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Would Households Understand Average Inflation Targeting?

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Would Households Understand Average Inflation Targeting?

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Abstract

Yes, they would. In a randomized control trial, we provide groups of respondents from the Bundesbank Online Panel Households with information about a hypothetical alternative ECB monetary policy regime akin to the Federal Reserve's flexible average inflation targeting (AIT). Inflation expectations significantly increase for the treated individuals. When provided with additional information about near-term inflation, individuals update their expected inflation path in line with the central banks' intentions. This is particularly true for individuals with high trust in the ECB. We assess the economic significance of our findings by comparing two model economies under different monetary policy strategies, calibrated to match the difference in medium-term inflation expectations from our survey results. Under AIT, inflation is substantially less volatile and the frequency of hitting the lower bound on interest rates is considerably reduced.

Keywords: Monetary Policy Strategy, Household Inflation Expectations, Randomized Control Trial, Survey Data.
JEL: F33, E31, E32

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1. Introduction

Central banks increasingly emphasize the importance of communicating their policies to the general public. A key goal is to steer the inflation expectations of households and firms such that real interest rates stabilize the economy even in periods when the policy rate is constrained. As the first major central bank, the U.S. Federal Reserve (Fed) announced in August 2020 that it would pursue a new monetary strategy labeled as 'flexible average inflation targeting' (AIT). Under this new strategy, the Fed aims to deliver inflation that averages 2% in the medium term. This implies that periods during which inflation has undershot the 2% target will be followed by periods of higher than 2% inflation. While such history-dependent monetary strategies have been shown to have good stabilization properties in theory, an open question is whether they will be successful in practice.

In this paper, we study whether households understand the implications of such a new monetary strategy and update their expected inflation paths accordingly. We do so by eliciting probabilistic expectations about the medium- and longer-term inflation outlook from 9,000 respondents from the Bundesbank Online Panel Households (BOP-HH). Inflation expectations are well-anchored around the inflation aim of (close to but below) 2% which the European Central Bank (ECB) targeted until recently. We use randomized control trials to assess whether individuals would understand the implications of a hypothetical shift to an average inflation targeting strategy as the one introduced by the Fed in 2020. We also assess the quantitative adjustment of inflation expectations towards the target from below and above and study to what extent trust in the ECB affects the adjustment of inflation expectations. Importantly, we fielded our survey questions before the European Central Bank concluded its own framework review in July 2021.[1]

Our analysis shows that individuals asked to assume a hypothetical shift to average inflation targeting significantly increase their medium- and longer-term inflation expectations. Providing them with additional information about near-term inflation, respondents update their expected inflation paths in line with economic theory: they raise their inflation expectations if near-term inflation is below target and lower them when it is above target. The latter effect is quantitatively smaller, however, suggesting that individuals understand the asymmetry embedded in the Fed's communication which we follow in our information treatment. Individuals with high levels of trust in the ECB to deliver on its price stability mandate adjust their inflation expectations substantially more strongly. At the same time, respondents with the lowest levels of trust revise their inflation expectations downwards when provided with information about the alternative strategy.

While the stabilization properties of history-dependent monetary policy regimes are well understood in theory (see, e.g. Reifschneider and Williams

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[1]The ECB started a review of its monetary policy strategy in January 2020, discussing a range of issues including an update of its definition of price stability. The introduction of some form of average inflation targeting seemed a realistic strategic option. For instance, in a speech at the ECB and its Watchers Conference 2020, President Christine Lagarde highlighted that, within the strategic review, it will be assessed *whether central banks should commit to explicitly make up for inflation misses when they have spent quite some time below their inflation goals.*

(2000), Mertens and Williams (2019), and Amano et al. (2020)), surprisingly little is known about the key question our paper tries to answer: *Would households understand average inflation targeting?* To the best of our knowledge, the only other paper that aims to shed light on this question is Coibion et al. (2021). Using a daily online survey of U.S. individuals, these authors study whether the August 2020 introduction of the Fed's new monetary policy strategy had an impact on households' inflation expectations. They show that the announcement remained largely unnoticed by the general public. But even households who heard about the announcement did not incorporate the regime change into their expectations. Moreover, when providing individuals with specific information about inflation targeting (IT) and AIT in a randomized control trial, Coibion et al. (2021) find that both treatments lead to similarly large and significant *reductions* in expected inflation, expected output growth and expected growth in personal income. Importantly, they also document that even one year after the Fed announcement, U.S. households had not incorporated the change of monetary strategy into their expectation formation.

At the surface, the findings in Coibion et al. (2021) seem to be in contrast with our results which show that individuals who are asked to assume an alternative monetary strategy akin to AIT on average *increase* their inflation expectations. While our survey design is inspired by their analysis, there are several important differences. First, our analysis studies a hypothetical rather than an actual shift of central bank policy as in Coibion et al. (2021). Second, the distribution of expected inflation is more tightly centered around the 2% inflation target in our survey of German individuals relative to comparable surveys of U.S. households where a larger share of households report inflation expectations considerably above the target. As a result, when provided with information about Fed policy, U.S. households tend to reduce their inflation expectations (Coibion et al., forthcoming). Third, and most importantly, our results show that German households with low levels of trust in the ECB also *reduce* their inflation expectations when provided with information about the alternative monetary strategy, in line with the findings in Coibion et al. (2021) for the average treatment effect. Hence, differences across populations with respect to trust in the central bank may contribute to the observed differences in the effects of communicating monetary strategies.

At first sight, the increase in expected inflation under the hypothetical average inflation targeting regime appears quantitatively small. It ranges between 12 and 23 basis points at the two-to-three year horizon across specifications. To assess the economic significance of this increase, we use a small-scale Dynamic Stochastic General Equilibrium (DSGE) model. We consider two model economies, where in one the central bank follows an inflation targeting regime, while in the other the central bank pursues an average inflation targeting policy. We calibrate the differences in medium-term inflation expectations to match the survey evidence and then simulate the two economies to compare their stabilization properties. We find that the volatility of inflation is substantially smaller under AIT compared to IT while the variability of the output gap is similar across regimes. Moreover, the frequency of hitting the lower bound on interest rates is considerably reduced under AIT. Combined, our results suggest that a history-dependent monetary strategy may have good stabilization properties to the extent that it is well communicated and understood by the public.

The paper is organized as follows. In Section 2, we describe our survey experiments and the collected data. Section 3 provides the results of our randomized control trial. The section also discusses to what extent households incorporate their inflation expectations into their consumption plans. The role of trust in the central bank for the adjustment of inflation expectations is analysed in Section 4. Section 5 assesses the economic significance of the observed differences between IT and AIT using a small-scale DSGE model. Section 6 concludes.

2. Survey Experiments On Average Inflation Targeting

In this section, we describe the design of the randomized control trial (RCT) which we used to elicit household inflation expectations under different assumptions about the monetary regime and the near-term inflation outlook. We first provide some general information about the Bundesbank Online Panel Households in which we conduct our experiments. We then discuss the details of the experimental setup which is inspired by the analysis in Coibion et al. (2021).

2.1. The Bundesbank Online Panel Households

The survey experiments presented in this study were performed within the Bundesbank Online Panel Households (BOP-HH). BOP-HH is a survey conducted at the monthly frequency to elicit consumer expectations about both macroeconomic and household-specific outcomes. The survey is representative for the German online population and has participants from the age of 16 years and above. It contains a core set of general interest questions and typically includes a set of additional questions for the investigation of specific topics.[2]

In our analysis, we use BOP-HH data collected in October 2020 (Wave 10) with 1,903 respondents, and in January and February 2021 (Waves 13 and 14) with 2,342 and 4,737 respondents, respectively. In October 2020, we surveyed participants about their inflation expectations 2-3 years ahead, which we consider the horizon that best reflects the medium term. In January 2021, participants were asked about inflation expectations 5-10 years ahead, a horizon which we refer to as the longer term. We used the February 2021 wave with its larger sample size to construct two subsamples of about 3,000 and 1,700 respondents who were asked about medium- and longer-term inflation expectations, respectively. While the survey has a small panel component, in our study we focus on results from three cross-sections of individuals. We ensure that our results are not driven by learning of the panel households across survey waves.[3] In addition to the questions regarding inflation expectations we also surveyed households about their spending intentions with respect to durable goods and their trust in the ECB's ability to achieve price stability.

Table 1: BOP-HH randomized control trial on average inflation targeting.

Stage 1	Infobox for all participants:
	ECB's current strategy to aim at inflation rates close to, but below 2% in the medium term.
	An alternative strategy, as currently practised by the Fed, to steer the inflation rate at 2% on average.
	Example that if inflation runs below the target, Fed will raise inflation above target for some time.
Stage 2	All participants — assuming ECB is pursuing current strategy — are asked to assign probabilities for inflation 2-3 years (5-10 years)$^{\sharp:}$ ahead being
	... less or equal than 1%
	... greater than 1%, but at most 2%
	... greater than 2%, but at most 3%
	... greater than 3%
Stage 3	Participants are randomly sampled into one of five subgroups, A, B, C, D$^{\sharp:}$ or E$^{\sharp:}$, facing different assumptions about monetary policy and current inflation. Then, participants are asked again to assign probabilities as in Stage 2:
	Group A — alternative strategy
	Group B — current strategy; 2021 inflation at 1%
	Group C — alternative strategy; 2021 inflation at 1%
	Group D — current strategy; 2021 inflation at 3%$^{\sharp:}$
	Group E — alternative strategy; 2021 inflation at 3%$^{\sharp:}$

Notes: The RCT as described was conducted in October 2020 to elicit medium-term (2-3 years ahead) expectations, and in January to elicit longer-term (5-10 years) expectations, both Waves using subsamples A, B and C. Subsamples D and E in Stage 3 of the RCT, marked with a $^{\sharp:}$, are exclusive to Wave 14 of February 2021 where both medium- and longer-term expectations were elicited, so Stage 3 comprises subsamples A, B, C, D and E.

2.2. Randomized Control Trial Set-Up

The basic AIT experiment conducted in the October 2020, January and February 2021 waves of the BOP-HH is a randomized control trial with a simple three-stage procedure, as summarized in Table 1.

In the first stage, all participants receive general information about two monetary policy regimes. One is the strategy to aim at inflation rates close to, but below 2% in the medium term, as pursued by the ECB until July 2021.[4] We refer to this as the 'current strategy' or 'IT' in the remainder of the paper. The other monetary policy regime that we describe represents average inflation targeting

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[2]The German-language questionnaires and English-language translations are provided under https://www.bundesbank.de/en/bundesbank/research/survey-on-consumer-expectations/.

[3]There is a small number of about 300 individuals which remain in the panel between October 2020, the first wave in which we ran our first experiment, and February 2021 which was the last wave. We confirm that our results are essentially unchanged when excluding these individuals from the analysis of the January and February waves.

[4]There is a marginal variation in the questionnaire between Wave 10 and 14, where Wave 10 swapped the "close to" formulation for a precise point target formulation. The comparison of the different waves shows that our results are robust to the communication variation.

as introduced by the U.S. Federal Reserve in August 2020. Specifically, we inform survey participants that the Fed now aims to steer the inflation rate at 2% on average. We describe in simple terms that this would involve that if inflation were to fall below 2% for some time, then the Fed would aim to raise inflation above 2% for some time thereafter. That is, we explicitly adopt the asymmetric communication used by Federal Reserve Chairman Powell in his August 2020 Jackson Hole announcement.[5] We choose this formulation as it was geared towards a broader public and appears straightforward to understand. We refrain from using the term "average inflation targeting" as a potential strategy the ECB could adopt as it was only vaguely discussed by policy makers in the euro area. Nonetheless, for brevity, we refer to this 'alternative strategy' as 'AIT' in the remainder of the paper.

In the second stage, participants are asked to make a probabilistic assessment for inflation 2-3 years (October 2020 and February 2021) and 5-10 years (January and February 2021) ahead. For simplicity, we offer respondents a simple four-bin histogram where they are asked to assign probabilities to the events that inflation over the solicited horizon is less or equal 1%, greater than 1% but at most 2%, greater than 2% but at most 3%, or greater than 3%.

In the third stage of the experiment, participants are randomly sampled into five subgroups and are again asked for their probabilistic assessment of inflation 2-3 or 5-10 years ahead. In two of the groups, we ask respondents to continue assuming that the ECB follows its current strategy, but to make additional assumptions about near-term inflation. Specifically, one of the groups is asked to assume that inflation in the calendar year 2021 (the beginning of the forecast horizon) would be at 1% and the other group that 2021 inflation would equal 3%. The purpose of this additional assumption is to investigate individuals' expected inflation *path* back to the target. In a third group, we ask participants to assume that the ECB would be pursuing the alternative strategy described before, without further assumptions about 2021 inflation. Finally, the last two groups are asked to assume that the ECB would be following the alternative strategy under the additional assumption that inflation in 2021 would be at 1% or 3%, respectively.

3. Inflation Expectations under Different Monetary Regimes

This section provides an analysis of expected inflation over the medium and longer run elicited under the two different monetary policy regimes. As the February 2021 wave with about 4,700 respondents allows us to provide the most granular analysis, we focus on this wave. We provide comparisons with the other waves along the way to document the robustness of our findings.

3.1. Expected Inflation Outcomes in the Medium and Longer Run

Figure 1 compares the average probability distribution of medium (left panel) and longer-term (right panel) inflation expectations under the two different regimes, without additional assumptions about near-term inflation. Dark blue bars show inflation expectations when respondents are asked to assume that the ECB is pursuing its current price stability objective to aim at an inflation rate

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[5]Note that the Fed communication of the new strategy explicitly did not mathematically define a reaction function, but purposefully embedded some flexibility.

Figure 1: Inflation expectations for 2-3 years and 5-10 years ahead (February 2021 Wave 14).
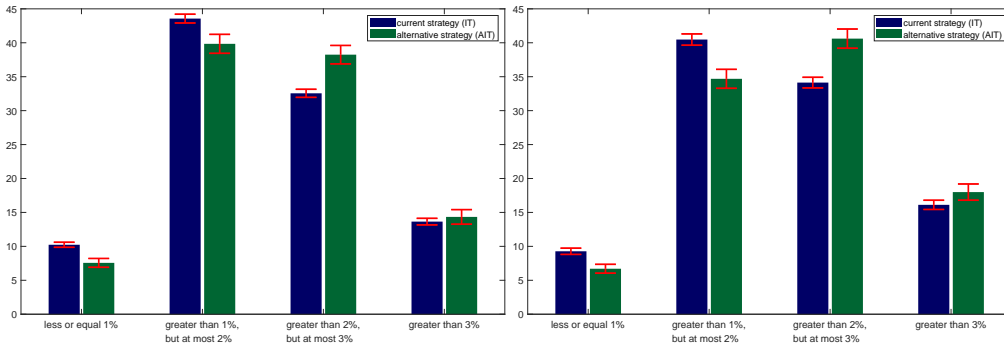
Notes: Left panel: Inflation expectations for 2-3 years ahead elicited in February 2021 (Wave 14) of BOP-HH. Right panel: Inflation expectations for 5-10 years ahead elicited from a disjoint sample of respondents in February 2021 (Wave 14) of BOP-HH. Dark blue bars show average subjective probabilities of medium-term inflation with respondents assuming current monetary policy (IT). Dark green bars show average subjective probabilities of respondents assuming the alternative strategy (AIT). A two standard error band is plotted in red. Test statistics are provided in Table A.1 in the Online Appendix.

close to, but below 2% over the medium term. The bars of the second and third bin taken together show that, for both forecast horizons more than 75% of the mass is assigned to inflation falling between 1 and 3%. Hence, both medium and longer-term inflation expectations of German households appear to be relatively well-centered around the ECB's price stability objective of 2% at the time when the survey was conducted. The average subjective probability of inflation exceeding 3% is roughly 13-15% while that of inflation falling below 1% is about 10% for both horizons.

The dark green bars show average subjective probabilities when respondents are asked to assume that the ECB would pursue the alternative strategy. At both forecast horizons, the reported probabilities for inflation below 2% are considerably lower than under the current strategy. In contrast, the probability mass is shifting towards higher expected inflation. Statistically, these average subjective probabilities under the two strategies are different, bin by bin and jointly. The p values of the corresponding t test statistics and for the $\mathcal{T}^2$ test statistic of Hotelling (1931) are shown in Table A.1 in the Online Appendix. A two standard error bar is plotted in red to visualize the sampling uncertainty around the mean differences for every bin. Despite the upward shift of inflation expectations under AIT, the distribution is a bit more symmetric than under IT with about 75-80% of the probability mass allocated to inflation being between 1 and 3% at both horizons. The February 2021 results are consistent with the findings of October 2020 for the medium-run, as shown in the left panel of Figure A.1 in the Online Appendix. As realized inflation had increased markedly over this time period, our results thus seem to be robust to changes in the underlying inflation dynamics.

To summarize, this first analysis suggests that inflation expectations for the medium and longer run would be somewhat higher under average inflation targeting as compared to inflation targeting. At first sight, it might appear surprising that longer-term inflation expectations are also shifted up significantly under the assumed AIT strategy. The reason is that under AIT the central bank is supposed to bring inflation back to the 2% target in the medium term, such that well-

anchored longer-term inflation expectations should be at target. We can offer three potential explanations for this finding. First, households may consider 5-10 years into the future as the medium term, in contrast to most central bankers who would associate the medium term with shorter horizons of 2-3 years. Second, households may well understand the asymmetry implicit in the communication by the Fed chair which we use in our information treatment. Accordingly, while they understand that inflation may rise above 2% for some time after a period of below target inflation, they may not anticipate inflation to be pushed *below* 2% after a period of higher than target inflation. Third, assuming an arguably implausible level of sophistication of households, they may understand that average inflation in the longer-term will be higher under AIT as the economy will hit the lower bound on interest rates less often under such a policy regime.

3.2. Comparing Mean Inflation Expectations

In the previous section we have shown that the distribution of medium- and longer-term inflation expectations is significantly different across monetary policy regimes, with more probability mass at inflation levels above 2% under AIT. In this section, we translate these probabilistic assessments into mean inflation expectations to measure the magnitude of the increase in expected inflation.

We back out mean inflation expectations as the first moment of the individual respondents' histograms broadly following Engelberg et al. (2009). The resulting distributions of mean inflation expectations for the medium term across the two policy regimes are provided in Figure A.2 in the Online Appendix. They confirm the pronounced upward shift under the hypothetical AIT strategy as compared to the IT strategy. In particular, while the mass of mean inflation expectations falling in the interval 1.5 to 2% is reduced moving from IT to AIT, the share of mean expectations falling into the 2 to 2.5% and the 2.5 to 3% bin increase markedly. The average of the mean inflation expectations across individuals shifts from 2.03% to 2.17% in the October 2020 wave and from 2.02% to 2.15% in the February 2021 wave. A similar shift can be observed for the longer-term mean inflation expectations, elicited in January 2021 and February 2021, as shown in Figure A.3 in the Online Appendix.

3.3. Adjustment of Inflation Expectations towards the Target

Thus far we have established that households have somewhat higher medium-term and longer-term inflation expectations under AIT than under IT. A key aspect of make-up strategies such as AIT is that inflation expectations work as "automatic stabilizers" in the sense that they increase when inflation is running below target and decline when inflation is running above target for some time. Here, we assess the quantitative adjustment of inflation expectations towards the target from below and above. As noted above, the current communication of the Fed with respect to their flexible AIT strategy is asymmetric. While it is clearly stated that the Fed would try to steer inflation above the 2% target after it has been undershooting the target for some time, the opposite is not explicitly mentioned. We follow this communication and provide participants with an explanation of the alternative (AIT) strategy in line with the Fed's asymmetric statement.

To assess the adjustment of expected inflation paths, we asked subgroups of respondents in Stage 3 of the RCT to assume that the ECB would continue to

Figure 2: Inflation expectations for 2-3 years with 2021 inflation at 1% and 3%, respectively (February 2021 Wave 14).
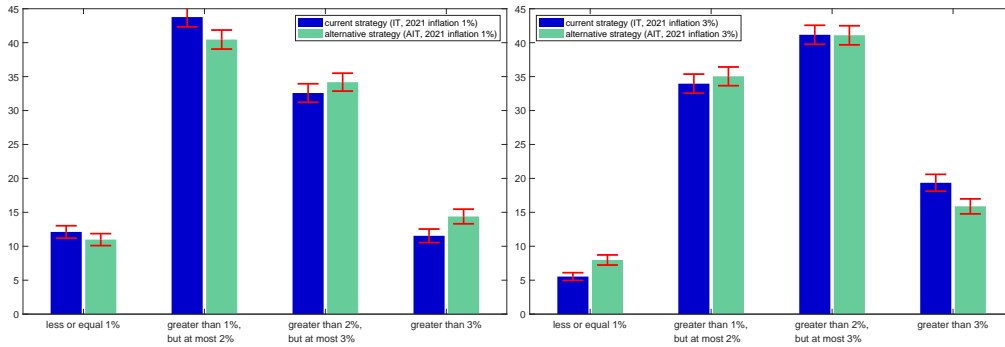
Notes: Left panel: Respondents are asked to assume 2021 inflation at 1%. Right panel: Respondents are asked to assume 2021 inflation at 3%. Inflation expectations for 2-3 years ahead elicited in February 2021 (Wave 14) of BOP-HH. Royal blue bars show average subjective probabilities of medium-term inflation with respondents assuming current monetary policy (IT). Teal bars show average subjective probabilities of respondents assuming the alternative strategy (AIT). A two standard error band is plotted in red. Test statistics are provided in Table A.1.

follow its current (IT) strategy and, in addition, to assume that 2021 inflation would be at 1%, that is, below the inflation target. Another group was asked to assume that 2021 inflation would be at 3%, i.e. above the inflation target. Analogously, we proceed for the two groups receiving information about the alternative strategy.

The left-hand panel of Figure 2 compares the outcomes for the 1% treatment, the right-hand panel those for the 3% treatment. With the additional assumption of inflation averaging 1% in 2021, respondents under AIT report significantly less probability mass in the below-target bins than the respondents under IT, but instead more mass than the IT group in the above-target bins. This is in line with the desired adjustment of inflation expectations. The effect is to some extent reversed under the 3% assumption treatment. While IT and AIT respondents attribute about the same probability mass to medium-term inflation falling in the 1 to 2% and the 2 to 3% bins, there is a significant difference in the outer bins. Survey participants asked to assume the alternative strategy see a larger probability that inflation will fall below 1% than IT respondents; the opposite is true for inflation above 3%. Hence, households appear to understand that a lower (higher) than target near-term inflation rate is more likely to be followed by an above (below) target medium-term inflation rate under AIT than under IT.

To assess the quantitative magnitude of these effects, we again consider mean inflation expectations derived from the individual respondents' probabilistic assessments. The cross-sectional distributions of mean expectations for the medium-term under the various treatments are provided in Figure A.4 in the Online Appendix. While the distributions have fairly similar shapes under the two regimes, the average expected mean inflation is about 10 basis points higher for AIT than for IT respondents when asked to assume inflation in 2021 to be at 1%, but is about 10 basis points lower for AIT than IT respondents under the 3% treatment. Again, these results suggest that households perceive a stronger adjustment of inflation towards the target under AIT as compared to the IT strategy.

We now assess the statistical significance of the shifts in mean inflation ex-

Table 2: Baseline regression results for mean inflation expectations 2-3 years and 5-10 years ahead (February 2021 Wave 14)

$$\text{mean}_i^s - \text{mean}_i^{IT} = \sum_s^S \delta_s d_{s,i} + u_i, \; s \in \{AIT, IT1\%, AIT1\%, IT3\%, AIT3\%\}$$

| Specification | Expectations 2-3 years ahead | | Expectations 5-10 years ahead | |
	(1)	(2)	(3)	(4)
AIT	0.13***	0.23***	0.12***	0.21***
	(0.03)	(0.05)	(0.03)	(0.05)
$IT1\%$	−0.09***	−0.14***	0.02	0.03
	(0.03)	(0.05)	(0.03)	(0.04)
$AIT1\%$	0.03	0.05	0.07**	0.10**
	(0.03)	(0.05)	(0.03)	(0.04)
$IT3\%$	0.25***	0.37***		
	(0.03)	(0.05)		
$AIT3\%$	0.28***	0.42***		
	(0.03)	(0.05)		
$AIT1\% - IT1\%$	0.12**	0.19***	0.05	0.07
$AIT3\% - IT3\%$	0.03	0.05		
Observations	2970	1848	1745	1057
Adjusters only	No	Yes	No	Yes

Notes: Sub- and superscript s refers to a certain monetary policy strategy with specific assumptions about near-term inflation. For instance, $s = AIT3\%$ denotes 'average inflation targeting', with respondents additionally asked to assume that the inflation rate in 2021 would be at 3%. Columns (1) and (3) report the change of inflation expectations 2-3 (5-10) years ahead for all respondents, while columns (2) and (4) show results only for individuals who updated their inflation expectations after the information treatment for the respective horizons. All regressions use weighted survey responses where the weights ensure the representativeness of the sample. Asterisks (***, **, *) indicate significance levels of 1, 5 and 10% for the usual t test statistics for coefficient estimates and for the F test statistics for differences in coefficient estimates.

pectations. Specifically, we follow Coibion et al. (2019) and compute the differences between the individual post-treatment mean inflation expectation and the pre-treatment mean inflation expectation formed under the assumption of current monetary policy. We then regress these differences on dummy variables indicating whether or not an individual was sampled into a specific subgroup. The estimation equation is then simply

$$\text{mean}_i^s - \text{mean}_i^{IT} = \sum_s^S \delta_s d_{s,i} + u_i, \; s \in \{AIT, IT1\%, AIT1\%, IT3\%, AIT3\%\}. \quad (1)$$

The subscript i represents the individual respondent in the cross-section, and sub- and superscript s reflects the subsample, corresponding to a specific combination of monetary policy strategy and 2021 inflation the participant is asked to assume. The coefficient δ_s captures the change in medium-term inflation expectations due to treatment s, measured in basis points. The variable $d_{s,i}$ is the treatment dummy. All mean differences are pre-post comparisons, calculated with respect to the information that the ECB is currently pursuing its inflation targeting strategy, such that $\text{mean}_i^{IT} \equiv \text{mean}_i^{pre}$ and $\text{mean}_i^s \equiv \text{mean}_i^{post}$.

Table 2 reports the results. The first column shows the treatment effects for

medium-term inflation expectations. The coefficient for AIT is 13 basis points and statistically significant at the 1% level. Hence, the medium-term inflation expectations of respondents asked to assume the alternative strategy are significantly higher without any additional assumptions about near-term inflation. In contrast, the coefficient for IT1% is a strongly statistically significant negative 9 basis points, suggesting individuals lower their medium-term inflation expectations under the current regime when prompted to assume near-term inflation below target. This suggests that below target inflation rates might become entrenched in expectations under the IT strategy. This is not true, however, for the participants asked to assume that the ECB follows the alternative (AIT) strategy. These individuals slightly increase their medium-term inflation expectations, albeit not statistically significantly. Turning to the coefficients for the $IT3\%$ and $AIT3\%$ treatments, we see that both groups significantly increase their medium-term inflation expectations by similar magnitudes. While the estimated coefficients are interesting for themselves, it is instructive to compare the differences across regimes, given a specific assumption about start-year inflation. The corresponding F test results are shown in the last two rows for the 1% and 3% groups, respectively. Mean inflation expectations increase by a statistically significant 12 basis points more under AIT as compared to IT when asked to assume below-target near-term inflation. They also increase somewhat more under AIT under the assumption of above-target near-term inflation, but that difference is not statistically significant.

These results capture all survey responses, including those of individuals who did not adjust their perceived inflation outcomes after the information treatment. To evaluate the magnitude of the adjustments for those who revise their expectations, the second column of Table 2 repeats these results only for those individuals who changed their assessment in response to the treatment. The share of non-adjusters is sizeable, with roughly 30% of respondents not changing their expectations between Stage 2 and Stage 3 of the experiment. Nonetheless, the vast majority of remaining participants, dubbed 'adjusters', seems to understand the key mechanism of AIT. Inflation expectations increase by a highly statistically significant 23 basis points for households asked to assume the alternative strategy. Individuals in the IT1% group lower their inflation expectations by a significant 14 basis points while those in the $AIT1\%$ group increase them by 5 basis points. The difference of 19 basis points is highly statistically significant, showing households would understand the concept of inflation overshooting when it is currently running below target. In contrast, as shown by the positive but insignificant difference between the $AIT3\%$ and the $IT3\%$ groups, they do not anticipate an undershooting of inflation when it is currently running above the target. As discussed above, this response is in line with the asymmetric Fed communication that we treat individuals with.

The third and fourth column of Table 2 report the regression results for longer-term inflation expectations. Due to the smaller number of respondents in this treatment arm, we only compare the two strategies without additional assumptions about near-term inflation and under the 1% assumption. The coefficients show that households raise their longer-term inflation expectations by similar magnitudes as their medium-term inflation expectations when asked to assume the alternative monetary strategy: 12 basis points for all households and 21 basis points considering only those who adjusted their assessment after the

treatment. Interestingly, in contrast to the medium-term inflation expectations, households asked to assume the current strategy and 2021 inflation at 1% did not lower their longer-term inflation expectations. This suggests that they understand that inflation would move back to target over the longer-run under the IT strategy. Again in contrast to the medium-term expectations, individuals asked to assume the alternative strategy and 2021 inflation at 1% significantly raised their 5-10 years ahead inflation expectations. This might imply that they perceive this longer horizon as representative of the "medium term" used in the description of the two strategies that we provide to the survey participants.

Table A.2 in the Online Appendix shows that these results are robust to various modifications in the regression specification. In particular, they are largely unchanged when we use unweighted as opposed to weighted individual survey responses as in our baseline regression. The weights ensure that the survey responses are representative of the German online population in terms of a range of socioeconomic characteristics including gender, age, education status, income, region of domicile, etc. Our results are also robust with respect to possible outliers or heteroskedasticity. Therefore, throughout the remainder of the paper, we show results for the weighted data and employ simple OLS estimations.

A potential concern with our analysis based on repeated cross-sections is that inflation expectations could respond to changes in actual inflation from wave to wave. Indeed, annualized consumer price inflation in Germany increased substantially from below two percent in the fall of 2020 to above three percent in early 2021. Several factors contributed to this shift: a temporary reduction in the VAT rate from 19% to 16% between July 2020 and December 2020, an increase in carbon taxes on fuel and other energy sources, and base effects related to the strong decline of commodity and other prices at the beginning of the COVID-19 pandemic. Table A.3 in the Online Appendix compares the regression results for the three different survey waves conducted in October 2020, January and February 2021. While the coefficients vary somewhat in magnitude, the main conclusions are unchanged: households understand the concept of average inflation targeting and adjust their inflation expectations in the desired way.

3.4. Adjustment of Consumption Plans

So far, we have shown that German households adjust their inflation expectations in line with the theoretical prescription of average inflation targeting. But even if central banks were able to steer inflation expectations in the desired way, the stabilisation properties of history-dependent monetary policy rules also depend on the impact that movements in expected inflation have on aggregate demand and in particular, household consumption. Despite the tight link between inflation expectations and consumption via the real interest rate channel in economic theory, prior research e.g. by Bachmann et al. (2015) has found at best mixed evidence supporting such a connection.

We follow Bachmann et al. (2015) and evaluate the relation between expected inflation and intended durable consumption. To this end, we complemented our RCT with two follow-up questions. The first asks whether or not it is currently a good time to buy durable goods. The second lets respondents state a reason for the answer to the previous question. The augmented survey design is shown in Table A.4 in the Online Appendix. We then specify a probit model regressing the binary variable capturing the reported consumption intention on the

individual mean inflation expectations post-treatment and a set of demographic controls. The average marginal effects implied by both regressions are shown in Table A.5 in the Online Appendix. In both specifications, the impact of inflation expectations on households' spending intentions is essentially zero, confirming the findings of Bachmann et al. (2015) in our data.[6] While inflation expectations do not play a role, several socio-demographic characteristics significantly affect individuals' spending intentions. In particular, wealthier and more educated individuals show a higher propensity to consume durables, consistent with Armantier et al. (2015). The same is true for female respondents, who seem to be more sensitive to price developments, as also pointed out by D'Acunto et al. (2021a) and D'Acunto et al. (2021b). In contrast, individuals who have lived in East Germany prior to 1990 feature a strongly lower propensity to consume durables. Our results also show that the missing link between inflation expectations and reported spending plans is not driven by the weighting of respondents to match the online population of German individuals. We also do not find a link between inflation uncertainty extracted from the probabilistic inflation expectations and spending plans, in contrast to the results reported in Coibion et al. (2019). Finally, there is no statistically significant link between (changes in) inflation expectations and consumption plans when excluding participants who do not adjust their expectations in response to the provided information.

Despite the missing link between inflation expectations and durable spending intentions, we find that households *qualitatively* associate expected price changes with consumption. After deciding whether now is a 'good time to buy' or 'not a good time to buy', respondents were asked to specify a reason for their answer.[7] As Table A.6 in the Online Appendix shows, expected price increases for prices in general and for those of durable goods are the major reported reason for respondents to answer that currently is a good time to buy durables. This is true both prior to and after the treatment and across the two monetary policy regimes. When participants were asked to give a reason why currently it is not a good time to buy, smaller price increases only play a marginal role. The primary reason chosen for not planning to purchase durables is the lack of need for replacement, followed by a precautionary savings motive where participants do not want to spend savings.

In sum, the information treatment ignites little change in respondents' reported consumption plans. We interpret these findings as evidence that the magnitude of the shift in expected inflation induced by a hypothetical change in monetary policy may be too small to meaningfully affect private households' spending intentions. In fact, as pointed out by Andrade et al. (2020), household consumption is more likely to respond to broad changes in the inflation regime rather than to small variations in inflation.

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[6]We also do not find a significant impact on durable spending intentions when using the difference in mean inflation expectations before and after the treatment as explanatory variable.

[7]Answering options were provided as a list, with the ordering of the entries randomized. Alternatively, participants could type a reason into a free-form text field, but this option was rarely used in practice. The reasons that could be chosen by the respondents and the resulting distribution of answers are shown in Table A.6 in the Online Appendix. The top panel lists the reasons chosen at Stage 2, prior to treatment. The bottom panel shows the selected reasons post-treatment.

4. The Role of Trust for the Adjustment of Inflation Expectations

It is well understood by central bankers and academic economists that central banks' ability to steer the inflation expectations of households and firms crucially depends on their credibility (Blinder, 2000). This is particularly important for AIT which makes monetary policy history-dependent by promising to offset past misses of inflation in the future (Amano et al., 2020). In this section, we analyze whether the observed differences between AIT and IT are possibly amplified by the degree of central bank credibility.

In the survey literature, central bank credibility is often associated with high reported levels of trust in the central bank, see e.g. Christelis et al. (2020). They find that individuals with higher trust in the ECB on average have lower inflation expectations and report lower uncertainty about future inflation. To investigate whether trust in the central bank affects households' inflation expectations under different monetary policy regimes, we explicitly asked participants to what extent they trust the ECB's ability to achieve price stability in the February 2021 wave of the BOP-HH survey. Respondents could choose any value between '0 = Do not trust at all' and '10 = Trust entirely', and could also exit stating 'I do not know the ECB'. The modal value of trust across respondents is 5, with a mean of 4.7. Few reported very high levels of trust and about 10 percent of respondents did not show any trust in the ECB. Importantly, we elicited these trust values *before* the information treatment that is part of our RCT experiment.[8]

To assess the extent to which trust in the central bank affects the mean inflation expectations of private households across monetary policy regimes, we interact the treatment dummy with the trust variable as follows:

$$\text{mean}_i^s - \text{mean}_i^{IT} = \sum_s^S \delta_s d_{s,i} + \sum_s^S \gamma_s d_{s,i} \times \text{Trust}_i + u_i, \quad (2)$$

where $s \in \{AIT, IT1\%, AIT1\%, IT3\%, AIT3\%\}$ denotes the various treatment arms. Due to the interaction terms in the regression model, the treatment effect of a particular monetary policy strategy s now also depends on the level of trust in the ECB, so that the treatment effect under s is given by $\delta_s + \gamma_s \times \text{Trust}_i$.

The results are shown in Table 3. We test the Null hypotheses that the shifts of mean expected inflation under the various information treatments are unchanged once we interact with trust. We evaluate the corresponding F tests at the 10%, median and the 90% quantile of the trust distribution. Focusing first on the medium-run inflation expectations shown for all respondents and for adjusters only in the first and second column, we make the following observations. First, without providing additional assumptions about near-term inflation, both the coefficient on the treatment dummy *AIT* and on the interaction with trust are highly significant. Interestingly, the former switches sign and becomes negative while the latter is positive. This indicates that individuals with higher trust in the ECB increase their inflation expectations more strongly under AIT, while individuals with low trust revise their inflation expectations downward. As a result, the medium-term inflation expectations are negative at the 10th percentile, but positive at the median and strongly positive at 40 bps at the 90th percentile of

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[8]The distribution of reported trust values is shown in Figure A.5 in the Online Appendix.

the trust distribution. This is somewhat in contrast to Coibion et al. (2021) who find that the average respondent in a survey of U.S. individuals adjusts inflation expectations negatively when confronted with information about the new Fed strategy.

Second, under the additional assumption that current inflation would initially be below target at 1%, the difference between AIT and IT becomes more pronounced at medium and high trust levels relative to the baseline specification. For low levels of trust, the difference between mean inflation expectations is still positive, but statistically insignificant. Individuals with intermediate and high levels of trust, however, revise their inflation expectations more strongly upwards. Third, respondents with low and intermediate levels of trust also somewhat raise their inflation expectations relative to IT when near-term inflation is assumed to be 3%. Only for high levels of trust this adjustment is negative, in line with the expected make-up effect that medium-term inflation expectations under AIT should be lower than under IT. As in the baseline specification without taking trust into account, these differences are largely statistically insignificant. Importantly, the difference between AIT and IT declines as trust increases, suggesting that confidence in the ECB to achieve its price stability objective contributes to the adjustment of inflation expectations in line with the central banks' intentions, independently of the monetary regime. For the longer run, displayed in columns 3 and 4 of the table, the differences between the mean inflation expectations are positive and highly statistically significant for intermediate and high levels of trust. Under the additional 1% assumption they are not statistically significant at any level of trust.[9]

Figure 3 visualizes the effect of trust in the ECB on the adjustment of inflation expectations. The left column shows results for all respondents, corresponding to the regression results in the first column of Table 3, while the right column provides results looking only at the roughly two thirds of adjusters who have changed their inflation expectations after the information treatment (corresponding to the second column of the table).

The top row shows results for the AIT treatment without additional information about start-year inflation. For each level of trust, we plot the change in inflation expectations from before to after the information treatment as green circles. The red diamonds show the average of these observations for each level of trust. The regression line in the top-left chart plots the estimated relation between the change in inflation expectations and trust.[10] The line is upward-sloping, showing that higher levels of trust are associated with a stronger adjustment of inflation expectations to the provided information. More importantly, however, it highlights that for levels of trust below 3, the adjustment of inflation expectations tends to be negative. This is in line with the baseline results of Coibion et al. (2021) who document a negative average impact of information about the new monetary strategy of the Federal Reserve on U.S. households' inflation expecta-

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[9]While we only show results based on weighted data in Table 3 with the weights ensuring that the survey responses are representative of the German online population, our findings are robust to using Huber (1981) weights or unweighted data. They are also robust with respect to possible outliers or heteroskedasticity.

[10]That is, the intercept corresponds to the coefficient on the AIT treatment dummy (−0.24% for all respondents), and the slope corresponds to the coefficient on the interaction with trust (0.08%).

Table 3: Inflation expectations and trust in the central bank (February 2021 Wave 14)

$$\text{mean}_i^s - \text{mean}_i^{IT} = \sum_s^S \delta_s d_{s,i} + \sum_s^S \gamma_s d_{s,i} \times \text{Trust}_i + u_i, \ s \in \{AIT, IT1\%, AIT1\%, IT3\%, AIT3\%\}$$

Specification	Expectations 2 - 3 years ahead		Expectations 5 - 10 years ahead	
	(1)	(2)	(3)	(4)
AIT	−0.24***	−0.41***	−0.01	0.01
	(0.07)	(0.12)	(0.06)	(0.10)
IT1%	−0.15**	−0.26**	0.04	0.07
	(0.07)	(0.11)	(0.06)	(0.10)
IT3%	0.07	0.15		
	(0.07)	(0.12)		
AIT1%	−0.09	−0.14	0.07	0.11
	(0.07)	(0.11)	(0.06)	(0.10)
AIT3%	0.24***	0.38***		
	(0.06)	(0.10)		
AIT × Trust	0.08***	0.13***	0.03**	0.04**
	(0.01)	(0.02)	(0.01)	(0.02)
IT1% × Trust	0.01	0.02	−0.00	−0.01
	(0.01)	(0.02)	(0.01)	(0.02)
IT3% × Trust	0.04***	0.04**		
	(0.01)	(0.02)		
AIT1% × Trust	0.03**	0.04**	0.00	−0.00
	(0.01)	(0.02)	(0.01)	(0.02)
AIT3% × Trust	0.01	0.01		
	(0.01)	(0.02)		
AIT				
at 10%-Quantile	−0.16***	−0.15**	−0.01	0.05
at 50%-Quantile	0.16***	0.24***	0.14***	0.21***
at 90%-Quantile	0.40***	0.63***	0.23***	0.33***
AIT1% − IT1%				
at 10%-Quantile	0.08	0.16	0.03	0.03
at 50%-Quantile	0.16***	0.22***	0.03	0.09
at 90%-Quantile	0.22**	0.28**	0.03	0.12
AIT3% − IT3%				
at 10%-Quantile	0.14*	0.17		
at 50%-Quantile	0.02	0.08		
at 90%-Quantile	−0.07	−0.01		
Observations	2957	1841	1735	1050
Adjusters only	No	Yes	No	Yes

Notes: Columns (1) and (3) report the change of inflation expectations 2-3 (5-10) years ahead for all respondents, while columns (2) and (4) show results only for individuals who updated their inflation expectations after the information treatment for the respective horizons. Asterisks (***, **, *) indicate significance levels of 1, 5 and 10% for the usual t test statistics for coefficient estimates and for the F test statistics for the differences between *IT1%* versus *AIT1%* and *IT3%* versus *AIT3%*, respectively. As the monetary policy regimes are now interacted with the trust level, the F tests are set up to assess the Null of the equality of a given IT-AIT pair of partial derivatives, calculated for the 10%-, the 50%- and 90%-quantiles of the trust distribution. For example, the Null of the F test for the comparison *AIT1% − IT1%* is obtained as $H_0 : \hat{\delta}_{AIT1\%} - \hat{\delta}_{IT1\%} + (\hat{\gamma}_{AIT1\%} - \hat{\gamma}_{IT1\%}) \times \text{Trust}_{50\%} = 0$. All regressions use weighted survey responses where the weights ensure the representativeness of the sample.

Figure 3: Change in inflation expectations when controlling for the level of trust in the ECB's ability to achieve price stability.
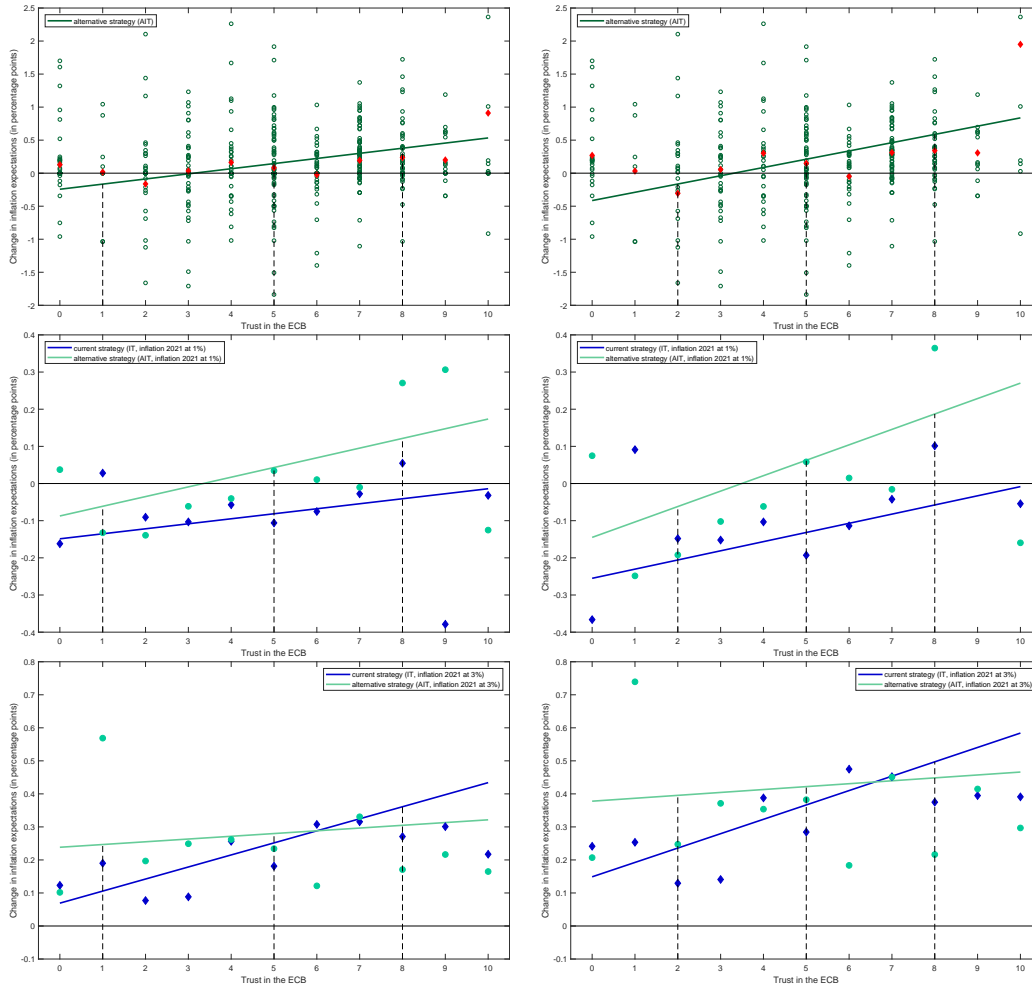
Notes: Left side: All respondents in respective treatment group. Right side: Only respondents that have adjusted their inflation expectations post-treatment (adjusters only). Top panel: Observations exceeding −2 and 2.5 are not displayed. Observations depicted in red are group-means computed for each level of trust. The middle and bottom panel report only group-means for different trust levels. Dashed lines represent 10%-, 50%- and 90%-quantiles. The regression lines plot the marginal impact of trust on the change in inflation expectations for a given information treatment.

tions. While these authors don't report trust in the Fed, their result of a negative impact on the provided information on inflation expectations might be consistent with our results if many of their respondents had low levels of trust. The corresponding chart in the top-right panel of Figure 3 shows the same regression for adjusters only. While the impact of trust on the adjustment of inflation expectations is a bit more pronounced, the conclusion that individuals with levels of trust below 3 tend to lower their inflation expectations remains valid.

The middle and bottom panels of Figure 3 show the corresponding relationships between trust and the adjustment of inflation expectations for the groups of respondents provided with the additional 1% and 3% assumption, respectively. Rather than plotting all individual changes in inflation expectations, for ease of exposition we simply show the average per treatment arm and level of trust (green for the alternative (AIT) strategy and blue for the current (IT) strategy).

The regression lines correspond to the coefficients based on the individual responses documented in Table 3. For the groups asked to assume below-target start-year inflation the green line is steeper and consistently above the blue, indicating that trust in the ECB amplifies the adjustment of inflation expectations. As for the AIT treatment without additional information, only AIT1% respondents with levels of trust below 3 reduce their inflation expectations. That said, for all levels of trust in the ECB IT1% respondents lower their inflation expectations, consistent with the notion that low initial inflation would not lead to a subsequent inflation overshoot under the inflation targeting policy.

A slightly different picture emerges from the bottom panel showing the groups of respondents asked to assume a 3% start-year inflation. Here, individuals treated with information about the alternative strategy consistently revise their inflation expectations upwards, and the impact of trust on these revisions is fairly low. In contrast, and somewhat counterintuitively, the respondents asked to assume the current IT policy increase their inflation expectations more strongly the more they trust in the ECB's ability to achieve price stability.

In light of the important role of trust in the ECB it is instructive to study the sociodemographics of individuals with different levels of trust. Table 4 provides the percentage shares of various sociodemographic characteristics for individuals with low (trust ≤ 1), intermediate (trust = 5) and high levels of trust (trust ≥ 8), respectively. The pattern that emerges from these numbers is that respondents with low levels of trust tend to have fewer years of education and lower incomes. Regarding the age structure, individuals between 40 and 60 years have lower levels of trust, while those younger than 40 years tend to have higher levels of trust. The distribution of trust is relatively flat for respondents older than 60 years. Both employment status and gender also do not seem to play a role. That said, individuals who lived in East Germany before the wall came down tend to have lower levels of trust.

In sum, these results suggest that high trust in the ECB increases both the level of medium-term and longer-term inflation expectations and the strength of the adjustment of inflation expectations back towards target, especially when inflation starts from below. Moreover, since trust is distributed quite unevenly among different socioeconomic groups, central bank communication efforts targeting constituents with low levels of trust might have particularly large benefits for central banks aiming to steer the public's inflation expectations.

5. Assessing the Economic Significance

In the previous sections we have shown that households increase their inflation expectations when prompted to assume an alternative monetary strategy akin to average inflation targeting. While the increase is highly statistically significant, the magnitude of the observed shift in mean inflation expectations of about 12 to 23 basis points across the various specifications might appear small at first glance. In this section we gauge the economic significance of this increase in a simple New Keynesian model. We first summarize the model's aggregate demand and supply conditions in equilibrium, as well as the monetary policy rules corresponding to AIT and IT, respectively. We then calibrate the model to match the estimated differences in medium-term inflation expectations and simulate the model to compare the stabilization properties of the two monetary regimes.

Table 4: Percentage share breakdown of socio-economic characteristics of the Wave 14 sample, categorized by trust levels

	Low trust	Median trust	High trust
Age (in years)			
below 40	25.1	34.9	41.7
40 to 60	46.7	35.3	30.3
over 60	28.2	29.8	28.0
Female	48.7	60.1	43.7
HH income (in EUR)			
under 1500	16.3	11.6	10.9
1500 to 3000	39.6	37.2	28.1
3000 to 5000	32.8	34.0	40.6
over 5000	11.3	17.2	20.4
Employed	62.9	60.2	60.7
College degree	14.7	18.9	32.9
High school degree	22.9	30.3	51.1
East GER pre 1990	27.2	16.1	15.8
No. of observations	364	592	440

Notes: Figures correspond to percentage shares of a total of 100% or each variable for the respective trust level, i.e., column-wise. *Low trust* numbers comprise individuals with trust levels of 0 and 1; *Median trust* with a trust level of 5; and *High trust* with trust levels of 8, 9 and 10, respectively.

5.1. The Model's Equilibrium Conditions

The equilibrium conditions are log-linearized around the non-stochastic steady state, such that $\overline{X}$ reflects the steady state of variable X, and $x_t = \log(X_t) - \log(\overline{X})$ represents its log-linearized form.

The benefits of AIT and other history-dependent monetary policy rules derive from their ability to steer inflation expectations. In practice, however, the expectation channel appears to be constrained as expectations only adjust sluggishly (e.g. Coibion et al. (2018)) or as agents adjust their expectations only partially to policy announcements (e.g. Mauersberger and Nagel (2018)). To account for the empirical evidence, we mitigate the expectation channel in the model.[11] Specifically, we follow Galí et al. (2007) and Bilbiie (2019) and assume that a share of households λ is limited to borrow or save in financial markets, which yields the following aggregate demand equation.

$$ x_t = E_t [x_{t+1}] - \frac{1 - \lambda}{\sigma(1 - \lambda(1 + \psi))} (r_t - E_t [\pi_{t+1}] - r_t^n). \qquad (3) $$

A higher λ, i.e. a higher share of households subject to a borrowing or lending constraint, attenuates the real interest rate channel and, hence, the role of inflation expectations, $E_t [\pi_{t+1}]$, on aggregate demand today. We set $\lambda = 0.2$ to match our survey evidence. This reflects our finding that when asked about whether

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[11]For simplicity, we focus on the consequences of constraining the expectation channel from a static perspective only. For models that endogenize the interaction between monetary policy and expectation formation, see Melosi (2017), Falck et al. (2021), and Carvalho et al., forthcoming.

it is currently a good time to buy durable goods, around 20% of households replied they would not adjust their spending decisions in response to expected price changes because of limited access to credit and or liquid savings (see Table A.6 in the Online Appendix). The value of $\lambda = 0.2$ is also in line with empirical estimates based on DSGE models by Coenen and Straub (2005), Ratto et al. (2009), and Hoffmann et al. (2021a).

The variable r_t captures the policy rate. The difference between the policy rate and expected inflation, $r_t - E_t[\pi_{t+1}]$, is the real interest rate. The variable x_t reflects the output gap in deviations of output from its natural level. The natural rate of interest, $r_t^n = (1 - \rho^r)\bar{r}_t^n + \rho^r r_{t-1}^n + \sigma^r \varepsilon_t^r$, is assumed to evolve exogenously. A drop in ε_t^r reflects the effects of a negative demand shock. The intertemporal elasticity of substitution equals $1/\sigma$. The labour supply elasticity equals ψ.

For the firm sector, we assume that some firms ω are backward-looking, similar to Galí and Gertler (1999). Rather than setting their prices optimally based on expectations about future inflation, these firms set prices by a rule of thumb. This assumption results in the Phillips curve

$$\pi_t - \pi^* = \beta\chi E_t[\pi_{t+1} - \pi^*] + \frac{\omega}{\theta}\chi(\pi_{t-1} - \pi^*) + \kappa x_t + u_t. \tag{4}$$

Firms set their prices around the central bank's inflation target, $\pi^* > 0$. The variable $u_t = \rho^u u_{t-1} + \sigma^u \varepsilon_t^u$ captures an exogenous supply disturbance in the form of a cost-push shock ε_t^u. The parameter β captures the discount factor. The parameter θ represents the fraction of forward-looking firms which cannot adjust their prices the next quarter. The weight on expected inflation in the Phillips curve, χ, as well as the slope of the Phillips curve, κ, are defined as

$$\chi = \frac{\theta}{\omega(1 - \theta + \theta\beta) + \theta} \text{ and } \kappa = \frac{(\sigma + \psi)(1 - \omega)(1 - \theta)(1 - \beta\theta)}{\omega(1 - \theta + \theta\beta) + \theta}. \tag{5}$$

Both coefficients are decreasing in ω. Thus, the higher the share of firms which set their prices based on a rule of thumb, the weaker the effects of expected inflation on inflation today, and the flatter the slope of the Phillips curve. In our simulations we set the share of backward-looking firms to $\omega = 0.75$, in line with Galí and Gertler (1999). This also accounts for the apparent flattening of the Phillips curve, as discussed in Clarida (2019) and Bobeica et al. (2019), among others.

The model is closed by the respective monetary policy rule. To highlight the implications of make-up strategies on inflation and inflation expectations, we compare an AIT regime with a regime of IT, where the latter is currently common practice among major central banks.[12] Under IT, the policy rule equals
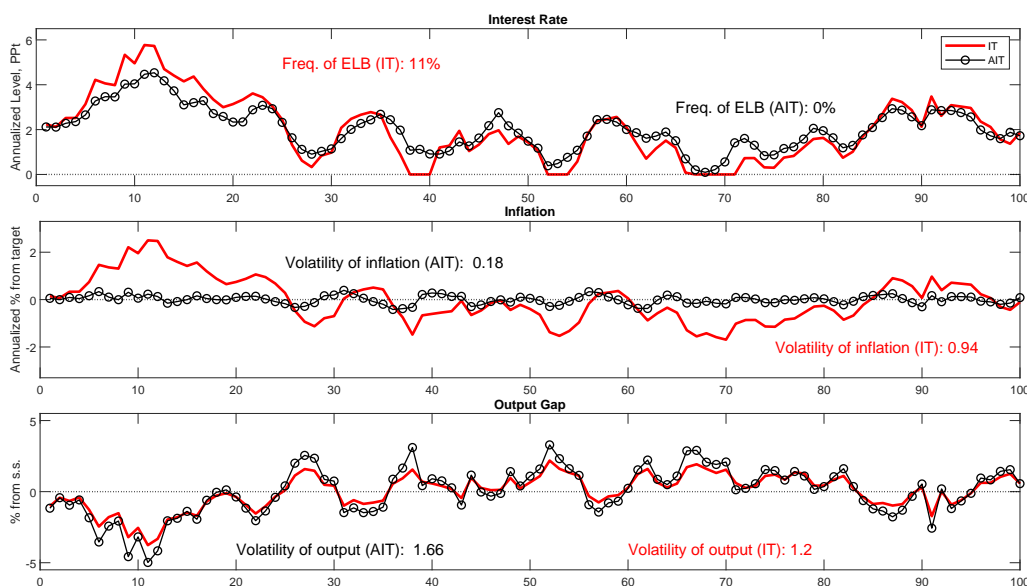
$$r_t = \max\{0, \bar{r}^n + \pi^* + \phi^\pi(\pi_t - \pi^*) + \phi^x x_t\}, \tag{6}$$

where the central bank stabilizes *current inflation* around its inflation target π^* and the output gap. Under AIT, the policy rule is instead defined as

$$r_t = \max\{0, \bar{r}^n + \pi^* + \frac{\phi_{AIT}^\pi}{1 + l}\sum_{k=0}^{l}(\pi_{t-k} - \pi^*) + \phi^x x_t\}, \tag{7}$$

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[12]See Hammond (2012) for a thorough overview of inflation targeting central banks.

Figure 4: Movements of the interest rate, inflation and output.

Notes: Parameter settings: Annualized inflation target $\pi^* \times 400 = 2\%$, discount factor $\beta = 0.995$, intertemporal elasticity of substitution $1/\sigma = 1$, labour supply elasticity $\psi = 1$, the probability of adjusting prices is $1-\theta = 0.3$. The share of backward-looking firms is $\omega = 0.75$, of constrained households is $\lambda = 0.2$. Taylor rule coefficients are $\phi^\pi = 1.5$ and $\phi^{\pi AIT} = (1+l) \times \phi^\pi$. Persistence of demand and supply shocks are $\rho^r = 0.7$ and $\rho^u = 0.7$, respectively, with $\varepsilon_t^r = \varepsilon_t^u = .0006$.

with l denoting the number of lags of inflation. Now, the central bank focuses on stabilizing *average inflation* around its inflation target over the past l periods. Similarly to Amano et al. (2020) we set $l = 8$ in our simulation exercise below.[13] To make the monetary policy responses to demand and supply disturbances comparable between the two monetary policy regimes, we match the volatilities of the policy rates. This implies $\phi^\pi_{\text{AIT}} > \phi^\pi$ in our simulation exercise.[14]

5.2. *The Implications Of Demand And Supply Disturbances*

In this section we assess the dynamics of both model economies by simulating random sequences of demand and supply disturbances over 100 quarters. We assume that both types of shocks are equally important. Crucially, we calibrate the difference in households' inflation expectations under AIT versus IT 2-3 years ahead to the value of 12 basis points obtained under the additional assumption of 2021 inflation being one percent below target, see Table 2.[15]

The first row of Figure 4 displays the annualized level of policy rates in one set of model simulations. The graph shows that the frequency of hitting the effective lower bound (ELB) is significantly higher under an IT policy. Over our

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[13]Amano et al. (2020) have shown that, in a model similar to ours, without an explicit inflation target a lag length of $l = 6$ resembles closely a policy regime of price-level targeting.

[14]To account for the effective lower bound, we are solving the model by using the OccBin-toolbox provided by Guerrieri and Iacoviello (2015).

[15]To do so, the initial value of inflation is set independently of supply and demand disturbances to 1% below the model's inflation target in both policy regimes. Then, the calibration is set to imply 12 basis points higher inflation expectations under AIT compared to IT. The parameter values are within the range of empirical estimates for the Euro area and Germany by Hoffmann et al. (2021a).

simulation horizon, the economy remains at the ELB for 11 quarters (i.e. 11% of the time) under an IT rule. In contrast, under the AIT rule the economy does not hit the ELB in our simulation.

The stabilisation properties to inflation and output in the presence for this sequence of demand and supply shocks are provided in the second and third row of Figure 4. The volatility of inflation is about five times smaller under AIT compared to IT, while the variability of the output gap is relatively similar across the two monetary policy regimes.

The findings for this particular simulation are representative of the average dynamics in the two economies, repeating random sequences of demand and supply disturbances over 1000 times. Figures A.6 and A.7 in the Online Appendix confirm this also for the case where either demand or supply shocks would dominate. Moreover, Figure A.8 shows that reducing the real interest rate channel by increasing the share of borrowing-constrained households λ by 100% also does not alter the main conclusion of this section. The model economy remains at the ELB less often and experiences lower inflation volatility under AIT, while the volatility of output is similar under the two monetary policy regimes. In sum, these results suggest that even small differences in expected inflation substantially enhance the stabilization properties of AIT relative to IT.

6. Conclusion

In this study, we have investigated whether private households would understand key differences in the characteristics of monetary policy strategies. We collected survey data from about 9,000 participants in the Bundesbank Online Panel Households and treated respondents with different pieces of information regarding the ECB's hypothetical monetary policy regime in a randomized control trial. Our results show that the average respondents' probability mass is well-centered around the ECB's inflation aim of (close to, but below) 2% when assuming current monetary policy, but significantly increases when asked to assume an alternative monetary policy regime akin to average inflation targeting. Moreover, households appear to understand well the adjustment path of inflation back to the target. AIT households treated with a 1% start-year inflation assumption raise inflation expectations significantly more than the corresponding IT households, while a 3% start-year inflation assumption produces the opposite effect, albeit of a smaller magnitude.

The adjustment is particularly strong for individuals who, prior to the treatment, report intermediate to high levels of trust in the ECB to achieve its price stability objective. In contrast, individuals with low levels of trust reduce their inflation expectations when being informed about AIT. While expected price increases are in fact key drivers of spending intentions, the empirical link between expected inflation and durable consumption plans is fairly weak, however, and does not significantly differ across assumed monetary regimes. We assess the economic significance of our survey results in a small New Keynesian Model. We find that inflation is considerably less volatile and the frequency of hitting the lower bound on interest rates is strongly mitigated under AIT compared to IT.

In sum, these results suggest that — if communicated clearly — households seem to understand the intended mechanics of average inflation targeting and ad-

just their inflation expectations in line with theory. Moreover, as trust in the central bank appears to strengthen the effect of information about monetary strategies on inflation expectations, targeting people with low levels of trust may have particularly large benefits when communicating a new central bank strategy. An interesting direction for follow-up work is to assess the understanding of the new monetary strategy communicated by the ECB in July 2021, after our survey experiments. A first analysis by Hoffmann et al. (2021b) suggests that German households indeed raised their inflation expectations somewhat when provided with information about the new strategy and in particular when being informed that inflation might exceed the target for some time after periods of below-target inflation rates.

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8. Acknowledgements

— ONLINE APPENDIX —

Would Households Understand Average Inflation Targeting?

Mathias Hoffmann[*]   (Deutsche Bundesbank)

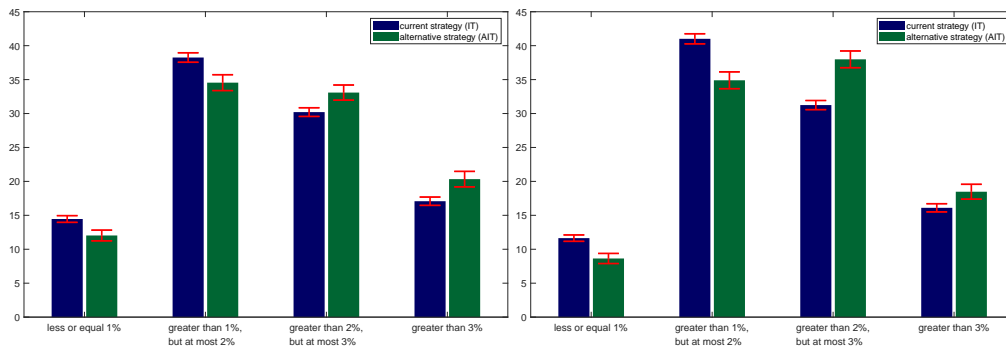Emanuel Moench (Frankfurt School of Finance and Management, CEPR)

Lora Pavlova (Deutsche Bundesbank, Karlsruhe Institute of Technology)

Guido Schultefrankenfeld (Deutsche Bundesbank)

[*]Corresponding author. Email: mathias.hoffmann@bundesbank.de

Figure A.1: Inflation expectations for 2-3 years and 5-10 years ahead (October 2020 Wave 10 and January 2021 Wave 13).

Notes: Left panel: Inflation expectations for 2-3 years ahead elicited in October 2020 (Wave 10) of BOP-HH. Right panel: Inflation expectations for 5-10 years ahead elicited in January 2021 (Wave 13) of BOP-HH. Dark blue bars show average subjective probabilities of inflation with respondents assuming current monetary policy (IT). Dark green bars show average subjective probabilities of respondents assuming the alternative strategy (AIT). A two standard error band is plotted in red. Test statistics are provided in Table A.1.

1

Figure A.2: Mean inflation expectations 2-3 years ahead (October 2020 Wave 10 and February 2021 Wave 14): IT vs. AIT
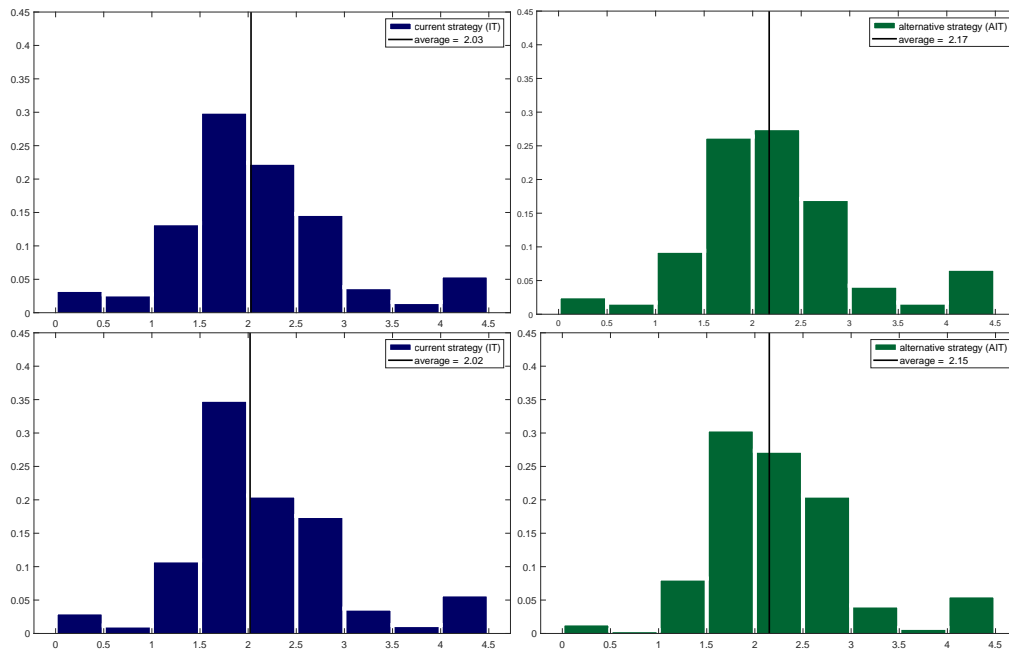
Notes: Top row: October 2020 Wave 10 of BOP-HH. Bottom row: February 2021 Wave 14 of BOP-HH. Left panels: Dark blue bars show mean inflation expectations for the medium term with respondents assuming IT. Right panels: Dark green bars show mean inflation expectations for the medium term with respondents assuming AIT. An upright black line depicts the respective average of the mean inflation expectations. Test statistics are provided in Table A.1.
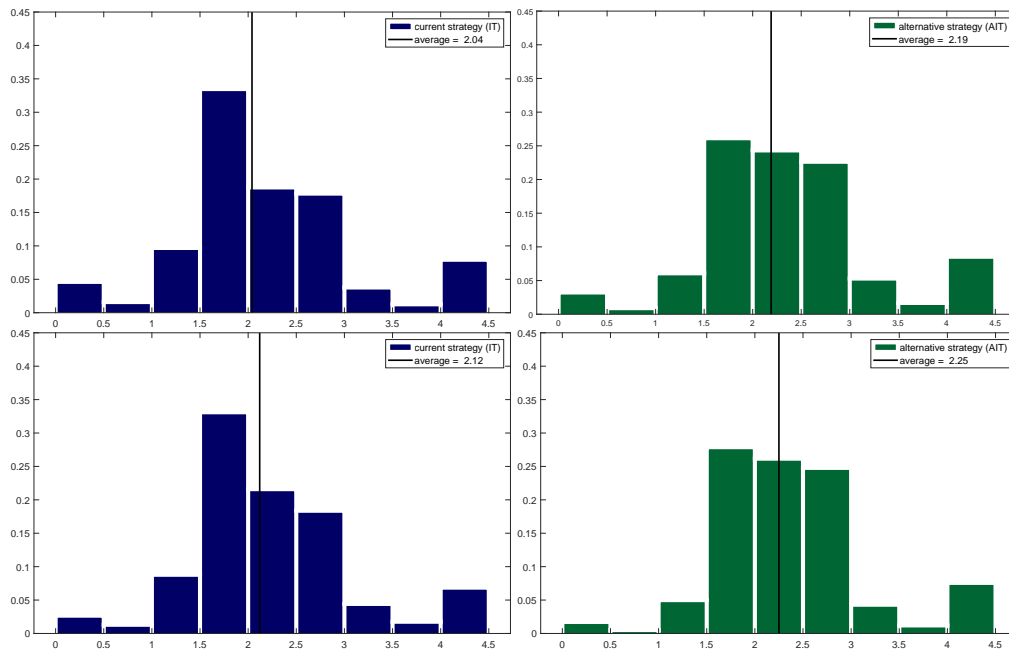
Figure A.3: Mean inflation expectations 5-10 years ahead (January 2021 Wave 13 and February 2021 Wave 14): IT vs. AIT

Notes: Top row: January 2021 (Wave 13) of BOP-HH. Bottom row: February 2021 (Wave 14) of BOP-HH. Left panels: Dark blue bars show mean inflation expectations for the longer term with respondents assuming IT. Right panels: Dark green bars show mean inflation expectations for the longer term with respondents assuming AIT. An upright black line depicts the respective average of the mean inflation expectations. Test statistics are provided in Table A.1.

Figure A.4: Mean Inflation expectations 2-3 years ahead, 2021 inflation at 1% and 3%, respectively (February 2021 Wave 14).

Notes: February 2021 (Wave 14) of BOP-HH. Left panels: Respondents are asked to assume that 2021 inflation is at 1%. Right panels: Respondents are asked to assume that 2021 inflation is at 3%. All panels: Royal blue bars show mean inflation expectations for the medium term with respondents assuming IT. Teal bars show mean inflation expectations for the medium term with respondents assuming AIT. An upright black line depicts the respective average of the mean inflation expectations. Test statistics are provided in Table A.1.
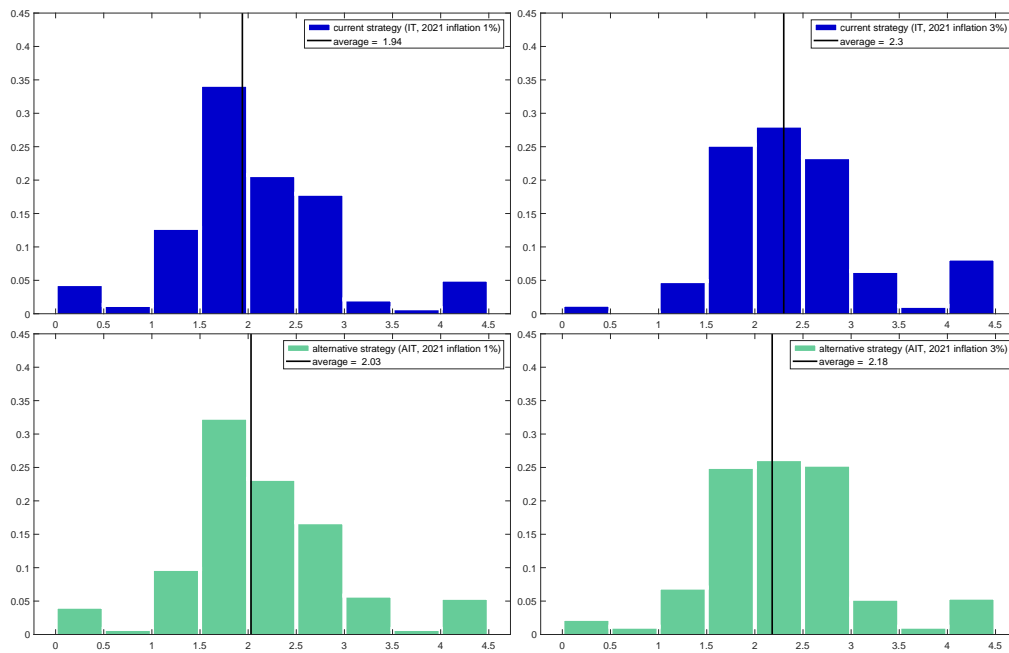
Figure A.5: To what extent do you trust the ECB's ability of achieving price stability — Distribution of responses.
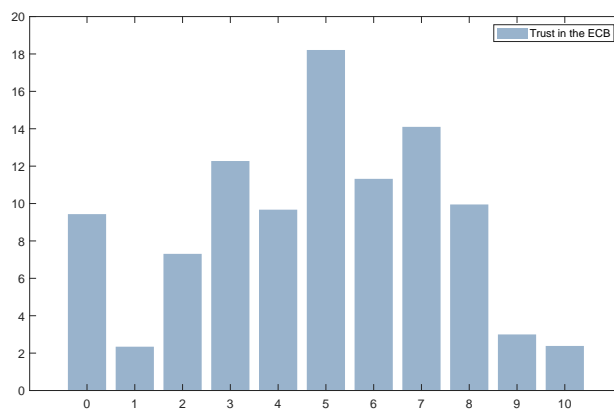
Notes: The English language wording of the question asked in German language is: *"On a scale from 0 to 10, how much do you trust that the European Central Bank is able to deliver price stability?* Answer option rank from zero to ten, with 0 = 'Do not trust at all'; 1-9 [gradually increasing trust values]; 10 = 'Trust entirely', or respondents can tick 'I don't know the European Central Bank.'

Figure A.6: Demand shocks dominate supply shocks: Movements of interest rate, inflation, and output.
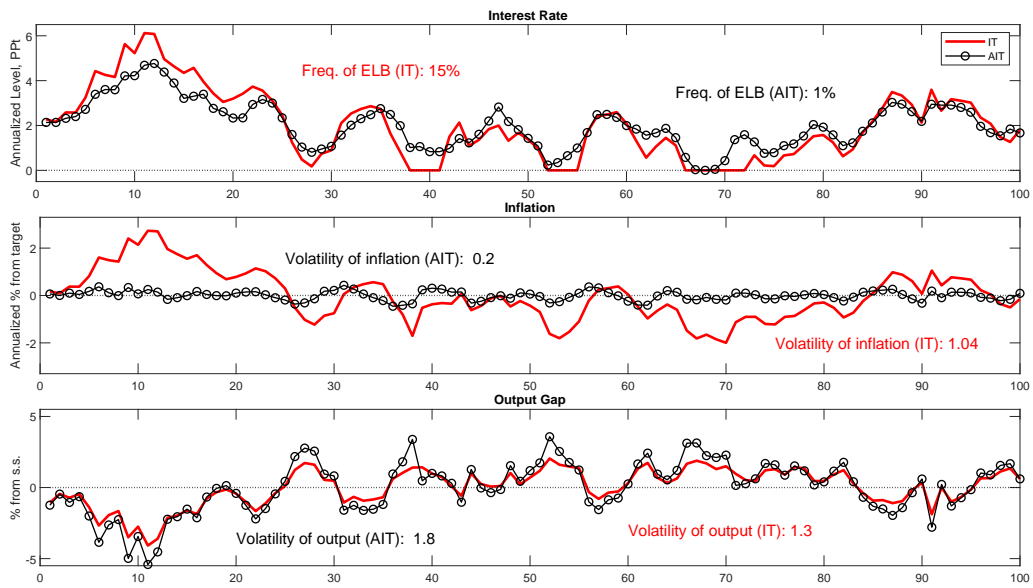
Notes: Parameter settings as in Figure 4, except that demand shocks dominate supply shocks, $\varepsilon_t^r > \varepsilon_t^u$, by factor 1.5.

Figure A.7: Supply shocks dominate demand shocks: Movements of interest rate, inflation, and output.
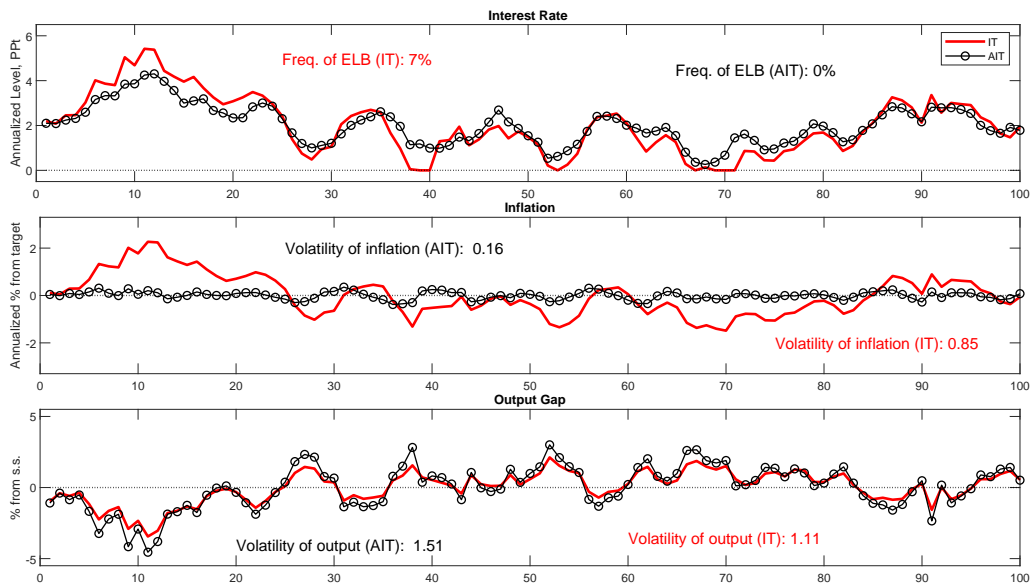
Notes: Parameter settings as in Figure 4, except that supply shocks dominate demand shocks, $\varepsilon_t^u > \varepsilon_t^r$, by factor 1.5.

Figure A.8: The share of credit-constrained households equals $\lambda = 0.4$: Movements of interest rate, inflation, and output.

Notes: Parameter settings as in Figure 4, except that the share of credit-constrained households equals $\lambda = 0.4$.

Table A.1: Results for testing equality of mean average subjective probabilities.

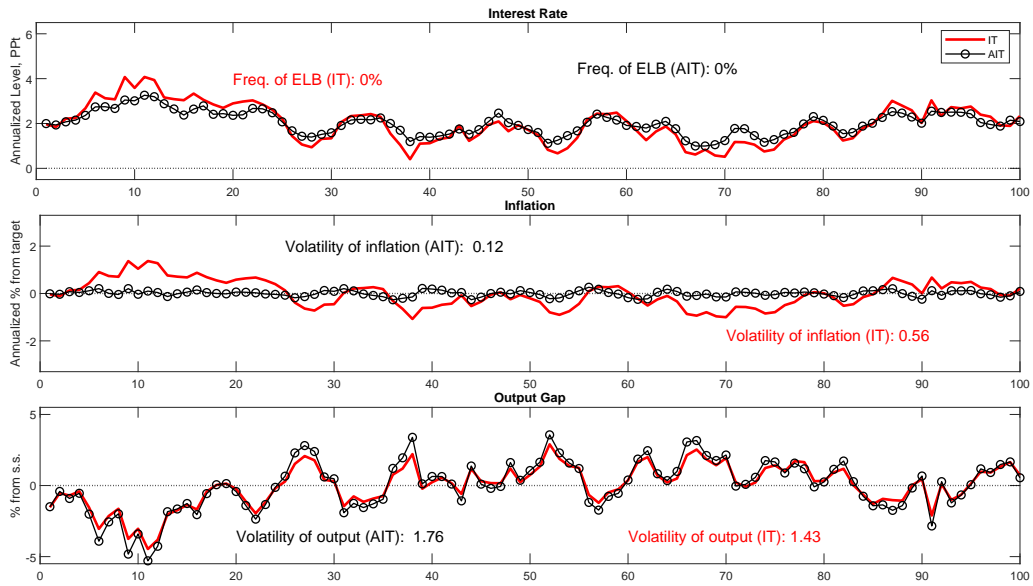| Bin considered	$\pi < 1$	$1 \leq \pi < 2$	$2 \leq \pi < 3$	$\pi \geq 3$	jointly
Wave 10 (medium-term inflation expectations, 2-3 years ahead)					
$IT = IT1\%$	0.335	0.039	0.287	0.040	0.095
$AIT = AIT1\%$	0.008	0.370	0.401	0.030	0.024
$IT = AIT$	0.013	0.008	0.025	0.009	0.002
$IT1\% = AIT1\%$	0.885	0.002	0.059	0.098	0.022
Wave 13 (longer-term inflation expectations, 5-10 years ahead)					
$IT = IT1\%$	0.699	0.733	0.817	0.890	0.961
$AIT = AIT1\%$	0.274	0.123	0.284	0.178	0.234
$IT = AIT$	0.001	0.000	0.000	0.053	0.000
$IT1\% = AIT1\%$	0.169	0.033	0.002	0.917	0.016
Wave 14 (medium-term inflation expectations, 2-3 years ahead)					
$IT = IT1\%$	0.043	0.896	0.986	0.071	0.094
$IT = IT3\%$	0.000	0.000	0.000	0.000	0.000
$AIT = AIT1\%$	0.002	0.757	0.032	0.975	0.011
$AIT = AIT3\%$	0.677	0.015	0.146	0.317	0.109
$IT = AIT$	0.003	0.019	0.000	0.560	0.000
$IT1\% = AIT1\%$	0.375	0.098	0.402	0.052	0.158
$IT3\% = AIT3\%$	0.010	0.581	0.973	0.037	0.022
Wave 14 (longer-term inflation expectations, 5-10 years ahead)					
$IT = IT1\%$	0.509	0.466	0.321	0.504	0.567
$AIT = AIT1\%$	0.047	0.404	0.031	0.770	0.085
$IT = AIT$	0.004	0.000	0.000	0.171	0.000
$IT1\% = AIT1\%$	0.934	0.007	0.042	0.393	0.053

Notes: Values in table correspond to p values for the usual t test statistic when testing for equality of the mean average subjective probabilities from two monetary policy regimes bin by bin. The right column of the table shows p values for the Hotelling (1931) T^2 test statistic when testing for the equality of the mean average subjective probabilities from two monetary policy regimes for all bins jointly.

Table A.2: Baseline regression results for mean inflation expectations 2-3 years ahead (February 2021 Wave 14)

$$\text{mean}_i^s - \text{mean}_i^{IT} = \sum_s^S \delta_s d_{s,i} + u_i, \ s \in \{AIT, IT1\%, AIT1\%, IT3\%, AIT3\%\}$$

Variation	(1)	(2)	(3)	(4)
AIT	0.12***	0.13***	0.13***	0.10***
	(0.03)	(0.03)	(0.02)	(0.01)
*IT*1%	−0.08***	−0.09***	−0.09***	−0.05**
	(0.03)	(0.03)	(0.02)	(0.02)
*IT*3%	0.23***	0.25***	0.25***	0.15***
	(0.03)	(0.03)	(0.04)	(0.02)
*AIT*1%	0.02	0.03	0.03	0.00
	(0.03)	(0.03)	(0.03)	(0.02)
*AIT*3%	0.22***	0.28***	0.28***	0.16***
	(0.03)	(0.03)	(0.03)	(0.02)
*AIT*1% − *IT*1%	0.10**	0.12**	0.12***	0.05**
*AIT*3% − *IT*3%	−0.01	0.03	0.03	0.01
Observations	2970	2970	2970	2970
Weighting	No	Yes	Yes	Yes
Robust SE	No	No	Yes	No
Huber outlier weighting	No	No	No	Yes

Notes: Sub- and superscript *s* refers to a certain monetary policy strategy with specific assumptions about current inflation. For instance, $s = AIT3\%$ denotes 'average inflation targeting', with respondents assuming the inflation rate in 2021 at 3%. Asterisks (***, **, *) indicate significance levels of 1, 5 and 10% for the usual *t* test statistics for coefficient estimates and for the *F* test statistics for differences in coefficient estimates.

Table A.3: Baseline regression results for mean inflation expectations 2-3 years and 5-10 years ahead (October 2020, January 2021, February 2021)

$$\text{mean}_i^s - \text{mean}_i^{IT} = \sum_s^S \delta_s d_{s,i} + u_i, \ s \in \{AIT, IT1\%, AIT1\%, IT3\%, AIT3\%\}$$

| | Expectations 2-3 years ahead | | Expectations 5-10 years ahead | |
| | October 2020 | February 2021 | January 2021 | February 2021 |
Specification	(1)	(2)	(3)	(4)
AIT	0.05*	0.13***	0.15***	0.12***
	(0.03)	(0.03)	(0.03)	(0.03)
*IT*1%	−0.15***	−0.09***	−0.11***	0.02
	(0.03)	(0.03)	(0.03)	(0.03)
*IT*3%		0.25***		
		(0.03)		
*AIT*1%	0.06**	0.03	0.06**	0.07**
	(0.03)	(0.03)	(0.03)	(0.03)
*AIT*3%		0.28***		
		(0.03)		
*AIT*1% − *IT*1%	0.21***	0.12**	0.17***	0.05
*AIT*3% − *IT*3%		0.03		
Observations	1903	2970	2342	1745

Notes: Sub- and superscript *s* refers to a certain monetary policy strategy with specific assumptions about current inflation. For instance, *s* = *AIT*3% denotes 'average inflation targeting', with respondents assuming the inflation rate in 2021 at 3%. All regressions use weighted survey responses where the weights ensure the representativeness of the sample. Asterisks (***, **, *) indicate significance levels of 1, 5 and 10% for the usual *t* test statistics for coefficient estimates and for the *F* test statistics for differences in coefficient estimates.

Table A.4: RCT including follow-up questions on spending intentions of private households

Stage 1	Infobox for all participants:
	[Infobox as in Table 1 of main paper]

Stage 2 All participants — assuming ECB is pursuing current strategy — are asked to assign probabilities for inflation 2-3 years ahead

[Histogram as in Table 1 of main paper]

Participants receive follow-up questions:

"You expect the inflation rate over the next two to three years to [keeps displaying histogram]. Assume that you would like to make major purchases (e.g. a fridge, sofa or wardrobe). In view of your expectations regarding the inflation rate, which of the following statements applies to you?"
   (1) I think that now would be the right time to make major purchases.
   (2) I think that now would not be the right time to make major purchases.

"Why do you think that now would be the right time to make major purchases? Please select the reason you think is most important.

Stage 3 Participants are randomly sampled into one of five subgroups, A, B, C, D$^{\sharp}$ or E$^{\sharp}$, facing different assumptions about monetary policy and current inflation. Then, participants are asked again to assign probabilities as in Stage 2:

[Histogram as in Table 1 of main paper]

Participants again receive follow-up questions:

"You expect the inflation rate over the next two to three years to [keeps displaying histogram]. Assume that you would like to make major purchases (e.g. a fridge, sofa or wardrobe). In view of your expectations regarding the inflation rate, which of the following statements applies to you?"
   (1) I think that now would be the right time to make major purchases.
   (2) I think that now would not be the right time to make major purchases.

"Why do you think that now would be the right time to make major purchases? Please select the reason you think is most important.

Notes: The RCT with follow-up questions to each subgroup A, B, C, D and E was conducted exclusively in February 2021 to elicit the spending behavior related to medium-term (2-3 years ahead) expectations. The original questionnaire is in German language.

Table A.5: Inflation expectations and their role for the readiness to spend on durables.

		$y_i = \alpha + \beta mean_i^s + \gamma_k \mathbf{X_i} + u_i$		
AME	(1)	(2)	(3)	(4)
$Mean_i^s$	0.00	0.01	0.01	−0.00
	(0.01)	(0.01)	(0.01)	(0.02)
Uncertainty			0.01	
			(0.04)	
Female	0.04**	0.02	0.02	0.06**
	(0.02)	(0.02)	(0.02)	(0.03)
Age				
40 to 60	0.04	0.07*	0.07*	0.03
	(0.03)	(0.04)	(0.04)	(0.05)
over 60	0.05	0.12**	0.12**	0.05
	(0.04)	(0.05)	(0.05)	(0.06)
HH income				
1500 to 3000	0.01	0.03	0.03	0.10
	(0.04)	(0.05)	(0.05)	(0.06)
3000 to 5000	0.10**	0.11**	0.11**	0.17**
	(0.04)	(0.06)	(0.06)	(0.06)
over 5000	0.14***	0.14***	0.14**	0.17**
	(0.04)	(0.06)	(0.06)	(0.07)
HH size				
two	−0.01	−0.02	−0.02	−0.01
	(0.03)	(0.03)	(0.03)	(0.04)
three	−0.03	−0.02	−0.02	−0.01
	(0.03)	(0.04)	(0.04)	(0.06)
over four	0.01	0.02	0.02	0.09*
	(0.03)	(0.04)	(0.04)	(0.05)
Employed	0.00	−0.00	−0.00	−0.07
	(0.03)	(0.04)	(0.04)	(0.04)
College degree	0.01	0.00	0.00	−0.01
	(0.03)	(0.03)	(0.03)	(0.04)
High school degree	0.05**	0.11***	0.11***	0.10***
	(0.03)	(0.03)	(0.03)	(0.04)
East pre 1990	−0.09***	−0.09***	−0.09***	−0.06
	(0.02)	(0.03)	(0.03)	(0.04)
Observations	2657	2657	2657	1651
Weighting	No	Yes	Yes	Yes
Demographic controls	Yes	Yes	Yes	Yes
Adjusters only	No	No	No	Yes

Notes: Columns 1 to 4 report the average marginal effects (AME) from a standard probit estimation when the readiness to spend y_i is regressed on the mean inflation expectations post-treatment and a set of controls as shown in the various rows of the table.

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Table A.6: Pre- and post-treatment frequency distribution of the reasons respondents selected to indicate whether or not currently is a good time to buy durable goods.

Pre-treatment	All	*IT*1%	*IT*3%	*AIT*	*AIT*1%	*AIT*3%
Good time to buy = 'Yes'						
Stronger price increase	33.67	35.77	34.61	31.01	34.58	32.29
Stronger price increase in these goods	10.19	10.33	8.91	10.34	10.45	10.94
Need for replacement	23.74	22.67	23.92	26.1	23.13	22.92
Abundant finance	21.19	18.64	21.12	22.22	20.65	23.44
Favourable access to credit	4.58	4.79	4.83	4.65	3.98	4.69
Other	6.62	7.81	6.62	5.68	7.21	5.73
Good time to buy = 'No'						
Weaker price increase	2.12	2.06	1.52	1.57	4.55	0.96
Weaker price increase in these goods	3.24	4.12	3.03	2.09	4.04	2.88
No need for replacement	54.5	59.28	52.02	57.07	50.51	53.85
Not enough finances	13.04	11.34	12.12	12.04	15.15	14.42
No access to credit	5.56	6.19	4.55	5.76	3.03	8.17
Do not spend savings	17.9	14.43	22.73	17.28	18.69	16.35
Other	3.64	2.58	4.04	4.19	4.04	3.37

Post-treatment	All	*IT*1%	*IT*3%	*AIT*	*AIT*1%	*AIT*3%
Good time to buy = 'Yes'						
Stronger price increase	33.57	34.6	32.28	31.94	35.98	32.9
Stronger price increase in these goods	13.89	16.41	13.39	13.61	12.16	13.88
Need for replacement	23.12	21.46	22.57	25.39	24.57	21.59
Abundant finance	20.04	16.41	22.83	19.9	18.36	22.88
Favourable access to credit	4.25	4.04	4.46	5.24	3.47	4.11
Other	5.13	7.07	4.46	3.93	5.46	4.63
Good time to buy = 'No'						
Weaker price increase	2.87	1.47	1.94	2.93	3.63	4.41
Weaker price increase in these goods	3.06	4.9	2.43	2.93	3.63	1.47
No need for replacement	55.93	60.78	55.34	53.66	53.37	56.37
Not enough finances	10.77	7.84	9.71	10.24	13.99	12.25
No access to credit	6.42	4.9	6.31	10.73	3.11	6.86
Do not spend savings	17.29	15.69	20.87	16.59	17.62	15.69
Other	3.66	4.41	3.4	2.93	4.66	2.94