Central Bank Announcements: Big News for Little People?

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Abstract

Little is known on how and whether central bank announcements affect consumers' beliefs about policy-relevant economic figures. This paper focuses on consumers' perceptions and expectations of inflation and interest rates and confidence therein. Based on a sound identification (running surveys shortly before and after communication events), and relying on above 15 000 observations, spanning over 12 FOMC press conferences between December 2015 and June 2018, we document the impact of the central bank communication on the general public. While announcement events have no measurable direct effect on average beliefs, they make people more likely to receive news about the central bank's policy. In general, informed consumers tend to have lower perceptions and expectations, higher confidence and, at least for perceived inflation, smaller errors.

Keywords: perceptions, expectations, central bank communication, consumers.
JEL classification: E52; E58.

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1. Introduction

Policy communication has long been a crucial tool for central banks to steer expectations and arguably became more so with the onset of the most recent global financial crisis and the introduction of forward guidance. While there is plenty of empirical support for the impact of central bank announcements on financial markets and, to some extent, on professional forecasters, there is almost no evidence on how these announcements influence the mindset of consumers.[1] Consequently, Blinder et al. (2008) p. 941, emphasize, "Virtually all the research to date has focused on central bank communication with the financial markets. It may be time to pay some attention to communication with the general public." This is particularly relevant as expectations of market professionals and consumers may significantly differ.[2] Understanding the effect of a central bank's communication on the information set and the resulting beliefs of the general public is pivotal for central banks because the effectiveness of monetary policy depends on how well people understand its goals and strategies (Bernanke, 2007), and at the same time critical for consumers themselves, as their potential non-response to or misinterpretation of the central bank's actions might reduce welfare by guiding into inferior choices. Given the current efforts of many central banks to use new channels of communication, such as social media, to reach out to the general public, it is important to establish whether and to which extent news about the central bank policy comes to consumers under the current communication regime.

The lack of empirical evidence on consumers' awareness of the moves of the central bank and on its implications is mainly due to the fact that existing datasets do not allow for a timely tracking of consumers' beliefs, and the information collected does not suffice

[1] Policy announcements by central banks have been shown to affect financial markets (see e.g. Conrad & Lamla (2010) for exchange rates, Faust et al. (2007) for interest rates and exchange rates, Rosa & Verga (2008) for asset prices), and there is some evidence that communication can improve professional forecasters' predictions of future interest rate changes, as compared to Taylor-rule based predictions (see, e.g., (Sturm & de Haan, 2011)). Sinha (2015) demonstrates forward guidance affects investors' beliefs about current and future risks as extracted from derivative prices.

[2] For example, Allcott (2011) finds U.S. consumers significantly overestimate future energy prices as compared to expectations derived from traded futures contracts.

for a complete assessment.[3] Typical consumer surveys, like the University of Michigan Survey of Consumers, render monthly frequency data at best, which prevents exact identification: the change in expectations between months is blurred by a number of events happening within this period, not only the policy announcement. To tackle this issue, we conduct a series of original surveys tailored to our needs in terms of both the identification and the variables capturing the effects of announcements. The surveys are administered in rounds of two, one just before and one right after a monetary policy announcement. This helps us to precisely pinpoint the influence of central bank announcements on the mindset of consumers. The content of the survey is catered to our needs by including questions on expectations and perceptions of inflation and interest rates. We also ask about subjects' confidence in their estimates. Along with that, we control for the information set by asking whether people have recently heard news about monetary policy and account for a large set of socioeconomic characteristics.

Specifically, we survey a stratified random sample of the general U.S. public up to two days before and after the Federal Open Market Committee (FOMC) press conference. We focus on the Federal Reserve Board because it is the only central bank at the time of writing, which began and was widely believed to continue to adjust their interest rate path after a decade of stable interest rates. This study covers the period from the first post-crisis interest rate hike in December 2015 to June 2018, including seven changes in the target federal funds rate. This gives us over 15 000 responses by representative individuals.

Previewing our empirical results, announcements exert little effect on consumers' perceptions and expectations of either inflation or interest rates. However, announcements trigger an increase in the proportion of people who have heard monetary policy news. People who receive news on monetary policy have lower perceptions and expectations and

[3] In his 2018 AEA meeting discussion of Haldane & McMahon (2018), Refet Gurkaynak noted that "if you wanted to look at national experiments, ... you had to do this with financial market data, because financial market data is high frequency, and... you can't survey people all the time. [But] you don't have to survey them all the time, you just have to survey them right before the announcement goes out and right after the announcement goes out." This is exactly what we do in this paper.

higher confidence in their beliefs. Furthermore, we find some evidence that they also have more accurate beliefs about inflation.

Theoretically, if expectations are rational, as in Cukierman & Meltzer (1986) and Faust & Svensson (2001), the press conference itself does not matter for beliefs, yet the dissemination of news (the information set) does. One could model the impact of communication events by splitting the expectation formation process into two regimes: after the communication event, when the central bank credibly announces its monetary policy, people have to incorporate this news in their expectation model (this approach is adopted, for example, in Eusepi & Preston, 2010, 2012). Prior to the announcement news coverage and expert opinions already equip consumers with easily interpretable and ready to use information. An announcement by the central bank thus potentially affects expectations of consumers in two ways: first, by increasing the precision of the information about future developments, due to the actual information content of news, and, second, by increasing the probability of being exposed to news as the amount of news grows. Some consumers would have received expert reports before the announcement, and, if experts' forecasts are correct, these consumers' beliefs may be unaffected by the press conference. Others would miss news both before and after the announcement, and also remain unaffected. But there may be a cohort of consumers who did not receive news before the announcement, yet higher news coverage after the announcement makes them informed. If it also affects their expectations, the average expectation in the sample may change. We study therefore both the overall effect, and the two channels - updating of beliefs, conditional on the information set, and changes in the exposure to news.

This paper is linked to several strands of research. In terms of how central bank communication affects non-expert beliefs, it relates to Binder (2017a), Haldane & McMahon (2018), Coibion et al. (2018) and Coibion et al. (2019). Binder (2017a) discusses the rationales of the central bank communication with households and demonstrates the anchoring effect of policy communications. The latter is more pronounced for the public she conjectures is likely to be better informed. Haldane & McMahon (2018) survey MPhil students and the general public to investigate the impact of monetary policy communi-

cation on consumers' beliefs by focusing on the accessibility of the message conveyed.[4] Coibion et al. (2018) look at inflation expectations of managers. In particular, managers, similar to consumers, expect higher inflation than professional forecasters do. Additional information on monetary policy changes their firms' investment behavior. While this supports the relevance of central bank communication, the effect is short-lived, and the authors conclude that more aggressive and direct means of communication are needed. Coibion et al. (2019) conduct a randomized controlled trial of U.S. households and analyze how different types of communication regarding monetary policy affect consumers' inflation expectations. They show that media coverage of FOMC statements moves expectations less than "official" communication.

With respect to beliefs themselves, our paper relates to the studies of possible drivers of expectations and perceptions of the general public. Easaw et al. (2013) as well as Dräger & Lamla (2017) analyze how expectations of consumers are adjusted and which factors might affect the adjustment process. van der Cruijsen et al. (2015) distill from a survey how much consumers know about the European Central Bank's objectives. At least two papers have analyzed the extent to which consumers and professionals understand relevant economic concepts. Carvalho & Nechio (2014) use the Michigan survey of consumers to explore how many people are aware of the Taylor rule, while Dräger et al. (2016) look at both consumers and professionals and check whether central bank communication can improve their understanding and increase the share of people whose expectations are consistent with the Taylor rule, the Phillips Curve and who are able to separate nominal from real figures; news on monetary policy are found to improve consistency.

Finally, related to the literature on the role of mass media, our findings confirm and emphasize the relevance of the media news channel of the transmission of policy announcements (Berger et al., 2011; Böhm et al., 2012; Reid et al., 2011) and characterize the mechanism of the impact of announcements on people's perceptions and expectations

[4] In their experiment, participants from the general public and Oxford MPhil students outlined their expectations for CPI inflation, unemployment and interest rates over the two-year horizon. They were then given either the traditional summary of the decision of the Bank of England's Monetary Policy Committee, or the simplified version of it, and subsequently, an opportunity to adjust their reported beliefs.

of interest rates and inflation. Berger et al. (2011) see two primary functions for the media: (1) dissemination of the information about the central bank decisions, and (2) improving the understanding of those decisions by the public. They analyze the media coverage of the ECB announcements and find, *inter alia*, that central bank communication intensifies media coverage. Similarly, Binder (2017b) shows that media coverage of the Fed and its Chair is elevated on the day of or following a press conference. Still, its impact on expectations and decisions of the public remains unknown; in particular, it needs to be shown that increased coverage (supply of news) leads to an increased exposure (absorption of news by consumers).[5] This is an aspect where we contribute to this strand of literature.

Our main irrelevance result, i.e. no impact of announcements on either beliefs or confidence of consumers, indicates poor efficiency of the existing policy communication regime, especially in stark contrast with how markets and professionals react to announcements. The good news is that press-conferences indeed improve the outreach: more consumers receive news about the Fed. Even though one could wish even more people get the news, the burning question is whether the information that people receive about the Fed helps guide their beliefs and decisions. So far our data reveals only a very limited impact, and this is where central banks should concentrate their efforts. Yet we observe a significant gap in beliefs and confidence between informed and uninformed individuals. To ensure increased coverage affects beliefs, the work should be directed not only at making more people informed but also at making them better understand the information they receive. All in one a big agenda to make policy news matter for little people.

2. Identification strategy, survey design and data

At the heart of the paper is a sound identification strategy which allows us to better isolate the effects of announcement events on consumers' perceptions and expectations. We conduct a survey of the U.S. public in rounds that are precisely timed around regular FOMC press conferences. The timeline of our data collection per announcement event is as follows: first wave invitations are sent out on Monday morning, 2 days ahead of the

[5] That media affects financial markets is widely accepted, e.g. see Hayo & Neuenkirch (2012)

FOMC press-conference on a Wednesday, and the second wave invitations are sent out on Thursday. The speed with which responses are collected is vital for the identification. If responses in each wave are collected quickly, we end up with two non-overlapping cross-sections of expectations and perceptions taken within a maximum of 5 days between each other, minimizing the impact of other possible macroeconomic factors. Conventional ways to target respondents (letters or telephone interviews) do not allow one to collect enough responses within this short event window, therefore we resort to an online survey platform, *Surveymonkey.com*.[6] Each wave covers 400-600 responses; usually, this target is achieved within 6 hours or less. Surveymonkey incentivizes respondents by offering an opportunity to win a sweepstakes prize, earn credits to redeem for rewards, or make a donation to a charity of respondents' choice upon completion of the survey. Pre-registered users (over 18 years old) are invited to participate in the survey. The panels are balanced according to census data of age and gender; according to the provider, "location tends to balance out naturally". While the selection is intentionally random from a panel of millions of potential respondents, there is an additional guarantee that the repeated survey is not sent to the same people within any 100-day period.

The survey covers 15 questions.[7] The full questionnaire is in Appendix A. The core questions refer to perceptions and expectations of inflation and interest rates. We adapt the style of the University of Michigan Survey of Consumers for them. For instance, the question on perceived inflation is worded as "From your perspective, by how much did prices in general change during the past 12 months? Please use the drop-down menu below. For example, if you think prices on average have decreased by about 5%, choose "down by 5%"; if you think they have risen by 5%, choose "up by 5%"", and the question on interest rates is "What annual interest rate do you think an average US citizen would be charged, if they take a car loan of $ 10,000 this week? Please use the drop-down menu

[6] Binder & Rodrigue (2018) compare an online survey-based information experiment to study consumers' formation of inflation expectations with other non-web-based survey experiments and show that the web-based format yields reliable results. Other studies using data collected through Surveymonkey include, e.g., Solnick & Hemenway (2009) and Wiswall & Zafar (2015). Alternative platforms (e.g. Qualtrics, as in Bursztyn et al. (2014)) offer a similar service, yet with a different incentive scheme (participants are directly paid for responses).

[7] Having the survey short keeps subjects motivated (Vinogradov & Shadrina, 2013) and helps achieve high completion rates.

below." As central bank communication might affect not only the level of expectations but also the degree of perceived uncertainty (communication might reduce uncertainty about inflation or interest rates without changing their expected levels) we also ask how confident respondents are in their answer by using a 5-point scale. Such a confidence question follows each of the four perception/expectation questions.

An important innovation is the inclusion of the exposure to news question "During the last week, have you heard any news about the monetary policy of the Federal Reserve (Fed)? What did you hear?" The answer options are formulated as "I have heard that the Fed would raise/keep at the current level/lower interest rates" in each pre-announcement wave, and as "I have heard that the Fed is raising/keeping at the current level/lowering interest rates" in each post-announcement wave. This wording is chosen to signal the modality: the potential event (*potential mood* in linguistics) in the pre-announcement wave versus the fact (*realis mood*) post-announcement. The grammatical emphasis on "the fact" is implicit, in order to avoid explicitly mentioning the policy announcement event. The answer options also include "I have NOT heard any news about the Fed policy" and "I have heard some other news about the Fed, namely:" with a possibility of a free-text answer.[8]

In terms of control variables, the provider supplies an extensive set of characteristics we can condition on like age, gender, household income, U.S. census region or even the device type used by respondents. In addition, we assess participants' financial literacy by asking how many of the four statements (equivalent to QK4 b and QK5 a, b and c in INFE (2011)) shown in one question are true. By design, all of them are true, thus the answer gives us a measure of financial literacy on the scale 0-4. On average, slightly below 50% of participants recognize that all 4 questions are true.[9] For reference, the 2015 S&P Global FinLit Survey (Klapper et al., 2015), using a more detailed and comprehensive

[8] We check the clarity of questions by analyzing free-text responses and comments of respondents. Notably, in the post-announcement survey, many respondents who choose the "some other news" option, indicate they heard the news the Fed *intended* to decide but they didn't know what the actual decision was. This speaks in favor of our modality wording.

[9] Some 23% respondents answer that 3 out of 4 are true, 17% answer that 2 out of 4 are true, and the remainder reports that either one or none are true.

methodology, found about 57% of adults in the U.S. are financially literate, which is a comparable figure to ours.

Table 1 presents summary statistics of the main variables.[10] In our data inflation expectations have a median of 5 and fall in the same range as beliefs in D'Acunto et al. (2018) who survey U.S. consumers via the Kilts-Nielsen Consumer Panel, yet the median is higher than reported in other surveys like the University of Michigan of Consumer or the New York Fed's Survey of Consumer Expectations (average median inflation expectation of 2.6 over our period). We believe this difference is due to the sample selection. Both Michigan and FRBNY surveys operate with a sample where a large fraction of participants took part in the previous waves of the survey (up to 80% in FRBNY), and the sample selection procedure involves contacting participants who previously completed the questionnaire and thus are likely to do so again. In contrast, in our survey, an effort is made to minimize the repetition, as conducting such a survey may draw subjects' attention to news on inflation and central banks, and thus artificially inflate the fraction of informed consumers in subsequent rounds. Dräger & Lamla (2017) find that in a repeated sample absolute forecast errors decrease between interviews, which may explain lower values of inflation expectations in Michigan and FRBNY surveys. Similarly, Kim (2019) shows using the Survey of Consumer Expectations of the New York Fed that survey respondents that have been repeatedly interviewed have 2.1% lower inflation expectations. Econometrically speaking, a level difference is not relevant as long as the survey responses are meaningfully correlated with the true inflation perceptions/expectations. To further validate the quality of our survey responses, we calculate the correlation coefficient between our monthly average and the monthly average of CPI, the Michigan Survey inflation expectations and the Survey of Professional Forecaster inflation expectations. The correlation coefficient between perceived inflation based on our data and the official CPI figure

[10] Data is truncated by removing respondents who spent less than 150 seconds or more than 900 seconds to answer our questionnaire. The median time spent on the survey was 340 seconds. In trials we noted that when people make an effort to reflect on their answers it takes 3 minutes or more to complete the survey. We treat respondents with long completion times (over 900 seconds) as inattentive. Moreover, all estimations remove the top and bottom 5% of the dependent variable. Truncation by time spent on the survey sacrifices less than 3% of the sample on top of this truncation by reported values. Results are qualitatively robust to variations in these truncation criteria.

is 0.5; the correlation coefficient between expected inflation in our data and the survey of professional forecasters is 0.27. This positive and statistically significant co-movement between reality/best possible forecast and perceptions/expectations is reassuring.

The confidence variable in Table 1 is a dummy that takes a value of 1 if respondents report a confidence level of 4 or 5 on a 5-point scale. Less than half of respondents show this degree of confidence, signifying a large bit of uncertainty they face when reporting expectations and perceptions. Confidence in future values is lower than that in current rates: 43-44% respondents say they are confident in their perception of the past inflation and interest rate, while only 35-40% are confident in their estimate of the expected interest rate and inflation rate. A rather obvious explanation would be that it is harder to predict the future than to reflect on the present. Along with perceptions and expectations, confidence is our variable of interest in detecting the impact of monetary policy announcements on beliefs.

The main explanatory variable in our design is the variable "Announcement". It takes a value of 1 if the respondent belongs to the post-announcement subsample and 0 otherwise. By construction, the split between pre- and post-announcement is roughly half-half. The second key explanatory factor is the variable capturing whether the respondent reports having heard some news on the Fed in the last week ("News Fed"). Again it takes a value of 1 if the respondent reports having heard something about what the Fed would do (before the announcement) or has done (after the announcement). About 35 percent of respondents report having heard some news about the Fed. This number includes all subjects who report anything but "I have not heard any news about the Fed". The number seems low, but not unexpected as our sample consists of the general public, not professional forecasters. The variable Gender shows an appropriate balance between men and women in our sample.

3. Results

3.1. Mean Effects

We begin our analysis by comparing the densities of expectations and perceptions of inflation and interest rates before and after the announcement. In Figure 1 each

Table 1: Summary Statistics

Variable	Mean	Median	SD
Past Inflation (PastInfl)	7.64	5.00	5.89
Expected Inflation (ExpInfl)	6.04	5.00	4.69
Past Interest Rate (PastRate)	6.99	6.00	3.65
Expected Interest Rate (ExpRate)	8.14	7.00	4.37
Confidence Past Inflation	0.44		0.49
Confidence Expected Inflation	0.40		0.50
Confidence Past Interest Rate	0.44		0.49
Confidence Expected Interest Rate	0.35		0.50
News Fed	0.35		0.48
Announcement	0.50		0.50
Gender	0.51		0.50
Age	46	52	15.17

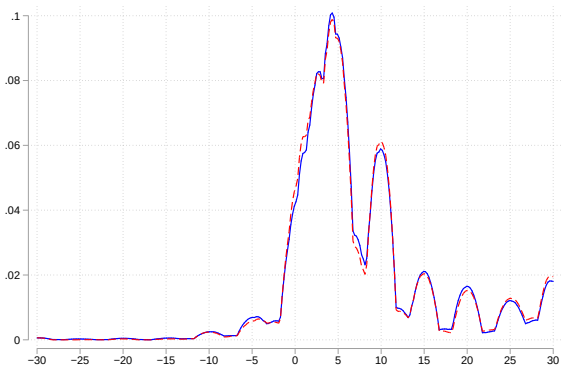
Notes: SD denotes the standard deviation of the corresponding series.

panel plots two distributions (kernel densities): the pre-announcement distribution is shown in blue and the post-announcement in red. While we observe a slightly increased concentration of the post-announcement densities with some shift to the left, the changes are not substantial: the announcement effect on expectations and perceptions of both inflation and interest rates is close to nil.

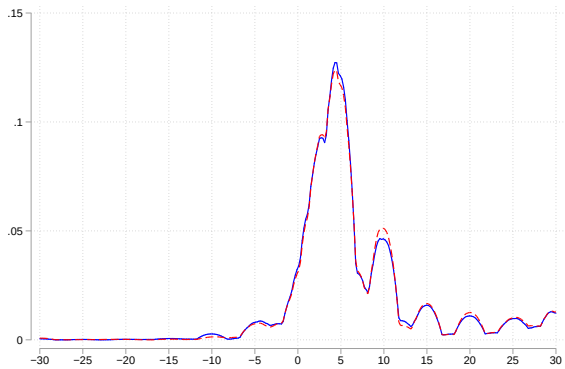
One might argue that finding almost no differences between pre- and post-announcement samples in this graph might be due to the underlying dispersion, particularly reflecting variation in actual inflation and interest rates or the monetary policy stance across announcements. To get a feeling for the relevance of this variation over time we purge the distribution by time/announcement specific effects. For this purpose we run the regression $y_i = \alpha + \tau_t + \varepsilon_i$, where τ_t accounts for time/announcement-specific fixed effects, and plot the residuals of this estimation. Figure 2 shows perceptions and expectations before and after announcements, purged by time fixed effects. The conclusion remains the same: we observe a very minor, if at all noticeable, effect of announcements. The only visible difference of this cleaning exercise is that both distributions became somewhat smoother.[11]

[11] For reasons of robustness we also purged the distribution by all time, region and demographic fixed effects. Results remain the same.

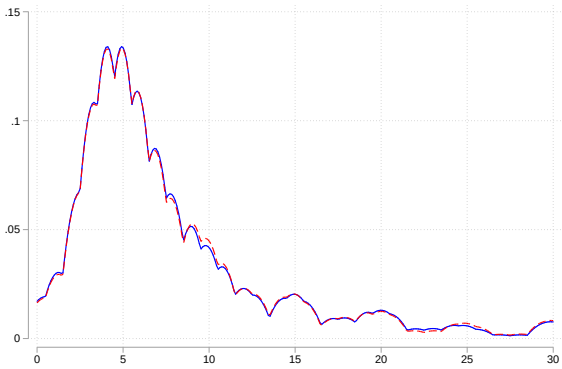
Figure 1: Effects of Monetary Policy Announcement Events



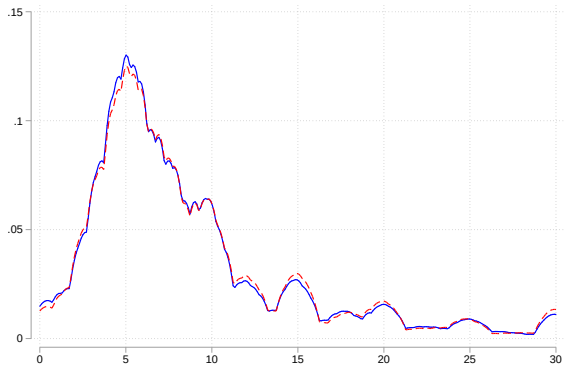
Past Inflation



Expected Inflation



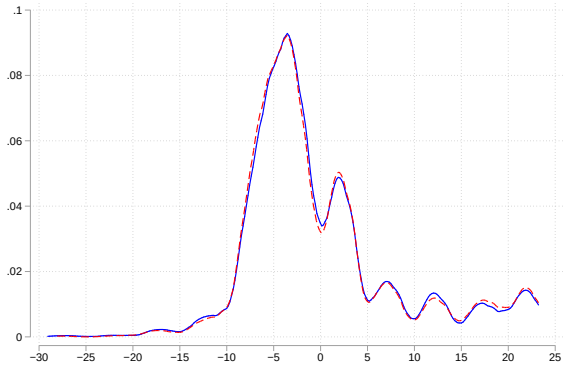
Past Interest Rate



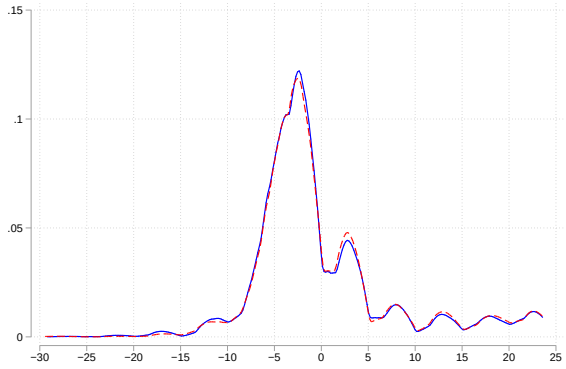
Expected Interest Rate

Notes: Kernel density plots. The blue line shows the distribution of perceptions and expectations of individual respondents 1-2 days **before** the announcement event. The red dashed line depicts the distributions of expectations and perceptions 1-2 days **after** the announcement event.

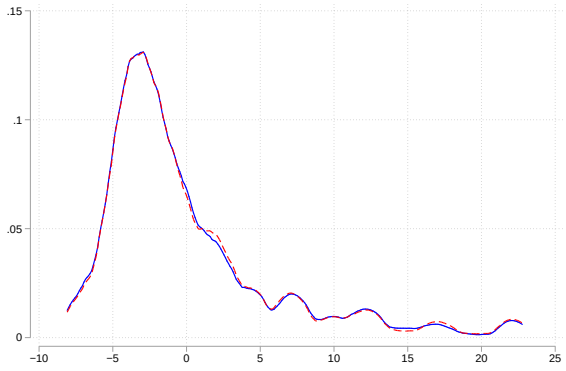
Figure 2: Effects of Monetary Policy Announcement Events Purged by Announcement Fixed Effects



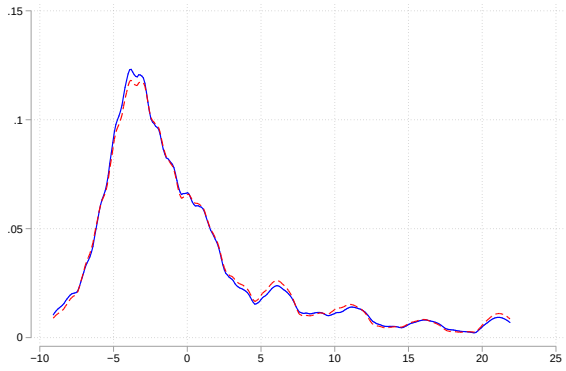
Past Inflation



Expected Inflation



Past Interest Rate



Expected Interest Rate

Notes: The blue line shows the distribution of the residuals of expectations and perceptions purged by all fixed effects 1-2 days before the announcement, while the red dashed line depicts the distributions of the residuals 1-2 days after the announcement. Specifically, they are residuals from the following estimation: $y_i = \alpha + \tau_t + \varepsilon_i$ where τ_t captures announcement event fixed effects.

Finding no announcement effect in the whole sample may be due to a failure of either the information channel (no updating of beliefs) or the news channel (low or no change in the number of informed subjects), or both. To test the relevance of the exposure to news channel, Figure 3 compares expectations and perceptions of consumers who heard some news about the Fed's monetary policy with those who did not receive such news. As in Figure 1, we use kernel densities, marking expectations and perceptions of subjects who were not exposed to the news with the blue line, and using the red line for consumers who report that they heard some news on the Fed policy decision. Figure 3 reveals a substantial and statistically significant difference[12] between the two cohorts. Generally, the densities are more centered, and perceptions and expectations are less dispersed for consumers who heard the news. Purging perceptions and expectations by time fixed effects, similarly to Figure 2, again only smoothes out the distributions (and therefore is not reported here) but does not affect the result: beliefs in cohorts with different exposure to news differ.

For a more rigorous analysis of the role of announcements, we regress perceptions and expectations of inflation and interest rates on announcement events. Given our identification approach, the following regression allows for a causal interpretation of the role of announcements on perceptions and expectations:

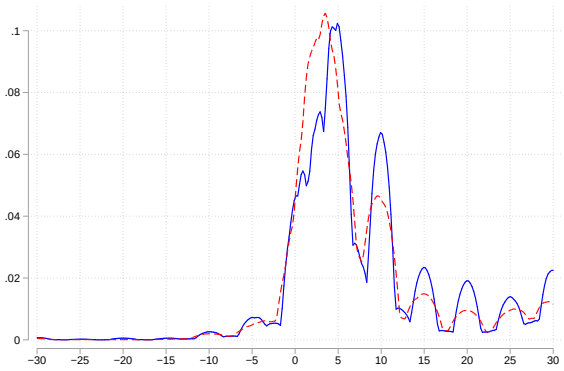
$$y_i = \alpha + \beta_A \cdot A + \Gamma Z_i + \varepsilon_i, \tag{1}$$

where A is the announcement dummy (equals 1 if the response is post-announcement, zero otherwise), and Z contains both time (announcement round) fixed effect as well as individual-specific (region, gender, financial literacy and age) fixed effects. The coefficient estimate of β_A reveals whether announcements cause adjustments in perceptions or expectations of inflation and interest rates.

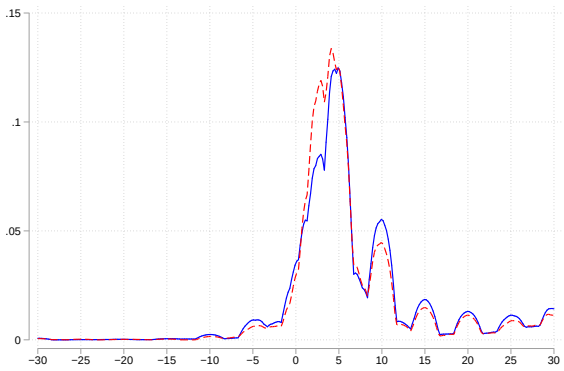
Estimates in Table 2 (Panel A) show there is no statistically significant effect of announcements on any of the beliefs we consider. To account for possible differential effects

[12] Both the Kolmogorov-Smirnov and the Epps-Singleton two-sample test of similarity of distributions lead to qualitatively identical results, not rejecting similarity of distributions before and after the announcement, but strongly rejecting similarity of distributions generated by different exposures to news at $p < .001$.

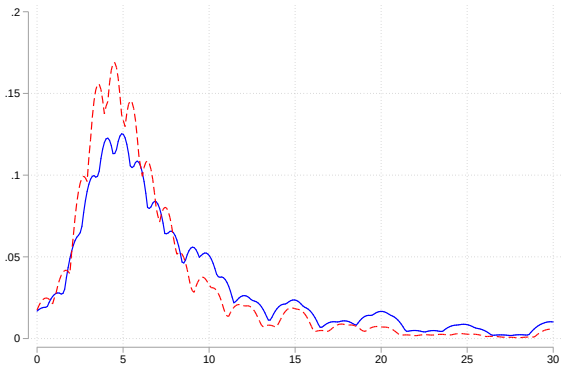
Figure 3: Effects of Monetary Policy News



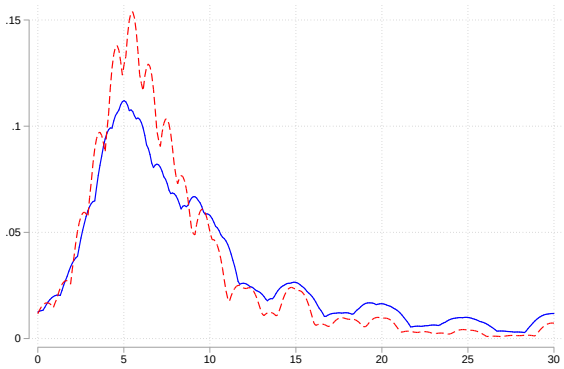
Past Inflation



Expected Inflation



Past Interest Rate



Expected Interest Rate

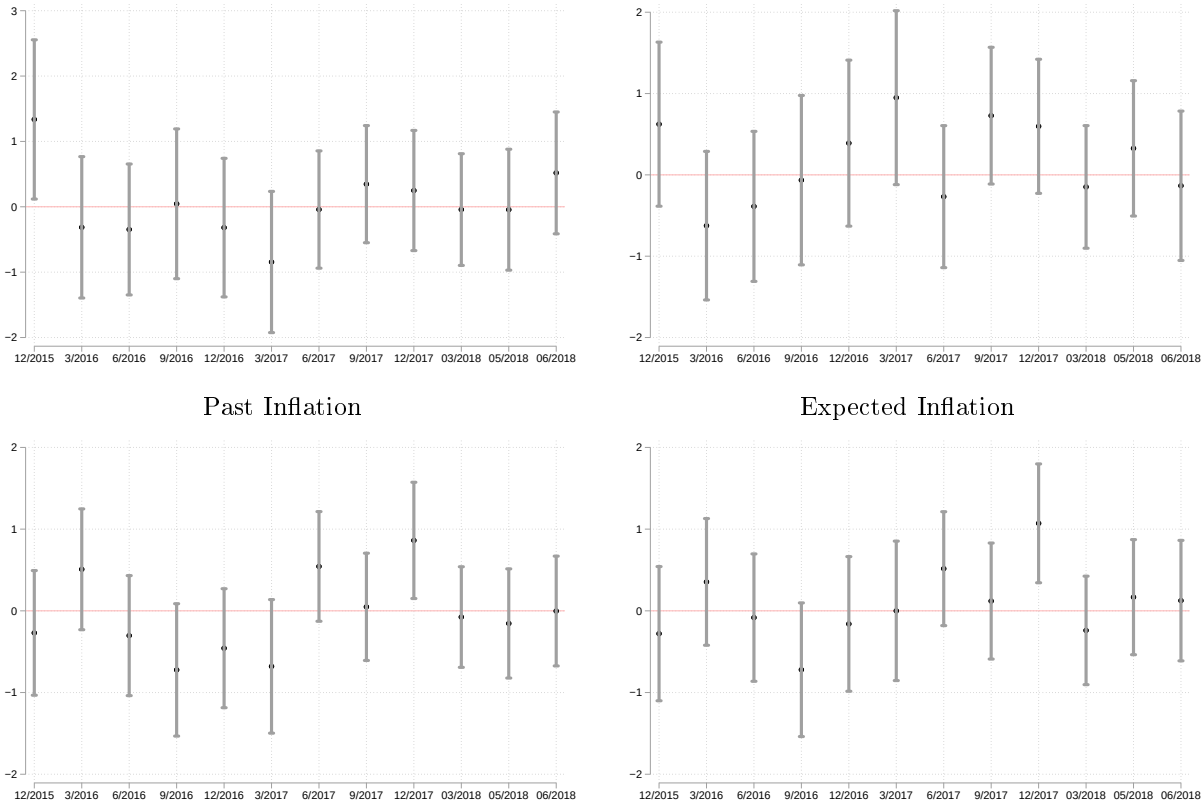
Notes: Kernel density plots. The Red dashed line shows the distribution of expectations and perceptions of individual respondents that heard news about the Fed. The Blue line depicts the distribution of expectations and perceptions of individual respondents that heard no news about the Fed.

Table 2: Effects of Announcements on the Perceptions and Expectations of Inflation and Interest rates

	(1) PastInfl	(2) ExpInfl	(3) PastRate	(4) ExpRate
Panel A	b/se	b/se	b/se	b/se
Announcement	-0.138	0.143	-0.008	-0.001
	(0.12)	(0.09)	(0.07)	(0.09)
Survey	Yes	Yes	Yes	Yes
Demographics	Yes	Yes	Yes	Yes
Regional	Yes	Yes	Yes	Yes
R^2	0.029	0.022	0.026	0.036
Panel B				
Announcement	-0.304	0.158	-0.106	-0.067
	(0.19)	(0.14)	(0.12)	(0.13)
Δi	-0.267	0.045	-0.059	0.037
	(0.17)	(0.13)	(0.11)	(0.12)
Announcement$\times\Delta i$	0.297	0.010	0.179	0.129
	(0.24)	(0.18)	(0.15)	(0.17)
Survey	No	No	No	No
Demographics	Yes	Yes	Yes	Yes
Regional	Yes	Yes	Yes	Yes
R^2	0.026	0.017	0.024	0.035
Observations	9573	10300	9789	10216

Notes: Announcement is a dummy variable being 1 after announcement and 0 before announcement. Δi is a dummy variable capturing an interest rate change (a rise by 25bp in our sample period). Survey, Demographic and Regional represent fixed effects. Robust standard errors in parentheses. ExpInfl and ExpRate denote expected inflation and interest rates 12 months ahead, while PastInfl and PastRate denote inflation and interest rates perceived over the past 12 months. ***, **,* denote significance at 99%, 95% and 90% level.

Figure 4: Announcement effects per meeting.



Past Inflation

Expected Inflation

Past Interest Rate

Expected Interest Rate

Notes: Each panel shows the estimated coefficient β_A from model (1), shown as dots, and the corresponding 90% confidence interval, shown as vertical bars. The labels of the panels coincide with the dependent variable used in the corresponding estimation of (1). Dates on the x-axis identify FOMC meetings, for which the estimates are constructed.

of announcement events, such as those with interest rate changes and those without, we interact the announcement dummy with a dummy variable capturing interest rate hikes. We opt for a dummy variable for interest rate changes as our sample has seven interest rate hikes of the same magnitude (25 basis points) and direction.[13] Again, as shown in Table 2 (Panel B), announcements have no effect on beliefs. Figure 4 provides an even deeper view by showing the estimates of the announcement coefficient in model (1) and the corresponding 90% confidence intervals for each of the FOMC meetings separately. In most instances, estimates bear no statistical significance at conventional levels, yet occasionally we observe a positive coefficient - for inflation perceptions in December 2015 (rate hike), and for interest rate perceptions and expectations in December 2017 (again, rate hike). While overall, on average, over three years of observations the effect is statistically nil, this does not yet necessarily mean announcements are irrelevant. As elaborated earlier, irrelevance occurs if receiving news about the Fed does not matter for beliefs, or if the number of people who heard news about the Fed is low, and does not change much after the announcement. We therefore now turn to the role of announcements as a trigger of news and to the relevance of news for beliefs.

Announcements may raise the fraction of informed consumers because they trigger media reports about the Fed. In our data, about 30% of consumers report having heard news about the Fed already before the announcement, yet this share rises significantly to approximately 40% in the first two days after the announcement. To test the causal impact of announcements on the probability of exposure to policy news, we estimate the following probit regression (notation is as above, and F is the probit transformation):

$$F(NewsFed_i) = \alpha + \beta_A \cdot A + \Gamma Z_i + \varepsilon_i, \tag{2}$$

which explains the probability of an individual receiving news about the Fed by FOMC announcements taking place (in other words, it measures whether more consumers report that they have received news in the days after the announcement). As the coverage of the

[13] FOMC meetings with interest rate changes were on Dec 16, 2015 – target range set at 0.25-0.50, Dec 14, 2016 – 0.50-0.75, Mar 15, 2017 – 0.75-1.00, Jun 14, 2017 – 1.00-1.25, Dec 13, 2017 – 1.25-1.50, Mar 21, 2018 – 1.50-1.75, and Jun 13, 2018 – 1.75-2.00.

Table 3: Impact of announcements on exposure to news

	NewsFed (1)	NewsFed (2)
Announcement	0.078***	0.098***
	(0.01)	(0.01)
Survey	No	Yes
Demographics	No	Yes
Regional	No	Yes
Observations	15169	12523

Note: Dependent variable is NewsFed, a dummy variable, which captures whether the individual respondent received any news about the Fed. Announcement is a dummy variable being 0 before the announcement and 1 after the announcement. Reported coefficient estimates are marginal effects of a probit regression. Standard errors in parentheses. ***, **,* denote significance at 99%, 95% and 90% level.

Fed meeting may intensify already shortly before the announcement when journalists and experts start discussing potential outcomes and their implied consequences, it is fair to say we estimate a lower bound of the announcement effect on news exposure.[14] Results for model (2) are in Table 3 with the bi-variate system ($\Gamma = 0$) reported in column 1, and added control for the whole set of socioeconomic characteristics and survey fixed effects in column 2: announcements increase the probability of receiving news about the Fed by almost 10%, which means raising the pre-announcement level of news exposure by about one third.

We now turn to the second channel and investigate if receiving news about the Fed matters for beliefs. To begin with, we estimate a model similar to (1), with the only difference that the main explanatory variable is now the $NewsFed$ dummy (equals to 1 if the respondent indicates having heard some news about the Fed, zero otherwise):

$$y_i = \alpha + \beta_{News} \cdot NewsFed + \Gamma Z_i + \varepsilon i, \tag{3}$$

[14] If we compare post-announcement data with, for instance, a week beforehand, we would likely observe an even stronger movement in the amount of additional news received. However, this would come at the cost of a weaker identification.

Table 4 (Panel A) summarises results for model (3). Odd columns report results with no controls ($\Gamma = 0$), while even columns show estimates that take all available controls into account. In all cases coefficients for the $NewsFed$ variable are significant and negative, confirming that expectations of informed consumers differ from those of uninformed, as one would expect for the information channel. Note that adding controls reduces the coefficient estimate for $NewsFed$, which is due to a reduction of such biases as, for example, self-selection (consumers with certain demographic characteristics may be more likely to follow Fed news, and at the same time may differ in expectations from the rest of the sample). In all cases, the remaining effect is still statistically significant.

The effect of the exposure to news might be different before and after the announcement. If policy announcements improve the precision and clarity of news, the effect of news should be bigger after an announcement. To test this, we amend model (3) by adding an interaction term between the news and the announcement dummies:

$$y_i = \alpha + \beta_A \cdot A + \beta_{News} \cdot NewsFed + \beta_{A \times News} \cdot A \times NewsFed + \Gamma Z_i + \varepsilon_i. \qquad (4)$$

Results are in Table 4 (Panel B): odd columns show estimates of (4) without the interaction term ($\beta_{A \times News} = 0$), and even columns - with the interaction. Compared to Panel A, estimates with $\beta_{A \times News} = 0$ in Panel B include the Announcement dummy as an additional control, and as such confirm the difference between informed and uninformed subjects, although significance drops for perceptions of inflation (as established above, there is no statistically significant difference in expected inflation between informed and uninformed cohorts). Results for the interaction effect are mixed: the interaction term is insignificant for interest rates, and although it is highly significant for inflation, interpretations qualitatively differ for perceptions and expectations. For perceptions of inflation, the gap between informed and uninformed subjects stems mainly from the post-announcement difference in beliefs (compare coefficients for NewsFed in columns 1 and 2, Panel B of Table 4). Announcements here only affect beliefs of the informed cohort[15], which speaks

[15] Additional estimations of (3) separately for subsamples of informed and uninformed subjects confirmed no effect of exposure to news on uninformed subsample and significant effect on the informed one.

Table 4: Effects of news on the perceptions and expectations of inflation and interest rates

	(1) PastInfl	(2) PastInfl	(3) ExpInfl	(4) ExpInfl	(5) PastRate	(6) PastRate	(7) ExpRate	(8) ExpRate
Panel A								
NewsFed	-1.079***	-0.530**	-0.656***	-0.234**	-0.837***	-0.561***	-0.977***	-0.554***
	(0.12)	(0.13)	(0.09)	(0.10)	(0.07)	(0.08)	(0.08)	(0.09)
Survey	No	Yes	No	Yes	No	Yes	No	Yes
Demogr.	No	Yes	No	Yes	No	Yes	No	Yes
Regional	No	Yes	No	Yes	No	Yes	No	Yes
R^2	0.008	0.030	0.005	0.021	0.012	0.039	0.012	0.039
Observations	10287	9573	10974	10300	10470	9789	10860	10216
Panel B								
Announcement	-0.091	0.197	0.168*	0.452***	0.045	0.040	0.053	0.121
	(0.12)	(0.15)	(0.09)	(0.12)	(0.07)	(0.10)	(0.09)	(0.12)
NewsFed	-0.520***	-0.131	-0.254**	0.140	-0.566***	-0.574***	-0.560***	-0.468***
	(0.13)	(0.19)	(0.10)	(0.14)	(0.08)	(0.11)	(0.09)	(0.13)
NewsFed × Announcement		-0.758***		-0.755***		0.014		-0.178
		(0.24)		(0.18)		(0.15)		(0.17)
Survey	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.030	0.031	0.023	0.024	0.031	0.031	0.039	0.039
Observations	9573	9573	10300	10300	9789	9789	10216	10216

Notes: NewsFed is a dummy variable with value 1 if a respondent has heard news about the Federal Reserve. Announcement is a dummy variable being 1 after announcement and 0 before announcement. $NewsFed \times Announcement$ is an interaction term. Survey, Demographic and Regional represent fixed effects. ExpInfl and ExpRate denote expected inflation and interest rates 12 months ahead, while PastInfl and PastRate denote inflation and interest rates perceived over the past 12 months. Robust standard errors are reported in parentheses. ***, **,* denote significance at 99%,95% and 90% level.

Table 5: Impact of News before and after Announcement on Inflation Expectation Error and Expectations Gap

	(1) ape b/se	(2) ape b/se	(3) ape b/se	(4) aeg b/se	(5) aeg b/se	(6) aeg b/se
Announcement	-0.180	-0.135	0.184	0.066	0.095	0.333***
	(0.12)	(0.12)	(0.16)	(0.09)	(0.09)	(0.12)
NewsFed		-0.539***	-0.116		-0.274***	0.046
		(0.14)	(0.19)		(0.10)	(0.14)
NewsFed × Announcement			-0.827***			-0.614***
			(0.25)			(0.18)
Survey	Yes	Yes	Yes	Yes	Yes	Yes
Demographics	Yes	Yes	Yes	Yes	Yes	Yes
Regional	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.032	0.034	0.035	0.022	0.023	0.024
Observations	8592	8592	8592	9235	9235	9235

Notes: NewsFed is a dummy variable with value 1 if a respondent has heard news about the Federal Reserve and 0 otherwise. Announcement is a dummy variable being 1 after announcement and 0 before announcement. $NewsFed \times Announcement$ is the interaction term. Survey, Demographic and Regional represent fixed effects. Standard errors in parenthesis. "ape" denotes the absolute perception gap calculated by taking the absolute value after subtracting CPI inflation from survey individual perceived inflation. Similarly "aeg" is the absolute expectations gap calculated by taking the absolute value of subtracting the average expected inflation of professional forecasters from the surveyed expected inflation of individual consumers. Standard errors in parentheses. ***, **,* denote significance at 99%,95% and 90% level.

in favor of the information channel. For expected inflation, the inclusion of the interaction term alters the coefficient and significance of the announcement dummy, which implies differences for the uninformed cohort, too: while the average belief of the informed cohort after the announcement goes down, it goes up for the uninformed subjects. Although we control for individual characteristics of respondents, we cannot completely rule out the endogeneity of exposure to news in this case (see Section 4 for a more detailed discussion). It follows that even though the causal effect of announcements on exposure to news is significant (Table 3), this exogenous variation in the exposure to news does not seem to affect beliefs apart from some effect on perceived inflation.

Our final question in this subsection is whether communication guides beliefs in the right direction. To test this we estimate models (1) and (4) where the dependent variable y is now defined as the absolute difference between the perceived inflation rate and the actual inflation rate (CPI inflation) denoted as "ape" (absolute perception error) and the absolute difference between the expected inflation rate and the average expected inflation

rate of professional forecasters (absolute expectations gap, "aeg"). Table 5 presents the results. Indeed, we observe that the absolute perception error is smaller for people that have heard the news, more so after the announcement (columns (2) and (3) respectively). If news change perceptions, as discussed above, then the result in Table 5 suggests it steers perceptions in the right direction as well. For expected inflation, being informed also means having expectations closer to those of professional forecasters, see column (5).

However the marginal contribution of the announcement here is blurred by the suspected endogeneous redistribution of subjects between the informed and the uninformed cohorts, similarly to what we discussed above with respect to Table 4.

3.2. Confidence

Apart from the mean level of perceptions and expectations, central bank communication might affect the degree to which respondents are confident in their beliefs. For instance, if a consumer sees his/her expectations confirmed by the communication of the central bank, expectations would not change, but confidence should increase. If we calculate the share of consumers who are confident[16] in their reported beliefs, our data reveals no difference in average confidence pre- and post-announcements, same as for the announcement effects on the level of expectations and perceptions. However, conditioning on exposure to news produces a sizable effect, for instance, only 28% of consumers who heard no news are confident in their estimates of future interest rates, while in the cohort of those who have heard the news, this share increases to 41%.

To investigate the importance of announcements and news for the probability of being confident, we estimate the following probit regression:

$$F(Confidence_i) = \alpha + \beta_A \cdot Announcement + \Gamma Z_i + \varepsilon_i. \tag{5}$$

Again, we control for individual socioeconomic characteristics, region, financial literacy and time effects, all reflected in Z. Results are in Table 6, where panels A and B are analogous to the level analysis in Table 2. Similar to the level results, in Panel A we

[16] A respondent is classified as confident if (s)he indicates confidence of 4 or 5 on the five-point scale, otherwise we deem the respondent as lacking confidence.

observe no direct effect of announcements on confidence, and in Panel B conditioning the announcement effect on types of announcements (with or without interest rate change) does not matter. Panel C estimates

$$F(Confidence_i) = \alpha + \beta_A \cdot A + \beta_{News} \cdot NewsFed + \beta_{A \times News} \cdot A \times NewsFed + \Gamma Z_i + \varepsilon_i. \quad (6)$$

, where A stands again for Announcement. The results again highlight the relevance of receiving news. Receiving news implies a 8% higher probability of being confident in their own beliefs. Again, we observe differences in the estimates before and after the announcement, which are falling after the announcement; this is opposite to the direction observed for the means. Given the overall nil effect of the announcement, we cannot attribute it to the surprise component of news or the lack of clarity in policy communication (these would only affect the informed cohort, hence contributing to the average effect). A redistribution argument may again apply if subjects with low confidence are more likely to receive news after the announcement than before, and if their confidence does not change - in this case, the average confidence in the informed cohort would go down, while the average confidence of the uninformed cohort would go up, explaining the result in Panel C. The exact mechanics of this effect requires further investigation, yet it is clear that our $NewsFed$ variable captures individual characteristics beyond those already controlled for by standard demographics data.

The results of this section extend the irrelevance result for monetary policy announcements from levels of expectations to confidence, i.e. to uncertainty individual consumers face when assessing policy-relevant variables. In times of ultra-low interest rates, providing certainty might arguably be at least as important as steering expectations.

3.3. Press Conferences

Over the past years, there has been a substantial increase in the level of communication to the general public. Empirical studies provide evidence that with press conferences and forward guidance the central bank can influence expectations. However, there is no evidence whether holding a press conference in comparison to, for instance, announcing the federal funds target rate, has any value-added. Our data allows us to judge directly

Table 6: Announcements and Confidence

	(1) PastInfl	(2) ExpInfl	(3) PastRate	(4) ExpRate
Panel A	b/se	b/se	b/se	b/se
Announcement	0.003	-0.008	-0.009	-0.002
	(0.01)	(0.01)	(0.01)	(0.01)
Survey	Yes	Yes	Yes	Yes
Demographics	Yes	Yes	Yes	Yes
Regional	Yes	Yes	Yes	Yes
Panel B				
Announcement				
$\Delta i = 0$	-0.002	-0.001	-0.009	-0.006
	(0.02)	(0.02)	(0.02)	(0.01)
$\Delta i = 0.25$	0.007	-0.013	-0.009	0.001
	(0.01)	(0.01)	(0.01)	(0.01)
Survey	No	No	No	No
Demographics	Yes	Yes	Yes	Yes
Regional	Yes	Yes	Yes	Yes
Panel C				
NewsFed				
Before Announcement	0.115***	0.106***	0.102***	0.113***
	(0.02)	(0.02)	(0.02)	(0.01)
After Announcement	0.038***	0.062***	0.043***	0.057***
	(0.01)	(0.01)	(0.01)	(0.01)
Survey	Yes	Yes	Yes	Yes
Demographics	Yes	Yes	Yes	Yes
Regional	Yes	Yes	Yes	Yes
Observations	10459	11233	10722	11188

Notes: Announcement is a dummy variable being 1 after announcement and 0 before announcement. NewsFed is a dummy variable with value 1 if a respondent has heard news about the Federal Reserve and 0 otherwise. Survey, Demographic and Regional represent fixed effects. Standard errors in parentheses. Δi captures the interest rate change announced at a FOMC meeting. ExpInfl and ExpRate represent the confidence expressed in the surveyed figures of expected inflation and interest rates 12 months ahead, while PastInfl and PastRate represent the confidence expressed in the surveyed figures of inflation and interest rates perceived over the past 12 months. ***, **,* denote significance at 99%, 95% and 90% level respectively.

on the relevance of holding a press conference by comparing meetings with and without one. At the descriptive level, we observe that in weeks with a press conference the share of people receiving news about the Fed is slightly higher on average (27% without vs 36% with press conference). The share of people who have heard news about the Fed before the announcement and after the announcement in the no-press-conference sample is almost identical (approximately 27%). This is in stark contrast to the 10% increase (31% to 41%) in the share of subjects exposed to news when a press conference is being held.

To test this effect econometrically, we augment the probit analysis of the announcement effect on the exposure to news from Table 3 by adding a dummy "nopress" that equals 1 if there was no press conference, and zero if there was one. Table 7 shows having no press conferences has a negative and statistically significant (columns 1 and 2) effect on the exposure to news. As the main effect of news comes from the announcement, we add an interaction term between this dummy and the announcement. The marginal effect of this interaction is reported in column (3). Announcements with a press conference increase the probability of receiving news by 10.7% while FOMC meetings without press conferences have no effect that is statistically different from zero.

Our analysis thus reveals that holding a press conference has a remarkable added value as almost all of the positive effect of announcements on news exposure stems from press conferences. That being said, we need to highlight one shortcoming of this distinction. Meetings with and without press conferences are not perfectly identical as meetings with press conferences have been used for announcements of major policy changes as well as for the publication of the quarterly economic projections. As both interest rate change decisions and the outcome of economic projections have been widely anticipated in our sample period, most of the increased news exposure should be attributed to the content of the press conference of the FOMC meeting.

4. Discussion

Even though consumers are believed to lack knowledge and skills to digest information about monetary policy, the economy contains both the experts who make news digestible

Table 7: Relevance of Press Conference

	(1) NewsFed	(2) NewsFed	(3) NewsFed
Announcement	0.078***	0.095***	
	(0.01)	(0.01)	
NoPress	-0.072***	-0.102***	
	(0.01)	(0.01)	
Announcement Press			0.107***
			(0.01)
Announcement NoPress			0.015
			(0.03)
Survey	No	Yes	Yes
Demographics	No	Yes	Yes
Regional	No	Yes	Yes
Observations	15169	12523	12523

Note: Probit regression with NewsFed as the dependent variable. NewsFed being 1 when a respondent heard news about the Fed and 0 otherwise. Announcement is a dummy variable being 0 before the announcement and 1 after the announcement. NoPress is a dummy variable being 1 if it is a FOMC meeting without a press conference 0 otherwise. Marginal effects reported. ***, **,* denote significance at 99%,95% and 90% level respectively.

and the mass media who deliver such digestible news to consumers. If experts' expectations are rational, informed consumers predict monetary policy (changes), too, hence announcements affect neither their expectations nor their expectation errors. Still, announcements may affect the mean belief in the population by raising the news coverage and through that the exposure of people to the news. In this case, if informed and uninformed subjects differ in beliefs, the average expectations in the population should change after the announcement. Empirically we, indeed, observe a significant increase of the informed cohort after the announcement, yet there is no significant impact of announcements on average beliefs. We also observe announcements exert no significant effect on the beliefs of the informed cohort, apart from their perceptions of current inflation, which seem to update downwards. Somewhat surprisingly, confidence in the informed cohort post-announcement is also lower than pre-announcement, and this holds for all the four indicators used. In this section, we take a deeper look into these observations.

To clarify the interaction between the two channels, consider expectations formed at two dates, $t = 0$ and $t = 1$. Fraction $a(t)$ of the population, denoted as type a, are aware of monetary policy developments (we call them informed), while fraction $1-a(t)$, denoted

as type u, remain unexposed to news (we call them uninformed).[17] Let $i^{e,a}(t)$ and $i^{e,u}(t)$ be expectations of a specific interest rate, such as a car loan, of the above two groups of consumers. At each date t, the average expected interest rate $i^e(t)$ in the population is:

$$i^e(t) = a(t) \cdot i^{e,a}(t) + (1 - a(t)) \cdot i^{e,u}(t) \tag{7}$$

Before the announcement, at $t = 0$, mass media communicate expert opinions on the interest rate the Central bank can set as a target. This feeds into expectations of the informed public, $i^{e,a}(0)$. At $t = 1$ the central bank communicates its policy [target] interest rate, which affects expectations of informed consumers $i^{e,a}(1)$. Beliefs of type u consumers are unaffected by signals from the Central Bank or experts; they may still be based on historical macroeconomic data. This simple setup exposes two channels through which policy communication can impact expectations. First, this occurs through providing information that differs from expert views. This *information channel* may induce a change in $i^{e,a}(t)$ but not in $i^{e,u}(t)$. Second, the impact may come through a change in the fraction of informed subjects, $a(t)$, which is the *exposure to news channel*.

Announcements are irrelevant for expectations if $i^e(0) = i^e(1)$. This happens in one of the following four cases: (i) the exposure to news channel fails and nobody is informed, $a(1) = a(0) = 0$, (ii) some people are informed but both the news and the information channels fail, $a(1) = a(0) > 0$ and $i^{e,a}(1) = i^{e,a}(0)$, (iii) only the information channel fails, $a(1) \neq a(0)$ but $i^{e,u}(0) = i^{e,a}(0) = i^{e,a}(1)$, and (iv) none of the channels fails, but the effects through them perfectly offset each other, $a(0) \cdot [i^{e,a}(0) - i^{e,u}(0)] = a(1) \cdot [i^{e,a}(1) - i^{e,u}(0)]$. The latter happens, for example, if more people are informed after the announcement, $a(1) > a(0)$, yet their beliefs update toward those of the uninformed public, i.e. one of the following holds: either $i^{e,a}(0) > i^{e,a}(1) > i^{e,u}(0)$, or $i^{e,a}(0) < i^{e,a}(1) < i^{e,u}(0)$.[18] We may interpret case (iv) as an inefficient communication. Our results demonstrate the exposure to news channel is alive, and in particular we find

[17] Types may be seen as exogeneous to consumers and randomly drawn by nature, in which case $a(t)$ is the probability of being type a. In particular, this view is convenient to interpret the impact of mass media on $a(t)$: an increase in media coverage makes it more likely that consumers come across news, and hence probability of being informed increases.

[18] This employs irrelevance of announcements for the uninformed public, $i^{e,u}(1) = i^{e,u}(0)$.

$a(1) > a(0) > 0$ (Table 3) thus ruling out cases (i) and (ii). As for the information channel, we find that subjects who receive news have lower inflation (and interest rate) expectations and perceptions than those unexposed (Table 4, Panel A), i.e. either $i^{e,u}(0) > i^{e,a}(0)$ or $i^{e,u}(0) > i^{e,a}(1)$, ruling out the failure of the information channel. Finally, the inefficiency of policy communication (case iv) under $a(1) > a(0) > 0$ requires that if beliefs of the informed cohort are below those of the uninformed one, then for the inefficiency to hold, after announcement informed beliefs should update upwards, $i^{e,a}(1) > i^{e,a}(0)$ (convergence of beliefs toward those of the uninformed public). In our data, in contrast, they do not get updated upwards after the announcements (see interaction terms in Table 4, Panel B), which violates the above equivalence, and thus rules out the inefficient communication case. The remaining explanation for the empirical irrelevance of announcements within this simple view is the small size of the cohort of informed subjects, which possibly makes the overall impact of announcements in our sample small and statistically insignificant.

However, the cohorts of informed and uninformed consumers are not necessarily homogeneous. A concern may arise regarding possible endogeneity of exposure to news: consumers with low expectations and perceptions may be more inclined to read the news, and thus are more likely to receive news after the announcement.[19] The endogenous redistribution of consumers between the informed and the uninformed cohorts may imply changes in average expectations within each cohort while maintaining no change in the aggregate. Assume that consumers are of two types - fraction λ with low expectation $\underline{i}$ and fraction $1-\lambda$ with high expectation $\overline{i}$, a fraction $\underline{a}(t)$ of the former and $\overline{a}(t)$ of the latter is informed at each t. The average expectation in the population, $\lambda \cdot \underline{i} + (1-\lambda) \cdot \overline{i}$, is independent of t. Average expectations of the informed cohort depend on the endogenously determined proportion of high and low types in it:

$$i^{e,a}(t) = \frac{\lambda \cdot \underline{a}(t)}{a(t)} \cdot \underline{i} + \frac{(1-\lambda) \cdot \overline{a}(t)}{a(t)} \cdot \overline{i}, \tag{8}$$

where the fractions on the right-hand side are relative shares of the two types of consumers in the informed cohort, and $a(t) = \lambda \cdot \underline{a}(t) + (1-\lambda) \cdot \overline{a}(t)$ is the total mass of informed

[19] We thank our discussant, Carola Binder, for stimulating remarks on this issue.

consumers. Now both the exposure to news, $a(t)$, and the average informed beliefs, $i^{e,a}(t)$, are determined by the distribution of types, given by $\underline{a}(t)$ and $\overline{a}(t)$. If types are not controlled for, the omitted variable bias, and thus the endogeneity problem, arise. First, we control for a rich array of individual characteristics, which help describe the two types[20] and reduce the bias. Second, an endogenous redistribution of subjects between the informed and the uninformed cohorts inevitably implies a change in the expectations of the informed cohort is matched by an oppositely directed change in the expectations of the uninformed cohort.[21] This may be the case for inflation expectations (Table 4, Panel B, column (4)) but does not hold for perceptions (same table and panel, columns (1-2)). Although endogeneity alone cannot explain the result for inflation perceptions and does not completely rule out the information effect on inflation expectations, the role of the information channel appears rather limited.

A similar decomposition of channels applies to the confidence in beliefs: the information channel may affect the confidence of informed consumers, while the news exposure channel would raise the number of them. The diversity of expert opinions (even though all of them are rational) implies consumers face more uncertainty before the announcement than after, and hence confidence in expectations implied by expert reports should be lower than that in expectations based on the policy communication by the central bank. However, an increase in the share of informed subjects after the announcement means informing subjects who previously did not pay attention to monetary policy news. If their confidence is low, the average confidence of the post-announcement informed cohort may be lower than pre-announcement. This is exactly what we observe in our data. Still, we believe, a more detailed analysis is needed to investigate the effects of the announcement on those who always follow the news, or even actively seek for this type of news, and those who only sporadically receive news.

[20] In particular, gender, age, and income are important drivers of expectations, see, e.g. Leung et al. (2009).

[21] As a special case, one could fix the average belief of the uninformed cohort by assuming its composition does not change, i.e. $(1-\underline{a}(t))/(1-\overline{a}(t))$ is constant, but in this rather extreme case the average belief of the informed cohort ought to change upwards after the announcement, as there will be a disproportionate inflow of high types in the informed cohort or the informed cohort will have beliefs above those uninformed - both contradict our data. A formal exposition of this argument is available on request.

5. Conclusion

While there is ample evidence of financial markets' reaction to central bank announcements, little is known on how consumers and the greater public receive this information and how they respond to it. To address the issue, we have generated a new dataset by repeatedly running a survey of U.S. consumers just before and right after FOMC press conferences, ensuring sound identification of the announcement factor. This new data allows us to track the effect of announcements on perceptions and expectations of relevant variables as well as consumers' confidence therein. Our main finding is that FOMC announcements have no measurable effect on consumers' perceptions and expectations of inflation and interest rates.

To rationalize this result, we distinguish between two channels through which announcements potentially contribute to the expectation formation process. One is the information channel: announcements give details on the current state of the economy and the future directions of monetary policy and economic development of the country. The second one is the news exposure channel: announcements raise the probability of receiving news by the public. As for the latter, we find FOMC press-conferences increase the probability of receiving news by approximately 10%. As for the former, we do find beliefs and confidence of consumers who receive news differ from the uninformed cohort. For inflation beliefs, we observe an improvement in their quality. In striking contrast to professional forecasters and financial markets, who are known to respond to policy news, for consumers our data documents only minor effects. While the current system of policy communication succeeds to an extent in reaching out to consumers (the news channel) and affecting their expectations (the information channel), more could be done in this direction.

On average only 35% of consumers in our data are aware of the FOMC announcement during the announcement week; their share is 10% higher after the announcement than before. Of course, reaching all consumers is neither necessary nor efficient, but it should be possible to increase this informedness ratio. We find that so far press conferences have been a useful tool of drawing media attention to monetary policy announcements and through that increasing dissemination of news among the public. Receiving news, in

turn, can improve the quality of beliefs. If central banks want to use the media channel more actively, research should focus on identifying what makes media pay more attention to policy announcements, and what makes people absorb this news.

Outsourcing central bank communication to the media has an advantage of interpreting complex policy wordings in plain language accessible to the general public. This comes at a risk that simplified language might, at some point, undermine precision and thus the positive effect of spreading out news about the Fed might be offset. Several central banks, including the Fed, the ECB, the Bank of England (BoE), among others, attempt to increase the communication outreach via Twitter and other social media; the BoE has begun to use simplified language to make messages more accessible. Given our results, this makes well sense as more outreach appears useful for the quality of beliefs. Whether communicating with the public through social media is the right channel, is still a big question. On the one hand, this channel mainly covers people who are interested in receiving news about the central bank. On the other hand, this group of people almost surely includes experts who then broadcast central bank news to other people, and thus being actively present on social media with more news and policy guidance may pay off. With this in mind, it may well make sense for the central banks to keep outsourcing communication with the general public to mass media while using social networks for communication with experts and triggering more and more persistent news coverage through them. However, more research is necessary to identify the right channels, the right language and the right amount.

Our analysis highlights the importance of media as a transmission device between the central bank and the greater public. As such, it justifies the great efforts of central banks over the last 20 years to become more transparent about their policy. In particular, it reflects the importance of press conferences, which draw significant attention of media outlets, as a crucial tool in managing the expectations of the greater public. However, it also shows that more efforts are needed to increase the awareness of people about monetary policy decisions and their implications.

Acknowledgements

We thank the participants of research seminars at the University of Karlsruhe, the University of Glasgow, the ETH Zurich as well as at the Royal Economic Society Meeting in Sussex, the European Economic Association Meeting in Cologne, German Economic Society Meeting in Vienna, the Workshop on The New Challenges For Central Bank Communication in Brussels, the iCare conference in Perm, the 7th IWH/INFER Workshop on Challenges and Implications of Inflationary Dynamics in Leipzig, Workshop on Household Surveys in Macroeconomics in Hamburg. Both authors acknowledge financial support by British Academy / Leverhulme grant SG163018; data collection was partly financed through the University of Essex research awards. Vinogradov acknowledges support from the Russian Foundation for Basic Research grant RFBR 18-010-01166.

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Appendix

A. Questionnaire

Thank you for participating in our survey. We are interested in your view on current and future prices, inflation and interest rates in the United States.

The survey consists of 15 questions. It usually takes less than 5 minutes to answer them (most participants do this in 3 minutes). No special knowledge is required. There is no right or wrong answer to our questions. In fact, any answer is correct as long as it truly reflects your opinion. All responses are anonymous.

If you decide to quit the survey at any stage, please let us know why, by using a special comment field available at each page. You will also be able to give us some general feedback in the end.

Thank you for your help, and welcome to the survey!

1. From your perspective, by how much did prices in general change during the past 12 months? Please use the drop-down menu below. For example, if you think prices on average have decreased by about 5%, choose "down by 5%"; if you think they have risen by 5%, choose "up by 5%".

   Answer options: dropdown scrollable menu with options from "up by 30%" to "down by 30%".

2. How confident are you in this answer?

   Answer options: Absolutely sure, Rather sure; Neither sure, nor unsure; Rather unsure; Absolutely unsure.

3. What annual interest rate do you think an average U.S. citizen would be charged, if they take a car loan of $ 10,000 this week? Please use the drop-down menu below.

Answer options: dropdown scrollable menu with options from "0%" to "30% and above".

4. How confident are you in this answer?

Answer options: Absolutely sure, Rather sure; Neither sure, nor unsure; Rather unsure; Absolutely unsure.

5. By how much do you think prices in general will change during the next 12 months? Please use the drop-down menu below. For example, if you think prices on average will decrease by about 5%, choose "down by 5%"; if you think they will rise by 5%, choose "up by 5%".

Answer options: dropdown scrollable menu with options from "up by 30%" to "down by 30%".

6. How confident are you in this answer?

Answer options: Absolutely sure, Rather sure; Neither sure, nor unsure; Rather unsure; Absolutely unsure.

7. What annual interest rate do you think an average U.S. citizen will be charged, if they take a car loan of $ 10,000 in a year from now? Please use the drop-down menu below.

Answer options: dropdown scrollable menu with options from "0%" to "30% and above".

8. How confident are you in this answer?

Answer options: Absolutely sure, Rather sure; Neither sure, nor unsure; Rather unsure; Absolutely unsure.

9. If you had an extra $ 1,000 now, how much of this amount, in dollars, you would spend in the current situation on the following (you can also allocate the whole amount to just one option):

   - Stocks (mutual funds)
   - Safe assets (401k, pension funds, treasury bills)
   - Term deposit for 3 months or more
   - Mortgage contribution (raise mortgage deposit or make an extra payment)
   - Buy a car, holiday trip, jewelery or durable goods like a fridge/freezer
   - Other household expenses

   Answer options: free text box for each option with control that the input content is a number and the sum of all numbers equals 1000.

10. In your opinion, how many of the following four statements are true?

    (a) An investment with a high return is likely to be high risk.

    (b) High inflation means that the cost of living is increasing rapidly.

    (c) It is usually possible to reduce the risk of investing in the stock market by buying a wide range of stocks and shares.

    (d) If you put $ 100 into a no fee savings account with a guaranteed interest rate of 2% per year, at the end of five years there will be over $ 110.

    Answer options: - none of them is true - 1 is true - 2 are true - 3 are true - all 4 of them are true

11. Consider a lottery ticket with a 50% chance of winning $ 100,000 and 50% chance of getting nothing. What is the LOWEST AMOUNT of money you would accept in exchange for this lottery ticket? We assume that you would also be happy to swap the lottery ticket for any amount higher than the one you indicate.

    Answer options: from $ 60,000 to $ 5,000 with step $ 5,000, and additional two options of $ 1,000 and $ 500.

12. Consider two urns, each containing 100 balls coloured either red or blue.

    Urn A contains red and blue balls in an unknown proportion. Urn B contains 50 red balls and 50 blue balls.

    You will get a prize if you draw a RED ball. From which urn would you draw - from urn A or B?

    Answer options: - Urn A (unknown proportion) - Urn B (50/50)

13. Consider the same two urns as above, again each containing 100 balls coloured either red or blue.

    Urn A contains red and blue balls in an unknown proportion. Urn B contains 50 red balls and 50 blue balls.

    You will get a prize if you draw a BLUE ball. From which urn would you draw - from urn A or B? w

    Answer options: - Urn A (unknown proportion) - Urn B (50/50)

14. Question 14 has two version. Question 14before is asked in the wave before the announcement and Question 14after is asked after the announcement. This way we try to make sure that there is no overlap.

    Q14before

During the last week, have you heard any news about the monetary policy of the Federal Reserve (Fed)? What did you hear?

Answer options:

- I have NOT heard any news about the Fed policy
- I have heard that the Fed *would* raise interest rates
- I have heard that the Fed *would* keep interest rates at the current level
- I have heard that the Fed *would* lower interest rates
- I have heard some other news about the Fed, namely: [Open box]

Q14after

During the last week, have you heard any news about the monetary policy of the Federal Reserve (Fed)? What did you hear?

Answer options:

- I have NOT heard any news about the Fed policy
- I have heard that the Fed raised interest rates
- I have heard that the Fed kept interest rates at the current level
- I have heard that the Fed lowered interest rates
- I have heard some other news about the Fed, namely: [Open box]

15. During the last week, what were your main sources of information on economic and business conditions? Please choose up to three options.

Answer options:

- Official sources (like the webpages of the White House, the Government, statistical agencies or the Fed)
- Articles in specialised newspapers (like Financial Times, The Wall Street Journal, The Economist) - online or in print