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What matters in households' inflation expectations?☆

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ABSTRACT

Using survey data on French households over the 2004–2018 period, we provide new evidence on the role of households' inflation expectations for durable spending decisions. A large share of households expects prices to remain stable instead of increasing. This share accounts for 75% of fluctuations in the average inflation expectation. Households expecting stable prices have a lower propensity to buy durable goods than those expecting positive inflation. In contrast, differences across households expecting positive inflation are associated with insignificant differences in durable consumption decisions. We discuss some policy implications.

1. Introduction

Households' inflation expectations are a central transmission channel in New Keynesian (NK) models and are key for monetary and fiscal policies advocated to bypass the effective lower bound (ELB) on the nominal interest rate.[1] This setup postulates that agents have full information and rational expectations, and that their inflation expectations positively affect their consumption through their impact on the real interest rate.

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[1] See Eggertsson and Woodford (2003) among many others.

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Such a theoretical channel contrasts with what is observed in households' surveys. There is clear evidence that their inflation expectations do not satisfy the assumption of full information and rational expectation (Coibion and Gorodnichenko, 2015a). Moreover, unlike what the intertemporal substitution mechanism predicts, the effect of household inflation expectation on their spending is often found to be small and non-significant in empirical studies (see Bachmann et al., 2015, among others). To date, the questions of how households form their inflation expectations and of how these expectations contribute to their spending decisions remain debated.

In this paper, we provide new facts that speak to these two questions. We highlight the importance of the *extensive margin* of households' expectations—that is whether households expect prices to remain stable or to increase. We show that such an extensive margin is important to account for the fluctuations in households' inflation expectations. We also show that it is a significant predictor of household durable consumption: Households expecting prices to increase have a higher propensity to buy durable goods than households expecting prices to remain stable. In contrast, unlike in standard macroeconomic models, the *intensive margin*—differences in the precise *quantitative* inflation rate households expect—matters much less: Households with different positive quantitative inflation expectations make similar durable consumption choices. The key role of the extensive margin in the inflation expectation channel has some important policy implications that we discuss.

Our baseline results are obtained from a survey of French households covering about 2000 individuals every month. We had access to a sample covering the January 2004 and December 2018 period. This survey provides detailed individual information on both qualitative and quantitative inflation expectations as well as on durable consumption decisions for a relatively long sample period. In particular, it contains information on both individuals' own durable consumption decisions (as in, e.g., Burke and Ozdagli, 2013; Dräger and Nghiem, 2020) and individuals' views on durable consumption in general, often named "readiness to spend" (as in, e.g., Bachmann et al., 2015; D'Acunto et al., 2016). Finally, we had access to additional ad hoc surveys that provide micro-evidence on what drives individual inflation expectations.

We first document the importance of the extensive margin in the formation of households' inflation expectations. Looking at the qualitative assessment of future inflation reveals that a large share of households expect prices to "stay about the same" over the next year. On average, they make up almost one-third of the total sample. This share of households expecting stable prices fluctuates over time and declines when realized inflation increases. We document that the corresponding extensive margin, instead of positive inflation, accounts for up to 75% of the fluctuations in inflation expectations averaged across households, and it is also a stronger predictor of actual inflation than the intensive margin. Finally, we document that at the individual level, households can shift from expecting stable prices to expecting positive inflation and vice-versa and that their views about aggregate inflation are connected to their views on individual items' price changes, consistent with recent evidence that personal shopping experience and salient prices shape individual inflation expectations (Cavallo et al., 2017; Coibion and Gorodnichenko, 2015b; D'Acunto et al., 2019).

We then highlight the role of the extensive margin of households' inflation expectations in their durable consumption decisions. We find that households expecting prices to increase over the next year have a higher probability of buying new durable goods in the current year than households expecting prices to remain stable. By contrast, households with different positive inflation expectations have a similar propensity to buy durable goods. These findings hold for individuals' own durable consumption choices but also for individuals' general readiness to spend on durable goods.[2]

Our baseline results are obtained in regressions using a repeated cross-section of households together with a rich set of individual characteristics and beliefs. In particular, we control for individuals' perceived current inflation, which limits the risk of reverse causality whereby the shopping experience resulting from past durable spending would lead individuals to more likely infer that prices are increasing rather than stable. The survey design also allows us to address some endogeneity concerns stemming from omitted variables that could vary with inflation expectations and also affect consumption choices. More specifically, we can control for individuals' own financial and consumption expectations as well as aggregate macroeconomic perspectives. This mitigates the concern that households' durable consumption reacts to shocks affecting both their inflation and real income expectations. Finally, we can control for households' perceptions of whether the current period is a good time to save, which relates to their nominal interest rate perceptions. This limits the endogeneity stemming from households' understanding that the central bank reacts to higher expected inflation by tightening interest rates, which would then lower private spending.

We conduct several robustness checks. We confirm our main findings using the panel dimension of the French survey, showing that our baseline results hold when controlling for unobserved fixed individual characteristics. We also check that the results are robust to alternative imputations of quantitative inflation expectations of households answering "stable prices." Moreover, we provide evidence that these results are not driven by households with a worse understanding of inflation. They still hold when dropping households with extreme views on future inflation, or when focusing on households with the most precise inflation forecasts. We document that the results also hold when splitting the sample between the pre-ELB and the ELB periods, or when looking at surveys of German and US households that have been previously studied in the literature.

[2] As for many surveys, we only have information on durable spending. Nevertheless, it is the most important margin of adjustment in total private consumption fluctuations over the business cycle and the component that is the most interest-rate sensitive (see, e.g., Berger and Vavra, 2015).

Finally, we illustrate that, while our findings imply an economically significant impact of inflation expectations on private consumption, it is strongly mitigated compared to a standard NK model with full information rational expectations. We also discuss some policy implications of our results.[3]

Literature. Our paper is related to the literature studying the formation of macroeconomic expectations. Recent contributions highlight deviations from full information and rational expectation in surveys of professional forecasters (e.g. Andrade et al., 2016; Andrade and Le Bihan, 2013; Angeletos et al., 2020; Bordalo et al., 2020; Coibion and Gorodnichenko, 2012; Fuhrer, 2018), households (e.g. Afrouzi et al., 2020; Cavallo et al., 2017; Coibion and Gorodnichenko, 2015a; Coibion et al., 2022; D'Acunto et al., 2021; Malmendier and Nagel, 2016; Mankiw et al., 2003), or firms (e.g. Coibion et al., 2018; 2020). Still, which alternative model can better characterize these expectations is debated. These works rely on *quantitative* expectation measures. We emphasize that changes in the broad *qualitative* inflation regime households expect is an important feature of households' inflation expectations.[4] Thus, our findings echo the more recent contributions of Andre et al. (2022), who show that broad narratives shape households' expectations, or Dräger et al. (2022) who document that households have similar attitudes towards inflation despite substantial differences in their quantitative perceptions.

We also contribute to the literature using surveys to assess whether, consistent with the NK setup, households' inflation expectations positively affect their spending decisions (see Armantier et al., 2015; Bachmann et al., 2015; Binder and Brunet, 2022; Burke and Ozdagli, 2013; Coibion et al., 2019; Crump et al., 2022; D'Acunto et al., 2021; 2016; Dräger and Nghiem, 2020; Duca-Radu et al., 2020; Ichiue and Nishiguchi, 2015; Vellekoop and Wiederholt, 2019). These studies do not distinguish between the intensive and the extensive margins of inflation expectation. We find that merging the two leads to estimating a non-significant effect of inflation expectations on households' durable spending, which masks the positive impact of the extensive margin. We also find that inflation expectations have a positive effect on households' spending, but only through variations in the broad *qualitative* inflation regime they expect. This mitigates the inflation expectation channel compared to the standard NK setup where variations in *quantitative* inflation expectations matter. This complements the informational and financial constraints introduced to limit such a channel (e.g., Andrade et al., 2019; Angeletos and Lian, 2018; Farhi and Werning, 2019; Gabaix, 2020; Garcia-Schmidt and Woodford, 2019; McKay et al., 2016; Michelacci and Paciello, 2019; Wiederholt, 2015).

2. Data

In this section, we describe the sample and the design of the questionnaire for the survey of French households. We then discuss the questions on inflation expectations and durable consumption decisions that are available. Finally, we provide some descriptive statistics.

2.1. Sample and questionnaire

We exploit individual answers to the monthly consumer confidence survey conducted by INSEE (Institut National de la Statistique et des Etudes Economiques, the French public statistical agency) over the January 2004–December 2018 period (before 2008, the survey was not conducted in August). Every month, about 2000 interviews are carried out by phone. This is larger than comparable surveys used in the literature—the Michigan Survey of Consumers conducts around 500 interviews each month and the New York Fed Survey of Consumer Expectations is based on a rotating panel of about 1300 households. The sample is designed to be representative of the overall French adult population (sampling weights are calculated by city size, age, household composition, occupation, socio-professional category, education).

Each household is surveyed over three consecutive months, although with a notable non-response rate. Out of a total of about 160,000 households that are in our sample, 42% responded to three consecutive interviews, 25% to two, and 33% to only one. Still, the dataset has a short panel dimension for households responding to several interviews.

The questionnaire contains about 20 questions on households' perceptions of the macroeconomic outlook (general economic situation, quality of life, unemployment, prices), as well as on their own economic prospects and decisions (financial situation, savings, durable consumption decisions). In addition, the survey collects socio-demographic information (age, gender, education, income, employment status, household composition).[5]

INSEE also occasionally runs surveys with one-off modules of additional questions (see Appendix D for details on these modules). In particular, in April 2007 and February 2009, households were asked about their inflation perceptions for some specific items. In September 2007, households expecting prices to stay about the same were asked what exactly they meant by this answer. We use these specific survey waves to provide further insights on how households form their inflation expectations.

[3] We introduce and discuss a simple NK model featuring households behaving in a way consistent with our results in Appendix G.

[4] Another literature, beginning with Carlson and Parkin (1975), derives the average quantitative inflation expectation from individual qualitative inflation expectations. We observe both quantitative and qualitative expectations for a large number of households in the sample.

[5] See Appendix A for the full questionnaire.

2.2. Expected inflation

Individuals are asked about both their *qualitative* and their *quantitative* perceptions of the evolution of prices over the next 12 months. While most of the literature focuses on the latter, we take advantage of having access to both measures of inflation expectation to emphasize the importance of the former in how the inflation expectation channel operates.

More specifically, individuals are first asked the following *qualitative* question:

Question 1. *In comparison with the past 12 months, how do you expect consumer prices will develop in the next 12 months? They will...*

1. *Increase more rapidly,* ***2.*** *Increase at the same rate,* ***3.*** *Increase at a slower rate,* ***4.*** *Stay about the same,* ***5.*** *Fall,* ***6.*** *Don't know.*

Note that the set of possible qualitative answers is more detailed than the Michigan Survey of Consumers, which only distinguishes between three categories "declining prices," "stable prices," and "increasing prices."[6] In what follows, we will refer to the answer "stay about the same" as the expectation of stable prices.

Households are then asked the following *quantitative* question:

Question 2. *By how many percents do you think consumer prices will go up/down over the next 12 months? Consumer prices will increase/decrease by XX.X%*

The survey design is such that the quantitative question is not asked to individuals who previously answered "stay about the same." Following the usual practice, we impute 0% to the quantitative inflation rate that these households expect.[7]

There is a significant proportion of non-responses to the quantitative question.[8]

By contrast, a quantitative inflation expectation is imputed to every household answering "stay about the same." So the usual imputation over-samples households with a 0% quantitative expected inflation. To correct for this over-sampling, we estimate how individual characteristics affect the non-response to the quantitative question for households that answered to the qualitative question in the first place. Based on these estimates, we compute the estimated probability of a non-response to the quantitative expected inflation question for each household. We then impute a "missing value" to households that have the largest probability of not answering the quantitative question within the group of households that expect prices to "stay about the same", so that the response rate in this category is equal to the one observed for alternative answers to the qualitative question.

No imputation is done for households answering "I don't know" to the qualitative question, so their quantitative assessment of inflation is missing.

In Section 3.4 below, we use additional one-off modules of the survey to discuss what households mean when they answer that they expect prices to remain stable.

2.3. Consumption decisions

The survey asks households about both their *own* durable consumption decisions and about their *general* assessment on whether it is a good time to buy durable goods.

More precisely, the survey first asks whether a household bought durable goods:

Question 3. *Have you made any major purchase over the last 12 months? (such as furniture, household appliances, electronic or computer equipment, etc.)*

1. *Yes,* ***2.*** *No,* ***3.*** *Don't know.*

The survey also asks a question on whether the surveyed individual thinks it is the right time for people in general to make major purchases of durable goods, which Bachmann et al. (2015) labeled the "readiness to spend on durables":

Question 4. *In view of the current general economic situation, do you think now is the right time for people to make major purchases (such as furniture, household appliances, electronic or computer equipment, etc.)?*

1. *Yes, now is the right time,* ***2.*** *It is neither the right time nor the wrong time,* ***3.*** *No, it is the wrong time,* ***4.*** *Don't know.*

In what follows, we use both variables as proxies for individual durable consumption. Several recent works assessing the impact of households' inflation expectations on their consumption decisions only provide information on households'

[6] Also note that when answering that prices will increase, households have to qualify the expected variation of inflation and not the increase in prices per se. All country-level surveys conducted within the European Commission framework use the same set of answers to this question.

[7] See EC (2019), footnote 17: "The two questions are not asked if the response to the qualitative questions is 'don't know' or that prices will 'stay about the same,' as in this latter case it is assumed that the respondent perceives or expects no change in 'consumer prices.' When the respondent says that prices will 'stay about the same,' the interviewer is instructed to automatically impute a zero inflation rate in response to the quantitative questions." See also Arioli et al. (2017), footnote 8. Note that this approach differs from the ECB quantitative definition of price stability, which was (at the time) an inflation rate of close to but below 2%.

[8] About 50% of households do not answer the quantitative question on inflation. This proportion is only 5% for the qualitative question. Households that have higher income and degree and are younger are more likely to report a quantitative inflation expectation. See Appendix B.1 for details.

readiness to spend on durables (see Bachmann et al., 2015; D'Acunto et al., 2021; 2016; Duca-Radu et al., 2020) or on households' own durable consumption (see Burke and Ozdagli, 2013; Dräger and Nghiem, 2020). Having access to both measures allows us to draw comparisons with these two sets of papers.

Another advantage of having access to the two questions is that they are complementary proxies for individuals' *own* and *current* durable consumption. Question 3 is a measure of individuals' *own* durable consumption but goes 12 months back in time. While there is evidence that the question captures movements in relatively recent lags of realized durable consumption, as we document in the next subsection, it may include some noise because some of these past spending decisions could be unrelated to current expected inflation.[9] Question 4 is a measure of *current* desired durable consumption, so it can arguably be more directly connected to current inflation expectations, but it is indirectly linked to individuals' own consumption.

Both questions are qualitative, so we cannot observe the amount households spend on durables. Moreover, the survey focuses on durable goods, and more specifically "major purchases" such as furniture, washing machines, and electronic or computer equipment, and does not provide information on households' non-durable consumption. However, there is evidence that variations in the share of households that decide to buy durable goods is the margin that matters the most for aggregate consumption fluctuations (see, e.g. Berger and Vavra, 2015). Moreover, recent survey studies by Burke and Ozdagli (2013); Coibion et al. (2019) that have information on both durable and non-durable consumption show that the effect of inflation expectations on household spending predominantly goes through durables and, within that category, through the extensive margin of durable consumption.

2.4. Some descriptive statistics

This subsection presents summary statistics on inflation expectations and durable good consumption decisions.

Inflation expectations. Our data on inflation expectations are consistent with two well-known facts: households' inflation expectations overestimate the actual inflation rate but at the same time are strongly positively correlated with it. Inflation expectations average 2.8%, while the inflation rate averages about 1.5% over the sample period. The overestimation is much smaller when we consider the median expected inflation instead of the mean, suggesting that few but very large inflation expectations contribute a lot to this overestimation when we use the mean expected inflation rate. Despite this overestimation, the correlation between the average expected inflation rate and the actual headline inflation rate is about 0.8.[10]

Durable consumption decisions. Consistent with the fact that non-durables are infrequently purchased, only a minority (31%) of households reported major purchases over the past 12 months. Similarly, only 15% of households thought it was the right time to make major purchases. Both variables are positively correlated with annual consumption growth. The correlation of the fraction of individuals reporting their own past durable consumption with their current realized consumption is relatively large at 0.45. This is consistent with the fact that a large share of aggregate consumption variations comes from variations in the frequency of purchases of durable goods, as emphasized in Berger and Vavra (2015) for example. Moreover, the correlation with current durable decisions is also large, at 0.41, which shows that, although the question is about major consumption expenditures over the past 12 months, it is linked with actual recent decisions.[11]

3. The extensive margin of inflation expectations

In this section, we provide new stylized facts on how households form their inflation expectations, highlighting the importance of fluctuations in the share of households expecting prices to "stay about the same" in the average inflation expected by households.

3.1. A large share expects prices to "stay about the same"

Fig. 1 displays the cross-section distribution of individuals' inflation expectations. As it is well known, this exhibits a huge degree of heterogeneity across individuals: While actual inflation realizations are between -1% and $+4\%$ over the sample period, 40% of individuals' inflation expectations are outside this range over the same period. However, there is a clear mode in this cross-section distribution: About one-third of households expect prices "to stay about the same," which the survey interprets as zero expected inflation.[12] Another feature of this distribution is that very few households expect prices to decrease (about 1%). Gorodnichenko and Sergeyev (2021) also find this pattern in several other countries. These households are dropped from our baseline analysis, which focuses on the difference between the expectations of stable prices and of positive inflation.[13]

[9] Note that, as purchases of durable goods are relatively infrequent, it makes sense to survey individuals about their durable consumption over a period of time rather than at a precise date. For instance, Coibion et al. (2019) consider individuals' durable consumption reported over the last three months.

[10] See Appendices B.2 and B.4 for more descriptive statistics.

[11] See Appendix C for more descriptive statistics and evidence on the connection between durable consumption and total consumption.

[12] See Table B.8 in the Appendix for results on household heterogeneity.

[13] We provide evidence below that our main results are robust to keeping negative inflation expectations.

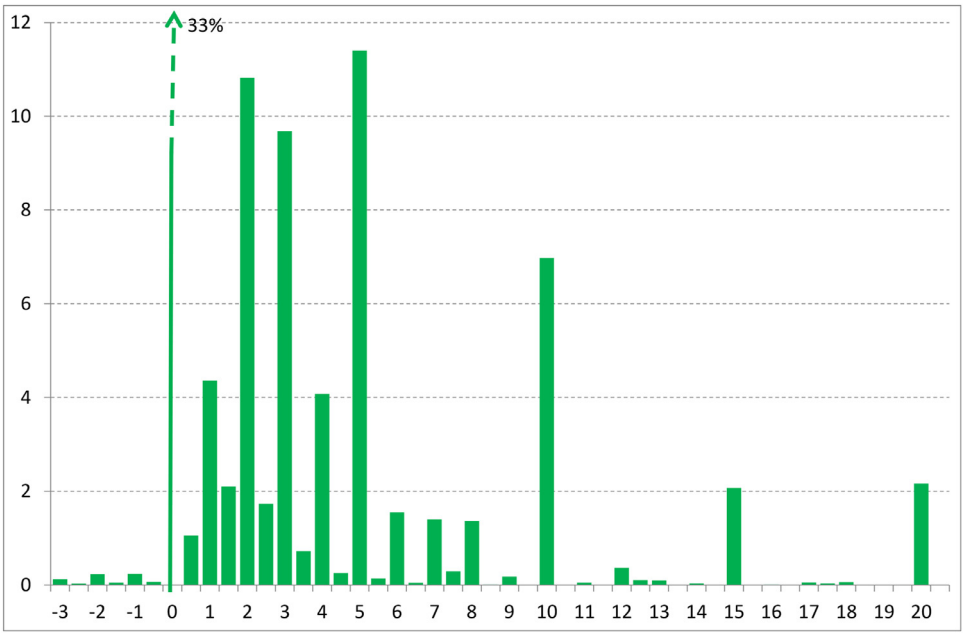

Fig. 1. Cross-distribution of inflation expectations. *Note*: This figure shows the distribution of inflation expectations across households computed over the period Jan. 2004 - Dec. 2018. The proportion of answers above 20% is not reported. The distribution is unweighted.

We summarize these findings in the following fact:

Fact 1. *Inflation expectations are heterogeneous, but a large fraction of households expect stable prices (and very few households expect negative inflation).*

3.2. Fluctuations in the average expectation

We decompose the fluctuations in the average inflation expectation into changes in the share of households expecting stable prices—which we call the *extensive margin* of inflation expectations—and changes in the average expectation of households reporting strictly positive inflation—which we call the *intensive margin* of inflation expectations.

To do so, we apply Klenow and Kryvtsov (2008)'s decomposition of micro-price variations to individual inflation expectations. Let $\pi^e_{i,t|t+1}$ denote individual i's inflation expectation at date t for date $t+1$, and let I_{it} be an indicator variable verifying $I_{it}=1$ if $\pi^e_{i,t|t+1}>0$ and $I_{it}=0$ otherwise. The average of individual expectations, $\pi^e_{t|t+1}=\frac{1}{n_t}\sum_{i=1}^{n_t}\pi^e_{i,t|t+1}$, can be broken down into two components:

$$\pi^e_{t|t+1}=fr_t\times dp^e_{t|t+1} \tag{1}$$

with $fr_t=\left(\frac{1}{n_t}\sum_{i=1}^{n_t}I_{it}\right)$ the fraction of households with positive inflation expectations and with $dp^e_{t|t+1}=\left(\sum_{i=1}^{n_t}I_{it}\right)^{-1}\left(\sum_{i=1}^{n_t}\pi^e_{i,t|t+1}\right)$ the average expectation among households having positive expectations.

A first-order approximation around the sample mean of the average inflation expectation, $\overline{\pi}^e$, leads to:

$$\pi^e_{t|t+1}-\overline{\pi}^e=\underbrace{\left(fr_t-\overline{fr}\right)\overline{dp}^e}_{extensive}+\underbrace{\left(dp^e_{t|t+1}-\overline{dp}^e\right)\overline{fr}}_{intensive}+O(t).$$

Fig. 2 plots these two margins in the fluctuations of aggregate inflation expectation and illustrates that the extensive margin matters a lot, in particular when the average inflation expectation is below its sample mean. The previous expression implies that the variance of aggregate expected inflation $\pi^e_{t|t+1}$ can also be broken down into its intensive- and extensive-margin

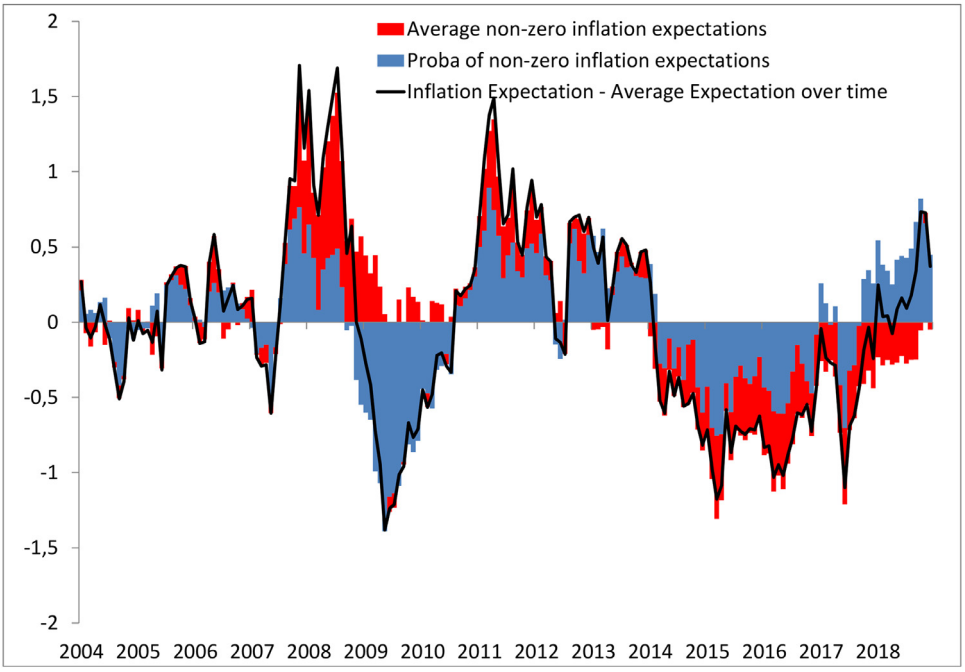

Fig. 2. Breakdown of aggregate inflation expectations – Extensive vs intensive margins. *Note:* This figure plots the time variations in the average of individual inflation expectations (black line) as well as the contribution of time variations in the probability of non-zero answers—the extensive margin—(blue histogram) and the contribution of time variations in the average expected inflation—the intensive margin—(red histogram) to these fluctuations. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

components:[14]

$$V\left(\pi^e_{t|t+1}\right) = \underbrace{V\left(dp^e_{t|t+1}\right)\overline{fr}^2}_{intensive} + \underbrace{V(fr_t)\overline{dp^e}^2 + 2cov\left(fr_t, dp^e_{t|t+1}\right)\overline{dp^e fr}}_{extensive}. \quad (2)$$

Table 1 shows the results of this decomposition on our data. In the first panel, following the survey's practice, it is assumed that households answering that prices will "stay about the same" expect zero inflation over the next year. In this case, the extensive margin accounts for about 75% of the total variance of the average inflation expectation, with 50% coming from the mere variance in the share of households expecting stable prices. As Table 1 also illustrates, the contribution of the extensive margin increases to about 90% in a very low-inflation environment, defined here as lower than the median inflation rate over our sample (1.6%). It is lower, at about 60%, when inflation is higher than this sample average. Overall, the contribution of the extensive margin cannot be neglected when assessing variations in the average inflation expectation.

The second panel of Table 1 shows that the extensive margin still accounts for most of the fluctuations when imputing low positive inflation expectations instead of zero to households expecting stable prices. The contribution declines as the difference between the average inflation expectation in the two regimes is reduced. But it still explains about 60% of the fluctuations in the average inflation expectation when imputing an inflation rate between 1% and 1.5%. This range is consistent with the average quantitative inflation expectation observed for households expecting stable prices in the additional survey of September 2007 (see Section 3.4).[15] Putting the results of this subsection together, we obtain:

Fact 2. *Variations in the share of households expecting stable prices (the extensive margin) contribute to a large share of the fluctuations in the average inflation expectation. In contrast, variations in the average expectation of households reporting positive inflation (the intensive margin) contribute much less.*

[14] As in Klenow and Kryvtsov (2008), the extensive margin captures the contribution of variations in the fraction of households expecting a positive inflation rate, including the covariance term. If that fraction were constant, the covariance term would be equal to 0 and would not contribute to the variance of aggregate expected inflation.

[15] In Table B.9 of the Appendix, we further allow the imputed value to vary over time (around the mean) in a similar way as the average of non-zero quantitative answers. The share of variance explained by the extensive margin then mechanically declines. However, that share still remains sizeable and is close to 50% when imputing an inflation rate between 1% and 1.5%.

Table 1
Fluctuations in average inflation expectation and extensive margin.

Imputed Value (in%)	$E(\pi^e_{t\|t+1})$	$V(\pi^e_{t\|t+1})$	Variance of Extensive Margin (EM)			% of $V(\pi^e_{t\|t+1})$ explained by EM	
			Total	from Freq.	from Cov.	Total	from Freq.
Baseline							
0 - All sample	2.82	0.41	0.30	0.20	0.10	73.2	49.4
0 - Low inflation	2.43	0.41	0.36	0.26	0.10	88.4	64.2
0 - High inflation	3.20	0.42	0.25	0.15	0.10	58.4	35.0
Robustness							
0.5	2.98	0.35	0.24	0.16	0.09	69.0	44.6
1	3.14	0.30	0.19	0.12	0.07	63.8	39.1
1.5	3.30	0.25	0.15	0.08	0.06	57.5	32.8
2	3.47	0.21	0.11	0.06	0.05	49.7	25.7
2.5	3.63	0.18	0.07	0.03	0.04	40.2	18.2

Notes: This table reports the mean and variance of the average of individual inflation expectations $\pi^e_{t|t+1} = (1/\#i)\sum_i \pi^e_{it|t+1}$ depending on the average value imputed to households answering that prices will stay about the same (Col. 1) and assuming no time variation in the average expectations of these households' answers. Assumption "0" is our baseline scenario. Col. 2 gives the mean of this average inflation expectation over time (using all types of answers to the quantitative question, imputed or not), Col. 3 reports the time variance of this average inflation expectation. Col. 4-5-6 report the contribution of the extensive margin to the overall variance of inflation (total and separately the relative contribution of the time variations of the share of answers "stay about the same" and the covariance term in Equation (2). Col. 7 reports the relative contribution of the extensive margin to the overall variance (the relative contributions of extensive and intensive margins sum to 100%). Col. 8 reports the relative contribution of the time variations of the share of answers "stay about the same." In Appendix B.5, we provide more details on how we obtained this table and other robustness checks.

3.3. The extensive margin is a predictor of actual inflation

In this subsection, we show that the extensive margin accounts for the strong correlation between the average inflation expectation of households and actual inflation documented in Section 2.4.[16]

Table 2 provides regressions of current inflation on the average inflation expectation and its extensive and intensive margins. Column (1) shows that average expected inflation is a predictor of current inflation. In Column (2), we split the average expected inflation into its extensive and its intensive margins. We find that current inflation is strongly connected to the extensive margin. By contrast, we find no statistically significant link with the intensive margin. These findings are robust to considering each of these components individually, as shown in Columns (3) and (4). They are also robust to including both the intensive and extensive margins of perceived past inflation as reported in Column (5). Finally, as Column (6) illustrates, the link between the extensive margin and actual inflation is even larger in relatively lower inflation periods. In relatively higher inflation periods, both the extensive margin and the intensive margin correlate with actual inflation. Overall, we have:

Fact 3. *Variations in the share of households expecting stable prices (the extensive margin) are a stronger predictor of current inflation realizations than the intensive margin.*

3.4. Micro-evidence on the extensive margin

We provide further evidence on what makes an individual expect that prices will remain the same rather than increase.

Individuals can shift between expecting stable prices or positive inflation. Looking at the sub-sample of households answering the survey multiple times, we observe that they can shift relatively frequently from the stable prices regime to the positive inflation regime: 41% of respondents expecting at date $t-1$ stable prices over the next 12 months shifted at date t to a positive inflation expectation, while 17% of respondents expecting a strictly positive inflation shifted to expecting stable prices.[17]

Connection to perceived changes in prices of specific items. Two additional survey modules conducted in April 2007 and February 2009 provide information on individuals' qualitative perceptions of how the price of nine specific items evolved recently. These cover basic non-durable and durable goods and services: bread, beef, food oil, electricity, car repair, gasoline, phone/internet, washing machines and TV sets.

Table 3 reports the results. On average, 30% of households perceived that the prices of these items remained stable. These shares of households are smaller for items with more frequent price changes, like gasoline, and larger for items with

[16] Figures B.2 and B.3 in the Appendix show scatter plots of how the share of individuals expecting "stable prices" and the average of positive inflation expectations fluctuate with actual inflation.

[17] See Table B.5 in the Appendix for the complete transition matrix.

Table 2
Margins of inflation expectations and current inflation realizations.

Effect on current inflation rate						
	(1)	(2)	(3)	(4)	(5)	(6)
Inflation ($t-1$)	0.881***	0.875***	0.895***	0.940***	0.875***	
	(0.0294)	(0.0303)	(0.0305)	(0.0260)	(0.0402)	
Average expectation	0.0946***					
	(0.0227)					
% of positive expectations		0.969***	0.968***		1.167**	
		(0.301)	(0.295)		(0.576)	
Avg. of positive expectations		0.0350		0.0350	0.0144	
		(0.0256)		(0.0274)	(0.0536)	
% of positive perceptions					-0.192	
					(0.558)	
Avg. of positive perceptions					0.0169	
					(0.0401)	
Inflation ($t-1$)						
× Very low inflation						0.717***
						(0.0555)
× Low inflation						0.671***
						(0.0460)
% of positive expectations						
× Very low inflation						1.060***
						(0.301)
× Low inflation						0.881**
						(0.383)
Avg. of positive expectations						
× Very low inflation						0.0252
						(0.0322)
× Low inflation						0.0892***
						(0.0258)
Observations	179	179	179	179	179	179
R^2	0.930	0.932	0.931	0.925	0.932	0.944
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table shows the result of OLS regressions of inflation (using the French HICP year-over-year inflation rate) at date t with inflation at date $t-1$ and time series variables constructed from micro data of the household survey. In column (1), the regressor is the average of all inflation expectations measured at date t in our sample. In column (2), we include the share of households expecting positive inflation—i.e. the extensive margin of inflation expectations—and the average inflation expectation calculated among households expecting positive inflation—i.e. the intensive margin of inflation expectations. In columns (3) and (4), we separately consider the link with the share of positive inflation expectations (extensive margin) and with the average positive inflation expectation (intensive margin). In column (5), we add controls for the average current inflation perceived by households, namely the share of households perceiving a positive inflation rate and the average inflation for households perceiving a positive inflation rate. In column (6), we interact these regressors with two dummy variables: one selecting a "very low inflation" regime corresponding to the periods of inflation below 1.6% (the median HICP inflation rate over our sample period), the other selecting a "low inflation" regime corresponding to the periods of inflation above 1.6%. Robust standard errors in parentheses. *p<0.1; **p<0.05; ***p<0.01.

Table 3
Price changes of specific products perceived by individuals.

	Share of households (in %) perceiving that prices			
Products	Decreased	Remained stable	Increased	It depends
Bread	0.2	19.2	75.3	5.3
Beef	0.7	23.9	69.9	5.5
Food oil	0.8	43.3	49.9	6.0
Electricity	1.1	24.7	73.0	1.2
Car repair	0.0	16.1	75.5	8.4
Gasoline	16.5	10.2	71.6	1.7
Phone/internet	5.0	58.2	31.7	5.1
Washing machine	11.5	52.8	22.2	13.5
TV set	35.8	25.0	17.4	21.9

Notes: This table reports the proportions of households answering product-specific questions on perceived price changes in the one-off modules incorporated in the regular survey of April 2007 and February 2009 (see Appendix D for details on these one-off modules of additional questions). For each of these products, households could choose to answer that they perceived that recent prices of a specific type of good or service decreased / remained stable / increased / increased a lot / it depends. For simplicity, we grouped answers "increased" and "increased a lot" into a single modality. For each product, columns sum to 100.

Table 4
Individuals' specific price perceptions and their expected inflation regime.

Effect on probability of expecting a "positive inflation rate"					
	Price perceptions				
Products	Decrease	Stable	Increase	It depends	# obs
Bread	-10.158**	Ref.	7.425***	7.511***	3,463
	(4.320)		(1.017)	(1.168)	
Beef	-4.776	Ref.	11.252***	5.725	3,116
	(23.066)		(2.628)	(4.773)	
Oil	-1.295	Ref.	8.394***	-2.355	2,732
	(8.603)		(0.264)	(3.840)	
Electricity	-8.989	Ref.	4.778**	0.698	3,272
	(15.940)		(2.203)	(10.414)	
Car repair	_	Ref.	6.440***	4.697**	2,491
			(2.329)	2.044)	
Gasoline	-1.319**	Ref.	7.627***	-1.567	3,346
	(0.642)		(0.923)	(5.793)	
Phone/internet	-4.476	Ref	3.278**	10.693***	3,449
	(5.579)		(1.393)	(3.647)	
Washing machine	-3.816	Ref.	9.269***	2.330***	2,110
	(3.574)		(1.140)	(0.095)	
TV set	-7.777**	Ref.	5.552**	-2.991***	2,808
	(3.928)		(2.532)	(0.050)	

Notes: This table reports marginal effects (in percentage points) from probit regressions where the dependent variable is a dummy variable taking the value 1 if a household answers that they expect prices to increase over the next 12 months and 0 otherwise. Negative inflation expectations have been removed from the sample; they represent less than 2% of qualitative answers, and we only keep observations for which the quantitative answer on expected price inflation is available. Each line corresponds to one regression where we use—as the right-hand side variable of interest—households' qualitative answers about perceived changes in prices of specific goods and services collected in the April 2007 and February 2009 supplementary modules of the survey (see Appendix D for details on the one-off modules of additional questions). For each of these products, households could choose to answer that they perceived that recent prices of a specific type of good or service decreased / remained stable / increased / increased a lot / it depends. For simplicity, we grouped answers "increased" and "increased a lot" into a single modality. Control variables include date dummies and individual characteristics (age, location [city, region], education, job, income, and survey round [1st, 2nd, or 3rd]) as well as a dummy variable equal to 1 if an individual thinks that prices have increased over the past 12 months. Standard errors are clustered at the date level. $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

less frequent price changes, such as services and durable goods.[18] Another interesting finding is that for some products, like gasoline, washing machines or TV sets, the share of households perceiving that prices declined can be quite large. So, the fact that almost no households expect a decline in aggregate prices, documented in Fig. 1 (see, more generally, Gorodnichenko and Sergeyev, 2021), does not imply that households think that individual prices cannot decline.

That being said, as reported in Table 4, individuals who perceived that the price of these specific items increased also were more likely to expect that aggregate prices would increase over the next year compared to individuals who perceived that the price of these items remained stable.[19] This correlation is stronger for items that are bought more frequently like food (bread, beef, food oil) and gasoline. Although data limitations prevent identifying a causal mechanism, these results are consistent with the view that households form their aggregate inflation expectations based on their shopping experience and salient prices, as documented in Cavallo et al. (2017); Coibion and Gorodnichenko (2015b); D'Acunto et al. (2019).[20] A novelty of our results is to show that individuals' perceptions of micro prices are also correlated with the broad aggregate inflation regime they expect.

What does "stay about the same" mean? An additional survey module that was conducted in September 2007 can be used to shed some light on this question. Indeed, households that answered that prices will "stay about the same" to the question on inflation expectations over the next 12 months were asked if they meant that "prices will increase at the same rate as today" or if "prices will remain the same." In addition, individuals answering that they meant that "prices will increase at the same rate as today" were asked about their quantitative inflation expectations.

Among the 1847 households that were surveyed in September 2007, 16% answered that prices will "stay about the same." Among these households, about 60% confirmed that they truly meant that "prices will remain the same." Overall individuals,

[18] Table D.1 illustrates how the fraction of individuals perceiving that the price of specific items remained "stable" varies across households' characteristics.

[19] Differences in the coefficients associated with "decrease," "increase," and "it depends" answers on perceived prices for different items are mostly statistically non-significant. Data limitations prevent us from conducting a more detailed analysis of these disparities.

[20] A related contribution is Montag (2019), who also uses the French survey of households to show that individuals tend to overweight goods that they purchase frequently, typically bread, when forming their views on *current* inflation.

who answered that "prices will increase at the same rate as today," expected a relatively small inflation rate: their average expected inflation was 1.35%, well below the average obtained for individuals expecting a positive inflation rate.[21]

To wrap up. The main findings of this subsection are summarized as follows:

Fact 4. *Individual households can shift between expecting stable prices and positive inflation. The former belief is positively correlated with the perception that prices of frequently-bought non-durable items stayed about the same. A majority of households expecting prices to stay about the same actually mean that prices will not increase; the remaining ones expect a much lower inflation rate compared to households answering that they expect a positive inflation rate.*

4. The extensive margin and consumption decisions

In this section, we investigate how households relate their durable consumption decisions to their inflation expectations. More specifically, we assess whether higher inflation expectations have a positive impact on durable expenditures as a Euler equation would imply (see, e.g. Bachmann et al., 2015). Compared to previous studies, we look separately at the effects of the extensive margin and the intensive margin of inflation expectations.

4.1. A discrete choice model of durable consumption

Specification. We consider that the decision to buy durable goods between $t-1$ and t, $b_{i,t}$ is a binary process that follows:

$$b_{i,t} = \begin{cases} 1 & \text{if } z^*_{i,t} > 0 \\ 0 & \text{otherwise} \end{cases} \tag{3}$$

where $z^*_{i,t}$ is a latent variable which evolves according to:[22]

$$z^*_{i,t} = \alpha + \beta \pi^e_{i,t|t+1} + \gamma X_{i,t} + \lambda_t + \mu z_i + \epsilon_{i,t} \tag{4}$$

with $\pi^e_{i,t|t+1}$ the inflation expectation formed by household i at date t for the next year (between t and $t+1$). X_{it} is a set of controls for other individuals' beliefs namely, their perceived inflation (question Q6 in the questionnaire, see Appendix A), their assessment about the aggregate economic situation (questions Q1 to Q5), their intention to buy durables in the next 12 months (question Q14), their assessment about their own financial situation (questions Q19 to Q21), and whether they think it is the right time to save (question Q11). λ_t are time fixed-effects controlling for aggregate variations. Finally, z_i is a set of fixed household characteristics such as age, composition of the household, occupation, income, working regime, education, gender, region, and city size.[23]

Our data set provides two measures for $b_{i,t}$ that were used separately in previous studies: first, individuals' *own* decisions to make major purchases given in answer to Question 3. This gives us information on whether household i bought some durable goods over the past year (between $t-1$ and t). Second, our data set includes individuals' beliefs on whether the current time is a right time to consume durables or not, reported in response to Question 4. We also have access to two different measures for the inflation an individual expects for the next year, $\pi^e_{i,t|t+1}$, the *qualitative* assessment given in answer to Question 1 and the *quantitative* estimates provided in response to Question 2.

Addressing potential endogeneity issues. Our baseline empirical model raises three potential identification issues.

First, the identification relies on cross-sectional variation in households' inflation expectations. However, as shown by Vellekoop and Wiederholt (2019), individual fixed effects are key to explaining such individual disparities, and this can bias our estimates. To clarify why, consider two households. Household 1 typically thinks inflation is 2% but expects higher inflation, say 3%, and hence they think it is a good time to buy durables. Household 2 instead typically perceives inflation around 6% but now expects lower inflation, say 5%, going forward, and thus refrains from buying durables. Regressing their willingness to buy on their numerical inflation expectations would yield a negative coefficient, contrasting with the positive link assumed in the data generating process. This issue is mitigated by the fact that we control for the current inflation rate perceived by an individual, which in the example above captures individual specific bias in inflation perception. Moreover, we can also control for a large set of household characteristics z_i that may explain these systematic difference in inflation expectation across individuals. Finally, as a robustness check (see below), we use the short panel dimension of the data to verify that our results are preserved when controlling for unobserved household heterogeneity.

Second, our specification may also suffer from reverse causality: households that purchased durables may tend to perceive that prices increased and thus expect a positive inflation rate rather than stable prices. Additionally, households that

[21] The full distribution of quantitative inflation expectations in this additional module is reported in Table D.2 of the Appendix.

[22] $z^*_{i,t}$ can be interpreted as the difference between the desired stock and the current stock of durable goods. The fact that durable consumption is a discrete choice is consistent with the view that it is subject to fixed costs. It is also consistent with our data, as only one-third of the respondents declared they bought durables over the last year.

[23] Expectations about durable goods prices might also matter for durable goods decisions. However, this question is not asked in the survey so we cannot investigate this effect.

decide to consume durables may think other households do the same and thus expect higher current and future price inflation from excess demand. In both cases, the reverse causality goes through individual perceived current inflation, which we control for.

Third, our estimates might also suffer from an endogeneity bias resulting from omitted time-varying variables. Higher inflation expectations could be associated with persistent shocks that coincidentally affect households' expected future income and expected future durable consumption, and hence could be correlated with past durable consumption decisions. To address this potential issue, we control for individuals' future consumption plans and expected own financial situation as well as expected future macroeconomic conditions. Another concern is that higher expected inflation could lead to a tightening of monetary policy, hence a higher real interest rate which reduces durable spending. We address this concern by controlling for households' subjective views on whether the time is a right time to save, which is related to the nominal interest rate.[24] In addition, as a robustness exercise (see below), we estimate the regression model over the subsample during which the ECB policy rate was kept at its effective lower bound (ELB), assuming households expected little central bank reaction to expected inflation at that time.

Note that endogeneity issues could be responsible for finding a spurious relation between individual inflation expectations and consumption decisions. But it is harder to rationalize why they would explain the difference between the effects of the extensive and the intensive margins of inflation expectations on durable consumption that we find.

4.2. What matters for durables consumption?

Let us investigate how inflation expectations are connected to durable good decisions.

The extensive margin does. Column 1 in the left panel of Table 5 shows the impact of the quantitative measure of inflation expectations on individual own durable consumption decisions when considering all quantitative answers. In column 2, the sample is restricted to households expecting a strictly positive inflation rate, so the coefficient corresponds to the effect of the intensive margin of inflation expectations. Finally, column 3 shows the effect of a dummy variable equal to 1 when a household gives a positive expectation and 0 when a household gives a zero-inflation answer, which corresponds to the effect of the extensive margin of inflation expectations.

As column 1 illustrates, the link between inflation expectations and durable consumption is positive but non significant when aggregating the intensive and extensive margins of inflation expectations. However, columns 2 and 3 show that this actually mixes up two very different effects of both margins: While the effect of the intensive margin is negative and non significant (col. 2), the effect of the extensive margin is positive and significant (col. 3): When households expect prices to increase rather than stay the same, the probability that they have made a durable purchase increases by about 1 percentage point. As the right panel of Table 5 shows, these results are broadly unchanged when looking at the impact of inflation expectations on the readiness to spend on durables.

Overall, quantitative variations in expected inflation have no significant impact on durable decisions. This is reminiscent of the results Bachmann et al. (2015) obtained with the Michigan survey of US households. Our additional evidence shows that this conceals the positive impact of the extensive margin of inflation expectations.

Do other expected inflation regimes matter? The previous results could mask variations in the reaction of durable consumption across different subsets of positive inflation expectations. We check whether this is the case by running the same regression as above but splitting the inflation expectation regressor into different brackets: 0%, between 0 and 3%, between 3 and 5%, between 5 and 10%, and above 10%.

The results are displayed in the fourth column of each of the two panels of Table 5. When households report a positive inflation expectation, their probability of making large purchases is higher by about 1 percentage point than when they expect prices to remain stable. This coefficient is constant across all subsets of expected inflation between 0 and 10%. The only significant difference that emerges is for inflation expectations above 10%, which have no impact on durable consumption compared to expecting stable prices.[25] As Fig. 3 illustrates, this result also holds when considering finer expected inflation brackets of 1 percentage point. This also shows that the absence of effects along the intensive margin is not driven by any particular value of inflation expectations.

We also investigate whether differences in qualitative inflation regimes that households expect matter for durable consumption: We run the same regression as before using the qualitative measure of inflation expectations (Question 1) instead of the quantitative measure (Question 2). Considering qualitative inflation expectations more than doubles the sample size as a large number of households only answer this question and not the quantitative question.[26] Results are displayed in

[24] The link between interest rates and the average belief of whether the time is "a right time to save" is illustrated in Figure C.4 in the Appendix. This variable is only a proxy for the nominal interest rate and could also capture changes in income, inflation, or uncertainty. Note, however, that we control for households' perceived own financial situation, inflation, and macroeconomic conditions which partially capture such related determinants of savings.

[25] This is consistent with our main result that inflation expectations affect durable consumption through the broad inflation regime and not the precise quantitative inflation that households expect. Individuals expecting a high inflation regime consume less than individuals expecting a regime of positive but moderate inflation.

[26] Table B.4 in the Appendix reports the connections between the qualitative and quantitative questions (see also Stanislawska et al., 2019, for further facts on these connections).

Table 5
Effect of inflation expectations on durable consumption – Baseline.

Dependent var.:	Own Major Purchases Over the Last 12 Months				Right Time to Purchase			
Exogenous var.:	All π^e	Intensive margin	Extensive margin	Subregimes	All π^e	Intensive margin	Extensive margin	Subregimes
π^e	0.005	-0.058			0.006	-0.028		
	(0.028)	(0.039)			(0.016)	(0.020)		
$1(\pi^e > 0)$			1.047***				0.620***	
			(0.337)				(0.187)	
By intervals:								
[10%; +∞[				0.049				-0.106
				(0.574)				(0.299)
[5%; 10%[				1.475***				0.772***
				(0.462)				(0.281)
[3%; 5%[				1.267***				1.157***
				(0.493)				(0.301)
]0%; 3%[				1.261***				0.839***
				(0.421)				(0.249)
0%				Ref.				Ref.
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	135,337	90,765	135,337	136,574	132,897	89,346	132,897	132,897

Notes: This table reports marginal effects (in percentage points) of various quantitative measures of households' inflation expectations on their "Own Major Purchases" and "Right Time to Purchase" from probit and ordered probit regressions, respectively. For the "Own Major Purchases" panel, the dependent variable is a dummy variable equal to 1 if the household answered "Yes" to the question "Have you made major purchases during the last 12 months?" and zero otherwise. For the "Right Time to Purchase" panel, the dependent variable is equal to 0 if the household answered "No, it is the wrong time," 1 if "It is neither the right time nor the wrong time," and 2 if "Yes, now is the right time" to the question "Do you think now is the right time for people to make major purchases?" Marginal effects are calculated for the value "Yes." In columns (1) and (5), we relate households' consumption decisions to all type of quantitative inflation expectations including those of households expecting "stables prices" (i.e. with a quantitative inflation expectation equal to 0). In columns (2) and (6), we look at the impact of the "Intensive Margin" of inflation expectation by relating households consumption decisions to their quantitative inflation expectations for households that expect a positive inflation rate, that is excluding households expecting "stable prices." In columns (3) and (7), we look at the impact of the "Extensive Margin" of inflation expectation by relating households' consumption decisions to a dummy variable equal to 1 if households expect a positive quantitative inflation expectation, and 0 if they expect "stable prices." In columns (4) and (8), we look at the impact of "Subregimes" of inflation expectations by relating households consumption decisions to a discrete variable selecting in which interval an individual quantitative inflation expectation falls. In all regressions, we have removed negative inflation expectations. Control variables include year and month dummies, household characteristics (age, location [city, region], education, job, income, individual survey round [1st, 2nd, or 3rd]), answers to other questions on French economic conditions (standard of living, unemployment, etc), and answers to the questions about future plans for major purchases, right time to save, and perceived current inflation. The sample period is 2004-01 to 2018-12. Standard errors are clustered at the date level. $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

Table 6. The left panel corresponds to estimates obtained with households' own reported durable consumption decisions, and the right panel with households' readiness to spend on durable goods. In each panel, the first column shows the effect of expecting a positive inflation rate as opposed to zero inflation (i.e. we include a dummy variable equal to 1 when a household answered "increase more rapidly," "increase at the same rate," or "increase at a slower rate" to the qualitative variable and 0 when a household answered "stay about the same"). This confirms, on a larger sample of households, the previous result that when a household expects something different from "stay about the same," the likelihood of making major purchases is significantly larger compared to the case where the household answered "stay about the same." The second column shows the results obtained when splitting among the three qualitative modalities of positive inflation expectations. The relation between expected inflation and durable consumption is not monotonic, but these differences are of second order compared to the difference between expecting stable prices or positive inflation: The distinction that really matters when it comes to consumption decisions is between the "prices stay about the same" and the "positive inflation" regimes. The third and the fourth columns confirm these results on the subsample of households that answered both the qualitative and quantitative questions on inflation expectations.[27]

The ECB's quantitative definition of price stability is a stable inflation close to 2%. Our results show that households expecting "stable prices" make different spending decisions from those expecting "stable inflation," and that the latter make spending decisions that are not statistically different from the ones of households expecting other regimes of positive inflation ("slower" or "faster" price increases). We provide further evidence that expecting stable prices leads to a different spending pattern compared with expecting a stable inflation of 2% by splitting inflation expectations into three regimes: "stable prices," "stable inflation with a quantitative rate close to 2%," and "other positive inflation" in our baseline regression. We find that households expecting stable inflation close to 2% make spending decisions comparable to those of

[27] Table E.4 shows the results obtained when keeping the few individuals expecting a deflation and the ones answering "don't know." The results are unchanged, and the effect of expecting a deflation is not statistically different from expecting stable prices.

Fig. 3. Marginal Effect of Inflation Expectations on Decision to Buy. *Notes:* These two figures plot estimates of the marginal effects of inflation expectations on individuals' reported "Own durable consumption" (Panel a) and "Right Time to consume" (Panel b). The effects are reported in percentage points and in deviations from individual expecting "stable prices" (hence a 0% inflation rate). The dashed dark line corresponds to the baseline estimates obtained with relatively large brackets of quantitative inflation expectations (as reported in Table 5), and the gray shaded area corresponds to the 95% confidence interval associated with these estimates. The orange line shows results obtained when sorting quantitative inflation expectations in finer regimes defined by smaller brackets. Dashed orange lines correspond to the 95% confidence interval.

households expecting other positive inflation rates and spend more than households expecting prices to remain stable (see Appendix E.6).[28]

Main fact. Overall, there exists a positive link between inflation expectations and durable consumption through inflation expectations shifting from stable prices to positive inflation. The decision to consume durable goods is uniform across households expecting positive inflation, as Fig. 3 shows, with the exception of households expecting very large inflation

[28] Note that the gap between the ECB's and households' definition of price stability did not prevent the ECB from achieving an inflation rate close to 2% over the sample considered. So our results do not imply that households' expectations are not anchored at a level consistent with the ECB's definition of price stability.

Table 6
Effect of inflation expectations on durable consumption – Qualitative answers.

Dependent var.:	Own Major Purchases Over the Last 12 Months				Right time to purchase			
Sample:	All Individuals		Ind. with Non-Missing Quantitative Answers		All Individuals		Ind. with Non-Missing Quantitative Answers	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exog. var.: Prices will...								
Increase	0.933***		1.047***		0.238*		0.620***	
	(0.223)		(0.338)		(0.138)		(0.187)	
Increase more rapidly		1.758***		1.446***		0.063		0.441
		(0.337)		(0.523)		(0.223)		(0.309)
Increase at the same rate		0.722***		0.931***		0.300**		0.743***
		(0.236)		(0.360)		(0.143)		(0.199)
Increase at a slower rate		1.261***		1.352***		0.807***		1.073***
		(0.288)		(0.466)		(0.159)		(0.243)
Stay about the same	Ref	Ref.	Ref	Ref.	Ref	Ref.	Ref	Ref.
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	293,874	293,874	135,337	135,337	285,289	285,289	132,897	132,897

Notes: This table reports marginal effects (in percentage points) of various qualitative measures of households' inflation expectations on their "Own Major Purchases" and "Right Time to Purchase" from probit and ordered probit regressions, respectively. In the "Own Major Purchases" panel, the dependent variable is a dummy variable equal to 1 if the household answered "Yes" to the questions "Have you made major purchases during the last 12 months?" and zero otherwise. In the "Right Time to Purchase" panel, the dependent variable is equal to 0 if the household answered "No, it is the wrong time," 1 if "It is neither the right time nor the wrong time," and 2 if "Yes, now is the right time" to the question "Do you think now is the right time for people to make major purchases?" Marginal effects are calculated for the value "Yes." The first two columns in each panel report the effect of qualitative measures of inflation expectations when taking all individuals. The last two columns report results excluding households with missing observations on the quantitative question on both inflation expectations and perceptions. Negative inflation expectations and "don't know" answers are removed from the estimation sample. Columns (1), (3), (5), and (7) report the impact of expecting "prices to increase" compared to "stable prices" on households' spending. Columns (2), (4), (6), and (8) report the impact of the various qualitative modalities of price increase available in the survey compared to "stable prices" on households' spending. Control variables include year and month dummies, household characteristics (age, location [city, region], education, job, income, individual survey round []st, 2nd, or 3rd]), answers to other questions on French economic conditions (standard of living, unemployment, etc), and answers to the questions about future plans for major purchases, right time to save, and perceived current inflation. The sample period is 2004-01 to 2018-12. Standard errors are clustered at the date level. $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

rates. In other words, households do not seem to act based on the exact level of inflation expectation that they report but on the broad qualitative inflation regime they expect. Our findings can be summarized as follows:

Fact 5. *Households' durable consumption is positively related to the extensive margin of households' inflation expectations. In contrast, durable consumption does not significantly vary with the intensive margin of inflation expectations.*

4.3. Robustness

Table 7 illustrates that our main result is robust to several alternative specifications of the baseline regression.[29]

Panel regressions. Some households in the survey were surveyed several times. We use this panel dimension of our data set to check that our results are not driven by unobserved household characteristics. Reconstructing a panel from the sequence of cross-section data presents several challenges that we detail in Appendix E.1. The panel dimension remains short, which limits the possibility of obtaining precise estimates. The second row in Panel A of Table 7 reports the estimation of panel probit models with households' random effect, still controlling for observed households' heterogeneity. As for the baseline regression, the extensive margin of households' inflation expectations is positively related to their decisions to buy durable goods. In contrast the intensive margin has a negative and non-significant impact.[30]

Imputation and negative answers. In our benchmark regression, we impute a 0% inflation expectation to households expecting prices to "stay about the same." We provide evidence that our main result is not an artefact of this specific imputation. Namely, we run the same regression but we impute to households expecting prices to "stay about the same" values of inflation expectations that are randomly drawn from the distribution of inflation expectations observed in the ad hoc additional survey of September 2007. The results obtained are reported on the third row in Panel A of Table 7. They confirm that the extensive margin of inflation expectation has a significantly positive impact on durable consumption (see Figure E.1

[29] Note that we also illustrate which controls matter to obtain our baseline results in Appendix E.9.

[30] We also report in Appendix E.1 the results of Logit models with fixed household effects using the qualitative answers to expected inflation to keep the sample sufficiently large. The results are very similar with our benchmark specification: Households are more likely to consume when they expect prices to increase instead of remaining stable.

Table 7
Effect of inflation expectations on durable consumption – Robustness.

Exog. var.	All π^e	Intensive margin	Extensive margin
A - Dep. var.: Own Major Purchases			
Baseline	0.005	-0.058	1.047***
	(0.028)	(0.039)	(0.337)
Panel regression	0.003	-0.043	0.646**
	(0.024)	(0.036)	(0.288)
Alternative imputation	-0.010	-0.048***	0.792***
	(0.007)	(0.012)	(0.270)
Excluding outliers	0.226***	-0.028	1.452***
	(0.074)	(0.123)	(0.343)
HHs with higher income	0.029	0.024	1.097**
	(0.045)	(0.061)	(0.470)
HHs with more precise forecasts	0.347***	-0.064	1.264***
	(0.133)	(0.253)	(0.390)
Pre-ELB	-0.005	-0.006	0.806*
	(0.028)	(0.035)	(0.425)
ELB	0.015	-0.118*	1.510***
	(0.045)	(0.067)	(0.544)
B- Dep. var.: "Right Time to Purchase"			
French households	0.006	-0.028	0.765***
	(0.015)	(0.020)	(0.187)
German households	-0.073***	-0.118***	0.832***
	(0.019)	(0.018)	(0.277)
US households	-0.147***	-0.339***	1.664***
	(0.024)	(0.030)	(0.290)

Notes: Each cell of this table presents specific robustness checks of the baseline regression results obtained with the three different measures of individual inflation expectations in Table 5: All quantitative answers ("all answers"), only positive answers ("intensive margin"), a dummy equal to 1 for positive answers and 0 otherwise ("extensive margin"). Panel A reports marginal effects (in percentage points) from probit regressions, where the endogenous variable is a dummy variable equal to 1 if the household answered "Yes" to the question "Have you made major purchases during the last 12 months?" "Panel regression" reports results from a panel regression with random individual household effects. "Alternative imputation" reports the average marginal effect (and the standard deviation of the distribution of marginal effects) obtained from regressions on 50 different samples of quantitative inflation expectations imputed to households answering that "prices will remain the same." Each sample is randomly drawn in the distribution of quantitative answers of these individuals observed in the complementary module of September 2007. The different samples correspond to different seeds for the DGP of the imputation. "Excluding outliers" reports results when excluding households expecting inflation rates above 10%. "Pre-ELB" ("ELB") reports results obtained on a sample ending (starting) in June 2014, when the ECB deposit facility rates became negative. Control variables include year and month dummies, household characteristics (age, location [city, region], education, job, income, individual survey round [1st, 2nd, or 3rd], answers to other question on French economic conditions (standard of living, unemployment, etc), answer to the question about future plans for major purchases, and right time to save and perceived inflation. Unless otherwise stated, the sample period is 2004-01 to 2018-12. Panel B reports additional country evidence from Germany and the US using answers to the question "Do you think now is the right time for people to make major purchases?". As a baseline, "French households" reports marginal effects estimated on the French data (in percentage points) from ordered probit regressions where the endogenous variable is a variable taking 3 different values: 0 if the household answers "No, it is the wrong time," 1 if "It is neither the right time nor the wrong time," 2 if 1"Yes, now is the right time" to the question "Do you think now is the right time for people to make major purchases?" Marginal effects are calculated for the value "Yes." We control for the same observable households characteristics and answers to the survey as in Panel A. "German households" reports marginal effects obtained from the equivalent regression using German data (from the GfK survey on German households; see Appendix F.1 for more details) on the same 2004–2018 sample period as for the French survey. "US households" presents results obtained from a similar regression using the Michigan Survey of Consumers over a 1978–2018 sample. The endogenous variable is 0 if the household answers "Bad," 1 if "Pro-Con," 2 if "Good" to the question "Generally speaking, do you think now is a good or a bad time for people to buy major household items?" Marginal effects are calculated for the value "Good." We control for a set of observable household characteristics and questions on the economic outlook as close as possible to the French survey (see Appendix, Table F.5, for more details). Standard errors are clustered at the date level. *p<0.1; **p<0.05; ***p<0.01.

in the Appendix). The intensive margin has the same negative impact as in the baseline, although the effect becomes more tightly estimated, and thus statistically significant, as the number of households expecting a positive inflation increases. As discussed previously, this negative effect is driven by individuals with high inflation expectations, which can be considered as a third broad inflation regime that households have in mind.

We also run several robustness regressions where we keep households with negative inflation expectations in our sample and consider a couple of alternative definitions of the extensive and intensive margins. In one, the extensive margin is defined as switching from stable prices (i.e. 0% inflation) to either positive or negative answers and the intensive margin considers variations across households expecting non-zero, including negative, inflation rates. In another, the extensive margin is defined as switching from non-positive inflation (aggregating expectations of deflation and 0% inflation) and the

intensive margin considers variations across households expecting strictly positive inflation. Results in Appendix E.4 show these variations provide results very close to our baseline regression.

Finally, in our baseline, we imputed missing observations to a share of 0% expectation answers to reproduce the same non-response rate for 0% inflation answers as the one obtained for other-than-0 quantitative answers. We run a robustness check where we keep all 0% answers (i.e. oversampling this answer among quantitative answers), and we find results very similar to those of the baseline specification (see Appendix E.5).

Outliers and household heterogeneity. As Fig. 1 illustrates, a significant share of households have inflation expectations that are well above the typical inflation realization over the sample period. Bachmann et al. (2015) emphasize that the link between expected inflation and durable consumption is closer to the one implied by the theory and the Euler equation when dropping these outliers: These households may not understand or care about inflation. The fourth row of Panel A in Table 7 shows the estimation results obtained when dropping "extreme" expected inflation, more specifically households expecting inflation to be higher than 10% over the following year. The results illustrate that these outliers are not driving our results.[31]

The fifth and sixth rows in Table 7 show the results obtained for households with, respectively, more precise inflation forecasts and higher income. These are households that likely face respectively lower cognitive constraints (D'Acunto et al., 2021) and lower financial constraints than the average household in the sample. The baseline result also holds for these individuals. In other words, we do not find evidence that the cognitive distortion that we highlight results from a composition effect and from households with a lower understanding (or a lower incentive to understand) of inflation.[32]

ELB. One may wonder how the period during which the ECB policy rate was constrained by its ELB is affecting the results. The seventh and eighth rows of Panel A in Table 7 contrast estimates obtained from a pre-ELB period and an ELB period—which we assume started in 2014. We find that, both before and during the ELB period, the link between the extensive margin of inflation expectations and durable consumption is positive and statistically significant. This connection is stronger during the ELB period than before consistent with the fact that the inflation expectation channel is larger when the central bank is expected to keep its interest rate at a low level even if inflation pressures are expected going forward.

The ELB period can also be seen as a way to mitigate the potential bias in the estimation of the effect of inflation expectations on households' expenditures that can result from the fact that individuals expect the central bank to tighten when they foresee higher inflation. As the results show, the difference between the two estimated coefficients is not statistically different. If anything, this bias may cause the effect of the extensive margin on household durable spending to be underestimated.[33]

Additional country evidence. We study how the extensive margin of inflation expectations matters for durable consumption in two other surveys that have been used in the literature: The German survey of households and the US Michigan survey of consumers. These surveys provide information only on individuals' readiness to spend on durable goods, so we compare these responses with the results obtained for this measure of household expenditure in the French survey. The sample period is 2004–2018 for Germany and 1978–2020 for the US. The set of controls available is roughly the same.[34]

We report the results of regressions run for the three countries in Panel B of Table 7. Like French households, US and German households expecting prices to increase are more likely to report that now is a good time to buy durables compared to households expecting stable prices. A difference with the French survey is that the effect of the intensive margin is significantly negative, leading to an overall effect that is also significantly negative. Further investigation shows that this effect is mainly driven by households expecting a relatively high inflation rate, more specifically greater than 5%, that have a lower-than-average readiness to spend.[35] These households behave like households expecting inflation to be greater than 10% in the French survey. Understanding what drives these country differences is left for further research.

5. Discussion of results and policy implications

In this section, we compute the contemporaneous impact of a one-standard-deviation change in the extensive margin of inflation expectation on aggregate consumption that our estimates imply. We illustrate that this impact is economically significant. We then discuss some general policy implications of our results.

A back-of-the-envelope quantification. Our estimation gives us $\Delta\text{Share}(\text{Dur=1}) = \beta \times \Delta\text{Share}(\pi^e > 0)$. The standard deviation of monthly changes in the share of households shifting their expectations from "stay about the same" to "increase"

[31] See also Appendix E.2 for more details.

[32] Appendix E.7 provides a more detailed analysis of household heterogeneity. Consistent with previous studies, households that are richer, older, with a higher education degree, or making more precise inflation forecasts exhibit inflation expectations that predict their spending on durables. However, even for these households, inflation expectations matters only through the extensive margin.

[33] Table E.12 shows that the baseline results are robust to dropping the "right time to save" control variable. In this regression, we have also not included "future plans of durable consumption" as a control.

[34] There are some differences though. For instance, the Michigan survey of households does not ask about perceived inflation, which can be an important control. Appendix F.1 for Germany and Appendix F.2 for the United States give a detailed description of the surveys and further replication of the results that we obtain on France.

[35] See Figures F.1 and F.2 in the Appendix for details.

is about 10 percentage points. So, according to our baseline estimate of the marginal effect $\beta = 0.01$, a one standard deviation increase in the share of households expecting positive inflation increase the share of households reporting that they made major purchases by $.01 \times .1 = 0.1\%$. The average share of households purchasing durable goods over the last 12 months is 31%. Assuming that durable consumption is given by this share of households multiplied by a typical durable expenditure $\bar{d}$ that does not vary across individuals and over time, the change in total durable consumption in reaction to a typical shift in households' inflation expectations from prices will "stay about the same" to will "increase" is $\Delta\text{Share(Dur=1)}/\text{Share(Dur=1)} = 0.001/0.31 = 0.3\%$.[36] Durable goods account for roughly 1/10 of total household spending and 1/4 of household consumption of goods, respectively implying a 0.03% and a 0.075% increase in such aggregates over a month. In comparison, the standard deviation of monthly household goods consumption growth equals 0.9% over our sample.[37] So the effect is small but still economically significant.

Policy implications. Our results have important implications for how expected inflation can affect aggregate demand.[38]

First, although significant, the behavioral friction that we uncover limits the inflation expectation channel compared to the full information and rational expectation setup assumed in standard New Keynesian models. According to our results, changes in the average inflation expectation have no effect on durable consumption if they are not associated with a change in the share of household expecting "stable" prices. This is not the case in a typical NK model, which makes the inflation expectation channel much stronger. This difference can be illustrated with the following back-of-the-envelop exercise. The change in the average inflation expectation induced by a one standard deviation increase in the share of households expecting positive inflation is $\Delta\overline{\pi}^e = \Delta\text{Share}(\pi^e > 0) \times \text{E}(\pi^e | \pi^e > 0) = 0.1 \times 4.15\% = 0.415\%$. This measures the additional inflation expected on average over the next year. A standard Euler equation implies that, everything else being constant, a change in expected inflation leads to an increase in monthly consumption growth of $\Delta \log C = \sigma \Delta\overline{\pi}^e$.[39] With $\sigma = 0.5$, $\Delta \log C = 0.21\%$, which is 7 times larger than the estimates of 0.03% implied by our baseline regression results.[40]

Second, and specific to the friction that we emphasize, monetary policy tools aimed at stabilizing aggregate demand through inflation expectations—such as forward guidance or average inflation targeting—can run out of ammunitions. The simple reason is that the share of households expecting prices to "stay about the same" is naturally bounded and it cannot fall below 0. Once everybody is in the positive expected inflation regime, increasing expected inflation further does not increase durable consumption.[41] Importantly, this limited ammunition implication of our results holds "locally," as the inflation regimes that we identify are specific to the low inflation environment that characterizes the sample period considered. Policies and inflation realizations could also modify the inflation regimes households have in mind so that the expectation channel could still be at play. But the modification of households' decision rules would probably require stronger and more persistent policy moves than those usually considered (see Carvalho et al., 2023, for an analysis of such non-linearities in expected inflation).

6. Conclusion

In this paper, we provide new evidence on how households form their inflation expectations and how these matter for their consumption decisions, highlighting the importance of the subjective and broad inflation regime that households expect. In particular, on our low inflation sample, we identify that the most important margin in inflation expectations is in between two simple regimes: Stable prices or positive inflation. These results are at odds with a full information and rational expectation setup. The literature on inattention shows that the cost of processing information can lead to situations where, even if agents have access to a continuum of actions, they may rather opt for a discrete, if not finite, set of choices (see e.g. Gabaix, 2019; Mackowiak et al., 2018; Reis, 2006).

Data availability

The data are confidential but However, researchers interested in replicating our empirical work can have easily access to these data by contacting the providers (INSEE and GfK)

[36] Indeed, assuming $\Delta\bar{d} = 0$ implies that $\frac{\Delta\text{Dur}}{\text{Dur}} = \frac{\Delta\bar{d} \times \text{Share(Dur=1)} + \bar{d} \times \Delta\text{Share(Dur=1)}}{\bar{d} \times \text{Share(Dur=1)}} = \frac{\Delta\text{Share(Dur=1)}}{\text{Share(Dur=1)}}$.

[37] Total consumption is not observed at a monthly frequency.

[38] We develop these points more formally in Appendix G, which introduces an inflation expectation channel working though the extensive margin in an otherwise standard New Keynesian model.

[39] More precisely, households expect an increase in the monthly inflation rate of $\frac{1}{12}\Delta\overline{\pi}^e$ over the next 12 months. First-differencing and iterating forward over the next 12 months the Euler equation gives $\Delta \log C = \sigma \sum_{h=1}^{12} \frac{1}{12} \Delta\overline{\pi}^e = \sigma \Delta\overline{\pi}^e$.

[40] $\sigma = .5$ corresponds to the estimate Crump et al. (2022) obtain using total spending growth reported in household surveys and is typically used in the calibration of medium-scale NK models. Note that these simple comparisons also assume that expected inflation affects aggregate spending only through durable goods, that is its interest sensitive component, consistent with the findings of e.g. Coibion et al. (2019). The mitigation of the inflation expectation channel we obtain is in the ballpark of what is obtained with the discounted Euler equation of McKay et al. (2016) and Gabaix (2020).

[41] See McKay and Wieland (2020) for a similar "limited ammunition" result in a model with sticky prices and adjustment costs on durable consumption.

Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jmoneco.2023.05.007.

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