Federal Reserve Bank of Cleveland Working Paper Series

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Working Paper No. 25-23

October 2025

Suggested citation: Eva, Kenneth, Michael J. Lamla, and Damjan Pfajfar. 2025. "State-Dependent Sticky Expectations: Evidence and Theory." Working Paper No. 25-23. Federal Reserve Bank of Cleveland. https://doi.org/10.26509/frbc-wp-202523.

Federal Reserve Bank of Cleveland Working Paper Series
ISSN: 2573-7953

State-Dependent Sticky Expectations: Evidence and Theory *

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October 7, 2025

Abstract

We document novel stylized facts regarding updating of households' inflation expectations. Using two randomized controlled trials fielded in the US and Germany where signals in the form of professionals' inflation forecasts have different perceived levels of precision, we show that households react more to information with higher levels of precision, in line with Bayesian updating. However, in contrast to Bayesian updating, they mostly respond differently to these signals in the decision to update expectations (extensive margin) and not in the size of the adjustment (intensive margin). The extensive margin also displays a pronounced asymmetry: Households more frequently update their expectations when the signal is above the prior compared to when the signal is below the prior. We propose a model where households' inflation expectations exhibit state-dependent inattentiveness to inflation signals. In times of high uncertainty, elevated inflation expectations may persist due to the increased information processing costs of uncertain inflation signals and the relatively smaller welfare losses of not adjusting expectations when signals are below priors (disinflations) compared to when signals are above priors (accelerating inflation). Our model provides microfoundations for the asymmetric loss function that is commonly assumed to explain biases in inflation expectations.

Keywords: Inflation expectations, rational inattention, signal uncertainty, randomized controlled trial, survey experiment.
JEL classification: E31, E52, E58, D84.

*We are thankful for the support of the survey team at the Bundesbank Online Panel Households at the Deutsche Bundesbank. We thank Fabian Winkler, Oliver Pfäuti, Camilo Morales-Jiménez, and the participants at the MSU Brownbag Seminar at the Federal Reserve Board, University of Duisburg-Essen, University of Bochum, University of Innsbruck, Macquarie University, 2025 CEBRA Annual Conference, 2024 University of Oxford and CEPR Central Bank Communication RPN workshop, the 2023 Computing in Economics and Finance conference, SED 2024, and the Workshop Challenges for Monetary Policy in Times of High Inflation for their comments and suggestions. This paper uses data from the Bundesbank-Online-Panel Households. The results published and the related observations and analysis may not correspond to results or analysis of the data producers. The views expressed in this paper are solely the responsibility of the authors and should not be interpreted as reflecting the views of the Federal Reserve Bank of Cleveland or the Federal Reserve System. The randomized controlled trial has been registered at the AEARCTR under the ID AEARCTR-0010292.

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1 Introduction

> "Once consumers took notice of rising inflation, their inflation perceptions responded quickly but reduced more sluggishly when inflation started to fall."
> Christine Lagarde, ECB's President, March 12, 2025.

How economic agents form expectations remains an exciting area of research, as studies show that inflation expectations matter for agents' economic decisions. In addition, how households form their inflation expectations has implications for the inflation process, especially in an environment where inflation is high. Two popular assumptions for how households form their expectations are Bayesian updating and rational inattention. However, there is little empirical evidence as to whether households recognize different levels of signal precision as postulated by the Bayes' rule. In addition, neither model implies a systematic variation in the decision to update the forecast (extensive margin). Rational inattention postulates that economic agents cannot process all available information, but they can select which exact pieces of information to attend to. While rational inattention has an explicit extensive margin, the decision to update the forecast is mostly based on the precision of the signal and the information processing function, but not on economic fundamentals or the distance between prior expectations and the signal. Following Bayes' rule, households incorporate different levels of signal precision in the intensive margin, when they decide by how much to update their expectations. Furthermore, the standard theories are silent on potential asymmetries when updating inflation expectations. To study the role of the extensive margin, we design two randomized controlled trials (RCT) where households receive signals about future inflation that have different perceived levels of precision. As our empirical evidence points to significant departures from both theories, we propose a new state-dependent model of how households form expectations, consistent with our empirical evidence, and evaluate the dynamics of inflation in this new environment.

We start by investigating how households update their inflation expectations. To test causally how the decision to update expectations varies, we employ two different RCTs where households receive signals with different perceived precision. These RCTs are designed so that we can distinguish between the decision to update expectations (extensive margin) and the decision by how much to update their expectations (intensive margin), which is not standard in the literature. The first RCT was fielded to US households (in December 2022) and the second was fielded to German households (in July 2023) as part of the Bundesbank Online Panel Households (BOP-HH). These survey experiments are designed to elicit prior 12-months-ahead inflation expectations, uncertainty about prior expectations, and news heard about inflation. Following that, we randomly provide the participants with different information about professionals' forecasts of inflation that include measures of disagreement about those forecasts. Specifically, we provided the mean forecast of the Survey of Professional Forecasters (SPF), the SPF mean with a high perceived precision (bands that correspond to the inner 60 percent of the distribution), the SPF mean with a low perceived precision (bands that correspond to the lowest and the highest forecast), a placebo piece of irrelevant news (past population growth), or no additional news. After the information treatment, we elicit participants' posterior inflation expectations. We then test whether, for a given prior, households that receive a perceived low-precision inflation signal, on average, update their beliefs by a smaller amount relative to households that receive a high-precision signal (overall margin). We also test whether those that receive the low-precision signal choose to update less often than those who receive the high-precision signal (equality in the extensive margin) and whether the size of the update is smaller for those that decide to update their expectations (differences in the intensive margin).

In this paper we provide evidence for two new stylized facts regarding the updating of inflation expectations: (i) Our results show that households do adjust their expectations based on the signal strength, but most of the variation comes through the extensive margin and not through the intensive margin as postulated by Bayesian updating; (ii) the decision to update expectations is asymmetric between those that receive a signal that is below their prior expectations and those that receive a signal that is above their prior expectations.

We provide evidence that households adjust their inflation expectations more strongly to a perceived high-precision signal in comparison to a perceived low-precision signal. Hence, households seem to be able to discern the level of uncertainty and factor this in when forming expectations. Interestingly, the response to the high-precision signal is quantitatively similar to the response to providing information about the mean only (i.e., without any information on the signal strength), which suggests that consumers may understand that even the mean forecast is uncertain as well. We further disentangle the effects along the extensive and intensive margins. For the extensive margin we show that the probability of adjusting expectations is higher after receiving a high-precision signal compared to the treatment with a low-precision signal. With respect to the intensive margin the adjustment size is not statistically different across high and high-precision signals. Hence, while there is a lower probability that households will adjust to a low-precision signal, the strength of the adjustment is comparable across perceived high and high-precision signals. These findings are only partially in line with Bayesian updating, as our results show that the extensive margin—and not just the intensive margin—is important. These results, however, are in line with Dräger et al. (2024) who recently emphasized the importance of the extensive margin for the formation of inflation expectations. Pfajfar and Santoro (2013) studied the extensive margin decision in the Michigan survey and noted that about 75 percent of re-interviewed households update their expectations and that the probability of updating is positively associated with the level of inflation and the observance of inflation news.[1] Notably, these studies did not test the difference in updating frequency across treatments with different signals and asymmetries in updating expectations.

We also study the role of prior uncertainty and self-reported observance of news regarding inflation on updating inflation expectations. Households that reported higher certainty regarding their priors rely more on their priors and update less with respect to the signal. Households tend to put an especially high weight on the signal if they are highly uncertain about their priors and they receive a signal with higher precision. The response to both the high-precision and the low-precision treatments is significantly larger for households with a high prior uncertainty. An investigation of the effects of hearing news before the survey experiment—which can also be an indication of the strength of the prior—also reveals an interesting pattern. When households are provided with a high-precision signal, both those that report hearing news and those that report hearing no news update by about the same amount. Households that report hearing news about inflation update their expectations less when exposed to a low-precision signal, especially in the US sample where the weight is almost 50 percentage points lower than in the high-precision treatment. In contrast, those that report hearing no news about inflation update their priora in a similar way when receiving low-precision treatments compared to those receiving high-precision treatment.

We then further study the extensive margin decision to establish the second new stylized fact regarding the asymmetry of updating. Households that have priors below the signal tend to update their expectations more frequently than households with priors above the signal. We also find that the likelihood of updating expectations is correlated with the distance between the prior and the signal: When the prior and signal are farther apart, there is a higher likelihood of updating expectations. Furthermore, we focus on the potential asymmetry with respect to the relative position of signal and prior. We indeed find a pronounced asymmetry. If the prior is below the signal, the likelihood of updating increases faster with the distance between the prior and the signal compared to the case when the prior is above the signal. This finding is in line with evidence that consumers are more attentive to unfavorable news about inflation (signals of higher inflation) com-

[1] Andrade et al. (2023) also study the extensive margin using French survey data by defining it as an answer to the question that inflation increased or decreased compared to saying that inflation remained about the same.

pared to favorable news about inflation (lower inflation signal), previously documented in, e.g., Pfajfar and Santoro (2013). They find that unfavorable news increases the chances of overpredicting, while favorable news has a negative marginal effect on updating expectations. Recently, Chahrour et al. (2025) also show a similar result while studying the overall effect, but not specifically the extensive margin. Armantier et al. (2022b) also show that households' long-run inflation expectations react more to positive than to negative inflation surprises in a high-inflation environment, while D'Acunto et al. (2023) argue that households put a higher weight on positive relative to negative price changes when forming inflation expectations. The asymmetry that we document is also in line with the literature on asymmetric loss function of forecasters (e.g., Elliott et al., 2005, 2008, and Capistrán and Timmermann, 2009).

After we establish these stylized facts about how consumers update their inflation expectations, noticing that they do not fully align with a Bayesian updating view when considering both intensive and extensive margins as well as the observed asymmetry, we propose a model to match the role of the extensive margin we document in the surveys. We utilize insights from the rational inattention models of Woodford (2009) and Morales-Jiménez and Stevens (2025), who study the role of the extensive margin in firms' pricing decisions and propose a model of households' attention problem: Households optimize their inflation information source given information processing costs. As a result, the household observes a binary signal that randomly induces them to update, with the probability of updating increasing in the distance between the household's prior and the optimal inflation expectation, consistent with what we see in the RCTs. This modeling framework is able to explain both the behavior of those that do update their beliefs and the fraction of those that leave their beliefs unchanged. In this model, after the decision to update expectations, the decision by how much to update their expectations is rational.

This mechanism is able to reproduce both novel facts about the updating of inflation expectations: the role of the extensive margin in updating inflation expectations and the asymmetric response based on the position of the signal. With respect to the latter, we also provide detailed microfoundations for the asymmetric loss function. While some of this literature, specifically Elliott et al. (2008), argues that the concavity of the utility function may be the reason for the asymmetric loss function, we detail the mechanism behind this observation. Households with prior inflation beliefs below the optimal level expect a higher real wage and real interest rate in the next period, causing them to consume more in the current period and to consume too little in the following period. Due to the concavity of the utility function, the loss associated with too-low inflation beliefs is greater than the loss associated with too-high inflation beliefs, and households optimally updates their beliefs more frequently when their beliefs are below the optimal level. We first demonstrate this asymmetry in a two-period model, then extend this mechanism to an infinite horizon consumption-savings model. We perform a partial equilibrium experiment where we demonstrate the consequences of the asymmetric updating in our mechanism: Positive inflationary shocks lead to faster updating and more persistence in inflation beliefs than negative shocks.

While similar in spirit to the sticky expectations models of Carroll et al. (2020) and Auclert et al. (2020), our rational inattention model makes important departures from existing work. In both of these previous studies, households have sticky expectations with respect to aggregate conditions, but the degree of inattention is exogenously set and fixed for all idiosyncratic states. In our model, we offer a microfoundation where households endogenously select in which states of the world they pay more attention in. Additionally, in both earlier papers, households learn about the underlying state of the economy. As a result, in impulse response experiments, once a household updates its beliefs, it has perfect foresight for the remainder of the experiment. In contrast, we study households that are inattentive to the level of future inflation. As a result, even households that update early in the impulse response experiment can have out-of-date beliefs later on. We show that this is critical for generating the asymmetries and sluggishness of beliefs in our model.

Our model also differs from those in Weber et al. (2025), Pfäuti (2025b), and Pfäuti (2025a), as it explicitly endogenizes the extensive margin of updating inflation expectations. While this margin exists in standard rational inattention models, it does not depend on other endogenous variables in the model. Hence, our variant of rational inattention represents an alternative source of inflation persistence not previously mentioned in the literature on inflation expectations. In the attention threshold models, as in Pfäuti (2025a), the attention increases the precision of the signal and the extensive margin is governed by the time-invariant cost of information acquisition and processing. In our model, the probability of updating is fully endogenous and is a function of the distance of the prior expectations from the underlying state and the cost of information processing. Compared to Pfäuti (2025a), who presents "time-series evidence" of attention thresholds, we provide cross-sectional evidence that the observed heterogeneity in the distance of prior expectations from the signal results in different frequencies of updating. The implications for the dynamics of inflation are similar to those in Pfäuti (2025a), as we also find the "last half mile" effect after a surge in inflation. However, our paper provides an alternative mechanism behind this result.

Our paper is also related to several strands of the empirical literature. Cavallo et al. (2017), Weber et al. (2025), Pfajfar and Žakelj (2014), and Dräger et al. (2024) study the formation of inflation expectations in a high-inflation environment and how it compares with the formation of expectations in times of low inflation. In a high-inflation environment, consumers are more attentive to inflation developments (Cavallo et al., 2017) and the information effects of providing current inflation levels are smaller than in an environment with low inflation (Weber et al., 2025). Armantier et al. (2022a) point out that in the current inflation environment, there is substantial disagreement between households regarding the future course of inflation.[2] Dräger et al. (2024) study the updating of inflation expectations in a high-inflation environment using the RCT survey experiment where households are presented with different information about future inflation—numeric and narrative based; they argue that inflation forecasts can affect the whole term structure of inflation expectations, where the effects are smaller for longer-run expectations.[3] The fact that we have conducted these information treatments in a high-inflation environment with elevated inflation uncertainty and disagreement among experts (i.e., team transitory vs. team persistent) gives us an advantage, as it allows us to study, in a real-world environment, the effects of signals that have plausibly different uncertainty associated with them.

The paper builds on previous papers utilizing the RCT environment to test how households and firms form their inflation expectations. Coibion et al. (2022) test how different forms of communication affect expectations. They show that information about the current level of inflation reduces inflation expectations, making them more accurate. Coibion et al. (2020b) employ an information treatment that presents current inflation to firms participating in the survey. Not only do treated firms adjust their inflation expectations, they also make decisions that ultimately lead to higher firm profits. Using the RCT design, Coibion et al. (2023b) study the effect of different forms of forward guidance on several macroeconomic forecasts, while Haldane and McMahon (2018) use this design to test the relevance of the layered communications adopted at the Bank of England.[4] Coibion et al. (2021) analyze the effect of the variation in uncertainty on households spending and Kumar et al. (2022) study similar implications for firms' decisions.

More generally, we study the formation of inflation expectations. There is a growing literature using survey data to better understand and explain inflation expectation formation processes.[5] Different papers have shown that (inflation) expectations are inconsistent with full information rational expectations hypothesis (Coibion and Gorodnichenko, 2015a); that informational frictions are present when forming expectations (Coibion and Gorodnichenko, 2012); that households use different models to form expectations (Branch,

[2] In fact, they document that some households even have expectations of deflation.

[3] The paper by Andre et al. (2021) analyzes the inflation narratives that experts, households, and managers have in mind to explain the recent inflation surge. They find that experts view the reasons for the inflation surge very differently than households or managers.

[4] Hoffmann et al. (2022) implement information treatments to study the effects of a hypothetical move to flexible average inflation targeting on inflation expectations in Germany.

[5] For a recent literature review, see Coibion et al. (2020a).

2004, Pfajfar and Santoro, 2010); and that they rely on their lifetime inflation memories (Ehrmann and Tzamourani, 2012, Malmendier and Nagel, 2015), on recent shopping experiences (D'Acunto et al., 2021), and on gasoline prices (Coibion and Gorodnichenko, 2015b) when forming inflation expectations. Gennaioli et al. (2024) propose a model and provide empirical evidence that de-anchoring of inflation expectations might be driven by past experience, as current high-inflation episodes might trigger memory cues of past inflation spells. Furthermore, sociodemographic characteristics capture heterogeneity due to economic status and lifetime experiences (Ehrmann et al., 2017, Das et al., 2019).

The remainder of the paper is organized as follows: Section 2 presents a simple Bayesian updating model to derive testing hypotheses. Section 3 details the data we use and the survey experiment with US and German households, while Section 4 discusses our empirical results. Section 5 presents a model of updating expectations that explicitly takes into account the extensive margin and implements it in a consumption-savings model. Section 6 concludes.

2 A Simple Model of Expectation Updating

In this section we propose a simple Bayesian model of inflation expectation updating and derive some of its testable predictions.

Suppose a household's prior for future inflation is normally distributed about $\pi^e_{t|t-1}$ and with precision τ_0. It receives an inflation signal z_t that is normally distributed about true future inflation π_{t+1} with perceived variance $\tau_{z,t}$. The household updates its beliefs about the distribution of π_{t+1} after viewing z_t to the conjugate posterior

$$\pi_{t+1}|z_t \sim N\left(\frac{\pi^e_{t|t-1}\tau_0 + z_t\tau_{z,t}}{\tau_0 + \tau_{z,t}}, (\tau_0 + \tau_{z,t})^{-1}\right),$$

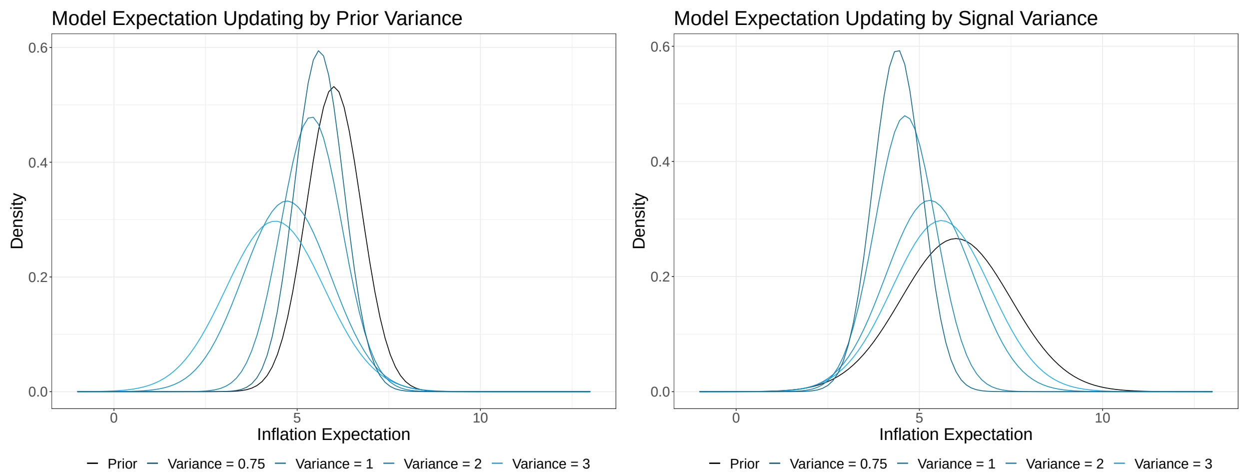
and sets its updated point estimate $\pi^e_{t|t}$ to the posterior mean

$$\pi^e_{t|t} = \frac{\tau_0}{\tau_0 + \tau_{z,t}}\pi^e_{t|t-1} + \frac{\tau_{z,t}}{\tau_0 + \tau_{z,t}}z_t. \tag{1}$$

Equation 1 is our proposed updating process. The household's posterior point estimate of inflation is a weighted average of its prior point estimate and the inflation signal, with weights depending on signal precision $\tau_{z,t}$ and prior precision τ_0^2.

What does this model predict about households' expectation updating processes? Beginning with the level effects of a household's prior, households with higher prior infla-

Figure 1: Posterior expectations by varying prior precision and by varying signal precision.



tion expectations should have higher posterior expectations. Subtracting $\pi^e_{t|t-1}$ from (1) and defining the expectation update $\Delta\pi^e_t = \pi^e_{t|t} - \pi^e_{t|t-1}$ reveals

$$\Delta\pi^e_t = \frac{\tau_{z,t}}{\tau_0 + \tau_{z,t}} \left(z_t - \pi^e_{t|t-1} \right) . \tag{2}$$

This tells us that the size of a household's update is proportional to the distance of the inflation signal from the household's prior expectation: $\Delta\pi^e_t$ is an increasing function of $z_t - \pi^e_{t|t-1}$. Furthermore, the change in beliefs is symmetric with respect to z_t being above or below $\pi^e_{t|t-1}$. That is, inflation news with the same distance above and below prior beliefs induces the same size of update. Lastly, $\Delta\pi^e_t > 0$ for all prior expectations and signals received: All observed updating behavior in the Bayesian model is through the intensive margin, not the extensive margin.

Next, consider the effects of prior and signal precision. With respect to prior uncertainty, (2) is decreasing in τ_0. Hence, agents with more certain priors update their expectations by less. With respect to signal uncertainty, (2) is increasing in $\tau_{z,t}$. Hence, the more precise the signal, the more the agent updates their beliefs. Figure 1 depicts the posterior distribution for varying levels of precision of the prior and signal.

Another implication of the Basyesian updating is that when the signal falls outside the support of the prior distribution, households will treat this signal as uninformative and will not update their expectations.

In summary, the Bayesian model of expectation updating has the following testable predictions: (i) higher prior expectations result in higher posterior expectations; (ii) the farther a signal is from the prior the larger the size of the update; (iii) expectation updating is symmetric for beliefs above and below the signal; (iv) no one will leave their beliefs completely unchanged; (v) the size of the update is smaller for lower signal precision and larger when prior uncertainty is higher; and lastly, (vi) if the signal falls outside the support of the prior distribution, the household will not update its expectations.

3 Randomized Controlled Trials

The data used in this paper come from two randomized controlled trials (RCTs) that were conducted in Germany and the US. Our US data were collected via an online survey conducted in December 2022 using the survey platform Pollfish. Pollfish sources respondents for our survey and guarantees a representative sample of the US population.[6]

The second dataset comes from an RCT that we implemented as part of the Bundesbank Online Panel Households (BOP-HH). It was fielded in July 2023 and is very similar to the one that was conducted using Pollfish.[7] The BOP-HH is a survey administered by the Bundesbank since 2019.

At the time of our RCT survey experiment in the US, inflation had already started to decline, but it remained elevated at 6.5 percent.[8] Short-run inflation expectations in our US survey were about 8 percent (median was 7 percent) as can be seen in Table1, slightly higher than the CPI at that time. In the quarters after the experiment, inflation continued to decline in the US, so that, on average, the one-year-ahead inflation expectations in December 2022 proved to be too pessimistic, since the realized value for total CPI in December 2023 was 3.4 percent. The mean inflation projection was similar in the German and US samples. However, in contrast to the timing of the Pollfish survey—inflation in the US was close to peak values—the survey in Germany was fielded when inflation rates were already on a downward trajectory.

The setup of our RCTs is as follows. First, we elicit 12-months-ahead inflation expectations. Following that, we provide each respondent with an information treatment, and afterwards, we ask the respondent if they want to adjust their previously voiced inflation expectations. To make sure that we avoid any potential effect from a memory lapse, we provide the respondent's prior inflation expectation on the screen. In terms of controls, we have a large array of socioeconomic characteristics and added questions to elicit con-

[6]Pollfish promises to tackle data quality issues related to respondents, such as panel fatigue, unconscious bias, bots, or professional survey-takers. Table A.1 in Appendix A contains summary statistics of respondents' demographics by treatment arm for this survey. The information presented in this table demonstrates that there is no statistical difference in terms of demographics between treatment arms.

[7]We were able to place our own questions as an additional module in the Bundesbank survey.

[8]See Figure A.1 in Appendix A for the evolution of the inflation rate in the US together with short-run inflation expectations from the University of Michigan Survey of Consumers and a comparison with our RCT fielded in the US.

fidence in the voiced expectations and news exposure. The full list of questions included in the survey is available in Appendix C. The full set of questions for wave 43 (July 2023) of the BOP-HH survey is available online and an excerpt of questions used for our study is provided in Appendix D.

Our inflation expectations question reads as follows:

> **Q2:** What do you expect the rate of inflation to be over the next 12 months (in percent)?

The wording is motivated by existing surveys such as the New York Fed's Survey of Consumer Expectations. We also ask a follow-up question to asses how certain respondents were about their expectations.

Respondents are then randomly assigned to five treatment arms. We provide respondents with a professional forecast (but no information about the quality of the mean estimate), the mean professional forecast with a small band (low variance/high precision) and the mean professional forecast with large band (high variance/low precision). Lastly, we include a placebo treatment with irrelevant information. In the US we used the Survey of Professional Forecasters (SPF) for the source of inflation forecasts, while for Germany we used a Bloomberg survey of professional forecasters. The advantage of using these professional forecasts as our inflation news source is that it eliminates the possibility that differences in news sources across treatments drive our results. If we had instead chosen inflation reports from two different newspapers, there would be a risk that the reputations of the papers could cause people to either heavily discount or heavily weight the information regardless of its information content. The panel dimension of the SPF and the Bloomberg surveys allows us to construct the "mean only," "large band," and "small band" news treatments from the same source, thereby preventing any differences in source credibility from affecting our results. The "large band" treatment should reflect a lower perceived precision of the signal/forecasts in comparison to the "small band" treatment.

In the following we present the questionnaire used in the December 2022 survey of US consumers; BOP-HH questions are identical but contain forecasts for Germany. First, we remind all respondents of their prior inflation expectations:

> Your previous inflation expectation was [insert answer from **Q2**] percent.

In the first treatment arm, referred to as the "Baseline" treatment, we provide respondents with no additional information and ask:

> **Q5 [Treatment 1]:** Would you like to adjust your expectations? Note: if you do not wish to adjust your expectations please fill in the same figure in the box below.

In the second treatment arm, referred to as the "mean only" treatment, we provide respondents with information regarding the mean CPI inflation forecast from the November 2022 SPF:

> **Q5 [Treatment 2]:** Would you like to adjust your expectations based on the following information?
>
> *According to a mean response in the Survey of Professional Forecasters, inflation over the next 12 months will be 3.7 percent.*

In the third treatment arm, referred to as the "large band" treatment, we provide respondents with both the mean CPI inflation forecast forecast and the range of individual responses from the SPF:

> **Q5 [Treatment 3]:** Would you like to adjust your expectations based on the following information?
>
> *According to a mean response in the Survey of Professional Forecasters, inflation over the next 12 months will be 3.7 percent, where the range of responses was between 1.7 percent and 7.1 percent.*

In the fourth treatment arm, referred to as the "small band" treatment, we provide respondents with both the mean CPI inflation forecast and the range of the central 60 percent of individual responses from the SPF:

> **Q5 [Treatment 4]:** Would you like to adjust your expectations based on the following information?
>
> *According to a mean response in the Survey of Professional Forecasters, inflation over the next 12 months will be 3.7 percent, where most responses fell between 2.9 percent and 4.8 percent.*

Finally, in the fifth "placebo" treatment arm, we provide respondents with a backward-looking statement about US population growth that is not relevant for forming inflation expectations:

> **Q5 [Treatment 5]:** Would you like to adjust your expectations based on the following information?
>
> *The US population grew 1.2 percent over the last three years.*

In comparison to the US, the inflation forecast for Germany was 3.9 percent, the "small band" signal ranged between 3.3 and 4.6 percent and the "large band" signal spanned from 1.7 to 5.3 percent. The difference in the range between the "small band" and the "large band" is substantially smaller for Germany, which may lead, together with a different inflation environment and a higher degree of media coverage about inflation, to less pronounced differences across treatments in the BOP-HH data than in the Pollfish US data.

There are two design choices of ours worth justifying. First, we choose to focus on point inflation expectations rather than distributional inflation expectations. Existing studies, rather than explicitly asking for updated expectations, ask a follow-up question about the distribution of respondents' expectations. They then infer participants' revised expectations from moments of their reported distributions. Second, we explicitly ask whether respondents want to update their inflation expectations after the participants are treated, stating their prior inflation expectations. Similar to Dräger et al. (2024), our paper is concerned with the conscious process of expectation updating; therefore, we directly ask respondents for revised point forecasts.

4 RCT Results

4.1 Summary Statistics

Table 1 shows summary statistics for prior and posterior inflation expectations across treatment arms fielded in December 2022 for the US and in July 2023 for Germany. The mean prior inflation expectations in our sample is 7.98 percent (the median 7 percent) for the US and 5.72 percent for Germany (the median 6 percent). These means show little variation across treatment arms. The realized inflation (total CPI) in the US was 3.4 percent in December 2022 and 2.6 percent in Germany in July 2023. However, if we compare posterior inflation expectations we see substantial variation across treatment arms, indicating an effect of the information treatments. We observe that in the "baseline" treatment, posterior inflation expectations remain almost identical to the prior inflation expectations in both surveys, while all other treatments seem to affect the level of posterior inflation expectations substantially. Specifically, we can document lower posterior inflation expectations for the "small band" treatment compared to the "large band" treatment. These results seem very plausible and in line with our model, as we see that respondents react more to signals that have higher precision and react less to signals with lower precision (or no and irrelevant information, respectively). Furthermore, we can see that the variance of posterior expectations is lower in the "small band" treatment compared to the "large band" treatment. When looking at the share of people who adjust their expectations, we find that respondents find the "mean only," "large," and "small band" treatments informative relative to the "baseline" and "placebo" treatments. We can see that the share is higher for “small band” treatments: 0.62 in the US and 0.77 in Germany and lower for the “large band” treatments in both surveys. In the “baseline” treatments substantially fewer people revised their expectations.[9]

Table 1: Summary Statistics by Treatment.

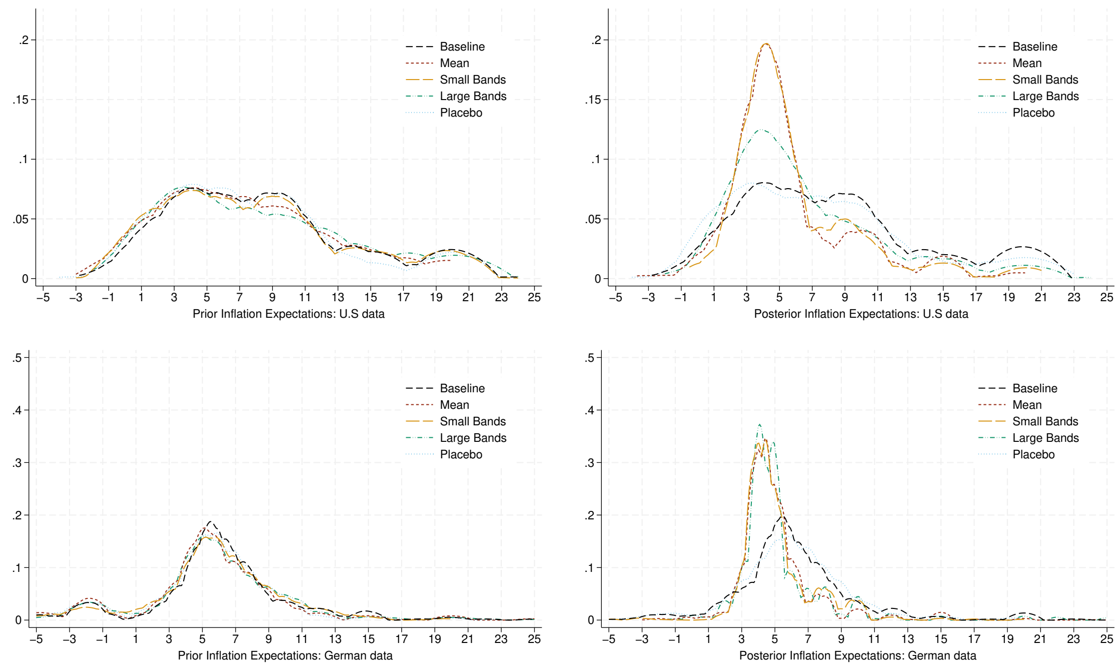
	US: December 2022			Germany: July 2023		
	$\pi^e_{i,prior}$	$\pi^e_{i,posterior}$	Frac. revised	$\pi^e_{i,prior}$	$\pi^e_{i,posterior}$	Frac. revised
Baseline						
Mean	8.28	8.21	0.24	6.09	6.26	0.38
Median	8.00	8.00		6.00	6.00	
Std. Dev.	5.61	5.61		4.22	3.73	
Mean Only						
Mean	7.61	5.55	0.63	5.43	5.11	0.70
Median	6.70	5.00		5.00	4.90	
Std. Dev.	5.40	3.77		4.36	2.48	
Large Band						
Mean	8.31	6.55	0.45	5.87	5.28	0.70
Median	7.50	5.00		6.00	4.80	
Std. Dev.	5.85	4.73		4.25	2.84	
Small Band						
Mean	7.98	5.84	0.62	5.69	5.11	0.77
Median	8.00	5.00		6.00	4.60	
Std. Dev.	5.66	3.84		3.90	2.21	
Placebo						
Mean	7.69	7.38	0.32	5.52	6.13	0.39
Median	7.00	6.00		6.00	6.00	
Std. Dev.	5.45	5.45		3.81	3.38	
Total						
Mean	7.98	6.70	0.45	5.72	5.57	0.59
Median	7.00	5.00		6.00	5.00	
Std. Dev.	5.60	4.83		4.12	3.01	

Notes: Pollfish data for the US, fielded in December 2022 and Bundesbank Online Panel Households (BOP-HH), July 2023 wave. All inflation expectations are truncated to lie in the range between -5 percent and +25 percent.

Table 1 provides the first evidence that signal uncertainty matters for households' inflation expectations. However, looking at means only might not capture the whole dynamic across all respondents. For this purpose we plot kernel densities for all treatment arms for both prior and posterior expectations (see Figure 2). Looking at the upper-left panel depicting the complete distribution of prior inflation expectations across treatments arms, we can clearly confirm that we observe no differences not only for the mean but also for the complete distribution. Hence, there is no hidden sample heterogeneity across the different treatment sub-samples. The picture changes substantially if we consider the

[9]The slightly higher updating share may be country specific, may be a product of different informedness about inflation across these countries, or may be due to a slight change in the wording of this question due to requirements of the Bundesbank. See details in the appendix.

Figure 2: Kernel Densities of Prior and Posterior Expectations for Each Treatment Arm.



Notes: Pollfish data for the US, fielded in December 2022 (upper panels) and Bundesbank Online Panel Households (BOP-HH), July 2023 wave (lower panels). Kernel densities plotted. The left panels show the distribution of prior inflation expectations for all respondents, while the right panels show the posterior expectations for each treatment arm. Densities use population weights.

upper-right panel. We clearly observe that some treatments have a substantial impact on the posterior densities. Again the "mean only" and the "small band" treatments seem to affect the distribution of inflation expectations substantially. Instead, the distributions of the "baseline" and the "placebo" treatments remain visually indistinguishable from the prior expectations densities.[10] This visualization nicely shows that low perceived signal uncertainty ("small band" treatment) leads to a much tighter distribution and lower variance of posterior expectations compared to the "large band" treatment. For the German data a similar picture emerges. The prior expectations are indistinguishable across treatment arms and become different after information treatment. Here we also see that there is a substantial difference between the "baseline" and "placebo" treatment against all informative treatments.

[10]Kolmogorov-Smirnov tests reveal that the posterior distributions of the "mean only," "small band," and "large band" treatments are significantly different from the "baseline" posterior distribution at the 1 percent level, while the difference between the "placebo" and "baseline" posterior distributions is not significant at the 10 percent level.

4.2 Regression Analysis

We now evaluate the treatment effects on inflation expectations in a regression model. In the literature on survey experiments, it is common to assume that agents behave in a Bayesian way (see Coibion et al., 2018 or Armantier et al., 2016), where agents form beliefs as a weighted average of the prior, $\pi^e_{i,prior}$, and the signal, $\pi^e_{i,info}$:

$$\pi^e_{i,post} = a_1 \cdot \pi^e_{i,prior} + (1 - a_1) \cdot \pi^e_{i,info}, \tag{3}$$

where $\pi^e_{i,post}$ denotes participant i's posterior inflation expectation after the treatment. This is precisely the posterior inflation expectation we derived in equation (1). Hence, the model predicts a_1 to be larger (and $1 - a_1$ to be smaller) for signals with lower perceived precision and for respondents with more certain prior expectations.

Following Coibion et al. (2022) and Coibion et al. (2023a), we use the following specification for all margins (overall, extensive, and intensive) where we estimate the effect of each treatment controlling for prior inflation expectations:

$$\pi^e_{i,post} = \alpha_0 + \alpha_1 \pi^e_{i,prior} + \beta_1 T_i + \beta_2 T_i \times \pi^e_{i,prior} + \gamma' X^c_i + u_i, \tag{4}$$

where X^c_i is a vector of age, gender, and income indicator variables, T_i is a vector of treatment dummies, and u_i is an i.i.d. error term. The regression models are estimated using population and Huber (1964) weights.[11] In the literature, the results from the specification in equation (4) are often interpreted under the assumption that the restriction on coefficients holds ($a_1 = \alpha_1$), as in equation (3).[12]

Table 2 contains the main results and shows the estimated average treatment effects on posterior inflation expectations (overall) as well as on the intensive and the extensive margin. For each specification we show the resulting average impact of the treatment and the treatment effects dissected into the intercept and slope component following the intuition in equation (3).[13] Columns (1)–(6) report results for the U.S. RCT, while columns (7)–(12) report the results for the RCT in Germany.

Starting with the overall effect and looking at column (1), we find that respondents in "mean only," "large band," and "small band" treatments, on average, significantly adjust their expectations downwards after being treated. This adjustment is lower in the "large

[11] We truncate the sample to include those with prior expectations between -5 and 25. Note that for the extensive margin is not practical to use Huber (1964) weights when there is a high share of updating—Huber (1964) weights can drop all observations that do not adjust as outliers.

[12] We also provide results for the alternative specification without interaction terms, i.e. $\pi^e_{i,post} = \alpha_0 + \alpha_1 \pi^e_{i,prior} + \beta_1 T_i + \gamma' X^c_i + u_i$.

[13] The results are very similar in models with and without demographic controls. Results without demographic controls are not reported.

Table 2: Main Results: Overall, Extensive, and Intensive Margins

	US (December 2022)						Germany (July 2023)					
	Overall		Extensive		Intensive		Overall		Extensive		Intensive	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
π^e_{prior}	0.7299***	0.9846***	-0.0012	-0.0170***	0.2149***	0.4559***	0.7457***	0.9337***	-0.0033	-0.0074	0.2292***	0.5205***
	(0.0159)	(0.0063)	(0.0024)	(0.0052)	(0.0139)	(0.0701)	(0.0089)	(0.0148)	(0.0034)	(0.0089)	(0.0085)	(0.0204)
Mean Only	-1.8307***	1.1757***	0.3845***	0.2119***	0.1968	1.2801***	-0.6348***	2.0619***	0.3432***	0.3159***	-1.0817***	0.7423***
	(0.1823)	(0.1878)	(0.0448)	(0.0815)	(0.2765)	(0.4029)	(0.0419)	(0.1863)	(0.0362)	(0.0714)	(0.0914)	(0.2745)
Large Band	-1.2101***	0.1210	0.2085***	-0.0002	0.2030	1.8714***	-0.6048***	2.4972***	0.3317***	0.2350***	-1.1260***	0.8577***
	(0.1796)	(0.1192)	(0.0440)	(0.0797)	(0.2984)	(0.4306)	(0.0416)	(0.1612)	(0.0363)	(0.0742)	(0.0929)	(0.1846)
Small Band	-1.6819***	1.7791***	0.3832***	0.1917**	0.3671	1.6181***	-0.7638***	2.7537***	0.4152***	0.3735***	-1.1628***	0.8045***
	(0.1883)	(0.2227)	(0.0449)	(0.0803)	(0.2734)	(0.3984)	(0.0428)	(0.1358)	(0.0329)	(0.0637)	(0.0910)	(0.1742)
Placebo	-0.3457**	-0.1745*	0.0939**	0.0279	-0.7907**	-0.4253	0.0230	0.2220	0.0020	0.0779	-0.0006	-0.3265
	(0.1645)	(0.1028)	(0.0434)	(0.0796)	(0.3309)	(0.4629)	(0.0401)	(0.1524)	(0.0386)	(0.0809)	(0.1233)	(0.2435)
Mean Only $\times \pi^e_{prior}$		-0.3659***		0.0213***		-0.2456***		-0.5229***		0.0050		-0.3081***
		(0.0367)		(0.0076)		(0.0740)		(0.0327)		(0.0114)		(0.0440)
L. Band $\times \pi^e_{prior}$		-0.0324**		0.0252***		-0.3296***		-0.6102***		0.0178		-0.3428***
		(0.0139)		(0.0073)		(0.0748)		(0.0313)		(0.0114)		(0.0278)
Sm. Band $\times \pi^e_{prior}$		-0.4827***		0.0235***		-0.2681***		-0.6728***		0.0076		-0.3537***
		(0.0423)		(0.0075)		(0.0740)		(0.0270)		(0.0104)		(0.0283)
Placebo $\times \pi^e_{prior}$		0.0082		0.0074		0.0647		-0.0391		-0.0140		0.0482
		(0.0096)		(0.0075)		(0.0849)		(0.0248)		(0.0131)		(0.0361)
Constant	2.3644***	0.1577	0.1152	0.2306*	1.4535	1.0651	0.8508***	0.1336	0.5693***	0.5763***	0.1849	2.2880***
	(0.6030)	(0.2304)	(0.1181)	(0.1264)	(0.9189)	(0.9595)	(0.1434)	(0.1906)	(0.0861)	(0.0939)	(0.6539)	(0.1947)
N	1605	1467	1609	1609	727	733	2871	2909	3092	3092	1578	1583
R^2	0.720	0.935	0.124	0.137	0.364	0.414	0.828	0.834	0.147	0.151	0.515	0.604
Mean Only = L. Band	0.002	0.000	0.000	0.007	0.974	0.057	0.502	0.042	0.752	0.246	0.411	0.661
Sm. Band = L.Band	0.023	0.000	0.000	0.013	0.384	0.399	0.001	0.131	0.011	0.025	0.501	0.721
Mean Only = L. Band (int)		0.000		0.614		0.027		0.030		0.205		0.427
Sm. Band = L. Band (int)		0.000		0.817		0.090		0.077		0.257		0.685

Notes: Pollfish data for the US, fielded in December 2022 and Bundesbank Online Panel Households (BOP-HH), July 2023 wave. Inflation expectations prior to and post treatment are truncated to lie in the range $-5 \leq \pi^e \leq 25$. In the BOP-HH data, since we have information on prior uncertainty, we restrict the sample to those who at least in the "large band" treatment, would fall within the support of the prior distribution. All regressions use population and Huber (1964) adjusted weights, except for the extensive margin results, and show heteroscedasticity-robust standard errors in parentheses. Demographic control variables include gender, age, and income groups. *** p<0.01, ** p<0.05, * p<0.1

band" treatment than in the "mean only" and "small band" treatments implying—in accordance with our model—that the strength of the signal matters for the process of updating inflation expectations. As can be seen at the bottom of Table2, these differences are significant at the 5 percent level for the "mean only" treatment and the "small band" treatment. In these three treatments posterior inflation expectations are, on average, revised downward in response to the information about the SPF forecasters. The information effect of the "placebo" treatment relative to the "baseline" treatment is small and statistically significant only at the 5 percent significance level. In column (2) of this table we further study whether the information treatment effects come from a lower reliance on priors when treated with the information. Our results imply that the majority of the effect comes from the lower reliance on priors. Again, we observe that the "large band" treatment leads to larger reliance on priors in comparison with the "mean only" and "small band" treatments. Hence, we can document, for the first time, that consumers are able to discriminate between high- and low-precision signals, as they respond more strongly to the "small band" information treatment relative to the "large band" treatment. This difference is not only quantitatively different, but also significantly different as shown by the t-tests on those coefficient estimates. Another interesting observation appears. We observe only a minor difference between the "mean only" treatment and the "small band" treatment. This may indicate that, although we do not explicitly state it, the mean forecast is perceived as uncertain and consumers automatically account for this uncertainty of the mean forecast leading to an adjustments of expectations that are not statistically different from each other.

As the results discussed in columns (1) and (2) are a combination of the extensive and intensive margins, we further study these margins in the columns (3)–(4) ("Extensive") and (5)–(6) ("Intensive"). Looking at the results of the extensive margin in columns (3)–(4) we see that they it mirror the observations from the overall estimation. Generally speaking, all our information treatments increase the probability that respondents will adjust their expectations. Again, being treated by the "mean only" or the "small band" leads to the strongest adjustment in the probability that expectations will be adjusted followed by the "large band" treatment relative to the "baseline" treatment. The "placebo" treatment is only statistically significant in the aggregate specification. These results confirm the initial results in the summary statistics in Table1 showing that there are differences in the frequency of updating expectations across treatments. On average, those with higher priors update expectations slightly less frequently, but the results are similar across the three treatments with relevant information.

In the next two columns we show the results for the intensive margin, i.e., by how much the participants update their prior inflation expectations after they have been treated given that they have decided to update. In contrast to our previous results, we see only small differences in the size of the coefficient estimates across treatment arms for the intensive margin. For the specification in column (5) no treatment dummy (except the placebo) is statistically different from the baseline. Results in column (6) suggest that the reliance on priors is very small in all our treatments where we provide a relevant inflation outlook. If anything, the reliance on priors in the intensive margin may be a bit lower in the "large band" treatment than in the "small band" treatment, suggesting the opposite results for the intensive margin compared to the overall margin. These results imply that the main difference between the "large band" treatment and the "small band" treatment (or the "mean only" treatment), on average, mostly comes from the extensive margin. Thus, the variation is driven by the decision to update expectations but not the size of the adjustment, which is very similar across treatments. In fact, in Table1 we can see that the frequency of updates is about 60 percent for the "mean only" and "small band" treatments, while the frequency for the "large band" treatment is only 46 percent.

Columns (7)–(12) in Table2 show the estimation results based on the specification in equation 3 for the German data fielded in July 2023. Overall, we can confirm our previous results. There is clear evidence that "small band" and "large band" treatments have different effects as shown by the tests in the bottom part of the table. Overall, the information treatments are more effective in Germany, as the overall reliance on priors for the three informative treatments is lower compared to in the US Furthermore, we can reconfirm that this difference is mainly driven by the extensive margin, hence, the decision to adjust expectations, as can be seen in the summary statistics table where the updating frequency is higher for the "small band" treatments (see Table1). The results for the intensive margin do not yield any statistically significant differences across the three informative treatments.

Figure A.2 in Appendix A reports binscatter plots, which are a visualization of our empirical estimates for the overall effect and the intensive margin (columns 2 and 6 and 8 and 12, respectively) as presented in Table 2. These figures give us information to check whether outliers are driving the results or to study the heterogeneity of responses. The results show that no outliers or particular parts of the distribution drive the results. As in table 2 we clearly see the results for both the US data and the German data, supporting the econometric results that the observed heterogeneity across treatments is driven by the probability that expectations will be updated and not by the size of the update. We further study potential nonlinearities below.

We also employ an additional robustness test to show that consumers are using the additional information on the bands and not just the mean forecast. To secure the validity of our main results, we explicitly asked respondents whether they incorporated the information in the provision experiments. These answers allow us to filter out respondents who did not incorporate this information, although it was provided. We utilize the question that asked them if they considered bands in updating their inflation expectations.[14] Results are reported in TableA.2 in Appendix A, where the reference treatment is "small bands" as the other treatments (e.g., "mean only") provide no information about bands. Looking at the coefficient estimate of the dummy variable "Considered Band", which identifies respondents who stated that they incorporated this information on the bands into their posterior forecast, we can immediately see from the "overall" effect in column (1) that those respondents adjusted expectations more strongly. Additionally, we see from the "extensive" column (2) that these respondents have a significantly higher probability of updating their expectations. Hence, this is direct evidence that respondents actively use this information. Those who report using this information respond more on average to the signal and have a higher probability of updating their expectations compared to those who leave this information aside.[15]

4.3 Prior Reported Uncertainty

From the simple model we know that prior uncertainty should matter for the updating behavior. To measure prior uncertainty in the US survey, we ask respondents how certain they are about their prior prediction for inflation, and in the German survey, they are explicitly asked about their prior distribution with a standard question where they provide a probability for each "bin" of the distribution. We then split them into two sub-samples based on whether their reported prior uncertainty is below/above the median prior uncertainty. As outlined above, we would expect that those who have stronger priors—and thus lower uncertainty regarding their forecast of inflation—will update less after we provided them with information treatments.

Table 3 provides the results where we split the sample between those who reported high prior uncertainty and those who reported low prior uncertainty. We would expect, in line with the theory on Bayesian updating, that respondents with high prior uncertainty

[14] As described in Q6 in the Appendix C and question Q5 in Appendix D.

[15] The results in the main part of the paper consider those households for which the signal falls within the support of prior expectations. For the US data this is approximated with the truncation, while for the German data—where we have information on the prior distribution—we can check whether the prior distribution overlaps with the signal range. As a reminder, Bayesian updating implies that updating occurs only when the signal falls within the support of the prior expectations. In TableA.5 in Appendix A we report results for those respondents who were excluded from the regression in Table2. We see that for these respondents—who generally have priors that are farther away from the signal—there are also significant treatment effects. However, especially in the US data where there are more respondents with high prior inflation expectations, the effects of the "large band" treatment are larger than those for the "small band" treatment. One possible explanation is that these respondents can more easily "familiarize" with signals with higher uncertainty.

Table 3: Treatment Effects: Prior Uncertainty

	US (December 2022)						Germany (July 2023)					
	High Prior Uncertainty			Low Prior Uncertainty			High Prior Uncertainty			Low Prior Uncertainty		
	Overall	Extensive	Intensive	Overall	Extensive	Intensive	Overall	Extensive	Intensive	Overall	Extensive	Intensive
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
π^e_{prior}	0.9601***	-0.0093	0.7194***	0.9843***	-0.0157***	0.7161***	0.9483***	0.0075	0.4695***	0.8867***	-0.0428***	0.5770***
	(0.0194)	(0.0059)	(0.1238)	(0.0093)	(0.0051)	(0.1229)	(0.0162)	(0.0103)	(0.0272)	(0.0307)	(0.0131)	(0.0386)
Mean Only	1.7421***	0.2951***	0.6965	0.7761***	0.3608***	1.5939**	2.6563***	0.5000***	0.4661	1.9834***	0.0278	0.6651**
	(0.2973)	(0.0964)	(1.1178)	(0.2608)	(0.0912)	(0.6926)	(0.4089)	(0.0821)	(0.3490)	(0.2392)	(0.1262)	(0.2621)
Large Band	0.2589	0.2057**	1.9050	0.1988	-0.0223	2.2440***	2.8452***	0.4201***	0.5025**	2.1402***	-0.0678	0.7560**
	(0.2989)	(0.0913)	(1.4071)	(0.1833)	(0.0978)	(0.7369)	(0.2040)	(0.0853)	(0.2472)	(0.2920)	(0.1368)	(0.3048)
Small Band	2.1883***	0.4480***	0.9108	1.7293***	0.1622*	2.0858***	2.8319***	0.4914***	0.5732**	2.5252***	0.1805**	0.9519***
	(0.3280)	(0.0900)	(1.1466)	(0.2508)	(0.0929)	(0.6503)	(0.1874)	(0.0813)	(0.2671)	(0.2193)	(0.0901)	(0.2463)
Placebo	0.1761	0.1777*	1.5034	-0.2717*	0.0251	-0.2349	0.3879**	0.2070**	-0.1371	-0.0015	-0.1088	-0.8764***
	(0.2807)	(0.0926)	(1.3903)	(0.1429)	(0.0863)	(0.9670)	(0.1952)	(0.0997)	(0.3192)	(0.2697)	(0.1259)	(0.3243)
Mean Only $\times \pi^e_{prior}$	-0.5728***	0.0235**	-0.4888***	-0.2662***	0.0135	-0.4626***	-0.6151***	-0.0124	-0.2708***	-0.5361***	0.0371*	-0.3301***
	(0.0519)	(0.0095)	(0.1329)	(0.0454)	(0.0082)	(0.1309)	(0.0672)	(0.0124)	(0.0524)	(0.0432)	(0.0225)	(0.0455)
L. Band $\times \pi^e_{prior}$	-0.1080***	0.0117	-0.6523***	-0.0330	0.0309***	-0.4957***	-0.6694***	0.0014	-0.3072***	-0.5405***	0.0502**	-0.3203***
	(0.0405)	(0.0085)	(0.1404)	(0.0228)	(0.0091)	(0.1384)	(0.0378)	(0.0123)	(0.0344)	(0.0533)	(0.0232)	(0.0534)
Sm. Band $\times \pi^e_{prior}$	-0.5650***	0.0095	-0.5187***	-0.4783***	0.0315***	-0.4891***	-0.6841***	-0.0050	-0.3360***	-0.6279***	0.0319**	-0.3761***
	(0.0601)	(0.0095)	(0.1418)	(0.0382)	(0.0081)	(0.1320)	(0.0364)	(0.0123)	(0.0398)	(0.0405)	(0.0158)	(0.0439)
Placebo $\times \pi^e_{prior}$	-0.0427	0.0023	-0.3259**	0.0172	0.0050	-0.0705	-0.0570*	-0.0265*	0.0385	-0.0026	0.0074	0.1030*
	(0.0351)	(0.0098)	(0.1579)	(0.0129)	(0.0079)	(0.1980)	(0.0305)	(0.0152)	(0.0455)	(0.0452)	(0.0217)	(0.0529)
Constant	0.6891	0.0289	3.8600*	0.0913	0.1084	7.3597***	-0.0318	0.3703***	2.5554***	0.4840*	0.8800***	2.8414***
	(0.6635)	(0.1458)	(2.2370)	(0.2263)	(0.1144)	(1.0081)	(0.2257)	(0.1176)	(0.2516)	(0.2833)	(0.1406)	(0.4064)
N	703	717	353	820	892	406	1741	1848	980	1178	1244	602
R^2	0.830	0.212	0.302	0.935	0.229	0.386	0.820	0.192	0.589	0.816	0.117	0.660

Notes: Pollfish data for the US, fielded in December 2022 and Bundesbank Online Panel Households (BOP-HH), July 2023 wave. Two sub-samples are split based on whether reported prior uncertainty is below/above the median prior uncertainty. The extensive margin measures the likelihood of an update in posterior expectations. The intensive margin measures posterior expectations given that an update in expectations occurred after treatment. Inflation expectations prior to and post treatment are truncated to lie in the range $-5 \leq \pi^e \leq 25$. In the BOP-HH data, since we have information on prior uncertainty, we restrict the sample to those who, at least in the "large band" treatment, would fall within the support of the prior distribution. All regressions use population weights and show heteroscedasticity-robust standard errors in parentheses. Huber (1964) robust regressions endogenously account for outliers, except for the extensive margin results where population weights are used. Demographic control variables include gender, age, and income groups. *** p<0.01, ** p<0.05, * p<0.1

should respond more to the information treatments than respondents with lower prior uncertainty. To start with, we observe that the main results continue to remain valid for both sub-samples: Respondents respond less to the signal with the "large band" compared to the "small band" signal. However, while qualitatively similar, there are sizable differences in the coefficient estimates across the two sub-samples. Households who reported lower prior uncertainty rely more on their priors and update less with respect to the signal they received compared to households with higher prior uncertainty. The weight on the prior for the "mean only," "large band," and "small band" treatments is notably smaller for households with a high prior uncertainty. Households tend to put especially high weight on the signal if they are highly uncertain about the prior and they receive a signal with higher precision, in line with what Bayesian updating would suggest. In contrast, when households have high certainty about their prior, they update very little, if at all, when they receive a signal in a "large band" treatment (lower precision). These results hold for the US data and also for the German data, although the difference between the "small band" and the "large band"treatment is smaller for Germany; see the interaction terms in column (1) in comparison to column (4) for the US and columns (7) and (10) for Germany.

To further explore the differences between those who report higher and lower uncertainty about their prior expectations, we investigate the extensive and intensive margins separately. To facilitate this analysis, we first look at the aggregate treatments effects presented in TableA.3 in Appendix A. The high prior uncertainty group has a higher propensity to update their expectations and the differences across treatments are statistically significant (see columns (2) and (5) for the US and (8) and (11) for Germany). This observation holds, both for the US (except for the "mean only" treatment) and for Germany. For Germany the differences between high and low prior uncertainty seem even more pronounced. Once the respondents decide to update their expectations, the results for the intensive margin in both samples suggest relatively small and mostly not significant differences across the three information treatments, as can be seen in both Tables 3 and A.3. For Germany, the intensive margin results are not significantly different from each other, but are substantially lower for the respondents with low prior uncertainty. Particularly, they react less to the "large band" signal in comparison to the "small band" treatment, which is in line with our expectations as their prior uncertainty is lower. Hence, we are able to provide evidence that prior uncertainty matters for the updating process. Higher prior uncertainty implies a higher propensity to update to any signal provided. However, as in our results in Table2, the quality of the signal matters: We observe heterogeneity across the propensity to update that is statistically significant, while the heterogeneity in the intensive margin is either not significant at all or not statistically different from each other.

4.4 The Effect of Hearing Inflation News on Updating Expectations

We also study the role of news for the expectation formation mechanism by examining any differences between those consumers who reported hearing news about inflation recently and those who reported that they had not come across any news about inflation. Our prior would be that those that had come across news may respond less to the information treatments we provide, as their information set is more up to date than the information set of those who have not heard any news about inflation recently (Weber et al., 2025).

Results for all three margins are reported in Table4.[16] The results for those who report hearing news about inflation are very similar to our overall results: The reliance on priors is very high in the "large band" treatment and considerably smaller in the "small band" treatment. When households are exposed to the "small band" treatment, both those who report hearing news and those who report hearing no news have a similar reliance on the prior. However, those who report hearing no news about inflation update their prior in a similar way when receiving "large band" treatments compared to those receiving "small band" treatment, in stark contrast to those who report hearing news. In fact, households that report hearing news about inflation update their expectations very little when exposed to the "large band" treatment; the weight on the prior is almost 50 percentage points lower than in the "small band" treatment. These results are qualitatively similar for both US and German data. For the extensive margin we can also rely on the aggregate effects reported in TableA.4 in Appendix A. We can clearly observe, comparing the treatment effects in column (1) against those in column (4), that respondents hearing no news react much more strongly to our treatments than those who reported hearing news. The same effect is observable for the German data, comparing columns (7) and (10). This complements the results from Table4 discussed above. The probability of updating based on the treatment information is smaller for respondents who heard news recently compared to those who have reported not hearing news. This result seems reasonable, as the fromer group has been informed recently and should be less inclined to incorporate additional news, or any additional news does not add much insight. Furthermore, for both groups we observe that the variation in adjustment is mainly driven by the extensive margin and not the intensive margin. This effect is dominant for those who report hearing no news, as the coefficients for the intensive margin are mostly statistically insignificant (see columns 6 and 12), but also for those who report hearing news, because the difference between the "large band" and the "small band" treatments is not statistically significant

[16] Note that in the US 75 percent of respondents report hearing news about inflation, consistent with our expectations, since inflation was high in December 2022. In Germany, this share is even higher: 91 percent of respondents report hearing news about inflation.

Table 4: Treatment Effects: News

	US (December 2022)						Germany (July 2023)					
	reported hearing news			reported hearing no news			reported hearing news			reported hearing no news		
	Overall	Extensive	Intensive	Overall	Extensive	Intensive	Overall	Extensive	Intensive	Overall	Extensive	Intensive
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
π^e_{prior}	0.9672***	-0.0143***	0.4896***	0.9725***	-0.0088**	0.2850	0.9213***	-0.0124	0.5185***	0.9832***	-0.0015	0.3967***
	(0.0122)	(0.0055)	(0.0710)	(0.0190)	(0.0043)	(0.2027)	(0.0160)	(0.0086)	(0.0208)	(0.0385)	(0.0029)	(0.0870)
Mean Only	1.6885***	0.3534***	1.6213***	1.1635***	0.2282**	-0.3137	2.0704***	0.3986***	0.7362**	1.8318***	0.9832***	-1.9292***
	(0.2354)	(0.0809)	(0.3818)	(0.3761)	(0.1022)	(0.9417)	(0.1922)	(0.0647)	(0.3280)	(0.3911)	(0.0254)	(0.6359)
Large Band	0.1667	-0.0274	2.8474***	2.0916***	0.4782***	-0.6082	2.4114***	0.3379***	0.8378***	3.1389***	0.9600***	-1.6317***
	(0.1918)	(0.0810)	(0.4783)	(0.3627)	(0.1089)	(0.8525)	(0.1707)	(0.0646)	(0.1963)	(0.4324)	(0.0352)	(0.6110)
Small Band	2.1567***	0.2616***	2.0774***	1.7154***	0.3836***	-0.2368	2.7424***	0.4398***	0.8235***	2.2025***	0.9295***	-2.7332***
	(0.2528)	(0.0821)	(0.3841)	(0.3727)	(0.1108)	(0.9115)	(0.1486)	(0.0592)	(0.1768)	(0.3916)	(0.0617)	(0.6568)
Placebo	-0.0773	0.1498*	-0.1936	-0.4472	-0.0130	-2.0467**	0.1506	0.1784**	-0.3463	0.5052	-0.0200	-0.0310
	(0.1844)	(0.0825)	(0.4982)	(0.2895)	(0.0840)	(0.9793)	(0.1667)	(0.0723)	(0.2472)	(0.3915)	(0.0277)	(0.9870)
Mean Only $\times \pi^e_{prior}$	-0.4818***	0.0089	-0.2943***	-0.4696***	0.0380***	0.0037	-0.5216***	0.0122	-0.3020***	-0.5297***	0.0017	-0.1279
	(0.0426)	(0.0082)	(0.0753)	(0.0503)	(0.0074)	(0.2068)	(0.0337)	(0.0105)	(0.0527)	(0.0650)	(0.0031)	(0.0994)
L. Band $\times \pi^e_{prior}$	-0.0754**	0.0273***	-0.4306***	-0.6466***	0.0023	-0.0096	-0.5955***	0.0206**	-0.3353***	-0.7124***	0.0017	-0.1771*
	(0.0292)	(0.0080)	(0.0795)	(0.0481)	(0.0092)	(0.2036)	(0.0329)	(0.0102)	(0.0297)	(0.0841)	(0.0045)	(0.1040)
Sm. Band $\times \pi^e_{prior}$	-0.5419***	0.0204***	-0.3146***	-0.5472***	0.0312***	0.0056	-0.6619***	0.0094	-0.3457***	-0.5702***	0.0026	0.0795
	(0.0403)	(0.0077)	(0.0761)	(0.0568)	(0.0108)	(0.2090)	(0.0294)	(0.0098)	(0.0304)	(0.0668)	(0.0066)	(0.1046)
Placebo $\times \pi^e_{prior}$	0.0032	-0.0053	0.1276	0.0257	0.0139	0.1162	-0.0246	-0.0289**	0.0494	-0.0939	0.0028	-0.0576
	(0.0193)	(0.0078)	(0.0933)	(0.0226)	(0.0092)	(0.2128)	(0.0269)	(0.0116)	(0.0364)	(0.0634)	(0.0039)	(0.1455)
Constant	0.2025	0.0362	0.1954	2.0855**	0.2489	3.3961***	0.1185	0.5005***	2.2639***	0.1942	0.1346*	5.3465***
	(0.4157)	(0.1156)	(0.9696)	(0.8747)	(0.1619)	(0.9387)	(0.2202)	(0.0821)	(0.2153)	(0.4408)	(0.0754)	(0.7872)
N	1174	1203	551	391	405	177	2684	2851	1440	220	172	146
R^2	0.854	0.171	0.434	0.897	0.392	0.579	0.828	0.242	0.611	0.874	0.914	0.717

Notes: Pollfish data for the US, fielded in December 2022 and Bundesbank Online Panel Households (BOP-HH), July 2023 wave. The extensive margin measures the likelihood of an update in posterior expectations. The intensive margin measures posterior expectations given that an update in expectations occurred after treatment. Inflation expectations prior to and post treatment are truncated to lie in the range $-5 \leq \pi^e \leq 25$. In the BOP-HH data, since we have information on prior uncertainty, we restrict the sample to those who at least in the "large band" treatment, would fall within the support of the prior distribution. All regressions use population weights and show heteroscedasticity-robust standard errors in parentheses. Huber (1964) robust regressions endogenously account for outliers. Demographic control variables include gender, age, and income groups. *** p<0.01, ** p<0.05, * p<0.1

for the intensive margin (see columns 3 and 9 in Table4), while they are different for the overall margin.

4.5 The Relevance of Intensive and Extensive Margin Effects

In this subsection we study the relevance of extensive and intensive margins in our survey experiment by using a similar decomposition of the average level of posterior inflation expectations and their cross-sectional variance as in Dräger et al. (2024). Dräger et al. (2024) adapt the Klenow and Kryvtsov (2008) decomposition in Andrade et al. (2023) for a cross-sectional comparison in our RCT environment (see Appendix B for details).

Table 5: Cross-Sectional Variation of Average Inflation Expectations: The Role of Intensive and Extensive Margins

	US–Dec. 2022					Germany–July 2023				
	Base	Mean	Large	Small	Pl.	Base	Mean	Large	Small	Pl.
$\pi^{e,h}_{j,post}$	8.22	4.88	6.91	5.07	7.31	5.67	4.80	4.84	4.78	5.69
$\pi^{e,h}_{i,post} - \overline{\pi^e}$	1.60	-1.73	0.29	-1.54	0.70	0.49	-0.38	-0.34	-0.40	0.51
IM contr.	0.69	-1.28	0.07	-1.18	0.07	0.47	-0.35	-0.34	-0.37	0.42
EM contr.	0.70	-0.61	0.07	-0.60	0.42	0.11	-0.07	-0.11	-0.06	0.11
$V\left(\pi^{e,h}_{i,post}\right)$	30.9	9.9	24.1	8.9	29.0	3.68	1.98	2.20	1.83	4.05
IM contr. (in %)	62	45	46	47	54	63	56	59	54	61
EM contr. (in %)	38	55	54	53	46	37	44	41	46	39

Note: Pollfish data for the US, fielded in December 2022 and Bundesbank Online Panel Households (BOP-HH), July 2023 wave. All statistics are calculated using Huber (1964) robust and population weights from the overall margin estimation in Table 2. IM stands for intensive margin and EM for extensive margin. Base, Mean, Large, Small, Pl. stand for Baseline, Mean only, Large bands, Small bands, and Placebo treatments. $\pi^{e,h}_{i,post} - \overline{\pi^e}$ is the difference in average expectations in treatment i and the average expectations in this RCT.

The results for the US in Table 5 suggest that in "mean only" and "small band" treatments about two-thirds of the variation in the level of average posterior inflation expectations across treatments can be explained by the contributions of the intensive margin and about one-third from the extensive margin. In the remaining treatments the split is close to half from the intensive margin and half from an extensive margin. The results for Germany are similar, though the share of the extensive margin is slightly smaller. The variance of posterior inflation expectations across treatments is also explained by both margins. The contributions of the extensive margin range from 38 to 55 percent for expectations collected using the Pollfish platform, while the contribution in the German BOP-HH survey ranges from 37 to 46 percent. The contribution of the extensive margin is relatively smaller in the case of the two control treatments.

4.6 Asymmetries in Updating Inflation Expectations

We now look at the potential asymmetries in the updating of expectations, depending on whether the signal is above or below the respondents' prior. Across all treatments, in the US survey 55 percent of respondents update their forecasts if their prior was below the signal, while 45 percent update their expectations if their prior was above the signal. In the German survey the difference is even more pronounced: 73 percent updated if their priors were below the signal and 53 percent update if their priors were above the signal. We further investigate the potential asymmetric effect that the distance between the prior and the signal exerts on expectations depending on the position of the prior relative to the signal.

Table 6: Updating Expectations for Those with Priors Above/Below the Signal

	Overall		Extensive		Intensive	
	Above	Below	Above	Below	Above	Below
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: US(Dec. 2022)						
$\lvert\pi^e_{prior} - z\rvert$	0.2631***	-0.5513***	0.0200***	0.1602***	0.1016***	-0.5322***
	(0.0237)	(0.0600)	(0.0036)	(0.0261)	(0.0194)	(0.0871)
Large Band	0.6884***	0.0318	-0.2365***	-0.0495	0.1852	0.2203
	(0.2293)	(0.1362)	(0.0465)	(0.0786)	(0.2140)	(0.2253)
Small Band	-0.0260	0.6114***	-0.0102	0.0712	0.0882	0.9216***
	(0.2073)	(0.1674)	(0.0477)	(0.0704)	(0.1648)	(0.2547)
Constant	3.6919***	1.7487***	0.3180*	-0.3313	3.3323***	1.4404
	(1.0530)	(0.5602)	(0.1652)	(0.2399)	(0.5491)	(0.9398)
N	723	240	733	244	415	145
R^2	0.195	0.399	0.133	0.261	0.104	0.331
Panel B: Germany (July 2023)						
$\lvert\pi^e_{prior} - z\rvert$	0.4894***	0.0452**	0.0276***	0.0522***	0.4983***	-0.0173
	(0.0099)	(0.0177)	(0.0053)	(0.0087)	(0.0135)	(0.0167)
Large Band	0.0105	-0.0037	-0.0216	0.0110	-0.0121	-0.0328
	(0.0469)	(0.1120)	(0.0355)	(0.0557)	(0.0550)	(0.1126)
Small Band	-0.0459	0.1417	0.0549	0.0567	0.0058	0.0006
	(0.0480)	(0.1070)	(0.0346)	(0.0506)	(0.0485)	(0.1010)
Constant	1.5804***	3.7820***	0.9003***	0.7338***	1.4834***	3.8186***
	(0.3287)	(0.1458)	(0.0780)	(0.1841)	(0.2959)	(0.1586)
N	1726	368	1830	384	1090	302
R^2	0.681	0.044	0.088	0.187	0.764	0.026

Notes: Panel A presents Pollfish data for the US, fielded in December 2022, and Panel B presents Bundesbank Online Panel Households (BOP-HH), July 2023 wave. The intensive margin measures posterior expectations given that an update in expectations occurred after treatment. Inflation expectations prior to and post treatment are truncated to lie in the range $-5 \leq \pi^e \leq 25$. All regressions, except for the extensive margin, use population and Huber (1964) adjusted weights and show heteroscedasticity-robust standard errors in parentheses. Demographic control variables include gender, age, and income groups, which are included but not reported. *** p<0.01, ** p<0.05, * p<0.1

To study these asymmetries we design a regression that relates posterior expectations to the absolute gap between the prior and the signal z, controlling for treatment effects and demographic characteristics. As the signal appears only in the three information treatments, we restrict these regressions only to those that participated in one of these three treatments.

Table 6 presents the results separately for households that have inflation priors below or above the forecast of professional forecasters where the reference treatment is "mean only" treatment. The overall results in columns (1)–(2) suggest that in the US survey, those that received a high-precision signal update their expectations by more than those that received a low-precision signal, like in our main results. We also see that those that received a low-precision signal have higher posterior expectations if their priors are above the signal and lower expectations if their priors are below the signal. In Germany the differences in the overall margin are smaller for the effect on the mean expectations of each group. However, the results indicate that asymmetries in updating expectations indeed exist in the two RCTs when it comes to the adjustment on the intensive and extensive margins. When their prior is below the signal, consumers tend to update their expectations more often compared to the case when their prior is above the signal (columns 3–4), as already suggested by the summary statistics mentioned in the previous paragraph. This result is clearly seen in the German data, where virtually all respondents with a prior below the signal update almost exactly to the signal (column 6). Another result is that the extensive margin depends on the distance between the prior and the signal (columns 3–4), where the probability of updating is significantly more sensitive to the distance between the prior and the signal when the prior is below the signal. This holds for both the US and the German data. In other words, when inflation is increasing and the prior lags behind, consumers have a higher probability of updating their expectations compared to the case when inflation is decreasing and priors are above the signal.

This result is in line with evidence that consumers are more attentive to unfavorable news about inflation compared to favorable news about inflation as outlined in Pfajfar and Santoro (2013) and Ehrmann et al. (2017). In Armantier et al. (2022b) households' long-run inflation expectations also react more to positive than to negative inflation surprises in a high-inflation environment. D'Acunto et al. (2023) also show that households extract more information from positive relative to negative price changes when forming inflation expectations.

5 A Simple Model of the Extensive Margin

The dominance of the extensive margin in our RCT experiment is at odds with the Bayesian model of belief updating. Under Bayesian updating, the difference between the "large band," "small band," and "mean only" treatment groups would lie only along the intensive margin, with no difference along the extensive margin. Participants who had less precise information would still update their beliefs, just by a smaller amount. Instead, we observed that participants in the "large band" treatment group were more likely to leave their beliefs unchanged compared to the "small band" group. Additionally, the distance of a participant's prior from the inflation signal on average increased the likelihood that the participant would update beliefs. Neither of these behaviors can be accounted for under the standard model of Bayesian updating.

In this section, we present an alternative mechanism for updating inflation beliefs based on the rational inattention models of Woodford (2008) and Morales-Jiménez and Stevens (2025), who model the extensive margin of firms' pricing decisions. We apply the intuition from those models to households' expectation formation. Households begin each period with a prior belief about the next period's inflation rate, and may either learn about actual future inflation subject to an information and updating cost, or leave their beliefs unchanged. We first present a two-period partial equilibrium decision problem to study the implications of the rational inattention model for belief updating. We demonstrate that our inattention mechanism is able to match two of our new empirical facts: Households with a lower-precision signal are less likely to update their beliefs, and households behave asymmetrically when their beliefs are above or below the true value of inflation. We then extend this decision to an infinite horizon decision problem where the household's steady-state information policy depends on both its inflation prior and its asset holdings. Lastly, we study the partial-equilibrium response to an inflationary shock, and demonstrate that our rational inattention model, with state-dependent inattention through the extensive margin and an asymmetric response to high and low inflation, delivers this interesting dynamic: a rapid rise and sluggish fall in inflation expectations following an inflationary shock.

5.1 A Two-Period Decision Problem

We first solve a two-period decision problem for a household with potentially misspecified prior beliefs about future inflation. We demonstrate that even in this simple environment, our belief updating mechanism is able to match two key facts from our RCT experiments: Households are less responsive to noisy information and respond to information more strongly when their priors are below the signal than when their priors are above.

First, we detail the preferences and technology available to the household. It enjoys consumption and receives a nominal endowment w in each period. It can buy or sell one-period-ahead bonds, a, that pay a nominal interest rate i. At the start of the first period, it has prior belief π^e over the rate of inflation in the second period, which also dictates its beliefs about its real endowment and interest rate in the next period. Prior to making its consumption-saving decision, the household may select probability Λ that it will update its inflation beliefs to the second period's true value π' subject to the information cost

$$\theta D\left(\Lambda \,||\, \overline{\Lambda}\right) = \theta \left[\Lambda \log\left(\frac{\Lambda}{\overline{\Lambda}}\right) + (1-\Lambda)\log\left(\frac{1-\Lambda}{1-\overline{\Lambda}}\right)\right], \tag{5}$$

where $D(\cdot \,||\, \overline{\Lambda})$ is the Kullback-Leibler divergence from the reference probability of updating $\overline{\Lambda} \in (0,1)$ and θ is a unit cost of information. As the household chooses a larger value of Λ, the divergence from $\overline{\Lambda}$ increases, making more precise information costly. Furthermore, if $\overline{\Lambda}$ is small, then any information about future inflation is noisy and it is costly to acquire more precise information about future inflation. Formally, given π^e, the household faces the decision problem

$$V_\Lambda(\pi^e) = \max_{\Lambda} \left\{\Lambda(V(\pi') - \kappa) + (1-\Lambda)V(\pi^e) - \theta D(\Lambda||\bar{\Lambda})\right\}, \tag{6}$$

where $V(\pi')$ is the household's lifetime utility with correct inflation beliefs and $V(\pi^e)$ is its lifetime utility when consuming and saving under incorrect inflation beliefs. With probability Λ, the household updates to the correct belief about the next period's inflation, but pays an adjustment cost κ. With complementary probability, its beliefs remain unchanged. In both cases, the household incurs the information cost $\theta D(\Lambda \,||\, \overline{\Lambda})$.

Given π^e, the household chooses consumption c and assets a' to maximize its expected lifetime utility under the conviction that inflation next period will be π^e. Formally, it faces the decision problem

$$\max_{c,a'} \frac{c^{1-\sigma}}{1-\sigma} + \beta\frac{\tilde{c}^{1-\sigma}}{1-\sigma}, \text{ s.t.} \tag{7}$$

$$c + a' = w; \quad (1+\pi^e)\tilde{c} = w + (1+i)a'; \quad a' \geq -\frac{w}{1+i}.$$

After choosing c and a' in the first period, inflation in the second period realizes and the household consumes

$$c' = \frac{(1+i)a' + w}{1+\pi'},$$

implying that lifetime utility from having inflation beliefs π^e is

$$V(\pi^e) = \frac{c^{1-\sigma}}{1-\sigma} + \beta\frac{(c')^{1-\sigma}}{1-\sigma}. \tag{8}$$

Equation (8) achieves its maximum at the correct belief π'; hence, incorrect inflation beliefs lead to losses in welfare.

To characterize the optimal choice of Λ, the first-order condition of (6) gives the optimality condition

$$\Lambda(\pi^e) = \frac{\frac{\overline{\Lambda}}{1-\overline{\Lambda}} \exp\left\{\frac{1}{\theta} L(\pi^e)\right\}}{1 + \frac{\overline{\Lambda}}{1-\overline{\Lambda}} \exp\left\{\frac{1}{\theta} L(\pi^e)\right\}}. \tag{9}$$

where

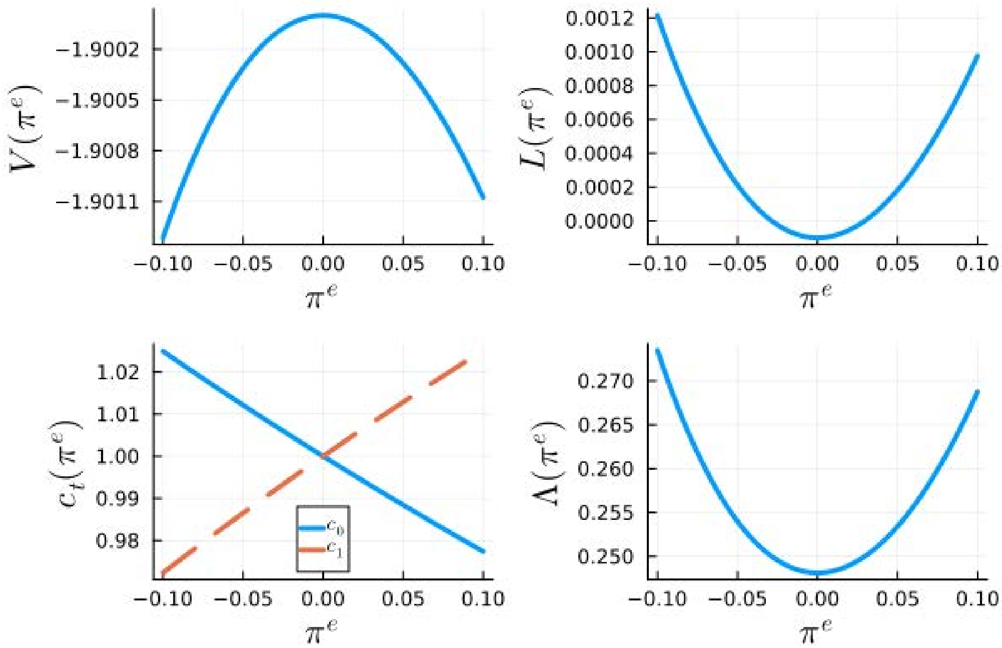
$$L(\pi^e) = V(\pi') - \kappa - V(\pi^e) \tag{10}$$

is the loss associated with having incorrect inflation beliefs. Equation (9) is an increasing function of the loss function, implying that households with less accurate priors are more likely to update their inflation beliefs.

As an illustrative example, we present the solution to this model in Figure 3 when the rate of inflation in the second period is 0. The bottom-right panel of Figure 3 depicts the updating policy from equation (9). Two properties of the information policy are worth detailing. First, as the distance between the prior and the true level of second-period inflation increases, the household is more likely to update. Second, for inflation beliefs below 0, the household is slightly more likely to update its beliefs than if its beliefs are above 0. That is, the hazard rate for updating inflation beliefs is asymmetric about the true level of second-period inflation, with households with too-low beliefs more likely to update than households with too-high beliefs.

The top-left panel of Figure 3 depicts the value function from equation (8) and the top-right panel depicts the loss function from misspecified inflation beliefs. Comparing the value function for $\pi^e < 0$ with $\pi^e > 0$, notice there is an asymmetry, with the value function being lower for too-low inflation beliefs than for too-high inflation beliefs. It is exactly this asymmetry in the value function that causes the asymmetry in the updating policy function. For too-low inflation beliefs, the expected rise in the real wage and real interest rate dominates the substitution effect, and household consumes more in the first period than if their beliefs were correct, as shown in the bottom-left panel of figure 3. They under-save, expecting a higher real wage and a higher real interest rate in the second period, and are met with much less consumption when the higher than expected inflation realizes. On the contrary, agents with too-high inflation beliefs consume less in the first period, but are rewarded in the second period with a higher real interest rate and a higher wage than expected. Therefore, while the consequences of too-high inflation beliefs are slightly offset by an unexpected boost in consumption in the second period, too-low inflation beliefs induce a significant shortfall of resources in the second period. Hence, households are more likely to update their beliefs if their inflation expectations are too low than if they are too high.

Figure 3: Household's Value Function $V(\pi^e)$, Loss Function $L(\pi^e)$, Consumption Functions $c_t(\pi^e)$, and Information Policy $\Lambda(\pi^e)$.



Notes: The horizontal axis in each panel represents the deviation of the household's expected inflation from the true level of inflation $\pi' = 0$. The top-left panel depicts the household's value function. The top-right panel depicts the household's loss function. The bottom-left panel depicts the household's consumption function, with the solid line representing consumption in the first period, and the dashed line consumption in the second period. The bottom-right panel depicts the household's information policy, or the probability of updating its beliefs given its prior.

Even in this simple two-period model, the behavior is consistent with the behavior we observe in the RCTs. At all levels of distance from the prior and the signal, only a fraction of participants choose to update. Agents with prior beliefs further from the inflation signal are more likely to update their beliefs on average. Also, agents with prior inflation beliefs below the signal are more likely to update than agents with prior beliefs above the signal.

5.2 Infinite Horizon Decision Problem

We now characterize the steady-state information policy in an infinite horizon model following Woodford (2009) and Morales-Jiménez and Stevens (2025).

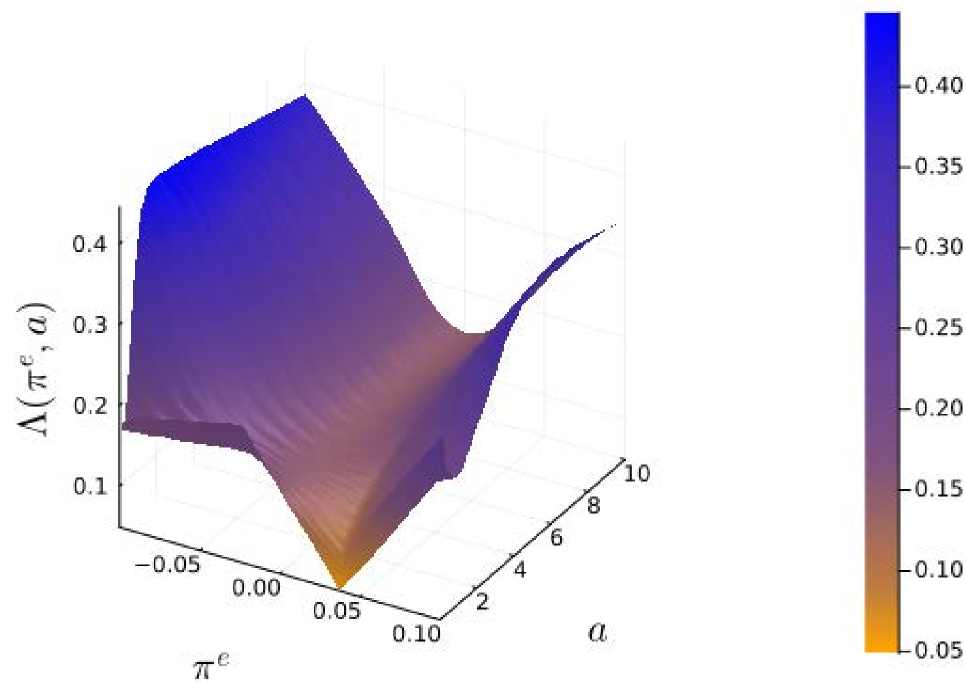
The economy is populated by a continuum of households with preferences over consumption and leisure. They earn nominal wage w and are paid nominal interest rate i on their savings. The model is in a steady state with a constant nominal wage, a constant nominal interest rate, and zero inflation. Households enter each period with a prior belief about the next period's rate of inflation, and can update it to the correct level subject to an information cost.

As in the two-period model, a household with inflation beliefs π^e chooses a probability of updating its beliefs to the correct level of expected inflation. However, now the household's current level of assets a is a payoff-relevant state variable as well. The infinite horizon information decision problem is therefore

$$V_\Lambda(\pi^e, a) = \max_\Lambda \left\{ \Lambda(V(0,a) - \kappa) + (1-\Lambda)V(\pi^e, a) - \theta D(\Lambda \,||\, \overline{\Lambda}) \right\}, \tag{11}$$

where $V(\pi^e, a)$ is the expected lifetime utility of the household when it consumes and saves under the incorrect conviction that the price level in the next period will be $1 + \pi^e$ and follows its optimal information policy thereafter. Importantly, the household still expects a nominal wage of w and a nominal interest rate of i in the next period, implying that it expects its labor and interest earnings to erode at rate π^e.

Figure 4: Household's Probability of Updating Inflation Beliefs as a Function of (π^e, a).



Notes: This figure depicts optimal expectations updating probabilities in the infinite horizon steady state as a function of prior inflation beliefs and current asset holdings. The left-hand horizontal axis represents prior expectations for inflation. The right-hand horizontal axis represents current asset holdings. The vertical axis represents the hazard rate, or the probability of updating inflation beliefs given the state (π', a).

We solve for the information policy nonlinearly, with computational details in Appendix E.1. Figure 4 contains a graph of the optimal Λ as a function of (π^e, a). Two features are worth noting. First, the region of the surface corresponding to where $\pi^e = 0$ shows that households are unlikely to update their inflation beliefs. Households with near-correct beliefs about inflation have no incentive to pay additional attention to the underlying state, so they lower their likelihood of updating their beliefs to avoid paying the adjustment cost κ. Second, there is a marked asymmetry in updating behavior where households with $\pi^e < 0$ are more likely to update their beliefs than households with $\pi^e > 0$. Households with expectations below the true value of inflation are more likely to update than those with expectations above the true value of inflation for precisely the same reasons as outlined in the two-period model: Households with too-low inflation beliefs seek to avoid being surprised by a lower than expected real wage and interest rate.

5.3 Partial Equilibrium Expectation Dynamics

We now study the dynamics of our expectations updating mechanism in response to a partial equilibrium inflationary shock.

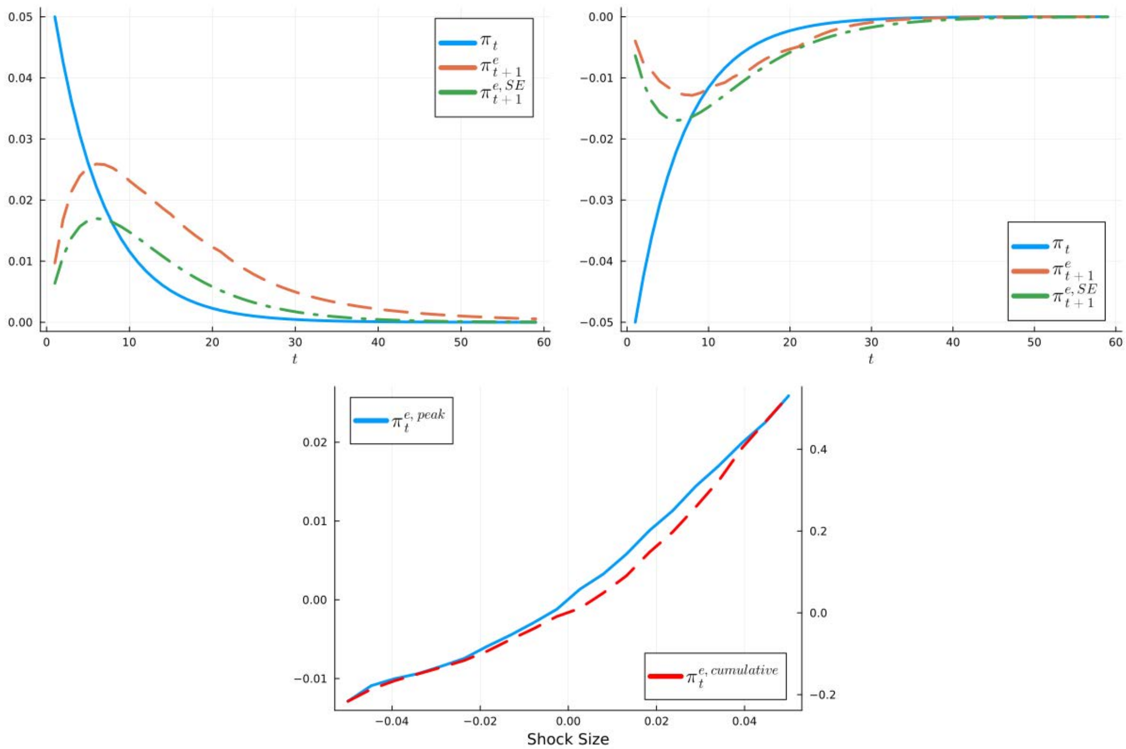
We consider a simple environment of inflation and nominal interest rate setting. Suppose π_t follows an AR(1) process, w_t tracks inflation perfectly, and i_t follows a simple Taylor-type rule, $i_t = \phi\pi_t$.

The top two panels of Figure 5 depict the response to an inflationary shock in partial equilibrium. The left-hand panel depicts a positive inflation shock, and the right-hand panel a negative inflation shock. The solid blue line represents actual inflation π_t, the dashed red line represents expected inflation using our rational inattention mechanism, and the dot-dashed green line represents standard sticky expectations at the reference distribution updating probability

$$\pi_{t+1}^{e,SE} = \overline{\Lambda}\pi_{t+1} + (1 - \overline{\Lambda})\pi_t^{e,SE}.$$

Compared to model-consistent rational expectations, the rational inattention model is able to deliver a hump shape in expected inflation. For the positive inflation shock, compared to standard sticky expectations, the rational inattention model delivers both a faster rise in expected inflation and a slower convergence back to steady state. The fast uptake is due to the state dependence of the mechanism, pushing households to pay more attention when inflation is far above their initial beliefs. As inflation falls, the difference between expected and true future inflation is smaller, and households become more inattentive again. Moreover, due to the asymmetry in belief updating, the convergence back to the steady state is markedly slower than the initial rise in expectations. This is precisely because

Figure 5: Impulse response of expected inflation, with rational inattention and fixed sticky expectations.



Notes: This figure depicts the partial equilibrium response of expected inflation in response to an AR(1) inflationary shock. The top two panels depict the response to a positive and a negative 5 percent inflationary shock. The solid blue line represents inflation, the dashed red line represents expected inflation using our rational inattention mechanism, and the green dot-dashed line represents expected inflation using standard sticky expectations. The bottom panel depicts the partial equilibrium response to inflationary shocks of different sizes. The solid blue line (corresponding to the left-hand axis) represents inflation the peak inflation expectation following the impact of the shock. The dashed red line (corresponding to the right-hand axis) represents the cumulative effect on expected inflation, computed as the area underneath the π^e_t impulse response curve.

households in our model are inattentive to the level of future inflation, rather than the underlying state of the economy: Households that update early in the impulse response experiment can still have out-of-date beliefs later on, which in turn leads to even greater persistence of beliefs as compared to the sticky expectations benchmark. For the negative inflation shock, the rational inattention model now reacts *less* than the sticky expectations benchmark. Hence, our rational inattention model is able to explain the asymmetric response of expectations to an inflationary shock, with a relatively fast increase in beliefs but a persistent and sluggish decrease for positive inflation shocks, and a muted response to negative inflation shocks.

The bottom panel of Figure 5 depicts the peak and cumulative effects on expected inflation for varying shock sizes. The solid blue line (corresponding to the left-hand axis) represents the peak of the trajectory of expected inflation. Consistent with Figure 5, positive shocks induce peak inflation expectations with absolute values twice those of negative shocks, highlighting the asymmetry in uptake. The dashed red line (corresponding to the right-hand axis) represents the cumulative effect on inflation expectations, computed as the area underneath the expected inflation impulse response curve. Again, the asymmetries between positive and negative shocks are marked: Positive shocks have nearly twice the cumulative impact on expected inflation than negative shocks. This highlights the asymmetries in the persistence of expectations. Following positive shocks, many households start to have too-high inflation expectations as the true inflation begins to fade. Since the rational inattention mechanism causes those with too-high expectations to update less frequently compared to those with too-low expectations, the elevated inflation expectations persist longer than for a comparable negative inflation shock.

6 Conclusion

This paper explores whether households update their expectations in response to signals with varying levels of precision in a way consistent with a simple Bayesian updating rule. We show that the extensive margin—and not just the intensive margin—is important. Using a randomized controlled trial experiment in the US and Germany, we study several hypotheses derived from a simple Bayesian updating model and find that agents who receive a more precise signal update their expectations by more than those who receive a less precise signal. However, in contrast to the Bayesian updating model, the differences in the adjustment mostly come from the extensive margin—when households decide whether to react to the signal and update their expectations—and not from the intensive margin. Furthermore, we show that households that have priors with lower uncertainty update their expectations less than those with more dispersed priors. In addition, we provide evidence that well-informed households respond less to the information treatments in comparison to uninformed households. Lastly, we document an asymmetric response to the treatments, which shows a pronounced reaction of households when the signal is above their prior and a more muted reaction when the signal is below their prior.

We then proceed to build model that exhibits the main features of expectations formations we document in our survey experiment. We use the intuition in Woodford (2008), and build a model with households that are rationally inattentive to inflation news by explicitly endogenizing the extensive margin. We show that in this environment, we are able to explain both the behavior of those who do update their beliefs and the fraction of those who leave their beliefs unchanged. In addition, the model is able to replicate the observed asymmetry in expectation updating based on the position of the signal relative to the prior. Households update their expectations on average more frequently when their signal is above their prior compared to when their signal is below their prior.

We also study the implications of forming inflation expectations using this mechanism for the dynamics of inflation and find that the "last mile" or the "last half a mile" in the disinflation process may be slow, as fewer households update their expectations when inflation is decelerating than when inflation is accelerating.

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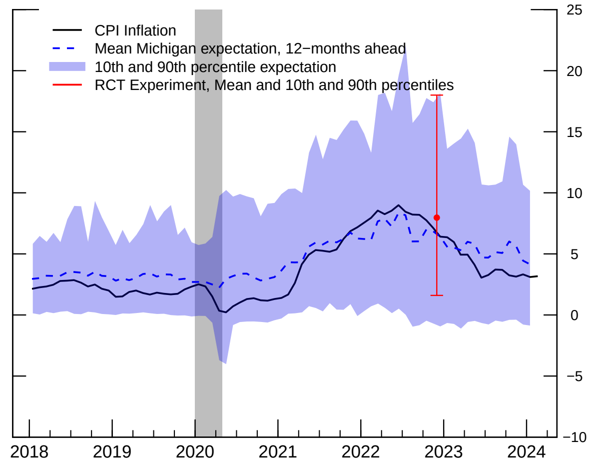
A Additional Tables and Figures

Figure A.1: Inflation and Inflation Expectations.

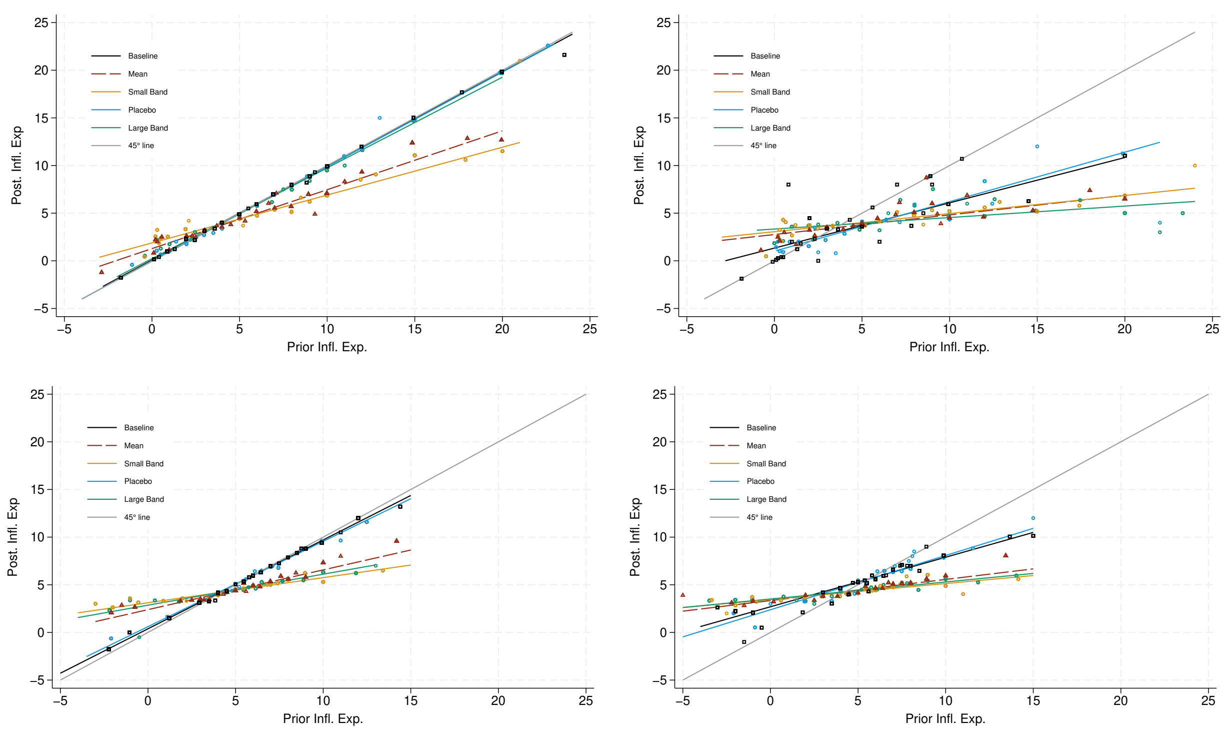


Notes: Solid black line is US CPI Inflation as reported by the Bureau of Labor Statistics. The mean and disagreement measures are from University of Michigan Survey of Consumers. The vertical line indicates December 2022, the time at which we fielded our survey using the Pollfish platform and panel. The mean value from our survey is shown by the red point. The measure of disagreement, as portrayed by the difference between the 90^{th} and 10^{th} percentile of the distribution of one-year-ahead inflation expectations, is displayed using red "whiskers."

Table A.1: Demographic Breakdown by Treatment Group for the US Data

	Female	Over 54	Mid. inc.	High inc.	High school	Voc.	Uni.
Baseline	0.55	0.19	0.28	0.09	0.35	0.14	0.49
Mean only	0.57	0.19	0.26	0.11	0.34	0.16	0.48
Large Band	0.57	0.16	0.24	0.11	0.35	0.18	0.45
Small Band	0.54	0.19	0.28	0.11	0.33	0.19	0.48
Placebo	0.56	0.17	0.27	0.10	0.27	0.19	0.53
Average	0.56	0.18	0.27	0.10	0.33	0.17	0.49

Figure A.2: Inflation Expectations: Overall and Intensive Margins



Notes: Top panels show binscatter plots across treatments with population and Huber (1964) robust weights from estimations in Table 2 for the overall and the intensive margin. Pollfish data for the US, fielded in December 2022. Bottom panels show binscatter plots across treatments with population and Huber (1964) robust weights from estimations in Table 2. Bundesbank Online Panel Households (BOP-HH), July 2023 wave.

Table A.2: Treatment Effects: Bands

	US (December 2022)			Germany (July 2023)		
	Overall (1)	Extensive (2)	Intensive (3)	Overall (4)	Extensive (5)	Intensive (6)
π^e_{prior}	0.4102***	0.0051	0.1605***	0.2775***	-0.0048	0.1673***
	(0.0209)	(0.0034)	(0.0164)	(0.0103)	(0.0037)	(0.0093)
Large Band	0.1794	-0.1553***	-0.0933	0.0135	-0.0616***	0.0399
	(0.1655)	(0.0409)	(0.1730)	(0.0415)	(0.0205)	(0.0499)
Considered Band	-1.4015***	0.2778***	-0.2702	-0.3124***	0.7106***	0.3126***
	(0.1710)	(0.0423)	(0.2029)	(0.0447)	(0.0293)	(0.0736)
Constant	1.2299	0.3113*	2.1630***	2.9475***	0.4580***	2.9987***
	(0.9481)	(0.1689)	(0.6461)	(0.1842)	(0.0942)	(0.1749)
N	652	661	364	1194	1257	794
R^2	0.500	0.159	0.295	0.506	0.641	0.421

Notes: Pollfish data for the US, fielded in December 2022 and Bundesbank Online Panel Households (BOP-HH), July 2023 wave. The extensive margin measures the likelihood of an update in posterior expectations. The intensive margin measures posterior expectations given that an update in expectations occurred after treatment. Inflation expectations prior to and post treatment are truncated to lie in the range $-5 \leq \pi^e \leq 25$. In the BOP-HH data, since we have information on prior uncertainty, we restrict the sample to those who, in the "large band" treatment, have the signal fall within the support of the prior distribution. All regressions use population weights and show heteroscedasticity-robust standard errors in parentheses. Huber (1964) robust regressions endogenously account for outliers in all regressions, but regressions for the extensive margin. Demographic control variables include gender, age, and income groups. *** p<0.01, ** p<0.05, * p<0.1

Table A.3: Treatment Effects: Prior Uncertainty, No Interactions

	US (December 2022)						Germany (July 2023)					
	High Prior Uncertainty			Low Prior Uncertainty			High Prior Uncertainty			Low Prior Uncertainty		
	Overall	Extensive	Intensive	Overall	Extensive	Intensive	Overall	Extensive	Intensive	Overall	Extensive	Intensive
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
π^e_{prior}	0.7133***	0.0004	0.1791***	0.7579***	-0.0003	0.2288***	0.6952***	-0.0012	0.2054***	0.8519***	-0.0135***	0.2895***
	(0.0242)	(0.0032)	(0.0185)	(0.0202)	(0.0029)	(0.0208)	(0.0119)	(0.0035)	(0.0111)	(0.0118)	(0.0051)	(0.0139)
Mean Only	-1.5985***	0.4650***	0.3266	-1.9112***	0.4800***	0.3757	-0.7790***	0.4679***	-1.0766***	-0.3786***	0.3622***	-0.9791***
	(0.2794)	(0.0560)	(0.3718)	(0.2400)	(0.0490)	(0.3891)	(0.0604)	(0.0386)	(0.1296)	(0.0534)	(0.0502)	(0.1258)
Large Band	-1.1225***	0.2953***	0.1188	-1.1913***	0.2419***	0.4686	-0.7437***	0.4670***	-1.2222***	-0.3590***	0.3352***	-0.8698***
	(0.2914)	(0.0548)	(0.4139)	(0.2226)	(0.0503)	(0.4159)	(0.0598)	(0.0382)	(0.1307)	(0.0519)	(0.0502)	(0.1308)
Small Band	-0.9981***	0.5182***	0.3716	-2.0351***	0.4279***	0.6491*	-0.8670***	0.4918***	-1.2523***	-0.4706***	0.4368***	-0.9195***
	(0.2996)	(0.0572)	(0.3831)	(0.2327)	(0.0479)	(0.3802)	(0.0605)	(0.0380)	(0.1303)	(0.0546)	(0.0447)	(0.1265)
Placebo	-0.2794	0.1994***	-0.4198	-0.3712*	0.0758*	-1.0809**	0.1237**	0.0643	0.3640**	-0.0149	-0.0544	-0.1103
	(0.2710)	(0.0549)	(0.4682)	(0.1984)	(0.0415)	(0.4507)	(0.0617)	(0.0456)	(0.1736)	(0.0443)	(0.0506)	(0.1794)
Constant	2.7404***	-0.0290	1.8589**	1.6754**	0.0180	8.0751***	1.0974***	0.4395***	5.7520***	0.4609***	0.7327***	-0.0191
	(0.8960)	(0.1398)	(0.7650)	(0.6851)	(0.1047)	(0.6234)	(0.1959)	(0.0924)	(0.9034)	(0.1761)	(0.1076)	(0.4921)
N	711	717	333	892	892	390	1733	1848	974	1128	1242	610
R^2	0.719	0.201	0.335	0.735	0.204	0.402	0.798	0.219	0.495	0.883	0.201	0.596

Notes: Pollfish data for the US, fielded in December 2022 and Bundesbank Online Panel Households (BOP-HH), July 2023 wave. Two sub-samples are split based on whether reported prior uncertainty is below/above the median prior uncertainty. The extensive margin measures the likelihood of an update in posterior expectations. The intensive margin measures posterior expectations given that an update in expectations occurred after treatment. Inflation expectations prior to and post treatment are truncated to lie in the range $-5 \leq \pi^e \leq 25$. In the BOP-HH data, since we have information on prior uncertainty, we restrict the sample to those who, in the "large band" treatment, have the signal fall within the support of the prior distribution. All regressions use population weights and show heteroscedasticity-robust standard errors in parentheses. Huber (1964) robust regressions endogenously account for outliers. Demographic control variables include gender, age, and income groups. *** p<0.01, ** p<0.05, * p<0.1

Table A.4: Treatment Effects: News, No Interactions

	US (December 2022)						Germany (July 2023)					
	reported hearing news			reported hearing no news			reported hearing news			reported hearing no news		
	Overall	Extensive	Intensive	Overall	Extensive	Intensive	Overall	Extensive	Intensive	Overall	Extensive	Intensive
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
π^e_{prior}	0.7795***	-0.0033	0.2029***	0.6929***	0.0070**	0.2991***	0.8542***	-0.0034	0.2494***	0.5184***	-0.0063	0.2425***
	(0.0168)	(0.0026)	(0.0166)	(0.0301)	(0.0034)	(0.0255)	(0.0094)	(0.0036)	(0.0092)	(0.0342)	(0.0073)	(0.0316)
Mean Only	-1.3658***	0.4282***	0.2160	-2.6912***	0.5708***	0.0782	-0.4906***	0.3599***	-1.0021***	-1.3202***	0.4762***	-2.0753***
	(0.1917)	(0.0441)	(0.3018)	(0.3634)	(0.0599)	(0.5678)	(0.0391)	(0.0357)	(0.0918)	(0.2659)	(0.1061)	(0.4110)
Large Band	-0.8799***	0.1915***	0.4060	-1.7787***	0.5045***	-0.2148	-0.4732***	0.3558***	-1.0595***	-0.8793***	0.4053***	-2.0589***
	(0.1804)	(0.0450)	(0.3407)	(0.4050)	(0.0639)	(0.5716)	(0.0395)	(0.0354)	(0.0929)	(0.2921)	(0.1051)	(0.4103)
Small Band	-1.3822***	0.4255***	0.5394*	-2.1369***	0.6306***	0.0802	-0.5556***	0.4223***	-1.0132***	-0.7955***	0.4881***	-2.3402***
	(0.1997)	(0.0444)	(0.3025)	(0.3683)	(0.0632)	(0.5431)	(0.0478)	(0.0325)	(0.0910)	(0.2930)	(0.0985)	(0.3859)
Placebo	-0.0568	0.1084**	-0.3926	-1.1599***	0.1235**	-1.3896**	0.0154	0.0297	0.0324	-0.1852	-0.1706	1.1151
	(0.1690)	(0.0422)	(0.3808)	(0.3593)	(0.0500)	(0.6569)	(0.0327)	(0.0383)	(0.1241)	(0.3023)	(0.1108)	(0.7105)
Constant	1.7237***	-0.0203	0.3940	4.8652***	0.1395	6.3512***	0.9150***	0.4673***	4.6213***	2.6807***	0.7806***	5.6910***
	(0.5692)	(0.1038)	(0.8390)	(1.0818)	(0.1620)	(0.7161)	(0.1338)	(0.0992)	(0.3205)	(0.5731)	(0.1517)	(0.5774)
N	1194	1203	547	405	405	178	2609	2855	1439	228	236	146
R^2	0.756	0.154	0.336	0.732	0.367	0.590	0.882	0.148	0.519	0.723	0.368	0.652

Notes: Pollfish data for the US, fielded in December 2022 and Bundesbank Online Panel Households (BOP-HH), July 2023 wave. The extensive margin measures the likelihood of an update in posterior expectations. The intensive margin measures posterior expectations given that an update in expectations occurred after treatment. Inflation expectations prior to and post treatment are truncated to lie in the range $-5 \leq \pi^e \leq 25$. In the BOP-HH data, since we have information on prior uncertainty, we restrict the sample to those who, in the "large band" treatment, have the signal fall within the support of the prior distribution. All regressions use population weights and show heteroscedasticity-robust standard errors in parentheses. Huber (1964) robust regressions endogenously account for outliers. Demographic control variables include gender, age, and income groups. *** p<0.01, ** p<0.05, * p<0.1

Table A.5: Results for Forecasts Outside of the Support of the Prior

	US (December 2022)						Germany (July 2023)					
	Overall		Extensive		Intensive		Overall		Extensive		Intensive	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
π^e_{prior}	0.5857***	0.8057***	-0.0014***	-0.0013	0.0539**	0.1913***	0.2632***	0.4505***	-0.0032***	-0.0064**	0.0659***	0.2354***
	(0.0325)	(0.0400)	(0.0005)	(0.0011)	(0.0220)	(0.0631)	(0.0128)	(0.0288)	(0.0009)	(0.0031)	(0.0087)	(0.0323)
Mean Only	-16.9451***	-7.5795**	0.3474***	0.2541***	-23.7989***	-18.6781***	-1.7765***	-0.6089*	0.0601	0.0498	-0.9282***	-0.9884***
	(2.5984)	(3.8478)	(0.0511)	(0.0937)	(2.5487)	(4.0661)	(0.2351)	(0.3269)	(0.0374)	(0.0381)	(0.2600)	(0.2830)
Large Band	-21.6606***	1.0105	0.3348***	0.3580***	-29.7901***	-22.5644***	-1.8316***	-0.3738	0.0878**	0.0585*	-1.1941***	-0.9134***
	(2.4694)	(3.5713)	(0.0513)	(0.0861)	(2.4040)	(3.2743)	(0.2385)	(0.3459)	(0.0353)	(0.0347)	(0.2597)	(0.2770)
Small Band	-14.1903***	-5.7191	0.2961***	0.3450***	-26.1580***	-22.1118***	-2.0190***	-0.7328**	0.0992**	0.0605	-1.1371***	-1.1068***
	(2.4280)	(3.9567)	(0.0510)	(0.0927)	(2.5624)	(3.9848)	(0.2337)	(0.3133)	(0.0398)	(0.0403)	(0.2566)	(0.2807)
Placebo	-1.9842	3.0056	0.1747***	0.2441***	-7.6403***	-15.1806***	0.4880*	0.3404	0.0091	-0.0124	1.2632***	0.8964***
	(2.2062)	(3.7708)	(0.0525)	(0.0898)	(2.9248)	(4.2767)	(0.2840)	(0.3496)	(0.0390)	(0.0381)	(0.3070)	(0.3467)
Mean Only $\times\pi^e_{prior}$		-0.2148***		0.0021		-0.1729**		-0.2803***		0.0011		-0.1111***
		(0.0816)		(0.0017)		(0.0815)		(0.0402)		(0.0042)		(0.0375)
L. Band $\times\pi^e_{prior}$		-0.5306***		-0.0005		-0.2103***		-0.3442***		0.0042		-0.1713***
		(0.0765)		(0.0015)		(0.0656)		(0.0529)		(0.0034)		(0.0380)
Sm. Band $\times\pi^e_{prior}$		-0.2001**		-0.0010		-0.1468*		-0.3002***		0.0059*		-0.1269***
		(0.0804)		(0.0017)		(0.0802)		(0.0376)		(0.0032)		(0.0384)
Placebo $\times\pi^e_{prior}$		-0.1085		-0.0015		0.2135**		-0.0051		0.0032		0.0925**
		(0.0682)		(0.0016)		(0.0846)		(0.0328)		(0.0035)		(0.0460)
Constant	22.6759***	16.1386*	0.3629***	0.3438***	19.4094***	19.0296***	3.9327***	3.5136***	0.9435***	0.9621***	1.9570***	3.8039***
	(8.3681)	(8.2715)	(0.1274)	(0.1281)	(5.1694)	(5.3001)	(0.4445)	(0.4279)	(0.0720)	(0.0702)	(0.6614)	(0.4756)
N	1193	1192	1193	1193	668	651	967	957	1331	1331	748	755
R^2	0.377	0.435	0.091	0.098	0.312	0.429	0.459	0.615	0.040	0.045	0.276	0.442
Mean Only = L. Band	0.107	0.041	0.805	0.258	0.000	0.208	0.762	0.404	0.387	0.797	0.064	0.694
Sm. Band = L.Band	0.009	0.120	0.449	0.886	0.034	0.879	0.300	0.181	0.748	0.956	0.679	0.303
Mean Only = L. Band (int)		0.001		0.115		0.497		0.221		0.325		0.029
Sm. Band = L. Band (int)		0.000		0.748		0.236		0.385		0.266		0.127

Notes: Pollfish data for the US, fielded in December 2022 and Bundesbank Online Panel Households (BOP-HH), July 2023 wave. Inflation expectations prior to and post treatment are truncated to lie in the range $-5 \leq \pi^e \leq 25$. In the BOP-HH data, since we have information on prior uncertainty, we restrict the sample to those who, in the "large band" treatment, have the signal fall within the support of the prior distribution. All regressions use population and Huber (1964) adjusted weights, except for the extensive margin results, and show heteroscedasticity-robust standard errors in parentheses. Demographic control variables include gender, age, and income groups. *** p<0.01, ** p<0.05, * p<0.1

B Decomposing the Overall Treatment Effect into Extensive and Intensive Margins

In line with Dräger et al. (2024), following the logic of the Klenow and Kryvtsov (2008) decomposition as presented in Andrade et al. (2023), we can decompose the treatment effects using the cross-sectional data in the following way:

$$\pi^{e,h}_{i,post} = fr_i \cdot \pi^{e,ch}_{i,post} + (1 - fr_i) \cdot \pi^{e,nch}_{i,post}, \tag{12}$$

where $\pi^{e,h}_{i,post}$ is the average expectation in treatment i for horizon h and fr_i is the fraction of households that update their expectations in treatment i. $\pi^{e,ch}_{i,post}$ represents the average expectation of those who decide to update their expectations in treatment i and $\pi^{e,nch}_{i,post}$ is the average inflation expectation of those who do not update their expectations in treatment i.

Furthermore, by taking a first-order approximation around the average inflation expectations in this survey experiment ($\overline{\pi^e}$), we can decompose the differences in the average inflation expectations into changes in the intensive and extensive margins:

$$\pi^{e,h}_{i,post} - \overline{\pi^e} = \underbrace{\left(fr_i - \overline{fr}\right)\left(\overline{\pi^{e,ch}_{post}} - \overline{\pi^{e,nch}_{post}}\right)}_{\text{extensive}} + \underbrace{\left(\pi^{e,ch}_{i,post} - \overline{\pi^{e,ch}_{post}}\right)\overline{fr} + \left(\pi^{e,nch}_{i,post} - \overline{\pi^{e,nch}_{post}}\right)\left(1 - \overline{fr}\right)}_{\text{intensive}} + O_i. \tag{13}$$

where O_i is the residual. Note that variables with the upper bar represent averages across all treatments. The cross-sectional variance of inflation expectations, $V\left(\pi^{e,h}_{i,post}\right)$, can be decomposed into the contributions of the extensive margin and the intensive margin, where the contribution of the intensive margin is equal to:

$$V\left(\pi^{e,ch}_{i,post}\right)\overline{fr}^2 + V\left(\pi^{e,nch}_{i,post}\right)\left(1 - \overline{fr}\right)^2 + 2cov\left(\pi^{e,ch}_{i,post}, \pi^{e,nch}_{i,post}\right)\overline{fr}\left(1 - \overline{fr}\right). \tag{14}$$

The contribution of the extensive margin is thus:

$$\begin{aligned} V\left(fr_i\right)\left(\overline{\pi^{e,ch}_{post}} - \overline{\pi^{e,nch}_{post}}\right)^2 + 2cov\left(\pi^{e,ch}_{i,post}, fr_i\right)\left(\overline{\pi^{e,ch}_{post}} - \overline{\pi^{e,nch}_{post}}\right)\overline{fr} \\ + 2cov\left(\pi^{e,nch}_{i,post}, fr_i\right)\left(\overline{\pi^{e,ch}_{post}} - \overline{\pi^{e,nch}_{post}}\right)\left(1 - \overline{fr}\right). \end{aligned} \tag{15}$$

C Pollfish Survey

Question 0

This survey is not for profit, but for academic research. It is designed to improve the understanding of economic decision-making. There are no right or wrong answers. The information you provide is confidential and is only shared at an aggregate (not individual) level.

Question 1

Over the next 12 months, do you think that there will be inflation or deflation? (Note: deflation is the opposite of inflation.)

- inflation
- deflation

Question 2

What do you expect the rate of inflation to be over the next 12 months (in percent)? Please give your best guess up to one decimal place. (Note, for deflation please enter a negative number.)

-

Question 3

How certain, on a scale from 0 to 100, are you about your inflation expectation?

- Very uncertain 0: to 100: Very certain

Question 4

In the last month did you hear any news about inflation in the media that you follow?

- Yes, favorable news
- Yes, but unfavorable news
- I heard no news about inflation

Question 5 [IF TREATMENT 1]

Your previous inflation expectation was [Q2]%. Would you like to adjust your expectation? Note: if you do not wish to adjust your expectations please fill in the same figure in the box below.

-

Question 5 [IF TREATMENT 2]

Your previous inflation expectation was [Q2]%. Would you like to adjust your expectations based on the following information? According to a mean response in the Survey of Professional Forecasters, inflation over the next 12 months will be 3.7 percent. Note: if you do not wish to adjust your expectations please fill in the same figure in the box below.

-

Question 5 [IF TREATMENT 3]

Your previous inflation expectation was [Q2]%. Would you like to adjust your expectations based on the following information? According to a mean response in the Survey of Professional Forecasters, inflation over the next 12 months will be 3.7 percent, where the range of responses was between 1.7 percent and 7.1 percent. Note: if you do not wish to adjust your expectations please fill in the same figure in the box below.

-

Question 5 [IF TREATMENT 4]

Your previous inflation expectation was [Q2]%. Would you like to adjust your expectations based on the following information? According to a mean response in the Survey of Professional Forecasters, inflation over the next 12 months will be 3.7 percent, where most responses fell between 2.9 percent and 4.8 percent. Note: if you do not wish to adjust your expectations please fill in the same figure in the box below.

-

Question 5 [IF TREATMENT 5]

Your previous inflation expectation was [Q2]%. Would you like to adjust your expectations based on the following information? The US population grew 1.2 percent over the last three years. Note: if you do not wish to adjust your expectations please fill in the same figure in the box below.

-

Question 6 [SKIPPED IF TREATMENT 1]

Question 6 [IF TREATMENT 2 OR 5]

Please explain your response to the previous question.

- I do not trust professional forecasters
- My personal forecast matches the information provided
- This information was not useful to me
- This information was new to me and I incorporated it
- Other:

Question 6 [IF TREATMENT 3 OR 4]

Please explain your response to the previous question.

- I only considered the information about the mean
- I considered equally the mean and the range of forecasters' responses
- I considered both the mean and the range of forecasters' responses, but I updated closer to the higher end of forecasters' response
- I considered both the mean and the range of forecasters' responses, but I updated closer to the lower end of forecasters' response
- I only considered the range of forecasters' responses
- I only considered the lower end of forecasters' responses
- This information was not useful to me
- My personal forecast matches the information provided
- Other:

Question 7

How would you rank your understanding of economic and business issues?

- 1 to 5 stars

Question 8

Many thanks again for taking your time and answering our survey. If you have something to add or comment on please feel free to share it with us in the textbox below.

D BOP-HH Survey

The complete questionnaire of the Bundesbank survey we are using (wave 43, July 2023) can be found online on the home page of the Bundesbank following this link. The detailed wording of the relevant questions we are using translated into English is presented below.

Question 1

Over the next 12 months, do you think that there will be inflation or deflation? Note: Inflation is a percentage increase in prices. It is measured in most cases using the consumer price index. A fall in prices is called deflation. Please choose one of the following answer options.

- likely inflation
- likely deflation

Question 2

What do you think will be the rate of inflation [deflation] in the next 12 months?

Note inflation is a percentage change in the price level as measured by the consumer price index. Please enter a number value, one decimal point is allowed.

Question 3

In the last month did you hear any news about inflation in the media that you follow?

- Yes, favorable news
- Yes, but unfavorable news
- Yes, I heard favorable and unfavorable news
- I heard no news about inflation

Question 4 [If Treatment 1]

Your inflation expectation, which you mentioned in a previous question, was at [Q2] percent.

What do you think the inflation rate/deflation rate will most likely be in the next twelve months? And what will be the maximum and minimum values? Note: In the case of an expected deflation rate, please enter a negative value. You can enter a maximum of one decimal place.

- Most likely inflation rate/deflation rate: [Input field] percent
- Minimum: [Input field] percent
- Maximum: [Input field] percent

Question 4 [If Treatment 2]

Your inflation expectation, which you mentioned in a previous question, was at [Q2] percent. Professional analysts, on average, stated in a survey that they expect an inflation rate of 3.9 percent in Germany over the next twelve months.

What do you think the inflation rate/deflation rate will most likely be in the next twelve months? And what will be the maximum and minimum values? Note: In the case of an expected deflation rate, please enter a negative value. You can enter a maximum of one decimal place.

- Most likely inflation rate/deflation rate: [Input field] percent
- Minimum: [Input field] percent
- Maximum: [Input field] percent

Question 4 [If Treatment 4]

Your inflation expectation, which you mentioned in a previous question, was at [Q2] percent. Professional analysts, on average, stated in a survey that they expect an inflation rate of 3.9 percent in Germany over the next twelve months. The majority of responses ranged between 3.3 and 4.6 percent.

Question: What do you think the inflation rate/deflation rate will most likely be in the next twelve months? And what will be the maximum and minimum values?

Note: In the case of an expected deflation rate, please enter a negative value. You can enter a maximum of one decimal place.

- Most likely inflation rate/deflation rate: [Input field] percent
- Minimum: [Input field] percent
- Maximum: [Input field] percent

Question 4 [If Treatment 3]

Your inflation expectation, which you mentioned in a previous question, was at [Q2] percent. Professional analysts, on average, stated in a survey that they expect an inflation rate of 3.9 percent in Germany over the next twelve months. The responses ranged from 1.7 to 5.3 percent. Question: What do you think the inflation rate/deflation rate will most likely be in the next twelve months? And what will be the maximum and minimum values? Note: In the case of an expected deflation rate, please enter a negative value. You can enter a maximum of one decimal place.

- Most likely inflation rate/deflation rate: [Input field] percent
- Minimum: [Input field] percent
- Maximum: [Input field] percent

Question 4 [If Treatment 5]

Your inflation expectation, which you mentioned in a previous question, was at [Q2] percent. According to the Federal Statistical Office, the population in Germany is expected to grow to 85 million people by 2031.

Question: What do you think the inflation rate/deflation rate will most likely be in the next twelve months? And what will be the maximum and minimum values?

Note: In the case of an expected deflation rate, please enter a negative value. You can enter a maximum of one decimal place.

- Most likely inflation rate/deflation rate: [Input field] percent
- Minimum: [Input field] percent
- Maximum: [Input field] percent

Question 5 [if Treatments 3 or 4]

Reason for revision
Question: We now ask you to explain your answer to the previous question. Note: Please choose the answer that best applies to you.

- I only considered the information about the average of expectations.
- I considered both the information about the average and the range of expectations.
- I considered both the information about the average and the range of expectations, but I adjusted my expectations to the higher end of the expert estimates.
- I considered both the information about the average and the range of expectations, but I adjusted my expectations to the lower end of the expert estimates.
- I only considered the range of expectations and not the average.
- I only considered the expectations at the lower end of the range.
- I only considered the expectations at the upper end of the range.

Question 6 [if Treatments 3 or 4]

Reason for no revision
Question: We now ask you to explain your answer to the previous question. Note: Please choose the answer that best applies to you.

- This information was not useful for me.
- I do not trust expert opinions.
- My personal inflation expectation matches the provided information.

Question 7 [if Treatment 2]

Reason for revision
We now ask you to explain your answer to the previous question. Note: Please choose the answer that best applies to you.

- I incorporated this information because I trust experts
- I incorporated this information because I was uncertain in my previous assessment
- I incorporated this information for other reasons

E Model Solution Appendix

E.1 Steady-State Information Policy Solution

1. Given Λ_n and V_n, compute V_{n+1}:

   - Compute $c^*, \ell^*, a^{'*}$ that solve

$$\max_{c,\ell,a'} \frac{c^{1-\sigma}}{1-\sigma} - \frac{\ell^{1+\varphi}}{1+\varphi} + \beta V_{\Lambda,n}(\pi^e, a') \text{ s.t.}$$

$$c + a' \leq \frac{1+i}{1+\pi^e} a + \frac{w}{1+\pi^e} \ell$$

$$a' \geq 0.$$

   - Set

$$\begin{aligned} V_{n+1}(\pi^e, a) = & \frac{(c^*)^{1-\sigma}}{1-\sigma} - \frac{(\ell^*)^{1+\varphi}}{1+\varphi} \\ & + \beta[\Lambda_n(\pi^e, a'^*)(V_n(\pi, a'^*) - \kappa) + (1 - \Lambda_n(\pi^e, a'^*))V_n(\pi^e, a'^*)] \\ & - \beta\theta D(\Lambda_n(\pi^e, a'^*) \,||\, \overline{\Lambda}) \end{aligned}$$

2. Given V_{n+1} and Λ_n, compute Λ_{n+1}

   - Compute

$$\Lambda_{n+1} = \frac{\frac{\overline{\Lambda}}{1-\overline{\Lambda}} \exp\left\{\frac{1}{\theta}[V_{n+1}(p_{ss}, a) - \kappa - V_{n+1}(p^e, a)]\right\}}{1 + \frac{\overline{\Lambda}}{1-\overline{\Lambda}} \exp\left\{\frac{1}{\theta}[V_{n+1}(p_{ss}, a) - \kappa - V_{n+1}(p^e, a)]\right\}}$$

3. Check $||\Lambda_{n+1} - \Lambda_n||_\infty < \varepsilon$, if holds then stop.

E.2 Household Impulse Response Solution

To compute the trajectory of consumption and savings given a trajectory of inflation, nominal interest rates, and nominal wages, we must solve for consumption twice: once for consumption in the next period under incorrect beliefs $\tilde{c}$, and once for consumption today *given* $\tilde{c}$.

E.2.1 Solving for $\tilde{c}$

A household with beliefs π^e expects that tomorrow it will solve the problem

$$\tilde{V}_{t+1}(\pi^e, a) = \max_{c,\ell,a'} u(c) - v(\ell)$$
$$+ \beta[\Lambda(\pi^e, a')(V_{t+2}(\pi', a') - \kappa) + (1 - \Lambda(\pi^e, a'))V_{t+2}(\pi^e, a') - \theta D(\Lambda(\pi^e, a')||\overline{\Lambda})]$$

$$c + a' = \frac{1 + i_t}{1 + \pi^e} a + w_{t+1}\ell$$

This problem admits the Euler equation:

$$\beta \left[\Lambda_a(\pi^e, a')(V_{t+2}(\pi_{t+2}, a') - \kappa - V_{t+2}(\pi^e, a'))\right]$$
$$+ \beta \left[\Lambda(\pi^e, a') \frac{1 + i_{t+1}}{1 + \pi_{t+2}} u'(c_{t+2}(\pi', a')) + (1 - \Lambda(\pi^e, a')) \frac{1 + i_{t+1}}{1 + \pi^e} u'(c_{t+2}(\pi^e, a'))\right]$$
$$- \beta\theta D'(\Lambda(\pi^e, a'||\overline{\Lambda}))\Lambda_a(\pi^e, a')$$
$$= u'(c_{t+1}(\pi^e, a)).$$

We have V_{t+2}, c_{t+2}, and Λ from a previous iteration. In practice, Λ_a is near zero, so we ignore terms with it during our computations for numerical stability.

E.2.2 Solving for c

A household with inflation beliefs π^e that does not update in the current period solves the probelm

$$V_t(\pi^e, a) = \max_{c,\ell,a'} u(c) - v(\ell) + \beta\tilde{V}_{t+1}(\pi^e, a')$$

$$c + a' = \frac{1 + i_{t-1}}{1 + \pi_t} a + w_t\ell$$

where $\tilde{V}$ is the expected continuation value of following the consumption plan $\tilde{c}$ under the conviction that inflation in the next period will be π^e. This problem admits the usual Euler equation

$$\beta \frac{1 + i_t}{1 + \pi^e} u'(\tilde{c}_{t+1}) = u'(c_t).$$

E.2.3 Aggregating Household Behavior

To compute the aggregate behavior of the economy, we need to simulate forward. The procedure to do this is:

1. In $t = 0$, compute consumption and labor for households with beliefs π_1 and those with π_{ss}. Measure $\Lambda(\pi_{ss}, a_{ss})$ consume and save as if tomorrow's rate of inflation will be π_1, and measure $1 - \Lambda(\pi_{ss}, a_{ss})$ as if tomorrow's rate of inflation will be π_{ss}.

2. In t, compute consumption and labor for households with beliefs $\{\pi_0, \ldots, \pi_t\}$. For each expectation, compute decisions for both updating and non-updating, then compute measures of each. Aggregate over all expectations and asset choices.