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Publication date:

2024-01

Permanent link:

<https://doi.org/10.3929/ethz-b-000657552>

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Originally published in:

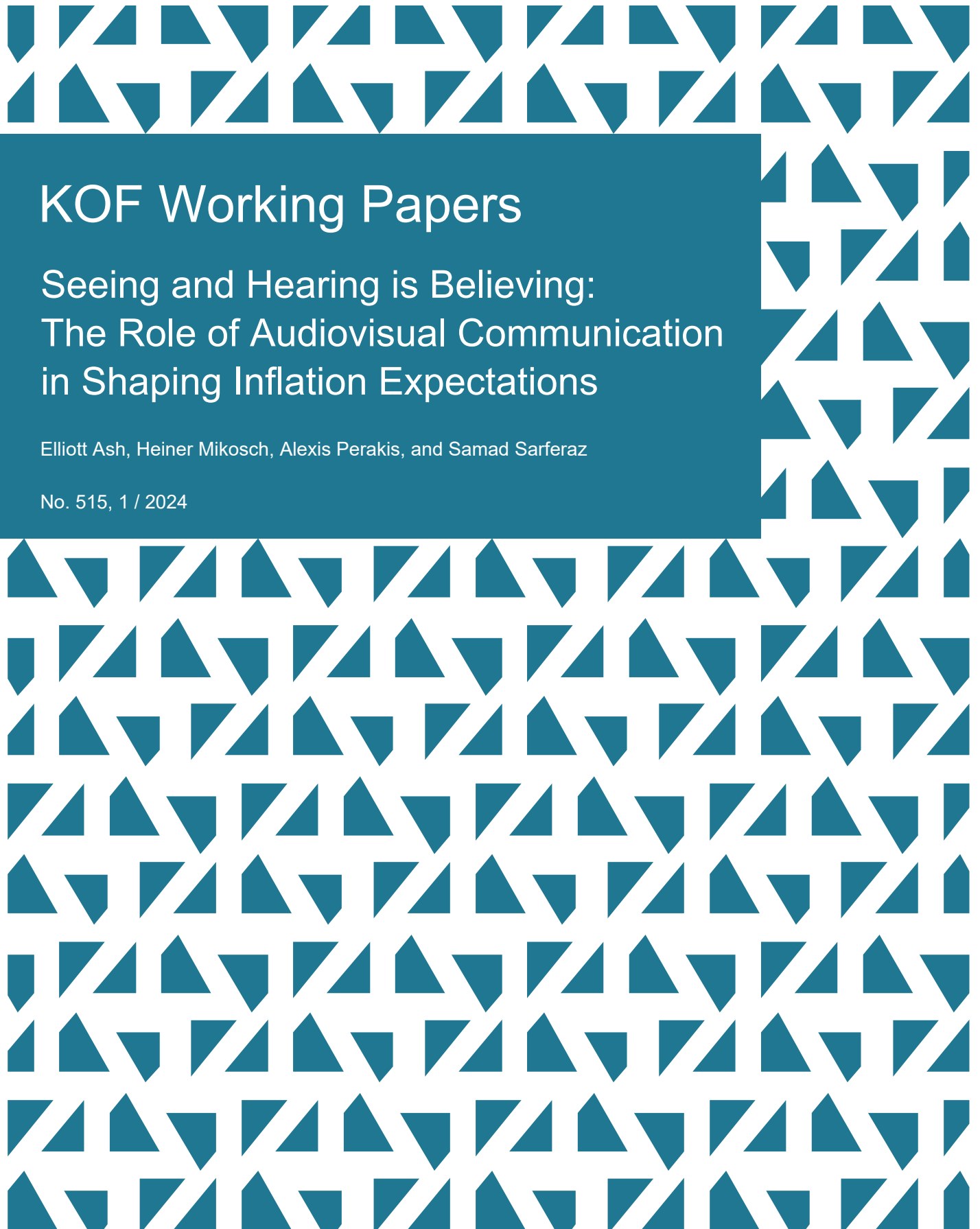
KOF Working Papers 515

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No. 515, 1 / 2024

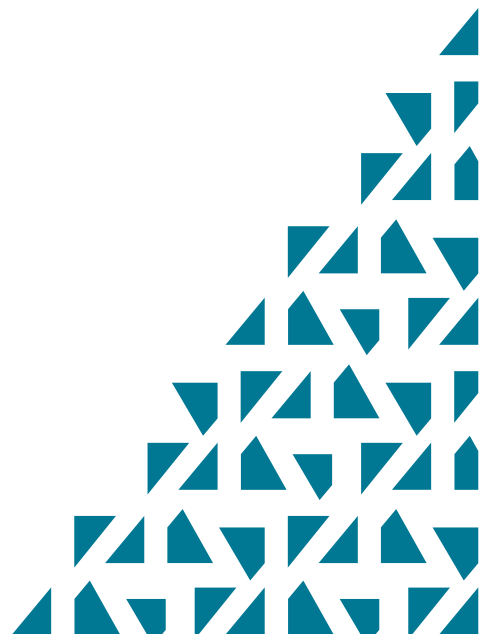


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First version: January 2024

This version: May 22, 2024

Abstract

This paper presents novel causal evidence on the effect of different communication channels employed by central banks on people's expectations about future inflation. In a pre-registered randomized survey experiment among a representative household sample, we examine adjustment of inflation expectations when confronted with a press conference statement by the president of the European Central Bank (ECB) articulating the bank's commitment to its 2% inflation target. First, we replicate previous literature showing that respondents update toward the inflation target. Second, we show that the medium of communication matters, holding the content of the message constant: Relative to a text transcript, audiovisual mediums strengthen updating toward the inflation target, with dynamic mediums (audio and video) being more effective than static mediums (photo). In a Bayesian updating framework, we show that audiovisual communication increases the signal gain as compared to textual communication, i.e., respondents put more weight on the information they receive. We also find that economically less-informed households (those consuming less economic news) are more responsive in updating to audiovisual mediums. Overall, our results suggest that central bank messages aimed directly at the public can help to anchor inflation expectations.

JEL Classification: E71, E58, D83, C83, E31, E52.

Keywords: Inflation expectations, central bank communication, randomized survey experiment, communication mediums, monetary policy.

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1 Introduction

Perhaps more so than with any other area of governance, the effectiveness of monetary policy depends on how that policy is communicated. In even the most basic models of inflation, a fundamental contributor is expectations about inflation (Woodford, 2001). Hence, what is communicated about inflation, and how it is communicated, can have real effects on the economy (Blinder et al., 2008).

Given their economic impact, then, it is not surprising that central bank press conferences have evolved into sophisticated, highly controlled, highly ritualized communication events. Central banks carefully construct their messaging and the associated arguments, as more persuasive messages can change expectations and thereby move inflation (e.g., Blinder et al., 2008). On top of the content, it is likely that nonverbal elements, such as the speaker’s voice or facial expressions, also shape their credibility and the associated market reactions (Gorodnichenko, Pham and Talavera, 2023; Curti and Kazinnik, 2023).

This paper provides empirical evidence on this latter part of central bank messaging – the medium of communication. In a pre-registered randomized survey experiment, we look at the influence of different communication channels – such as written text, audio, and video – while holding the information constant. Importantly, our design allows us to make causal claims about the effect of audiovisual mediums on the inflation beliefs of households, going beyond previously established correlations between central bank communication and financial market responses. We find that households are more responsive in revising their inflation expectations after exposure to dynamic mediums – particularly audio and video – compared to static mediums such as text and photographs. Our results have concrete policy implications – namely, that central banks can have a sizeable impact on the inflation expectations of households by broadcasting short audio or video recordings communicating the inflation target.

More specifically, we examine the inflation target statement by European Central Bank (ECB) President Christine Lagarde, where she articulates the ECB’s commitment to a 2% inflation target during the ECB Governing Council press conference. In a representative sample from Ireland, participants are randomly assigned to one of the following treatment groups. The first group receives only the text transcript of Lagarde’s statement about the ECB’s inflation target. Then, there are four groups that observe the text in conjunction with an additional audiovisual treatment: (a) a photo of Lagarde, (b) an audio recording of the

same inflation target statement, (c) both the photo and the audio recording, and (d) a video recording of the same statement. Finally, a placebo group is presented with an off-topic text statement unrelated to the inflation target. Participants are asked to provide their short- and medium-term inflation expectations before and after treatment.

Our results show that survey respondents move toward central bank communications in their self-reported inflation expectations. First, as with previous work, we find that exposure to any information about the inflation target increases updating toward the target. Second, the medium of communication matters. Participants in audiovisual treatments – photo, audio, audio & photo, video – update more toward the target than those just reading the text transcript. Further, the effect is significantly larger for more “dynamic” mediums (audio or video) relative to more “static” mediums (text or photo).

The differences are economically meaningful. On average, respondents expect annual euro area inflation for the year 2022 to be 5.6% before the treatment. After treatment, respondents treated with Lagarde’s target statement move their short-term inflation expectations about 0.4 percentage points closer to the target (relative to respondents who received a placebo statement unrelated to inflation). The additional effects of the audiovisual treatments are also sizeable, with audio or video treatments increasing movement toward the target by about 0.4 additional percentage points on top of the text treatment. Treatment effects on medium-term inflation expectations are similar in magnitude. The results are robust to a number of alternative specifications and other checks, including controlling for different observable characteristics and using different estimation methods (ordinary least squares, outlier-robust Huber regressions), different transformations of the inflation report variable (levels, logs, or binary), and different sample restrictions.

We further study audiovisual communication in a Bayesian updating setting. In a regression specification that allows us to adjust for observable characteristics, we estimate the treatment effects directly on the signal gain. Corroborating our previous results, we find that dynamic mediums lead to a sizeable and statistically significant increase in the signal weight. Moreover, consistent with a higher perceived precision of the signal, respondents in the audio or video treatments are more confident in their post-treatment inflation predictions.

To further explore the implications of a Bayesian updating approach, we look at treatment effect heterogeneity by respondents’ frequency of consuming economic news. News consumption provides a measure of how informed the respondents are about economic issues, which in turn proxies for the strength of the respondent’s prior on monetary policy issues. We

show that the effects of audiovisual treatments are statistically larger for less-informed respondents, relative to more-informed respondents. Our interpretation of this difference is that the more-informed respondents have a stronger prior about monetary policy, so they get less value from a more precise signal. Hence, they are less responsive to the audiovisual mediums.

These results contribute to the growing empirical literature on how monetary policy communication affects inflation expectations. In particular, this study is the first to compare experimentally different audiovisual communication channels in the context of inflation expectations, while holding the information constant. In closely related work, Coibion, Gorodnichenko and Weber (2022) conduct a survey experiment with U.S. households to examine the impact of different textual information treatments on individuals' inflation expectations. They find that the effectiveness of textual information varies, with newspaper articles having the least impact on households' updating of inflation expectations. In a related paper, D'Acunto, Fuster and Weber (2021) display different portrait photos of members of the Federal Reserve's monetary policy committee to survey respondents. That study shows that the ethnicity and gender depicted in the photos affect the formation of unemployment expectations, particularly for underrepresented groups.

Coibion, Gorodnichenko and Weber (2022) show that their results are consistent with Bayesian updating, suggesting that households give more weight to more informative signals. Our study complements their analysis by investigating how audiovisual stimuli influence the signal weight. In related work, Armantier et al. (2016) investigate the impact of information treatments with, e.g., food price inflation data and inflation forecasts. Their results are in line with Bayesian learning, as they find that households update their inflation expectations in the direction of the provided signal. Roth and Wohlfart (2020) also find evidence for Bayesian updating when studying households' expectations about macroeconomic conditions. Cavallo, Cruces and Perez-Truglia (2017) use Bayesian updating in the context of information frictions and their impact on inflation expectations of households. In a somewhat different setting, Armona, Fuster and Zafar (2018) do not find evidence that households are Bayesians when updating their house price expectations. As far as firms are concerned, Coibion, Gorodnichenko and Kumar (2018) report that they update their expectations in line with Bayesian learning, both in direction and magnitude (proportional to their prior belief uncertainty), and especially when confronted with the central bank's inflation target.

Other research involving survey experiments on inflation expectations includes Bholat

et al. (2019) who explore the effects of visual representation of text, specifically using visual summaries, in the context of the Bank of England’s Inflation Report. Although their work does not involve photos or videos, it fits well with our findings as it highlights the advantages of incorporating visual components alongside textual information. Keeping the medium and the messenger constant, D’Acunto et al. (2020) investigate whether communication about the central bank target or about the instrument used is most effective in shaping household inflation expectations. Kryvtsov and Petersen (2021) conduct a laboratory experiment and employ a learning-to-forecast task to study the impact of central bank communication on agents’ expectations. Coibion et al. (2023) leverage the exogenous variation in households’ inflation expectations resulting from information treatments to examine the causal effect of beliefs on consumption decisions. Weber et al. (2023) study the effects of economic conditions on the learning process of households and firms.

Furthermore, using non-experimental high-frequency text and audio data, Gorodnichenko, Pham and Talavera (2023) study the effects of emotions communicated during FOMC press conferences on stock prices. Their findings indicate a significant correlation between the optimistic tonality expressed by Federal Reserve chairs and a consequential surge in stock prices. Adding video analysis, Curti and Kazinnik (2023) study the effects of the Fed Chairs’ facial expressions on financial markets. They find that investors react negatively to adverse expressions revealed during press conferences. Alexopoulos et al. (2024) combine text, voice, and video analysis and show that emotions displayed by the Federal Reserve chairs during congressional testimonies correlate with financial market fluctuations.

The aforementioned body of literature mainly focuses on intra-medium effects of central bank communication, e.g., the effect of different portrait photos such as in D’Acunto, Fuster and Weber (2021). To the best of our knowledge, we are the first study to provide an inter-medium causal investigation of the impact of different communication mediums (text, photo, audio, and video) on inflation expectations, while keeping the content of the message constant. By adopting an across-medium approach, we are able to isolate the effects of different communication channels on the recipients and gain valuable insights into the factors influencing communication in monetary policy.

Generally, we contribute to the central bank communication literature by highlighting the importance of the medium (or channel) of communication.¹ Concretely, our evidence could help motivate the expansion of existing efforts by central banks to record and stream their

¹See de Haan and Sturm (2019) and Blinder et al. (2023) for an overview of this literature.

monetary policy announcements online. For example, central banks could influence inflation expectations by disseminating short video or audio statements about the bank’s inflation target. This approach might also address the difficulty of reaching economic agents beyond financial markets participants (see e.g. Ehrmann and Wabitsch (2022)), as households can be targeted even if they do not actively seek information about monetary policy. Furthermore, statements could be targeted based on household characteristics – for example, frequency of consumption of economic news.

The paper is organized as follows. Section 2 describes our household survey including the randomized intervention and the regression setup used for the empirical analysis. Section 3 discusses our empirical findings. Section 4 concludes.

2 Methods

This section describes our survey including the underlying household sample, the randomized intervention, and the regression setup for our empirical analysis.

2.1 Recruitment, Ethics, and Pre-registration

We conducted a survey of individuals from 2169 Irish households.² We chose households from Ireland as it is the only native English-speaking country in the Euro Area. The survey tasks involve reading or listening to excerpts from the European Central Bank (ECB) press conference, which is carried out in English.

Recruitment was done via Dynata, a widely recognized online panel provider in the social sciences (see Stantcheva, 2023 for a recent review). Respondents were paid around 2 euros with a median response time of 6min 39s (mean of 17min 19s).³ We conducted two waves of the same survey (no duplicate responses) in 2022: a first wave from January 12 to January 26 ($N = 461$) and a second wave from June 16 to August 23 ($N = 1708$).

The survey sample was recruited for representativeness on income, age, and gender.

²The sample size is comparable to, e.g., the size of the UK household sample in Haldane and McMahon (2018) (around 2000 respondents) and the size of the Dutch household sample in Coibion et al. (2023) (2187 respondents from 1843 households).

³The survey provider Dynata uses a varied compensation scheme. See Appendix A.2 for more information on this point.

We checked our sample demographics against population statistics and can confirm that the sample is representative of the Irish population in terms of household income, age group, and gender. Appendix A.1 reports the associated distributional comparisons and some additional statistics on the sample.

The experiment design has approval from ETH Zurich’s Ethics Commission. The experiment design, main hypotheses, and regression approach were pre-registered on the OSF Registries platform (Perakis et al., 2022). Additional details on ethics, the pre-registered analysis, and deviations are included in Appendix A.2.

2.2 Survey Overview

The survey questionnaire, implemented in Qualtrics, consists of three parts: introductory questions, the information intervention, and additional questions. Appendix Figure C.1 gives an overview. The full questionnaire is included in Appendix C.

After filling out a consent form, we first ask the respondents to guess the inflation rate for the previous year (2021) in the Euro Area. Thereafter, we inform the respondents about the yearly inflation rates for the period 2017–2021. This ensures that all respondents have at least some basic information about inflation in the Euro Area.

Next, we ask the respondents about their short-term (2022) and medium-term (2024) expectations for yearly inflation (point forecasts). We also ask, on a 10-point scale, how confident they are about their forecast for 2024.

Each participant is then randomized into one of several treatment arms. This involves a text message and potentially audio or video. The treatment arms are described in detail in Section 2.3 below. After the treatment, we ask the respondents again for their yearly inflation expectations for 2022 and 2024.

To conclude the survey, the respondents proceed by indicating their age, gender, education status, and household income. Finally we ask them to rate, on 10-point scales, their trust in the ECB to adequately manage inflation, and how much they trust the ECB to care about the economic well-being of the people in the Euro Area. The survey ends with two questions that elicit attentiveness of the respondents during the survey: about the job position of Christine Lagarde and about the content of Lagarde’s statement quoted in the survey.

2.3 Information Treatments

We are interested in empirically assessing whether households update their inflation expectations more when exposed to a photo, audio, or video recording of a statement by Christine Lagarde, the president of the European Central Bank, emphasizing the central bank’s commitment to its 2% inflation target, compared to simply reading a text transcript of the statement. Put differently, we are investigating the effect of the *delivery* (the “how”) of information (the “what”). Hence, the audiovisual treatments also contain the text transcript, in order to keep the information provided constant.

Each survey participant is randomized into one of several different treatment groups.⁴ We list and describe the information treatments associated with each treatment arm as follows.

Text. In the Text treatment group, respondents view the following text printed on the screen:

The sentence below is part of a statement on future inflation in the Euro Area by Christine Lagarde, the president of the European Central Bank (ECB), at the press conference following the ECB Governing Council Meeting on October 28, 2021:

“We stand ready to adjust all of our instruments, as appropriate, to ensure that inflation stabilises at our 2 per cent target over the medium term.”

Photo. In the Photo treatment group, respondents view the same text as in Text. In addition, a portrait photograph of Christine Lagarde is printed on the screen. See Appendix B.3 for additional details on the Photo treatment.

Audio. The respondents in the Audio group view the same text as in Text. In addition, they hear the original audio recording of Christine Lagarde pronouncing the statement during the press conference.⁵

⁴See Appendix Table A.2 for supporting information on the treatment groups.

⁵The audio recording can be listened to here: <https://polybox.ethz.ch/index.php/s/iVSuD6UIPX5uLJX>. For robustness, we also randomized whether Audio respondents saw subtitles along with the sound recording.

Figure 1: Video Treatment Screenshot



Notes. Video Screenshot of Christine Lagarde at the press conference after the ECB Governing Council meeting on October 28th, 2021.

Audio & Photo. This treatment is a combination of the Audio and Photo treatments, i.e., the respondents view the text, hear the original audio recording, and view the portrait photograph of Christine Lagarde.⁶

Video. The respondents view the same text as in Text. In addition, they watch the original press conference video excerpt in which Christine Lagarde makes the statement.⁷ A screenshot from the video is shown in Figure 1.

Placebo. The respondents view either of the following printed text statements:

The sentence below is part of a statement on future inflation in the Euro Area by Christine Lagarde, the president of the European Central Bank (ECB), at the press conference following the ECB Governing Council Meeting on October 28, 2021:

“An effective implementation of the Next Generation EU programme and the ‘Fit for 55’ package will contribute to a stronger, greener and more even recovery

⁶Here we use a single photo of Christine Lagarde (the top left, neutral one from Appendix Figure B.1) and use the audio recording without subtitles.

⁷The video sequence can be watched here: <https://polybox.ethz.ch/index.php/s/ULE7FvGigrgxCYe>. For robustness, respondents were randomized into seeing videos with or without subtitles.

across euro area countries.”

or

The sentence below is part of a statement on future inflation in the Euro Area by Christine Lagarde, the president of the European Central Bank (ECB), at the press conference following the ECB Governing Council Meeting on October 28, 2021:

“The grip of the pandemic on the economy has visibly weakened, with restrictions being lifted as a result of successful health measures and large numbers of people now vaccinated.”

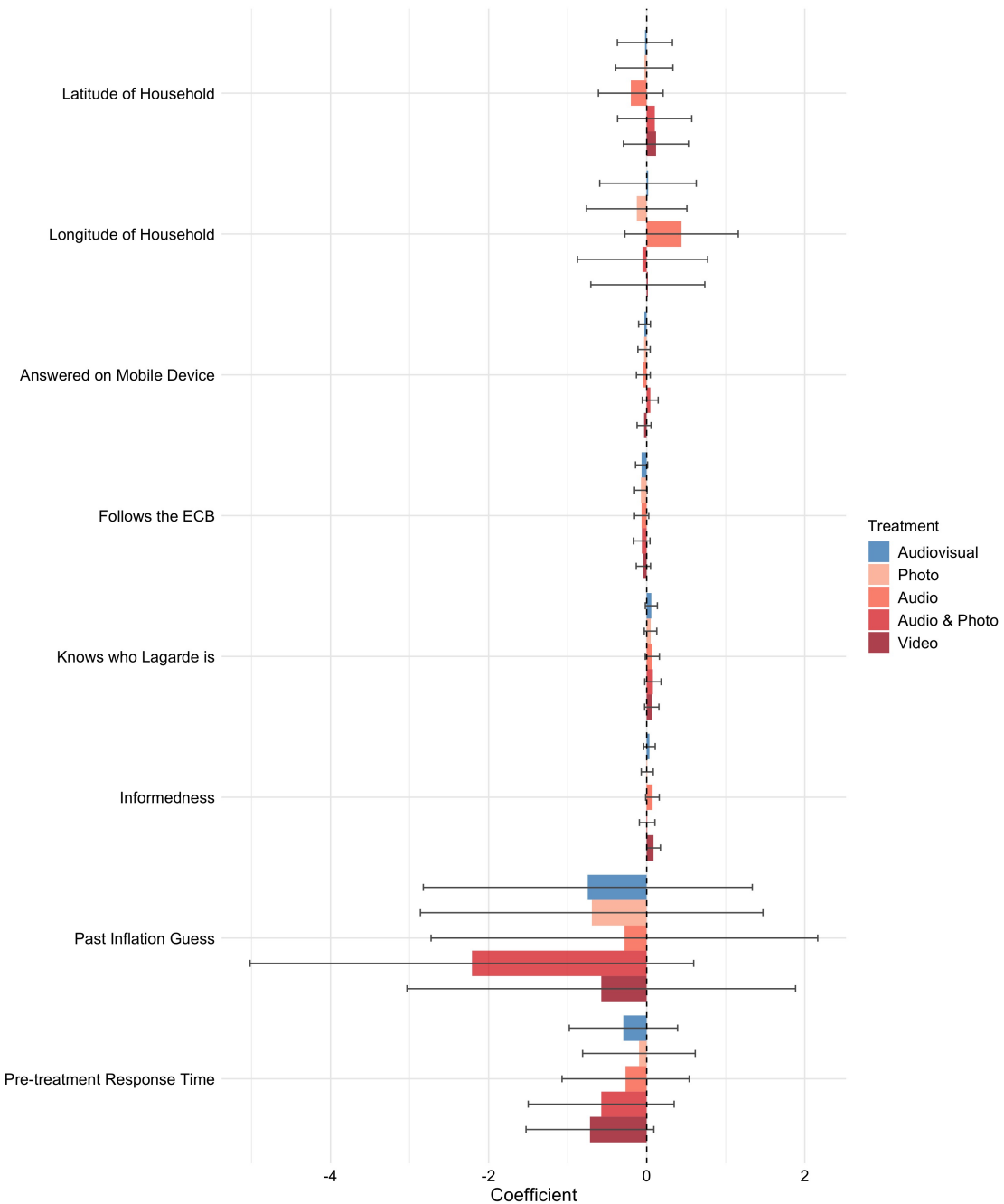
The two statements intentionally have no direct reference to the inflation target of the ECB. We use them as an active control placebo treatment, as they have the experiential features of the inflation treatment but without the pivotal information (Haaland, Roth and Wohlfart, 2023).

2.4 Experiment Validity

We test for randomization by regressing pre-treatment variables against the treatment indicators. If there is a violation of randomization, for example due to selective attrition, then these pre-treatment observables might be correlated with treatment. If randomization is successful and the treatments are exogenous, then these indicators should be uncorrelated with all of the pre-treatment variables.

A coefficient plot for these regressions is shown in Figure 2. We show that the treatment indicators are not significantly related to household location, whether the respondent is using a mobile phone or tablet, whether the respondent follows the ECB or knows who Lagarde is, is economically informed (follows economic news at least weekly), the past inflation guess, or the response time on questions answered before the information intervention. More detailed balance checks for pre-treatment inflation expectations are reported in Appendix Table B.14. Overall, these balance checks provide some reassurance that our experiment’s randomization has worked as intended. Still, to address any existing concerns about imbalances between the treatment group samples, we incorporate a battery of individual-specific control variables in our regressions. We describe this in more detail below.

Figure 2: Pre-treatment Balance Checks - Coefficient Plot with 95% Confidence Intervals



Notes. This figure shows the coefficient plot for estimates of the respective pre-treatment variables (listed along the left vertical axis) as outcome variables against the respective treatment variables (ordered and colored as indicated in the legend at right). The Text group is the left-out baseline. Regressions do not include controls and coefficients are estimated using OLS. Error bars indicate 95% confidence intervals.

Additional information on experiment validity, including unplanned deviations from the pre-registered design, are discussed in Appendix A.2.

2.5 Measuring Inflation Expectations Updates

We are interested in how often and to what degree the survey respondents follow the ECB’s guidance in their reported inflation expectations. The ECB target is 2%, so the extent to which the respondents follow the guidance can be measured by the difference between absolute values of the reported distance of expectations to 2%. To get at treatment effects more precisely, we use within-subject differences in the net-of-target inflation expectations before and after the information intervention.

More formally, our main outcome variable is defined as the difference in the absolute deviation of respondent i ’s post-treatment and pre-treatment inflation expectations to the signal. That is,

$$\Delta E_i(\pi) = |E_i^{\text{post}}(\pi) - 2| - |E_i^{\text{prior}}(\pi) - 2|,$$

where $E_i^{\text{post}}(\pi)$ and $E_i^{\text{prior}}(\pi)$ are respondent i ’s post-treatment and pre-treatment inflation expectations, respectively.⁸ This outcome arises naturally in a single-signal setting.

For additional robustness and to better understand the treatment effects, we report results with two alternative outcomes. First, we report a log-differenced specification, defined as

$$\Delta E_i(\log \pi) = |\log(E_i^{\text{post}}(\pi)/2)| - |\log(E_i^{\text{prior}}(\pi)/2)|.$$

This specification will give coefficients that are interpretable as proportional changes in the distance to the target, and it will be less sensitive to outliers. Second, we report a set of binary outcomes equalling one if the respondent picked values close to 2% and zero otherwise,

⁸Some of the other previous literature (e.g., Coibion, Gorodnichenko and Weber, 2022) has focused on the reported expected inflation, $\tilde{\Delta}E_i(\pi) = E_i^{\text{post}}(\pi) - E_i^{\text{prior}}(\pi)$, without differencing relative to the target. We prefer the distance to the target so that we can directly infer from the measured treatment effects whether the treatments bring the respondents closer to the inflation target, from either above or below. To see this, take for example the change in inflation expectations of two respondents j and k to the same treatment, where $E_j^{\text{prior}}(\pi) = 1\%$, $E_j^{\text{post}}(\pi) = 1.5\%$, $E_k^{\text{prior}}(\pi) = 3\%$, and $E_k^{\text{post}}(\pi) = 2.5\%$. These expectations yield equally large updates for both respondents, i.e., $\Delta E_j(\pi) = \Delta E_k(\pi) = -0.5$ percentage points. In contrast, using the raw update in beliefs would yield opposite updates of $\tilde{\Delta}E_j(\pi) = 0.5$ percentage points and $\tilde{\Delta}E_k(\pi) = -0.5$ percentage points, respectively, even though the treatment funnels inflation expectations toward the target communicated by the central bank. For completeness, we also implement a regression with $\tilde{\Delta}E_i(\pi)$ as the dependent variable with qualitatively similar results (see Appendix Table B.1).

in the spirit of D’Acunto, Fuster and Weber (2021). That includes a variable for picking exactly 2%, which measures the probability that a respondent directly follows the guidance.

2.6 Regression Setup

We use a linear model to analyze how different communication mediums affect the update of inflation expectations. Formally, we estimate the individual-level regression model

$$\Delta E_i(\pi) = \alpha + \mathbf{T}'_i \boldsymbol{\gamma} + \mathbf{X}'_i \boldsymbol{\beta} + \epsilon_i, \quad (1)$$

where α denotes the intercept. \mathbf{T}_i is a J -dimensional vector of indicator variables for treatment assignment, which, for each treatment group $j \in \{1, \dots, J\}$, takes value 1 if respondent i has been randomly assigned to treatment group j and zero otherwise. We also run regressions with one single indicator variable T_i (i.e., $J = 1$ and, hence, $\mathbf{T}_i = T_i$). The vector of treatment effect coefficients $\boldsymbol{\gamma}$ gives the differences in inflation updating for the respective treatment group j , relative to a held-out category (i.e., control group), as described further below. \mathbf{X}_i is a vector of individual-specific (mostly) self-reported covariates – estimate of past inflation rate, survey wave, age, gender, household income, education, frequency of business news consumption, familiarity with Christine Lagarde, and general interest in the decisions of the ECB (with estimated coefficients $\boldsymbol{\beta}$ that are not reported in the main text). ϵ_i is an error term.

In the baseline results, we estimate the coefficients of Equation (1) using Huber robust regressions (Huber, 1964; Coibion, Gorodnichenko and Weber, 2022). This estimation method is robust to outliers, which are important in our setting given the wide range of the inflation variable. In the appendix, we report similar results using ordinary least squares regressions with winsorized outcomes and heteroskedasticity-robust standard errors (Appendix Table B.2). For each of these estimators, the coefficients $\boldsymbol{\gamma}$ have a causal interpretation thanks to the random assignment of respondents to treatment groups $1, \dots, J$.

2.7 Hypothesis Testing

We analyze the effects of central bank communications, and how those communications are made, by comparing the treatment groups by their changes in inflation updating relative to the target.

Effect of Any Information. The first basic comparison is to look at the effect of receiving any information. T_i is a single indicator variable equalling one for any of the groups receiving information on the target (Text, Photo, Audio, Audio & Photo, and Video). In turn, $T_i = 0$ for the active control treatment – the Placebo intervention without information on the inflation target.⁹

Effect of Audiovisual Medium, Relative to Text Medium. The second comparison looks at the effect of audiovisual treatments relative to Text. The control group is now the Text treatment group. For a first binary comparison, we have a single indicator $T_i = 1$ for any of the audiovisual treatments (Photo, Audio, Audio & Photo, and Video) and $T_i = 0$ for the Text group. Second, we break out the separate effects of the four different audiovisual treatments, relative to text. In that regression, we have a 4-dimensional vector \mathbf{T}_i with separate indicators T_i^j for $j \in \{\text{Photo, Audio, Audio \& Photo, and Video}\}$. T_i^j equals one if respondent i is in treatment group j and zero otherwise. The control group, which is left out of \mathbf{T}_i , is Text.

Effect of Dynamic Audio-Video Medium, Relative to Static Medium. The third analysis compares inflation updating for the dynamic mediums – audio and video – relative to the static medium – Photo. The sample excludes Placebo and Text. Here, for the binary comparison, $T_i = 1$ for the mediums with a dynamic audio-video component – Audio, Audio & Photo, and Video. The left-out group with $T_i = 0$ is Photo, the “static” audiovisual treatment. Again we break out the separate effects of the three audio-video treatments, with three indicators in \mathbf{T}_i : T_i^j for $j \in \{\text{Audio, Audio \& Photo, and Video}\}$. Correspondingly, Photo is the left-out category.

3 Results

This section presents our empirical results. We first provide an examination of the effects of communicating the ECB’s 2% inflation target via different mediums on respondents’ short-term and medium-term inflation expectations. Second, we study how audiovisual mediums affect the signal gain in a Bayesian updating framework for households. Finally, we look at

⁹The sample includes all observations from the second wave, as we introduced the Placebo treatment only in the second survey wave.

Table 1: Effects of Inflation Target Information on Inflation Expectations

	Effect on Inflation Updating Net of 2% Target			
	Short-term		Medium-term	
	(1)	(2)	(3)	(4)
Any Inflation Target Information	-0.424*** (0.094)	-0.441*** (0.092)	-0.399*** (0.114)	-0.402*** (0.109)
Sociodemographic controls	No	Yes	No	Yes
Control group	Placebo	Placebo	Placebo	Placebo
Observations	1708	1708	1708	1708

Notes. This table reports estimates of regressing the term $\Delta E_i(\pi) = |E_i^{\text{post}}(\pi) - 2| - |E_i^{\text{prior}}(\pi) - 2|$ (i.e., the difference between the post-treatment inflation expectations and pre-treatment inflation expectations, both relative to the 2%-inflation target) on any type of information provision of this target. The Placebo treatment, i.e., the text treatment with off-topic content, purposefully not mentioning the inflation target, serves as an active control group. All treatments containing the inflation target of the ECB (i.e., Text, Audio, Photo, Audio & Photo and Video) are pooled together. In all regressions, we control for the respondents' initial guess of the past annual inflation rate. The sociodemographic controls are age, gender, household income, education, frequency of business news consumption, whether households know who Christine Lagarde is, and whether they follow the decisions of the ECB. The observations are from the second survey wave, as we did not have the Placebo treatment (active control) in the first wave. Coefficients are estimated using Huber robust regressions. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

heterogeneity by the economic informedness of respondents.

3.1 Effects of Audiovisual Mediums

Effect of Any Information. To start with, we investigate whether any informative treatment about the inflation target leads to an update in the inflation expectations toward the target, as shown in previous work (e.g. Coibion, Gorodnichenko and Weber, 2022). Table 1 shows the results of a regression specification where the control group is composed of households exposed to either of the placebo sentences (i.e., non-informative) and where all other treatment groups (i.e., informative) are pooled together. There is a highly significant negative effect of that treatment, meaning that the treated groups tended to converge toward the guidance. On average, respondents converge by about 0.4 percentage points in both

the short term (Columns 1-2) and medium term (Columns 3-4), and the coefficient is not sensitive to the inclusion of controls (Columns 2 and 4).

Effect of Audiovisual Medium, Relative to Text Medium. We report the average treatment effects of different audiovisual mediums on inflation expectations updating in Table 2. The coefficients capture the effects of the various audiovisual mediums relative to the Text control group – which is the transcript of Christine Lagarde. That is, the information on the target inflation is held constant, while we estimate the differential effect of audiovisual mediums – Photo, Audio, Audio & Photo, and Video.

Table 2 Panel A shows the estimates for the binary regression specification, where all the audiovisual-medium treatments are pooled and their combined effect is estimated relative to the text-only treatment. We can see that the effect on short-term inflation expectations (Columns 1-2) is highly significant, with the effect on medium-term inflation (Columns 3-4) still significant at the 10% level. The estimated magnitudes of -0.28 percentage points in the short term and -0.2 percentage points in the medium term are economically meaningful. Inclusion of covariates does not move the coefficients.

In Table 2 Panel B, we break out the separate effects of the four audiovisual treatments relative to Text-Only. In the short term (Columns 5 and 6), we observe statistically significant convergence toward the guidance for all of these treatments. We document mostly similar results for medium-term forecasts (Columns 7 and 8). The notable exception, in terms of magnitude and significance, is the Photo treatment. It has a much smaller effect in magnitude for both short-term and medium-term, and in the medium term, it is no longer statistically significant.

Effect of Dynamic Audio-Video Medium, Relative to Static Medium. Among the various audiovisual mediums, the most notable difference is between the static Photo and the other more dynamic audio/video treatments. To check whether these differences are statistically significant, we run an additional set of regressions where Photo is the control group. Thus, we estimate the effects of Audio, Audio & Photo, and Video relative to Photo.

Table 3 reports the results. In Panel A we show the pooled regression for the three audio-video treatments combined. In both the short term and medium term, there is a statistically significant negative effect. This means that, relative to Photo, the respondents hearing audio and/or seeing video respond more strongly to the ECB guidance. Panel B

Table 2: Effects of Audiovisual Mediums, Relative to Text

Effect on Inflation Updating Net of 2% Target				
Panel A: Aggregate Effects	Short-term		Medium-term	
	(1)	(2)	(3)	(4)
Audiovisual treatment	-0.279*** (0.093)	-0.293*** (0.092)	-0.197* (0.111)	-0.207* (0.106)
Panel B: Separate Effects	Short-term		Medium-term	
	(5)	(6)	(7)	(8)
Photo	-0.159* (0.090)	-0.192** (0.097)	-0.053 (0.106)	-0.068 (0.108)
Audio	-0.384*** (0.102)	-0.421*** (0.110)	-0.384*** (0.121)	-0.396*** (0.122)
Audio & Photo	-0.304*** (0.116)	-0.337*** (0.125)	-0.333** (0.138)	-0.374*** (0.139)
Video	-0.389*** (0.102)	-0.441*** (0.110)	-0.276** (0.121)	-0.305** (0.123)
Sociodemographic controls	No	Yes	No	Yes
Control group	Text	Text	Text	Text
Observations	1971	1971	1971	1971

Notes. This table reports estimates of regressing the term $\Delta E_i(\pi) = |E_i^{\text{post}}(\pi) - 2| - |E_i^{\text{prior}}(\pi) - 2|$ (i.e., the difference between the post-treatment inflation expectations and pre-treatment inflation expectations, both relative to the 2%-inflation target) on different audiovisual treatments (i.e., Photo, Audio, Audio & Photo, and Video) and on a treatment which pools the audiovisual treatments together. The Text treatment, i.e., showing only the text transcript of Christine Lagarde's statement, serves as the control group. All the audiovisual treatments (Photo, Audio, Audio & Photo, and Video) also display the text transcript. In all regressions, we control for the respondents' initial guess of the past annual inflation rate and additionally include a dummy variable indicating whether the respective respondent took part in the first or the second survey wave. The self-reported sociodemographic controls are age, gender, household income, education, frequency of business news consumption, whether households know who Christine Lagarde is, and whether they follow the decisions of the ECB. Coefficients are estimated using Huber robust regressions. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

Table 3: Effects of Dynamic Audio-Video Mediums, Relative to Static Medium

	Effect on Inflation Updating Net of 2% Target			
Panel A: Aggregate Effects	Short-term		Medium-term	
	(1)	(2)	(3)	(4)
Audio-Video treatment	-0.210*** (0.051)	-0.219*** (0.055)	-0.282*** (0.061)	-0.293*** (0.062)
Panel B: Separate Effects	Short-term		Medium-term	
	(5)	(6)	(7)	(8)
Audio	-0.224*** (0.068)	-0.230*** (0.073)	-0.335*** (0.082)	-0.334*** (0.083)
Audio & Photo	-0.145* (0.088)	-0.148 (0.094)	-0.278*** (0.106)	-0.305*** (0.106)
Video	-0.229*** (0.069)	-0.253*** (0.074)	-0.227*** (0.083)	-0.243*** (0.084)
Sociodemographic controls	No	Yes	No	Yes
Control group	Photo	Photo	Photo	Photo
Observations	1792	1792	1792	1792

Notes. This table reports estimates of regressing the term $\Delta E_i(\pi) = |E_i^{\text{post}}(\pi) - 2| - |E_i^{\text{prior}}(\pi) - 2|$ (i.e., the difference between the post-treatment inflation expectations and pre-treatment inflation expectations, both relative to the 2%-inflation target) on different dynamic audio-video treatments (i.e., Audio, Audio & Photo, and Video) and on a treatment which pools the dynamic audio-video treatments together. The Photo treatment, i.e., a portrait photograph of Christine Lagarde shown together with the text transcript, serves as the control group. All the audio-video treatments (Audio, Audio & Photo, and Video) also display the text transcript. In all regressions, we control for the respondents' initial guess of the past annual inflation rate and additionally include a dummy variable indicating whether the respective respondent took part in the first or the second survey wave. The self-reported sociodemographic controls are age, gender, household income, education, frequency of business news consumption, whether households know who Christine Lagarde is, and whether they follow the decisions of the ECB. Coefficients are estimated using Huber robust regressions. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

reports the separated treatment effects for the Audio, Audio & Photo, and Video treatments relative to Photo. Again, we see statistically significant negative effects. The exception is Audio & Photo, which has a notably weaker effect than Audio or Video, at least in the short term.

Robustness Checks. We report a number of robustness checks in Appendix B. Our results are robust to using the raw update in inflation expectations as outcome (that is, not normalizing relative to the 2.0% target; Appendix Table B.1) and to using OLS rather than Huber regressions (Appendix Table B.2). The OLS regressions are robust to using the log-transformed expected inflation variable (Appendix Table B.3). We see qualitatively similar effects when looking at a binary outcome for the probability of guessing within 0.5 percentage points of 2.0% (Appendix Table B.4) or 2.0% exactly (Appendix Table B.5).

Next, the results are robust to a number of sample restrictions. We can exclude respondents who report exactly 2.0% as their post-treatment inflation expectations (Appendix Table B.6). The results are also robust to dropping the 5% fastest and 5% slowest respondents in terms of the time spent on the survey (Appendix Table B.7).

Further, we compare the main estimates from the two survey waves with an interaction term and do not find statistically significant differences (Appendix Table B.8). In the Audio and Video treatments, we experimented with including subtitle controls for the texts embedded in the recording files (so that the text is still salient on mobile devices). That does not change the results either (Appendix Table B.9).

Additional supporting results are included in the appendix. In Appendix B.2, we show that the results are not driven by a mechanical increase in the attentiveness of respondents to the survey. Similarly, Appendix B.4 reports supporting results on how the audiovisual treatments affected answers to questions about the credibility of and trust in the ECB as an institution.

3.2 Bayesian Updating on Inflation Beliefs

One way to understand our experiment is in a signaling framework. That is, our participants follow a Bayesian updating process for inflation expectations based on an informative signal about future inflation: the ECB's target inflation message. The participant initially has a prior belief about inflation, which is updated upon receiving a new signal. The precision of

the signal might vary according to the communication medium.

The updating process for the respondents can be modeled as an aggregation of the signal with the prior. Respondent i 's prior is measured by $E_i^{\text{prior}}(\pi)$. The signal, by construction, is the inflation target of 2.0%. We can assume that the respondent computes the posterior $E_i^{\text{post}}(\pi)$ according to

$$E_i^{\text{post}}(\pi) = \rho_i \times 2.0 + (1 - \rho_i) \times E_i^{\text{prior}}(\pi),$$

where ρ_i is the individual specific weight on the signal. Respondent i 's signal weight can be computed from observables as

$$\rho_i = \frac{E_i^{\text{post}}(\pi) - E_i^{\text{prior}}(\pi)}{2 - E_i^{\text{prior}}(\pi)},$$

that is, the change in belief normalized by the prior's distance to the signal. When ρ_i equals 1, the respondent completely adopts the new signal, disregarding her prior belief. Conversely, a ρ_i value of 0 implies that the respondent ignores the new signal, sticking with her prior belief. For values in between, the respondent is partially influenced by the new signal, with the degree of influence increasing as ρ_i gets closer to 1.

We use the quantity ρ_i as an outcome in a regression to test for the effect of the different communication mediums on the signal weight. Using ρ_i as an outcome allows us to adjust the estimates for observable characteristics. Specifically, we estimate the same regression specification as above,

$$\rho_i = \alpha + \mathbf{T}'_i \boldsymbol{\gamma} + \mathbf{X}'_i \boldsymbol{\beta} + \epsilon_i, \tag{2}$$

where now we have the signal weight ρ_i as the dependent variable. As before, the Text treatment is the left-out category, so the estimate $\hat{\gamma}_k$ for audiovisual medium k can be interpreted as the treatment effect of that medium on signal precision, relative to the text transcript.

The estimates from Equation (2) are reported in Table 4. The estimates suggest that, especially in the short term (Columns 1 and 2), Audio (with or without Photo) and Video increase signal precision and induce more movement toward the target, relative to Text. For example, Audio and Video might improve signal precision by sending the same information through multiple sensory channels. In consequence, the participants in those groups have more precise information about future inflation, and their posterior moves more toward the

Table 4: Effects of Audiovisual Mediums on Signal Gain

Separate Effects	Effect on Signal Gain ρ			
	Short-term		Medium-term	
	(1)	(2)	(3)	(4)
Photo	-0.003 (0.052)	0.012 (0.050)	-0.089 (0.061)	-0.069 (0.062)
Audio	0.127** (0.058)	0.138** (0.056)	0.087 (0.069)	0.111 (0.070)
Audio & Photo	0.114* (0.067)	0.144** (0.065)	0.190** (0.078)	0.216*** (0.080)
Video	0.142** (0.059)	0.157*** (0.057)	0.093 (0.069)	0.117* (0.071)
Sociodemographic controls	No	Yes	No	Yes
Control group	Text	Text	Text	Text
Observations	1830	1830	1770	1770

Notes. This table reports estimates of regressing the signal gain term $\rho_i = (E_i^{\text{post}}(\pi) - E_i^{\text{prior}}(\pi))/(2 - E_i^{\text{prior}}(\pi))$ (i.e., the difference between the post-treatment inflation expectations and pre-treatment inflation expectations, relative to the deviation of the pre-treatment inflation expectations from the 2%-inflation target) on different audiovisual treatments (i.e., Photo, Audio, Audio & Photo, and Video). The Text treatment, i.e., showing only the text transcript of Christine Lagarde's statement, serves as the control group. All the audiovisual treatments (Photo, Audio, Audio & Photo, and Video) also display the text transcript. We exclude respondents from the sample that have pre-treatment inflation expectations of exactly 2%, for the outcome to be defined. In all regressions, we control for the respondents' initial guess of the past annual inflation rate and additionally include a dummy variable indicating whether the respective respondent took part in the first or the second survey wave. The self-reported sociodemographic controls are age, gender, household income, education, frequency of business news consumption, whether households know who Christine Lagarde is, and whether they follow the decisions of the ECB. Coefficients are estimated using Huber robust regressions. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

target. Interestingly, the signal gain coefficient for Video is always larger than for Audio, consistent with Video sending information through three channels (Text, Audio, and Video) rather than two (just Text and Audio), although that difference is not statistically significant.

Unlike Audio or Video, the Photo treatment’s image does not contain any additional information about the inflation target. For Bayesian households, one would expect no additional movement toward the target for Photo relative to Text. Consistent with that, Table 4 shows zero effect of Photo in terms of signal gain.

If the audiovisual mediums increase signal precision, then the respondents who viewed audiovisual mediums are also likely to have a more precise posterior on future inflation. That is, subjectively, they will feel more confident in their prediction. We can assess this directly using one of the survey’s post-treatment questions: “On a scale of one to ten, how confident are you in your predictions about the yearly rate of inflation in the year 2024?” In Appendix Table B.10, we show the effect of the treatments on this outcome. Consistent with our prediction, we see a highly statistically significant positive effect of the audiovisual mediums on confidence in the inflation predictions.

3.3 Heterogeneity by Informedness

Next, we look at heterogeneity by the level of economic informedness of respondents. We are interested in whether the frequency of households’ news consumption on economics or business conditions has an influence on the treatment effects. If audiovisual mediums increase the weight of the signal, we would expect larger effects for less-informed respondents. Put differently, it could be that the more-informed respondents have a stronger prior on inflation, and therefore are less responsive at the margin to increases in signal precision.

In the survey, we asked respondents to indicate how often they consume economics or business news. We identify two groups in the sample, corresponding to more often (weekly or daily) and less often (never or about once every month). We define a dummy variable “Informed” to refer to the respondents who consume economic news more often. To get at heterogeneous effects, we interact the treatment indicators with “Informed”.

The results are reported in Table 5. The top panel shows the interaction with the pooled Audiovisual treatment. The bottom panel shows the interactions for the separate treatments. In each panel, we report the coefficients on the treatment dummies, the Informed dummy, and the interactions between the treatment and Informed dummies.

Table 5: Heterogeneity by Informedness about the Economy

	Effect on Inflation Updating Net of 2% Target			
Panel A: Aggregate Effects	Short-term		Medium-term	
	(1)	(2)	(3)	(4)
Audiovisual treatment	-0.530*** (0.152)	-0.568*** (0.149)	-0.524*** (0.175)	-0.559*** (0.173)
Audiovisual treatment × Informed	0.381** (0.192)	0.416** (0.188)	0.503** (0.221)	0.527** (0.219)
Informed	-0.387** (0.183)	-0.432** (0.180)	-0.398* (0.211)	-0.421** (0.209)
Panel B: Separate Effects	Short-term		Medium-term	
	(5)	(6)	(7)	(8)
Photo	-0.416*** (0.149)	-0.491*** (0.158)	-0.379** (0.173)	-0.427** (0.175)
Photo × Informed	0.389** (0.189)	0.447** (0.199)	0.500** (0.219)	0.540** (0.222)
Audio	-0.711*** (0.175)	-0.802*** (0.185)	-0.449** (0.203)	-0.504** (0.206)
Audio × Informed	0.485** (0.218)	0.566** (0.230)	0.098 (0.252)	0.165 (0.256)
Audio & Photo	-0.446** (0.194)	-0.494** (0.205)	-0.683*** (0.225)	-0.755*** (0.228)
Audio & Photo × Informed	0.200 (0.245)	0.214 (0.259)	0.541* (0.284)	0.577** (0.288)
Video	-0.631*** (0.178)	-0.736*** (0.188)	-0.771*** (0.206)	-0.842*** (0.209)
Video × Informed	0.360 (0.220)	0.440* (0.232)	0.722*** (0.255)	0.787*** (0.258)
Informed	-0.376** (0.173)	-0.443** (0.184)	-0.359* (0.201)	-0.406** (0.205)
Sociodemographic controls	No	Yes	No	Yes
Control group	Text	Text	Text	Text
Observations	1971	1971	1971	1971

Notes. This table reports estimates of regressing the term $\Delta E_i(\pi) = |E_i^{\text{post}}(\pi) - 2| - |E_i^{\text{prior}}(\pi) - 2|$ on different audiovisual treatments and their interactions with economic informedness. “Informed” is a dummy being one if a respondent consumes economic or financial news at least once a week and zero otherwise. The Text treatment serves as the control group. All the audiovisual treatments (Photo, Audio, Audio & Photo, and Video) also display the text transcript. In all regressions, we control for the respondents’ initial guess of the past annual inflation rate and additionally include a dummy variable indicating whether the respective respondent took part in the first or the second survey wave. The self-reported sociodemographic controls are age, gender, household income, education, frequency of business news consumption, whether households know who Christine Lagarde is, and whether they follow the decisions of the ECB. Coefficients are estimated using Huber robust regressions. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

First, consider the Informed variable on its own, giving the average difference between the more-informed respondents (reading economics/business news at least weekly) and the less-informed respondents (monthly or not at all). That coefficient is always negative and statistically significant in all specifications. The more-informed individuals tend to move more toward the ECB’s inflation target in the Text treatment.

Second, take the treatment dummies on their own (pooled in the top panel, separated in the bottom panel). Those coefficients give the average treatment effects for the less-informed respondents. As in Table 2, they are all negative and statistically significant, meaning that the audiovisual treatments result in statistically more updating toward the inflation target. Interestingly, the coefficients are quite a bit larger in magnitude for the less-informed group, relative to the overall effect reported in Table 2. For example, in the pooled treatment (top panel), the magnitude is about -0.52 to -0.57 for the less-informed, compared to -0.2 to -0.29 for the whole sample from Table 2.

Third, consider the interaction terms between treatments and Informed. These coefficients, giving the relative effect of the treatments for the informed respondents, are always positive, and almost always significant. That shows that there is a statistically weaker effect of the audiovisual treatments for the informed group. It is always highly significant for the pooled regression (top panel). In the separated treatments (bottom panel), the interaction coefficients are always positive, but not always statistically significant.

Overall, these heterogeneity results provide additional support for households behaving as Bayesians. Less-informed respondents presumably have a weaker prior on inflation than the more-informed respondents. Suggestive evidence for that presumption can be seen in that respondents who are less economically informed also tend to be less confident in their inflation predictions (Appendix Figure B.2).

4 Conclusion

This paper contributes to the growing literature on the effects of monetary policy communication on economic agents’ inflation expectations. By conducting a randomized experiment, we provide the first inter-medium causal investigation of the impact of different communication mediums (text, photo, audio, and video) on households’ inflation expectations, while keeping the content of the message fixed.

We find that the medium matters. Seeing and hearing leads to greater belief in the ECB’s inflation target message. In a Bayesian updating framework, dynamic audio and video (but not static images) increase the precision of the signal received by the respondents and shift their beliefs more effectively. In addition, we find that audiovisual mediums are more effective for the less economically informed.

This research complements and expands upon the previous literature on household inflation expectations. In the space of experiments, previous work primarily focuses on different messages or different messengers, rather than different mediums. We further expand upon studies that have used observational data to analyze the effects of various types of communication channels on financial markets. Differing from these studies, we utilize an experimental approach, which offers a stronger basis for drawing causal conclusions. Furthermore, our paper contributes to the continuing discourse on the efficacy of diverse communication strategies employed by central banks.

Outside of economics, our findings on audiovisual treatment effects are in line with the social psychology literature. For example, Chaiken and Eagly (1976) find that opinion change is greater and significantly different for videotaped material as compared to text. In similar work, Chaiken and Eagly (1983) observe that experiment participants are more persuaded by an audio or video medium as opposed to text, for a communicator perceived as being likable and expert. In both works, the authors keep the message content fixed while varying the medium of message delivery, such that the text treatment always corresponds to the transcript of the recording. Our evidence is consistent.

A causal investigation on the effects of different communication mediums provides insights for central banks aiming to optimize their communication strategies to anchor inflation expectations. Both the medium and the message matter for policy outcomes. Our results suggest that the choice of medium helps determine the effectiveness of monetary policy communication, with potential implications for central bank credibility, pre-commitment, and consistency. In particular, our evidence that mediums influence signal precision can help central bankers evaluate when a medium-based policy could be most helpful.

This research invites a number of compelling lines for future work. For example, it would be interesting to know if the emotional content of audio and video matters in an experimental setting (Gorodnichenko, Pham and Talavera, 2023; Curti and Kazinnik, 2023). That could be carried out with new AI tools allowing the generation or modulation of specific emotional moods. Another idea for future research is to investigate, by means of survey experiments,

the effect of central bank communication mediums on the price and wage setting behavior of firms, as this is central to the development of inflation (see, e.g., Coibion, Gorodnichenko and Kumar, 2018, Dibiasi, Mikosch and Sarferaz, 2021, Drechsel et al., 2022, and Mikosch et al., 2023 for survey experiments with firm managers).

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A Supplemental Information on Survey Experiment

A.1 Representativeness and Summary Statistics

Figure A.1 compares the age, income, and gender distributions of the Irish population with the ones of our survey sample. In terms of household income, the distribution observed in our survey closely mirrors that of the official statistics, demonstrating congruence across a wide range of income brackets. Similarly, when focusing on the age groups and gender, our survey data displays a distribution that aligns well with the official statistics. In sum, the comparison suggests that our survey sample is quite representative of the Irish population as regards the aforementioned categories.

Table A.1 presents descriptive statistics for pre-treatment inflation expectations, showcasing how these expectations vary along demographic factors and business news consumption frequencies for two time horizons: short-term and medium-term expectations. Table A.2 reports descriptive statistics for the different treatment groups, displaying demographic and economic variables, such as age, female share, income, the pre-treatment estimate of the past inflation rate, and pre-treatment inflation expectations for the short-term and medium-term.

A.2 Ethics, Compensation, and Pre-registration

The survey and the included experiment design have approval from the ETH Zurich Ethics Commission (Proposal EK-2021-N-195). The survey was voluntary and respondents were compensated for their time for a fixed amount. Given the short survey length (median = 7 minutes), the compensation of around €2 makes for an hourly rate of more than €17, much higher than Ireland’s 2022 minimum wage of €10.50. While respondents received different information treatments, none of the treatments involved deception. So overall the study posed minimal risks to respondents.

Compensation was not uniform across subjects, consistent with Dynata’s practices of using a varied compensation scheme that is done across multiple platforms. According to their officer:

Because Dynata recruits panelists from many different partners, communities and loyalty programs, many different reward levels and types are offered to panelists. In one single survey, individual participants are likely to receive a variety of different reward levels and types. The gratuity value, while different by audiences, partners, panels, and motivations, is based on survey length, audience, and level of effort required, and is kept constant across projects and over time to reduce bias and changes in participation rates. Dynata rewards are constantly refined and adjusted to provide the most appropriate reward for the participant and project. Panelists can, for example, earn points to be redeemed at Amazon, PayPal, and

iTunes or earn airline miles, as well as being entered into prize drawings for cash. Rewards offered also vary by survey length and the characteristics of the population being targeted. Dynata uses a reasonable level of reward based on the amount of effort required, the population and appropriate regional customs.

Attrition in the experiment was low. We removed one respondent that did not finish the survey in the first wave, and three further respondents that provided impossible age values. Respondents only participated in our survey once, with first wave participants being excluded from the second survey wave.

Pre-registration documents are available at <https://osf.io/7kajw/registrations>. The timeline for the experiment and pre-registration is summarized as follows, with all dates from 2022:

- Jan 12-26: First wave data collection by Dynata (N=461)
- March 11: First wave pre-registration
- After March 12: First wave data analysis
- June 16-August 23: Second wave data collection by Dynata (N=1708)
- June 20: Second wave pre-registration
- After August 23: Both waves data analysis

Ideally, we would have had a single pre-registration that came before the start of any data collection. We were unable to do so for two reasons. First, there was time pressure with the survey provider for the first wave that coincided with coauthor Perakis having to prepare for a doctoral exam. That led to pre-registration after data collection (but before data analysis). Second, we realized some limitations of the design after an initial consideration of the first wave data, which resulted in a second pre-registration (see below). Still, we pre-registered all of the important design elements, research hypotheses, and regression specifications before any data were analyzed.

The following design elements were successfully pre-registered in the first wave pre-registration:

- The sample size (target = 460, sampled = 461)
- Hypotheses:
 1. “The modality (i.e., “medium”) used to communicate information to households about monetary policy influences how they update their short-term inflation expectations (non-directional)”
 2. “The modality (i.e., “medium”) used to communicate information to households about monetary policy influences how they update their medium-term inflation expectations. (non-directional)”

- Manipulated variables: “We will manipulate the survey participants’ inflation forecasts (short- and medium term) by showing a statement of the ECB president in the form of pure text, audio, video, photo, or a combination of those.”
- Measured variables:
 - “We measure the following variables of interest before and after the treatments: respondents’ POINT estimate of SHORT term inflation rate, respondents’ POINT estimate of MEDIUM term inflation rate.”
 - “We also measure various demographic and socio-economic controls.”
- The regression setup, pre-registered as follows:

We plan to estimate the following regression

$$E_i^{update} \pi = \alpha + \beta Treatment_i + \gamma X_i + \epsilon_i \quad (1)$$

where $E_i^{update} \pi = E_i^{post} \pi - E_i^{prior} \pi$, $E_i^{post} \pi$ is the inflation expectation of individual i after the treatment and $E_i^{prior} \pi$ is the inflation expectation of individual i before the treatment. $Treatment_i$ is a dummy variable containing the various media channel treatments. X_i contains individual specific controls such as gender, age, income, education and politics. ϵ_i is an iid normally distributed error term.

The following additional design elements were successfully pre-registered in the second wave pre-registration:

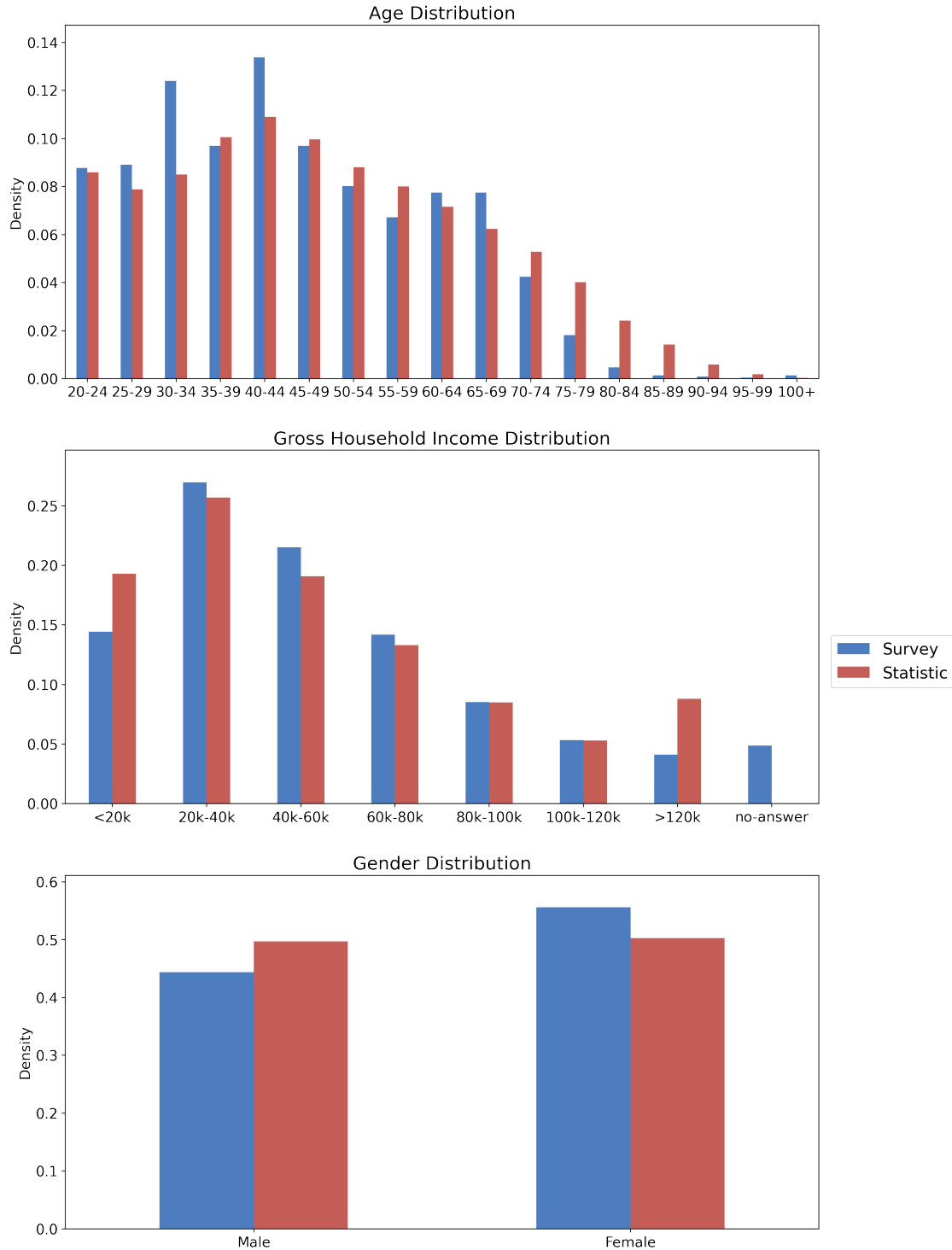
- The sample size (target = 1700, sampled = 1708)

Otherwise, the second wave pre-registration was the same as the first wave pre-registration.

In the pre-registered design, we also planned that respondents provide density forecasts for medium-term (not short-term) inflation. We may report on medium-term density forecasts in future work.

None of the other analysis aspects were pre-registered. In particular, the robustness checks arose during the work with the data.

Figure A.1: Comparison of Survey Sample and Population Statistics



Notes. The figure compares the age, income, and gender distributions of the Irish population with the ones of our survey sample. The population statistics are taken from the Central Statistics Office of Ireland (see <https://www.cso.ie>).

Table A.1: Pre-treatment Inflation Estimates and Pre-treatment Inflation Expectations

	Estimate of past inflation			Short-term expectation			Medium-term expectation		
	Mean	Median	Std	Mean	Median	Std	Mean	Median	Std
Female	4.59	4.00	0.11	3.96	3.50	0.08	3.90	3.50	0.07
Male	4.08	3.00	0.10	5.26	5.00	0.11	4.21	4.00	0.09
Education: High school or less	4.54	3.50	0.19	4.74	4.00	0.18	4.29	4.00	0.14
Education: Some college but no degree	4.63	4.00	0.16	4.40	4.00	0.15	4.10	4.00	0.12
Education: Junior College degree	4.73	4.00	0.20	4.16	3.50	0.16	3.96	3.50	0.13
Education: Bachelor's Degree	4.11	3.55	0.12	4.55	4.00	0.13	3.95	3.75	0.10
Education: Postgraduate degree	3.80	3.00	0.16	4.68	4.00	0.17	3.68	3.50	0.14
Income: low (<40k)	4.68	4.00	0.13	4.18	3.50	0.10	4.09	3.90	0.09
Income: middle (40k-90k)	4.24	3.50	0.11	4.64	4.00	0.11	4.08	4.00	0.09
Income: high (>90k)	3.76	3.20	0.16	5.28	5.00	0.20	3.74	3.50	0.13
Business news consumption: Daily	4.15	3.55	0.13	5.32	5.00	0.14	4.38	4.00	0.12
Business news consumption: Weekly	4.23	3.50	0.11	4.22	3.60	0.11	3.72	3.40	0.08
Business news consumption: Once	4.44	4.00	0.19	4.43	4.00	0.18	4.07	4.00	0.17
Business news consumption: Never	4.71	4.00	0.18	3.87	3.50	0.11	3.81	3.50	0.11

Notes. This table reports the mean, median, and standard deviation of households' estimates of the past inflation rate, along with pre-treatment short-term and medium-term inflation expectations, segmented by gender, education, and income levels. We use robust Huber regressions on a constant to compute robust estimates of the mean and standard deviation.

Table A.2: Demographics and Pre-treatment Inflation Estimates & Expectations Across Treatment Groups

	Sample size			Age	Female share	Income	Estimate of past inflation	Short-term expectation	Medium-term expectation
	Total	Wave 1	Wave 2						
All	2169	461	1708	44.95 (15.79)	0.56 (0.5)	47.69k (30.38k)	5.89 (9.32)	5.64 (9.32)	7.35 (13.85)
Text	179	53	126	46.27 (16.65)	0.65 (0.48)	51.43k (31.79k)	5.46 (7.73)	6.12 (10.35)	7.92 (14.08)
Photo	933	253	680	44.97 (15.62)	0.58 (0.49)	50.33k (31.61k)	5.52 (7.61)	5.28 (7.91)	7.23 (12.96)
Audio	345	52	293	44.74 (15.44)	0.51 (0.5)	55.78k (33.68k)	6.53 (10.67)	6.01 (10.02)	7.64 (14.91)
Photo & Audio	179	53	126	44.07 (15.38)	0.54 (0.5)	51.72k (29.43k)	5.39 (9.77)	4.62 (6.86)	5.71 (9.56)
Video	335	50	285	44.05 (15.47)	0.52 (0.5)	51.74k (30.67k)	6.64 (11.85)	6.07 (11.4)	7.35 (15.1)
Placebo	198	0	198	46.39 (17.3)	0.55 (0.5)	51.38k (31.4k)	6.05 (10.09)	6.48 (11.03)	8.42 (16.56)

Notes. This table reports, for all treatment groups combined (“All”) and separately for each treatment group, the number of respondents as well as the means and standard deviations (in parentheses) of demographic variables (age, female share, income), households’ pre-treatment estimates of the past inflation rate, and households’ pre-treatment short- and medium-term inflation expectations.

B Supporting Results

B.1 Main Supporting Results

Table B.1: Robustness of Audiovisual Medium Effects – Raw Belief Update

	Effect on Inflation Expectations Updating			
Panel A: Aggregate Effects	Short-term		Medium-term	
	(1)	(2)	(3)	(4)
Audiovisual treatment	-0.280*** (0.097)	-0.286*** (0.100)	-0.245** (0.115)	-0.253** (0.114)
Panel B: Separate Effects	Short-term		Medium-term	
	(5)	(6)	(7)	(8)
Photo	-0.217** (0.101)	-0.227** (0.105)	-0.171 (0.121)	-0.178 (0.119)
Audio	-0.399*** (0.115)	-0.404*** (0.119)	-0.450*** (0.137)	-0.443*** (0.135)
Audio & Photo	-0.272** (0.131)	-0.290** (0.136)	-0.243 (0.156)	-0.274* (0.154)
Video	-0.334*** (0.115)	-0.353*** (0.120)	-0.244* (0.137)	-0.264* (0.136)
Sociodemographic controls	No	Yes	No	Yes
Control group	Text	Text	Text	Text
Observations	1971	1971	1971	1971

Notes. This table reports estimates of regressing the term $\tilde{\Delta}E_i(\pi) = E_i^{\text{post}}(\pi) - E_i^{\text{prior}}(\pi)$ (i.e., the difference between the post-treatment inflation expectations and pre-treatment inflation expectations, not relative to 2.0) on different audiovisual treatments. The Text treatment, i.e., showing only the text transcript of Christine Lagarde’s statement, serves as the control group. All the audiovisual treatments (Photo, Audio, Audio & Photo, and Video) also display the text transcript. Coefficients are estimated using Huber robust regressions. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

Table B.2: Robustness of Audiovisual Medium Effects – OLS Specification

Effect on Inflation Updating Net of 2% Target				
Panel A: Aggregate Effects	Short-term		Medium-term	
	(1)	(2)	(3)	(4)
Audiovisual treatment	-0.284*** (0.094)	-0.297*** (0.094)	-0.157 (0.096)	-0.172* (0.097)
Panel B: Separate Effects	Short-term		Medium-term	
	(5)	(6)	(7)	(8)
Photo	-0.198** (0.098)	-0.208** (0.098)	-0.055 (0.100)	-0.066 (0.101)
Audio	-0.406*** (0.109)	-0.422*** (0.109)	-0.329*** (0.112)	-0.349*** (0.112)
Audio & Photo	-0.328*** (0.122)	-0.343*** (0.121)	-0.271** (0.126)	-0.290** (0.127)
Video	-0.382*** (0.110)	-0.408*** (0.110)	-0.213* (0.114)	-0.243** (0.114)
Sociodemographic controls	No	Yes	No	Yes
Control group	Text	Text	Text	Text
Observations	1971	1971	1971	1971

Notes. This table reports estimates of regressing the term $\Delta E_i(\pi) = |E_i^{\text{post}}(\pi) - 2| - |E_i^{\text{prior}}(\pi) - 2|$ (i.e., the difference between the post-treatment inflation expectations and pre-treatment inflation expectations, both relative to the 2%-inflation target) on different audiovisual treatments. The Text treatment, i.e., showing only the text transcript of Christine Lagarde's statement, serves as the control group. All the audiovisual treatments (Photo, Audio, Audio & Photo, and Video) also display the text transcript. Coefficients are estimated using OLS (rather than Huber robust regressions), where the dependent variable was winsorized for values in the lowest 10% and highest 10% of the data. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

Table B.3: Robustness of Audiovisual Medium Effects – Log Transformed Outcome

Effect on Inflation Updating Proportional to 2% Target				
Panel A: Aggregate Effects	Short-term		Medium-term	
	(1)	(2)	(3)	(4)
Audiovisual treatment	-0.122** (0.055)	-0.140** (0.056)	-0.052 (0.054)	-0.068 (0.054)
Panel B: Separate Effects	Short-term		Medium-term	
	(5)	(6)	(7)	(8)
Photo	-0.076 (0.057)	-0.090 (0.058)	-0.014 (0.055)	-0.027 (0.056)
Audio	-0.195*** (0.063)	-0.215*** (0.062)	-0.117* (0.062)	-0.138** (0.062)
Audio & Photo	-0.186** (0.073)	-0.207*** (0.073)	-0.106 (0.072)	-0.123* (0.073)
Video	-0.146** (0.065)	-0.172*** (0.065)	-0.065 (0.065)	-0.089 (0.065)
Sociodemographic controls	No	Yes	No	Yes
Control group	Text	Text	Text	Text
Observations	1943	1943	1943	1943

Notes. This table reports estimates of regressing the term $\Delta E_i(\log \pi) = |\log(E_i^{\text{post}}(\pi)/2)| - |\log(E_i^{\text{prior}}(\pi)/2)|$ (i.e., the proportional difference between the post-treatment inflation expectations and pre-treatment inflation expectations, both relative to the 2%-inflation target) on different audiovisual treatments. The Text treatment, i.e., showing only the text transcript of Christine Lagarde's statement, serves as the control group. All the audiovisual treatments (Photo, Audio, Audio & Photo, and Video) also display the text transcript. Respondents that did not report positive inflation expectations were excluded from the sample. Coefficients are estimated using OLS. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

Table B.4: Robustness – Binary Outcome: Post-treat Expectations Between 1.5% & 2.5%

	Effect on whether Beliefs are within Range of Target			
Panel A: Aggregate Effects	Short-term		Medium-term	
	(1)	(2)	(3)	(4)
Audiovisual treatment	0.104*** (0.029)	0.118*** (0.030)	0.065** (0.032)	0.071** (0.033)
Panel B: Separate Effects				
	Short-term		Medium-term	
	(5)	(6)	(7)	(8)
Photo	0.062** (0.030)	0.074** (0.031)	0.017 (0.033)	0.021 (0.034)
Audio	0.146*** (0.036)	0.162*** (0.037)	0.133*** (0.039)	0.144*** (0.040)
Audio & Photo	0.131*** (0.043)	0.147*** (0.043)	0.116** (0.046)	0.122*** (0.047)
Video	0.169*** (0.036)	0.187*** (0.037)	0.106*** (0.039)	0.117*** (0.040)
Sociodemographic controls	No	Yes	No	Yes
Control group	Text	Text	Text	Text
Observations	1971	1971	1971	1971

Notes. This table reports estimates of regressing the binary variable for whether respondents answer (post-treatment) within 0.5 percentage points of the 2.0 % target, on different audiovisual treatments. The Text treatment, i.e., showing only the text transcript of Christine Lagarde’s statement, serves as the control group. All the audiovisual treatments (Photo, Audio, Audio & Photo, and Video) also display the text transcript. Coefficients are estimated using OLS. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

Table B.5: Robustness – Binary Outcome: Post-treat Expectation is Exactly 2.0%

	Effect on whether Beliefs are the 2% Target			
Panel A: Aggregate Effects	Short-term		Medium-term	
	(1)	(2)	(3)	(4)
Audiovisual treatment	0.068*** (0.025)	0.075*** (0.026)	0.070*** (0.025)	0.079*** (0.026)
Panel B: Separate Effects	Short-term		Medium-term	
	(5)	(6)	(7)	(8)
Photo	0.029 (0.026)	0.036 (0.026)	0.022 (0.026)	0.030 (0.027)
Audio	0.100*** (0.031)	0.108*** (0.032)	0.145*** (0.033)	0.159*** (0.033)
Audio & Photo	0.110*** (0.039)	0.119*** (0.039)	0.097** (0.038)	0.105*** (0.039)
Video	0.123*** (0.032)	0.136*** (0.033)	0.116*** (0.032)	0.128*** (0.033)
Sociodemographic controls	No	Yes	No	Yes
Control group	Text	Text	Text	Text
Observations	1971	1971	1971	1971

Notes. This table reports estimates of regressing the binary variable for whether respondents answer (post-treatment) exactly 2.0 % (i.e., the target), on different audiovisual treatments. The Text treatment, i.e., showing only the text transcript of Christine Lagarde’s statement, serves as the control group. All the audiovisual treatments (Photo, Audio, Audio & Photo, and Video) also display the text transcript. Coefficients are estimated using OLS. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

Table B.6: Robustness of Audiovisual Effects – Dropping 2.0% Post-treatment Answers

Effect on Inflation Updating Net of 2% Target				
Panel A: Aggregate Effects				
	Short-term		Medium-term	
	(1)	(2)	(3)	(4)
Audiovisual treatment	-0.251** (0.105)	-0.266** (0.105)	-0.183 (0.131)	-0.201 (0.128)
Panel B: Separate Effects				
	Short-term		Medium-term	
	(5)	(6)	(7)	(8)
Photo	-0.182* (0.107)	-0.210* (0.110)	-0.121 (0.135)	-0.139 (0.132)
Audio	-0.349*** (0.125)	-0.368*** (0.129)	-0.335** (0.158)	-0.343** (0.155)
Audio & Photo	-0.322** (0.147)	-0.335** (0.150)	-0.360* (0.185)	-0.387** (0.181)
Video	-0.304** (0.126)	-0.324** (0.130)	-0.131 (0.159)	-0.165 (0.156)
Sociodemographic controls	No	Yes	No	Yes
Control group	Text	Text	Text	Text
Observations	1456	1456	1456	1456

Notes. This table reports estimates of regressing the term $\Delta E_i(\pi) = |E_i^{\text{post}}(\pi) - 2| - |E_i^{\text{prior}}(\pi) - 2|$ (i.e., the difference between the post-treatment inflation expectations and pre-treatment inflation expectations, both relative to the 2%-inflation target) on different audiovisual treatments. The Text treatment, i.e., showing only the text transcript of Christine Lagarde’s statement, serves as the control group. All the audiovisual treatments (Photo, Audio, Audio & Photo, and Video) also display the text transcript. Respondents that answered 2% for the short-term or medium-term (or both) post-treatment inflation expectations were excluded from the sample. Coefficients are estimated using Huber robust regressions. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

Table B.7: Robustness of Audiovisual Effects – Dropping 5% Slowest/Fastest Respondents

Effect on Inflation Updating Net of 2% Target				
Panel A: Aggregate Effects				
	Short-term		Medium-term	
	(1)	(2)	(3)	(4)
Audiovisual treatment	-0.231** (0.093)	-0.232** (0.093)	-0.128 (0.106)	-0.124 (0.104)
Panel B: Separate Effects				
	Short-term		Medium-term	
	(5)	(6)	(7)	(8)
Photo	-0.121 (0.091)	-0.138 (0.097)	0.011 (0.104)	0.016 (0.106)
Audio	-0.358*** (0.104)	-0.375*** (0.110)	-0.301** (0.118)	-0.295** (0.121)
Audio & Photo	-0.240** (0.119)	-0.259** (0.126)	-0.313** (0.135)	-0.337** (0.137)
Video	-0.305*** (0.104)	-0.339*** (0.110)	-0.197* (0.118)	-0.211* (0.121)
Sociodemographic controls	No	Yes	No	Yes
Control group	Text	Text	Text	Text
Observations	1772	1772	1772	1772

Notes. This table reports estimates of regressing the term $\Delta E_i(\pi) = |E_i^{\text{post}}(\pi) - 2| - |E_i^{\text{prior}}(\pi) - 2|$ (i.e., the difference between the post-treatment inflation expectations and pre-treatment inflation expectations, both relative to the 2%-inflation target) on different audiovisual treatments. The Text treatment, i.e., showing only the text transcript of Christine Lagarde's statement, serves as the control group. All the audiovisual treatments (Photo, Audio, Audio & Photo, and Video) also display the text transcript. Respondents that were among the 5% slowest and 5% fastest to answer the survey were excluded from the sample. Coefficients are estimated using Huber robust regressions. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

Table B.8: Robustness of Audiovisual Medium Effects – Difference Across Waves

	Effect on Inflation Updating Net of 2% Target			
Panel A: Aggregate Effects	Short-term		Medium-term	
	(1)	(2)	(3)	(4)
Audiovisual treatment	−0.293*** (0.110)	−0.324*** (0.109)	−0.087 (0.132)	−0.123 (0.126)
Audiovisual treatment x first wave	0.052 (0.205)	0.126 (0.202)	−0.380 (0.246)	−0.289 (0.234)
Panel B: Separate Effects	Short-term		Medium-term	
	(5)	(6)	(7)	(8)
Photo	−0.163 (0.107)	−0.214* (0.115)	0.060 (0.127)	0.027 (0.128)
Audio	−0.402*** (0.117)	−0.454*** (0.126)	−0.297** (0.139)	−0.322** (0.141)
Audio & Photo	−0.338** (0.139)	−0.377** (0.149)	−0.253 (0.164)	−0.308* (0.167)
Video	−0.386*** (0.118)	−0.449*** (0.127)	−0.154 (0.140)	−0.195 (0.142)
Photo × first wave	0.015 (0.198)	0.086 (0.212)	−0.380 (0.234)	−0.326 (0.237)
Audio × first wave	0.082 (0.245)	0.152 (0.263)	−0.272 (0.290)	−0.233 (0.294)
Audio & Photo × first wave	0.111 (0.255)	0.147 (0.274)	−0.277 (0.302)	−0.235 (0.306)
Video × first wave	−0.042 (0.248)	0.008 (0.265)	−0.470 (0.293)	−0.431 (0.296)
Sociodemographic controls	No	Yes	No	Yes
Control group	Text	Text	Text	Text
Observations	1971	1971	1971	1971

Notes. This table reports estimates of regressing the term $\Delta E_i(\pi) = |E_i^{\text{post}}(\pi) - 2| - |E_i^{\text{prior}}(\pi) - 2|$ on different audiovisual treatments. The Text treatment, i.e., showing only the text transcript of Christine Lagarde’s statement, serves as the control group. Coefficients are estimated using Huber robust regressions and all specifications (Columns 1 to 8) include a dummy variable indicating whether the respective respondent took part in the first or the second survey wave. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

Table B.9: Robustness of Audiovisual Medium Effects – Subtitle Controls

	Effect on Inflation Updating Net of 2% Target			
Separate Effects	Short-term		Medium-term	
	(1)	(2)	(3)	(4)
Photo	−0.164* (0.092)	−0.193** (0.097)	−0.053 (0.105)	−0.068 (0.108)
Audio	−0.335*** (0.119)	−0.329*** (0.126)	−0.339** (0.137)	−0.334** (0.140)
Audio & Photo	−0.312*** (0.119)	−0.338*** (0.125)	−0.332** (0.137)	−0.375*** (0.139)
Video	−0.356*** (0.120)	−0.398*** (0.127)	−0.336** (0.138)	−0.370*** (0.141)
Subtitle controls	Yes	Yes	Yes	Yes
Sociodemographic controls	No	Yes	No	Yes
Control group	Text	Text	Text	Text
Observations	1971	1971	1971	1971

Notes. This table reports estimates of regressing the term $\Delta E_i(\pi) = |E_i^{\text{post}}(\pi) - 2| - |E_i^{\text{prior}}(\pi) - 2|$ (i.e., the difference between the post-treatment inflation expectations and pre-treatment inflation expectations, both relative to the 2%-inflation target) on different audiovisual treatments. The Text treatment, i.e., showing only the text transcript of Christine Lagarde’s statement, serves as the control group. All the audiovisual treatments (Photo, Audio, Audio & Photo, and Video) also display the text transcript. Coefficients are estimated using Huber robust regressions. All specifications include controls for subtitles in the Audio and Video treatments. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

Table B.10: Respondent Confidence

	Effect on Confidence	Effect on Inflation Updating Net of 2% Target			
	Confidence of Households	Short-term		Medium-term	
	(1)	(2)	(3)	(4)	(5)
Panel A: Aggregate Effects					
Audiovisual treatment	0.517*** (0.181)	-0.293*** (0.092)	-0.302*** (0.092)	-0.207* (0.106)	-0.221** (0.106)
Confidence of Households			0.026** (0.011)		0.028** (0.013)
Panel B: Separate Effects					
	Confidence of Households	Short-term		Medium-term	
	(6)	(7)	(8)	(9)	(10)
Photo	0.443** (0.188)	-0.192** (0.097)	-0.202** (0.096)	-0.068 (0.108)	-0.084 (0.108)
Audio	0.491** (0.214)	-0.421*** (0.110)	-0.432*** (0.109)	-0.396*** (0.122)	-0.410*** (0.123)
Audio & Photo	0.814*** (0.244)	-0.337*** (0.125)	-0.351*** (0.125)	-0.374*** (0.139)	-0.398*** (0.141)
Video	0.597*** (0.215)	-0.441*** (0.110)	-0.457*** (0.110)	-0.305** (0.123)	-0.323*** (0.124)
Confidence of Households			0.027** (0.012)		0.029** (0.013)
Sociodemographic controls	Yes	Yes	Yes	Yes	Yes
Control group	Text	Text	Text	Text	Text
Observations	1971	1971	1971	1971	1971

Notes. The dependent variable in Columns 1 and 6 is an ordinal variable ranging from 1 to 10 which measures how confident the respondents are about their inflation prediction in the medium-term (see Appendix C, Question 18). For ease of direct comparison, Columns 2, 4, 7, and 9 repeat Columns 2, 4, 6, and 8 of Table 2. The effects on confidence (Columns 1 and 6) are estimated using OLS, while the effects on inflation updating (Columns 2 to 5 and 7 to 10) are estimated using Huber robust regressions. In all regressions, we control for the respondents' initial guess of the past annual inflation rate and additionally include a dummy variable indicating whether the respective respondent took part in the first or the second survey wave. The self-reported sociodemographic controls are age, gender, household income, education, frequency of business news consumption, whether households know who Christine Lagarde is, and whether they follow the decisions of the ECB. Robust standard errors are in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Seeing and Hearing is Believing: The Role of Audiovisual
Communication in Shaping Inflation Expectations
– **Online Appendix** –

Elliott Ash, Heiner Mikosch, Alexis Perakis, and Samad Sarferaz

ETH Zurich

May 22, 2024

This appendix provides supplementary material. Section A presents supplemental information on the survey experiment, including a graphical overview of the survey, evidence on the representativeness of the survey sample, summary statistics of the survey data, and information on the ethics approval and the pre-registration. Section B presents various additional regressions results. Section C provides the survey questionnaire.

B.2 Survey Attentiveness

More dynamic mediums could mechanically cause participants to be more attentive to the message shown in the survey experiment. An increase in attentiveness would then increase updating by shifting respondents to simply repeat the target value (i.e. 2%). This appendix evaluates the relative importance of this mechanical effect in our results.

We can check for treatment effects on attentiveness by looking at the effects of the treatments on the post-treatment survey attentiveness checks. We asked the respondents two such questions: (1) “What is Christine Lagarde’s position?” and (2) “What was her statement about?”. These are both multiple-choice questions with four options. We combine the two questions into a single attentiveness measure equalling one if the respondent answered both questions correctly (with mean 0.78). We then test whether our treatments have an effect on the attentiveness outcome in Appendix Table B.11. Column 1 in Panel A shows a positive and significant effect of the pooled treatments on attentiveness.

However, we can rule out that our main results on inflation expectations updates are driven mechanically by this effect on survey attentiveness. First, in Appendix Table B.11 (Columns 3, 5, 8, and 10), we include the attentiveness variable as a covariate in our main regressions. Intuitively, more attentive respondents tend to update more toward the target. But the inclusion of the control does not change the other treatment coefficients at all. Second, there is no effect of the treatments on the time spent on the survey post-intervention (Appendix Table B.12). Third, the results are not driven solely by respondents picking 2.0% exactly as their expected inflation post-intervention – that is, repeating the provided target (Appendix Table B.6). Rather, we see updating *toward* the target.

Table B.11: Respondent Attentiveness

	Effect on Attentiveness		Effect on Inflation Updating Net of 2% Target		
Panel A: Aggregate Effects					
	Attentiveness of Households		Short-term		Medium-term
	(1)	(2)	(3)	(4)	(5)
Audiovisual treatment	0.070** (0.032)	-0.293*** (0.092)	-0.273*** (0.093)	-0.207* (0.106)	-0.199* (0.108)
Attentiveness of Households			-0.332*** (0.065)		-0.229*** (0.076)
Panel B: Separate Effects					
	Attentiveness of Households		Short-term		Medium-term
	(6)	(7)	(8)	(9)	(10)
Photo	0.082** (0.034)	-0.192** (0.097)	-0.165* (0.097)	-0.068 (0.108)	-0.055 (0.109)
Audio	0.055 (0.038)	-0.421*** (0.110)	-0.415*** (0.110)	-0.396*** (0.122)	-0.391*** (0.123)
Audio & Photo	0.058 (0.043)	-0.337*** (0.125)	-0.326*** (0.126)	-0.374*** (0.139)	-0.367*** (0.141)
Video	0.058 (0.038)	-0.441*** (0.110)	-0.421*** (0.111)	-0.305** (0.123)	-0.293** (0.124)
Attentiveness of Households			-0.352*** (0.066)		-0.226*** (0.073)
Sociodemographic controls	Yes	Yes	Yes	Yes	Yes
Control group	Text	Text	Text	Text	Text
Observations	1971	1971	1971	1971	1971

Notes. The dependent variable in Columns 1 and 6 is a dummy being one if the respondent has been attentive during the survey and zero otherwise. We classify respondents as attentive if they click the correct answer to the following two questions at the end of the survey (see Appendix C, Questions 25 and 26): “What is Christine Lagarde’s position?” “What was her statement about?” Columns 3, 5, 8, and 10 iterate the regressions of Columns 2, 4, 6, and 8 of Table 2, but including the attentiveness dummy. For ease of direct comparison, Columns 2, 4, 7, and 9 repeat Columns 2, 4, 6, and 8 of Table 2. The effects on attentiveness (Columns 1 and 6) are estimated using OLS, while the effects on inflation updating (Columns 2 to 5 and 7 to 10) are estimated using Huber robust regressions. In all regressions, we control for the respondents’ initial guess of the past annual inflation rate and additionally include a dummy variable indicating whether the respective respondent took part in the first or the second survey wave. The self-reported sociodemographic controls are age, gender, household income, education, frequency of business news consumption, whether households know who Christine Lagarde is, and whether they follow the decisions of the ECB. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

Table B.12: Audiovisual Effects on Response Time

	Effect on Post-Treatment Duration	
Panel A: Aggregate Effects		
	(1)	(2)
-----	-----	-----
Audiovisual treatment	-1.536 (3.018)	0.921 (2.954)
<hr/>		
Panel B: Separate Effects		
	(3)	(4)
-----	-----	-----
Photo	1.028 (3.136)	2.811 (3.069)
Audio	-4.363 (3.552)	-1.741 (3.483)
Audio & Photo	-2.886 (4.064)	1.543 (3.975)
Video	-5.125 (3.570)	-2.148 (3.500)
<hr/>		
Sociodemographic controls	No	Yes
Control group	Text	Text
Observations	1971	1971

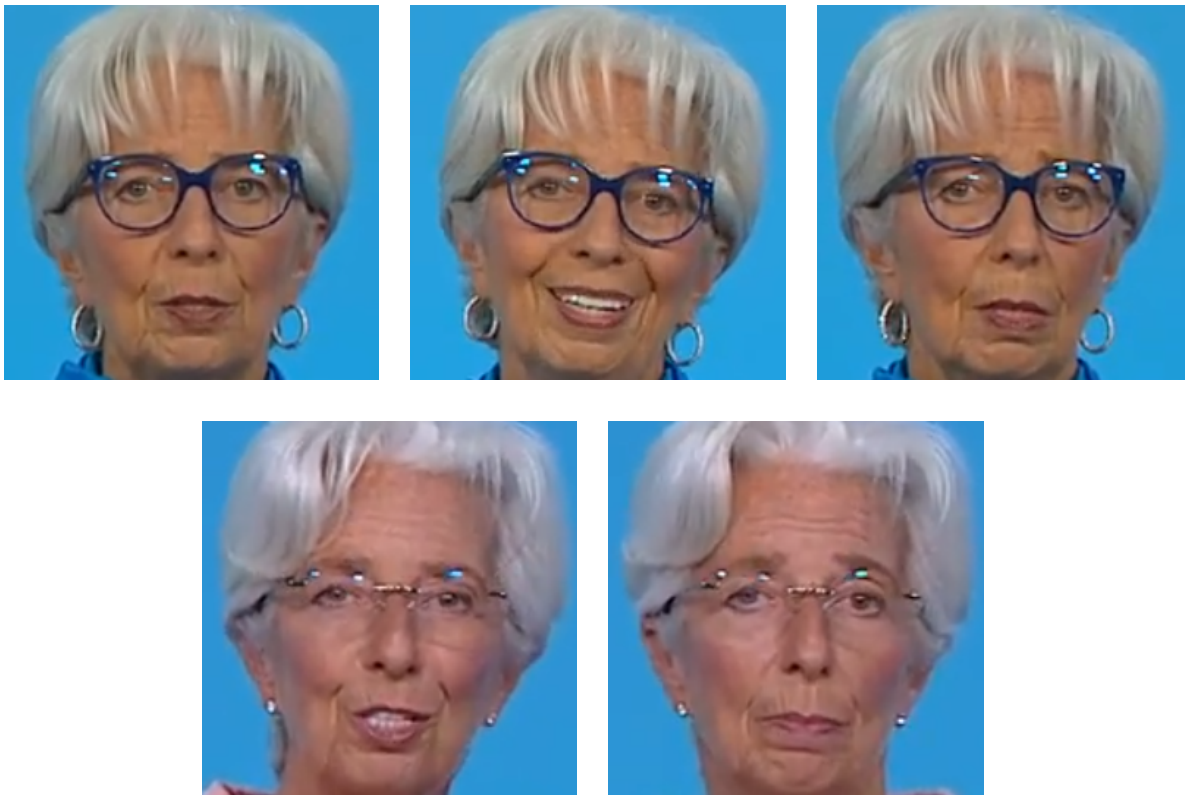
Notes. This table reports estimates of regressing the post-treatment survey response duration on different audiovisual treatments. The Text treatment, i.e., showing only the text transcript of Christine Lagarde’s statement, serves as the control group. All the audiovisual treatments (Photo, Audio, Audio & Photo, and Video) also display the text transcript. Coefficients are estimated using Huber robust regressions. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

B.3 Photo Treatment Images

We extract three photos from the official video recording of the press conference (see [here](#)). In addition, we extract two photos from the video recording of the previous press conference, namely the one following the ECB Governing Council on September 9, 2021 (see [here](#)). Figure B.1 shows the photos. We randomize the photo assignment within the Photo treatment arm among the five photo alternatives.

In a preliminary assessment, we examined whether the emotions displayed by Christine Lagarde in the photos have a differentiated impact on the inflation expectations of households. Since we do not find average treatment effect differences across photos, we pool them together for our main analysis.

Figure B.1: Images of Christine Lagarde used in Photo Treatment



Notes. Various emotional expressions of Christine Lagarde. Top row: Photos at the press conference after the ECB Governing Council meeting on October 28th, 2021. Bottom row: Photos at the press conference after the ECB Governing Council meeting on September 9th, 2021. The top left image was used in the Audio & Photo treatment.

B.4 Credibility/Trust in the ECB

This appendix reports additional supporting results on whether the audiovisual treatments can influence the credibility and/or trust in the European Central bank. We ask whether the treatments change respondents' perceptions of the ECB's credibility in pursuing inflation targets, or otherwise increase respondents' trust in the ECB as an institution. This evidence is relevant to an ongoing discussion about the importance of trust and credit in the functioning of central banks (Blinder, 2000).

In line with Ehrmann, Georgarakos and Kenny (2023), we get at credibility and trust using two post-treatment survey questions that ask about those issues. First, to measure ECB credibility: "How much do you trust the European Central Bank (ECB) to adequately manage inflation?". Second, to measure trust in the central bank: "How much do you trust the European Central Bank (ECB) to care about the economic well-being of all people in the Euro Area, including people like yourself?". The answers to both questions are on a scale of 1-10, with 10 indicating the highest level of credibility or trust.

We then examine how the treatments affect the credibility and trust variables. Appendix Table B.13 Panel A shows that in the pooled treatment specification, there are positive coefficients for both credibility in managing inflation (Column 1) and trust to care about well-being (Column 2), but only the trust coefficient is statistically significant (at the 10% significance level). Breaking out the mediums, we see positive coefficients of mixed magnitude and significance. Photo and Audio & Photo increase credibility on inflation management (at the 10% significance level; Column 7). Photo and Video increase trust in terms of caring about well-being (Column 8). However, Audio on its own does not appear to increase credibility or trust.

These results suggest that audiovisual mediums influence credibility and trust in a different way to how they influence inflation expectations updating. Photo has the largest effect on credibility/trust, while having the weakest effect on inflation beliefs. That is the opposite to the main results on inflation beliefs. To further assess the connection between credibility/trust and inflation beliefs, we include the credibility and trust variables as covariates in the main regression (Appendix Table B.13, Columns 4, 6, 10, and 12). Interestingly, credibility to manage inflation is associated with more inflation updating toward the target, while trust to care about the people's well-being is associated with less inflation updating (at least in the short term; Columns 4 and 10). Nonetheless, controlling for credibility/trust does not move the treatment coefficient estimates.

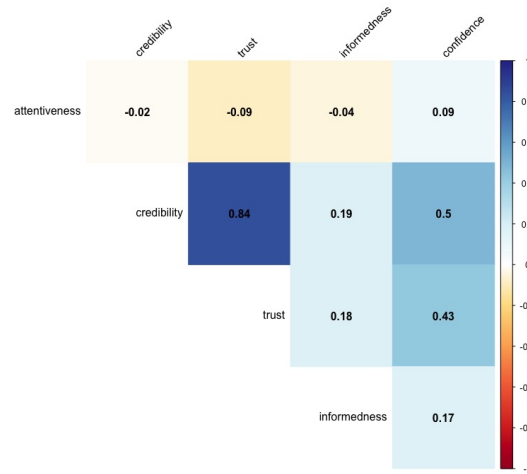
Table B.13: Credibility and Trust in the ECB

	Effect on Credibility/Trust		Effect on Inflation Updating Net of 2% Target			
	Manage Inflation	Care about Well-Being	Short-term		Medium-term	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Aggregate Effects						
Audiovisual treatment	0.268 (0.167)	0.340* (0.180)	-0.293*** (0.092)	-0.292*** (0.093)	-0.207* (0.106)	-0.199* (0.106)
Credibility: Manage Inflation				-0.062*** (0.021)		-0.017 (0.024)
Trust: Care about Well-Being				0.057*** (0.019)		-0.010 (0.022)
Panel B: Separate Effects						
	Manage Inflation	Care about Well-Being	Short-term		Medium-term	
	(7)	(8)	(9)	(10)	(11)	(12)
Photo	0.289* (0.173)	0.355* (0.186)	-0.192** (0.097)	-0.187* (0.097)	-0.068 (0.108)	-0.060 (0.108)
Audio	0.117 (0.196)	0.209 (0.212)	-0.421*** (0.110)	-0.425*** (0.110)	-0.396*** (0.122)	-0.394*** (0.122)
Audio & Photo	0.434* (0.224)	0.315 (0.242)	-0.337*** (0.125)	-0.328*** (0.125)	-0.374*** (0.139)	-0.362*** (0.140)
Video	0.266 (0.197)	0.443** (0.213)	-0.441*** (0.110)	-0.450*** (0.110)	-0.305** (0.123)	-0.299** (0.123)
Credibility: Manage Inflation				-0.067*** (0.021)		-0.020 (0.023)
Trust: Care about Well-Being				0.060*** (0.019)		-0.007 (0.022)
Sociodemographic controls	Yes	Yes	Yes	Yes	Yes	Yes
Control group	Text	Text	Text	Text	Text	Text
Observations	1971	1971	1971	1971	1971	1971

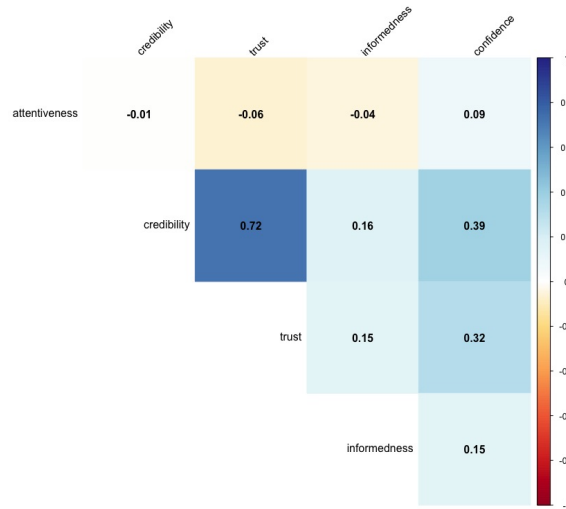
Notes. The dependent variable in Columns 1 and 7 is an ordinal variable ranging from 1 to 10 which measures how much the respondents trust the ECB to adequately manage inflation (see Appendix C, Question 23). The dependent variable in Columns 2 and 8 is another ordinal variable ranging from 1 to 10 which measures how much the respondents trust the ECB to care about the economic well-being of all people in the Euro Area (see Appendix C, Question 24). Columns 4, 6, 10, and 12 iterate the regressions of Columns 2, 4, 6, and 8 of Table 2, but with additional inclusion of the trust variables. For direct comparison, Columns 3, 5, 9, and 11 repeat Columns 2, 4, 6, and 8 of Table 2. The effects on credibility/trust (Columns 1, 2, 7 and 8) are estimated using OLS, while the effects on inflation updating (Columns 3 to 6 and 9 to 12) are estimated using Huber robust regressions. In all regressions, we control for the respondents' initial guess of the past annual inflation rate and additionally include a dummy variable indicating whether the respective respondent took part in the first or the second survey wave. The self-reported sociodemographic controls are age, gender, household income, education, frequency of business news consumption, whether households know who Christine Lagarde is, and whether they follow the decisions of the ECB. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

Figure B.2: Correlations in Attentiveness, Credibility, Trust, Informedness, Confidence

Panel A: Pearson Coefficient



Panel B: Kendall Coefficient



Notes. The panels show the Pearson and Kendall correlation coefficients between different survey variables for the Placebo treatment group: respondent attentiveness during the survey, credibility of the European Central Bank (ECB), trust in the ECB, respondent informedness about economic conditions, and respondent confidence in their post-treatment medium-term inflation prediction.

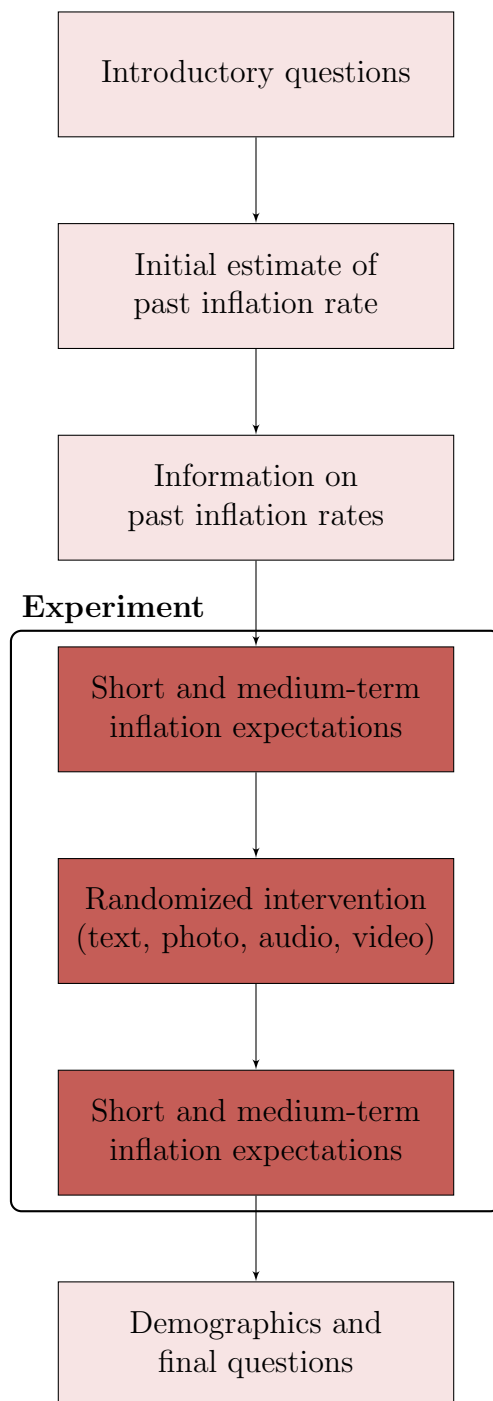
Table B.14: Treatment Balance Check on Pre-treatment Inflation Expectations

	Effect on Pre-treatment Inflation Expectations			
	Short-term		Medium-term	
	(1)	(2)	(3)	(4)
Panel A: Aggregate Effects				
Audiovisual treatment	0.237 (0.220)	0.247 (0.201)	-0.017 (0.178)	-0.013 (0.177)
Panel B: Separate Effects				
	Short-term		Medium-term	
	(5)	(6)	(7)	(8)
Photo	0.241 (0.229)	0.277 (0.208)	0.026 (0.185)	0.035 (0.184)
Audio	0.334 (0.260)	0.283 (0.236)	0.022 (0.210)	-0.004 (0.209)
Audio & Photo	0.047 (0.297)	0.044 (0.269)	-0.269 (0.240)	-0.226 (0.238)
Video	0.234 (0.261)	0.231 (0.237)	-0.043 (0.211)	-0.042 (0.210)
Sociodemographic controls	No	Yes	No	Yes
Control group	Text	Text	Text	Text
Observations	1971	1971	1971	1971

Notes. Balance checks for pre-treatment expected inflation. This table reports estimates of regressing the term $E_i^{\text{prior}}(\pi)$ (i.e., the pre-treatment inflation expectations) on different audiovisual treatments. The Text treatment, i.e., showing only the text transcript of Christine Lagarde's statement, serves as the control group. All the audiovisual treatments (Photo, Audio, Audio & Photo, and Video) also display the text transcript. Coefficients are estimated using Huber robust regressions. Robust standard errors are in parentheses. *p<0.1; **p<0.05; ***p<0.01.

C Questionnaire

Figure C.1: Survey Timeline



Basic Information

1. During the last month, how often have you consulted information on economics or business conditions in Europe (via official sources, television, radio, newspapers print or online, social media, friends, relatives, colleagues, or other sources)?
- Daily
 - Weekly
 - Once
 - Never

2. Do you know who Christine Lagarde is?
- Yes
 - No

[Display Question 3 if answer to Question 2 == Yes]

3. Do you know what her current position is?
- Yes
 - No

4. Do you follow the decisions of the European Central Bank (ECB) (e.g., through newspapers, social media, their official website, or other sources)?
- Yes
 - No

5. Now, we would like to ask you for your best guess about the **past** rate of inflation/deflation in the Euro Area. What do you think was the yearly rate of inflation for the Euro Area in the year **2021**? Please answer in %.

Note: The yearly rate of inflation for the Euro Area is the percentage rise in the Harmonised Index of Consumer Prices (HICP) in a given year as compared to the previous year. The HICP measures the overall price level of goods and services in the Euro Area economy. For instance, if the HICP moves from 100 to 102, the rate of inflation is $(102-100)/100 = 2.0\%$. Phrased differently and considering only a single good: If the price of the good moves from 1.00 euro to 1.02 euro, the rate of inflation for this good is $(1.02-1.00)/1.00 = 2.0\%$. Deflation means that prices are falling, and hence, deflation is the opposite of inflation.

6. INFO: We would like to inform you about the yearly inflation rates in the Euro Area for the past years:

2017: 1.5%
2018: 1.7%
2019: 1.2%
2020: 0.2%
2021: 2.6%

Now, we would like to ask you for your best guess about the **future** rate of inflation/deflation in the Euro Area in the **short term**, i.e., in the year **2022**. What do you think is going to be the yearly rate of inflation/deflation in the year 2022? Please answer in %.

7. Now, we would like to ask you for your best guess about the **future** rate of inflation/deflation in the Euro Area in the **medium term**, i.e., in the year 2024. What do you think is going to be the yearly rate of inflation/deflation in the year **2024**? Please answer in %.

8. In the next question, you will be asked about the PERCENT CHANCE of something happening. The percent chance must be a number between 0 and 100. For example, numbers like: 1 and 4 percent may indicate "almost no chance" 15 percent or so may mean "not much chance" 47 or 53 percent chance may be a "pretty even chance" 85 percent or so may mean a "very good chance" 96 or 99 percent chance may be "almost certain".

When we ask you about the percent chance of different options, the sum of your answers must add up to 100. We realize that these questions take a little more effort.

What do you think is the percent chance that, over the **medium term**, i.e., in the year **2024**:

The yearly rate of inflation in the Euro Area will be 8.0% or more: _____
The yearly rate of inflation in the Euro Area will be between 4.0% and 7.9%: _____
The yearly rate of inflation in the Euro Area will be between 2.0% and 3.9%: _____
The yearly rate of inflation in the Euro Area will be between 0% and 1.9%: _____
The yearly rate of inflation in the Euro Area will be between -0.1% and -2.0%: _____
The yearly rate of inflation in the Euro Area will be between -2.1% and -4.0%: _____
The yearly rate of inflation in the Euro Area will be between -4.1% and -8.0%: _____
The yearly rate of inflation in the Euro Area will be -8.1% or lower: _____
Total : _____ [Computed automatically]

The range of each answer above must be between 0-100, where we do not allow for decimal points. Negative rates of inflation correspond to deflation.

Information Treatments

Central Bank Statement (Text)

9. The sentence below is part of a statement on future inflation in the Euro Area by Christine Lagarde, the president of the European Central Bank (ECB), at the press conference following the ECB Governing Council Meeting on 28.10.2021.

We stand ready to adjust all of our instruments, as appropriate, to ensure that inflation stabilizes at our two per cent target over the medium term.

Central Bank Statement (Audio & Text)

10. The sentence below is part of a statement on future inflation in the Euro Area by Christine Lagarde, the president of the European Central Bank (ECB), at the press conference following the ECB Governing Council Meeting on 28.10.2021.

Please play the following recording: ►

We stand ready to adjust all of our instruments, as appropriate, to ensure that inflation stabilizes at our two per cent target over the medium term.

Central Bank Statement (Photo & Text)

11. The sentence below is part of a statement on future inflation in the Euro Area by Christine Lagarde, the president of the European Central Bank (ECB), at the press conference following the ECB Governing Council Meeting on 28.10.2021.

Press conference photo of Christine Lagarde.

We stand ready to adjust all of our instruments, as appropriate, to ensure that inflation stabilizes at our two per cent target over the medium term.

Central Bank Statement (Audio & Photo & Text)

12. The sentence below is part of a statement on future inflation in the Euro Area by Christine Lagarde, the president of the European Central Bank (ECB), at the press conference following the ECB Governing Council Meeting on 28.10.2021.

Press conference photo of Christine Lagarde (ECB president).

Please play the following recording: ►

We stand ready to adjust all of our instruments, as appropriate, to ensure that inflation stabilizes at our two per cent target over the medium term.

Central Bank Statement (Video & Text)

13. The sentence below is part of a statement on future inflation in the Euro Area by Christine Lagarde, the president of the European Central Bank (ECB), at the press conference following the ECB Governing Council Meeting on 28.10.2021.

Please play the following recording: ►

We stand ready to adjust all of our instruments, as appropriate, to ensure that inflation stabilizes at our two per cent target over the medium term.

Central Bank Statement (Placebo 1)

14. The sentence below is part of a statement on future inflation in the Euro Area by Christine Lagarde, the president of the European Central Bank (ECB), at the press conference following the ECB Governing Council Meeting on 28.10.2021.

An effective implementation of the Next Generation EU programme and the “Fit for 55” package will contribute to a stronger, greener and more even recovery across euro area countries.

Central Bank Statement (Placebo 2)

15. The sentence below is part of a statement on future inflation in the Euro Area by Christine Lagarde, the president of the European Central Bank (ECB), at the press conference following the ECB Governing Council Meeting on 28.10.2021.

The grip of the pandemic on the economy has visibly weakened, with restrictions being lifted as a result of successful health measures and large numbers of people now vaccinated.

Post-Treatment Questions

16. Now, we would like to ask you once again for your best guess about the **future** rate of inflation/deflation in the Euro Area in the **short term**, i.e., in the year 2022. What do you think is going to be the yearly rate of inflation/deflation in the year 2022? Please answer in %.

17. Further, we would like to ask you once again for your best guess about the **future** rate of inflation/deflation in the Euro Area in the **medium term**, i.e., in the year 2024. What do you think is going to be the yearly rate of inflation/deflation in the year 2024? Please answer in %.

18. On a scale of one to ten, how confident are you in your predictions about the yearly rate of inflation in the year 2024?

- not confident at all 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- fully confident 10

19. In the next question, you will be asked once again about the PERCENT CHANCE of something happening.

What do you think is the percent chance that, over the **medium term**, i.e., in the year **2024**:

The yearly rate of inflation in the Euro Area will be 8.0% or more: _____

The yearly rate of inflation in the Euro Area will be between 4.0% and 7.9%: _____

The yearly rate of inflation in the Euro Area will be between 2.0% and 3.9%: _____

The yearly rate of inflation in the Euro Area will be between 0% and 1.9%: _____

The yearly rate of inflation in the Euro Area will be between -0.1% and -2.0%: _____

The yearly rate of inflation in the Euro Area will be between -2.1% and -4.0%: _____

The yearly rate of inflation in the Euro Area will be between -4.1% and -8.0%: _____

The yearly rate of inflation in the Euro Area will be -8.1% or lower: _____

Total : _____ [Computed automatically]

The range of each answer above must be between 0-100, where we do not allow for decimal points. Negative rates of inflation correspond to deflation.

Personal Characteristics

20. What year were you born?
▼ 1921 (1) ... 2011 (105)
21. What is your gender?
- Female
 - Male
 - Other
22. What is the highest level of school you have completed, or the highest degree you have received?
- High school or less
 - Some college but no degree (including academic, vocational, or occupational programs)
 - Associate/Junior College degree (including academic, vocational, or occupational programs)
 - Bachelor's Degree (For example: BA, BS)
 - Postgraduate Degree (For example: MA, MBA, MS, PhD, JD, MD)
 - Other (please specify)
23. How much do you trust the European Central Bank (ECB) to adequately manage inflation?
- no trust at all 1
 - 2
 - 3
 - 4
 - 5
 - 6
 - 7
 - 8
 - 9
 - completely trust 10
24. How much do you trust the European Central Bank (ECB) to care about the economic well-being of all people in the Euro Area, including people like yourself?
- no trust at all 1
 - 2
 - 3
 - 4
 - 5
 - 6
 - 7
 - 8
 - 9
 - completely trust 10
25. Earlier in the survey, we showed you a statement by Christine Lagarde. What is her role?
- President of the European Commission
 - President of the European Parliament
 - President of the European Central Bank
 - President of the European Court of Justice
26. Earlier in the survey, we showed you a statement related to the European Central Bank (ECB). What was this statement about?
- Unemployment
 - Gross domestic product
 - Inflation
 - Interest rates
27. Which category represents the total combined pre-tax income of all members of your household (including yourself) during the past 12 months?
- Please include money from all jobs, net income from business, farm or rent, pensions, interest on savings or bonds, dividends, social security income, unemployment benefits, workers compensation or disability benefits, child support,

alimony, scholarships, fellowships, grants, inheritances and gifts, and any other money income received by members of your household.

▼ Less than 10'000 Euro (1) ... I do not want to answer (99)

28. Could you tell us how interesting or uninteresting you found the questions in this survey?

- Very uninteresting
- Somewhat uninteresting
- Neither interesting or uninteresting
- Somewhat interesting
- Very interesting