TELL ME SOMETHING I DON'T ALREADY KNOW: LEARNING IN LOW AND HIGH-INFLATION SETTINGS

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Abstract

Using randomized control trials (RCTs) applied over time in different countries, we study how the economic environment affects how agents learn from new information. We show that as inflation has recently risen in advanced economies, both households and firms have become more attentive and informed about inflation, leading them to respond less to exogenously provided information about inflation and monetary policy. We also study the effects of RCTs in countries where inflation has been consistently high (Uruguay) and low (New Zealand) as well as what happens when the same agents are repeatedly provided information in both low- and high-inflation environments (Italy). Our results broadly support models in which inattention is an endogenous outcome that depends on the economic environment.

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"Tell me and I forget. Teach me and I remember. Involve me and I learn." Benjamin Franklin

I Introduction

The environment in which we live shapes our behavior and beliefs. Those who grew up in the Great Depression, for example, tend to be more wary of taking on financial risk (Malmendier and Nagel 2011). Those who lived through hyperinflations are similarly scarred by the experience and are less likely to invest in risky assets (Fajardo and Dantas 2018). While the effects of historical episodes on behavior can be studied ex-post, it is more challenging – but of paramount importance for policy making – to study how the beliefs of individuals evolve in real time. In this paper, we study how a changing inflation environment alters the learning process of individuals.

To characterize how learning evolves with economic environments, we bring together a wide range of randomized control trials (RCTs) across countries and time in which some individuals were provided with publicly available information about inflation, such as the most recent inflation rate or the central bank's target. The extent to which individuals adjust their economic expectations to this information tells us about their learning process and prior informedness about inflation. In a nutshell, when economic agents place a lot of weight on the provided information, this indicates that the information is new to them, a sign of having been inattentive to recent inflation. When individuals are already informed about inflation dynamics, the information provided should have little effects on their beliefs. The strength of the response of expectations to exogenously provided information therefore speaks directly to the inattentiveness of individuals.

We show that as inflation has increased to historically high levels in the past few years, households and firms in the U.S. and euro area have become more informed about rising prices and therefore less responsive to information treatments involving information about inflation. As the economic landscape has changed, so too has the degree of inattention of individuals to their environment, as predicted by e.g. rational inattention models (Sims 2003, Mackowiak and Wiederholt 2009). These results therefore complement other recent research studying the changing degree of inattention as inflation rates rise (Bracha and Tang 2019, Korenok, Munro and Chen 2023, Pfäuti 2023).

Assessing changes in the degree of inattention across different inflation regimes is empirically challenging. In a changing environment, economic agents are subject to idiosyncratic and aggregate shocks that affect them differently due to their heterogeneous characteristics. As a result, economic agents' time-varying unobserved characteristics (e.g., economic sentiment, risk aversion) correlate with prevailing conditions and most likely confound the inference on their inflation attention. Our key innovation relative to existing papers is that we rely on a sequence of RCTs to assess how inattention changes across economic environments. By construction, the random allocation of subjects (and their unobserved characteristics) between treatment and control groups ensures that the role of attention can be consistently estimated at each given point in time allow us to obtain reliable comparisons across different inflation regimes.

To this end, we construct a unique collection of many such RCTs fielded in nationally representative surveys of households and firms for different countries and periods to speak directly to the changing degree of attention. Our first setting for doing so is a sequence of RCTs applied to surveys of U.S. households participating in the Nielsen Homescan Panel. The first RCT in this context was in 2018Q2, when inflation was close to 2%, and studied in Coibion, Gorodnichenko and Weber (2022). Seven subsequent and comparable RCTs were implemented through much of 2021 and 2023, the period in which U.S. inflation rose sharply. We show that as inflation rose, survey participants responded significantly less to exogenously provided information about inflation, consistent with them being more informed about inflation. Using five different RCTs applied first in the Netherlands (in 2018Q2) and subsequently in the euro area using the European Central Bank's (ECB) Consumer Expectations Survey (CES) from 2021 to 2023, we similarly find that European households' response to information about inflation fell sharply as the inflation rate increased. Finally, using two RCTs implemented in the Atlanta Fed's Business Inflation Expectations survey in 2019 and 2023, we similarly document a decline in the responsiveness of U.S. firms to exogenously provided information as the inflation rate increased.

Why necessarily attribute this time variation in treatment effects to a different inflation environment? First, we provide evidence based on the ECB's CES that 60% of households report that they are now paying more attention to inflation than they were in the past. Furthermore, households who report being attentive to inflation have expectations of inflation that are much closer to actual levels of inflation and generally respond significantly less to information treatments than do households who report that they do not pay much attention to inflation. Second, we use four RCTs from firms in Uruguay to study the effects of repeated information treatments in an environment where inflation has consistently been high (approximately 8 percent) during the same period of 2018-2023. We show that Uruguayan firms' short-term inflation expectations did *not* respond to information treatments about recent inflation or the central bank's inflation target in

2018, 2019 and 2023, in line with the notion that agents in higher inflation environments consistently choose to pay more attention to inflation. Third, we use four RCTs applied to firms in New Zealand from 2014 to 2019, when inflation was consistently low. We find for this setting that all information treatments had large and powerful effects on the expectations of these firms, in agreement with the notion that agents in low inflation environments consistently choose to pay little attention to inflation. Fourth, we use repeated quarterly RCTs applied to a panel of firms in Italy over a decade to show that again, the magnitude of the estimated effects of information treatments fell as the inflation rate rose. Finally, pooling across all RCTs across countries and time, we find a clear negative relationship between the level of inflation and the magnitude of inflation treatment effects.

Our paper builds on a growing literature applying RCTs in macroeconomics to study how new information shapes expectations and the way in which these expectations subsequently affect economic decisions. Much of this literature has focused on inflation expectations (e.g. Armantier et al. 2016, Coibion, Gorodnichenko and Weber 2022) as we do here, but others have applied similar techniques to study expectations of housing prices (Armona, Fuster and Zafar 2019, Chopra, Roth and Wohlfart 2023), income expectations (D'Acunto et al. 2020), the state of the business cycle (Roth and Wohlfart 2020), asset prices (Beutel and Weber 2022), monetary policy (Coibion et al. 2021a), economic uncertainty (Coibion et al. 2022, Kumar et al. 2022), and other topics. These studies typically focus on a single RCT to generate exogenous variation in the beliefs of treated individuals relative to an untreated control group, which raises concerns about external validity if a similar RCT was to be implemented in a different context. Relative to these studies, our main contribution is to consider a large number of comparable RCTs applied to households and firms and in different countries, periods and economic environments. As a result, we shed more light on the state dependency of inattention to inflation. Our results therefore inform policymakers on how anchored inflation expectations are and how powerful policy communication can be.

Our paper is also closely related to recent work studying the time variation in inattention paid by individuals to economic conditions. Coibion and Gorodnichenko (2015) estimated time variation in information rigidities of professional forecasters, showing that information rigidities went up during the Great Moderation. Goldstein (2022) finds that inattention falls after large shocks. Bracha and Tang (2019) focus on inattention by U.S. households to inflation, as measured by people saying "I don't know" when asked about current inflation levels, and show that this metric historically declines when inflation is higher.[1] Korenok, Munro and Chen (2023) show that, across many countries, Google searches for "inflation" rise with the level of inflation whenever inflation exceeds a threshold around 4%. Pfäuti (2023) estimates how strongly inflation expectations of households and professionals in the U.S. respond to past forecast errors and shows that higher inflation periods are associated with larger responses to past errors, consistent with changing inattention. Relative to these papers, we use the response of expectations to exogenously provided information in RCTs to measure inattention across a range of countries and environments. Our RCT-based findings complement these other papers in illustrating the endogenous nature of inattention.

Finally, our paper builds most closely on the path-breaking work of Cavallo, Cruces and Perez-Truglia (2017). They compare a treatment providing information about recent inflation to college graduates and supermarket shoppers in Argentina, where inflation was over 20%, and to crowdworkers on Amazon Mechanical Turk in the United States, where inflation was about 2%. They document a striking difference in how strongly respondents in the two countries react to the information: U.S. individuals placed far more weight on the provided information and less weight on their priors than Argentine individuals, consistent with people living in a high-inflation environment being more attentive to inflation.[2] Like them, we compare the effects of RCTs in low- and high-inflation environments to characterize how the level of inflation affects how attentive individuals are. Due to the much larger number of RCTs available to us, we can address a number of limitations associated with this prior work. For example, because there are many differences between Argentina and the U.S., one cannot necessarily attribute the difference in the effects of information treatments to the level of inflation. In contrast, because we study the changing effects of RCTs *within a country* over time, we can more precisely identify the role of the inflation environment in driving inattention. Furthermore, we can do this for both households and firms in nationally representative samples. Overall, our results strongly support the view of Cavallo, Cruces

[1] In a related work, Binder (2017) documents that one can use rounding of reported inflation forecasts to measure knowledge and uncertainty about inflation.

[2] A related result is in Link et al. (2023) who rely instead on cross-sectional variation in inattention within a country. They study the effects of an information provision experiment in Germany that was applied to both households and firms. They show first that firms are overall better informed about recent conditions than households. They then find that firms respond less to the provided information than households, again consistent with the notion that more informed agents are less responsive to new information.

and Perez-Truglia (2017) that the inflation environment has first-order effects on how attentive individuals are to aggregate inflation developments.

The paper is organized as follows. Section II describes the randomized provision of information and how the results of RCTs speak to the inattention of economic agents. Section III presents empirical evidence for U.S. households, euro-area households, and U.S. firms. Section IV considers additional evidence from firms in Uruguay, firms in New Zealand, and firms in Italy. Section V presents results pooled across all RCTs while section VI concludes.

II Information Treatments and the Economic Environment

When processing information is costly to agents, either because of the opportunity or mental costs involved, they will naturally make decisions about how much attention to allocate to different areas that may affect them. The macroeconomic environment is one such domain. When economic conditions are volatile or risky, agents may choose to pay more attention to their economic environment than during normal times. This follows naturally from models of rational inattention.

To what extent do we see variation in inattention as economic conditions change? Bracha and Tang (2019) study this question for U.S. households participating in the University of Michigan's Survey of Consumers (MSC). Using the phrasing of the inflation expectations question, Bracha and Tang (2019) note that one can identify the fraction of households that anticipate constant inflation but do not know the current inflation rate. The latter can be interpreted as one measure of inattention, and they show that this measure of inattention is greater when U.S. inflation is lower. They also document similar evidence for the euro area. A closely related measure of inattention is comparing the reported perceived inflation rates of households to actual inflation rates, the idea being that attentive households would have better knowledge of recent inflation than inattentive households. In Figure 1, we plot the perceived inflation rates of U.S. households (measured using the Nielsen survey described in section 3.1) against actual inflation (Panel A) as well as that of euro-area households (Panel B) using the CES (described in section 3.2). In both cases, we see that households significantly overestimated inflation when inflation rates were low but average perceptions got very close to actual inflation once inflation started rising. Korenok, Munro and Cheng (2023) use the intensity of Google searches about inflation to measure how attentive households are to inflation and find that, in many countries, attentiveness increases with the level of inflation once inflation exceeds a threshold. Pfäuti (2023) studies how strongly expectations of households and professionals in the U.S. respond to past forecast errors, which is a measure of inattention derived from theoretical models. He finds that higher inflation periods are associated with larger responses to past forecast errors, as predicted by rational inattention models. Coibion and Gorodnichenko (2015) show that the predictability of forecast errors stemming from ex-ante forecast revisions provides another metric of how attentive agents are. They find that U.S. professional forecasters' attentiveness declined during the Great Moderation. Goldstein (2022) uses a similar approach to study time variation in inattentiveness of professional forecasters in Israel. Finally, Borraz, Orlik and Zacheo (2023) emphasize that firms in Uruguay have consistently been well informed about inflation.

In Figure 2, we provide additional evidence in the same spirit but from households in the euro area showing that their attentiveness to inflation has increased as the level of inflation in the euro area has risen. In the 2023M1 wave of the CES, households were asked how attentive they were to inflation. As shown in Panel A, only about 20% of households reported that they paid no attention or little attention to inflation, indicating that most households were paying at least some attention to inflation. Households were also asked whether they were paying more or less attention to inflation compared to 12 months before when realized inflation was lower. As shown in Panel B, over 60% of households answered that they were paying more attention to inflation than previously, consistent with inattention varying depending on the level of inflation. Furthermore, as shown in Panel C, inattention is not innocuous: those households who reported paying more attention to inflation tended to have forecasts closer to recent inflation levels (8.6% in January 2023). However, more attention does not seem to translate into more confidence however: Panel D shows that uncertainty in inflation forecasts does not decrease monotonically in attention. Of course, this evidence should only be viewed as suggestive since inattention is self-reported and causality toward beliefs cannot be established.

Instead, following Armantier et al. (2016), Cavallo, Cruces and Perez-Truglia (2017) and Coibion, Gorodnichenko and Kumar (2018), our main approach measures the attentiveness of economic agents through their responsiveness to exogenously provided information about inflation. To see why such an approach is helpful, consider the following typical Bayesian updating rule for beliefs:

$$posterior_i = (1 - G) \times prior_i + G \times signal = prior_i + G \times (signal_i - prior_i) \quad (1)$$

such that the posterior belief of agent i is a weighted average of their prior belief and the new information ("signal") that they receive. The Kalman gain G captures how much weight the agent places on this information relative to their prior belief. If the signal is precise and informative relative to the prior, agents will tend to place a lot of weight on this new information and little weight on their prior belief. If the signal is imprecise or consists of information which is already known, then the weight that agents assign to it will be small, in which case the posterior will be close to the prior. Thus, if one can observe how much weight agents assign to new information, then this can speak directly to how informed they already are.

Like Armantier et al. (2016), we consider settings in which some randomly selected survey participants are provided with information about inflation or monetary policy and compare their posterior expectations to those of a control group which were not provided with such information. Like Cavallo, Cruces and Perez-Truglia (2017), we compare the effects of these RCTs across countries to assess the role that the inflation environment plays in explaining how informed economic agents are about recent inflation dynamics. Like Coibion, Gorodnichenko and Kumar (2018), we use the weight on the prior to measure the sensitivity to signals about inflation. Unlike these studies, however, we are able to do these comparisons across a number of different countries and agents as well as within a country over time, which allows us to effectively control for country-specific fixed effects and more precisely identify the role of inflation in determining how informed economic agents are.

Table 1 summarizes the countries and surveys that we rely on. For the U.S., we utilize RCTs applied to households participating in the Nielsen Homescan Panel as well as to businesses participating in the Federal Reserve Bank of Atlanta's Business Inflation Expectations (BIE) survey. For both, RCTs were implemented during low-inflation and high-inflation periods. For the euro area, we rely on the RCTs implemented in the CES starting in 2021, as well as an earlier RCT applied in the Netherlands in 2018 (Coibion et al. 2023). Jointly, these again cover both low- and high-inflation settings. In addition, we consider RCTs applied to firms in Uruguay in 2018, 2019 and 2023, during which inflation was consistently high and above the central bank target range. We also consider RCTs applied to firms in New Zealand from 2014 through 2019, during which inflation was consistently low. Finally, we also consider repeated quarterly RCTs implemented on firms participating in the Bank of Italy's Survey on Inflation and Growth Expectations (SIGE), from 2012 through 2022. The RCTs include different types of provided information, such as recent inflation rates, central bank targets, or inflation forecasts from the central bank. Questions used to measure prior and posterior expectations are also not identical across surveys, so some care is required in comparing across these settings.[3] Given this heterogeneity, we describe the specific surveys and results for each setting individually in the next sections. Because surveys range from not measuring households'/firms' choices to collecting some information, our RCT analysis focuses on beliefs to ensure consistency across time and space. For the same reason, we focus on short-term inflation expectations and do not explore responses of other macroeconomic expectations or inflation expectations at longer horizons.

III Time-Varying Inflation and the Changing Effects of Information Treatments

In this section, we focus on RCTs applied to households and firms in the United States and the euro area where we have the largest sample sizes and can compare within-country estimates in low- and high-inflation regimes. In our analysis, we focus on information treatments that provide three types of information: *i*) past inflation (π_t); *ii*) inflation target (π^*); *iii*) inflation forecast from the central bank ($F_t^{CB}\pi_{t+h}$).[4] These three treatments should be relevant for inflation expectations and allow us to maximize the coverage across countries and times. Each of these information pieces is routinely available from statistical agencies or central banks and thus one should not observe a response to any of these information interventions if economic agents behave according to the full-information rational expectations (FIRE) framework. We report these treatments in Appendix Figure A.9.

3.1 U.S. Households

The Nielsen Homescan panel consists of approximately 80,000 nationally representative households who regularly scan their purchases and participate in occasional surveys run by Nielsen (see, e.g., D'Acunto et al. 2021). These surveys typically achieve response rates of around 20-25%, yielding survey sample sizes of 15,000-20,000 on average. In 2018Q2, one survey offered to households included an RCT in which randomly selected respondents were presented with different types of information about inflation, as described in Coibion, Gorodnichenko and Weber (2022). One information treatment consisted of being told that inflation over the previous twelve months (π_t) was 2.3%. Another consisted of being told that the Federal Reserve's inflation target (π^*) was 2%. A third group was told that the FOMC forecast of inflation over the next 12 months ($F_t^{CB}\pi_{t+12}$) was

[3] We report actual questions used in each survey in Appendix Table A.1.

[4] If the forecast from the central bank was not available and not used in the treatment, we use the inflation forecast from a survey of professional forecasters (SPF). The sensitivity to provided information may vary with the credibility of the information source. Thus, whether inflation forecast come from a central bank or a survey of professional forecasters can matter. In practice, inflation forecasts from these two sources are very similar in our sample.

1.9%. Another set of respondents was not provided with any information and therefore serves as the "control" group. Prior to the information treatments, all households were asked about their inflation expectations through a distribution question in which they had to assign probabilities to a range of possible inflation outcomes, following the question design from the Federal Reserve Bank of New York's Survey of Consumer Expectations (SCE). From this question, we construct an implied mean forecast of inflation which represents the prior belief of the household. Following the information treatments, all respondents (including the control group) were asked to provide a point forecast for inflation over the next 12 months, which represents the posterior belief of the household.

Building on equation (1), we can estimate the effect of the information treatments by estimating the following specification:

$$F_{t+}^{i}\pi_{t+12} = \alpha + \beta \times F_{t-}^{i}\pi_{t+12} + \sum_j \delta_j \times \mathbb{I}_j^i + \sum_j \gamma_j \times \left(\mathbb{I}_j^i \times F_{t-}^{i}\pi_{t+12}\right) + error_i \qquad (2)$$

where $F_{t-}^{i}\pi_{t+12}$ and $F_{t+}^{i}\pi_{t+12}$ denote the prior and posterior expectations of household i and $\mathbb{I}_j^i$ is an indicator variable equal to 1 if household i is in treatment group j where $j \in \{\pi_t, \pi^*, F_t^{CB}\pi_{t+12}\}$ identifies the different treatment groups, and 0 otherwise. Note that we allow for both the intercept and the slope coefficient to vary across treatment groups since different signals have different values and are likely to have different perceived precisions, leading to different gains associated with each. Following Coibion, Gorodnichenko and Weber (2022), we use Huber (1964) robust regressions to deal with outliers and influential observations.

The coefficient β represents the relationship between prior and posterior beliefs of the control group. In principle, one would expect the slope coefficient to be one, since no new information is provided to these households and their posteriors should therefore simply equal their priors. However, because priors and posteriors are measured using two different questions, it is not uncommon for the estimated slope to differ from one.[5] For example, Figure 3 plots a binscatter of prior expectations against posterior expectations for the control group in 2018Q2: the estimated slope is 0.85 and statistically different from one.

The coefficients δ_j represent different intercepts for treatment groups, which capture the fact that information treatments may move the average posterior beliefs up or down relative to the control group. Note that δ_j measures the combined effect of the sensitivity to the provided information and

[5] RCTs often use two different question formulations to measure priors and posteriors because asking survey participants to answer the exact same question multiple times in the same survey can lead to increased panelist attrition rates and raises the concern of survey demand effects.

how the signal differs from the average prior. Importantly, if the information provided is close to the average prior of households, the average treatment effect can be small. Intuitively, Bayesian learning predicts that treatments should move beliefs towards the provided signals and we can posit that such moves should be stronger in periods of low inflation and high inattention. If signals are relatively close to the average prior, the posterior may not move much on average. To see how this works, consider the following thought experiment. Suppose that in a period of low attention to inflation, we have two respondents with prior beliefs at 0% and 4% and that the provided signal is 2%. Posteriors at 1% and 3% would be consistent with Bayesian learning (the posteriors are closer to the signal than the priors). However, the average prior (2%) is equal to the average posterior (2%) and so on average we can find no effect on the levels of beliefs even though there is a clear treatment effect on beliefs in this thought experiment. Instead, in a period of higher attention to inflation the priors of two respondents can be 1% and 3% and their posteriors at 1.1% and 2.9%. In this case, posteriors move relatively less than in the case of higher inattention, but the average change in beliefs is still zero. This is why in our baseline we condition the effect of information treatments on prior beliefs since this is what provides the relevant variation and allows for direct comparisons.

Learning by households is therefore best captured by γ_j which measures the change in the slope of the relationship between priors and posteriors for the treated groups. In the context of equation (1), $\beta + \gamma_j$ should be equivalent to $(1 - G)$: the weight that households assign to their prior beliefs in the face of new information. If the provided information has no effect on beliefs, γ_j will be equal to zero and the slope linking priors and posteriors will be the same as for the control group. However, a negative γ_j indicates that the treatment group is placing less weight on their priors and more weight on the new information. When $\beta + \gamma_j = 0$, households are placing all the weight on the provided signal in forming their posteriors and none on their prior beliefs. The fraction of β that is being offset by γ_j is therefore the key metric that allows us to assess how household beliefs change when presented with the new information.

Figure 3 illustrates through a binscatter the relationship between priors and posteriors for the three treatment groups in 2018Q2. It is immediately clear that the slope for each treatment group is much flatter than for the control group. In each case, the slope coefficient is approximately 0.2, indicating that households are placing a lot of weight on the newly provided information and very little on their priors when forming their posterior beliefs. However, because the slope coefficient for the control group is less than one, we cannot directly interpret the estimated γ_j as capturing how household beliefs change when presented with the new information. Instead, one needs to normalize by the estimated slope of the control group to recover the effective weight on priors. As a result, we will focus on γ_j/β (that is, the scaled change in the slope) as the best metric of how inattentive agents are, that is, how much flatter the relationship between priors and posteriors is for the treatment group *relative to the control group*.[6]

To assess how and whether this inattention has changed over time, we then rely on the fact that similar RCTs were applied in subsequent survey waves. For example, in 2019Q1, another RCT was done in which only the information treatment with the recent inflation rate was applied. Then, three more RCTs were run in 2021, another two were done in 2022, and one more in 2023. Most of these included all three information treatments. We plot the resulting estimates of the scaled treatment effect γ_j/β for each wave and treatment separately in Panel A of Figure 4, along with the time series of U.S. inflation and the average inflation expectations of households participating in the Nielsen surveys. A clear pattern arises: the treatment effects remain very large (in fact even larger) in 2019 but fall (in absolute value) as inflation rises starting in 2021. For example, the scaled treatment effects from providing the most recent inflation rate go from around -0.75 in 2018 to -0.25 in late 2021 and early 2022, before increasing slightly in absolute value in late 2022 as the inflation rate started to decline. While there is some sampling variation depending on the specific treatment and survey wave, the results point toward a clear pattern of households becoming more attentive as the inflation rate rose, leading to smaller treatment effects.

One might worry that these treatment effects reflect a desire on the part of survey participants to please the surveyors by reporting forecasts close to the provided information, without real learning taking place. One way to address this concern is by examining the persistence of treatment effects. For example, since the Nielsen survey of households is implemented quarterly, one can consider treatment effects after three months rather than immediately after the treatment is provided to households. There is little reason to believe that survey demand effects would persist beyond the current survey that implements the RCT, so this setting provides a natural check against this alternative explanation (De Quidt et al. 2018). We do so by estimating the following specification:

$$F_{t+3}^{i}\pi_{t+12} = \alpha + \beta \times F_{t-}^{i}\pi_{t+12} + \sum_j \delta_j \times \mathbb{I}_j^i + \sum_j \gamma_j \times \left(\mathbb{I}_j^i \times F_{t-}^{i}\pi_{t+12}\right) + error_i \qquad (3)$$

[6] We present all unscaled estimates of γ_j in the Appendix. These are qualitatively the same as the scaled estimates but generally present even stronger evidence of time-variation in inattention linked to the level of inflation.

which is identical to our previous one except posterior beliefs are now measured using the subsequent quarterly survey. We report results for scaled treatment effects in Panel B of Figure 4. While the treatments effects are smaller overall after three months than they were contemporaneously, especially when using the inflation target or the inflation forecasts of the central bank, the same time series variation obtains: treatment effects decline in absolute value as inflation rises, converging to around zero when inflation reaches its peak. While the temporal profile is inconsistent with survey demand effects, this is very much what one would expect from imperfect information models. When agents become more attentive, they receive more signals and earlier signals therefore lose their value more rapidly.

These results are robust to a number of reasonable variations. For example, if we focus on the unscaled size of treatment effects instead of the scaled version, the estimates are essentially unaffected, both in terms of instantaneous treatment effects as well as treatment effects after three months (Appendix Figure A.1). Another possibility is that agents learn about inflation as they participate in the survey repeatedly, as emphasized in Kim and Binder (2023). In general, the RCT set up should be robust to this concern as survey participants with different tenures are equally present in the control and treatment groups and some panel refreshment typically takes place in online surveys. In any case, when we restrict our attention to households who have not participated in the last wave or in the last two waves, we find the same patterns (Appendix Figure A.2). Since Kim and Binder (2023) show that panel conditioning effects mostly die out within six months, we can rule out this alternative explanation of our results. Nor is this pattern driven by only a subset of survey participants. We find similar results when we explicitly control for the number of waves in which survey participants have participated. When we split samples by age (Appendix Table A.2), political party (Appendix Table A.3), education (Appendix Table A.4) or gender (Appendix Table A.5), we do not find any clear differences in the time variation in treatment effects along any of these metrics. In short, these results confirm the findings of Cavallo, Cruces and Perez-Truglia (2017) that inflation treatment effects are much smaller when inflation is high and agents are attentive, but using multiple RCTs within the same country.

3.2 Euro Area Households

To complement the findings for U.S. households, we utilize a series of RCTs applied to the European Central Bank's CES. The CES was established in 2020 and originally included France, Germany, Spain, Italy, Belgium and the Netherlands, while starting in 2022 the survey was also piloted in five additional countries (Austria, Finland, Greece, Ireland, and Portugal). More detailed information about the survey is provided in ECB (2021) and Georgarakos and Kenny (2022). The CES can use occasional ad hoc modules to run RCTs to study how various information interventions affect the beliefs of households in the euro area. We focus on RCTs implemented in 2021Q4, 2022Q1, 2022Q2 and 2022Q4, all of which included at least one information treatment about inflation to a randomized subset of participants. In the CES we measure prior beliefs of households using one-year ahead inflation point forecasts reported before any information treatment. After information treatments, households provide a point forecast for year-ahead inflation, which serves as our measure of posterior beliefs.[7] Each RCT also includes a control group that is not provided with any information.

To assess the effects of information treatments on euro-area households, we apply the same empirical specifications as for the Nielsen survey, using both the instantaneous change in forecasts within the survey as well as the inflation forecasts three months later. Panel A of Figure 5 plots the resulting estimates of scaled instantaneous treatment effects while Panel B of Figure 5 plots treatment effects after three months. In 2021Q4, inflation in the euro area was already around 5%, so initial instantaneous treatment effects are small, around -0.2. As the inflation rate rose further to around 10% in 2022, we see treatment effects become even smaller, even insignificantly different from zero in the final available RCT in 2022Q4 (when inflation stood at 8.6%). Hence, we can observe the same decline in instantaneous treatment effects in the CES as was visible in the Nielsen survey of U.S. households, albeit over a shorter time sample. With treatment effects after 3 months, these are consistently estimated to be close to zero throughout the sample. Again, the results are broadly similar across information treatments.

One clear feature of the above experiments implemented in the CES is that by the time they began, inflation was already relatively high and in the news, so treatment effects are small to start with and it is difficult to identify time variation in treatment effects within this limited time frame. We consider two independent strategies to address this limitation. First, we include an additional comparable RCT that was run in the Netherlands before the inflation run-up on the Dutch National Bank's household survey (DHS). Second, we provide cross-sectional evidence from the CES that

[7] Only the most recent RCT (2022Q4) uses a distributional question pos-treatment to measure posterior beliefs. In this case, we compare these posterior beliefs to respondents' prior beliefs using information from a counterpart distributional question asked prior to RCT.

confirms that households who report paying a lot of attention to inflation respond significantly less to information treatments than those who report paying little attention.

The Dutch RCT, which was run in 2018Q2, used a nearly indistinguishable survey design from the CES in which the treated households were informed about the most recent inflation rate in the Netherlands (see Coibion et al. 2023 for a detailed description). The survey was smaller in size (approx. 2,000 respondents vs. approx. 10,000 respondents in the CES), but it was large enough to obtain reasonably precise estimates. One follow-up wave was implemented three months later, in order to estimate both instantaneous and 3-month treatment effects in a manner comparable to that applied to the CES.[8] We include these results in Panels A and B of Figure 5. In each case, we find much larger treatment effects in 2018 than those we obtain later in the CES sample, providing more evidence that as the inflation rate increased in the euro area, information treatment effects became smaller as households became more attentive to inflation.

Another approach that we can use to verify the role played by attention is to exploit the fact that, in a recent ad hoc module of the CES, some households explicitly report being more informed about inflation than others. Specifically, we split respondents in the 2022Q4 wave into two groups: low-attention and high-attention (53% and 47% of the sample, respectively) based on self-reported attention to inflation. We then estimate the instantaneous treatment effect for each group separately and report the results in Table 2. For the high-attention group, we find no treatment effect, either in terms of the slope or the intercept. For the low-attention group on the other hand, we identify a negative scaled slope effect and a positive intercept. Hence, there is a clear difference in how the two groups respond. Those who are attentive place no weight on the provided information, likely because they already know the prevailing inflation rate, whereas those who are less attentive to inflation update their beliefs when presented with information about recent inflation.

Jointly, these results are in line with the finding from U.S. households: as inflation rises, households become more attentive to and informed about inflation, leading to smaller treatment effects. With euro area households, we can identify this effect both in the time series as well as in the cross-section.

[8] Dutch respondents in the CES have inflation expectations comparable to households in other euro area countries (ECB 2021). Inflation in the Netherlands is highly correlated with inflation in the euro area (ρ=0.96) for the 2015-2023 period.

3.3 U.S. Firms

So far, all of our evidence comes from surveys of households. Evidence for firms is inherently more challenging in this context. There are far fewer large representative surveys of firms in which RCTs are allowed or feasible compared to household surveys. One exception is the Federal Reserve Bank of Atlanta's Business Inflation Expectations survey (BIE). The BIE is a monthly survey of firms in the 6th District of the Federal Reserve System. The industry composition of the survey roughly conforms to the industrial mix of the United States, so that it can be viewed as broadly representative. Each month, around 300 firms are surveyed. More details about this survey are provided in Bryan, Meyer and Parker (2015) and Meyer and Sheng (2022). Note that this sample is much smaller than household surveys, making it more difficult to implement RCTs with strong statistical power.

The Atlanta Fed implemented two such RCTs in January of 2019 and February of 2023. In each case, a randomly selected subset of firms was provided with the most recent inflation rate. Prior to this, all firms had been asked about what they thought the inflation rate had been over the previous twelve months, which we use as the prior. After the treatment, all firms were asked to provide a point forecast for aggregate inflation in the U.S. over the next 12 months, which serves as our measure of the posterior. Thus, we can estimate the instantaneous effect of information treatments on firms' expectations in a manner directly analogous to that used for households. However, because the BIE does not regularly ask about firms' aggregate inflation expectations, we cannot estimate the treatment effects after three months. In addition, because we now measure prior beliefs with firms' perceptions of recent inflation rather than their expectations of future inflation, the size of estimated coefficients cannot be compared directly to those estimated with household surveys.

We report estimates of the scaled treatment coefficient in Figure 6. In 2019, when inflation was low, the estimated weight on priors for treated firms was 73 percent smaller than for the control group. By 2023, this coefficient had declined to 52 percent smaller than the control group, suggesting that firms' attention to inflation also increased as the inflation rate rose. However, given the small samples, we cannot reject the null of equality across the two survey waves, although we can strongly reject this null when we use the unscaled treatment effects (Appendix Figure A.4). At the same time, Meyer and Sheng (2022) document a pattern of increased attention to inflation in a high inflation environment among firms. Specifically, the share of firms indicating that inflation has at least a "moderate" influence of business decision-making rose from below half of the panel in January 2015 (when overall inflation was roughly flat) to nearly 2/3 of the panel in May 2022 (when the 12-month growth rate in the CPI was 8.6 percent). Hence, despite the statistical ambiguity in the regression estimates, the combined body of evidence is consistent with the notion that inattention to inflation among U.S. firms has likely declined as inflation has risen.

IV Additional Evidence from Other Settings

RCTs in the U.S. Nielsen survey, euro-area CES, and Atlanta Fed's BIE survey all allow us to compare information treatments before and during the 2021 global rise in inflation. As described in section III, this evidence jointly is consistent with the notion that households and firms became more attentive as the inflation rate increased. In this section, we consider other settings which also speak to this question, albeit each from a different angle. First, we consider the case of firms in Uruguay, for which we also have RCTs in 2018, 2019 and 2023. Unlike in the U.S. and euro area however, Uruguay experienced relatively high inflation throughout this period. One would therefore expect to see small information treatment effects in the survey waves if inflation is indeed the driving source of the change in inattention. Second, we consider firms in New Zealand, to whom multiple RCTs were applied from 2014 to 2019. During this time period, inflation was consistently low in New Zealand, so one would expect the opposite result from Uruguay: large treatment effects throughout. Third, we consider the case of firms in Italy, some of which were repeatedly provided with information about inflation since 2012 while others were not, thereby providing another laboratory to study how information treatments may have changed over time.

4.1 Uruguay: Information treatments in a consistently high-inflation environment

We plot inflation dynamics in Uruguay since 2017 in Figure 7: inflation averaged around 8% over this period and never fell below 5%. This inflation level has been sustained since the mid-2000s and is somewhat above the central bank's inflation target range.[9] Interestingly, there is only a mild increase in inflation from 2021-23 in Uruguay, and it has proven to be transitory. Thus, unlike the U.S. or the euro area, Uruguay can be characterized as having experienced consistently high inflation (by the standards of advanced economies) *over the entire time period*.

The National Institute of Statistics (INE) of Uruguay, on behalf of the Central Bank of Uruguay, runs a monthly representative survey of firms. The survey is relatively large, with around 550 firms participating per month, and quantitative in nature. It includes questions on inflation and

[9] This target range has fluctuated over time, both in terms of level and spread of the range. The target range was 3%-7% between July 2013 and September 2022, and it has been 3%-6% since September 2022.

cost expectations of firms, among other included topics. The survey is described in more detail in Frache and Lluberas (2019) and Borraz and Mello (2020).

We focus on four RCTs which were implemented in 2018M3, 2018M6, 2019M6 and 2023M3. In each survey wave, a randomly selected subset of firms was provided with the inflation rate over the last 12 months or the central bank's inflation target, while other firms were not provided with information. Prior to the information treatments, all firms were asked to provide a point forecast for what they expected inflation to be over the next 12 months. Because no comparable question was asked immediately after the treatments, we use firms' inflation expectations in the next month wave as the posterior.

We estimate the same empirical specification as before to measure the treatment effects of information about inflation on firms' inflation forecasts and report results in Figure 7. The scaled treatment effects on short-term inflation expectations are consistently close to zero in magnitude and never statistically different from zero or each other. In other words, we find no change in inattention of firms in Uruguay. Throughout the sample, they appear to be well informed about inflation and monetary policy so that, when provided with information about either inflation or the central bank's target range, they do not change their forecasts. This "zero effect" of inflation information treatments is precisely what one would expect from agents living in a high-inflation environment: they are constantly attentive to and already informed about inflation and monetary policy.[10]

4.2 New Zealand: Information treatments in a consistently low-inflation environment

The case of Uruguay is unique in that it covers multiple RCTs over the course of many years in a high-inflation environment. What happens over the course of many years in a low-inflation environment? We consider this case using repeated RCTs of firms that were implemented in New Zealand from 2014 to 2019, a time period during which inflation never exceeded 2.5% and occurred after more than two decades of low and stable inflation since New Zealand adopted its 2% inflation target in 1990.

Unlike previous settings considered, the RCTs in New Zealand were not implemented in the context of a regular ongoing survey. Instead, they were implemented individually at different times. Like in the Nielsen and CES surveys, prior inflation expectations were measured using a distributional question while posteriors were measured using a point forecast for inflation over the

[10] This result is also consistent with the fact that firms in Uruguay are better forecasters than those in New Zealand (Frache and Lluberas, 2019).

next 12 months. The first two RCTs in New Zealand (2014Q4 and 2016Q2) were part of a sequence of surveys described in Coibion, Gorodnichenko and Kumar (2018). In 2014Q4, around 1,600 firms were randomly assigned to either a control group or one of three treatment groups. The latter received either the most recent inflation rate, the central bank's inflation target, or professional forecasts of one-year ahead inflation. Applying our same empirical specification, we find (Figure 8) that the treatments had large effects on inflation expectations, with scaled slope treatment effects ranging from -0.55 (central bank target) to -0.95 (professional forecasts).

In 2016Q2, another information treatment was applied to a new representative group of firms in New Zealand. In this case, around 2,000 firms were either randomly assigned to the control group or were provided with the central bank's inflation target. Applying the same empirical specification, we estimate a slightly smaller scaled treatment effect of around -0.35, perhaps reflecting the fact that inflation was close to the deflationary zone and may therefore have been receiving more news coverage than in 2014.

Another RCT was applied to a new representative group of firms in 2018Q1, as described in more detail in Coibion et al. (2021b). In this case, 251 firms received only the past inflation treatment or were in the control group. As shown in Figure 8, the estimated scaled treatment effect in this case is -0.63, effectively indistinguishable from that estimated with the same treatment in 2014Q1, when inflation had been running at a similar level as in 2018.

Finally, yet another RCT was implemented on a new group of around 1,000 New Zealand firms in 2019Q3. In this case, the information treatment consisted of a combination of the previous period's inflation rate and central bank inflation target. Hence, the treatment is not directly comparable to the previous ones. Nonetheless, the estimated scaled treatment effect is still in the same neighborhood as in prior waves, at -0.9.

In short, over a 6-year time interval during which inflation was relatively low and stable, we find across four RCTs of firms in New Zealand what looks like systematically high levels of inattention. This evidence is consistent with New Zealand's long history of inflation targeting and low inflation.

4.3 Italy: The effect of repeatedly treating firms in low- and high-inflation environments

Finally, we consider another unique setting, that of Italy, in which an RCT has been repeatedly applied for over a decade. In the Italian SIGE, some firms have been *repeatedly* provided with information about the most recent inflation rate, whereas others have not, over the course of years, thereby providing a unique setting to study how the level of inflation shapes inattention.

The SIGE is a quarterly survey of firms in which approximately 1,000 firms per quarter participate. As described in Grasso and Ropele (2018) and Coibion, Gorodnichenko and Ropele (2020), at infrequent intervals, firms are randomly assigned to one of two groups. One group is simply asked what they expect inflation to be over the next 12 months. The other group is also asked about their inflation expectations, but after being told what the most recent inflation rate was both in Italy and in the euro area. Firms remain in their group until the next reshuffling, meaning that in between re-assignments, some firms are repeatedly provided with information while others are not. Before 2012Q3, all firms were provided with the same information about recent inflation. In 2012Q3, approximately one-third of firms were randomly assigned to the group that is not provided with any information. In 2012Q4, the firms were reshuffled across the two groups, again in a randomized fashion. Firms remained in these groups until 2017Q2, at which time another reshuffling took place. Firms stayed in their new groups until 2019Q4, when another reassignment took place.

The survey only asks for inflation expectations after information is provided to firms (for those in the treatment group). As a result, we use firms' inflation expectations from the previous wave as the measure of their prior belief. We can then run the following cross-sectional regression each period t:

$$F_t^i \pi_{t+12} = \alpha_t + \beta_t \times F_{t-1}^i \pi_{t-1+12} + \delta_t \times \mathbb{I}_{t-1}^i + \gamma_t \times \left(\mathbb{I}_{t-1}^i \times F_{t-1}^i \pi_{t-1+12}\right) + error_{i,t} \tag{4}$$

which yields a time series of estimated $\hat{\gamma}_t/\hat{\beta}_t$. We plot this time series in Figure 9 (time series for unscaled slopes are in Appendix Figure A.7). While there is significant variation over time in the estimates, we note a clear increase in $\hat{\gamma}_t/\hat{\beta}_t$ from -0.45 for 2012Q3-2021Q3 when inflation is below 1% on average to -0.04 for 2021Q4-2023Q1 when inflation exceeds 5%. Hence, these results again suggest that firms became more attentive to inflation as the inflation rate increased in recent years.[11]

V Pooled Evidence

Having considered these country-specific results in isolation, we now bring them together to assess the extent to which the level of inflation is related to how (in)attentive households and firms are to inflation. We do so by combining the results from all the RCTs of U.S. households in Nielsen, euro-

[11] In periods of high inflation firms could become more attentive to inflation as it matters for wage claims. Conflitti and Zizza (2021), using data from SIGE, explore the role of wage bargaining in shaping firms' inflation beliefs and report differences according to the level of inflation.

area households in the CES, U.S. firms in the BIE, Uruguayan firms, and New Zealand firms. For the Italian SIGE, we pool estimates from 2012-2021 into one low-inflation estimate and estimates from 2022 into one high-inflation estimate. We then plot in Figure 10 the level of CPI inflation existing at the time of each RCT against the scaled slope treatment effect ($\hat{\beta}/\hat{\gamma}$) of each RCT. There is a striking positive correlation ($\rho = 0.6$) between the two (Appendix Figure A.8 plots the equivalent results for unscaled treatment effects and finds an even stronger positive correlation), consistent with inattention to inflation being more pervasive in low-inflation than high-inflation environments.

Despite the different treatment types, the different questions used to measure priors and posteriors, and the fact that we consider both households and firms, all of which should tend to attenuate any underlying correlation, we still uncover a clear positive link between inflation and inattention. When we pool estimates across countries, times, and treatments and regress $\hat{\beta}/\hat{\gamma}$ on the rate of inflation at the RCT time, we find that a one percentage point increase in the rate of inflation is associated with a 0.064 (s.e. 0.013) increase in $\hat{\beta}/\hat{\gamma}$. This fitted relationship suggests that households and firms pay very close attention when inflation reaches 11.5 percent per year (i.e., $\hat{\beta}/\hat{\gamma} \approx 0$) while the degree of inattention is high ($\hat{\beta}/\hat{\gamma} \approx -0.6$) when inflation is close to 2 percent per year.

We interpret this pattern as adding further credence to the external validity of RCTs, which is a concern with this methodology. While there is clearly some variation in estimated effects of similar information treatments coming from question formulations that are survey-specific, it is remarkable how close the estimates are for different countries *experiencing similar economic environments* at different times. This indicates that researchers can have some confidence that RCTs implemented in one moment in time in one particular country deliver results that can apply more generally. At the same time, the fact that treatment effects clearly vary with the level of inflation also indicates that one must be careful in generalizing from individual RCTs because, in a very different economic environment, treatment effects may change.

VI Conclusion

When inflation is higher, households and firms pay more attention. Our results documenting this pattern through repeated RCTs in different countries support other recent evidence such as Cavallo, Cruces and Perez-Truglia (2017), Bracha and Tang (2019), Korenok, Munro and Chen

(2023) and Pfäuti (2023). Jointly, this line of research presents clear evidence, using a variety of empirical strategies, that attention to inflation is endogenous and varies with the level of inflation.

This endogeneity of inattention matters for policymaking. When agents are more inattentive, the Phillips curve is flatter (Afrouzi and Yang 2023), forward guidance is less powerful (Kiley 2021) and the ZLB limits to a larger extent the effectiveness of monetary policy (Pfäuti 2023). Each of these mechanisms is central to monetary policy decisions. Incorporating the systematic endogeneity of inattention should therefore be an important objective for future work in optimal policy design.

Endogeneity of inattention also matters for policy communication and management of inflation expectations (Coibion et al. 2020). In an environment where agents are inattentive, the main challenge for policymakers who seek to affect expectations is *how* to reach households and firms. Conditional on reaching them, communication is very powerful, as found in Coibion, Gorodnichenko and Weber (2022), and can enhance central bank credibility (Ehrmann, Georgarakos and Kenny 2022). In contrast, when agents are attentive, reaching them is less of a challenge. Instead, the difficulty becomes that they are less responsive to policy communications since they are already better informed. *What* information is relayed to them therefore becomes the main challenge (Candia, Coibion and Gorodnichenko 2020; D'Acunto et al, 2020). Policymakers who are interested in shaping expectations to better stabilize economic outcomes should consider how the economic environment shapes the way to successfully communicate with the public.

Methodologically, our results also provide support for the use of RCTs along with a call for caution. We find that similar RCTs implemented in different countries at different times but experiencing similar economic environments yield results that are broadly similar. This indicates that RCTs can be viewed as having some external validity. But the "similar economic environment" is an important caveat. As emphasized in the Lucas (1976) critique, a changing environment will lead to changing behavior on the part of economic agents. Our results provide yet more evidence for Lucas' insight, in this case by showing that the level of inflation affects how inattentive households and firms are to macroeconomic conditions.

References

Afrouzi, Hassan, and Choongryul Yang, 2021. "Dynamic Rational Inattention and the Phillips Curve," Manuscript.

Armantier, Olivier, Scott Nelson, Giorgio Topa, Wilbert van der Klaauw, and Basit Zafar, 2016. "The Price Is Right: Updating Inflation Expectations in a Randomized Price Information Experiment," *Review of Economics and Statistics* 98(3): 503-523.

Armona, Luis, Andreas Fuster, and Basit Zafar, 2019. "Home Price Expectations and Behavior: Evidence from a Randomized Information Experiment," *Review of Economic Studies* 86(4): 1371-1410.

Beutel, Johannes, and Michael Weber, 2022. "Beliefs and Portfolios: Causal Evidence," Chicago Booth Research Paper No.22-08.

Binder, Carola, 2017. "Measuring uncertainty based on rounding: New method and application to inflation expectations," *Journal of Monetary Economics* 90(C): 1-12.

Borraz, Fernando, and Miguel Mello, 2020. "Communication, Information and Inflation Expectations," Working Paper of the Banco Central de Uruguay No. 005-2020.

Borraz, Fernando, Anna Orlik, and Laura Zacheo, 2023. "On Firms' Inflation Expectations, (In)Attention and Inflation Targeting: Survey Evidence for Uruguay," Manuscript.

Bracha, Anat, and Jenny Tang, 2019. "Inflation Levels and (In)Attention," Federal Reserve Bank of Boston Working Paper 2019-14.

Bryan, Michael F., Brent H. Meyer, and Nicholas B. Parker, 2015. "The Inflation Expectations of Firms: What Do They Look Like, Are They Accurate, and Do They Matter?" Federal Reserve Bank of Atlanta Working Paper 2014-27a.

Candia, Bernardo, Olivier Coibion, and Yuriy Gorodnichenko, 2020. "Communication and the Beliefs of Agents," in *Navigating the Decade Ahead: Implications for Monetary Policy*, Economic Policy Symposium (Jackson Hole, WY) Proceedings, Federal Reserve Bank of Kansas City.

Cavallo, Alberto, Guillermo Cruces, and Ricardo Perez-Truglia. 2017. "Inflation Expectations, Learning, and Supermarket Prices: Evidence from Survey Experiments." *American Economic Journal: Macroeconomics*, 9 (3): 1-35.

Chopra, Felix, Christopher Roth, and Johannes Wohlfart, 2023. "Home Price Expectations and Spending: Evidence from a Field Experiment," Manuscript.

Coibion, Olivier, Dimitris Georgarakos, Yuriy Gorodnichenko, and Maarten van Rooij, 2023. "How Does Consumption Respond to News about Inflation? Field Evidence from a Randomized Control Trial," *American Economic Journal: Macroeconomics* 15(3): 109-152.

Coibion, Olivier, Dimitris Georgarakos, Yuriy Gorodnichenko and Michael Weber, 2021a. "Forward Guidance and Household Expectations," Forthcoming in *Journal of European Economic Association*.

Coibion, Olivier, Dimitris Georgarakos, Yuriy Gorodnichenko, Geoff Kenny and Michael Weber, 2022. "The Effect of Macroeconomic Uncertainty on Household Spending," Forthcoming in *American Economic Review*.

Coibion, Olivier, Yuriy Gorodnichenko, and Saten Kumar, 2018. "How Do Firms Form Their Expectations? New Survey Evidence," *American Economic Review* 108(9): 2671-2713.

Coibion, Olivier, Yuriy Gorodnichenko, Saten Kumar, and Mathieu Pedemonte, 2020. "Inflation expectations as a policy tool?" *Journal of International Economics* 124(C): 103297.

Coibion, Olivier, Yuriy Gorodnichenko, Saten Kumar, and Jane Ryngaert, 2021b. "Do You Know That I Know That You Know…? Higher Order Beliefs in Survey Data," *Quarterly Journal of Economics* 136(3): 1387-1446.

Coibion, Olivier, Yuriy Gorodnichenko, and Tiziano Ropele, 2020. "Inflation Expectations and Firm Decisions: New Causal Evidence," *Quarterly Journal of Economics* 135(1): 165-219.

Coibion, Olivier, Yuriy Gorodnichenko, and Michael Weber, 2022. "Monetary Policy Communications and their Effects on Household Inflation Expectations," *Journal of Political Economy* 130(6): 1537-1584.

Conflitti, Cristina, and Roberta Zizza, 2021. "What's Behind Firms' Inflation Forecasts?", *Empirical Economics* 61(5): 2449-2475.

D'Acunto, Francesco, Ulrike Malmendier, Juan Ospina, and Michael Weber, 2021. "Exposure to Grocery Prices and Inflation Expectations," *Journal of Political Economy* 129(5): 1615-1639.

D'Acunto, Francesco, Daniel Hoang, Maritta Paloviita, and Michael Weber, 2020. "Effective Policy Communication: Targets versus Instrument," Working Paper.

De Quidt, Jonathan, Johannes Haushofer, and Christopher Roth, 2018. "Measuring and Bounding Experimenter Demand Effects," *American Economic Review* 108(11): 3266-3302.

Ehrmann, Michael, Dimitris Georgarakos, and Geoff Kenny, 2022. "Credibility Gains from Communicating with the Public: Evidence from the ECB's new Monetary Policy Strategy," ECB WP No. 2785.

European Central Bank, 2021. "ECB Consumer Expectations Survey: an overview and first evaluation", Occasional Paper Series, No 287, December.

Fajardo, Jose, and Manuela Dantas, 2018. "Understanding the impact of severe hyperinflation experience on current household investment behavior," *Journal of Behavioral and Experimental Finance* 17(March): 60-67.

Frache, Serafin, and Rodrigo Lluberas, 2019. "New Information and Inflation Expectations among Firms," BIS working paper No. 781.

Georgarakos, Dimitris, and Geoff Kenny, 2022. "Household spending and fiscal support during the COVID-19 pandemic: Insights from a new consumer survey", *Journal of Monetary Economics*, Vol. 129, Supplement, pp. S1-S14.

Goldstein, Nathan, 2020. "Tracking Inattention," Forthcoming in *Journal of European Economic Association*.

Grasso, Adriana, and Tiziano Ropele, 2018. "Firms' inflation expectations and investment plans," Bank of Italy Working Paper Series 1203.

Huber, Peter J., 1964. "Robust estimation of a location parameter," *Annals of Mathematical Statistics* 35: 73–101.

Kiley, Michael, 2021. "Policy Paradoxes in the New Keynesian Model," FEDS Working Paper No. 2014-29.

Kim, Gwangmin, and Carola Binder. 2023. "Learning-through-Survey in Inflation Expectations," *American Economic Journal: Macroeconomics*, 15 (2): 254-78.

Korenok, Oleg, David Munro, and Jiayi Chen, 2023. "Inflation and Attention Thresholds," Manuscript.

Kumar, Saten, Yuriy Gorodnichenko, and Olivier Coibion, 2022. "The Effect of Macroeconomic Uncertainty on Firm Decisions," forthcoming in *Econometrica*.

Link, Sebastian, Andreas Peichl, Christopher Roth, and Johannes Wohlfart, 2023. "Information Frictions among Firms and Households," *Journal of Monetary Economics* 135(April): 99-115.

Lucas, Robert E., 1976. "Econometric Policy Evaluation: A Critique," *Carnegie-Rochester Conference Series on Public Policy* 1: 19-46.

Mackowiak, Bartosz, and Mirko Wiederholt. 2009. "Optimal Sticky Prices under Rational Inattention." *American Economic Review* 99 (3): 769-803.

Malmendier, Ulrike, and Stefan Nagel, 2011. "Depression Babies: Do Macroeconomic Experiences Affect Risk-Taking?" *Quarterly Journal of Economics* 126(1): 373-416.

Meyer, Brent H., and Xuguang Simon Sheng, 2022. "Unit Cost Expectations and Uncertainty: Firms' Perspectives on Inflation," Manuscript.

Pfauti, Oliver, 2023. "Inflation – Who Cares? Monetary Policy in Times of Low Attention," Manuscript.

Roth, Christopher, and Johannes Wohlfart, 2020. "How Do Expectations about the Macroeconomy Affect Personal Expectations and Behavior?" *Review of Economics and Statistics* 102: 731-748.

Sims, Christopher A., 2003. "Implications of Rational Inattention," *Journal of Monetary Economics*, 50(3): 665-690.

Table 1: Overview of RCTs

Country	Agents	RCT dates	Priors	Posteriors	Information treatments
United States	Households (~20K per wave)	2018Q2, 2019Q1, 2021Q2-Q4, 2022Q3-Q4, 2023Q2	One-year ahead inflation expectations from distribution	One-year ahead inflation expectations from point forecast	• Inflation over the last year • FOMC inflation target • FOMC inflation forecast
Euro area	Households (~10K per wave)	2021Q4, 2022Q2-Q2, 2022Q4	One-year ahead inflation expectations from distribution	One-year ahead inflation expectations from point forecast	• Inflation over the last year • ECB inflation target and past inflation • Professional inflation forecast
Netherlands	Households (~2,000)	2018Q2	One-year ahead inflation expectations from distribution	One-year ahead inflation expectations from point forecast	• Inflation over the last year
United States	Firms (~300 per wave)	2019Q1, 2023Q1	Perceived inflation over last year	One-year ahead inflation expectations from point forecast	• Inflation over the last year
Uruguay	Firms (~500 per wave)	2018Q1-Q2, 2019Q2 2023Q1	One-year ahead inflation expectations from point forecast	One-year ahead inflation expectations from next wave	• Inflation over the last year • Central Bank of Uruguay inflation target range
New Zealand	Firms (~2,000 per wave)	2014Q4, 2016Q2, 2018Q1, 2019Q3	One-year ahead inflation expectations from distribution	One-year ahead inflation expectations from point forecast	• Inflation over the last year • Reserve Bank of NZ inflation target • Professional forecast of inflation • Combination
Italy	Firms (~1000 per wave)	2012Q3-22Q4	Inflation expectations in previous quarter from point forecast	One-year ahead inflation expectations from point forecast	• Inflation over the last year in Italy and euro area

Notes: The table summarizes surveys, measurement of expectations, and information treatments used in our analysis.

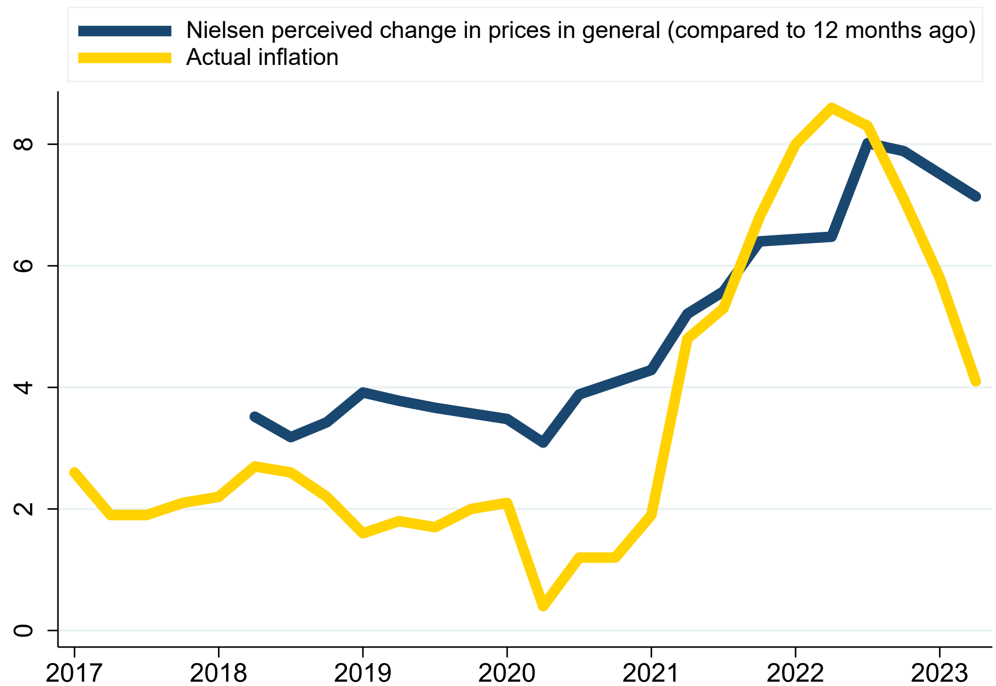
Table 2: Treatment Effects for Attentive and Inattentive Households

	Treatment effects	
	Slope (scaled)	Intercept
	(1)	(2)
High attention to inflation	0.01	-0.07
	(0.08)	(0.41)
Low attention to inflation	-0.19***	1.21***
	(0.06)	(0.05)

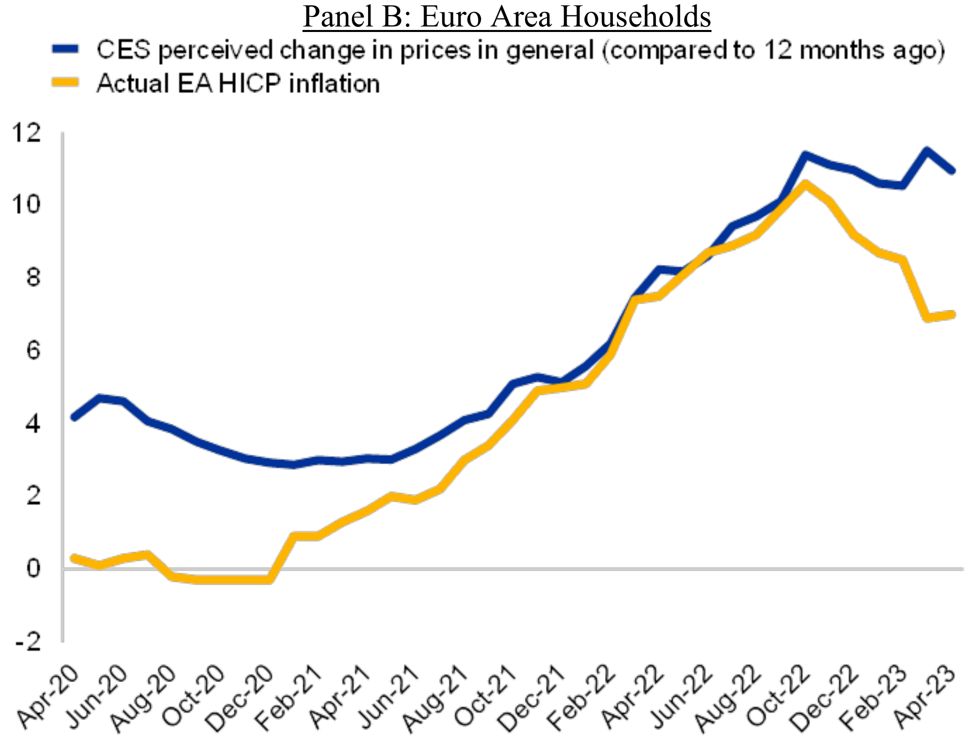
Notes: The table reports estimates for γ/β (scaled slope) and δ (intercept) in specification (2) for CES based on whether respondents pay high or low attention to inflation. The low-attention group includes respondents who report that they pay "almost no attention", "a little attention" or "some attention" to inflation. The high-attention group includes respondents who report that they pay "much attention" or "a great deal of attention" to inflation. The estimates are based on the Huber robust regressions. Robust standard errors are reported in parentheses. ***, **, * indicate statistical significance at 1, 5, and 10 percent levels.

Figure 1: Actual Inflation and Perceived Inflation by Households

Panel A: U.S. Households

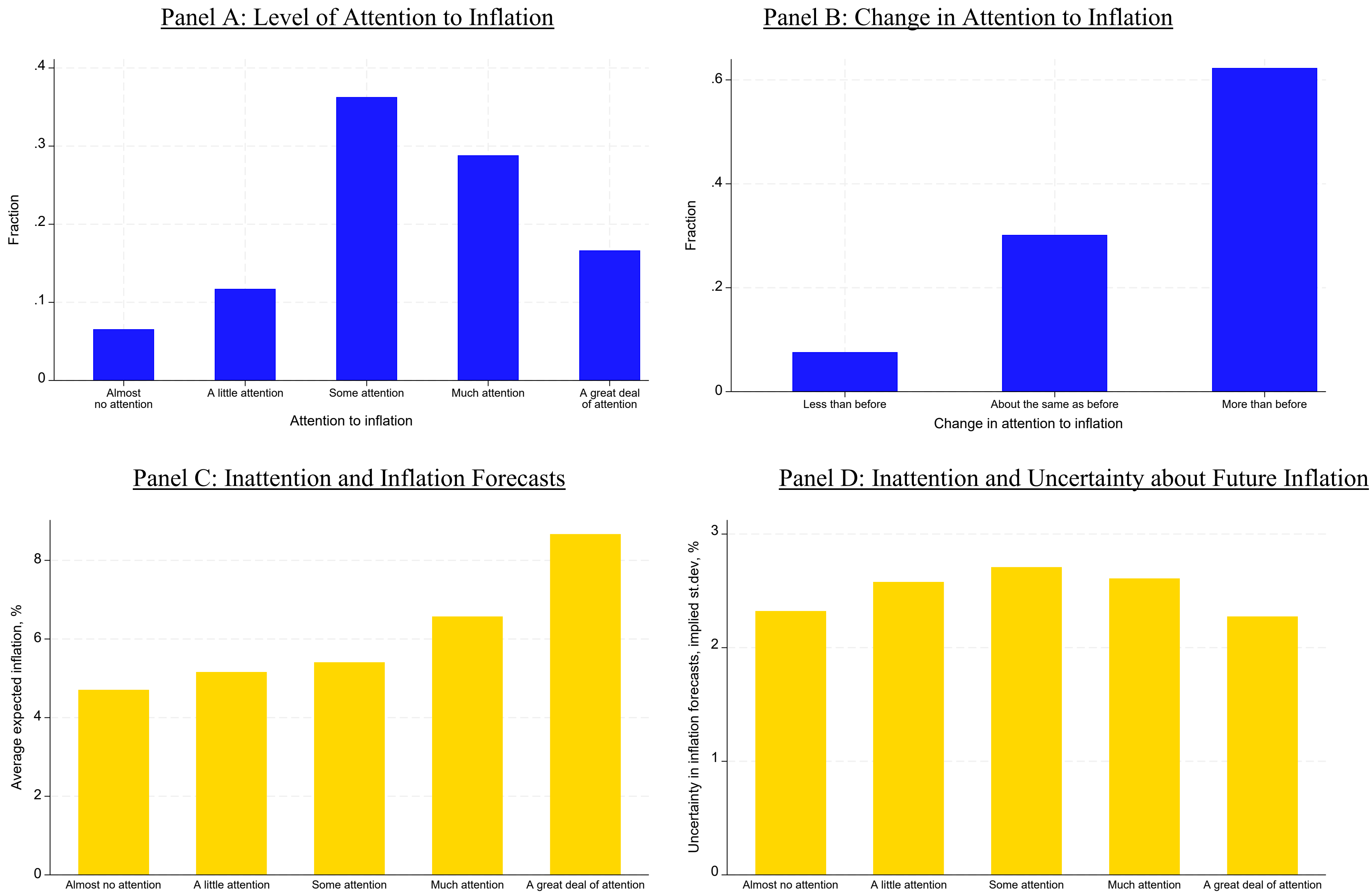


Panel B: Euro Area Households



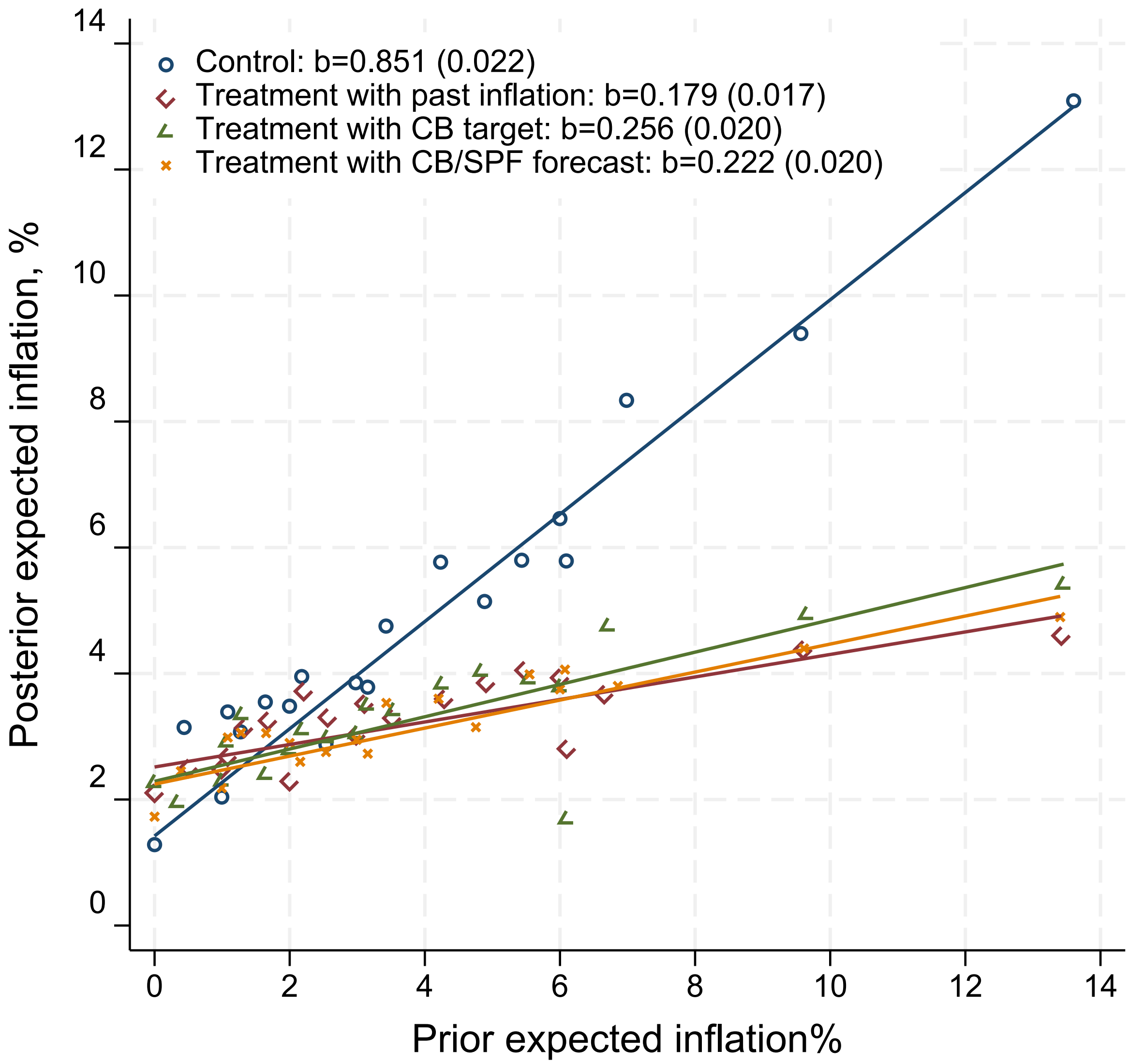
Notes: The figure shows time series of actual inflation and average perceived inflation in the US (Panel A) and the euro area (Panel B).

Figure 2: Attention to Inflation by Households



Notes: The figures report the distribution of respondents by the level (or change) of attention to inflation in the 2023M1 wave of the CES as well as their inflation forecasts and uncertainty in their inflation forecasts.

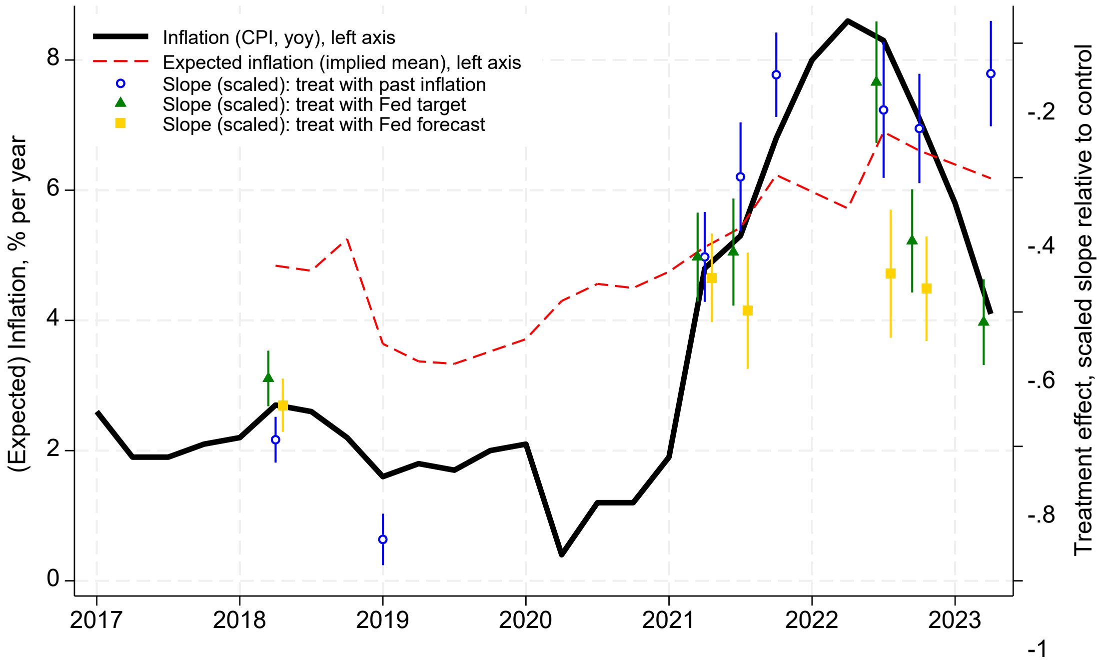
Figure 3: Priors and Posteriors of U.S. Households, 2018Q2



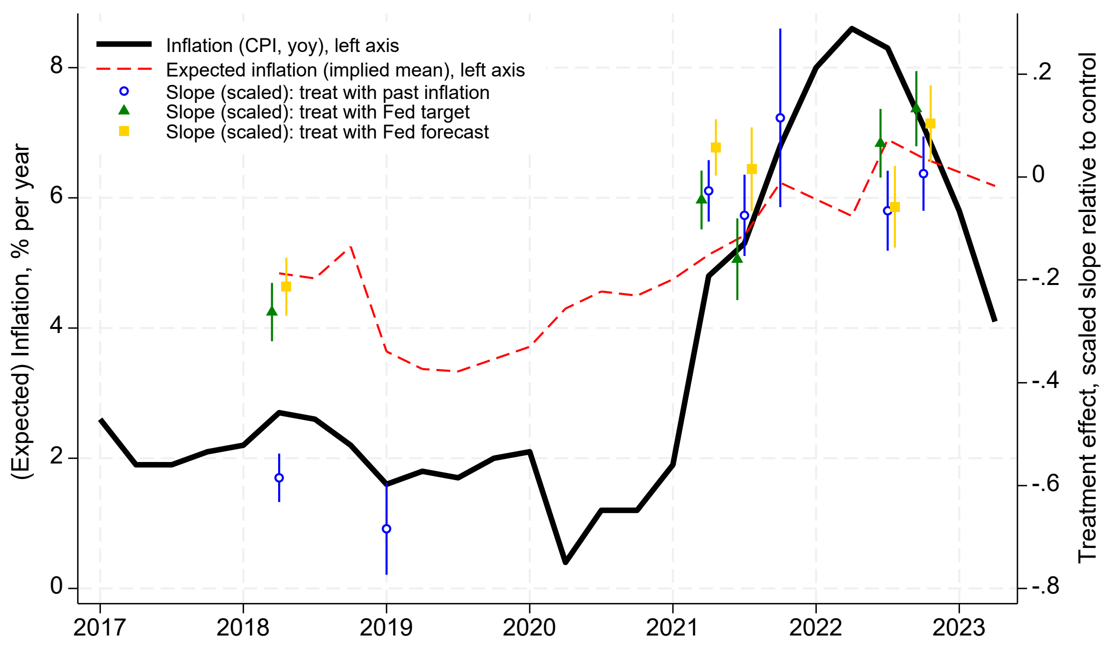
Notes: The figures plot binscatters of priors (x-axis) versus the posteriors (y-axis) of households in the control and treated groups in the Nielsen survey in 2018Q2.

Figure 4: The Changing Effects of Information Treatments on U.S. Households

Panel A: Instantaneous Treatment Effects



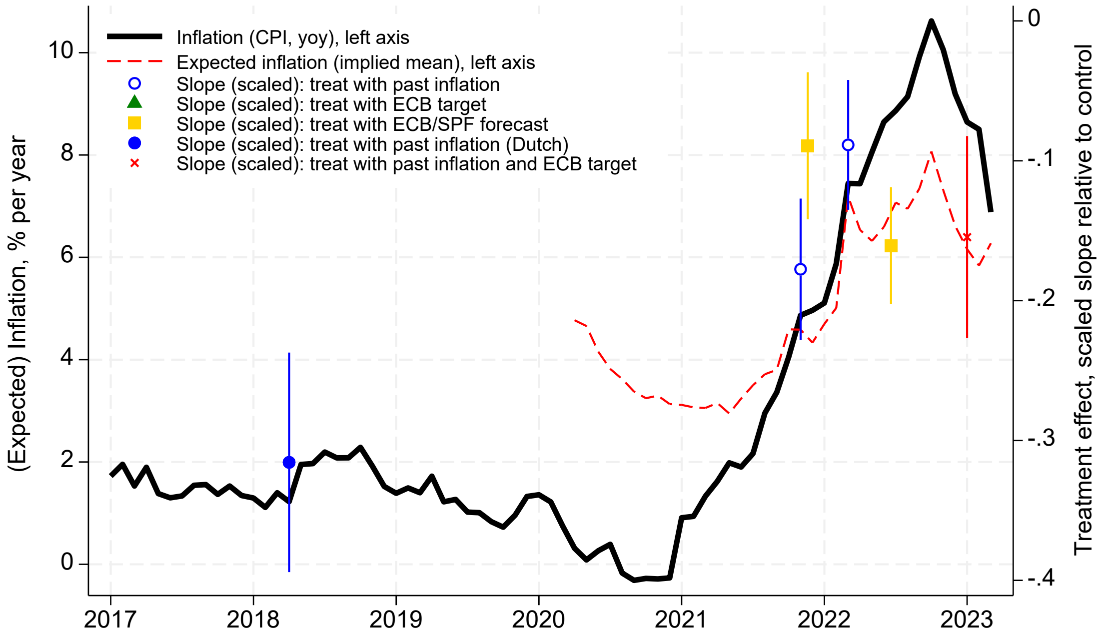
Panel B: Treatment Effects after 3 Months



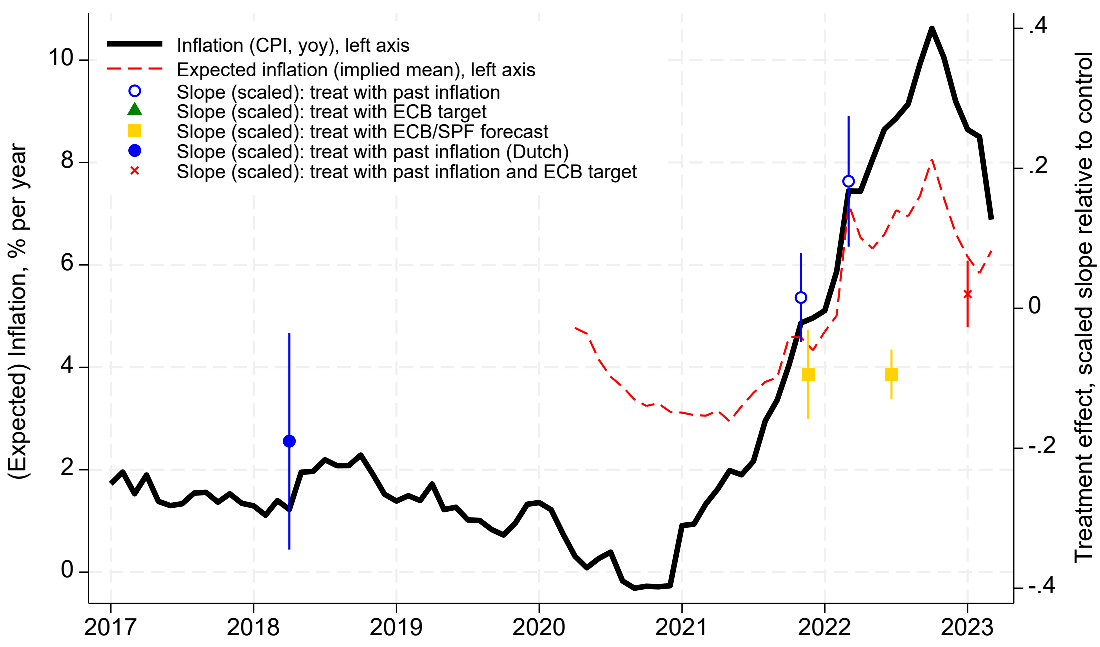
Notes: Each panel shows the time series of actual inflation and average expected inflation as well as the scaled slopes (γ/β in specification (2) for Panel A and γ/β in specification (3) for Panel B) for various treatments across RCTs. The whiskers show the 90% confidence intervals based on heteroskedasticity robust standard errors.

Figure 5: The Changing Effects of Information Treatments on Euro Area Households

Panel A: Instantaneous Treatment Effects

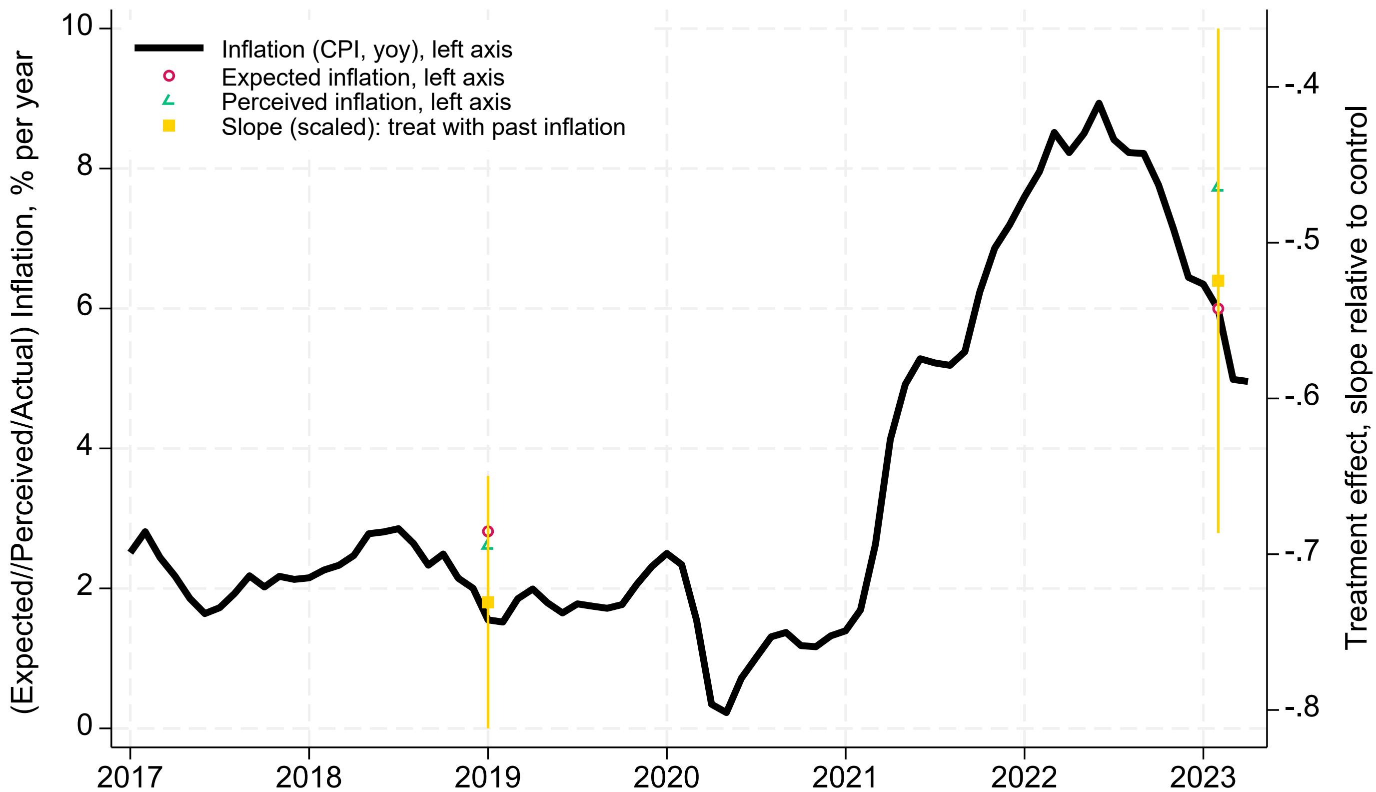


Panel B: Treatment Effects after 3 Months



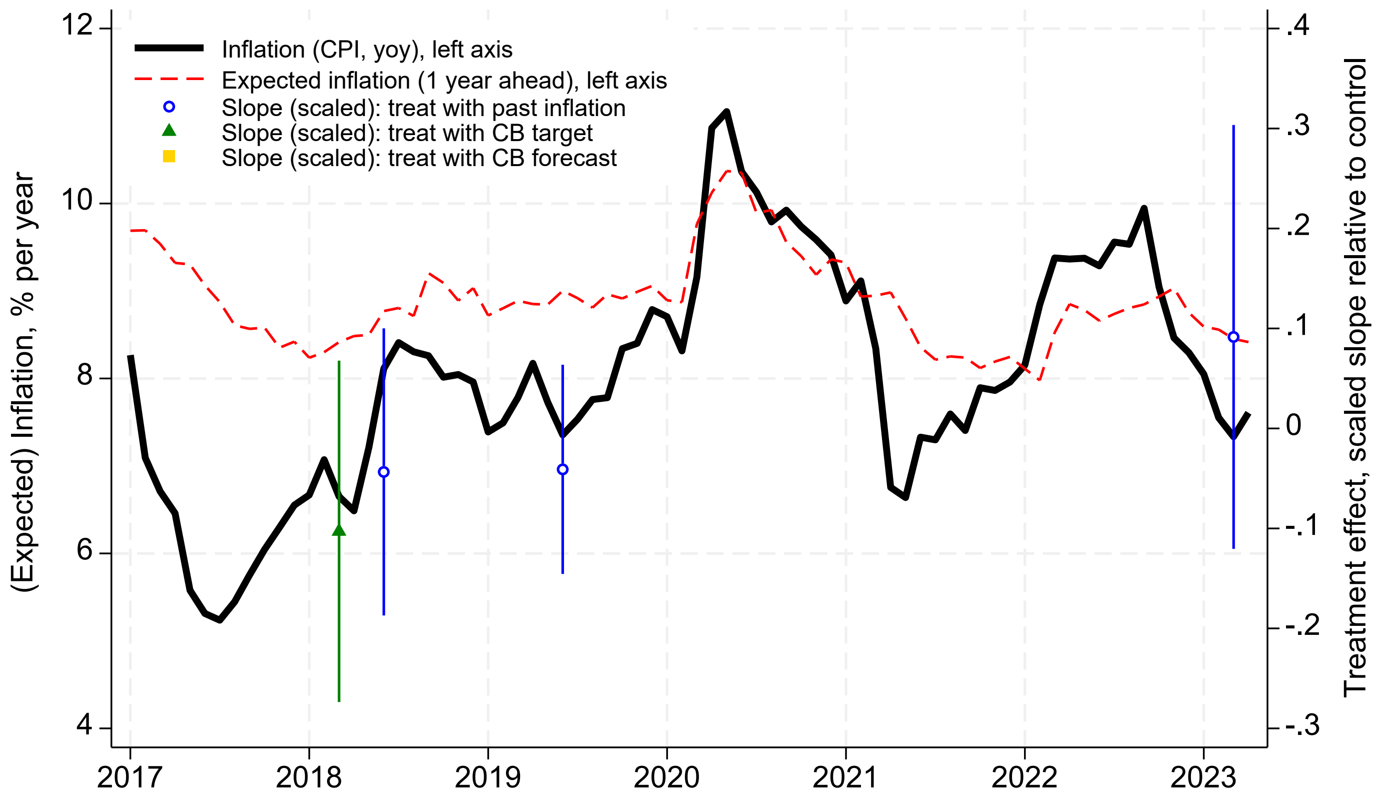
Notes: Each panel shows the time series of actual inflation and average expected inflation as well as the scaled slopes (γ/β in specification (2) for Panel A and γ/β in specification (3) for Panel B) for various treatments across RCTs. The whiskers show the 90% confidence intervals based on heteroskedasticity robust standard errors.

Figure 6: The Changing Effects of Information Treatments on U.S. Firms



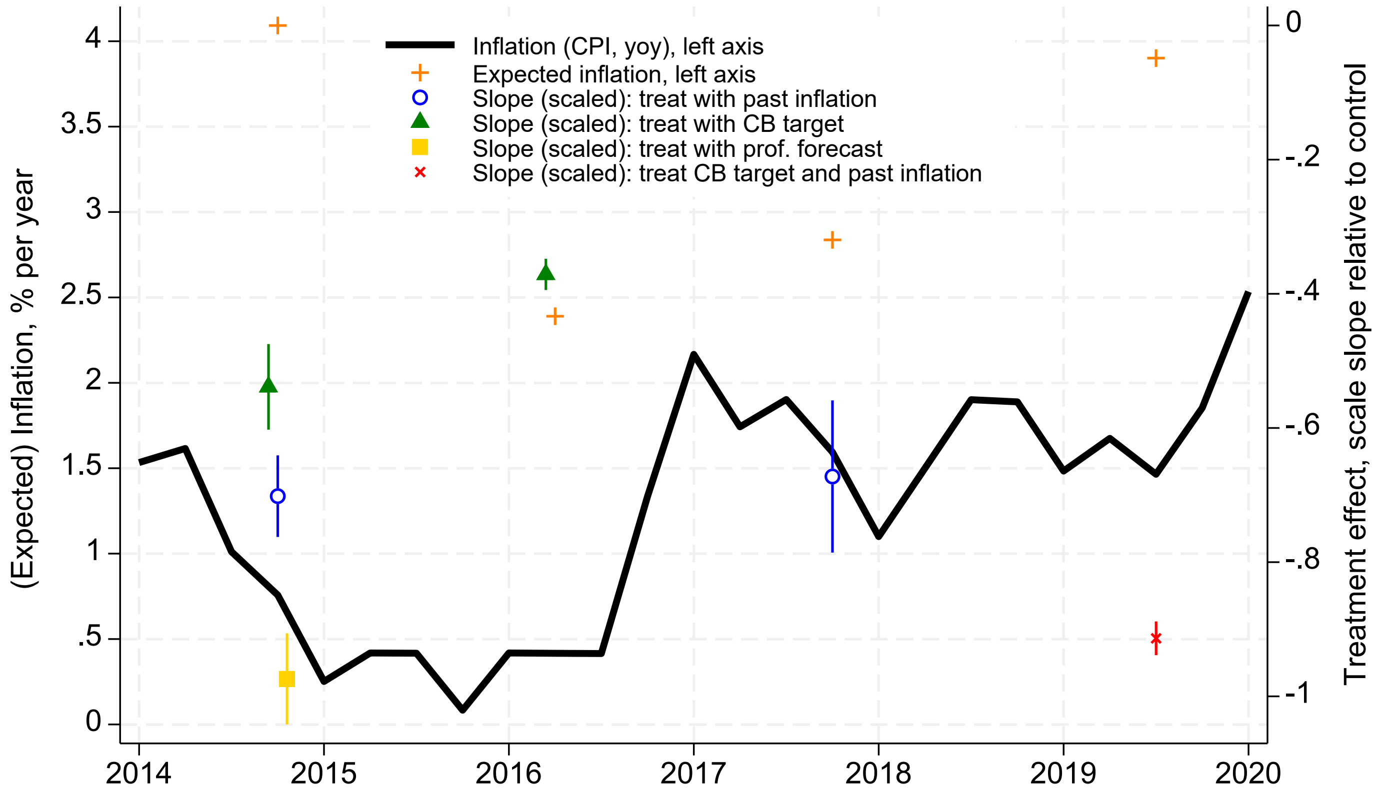
Notes: The figure shows the time series of actual inflation as well as the scaled slopes (γ/β in specification (2)) for various treatments across RCTs. The whiskers show the 90% confidence intervals based on heteroskedasticity robust standard errors. The figure also reports average expectation and perceived inflation at the time when RCTs were conducted.

Figure 7: Time Variation in Treatment Effects on Firms in Uruguay



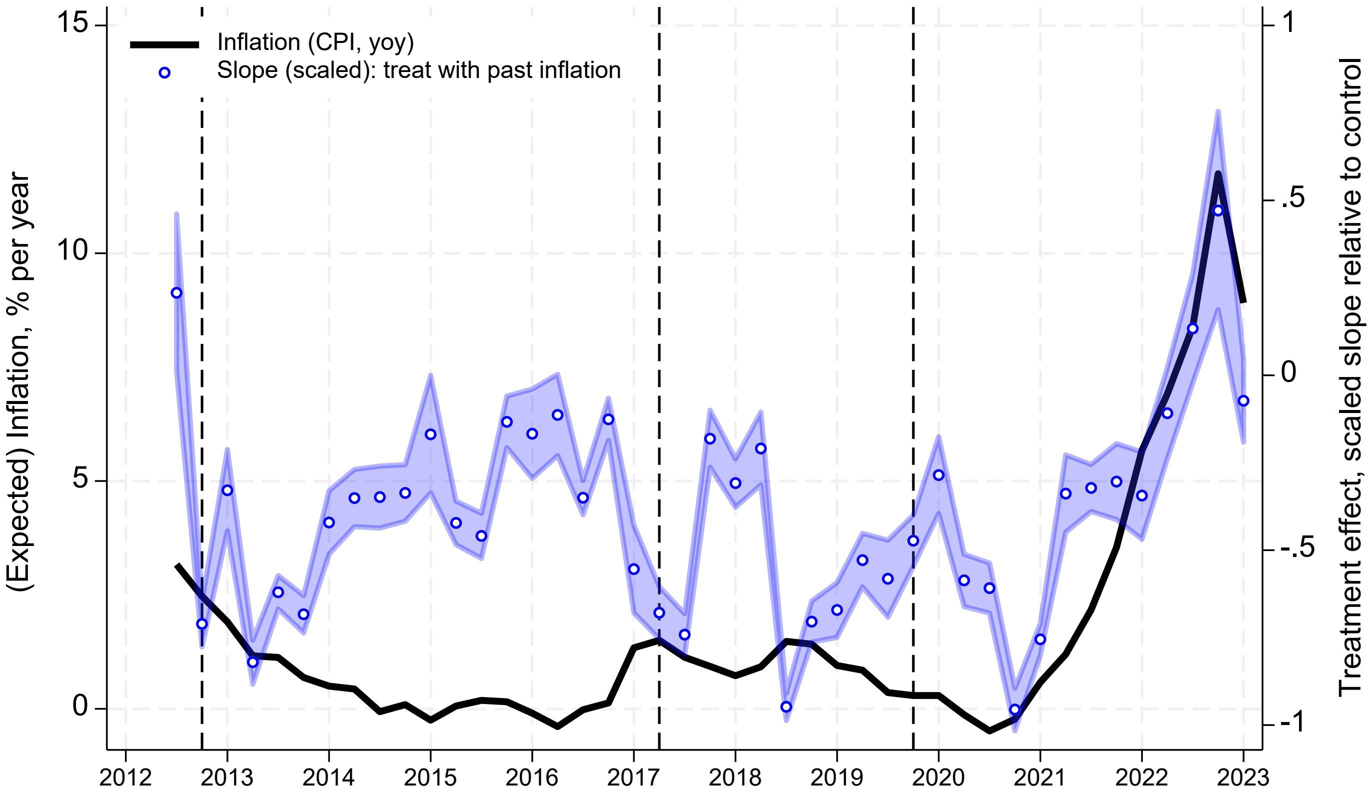
Notes: the figure shows the time series of actual inflation and average expected inflation as well as the scaled slopes (γ/β in specification (2)) for various treatments across RCTs. The whiskers show the 90% confidence intervals based on heteroskedasticity robust standard errors.

Figure 8: Time Variation in Treatment Effects on Firms in New Zealand



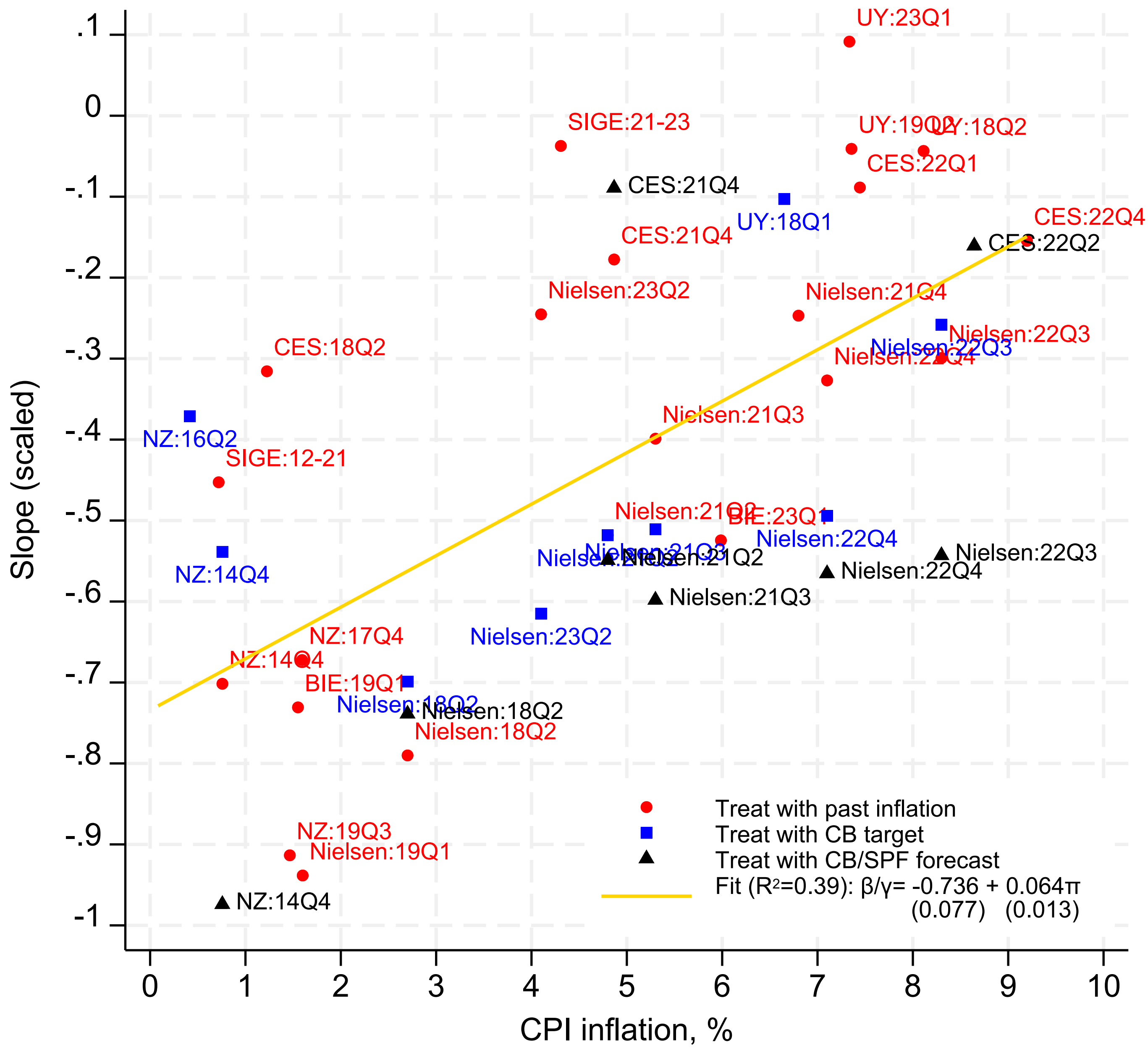
Notes: The figure shows the time series of actual inflation as well as the scaled slopes (γ/β in specification (2)) for various treatments across RCTs. The whiskers show the 90% confidence intervals based on heteroskedasticity robust standard errors.

Figure 9: Time Variation in Treatment Effects on Firms in Italy



Notes: The figure shows the time series of actual inflation as well as the scaled slopes (γ/β in specification (4)) for various treatments across RCTs. The shaded area shows the 90% confidence intervals based on heteroskedasticity robust standard errors. The dashed vertical lines show times when firms were randomly reshuffled into treatment and control groups.

Figure 10: Pooled Treatment Effects across Countries and Time

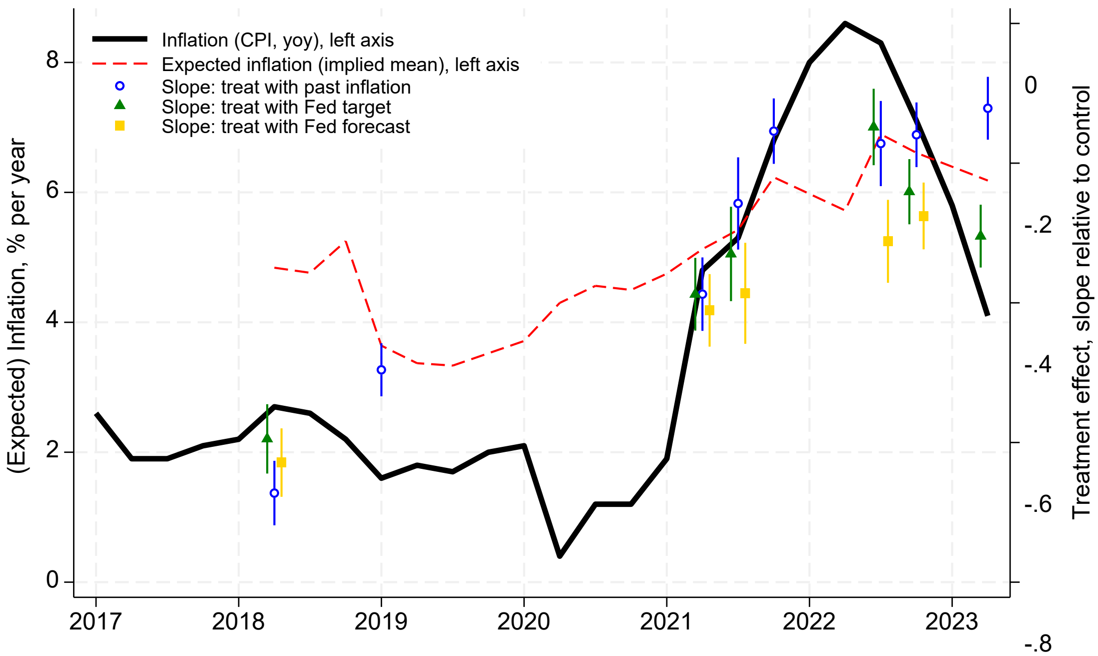


Notes: The figure plots the estimated scaled slopes (γ/β in specifications (2)-(4)) vs. the annual rate of inflation at the time of the corresponding survey. The format of labels is "survey/country: year-quarter". Surveys/countries are coded as follows: NZ is for New Zealand, CES is for the European Central Bank's Consumer Expectations Survey, SIGE is for the Bank of Italy's Survey on Inflation and Growth Expectations, UY is for Uruguay, Nielsen is for the Nielsen Homescan Panel, BIE is the Atlanta Fed's Business Inflation Expectations survey. Inflation is for the year-quarter when the corresponding survey/RCT was conducted. Data for SIGE are pooled into two "periods": 2012Q3-2021Q3 and 2021Q4-2023Q1.

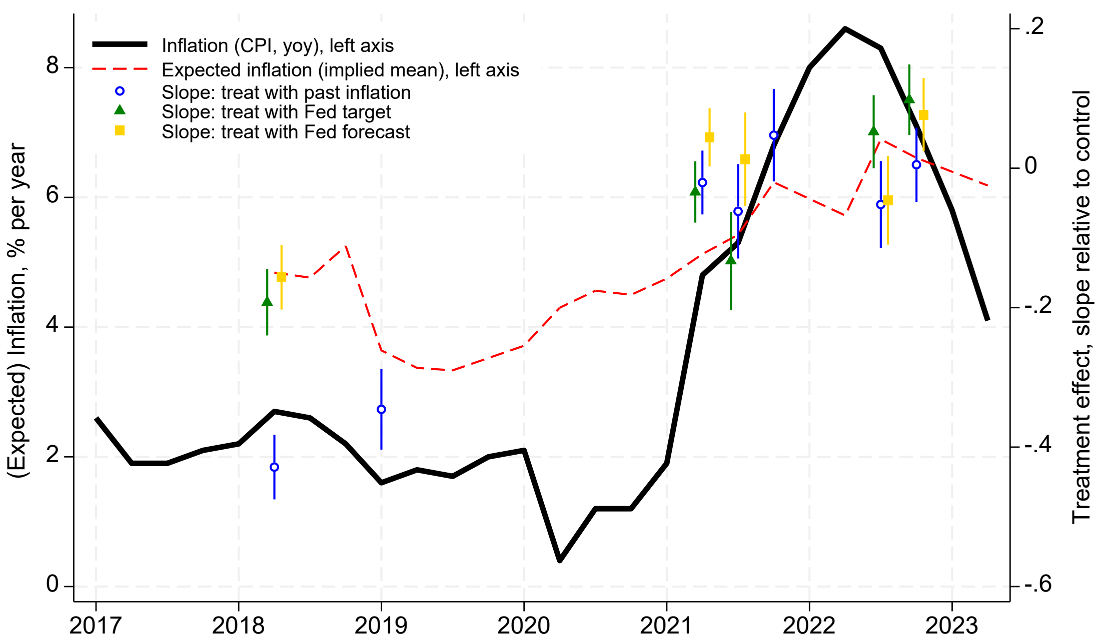
Online Appendix

Appendix Figure A.1: Not controlling for slope of control group for U.S. households

Panel A: Instantaneous Treatment Effects



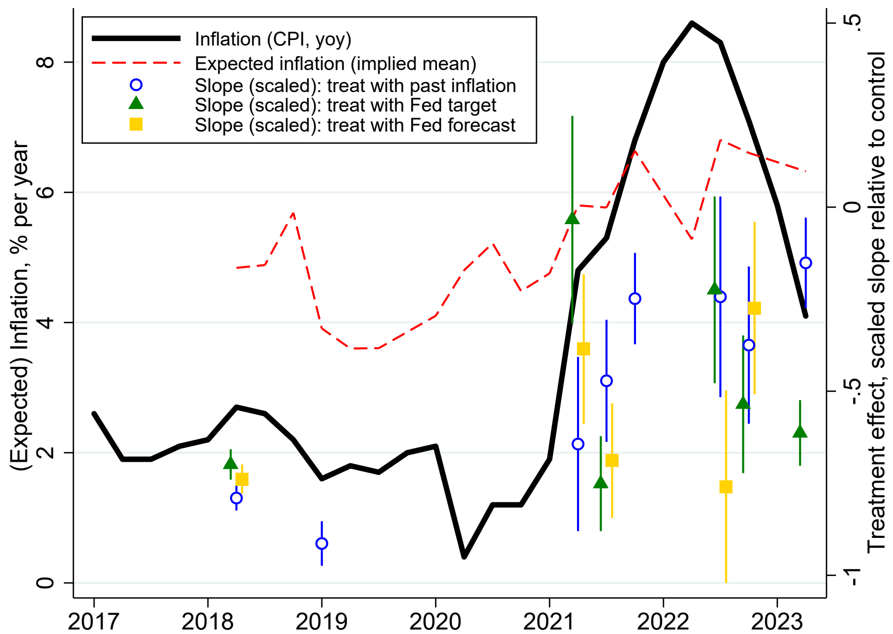
Panel B: Treatment Effects after 3 Months



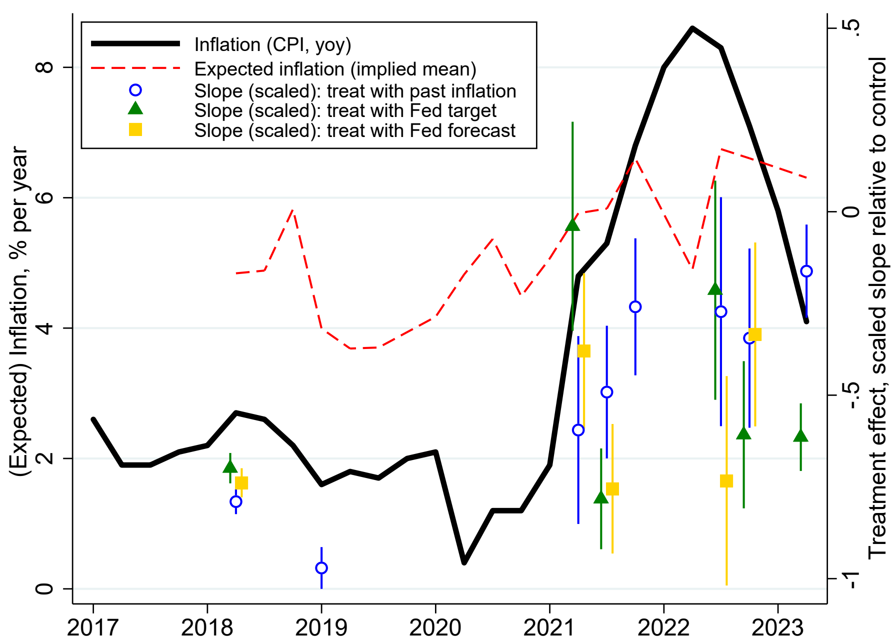
Notes: Each panel shows the time series of actual inflation and average expected inflation as well as the slopes (γ in specification (2) for Panel A and γ in specification (3) for Panel B) for various treatments across RCTs. The whiskers show the 90% confidence intervals based on heteroskedasticity robust standard errors.

Appendix Figure A.2: Panel Conditioning

Panel A: Subsample of households not participating in previous 1 wave



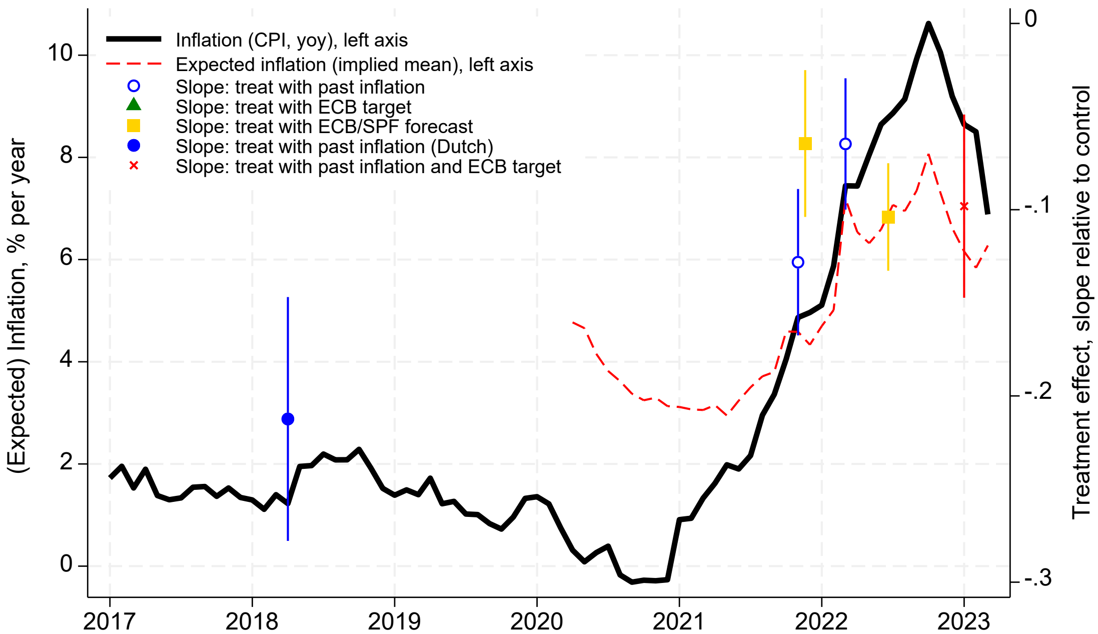
Panel B: Subsample of households not participating in previous 2 waves



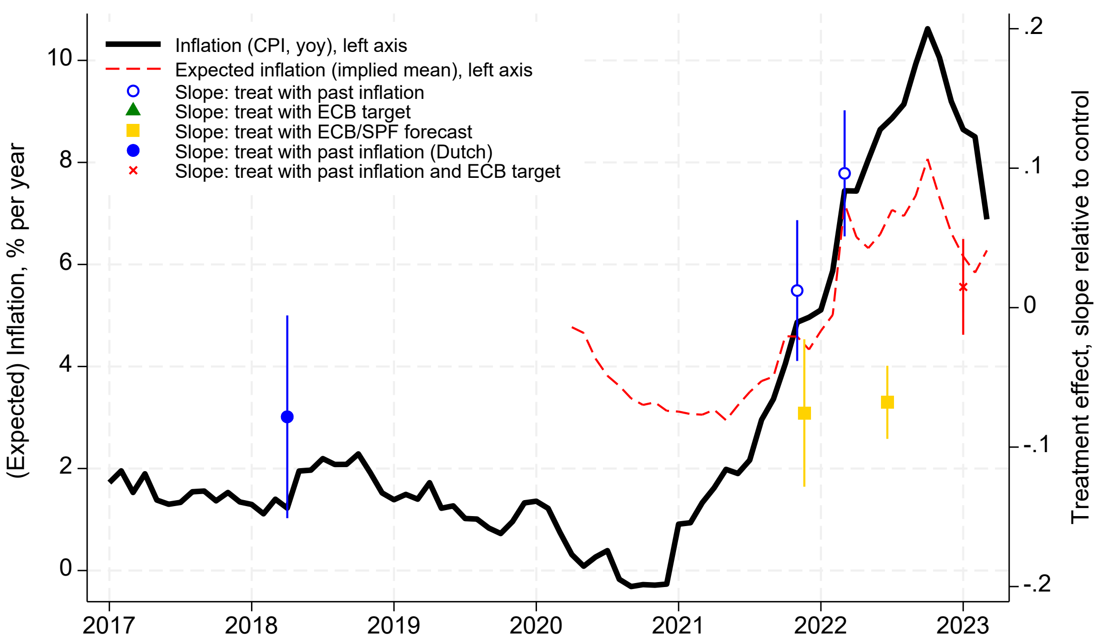
Notes: Each panel shows the time series of actual inflation and average expected inflation as well as the scaled slopes (γ/β in specification (2) for Panel A and γ/β in specification (3) for Panel B) for various treatments across RCTs. The whiskers show the 90% confidence intervals based on heteroskedasticity robust standard errors.

Appendix Figure A.3: Not controlling for slope of control group for euro area households

Panel A: Instantaneous Treatment Effect

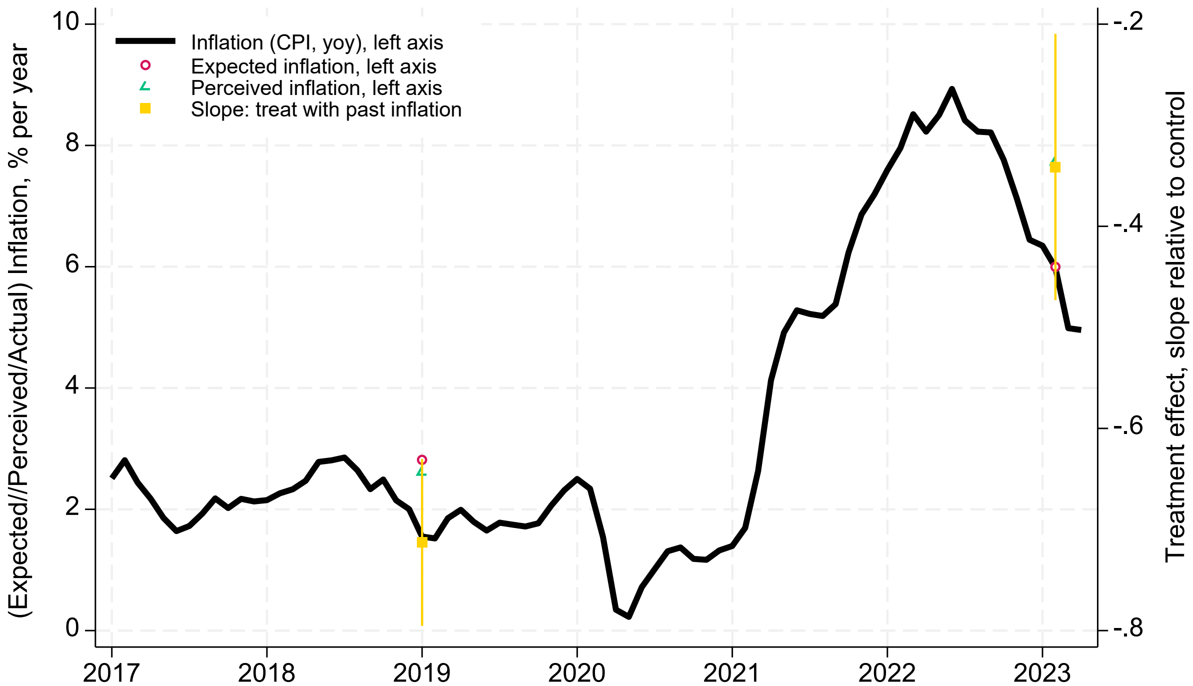


Panel B: Treatment Effect after 3 Months



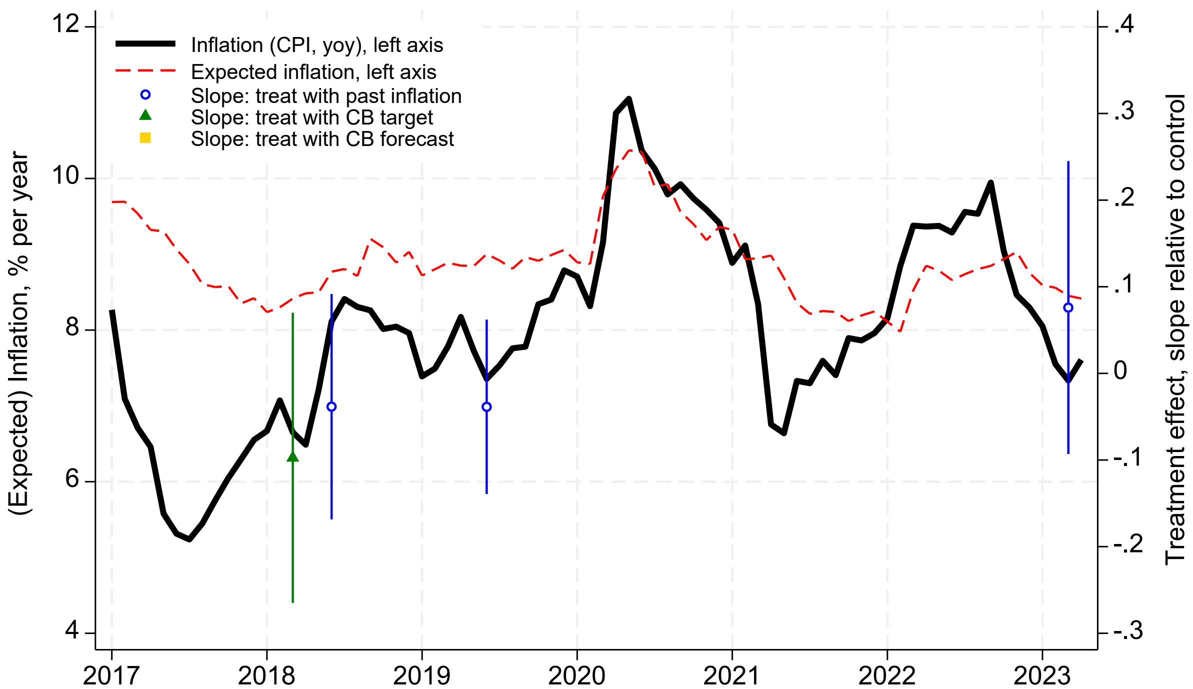
Notes: Each panel shows the time series of actual inflation and average expected inflation as well as the slopes (γ in specification (2) for Panel A and γ in specification (3) for Panel B) for various treatments across RCTs. The whiskers show the 90% confidence intervals based on heteroskedasticity robust standard errors.

Appendix Figure A.4: Not controlling for slope of control group for U.S. firms



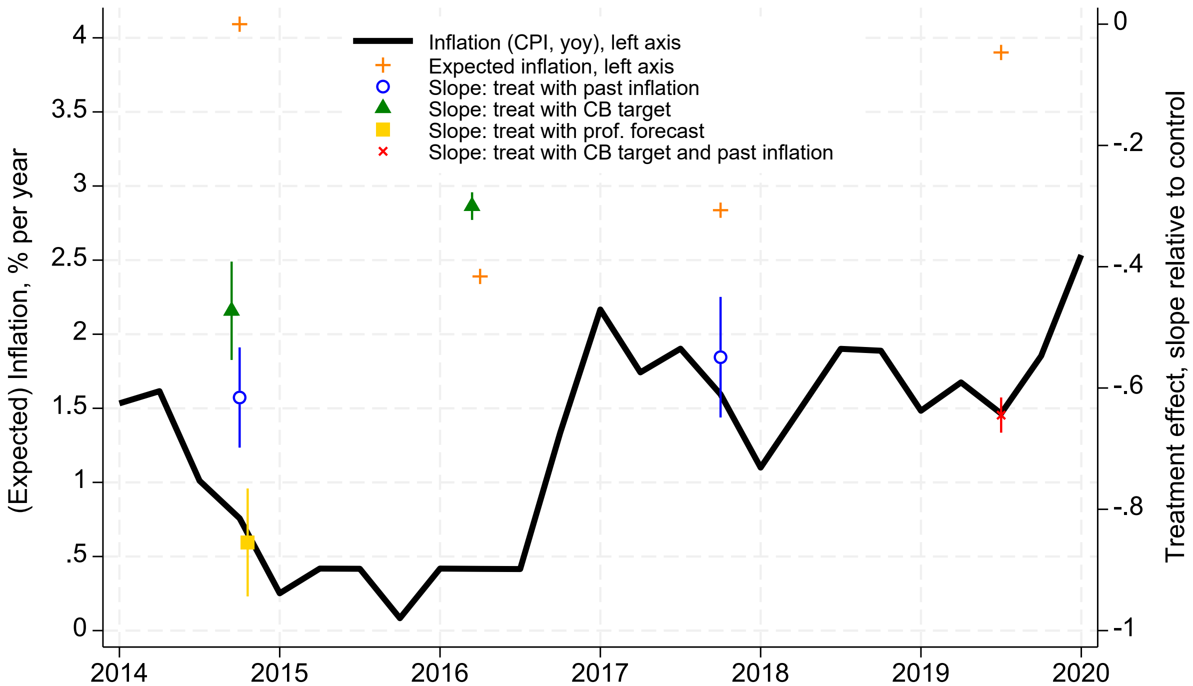
Notes: The figure shows the time series of actual inflation as well as the slopes (γ in specification (2)) for various treatments across RCTs. The whiskers show the 90% confidence intervals based on heteroskedasticity robust standard errors. The figure also reports average expectation and perceived inflation at the time when RCTs were conducted.

Appendix Figure A.5: Not controlling for slope of control group for Uruguayan firms



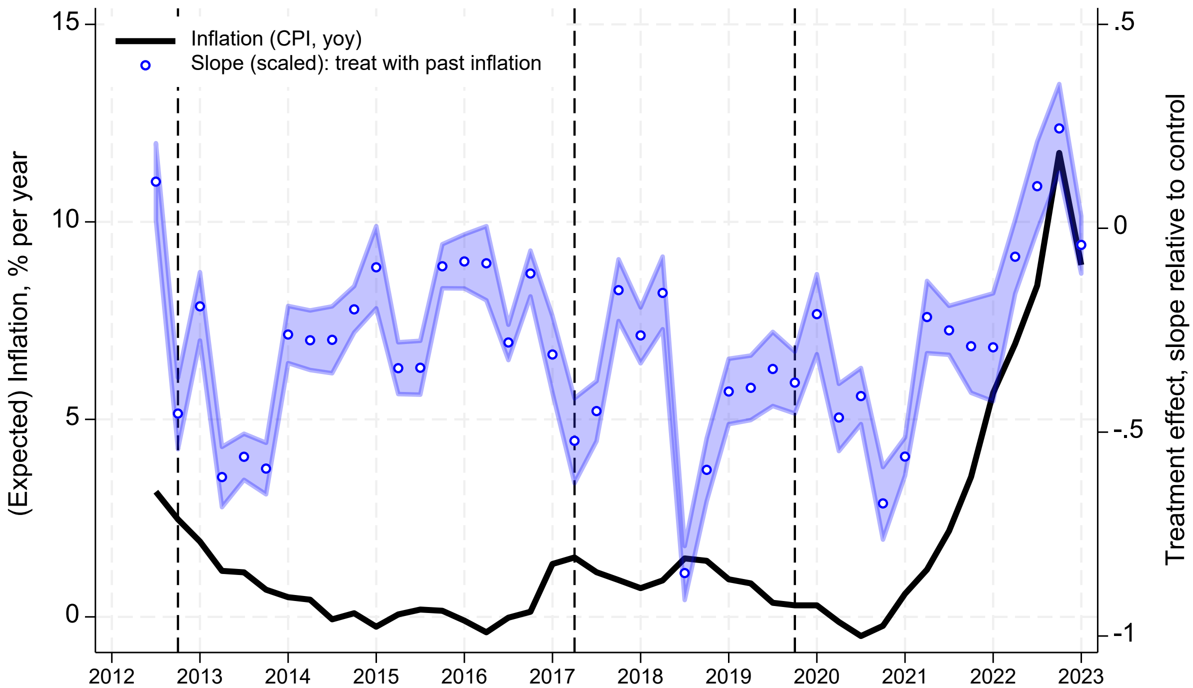
Notes: The figure shows the time series of actual inflation and average expected inflation as well as the slopes (γ in specification (2)) for various treatments across RCTs. The whiskers show the 90% confidence intervals based on heteroskedasticity robust standard errors.

Appendix Figure A.6: Not controlling for slope of control group for New Zealand firms



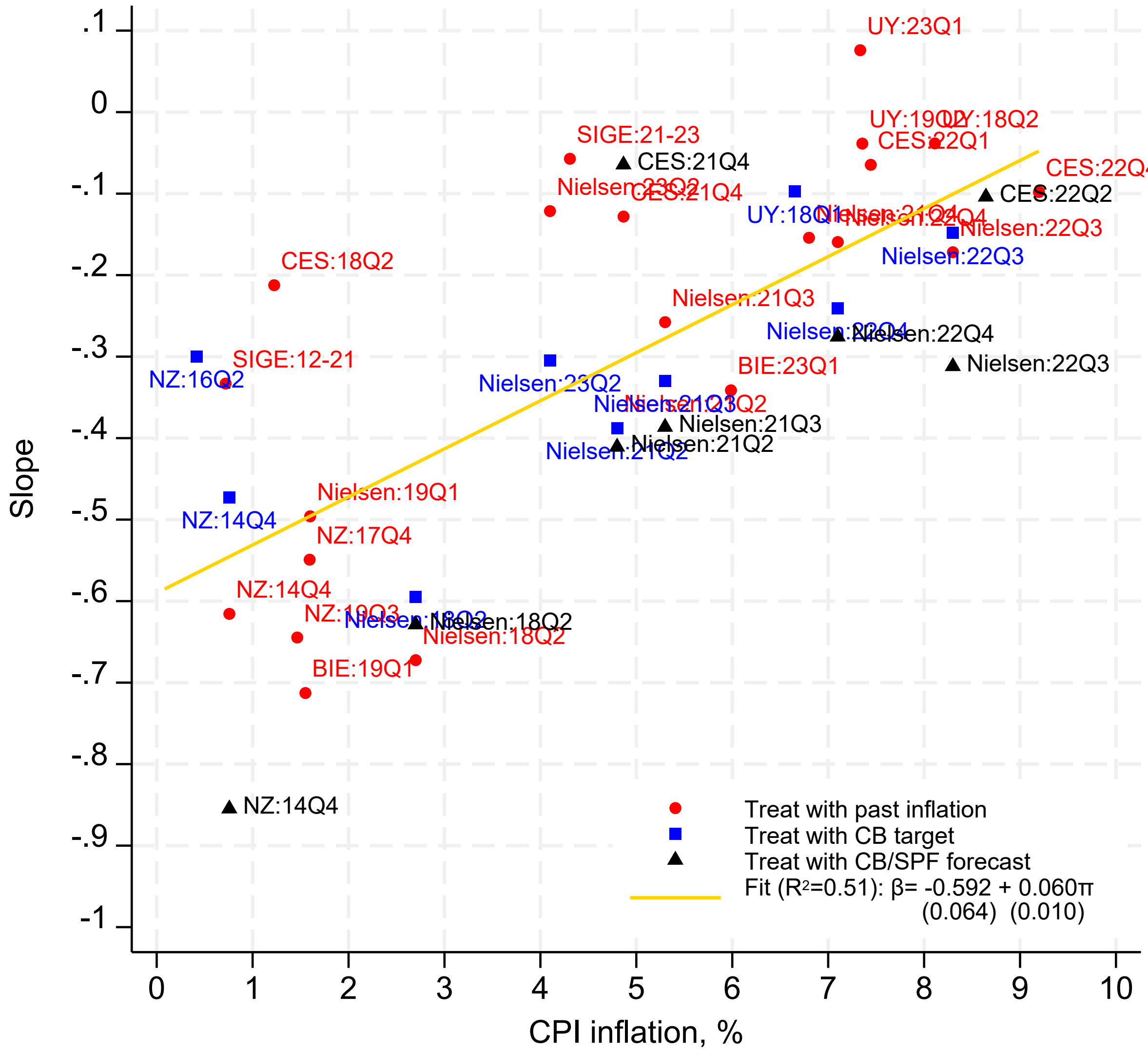
Notes: The figure shows the time series of actual inflation as well as the slopes (γ in specification (2)) for various treatments across RCTs. The whiskers show the 90% confidence intervals based on heteroskedasticity robust standard errors.

Appendix Figure A.7: Not controlling for slope of control group for Italian firms



Notes: The figure shows the time series of actual inflation as well as the slopes (γ in specification (4)) for various treatments across RCTs. The shaded area shows the 90% confidence intervals based on heteroskedasticity robust standard errors. The dashed vertical lines show times when firms were randomly reshuffled into treatment and control groups.

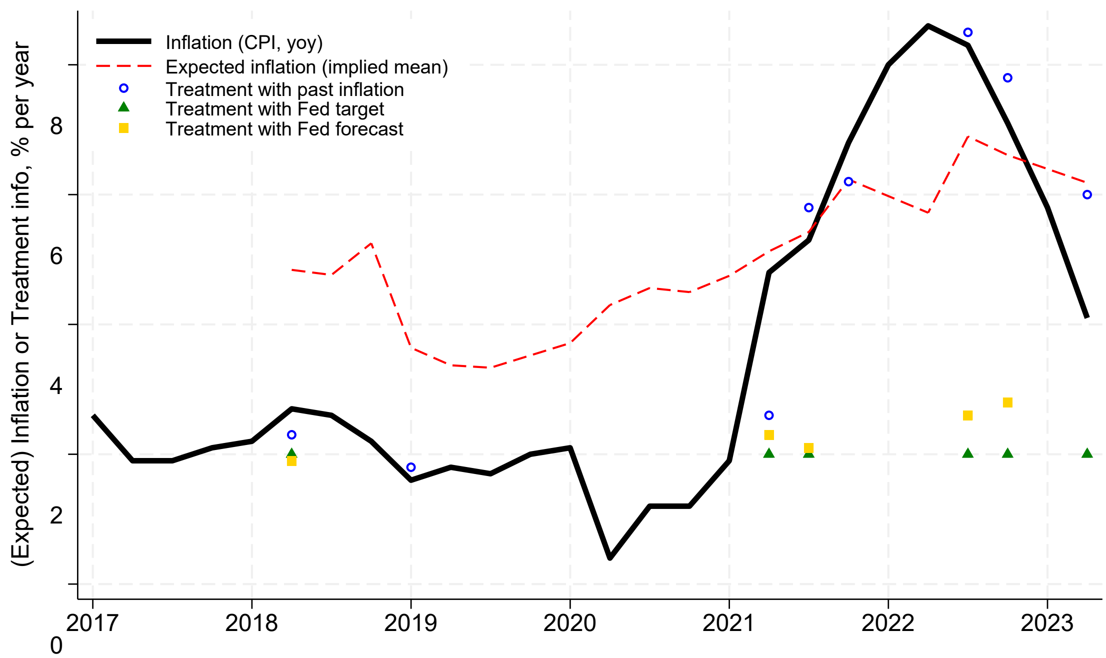
Appendix Figure A.8: Pooling across countries, not controlling for slope of control group



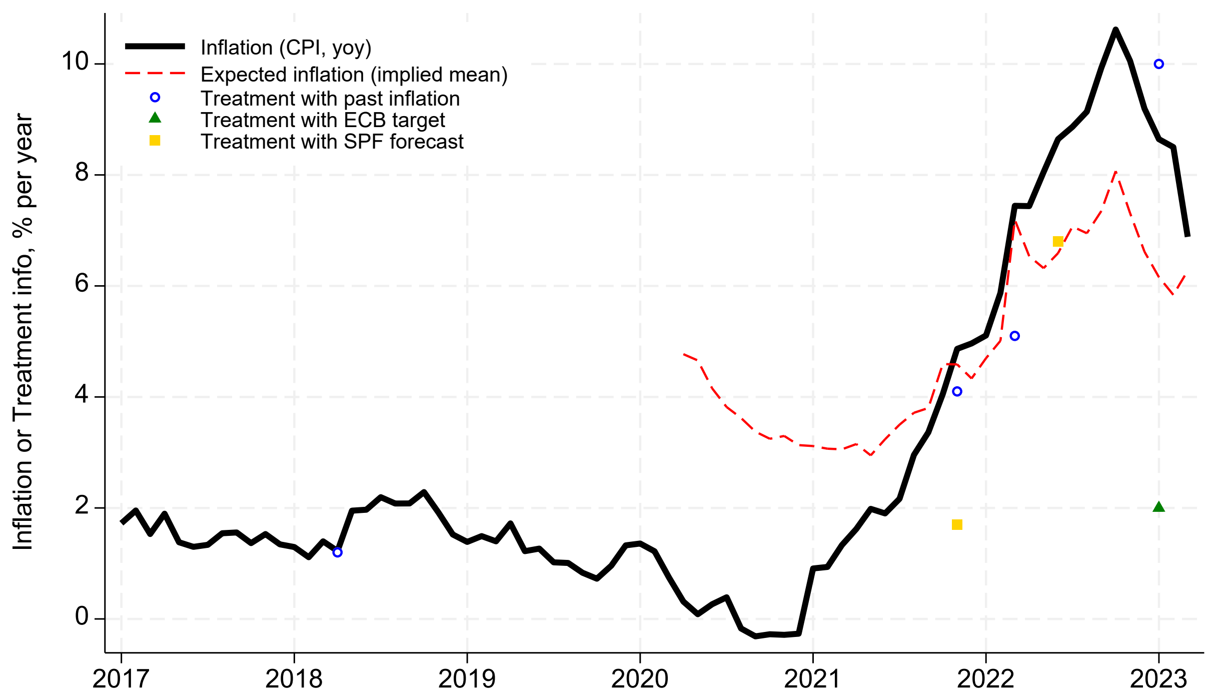
Notes: The figure plots the estimated slopes (γ in specifications (2)-(4)) vs. the annual rate of inflation at the time of the corresponding survey. The format of labels is "survey/country: year-quarter". Surveys/countries are coded as follows: NZ is for New Zealand, CES is for the European Central Bank's Consumer Expectations Survey, SIGE is for the Bank of Italy's Survey on Inflation and Growth Expectations, UY is for Uruguay, Nielsen is for the Nielsen Homescan Panel, BIE is the Atlanta Fed's Business Inflation Expectations survey. Inflation is for the year-quarter when the corresponding survey/RCT was conducted. Data for SIGE are pooled into two "periods": 2012Q3-2021Q3 and 2021Q4-2023Q1.

Appendix Figure A.9: Information treatments

Panel A. Nielsen Homescan Panel

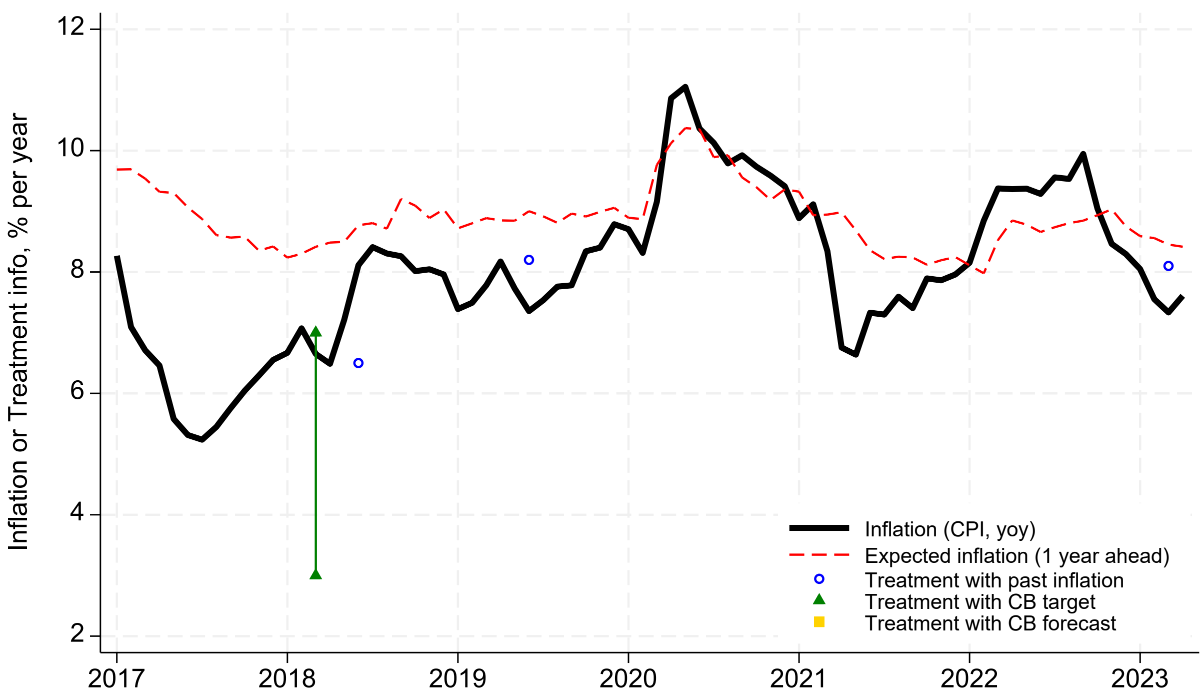


Panel B. ECB's Consumer Expectations Survey (CES)

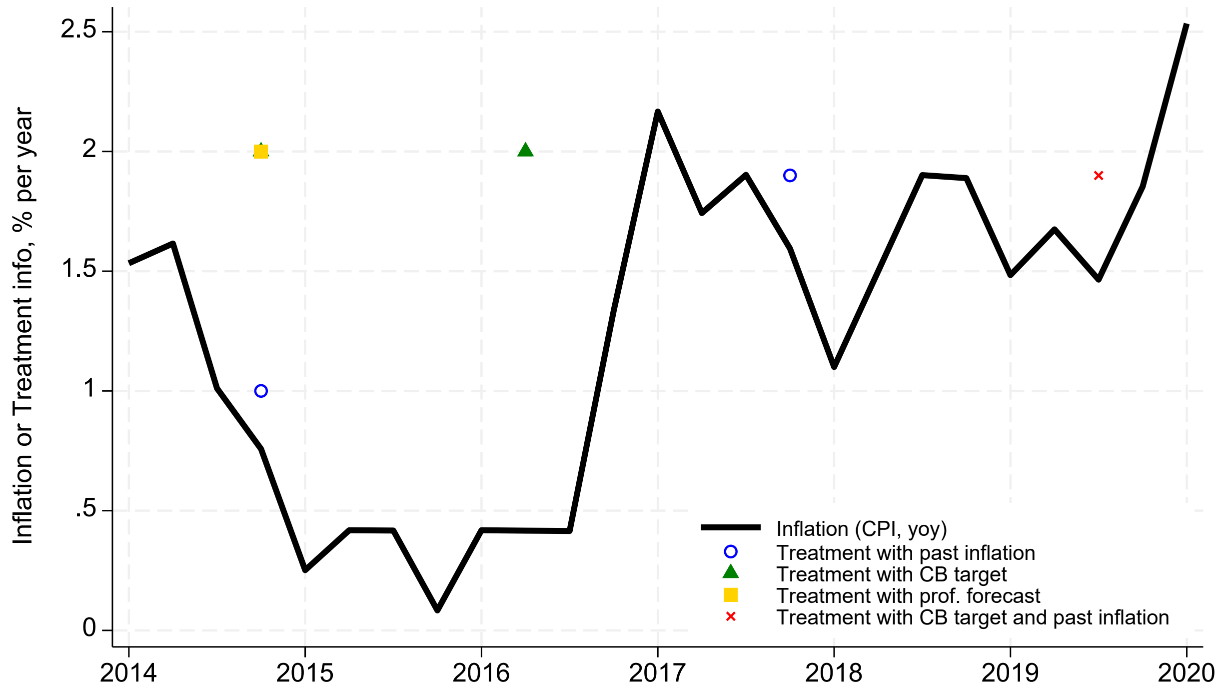


Panel C. Atlanta Fed's Business Inflation Expectations (BIE) Survey

Panel D. Uruguay's Survey of Firms' Expectations



Panel E. New Zealand's Surveys of Firms



Notes: The figures report statistics that were reported in information treatments.

Appendix Table A.1: Question Formulations in Each Survey

Country	RCT dates	Prior question	Posterior question
United States (Nielsen panel)	2018Q2, 2019Q1, 2021Q2-Q4, 2022Q3-Q4, 2023Q2	We would like to ask you about the rate of inflation/deflation (Note: inflation is the percentage rise in overall prices in the economy, most commonly measured by the CPI and deflation corresponds to when prices are falling). In this question, you will be asked about the prob. (percent chance) of something happening. The percent chance must be a number between 0 and 100 and the sum of your answers must add up to 100. What do you think is the percent chance that, over the next 12 months the rate of inflation will be (-∞,-12][-12,-8][-8,-4][-4,-2][-2,0][0,2][2,4][4,8][8,12] [12, ∞)	What do you think the inflation rate (as measured by the Consumer Price Index) is going to change over the next 12 months? Please provide an answer as a percentage change from current prices ____% If you think there was inflation, please enter a positive number. If you think there was deflation, please enter a negative number. If you think there was neither inflation nor deflation, please enter zero.
Euro area	2021Q4, 2022Q1-Q2, 2022Q4	How much higher/ lower do you think prices in general will be **12 months from now** in the country you currently live in? Please give your best guess of the change in percentage terms. You can provide a number up to one decimal place. *Show 2 boxes with a decimal point in between.* For prob-bins version question see below [*]	**[2021Q4, 2022Q1-Q2]** How much higher or lower do you think prices in general will be **12 months from now** in the country you currently live in? *Please give your best guess of the change in percentage terms. Use the slider below to indicate the increase or decrease in prices in percentage terms. If you think prices will decrease rather than increase you can provide a negative percentage* **[2022Q4]** Now we would like you to think about what inflation or deflation (the opposite of inflation) in the country you currently live in is likely to be in 12 months from now. We realise that this question may take a little more effort. Below you see 10 possible ways in which inflation or deflation could happen. Please distribute 100 points among them, to indicate how likely you think it is that inflation or deflation will be in that range. The sum of the points you allocate should total 100. The rate of inflation/ deflation will be: (-∞,-12][-12,-8][-8,-4][-4,-2][-2,0][0,2][2,4][4,8][8,12] [12, ∞)

(continued on the next page)

Country	RCT dates	Prior question	Posterior question
Netherlands	2018Q2	How much do you think consumer prices in general will change in the next twelve months in the Netherlands? Please allocate 100 points indicating how likely the listed changes are. (Note that the probabilities in the column should sum to 100) (-∞,-8][-8,-4][-4,-2][-2,-1][-1,1][1,2][2,4][4,8][8, ∞)	How much do you think consumer prices in general will change in the next twelve months in the Netherlands? Please provide an answer in percentage terms. If you think consumer prices on average will decrease, please fill a negative percentage (inset aa minus sign for the number). If you think consumer prices on average will increase, please fill in a positive percentage. If you think consumer prices on average will not change, please fill in 0 (zero).
United States (Atlanta Fed)	2019Q1, 2023Q1	What do you think has been the aggregate rate of inflation in the US over the last 12 months, as measured by the consumer price index? Please prove an answer in percentage terms.	What do you think will be the aggregate inflation rate as measured by the consumer price index, over the next 12 months? Please provide an answer in percentage terms.
Uruguay	2018Q1-Q2, 2019Q2 2023Q1	What do you think the variation in CPI will be in 12 months from now?	What do you think the variation in CPI will be in 12 months from now? (subsequent wave)
New Zealand	2014Q4, 2016Q2, 2018Q1, 2019Q3	Please assign probabilities (from 0-100) to the following ranges of overall price changes in the economy over the next 12 months for New Zealand: (Note that the probabilities in the column should sum to 100). Percentage price changes in 12 months. (-∞,0][0,2][2,4][4,6][6,8][8,10][10,15][15,25][25,∞) (2014Q4) (-∞,-25][-25,-15][-15,-10][-10,-8][-8,-6][-6,-4][-4,-2][-2,0][0,2][2,4][4,6][6,8][8,10][10,15][15,25][25, ∞) (2016Q2, 2018Q1, 2019Q3)	By how much do you think overall prices in the economy will change during the next twelve months? Please provide a precise quantitative answer in percentage terms (2014Q4, 2018Q1, 2019Q3) During the next twelve months, by how much do you think prices will change overall in the economy? Please provide an answer in percentage terms.(2016Q2)
Italy	2012Q3-22Q4	What do you think consumer price inflation in Italy measured by the 12-months change in the harmonized index of consumer prices will be?	What do you think consumer price inflation in Italy measured by the 12-months change in the harmonized index of consumer prices will be? (subsequent wave)

Notes: The table reports actual questions used in each survey.

Appendix Table A.2: Treatment Effects by Age

	past inflation		inflation target		inflation forecast	
	Age<=40	Age>40	Age<=40	Age>40	Age<=40	Age>40
	(1)	(2)	(3)	(4)	(5)	(6)
Slope for the control group by wave						
Wave 1	0.701***	0.865***	0.701***	0.865***	0.701***	0.865***
	(0.065)	(0.023)	(0.065)	(0.023)	(0.065)	(0.023)
Wave 4	-0.125	-0.348***				
	(0.079)	(0.031)				
Wave 12	0.083	-0.127***	0.083	-0.127***	0.083	-0.127***
	(0.070)	(0.026)	(0.070)	(0.026)	(0.070)	(0.026)
Wave 13	-0.018	-0.243***	-0.018	-0.243***	-0.018	-0.243***
	(0.079)	(0.034)	(0.079)	(0.034)	(0.079)	(0.034)
Wave 14	-0.141	-0.200***				
	(0.119)	(0.041)				
Wave 16	-0.132*	-0.288***	-0.132*	-0.288***	-0.132*	-0.288***
	(0.073)	(0.029)	(0.073)	(0.029)	(0.073)	(0.029)
Wave 17	-0.198***	-0.376***	-0.198***	-0.376***	-0.198***	-0.376***
	(0.076)	(0.032)	(0.076)	(0.032)	(0.076)	(0.032)
Wave 18	-0.211***	-0.369***	-0.211***	-0.369***	-0.211***	-0.369***
	(0.108)	(0.031)	(0.108)	(0.031)	(0.108)	(0.031)
Treatment effect: intercept						
Wave 1	0.721*	1.131***	0.568	0.901***	0.645	0.844***
	(0.430)	(0.136)	(0.425)	(0.138)	(0.405)	(0.135)
Wave 4	0.887***	0.716***				
	(0.167)	(0.102)				
Wave 12	0.557*	0.374**	0.469	0.533***	0.916***	0.223
	(0.325)	(0.159)	(0.290)	(0.156)	(0.333)	(0.160)
Wave 13	2.339***	1.776***	1.059***	-0.318*	0.511*	-0.275
	(0.317)	(0.199)	(0.253)	(0.187)	(0.290)	(0.196)
Wave 14	1.604***	1.344***				
	(0.580)	(0.256)				
Wave 16	2.015**	2.141***	-0.051	-0.120	0.814	-0.181
	(0.792)	(0.353)	(0.453)	(0.283)	(0.618)	(0.296)
Wave 17	1.413***	1.632***	-0.288	-0.187		
	(0.432)	(0.251)	(0.383)	(0.235)		
Wave 18	0.184	1.011***	-0.545	-0.065		
	(0.701)	(0.193)	(0.668)	(0.181)		
Treatment effect: slope						
Wave 1	-0.555***	-0.684***	-0.469***	-0.608***	-0.603***	-0.633***
	(0.090)	(0.029)	(0.097)	(0.031)	(0.092)	(0.031)
Wave 4	-0.550***	-0.482***				
	(0.048)	(0.026)				
Wave 12	-0.455***	-0.364***	-0.291***	-0.409***	-0.492***	-0.386***
	(0.067)	(0.036)	(0.071)	(0.034)	(0.071)	(0.035)
Wave 13	-0.274***	-0.241***	-0.452***	-0.278***	-0.449***	-0.351***
	(0.059)	(0.033)	(0.056)	(0.034)	(0.059)	(0.037)
Wave 14	-0.114	-0.187***				
	(0.104)	(0.039)				
Wave 16	-0.149*	-0.177***	-0.133**	-0.153***	-0.408***	-0.286***
	(0.089)	(0.041)	(0.066)	(0.038)	(0.076)	(0.041)
Wave 17	-0.185***	-0.157***	-0.313***	-0.222***		
	(0.057)	(0.032)	(0.055)	(0.033)		
Wave 18	-0.056	-0.127***	-0.336***	-0.304***		
	(0.102)	(0.028)	(0.110)	(0.028)		
Observations	3,940	22,219	3,107	18,599	2,630	14,418
R-squared	0.441	0.458	0.383	0.420	0.351	0.428

Notes: The table reports estimates of specification (2) for subsamples of the Nielsen Homescan Panel. Robust standard errors are reported in parentheses. ***, **, * denote statistical significance at 1, 5, and 10 percent levels.

Appendix Table A.3: Treatment Effects by Political Affiliation

	past inflation		inflation target		inflation forecast	
	Democrats	Republicans	Democrats	Republicans	Democrats	Republicans
	(1)	(2)	(3)	(4)	(5)	(6)
Slope for the control group by wave						
Wave 1	0.824***	0.812***	0.824***	0.812***	0.824***	0.812***
	(0.050)	(0.056)	(0.050)	(0.056)	(0.050)	(0.056)
Wave 4	-0.331***	-0.307***				
	(0.064)	(0.067)				
Wave 12	-0.153***	-0.084	-0.154***	-0.084	-0.154***	-0.084
	(0.057)	(0.060)	(0.057)	(0.060)	(0.057)	(0.060)
Wave 13	-0.313***	-0.201***	-0.313***	-0.201***	-0.313***	-0.201***
	(0.071)	(0.071)	(0.071)	(0.071)	(0.071)	(0.071)
Wave 14	-0.273***	-0.171**				
	(0.081)	(0.077)				
Wave 16	-0.294***	-0.227***	-0.294***	-0.225***	-0.294***	-0.225***
	(0.064)	(0.066)	(0.064)	(0.066)	(0.064)	(0.066)
Wave 17	-0.415***	-0.306***	-0.415***	-0.306***	-0.415***	-0.306***
	(0.070)	(0.072)	(0.070)	(0.072)	(0.070)	(0.072)
Wave 18	-0.366***	-0.097	-0.366***	-0.097	-0.366***	-0.097
	(0.124)	(0.094)	(0.124)	(0.094)	(0.124)	(0.094)
Treatment effect: intercept						
Wave 1	0.953***	1.065***	0.718**	0.916***	0.475*	1.011***
	(0.282)	(0.262)	(0.291)	(0.259)	(0.281)	(0.264)
Wave 4	0.671***	0.809***				
	(0.178)	(0.160)				
Wave 12	0.335	0.097	0.465**	0.162	0.268	0.368
	(0.254)	(0.304)	(0.224)	(0.262)	(0.239)	(0.280)
Wave 13	2.003***	1.255***	-0.379	-0.551*	-0.026	-0.990***
	(0.300)	(0.349)	(0.282)	(0.330)	(0.291)	(0.348)
Wave 14	1.263***	0.992**				
	(0.393)	(0.462)				
Wave 16	2.551***	1.801**	0.008	-0.348	-1.086**	-0.292
	(0.636)	(0.870)	(0.455)	(0.630)	(0.523)	(0.582)
Wave 17	1.115**	1.280**	0.115	-0.341		
	(0.474)	(0.574)	(0.439)	(0.549)		
Wave 18	1.263*	1.454**	-0.249	1.080		
	(0.688)	(0.659)	(0.671)	(0.688)		
Treatment effect: slope						
Wave 1	-0.697***	-0.565***	-0.619***	-0.511***	-0.571***	-0.637***
	(0.059)	(0.065)	(0.063)	(0.072)	(0.060)	(0.071)
Wave 4	-0.474***	-0.503***				
	(0.048)	(0.045)				
Wave 12	-0.327***	-0.331***	-0.419***	-0.361***	-0.383***	-0.417***
	(0.070)	(0.066)	(0.053)	(0.053)	(0.061)	(0.058)
Wave 13	-0.251***	-0.167***	-0.172**	-0.210***	-0.297***	-0.255***
	(0.064)	(0.055)	(0.067)	(0.058)	(0.070)	(0.067)
Wave 14	-0.158**	-0.143**				
	(0.076)	(0.063)				
Wave 16	-0.243***	-0.152	-0.167**	-0.055	-0.158*	-0.210***
	(0.098)	(0.093)	(0.080)	(0.072)	(0.084)	(0.081)
Wave 17	-0.083	-0.119*	-0.255***	-0.153**		
	(0.077)	(0.070)	(0.072)	(0.069)		
Wave 18	-0.276**	-0.227**	-0.334**	-0.403***		
	(0.135)	(0.109)	(0.135)	(0.105)		
Observations	5,498	6,075	4,452	4,897	3,803	4,294
R-squared	0.433	0.410	0.379	0.352	0.396	0.326

Notes: The table reports estimates of specification (2) for subsamples of the Nielsen Homescan Panel. Robust standard errors are reported in parentheses. ***, **, * denote statistical significance at 1, 5, and 10 percent levels.

Appendix Table A.4: Treatment Effects by Education

	past inflation		inflation target		inflation forecast	
	Assoc. Degree, High school or less	College or more	Assoc. Degree, High school or less	College or more	Assoc. Degree, High school or less	College or more
	(1)	(2)	(3)	(4)	(5)	(6)
Slope for the control group by wave						
Wave 1	0.880***	0.808***	0.880***	0.808***	0.880***	0.808***
	(0.029)	(0.034)	(0.029)	(0.034)	(0.029)	(0.034)
Wave 4	-0.342***	-0.292**				
	(0.038)	(0.048)				
Wave 12	-0.135***	-0.062*	-0.135***	-0.062*	-0.135***	-0.062*
	(0.033)	(0.037)	(0.033)	(0.037)	(0.033)	(0.037)
Wave 13	-0.186***	-0.225***	-0.186***	-0.225***	-0.186***	-0.225***
	(0.043)	(0.045)	(0.043)	(0.045)	(0.043)	(0.045)
Wave 14	-0.236***	-0.116**				
	(0.054)	(0.056)				
Wave 16	-0.297***	-0.243***	-0.297***	-0.243***	-0.297***	-0.243***
	(0.036)	(0.041)	(0.036)	(0.041)	(0.036)	(0.041)
Wave 17	-0.371***	-0.352***	-0.371***	-0.352***	-0.371***	-0.352***
	(0.039)	(0.045)	(0.039)	(0.045)	(0.039)	(0.045)
Wave 18	-0.380***	-0.319***	-0.380***	-0.319***	-0.380***	-0.319***
	(0.041)	(0.046)	(0.041)	(0.046)	(0.041)	(0.046)
Treatment effect: intercept						
Wave 1	0.966***	1.178***	0.862***	0.842***	0.830***	0.758***
	(0.190)	(0.178)	(0.193)	(0.179)	(0.192)	(0.174)
Wave 4	0.870***	0.531***				
	(0.124)	(0.129)				
Wave 12	0.290	0.465**	0.399*	0.536***	0.331	0.375**
	(0.224)	(0.192)	(0.206)	(0.192)	(0.248)	(0.175)
Wave 13	1.802***	2.136***	0.164	-0.075	-0.134	0.013
	(0.263)	(0.221)	(0.234)	(0.207)	(0.251)	(0.216)
Wave 14	1.454***	1.496***				
	(0.339)	(0.314)				
Wave 16	2.404***	1.665***	0.153	-0.417	-0.055	0.067
	(0.428)	(0.500)	(0.337)	(0.346)	(0.387)	(0.367)
Wave 17	1.956***	1.159***	-0.139	-0.301		
	(0.316)	(0.300)	(0.286)	(0.284)		
Wave 18	1.181***	0.675***	-0.092	-0.134		
	(0.263)	(0.261)	(0.248)	(0.243)		
Treatment effect: slope						
Wave 1	-0.678***	-0.655***	-0.612***	-0.565***	-0.641***	-0.601***
	(0.037)	(0.041)	(0.040)	(0.046)	(0.040)	(0.044)
Wave 4	-0.515***	-0.433***				
	(0.028)	(0.042)				
Wave 12	-0.416***	-0.343***	-0.424***	-0.327***	-0.432***	-0.371***
	(0.044)	(0.047)	(0.041)	(0.049)	(0.044)	(0.047)
Wave 13	-0.270***	-0.255***	-0.384***	-0.259***	-0.425***	-0.335***
	(0.039)	(0.042)	(0.041)	(0.041)	(0.045)	(0.043)
Wave 14	-0.186***	-0.211***				
	(0.051)	(0.050)				
Wave 16	-0.202***	-0.126**	-0.193***	-0.094**	-0.333***	-0.283***
	(0.048)	(0.059)	(0.047)	(0.047)	(0.049)	(0.054)
Wave 17	-0.208***	-0.103**	-0.255***	-0.221***		
	(0.039)	(0.041)	(0.039)	(0.041)		
Wave 18	-0.147***	-0.088**	-0.330***	-0.271***		
	(0.037)	(0.040)	(0.037)	(0.040)		
Observations	10,843	15,316	8,969	12,737	6,957	10,091
R-squared	0.518	0.386	0.473	0.344	0.481	0.346

Notes: The table reports estimates of specification (2) for subsamples of the Nielsen Homescan Panel. Robust standard errors are reported in parentheses. ***, **, * denote statistical significance at 1, 5, and 10 percent levels.

Appendix Table A.5: Treatment Effects by Gender

	past inflation		inflation target		inflation forecast	
	Female	Male	Female	Male	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)
Slope for the control group by wave						
Wave 1	0.856***	0.825***	0.856***	0.825***	0.856***	0.825***
	(0.026)	(0.042)	(0.026)	(0.042)	(0.026)	(0.042)
Wave 4	-0.332***	-0.266***				
	(0.035)	(0.057)				
Wave 12	-0.110***	-0.082*	-0.110***	-0.082*	-0.110***	-0.082*
	(0.030)	(0.046)	(0.030)	(0.046)	(0.030)	(0.046)
Wave 13	-0.197***	-0.201***	-0.197***	-0.201***	-0.197***	-0.201***
	(0.039)	(0.054)	(0.039)	(0.054)	(0.039)	(0.054)
Wave 14	-0.222***	-0.093				
	(0.048)	(0.071)				
Wave 16	-0.284***	-0.243***	-0.284***	-0.243***	-0.284***	-0.243***
	(0.033)	(0.050)	(0.033)	(0.050)	(0.033)	(0.050)
Wave 17	-0.378***	-0.317***	-0.378***	-0.316***	-0.378***	-0.316***
	(0.036)	(0.054)	(0.036)	(0.055)	(0.036)	(0.055)
Wave 18	-0.385***	-0.284***	-0.385***	-0.284***	-0.385***	-0.284***
	(0.038)	(0.053)	(0.038)	(0.053)	(0.038)	(0.053)
Treatment effect: intercept						
Wave 1	0.990***	1.172***	0.679***	1.092***	0.790***	0.772***
	(0.163)	(0.224)	(0.166)	(0.229)	(0.164)	(0.214)
Wave 4	0.811***	0.661***				
	(0.104)	(0.161)				
Wave 12	0.268	0.552**	0.514***	0.581***	0.245	0.587***
	(0.201)	(0.217)	(0.195)	(0.201)	(0.199)	(0.210)
Wave 13	1.952***	1.924***	0.203	-0.236	-0.039	-0.129
	(0.224)	(0.268)	(0.206)	(0.237)	(0.216)	(0.269)
Wave 14	1.616***	1.165***				
	(0.298)	(0.376)				
Wave 16	2.248***	1.919***	-0.061	-0.187	-0.086	0.278
	(0.396)	(0.557)	(0.290)	(0.424)	(0.321)	(0.477)
Wave 17	1.904***	1.018***	-0.396	0.035		
	(0.266)	(0.376)	(0.251)	(0.340)		
Wave 18	0.819***	1.100***	-0.516**	0.583**		
	(0.266)	(0.299)	(0.220)	(0.286)		
Treatment effect: slope						
Wave 1	-0.685***	-0.616***	-0.599***	-0.554***	-0.647***	-0.565***
	(0.033)	(0.056)	(0.035)	(0.064)	(0.035)	(0.057)
Wave 4	-0.495***	-0.502***				
	(0.026)	(0.046)				
Wave 12	-0.396***	-0.344***	-0.396***	-0.372***	-0.403***	-0.418***
	(0.039)	(0.058)	(0.040)	(0.053)	(0.040)	(0.050)
Wave 13	-0.270***	-0.239***	-0.374***	-0.228***	-0.416***	-0.319***
	(0.036)	(0.049)	(0.036)	(0.050)	(0.039)	(0.055)
Wave 14	-0.192***	-0.202***				
	(0.044)	(0.063)				
Wave 16	-0.167***	-0.185***	-0.167***	-0.115**	-0.338***	-0.284***
	(0.045)	(0.065)	(0.040)	(0.058)	(0.044)	(0.062)
Wave 17	-0.167***	-0.153***	-0.243***	-0.223***		
	(0.033)	(0.051)	(0.034)	(0.050)		
Wave 18	-0.112***	-0.138***		-0.357***		
	(0.034)	(0.046)		(0.047)		
Observations	18,660	7,499	15,366	6,340	12,018	5,030
R-squared	0.458	0.470	0.412	0.431	0.413	0.441

Notes: The table reports estimates of specification (2) for subsamples of the Nielsen Homescan Panel. Robust standard errors are reported in parentheses. ***, **, * denote statistical significance at 1, 5, and 10 percent levels.