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MONETARY POLICY COMMUNICATIONS AND THEIR EFFECTS ON HOUSEHOLD
INFLATION EXPECTATIONS

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ABSTRACT

We study how different forms of communication influence the inflation expectations of individuals in a randomized controlled trial. We first solicit individuals' inflation expectations in the Nielsen Homescan panel and then provide eight different forms of information regarding inflation. Reading the actual Federal Open Market Committee (FOMC) statement has about the same average effect on expectations as simply being told about the Federal Reserve's inflation target. Reading a news article about the most recent FOMC meetings results in a forecast revision which is smaller by half. Our results have implications for how central banks should communicate to the broader public.

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“Since I’ve become a central banker, I’ve learned to mumble with great incoherence. If I seem unduly clear to you, you must have misunderstood what I said.”

Alan Greenspan, September 22, 1987

“[B]ecause monetary policy affects everyone, I want to start with a plain-English summary of how the economy is doing, what my colleagues and I at the Federal Reserve are trying to do, and why.”

Jerome Powell, June 13, 2018.¹

1 Introduction

Central bank communications have changed a lot in the last thirty years, as illustrated by the statements above from different chairmen of the Federal Reserve. Central bankers now announce their policy decisions, explain their reasoning and describe their plans for the future. These new communications strategies have been targeted primarily at financial markets, both to minimize financial volatility as well as to shape longer-term interest rates to better achieve central banks’ objectives. In this respect, they seem to have been successful, as illustrated e.g. by the effects of forward-guidance announcements on long-term interest rates (Swanson 2018).

In terms of influencing the expectations of households or firms, central banks have had the much more targeted goal of “anchoring” their inflation expectations.² Yet despite this modest objective, central banks appear to have systematically failed in achieving it across most advanced economies. Firms and households in low-inflation countries report beliefs about inflation that are far from anchored, seem unaware of even dramatic monetary policy announcements, and more generally display almost no knowledge of what central banks do (see e.g. Coibion et al. 2018a, D’Acunto et al. 2018a, and Binder 2017). This ignorance may be a sign of central banks’ success (since firms and households have little incentive to worry about inflation or monetary policy), but it is unlikely to be innocuous: some of the non-traditional policies at the zero lower bound (ZLB) are thought to operate primarily through the inflation expectations of households and firms. If their expectations are unresponsive to central bank announcements and communications, as they seem to be (Coibion et al. 2018a, D’Acunto et al. 2018b), then this class of policies cannot be effective. Understanding how

¹ The Greenspan quote is from Geraats (2007) who cites the Wall Street Journal. The Powell quote is from the press conference that day, transcripts of which are available here: <https://www.federalreserve.gov/mediacenter/files/FOMCpresconf20180613.pdf>

² Janet Yellen stated the communications objective as “Put differently, the purpose of providing greater clarity about the FOMC’s longer-run inflation goal is to anchor inflation expectations more firmly. These more firmly anchored expectations in turn free the Committee’s hand to more actively and effectively stabilize short-run fluctuations in economic activity.”

central banks can better communicate with the general public to shape their expectations is therefore of first-order importance for the implementation of policies at the ZLB.³

To better understand how central banks could communicate with the general public, we combine a new *large-scale* survey of households with a range of randomized information treatments to study how different types of communications affect the inflation expectations of consumers. While randomized control trials (RCTs) have recently begun to be applied in macroeconomics (e.g. Armona, Fuster and Zafar 2018, Coibion, Gorodnichenko and Kumar 2018, Binder and Rodrigue 2019), our approach is unique in the magnitude of the survey. Approximately *20,000 consumers* responded to our survey, more than ten times the size of the New York Federal Reserve of Bank’s Survey of Consumer Expectations or the size of other household surveys used for RCTs. This unprecedented scale allows us to consider *simultaneously* a wide range of different information treatments (eight different treatments and a control group) as well as to explore how different characteristics of respondents might affect their response to the treatment, both immediately as well as in subsequent months in which we deploy follow-up surveys. The subsequent surveys take place three and six months later, so we can measure the *persistence* of the information effect much more systematically than previous work relying on rapid follow-ups. It also allows for a much more precise identification of the size of these effects than possible otherwise, and through this precision we are able to identify some unexpected differences across treatments.

Our approach yields a novel set of facts about which types of information are most effective at influencing the beliefs of households, both immediately as well as over longer periods. We find that providing households with simple statistics about inflation, such as the most recent rate of inflation, the Fed’s inflation target or the FOMC’s inflation forecast, has statistically and economically significant effects on inflation expectations: this type of information reduces households’ average forecast of inflation by 1.0-1.2 percentage points. The implied change in the perceived real interest rate from this adjustment of inflation expectations dwarfs the estimated effects of quantitative easing or forward guidance on nominal (as well as real) interest rates (see Bhattarai and Neely 2018 for a survey of these estimates). Evidence suggests that individuals adjust their consumption plans to changes in inflation expectations as predicted by the consumer Euler equation (D’Acunto et al. 2016 and Crump et al. 2015), so the large effects on perceived real interest rates

³ Improved central bank communication with the public would also serve to enhance the credibility of those institutions. Since households and firms in low-inflation countries are largely unaware of the central bank’s policy objectives or of recent inflation rates, informing them of both could only improve the credibility of these institutions in the eyes of the public.

imply that the management of inflation expectations could be a very powerful policy tool if central banks were better able to reach consumers with their communication. The fact that pre-treatment inflation expectations are dispersed and substantially differ from the Fed's inflation target of 2% also implies that the current focus of central bank communication on financial market participants and professional forecasters limits its power to affect real decisions of households and firms, and ultimately the overall economy. Several central banks have realized the limited power of conventional monetary policy communication tools and have started to explore more unconventional communication such as music videos on inflation targeting by the Central Bank of Jamaica or the extensive use of Twitter to discuss and explain monetary policy decisions as exemplified by Olli Rehn, the Governor of the Bank of Finland.

The effect on households' inflation expectations from these simple pieces of information is also mildly persistent: when interviewed in follow-up interviews three months after the information treatment, households' inflation expectations had only converged half-way back to their original average levels but fully converge within six months. These results suggest central banks cannot rely on one-off messages but have to develop a repeated communication strategy to the extent central banks intend to manage consumer expectations through communication.

While these information treatments seem to have large effects on expectations, we find that not all information is processed in the same way. For example, a random subset of households was instead provided with the entire post-meeting statement of the Federal Open Market Committee (FOMC). Despite its length and detail, the effect of this treatment was no larger than simply providing households with the FOMC inflation forecast, reducing the average inflation expectation by about 1.2 percentage points. Another subset of households was given a news article from the *USA Today* covering the same FOMC meeting. Strikingly, this easy-to-read summary of the Fed's decision and motivation had a much *smaller* effect on inflation expectations: about half of the other treatments. Despite being written explicitly for the general public, this media transmission of the FOMC's decision and motivation seems to have either dissipated the message or, more likely given that the article is much clearer than the FOMC statement, been discounted by households because of its origin. Indeed, survey respondents indicate that newspapers are generally viewed as less credible than friends and co-workers, direct communication from the government, or even social media. This suggests one reason why monetary policy-makers have had so little success affecting the inflation expectations of households: relying on the conventional media to diffuse their message to the public can be ineffective because many households no longer read newspapers and even if they do, individuals discount reports from the news media.

Exploiting the micro-level heterogeneity underlying these results sheds additional insight. First, there is in general little variation in terms of how different types of consumers respond to most signals: conditional on their initial beliefs (which do differ across groups), the way they respond to a common signal is broadly similar. This pattern in updating yields declines in disagreement across agents after each treatment. Consistent with this homogeneity in how people respond to a common signal, we find that the average responses of beliefs to each treatment are not driven by large changes in the beliefs of a subgroup within the treatment, i.e. little extensive margin adjustment exists in the response to treatments across subgroups and almost all of the variation is coming from the intensive margin. The one exception to these otherwise fairly systematic responses to information treatments lies in the USA Today treatment: we find that low-income low-education individuals disproportionately downweigh the article from this news source, although all groups tend to discount the news report from USA Today. One explanation might have to do with political perspective, but the USA Today is a non-partisan newspaper and we find similar responses across political orientations. Our results point toward the need for more research toward understanding how consumers interpret news from the media, such as whether all newspapers would be treated alike (e.g. Wall Street Journal vs. USA Today vs. New York Times), the role that the media plays in communicating news about the economy and policy to households, and which individuals acquire news via traditional media outlets. Moreover, more researcher is needed to understand which medium is most effective for policy communication and whether the sender of the message affects the response of the broader population.

This paper builds on a growing literature focusing on how economic agents form their expectations and process information (see Coibion, Gorodnichenko and Kamdar (2018) for a survey, and Bordalo et al. 2018 for a recent example). It is most closely related to recent work using randomized information treatments to characterize how agents learn and respond to new information.⁴ Randomized information treatments applied to firms in New Zealand, for example, suggest that managers respond strongly to information about recent inflation or the inflation target (Coibion, Gorodnichenko and Kumar 2018) as well as to the higher-order beliefs of other managers (Coibion et al. 2018b). Coibion, Gorodnichenko and Ropele (2018) document similarly large responses of firm expectations in Italy to information about recent inflation or the inflation target, as do Humziker et al. (2018) for firms in

⁴ This approach builds on an earlier (and ongoing) literature in development using RCTs described in Banerjee, Duflo and Kremer (2016). See Cavallo et al. (2017) for an application of RCTs to inflation expectations households in the U.S. and Argentina and Fuster et al. (2019) for an RCT studying the spending response to unanticipated spending shocks.

Switzerland. Additional results have also been documented for households: Roth and Wohlfart (2018) consider how households respond to professionals' opinions about the likelihood of a recession while Armona et al. (2018) assess how households respond to news about housing prices. In related work, Haldane and McMahon (2018) use randomized treatments to explore how/whether changing the presentation of the Bank of England's statements alters the public's understanding of their message. Finally, Binder and Rodrigue (2018) document that households revise their long-run inflation forecasts when presented with information about recent inflation or the central bank's inflation target.

Relative to this prior work, we make a number of contributions. First, the scale of our randomized information treatment is simply unprecedented in this literature, which among other things allows for much more precise identification of estimated effects. Second, we are able to consider a much wider range of information treatments simultaneously than in prior work, including not just the provision of simple facts about inflation but also more original treatments like the FOMC statement or a newspaper description of FOMC decisions. This is important because *ex ante* it is unclear whether households react more in their inflation expectations to information about past inflation, inflation forecasts, or detailed discussions also about the state of the economy. Third, we have a more systematic follow-up of individuals than in prior work on household expectations that allows us to rule out experimenter demand effects. Fourth, we provide a placebo treatment to disentangle genuine learning from anchoring affects and spurious learning. Finally, our larger cross-section allows us to examine micro-heterogeneity in expectations and updating in exceptional detail.

Our work also speaks to a broader literature on central bank communication. While much of this work focuses on financial markets, as does central bank communication (see e.g. Blinder et al. 2008), there has been growing concern about the ability of central banks to communicate with the broader public. Blinder (2009), for example, was an early voice advocating for more focus on communicating with an audience beyond experts and financial markets. Recent work has documented the shortcomings of current communications strategies. Carvalho and Nechio (2014) find that few households in the U.S. form macroeconomic expectations that are consistent with how the Federal Reserve makes policy, a finding largely confirmed in Drager et al. (2016). Binder (2017) shows that most households do not know the names or objectives of U.S. monetary policy-makers. Not only do we provide more (and larger-scale) evidence on U.S. households' lack of knowledge about monetary policy, we also document a novel possible source of this: a dismissal of news reports about monetary policy.

2. Data and Survey Design

This section describes the survey design we use to elicit inflation expectations, the various treatments, and provides descriptive statistics of individual inflation expectations. We first detail the Nielsen Homescan panel on which we run the survey and then provide more information on the structure of the survey.

2.1 Nielsen Panel

In June, September, and December of 2018, we fielded three waves of the *Chicago Booth Expectations and Communications Survey* inviting participation by all household members in the Kilts-Nielsen Consumer Panel (KNCP). The KNCP represents a panel of approximately 80,000 households that report to AC Nielsen (i) their static demographic characteristics, such as household size, income, ZIP code of residence, and marital status, and (ii) the dynamic characteristics of their purchases, that is, which products they purchase, at which outlets, and at which prices. Panelists update their demographic information at an annual frequency to reflect changes in household composition or marital status.

Nielsen attempts to balance the panel on nine dimensions: household size, income, age of household head, education of female household head, education of male household head, presence of children, race/ethnicity, and occupation of the household head. Panelists are recruited online, but the panel is balanced using Nielsen's traditional mailing methodology. Nielsen checks the sample characteristics on a weekly basis and performs adjustments when necessary.

Nielsen provides households with various incentives to guarantee the accuracy and completeness of the information households report. They organize monthly prize drawings, provide points for each instance of data submission, and engage in ongoing communication with households. Panelists can use points to purchase gifts from a Nielsen-specific award catalog. Nielsen structures the incentives to not bias the shopping behavior of their panelists. The KNCP has a retention rate of more than 80% at the annual frequency. Nielsen validates the reported consumer spending with the scanner data of retailers on a quarterly frequency to ensure high data quality. The KNCP filters households that do not report a minimum amount of spending over the previous 12 months.

2.2 Chicago Booth Expectations and Communication Survey

Nielsen runs surveys on a monthly frequency on a subset of panelists in the KNCP, the online panel, but also offers customized solutions for longer surveys. Retailers and fast-moving consumer-good producers purchase this information and other services from Nielsen for product design and target-group marketing.

In spring 2018, we designed a customized survey consisting of 37 questions in total in cooperation with Nielsen, the *Chicago Booth Expectations and Communication Survey*. The survey also contains eight different information treatments as well as one control group. To reduce the burden of participating in the survey, some questions were asked only of a subset of respondents. We report the full survey of the first wave in the online appendix. Our survey design builds on the Michigan Survey of Consumers, the New York Fed Survey of Consumer Expectations, the Panel on Household Finances at the Deutsche Bundesbank as well as D’Acunto et al. (2018).

Nielsen fielded the first wave of the survey in May-June of 2018. The survey sample was 83,061 households. 24,510 individuals responded for a response rate of 26.50% and an average response time of 15 minutes. The second and third waves were shorter, consisting mostly of follow-up questions, with median response times of about 10 minutes and 32,658 unique respondents for the second wave and 13 minutes and 29,348 unique respondents for the third wave. Nielsen provides weights to ensure representativeness of the households participating in the survey.

The initial wave of the survey covers a wide range of questions. First, respondents are presented with a series of questions about their demographic characteristics, which are more detailed relative to the basic demographic information the KNCP provides. We collect information on employment status, current occupation, financial constraints, savings and portfolio choice, gas prices and expectations, past spending behavior in various categories including expenses that are not covered in the KNCP, and we identify the primary shopper of the household among all the responding members. Participants are then asked a sequence of questions about their perceptions and expectations of inflation. We follow the design in the recent New York Fed Survey of Consumer Expectations (SCE) and ask specifically about inflation, because asking about prices might induce individuals to think about specific items whose prices they recall rather than about overall inflation (see Crump et al. (2015) for a recent paper using the SCE data). We first ask individuals about their perception of past inflation, that is, inflation over the previous 12 months. We then ask them about their expectations for 12-month-ahead inflation. We elicit a full probability distribution of expectations by asking participants to assign probabilities to different possible levels of the inflation rate. In addition, we also ask about the perception of the current unemployment rate and the expected unemployment rate in twelve months.

Subsequent waves largely follow the same structure but in a much shorter form. Demographic characteristics are assumed to be time invariant. Hence, the follow-up surveys are primarily used to measure individuals’ perceptions and expectations of inflation over time.

2.3 Treatments

After respondents answered the initial set of questions in the first wave, they were assigned to one of nine groups: a control group and eight treatment groups. We designed the treatments to disentangle the effects of different possible types of monetary policy communication, especially ones that provide some simple statistics that might help individuals update their inflation expectations. In addition, we also provided a placebo treatment to differentiate true learning from spurious learning possibly due to anchoring effects. Each group consists of 1/9th of the total sample that received the survey and the treatments are randomly assigned. Appendix Table 6 confirms that the different treatment groups are comparable along all major observable characteristics.

Specifically, the treatments are (i) the actual CPI inflation rate over the last twelve month (2.3%); (ii) the inflation target of the Federal Reserve of 2% per year; (iii) the FOMC forecast for inflation in 2018 of 1.9% (we informed participants that the FOMC is responsible for setting short term interest rates); (iv) the most recent FOMC statement; (v) the coverage of the most recent FOMC decision in USA Today. We were also interested to see whether participants might have a Philips curve in mind and provided the most recent unemployment numbers as treatment (vi); D'Acunto et al. (2018) document individuals extrapolate from salient price changes to overall inflation and, hence, we informed one of the treatment groups that the national average gas price inflation over the previous three months of 6.4% as treatment (vii), and as placebo treatment we provided the actual fact that the U.S. population grew by 2% over the last two years. We report the treatments as part of the overall survey in the Online Appendix. Ex-ante it is not clear whether individuals might react more to information about current inflation, the inflation target, or inflation forecasts. Some households might extrapolate from current inflation to future inflation and providing them with accurate information about current inflation might be most effective in shaping expectations. Other individuals instead might have fully forward-looking information and providing these households with information on the forecasts of professionals or the official information target might be more relevant for shaping expectations. Finally, some individuals might form expectations about inflation jointly with expectations about other economic variables such as the unemployment rate and providing these households information about these variables could result in the largest revision in inflation expectations (Andre et al. 2019). No research exists that has systematically compared the effectiveness of different information treatments for households and different central banks follow different communication strategies to the extent they have any systematic communication with the ordinary people.

Following each treatment (as well as for the control group), respondents were again asked about their inflation forecasts and perceptions, but this time in the form of a point estimate to avoid them having to answer the exact same question twice. This allows us to measure the instantaneous revision in expectations (if any) after the information treatments compared to the control group. The treatments were only applied in the first wave of the survey. In subsequent waves, respondents were again asked for their inflation expectations and perceptions, but questionnaires were identical across all respondents in the two follow-up waves. The first follow-up was after three months and the second after six months.

2.4 Preliminary Facts and External Validity

We present in Table 1 average 12-month ahead inflation expectations and perceptions of all individuals in the survey prior to any information treatment being applied, as well as these same facts along a number of observable characteristics of the individuals. The average inflation expectation across all households is 2.5% with a standard deviation of 2.6%.⁵ For comparison, the average 12-month ahead inflation expectation in the Michigan Survey of Consumers in May 2018 was 3.3% (with a standard deviation of 2.9%). Hence, our results are broadly in line with other surveys of households taking place at the same time, both in terms of the first and second moments of the inflation expectation distribution.

We find that the perceived inflation rate of households in our sample was 2.5%, at a time when the annual CPI inflation rate was 2.3% (May 2018). While the average perceived inflation was therefore quite close to the actual inflation rate, this masks profound levels of disagreement across households about recent inflation: the cross-sectional standard deviation of perceived inflation was 2.7%, about the same amount of disagreement as for inflation forecasts. This points toward significant levels of inattention on the part of many individuals toward aggregate inflation. As documented in Jonung (1981) for Swedish households, there is a high correlation between households' perceptions of recent inflation and their expectations of future inflation at 0.79. D'Acunto et al. (2018) document in a preceding survey of U.S. households that individuals' perceptions of recent inflation are disproportionately shaped by the recent price movements of goods they purchase frequently. The associated inattention to recent aggregate inflation suggests that information treatments focusing on actual values of recent inflation might lead to significant revisions in households' expectations of future inflation.

⁵ Here and in what follows we use a Huber estimator to compute moments and estimate regression coefficients. This approach allows us to remove outliers and influential observations automatically. Descriptive statistics for unfiltered data are reported in Appendix Table 4. We apply sampling weights everywhere.

The inattention of households extends beyond inflation to monetary policy more generally. For example, respondents were also asked what inflation rate the Federal Reserve was trying to achieve in the long-run. The results of this question are displayed in Figure 1. Less than twenty percent of respondents correctly answered 2%. Barely 50% answered a number ranging from 0% to 5%. Strikingly, almost forty percent answered that the Federal Reserve was targeting an inflation rate of 10% or more, which suggests a pervasive lack of knowledge on the part of households about the objectives of the Federal Reserve. This is consistent with previous evidence on the knowledge of households and firms in low-inflation environments about monetary policy (Binder 2017, Kumar et al. 2015, Cavallo et al. 2017).

Other features of the survey are also consistent with previously documented evidence. For example, we find that men have lower and less dispersed inflation expectations than women on average (as in Bryan and Venkatu 2001 and D’Acunto et al. 2019), higher-income households also have lower and less dispersed inflation expectations (as in Binder 2015) as do households with higher stocks of savings and higher savings rates, where the latter is consistent with D’Acunto et al. (2018). Taken together, these results suggest that our survey replicates the main cross-sectional stylized facts of households’ inflation expectations and therefore supports the validity of our survey as a measure of individuals’ beliefs about inflation.

3 Treatment Effects of Different Communication Tools

In this section, we present and discuss how different treatments affect the inflation expectations of individuals

3.1 Average Effects on Beliefs

To characterize how information treatments affect expectations, we first regress, for each treatment group combined with the control group, the change in the inflation expectations of agents from before to after the information treatment on a dummy variable for their treatment group (equal to zero if in the control group and one otherwise), that is,

$$E_i^{post} \pi - E_i^{pre} \pi = a + b * Treatment_i + \beta X_i + error_i, \quad (1)$$

where $E_i^{post} \pi$ is the posterior forecast of individual i , $E_i^{pre} \pi$ is their prior average belief, $Treatment_i$ is the dummy variable, and X_i is a vector of individual-specific controls. These include a quadratic polynomial in the respondent’s age and a rich set of dummy variables for a respondent’s gender,

employment status, household income, household size, race, census region, spectra life style, and spectra behavior stage.⁶ For the posterior forecasts of individuals, we use the forecast provided immediately after the treatment as well as the forecasts provided three and six months later in follow-up waves. In Table 2, we report estimated values of b for each treatment group with and without these individual controls.⁷ Note that b identifies the average change in expectations of agents in the treatment group relative to the average change in the control group. Including the control group is important because inflation expectations before and after the treatment are measured using questions with different wording to elicit inflation expectations, so the control group serves to capture any effect driven by wording. Because initial beliefs about inflation are biased upwards prior to the treatment, this baseline specification focusing on the average revision provides a simple benchmark for assessing the power of each treatment on expectations. We also study convergence in beliefs below. In each regression, we use sampling weights in the regressions and use Huber regressions to control for outliers and influential observations.

Consider first the placebo treatment. In this case, individuals were told that the population growth of the U.S. was 2% over the last three years, a statement of little relevance to inflation but which included the number 2%. This placebo helps identify the potential importance and size of anchoring effects. We find very mild evidence for contemporaneous anchoring effects: the average respondent in this group reduces their inflation forecast by 0.2-0.3%, or less than one-tenth of the cross-sectional standard deviation of inflation expectations. These small anchoring effects have completely dissipated by the first follow-up, and the inflation expectations of individuals in this group are no different from those in the control group three and six months after the treatment.

We now turn to the direct treatments about inflation applied to three of the groups. One group was told the most recent 12-month CPI inflation rate (2.3%), one group was told that the Federal Reserve targets an inflation rate of 2%, and the third group was told that the FOMC was forecasting an inflation rate of 1.9% over the next twelve months. The effects across these three groups are very similar. On impact, all three reduce the average inflation forecast by 1.0-1.1% relative to the control group. Hence, these very simple information treatments have large effects on the beliefs of individuals. The responses are larger for individuals whose pre-treatment inflation expectations are

⁶ The last two variables are constructed by Nielsen to classify households into several types. Spectra life style has the following categories: Cosmopolitan Centers; Affluent Suburban Spreads; Comfortable Country; Struggling Urban Cores; Modest Working Towns; Plain Rural Living. Spectra behavior stage includes the following categories: Start Up Families; Small Scale Families; Younger Bustling Families; Older Bustling Families; Young Transitionals; Independent Singles; Senior Singles; Established Couples; Empty Nest Couples; Senior Couples

⁷ We find no evidence of nonlinear effects depending on the prior beliefs of respondents (see Appendix Figure 1).

greater than 2% (Appendix Table 3). These effects are mildly persistent. Three months later, the average expectations of these treated individuals are still lower than those of the control group, with the effect having dissipated by about 75%, and the effects have fully dissipated after six months.⁸ This persistence of information treatments is consistent with those observed in previous work (Coibion et al. 2018b, Coibion, Gorodnichenko and Kumar 2018, Coibion, Gorodnichenko and Ropele 2018, and Cavallo et al. 2017). Importantly, this persistence effect is not driven by a changing composition across waves: we find nearly identical results when we restrict our attention to individuals that participate in all waves (Appendix Table 5).⁹ Furthermore, these results indicate that all three treatments seem to convey broadly similar information to respondents, in that they adjust their beliefs in a comparable manner despite the treatments being conceptually distinct.

The transitory nature of the effect of these treatments on inflation expectations reflects the fact that the treatment itself seems to have only transitory effects on underlying knowledge. For example, when some respondents were told about the Fed’s inflation target in the first wave as their treatment, their recall of this information in subsequent waves was relatively low. We illustrate this by running the same regression as before but using changes in beliefs about the FOMC’s target in the two follow-up waves as dependent variables:

$$E_i^{post,3m} FedTarget - E_i^{pre} FedTarget = a + b * Treatment_i + error_i. \quad (2)$$

The results are reported in Table 3. Within three months, being treated with the Fed’s inflation target leads to modest revisions in beliefs about the target relative to priors before treatment. By six months, the effect of the treatment has dissipated and the recall of this information is close to zero. Similar results obtain for other treatments for which we measured the prior belief of respondents, which includes the contemporaneous rate of inflation and the contemporaneous rate of unemployment. Table 3 shows that respondents similarly seem to forget the provided information about each within three to six months. The very transitory nature of information treatments on inflation expectations therefore seems to reflect the fact that respondents are unable to remember the information for more than a few months. Therefore, policymakers that aim to influence inflation expectations of individuals might have to engage in a more persistent form of communication given that simple, one-off messages are not effective in moving expectations persistently.

⁸ The effect of being treated with the recent inflation rate is positive after six months, whereas we cannot reject the null of zero effect for all other treatments. We conjecture that this positive effect is a statistical aberration, given little reason exists why the treatment effect should become positive over time and no such effect exists for any other treatment group.

⁹ We also find no evidence of differential attrition rates across information treatments.

Going beyond these simple information treatments, the next treatment group was presented with the entire statement released by the Federal Reserve following FOMC meetings.¹⁰ Respondents in May 2018 received the FOMC statement from the March 21st 2018 FOMC meeting whereas those who took the survey in June 2018 received the FOMC statement from the May 2nd 2018 FOMC meeting. Both statements describe recent developments in the economy similarly, including that inflation had approached 2%, as well as the broader objectives of the Federal Reserve including its symmetric 2% objective for the inflation rate. We describe differences in the two in more detail in the next section. The statements, while not exceedingly long, are written in the dense language that is typical of central bank communications. On impact, reading the statement from the FOMC has approximately the same effect on inflation expectations as the previous three treatments, reducing the average forecast by 1.2% relative to the control group. The effect of reading the FOMC statement dissipates a little more rapidly, however, having no discernible effect on expectations relative to the control group after three or six months.

Another treatment group was presented with a news article from the *USA Today* covering the same FOMC meeting as the statement provided to the previous treatment group.¹¹ Those participating in May 2018 were given an article summarizing the March FOMC decision while those participating in June received an article summarizing the May FOMC decision. We describe differences between the two in more detail in section 3.2. Both articles, each published the day after FOMC meetings, are written in a much more accessible (and shorter) style that still transmits information about inflation and the central bank's objective. For example, the second sentence of the second article reads "The Fed held its key interest rate steady Wednesday but noted that inflation has climbed closer to its 2% goal, paving the way for another rate hike in June." Participants who read this article reduced their inflation expectations by only 0.5% points relative to the control group, less than half the effect of any of the other inflation-related treatments. Despite the fact that the articles seemingly transmits the same information about the central bank's inflation objective as the FOMC statement or our information treatment on the central bank's target (as well as information about the most recent inflation rate), this information appears to be discounted by households. With approximately the same objective information content but only the source of the information varying, it seems that households view information coming from the news media as being less reliable, leading them to place less weight

¹⁰ The FOMC statements are available in Appendix 1 as well as at this link: <https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm>. They are discussed in more detail in section 3.2.

¹¹ The USA Today article from March 21, 2018 can be found in the appendix and, for example, at this link: <https://www.usatoday.com/story/money/2018/03/21/fed-powell-hikes-interest-rates-consumer-loans/444986002/>.

on it when they revise their views.¹² However, its effect is relatively longer-lived, in that three months after reading the article, the average effect on expectations remains half of its instantaneous effect, but it too dissipates fully within six months after the information treatment.

Of course, households can form and change their beliefs about inflation using many different types of information. To assess how other forms of information affect their views, we consider two other types of information treatments. The first tells individuals that national gasoline prices rose 11% over the previous three months.¹³ As documented in Table 2, this information about salient prices leads to an immediate upward revision in households' inflation expectations of approximately 1.4-1.5% relative to the control group, a pass-through of about 10%, well above the average expenditure share of gasoline in consumption of 5% (Binder forthcoming). This excess sensitivity of individuals' inflation expectations to gasoline prices is consistent with the evidence provided in Coibion and Gorodnichenko (2015). However, this effect is relatively transitory. Within three months, individuals in this treatment group have slightly lower inflation expectations than the control group and the effect is again fully dissipated within six months. The extrapolation from salient prices like gas and groceries to overall inflation expectations poses a challenge to central banks because their conventional policy tools have little direct effect on these prices which is the reason why many central banks target measures of core inflation that exclude these price series.

Second, we provide individuals with information about the most recent rate of unemployment. All respondents in the first wave were initially asked what they thought was the current unemployment rate in the U.S. Their average answer was 6.3% with a standard deviation of 3.9%. Only 12 percent of respondents report unemployment rates less than or equal to 3.9%. Hence, when respondents in this group were told the actual value of the unemployment rate in the previous month of 3.9%,¹⁴ they were almost always being told that the unemployment rate was significantly lower than what they believed. The result was an immediate downward revision in their inflation

¹² We picked the *USA Today* as the article source to avoid the fact that other news sources like the *New York Times* or the *Wall Street Journal* are often perceived to have partisan leanings which might lead some to discount the quality of the information they provide. The *USA Today*, to the best of our knowledge, has no particular political association. Until 2016, the *USA Today* had never endorsed any presidential candidate. In the 2016 election, the Editorial Board declared that it considered Donald Trump unfit for the presidency but did not explicitly endorse Hillary Clinton (<https://www.usatoday.com/story/opinion/2016/09/29/dont-vote-for-donald-trump-editorial-board-editorials-debates/91295020/>).

¹³ Respondents participating in the May 2018 (June 2018) part of the survey were informed in this treatment that the actual price of gasoline increased by 6.4% (11%). Consistent with this difference in the size of the treatment, we find that the average change in beliefs of households surveyed in June was approximately twice as large as for those surveyed in May conditional on being treated with the information about gasoline prices.

¹⁴ Respondents participating in the May 2018 wave were told that unemployment rate was 4.1%.

expectation, albeit a relatively small one, of 0.3%. This is the opposite of what one would expect if households were perceiving this as a movement along a Phillips curve, in which case the reduction in unemployment would have been associated with higher inflation. Instead, they seem to hold a supply-side view of unemployment and inflation, associating higher levels of one with the other. This is the same pattern as that observed in Italian firms (Coibion, Gorodnichenko and Ropele, 2018) or in U.S. households (Kamdar 2018). This information effect is still somewhat visible in inflation expectations after three months but is also fully dissipated within six months.

Jointly, these results indicate that simple messages provided to households can have remarkably powerful, albeit transient, effects on their expectations. We find no evidence that the complicated and detailed information from FOMC statements have effects that are any more powerful than simply telling households what inflation has been or what inflation rate the central bank is targeting. This means communication strategies targeting households could potentially focus on presenting them with basic facts about inflation and monetary policy without resorting to “Fed-speak”. The major caveat is that relying on the media to transmit the central bank’s message is unlikely to be very successful: not only do many households not follow news about monetary policy but even when exposed to news articles focusing explicitly on monetary policy decisions, these news articles seem to be heavily discounted by the public due to their source. The mild persistence in the treatment effects after three and six months also alleviates concerns of experimenter demand effects. Moreover, de Quidt et al. (2018) show in settings similar to ours that these effects are plausibly small.

3.2 Interpreting the USA Today Treatment Effects

The most striking feature of Table 2 is probably the fact that the USA Today treatment has a much smaller effect than either simple messages about recent inflation, the Fed’s inflation target, or the corresponding FOMC statement. To better understand this effect, we first exploit the fact that two different versions of both the FOMC and USA Today treatments were presented in May and June. The two FOMC statements are broadly similar, with the most noticeable difference being the language with respect to inflation. In May 2018, it read

“On a 12-month basis, both overall inflation and inflation for items other than food and energy have continued to run below 2 percent... Inflation on a 12-month basis is expected to move up in coming months and to stabilize around the Committee’s 2 percent objective over the medium term.”

whereas the June 2018 version is

“On a 12-month basis, both overall inflation and inflation for items other than food or energy have moved close to 2 percent. Inflation on a 12-month basis is expected to run near the Committee’s symmetric 2 percent objective.”

The latter makes clear that inflation was close to and expected to remain around 2 percent whereas the former points to recent inflation being lower but expected to rise to 2 percent.

To assess whether this difference in language about inflation matters, we consider whether the revision in beliefs of households differs depending on which of these two treatments they received. The results in Table 4 suggests that this language has little discernible effect: inflation expectations fell by 1.1% on average for those surveyed in May and 1.3% on average for those in June.

The language of the USA Today articles covering these FOMC decisions is also somewhat different given the changing inflation outlook. In the article provided to households surveyed in May, the FOMC decision is described as

“Citing a brighter economic outlook, the Federal Reserve raised its key short-term interest rate Wednesday but maintained its forecast for a total of three hikes this year amid still-modest inflation... [The federal funds rate] is still low by historical standards but it marks the central bank’s fourth increase in the past 12 months and another vote of confidence in an economy that’s picking up steam nearly nine years after the Great Recession ended. ‘We’re trying to take that middle ground’ on rate hikes, boosting rates enough to head off an eventual spike in inflation without derailing the economic expansion, Fed chairman Jerome Powell said at a news conference.”

This article identifies that inflation is “modest” but emphasizes the upside potential to the economy and the possibility of an eventual spike in inflation raised by Chairman Powell. The June article, following the FOMC’s May 2nd decision to hold rates steady, takes a somewhat more ominous note:

“Inflation is creeping higher, and that’s making the Federal Reserve more confident about raising interest rates. The Fed held its key interest rate steady Wednesday but noted that inflation had climbed close to its 2% goal, paving the way for another rate hike in June... Fed policymakers have forecast two more rate increases this year, according to their median estimate, but faster inflation could trigger three additional moves.”

Like the corresponding FOMC statement, this article makes clear that recent inflation was close to 2% and that its rise justified an expected path of rising interest rates.

Table 4 then considers whether the two different USA Today articles had differential effects on inflation expectations. We find mild differences between the two: participants in the May sample revised their inflation expectations downward by 0.6-0.7% on average while those in the June sample revised their expectations by 0.3-0.4%, about half. While the darker language about rising inflation in the June article therefore seems to have some effect on how individuals revise their beliefs, it remains the case that revisions due to the USA Today treatment are much smaller than corresponding ones from the FOMC

treatments.¹⁵ Given that the FOMC statements and USA Today articles broadly conveyed the same information and the USA Today article did so using less jargon, the stronger effect from FOMC statements suggests that respondents discounted some of the information in the newspaper article.

To investigate the source of this discounting, we asked questions to participants in subsequent (and unrelated) surveys of Nielsen households in June 2019. These individuals were asked to rate how credible they viewed different news outlets as sources of information about the economy on a scale of 1 (very credible) to 5 (not credible). Results from more than 28,000 respondents presented in Table 5 indicate that U.S. households on average view newspapers as somewhat less reliable than television, the government, and friends/coworkers as a source of news, with social media being reported as the most credible news source of them all. We find smaller differences in the relative credibility of various newspapers: the USA Today is perceived as more credible than the New York Times, Washington Post or Wall Street Journal, but less credible than the Chicago Tribune or the Los Angeles Times.¹⁶ The discounting of the USA Today by our survey respondents therefore does not appear to reflect the fact that they view this particular newspaper as unreliable but rather a more widespread skepticism that traditional media such as newspapers and television serve as a reliable source of news.

3.3 Convergence in Beliefs

While the results above describe the average change in beliefs after an information treatment, this does not fully characterize how these treatments affect beliefs. For example, if agents act like Bayesians, their beliefs after the information treatments should be a weighted average of their initial beliefs and the treatment. If their initial beliefs were symmetrically distributed around the signal, one could observe no change in average belief after a treatment, even though all households actually changed their beliefs in the expected way. However, one would still expect to see a reduction in the cross-sectional post-treatment dispersion of beliefs, since everyone moved toward the signal.

To assess whether this is the case in our experiment, we compare the cross-sectional dispersion of beliefs across treatment groups both before and after the application of treatments. Unfortunately, the presence of outliers makes the measurement of higher moments sensitive. Given this, we estimate the dispersion of inflation expectations using robust methods. Specifically, we estimate the cross-sectional standard deviation within each treatment group as $\hat{\sigma} = 1.4826 \times MAD$ where $MAD \equiv$

¹⁵ The other treatments regarding recent inflation, the inflation target and the Fed's inflation forecast have similar effects in May and June waves.

¹⁶ However, respondents chose "do not know" option for the Chicago Tribune and the Los Angeles Times much more frequently than for the other four newspapers. This may reflect a more regional nature of the Chicago Tribune and the Los Angeles Times.

$median(|X_i - \tilde{X}|)$ and $\tilde{X} \equiv median(X_i)$. We then normalize the standard deviation in each treatment group and survey wave by the corresponding value from the control group in that same wave. Hence, Table 6 reports robust $\hat{\sigma}$ by treatment group relative to control group for various stages of the experiment. Note that we use the probability distribution question to compute mean inflation prediction in columns (1), (3) and (4) and we use point predictions in column (2).

With the exception of the population growth treatment and the USA Today treatment, we find large reductions in disagreement among each treatment group after being presented with information. The declines are in the order of about 50% for each group, with some groups being even higher (e.g. the inflation target or the FOMC statement lead to reductions in disagreement of about 70%). These effects then dissipate in subsequent months. When looking at either the population growth or USA Today treatments, we find much smaller declines in disagreement upon being presented with information, approximately 15% declines on impact. Hence, as with the mean effects, we find much more pronounced effects on the distribution of beliefs from simple messages involving inflation or presentation of an actual FOMC statement than from news summaries of monetary policy decisions.

Another way to assess whether beliefs are converging after receiving common signals is to directly quantify the weight that agents assign to signals they receive versus the weight they assign to their priors beliefs. If they act as Bayesians, the weight they assign to the signal in updating their beliefs should be the Kalman gain, and this weight should be increasing in the perceived precision of the signal. The weight they assign to their prior belief should then be one minus the Kalman gain. We assess this framework by regressing individuals' posterior beliefs on their prior beliefs. We allow for both the intercept and the slope coefficient to vary across groups since different signals have different values and are likely to have different perceived precisions, leading to different gains associated with each.

The results of these regressions, across different horizons, are presented in Table 7. When looking at the control group, one would expect an intercept of zero and a slope coefficient of one since these individuals are receiving no additional information. However, because posterior beliefs are measured using point forecasts while prior beliefs are measured using distributional questions, the associated measurement error naturally leads to a coefficient on priors of less than one, and these coefficients fall over time. This provides the benchmark relative to which we can measure the weight assigned to different signals.

Consider first the results when individuals are presented with the inflation forecast of the FOMC, a signal directly comparable to their own inflation forecast. The associated weight on their prior belief is only around 0.2, meaning that they place a very high weight on this signal, i.e. it is perceived

as being very informative. These effects taper off over time however. These results explain why we observe a strong and immediate decline in disagreement across the individuals who are presented with this common source of information. Given that average priors are significantly higher than this signal, this updating also accounts for the large average decline in expectations documented in Table 2 when the treatment is received. Very similar results obtain when households are presented with information about recent inflation, the Fed's inflation target, or the FOMC statement. Strikingly, the weight on the prior is significantly higher when presented with the USA Today article, consistent with households treating this as a less informative signal. Information about gasoline prices, unemployment and population growth also receive much less weight upon treatment, consistent with households either perceiving these as less informative about inflation or something that is already largely known to them.

Jointly, these results confirm that consumers respond to signals about inflation in the expected way. They systematically place weight on informative signals, leading to convergence in their beliefs upon receiving common information. They also assign more weight to signals that are perceived as more informative. While previous evidence for households has also largely been consistent with Bayesian updating, we are the first, to the best of our knowledge, to find these results for such a large group of households as well as being able to compare across a wide range of signals.

3.4 Heterogeneity

Do information treatments affect everyone equally? D'Acunto et al. (2016) find large differences in how individuals adjust consumption plans to their inflation expectations by demographics. In this section, we investigate this question in two ways. First, we decompose changes in beliefs within each group into an extensive margin and an intensive margin. Second, we consider whether the effects of information treatments on inflation forecasts differ along observable characteristics of respondents. Such heterogeneity can be useful for policy-makers if they aim to affect the actions of specific subsets of the population or if they are interested in maximizing the effects of communications on beliefs by targeting specific subgroups that are more responsive.

We begin by decomposing average treatment effects on expectations into an extensive margin and an intensive margin. A significant role for an extensive margin of expectations adjustment would suggest that information treatments disproportionately affect subsets of agents. Because prior beliefs are measured using distributional questions while posterior beliefs are measured using point forecasts, we cannot identify the extensive margin through a zero change in forecast after treatments. Instead, we define an individual as having a discrete change in expectations (i.e. participating along the extensive margin), if

their forecast changes by more than a specific threshold. As a benchmark, we use a 2% point change in expectations as the threshold but alternative values ranging from 1% to 4% yield the same qualitative results. This threshold applies to just over 50% of all respondents in the control group. We regress whether an individual's belief changed by more than the threshold on dummy variables for each treatment to quantify the importance of the extensive margin. As illustrated in columns (3) and (4) of Table 8, the extensive margin is almost never statistically significant and never economically significant.

Consistent with this, we can quantify the intensive margin by looking at the change in expectations of individuals conditional on those changes exceeding the threshold. As illustrated in columns (5) and (6) of Table 8, those changes are significantly larger in absolute value for the treatment groups than in the control groups, generally by 2% points for most inflation-related treatments. Given that the extensive margin applies to about 50% of respondents, this implies that the intensive margin can effectively account for *all* of the post-treatment differences in average beliefs across groups.¹⁷ The results in Table 8 also document that the difference in the treatment effect for the USA today treatment compared to the other treatments is fully driven by the intensive margin. The fact we don't find a difference in the extensive margin across treatments suggests that it is less likely that the USA today treatment has less of an effect than the other treatments because parts of the sample discounts this newspaper as an information source but rather suggests that the content of the article was perceived as less informative.

The importance of the intensive margin of adjustment implies that we should focus on the size of forecast revisions across agents rather than which respondents adjusted and which did not. We therefore regress respondents' revisions across treatment groups on a range of observable characteristics along which they differ including gender, income (by tercile), education, race, access to and amount of available credit, purchasing plans, wealth, savings behavior, and shopping behavior (e.g. if they are the main person in the household that does the shopping or frequency of purchasing gasoline). The full set of results are presented in Appendix Tables 1 and 2, and summary results for observable heterogeneity are in Table 9. In each case, we focus on the specification which includes individual-specific controls and uses the contemporaneous response of inflation forecasts as the dependent variable, but similar results obtain at longer horizons.

There is surprisingly little heterogeneity in how respondents change their beliefs in response to new information on average. For example, white and non-white individuals respond to information treatments similarly. So do young, middle-aged and senior respondents. There is little variation between

¹⁷ Columns (7) and (8) verify that, for those individuals' whose expectation revisions fall below the threshold used to identify the extensive margin, differences in revision size relative to the control group have little statistical or economic power.

those who are planning to purchase big durable goods (cars, house, or other big-ticket items) and those who are not. Political party does not seem to matter much, nor do we find systematic differences in responses to information treatments based on shopping behavior. We also consider whether there are systematic differences in responses to information depending on whether respondents have ready access to credit, have any savings or wealth, and their savings rate: we again find little variation along these dimensions. Gender, however, does seem to matter. Women respond more strongly to every information treatment including the placebo treatment of population growth, with information about gasoline prices being the only exception. The differences across the two groups are large in economic terms: women's responses are two to three times bigger than men's to information treatments. This may reflect the fact that men report more confidence in their beliefs about inflation, which should tend to lead toward less weight being placed on new information. Income also matters for how individuals respond to information. We find that those in the middle of the income distribution of respondents (income between \$40,000 and \$100,000) respond significantly more to information about recent inflation or unemployment, the Federal Reserve's inflation target, the FOMC's inflation forecast, FOMC statements, as well as news reports about the FOMC's decisions than either lower-income or higher-income respondents. Strikingly, lower-income individuals do not respond *at all*, on average, to the *USA Today* news report about the FOMC meeting even though they respond strongly to most other treatments. We find a similar result when we decompose households by education: those with no more than a high school degree do not respond at all to the *USA Today* news report treatment, even though they respond strongly to other information treatments.

Low-income and less-educated individuals are, on average, systematically less well-informed about inflation and monetary policy. For example, in our survey, both low-income and less-educated individuals have higher average beliefs about the Fed's inflation target. Hence, one might think that monetary policy-makers might be able to have the largest effects on the beliefs of these individuals by providing them with information about inflation and monetary policy. What our results indicate, however, is that these are also the individuals that are least likely to incorporate information about inflation from the news media. This implies that traditional communications strategies of central banks, which rely largely on the transmission of information via standard news outlets, are unlikely to be successful and raises the concern that purely relying on these transmission channels results in redistributive effects of monetary policy (see also Coibion et al. (2017) and D'Acunto et al. (2018b)).

4 Discussion

The narrative around inflation expectations that is commonly promoted by central bankers is that 1) inflation expectations are important for inflation dynamics, 2) they are anchored to the inflation target as a result of the credibility of the central bank, and 3) this anchoring is a source of economic stability. The first point was most clearly illustrated by Federal Reserve Chairman Jerome Powell when he said in Congressional testimony that inflation expectations were *the most important driver* of inflation.¹⁸ The second point was emphasized by the President of the San Francisco Federal Reserve, Mary Daly:

“Once inflation was under control, the Fed committed to keeping it that way. This commitment became a well-known and accepted position that people could depend on. And it ushered the conditions that dominate today –the era of well-anchored expectations...”

The third step in their argument is summarized by Mary Daly simply as “when the Fed is credible, it’s easier for the economic system to absorb shocks...” while the mechanism underlying it is described in more detail by Chairman Powell in the following:

“Anchored [inflation] expectations give a central bank greater flexibility to stabilize both unemployment and inflation. When a central bank acts to stimulate the economy to bring down unemployment, inflation might push above the bank's inflation target. With expectations anchored, people expect the central bank to pursue policies that bring inflation back down, and longer-term inflation expectations do not rise. Thus, policy can be a bit more accommodative than if policymakers had to offset a rise in longer-term expectations. ... I am confident that the FOMC would resolutely "do whatever it takes" should inflation expectations drift materially up or down.”

Our results, using one of the largest surveys of U.S. households’ expectations ever conducted, contradict this comforting narrative along a number of dimensions. We find little evidence that people know and accept the Fed’s commitment to a low inflation target. Many individual respondents are unwilling to even guess what the Fed’s inflation target is, and of those that do few answer correctly. Households’ average perceptions of recent inflation are quite different from actual inflation and their inflation forecasts bear little resemblance to those of the FOMC. When presented with the most basic facts about inflation or monetary policy, their views change dramatically. The limited evidence on U.S. firms’ inflation expectations closely resembles that of households and available evidence from other advanced economies yields similar messages for both households and firms (see Coibion,

¹⁸ See <https://www.bloomberg.com/news/articles/2019-03-15/fed-puts-inflation-expectations-at-heart-of-major-policy-review>.

Gorodnichenko and Pedemonte 2018 for a review). The notion that most U.S. citizens, those individuals signing the wage and rental agreements at the heart of the mechanism described by Chairman Powell, have well-anchored expectations therefore flies in the face of the available evidence.

We view this as having a number of potentially important implications that call both for future work as well as renewed consideration by policy-makers. First is the notion of the credibility of the Federal Reserve and comparable central banks. In an era where central banks in advanced economies are coming under intense criticism from politicians and populist movements, they should not assume that their credibility with the broader public will help protect their independence. While professional forecasters and some financial market participants may have embraced the Fed's inflation target, the broader public has not. The lack of public understanding of just how successful modern central banking has been in the last thirty years makes central banks an easy target for populist leaders. Communication campaigns that describe, in easy to understand messages, what inflation rate the central bank targets and how close to that target inflation has been on average could boost not only the average knowledge about inflation of the broader population but also, as a result, the credibility of central banks. Central banks, however, should not stop here but should also explain in detail the benefits of stable prices and the implications of changes in inflation expectations for economics choices. Many households in the US perceive persistent deflation as desirable and have little knowledge about basic economic concepts such as the consumer Euler equation (D'Acunto et al. 2018a).

A second implication of our results, and one that is more positive for central banks, is the scope for how potentially powerful communications policies toward the broader public could be. We find that simple information treatments that reach the public can easily move inflation expectations by over one hundred basis points. Relative to quantitative easing policies or forward guidance, this suggests that policy-makers may be able to change perceived real interest rates of households and firms in a quantitatively important way through new communications strategies, a feature that could be immensely useful at the zero bound on nominal interest rates. Doing so will require much more systematic evaluation of how different types of information affect the expectations of economic agents as well as formal models that characterize how these signals affect expectations and decisions as well as their general equilibrium implications. Intuitively, the decline in both the level and volatility of inflation since the early 1980s has lowered the benefit of being informed about inflation for households, leading to pervasive inattention on their part.¹⁹ To offset this force, policy-makers would need to reduce the price of collecting and

¹⁹ This is consistent with the fact that households in higher and more volatile inflation environments are more informed about inflation and monetary policy than those in living in low and stable inflation environments. It is also consistent with

processing this information for households, which would require simpler communication strategies that reach individuals in a more direct and systematic manner. The simple messages about inflation resulted in an average revision in forecasts of more than 1%. According to estimates in Bhattarai and Neely (2018), the first quantitative-easing program (QE1) of the Federal Reserve Bank amounted to \$1.725 trillion and resulted in a reduction in interest rates of only 0.34 percentage points. Crump et al. (2015) estimate an average subjective intertemporal elasticity of substitution of around 0.5 using expectations data from the New York Fed Survey of Consumer Expectations. Hence, our estimates imply that the change in inflation expectations of 1.2% would translate into a change in real consumption growth of 0.6%. This is twice the growth in current dollars personal consumption expenditure in June 2019 from the previous months and amounts to about \$82.0 billion.²⁰

A third implication for central banks has to do with the policy framework to use: e.g. inflation targeting vs price level targeting. The Federal Reserve system is beginning a process of reviewing its policy objectives and procedures in which, in particular, it is considering whether to adopt price level targeting in lieu of inflation targeting. The rationale for doing so is that, when the economy is facing the zero bound on interest rates, a price level targeting regime entails that inflation must be higher than the target after the zero bound ends, as this will be necessary to make up for the low inflation that occurs during the zero bound period. The expectation of higher future inflation while at the zero bound is predicted to be stimulative in New Keynesian models since higher expected inflation implies lower perceived real interest rates and therefore higher demand on the part of households. Price level targeting can therefore help stabilize economic outcomes during zero bound episodes relative to inflation targeting regimes. However, these effects hinge on households' inflation expectations correctly incorporating the effects of the regime and the zero bound such that they anticipate higher inflation than the target after the zero bound period ends. The absence of knowledge of what the target rate even is (documented in Figure 1) as well as the disconnect between household inflation expectations and recent inflation suggests that such a mechanism is unlikely to be effective as long as U.S. households remain as uninformed about inflation and monetary policy as they have been. Any change in regime on the part of U.S. policymakers should be accompanied by a massive and persistent communication campaign aimed at the broader public if it is to deliver any of the putative gains associated with price level targeting.

the evolution of inflation expectations over time in the U.S. as inflation went from high and volatile in the 1970s to low and stable in the 1980s. See Coibion, Gorodnichenko and Pedemonte (2018).

²⁰ <https://www.bea.gov/news/2019/personal-income-and-outlays-june-2019>

5 Conclusion

In times of low interest rates, central banks have increasingly turned to forward guidance and other communications strategies to affect economic activity. However, these strategies have focused primarily on communicating with financial markets rather than the broader public. Since many expectations channels run through households and firms, central banks could also aim to affect economic conditions via direct communications to the public. In this paper, we present new evidence that such communications can change expectations by economically significant magnitudes: simple messages about the central bank's inflation target have implications about real interest rates that dwarf those typically found for monetary policy announcements. However, we find that the effectiveness of these messages to the public is significantly dampened when transmitted via news media: households effectively dismiss much of the information content when presented to them in the form of a news article. This suggests that, if central banks want to add direct communications to the public as a new policy tool, they will have to find new ways to reach the public without relying on traditional media.

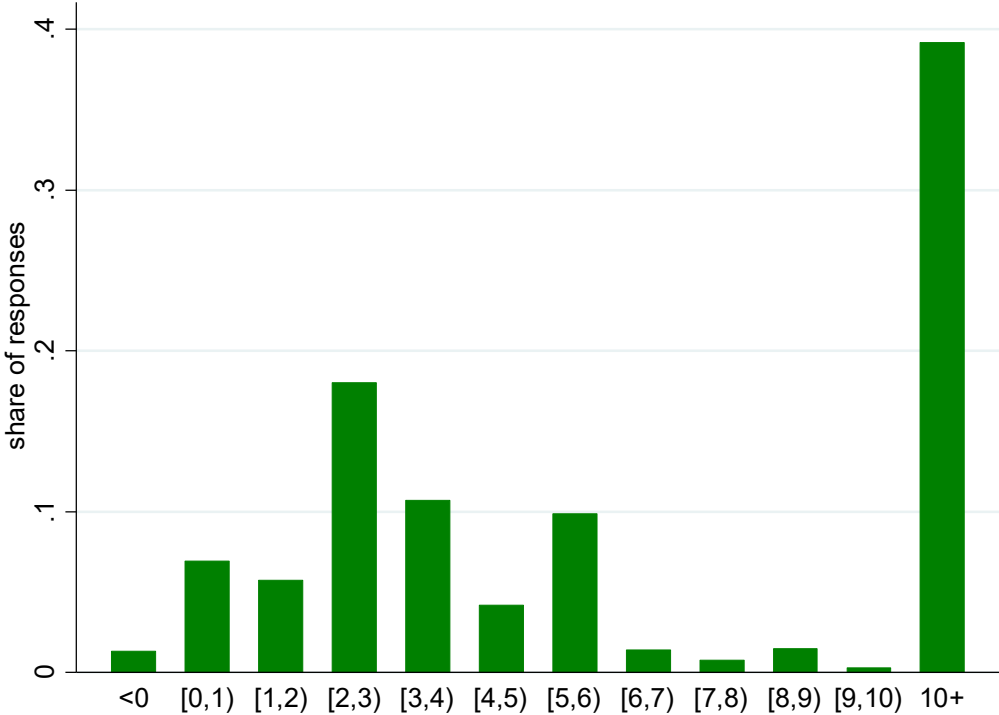
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Figure 1: Households' Beliefs about the Federal Reserve's Inflation Target



Notes: The figure plots the distribution of responses from individuals about what inflation rate they thought the Federal Reserve was trying to achieve in the long-run. This figure includes only respondents from the May 2018 part of survey wave 1, which did not have a “do not know” option for the question eliciting perceptions of the inflation target.

Table 1: Descriptive Statistics of the Survey

| Sample | Pre-treatment expected inflation | | Pre-treatment perceived inflation | | Pre-treatment perceived inflation target of the Fed | |
|-----------------------------------|-------------------------------------|---------|--------------------------------------|---------|---|---------|
| | Mean | St.Dev. | Mean | St.Dev. | Mean | St.Dev. |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| All | 2.47 | 2.57 | 2.46 | 2.66 | 3.37 | 2.72 |
| Male | 2.43 | 2.12 | 2.50 | 2.10 | 2.89 | 2.08 |
| Female | 2.49 | 2.75 | 2.44 | 2.90 | 3.60 | 2.96 |
| White | 2.49 | 2.59 | 2.54 | 2.71 | 3.36 | 2.74 |
| Non-white | 2.38 | 2.50 | 2.17 | 2.45 | 3.39 | 2.67 |
| Income: tercile 1 (low) | 2.41 | 2.83 | 2.32 | 2.96 | 3.53 | 3.10 |
| Income: tercile 2 | 2.58 | 2.85 | 2.58 | 2.97 | 3.61 | 3.11 |
| Income: tercile 3 | 2.45 | 2.22 | 2.49 | 2.27 | 3.18 | 2.29 |
| Enough credit | 2.54 | 2.44 | 2.61 | 2.52 | 3.28 | 2.57 |
| Not enough credit | 2.55 | 2.73 | 2.38 | 2.86 | 3.55 | 2.90 |
| HTM: less than 1 month in savings | 2.55 | 2.61 | 2.50 | 2.75 | 3.51 | 2.78 |
| HTM: 1-6 months in savings | 2.63 | 2.35 | 2.70 | 2.36 | 3.21 | 2.40 |
| HTM: 6+ months in savings | 2.62 | 2.15 | 2.65 | 2.16 | 3.01 | 2.11 |
| Plan to buy durable | 2.53 | 2.46 | 2.52 | 2.56 | 3.33 | 2.62 |
| No plan to buy durable | 2.45 | 2.60 | 2.44 | 2.69 | 3.38 | 2.75 |
| No financial wealth | 2.21 | 2.82 | 2.12 | 2.90 | 3.48 | 3.06 |
| Positive financial wealth | 2.60 | 2.43 | 2.63 | 2.52 | 3.31 | 2.53 |
| Saving rate: 0 | 2.57 | 2.76 | 2.36 | 2.90 | 3.60 | 2.93 |
| Saving rate: 0-10 | 2.58 | 2.43 | 2.68 | 2.55 | 3.36 | 2.57 |
| Saving rate: 10+ | 2.56 | 2.33 | 2.63 | 2.41 | 3.20 | 2.43 |
| Do grocery: me/self | 2.54 | 2.58 | 2.54 | 2.66 | 3.42 | 2.78 |
| Do grocery: share | 2.45 | 2.56 | 2.43 | 2.66 | 3.36 | 2.70 |
| Education: high school or less | 2.22 | 2.52 | 2.06 | 2.59 | 3.52 | 2.84 |
| Education: some college | 2.48 | 2.62 | 2.44 | 2.76 | 3.44 | 2.76 |
| Education: college or more | 2.59 | 2.55 | 2.66 | 2.61 | 3.28 | 2.66 |

Notes: The table reports average values and cross-sectional standard deviations of expected inflation over the next twelve months (columns 1-2), perceived inflation over the previous twelve months (columns 3-4) and beliefs about the Federal Reserve’s inflation target (columns 5-6). Rows indicate which subset of the sample is used. HTM stands for “hand to mouth” and indicates the amount of savings measured in monthly spending for a given household. All means and standard deviations are constructed from Huber robust regressions on a constant using sampling weights. Each row captures an observable characteristic of the respondent on which we condition.

Table 2: Average Household Responses to Treatments

| Treatments | Outcome: forecast revision | | | | | |
|-----------------------------|----------------------------|----------------------|-------------------------|----------------------|-------------------------|--------------------|
| | Immediate revision | | Revision after 3 months | | Revision after 6 months | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| T5 (pop growth) | -0.218** (0.105) | -0.269** (0.109) | -0.074 (0.090) | -0.097 (0.093) | 0.086 (0.102) | 0.096 (0.104) |
| T6 (UE) | -0.337*** (0.104) | -0.330*** (0.109) | -0.231** (0.093) | -0.250*** (0.096) | -0.116 (0.101) | -0.115 (0.103) |
| T4 (gas prices) | 1.491*** (0.114) | 1.430*** (0.119) | -0.169* (0.092) | -0.190** (0.095) | -0.121 (0.102) | -0.117 (0.103) |
| T2 (past inflation) | -1.039*** (0.104) | -1.111*** (0.109) | -0.014 (0.091) | -0.067 (0.094) | 0.276*** (0.102) | 0.251** (0.104) |
| T3 (inflation target) | -0.996*** (0.102) | -1.034*** (0.109) | -0.329*** (0.091) | -0.394*** (0.095) | 0.032 (0.101) | -0.017 (0.103) |
| T7 (Fed inflation forecast) | -1.071*** (0.102) | -1.143*** (0.108) | -0.220** (0.093) | -0.240** (0.095) | 0.162 (0.101) | 0.142 (0.103) |
| T8 (FOMC statement) | -1.197*** (0.103) | -1.213*** (0.108) | -0.138 (0.092) | -0.163* (0.095) | 0.078 (0.104) | 0.075 (0.107) |
| T9 (USA today coverage) | -0.444*** (0.105) | -0.528*** (0.109) | -0.196** (0.092) | -0.211** (0.095) | 0.117 (0.101) | 0.104 (0.103) |
| Remove outliers | Yes | Yes | Yes | Yes | Yes | Yes |
| Using sampling weights | Yes | Yes | Yes | Yes | Yes | Yes |
| Controls for demographics | No | Yes | No | Yes | No | Yes |
| Observations | 19,269 | 17,629 | 13,339 | 12,553 | 11,716 | 11,223 |
| R ² | 0.048 | 0.061 | 0.002 | 0.012 | 0.002 | 0.015 |

Notes: The table reports the average change in inflation expectations of individuals in each treatment group relative to those in the control group. Columns (1) and (2) consider the immediate change in expectations after the treatment, columns (3) and (4) consider the changes in beliefs after three months, columns (5) and (6) report changes in beliefs over a six month horizon. In each case, differences in beliefs are measured relative to initial beliefs from the first wave measured before all treatments. Treatments are described in detail in the text. For each time horizon, the second column uses the same specification as in the first column but augmented with respondent-specific controls. Results are from Huber robust regressions to control for outliers and influential observations. Robust standard errors are reported in parentheses.

Table 3: Average Effects of Treatments over Time on Specific Variables being Treated

| Treatments | Outcome: forecast revision | | | |
|---|----------------------------|----------------------|-------------------------|--------------------|
| | Revisions after 3 months | | Revision after 6 months | |
| | (1) | (2) | (3) | (4) |
| Panel A: Treatment effect on perceptions of the Fed's inflation target | | | | |
| T3 (inflation target) | -0.219*** (0.084) | -0.290*** (0.097) | -0.161 (0.099) | -0.184* (0.105) |
| Panel B: Treatment effect on perceptions past inflation | | | | |
| T2 (past inflation) | -0.239*** (0.089) | -0.221** (0.097) | -0.106 (0.099) | -0.107 (0.103) |
| Panel C: Treatment effect on perceptions of unemployment rate | | | | |
| T6 (UE) | -0.192*** (0.096) | -0.208* (0.109) | -0.120 (0.106) | -0.149 (0.112) |
| Controls for demographics | No | Yes | No | Yes |

Notes: The table reports the average changes in beliefs about variables being treated after 3 months (columns 1-2) and 6 months (3-4) relative to changes reported in the control group. In Panel A, we report how respondents in the group that received information about the Fed's inflation target revised their beliefs about the inflation target over time. In Panel B, we report how respondents in the group that received information about recent inflation revised their beliefs about recent inflation rates over time. In Panel C, we report how respondents in the group that received information about recent unemployment revised their beliefs about the unemployment rate over time. For each time horizon, the second column uses the same specification as in the first column but augmented with respondent-specific controls. Results are from Huber robust regressions to control for outliers and influential observations. Robust standard errors are reported in parentheses.

Table 4: Sensitivity to Differential Language in FOMC and USA Today Treatments

| Treatments | Outcome: immediate forecast revision | | | | | |
|---------------------------|--------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | Pooled sample | | May sample | | June sample | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| T8 (FOMC statement) | -1.197*** (0.103) | -1.213*** (0.108) | -1.094*** (0.150) | -1.090*** (0.162) | -1.298*** (0.141) | -1.297*** (0.145) |
| T9 (USA today coverage) | -0.444*** (0.105) | -0.528*** (0.109) | -0.586*** (0.152) | -0.696*** (0.163) | -0.320** (0.145) | -0.387*** (0.149) |
| Remove outliers | Yes | Yes | Yes | Yes | Yes | Yes |
| Using sampling weights | Yes | Yes | Yes | Yes | Yes | Yes |
| Controls for demographics | No | Yes | No | Yes | No | Yes |
| Observations | 19,269 | 17,629 | 8,992 | 7,851 | 10,277 | 9,778 |
| R ² | 0.048 | 0.061 | 0.037 | 0.052 | 0.060 | 0.074 |

Notes: The table reports the average change in inflation expectations of individuals in each treatment group relative to those in the control group. Columns (1) and (2) consider the immediate change in expectations after the treatment, columns (3) and (4) consider the changes in beliefs for those taking the survey in May of 2018, columns (5) and (6) report changes in beliefs for those participating in June 2018. Differences in information treatments between May and June waves are described in detail in section 3.2. For each time horizon, the second column uses the same specification as in the first column but augmented with respondent-specific controls. Results are from Huber robust regressions to control for outliers and influential observations. Robust standard errors are reported in parentheses.

Table 5: Credibility of Different News Sources

| | Score | | Share of people choosing “do not know” |
|------------------------------------|-------|---------|--|
| | mean | st.dev. | |
| | (1) | (2) | (3) |
| Credibility of news sources | | | |
| Newspapers | 3.07 | 1.16 | 0.11 |
| TV | 2.87 | 1.12 | 0.08 |
| Social media | 2.12 | 1.08 | 0.09 |
| Friends and coworker | 2.83 | 1.02 | 0.10 |
| Government | 2.84 | 1.14 | 0.11 |
| Credibility of newspapers | | | |
| New York Times | 3.20 | 1.42 | 0.36 |
| Wall Street Journal | 3.45 | 1.31 | 0.35 |
| USA Today | 3.05 | 1.26 | 0.36 |
| Washington Post | 3.14 | 1.40 | 0.39 |
| Chicago Tribune | 2.91 | 1.34 | 0.48 |
| Los Angeles Times | 2.92 | 1.36 | 0.47 |

Notes: The table reports scores to questions about the credibility of news sources (top panel) and the credibility of specific newspapers (bottom panel). In each case, respondents were asked to rate credibility on a scale of 1 (very credible) to 5 (not credible). Column (1) reports mean credibility scores across all respondents, column (2) reports the standard deviation of those scores across respondents, while column (3) reports the fraction of respondents who claimed that they did not know about the credibility of each source. 28,507 respondents provided their assessments.

Table 6: Effect of Treatments on Disagreement

| Treatments | Outcome: one-year ahead inflation expectation | | | |
|-----------------------------|---|------------------|------------------|------------------|
| | Pre-treatment | Post-treatment | | |
| | | Immediate | 3 months | 6 months |
| | (1) | (2) | (3) | (4) |
| T5 (pop growth) | 1.150 (0.142) | 1.000 (0.040) | 0.842 (0.056) | 0.914 (0.075) |
| T6 (UE) | 1.400 (0.144) | 1.000 (0.034) | 0.979 (0.052) | 0.943 (0.068) |
| T4 (gas prices) | 1.600 (0.127) | 1.000 (0.061) | 0.905 (0.047) | 0.914 (0.064) |
| T2 (past inflation) | 1.000 (0.115) | 0.500 (0.044) | 0.921 (0.059) | 0.800 (0.060) |
| T3 (inflation target) | 1.750 (0.123) | 0.750 (0.064) | 0.737 (0.055) | 0.943 (0.075) |
| T7 (Fed inflation forecast) | 1.500 (0.135) | 0.500 (0.029) | 0.979 (0.053) | 0.857 (0.056) |
| T8 (FOMC statement) | 1.600 (0.135) | 0.500 (0.025) | 0.842 (0.055) | 0.800 (0.058) |
| T9 (USA today coverage) | 1.000 (0.101) | 0.850 (0.141) | 0.842 (0.052) | 0.914 (0.059) |

Notes: The table reports robust measures of dispersion in inflation forecasts within each treatment group relative to dispersion within control group, as well as standard errors in parentheses. Column (1) reports these using inflation forecasts elicited prior to any treatment while column (2) uses inflation forecasts elicited immediately after information treatments. Columns (3) and (4) use forecasts from 3 and 6 months after information treatments respectively. Dispersion is measured using robust methods as described in text. Standard errors (bootstrap) are in parentheses.

Table 7: Average Household Responses to Treatments

| Treatments | Outcome: forecast revision | | | | | |
|-----------------------------|----------------------------|----------------------|-------------------------|----------------------|-------------------------|---------------------|
| | Immediate revision | | Revision after 3 months | | Revision after 6 months | |
| | Intercept | Slope | Intercept | Slope | Intercept | Slope |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| T1 (control) | 2.231*** (0.088) | 0.664*** (0.021) | 2.205*** (0.074) | 0.290*** (0.017) | 2.216*** (0.082) | 0.283*** (0.018) |
| Relative to control group | | | | | | |
| T5 (pop growth) | 0.289** (0.121) | -0.229*** (0.029) | -0.658*** (0.103) | 0.244*** (0.024) | -0.374*** (0.115) | 0.180*** (0.026) |
| T6 (UE) | 0.407*** (0.120) | -0.278*** (0.027) | -0.204* (0.107) | 0.067*** (0.024) | -0.435*** (0.115) | 0.140*** (0.027) |
| T4 (gas prices) | 2.190*** (0.131) | -0.211*** (0.028) | -0.174 (0.106) | 0.081*** (0.024) | -0.146 (0.114) | 0.027 (0.026) |
| T2 (past inflation) | 0.411*** (0.110) | -0.507*** (0.025) | 0.113 (0.102) | -0.099*** (0.022) | 0.168 (0.111) | -0.033 (0.024) |
| T3 (inflation target) | 0.247** (0.108) | -0.445*** (0.025) | -0.303*** (0.103) | -0.002 (0.023) | -0.283** (0.112) | 0.124*** (0.025) |
| T7 (Fed inflation forecast) | 0.103 (0.107) | -0.460*** (0.025) | -0.194* (0.108) | 0.091*** (0.024) | 0.064 (0.119) | 0.109*** (0.027) |
| T8 (FOMC statement) | 0.047 (0.110) | -0.490*** (0.026) | -0.077 (0.102) | -0.071*** (0.023) | 0.115 (0.113) | -0.021 (0.025) |
| T9 (USA today coverage) | 0.291** (0.114) | -0.371*** (0.028) | -0.136 (0.104) | 0.029 (0.024) | -0.136 (0.118) | 0.105*** (0.026) |
| Remove outliers | | Yes | | Yes | | Yes |
| Using sampling weights | | Yes | | Yes | | Yes |
| Controls for demographics | | No | | No | | No |
| Observations | | 18,942 | | 13,604 | | 11,853 |
| R ² | | 0.270 | | 0.278 | | 0.289 |

Notes: The table reports the slope and intercept in the following regression: $E_i^{post} \pi = a + b * Treat_i + \gamma * Treat_i * E_i^{pre} \pi + \psi * E_i^{pre} \pi$. Columns (1) and (2) consider the immediate change in expectations after the treatment, columns (3) and (4) are for beliefs after three months, columns (5) and (6) are for beliefs after six months. Results are from Huber robust regressions to control for outliers and influential observations. Robust standard errors are reported in parentheses.

Table 8: Extensive and Intensive Margins of Treatment Effects

| Treatments | Outcome: forecast revision | | | | | | | |
|-----------------------------|----------------------------|----------------------|-------------------------------|----------------------|-------------------------------|----------------------|---------------------------------|---------------------|
| | Immediate revision | | Extensive margin (2% or more) | | Intensive margin (2% or more) | | Intensive margin (less than 2%) | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| T5 (pop growth) | -0.218** (0.105) | -0.269** (0.109) | -0.010 (0.022) | -0.029 (0.022) | -0.387** (0.176) | -0.365** (0.183) | -0.006 (0.057) | 0.007 (0.059) |
| T6 (UE) | -0.337*** (0.104) | -0.330*** (0.109) | -0.009 (0.022) | -0.024 (0.022) | -0.609*** (0.176) | -0.502*** (0.183) | -0.037 (0.058) | 0.011 (0.060) |
| T4 (gas prices) | 1.491*** (0.114) | 1.430*** (0.119) | 0.184*** (0.021) | 0.162*** (0.022) | 1.327*** (0.157) | 1.368*** (0.165) | 0.150** (0.064) | 0.178*** (0.066) |
| T2 (past inflation) | -1.039*** (0.104) | -1.111*** (0.109) | 0.006 (0.021) | -0.006 (0.022) | -2.109*** (0.183) | -2.094*** (0.191) | -0.036 (0.058) | -0.049 (0.060) |
| T3 (inflation target) | -0.996*** (0.102) | -1.034*** (0.109) | -0.020 (0.021) | -0.034 (0.022) | -2.047*** (0.186) | -2.042*** (0.197) | 0.035 (0.057) | 0.075 (0.059) |
| T7 (Fed inflation forecast) | -1.071*** (0.102) | -1.143*** (0.108) | -0.048** (0.021) | -0.062*** (0.022) | -2.136*** (0.193) | -2.161*** (0.202) | 0.015 (0.056) | 0.020 (0.059) |
| T8 (FOMC statement) | -1.197*** (0.103) | -1.213*** (0.108) | -0.032 (0.021) | -0.051** (0.022) | -2.305*** (0.190) | -2.235*** (0.200) | -0.100* (0.056) | -0.060 (0.058) |
| T9 (USA today coverage) | -0.444*** (0.105) | -0.528*** (0.109) | -0.030 (0.022) | -0.048** (0.022) | -0.735*** (0.184) | -0.767*** (0.192) | -0.033 (0.058) | -0.019 (0.060) |
| Remove outliers | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Using sampling weights | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Controls for demographics | No | Yes | No | Yes | No | Yes | No | Yes |
| Observations | 19,269 | 17,629 | 19,269 | 17,629 | 11,502 | 10,498 | 7,767 | 7,131 |
| R ² | 0.048 | 0.061 | 0.016 | 0.040 | 0.067 | 0.087 | 0.004 | 0.020 |

Notes: Columns (1) and (2) reproduce average effects of different information treatments on inflation expectations relative to control groups from Table 2, with controls for observable characteristics of households in column (2). Columns (3) and (4) assess the extensive margin of treatment effects, defined as the probability of a change in each household's inflation expectation exceeding a threshold defined as a change in inflation expectation of 2% for each treatment group, relative to control group, with column (4) conditioning on observable characteristics of the individual. Columns (5) and (6) assess the intensive margin of treatment effects, defined as the size of the change in a household's inflation expectation, conditional on that change in expectation exceeding a threshold defined as a change in inflation expectation of 2% for each treatment group, relative to control group, with column (6) conditioning on observable characteristics of the individual. Columns (7) and (8) assess the average size of change in expectations for those individuals whose change in expectation was below the threshold used to define the extensive margin, (i.e. 2% for each treatment group, relative to control group, with column (6) conditioning on observable characteristics of the individual.

Table 9: Heterogeneity in Treatment Effects

| Breakdown of Sample: | By Gender | | By Income | | | By Education | | | Political affiliation | | |
|-----------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|---------------------|-------------------------------|--------------------|-----------------------|--------------------|---------------------|
| | Female | Male | Bottom Tercile | Middle Tercile | Highest Tercile | High school or less | Assoc. degree or some college | College or more | Democrat | Republican | Other |
| Treatment Group: | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| T5 (pop growth) | -0.31** (0.13) | -0.06 (0.17) | -0.05 (0.21) | -0.50** (0.23) | -0.19 (0.14) | -0.08 (0.24) | -0.40** (0.20) | -0.17 (0.14) | -0.93*** (0.31) | -0.15 (0.31) | -0.67*** (0.19) |
| T6 (UE) | -0.55*** (0.13) | 0.05 (0.17) | -0.20 (0.20) | -0.64*** (0.23) | -0.29** (0.14) | -0.30 (0.24) | -0.29 (0.19) | -0.39*** (0.14) | -0.94*** (0.33) | -0.32 (0.32) | -0.73*** (0.20) |
| T4 (gas prices) | 1.52*** (0.14) | 1.39*** (0.18) | 1.63*** (0.22) | 1.08*** (0.25) | 1.58*** (0.16) | 1.42*** (0.26) | 1.58*** (0.22) | 1.46*** (0.16) | 1.33*** (0.34) | 1.30*** (0.33) | 1.19*** (0.21) |
| T2 (past inflation) | -1.31*** (0.13) | -0.53*** (0.17) | -1.12*** (0.20) | -1.57*** (0.23) | -0.76*** (0.14) | -0.97*** (0.25) | -1.38*** (0.19) | -0.86*** (0.14) | -2.30*** (0.30) | -1.59*** (0.32) | -2.25*** (0.187) |
| T3 (inflation target) | -1.28*** (0.13) | -0.47*** (0.16) | -0.83*** (0.19) | -1.67*** (0.23) | -0.80*** (0.14) | -0.66*** (0.23) | -1.20*** (0.19) | -1.03*** (0.14) | -1.87*** (0.31) | -1.51*** (0.31) | -1.90*** (0.19) |
| T7 (Fed inflation forecast) | -1.26*** (0.13) | -0.74*** (0.16) | -1.29*** (0.20) | -1.53*** (0.22) | -0.74*** (0.14) | -1.20*** (0.24) | -1.10*** (0.19) | -1.01*** (0.14) | -2.33*** (0.31) | -1.21*** (0.30) | -2.01*** (0.19) |
| T8 (FOMC statement) | -1.44*** (0.13) | -0.74*** (0.17) | -1.09*** (0.19) | -1.79*** (0.23) | -1.01*** (0.14) | -1.16*** (0.24) | -1.21*** (0.19) | -1.21*** (0.14) | -1.89*** (0.31) | -1.63*** (0.31) | -2.11*** (0.19) |
| T9 (USA today coverage) | -0.60*** (0.13) | -0.18 (0.17) | -0.231 (0.20) | -0.84*** (0.23) | -0.40*** (0.14) | -0.17 (0.24) | -0.53*** (0.20) | -0.52*** (0.14) | -0.99*** (0.32) | -0.92*** (0.31) | -0.97*** (0.19) |
| Observations | 14,257 | 5,012 | 5,914 | 5,689 | 7,666 | 2,756 | 5,190 | 11,323 | 2,354 | 2,230 | 6,432 |
| R-squared | 0.052 | 0.043 | 0.047 | 0.048 | 0.053 | 0.048 | 0.056 | 0.045 | 0.146 | 0.092 | 0.105 |

Notes: The table reports the average change in inflation expectations of individuals in each treatment group relative to those in the control group, broken down along observable characteristics of individuals. Columns (1) and (2) separate households by gender, columns (3) to (5) consider where individuals rank in the income distribution of all respondents by tercile, columns (6) to (8) classify respondents using the highest level of education in the household, columns (9) to (11) classify respondents based on their political affiliations. In each case, revisions in beliefs are measured using the inflation forecasts at the end of the first wave of the survey relative to initial beliefs from the first wave measured before all treatments. Treatments are described in detail in the text. Results are from Huber robust regressions to control for outliers and influential observations. Robust standard errors are reported in parentheses.

Appendices

Appendix 1: Surveys and Treatments

First wave of the survey: May-June 2018

This survey is about your household's finances and opinions about the economy. As with any of our surveys, the information you provide is confidential and is only shared in an aggregate (not individual) level.

Please tell us about yourself...

1. What is your date of birth?

2. What is your gender?

Male Female

3. Do you have any credit cards?

Yes No Prefer to not answer

ASK IF: Q3=YES

4. Suppose that you had to make an unexpected payment equal to one month of your income, would you have sufficient credit on your credit card(s) to charge the entire amount?

Yes No Don't know/prefer to not answer

5. How much money did you have in your checking and savings accounts and in cash the day **before** your last *regular* paycheck arrived? Please do not include fixed term deposits, stocks, bonds, mutual funds, or retirement accounts, etc. (Please enter dollars and cents)

\$ _____ Don't know/prefer to not answer

6. Approximately how many times per month do you go to a gas station to buy gasoline or for other reasons? (Please enter a number) _____ times [RANGE: 0-999]

7. Who typically does the grocery shopping in your household? (Select one)

I do all of the grocery shopping in the household

I share the grocery shopping with others in the household

Someone else does the grocery shopping in the household

8. Over the last three months on average, how much did your household spend (per month) on goods and services in total and for each of the individual components listed below?

Please enter a number between 0 and 99,999 for each category. The sum of the expenditures for the individual categories should add up to the total amount. (Enter a "0" if you did not purchase anything in a given category)

Total monthly spending TOTAL [AUTOSUM] [RANGE: 0-99,999]

[HAVE THIS AUTOMATICALLY SUM]

\$ _____

Debt payments (mortgages, auto loans, student loans,...)

\$ _____

Housing (including rent, maintenance and home owner/renter insurance but *not* including mortgage payments) \$ _____

Utilities (including water, sewer, electricity, gas, heating oil, phone, internet)

\$ _____

Food (including groceries, dining out, and beverages)

\$ _____

Clothing, footwear, and personal care

\$ _____

Gasoline

\$ _____

Other regular transportation costs (including public transportation fares and car maintenance)

\$ _____

Medical care (including health insurance, medical bills, prescription drugs)

\$ _____

Travel, Recreation, and entertainment

\$ _____

Education and child care

\$ _____

Furniture, jewelry, small appliances and other small durable goods

\$ _____

Other (including gifts, child support or alimony, charitable giving, and other miscellaneous) \$ _____

Prefer not to answer

9. Saving is income that is neither spent nor used to make payments on debt. Methods of saving include putting money aside in, for example, a deposit account, a pension account, an investment fund, or as cash.

What percentage of your monthly income, on average, did you save during the last 12 months? (Please enter a number.

The number you enter should be greater than or equal to 0. If you did not save any money, please enter a "0". If you went into debt, enter a negative value)

_____ (Please enter a percent) [RANGE: -100-100]

Prefer not to answer

10. What percent of your financial wealth (excluding housing) do you invest in the following categories? (enter a "0" if you do not invest in a given category)

Checking and Savings Account percent
 Cash percent
 US Bonds percent
 US Stocks percent
 Foreign Stocks and Bonds percent
 Gold and precious metals percent
 Bitcoin and other cryptocurrencies percent
 Other percent
% Total 100 PN: TOTAL FOR RESPONDENT

I have no financial investments >EXCLUSIVE

11. Do you plan to buy a new home in the next 6 months?

Yes No

ASK IF: Q12=YES

12. What price do you expect/plan to pay for a new house?

\$ _____ Don't know/Won't answer

13. Do you plan to purchase a car in the next 6 months?

Yes No

ASK IF: Q13=YES

14. What price do you expect/plan to pay for this car?

\$ _____ Don't know/Won't answer

15. Do you plan to purchase any other big-ticket household items (TV, fridge, furniture, and similar items) over the next 6 months?

Yes No

ASK IF: Q15=YES

16. How much do you expect to spend on these big-ticket household items over the next 6 months?

\$ _____ Don't know/Won't answer

17. How much higher or lower do you think your household's total after-tax income will be over the next six months compared to the last twelve months?

Please provide an answer in percents. If you think that your household's total after-tax income will decrease, please fill in a negative percent (insert a minus sign for the number). If you think that your household's total after-tax income will increase, please fill in a positive percent. If you think that your household's total net income will not change, please fill in 0 (zero).

_____ %

18. In THIS question, you will be asked about the 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.

Nondurable goods and services include for instance food, tobacco, alcohol, gasoline, clothing, haircuts, transportation, and other small services and nondurable goods that do not last in time. What do you think is the percent chance that, over the next six months, your spending on non-durable goods and services will... (assign probabilities to each outcome; probabilities should sum to 100)

Increase by 10% or more _____
 Increase between 5% and 10% _____
 Increase between 2% and 5% _____
 Increase by 2% or less _____
 Stay the same _____
 Decrease 2% or less _____
 Decrease between 2% and 5% _____
 Decrease between 5% and 10% _____
 Decrease by 10% or more _____
% Total 100 PN: TOTAL FOR RESPONDENT

19. How many total hours per week do you and other members of your household work in a typical week? Please do not include volunteer hours or hours that are unpaid.

You: _____ hours per week

All others in household: _____ hours per week

20. Do you expect the hours for you or other people in your household will be the same over the next 6 months or not? Please do not include volunteer hours or hours that are unpaid.

- Yes, the same over the next 6 months
- No, not the same over the next 6 months

ASK IF: Q20=NO

23. How many hours per week do you expect to be working in 6 months and how many hours do you expect all other members of your household to be working in 6 months? Please do not include volunteer hours or hours that are unpaid.

You: _____ hours per week

All others in household: _____ hours per week

[Everyone who did not answer [] I have no financial investments in Q10 should get this question]

24. What do you think the rate of return will be on your financial investments over the next twelve months? Please provide a quantitative answer in percentage terms.

_____ % I have no financial investments

25. 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 Consumer Price Index and deflation corresponds to when prices are falling).

Please enter a number in the box below. If you do not think there was any inflation/deflation in the last 12 months, please enter a "0". If you think there was deflation, enter a negative value. If you think there was inflation, enter a positive value.

Over the **last** 12 months, the rate of inflation/deflation was

_____ percent

26. In THIS question, you will be asked about the 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% or more* _____
- the rate of inflation will be between 8% and 12%* _____
- the rate of inflation will be between 4% and 8* _____
- the rate of inflation will be between 2% and 4* _____
- the rate of inflation will be between 0% and 2%* _____
- the rate of deflation (opposite of inflation) will be between 0% and 2%* _____
- the rate of deflation (opposite of inflation) will be between 2% and 4%* _____
- the rate of deflation (opposite of inflation) will be between 4% and 8%* _____
- the rate of deflation (opposite of inflation) will be between 8% and 12%* _____
- the rate of deflation (opposite of inflation) will be 12% or more* _____

% Total _____ [PN: TOTAL ANSWERS
FROM ABOVE]

[Half of respondents get this question]

27. In THIS question, you will be asked about the probability (PERCENT CHANCE) of something being true. The percent chance must be a number between 0 and 100 and the sum of your answers must add up to 100.

What is the probability that the average American believes inflation or deflation over the next 12 months will be...

- The average American expects the rate of inflation will be 12% or more* _____
- The average American expects the rate of inflation will be between 8% and 12%* _____
- The average American expects the rate of inflation will be between 4% and 8* _____
- The average American expects the rate of inflation will be between 2% and 4* _____
- The average American expects the rate of inflation will be between 0% and 2%* _____
- The average American expects the rate of deflation (opposite of inflation) will be between 0% and 2%* _____
- The average American expects the rate of deflation (opposite of inflation) will be between 2% and 4%* _____
- The average American expects the rate of deflation (opposite of inflation) will be between 4% and 8%* _____
- The average American expects the rate of deflation (opposite of inflation) will be between 8% and 12%* _____
- The average American expects the rate of deflation (opposite of inflation) will be 12% or more* _____

% Total

_____ [PN: TOTAL ANSWERS FROM ABOVE]

[Other half of respondents get the next two question]

28. What do you think the current overall level of prices in the economy (as measured by the Consumer Price Index) relative to the level of prices 5 years ago?

Please provide an answer in percentage terms. If you think there was deflation (that is, prices fell), enter a negative value. If you think there was inflation (that is, prices rose), enter a positive value. If you do not think there was any inflation/deflation in the last 5 years, please enter a "0".

_____ overall percent change for last 5 years [RANGE: -100-100 Whole numbers only]

29. In THIS question, you will be asked about the probability (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 probability that, **over the next 5 years**, the overall level of prices in the economy (as measured by the Consumer Price Index) relative to the current level of prices will...

rise by 50% or more _____

rise from 25% to 50% _____

rise from 15% to 25% _____

rise from 5% to 15% _____

rise less than 5% _____

stay about the same _____

fall by less than 5% _____

fall from 5% to 15% _____

fall from 15% to 25% _____

fall from 25% to 50% _____

fall by 50% or more _____

% Total _____ [PN: TOTAL ANSWERS FROM ABOVE]

[75% of respondents get this question]

30. What is your best guess about the annual inflation rate that the Federal Reserve tries to achieve on average over long periods of time? Please use a percent between -100 and 100)

_____ % per year

[25% of respondents get this question instead]

30. What is your best guess about the annual inflation rate that the Federal Reserve tries to achieve on average over long periods of time? Please use a percent between -100 and 100)

_____ % per year Prefer to not answer

31. What is your best guess about the current unemployment rate in the U.S.? (Please use a percent between 0 and 100)

_____ %

32. What is your best guess at the current unleaded gas price in your area? (Please enter dollars and cents)

\$ _____

33. What is your best guess about the dollar change in gas prices over the next six months? (Please enter dollars and cents)

\$ _____

34. In THIS question, you will be asked about the 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 the average unemployment rate will be **over the next 12 months**:

The average unemployment rate will be 10% or more _____

The average unemployment rate will be between 8.0% and 9.9% _____

The average unemployment rate will be between 7.0% and 7.9% _____

The average unemployment rate will be between 6.0% and 6.9% _____

The average unemployment rate will be between 5.0% and 5.9% _____

The average unemployment rate will be between 4.0% and 4.9% _____

The average unemployment rate will be 4.0% or less _____

% Total _____ [PN: TOTAL ANSWERS FROM ABOVE]

[INFORMATION TREATMENTS]

[PN: RANDOMLY ASSIGN EACH RESPONDENT INTO EITHER THE "CONTROL GROUP" OR GROUPS 1 – 8 BASED ON LOWEST READS.]

CONTROL

GROUP 1

GROUP 2

GROUP 3

GROUP 4

GROUP 5

GROUP 6

GROUP 7

GROUP 8

IF Control group: [SKIP TO Q35]

SHOW IF: GROUPS 1-8

You are almost done with the survey. We have just a few more questions. But before you give us your responses, we would like you to know the following.

SHOW IF Group 1: Over the last twelve months, the inflation rate in the U.S. (as measured by the Consumer Price Index) was 2.3%.

SHOW IF Group 2: The inflation target of the Federal Reserve is 2% per year.

SHOW IF Group 3: The price of gasoline (national average) rose by 6.4% over the last three months.

SHOW IF Group 4: The U.S. population grew 2% over the last three years.

SHOW IF Group 5: The current rate of unemployment in the U.S. is 4.1%.

SHOW IF Group 6: The U.S. Federal Open Market Committee (which sets short-term interest rates) forecasts 1.9% inflation rate in 2018.

SHOW IF Group 7 [May 2018 version]: Please read the most recent policy statement by the U.S. Federal Open Market Committee.

Information received since the Federal Open Market Committee met in January indicates that the labor market has continued to strengthen and that economic activity has been rising at a moderate rate. Job gains have been strong in recent months, and the unemployment rate has stayed low. Recent data suggest that growth rates of household spending and business fixed investment have moderated from their strong fourth-quarter readings. On a 12-month basis, both overall inflation and inflation for items other than food and energy have continued to run below 2 percent. Market-based measures of inflation compensation have increased in recent months but remain low; survey-based measures of longer-term inflation expectations are little changed, on balance.

Consistent with its statutory mandate, the Committee seeks to foster maximum employment and price stability. The economic outlook has strengthened in recent months. The Committee expects that, with further gradual adjustments in the stance of monetary policy, economic activity will expand at a moderate pace in the medium term and labor market conditions will remain strong. Inflation on a 12-month basis is expected to move up in coming months and to stabilize around the Committee's 2 percent objective over the medium term. Near-term risks to the economic outlook appear roughly balanced, but the Committee is monitoring inflation developments closely.

In view of realized and expected labor market conditions and inflation, the Committee decided to raise the target range for the federal funds rate to 1-1/2 to 1-3/4 percent. The stance of monetary policy remains accommodative, thereby supporting strong labor market conditions and a sustained return to 2 percent inflation.

In determining the timing and size of future adjustments to the target range for the federal funds rate, the Committee will assess realized and expected economic conditions relative to its objectives of maximum employment and 2 percent inflation. This assessment will take into account a wide range of information, including measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial and international developments. The Committee will carefully monitor actual and expected inflation developments relative to its symmetric inflation goal. The Committee expects that economic conditions will evolve in a manner that will warrant further gradual increases in the federal funds rate; the federal funds rate is likely to remain, for some time, below levels that are expected to prevail in the longer run. However, the actual path of the federal funds rate will depend on the economic outlook as informed by incoming data.

SHOW IF Group 7 [June 2018 version]: Please read the most recent policy statement by the U.S. Federal Open Market Committee.

Information received since the Federal Open Market Committee met in March indicates that the labor market has continued to strengthen and that economic activity has been rising at a moderate rate. Job gains have been strong, on average, in recent months, and the unemployment rate has stayed low. Recent data suggest that growth of household spending moderated from its strong fourth-quarter pace, while business fixed investment continued to grow strongly. On a 12-month basis, both overall inflation and inflation for items other than food and energy have moved close to 2 percent. Market-based measures of inflation compensation remain low; survey-based measures of longer-term inflation expectations are little changed, on balance.

Consistent with its statutory mandate, the Committee seeks to foster maximum employment and price stability. The Committee expects that, with further gradual adjustments in the stance of monetary policy, economic activity will expand at a moderate pace in the medium term and labor market conditions will remain strong. Inflation on a 12-month basis is expected to run near the Committee's symmetric 2 percent objective over the medium term. Risks to the economic outlook appear roughly balanced.

In view of realized and expected labor market conditions and inflation, the Committee decided to maintain the target range for the federal funds rate at 1-1/2 to 1-3/4 percent. The stance of monetary policy remains accommodative, thereby supporting strong labor market conditions and a sustained return to 2 percent inflation.

In determining the timing and size of future adjustments to the target range for the federal funds rate, the Committee will assess realized and expected economic conditions relative to its objectives of maximum employment and 2 percent inflation. This assessment will take into account a wide range of information, including measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial and international developments. The Committee will carefully monitor actual and expected inflation developments relative to its symmetric inflation goal. The Committee expects that economic conditions will evolve in a manner that will warrant further gradual increases in the federal funds rate; the federal funds rate is likely to remain, for some time, below levels that are expected to prevail in the longer run. However, the actual path of the federal funds rate will depend on the economic outlook as informed by incoming data.

[SHOW IF Group 8 \[May 2018 version\]](#): On March 21, 2018, USA Today summarized the most recent decision of the U.S. Federal Open Market Committee (which sets short-term interest rates) as follows:

"Citing a brighter economic outlook, the Federal Reserve raised its key short-term interest rate Wednesday but maintained its forecast for a total of three hikes this year amid still-modest inflation.

The move is expected to ripple through the economy, nudging consumer and business borrowing costs higher, especially for variable-rate loans such as adjustable-rate mortgages and credit cards.

Investors cheered the unchanged rate forecast for 2018, pushing up the Dow Jones industrial average about 250 points initially before stocks pared their gains.

The Fed's policymaking committee, as widely anticipated, lifted the federal funds rate — what banks charge each other for overnight loans — by a quarter percentage point to a range of 1½% to 1¾%.

That's still low by historical standards but it marks the central bank's fourth rate increase in the past 12 months and another vote of confidence in an economy that's picking up steam nearly nine years after the Great Recession ended.

"We're trying to take that middle ground" on rate hikes, boosting rates enough to head off an eventual spike in inflation without derailing the economic expansion, Fed Chairman Jerome Powell said at a news conference. The meeting was the first led by Powell, a Republican and Trump appointee, who took the reins from Democrat Janet Yellen last month."

[SHOW IF Group 8 \[June 2018 version\]](#): On May 2, 2018, USA Today summarized the most recent decision of the U.S. Federal Open Market Committee (which sets short-term interest rates) as follows:

WASHINGTON — Inflation is creeping higher, and that’s making the Federal Reserve more confident about raising interest rates.

The Fed held its key interest rate steady Wednesday but noted that inflation has climbed close to its 2% goal, paving the way for another rate hike in June.

As expected, the Fed kept its benchmark short-term interest rate at a range of 1½% to 1¾%. The central bank’s policymaking committee lifted the rate by a quarter percentage point in March for the sixth time since late 2015 after holding it near zero for years following the 2008 financial crisis and recession.

In a statement after a two-day meeting, the Fed reiterated that it plans to continue to raise rates gradually, a pace that economists have interpreted as roughly every other meeting.

Fed policymakers have forecast two more rate increases this year, according to their median estimate, but faster inflation could trigger three additional moves. Before the statement release, Fed fund futures indicated a 90% chance of a hike in June, according to CME Group.

35. By how much do you expect prices in the economy (as measured by the Consumer Price Index) to change over the next 12 months? Please provide an answer as a percentage change from current prices. Please use a percent between -100 and 100, if no change please enter a “0”. You may enter a percent)

_____ %

[PN: ONLY THOSE THAT ANSWERED Q28 AND Q29 SHOULD ANSWER Q36]

36. By how much do you expect prices in the economy (as measured by the Consumer Price Index) to change over the next five years? Please provide an answer as a cumulative percentage change from the current level of prices. Please use a percent between -100 and 100, if no change please enter a “0”.)

_____ %

[PN: ONLY THOSE THAT ANSWERED Q27 SHOULD ANSWER Q37]

37. What inflation rate do you think the average American would predict for the next twelve months? (Please enter a number in one of the boxes below. If you think that the average American predicts no inflation or deflation, please enter a “0”. If you think the average American expects deflation, enter a negative value. If you expect, inflation, enter a positive value)

_____ %

38. What do you think the unemployment rate in the U.S. economy will be in twelve months? Please provide a quantitative answer in percentage terms. (Please use a percent between 0 and 100)

_____ %

39. What do you think the rate of return will be on your financial investments over the next twelve months? Please provide a quantitative answer in percentage terms.

_____ %

I have no financial investments

40. How much higher or lower do you think your household’s total after-tax income will be over the next six months compared to the last twelve months?

Please provide an answer in percents. If you think that your household’s total after-tax income will decrease, please fill in a negative percent (insert a minus sign for the number). If you think that your household’s total after-tax income will increase, please fill in a positive percent. If you think that your household’s total net income will not change, please fill in 0 (zero).

_____ %

41. How much higher or lower do you think your household’s spending on non-durable goods and services will be over the next six months compared to the last six months?

Please provide an answer in percentage terms. If you think that your household’s spending on non-durable goods and services will decrease, please fill in a negative percentage (insert a minus sign for the number). If you think that your household’s spending on non-durable goods and services will increase, please fill in a positive percentage. If you think that your household’s spending on non-durable goods and services will not change, please fill in 0 (zero). (You are able to enter a percent up to two decimal places)

_____ %

Second wave of the survey: September 2018

This survey is about your household's finances and opinions about the economy. As with any of our surveys, the information you provide is confidential and is only shared in an aggregate (not individual) level.

Please tell us about yourself...

1. What is your date of birth? (Please select the month, day and year)

Month: January, February... December

Day: 1, 2, 3... 31

Year: 1916, 1917... 2000

2. Over the last three months on average, how much did your household spend (per month) on goods and services in total and for each of the individual components listed below?

Please enter a number between 0 and 99,999 for each category. The sum of the expenditures for the individual categories should add up to the total amount. (Enter a "0" if you did not purchase anything in a given category)

Total monthly spending TOTAL [AUTOSUM] [RANGE: 0-99,999]

[PN: HAVE THIS AUTOMATICALLY SUM]

\$ _____

Debt payments (mortgages, auto loans, student loans,...)

\$ _____

Housing (including rent, maintenance and home owner/renter insurance but *not* including mortgage payments)

\$ _____

Utilities (including water, sewer, electricity, gas, heating oil, phone, internet)

\$ _____

Food (including groceries, dining out, and beverages)

\$ _____

Clothing, footwear, and personal care

\$ _____

Gasoline

\$ _____

Other regular transportation costs (including public transportation fares and car maintenance)

\$ _____

Medical care (including health insurance, medical bills, prescription drugs)

\$ _____

Travel, Recreation, and entertainment

\$ _____

Education and child care

\$ _____

Furniture, jewelry, small appliances and other small durable goods

\$ _____

Other (including gifts, child support or alimony, charitable giving, and other miscellaneous)

\$ _____

Prefer not to answer

3. What percent of your financial wealth (excluding housing) do you invest in the following categories? (Please enter a whole number if you invest in a given category. Percents should total 100%.)

Checking and Savings Account percent

Cash percent

US Bonds percent

US Stocks percent

Foreign Stocks and Bonds percent

Gold and precious metals percent

Bitcoin and other cryptocurrencies percent

Other percent

% Total 100

I have no financial investments

4. Did you buy a new home in the last 3 months?

Yes

No

ASK IF: Q4=YES

4a. What price did you pay for the new house?

\$ _____

Don't know/Won't answer

ASK IF: Q4=NO

4b. Do you plan to buy a new home in the next 3 months?

Yes No

ASK IF: Q4b=YES

4c. What price do you expect/plan to pay for a new house?

\$ _____

Don't know/Won't answer

5. Did you buy a new car in the last 3 months?

Yes No

ASK IF: Q5=YES

5a. What price did you pay for this car?

\$ _____

Don't know/Won't answer

ASK IF: Q5=NO

5b. Do you plan to purchase a car in the next 3 months?

Yes No

ASK IF: Q5b=YES

5c. What price do you expect/plan to pay for this car?

\$ _____

Don't know/Won't answer

6. Did you purchase any other big-ticket household items (TV, fridge, furniture, and similar items) in the last 3 months?

Yes No

ASK IF: Q6=YES

6a. How much did you spend on these big-ticket household items over the last 3 months?

\$ _____

Don't know/Won't answer

6b. Do you plan to purchase any other big-ticket household items (TV, fridge, furniture, and similar items) over the next 3 months?

Yes No

ASK IF: Q6b=YES

6c. How much do you expect to spend on these big-ticket household items over the next 3 months?

\$ _____

Don't know/Won't answer

7. How much higher or lower do you think your household's total after-tax income will be over the next three months compared to the last three months?

Please provide an answer in percent. If you think that your household's total after-tax income will decrease, please fill in a negative percent (insert a minus sign for the number). If you think that your household's total after-tax income will increase, please fill in a positive percent. If you think that your household's total net income will not change, please fill in 0 (zero).

_____ %

8. How many total hours per week do you and other members of your household work in a typical week? Please do not include volunteer hours or hours that are unpaid.

You: _____ hours per week

All others in household: _____ hours per week

9. Do you expect the hours for you or other people in your household will be the same over the next 3 months or not?

Please do not include volunteer hours or hours that are unpaid.

Yes, the same over the next 3 months

No, not the same over the next 3 months

ASK IF: Q9=NO

10. How many hours per week do you expect to be working in 3 months and how many hours do you expect all other members of your household to be working in 3 months? Please do not include volunteer hours or hours that are unpaid.

You: _____ hours per week

All others in household: _____ hours per week

11. 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 Consumer Price Index and deflation corresponds to when prices are falling).

Please enter a number in the box below. If you do not think there was any inflation/deflation in the last 12 months, please enter a "0". If you think there was deflation, enter a negative value. If you think there was inflation, enter a positive value.

Over the **last** 12 months, the rate of inflation/deflation was _____ percent

12. In THIS question, you will be asked about the 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% or more _____
- the rate of inflation* will be between 8% and 12% _____
- the rate of inflation* will be between 4% and 8 _____
- the rate of inflation* will be between 2% and 4 _____
- the rate of inflation* will be between 0% and 2% _____
- the rate of deflation (opposite of inflation)* will be between 0% and 2% _____
- the rate of deflation (opposite of inflation)* will be between 2% and 4% _____
- the rate of deflation (opposite of inflation)* will be between 4% and 8% _____
- the rate of deflation (opposite of inflation)* will be between 8% and 12% _____
- the rate of deflation (opposite of inflation)* will be 12% or more _____
- % Total** _____

13. What is your best guess about the annual inflation rate that the Federal Reserve tries to achieve on average over long periods of time? Please use a percent between -100 and 100)

_____ % per year

14. What is your best guess about the current unemployment rate in the U.S.? (Please use a percent between 0 and 100)

_____ %

15. What is your best guess at the current unleaded gas price in your area? (Please enter dollars and cents)

\$ _____

16. Are you? (Select one)

Male

Female

17. What is your first name?

18. Are there any members of your household aged 18 or older who have not yet taken this survey?

Yes

No

Third wave of the survey: December 2018

This survey is about your household's finances and opinions about the economy. As with any of our surveys, the information you provide is confidential and is only shared in an aggregate (not individual) level.

Please tell us about yourself...

1. What is your date of birth? (Please select the month, day and year)

2. Which political party do you lean towards?

- Democrats
- Republican party
- Green party
- Libertarian party
- Other
- Prefer not to answer

3. Over the last three months on average, how much did your household spend (per month) on goods and services in total and for each of the individual components listed below?

Please enter a number between 0 and 99,999 for each category. The sum of the expenditures for the individual categories should add up to the total amount. (Enter a "0" if you did not purchase anything in a given category)

Total monthly spending TOTAL [AUTOSUM] [RANGE: 0-99,999] \$ _____
 [PN: HAVE THIS AUTOMATICALLY SUM]

- Debt payments (mortgages, auto loans, student loans,...) \$ _____
- Housing (including rent, maintenance and home owner/renter insurance but *not* including mortgage payments) \$ _____
- Utilities (including water, sewer, electricity, gas, heating oil, phone, internet) \$ _____
- Food (including groceries, dining out, and beverages) \$ _____
- Clothing, footwear, and personal care \$ _____
- Gasoline \$ _____
- Other regular transportation costs (including public transportation fares and car maintenance) \$ _____
- Medical care (including health insurance, medical bills, prescription drugs) \$ _____
- Travel, Recreation, and entertainment \$ _____
- Education and child care \$ _____
- Furniture, jewelry, small appliances and other small durable goods \$ _____
- Other (including gifts, child support or alimony, charitable giving, and other miscellaneous) \$ _____
- Prefer not to answer

4. What percent of your financial wealth (excluding housing) do you invest in the following categories? (Please enter a whole number if you invest in a given category. Percents should total 100%.)

- Checking and Savings Account percent
- Cash percent
- US Bonds percent
- US Stocks percent
- Foreign Stocks and Bonds percent
- Gold and precious metals percent

Bitcoin and other cryptocurrencies percent
 Other percent
% Total 100

I have no financial investments

Consumption Plans:

5. Did you buy a new home in the last 6 months?
 Yes
 No

ASK IF: Q5=YES

5a. What price did you pay for the new house?
 \$ _____ [PN: MAX=10,000,000]
 Don't know/Prefer not to answer

6. Did you buy a new car in the last 6 months?
 Yes
 No

ASK IF: Q6=YES

6a. What price did you pay for this car?
 \$ _____ [PN: MAX=100,000]
 Don't know/Prefer not to answer

7. Did you purchase any other big-ticket household items (TV, fridge, furniture, and similar items) in the last 6 months?
 Yes
 No

ASK IF: Q7=YES

7a. How much did you spend on these big-ticket household items over the last 6 months?
 \$ _____
 Don't know/Prefer not to answer

8. How much higher or lower do you think your household's total after-tax income will be over the next six months compared to the last six months?

Please provide an answer with a percent. If you think that your household's total after-tax income will decrease, please fill in a negative percent (insert a minus sign before the number). If you think that your household's total after-tax income will increase, please fill in a positive percent. If you think that your household's total net income will not change, please fill in 0 (zero).

_____ % [RANGE: (-100) to 100]

9. How many total hours per week do you and other members of your household work in a typical week? Please do not include volunteer hours or hours that are unpaid. (Please enter a zero if you or others do not work)

You: _____ hours per week
 All others in household: _____ hours per week

;Inflation and Aggregate Expectations - DON'T SHOW

10. We would like to ask you about the rate of inflation/deflation (Note: Deflation is the opposite of inflation).

Over the **last** 12 months...

(Please enter a number in one of the boxes below. The number you enter should be greater than 0 or equal to 0. If you do not think there was any inflation/deflation in the last 12 months, please enter a "0" in one of the boxes.)

The rate of inflation was percent [RANGE: 0-100]
 The rate of deflation (the opposite of inflation) was percent [RANGE: 0-100]

11. In THIS question, you will be asked about the PERCENT CHANCE of something happening. The percent chance must be a number between 0 and 100. Numbers like 2% or 5% indicate "almost no chance," 19% or so may mean "not much chance," a 47% or 55% chance may be a "pretty even chance," 82% indicates a "very good chance," and 95% or 98% mean "almost certain."

What do you think is the percent chance that, **over the next 12 months...**
 [RANGE OF EACH OPTION BELOW: 0-100]

- the rate of inflation will be 12% or more* _____
- the rate of inflation will be between 8% and 12%* _____
- the rate of inflation will be between 4% and 8* _____
- the rate of inflation will be between 2% and 4* _____
- the rate of inflation will be between 0% and 2%* _____
- the rate of deflation (opposite of inflation) will be between 0% and 2%* _____
- the rate of deflation(opposite of inflation) will be between 2% and 4%* _____
- the rate of deflation(opposite of inflation) will be between 4% and 8%* _____
- the rate of deflation(opposite of inflation) will be between 8% and 12%* _____
- the rate of deflation(opposite of inflation) will be 12% or more* _____

% Total _____

12. What do you think is the probability that, in **10 years from now**, the overall level of prices in the economy (as measured by the Consumer Price Index) will...

[RANGE OF EACH OPTION BELOW: 0-100 ALLOW FOR UP TO 2 DECIMAL POINTS]

- fall by 50% or more* _____
- fall by 25% to 50%* _____
- fall by 15% to 25%* _____
- fall by 5% to 15%* _____
- fall but by less than 5%* _____
- stay about the same* _____
- grow but at less than 5%* _____
- grow by 5% to 15%* _____
- grow by 15% to 25%* _____
- grow by 25% to 50%* _____
- grow by 50% to 100%* _____
- grow by 100% or more* _____

% Total _____ [PN: TOTAL ANSWERS FROM ABOVE]

13. What is your best guess about the annual inflation rate that the Federal Reserve tries to achieve on average over long periods of time? Please use a percent between -100 to 100)

_____ % per year [RANGE: -100 to 100 Whole numbers]

14. What is your best guess about the current unemployment rate in the U.S.? (Please use a percent between 0 and 100, may enter up to 2 decimal points)

_____ % [RANGE: 0-100]

15. What is your best guess at the current unleaded gas price in your area? (Please enter dollars and cents)

\$ _____ [PN: ADD two DECIMAL FOR DOLLARS AND CENTS]

Appendix 2: Additional Results

Appendix Table 1: Heterogeneous Contemporaneous Effects of Treatments on Inflation Expectation

| | Enough credit | Not enough credit | Less than 1 month in savings | 1-6 months in savings | 6+ months in savings | Plan to buy durable | No plan to buy durable | No financial wealth | Positive financial wealth | Saving rate: 0 | Saving rate: 0-10 | Saving rate: 10+ |
|-----------------------------|----------------------|----------------------|------------------------------|-----------------------|----------------------|----------------------|------------------------|----------------------|---------------------------|----------------------|----------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| T5 (pop growth) | -0.177 (0.124) | -0.219 (0.279) | -0.260 (0.196) | -0.129 (0.259) | -0.140 (0.265) | -0.383* (0.231) | -0.173 (0.118) | -0.093 (0.193) | -0.277** (0.125) | -0.048 (0.242) | -0.339* (0.178) | -0.282 (0.203) |
| T6 (UE) | -0.310** (0.124) | -0.370 (0.286) | -0.567*** (0.193) | -0.645** (0.254) | 0.010 (0.258) | -0.269 (0.228) | -0.362*** (0.117) | -0.030 (0.195) | -0.478*** (0.123) | -0.518** (0.241) | -0.298 (0.181) | -0.429** (0.193) |
| T4 (gas prices) | 1.498*** (0.135) | 1.679*** (0.315) | 1.356*** (0.211) | 1.438*** (0.272) | 1.363*** (0.280) | 1.328*** (0.251) | 1.536*** (0.128) | 1.586*** (0.212) | 1.444*** (0.135) | 1.664*** (0.255) | 1.423*** (0.201) | 1.549*** (0.217) |
| T2 (past inflation) | -0.987*** (0.123) | -1.148*** (0.268) | -1.167*** (0.190) | -1.129*** (0.258) | -0.697*** (0.247) | -0.982*** (0.229) | -1.055*** (0.116) | -0.919*** (0.189) | -1.096*** (0.124) | -1.257*** (0.228) | -1.100*** (0.182) | -0.938*** (0.197) |
| T3 (inflation target) | -0.921*** (0.121) | -1.412*** (0.277) | -1.302*** (0.187) | -1.048*** (0.255) | -0.928*** (0.253) | -0.929*** (0.226) | -1.011*** (0.114) | -0.742*** (0.191) | -1.115*** (0.120) | -1.093*** (0.224) | -1.123*** (0.181) | -1.052*** (0.192) |
| T7 (Fed inflation forecast) | -0.943*** (0.121) | -1.374*** (0.270) | -1.331*** (0.187) | -1.055*** (0.248) | -0.677*** (0.246) | -0.882*** (0.228) | -1.120*** (0.114) | -1.066*** (0.197) | -1.083*** (0.119) | -1.573*** (0.224) | -1.188*** (0.176) | -0.599*** (0.193) |
| T8 (FOMC statement) | -1.247*** (0.123) | -1.127*** (0.274) | -1.349*** (0.189) | -1.391*** (0.249) | -0.960*** (0.252) | -1.262*** (0.232) | -1.179*** (0.114) | -0.825*** (0.187) | -1.377*** (0.122) | -1.254*** (0.219) | -1.525*** (0.179) | -1.101*** (0.202) |
| T9 (USA today coverage) | -0.481*** (0.123) | -0.592** (0.285) | -0.515*** (0.189) | -0.418 (0.263) | -0.455* (0.260) | -0.632*** (0.223) | -0.390*** (0.119) | -0.273 (0.195) | -0.525*** (0.124) | -0.457* (0.243) | -0.602*** (0.177) | -0.366* (0.202) |
| Observations | 13,160 | 2,845 | 5,904 | 3,084 | 2,507 | 3,860 | 15,409 | 6,025 | 13,244 | 4,224 | 6,474 | 4,417 |
| R-squared | 0.051 | 0.053 | 0.050 | 0.062 | 0.048 | 0.043 | 0.050 | 0.038 | 0.054 | 0.058 | 0.057 | 0.052 |

Notes: The table reports the average change in inflation expectations of individuals in each treatment group relative to those in the control group, broken down along observable characteristics of individuals. Columns (1) and (2) differentiate respondents by whether they report having enough credit on their credit cards to make an emergency payment equal to one month of their salary. Columns (3)-(5) differentiate respondents by the amount of their total liquid savings (checking plus savings accounts) relative to their monthly income. Columns (6) and (7) differentiate respondents by whether they plan to buy a car, house or other big ticket item over the next six months. Columns (8) and (9) differentiate between households depending on whether they report having any positive financial wealth. Columns (10) to (12) differentiate between respondents depending on what fraction of their monthly income they report having saved each of the last 12 months on average. In each case, revisions in beliefs are measured using the inflation forecasts at the end of the first wave of the survey relative to initial beliefs from the first wave measured before all treatments. Treatments are described in detail in the text. Results are from Huber robust regressions to control for outliers. Robust standard errors are reported in parentheses.

Appendix Table 1 (continued): Heterogeneous Contemporaneous Effects of Treatments on Inflation Expectation

| | Race | | Who does groceries: | | Number of bins used in inflation expectations distribution question | | | Time spent answering inflation expectations distribution question | | |
|-----------------------------|----------------------|----------------------|----------------------|----------------------|---|----------------------|----------------------|---|----------------------|---------------------|
| | White (1) | Non-White (2) | Just me (3) | Shared (4) | 1 bin (5) | 2 bins (6) | 3+ bins (7) | <20 sec. (8) | 20-120 sec. (9) | 120+ sec. (10) |
| T5 (pop growth) | -0.193* (0.116) | -0.315 (0.245) | -0.341 (0.208) | -0.195 (0.123) | -0.219 (0.134) | -0.207 (0.256) | -0.192 (0.225) | -0.019 (0.285) | -0.091 (0.171) | 0.377 (0.615) |
| T6 (UE) | -0.291** (0.115) | -0.500** (0.244) | -0.166 (0.201) | -0.444*** (0.123) | -0.270** (0.134) | -0.264 (0.247) | -0.560** (0.222) | -0.108 (0.275) | -0.266 (0.175) | 0.007 (0.658) |
| T4 (gas prices) | 1.516*** (0.125) | 1.375*** (0.274) | 1.554*** (0.227) | 1.447*** (0.134) | 1.424*** (0.146) | 1.700*** (0.264) | 1.587*** (0.252) | 1.663*** (0.327) | 1.934*** (0.193) | 2.651*** (0.659) |
| T2 (past inflation) | -0.986*** (0.114) | -1.241*** (0.242) | -0.861*** (0.200) | -1.113*** (0.122) | -0.947*** (0.135) | -1.091*** (0.236) | -1.247*** (0.221) | -0.938*** (0.281) | -1.108*** (0.169) | -0.730 (0.611) |
| T3 (inflation target) | -1.034*** (0.112) | -0.857*** (0.240) | -1.191*** (0.199) | -0.951*** (0.120) | -0.904*** (0.134) | -1.022*** (0.233) | -1.227*** (0.211) | -0.992*** (0.280) | -1.003*** (0.169) | -0.794 (0.556) |
| T7 (Fed inflation forecast) | -1.102*** (0.112) | -0.957*** (0.247) | -1.210*** (0.199) | -1.049*** (0.120) | -1.012*** (0.133) | -0.853*** (0.227) | -1.389*** (0.223) | -0.770*** (0.285) | -1.090*** (0.167) | -0.813 (0.551) |
| T8 (FOMC statement) | -1.191*** (0.114) | -1.215*** (0.232) | -1.273*** (0.199) | -1.201*** (0.121) | -1.114*** (0.133) | -1.116*** (0.230) | -1.485*** (0.225) | -1.100*** (0.277) | -1.389*** (0.171) | -1.197** (0.557) |
| T9 (USA today coverage) | -0.437*** (0.115) | -0.477* (0.249) | -0.403** (0.202) | -0.479*** (0.124) | -0.357*** (0.134) | -0.688*** (0.252) | -0.524** (0.226) | -0.527* (0.280) | -0.289* (0.176) | 0.299 (0.642) |
| Observations | 16,325 | 2,944 | 5,632 | 13,314 | 12,191 | 2,986 | 4,091 | 2,529 | 6,953 | 795 |
| R-squared | 0.049 | 0.044 | 0.050 | 0.048 | 0.041 | 0.066 | 0.062 | 0.047 | 0.065 | 0.071 |

Notes: The table reports the average change in inflation expectations of individuals in each treatment group relative to those in the control group, broken down along observable characteristics of individuals. Columns (1) and (2) differentiate respondents by their race. Columns (3) and (4) differentiate respondents by whether they report being the sole shopper for their household or share the shopping with others. Columns (5) to (7) differentiate respondents by the number of bins on which they assign positive probabilities when completing the distributional inflation expectations question. Columns (8) to (10) differentiate respondents based on the amount of seconds it took them to complete the distributional inflation expectations question. In each case, revisions in beliefs are measured using the inflation forecasts at the end of the first wave of the survey relative to initial beliefs from the first wave measured before all treatments. Treatments are described in detail in the text. Results are from Huber robust regressions to control endogenously for outliers. Robust standard errors are reported in parentheses.

Appendix Table 1 (continued): Heterogeneous Contemporaneous Effects of Treatments on Inflation Expectation

| | Age | | |
|-----------------------------|--------------------|--------------------|--------------------|
| | 40 or less | [41,60] | 61 or more |
| | (1) | (2) | (3) |
| T5 (pop growth) | -0.12 (0.21) | -0.32* (0.17) | -0.17 (0.18) |
| T6 (UE) | -0.51** (0.20) | -0.30* (0.17) | -0.24 (0.18) |
| T4 (gas prices) | 1.45*** (0.24) | 1.52*** (0.18) | 1.50*** (0.18) |
| T2 (past inflation) | -0.88*** (0.20) | -1.11*** (0.16) | -1.08*** (0.18) |
| T3 (inflation target) | -1.03*** (0.20) | -1.01*** (0.17) | -0.95*** (0.17) |
| T7 (Fed inflation forecast) | -0.95*** (0.20) | -1.15*** (0.16) | -1.07*** (0.17) |
| T8 (FOMC statement) | -1.34*** (0.20) | -1.12*** (0.16) | -1.18*** (0.17) |
| T9 (USA today coverage) | -0.57*** (0.20) | -0.47*** (0.17) | -0.30* (0.18) |
| Observations | 3,808 | 7,238 | 8,223 |
| R-squared | 0.05 | 0.05 | 0.04 |

Notes: The table reports the average change in inflation expectations of individuals in each treatment group relative to those in the control group, broken down by age of the respondent. Column (1) uses individuals aged 40 or less, column (2) uses individuals with ages from 41 to 60, and column (3) uses individuals aged 61 or more. In each case, revisions in beliefs are measured using the inflation forecasts at the end of the first wave of the survey relative to initial beliefs from the first wave measured before all treatments. Treatments are described in detail in the text. Results are from Huber robust regressions to control endogenously for outliers. Robust standard errors are reported in parentheses.

Appendix Table 2: Heterogeneous Three-Month Effects of Treatments on Inflation Expectation

| | Enough credit | Not enough credit | Less than 1 month in savings | 1-6 months in savings | 6+ months in savings | Plan to buy durable | No plan to buy durable | No financial wealth | Positive financial wealth | Saving rate: 0 | Saving rate: 0-10 | Saving rate: 10+ |
|-----------------------------|---------------------|---------------------|------------------------------|-----------------------|----------------------|---------------------|------------------------|----------------------|---------------------------|----------------------|--------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| T5 (pop growth) | -0.054 (0.119) | 0.018 (0.271) | -0.013 (0.184) | -0.140 (0.237) | -0.093 (0.247) | -0.391* (0.230) | -0.041 (0.109) | -0.243 (0.191) | -0.043 (0.115) | 0.155 (0.215) | -0.048 (0.179) | -0.445** (0.179) |
| T6 (UE) | -0.163 (0.118) | -0.598** (0.295) | -0.389** (0.196) | -0.174 (0.253) | -0.208 (0.238) | -0.154 (0.229) | -0.255** (0.113) | -0.354* (0.196) | -0.179 (0.118) | -0.611*** (0.217) | 0.021 (0.190) | -0.406** (0.185) |
| T4 (gas prices) | -0.211* (0.120) | -0.011 (0.282) | -0.240 (0.191) | -0.112 (0.248) | -0.234 (0.223) | -0.261 (0.233) | -0.139 (0.112) | -0.166 (0.198) | -0.164 (0.116) | -0.303 (0.212) | -0.093 (0.184) | -0.325* (0.185) |
| T2 (past inflation) | 0.025 (0.116) | -0.047 (0.298) | -0.053 (0.188) | -0.094 (0.241) | -0.210 (0.231) | -0.313 (0.221) | 0.056 (0.112) | 0.082 (0.196) | -0.065 (0.115) | 0.021 (0.215) | 0.072 (0.177) | -0.337* (0.188) |
| T3 (inflation target) | -0.228* (0.120) | -0.212 (0.277) | -0.250 (0.186) | -0.188 (0.252) | -0.388 (0.249) | -0.435* (0.228) | -0.288*** (0.111) | -0.631*** (0.193) | -0.175 (0.116) | -0.274 (0.214) | -0.099 (0.180) | -0.522*** (0.188) |
| T7 (Fed inflation forecast) | -0.128 (0.121) | -0.128 (0.281) | -0.102 (0.188) | -0.243 (0.256) | -0.037 (0.238) | -0.164 (0.241) | -0.228** (0.112) | -0.438** (0.196) | -0.120 (0.118) | -0.337 (0.225) | -0.138 (0.178) | -0.280 (0.185) |
| T8 (FOMC statement) | -0.182 (0.118) | -0.054 (0.307) | -0.057 (0.190) | -0.196 (0.242) | -0.160 (0.240) | -0.301 (0.235) | -0.089 (0.112) | -0.219 (0.191) | -0.092 (0.119) | 0.166 (0.218) | -0.318* (0.182) | -0.219 (0.188) |
| T9 (USA today coverage) | -0.266** (0.118) | -0.074 (0.296) | -0.176 (0.190) | -0.140 (0.260) | -0.052 (0.224) | -0.193 (0.230) | -0.227** (0.113) | -0.226 (0.197) | -0.221* (0.117) | -0.003 (0.226) | -0.312* (0.184) | -0.502*** (0.179) |
| Observations | 9,225 | 2,020 | 4,205 | 2,176 | 1,863 | 2,542 | 11,101 | 4,390 | 9,253 | 3,155 | 4,414 | 3,106 |
| R-squared | 0.001 | 0.003 | 0.002 | 0.001 | 0.002 | 0.002 | 0.002 | 0.004 | 0.001 | 0.007 | 0.002 | 0.004 |

Notes: The table reports the average change in inflation expectations of individuals in each treatment group relative to those in the control group, broken down along observable characteristics of individuals. Columns (1) and (2) differentiate respondents by whether they report having enough credit on their credit cards to make an emergency payment equal to one month of their salary. Columns (3) to (5) differentiate respondents by the amount of their total liquid savings (checking plus savings accounts) relative to their monthly income. Columns (6) and (7) differentiate respondents by whether they plan to buy a car, house or other big ticket item over the next six months. Columns (8) and (9) differentiate between households depending on whether they report having any positive financial wealth. Columns (10) to (12) differentiate between respondents depending on what fraction of their monthly income they report having saved each of the last 12 months on average. In each case, revisions in beliefs are measured using the inflation forecasts from the second wave of the survey relative to initial beliefs from the first wave measured before all treatments. Treatments are described in detail in the text. Results are from Huber robust regressions to control endogenously for outliers. Robust standard errors are reported in parentheses.

Appendix Table 2 (continued): Heterogeneous Three-Month Effects of Treatments on Inflation Expectation

| | Race | | Who does groceries: | | Number of bins used in inflation expectations distribution question | | | Time spent answering inflation expectations distribution question | | |
|-----------------------------|----------------------|---------------------|---------------------|----------------------|---|---------------------|-------------------|---|----------------------|-------------------|
| | White | Non-White | Just me | Shared | 1 bin | 2 bins | 3+ bins | <20 sec. | 20-120 sec. | 120+ sec. |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| T5 (pop growth) | -0.154 (0.108) | 0.104 (0.243) | -0.057 (0.206) | -0.101 (0.114) | -0.062 (0.128) | -0.378* (0.228) | -0.019 (0.210) | -0.031 (0.301) | -0.155 (0.164) | -0.500 (0.534) |
| T6 (UE) | -0.293*** (0.112) | 0.007 (0.241) | -0.166 (0.202) | -0.261** (0.118) | -0.336** (0.131) | -0.241 (0.237) | 0.094 (0.217) | -0.408 (0.293) | -0.436*** (0.167) | -0.264 (0.562) |
| T4 (gas prices) | -0.156 (0.110) | -0.246 (0.256) | 0.081 (0.206) | -0.227* (0.117) | -0.171 (0.131) | -0.294 (0.233) | -0.057 (0.213) | -0.221 (0.321) | -0.225 (0.165) | -0.621 (0.539) |
| T2 (past inflation) | -0.065 (0.110) | 0.169 (0.238) | 0.234 (0.199) | -0.092 (0.116) | -0.016 (0.131) | -0.283 (0.224) | 0.179 (0.206) | -0.186 (0.292) | -0.047 (0.165) | -0.645 (0.555) |
| T3 (inflation target) | -0.273** (0.111) | -0.488** (0.228) | -0.251 (0.207) | -0.316*** (0.116) | -0.436*** (0.131) | -0.298 (0.219) | 0.021 (0.213) | -0.524* (0.297) | -0.362** (0.162) | 0.609 (0.537) |
| T7 (Fed inflation forecast) | -0.286** (0.113) | 0.075 (0.232) | -0.311 (0.209) | -0.170 (0.117) | -0.304** (0.134) | -0.370 (0.227) | 0.150 (0.208) | -0.436 (0.322) | -0.272 (0.166) | -0.354 (0.516) |
| T8 (FOMC statement) | -0.204* (0.112) | 0.163 (0.230) | 0.098 (0.207) | -0.193* (0.117) | -0.090 (0.130) | -0.138 (0.246) | -0.235 (0.210) | -0.435 (0.292) | -0.276 (0.169) | -0.352 (0.570) |
| T9 (USA today coverage) | -0.254** (0.112) | -0.088 (0.237) | -0.426** (0.203) | -0.147 (0.118) | -0.247* (0.132) | -0.562** (0.235) | 0.099 (0.206) | -0.352 (0.294) | -0.364** (0.159) | 0.229 (0.554) |
| Observations | 11,587 | 2,056 | 3,633 | 9,844 | 8,723 | 2,071 | 2,848 | 1,615 | 4,672 | 532 |
| R-squared | 0.001 | 0.005 | 0.005 | 0.001 | 0.002 | 0.003 | 0.002 | 0.004 | 0.002 | 0.017 |

Notes: The table reports the average change in inflation expectations of individuals in each treatment group relative to those in the control group, broken down along observable characteristics of individuals. Columns (1) and (2) differentiate respondents by their race. Columns (3) and (4) differentiate respondents by whether they report being the sole shopper for their household or share the shopping with others. Columns (5) to (7) differentiate respondents by the number of bins on which they assign positive probabilities when completing the distributional inflation expectations question. Columns (8) to (10) differentiate respondents based on the amount of seconds it took them to complete the distributional inflation expectations question. In each case, revisions in beliefs are measured using the inflation forecasts from the second wave of the survey relative to initial beliefs from the first wave measured before all treatments. Treatments are described in detail in the text. Results are from Huber robust regressions to control endogenously for outliers. Robust standard errors are reported in parentheses.

Appendix Table 2 (continued): Heterogeneous Three-Month Effects of Treatments on Inflation Expectation

| Breakdown of Sample: | By Gender | | By Income | | | By Education | | |
|-----------------------------|----------------------|--------------------|---------------------|-------------------|---------------------|----------------------|-------------------------------|-------------------|
| | Female | Male | Bottom Tercile | Middle Tercile | Highest Tercile | High school of less | Assoc. degree or some college | College or more |
| Treatment Group: | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| T5 (pop growth) | -0.010 (0.129) | -0.266* (0.154) | -0.049 (0.181) | -0.139 (0.213) | -0.123 (0.140) | -0.645 (0.580) | -0.035 (0.456) | -0.008 (0.292) |
| T6 (UE) | -0.322** (0.130) | -0.050 (0.163) | -0.182 (0.180) | -0.058 (0.219) | -0.360** (0.147) | -1.538*** (0.546) | -1.165** (0.476) | -0.057 (0.285) |
| T4 (gas prices) | -0.111 (0.133) | -0.245 (0.154) | -0.231 (0.178) | 0.074 (0.213) | -0.231 (0.151) | -0.641 (0.552) | 0.517 (0.482) | -0.059 (0.268) |
| T2 (past inflation) | -0.024 (0.132) | -0.005 (0.152) | -0.028 (0.189) | 0.157 (0.216) | -0.092 (0.139) | -1.682*** (0.600) | -0.147 (0.453) | 0.269 (0.266) |
| T3 (inflation target) | -0.341*** (0.131) | -0.266* (0.155) | -0.377** (0.174) | -0.356 (0.220) | -0.247* (0.147) | 0.155 (0.534) | -0.011 (0.440) | -0.391 (0.289) |
| T7 (Fed inflation forecast) | -0.301** (0.133) | -0.078 (0.157) | -0.356* (0.184) | -0.064 (0.221) | -0.181 (0.144) | -1.131* (0.592) | -0.028 (0.447) | 0.398 (0.254) |
| T8 (FOMC statement) | -0.135 (0.132) | -0.118 (0.157) | -0.109 (0.182) | -0.079 (0.214) | -0.168 (0.147) | -0.394 (0.554) | -0.169 (0.488) | 0.037 (0.316) |
| T9 (USA today coverage) | -0.228* (0.130) | -0.205 (0.162) | -0.281 (0.181) | -0.146 (0.215) | -0.212 (0.148) | 0.311 (0.593) | -0.189 (0.466) | -0.009 (0.283) |
| Observations | 10,230 | 3,413 | 4,668 | 4,043 | 4,932 | 1,890 | 3,375 | 7,120 |
| R-squared | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.017 | 0.007 | 0.003 |

Notes: The table reports the average change in inflation expectations of individuals in each treatment group relative to those in the control group, broken down along observable characteristics of individuals. Columns (1) and (2) separate households by gender, columns (3) to (5) consider where individuals rank in the income distribution of all respondents by tercile, columns (6) to (8) classify respondents using the highest level of education in the household. In each case, revisions in beliefs are measured using the inflation forecasts from the second wave of the survey relative to initial beliefs from the first wave measured before all treatments. Treatments are described in detail in the text. Results are from Huber robust regressions to control endogenously for outliers. Robust standard errors are reported in parentheses.

Appendix Table 3: Treatment effects by initial inflation expectations.

| | Outcome: forecast revision immediately after treatment | | | |
|-----------------------------|--|---------------------|--|----------------------|
| | Pre-treatment expected inflation <2% | | Pre-treatment expected inflation \geq 2% | |
| | (1) | (2) | (3) | (4) |
| T5 (pop growth) | 0.197 (0.143) | 0.080 (0.149) | -0.597*** (0.138) | -0.645*** (0.146) |
| T6 (UE) | 0.013 (0.144) | 0.042 (0.151) | -0.624*** (0.138) | -0.664*** (0.149) |
| T4 (gas prices) | 1.957*** (0.166) | 1.781*** (0.171) | 1.264*** (0.147) | 1.221*** (0.157) |
| T2 (past inflation) | 0.239* (0.141) | 0.180 (0.149) | -2.048*** (0.135) | -2.111*** (0.143) |
| T3 (inflation target) | 0.144 (0.139) | 0.023 (0.148) | -1.774*** (0.132) | -1.792*** (0.142) |
| T7 (Fed inflation forecast) | -0.106 (0.135) | -0.132 (0.143) | -1.872*** (0.135) | -1.922*** (0.143) |
| T8 (FOMC statement) | -0.098 (0.137) | -0.173 (0.145) | -1.988*** (0.134) | -1.949*** (0.142) |
| T9 (USA today coverage) | 0.064 (0.143) | -0.088 (0.151) | -0.883*** (0.138) | -0.952*** (0.146) |
| Remove outliers | Yes | Yes | Yes | Yes |
| Using sampling weights | Yes | Yes | Yes | Yes |
| Controls for demographics | No | Yes | No | Yes |
| Observations | 7,157 | 6,555 | 12,020 | 11,016 |
| R ² | 0.040 | 0.070 | 0.081 | 0.102 |

Notes: the table reports estimated treatment effects for respondents who report pre-treatment expected inflation above 2% (columns 3 and 4) and 2% or below (columns 1 and 2). See notes to Table 2 for more details.

Appendix Table 4: Descriptive Statistics of the Survey, Unfiltered Data

| | Pre-treatment expected inflation | | | Pre-treatment perceived inflation | | | Pre-treatment perceived inflation target of the Fed | | |
|-----------------------------------|----------------------------------|------|---------|-----------------------------------|------|---------|---|-------|---------|
| | Median | Mean | St.Dev. | Median | Mean | St.Dev. | Median | Mean | St.Dev. |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| All | 3 | 3.62 | 5.12 | 3 | 4.60 | 6.25 | 5 | 17.83 | 30.21 |
| Male | 3 | 3.20 | 4.34 | 3 | 3.82 | 4.80 | 3 | 10.89 | 24.62 |
| Female | 3 | 3.79 | 5.41 | 3 | 4.94 | 6.76 | 5 | 20.31 | 31.61 |
| White | 3 | 3.55 | 4.94 | 3 | 4.54 | 6.13 | 5 | 15.87 | 28.49 |
| Non-white | 3 | 3.83 | 5.64 | 3 | 4.79 | 6.61 | 10 | 23.99 | 34.36 |
| Income: tercile 1 (low) | 3 | 3.87 | 5.92 | 3 | 5.19 | 7.04 | 10 | 23.84 | 35.87 |
| Income: tercile 2 | 3 | 3.73 | 4.98 | 3 | 4.73 | 6.46 | 5 | 19.33 | 30.93 |
| Income: tercile 3 | 3 | 3.37 | 4.48 | 3 | 4.12 | 5.44 | 3 | 12.55 | 23.52 |
| Enough credit | 3 | 3.44 | 4.49 | 3 | 4.32 | 5.63 | 4 | 13.42 | 25.87 |
| Not enough credit | 3 | 4.19 | 5.59 | 3 | 5.22 | 7.01 | 7 | 21.02 | 31.46 |
| HTM: less than 1 month in savings | 3 | 4.03 | 5.29 | 3 | 5.11 | 6.77 | 5 | 18.65 | 29.79 |
| HTM: 1-6 months in savings | 3 | 3.55 | 4.20 | 3 | 4.15 | 5.29 | 3 | 9.92 | 22.25 |
| HTM: 6+ months in savings | 3 | 3.13 | 3.55 | 3 | 3.60 | 4.28 | 3 | 8.61 | 18.63 |
| Plan to buy durable | 3 | 3.63 | 4.82 | 3 | 4.72 | 6.37 | 5 | 16.34 | 28.08 |
| No plan to buy durable | 3 | 3.61 | 5.21 | 3 | 4.57 | 6.21 | 5 | 18.31 | 30.85 |
| No financial wealth | 3 | 3.60 | 5.97 | 2 | 4.96 | 7.04 | 10 | 24.20 | 35.20 |
| Positive financial wealth | 3 | 3.63 | 4.55 | 3 | 4.41 | 5.76 | 4 | 13.10 | 24.86 |
| Saving rate: 0 | 3 | 4.30 | 5.72 | 3 | 5.26 | 7.18 | 6 | 20.65 | 31.72 |
| Saving rate: 0-10 | 3 | 3.69 | 4.39 | 3 | 4.56 | 5.78 | 4 | 12.42 | 23.85 |
| Saving rate: 10+ | 3 | 3.40 | 4.30 | 3 | 4.32 | 5.48 | 3 | 13.41 | 25.11 |
| Do grocery: me/self | 3 | 3.57 | 4.95 | 3 | 4.55 | 6.29 | 5 | 16.40 | 28.24 |
| Do grocery: share | 3 | 3.65 | 5.17 | 3 | 4.63 | 6.25 | 5 | 18.25 | 30.69 |
| Education: high school or less | 3 | 3.67 | 5.83 | 3 | 5.07 | 7.20 | 10 | 26.92 | 37.24 |
| Education: some college | 3 | 3.75 | 5.31 | 3 | 4.83 | 6.55 | 5 | 18.18 | 29.86 |
| Education: college or more | 3 | 3.48 | 4.46 | 3 | 4.16 | 5.32 | 3 | 12.08 | 23.68 |

Notes: The table reports average values and cross-sectional deviations of expected inflation over the next twelve months (columns 1-3), perceived inflation over the previous twelve months (columns 4-6) and beliefs about the Federal Reserve's inflation target (columns 7-9). Data are not restricted/filtered in any way. Rows indicate which subset of the sample is used. Each row captures an observable characteristic of the respondent on which we condition. All moments are computed using the Huber robust method.

Appendix Table 5: Treatment Effects over Time using only Repeat Participants

| Treatments | Outcome: forecast revision | | | | | |
|-----------------------------|----------------------------|-----------|-------------------------|-----------|-------------------------|---------|
| | Immediate revision | | Revision after 3 months | | Revision after 6 months | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| T5 (pop growth) | -0.267* | -0.282* | -0.053 | -0.073 | 0.153 | 0.183 |
| | (0.155) | (0.155) | (0.104) | (0.108) | (0.112) | (0.114) |
| T6 (UE) | -0.420*** | -0.451*** | -0.247** | -0.261** | -0.024 | -0.030 |
| | (0.154) | (0.155) | (0.107) | (0.111) | (0.109) | (0.112) |
| T4 (gas prices) | 1.259*** | 1.220*** | -0.128 | -0.156 | -0.029 | -0.027 |
| | (0.163) | (0.165) | (0.107) | (0.111) | (0.111) | (0.112) |
| T2 (past inflation) | -1.057*** | -1.131*** | 0.081 | 0.024 | 0.262** | 0.235** |
| | (0.154) | (0.156) | (0.106) | (0.110) | (0.111) | (0.113) |
| T3 (inflation target) | -0.882*** | -0.940*** | -0.320*** | -0.388*** | 0.051 | 0.010 |
| | (0.151) | (0.154) | (0.107) | (0.111) | (0.109) | (0.112) |
| T7 (Fed inflation forecast) | -1.091*** | -1.181*** | -0.151 | -0.180 | 0.136 | 0.118 |
| | (0.151) | (0.153) | (0.108) | (0.111) | (0.109) | (0.112) |
| T8 (FOMC statement) | -1.213*** | -1.265*** | -0.100 | -0.142 | 0.095 | 0.086 |
| | (0.149) | (0.151) | (0.106) | (0.110) | (0.113) | (0.116) |
| T9 (USA today coverage) | -0.572*** | -0.662*** | -0.156 | -0.163 | 0.191* | 0.159 |
| | (0.153) | (0.155) | (0.107) | (0.111) | (0.110) | (0.113) |
| Remove outliers | Yes | Yes | Yes | Yes | Yes | Yes |
| Using sampling weights | Yes | Yes | Yes | Yes | Yes | Yes |
| Controls for demographics | No | Yes | No | Yes | No | Yes |
| Observations | 9,097 | 8,743 | 9,761 | 9,353 | 9,873 | 9,438 |
| R ² | 0.042 | 0.063 | 0.002 | 0.013 | 0.001 | 0.015 |

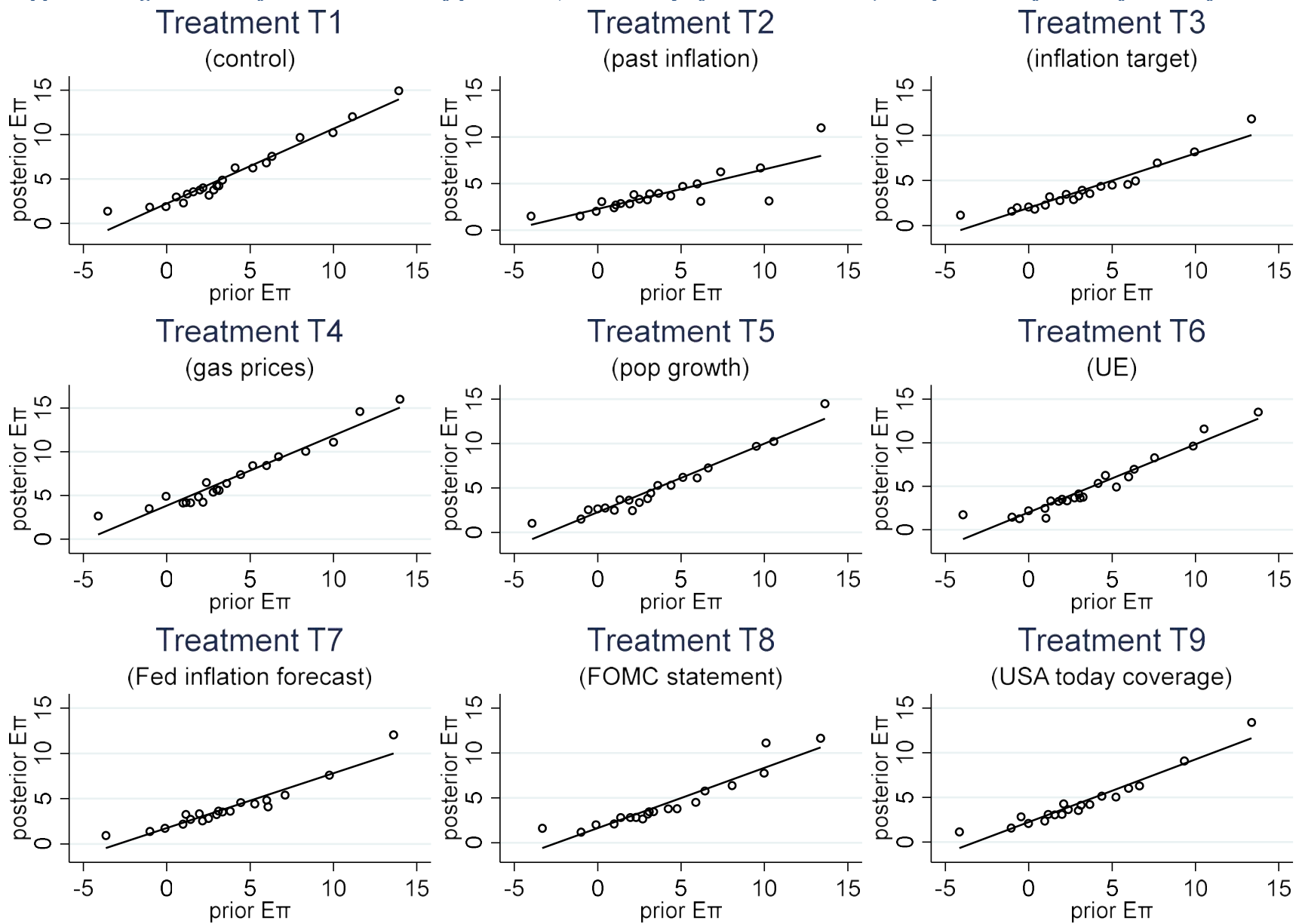
Notes: The table reports the average change in inflation expectations of individuals in each treatment group relative to those in the control group. Columns (1) and (2) consider the immediate change in expectations after the treatment, columns (3) and (4) consider the changes in beliefs after three months, columns (5) and (6) report changes in beliefs over a six month horizon. In each case, differences in beliefs are measured relative to initial beliefs from the first wave measured before all treatments. Treatments are described in detail in the text. For each time horizon, the second column uses the same specification as in the first column but augmented with respondent-specific controls. Results are from Huber robust regressions to control for outliers and influential observations. Robust standard errors are reported in parentheses. Only respondents who participate in all waves are included.

Appendix Table 6: Balancedness Tests across Treatment Arms

| | Treatment | | | | | | | | |
|----------------|------------------|------------------------|--------------------------|--------------------|--------------------|------------------|--------------------------------|------------------------|----------------------------|
| | T1 (control) | T2 (past inflation) | T3 (inflation target) | T4 (gas prices) | T5 (pop growth) | T6 (UE) | T7 (Fed inflation forecast) | T8 (FOMC statement) | T9 (USA today coverage) |
| Age | 50.36 (15.03) | 50.87 (14.85) | 51.29 (14.96) | 51.89 (15.28) | 50.74 (15.06) | 50.39 (14.83) | 50.60 (14.86) | 51.19 (14.54) | 50.28 (14.99) |
| Male share | 0.30 (0.46) | 0.28 (0.45) | 0.29 (0.46) | 0.31 (0.46) | 0.29 (0.46) | 0.28 (0.45) | 0.29 (0.45) | 0.29 (0.45) | 0.29 (0.45) |
| White share | 0.74 (0.44) | 0.74 (0.44) | 0.75 (0.44) | 0.76 (0.43) | 0.76 (0.42) | 0.74 (0.44) | 0.77 (0.42) | 0.73 (0.45) | 0.75 (0.43) |
| Household size | 2.55 (1.35) | 2.51 (1.29) | 2.49 (1.34) | 2.50 (1.30) | 2.44 (1.29) | 2.55 (1.31) | 2.47 (1.31) | 2.48 (1.30) | 2.52 (1.34) |
| Employed share | 0.57 (0.50) | 0.56 (0.50) | 0.54 (0.50) | 0.52 (0.50) | 0.57 (0.49) | 0.56 (0.50) | 0.54 (0.50) | 0.53 (0.50) | 0.57 (0.50) |
| Income (*000) | 63.97 (37.58) | 67.41 (37.08) | 63.77 (37.79) | 63.42 (37.77) | 64.24 (37.60) | 65.82 (37.80) | 64.16 (37.09) | 64.40 (37.48) | 65.06 (37.16) |
| Saving rate | 10.51 (15.00) | 10.40 (14.09) | 10.14 (14.31) | 10.44 (15.17) | 10.03 (14.75) | 10.84 (15.20) | 10.08 (13.90) | 9.35 (13.19) | 10.95 (15.19) |

Notes: The table reports means and standard deviations (in parentheses) for different observable characteristics of respondents in each treatment arm, using sampling weights. The first row of the table indicates treatment arms for which moments are reported.

Appendix Figure 1. The joint distribution of posterior (immediately after the treatment) and prior beliefs about future inflation.



Notes: the figure reports a binscatter plot of 12-month-ahead inflation expectations before treatment and immediately after treatment. Each circle represents 2.5 percent of the sample. The line shows fitted regression.