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## The role of information and experience for households' inflation expectations

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# Non-technical summary


### Research Question

Expectations of macroeconomic outcomes can vary because of different information sets, or due to alternative views on the workings of the economy. In this paper, we investigate the role that information channels about monetary policy (e.g. traditional media or social media) and inflation experience play in shaping households' inflation expectations.

### Contribution

Our analysis is based on a new survey of German households conducted by the Bundesbank. We contributed two questions to the questionnaire. First, we ask participants about the information channels they use to find out about the ECB's monetary policy. Second, we confront households with an unexpected policy rate change by the ECB and ask them to state its effect on their inflation expectations. These questions allow us to assess the role that information channels and inflation experience play in the expectation formation process, while controlling for socioeconomic characteristics.

### Results

We find that the types of information channels that households use to inform themselves have a major influence on the *level* of perceived past and expected future inflation. Specifically, consumers of traditional media have lower and, as a result, more accurate views of inflation over the last year, as well as lower inflation expectations for the coming year. By contrast, the expected future *change* in inflation is closely related to individual inflation experience. Similarly, the expected response of inflation to a change in the interest rate is also shaped by experience. We propose the interpretation that households obtain inflation numbers from the media, but their 'economic model' is shaped by experience.

# Nichttechnische Zusammenfassung


### Fragestellung

Makroökonomische Erwartungen können aufgrund unterschiedlicher Informationen oder durch eine alternative Sicht auf die Wirkungszusammenhänge einer Volkswirtschaft zwischen Individuen variieren. In dieser Studie untersuchen wir die Rolle von Informationskanälen über Geldpolitik (z.B. traditionelle oder soziale Medien) und Inflationserfahrungen für die Inflationserwartungen von Haushalten.

### Beitrag

Unsere Analyse basiert auf einer neuen Umfrage der Bundesbank unter deutschen Haushalten, zu der wir zwei Fragen beigetragen haben. Zum einen befragen wir die teilnehmenden Haushalte zu den Informationskanälen über die sie sich über die Geldpolitik der EZB informieren. Zum anderen konfrontieren wir Haushalte mit einer hypothetischen, unerwarteten Zinsanpassung durch die EZB und befragen sie zur Auswirkung auf ihre Inflationserwartung. Diese Fragen versetzen uns in die Lage, die Rolle der Informationskanäle und der Inflationserfahrung auf den Erwartungsbildungsprozess zu untersuchen und dabei für sozio-ökonomische Charakteristiken zu kontrollieren.

### Ergebnisse

Wir zeigen dass die Informationskanäle, über die sich die Haushalte informieren, einen wichtigen Einfluss auf das *Niveau* der wahrgenommenen vergangenen und erwarteten zukünftigen Inflation haben. Insbesondere finden wir, dass Konsumenten traditioneller Medien niedrigere, und dadurch genauere, Einschätzungen über die Inflation im letzten Jahr haben, sowie niedrigere Inflationserwartungen für das kommende Jahr. Im Gegensatz dazu hängt die erwartete zukünftige *Veränderung* der Inflation stärker mit der individuellen Inflationserfahrung zusammen. Ebenso wird die erwartete Anpassung der Inflation aufgrund einer Veränderung des Leitzinses durch die Erfahrung bestimmt. Wir interpretieren unsere Ergebnisse dahingehend, dass Haushalte Inflationszahlen aus den Medien erhalten, wohingegen ihr 'ökonomisches Modell' durch Erfahrung geformt wird.

Bundesbank Discussion Paper No 07/2021

# The role of information and experience for households' inflation expectations*

Christian Conrad† Zeno Enders‡ Alexander Glas§

**Abstract**

Based on a new survey of German households, we investigate the role that information channels and lifetime experience play in households' inflation expectations. We show that the types of information channels that households use to inform themselves about monetary policy are closely related to their socioeconomic characteristics. These information channels, in turn, have a major influence on the *level* of perceived past and expected future inflation, as well as on the uncertainty thereof. The expected future *change* in inflation and the unemployment rate, however, is strongly influenced by individual experience of these variables. Similarly, the expected response of inflation to a change in the interest rate is also shaped by experience. We propose the interpretation that households obtain inflation numbers from the media, but their 'economic model' is shaped by experience.

**Keywords:** Household expectations, inflation expectations, information channels, experience, Bundesbank household survey

**JEL classification:** E31, D84, E71.

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# 1 Introduction

What determines households' inflation expectations? Considering how important this question is for monetary policy, relatively few studies have explored this question empirically until recently. Moreover, most studies on this topic – see below for an overview – employ US data only. Presumably, data constraints are to blame for this research gap. In this paper, we take an explorative look at a large new survey of German households, conducted in 2019 by the Bundesbank, focusing on the role that information channels (e.g. traditional media or social media) and experiences play in shaping households' inflation expectations.[1] We find that both play a role, but for different aspects of how expectations are formed.

Expectations of economic variables can vary across households because of different information sets or due to alternative views on the workings of the economy, i.e. the 'economic model' of households. The information channels that households use will, at the very least, affect their information sets. First, there is evidence that the coverage of central bank news varies across information channels (Binder, 2017). Second, even if distinct information channels cover the same news, they might present the news in different ways. We find that socioeconomic characteristics are related to the information channel that households mainly use to find out about monetary policy. This channel, in turn, plays an important role in what households expect about the *level* of past and future inflation, controlling for other household characteristics. Specifically, consumers of traditional media such as newspapers or television have lower and, as a result, more accurate views of inflation over the last year, as well as lower inflation expectations for the coming year. The effect on future expected inflation works indirectly via perceived inflation. Households that use traditional media are also less uncertain about future inflation. These results can be rationalized by a high information content and a comprehensible presentation in traditional media. By contrast, we find no evidence that lifetime inflation experiences affect perceived inflation and only weak evidence that they affect expected inflation.

Next, we show that households that inform themselves about monetary policy via social media display greater uncertainty regarding future inflation. As discussed in Bundesbank (2019), this latter finding suggests that central banks might want to increase their social media presence to facilitate the spread of accurate information via this channel.

Finally, lifetime experience of inflation turns out to be highly relevant for expectations regarding the *direction* of future inflation. The higher the inflation an individual has experienced, the more likely it is that the individual will expect inflation to increase over the next twelve months. This is consistent with the hypothesis that experiences, rather than information channels, influence individuals' economic model, i.e. the way agents think about the basic mechanics of the economy. We confirm this result with our observations on the expected direction of the unemployment rate, and the answers to a thought experiment in which the European Central Bank unexpectedly raises interest rates. When individuals are asked about the effects of such a change in interest rates,

[1] Lagarde (2020) outlines the importance of both the public's economic expectations and communication about monetary policy for the ECB. Given that direct central bank communication finds it difficult to change households' inflation expectations (Lamla and Vinogradov, 2019), other communication channels might be crucial to fill this gap (Lamla and Lein, 2014).

their consumption of traditional media loses its importance. Experience again exerts a much stronger influence over expected linkages between economic variables. Specifically, individuals who have experienced higher inflation over their lifetime expect inflation to rise after an increase in the interest rate.

The remainder of this paper is organized as follows. Section 2 discusses the related literature. Section 3 presents the data set. Section 4 investigates the determinants of households' information channels, while Section 5 explores the role that information channels and experience play in inflation expectations. Section 6 analyzes the effect of a hypothetical change in the policy rate on inflation expectations. Section 7 concludes.

# 2 Related literature

Our paper relates to the literature on the determinants of households' inflation expectations. In particular, we contribute to the evidence on the role that information channels and experience play in individual expectations.[2] Using a survey of Dutch households, van der Cruijsen, Jansen, and de Haan (2015) find that knowledge about the ECB's objectives is quite limited. Similarly, Lamla and Vinogradov (2019) observe no general effect of FOMC meetings on household expectations in the US. Andre, Pizzinelli, Roth, and Wohlfart (2019) present households with hypothetical exogenous shocks and find that adjustments of households' expectations deviate strongly from those of economic experts. Household behavior follows a pattern in which variables co-move that households consider 'bad' or 'good'. Rather than using information about central bank actions, households seem to form inflation expectations based on their observations during grocery shopping, according to D'Acunto, Malmendier, Ospina, and Weber (2019). This also creates a significant gender gap in inflation perceptions (D'Acunto, Malmendier, and Weber, 2020). However, if confronted with alternative information treatments about current and next year's interest rates, households significantly adjust their inflation expectations (Coibion, Georgarakos, Gorodnichenko, and Weber, 2020).

An early study that, among other things, investigates the channels that US households use to inform themselves about economic issues is Krueger and Blinder (2004). Television and newspapers are the two most frequent and most important sources of information. In one part of their analysis, Kumar, Afrouzi, Coibion, and Gorodnichenko (2015) relate the information channels used by firm managers in New Zealand to their perceived and expected inflation, as well as to their estimate of the central bank's inflation target. They find that those managers who have the most accurate view on the inflation target primarily use television and newspapers to inform themselves, and that users of media have the lowest error for actual inflation. Coibion, Gorodnichenko, and Weber (2019) go one step further and test the reaction of households' inflation expectations to different forms of information about inflation. Reading the FOMC statement has approximately the same effect on households' forecast revisions as just providing the FED's inflation target. Compared to these information channels, the reaction to reading news articles is about half as strong.

Regarding the role of experience, Malmendier and Nagel (2016) find that individu-

[2] Previous studies have often focused on the socioeconomic determinants of inflation expectations, see, e.g. Jonung (1981) and Bruine de Bruin, Vanderklaauw, Downs, Fischhoff, Topa, and Amantier (2010).

als overweigh inflation that occurred during their lifetimes. Young individuals therefore update their expectations more strongly, which is also documented by Mertens, Lewis, and Makridis (2020) for the impact of surprise changes in the Federal Funds target rate on household confidence. For Germany, Goldfayn-Frank and Wohlfart (2020) show that eastern Germans expect higher inflation, most likely due to higher experienced inflation rates after reunification.

Evidence on how households form inflation expectations is economically important, given new evidence that these expectations have a bearing on actual household decisions. While Bachmann, Berg, and Sims (2015) identified a small correlation between expected inflation and readiness to spend, Dräger and Nghiem (2020) find a stronger impact of inflation expectations on current spending for German households that are active in financial markets, financially unconstrained, and display a high level of financial literacy. Coibion, Georgarakos, Gorodnichenko, and van Rooij (2019) use randomized information treatments about expected inflation and observe large negative effects of higher inflation expectations on durable spending. This effect seems to be driven by a more pessimistic view about real income in case of higher inflation expectations. Vellekoop and Wiederholt (2019) find that households with higher inflation expectations save less, while D'Acunto, Hoang, and Weber (2020) show that an announced future VAT increase raises households' inflation expectations and their durable consumption.

# 3 Data

Our analysis is based on data from the Bundesbank Online Pilot Survey on Consumer Expectations, which was conducted in April, May, and June 2019 and covers a representative sample of the German population.[3] In each wave, individuals were asked about their quantitative expectations of inflation, their qualitative expectations of inflation and the unemployment rate, and other macroeconomic figures. The data also contain detailed information about the respondents' socioeconomic characteristics. In our analysis, we focus on the subset of individuals who participated in Wave 3 (June 2019). We contributed one question to this particular wave on the information channels through which individuals find out about the ECB's monetary policy and another on the effect of an unexpected policy rate change by the ECB on inflation expectations.

## 3.1 Socioeconomic characteristics

We use information about the socioeconomic characteristics of individuals who participated in Wave 3 as control variables. The survey targeted individuals aged 16 and older. The average age was 53. We consider indicator variables for individuals living in eastern Germany shortly before reunification (*east*1989), gender (*female*), full employment (*fullemploy*), whether the individuals intend to buy a house in the next 10 years (*homebuy*), and whether individuals do not own real estate (*no_property*). In addition, we use information about household size (*hhsize*), income (*income*), and years of education (*yoe*). Further details on the construction of the variables are provided in Tables A.1-A.2 of the Appendix. Descriptive statistics are presented in Table A.3.

[3]For details on the process used to select respondents, see Bundesbank (2019).

## 3.2 Information channels

We contributed the following question on the information channels about the ECB's monetary policy.

`Q:314: Via which of the following channels do you most often receive information about the European Central Bank's (ECB) monetary policy? Please select all answers that apply.`

- `Traditional media such as newspapers, radio, television or the websites of such providers`
- `Social media such as Facebook or Twitter`
- `ECB communication channels (e.g. ECB's website, ECB's Economic Bulletin, ECB's monthly press conference)`
- `Other sources`
- `I do not follow the ECB's monetary policy`

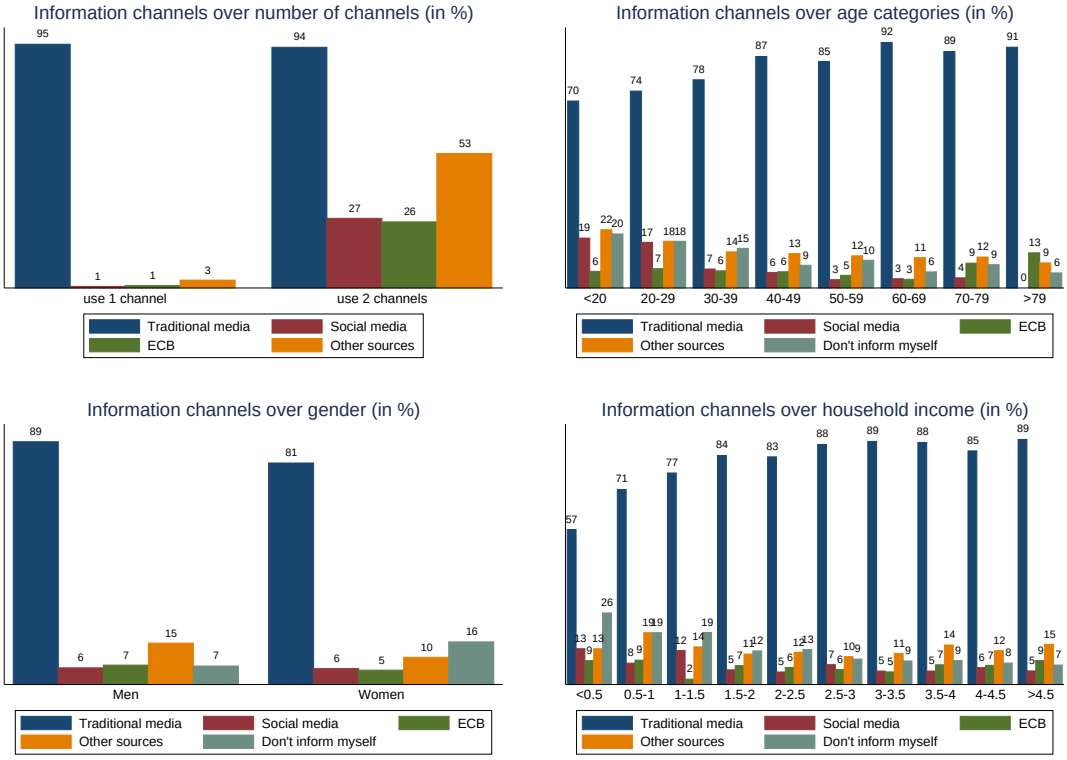
Among the 2,591 households in Wave 3, 2,585 answered Question Q:314. 85% of the respondents stated that traditional media are among the most important information channels through which they they receive information about the ECB's monetary policy. 6% of households use social media, 6.3% rely on direct ECB communication channels, and 12.9% use other information sources. Only 10.4% of households do not inform themselves about monetary policy. The majority of respondents (70.8%) stated that they receive information about monetary policy through a single information channel. 16.8% of respondents use two information channels. Hardly any respondent uses three or four information channels (1.9% and 0.1%).

The upper left panel in Figure 1 provides information about the information channels that respondents rely on when conditioning on the overall number of channels that are used. The panel shows that among those individuals who state that they use a single information channel, 95% rely on traditional media. Respondents who use two information channels still predominantly rely on traditional media (94%), followed by other sources (53%). For those individuals who use two information channels, the frequency of social media and direct ECB communication channels is more than 25%. The upper right panel shows that the use of traditional media increases with age, while social media are most popular among below 30-year olds. The lower left panel indicates that men are more likely than women to use traditional media, and that 16% of women (vs. 7% of men) do not inform themselves about monetary policy. The lower right panel shows that the likelihood of using traditional media increases with income, and that the percentage of individuals who do not receive information about monetary policy is the highest among low-income households (26%).

## 3.3 Survey-based expectations data

The Bundesbank survey elicits different types of inflation expectations. First, the survey asks for a point prediction of the rate of inflation over the past twelve months. This

Figure 1: Conditional distribution of information channels




*Notes*: The panels depict the share of German households relying on distinct information channels of monetary policy conditional on the number of information channels (upper left), age (upper right), gender (lower left) and income (lower right). Household income is expressed in 1,000 euro.

question was only put to participants of Wave 3 who did not participate in Wave 2. We consider those predictions as the perceived rate of inflation, $\pi_{i,t-12:t|t}$, of each household. Second, each individual was asked to make a point prediction of the rate of inflation over the next twelve months, $\pi_{i,t:t+12|t}$. We refer to $\pi_{i,t:t+12|t}$ as expected future inflation. Summary statistics for $\pi_{i,t-12:t|t}$ and $\pi_{i,t:t+12|t}$ can be found in Panel A in Table A.4. Following Bundesbank (2019), we focus on individuals with expectations in the range of -12% to 12%. For those individuals, the mean of the perceived inflation rate is 2.53%. This contrasts with an actual inflation rate over the May 2018 to May 2019 period of only 1.4%.[4] That is, on average households overestimated the actual inflation rate. In the following, we denote the individual perception errors by $e_{i,t-12:t|t}$. The expected rate of inflation over the next twelve months is 2.50% on average. Interestingly, Panel B of Table A.4 shows that households who primarily rely on traditional media have the lowest inflation expectations (2.41% on average), while those who do not inform themselves have the highest expectations (2.97% on average).

Besides these point predictions, the Bundesbank survey also asked for histogram forecasts for the rate of inflation over the next twelve months. For each individual, we compute the standard deviation, $\sigma_{i,t:t+12|t}$, of the histogram forecast based on the assumption that the probabilities within the distinct outcome intervals are centered at the midpoint. Glas (2020) shows that the impact of alternative distributional assumptions (e.g. fitting beta

[4]We compute the inflation rate based on the German CPI ("Verbraucherpreisindex, VPI").

distributions to the histograms) on quantifications of the standard deviation is negligible. We use $\sigma_{i,t:t+12|t}$ as a measure of inflation uncertainty. Panel C of Table A.4 reveals that users of social media are most uncertain, while users of traditional media are least uncertain.

Finally, the survey asked questions of a qualitative nature. We use questions about expected changes in inflation and the unemployment rate to better understand the economic model that individuals have in mind when forming expectations. Individuals were asked whether they believe that the inflation/unemployment rate would decrease significantly, decrease slightly, stay roughly the same, increase slightly or increase significantly. We reclassify the answers as -1, 0, 1, with -1 standing for a slight/significant decrease, 0 for no change, and 1 for a slight/significant increase. We denote the qualitative inflation and unemployment expectations by *infl_exp* and *unemp_exp*. For summary statistics see Panel D of Table A.4.

## 3.4 Time series data

To compute lifetime experiences of inflation and unemployment rates, we make use of annualized aggregate time series for western Germany from 1950 until 2019. The data on inflation are provided by the Bundesbank and refer to the German CPI, seasonally and working day adjusted. Unemployment data are sourced from Germany's Federal Employment Agency and refer to the official unemployment rate based on the dependent civilian labour force. There have been several distinct phases in the historical evolution of inflation and the unemployment rate in Germany since 1950. After WWII, unemployment came down from high levels, while inflation increased slowly. It remained high and volatile in the 1970s, fell in the 1980s, and has remained low and relatively stable since the mid-1990s. Unemployment rose in the 1970s, peaked in the late 1990s, and has fallen since. Given these developments, it is conceivable that households with different lifetime experiences of inflation and unemployment have different views of the future development of both variables.

Malmendier and Nagel (2011, 2016) have formally shown that individual experiences matter for the formation of expectations. We follow the methodological approach in Malmendier and Nagel (2011) and model inflation experience as a weighted average of the inflation rates that materialized during an individual's lifetime. Specifically, the inflation experience of individual $i$ is given by

$$\tilde{\pi}^{lt}_{i,2019}(\lambda) = \sum_{k=1}^{age_i-1} w_i(k,\lambda)\tilde{\pi}_{2019-k}, \tag{1}$$

where $\tilde{\pi}_{2019-k}$ is the annual inflation rate in (western) Germany in year $2019-k$ and

$$w_i(k,\lambda) = \frac{(age_i-k)^\lambda}{\sum_{k=1}^{age_i-1}(age_i-k)^\lambda}. \tag{2}$$

We restrict $\lambda$ to be non-negative. For $\lambda > 0$ the weights are declining from lag one onwards. This is in line with the empirical observation that individuals are usually influenced most strongly by recent inflation experience (Malmendier and Nagel, 2016). Nevertheless, for a

sufficiently small $\lambda$, individuals can attach considerable weight even to observations that lie in the distant past. In the extreme case where $\lambda = 0$, all lags receive the same weight. Additionally, we compute the lifetime experience of the unemployment rate, $\tilde{u}^{lt}_{i,2019}(\lambda)$, in the same way.

In the empirical analysis, we estimate either linear regression models or probit models. We estimate those models for a fixed value of $\lambda$ and then search over a grid of $\lambda$ values for one that either minimizes the sum of the squared residuals (linear regression models) or maximizes the log likelihood (probit models).

# 4 Determinants of information channels

In a first step, we study in detail the determinants of each household's most important information channels regarding monetary policy. For each information channel, we estimate a probit model that relates the choice of information channel to the households' socioeconomic characteristics. Motivated by the upper and lower right panels in Figure 1, we include *age* and $age^2$ as regressors as well as the log of income. The average marginal effects (multiplied by 100) are presented in Table 1. The first column shows that the probability that an individual will use traditional media increases with age, household income and years of education. For example, the predicted probability of using traditional media is 66.52% for a 20-year-old individual but 93.30% for an 80-year-old individual (the change in the predicted probabilities is denoted by $\Delta \mathrm{P}(y = 1|\mathbf{X})$ in Table 1). Increasing household income by one percent raises the probability of using traditional media by 5.52 percentage points. In addition, women are less likely to rely on traditional media. As expected, younger individuals use social media more often. By contrast, the probability that an individual will use direct ECB communication channels increases with age. Interestingly, individuals who intend to buy a house are more likely to inform themselves through direct ECB channels. This suggests that households that might take out a mortgage loan monitor the ECB's interest rate decisions more carefully than other households. Younger individuals, individuals with lower education, lower household income, women, and those who do not intend to buy a house are more likely to not inform themselves about monetary policy.

# 5 Inflation expectations

Next, we investigate whether information channels and/or individual experience can explain inflation expectations. In all regressions, we include dummies for the four information channels *traditional*, *social*, *ecb* and *other*. Individuals who state that they do not inform themselves about monetary policy serve as the reference group. For all individuals, the inflation experience in Equation (1) is based on western German historical inflation rates. That is, we assign western German inflation rates to individuals who lived in eastern Germany before 1989 as well. Nevertheless, in order to control for their specific experience we include the *east*1989 dummy in all regressions and conduct appropriate robustness checks.

Table 1: Information channels and socioeconomic characteristics

| | (1) *traditional* | (2) *social* | (3) *ecb* | (4) *other* | (5) *noinform* |
|---|---|---|---|---|---|
| *age* | 0.39*** | -0.17*** | 0.15*** | -0.09 | -0.27*** |
| | (0.06) | (0.04) | (0.06) | (0.06) | (0.05) |
| *east1989* | -3.06 | 0.24 | -2.40* | 2.26 | 1.73 |
| | (2.19) | (1.41) | (1.31) | (2.10) | (1.88) |
| *female* | -6.61*** | -0.51 | -0.92 | -5.56*** | 7.91*** |
| | (1.54) | (0.96) | (1.04) | (1.40) | (1.38) |
| *fullemploy* | -1.08 | -0.10 | 2.94** | -1.88 | 0.59 |
| | (1.84) | (1.20) | (1.45) | (1.83) | (1.59) |
| *hhsize* | -0.66 | 0.60 | -0.79 | -0.28 | 0.55 |
| | (0.79) | (0.48) | (0.67) | (0.81) | (0.68) |
| *homebuy* | 2.10 | -0.48 | 6.41*** | 3.88** | -3.20** |
| | (1.70) | (1.16) | (1.82) | (1.97) | (1.34) |
| ln(*income*) | 5.52*** | -1.24 | 1.12 | -1.87 | -3.86*** |
| | (1.63) | (0.95) | (1.45) | (1.68) | (1.36) |
| *no_property* | -0.17 | 1.55 | -0.70 | -3.67** | 1.36 |
| | (1.61) | (1.11) | (1.25) | (1.57) | (1.40) |
| *yoe* | 0.73*** | -0.09 | 0.00 | 0.49** | -0.52*** |
| | (0.23) | (0.15) | (0.15) | (0.20) | (0.20) |
| Observations | 2,307 | 2,307 | 2,307 | 2,307 | 2,307 |
| % corr. pred. | 65.76 | 74.99 | 59.90 | 59.73 | 65.06 |
| $\Delta P(y = 1\|\mathbf{X})$ | 26.78 | -12.38 | 8.81 | -5.35 | -18.87 |

*Notes*: This table presents average marginal effects from probit regressions of households' information channels on their socioeconomic characteristics. The underlying regression model includes age and age squared. Heteroskedasticity-consistent standard errors are reported in parentheses. The reported average marginal effects and standard errors are the estimated ones times 100. Asterisks '*', '**', and '***' indicate significance at the 10%, 5%, and 1% critical level, respectively. The estimation sample includes individuals with $-12 \leq \pi_{i,t:t+12|t} \leq 12$. In the second-to-last row, we report the fraction of correct predictions for each information channel. In the last row, we report the difference in the predicted probability of using a particular information channel for a 20- and an 80-year-old individual.

## 5.1 Quantitative expectations

### 5.1.1 Point predictions

The first three columns of Table 2 show the results of linear regressions of the point predictions for perceived inflation ($\pi_{i,t-12:t|t}$), absolute perception errors ($|e_{i,t-12:t|t}|$), and future expected inflation ($\pi_{i,t+12:t|t}$) on information channels and individual inflation experience while controlling for socioeconomic characteristics.[5] Columns (1)-(3) show that the only

[5]Due to the cross-sectional nature of our data set, we cannot include age dummies as done in Malmendier and Nagel (2011). If we did, these dummies would capture the effect of lifetime experience of

information channel which has a significant effect is traditional media. For individuals who use this information channel, perceived inflation is on average 0.55 percentage point lower than for individuals who do not inform themselves. Furthermore, as shown in Columns (2) and (3), users of traditional media have significantly lower absolute prediction errors and expect significantly lower future rates of inflation.[6] The effect of traditional media on expected inflation may be direct and/or indirect via perceived inflation. If we re-estimate the regression for expected inflation and include perceived inflation as an additional control variable, traditional media indeed become insignificant, see Column (1) of Table A.6 in the Appendix. To further check for this indirect effect, Column (4) of Table 2 reports results from a regression of expected inflation on the same variables as before, while additionally controlling for the residual from Column (1), $\pi^R_{i,t-12:t|t}$. Traditional media as well as $\pi^R_{i,t-12:t|t}$ both turn out to be significant. This suggests that the effect of traditional media on expected inflation works via perceived inflation.[7] When controlling for $\pi^R_{i,t-12:t|t}$, the effect of social media becomes significantly positive (at the 10% level). Similarly, while the estimated coefficients for the effect of lifetime inflation experience are insignificant in Columns (1)-(3), the effect now becomes significantly positive (again at the 10% level), as in Malmendier and Nagel (2016). Our coefficient estimate suggests an almost one-to-one relation between experienced and expected inflation. The finding that social media and lifetime inflation experience are only significant in Column (4) may be explained by the fact that $\pi^R_{i,t-12:t|t}$ substantially increases the adjusted $R^2$ while, by construction, being orthogonal to the other regressors. Hence, including $\pi^R_{i,t-12:t|t}$ allows the effects of the other regressors to be estimated more precisely.[8]

Note that we control for each household's socioeconomic characteristics. For brevity, detailed results are omitted from Table 2 (the detailed estimates can be found in Table A.7). In line with the previous literature, we find that women report higher perceived and expected inflation, and have larger perception errors. In contrast, years of education have a significantly negative effect on all three variables (see, for example, Bruine de Bruin et al., 2010). The *no_property* dummy is significantly positive in Columns (1) and (2), while higher income tends to go along with lower future expected inflation, see D'Acunto et al. (2019). We also find that the *east*1989 dummy is significantly positive in Column (3), which is in line with the findings in Goldfayn-Frank and Wohlfart (2020).

inflation. Instead, we leave out age controls in the baseline and resort to cohort dummies in a robustness check, as suggested by Malmendier and Nagel (2011) for cases of multicollinearity. As we discuss below, including cohort dummies does not affect our results.

[6] As a robustness check, we use the mean of the histogram inflation expectations, instead of the point prediction, as the dependent variable in Column (3). As shown in Column (1) in Table A.5 in the Appendix, this does not change our findings.

[7] Jonung (1981) and D'Acunto, Hoang, Paloviita, and Weber (2019) also find a strong correlation between perceived and expected inflation. Furthermore, as shown in Columns (3) and (4) of Table A.6, the use of traditional media also tends to significantly reduce inflation forecast errors, which reinforces the result from Column (2) of Table 2.

[8] We have conducted several robustness checks to investigate whether the relationship between inflation expectations and inflation experience differs for western and eastern Germans. In Table A.8, we focused on a subsample of households who lived in western Germany before reunification. In Table A.9, we assigned eastern German inflation rates (which were officially always close to zero) to individuals who lived in eastern Germany before 1990. In both cases, the estimates are very similar to those reported in Table 2.

Table 2: Regressions of expectations on information channels and lifetime experience

| | (1) $\pi_{i,t-12:t\|t}$ | (2) $\|e_{i,t-12:t\|t}\|$ | (3) $\pi_{i,t:t+12\|t}$ | (4) $\pi_{i,t:t+12\|t}$ | (5) $\sigma_{i,t:t+12\|t}$ | (6) *infl_exp* | (7) *unemp_exp* |
|---|---|---|---|---|---|---|---|
| *traditional* | -0.55*** | -0.57*** | -0.51*** | -0.55*** | -0.34** | -0.03 | -0.02 |
| | (0.18) | (0.17) | (0.18) | (0.16) | (0.13) | (0.03) | (0.03) |
| *social* | 0.16 | 0.15 | 0.27 | 0.33* | 0.54*** | 0.01 | 0.05 |
| | (0.27) | (0.25) | (0.22) | (0.18) | (0.20) | (0.04) | (0.04) |
| *ecb* | 0.04 | 0.17 | 0.01 | -0.11 | 0.07 | -0.06 | 0.05 |
| | (0.24) | (0.21) | (0.19) | (0.16) | (0.17) | (0.04) | (0.04) |
| *other* | -0.03 | -0.10 | 0.06 | -0.11 | -0.09 | -0.02 | 0.07** |
| | (0.14) | (0.13) | (0.14) | (0.14) | (0.11) | (0.03) | (0.03) |
| $\tilde{\pi}^{lt}_{i,2019}$ | 0.30 | 0.28 | 0.91 | 0.99* | -0.70*** | 0.45*** | |
| | (0.31) | (0.28) | (0.73) | (0.52) | (0.12) | (0.13) | |
| $\tilde{u}^{lt}_{i,2019}$ | | | | | | | 0.11*** |
| | | | | | | | (0.02) |
| $\pi^{R}_{i,t-12:t\|t}$ | | | | 0.74*** | | | |
| | | | | (0.06) | | | |
| Constant | 3.96*** | 3.97*** | 3.66*** | 3.32*** | 5.06*** | | |
| | (1.11) | (1.00) | (1.23) | (1.02) | (0.75) | | |
| Observations | 1,309 | 1,309 | 2,307 | 1,289 | 2,317 | 2,305 | 2,306 |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $\lambda$ | 1.70 | 1.60 | 5.10 | 3.90 | 0.20 | 4.40 | 2.70 |
| $\bar{R}^2$ | 0.07 | 0.09 | 0.03 | 0.41 | 0.04 | – | – |
| % corr. pred. | – | – | – | – | – | 61.95 | 49.96 |
| $\Delta P(y=1\|\mathbf{X})$ | – | – | – | – | – | 12.59 | 9.72 |

*Notes*: Columns (1)-(5) present OLS estimates from regressions of households' quantitative expectations on their sources of information about monetary policy, lifetime inflation, and socioeconomic characteristics. Column (4) includes the residual from Column (1), $\pi^{R}_{i,t-12:t|t}$, as an additional covariate. Columns (6)-(7) present average marginal effects for an increase (=1) in the respective dependent variable from ordered probit regressions of households' qualitative expectations on information channels, lifetime experience, and socioeconomic controls. Heteroskedasticity-consistent standard errors are reported in parentheses. Asterisks '*', '**', and '***' indicate significance at the 10%, 5%, and 1% critical level, respectively. The estimation sample in Columns (1) and (2) includes individuals with $-12 \leq \pi_{i,t-12:t|t} \leq 12$. Columns (3), (6), and (7) include those with $-12 \leq \pi_{i,t:t+12|t} \leq 12$. Column (4) is based on individuals with $-12 \leq \pi_{i,t-12:t|t} \leq 12$ and $-12 \leq \pi_{i,t:t+12|t} \leq 12$. Column (5) includes all individuals. In the second-to-last row, we report the fraction of correct predictions for each qualitative expectation. In the last row, we report the difference in the predicted probability of stating an increase (=1) in the respective dependent variable when comparing an individual with experience at the 90th percentile with an individual with experience at the 10th percentile.

### 5.1.2 Inflation uncertainty

In Column (5), we explore the effects on inflation uncertainty. We find that individuals who rely on traditional media are significantly less uncertain than those who do not inform themselves. Interestingly, we also find that individuals who use social media are more uncertain. According to Bundesbank (2019), the data from all three waves of the survey suggest that individuals with higher inflation uncertainty have less stable and potentially de-anchored inflation expectations. Hence, as discussed in Bundesbank (2019), our finding that users of social media are more uncertain about future inflation suggests

that central banks should disseminate accurate information through channels other than traditional media. Moreover, higher lifetime inflation experience significantly reduces inflation uncertainty.[9] This finding could be related to the empirical observation that higher levels of inflation typically go hand in hand with higher inflation variability (see, for example, Conrad and Hartmann, 2019). Individuals who have experienced phases of high inflation and, as a result, also high inflation volatility might therefore be more certain about the inflation outlook in the current low inflation environment with comparably low volatility.[10] The estimate of 0.2 for $\lambda$ implies that individuals take into account inflation experiences from large parts of their life when asked for the possible range of future inflation.

In addition, we find that men are significantly less uncertain than women and that individual uncertainty decreases with income and years of eduction.

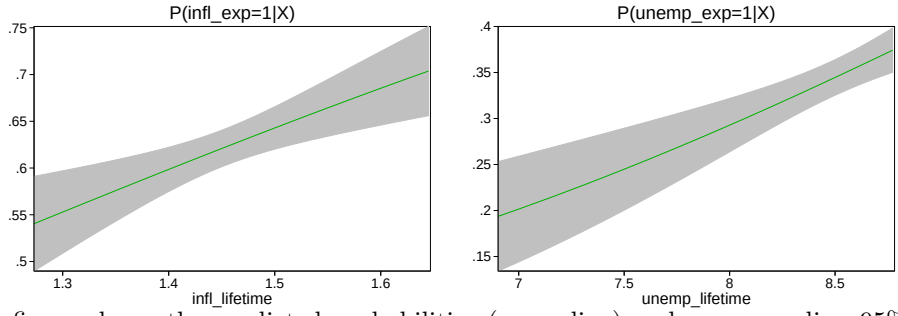
## 5.2 Qualitative expectations: directions of change

In the following, we analyze the determinants for the expected direction of inflation. To this end, we employ the qualitative question on inflation expectations, as it directly measures our object of interest. Before doing so, we note that the qualitative inflation expectations are well aligned with the quantitative expectations: for individuals with $-12 \leq \pi_{i,t:t+12|t} \leq 12$, the conditional means of expected inflation are 1.65%, 2.16% and 2.74% when the qualitative expectations are -1, 0 and 1. Column (6) of Table 2 presents the average marginal effects from an ordered probit regression of the qualitative inflation expectations on information channels, lifetime inflation experience as well as control variables. We report marginal effects on the probability that individuals expect a slight or significant increase in the inflation rate. It turns out that information channels are no longer relevant when explaining directional changes in inflation expectations. Instead, lifetime inflation experience plays a crucial role. The optimal $\lambda$ is estimated to be 4.4. This estimate implies that the weights in Equation (2) decline quickly for a 20-year-old individual while an 80-year-old individual will attach non-negative weights to inflation rates over the last 40 years. The left-hand panel in Figure 2 shows how inflation experience affects the predicted probability of expecting a slight or significant increase in the inflation rate. For example, for an individual with an inflation experience of 1.31% (which corresponds to the 10th percentile), the probability is 55.66% and for an individual with an experience of 1.59% (which corresponds to the 90th percentile) the probability is 68.25%. That is, individuals who have experienced higher inflation rates are more likely to expect an increase in the inflation rate. Concerning the control variables, we again find that individuals who lived in eastern Germany before reunification are more likely to expect an increase in the inflation rate.

[9] We also re-estimated Column (4) with an alternative measure of inflation uncertainty as the dependent variable. Krüger and Pavlova (2020) propose a new uncertainty measure for histogram forecasts, which they call the 'expected ranked probability score' (ERPS). The ERPS is based solely on the probabilities that an individual assigns to each bin and does not require any further distributional assumptions. When this new uncertainty measure was used, however, all results remained unchanged, see Column (2) in Table A.5.

[10] In Column (3) of Table A.5 we replace lifetime inflation experience with lifetime inflation volatility experience (computed as the within-year standard deviation of monthly inflation rates). Again, we find a negative effect, i.e. individuals who experienced higher inflation volatility in the past are currently less uncertain.

Figure 2: Predicted probabilities as a function of experience




*Notes*: The figure shows the predicted probabilities (green line) and corresponding 95% confidence intervals (gray shaded) for increases in the inflation rate (left-hand panel) and the unemployment rate (right-hand panel) as a function of lifetime experience. The predictions are based on the estimates in Columns (5) and (6) of Table 2.

As a robustness check we calculate the expected direction of inflation from quantitative inflation expectations and perceptions (which reduces the sample size by approximately half). Specifically, we assign a value of -1/0/1 to individuals whose inflation expectation is below/equal to/above their current inflation perception. Column (4) of Table A.5 displays the corresponding results. Lifetime inflation experience remains the only significant regressor.[11]

## 5.3 Summary and interpretation

Our findings so far are consistent with the following interpretation. Households learn about the level of current and future inflation rates mainly from traditional media, but individual inflation experience is key to explaining the expected change in inflation. In order to understand whether this finding applies more generally, we also investigate the determinants of the expected changes in the unemployment rate. As Column (7) shows, lifetime unemployment experience plays a crucial role in explaining the expected change in the unemployment rate. The right-hand panel in Figure 2 shows that the predicted probability of expecting an increase in the unemployment rate rises with lifetime unemployment experience. Additionally, individuals who rely on other information channels (e.g. personal interactions) are more likely to expect unemployment to rise. Thus, our analysis of the unemployment rate reveals a picture similar to that for the expected change in the inflation rate.

Our interpretation of these findings is that traditional media channels are important for gaining an accurate picture of the current state of the economy, i.e. for obtaining the correct figures. However, information channels either do not convey an economic model of the workings of the economy or households do not absorb this information. Instead, the economic model used by households to forecast future developments appears to be shaped to a large degree by their own experiences.

[11] Column (5) in Table A.5 shows that the results in Column (6) of Table 2 are robust to including cohort dummies, constructed as in Figure 1. In addition, when including cohort dummies, we find that the use of traditional media is still significant in the regressions for perceived and expected inflation while inflation experience remains insignificant (results available upon request).

# 6 Response to changes in the policy rate

In order to learn more about the economic model that households implicitly use when thinking about the economy, we investigate how individuals respond to a monetary policy shock. Specifically, we asked households how they would update their inflation expectations in response to an unexpected increase in the policy rate by the ECB. There were two randomly assigned versions of this question:

`Q:311A/B: Imagine that you have just found out that the Governing Council of the European Central Bank has unexpectedly announced that it is putting up the policy rate by...`

- `weak treatment (WT): ...0.25 percentage points.`
- `strong treatment (ST): ...1.00 percentage point.`

`What impact does this information have on your expectations regarding the rate of inflation over the next twelve months?`

- `I expect inflation to be lower`
- `It has no impact on my expectations`
- `I expect inflation to be higher`

The upper panel of Table 3 summarizes the answers. While Column (1) presents the results for the combined treatments, Columns (2) and (3) report results for the weak and strong treatments separately. Roughly 50% of individuals do not update their inflation expectations in response to an unexpected increase in the policy rate. The fraction of individuals who do not update expectations is somewhat lower in the treatment with a stronger increase in the policy rate, but still higher than the fraction of individuals who change their inflation expectations upwards or downwards. Interestingly, in both treatments the fraction of individuals who increase their inflation expectations is higher than the fraction of those who decrease their expectations. Although this behavior is at odds with standard theory, it has been previously observed for households and is in line with the notion that the increase in the interest rate has an information effect, i.e. households infer from the policy rate change that the central bank has a more positive view on the current state of the economy than the household previously thought, see Eminidou, Zachariadis, and Andreou (2020) or Enders, Hünnekes, and Müller (2019) in the context of a firm survey. Alternatively, households might have a mis-specified model of the effect of monetary policy shocks on inflation, see Andre et al. (2019) and Candia, Coibion, and Gorodnichenko (2020).

The lower panel of Table 3 shows the results of ordered probit regressions of the change in inflation expectations (*adj_infl_exp*) on the information channels and inflation experience while controlling for socioeconomic characteristics. In all three columns, we report marginal effects for the probability that a household will increase its inflation expectation in response to an unanticipated rise in the interest rate, i.e. for the response which is at odds with standard theory. For the strong and the combined treatment, we find that the direct ECB communication channel has a significant effect. Individuals who

Table 3: Regressions of inflation updating on information channels and lifetime inflation

| | (1) WT+ST | (2) WT | (3) ST |
|---|---|---|---|
| | Panel A: Summary of outcomes | | |
| Lower expected inflation | 586 | 274 | 312 |
| | (24.10%) | (22.50%) | (25.70%) |
| Same expected inflation | 1131 | 613 | 518 |
| | (46.50%) | (50.33%) | (42.67%) |
| Higher expected inflation | 715 | 331 | 384 |
| | (29.40%) | (27.18%) | (31.63%) |
| | 2432 | 1218 | 1214 |
| | Panel B: Ordered probit regression *adj_infl_exp* | | |
| *traditional* | -0.65 | -2.90 | 1.44 |
| | (2.38) | (3.31) | (3.43) |
| *social* | -0.86 | 2.07 | -2.15 |
| | (3.73) | (5.45) | (5.28) |
| *ecb* | -6.12* | -4.85 | -7.55* |
| | (3.13) | (4.34) | (4.46) |
| *other* | 3.62 | 6.16* | 1.02 |
| | (2.43) | (3.64) | (3.28) |
| $\tilde{\pi}^{lt}_{i,2019}$ | 8.27*** | 8.19** | 9.55** |
| | (2.80) | (3.57) | (4.66) |
| Observations | 2,295 | 1,150 | 1,145 |
| Controls | Yes | Yes | Yes |
| $\lambda$ | 0.10 | 0.00 | 0.40 |
| % corr. pred. | 46.14 | 50.26 | 42.79 |
| $\Delta \mathrm{P}(y = 1\|\mathbf{X})$ | 7.50 | 7.66 | 8.15 |

*Notes*: Upper panel: Absolute frequencies of the reactions to ECB announcements for the full sample, the 'weak treatment group' (WT) and the 'strong treatment group' (ST). Relative frequencies conditional on treatment status are reported in parentheses. Lower panel: Average marginal effects for an increase (=1) in *adj_infl_exp* from ordered probit regressions of households' inflation updating on their sources of information about monetary policy, lifetime inflation, and socioeconomic characteristics. Heteroskedasticity-consistent standard errors are reported in parentheses. The reported average marginal effects and standard errors are the estimated ones times 100. Asterisks '*', '**', and '***' indicate significance at the 10%, 5%, and 1% critical level, respectively. The estimation sample includes individuals with $-12 \leq \pi_{i,t:t+12|t} \leq 12$. In the second-to-last row, we report the fraction of correct predictions. In the last row, we report the difference in the predicted probability of stating an increase (=1) in *adj_infl_exp* when comparing an individual with inflation experience at the 90th percentile with an individual with experience at the 10th percentile.

rely on this channel are less likely to increase their inflation expectations in response to an unexpected rise in the policy rate. This suggests that households that rely on direct ECB communication channels have an economic model of the economy that is in line with standard theory. In the weak treatment, using other channels increases the likelihood of

revising the inflation expectation upwards. Interestingly, neither the traditional nor social media channel are important for expectation updating.

Experience, however, is highly relevant to updating behavior. Specifically, individuals with experience of higher inflation are more likely to revise their inflation expectations upwards in response to an unexpected increase in the interest rate. One potential interpretation could be that these households have experienced rising interest rates during times of high inflation and hence mentally connect these two phenomena. Alternatively, high experienced inflation rates could impact negatively on the perception that monetary policy is capable of reducing inflation. In both cases, inflation experience has shaped the economic model used by individuals. Note that the estimate of $\lambda$ is now much smaller than in Column (5) of Table 2. This suggests that the lifetime inflation experience which essentially applies equal weights to all experienced inflation rates is most informative for understanding an individual's updating behavior.

In the strong treatment, the *east*1989 dummy is significantly positive (see Table A.10 in the Appendix). That is, individuals who lived in eastern Germany before reunification are more likely to expect the inflation rate to increase in response to a contractionary policy shock. By contrast, individuals who plan to buy real estate are less likely to increase their inflation expectations.

# 7 Conclusion

We interpret our findings as follows. Only traditional media provide households with comparatively accurate information about the *level* of inflation. Perceived inflation and quantitative forecasts, which typically do not move too far away from perceived inflation rates, are, therefore, very dependent on the information channel used. In contrast, lifetime inflation experience appears to play a limited role. This may be either because experience is not remembered in the form of numerical values or because an existing effect is hard to identify in our data set which lacks a time series dimension. When forming expectations about the *direction* of future inflation, however, experience is crucial, while information channels are less important. This finding is consistent with the hypothesis that experiences, rather than information channels, influence individuals' economic model, i.e. how agents think about the basic mechanics of the economy. This is supported by our observations regarding the expected direction of the unemployment rate and the answers to a thought experiment in which the European Central Bank unexpectedly raises interest rates. In this context, we also observe that households that follow the ECB's communication have an economic model that is in line with standard economic reasoning. Yet, these households are no better at forecasting inflation than consumers of traditional media. Our findings suggest that central banks should not focus exclusively on direct central bank information channels to communicate news about monetary policy. Instead, they should communicate in a way that ensures coverage in the broader media (see also the argumentation in Bundesbank (2019), which is based on our results). In addition, our findings highlight that distinct information channels are used by different types of households. For example, younger individuals are mostly likely to receive monetary policy-related news if it is covered in social media.

# Appendix

Table A.1: Variable construction

| Variable | Questionnaire | Description |
|---|---|---|
| | | **Socioeconomic characteristics** |
| *age* | *age* | Age of individual. Set to 80 if *age* equals '80 years or older'. |
| *east1989* | *eastwest1989* | Equals unity if *eastwest1989* equals 'eastern Germany', and zero otherwise. |
| *female* | *gender* | Equals unity if *gender* equals 'female', and zero otherwise. |
| *fullemploy* | *employ* | Equals unity if *employ* equals 'employed, full-time', and zero otherwise. |
| *hhsize* | *hhsize* | Household size. Set to 6 if *hhsize* equals '6 or more'. |
| *homebuy* | *intbuyprop_renter* (Q:003A) and *intbuyprop_owner* (Q:003B) | Equals unity if either *intbuyprop_renter* or *intbuyprop_owner* equal 'yes', and zero otherwise. |
| *income* | *hhinc* | Monthly household income in €1,000 (interval midpoints): $\begin{cases} = 0.25 \text{ if } hhinc \text{ equals '}<€500\text{'}, \\ = 0.75 \text{ if } hhinc \text{ equals '}€500 - <€1{,}000\text{'}, \\ = 1.25 \text{ if } hhinc \text{ equals '}€1{,}000 - <€1{,}500\text{'}, \\ = 1.75 \text{ if } hhinc \text{ equals '}€1{,}500 - <€2{,}000\text{'}, \\ = 2.25 \text{ if } hhinc \text{ equals '}€2{,}000 - <€2{,}500\text{'}, \\ = 2.75 \text{ if } hhinc \text{ equals '}€2{,}500 - <€3{,}000\text{'}, \\ = 3.25 \text{ if } hhinc \text{ equals '}€3{,}000 - <€3{,}500\text{'}, \\ = 3.75 \text{ if } hhinc \text{ equals '}€3{,}500 - <€4{,}000\text{'}, \\ = 4.25 \text{ if } hhinc \text{ equals '}€4{,}000 - <€4{,}500\text{'}, \\ = 4.75 \text{ if } hhinc \text{ equals '}\geq €4{,}500 \text{ EUR'}. \end{cases}$ |
| *no_property* | *homeown* | Equals unity if *homeown* equals 'rent and do not own any other home(s)', and zero otherwise. |
| *yoe* | *eduschool* | Years of education of individual following SOEP-IS Group (2017): $\begin{cases} = 7 \text{ if } eduschool \text{ equals 'No school-leaving certificate'}, \\ = 9 \text{ if } eduschool \text{ equals 'Secondary school-leaving certificate'}, \\ = 10 \text{ if } eduschool \text{ equals 'Other school-leaving certificate'}, \\ = 10 \text{ if } eduschool \text{ equals 'Intermediate secondary school certificate'}, \\ = 10 \text{ if } eduschool \text{ equals 'Polytechnical secondary school certificate (8th/10th grade)'}, \\ = 13 \text{ if } eduschool \text{ equals 'University of applied sciences entrance diploma / completed technical school'}, \\ = 13 \text{ if } eduschool \text{ equals 'Senior school-leaving certificate/ general or subject-specific university entrance diploma'}, \\ = 18 \text{ if } eduschool \text{ equals 'College / university degree'}. \end{cases}$ |
| | | **Information channels** |
| *traditional* | *source_mpecb_a* (Q:314) | Equals unity if individual selects 'Traditional media such as newspapers, radio, television or the websites of such providers' as one of the channels through which he / she most often receives information about the ECB's monetary policy, and zero otherwise. |
| *social* | *source_mpecb_b* (Q:314) | Equals unity if individual selects 'Social media such as Facebook or Twitter', and zero otherwise. |

*Notes*: This table describes the construction of the variables used in the empirical analysis. In the middle column, we refer to the names of the original variables as listed in the questionnaire for Wave 3 of the Bundesbank Online Pilot Survey on Consumer Expectations.

Table A.2: Variable construction (cont.)

| Variable | Questionnaire | Description |
|---|---|---|
| *ecb* | *source_mpecb_c* (Q:314) | Equals unity if individual selects 'ECB communication channels (e.g. ECB's website, ECB's Economic Bulletin, ECB's monthly press conference)', and zero otherwise. |
| *other* | *source_mpecb_d* (Q:314) | Equals unity if individual selects 'Other sources', and zero otherwise. |
| *noinform* | *source_mpecb_e* (Q:314) | Equals unity if individual selects 'I do not follow the ECB's monetary policy', and zero otherwise. |
| | | **Quantitative expectations** |
| $\pi_{i,t-12:t\|t}$ | *devinfpoint* (Q:307) | Perceived German inflation rate over the previous twelve months in percent. This question was only asked to participants of Wave 3 of the Bundesbank survey who did not already participate in Wave 2. |
| $\|e_{i,t-12:t\|t}\|$ | *devinfpoint* (Q:307) | Perception error. Defined as $\|\pi_{i,t-12:t\|t}-1.4\|$, where 1.4 is the German CPI inflation rate in May 2019. |
| $\pi_{i,t:t+12\|t}$ | *infdef* (Q:005A) and *inflexppoint* (Q:005B) | Expected German inflation rate over the next twelve months in percent. Equals *inflexppoint* if *infdef* equals 'Inflation' and $(-1)\cdot$ *inflexppoint* if *infdef* equals 'Deflation'. |
| $\|e_{i,t:t+12\|t}\|$ | *infdef* (Q:005A) and *inflexppoint* (Q:005B) | Forecast error. Defined as $\|\pi_{i,t:t+12\|t} - 0.6\|$, where 0.6 is the German CPI inflation rate in May 2020. |
| $\sigma_{i,t:t+12\|t}$ | *infexprob_a* – *infexprob_j* (Q:308) | Standard deviation derived from the probabilities assigned to the distinct outcome intervals ('bins') for the German inflation rate over the next twelve months. We assume i) that the exterior bins have a width of four percentage points and ii) that the probability mass in each bin is located at the midpoint. |
| | | **Qualitative expectations** |
| *infl_exp* | *expmacroquali_e* (Q:004) | Expected development of the German inflation rate over the next twelve months: $\begin{cases} = -1 \text{ if } \textit{expmacroquali_e} \text{ equals 'decrease significantly' or 'decrease slightly'}, \\ = 0 \text{ if } \textit{expmacroquali_e} \text{ equals 'stay roughly the same'}, \\ = 1 \text{ if } \textit{expmacroquali_e} \text{ equals 'increase slightly' or 'increase significantly'}. \end{cases}$ |
| *unemp_exp* | *expmacroquali_a* (Q:004) | Expected development of the German unemployment rate over the next twelve months: $\begin{cases} = -1 \text{ if } \textit{expmacroquali_a} \text{ equals 'decrease significantly' or 'decrease slightly'}, \\ = 0 \text{ if } \textit{expmacroquali_a} \text{ equals 'stay roughly the same'}, \\ = 1 \text{ if } \textit{expmacroquali_a} \text{ equals 'increase slightly' or 'increase significantly'}. \end{cases}$ |
| | | **Inflation updating** |
| *adj_infl_exp* | *infexchange1* (Q:311A / Q:311B) | Adjustment in inflation expectations over the next twelve months in reaction to unexpected announcement that the Governing Council of the ECB is putting up the policy rate by 0.25 (Q:311A) / 1.0 (Q:311B) percentage points: $\begin{cases} = -1 \text{ if } \textit{infexchange1} \text{ equals 'lower expected inflation'}, \\ = 0 \text{ if } \textit{infexchange1} \text{ equals 'same expected inflation'}, \\ = 1 \text{ if } \textit{infexchange1} \text{ equals 'higher expected inflation'}. \end{cases}$ |

*Notes*: This table describes the construction of the variables used in the empirical analysis. In the middle column, we refer to the names of the original variables as listed in the questionnaire for Wave 3 of the Bundesbank Online Pilot Survey on Consumer Expectations. Question Q:307 is only assigned to individuals who did not also participate in Wave 2.

Table A.3: Summary statistics for socioeconomic characteristics

| | Obs. | Mean | Std. dev. | Min. | Max. |
|---|---|---|---|---|---|
| *age* | 2585 | 53.01 | 16.85 | 16 | 80 |
| *east1989* | 2583 | 0.14 | 0.35 | 0 | 1 |
| *female* | 2585 | 0.42 | 0.49 | 0 | 1 |
| *fullemploy* | 2585 | 0.43 | 0.50 | 0 | 1 |
| *hhsize* | 2580 | 2.24 | 1.08 | 1 | 6 |
| *homebuy* | 2584 | 0.22 | 0.41 | 0 | 1 |
| *income* | 2434 | 3.06 | 1.21 | 0.25 | 4.75 |
| *no_property* | 2584 | 0.36 | 0.48 | 0 | 1 |

*Notes*: This table provides summary statistics for the socioeconomic characteristics of the participants in Wave 3 of the Bundesbank Online Pilot Survey on Consumer Expectations. Household income is expressed in 1,000 euro. We consider only responses from households who revealed their information channels of monetary policy.

Table A.4: Summary statistics for inflation expectations / uncertainty

| **Panel A: Quantitative expectations** | | | | | |
|---|---|---|---|---|---|
| | Obs. | Mean | Std. dev. | Min. | Max. |
| $\pi_{i,t-12:t\|t}$ | 1389 | 2.53 | 1.95 | -10.00 | 12.00 |
| $\|e_{i,t-12:t\|t}\|$ | 1389 | 1.31 | 1.84 | 0.00 | 11.40 |
| $\pi_{i,t:t+12\|t}$ | 2445 | 2.50 | 2.20 | -12.00 | 12.00 |
| $\|e_{i,t:t+12\|t}\|$ | 2445 | 2.14 | 1.97 | 0.00 | 12.60 |
| $\sigma_{i,t:t+12\|t}$ | 2443 | 1.60 | 1.82 | 0.00 | 12.07 |
| **Panel B: Inflation expectations (conditional)** | | | | | |
| | Obs. | Mean | Std. dev. | Min. | Max. |
| $\pi^{traditional}_{i,t:t+12\|t}$ | 2106 | 2.41 | 2.01 | -12.00 | 12.00 |
| $\pi^{social}_{i,t:t+12\|t}$ | 132 | 2.77 | 2.48 | -10.00 | 10.00 |
| $\pi^{ecb}_{i,t:t+12\|t}$ | 154 | 2.54 | 2.40 | -5.00 | 12.00 |
| $\pi^{other}_{i,t:t+12\|t}$ | 318 | 2.61 | 2.36 | -5.00 | 12.00 |
| $\pi^{noinform}_{i,t:t+12\|t}$ | 238 | 2.97 | 3.05 | -10.00 | 12.00 |
| **Panel C: Inflation uncertainty (conditional)** | | | | | |
| | Obs. | Mean | Std. dev. | Min. | Max. |
| $\sigma^{traditional}_{i,t:t+12\|t}$ | 2109 | 1.52 | 1.72 | 0.00 | 10.21 |
| $\sigma^{social}_{i,t:t+12\|t}$ | 142 | 2.28 | 2.38 | 0.00 | 8.35 |
| $\sigma^{ecb}_{i,t:t+12\|t}$ | 158 | 1.69 | 2.10 | 0.00 | 12.07 |
| $\sigma^{other}_{i,t:t+12\|t}$ | 322 | 1.59 | 1.80 | 0.00 | 10.64 |
| $\sigma^{noinform}_{i,t:t+12\|t}$ | 234 | 2.05 | 2.24 | 0.00 | 10.17 |
| **Panel D: Qualitative expectations** | | | | | |
| | Obs. | $-1$ (decrease) | 0 (same) | 1 (increase) | |
| *infl_exp* | 2443 | 80 | 856 | 1507 | |
| | | (3.27%) | (35.04%) | (61.69%) | |
| *unemp_exp* | 2444 | 401 | 1198 | 845 | |
| | | (16.41%) | (49.02%) | (34.57%) | |

*Notes*: This table provides summary statistics for the macroeconomic expectations of the participants in Wave 3 of the Bundesbank Online Pilot Survey on Consumer Expectations. In Panels B and C, we present summary statistics for inflation expectations / uncertainty conditional on information channels. For $\pi_{i,t-12:t|t}$ and $|e_{i,t-12:t|t}|$, we only consider households with $-12 \leq \pi_{i,t-12:t|t} \leq 12$. For $\pi_{i,t:t+12|t}$, *infl_exp*, and *unemp_exp*, we only consider households with $-12 \leq \pi_{i,t:t+12|t} \leq 12$.

Table A.5: Regressions of expectations on information channels and lifetime experience: robustness checks

| | (1) $\pi^H_{i,t:t+12\|t}$ | (2) $\text{ERPS}_{i,t:t+12\|t}$ | (3) $\sigma_{i,t:t+12\|t}$ | (4) $infl_exp^{imp}$ | (5) $infl_exp$ |
|---|---|---|---|---|---|
| *traditional* | -0.46** | -0.05** | -0.33** | 0.01 | -0.03 |
| | (0.21) | (0.03) | (0.13) | (0.04) | (0.03) |
| *social* | 0.24 | 0.10** | 0.54*** | 0.05 | 0.01 |
| | (0.26) | (0.04) | (0.20) | (0.05) | (0.04) |
| *ecb* | -0.04 | 0.00 | 0.10 | -0.03 | -0.06 |
| | (0.22) | (0.03) | (0.17) | (0.05) | (0.04) |
| *other* | 0.06 | -0.01 | -0.10 | -0.02 | -0.02 |
| | (0.14) | (0.02) | (0.11) | (0.04) | (0.03) |
| $\tilde{\pi}^{lt}_{i,2019}$ | 0.25 | -0.15*** | | 0.07** | 1.44*** |
| | (0.16) | (0.02) | | (0.04) | (0.56) |
| $vol^{lt}_{i,2019}$ | | | -51.76*** | | |
| | | | (9.03) | | |
| Constant | 3.25*** | 1.01*** | 16.61*** | | |
| | (0.99) | (0.14) | (2.32) | | |
| Observations | 2,317 | 2,317 | 2,317 | 1,289 | 2,305 |
| Controls | Yes | Yes | Yes | Yes | Yes |
| Cohort dummies | No | No | No | No | Yes |
| $\lambda$ | 0.00 | 0.20 | 4.10 | 0.00 | 4.50 |
| $\bar{R}^2$ | 0.03 | 0.04 | 0.05 | – | – |
| % corr. pred. | – | – | – | 44.14 | 61.87 |
| $\Delta\text{P}(y=1\|\mathbf{X})$ | – | – | – | 7.07 | 36.30 |

*Notes*: Columns (1)-(3) present OLS estimates from regressions of households' quantitative expectations on their sources of information about monetary policy, lifetime experience, and socioeconomic characteristics. Column (1) presents the estimates for the histogram means. In Column (2), we use the 'expected ranked probability score' of Krüger and Pavlova (2020) as an alternative measure of inflation uncertainty. In Columns (3), we replace inflation experience with volatility experience. Volatility experience is defined as the optimally-weighted average over annual standard deviations of monthly year-on-year inflation rates. Columns (4)-(5) present average marginal effects for an increase (=1) in expected inflation from ordered probit regressions of households' qualitative expectations on information channels, lifetime inflation, and socioeconomic controls. In Column (4), we construct a qualitative measure of expected inflation changes based on the difference $\pi_{i,t:t+12|t} - \pi_{i,t-12:t|t}$. In Column (5), we use the qualitative measure from the survey questionnaire and add dummy variables for age cohorts. Heteroskedasticity-consistent standard errors are reported in parentheses. Asterisks '*', '**', and '***' indicate significance at the 10%, 5%, and 1% critical level, respectively. The estimation sample in Columns (1)-(3) includes all individuals. Column (4) focuses on those with $-12 \leq \pi_{i,t-12:t|t} \leq 12$ and $-12 \leq \pi_{i,t:t+12|t} \leq 12$, while Column (5) includes those with $-12 \leq \pi_{i,t:t+12|t} \leq 12$.

Table A.6: Regressions of expectations on information channels and lifetime experience: controlling for perceived inflation

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | $\pi_{i,t:t+12\|t}$ | $\|e_{i,t:t+12\|t}\|$ | $\|e_{i,t:t+12\|t}\|$ | $\sigma_{i,t:t+12\|t}$ | $\sigma_{i,t:t+12\|t}$ | *infl_exp* | *infl_exp* |
| *traditional* | -0.14 | -0.25** | -0.66*** | -0.25 | -0.34** | -0.00 | -0.01 |
| | (0.16) | (0.13) | (0.13) | (0.17) | (0.17) | (0.04) | (0.04) |
| *social* | 0.21 | 0.06 | 0.18 | 0.15 | 0.18 | 0.04 | 0.04 |
| | (0.19) | (0.17) | (0.17) | (0.23) | (0.23) | (0.06) | (0.06) |
| *ecb* | -0.14 | -0.24* | -0.21 | 0.19 | 0.20 | -0.03 | -0.03 |
| | (0.16) | (0.14) | (0.14) | (0.25) | (0.25) | (0.06) | (0.06) |
| *other* | -0.09 | 0.07 | 0.05 | -0.17 | -0.17 | -0.00 | -0.00 |
| | (0.14) | (0.10) | (0.10) | (0.13) | (0.13) | (0.04) | (0.04) |
| $\tilde{\pi}^{lt}_{i,2019}$ | 0.57 | 0.22 | 0.44** | -0.58*** | -0.56*** | 0.46*** | 0.47*** |
| | (0.54) | (0.15) | (0.18) | (0.14) | (0.14) | (0.16) | (0.16) |
| $\pi_{i,t-12:t\|t}$ | 0.74*** | 0.75*** | | 0.17*** | | 0.02** | |
| | (0.06) | (0.04) | | (0.04) | | (0.01) | |
| $\pi^{R}_{i,t-12:t\|t}$ | | | 0.75*** | | 0.17*** | | 0.02** |
| | | | (0.04) | | (0.04) | | (0.01) |
| Constant | 0.65 | 0.43 | 3.43*** | 3.81*** | 4.52*** | | |
| | (1.09) | (0.69) | (0.69) | (0.99) | (0.97) | | |
| Observations | 1,289 | 1,289 | 1,289 | 1,264 | 1,264 | 1,289 | 1,289 |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $\lambda$ | 4.00 | 0.60 | 1.10 | 0.00 | 0.00 | 4.20 | 4.20 |
| $\bar{R}^2$ | 0.41 | 0.57 | 0.57 | 0.06 | 0.06 | – | – |
| % corr. pred. | – | – | – | – | – | 63.38 | 63.38 |
| $\Delta P(y = 1\|\mathbf{X})$ | – | – | – | – | – | 13.56 | 13.97 |

*Notes*: Columns (1)-(5) present OLS estimates from regressions of households' quantitative expectations on their sources of information about monetary policy, lifetime experience and socioeconomic characteristics. Columns (6)-(7) present average marginal effects for an increase (=1) in expected inflation from ordered probit regressions of households' qualitative expectations on information channels, lifetime inflation and socioeconomic controls. Columns (1), (2), (4) and (6) include perceived inflation as an additional regressor. In Columns (3), (5) and (7) we replace perceived inflation with the residual from Table A.7 Column (1). Heteroskedasticity-consistent standard errors are reported in parentheses. Asterisks '*', '**' and '***' indicate significance at the 10%, 5% and 1% critical level, respectively. The estimation sample in Columns (1)-(3) and (6)-(7) includes respondents with $-12 \leq \pi_{i,t-12:t|t} \leq 12$ and $-12 \leq \pi_{i,t:t+12|t} \leq 12$. Columns (4)-(5) are based on those with $-12 \leq \pi_{i,t-12:t|t} \leq 12$.

Table A.7: Regressions of expectations on information channels and lifetime experience: control variables

| | (1) $\pi_{i,t-12:t\|t}$ | (2) $\|e_{i,t-12:t\|t}\|$ | (3) $\pi_{i,t:t+12\|t}$ | (4) $\pi_{i,t:t+12\|t}$ | (5) $\sigma_{i,t:t+12\|t}$ | (6) *infl_exp* | (7) *unemp_exp* |
|---|---|---|---|---|---|---|---|
| *traditional* | -0.55*** | -0.57*** | -0.51*** | -0.55*** | -0.34** | -0.03 | -0.02 |
| | (0.18) | (0.17) | (0.18) | (0.16) | (0.13) | (0.03) | (0.03) |
| *social* | 0.16 | 0.15 | 0.27 | 0.33* | 0.54*** | 0.01 | 0.05 |
| | (0.27) | (0.25) | (0.22) | (0.18) | (0.20) | (0.04) | (0.04) |
| *ecb* | 0.04 | 0.17 | 0.01 | -0.11 | 0.07 | -0.06 | 0.05 |
| | (0.24) | (0.21) | (0.19) | (0.16) | (0.17) | (0.04) | (0.04) |
| *other* | -0.03 | -0.10 | 0.06 | -0.11 | -0.09 | -0.02 | 0.07** |
| | (0.14) | (0.13) | (0.14) | (0.14) | (0.11) | (0.03) | (0.03) |
| $\tilde{\pi}^{lt}_{i,2019}$ | 0.30 | 0.28 | 0.91 | 0.99* | -0.70*** | 0.45*** | |
| | (0.31) | (0.28) | (0.73) | (0.52) | (0.12) | (0.13) | |
| $\tilde{u}^{lt}_{i,2019}$ | | | | | | | 0.11*** |
| | | | | | | | (0.02) |
| $\pi^{R}_{i,t-12:t\|t}$ | | | | 0.74*** | | | |
| | | | | (0.06) | | | |
| *east1989* | 0.24 | 0.20 | 0.32** | 0.18 | 0.09 | 0.07*** | -0.06** |
| | (0.16) | (0.15) | (0.14) | (0.16) | (0.11) | (0.03) | (0.02) |
| *female* | 0.53*** | 0.64*** | 0.36*** | 0.43*** | 0.21*** | 0.05** | -0.04** |
| | (0.12) | (0.11) | (0.10) | (0.10) | (0.08) | (0.02) | (0.02) |
| *fullemploy* | -0.16 | -0.07 | -0.05 | -0.04 | -0.02 | 0.08*** | 0.03 |
| | (0.13) | (0.12) | (0.12) | (0.12) | (0.08) | (0.02) | (0.02) |
| *hhsize* | 0.12* | 0.12** | 0.14*** | 0.12** | 0.05 | 0.03*** | -0.00 |
| | (0.06) | (0.06) | (0.05) | (0.05) | (0.04) | (0.01) | (0.01) |
| *homebuy* | -0.05 | -0.07 | 0.04 | -0.04 | 0.01 | 0.05* | -0.01 |
| | (0.12) | (0.11) | (0.11) | (0.11) | (0.10) | (0.02) | (0.02) |
| ln(*income*) | -0.22 | -0.37*** | -0.28** | -0.24** | -0.18** | -0.09*** | -0.01 |
| | (0.15) | (0.13) | (0.12) | (0.11) | (0.09) | (0.02) | (0.02) |
| *no_property* | 0.57*** | 0.52*** | 0.17 | 0.34*** | 0.07 | -0.01 | 0.01 |
| | (0.14) | (0.13) | (0.11) | (0.12) | (0.09) | (0.02) | (0.02) |
| *yoe* | -0.03** | -0.04*** | -0.03*** | -0.03*** | -0.03*** | -0.00 | -0.00 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.00) | (0.00) |
| Constant | 3.96*** | 3.97*** | 3.66*** | 3.32*** | 5.06*** | | |
| | (1.11) | (1.00) | (1.23) | (1.02) | (0.75) | | |
| Observations | 1,309 | 1,309 | 2,307 | 1,289 | 2,317 | 2,305 | 2,306 |
| $\lambda$ | 1.70 | 1.60 | 5.10 | 3.90 | 0.20 | 4.40 | 2.70 |
| $\bar{R}^2$ | 0.07 | 0.09 | 0.03 | 0.41 | 0.04 | – | – |
| % corr. pred. | – | – | – | – | – | 61.95 | 49.96 |
| $\Delta\mathrm{P}(y=1\|\mathbf{X})$ | – | – | – | – | – | 12.59 | 9.72 |

*Notes*: Columns (1)-(5) present OLS estimates from regressions of households' quantitative expectations on their sources of information about monetary policy, lifetime inflation, and socioeconomic characteristics. Column (4) includes the residual from Column (1), $\pi^{R}_{i,t-12:t|t}$, as an additional covariate. Columns (6)-(7) present average marginal effects for an increase (=1) in the respective dependent variable from ordered probit regressions of households' qualitative expectations on information channels, lifetime experience, and socioeconomic controls. Heteroskedasticity-consistent standard errors are reported in parentheses. Asterisks '*', '**', and '***' indicate significance at the 10%, 5%, and 1% critical level, respectively. The estimation sample in Columns (1) and (2) includes individuals with $-12 \leq \pi_{i,t-12:t|t} \leq 12$. Columns (3), (6), and (7) include those with $-12 \leq \pi_{i,t:t+12|t} \leq 12$. Column (4) is based on individuals with $-12 \leq \pi_{i,t-12:t|t} \leq 12$ and $-12 \leq \pi_{i,t:t+12|t} \leq 12$. Column (5) includes all individuals. In the second-to-last row, we report the fraction of correct predictions for each qualitative expectation. In the last row, we report the difference in the predicted probability of stating an increase (=1) in the respective dependent variable when comparing an individual with experience at the 90th percentile with an individual with experience at the 10th percentile.

Table A.8: Regressions of expectations on information channels and lifetime experience: results for western Germany

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | $\pi_{i,t-12:t\|t}$ | $\|e_{i,t-12:t\|t}\|$ | $\pi_{i,t:t+12\|t}$ | $\pi_{i,t:t+12\|t}$ | $\sigma_{i,t:t+12\|t}$ | *infl_exp* | *unemp_exp* |
| *traditional* | -0.59*** | -0.61*** | -0.39** | -0.50*** | -0.37*** | -0.01 | -0.01 |
| | (0.20) | (0.19) | (0.20) | (0.17) | (0.14) | (0.03) | (0.03) |
| *social* | 0.21 | 0.22 | 0.18 | 0.36* | 0.73*** | 0.01 | 0.03 |
| | (0.30) | (0.28) | (0.23) | (0.21) | (0.22) | (0.05) | (0.05) |
| *ecb* | 0.07 | 0.22 | -0.06 | -0.10 | 0.13 | -0.05 | 0.04 |
| | (0.27) | (0.23) | (0.20) | (0.18) | (0.18) | (0.04) | (0.04) |
| *other* | 0.10 | 0.03 | 0.14 | -0.06 | -0.13 | -0.02 | 0.07** |
| | (0.16) | (0.15) | (0.16) | (0.14) | (0.11) | (0.03) | (0.03) |
| $\tilde{\pi}^{lt}_{i,2019}$ | 0.77 | 0.61 | 0.75 | 0.40 | -0.76*** | 0.41*** | |
| | (1.20) | (1.09) | (0.81) | (0.26) | (0.14) | (0.14) | |
| $\tilde{u}^{lt}_{i,2019}$ | | | | | | | 0.10*** |
| | | | | | | | (0.03) |
| $\pi^{R}_{i,t-12:t\|t}$ | | | | 0.80*** | | | |
| | | | | (0.05) | | | |
| Constant | 3.28* | 3.11* | 3.45*** | 3.07*** | 5.09*** | | |
| | (1.79) | (1.63) | (1.31) | (0.79) | (0.78) | | |
| Observations | 1,108 | 1,108 | 1,972 | 1,092 | 1,995 | 1,970 | 1,971 |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $\lambda$ | 6.00 | 6.00 | 5.20 | 1.50 | 0.40 | 4.40 | 2.60 |
| $\bar{R}^2$ | 0.07 | 0.10 | 0.02 | 0.47 | 0.05 | – | – |
| % corr. pred. | – | – | – | – | – | 60.41 | 49.67 |
| $\Delta P(y = 1\|\mathbf{X})$ | – | – | – | – | – | 11.75 | 9.92 |

*Notes*: Columns (1)-(5) present OLS estimates from regressions of households' quantitative expectations on their sources of information about monetary policy, lifetime inflation and socioeconomic characteristics. Column (4) includes the residual from Column (1), $\pi^{R}_{i,t-12:t|t}$, as an additional covariate. Columns (6)-(7) present average marginal effects for an increase (=1) in the respective dependent variable from ordered probit regressions of households' qualitative expectations on information channels, lifetime experience and socioeconomic controls. Heteroskedasticity-consistent standard errors are reported in parentheses. Asterisks '*', '**' and '***' indicate significance at the 10%, 5% and 1% critical level, respectively. The estimation sample includes only western Germans. Columns (1) and (2) include individuals with $-12 \leq \pi_{i,t-12:t|t} \leq 12$. Columns (3), (6) and (7) include those with $-12 \leq \pi_{i,t:t+12|t} \leq 12$. Column (4) is based on individuals with $-12 \leq \pi_{i,t-12:t|t} \leq 12$ and $-12 \leq \pi_{i,t:t+12|t} \leq 12$. Column (5) includes all individuals. In the second-to-last row, we report the fraction of correct predictions for each qualitative expectation. In the last row, we report the difference in the predicted probability of stating an increase (=1) in the respective dependent variable when comparing an individual with experience at the 90th percentile with an individual with experience at the 10th percentile.

Table A.9: Regressions of expectations on information channels and lifetime experience: employing eastern and western German inflation rates

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | $\pi_{i,t-12:t\|t}$ | $\|e_{i,t-12:t\|t}\|$ | $\pi_{i,t:t+12\|t}$ | $\pi_{i,t:t+12\|t}$ | $\sigma_{i,t:t+12\|t}$ | *infl_exp* | *unemp_exp* |
| *traditional* | -0.50*** | -0.53*** | -0.51*** | -0.53*** | -0.37*** | -0.02 | -0.02 |
| | (0.18) | (0.17) | (0.18) | (0.16) | (0.13) | (0.03) | (0.03) |
| *social* | 0.11 | 0.11 | 0.27 | 0.30* | 0.57*** | 0.01 | 0.05 |
| | (0.27) | (0.25) | (0.22) | (0.18) | (0.20) | (0.04) | (0.04) |
| *ecb* | 0.06 | 0.18 | 0.01 | -0.09 | 0.10 | -0.06 | 0.05 |
| | (0.25) | (0.21) | (0.19) | (0.16) | (0.17) | (0.04) | (0.04) |
| *other* | -0.03 | -0.11 | 0.06 | -0.11 | -0.11 | -0.02 | 0.07** |
| | (0.14) | (0.13) | (0.14) | (0.14) | (0.11) | (0.03) | (0.03) |
| $\tilde{\pi}^{lt}_{i,2019}$ | -0.15 | -0.13 | 1.00 | 0.28 | -0.75*** | 0.56*** | |
| | (0.16) | (0.14) | (0.95) | (0.32) | (0.15) | (0.21) | |
| $\tilde{u}^{lt}_{i,2019}$ | | | | | | | 0.11*** |
| | | | | | | | (0.02) |
| $\pi^{R}_{i,t-12:t\|t}$ | | | | 0.74*** | | | |
| | | | | (0.06) | | | |
| Constant | 4.53*** | 4.50*** | 3.54** | 4.19*** | 4.92*** | | |
| | (1.08) | (0.96) | (1.43) | (0.88) | (0.73) | | |
| Observations | 1,309 | 1,309 | 2,307 | 1,289 | 2,317 | 2,305 | 2,306 |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $\lambda$ | 0.00 | 0.00 | 6.00 | 2.20 | 0.70 | 6.00 | 2.70 |
| $\bar{R}^2$ | 0.07 | 0.09 | 0.03 | 0.41 | 0.04 | – | – |
| % corr. pred. | – | – | – | – | – | 61.95 | 49.96 |
| $\Delta\mathrm{P}(y=1\|\mathbf{X})$ | – | – | – | – | – | 10.71 | 10.40 |

*Notes*: Columns (1)-(5) present OLS estimates from regressions of households' quantitative expectations on their sources of information about monetary policy, lifetime inflation and socioeconomic characteristics. Column (4) includes the residual from Column (1), $\pi^{R}_{i,t-12:t|t}$, as an additional covariate. Columns (6)-(7) present average marginal effects for an increase (=1) in the respective dependent variable from ordered probit regressions of households' qualitative expectations on information channels, lifetime experience and socioeconomic controls. Heteroskedasticity-consistent standard errors are reported in parentheses. Asterisks '*', '**' and '***' indicate significance at the 10%, 5% and 1% critical level, respectively. The estimation sample in Columns (1) and (2) includes individuals with $-12 \leq \pi_{i,t-12:t|t} \leq 12$. Columns (3), (6) and (7) include those with $-12 \leq \pi_{i,t:t+12|t} \leq 12$. Column (4) is based on individuals with $-12 \leq \pi_{i,t-12:t|t} \leq 12$ and $-12 \leq \pi_{i,t:t+12|t} \leq 12$. Column (5) includes all individuals. In the second-to-last row, we report the fraction of correct predictions for each qualitative expectation. In the last row, we report the difference in the predicted probability of stating an increase (=1) in the respective dependent variable when comparing a western German individual with experience at the 90th percentile with a western German individual with experience at the 10th percentile.

Table A.10: Regressions of inflation updating on information channels and lifetime inflation: control variables

| | (1) | (2) | (3) |
|---|---|---|---|
| | | *adj_infl_exp* | |
| | WT+ST | WT | ST |
| *traditional* | -0.65 | -2.90 | 1.44 |
| | (2.38) | (3.31) | (3.43) |
| *social* | -0.86 | 2.07 | -2.15 |
| | (3.73) | (5.45) | (5.28) |
| *ecb* | -6.12* | -4.85 | -7.55* |
| | (3.13) | (4.34) | (4.46) |
| *other* | 3.62 | 6.16* | 1.02 |
| | (2.43) | (3.64) | (3.28) |
| $\tilde{\pi}^{lt}_{i,2019}$ | 8.27*** | 8.19** | 9.55** |
| | (2.80) | (3.57) | (4.66) |
| *east1989* | 3.66 | -2.15 | 10.29*** |
| | (2.41) | (2.99) | (3.76) |
| *female* | 0.07 | 0.10 | 0.22 |
| | (1.67) | (2.28) | (2.45) |
| *fullemploy* | 0.84 | 1.05 | 1.57 |
| | (1.79) | (2.40) | (2.71) |
| *hhsize* | -0.27 | 0.42 | -0.97 |
| | (0.93) | (1.24) | (1.41) |
| *homebuy* | -2.32 | 0.70 | -5.31* |
| | (2.15) | (2.93) | (3.13) |
| ln(*income*) | -1.10 | -2.67 | 0.33 |
| | (2.02) | (2.63) | (2.99) |
| *no_property* | -2.29 | -0.38 | -4.18 |
| | (1.87) | (2.47) | (2.86) |
| *yoe* | 0.43* | 0.35 | 0.52 |
| | (0.24) | (0.33) | (0.35) |
| Observations | 2,295 | 1,150 | 1,145 |
| $\lambda$ | 0.10 | 0.00 | 0.40 |
| % corr. pred. | 46.14 | 50.26 | 42.79 |
| $\Delta \mathrm{P}(y = 1\|\mathbf{X})$ | 7.50 | 7.66 | 8.15 |

*Notes*: This table presents average marginal effects for an increase (=1) in *adj_infl_exp* from ordered probit regressions of households' inflation updating on their sources of information about monetary policy, lifetime inflation, and socioeconomic characteristics. Heteroskedasticity-consistent standard errors are reported in parentheses. The reported average marginal effects and standard errors are the estimated ones times 100. Asterisks '*', '**', and '***' indicate significance at the 10%, 5%, and 1% critical level, respectively. The estimation sample includes individuals with $-12 \leq \pi_{i,t:t+12|t} \leq 12$. In the second-to-last row, we report the fraction of correct predictions. In the last row, we report the difference in the predicted probability of stating an increase (=1) in *adj_infl_exp* when comparing an individual with inflation experience at the 90th percentile with an individual with experience at the 10th percentile.

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