Measuring Households' Inflation Expectations in the Euro Area: the Effect of Panel Conditioning¹

Erwan Gautier² Jérémi Montornès³

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Abstract

This paper documents how inflation expectations as reported by households in the European Central Bank's Consumer Expectations Survey vary with the tenure of survey respondents. Inflation expectations are significantly lower after some months of repeated participation in the survey, by about -2 percentage points after one year. Panel-conditioning effects are much stronger if households are initially less attentive to inflation. We document also some evidence that these negative tenure effects could be partly due to survey fatigue increasing with tenure. Finally, we find that the panel conditioning effects are not specific to inflation: they are also strong for other macroeconomic variables such as unemployment but they are not significant for households' perceptions of their own consumption or income growth.

Key words: Consumer Expectations Survey, Inflation, Survey Methods **JEL:** D83, D84, E31

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² Banque de France and Université Paris Dauphine-PSL (erwan.gautier@banque-france.fr)

³ Banque de France (jeremi.montornes@banque-france.fr)

Introduction

Inflation expectations of households play a key role for the macroeconomic dynamics because they affect households' decisions of saving and consumption but also because these expectations are monitored to assess the central bank credibility. Over the last 15 years, several household surveys have been launched by major central banks to measure these inflation expectations. In the United States, the Survey of Consumer Expectations (SCE) by the Federal Reserve Bank of New York (FRBNY) was one of the first surveys launched in 2013 whereas, for the euro area, the Consumer Expectation Survey (CES) of the European Central Bank (ECB) was run for the first time in 2020.¹ However, measuring household inflation expectations raises several challenges since households are on average much less informed about inflation than professional forecasters. This implies that repeated participation in the survey can influence their answers. This effect is often referred to as learning-through-survey or panel conditioning effects. In the case of the SCE-FRBNY survey, Kim and Binder (2023) document that panel conditioning effects can be large, but little is known for other similar surveys conducted in different economic areas. In this paper, we estimate the panel conditioning effects using answers to the ECB-CES survey.

Launched in 2020, the ECB-CES survey provides the benchmark indicators of aggregate inflation expectations of households in the euro area. These indicators are published every month by the ECB, they are regularly used for policy speeches of ECB Board members, and the release of the survey results are also monitored by ECB watchers and financial markets. This survey has also been widely used in economic research for various purposes (among others Weber et al. (2025) on inflation attention, Georgarakos and Kenny (2022) on consumption behavior during Covid, Coibion et al. (2024) or Marenčák and Nghiem (2025) on the link between inflation expectations and consumption decisions and Ferreira and Pica (2024) on household perceptions of demand and supply shocks). The methodological features of the CES survey are similar to those of the FRBNY-SCE. In particular, ECB-CES respondents can participate in the survey for several consecutive months.² The targeted maximum duration of participation has been set to 24 completed monthly questionnaires (which can be non-consecutive) but respondents are removed from the

¹Similar surveys were also implemented in Canada (Bellemare et al. (2020)), Germany (Beckmann and Schmidt (2020)) or Italy (Guglielminetti and Rondinelli (2024)). These surveys are often considered as the second generation of household expectations surveys extending the scope and the size of first-generation surveys such as the Michigan Confidence Survey in the United States or the European Commission Survey in the euro area.

²This is an important difference with previous existing surveys like the Michigan Confidence Survey or the European Commission Household Survey where respondents were recontacted only once or twice after their first participation in the survey.

panel after 36 months of repeated participation. The panel dimension of the ECB-CES is longer than the one allowed in the FRBNY-SCE (12 months). This very long panel dimension is an appealing feature of these surveys because, for instance, it allows researchers to control for unobservable households' characteristics but more importantly, it also lowers the cost of household recruitment every month. This is especially true for the ECB survey which is now conducted in 11 different countries of the euro area among about 20,000 households every month (versus 1,300 households for the FRBNY-SCE in the United States). However, one major drawback is that repeated participation in the survey might lead respondents to search for information or learn about inflation, which then might affect their responses.

In this paper, we show that, all things being equal, when they participate several months in the survey, households provide lower inflation perceptions but also lower inflation expectations. This conditioning-panel effect is significant from the second participation in the survey and the magnitude of this effect increases quite quickly in subsequent waves before stabilizing at its maximum value (in absolute terms) after about nine months. After participating 12 consecutive times in the CES survey, 1-year inflation expectations are on average lower by about 2 pp than in the first interview, and then the conditioning panel effect is found for long-term inflation expectations, although the magnitude of this effect is smaller. Once we take into account these learning effects, the aggregate indicators for inflation expectations are on average higher than the ones calculated from the raw data but they are still quite correlated.

We also find that these learning-through-survey effects are stronger when the answer to the initial wave was very large (typically larger than 10%) but we also obtain that households are less likely to report rounding numbers and are more certain about their answers. Besides, panel-conditioning effects are stronger when attention is higher. These results suggest that households provide more consistent answers when they participate repeatedly in the survey. However, we also show that repeated participation in survey may also reduce the engagement of households in survey participation and may lead them to respond less accurately to the survey. For instance, they report more frequently that prices will remain stable and they use fewer bins for the probabilistic questions, which reduces the time spent responding to the survey.

One possible explanation for these learning effects is that households do not know much about inflation and they might learn more by participating in the survey than for other macro variables as unemployment or economic growth which might be more familiar to households. However, we find that learning effects are also significant for both unemployment and economic growth. Households tend to revise their unemployment forecasts downward and their economic growth expectations upward. To some extent, after some months of participation in the survey, they are more optimistic about the economic outlook than initially: they expect less inflation, less unemployment, and more economic growth.

We might also wonder whether these effects arise because households are less attentive to macroeconomic conditions compared to their own economic environment. When looking at panel conditioning effects for household-specific variables such as their own income or their own consumption, we do not find significant effects of the repeated participation in the survey and these effects are much smaller than the ones found for macro variables.

Our main contribution is to provide, for the first time, some estimates of panel conditioning effects on inflation expectations obtained for the euro area ECB-CES survey.³ Our work builds closely on Kim and Binder (2023) who estimated that US households participating in the NYFRB-SCE reduced their inflation expectations by an average of 2.6 percentage points after twelve months of participation. Our estimates are somewhat smaller but very close: the magnitude of the effects is similar and, as in Kim and Binder (2023), we find that the panel conditioning effects appear only after some months of survey participation.⁴ Mitchell et al. (2024) also show that probabilistic questions of the SCE are more prone to panel conditioning effects than point estimates. Households with a long tenure in the sample on average produce less forecast uncertainty. In a similar way, we find that households respond differently to the probabilistic question: they use fewer bins to answer to this question, suggesting that they are more certain of their answer.⁵ Finally, Kraemer et al. (2024) find evidence of panel conditioning and that highly experienced respondents were more likely to provide less thoughtful responses by speeding through the questionnaire in the GESIS Panel.⁶ Our results also suggest that panel conditioning effects can be explained by households choosing more simple answers like "0" for inflation expectations or using only one bin for probabilistic answers, which may reduce the time they spent answering the questionnaire.

Our second contribution is to extend the analysis of panel conditioning effects to other quan-

³For the euro area, relying only on the French answers of the CES survey over the period 2020-2021, Gautier and Montornès (2022) also find significant panel conditioning effect while D'Acunto et al. (2024) using the full euro-area survey suggest the presence of panel conditioning in the ECB CES, motivating our analysis.

⁴In a different context, Bellemare et al. (2020) find some panel conditioning effects using data from the Bank of Canada CSCE even if the CSCE is only conducted at a quarterly frequency.

⁵Clements (2021) also provides evidence of significant panel conditioning effects in the Survey of Professional Forecasters, showing that repeated exposure to forecasting exercises can reduce reported uncertainty.

⁶The GESIS Panel is a bi-monthly survey conducted in Germany, focusing on a wide range of socio-economic topics.

titative questions of the survey. Kim and Binder (2023) provide some results for other questions in the FRBNY-SCE but most of them are qualitative or focus on prices. The ECB-CES covers a wider array of economic variables such as unemployment and economic growth for macro variables but also income and consumption for household-specific variables. This paper shows that tenure effects are not specific to inflation but are also significant for real macro variables. Panelconditioning effects are much smaller and less systematic for households' own variables like their consumption or their income.

The remainder of this paper is structured as follows. Section 1 describes the CES panel data, the survey methodology, and our estimation strategy. In Section 2, we document evidence of tenure effects for inflation variables. Section 3 investigates how attention and uncertainty car explain tenure effects. Section 4 compares tenure effects for other macro variables and for households' own variables like income and consumption. Section 5 concludes.

1 Measuring Panel Conditioning Effects on ECB-CES Data

This section describes the ECB-CES micro-data and how we identify the panel conditioning effects.

1.1 Data

The ECB-CES is a monthly representative survey of households with a rotating panel structure (ECB (2024)). The survey was launched in April 2020 and initially covered six countries (Germany, France, Italy, Spain, the Netherlands, and Belgium); in April 2022, five new countries were added (Austria, Finland, Greece, Ireland, and Portugal). Our sample covers the period from April 2020 to December 2024. For each country, the number of households can vary: initially, about 2,000 households in the four main euro-area countries were surveyed and this number increased to reach about 3,000 in 2024. For the seven other countries, the number of households surveyed is 1,000. Overall, in December 2024, about 19,000 different households were surveyed.⁷ Overall, our sample contains more than 950,000 answers reported by a little more than 105,000 different participants.

The methodology of the ECB-CES is very similar to the one followed by the Federal Reserve Bank of New York's SCE.⁸ The ECB survey is conducted online and collects information on different topics (inflation, housing and credit, income and consumption, labor and growth), as well

⁷By comparison, the FRBNY-SCE collects answers of 1,300 US households every month.

⁸See Appendix A for more details.

as background information (gender, age, education, etc.). The "inflation" module includes questions on inflation perceptions, 1-year expectations and 3-year expectations, households are asked to answer about "changes in the general level of prices for goods and services in the country [they] currently live in"; the survey elicits inflation perceptions and expectations in different ways: qualitative questions on the evolution of prices, quantitative questions asking for point estimates, and probabilistic answers for expectations.⁹ The exact phrasing of the questions is reported in the Appendix B. All questions are translated into each of the European national languages of the different euro-area countries covered by the survey.

The ECB-CES has a rotating panel structure so that households leaving the survey are replaced by new ones: every month the share of new entrants is about 10%. Most respondents answer to several waves of the survey. Initially, there was no strict rule for the maximum tenure of respondents (defined as the total number of survey waves in which an individual has participated (including non-consecutive participation)). In its methodological note, the ECB mentions a "target maximum length of participation" of 24 completed survey waves (which might be not consecutive) while respondents exceeding 36 months since their first participation are removed from the panel.¹⁰. Figure 1 displays the observations by tenure (left panel) and maximum tenure (right panel). Panel (a) shows a steep decline in representation as tenure increases, suggesting that many households have rather short tenures. The shape of the maximum tenure distribution shows a gradual decline with a spike at 24 months (consistent with the rule of removing households after 24 months). Some individuals have participated more than 24 months (about 5% of the participants) with another small spike at 31 months. By comparison, the maximum duration of participation in the FRBNY-SCE is set to 12 months.

1.2 Estimation Strategy

To estimate the tenure effects in the ECB-CES data, we rely on a standard linear panel regressions:

$$y_{i(s)t} = \sum_{s=2}^{24} \beta_s \tau_s + \gamma X_i + \lambda_t + \epsilon_{it}$$
(1)

where the dependent variable $y_{i(s)t}$ is the answer (in our baseline exercises, the 1-year inflation expectation answer) of respondent *i* (with tenure *s*) at date *t* (month-year), τ_s is a dummy variable for tenure *s* (between 2 and 24, 1 being the first participation and the modality of reference in

⁹In Appendix, Figure A.1 plots the average of point estimates for the perceived inflation and the expected inflation at 1 and 3-year horizons along with the actual HICP inflation in the euro area.

¹⁰https://www.ecb.europa.eu/stats/ecb_surveys/consumer_exp_survey/shared/pdf/CES_ methodological_guide.en.pdf





Notes: Full sample, all waves pooled Source: ECB Consumer Expectations Survey, authors' calculation

our regression) and β_s are the parameters of interest measuring by how much the average answer given at tenure *s* differs from the average answer given at first participation (*s* = 1). We include household-specific variables (*X_i*) such as country, sex, age, education, income, financial knowledge (self-assessment) and trust attitudes and time-fixed effects (λ_t), to control for average time variation, ϵ_{it} is an error term.¹¹ In our empirical analysis, the inflation variables are winsorized at the 2^{*nd*} and 98^{*th*} percentiles to mitigate the influence of extreme values.¹²

As highlighted in Kim and Binder (2023), panel attrition could lead to a sample selection issue when we estimate the tenure effect. In Appendix Tables A.1 and A.2, we provide detailed results on the determinants of panel attrition: male, older participants, lower-income respondents are more likely to stay longer in the survey panel. To control for this sample selection bias, we follow a similar strategy as the one proposed by Kim and Binder (2023): in our baseline analysis, we estimate tenure effects for respondents who participate in the survey 24 times, which is the theoretical maximum duration of participation. This restricts our estimation sample, which

¹¹In our baseline exercise, we do not include individual fixed effects because our empirical strategy relies on estimating the tenure effect only for households having completed the survey 24 times, which substantially reduces the influence of unobservable characteristics and the heterogeneity across households; controlling for observable characteristics makes the estimation much more parsimonious. In Appendix, we provide several robustness results (see below).

¹²This winsorization is the same as the one used for the calculation of the CES aggregate results published by the ECB.

still contains approximately 200,000 responses to the survey and about 10% of respondents who participated in the survey during our sample period.

We also run several robustness checks. We estimate the tenure effects using the full sample of answers (restricting our sample to respondents with a maximum tenure below 24). We also consider respondents with different maximum tenure (between 2 and 6 months, between 7 and 12 months, between 13 and 23 months and more than 24 months) to investigate whether our baseline results are only found for the group of respondents who have completed the questionnaire exactly 24 times and whether this maximum tenure can affect our baseline results.¹³ Finally, we also run regressions where we remove the time- and/or add individual fixed effects.

2 Panel Conditioning Effects on Inflation Expectations

In this section, we provide baseline estimations of tenure effects for perceived and expected inflation.

2.1 Average Tenure Effects

Figure 2 plots estimates of β_s which are interpreted as the average systematic deviation (in percentage points) of answers given at tenure s from the initial answer (for s = 1). The tenure effects are estimated for point estimates of inflation perceptions, and expectations at 1-year and 3-year horizons. For the three inflation variables, we find large, significant, and persistent tenure effects. After the first completed wave, expectations at both horizons are revised by 0.5 percentage points (pp) whereas for perceptions, the tenure effects appear at s = 3. At s = 6, the effects reach about -1.5 pp for the perceptions and the 1-year horizon expectations and -1 pp for the 3-year expectations. The panel conditioning effect continues to grow in absolute values for perceptions and 1-year expectations. After one year, the tenure effects of 1-year expectations stabilize between -2 pp and -2.5 pp whereas the tenure effect for perceptions reaches a maximum of about - 3 pp after 18 interviews. The tenure effect for 3-year inflation expectations remains stable at about -1.5 pp after s = 6; the smaller effect for the 3-year horizon might be related to the lower level of the average 3-year expectation. Results are consistent with the ones obtained by Kim and Binder (2023) for the FRBNY-SCE in the United States: the pattern of the panel conditioning effects over tenure is similar but the magnitude of the effects are also of the same order in the ECB-CES as in the FRBNY-SCE.

¹³We consider intervals of maximum tenure to keep a sufficient number of observations for the estimation.



Figure 2: Average tenure effects in the euro area (in pp)

Notes: This figure plots estimates β_s from the baseline regression equation (1). Sample restricted to respondents who participate in the survey for 24 waves. Observations are winsorized at the 2^{*nd*} and 98^{*th*} percentiles of each survey round. Shaded areas are 95% confidence intervals

Source: ECB Consumer Expectations Survey, all waves pooled, authors' calculation

Results of the robustness analysis run for the 1-year inflation expectations are reported in Appendix Figure A.2. Panel (a) shows that if we choose another definition of maximum tenure, results are quite similar during the first six months of tenure but the tenure effects tend to be stronger after s = 6 when the maximum tenure duration increases. This latter result suggests that tenure effects are quite robustly estimated for the first 6 months of tenure but then the maximum tenure duration is somewhat endogenous and sample selection effects might be stronger. Panel (b) shows that individual fixed effects play a very limited role in our estimation but the introduction of time fixed effects affects more strongly our results (in particular, learning effects). Ignoring time fixed effects makes harder to distinguish tenure effects from average time variation of expectations over our sample period which are pretty large (due to large variation in inflation over our sample period).

2.2 Implications for Aggregate Indicators of Inflation Expectations

Answering the survey in a repeated way significantly affects inflation responses of households. This might blur the reading of aggregate indicators since they will reflect these learning effects which are specific to households participating repeatedly in the survey and might be less representative of the general population. To assess how tenure effects have an impact on aggregate indicators, we compute a corrected series accounting for the panel conditioning. To do so, for every individual with tenure *s* in our sample, we calculate a counterfactual inflation expectation (\tilde{y}) as the difference between the raw answer (y) and the estimated average tenure effect $(\hat{\beta}_s)$:

$$\tilde{y}_{i(s)t} = y_{i(s)t} - \hat{\beta}_s \tag{2}$$

for $s \in 1, ..., 24$.

Figure 3 plots the actual average 1-year inflation expectation (similar to the one published by the ECB) and the average of expectations once we have controlled for tenure effects.¹⁴ We also add the average answer given by new participants in the survey, by construction, there are no learning effects in the answers of new entrants and this time series could be considered as an alternative way to assess the impact of learning effects on aggregate indicators without estimating the tenure effects.¹⁵

Three results emerge from this comparison. First, as expected, there is a systematic gap between the uncorrected series and the series correcting for tenure effects. This gap reflects the fact that many respondents participate several times in the survey, and they have on average lower expectations. Another result is that the series controlling for average tenure effects is rather well correlated with the uncorrected series. This is due to the fact that the composition of tenure over time varies little.¹⁶ The correlation is, however, weaker at the beginning of the survey (between 2020 and 2021) since all respondents were new at the first interview and the tenure effect increased progressively over the first year of the survey, leading to a mechanical decrease in the average inflation expectation.¹⁷ Finally, the average expectation of new entrants is close to the corrected series but is more volatile and possibly less precise because the number of new entrants is much smaller than the full sample.

¹⁴The time series computed from the raw data is close to the one released by the ECB.

¹⁵One caveat is of course that there might be a sample selection since characteristics of new entrants might differ considerably from those of other households.

¹⁶This correction can be further improved by allowing for heterogeneous tenure effects.

¹⁷In Appendix, Figure A.3 shows that this difference was much stronger for the median expectation which is another important aggregate indicator.



Figure 3: Average inflation expectations (in %)

Notes: Full Sample. Observations winsorized at the 2nd and 98th percentiles of each survey round. Source: ECB Consumer Expectations Survey, authors' calculation

2.3 Heterogeneity of Tenure Effects Across Households

Finally, we investigate how much the tenure effect differs across households. To do so, we interact the tenure effects with different dummy variables D_i capturing differences by gender, age, education or income.

$$y_{i(s)t} = \beta_0 + \sum_{s=2}^{24} \beta_{1,s} \tau_s + \beta_D D_i + \sum_{s=2}^{24} \beta_{2,s} (D_i \times \tau_s) + X_i + \gamma_t + \epsilon_{it}$$
(3)

Figure 4 plots the results. Overall, we find tenure effects across all household groups. The largest difference is obtained between men and women: women exhibit stronger tenure effects than men. Tenure effects also differ by the household position in the income distribution: they are much stronger for households at the bottom quintile of income. Differences are smaller by age or education. Learning effects are smaller for highly educated and older households. Overall, the tenure effects are larger for household categories with, on average, higher inflation expectations but also possibly less informed or attentive about inflation.



Figure 4: Effect of tenure on 1-year ahead inflation expectations (in pp)

Notes: This figure shows the change in responses of survey participants compared to their initial responses, in percentage points, estimated from regression. Sample restricted to respondents who participate in the survey for 24 waves. Observations winsorized at the 2nd and 98th percentiles of each survey round Source: ECB Consumer Expectations Survey, authors' calculation

3 Investigating Possible Determinants of Tenure Effects

Tenure effects can generally be explained by the fact that households with initially high expectations become more attentive or engage in a greater search for information as they participate in additional survey waves. This could also increase the degree of certainty with which households respond to the survey. In contrast, a repeated survey can also lead to a declining level of engagement of households and a lower accuracy of their answers. In this section, we investigate how we can relate tenure effects with attention or information search but also uncertainty of households.

3.1 Heterogeneity Along the Distribution of Inflation Expectations

First, we investigate how much the tenure effect depends on the level of the initial answer given by the respondent. Learning effects can be large because most households do not know much about inflation: generally, they provide rather large estimates but they are also quite uncertain about their answers. Households with initially high expectations may become more attentive or engage in greater information gathering as they participate in additional survey waves.¹⁸ This increased focus of households could lead to a reassessment and subsequent revision of their inflation expectations.

Figure 5 plots the tenure effects depending on the level of the initial answer to the survey. We find very large effects when the initial answer was above 10%, suggesting that the learning effects are stronger when the initial answer was large. The tenure effect is negative and significant for initial answers between 4 and 10% but it is smaller. Overall, most of the average tenure effect seems to be driven by households entering the survey with high inflation expectations. In contrast, the tenure effects for households entering with expectations lower or equal than 4% are positive, in particular for respondents who gave a negative initial answer. Again, this suggests that households giving initially negative answers provide more consistent answers after the first interview.

¹⁸In Appendix, Figure A.4 plots the distribution of initial answers to the survey.



Figure 5: Tenure effects by initial point estimate of 1-year inflation expectation (in pp)

Notes: This figure plots estimates β_s from the baseline regression equation (1). Sample restricted to respondents who participate in the survey for 24 waves. Observations are winsorized at the 2^{*nd*} and 98^{*th*} percentiles of each survey round. Source: ECB Consumer Expectations Survey, all waves pooled, authors' calculation

3.2 Role of Attention

A general explanation of the larger tenure effects observed for households with initially high expectations is that these households may become more attentive or engage in greater information gathering as they participate in additional survey waves. This increased focus of households could lead to a reassessment and subsequent revision of their inflation expectations.

One simple measure of attention or inattention consists in comparing households' inflation perceptions with actual inflation. For instance, Coibion et al. (2018) build an attention measure constructed as the difference between these two variables and consider that economic agents are inattentive when this difference is larger than 2 percentage points.¹⁹ One advantage of the ECB-CES is that the survey asks not only about inflation expectations but also about their inflation perceptions, which allows us to measure the level of attention of households using the measure proposed by Coibion et al. (2018). During the period, inflation also varies a lot, meaning that attentive households are not only those who provide lower inflation perceptions, as it can be the

¹⁹In Appendix, Figure A.5 plots the share of attentive households over the sample period.

case in low-inflation environments. Finally, in a given date, inflation also varies across euro-area countries. We build an attention dummy equal to 1 if, at a given date, the difference between the perceived inflation of a given household in a given country and the actual inflation in this country is lower than 2 pp in absolute values. First, we find that the probability of being attentive to inflation increases with tenure, suggesting that households do gather more information about information when they repeatedly participate in the survey. Figure 6 (a) plots the estimation results: the quantitative effects are, however, rather small (+3 pp after some months of participation).²⁰

Second, we investigate by how much attentive and inattentive households revise their inflation expectations over the tenure period. Figure 6 (b) plots the estimation results. We find that learning effects are much more limited for attentive households (about -1 pp after 18 months and a slow revision pattern), whereas inattentive households are associated with quicker and larger panel conditioning effects (-2 pp after 4 months and -3 pp after twelve months of tenure). This is consistent with the prediction that less attentive respondents revise more their inflation expectations because they also initially have higher inflation perceptions.²¹

Finally, attention can also be related to how households process information and the type of device (e.g., smartphone versus computer) used to answer the survey can play a major role, potentially influencing the level of accuracy of their answers (Neri et al. (2019)). For instance, respondents using devices that allow easier access to information or a more focused survey experience could be associated with smaller revisions over time.²² In our case, we find that the tenure effect of households using a computer is lower by approximately 1 pp compared to those using a smartphone or using another device to answer the survey (Figure 7).

²⁰We also find that this effect is stronger when inflation is below 3% and very small when inflation is high, consistent with the intuition that when inflation is high, households may be more attentive to inflation and are less likely to learn about inflation (Appendix Figure A.6.

²¹Korenok et al. (2023) and Weber et al. (2025) have shown that attention to inflation is endogenous and increases with the level of inflation. Looking at how the tenure effect varies when inflation is high or low (and implicitly when attention was high and low), we do not find strong evidence that tenure effects are weaker when inflation was high at the first participation in the survey (Appendix Figure A.7).

²²Gautier and Montornès (2022) show that, in European Commission surveys for France conducted via telephone interviews, the tenure effect is weaker or insignificant compared to the ECB-CES survey. In the United States, the Michigan survey transitioned from phone to online data collection in 2024, introducing a structural break in sentiment levels, with online responses showing sentiment levels approximately 8.9 points lower. Interestingly, Cummings and Tedeschi (2024) show that this break is mainly driven by more negative assessments of current economic conditions rather than expectations.

Figure 6: Attention as a motive for tenure effect



(a) Share of attentive households ($|\pi_{it}^p - \pi_t^{Ctry}| < 2\%$)

Notes: Sample restricted to respondents who participate in the survey for 24 waves. Observations winsorized at the 2nd and 98th percentiles of each survey round. π_{it}^p denotes individual inflation perceptions. Panel (a) plots the effect of tenure on the probability of being attentive. Panel (b) reports the panel conditioning effect on the 1-year inflation expectation for the group of households defined as attentive and the group of households defined as inattentive. Source: ECB Consumer Expectations Survey, authors' calculation

12 Tenure Low attention High attention

6

24

18

3.3 Uncertainty and Survey Fatigue

Households are generally not aware of inflation as measured by statistical offices and their answers on expected inflation are also quite uncertain. However, when households participate repeatedly in the same survey, they also tend to become more certain about their answers (Kim and



Figure 7: Tenure effects by device (in pp)

Notes: Sample restricted to respondents who participate in the survey for 24 waves. Observations are winsorized at the 2^{nd} and 98^{th} percentiles of each survey round. Source: ECB Consumer Expectations Survey, all waves pooled, authors' calculation

Binder (2023) and Mitchell et al. (2024)).

Figure 8 panel (a) plots the estimation results looking at the probability of giving a rounding number over tenure. We find that the share of respondents providing a rounding answer slightly decreases with tenure (by about 5 pp). In particular, we find that the share of households reporting a non-zero rounded value decreases sharply with tenure. These results would be very consistent with fewer households being uncertain when they participate repeatedly in the survey. However, we also find that households are more likely to provide a "0" answer: the proportion of households expecting "0" inflation is larger by 10 pp at maximum tenure of 24. This effect might come from the design of the questionnaire and how it interacts with tenure effects. In the ECB-CES, households are first asked a qualitative question on whether prices are expected to increase, to remain stable, or to decrease. When they answer that they expect prices to remain exactly the same, they do not have to answer the quantitative question and a "0" inflation answer is assigned. This type of questionnaire design is similar as in the European Commission Survey (Andrade et al. (2023)). However, this design may also encourage "speed-through" behavior: respondents may expedite the completion of their questionnaire by selecting a neutral option. Applying our bench-

mark regression to the qualitative question on inflation expectations suggests that the likelihood of selecting the response "exactly the same" increases with tenure (Figure A.8 in the Appendix), which could be consistent with households spending less time answering the survey rather than being more certain about their answers.

Figure 8: Uncertainty as a motive for tenure effect (change in probability)



Notes: Sample restricted to respondents who participate in the survey for 24 waves. Observations winsorized at the 2nd and 98th percentiles of each survey round, all waves pooled. (a) Percentage of respondents rounding their point estimate by tenure (b) Percentage of respondents replying to the probabilistic questions in fewer or equal than 2 bins and greater or equal than 3 bins

Source: ECB Consumer Expectations Survey, authors' calculation

Figure 8 panel (b) plots the estimation results using an alternative uncertainty measure built from the probabilistic question. We find that the share of households using 3 or more bins to answer to the probabilistic question lowers sharply with tenure (-10 pp after 24 months) whereas, symmetrically, the share of respondents filling 2 or less bins with a non-zero probability increases with tenure. Mitchell et al. (2024) report similar evidence from the FRBNY-SCE data. This result could be consistent with less uncertain answers but it could also be explained by households putting less effort in responding to the survey. ²³

Overall, our results show that households tend to be more certain of their answers. At the same time, these results could also be interpreted as an increasing survey fatigue when respondents participate repeatedly in the survey. Households might become more familiar with the economic

²³This type of survey fatigue is also more likely to appear when the questionnaire is rather long and cover many topics, as documented by Galesic and Bosnjak (2009).

concepts covered by the survey, which would explain why their answers are more consistent with actual inflation but they might also become more familiar with the design of the questionnaire, putting less effort in responding and providing less accurate answers. Disentangling genuine learning effects from the confounding effects of survey fatigue is rather difficult in our context but is also critical to ensure the validity of longitudinal analysis.

4 Panel Conditioning on Other Outcomes

How much do tenure-effects are specific to inflation? Tenure effects might be larger for inflation because this macro variable is less well-known and less well-understood by households than unemployment or GDP growth. Another possibility is that tenure effects are stronger for macroeconomic variables because households have less knowledge or are less attentive to these variables than their own economic variables like income, consumption spending etc. The ECB-CES allows to test these conjectures because the survey asks a vast array of quantitative questions to households. In this section, we document estimations of learning effects for other macro- and microquantitative variables of the ECB-CES.

4.1 Tenure Effects on Other Macro Quantitative Variables

One key advantage of the ECB-CES is that the survey asks households about their quantitative opinion on inflation but also on other macro variables such as unemployment and economic growth.²⁴ This allows us to investigate whether the tenure results obtained for inflation are similar to those we can find for other macro variables. The ECB-CES asks about the current unemployment rate, the 1-year expected unemployment rate and the expected economic growth.

A first result is that households tend to overestimate the unemployment rate and to underestimate economic growth. In Appendix, Figure A.10 plots the average perceived and expected unemployment rate and the actual unemployment rate in the euro area. There is a large and systematic positive gap between the perceived/expected unemployment rate and the actual unemployment rate (even if both actual and perceived unemployment rates are correlated). The overestimation is close to 5 pp.²⁵ Similarly, the average expectation of economic growth has been consistently below

²⁴Kim and Binder (2023) report results for qualitative change in the unemployment rate.

²⁵This finding also aligns with survey data conducted by the French unemployment insurance agency (Unedic), which reports that in Q4 2024, 60% of respondents believed the unemployment rate to be 15.3%, whereas the actual rate was 7.3%.

zero since 2022 whereas the actual GDP growth was more often positive than negative over the sample period. The underestimation is smaller than the one obtained for inflation but it seems to be significant and systematic after the Covid period.

This systematic under- or overestimation suggests that households are not more attentive to real variables than to nominal variables since they have biased perceptions in both cases. Second, households tend to be rather pessimistic about real variables in a similar way as about inflation.

Figure 9 plots the effect of tenure on unemployment and economic growth expectations. We find significant tenure effects for both variables. For the unemployment rate, the tenure effect after twelve months is even stronger than the one found for inflation (about -3 pp for both perceptions and 1-year expectations). We also obtain the same shape over tenure with large revisions after some months, the effect is then close to its maximum after a tenure of 12. The tenure effects for economic growth are positive but much smaller. The upward adjustment is also much more gradual than the one found for inflation or unemployment: the tenure effect is either insignificant or barely significant up to 9 months then the tenure effect for economic growth suggests that households might be more informed about the economic growth than the unemployment rate.

Overall, these tenure effects also suggest that households also have more optimistic views on the real economy when they participate several times in the survey. They also tend to provide more consistent and less biased views, and this pattern is very similar to the one obtained for inflation. These results suggest that the tenure effects are not specific to the inflation variables.

Figure 9: Effect of tenure on macroeconomic expectations (1-year ahead, in pp)



Notes: Sample restricted to respondents who participate in the survey for 24 waves. Observations winsorized at the 2^{nd} and 98^{th} percentiles of each survey round.

Source: ECB Consumer Expectations Survey, authors' calculation

4.2 Tenure Effects on Microeconomic Variables

One explanation for significant tenure effects obtained for macro variables is related to the fact that macro variables are less familiar to households than their own household-specific variables such as income or consumption. The ECB-CES asks households quantitative questions about the expected growth of their own income and two questions about their perceived and expected consumption growth.

In Appendix Figure A.10, we compare the average answers of households with the corresponding aggregate variables for the euro area (i.e. the annual growth rate of the disposable income and final consumption from the national accounts). Contrary to the macro variables, we do not find any systematic bias in the answers but we also find that the correlation between the actual and perceived variables is weaker.

Figure 10 reports the estimated tenure effects associated with income and consumption variables. For income, we find no significant effect for all tenures. For both expected and perceived growth of spending consumption, we find negative tenure effects, they are however rather small and are significant after 6 months of participation in the survey.

Overall, households are more attentive or informed about variables reflecting their own situa-

tion than about the macro variables in particular inflation or unemployment.



Figure 10: Effect of tenure on households own income and consumption (in pp)

Notes: Sample restricted to respondents who participate in the survey for 24 waves. Observations winsorized at the 2^{nd} and 98^{th} percentiles of each survey round

Source: ECB Consumer Expectations Survey, authors' calculation

5 Conclusion

We show the presence of a substantial tenure effect in the answers of households to the ECB-CES, which is consistent with previous findings of Kim and Binder (2023) obtained on FRBNY-SCE data for the United States. In both surveys, the tenure effect is estimated to reduce 1-year inflation expectations by approximately 2 percentage points after one year of survey participation. Taking into account those tenure effects would lead to higher aggregate average and median inflation expectations but the evolution would be similar to the one obtained from data not corrected for tenure effects.

Several mechanisms contribute to the tenure effects. Increased attention, as households voluntarily search for information after their first survey wave, improves accuracy by aligning expectations with new information. A priming effect, resulting from repeated exposure to similar questions, encourages respondents to provide more consistent answers by refining or correcting their previous responses. In particular, we find that tenure effects are stronger when the initial answer was above 10%. We also find that answers of households might be less uncertain: they report less frequently rounding numbers and use fewer bins when answering to the probabilistic question. However, these findings could also be consistent with less engagement from households in their participation in the survey. We show that households are also more likely to report that prices will be stable and then do not have to answer to the quantitative answer, which might reduce the time spent answering the questionnaire. We also find that the device used for participation (e.g., smartphone, tablet, or computer) also influence how questions are processed, potentially enhancing or diminishing response quality. Conversely, repeated participation leads to fatigue, with respondents providing less thoughtful answers over time, which may deteriorate the overall accuracy of their responses.

The tenure effect is crucial when comparing different surveys, such as the ECB-CES and the European Commission Consumer Survey, or the FRBNY SCE and the Michigan Survey of Consumers. Differences in methodology, sampling, and question design can increase or decrease the effect of tenure. Recognizing and adjusting surveys for tenure effects is important to improve survey design, to interpret time series, and to ensure accurate comparisons across surveys. Our finding underscores the significant influence of repeated survey participation on household responses, not only for inflation expectations but also for other macroeconomic expectations.

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Online Appendix – Measuring Households' Inflation Expectations in the Euro Area: the Effect of Panel Conditioning

Erwan Gautier - Jérémi Montornes

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A The ECB Consumer Expectations Survey

The Consumer Expectations Survey²⁶ is conducted by the European Central Bank in 11 euro-area countries, including Germany, France, Italy, Spain, the Netherlands, Belgium, Austria, Portugal, Finland, Ireland, and Greece. The survey started in 2020 for the first six countries and expanded in 2022 to include the remaining five. In each country surveyed, the questionnaires are standardized in terms of structure, and modes of data collection. The questions are formulated in a similar way with only minor adjustments for translation. It is administered online and nearly 19,000 households are surveyed every month.

The methodology for this survey aligns closely with the one of the FRBNY-SCE. The questions are categorized into three main types: (1) qualitative questions similar to those used in other consumer surveys (e.g., "What do you think will happen to prices in general over the next 12 months?"), (2) quantitative questions requesting point estimates, such as expected inflation rates over the next year, and (3) questions eliciting respondents' probability distributions for their forecasts. The survey also collects demographic and socioeconomic information, such as income, age, gender, region, and educational attainment. This allows the analysis of results across different household groups.

The survey design combines probability and non-probability sampling methods. Recruitment for the probability sample is conducted via telephone using random digit dialing. For the nonprobability samples, recruitment and data collection are exclusively internet-based. These samples are primarily sourced from existing online access panels but also include newly recruited participants with limited prior experience in survey participation. Additionally, some of these newly recruited respondents are identified through social media platforms, often through targeted advertising campaigns. Quotas for age, gender, and region are implemented to ensure representativeness within the non-probability component of the ECB-CES panel.

The survey covers a broad range of topics, including consumption, labor markets, housing, and credit. Beyond the core monthly questionnaire (approximately 20 minutes in total, averaging 20 seconds per question), there is also an extended quarterly and annual module with more detailed questions consumption, employment, and credit.

²⁶https://www.ecb.europa.eu/stats/ecb_surveys/consumer_exp_survey/html/index.en.html

B Sample questionnaire

This section provides details of the questions on inflation expectations from the CES questionnaire²⁷.

1. **Qualitative Question:** The question addresses expectations about the general price level in the country of residence 12 months ahead. Respondents are asked:

Looking ahead to 12 months from now, what do you think will happen to prices in general? We are interested in even very small changes.

- Prices will increase a lot
- Prices will decrease a lot
- Prices will increase a little
- Prices will decrease a little
- Prices will be exactly the same
- 2. **Quantitative Question** (Price change estimation in percentage terms): The question captures respondents' best guess of how much prices will change in percentage terms 12 months from now. The input is a numeric value that can include up to one decimal place.

How much higher (lower) do you think prices in general will be 12 months from now in the country you currently live in? Please give your best guess of the change in percentage terms. You can provide a number up to one decimal place. ___%

 Probabilistic Question (Distribution of Price Change Expectations): This question asks respondents to allocate 100 points across ten possible price change scenarios 12 months from now. The scenarios range from significant increases (12% or more) to significant decreases (12% or more). The points indicate the likelihood of each scenario.

Now we would like you to think about how much prices in general in the country you currently live in are likely to change in 12 months from now. We realise that

²⁷ https://www.ecb.europa.eu/stats/ecb_surveys/consumer_exp_survey/shared/pdf/CES_ sample_questionnaire.en.pdf

this question may take a little more effort.

Below you see 10 possible ways in which prices could change. Please distribute 100 points among them, to indicate how likely you think it is that each price change will happen. The sum of the points you allocate should total to 100.

You can allocate points by typing a percentage in each box. (Note that your answers should sum to 100 – if your sum exceeds 100, you should first decrease the points again in one option before you can add points in another).

Percent Change	
Increase by 12% or more	%
Increase by 8% to less than 12%	%
Increase by 4% to less than 8%	%
Increase by 2% to less than 4%	%
Increase by 0% to less than 2%	%
Decrease by 0% to less than 2%	%
Decrease by 2% to less than 4%	%
Decrease by 4% to less than 8%	%
Decrease by 8% to less than 12%	%
Decrease by 12% or more	%
The total mainte about d'aune to	100

The total points should sum to 100





Note: average inflation perceptions and expectations Source: Euostat HICP, ECB Consumer Expectations Survey, authors' calculation

C Attrition

Tenure (months)	1	6	12	18	24
Gender					
Men	46.3	50.3	51.3	50.7	49.8
Women	53.7	49.6	48.7	49.3	50.2
Age					
18-34 years	30.1	21.3	21.0	20.8	19.8
35-49 years	41.3	44.1	44.8	45.7	46.2
+ 50 years	28.6	34.6	34.2	33.5	34.00
Education					
Primary	11.9	11.6	11.5	11.4	11.2
Secondary	34.7	32.6	32.9	33.2	32.7
Tertiary	53.4	55.8	55.6	55.4	56.1
Income					
Quintile 1	20.7	19.6	20.4	21.3	22.4
Quintile 2	19.7	19.5	20.2	19.9	20.7
Quintile 3	18.7	19.4	20.1	20.5	20.4
Quintile 4	19.4	20.4	19.7	19.2	18.8
Quintile 5	21.5	21.2	19.7	19.1	17.7

Table A.1: Respondent Characteristics by Tenure (in %)

Notes: Percentages across gender, age, education and income categories. Sample restricted to 1-24 tenure Source: ECB Consumer Expectations Survey, authors' calculation.

	(1)	(2)	(3)	(4)	(5)
Tenure	1	6	12	18	24
Male	ref.	ref.	ref.	ref.	ref.
Female	0.078***	-0.010*	-0.031***	-0.022**	-0.011
	(0.004)	(0.005)	(0.006)	(0.007)	(0.008)
18-34 years	ref.	ref.	ref.	ref.	ref.
35-49 years	-0.219***	0.030***	0.032***	0.027**	0.037***
	(0.005)	(0.006)	(0.007)	(0.008)	(0.010)
50+ years	-0.263***	0.054***	0.031***	0.003	0.009
	(0.005)	(0.007)	(0.008)	(0.009)	(0.011)
Primary Edu.	ref.	ref.	ref.	ref.	ref.
Secondary Edu.	-0.008	-0.011	0.001	0.009	0.013
	(0.006)	(0.008)	(0.010)	(0.011)	(0.014)
Tertiary Edu.	-0.076***	-0.001	0.014	0.018	0.041**
	(0.006)	(0.008)	(0.009)	(0.011)	(0.013)
Quintile 1	ref.	ref.	ref.	ref.	ref.
Quintile 2	0.002	0.008	0.003	-0.022*	-0.024*
	(0.006)	(0.008)	(0.009)	(0.010)	(0.012)
Quintile 3	-0.009	0.010	0.004	-0.006	-0.030*
	(0.006)	(0.008)	(0.009)	(0.011)	(0.013)
Quintile 4	0.016**	0.025**	-0.016	-0.043***	-0.070***
	(0.006)	(0.008)	(0.009)	(0.010)	(0.013)
Quintile 5	0.076***	0.026**	-0.034***	-0.062***	- 0.114***
	(0.006)	(0.008)	(0.010)	(0.011)	(0.014)
Constant	-0.922***	-1.655***	-1.815***	-1.995***	-2.214***
	(0.008)	(0.010)	(0.012)	(0.014)	(0.017)
N	714636	714636	714636	714636	714636

Table A.2: Effect of socio-demographics on Tenure (in pp)

Marginal effects. Standard errors in parentheses

* p < 0.05, ** p < 0.01, *** p < 0.001

Notes: Being female increases the probability of having a tenure = 1 by 7.8 percentage points on average. Sample restricted to 1-24 tenure

Source: ECB Consumer Expectations Survey, authors' calculation.

D Robustness checks

This section provides robustness checks for the estimates of the effect of tenure on 1-year-ahead inflation expectations in the euro area. Similar results are obtained for different sampling rules and specifications.

Figure A.2: Robustness checks: Effect of tenure on 1-year ahead inflation expectations (in pp)



(b) Alternative specifications



Notes: Sample selections varies according the maximum tenure in panel (a), sample restricted to respondents who participate in the survey for 24 waves in panel (b). Observations winsorized at the 2^{nd} and 98^{th} percentiles of each survey round.

Source: ECB Consumer Expectations Survey, authors' calculation

E Aggregate Implications



Figure A.3: Median inflation expectations (in %)

Source: ECB Consumer Expectations Survey, authors' calculation

F Attention - Uncertainty



Figure A.4: Initial inflation expectations distribution (in percentage of respondents)

Notes: all waves pooled Source: ECB Consumer Expectations Survey, authors' calculation



Figure A.5: Proportion of attentive households over time

Notes: Sample restricted to respondents who participate in the survey for 24 waves. Observations winsorized at the 2^{nd} and 98^{th} percentiles of each survey round, all waves pooled. The dummy "high attention" is equal to 1 if $|\pi_{ct}^p - \pi_{ct}| < 2\%$ where π_t^p is the perceived inflation of a given household in country *c* and the actual inflation in country *c*. Source: ECB Consumer Expectations Survey, authors' calculation



Figure A.6: Tenure Effects - Attention

Notes: Sample restricted to respondents who participate in the survey for 24 waves. Observations winsorized at the 2^{nd} and 98^{th} percentiles of each survey round, all waves pooled. The dummy "high attention" is equal to 1 if $|\pi_{ct}^p - \pi_{ct}| < 2\%$ where π_t^p is the perceived inflation of a given household in country *c* and the actual inflation in country *c*. Source: ECB Consumer Expectations Survey, authors' calculation



Figure A.7: Tenure Effects - High vs Low Inflation

Notes: Sample restricted to respondents who participate in the survey for 24 waves. Observations winsorized at the 2^{nd} and 98^{th} percentiles of each survey round, all waves pooled. High inflation is defined as $\pi_t > 3\%$ Source: ECB Consumer Expectations Survey, authors' calculation



Figure A.8: Tenure Effects - Qualitative Answers

Notes: Sample restricted to respondents who participate in the survey for 24 waves. Observations winsorized at the 2nd and 98th percentiles of each survey round, all waves pooled. Answers from the qualitative questions on 1-year inflation expectations.

Source: ECB Consumer Expectations Survey, authors' calculation



Figure A.9: Rounding of point estimates and use of bins for probabilistic expectations

Notes: Sample restricted to respondents who participate in the survey for 24 waves. Observations winsorized at the 2^{nd} and 98^{th} percentiles of each survey round, all waves pooled. (a) Percentage of respondents rounding (0 and multiples of 5) their point estimate by tenure (b) Percentage of respondents replying to the probabilistic questions in fewer or equal than 2 bins and greater or equal than 3 bins

Source: ECB Consumer Expectations Survey, authors' calculation

G Other Macro and Micro Variables



(c) Household net income (y-o-y growth rate, in %)

Figure A.10: Survey expectations vs. aggregate statistics in the Euro area

(b) Economic activity (y-o-y growth rate, in %)

(a) Unemployment rate (in %)

(d) Spending expenditures (y-o-y growth rate, in %)



Notes: Weighted data. Full sample, observations are winsorized at the 2^{nd} and 98^{th} percentiles of each survey round, average expectations.

Source: ECB Consumer Expectations Survey, Eurostat Labor Force Survey and National accounts, authors' calculation