bank clarity by examining the readability of central bank communications (Bulř, 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 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

²Economic theory predicts that inflation expectations influence both inflation dynamics and real activity. In particular, according to the New Keynesian Phillips curve, inflation π_t depends on labor market slack X_t , expected inflation $E_t(\pi_{t+1})$, and a supply shock ζ_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.

³European Central Bank (2002). The Accountability of the ECB. Monthly Bulletin, November, 45-57.

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 (or political biases) likely interact with information in influencing citizens' inflation expectations and why this is more likely for citizens with lower financial literacy.

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 can link voters to opinions about policies, party ID 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 stark example of the effects of political beliefs on economic expectations comes from studies of individuals living in countries transitioning to democracy in Eastern Europe. In one important study, Tverdova (2012) finds that citizens' political dispositions matter for their economic forecasts, with those favorable to political transition having more optimistic perceptions of the future economy. Furthermore, Tverdova 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 that think the economy will improve.

Political divisions based on other political beliefs or biases may be equally forceful in shaping individuals' economic expectations as well. 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 as well. 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 was stabilised with no member state defaulting nor 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. Also important for our research, this led to 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.

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 with the transmission of central bank messages 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 (Crujisen, 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 or beliefs about 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. We also ask respondents to self report their evaluations of the ECB. As additional measures, we also examine their support for EU integration more broadly and their trust in inflation statistics. Importantly, our experimental manipulations allow us to make causal claims about across-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 literacy, which may make them particularly sensitive 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 messages. 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 future inflation make this time period especially interesting as the public’s motivations for paying attention to

inflation are conflicting.

Second, at first glance, 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 or not 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).⁴

3.3 Experimental design

We incorporate two sets of information treatments, one in wave 1 and one in wave 2, and use comparisons across groups to identify the causal effects of inflation clarity in central bank information on respondents' inflation expectations. In wave 3, we also ask respondents about their inflation beliefs, trust 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 or not respondents' expectations change given changes in the content of communications not whether or not communications affect respondents' expectations. There is a large and robust literature that shows elite cues matter for citizens' economic beliefs (Boydston, 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 or news consumption. In the first screen, respondents are asked to give an estimate of expected price changes for a particular basket of 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

⁴More details on general panel attrition and non-response are given in Table A.1 in the the appendix.

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.

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. Additionally, respondents are asked to give their evaluation of how well they think that the ECB was doing in terms of delivering on its mandate. In order to proxy an individual’s assessment of the ECB’s performance, we give respondents a 5 point scale ranging from “very good” to “not very good” and ask them for their assessment.

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 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

⁵See for e.g. Bundesbank president Jens Weidmann steps up criticism of QE: Comments highlight scale of opposition to asset purchases in Germany

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 $\pi_{i,2}^1$.⁶

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, $\pi_{i,1}^0$, which we call their *prior (to treatment) inflation belief*. We are interested in how their *posterior (after treatment inflation expectations* $\pi_{i,1}^1, \pi_{i,2}^1$) 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’ opinions about the ECB, which we call *ECB approval*. More specifically, we record respondents’ opinions on whether they approve of the ECB’s performance with respect to the ECB’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

⁶Questionnaire items are given verbatim (in German) in Section B.1 in the appendix.

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, $\pi_{i,1}^5, \pi_{i,1}^{10}$.

Because the experiments happen over time, Table 1 summarizes our treatment and outcome measures. The time-line indicates in which of the three waves of the survey and at which point within the wave an outcome was measured as well as when the treatment intervention happened. 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).

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

		→ Time →					
	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				✓	$\pi_{i,1}^5, \pi_{i,1}^{10}$		
Additional measures					ECB approval, News consumption, Business News consumption		Policy Congruence Uncertainty Trust Statistics

As shown in Table 1, ECB approval, news consumption, and business news consumption questions are asked after treatment but before the outcome measures. Alternatively, in wave 2, the policy congruence question is asked before the treatment and the outcome measure. In wave three, questions about uncertainty in their inflation estimate and trust in inflation statistics are asked after the inflation expectations question. In order to make sure that our measure for support for the ECB is not impacted due to it occurring after the vignette experiment, as a robustness we replace our measure on ECB support with a question on support for further European integration, which was asked by other researchers in July 2015. To make sure that it is euroskepticism and not political ideology that matters most, we also consider measures of ideological left-right self-placement, again using questions asked by other researchers in the September 2015 wave of the GIP. We report our findings as well as these robustness measures below.

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 than 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 thus 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.

We present the results from our experiments starting with descriptive information. 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 in-*

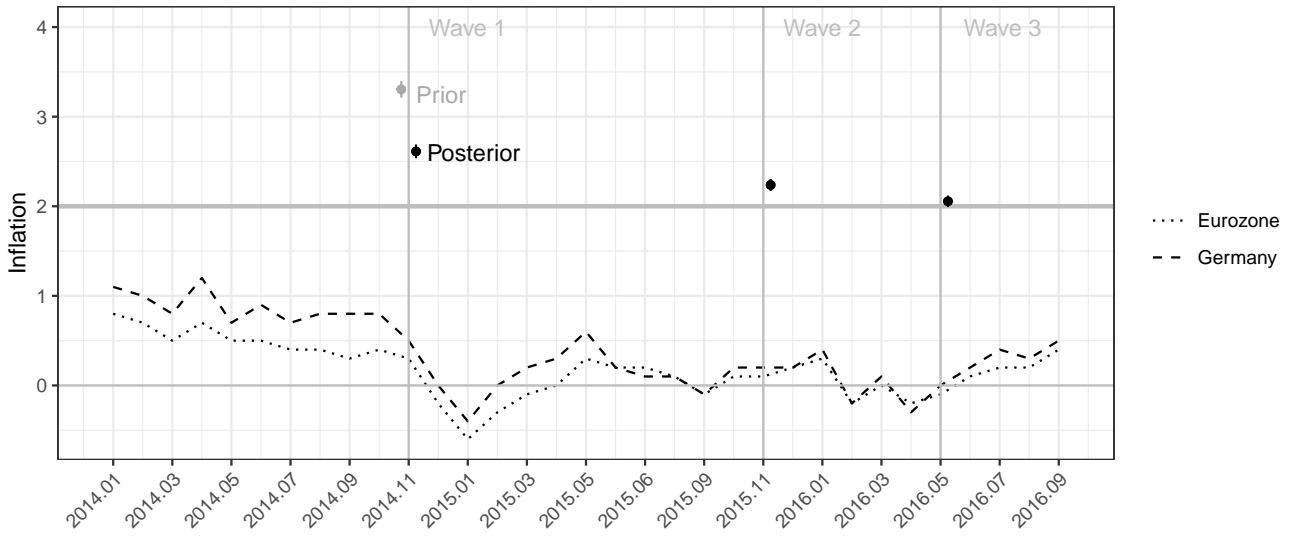


Figure 1: Prior and posterior expectation inflation in our sample (mean and standard error of the mean) and real inflation in Germany and the Eurozone.

formation). Figure 3 illustrates the effect of the different information treatments conditional on posterior expectations: clearer information significantly reduces respondents' average posterior inflation expectations and significantly lowers the variance amongst those in the *clear information* treatment group more than those 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 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. Changes in the variance across both groups is also stronger in the group getting the more clear text.

Rather than look at average expectations, we can also examine the variance in expectations across the groups. 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 also look at whether or not the information treatment persists over time. 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 surveys ⁷

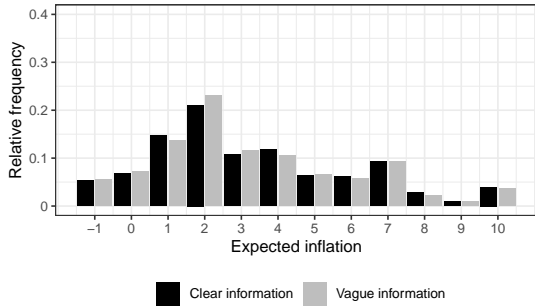


Figure 2: Respondents' Reported Prior Inflation Expectations

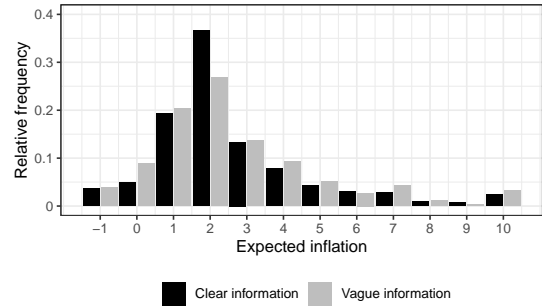


Figure 3: Respondents' Reported Posterior Inflation Expectations

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.

A t-test and a rank sum test of differences in the reductions across 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 3.⁸

⁷Figure A.1 in the appendix illustrates that differences in the distribution of the posterior inflation expectation disappears across waves

⁸See Figure A.2 in the appendix.

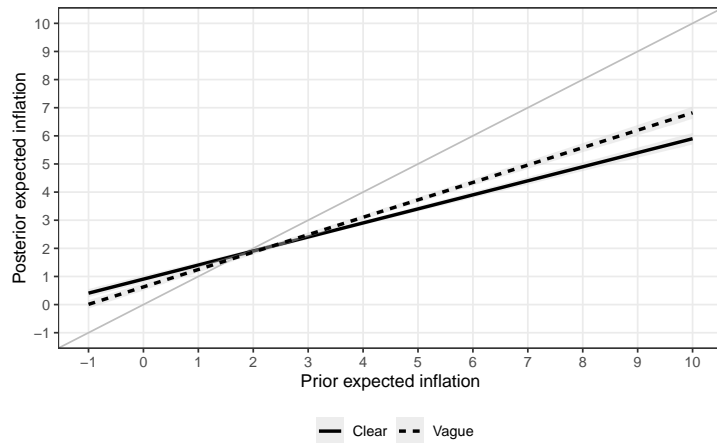


Figure 4: Respondents' Prior vs Posterior Inflation Expectations (Wave 1)

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 2.⁹ 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.

⁹The 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).

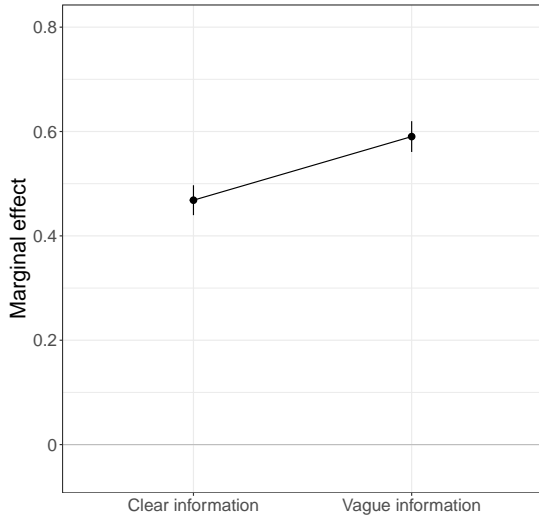


Figure 5: Marginal Effect of Respondents' Reported Prior Inflation Expectations (Wave 1) on Reported Posterior Inflation Expectations (Wave 1)

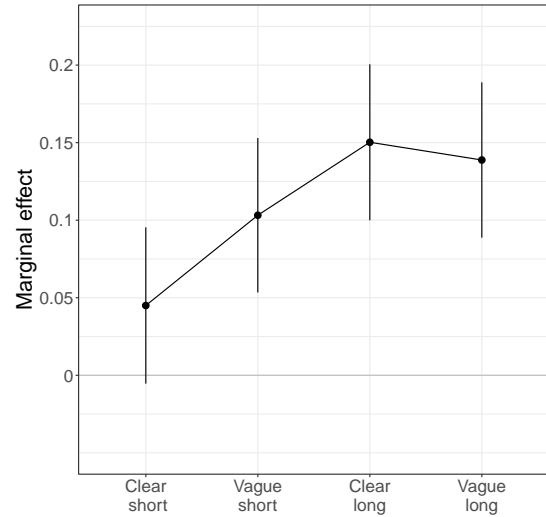


Figure 6: Marginal Effect of Respondents' Reported Prior Inflation Expectations (Wave 1) on Reported Posterior Inflation Expectations (Wave 2)

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 ECB's communication 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.

	<i>Posterior wave 1</i>	<i>Posterior wave 2</i>
<i>Prior</i>	0.385 (0.090)***	-0.091 (0.090)
<i>Information treatment</i>		
<i>Clear</i>	0.292 (0.084)***	
<i>Vague, short</i>		0.119 (0.162)
<i>Clear, long</i>		-0.029 (0.155)
<i>Clear, short</i>		0.282 (0.161)*
<i>Business news consumption</i>	-0.074 (0.032)**	-0.096 (0.040)**
<i>News Consumption</i>	0.049 (0.047)	-0.169 (0.062)***
<i>ECB approval</i>	0.070 (0.055)	0.201 (0.087)**
<i>Prior × Clear</i>	-0.122 (0.030)***	
<i>Prior × Vague, short</i>		-0.030 (0.041)
<i>Prior × Clear, long</i>		-0.007 (0.043)
<i>Prior × Clear, short</i>		-0.099 (0.040)**
<i>Prior × Business news consumption</i>	0.019 (0.011)*	0.003 (0.010)
<i>Prior × News Consumption</i>	-0.014 (0.014)	0.030 (0.014)**
<i>Prior × ECB approval</i>	0.068 (0.019)***	0.007 (0.020)
<i>Constant</i>	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 ≈ 0.10 (.05, 0.15). Another contribution is that fact 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'

approval of the ECB are measured on a Likert-type scale, where (1) is very good and (5) not very good, and (3) the middle category is neither good nor bad. If opinions about 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 significant differences for respondents that answered either 2, 3, or 4 on support for the ECB.

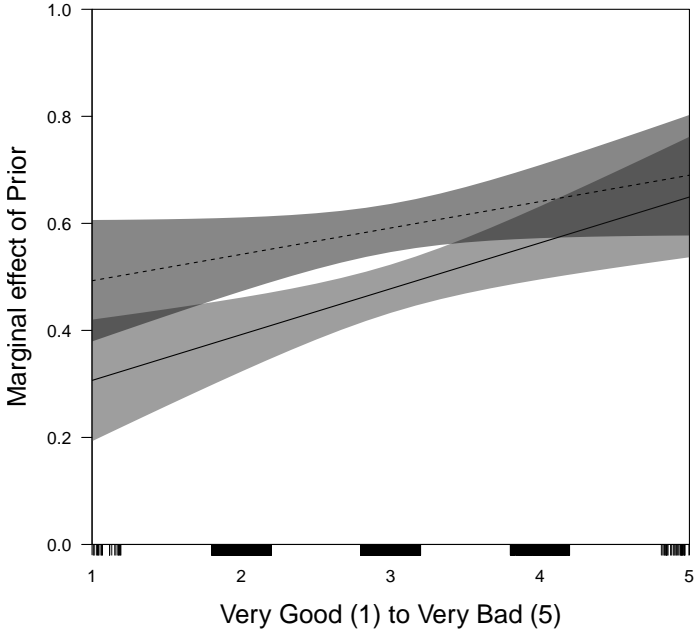
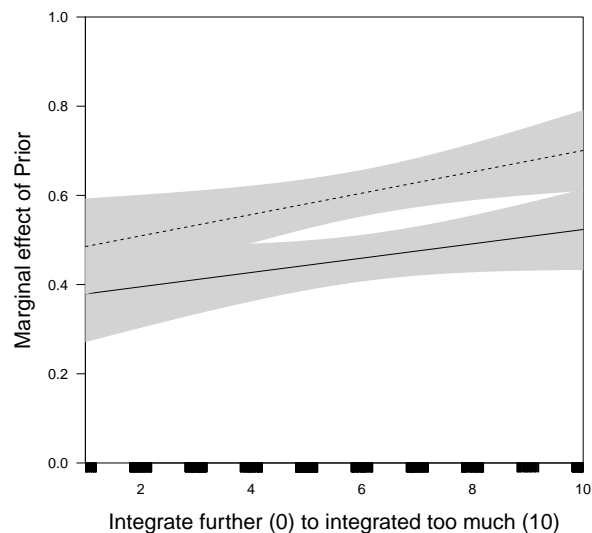


Figure 7: Marginal Effect of Prior on Posterior Inflation Expectation by Attitudes towards the ECB (Vague – dashed line, Clear – solid line)

Our measure of ECB approval 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. One concern is that 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 of the ECB, proxying support for the ECB with support for EU integration which was asked in another survey wave one year-later and by different researchers. 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 approval 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 euroskeptical opinions and less so with europhile opinions.

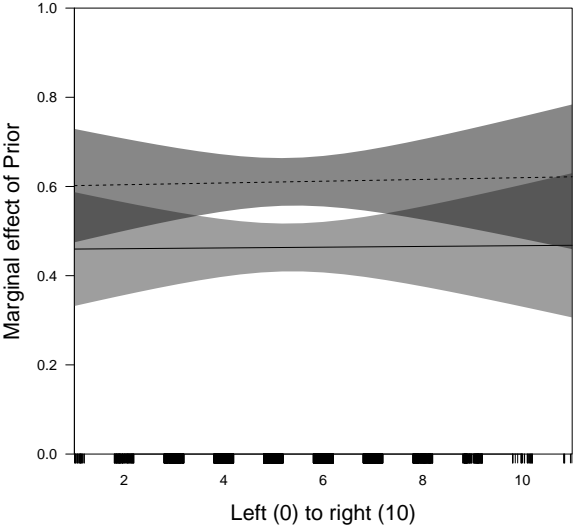
Figure 8: Marginal Effect of Prior on Posterior Inflation Expectation by Attitudes towards the EU Integration (Vague – dashed line, Clear – solid line)



A second concern is that ECB and EU support might be proxying other political biases, such as political ideology or partisanship, and not really reflective of euroskepticism at all. So

as to check whether or not this is the case, we again leverage another question on political ideology also from another survey wave one year later (2015). 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. 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 second result:

Result 3 *Respondents more skeptical of the ECB are less likely to incorporate ECB information in their expectations whereas political ideology has little effect.*

4.3 Alternative Mechanisms

So far, we have considered the effects of political biases, and namely euroskepticism, and how it interacts with information uptake from central bank messages. In this section, we consider a number of possible alternative mechanisms to examine whether or not these explanations are more likely to affect respondents' inflation expectations. We consider the role of (self-reported) financial sophistication, life-event changes, and personal inflation preferences as possible alternatives.

We also want to know whether a respondent's level of financial sophistication matters for information uptake. We proxy financial sophistication by asking respondents to self-report their media consumption, asking for both 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 and does not interact with prior inflation expectation in determining the posterior in wave 1. Respondents who self-report consuming more *business news*, however, hold lower wave 1 - posterior inflation expectations than those who do not consume business news as much. Business news consumption also interacts significantly with prior inflation expectation. In particular, as shown in Figure 10, the weight on prior inflation expectation increases with business news consumption. 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, 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 (as measured by political knowledge) are more rather than less likely to take up elite cues. In the case of central bank news, we see that people more exposed to business news have stickier priors than those with less exposure and that these priors are more likely to be correct.

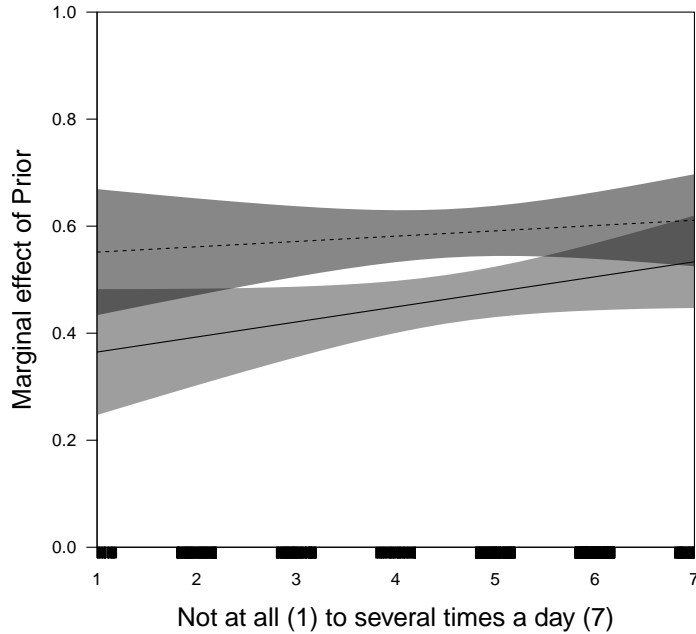


Figure 10: Marginal Effect of Priors on Posterior Inflation Expectation by Business News Consumption (Vague – dashed line, Clear – solid line)

Since we only depend on self-reported news and financial news consumption, one concern may be that respondents mis-report their knowledge. To check for this, we provide another measure as proxy: whether a respondent reported a change in occupation status (e.g. from employed to retired) during the panel. We consider this as a life event which might correspond to higher levels of awareness in their own financial situation. Indeed, we estimate that those who changed their occupation status also hold lower wave 1 - posterior inflation expectation and see a higher marginal effect of the prior than those whose occupation status remained constant.¹⁰

Our final consideration is whether deviations in individuals' policy preferences from the ECB's monetary target may also condition the influence of economic information. In wave 2, we ask respondents about the preferred inflation rate so as to measure policy congruence with the ECB's target rate. We elicit respondents' preferred inflation rate by deploying a number of techniques. Rather than consider only their self-reported preferences when asked directly, respondents also indicate their inflation preferences by completing a number of small interactive tasks. In all of these tasks, we also include an additional comprehension checks:

- 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

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

scenario where both indicators are stable is not given as an option.

- 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.
- 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 the outputs from these interactive tasks, we then measure *Policy Congruence* as the (quadratic) distance between the respondent’s preferred inflation rate and the ECB’s announced 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 similar preferences regardless of whether they are considering inflation in the Eurozone as a whole, Germany, or their own personally preferred situation. Furthermore, while we find within-respondent consistency, we observe significant across-respondent variation in answering these questions. For example, while two-thirds of respondents prefer a world in which there is low inflation and high-unemployment if made to choose, a remaining one-third of respondents prefer the converse.

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). For inducing respondents to consider monetary policy as if it involves trade-offs, we show respondents’ randomized sliders and ask them to move the slider to their preferred inflation rate. When they move one indicator, they observe the effect of their preferred rate on other variables of interest (interest rate, unemployment rate, and growth rate), thus prompting them to think of different economic variables as being inter-related. Respondents’ preferred inflation rate emerges at a very similar rate of 2.5 percent. When we put preferences rather than opinions into the model, we get very different results. Unlike the above, we find little evidence of 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 makes our findings that public opinions about

¹¹In 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 B.1.2 in the appendix.

the ECB do matter even more interesting. It seems that information is conditioned by whether or not someone positively (or negatively) evaluates the ECB (or the EU) and is independent from their own preferred inflation level.

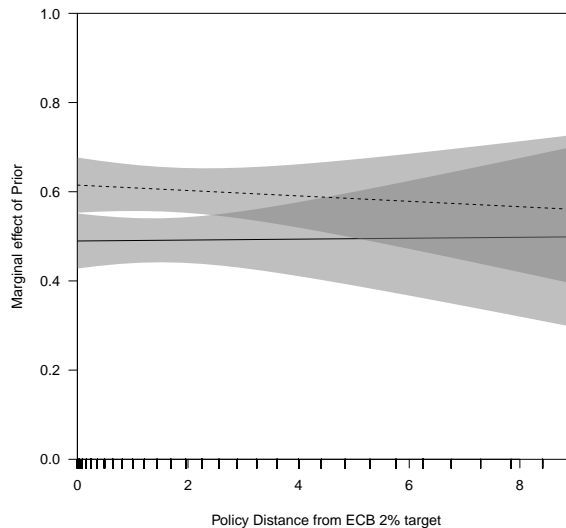


Figure 11: Marginal Effect of Priors on Posterior Inflation Expectation by Policy Congruence (Vague – dashed line, Clear – solid line)

5 Conclusion

In this paper, we provide some 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. We also 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, the German public have become even more critical of the ECB.¹² 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 finds 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 contributions, our findings provide a number of new findings for the literature on public opinion. While previous studies suggest that political sophisticates may be more likely to adopt political information by their favored elites, in our experiment, we find little evidence that public information crowds out private sector information for those consuming business news. 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 or not 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.

¹²German 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
Clear information long	767	.25
Vague information short	768	.25
Vague information 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

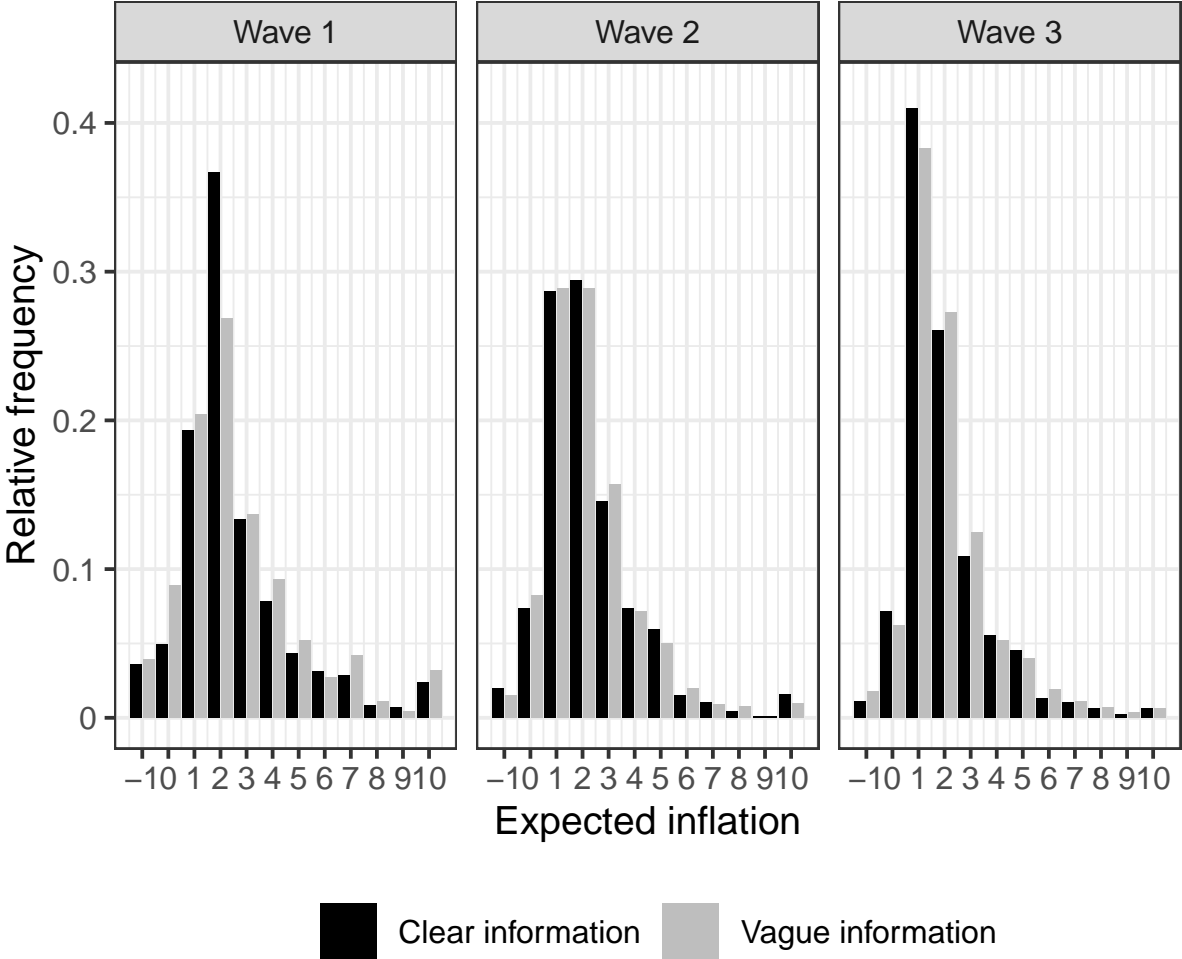


Figure A.2: Respondents Prior (Wave 1) vs Posterior Inflation Expectations

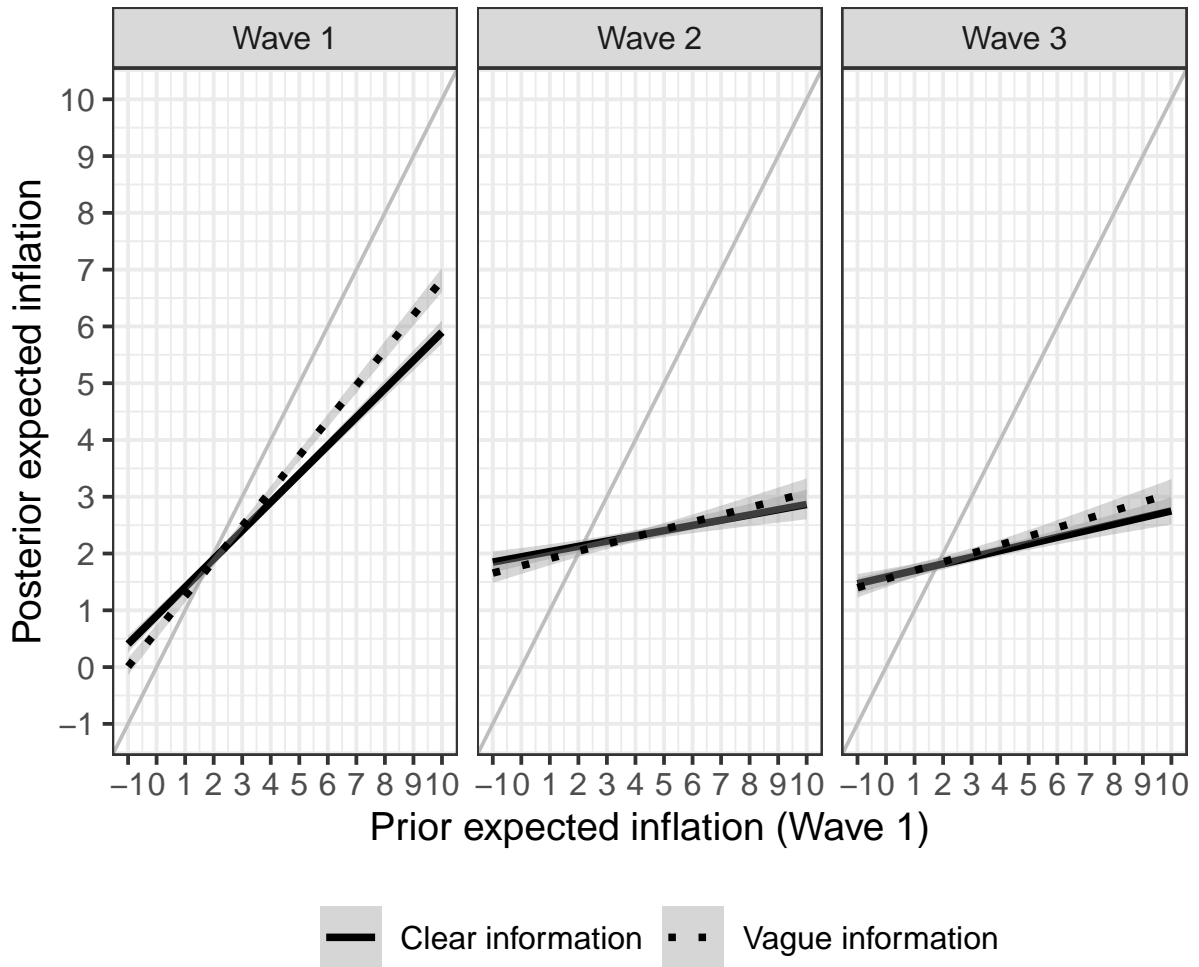


Figure A.3: Respondents' reported posterior inflation expectations by whether their occupations status changed from Wave 1 to Wave 2 and first information treatment (clear vs vague information in Wave 1) for Wave 2 and 3.

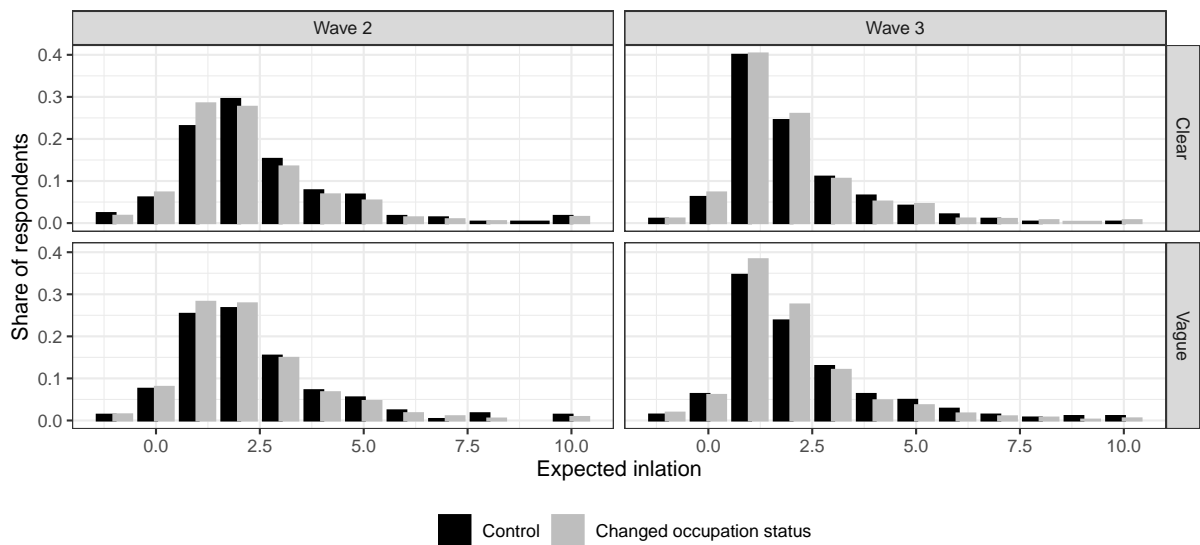


Table A.3: Linear Regression of reported posterior inflation expectation on indicator of first information treatment, whether respondents' occupation status change from Wave 1 to Wave 2, and the interaction of those two variables.

	<i>Posterior wave 1</i>	<i>Posterior wave 2</i>
<i>Prior</i>	0.415 (0.089) ^{***}	-0.072 (0.094)
<i>Information treatment</i>		
<i>Clear</i>	0.270 (0.084) ^{***}	
<i>Vague, short</i>		0.119 (0.161)
<i>Clear, long</i>		-0.065 (0.157)
<i>Clear, short</i>		0.288 (0.162) [*]
<i>Changed occupation status</i>	-0.092 (0.095)	-0.163 (0.150)
<i>News Consumption</i>	0.012 (0.033)	-0.236 (0.049) ^{***}
<i>ECB approval</i>	0.064 (0.054)	0.199 (0.088) ^{**}
<i>Prior × Clear</i>	-0.112 (0.030) ^{***}	
<i>Prior × Vague, short</i>		-0.033 (0.041)
<i>Prior × Clear, long</i>		0.004 (0.044)
<i>Prior × Clear, short</i>		-0.101 (0.040) ^{**}
<i>Prior × Changed occupation status</i>	0.012 (0.032)	0.010 (0.037)
<i>Prior × News Consumption</i>	-0.008 (0.010)	0.027 (0.012) ^{**}
<i>Prior × ECB approval</i>	0.073 (0.019) ^{***}	0.010 (0.021)
<i>Constant</i>	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 A.4: Statistical models

B Experimental design appendix

B.1 Questionnaire items

B.1.1 Wave 1 (November 2014)

1. Assessing inflation

(a) 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

(a) 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 Zinssätze 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

(a) 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

(a) 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

(a) 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 Europäischen 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

(a) 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

(a) 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

(a) 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*

B.1.2 Wave 2 (November 2015)

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

(a) 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_* or *CD20102 pref_inflation_unemployment_de_s3*)

(a) 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*)
- (a) German original:
Stellen Sie sich vor, dass Sie für den Euroraum zwischen zwei extremen Szenarien wählen müssten. 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 Euro-raum 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*)
- (a) 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/unemployment rate/growth rate preference Eurozone/Germany
 (*CD20106 pref_inflation_eu* or *CD20107 pref_inflation_de*)
- (a) 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 Euro-raum 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 Euro-raum. 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:]

The screenshot shows a survey interface with four sliders, each representing a different economic indicator. The sliders are arranged vertically and are interconnected. The current values are as follows:

Indicator	Minimum Value	Maximum Value	Current Value
Zinssatz (Interest Rate)	-0,5%	4,5%	~1,5%
Inflation	0,0%	5,0%	~2,5%
Arbeitslosenrate (Unemployment Rate)	4,5%	9,5%	~7,0%
Wirtschaftswachstum (Economic Growth)	-1,0%	4,0%	~1,5%

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

6. Preferences personal inflation (*CD20108 pref_inflation_personal*)

(a) 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*)

(a) 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:]

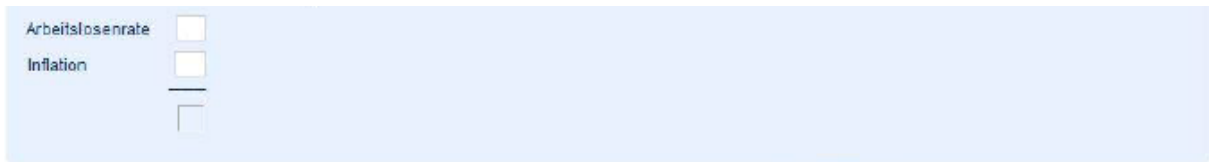


Figure B.2: Example of screen as displayed to respondents to answer question item *CD20106* and *CD20107*

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

(a) 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 Preisstabilität zu gewährleisten 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.