What Matters in Households' Inflation Expectations?*

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Abstract

We provide new evidence on how households form their inflation expectations and how these matter for their consumption decisions. Using individual data from a survey of French households we document that i) inflation expectations are heterogeneous but a large fraction of them expect prices to remain stable; ii) a large share of the adjustment in the average inflation expectation comes from the change in the share of households expecting that price will increase instead of remaining stable (the extensive margin); iii) the extensive margin is positively correlated with realized inflation, and contributes more when inflation is low; iv) individuals expecting prices to remain stable consume relatively less than the ones expecting positive inflation, and the extensive margin is the only dimension where individual inflation expectations are linked to individual durable consumption decisions. These findings suggest that what matters in households' inflation expectations is the subjective and broad inflation regime that households expect. We show the implications for the expectation channel of monetary policy.

JEL codes: D12, D84, E21, E31, E52.

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1 Introduction

Inflation expectations matter a great deal for central banks. They are considered both a measure of their credibility to achieve their price stability objective and a channel to manage current aggregate demand. In particular, when the economy is at its lower bound on nominal interest rates, committing to a policy that boosts expected inflation is deemed expansionary because it lowers the real rate and increases the incentive to consume rather than save.[1] It is thus no surprise that central banks devote a lot of resources to monitor the inflation expectations of various agents, typically via surveys.

However, how the inflation expectation channel operates in practice remains unclear when looking at these surveys.[2] In particular, it is usually found that individuals disagree strongly about future inflation and a significant fraction of respondents report expectations that are outliers given the distribution of inflation realizations. This evidence questions two key assumptions in the literature emphasizing the role of inflation expectation for monetary policy: that these matter for households' decisions and that central banks can manage them.

In this paper, we provide new evidence on how households' inflation expectations matter for their individual economic decisions. The main twist of our approach compared with the previous literature is to consider both qualitative and quantitative answers to the household survey. Our main insight is that what matters is the broad *inflation regime* – rather than the precise inflation rate – households expect. We draw this conclusion from four new facts. First, in our dataset, a significant fraction of households expect prices to remain stable. Second, fluctuations in the share of households expecting stable prices account for the bulk of the variations in the average inflation expectation. Third, the extensive margin co-moves with the business cycle as captured by realized inflation. Fourth, expecting stable prices or positive inflation is the only dimension of heterogeneity in the cross-section distribution of expected inflation that leads households to make different consumption decisions; households expecting positive inflation consume relatively more than those expecting stable prices, which is consistent with policies aiming at increasing

[1]See Krugman (1998); Eggertsson and Woodford (2003); Werning (2012).

[2]See Coibion et al. (2018b) for a survey of recent evidence.

current demand by promising future inflation. In contrast, differences in quantitative inflation expectations do not significantly matter.

We use individual data from a rich survey of French households covering about 2,000 individuals every month since January 2004. It provides detailed qualitative and quantitative information on both perceived and expected inflation. It is also informative about households' perceived and expected own and aggregate economic and financial situation and features questions on the household's own durable consumption choices. Finally, it gives information on the respondent's individual socio-economic characteristics.

We start by investigating the formation of inflation expectations of these households. We document a set of new facts using both the qualitative and the quantitative inflation expectations reported by households. First, a large share of households (more than 30%) expect prices to remain stable over next year. Second, we show that this share fluctuates a lot over time and consistently with realized inflation. More specifically, when imputing a strictly 0 quantitative inflation expectation to agents expecting prices to remain stable, we show that the fluctuations in the associated *extensive margin* of aggregate inflation expectation – that is variations in the share of households expecting positive inflation instead of stable prices – accounts for nearly 75% of the variance of the average inflation expectation. This implies that variations in the *intensive margin* – that is changes in the average expected inflation within households expecting positive inflation – contributes much less. In addition, the share of households expecting stable prices decreases when realized inflation declines. This correlation is stronger when realized inflation is low (typically below 2%). By contrast, the intensive margin correlates less with inflation when it is low.

We then assess the impact of inflation expectations on households' consumption decisions. We find that households expecting positive inflation over the next year have a higher probability to buy new durable goods in the current year than households expecting that prices will remain stable over the same period. By contrast, households with different positive inflation expectations have a similar propensity to buy durable goods over the current year. This finding holds true for various measures of durable consumption as used by the literature.[3]

Importantly, to obtain these results, the French survey provides a rich set of information that allows us to address the main potential sources of endogeneity at stake when studying the link between consumption and inflation expectations. To be more specific, we can control for individual perceived current inflation. This addresses the fact that inflation expectations are formed based on current prices, in particular shopping experiences, and thus the positive correlation might come from a decision to buy causing individual perception of current inflation to rise and individual inflation expectations as well. We can also control for expected own financial and consumption expectations as well as aggregate macroeconomic perspectives. This mitigates the concern that households' consumption reacts to a shock that raises inflation but can also have an impact on their expected real income. 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 the households who understand that the central bank reacts to higher expected inflation by tightening interest rates which would lower consumption.

We also provide some additional results and robustness checks. First, we emphasize that it is important to control for expected individual consumption and future business conditions to obtain a positive effect of expected inflation on durable consumption. The effect can otherwise be negative as several households expect more inflation to go with worse business conditions. While the individual controls can lead to different quantitative results, none of them are individually crucial for our qualitative results that only the extensive margin of inflation expectations matters. Second, we show how our results vary with households' individual characteristics related to their shopping and inflation experience, their cognitive capacity, or their financial constraint. Third, we show that our results are not driven by any specific year in our sample but increase for the years when the economy was at the Effective Lower Bound (ELB). Fourth, we confirm our findings

[3] As for many surveys, we only have information on durable consumption. Nevertheless, durable consumption is the most important margin of adjustment in total private consumption fluctuations over the business cycle and so the intertemporal substitution of private consumption induced by variations in expected inflation – hence in the real interest rate – should predominantly go through changes in durable consumption plans.

on a similar survey conducted among German households.

These findings have important implications on the use of inflation expectations for policy guidance. First, the large dispersion typically observed in the distribution of households' inflation expectations does not mean these are uninformative. Second, an important and informative component of this dispersion is the share of households expecting prices to remain stable.

In addition, our findings have also implications for macroeconomic policies. First, the ability to manage current aggregate demand by manipulating inflation expectations is more limited than in models where inflation expectations would react continuously to news. To be effective, forward guidance policies need to convince (at least a substantial share of) households expecting prices to remain stable to switch to a positive inflation regime. Moreover, once every agents expect positive inflation, any further increment in their expectations does not have additional stimulative effects, which contributes to exhaust the stimulative impact of forward guidance. Second, inflation expectations can be de-anchored despite the average of inflation expectations remains positive. This would happen when an important and stable share of households expect prices to remain about the same. This would put a persistent drag on current aggregate demand. Reanchoring will require to convince a substantial share of households that they should switch to a positive inflation regime. We illustrate these policy implications using a simple NK model with heterogeneous households' beliefs.

Literature Our paper is related to the literature using survey data to characterize the formation of private inflation expectations. Several contributions show that the dispersion of individual inflation expectations observed in various surveys is consistent with models of imperfect information (Mankiw et al., 2003; Coibion and Gorodnichenko, 2012, 2015; Andrade and Le Bihan, 2013; Andrade et al., 2016). Some other works focus on households' inflation expectations and emphasize the importance of sluggish adjustment to news (Carroll, 2003; Armantier et al., 2016; Fuhrer, 2018), overadjustment to salient prices (Cavallo et al., 2017; D'Acunto et al., 2019d) and historical inflation experiences (Malmendier and Nagel, 2016). Coibion et al. (2018a) show that firms' inflation expectations resemble households' ones. We emphasize that households think in terms of broad inflation regime rather than precise inflation numbers.

Our paper also contributes to the literature using survey of households to assess whether policies aiming at increasing expected inflation are expansionary or not. The evidence is mixed. On the one hand, Bachmann et al. (2015) and Burke and Ozdagli (2013) find a weak negative or no impact of US households' inflation expectations on durable consumption. On the other hand, D'Acunto et al. (2016) find that higher German households' inflation expectations driven by large pre-announced VAT hikes increased durable consumption, Vellekoop and Wiederholt (2018) show that Dutch households save less when they expect more inflation, and Crump et al. (2018) obtain that individual US households' expected consumption growth reacts negatively to their inflation expectation. Ichiue and Nishiguchi (2015), Dräger and Nghiem (2018) and Duca-Radu et al. (2020) report similar results for Japan, Germany and the euro area.

We also find that increasing inflation expectation can be expansionary. Our contribution is to stress that this requires households to change their qualitative perception of future inflation – i.e. a substantial share of households have to change their view on the future inflation regime – and not only their quantitative one. That being said, we also obtain that inflation expectation have a negative impact on consumption when one does not control for individuals' expected future consumption and economic prospects. This is in line with Coibion et al. (2019a) who show that an exogenous shock on expected inflation leads Dutch households to lower their durable consumption. Their interpretation is that for these households, in a stagflation logic, higher expected inflation is associated with lower expected income so that they reduce their current consumption. Another mechanism generating such a negative impact is Knightian uncertainty on future inflation as Binder (2017) and Michelacci and Paciello (2019a) emphasize in their study of US and UK households.

Finally, our results are consistent with the recent works rationalizing why inflation expectations is less expansionary in the data than in models with sticky prices, complete markets, and rational expectations with perfect information (see Del Negro et al., 2015). These contributions build models with limited intertemporal substitution due to non-diversifiable idiosyncratic risk and credit constraints (see McKay et al., 2016; Kaplan et al., 2018), limited adjustment of inflation expectations to news due to informational and cognitive constraints (Alvarez et al., 2012; Gabaix, 2016; Wiederholt, 2015; Angeletos and Lian, 2018; Andrade et al., 2019; Garcia-Schmidt and Woodford, 2019), a combination of the two (Farhi and Werning, 2019; Auclert et al., 2020) or decisions under Knightian uncertainty (Michelacci and Paciello, 2019b). In recent works, D'Acunto et al. (2019a,c,b) provide empirical evidence that cognitive constraints as proxied by IQ matter for expectation formation and economic decisions. In particular, our findings support models where rational inattention leads to sparse representations of the economy (Gabaix, 2014) and discrete decision rules (Jung et al., 2019).

2 Data

This section presents the main features of the French survey individual data that we use in this paper.

2.1 General design and sample

We use the underlying individual data from the monthly consumer confidence survey conducted by INSEE (Institut National de la Statistique et des Etudes Economiques), the French public statistical agency. This survey is part of the harmonized European household confidence indicators released by the European Commission for all countries in the European Union. The micro data are collected at a monthly frequency over the period January 2004 – December 2018.[4] Every month about 2,000 interviews are carried out via phone calls. Every household is surveyed during three consecutive months, so our data set contains a limited panel dimension. Every month, a new sample of households is surveyed (about 1,100 new calls) to replace households disappearing after three interviews and to replace households that do not answer to the second or third interviews. The sample is designed by INSEE to be representative of the overall French population (sampling weights are calculated by city size, age, household composition, job occupation, socio-

[4]Before 2008, the survey was not conducted in August.

professional category, diploma). Overall, our sample contains a little more than 330,000 individual observations over the 15-year period, i.e. about 2,000 observations per month on average. The total number of households surveyed is about 160,000; 42% are surveyed three times, 25% are surveyed twice and 33% only once.

The questionnaire contains a little more than 21 questions. Most of these questions are about the qualitative households' perceptions of the current and future macroeconomic situation, their quality of life, unemployment and on the evolution of prices but also on their own financial situation, and their saving and consumption behavior or intentions. In addition, during the first interview, surveyed households provide socio-demographic information like age, diploma, income, employment status, gender...), household's composition. The full questionnaire is reported in Appendix C.

2.2 Expected inflation and consumption decisions

Our empirical analysis mainly focuses on two types of questions in the survey: *(i)* households' expectations about future inflation over the next 12 months and *(ii)* households' purchases of durable goods.

Expected inflation The survey asks two types of questions on households' inflation expectations. First, households are asked to provide a *qualitative* answer on the expected evolution of prices:

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.*

Second, households are asked to give their *quantitative* estimation (in percentage) of expected inflation:

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

An important comment to make is that the response rate to the quantitative question is much lower than the response rate to the qualitative question.[5] In particular, when households answer "stay about the same" to the qualitative question, a 0% inflation is imputed to the quantitative question.

This imputation oversamples households answering 0 to the quantitative question on expected inflation. Indeed there is no missing quantitative value for households answering "stay about the same" to the qualitative question (since these households are not asked to answer to this question) whereas there is a significant proportion of non-response for the other qualitative answers. To correct for this oversampling of households answering 0 among all households answering to the quantitative question, we estimate a model of the determinants of the non-response using information on the characteristics of households who do not respond to the quantitative question but who have responded that prices are going to increase (Table D.2 in AppendixD.1). Using these estimates, we calculate for each household answering "stay about the same" the estimated probability of non-response to the quantitative question on expected inflation conditional on its observed characteristics. We then replace 0 with missing values for households with the highest estimated probability of missing observation so that the response rate is similar for the quantitative expected inflation associated with the answer "stay about the same" than the ones observed for other answers to the qualitative question.

Importantly, the French survey also contains similar qualitative and quantitative questions on households' perceived inflation over the past 12 months. In particular, the qualitative question is:

Question 3. *How do you think consumer prices have developed over the last 12 months? They have...*

1. *Risen a lot,* ***2.*** *Risen moderately,* ***3.*** *Risen slightly,* ***4.*** *Stayed about the same,* ***5.*** *Fallen,* ***6.*** *Don't Know.*

In what follows, we will refer informally to the answer 'Stayed about the same" as the expectation of stable prices. If the answer to Question 3 is different than "Stayed about

[5]See Appendix D.1 for summary statistics on response rates and, in particular, on the characteristics of non-respondents.

the same", households are asked the following quantitative question:

Question 4. *By how many percent do you think consumer prices have gone up/down over the past 12 months? Please give an estimate. Record up to one decimal place. Consumer prices have increased/decreased by XX.X%*

Durable goods The survey asks questions on households' *own* individual consumption and about their perception of *general* consumption of durable goods. In our baseline approach, we focus on a qualitative question on households' purchases of durable goods over the past 12 months:

Question 5. *Have you made any major purchase over the last 12 months? (washing machine, refrigerator, furniture, dishwasher, ...)*

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

We mainly focus on this question because of its timing and because it is directly about household's own consumption of durables. We provide more explanations on why we focus on this question in Section 4. We also provide robustness checks of our approach with the alternative questions on durable consumption in the survey.

The survey also asks a question on whether the household think it is the right time for people in general to make major purchases of durable goods. The exact wording is the following:

Question 6. *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, washing machines, electronic or computer equipment ...)?*

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.*

As this can be noted, the survey asks households about their consumption of durable goods and more specifically "major purchases" of furniture, washing machines, electronic or computer equipment. The answers to the question are only qualitative so that we observe whether households have decided to adjust their stock of durable goods (beyond depreciation) or not. However, we do not observe the amount of money spent by households.

Surveys used in several recent works assessing the impact of households' inflation expectations on households' consumption decisions often only provide information on whether households think that the time is the right time to make purchases of durable goods (see Bachmann et al., 2015; Duca-Radu et al., 2020). Questions on households' own durable consumption can be found in the Japanese survey (see Ichiue and Nishiguchi, 2015) but only in terms of growth rates. The New-York Fed survey asks about quantitative growth rate of own overall consumption (see Armantier et al., 2016; Crump et al., 2018). In what follows, we use the question on own consumption as a benchmark and we show that our findings are robust to considering the question on right time to purchase.

2.3 Summary statistics

Let us briefly describe some summary statistics on the average of inflation expectations and the decision to consume durable goods.

Inflation expectations Figure 1 plots the average and the median of inflation expectations (calculated date by date over all households) and the actual headline inflation rate. This figure illustrates two well-known facts in the literature that inflation expectations are i) overestimating the actual inflation rate but ii) strongly correlated with it.

More precisely, Table 1 reports the average expected inflation rates: the average inflation expectation is 2.8% whereas the average inflation rate over the sample period is about 1.5%.[6] The correlation between the average expected inflation rates and the actual headline inflation rate is about 0.8.

Finally, let us note that inflation expectations are also asymmetric in the French survey: a very small share of households reports negative inflation rates (about 1% of all households, Table D.3 in Appendix) and the share of negative inflation remains quite constant over time.

[6]This overestimation is much smaller when we consider the median expected inflation instead of the mean, suggesting that very large - non-plausible - inflation expectations (larger than 20%) contribute a lot to this overestimation when we use the mean expected inflation rate. In the Appendix D.3, we show that the difference between average expected inflation decreases quite rapidly when we exclude large inflation expectations.

Durable consumption decisions Let us briefly describe the durable consumption variables. We report in Table 2 some summary statistics.

Only a minority of households made major purchases over the past 12 months (about 31%). A similar observation can be made for on their opinion about the right time to make large purchases (15% of households believing it is the right time to make major purchases).[7]

Furthermore, the fraction of households answering they made major purchases is positively correlated with the annual growth of consumption. 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).

3 The extensive margin of inflation expectations

In this section, we establish a set of new stylized facts on the heterogeneity of inflation expectations. First, we show that the a large share of households answer to expect prices to "stay about the same". Second we show that the variations of the average inflation expectations are mainly driven by the variations of this share of households expecting prices to "stay about the same" – that is by variations in the *extensive margin*. As aggregate inflation expectations, the extensive margin is well correlated with inflation: when inflation rates are higher, a smaller share of households expect prices to remain stable. In contrast, the intensive margin – the variation of the average of inflation expectations of households expecting non-stable prices – is of less importance. Finally, we provide further evidence on which households expect prices to remain stable and what this means for them.

[7]In Appendix Table D.7 reports some simple statistics on households' actual spending in durable goods (including home appliances, TV, computers, phones, furniture but excluding cars) in France for the years 2005 and 2011 (overall and by category of products - based on household consumption survey): only 60% of households report durable spending. Among households reporting durable spending, the median amount is a little less than 750 euros. This implies that about 30% of households reports durable consumption of more than 750 euros (which would correspond to the threshold for 'large purchases' in the household survey).

3.1 A large share of households expect prices 'to stay about the same'

Let us first look at the cross-distribution of inflation expectations as plotted by Figure 2. We can make different observations. The first one is that, despite actual inflation being between -1 and 4% with a mean at 1.5% over the time period of sample, inflation expectations show much more dispersion in the cross-section. However, despite this heterogeneity, about one third of households reports prices "to stay about the same" (i.e. a zero-inflation) as expected inflation. There are also peaks in the distribution for values of expected inflation equal to 5, 10, 15, 20, but the sum of all these peaks corresponds to a little more than 20% of answers.

Fact 1 (Heterogeneity)**.** *Inflation expectations are heterogeneous but a large fraction of households expect stable prices.*

3.2 Fluctuations in the extensive margin explain a lot of the fluctuations in the average expectation

We now investigate how fluctuations in the share of households expecting prices "stay about the same" – that we call the *extensive margin* of inflation expectations – contributes to the overall evolution of the average inflation expectation. We compare this with the contribution of fluctuations of the average expectation of households reporting non-stable prices – the *intensive margin* of inflation expectations. In this exercise we follow the survey in the sense that we assume that households answering prices 'to stay about the same' literally expect zero inflation over next year. We relax this assumption in a subsection below. The decomposition we rely on has been introduced by Klenow and Kryvtsov (2008) in the literature on micro-price data.

More precisely, 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 decomposed into two components:

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

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 among households having non-zero inflation expectations.

Using a first-order approximation around the average inflation we can decompose fluctuations in the average inflation expectation of households into changes in both the extensive and the intensive margins:

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

Figure 4 plots the result of the decomposition between these two margins: the extensive margin matters a lot for variations of the aggregate inflation expectation, in particular when the average inflation expectation is below its long-run average.

Table 4 confirms these results. In this Table, we report the contribution to the variance of inflation of the intensive and the extensive margins as well as the co-movement between the two. Using that decomposition, one obtains that the extensive margin accounts for 75% of the total variance of the average inflation expectation, with 50% coming from the mere variance of the share of households answering stable prices in the survey.

In the end, this leads to the following stylized fact:

Fact 2 (The contribution of the extensive margin)**.** *A large share of the adjustment in the average inflation expectation comes from the change in the share of households expecting stable prices (the extensive margin); changes in the average expectation of households reporting positive inflation (the intensive margin) contribute much less.*

What drives the intensive margin? Still, the fluctuations of the intensive margin are positively correlated with average inflation expectations and explain 25% of the variance. To provide further understanding of this contribution, we decompose the fluctuations of the intensive margin between the inflation expectations that are multiples of 5 and the rest. As noted from Figure 2, positive inflation expectations are mainly between 0 and 8% except for multiples of 5. These rounded expectations correspond to implausible values for inflation and, arguably, they indicate some form of inattention or cognitive limits from these households.

We obtain that an important driver of the intensive margin is precisely the evolution of the share of households reporting multiples of 5 as inflation expectations. As Figure 5 illustrates, the share of households with inflation expectations that are multiples of 5 is an important part of the contribution of the intensive margin to the overall time variation of aggregate inflation expectation.

3.3 Variations in the extensive margin are not just random

Variations in the extensive margin are not pure noise. As Table 1 illustrates, the correlation between the actual inflation rate and the proportion of households expecting stable prices is about -0.7. This is stronger than the correlation between realized inflation and the average non-zero inflation expectation (the intensive margin) which equals 0.6.

Figure 3 plots the average proportion of answers 'prices stay about the same' against inflation. Interestingly, the relation is quite non-linear: the proportion of households answering that prices 'stay about the same' decreases quickly when the actual inflation rate goes from 0 to 2% but for higher levels of inflation, the curve is flatter. By contrast, the average non-zero inflation expectation is rather flat for inflation between 0 and 2% whereas it increases quite sharply when inflation is above 2%.

Table 4 further illustrates that the extensive margin matters more in a low inflation environment. It reports the contribution of the extensive and the intensive margin to the variations in the average inflation expectation in low- and high-inflation regimes, that is when inflation is respectively below and above median inflation over our sample. While 50% of this overall variation come from the mere variance of the share of households answering prices to 'stay about the same' to the survey, this latter contribution accounts for 63% in low-inflation periods but only 36% in high-inflation periods.

Fact 3. *The extensive margin is negatively correlated with realized inflation, and increases more for low realizations.*

Overall, the lower the inflation rate, the more households expect prices to remain stable. The more the extensive margin contributes to the average expected inflation. And the more the extensive margin reacts to realized inflation.

Flattening of inflation expectations in low-inflation environment This connection is not linear: the correlation between the extensive margin with realized inflation is stronger when inflation is low. This contributes to the flattening of the relation between realized inflation and average inflation expectations in low-inflation environment: as it can be observed in Figure 3, a marginal decrease in realized inflation corresponds to a lower decrease in inflation expectations in a low- than in a high-inflation environment. When realized inflation approaches 0 or enters in the negative territory, households simply expect prices to remain stable. Note that the intensive margin also contributes to this flattening as, when inflation becomes low, positive inflation expectations also flatten as a function of realized inflation.[8]

3.4 What does "stay about the same" mean?

As we detailed above, in the French survey, there are no quantitative inflation expectations for households answering that they expect prices to 'stay about the same'. We input a 0 for these households. This statistical treatment is motivated by the fact that households are first asked about their qualitative views on future inflation and that a decline in prices or a mild increase in prices are in the menu of what they can answer. So households reporting that they expect prices to 'stay about the same' expect an inflation rate that is not too far from zero so that it can arguably be proxied by zero.

But how much is "not too far from zero"? We can get some insights using the distribution of quantitative answers to the other modalities reported in Table D.3 in the

[8]Note also that when we decompose the intensive margin, we find that the fluctuations in the share of households reporting inflation expectations that are multiples of 5 is important to understand its strong correlation with realized inflation (see Appendix Table D.5).

Appendix. 25% of people expecting inflation will 'increase at a slower rate' report a quantitative inflation expectation that is below 2%. Likewise, 25% of people expecting prices will fall report a quantitative inflation expectation that is above -1%. One can therefore assume that the majority of households who think prices will 'stay about the same' have a inflation expectation between -1 and 2%.

Eventually, gauging whether one expects inflation to be close to zero or not is a subjective matter. In the next section we emphasize that what matters is not the precise number that household expect for inflation but the subjective broad inflation regime they expect. So why should we care about this choice by the survey agency to impute a zero instead of this moderate low but positive inflation? There are two reasons.

First, this mechanically biases the average expected inflation downward. Second and related, this tends to overestimate the contribution of the extensive margin to the average inflation expectation. 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 now be decomposed into two components:

$$\pi^e_{t|t+1} = (1 - fr_t) \times s^e_{t|t+1} + fr_t \times dp^e_{t|t+1}$$

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 $dp^e_{t|t+1} = (\sum_{i=1}^{n_t} I_{it})^{-1}\left(\sum_{i=1}^{n_t} I_{it}\pi^e_{i,t|t+1}\right)$ the average among households having non-zero inflation expectations, and $s^e_{t|t+1} = (\sum_{i=1}^{n_t}(1 - I_{it}))^{-1}\left(\sum_{i=1}^{n_t}(1 - I_{it})\pi^e_{i,t|t+1}\right)$ the average among households expecting prices to 'stay about the same'.

Using a first-order approximation around the average inflation we can decompose fluctuations in the average inflation expectations of households into changes in both the extensive and the intensive margins:

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

These two biases (on the average expected inflation and on the contribution of the extensive margin) thus depend on the first two moments in the distribution of $s^e_{t|t+1}$. Since these are the mean and variance among households who think inflation is not large, it seems reasonable to consider that they will be relatively small so that the associated biases will be small.[9]

3.5 Who answers that 'prices stay about the same'?

We now investigate who answers stable prices. The short answer is that it can possibly be everyone, no matter age, education, gender or income.

In Table 4, we report evidence on inflation expectations and their connection with realized inflation across different groups for the whole time period under consideration. More precisely, we report the average inflation expectation, the share of households expecting stable prices, the level of non-zero inflation expectation and the correlation with realized inflation. This correlation with realized inflation corresponds to the coefficient of a OLS regression where we take realized inflation as an explanatory variable.

For all the groups, we find that 1) a substantial share of households expect stable prices – roughly one third –, 2) non-zero expectations are around 4% and that average inflation expectation as well as the extensive margin moves with realized inflation.

If anything differs across groups, it is only quantitative but small differences. In particular, we find that richer, more educated households are in some way more accurate. We find that these households tend to respond more to realized inflation (both the intensive and the extensive margins), they report less expectations of "prices stay about the same" but their non-zero expectations are lower than less educated/poorer households. This last point suggests that richer/more educated households have more accurate inflation expectations as for example in Vellekoop and Wiederholt (2018).

[9]For example, assuming that 10% are uniformly distributed between -1 and 0, 60% are uniformly distributed between 0 and 1 and 30% are distributed between 1 and 2, we get an average expectation of 0.75% among people expecting that prices will remain 'about the same'. Under the above scenario, given that there is roughly 1/3 of the respondents expecting that prices stay about the same, the bias would be of 0.25% so fairly moderate (the average expected inflation obtained with 0 imputed to stable prices is 2.82%, see Table 1).

4 The extensive margin of inflation expectations and consumption decisions

In this section, we investigate how households relate their consumption decisions to their inflation expectations. For that, we use cross sectional differences between households in terms of consumption decision and inflation expectations. Our main finding is that, in the cross-section, variations in the extensive margin of the consumption of durable goods are significantly related only to variations in the extensive margin of inflation expectations. Our findings are robust using different measures of consumption decisions.

4.1 A discrete choice model of durable consumption

Theoretical setup We assume that consumption of durable goods is subject to fixed costs so that the adjustment of the stock of durable is a discrete variable. This is consistent with our data, since 1/3 of the respondents declare they bought durables over the last year. In this section, we only provide some key insights on how expected inflation affects durable consumption in a model with fixed adjustment costs and refer the reader to the Appendix A for a full description of the model.

Let $d_{i,t-1}$ be household i's initial stock of durables and $d^*_{i,t}$ its desired stock of durables absent adjustment costs, the decision to buy durable goods between $t-1$ and t, $b_{i,t}$ is a binary process that follows

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

with $z^*_{i,t}$ a latent variable that compares the opportunity cost of not adjusting – given by the gap between the desired stock of durables $d^*_{i,t}$ and the existing stock $(1-\delta)d_{i,t-1}$ with δ is the depreciation rate – with the adjusting cost κ_i which potentially differs across individuals.

We assume that the optimal amount of durable goods $d^*_{i,t}$ is a function of households' expectations and individual characteristics:

$$d^*_{i,t} = f\left(c^e_{i,t|t+1},\ rr^e_{i,t|t+1};\ x_{i,t}\right) = f\left(c^e_{i,t|t+1},\ r_{i,t} - \pi^e_{i,t|t+1};\ x_{i,t}\right) \tag{2}$$

where $c^e_{i,t|t+1}$ is household i's expected own total consumption, $rr^e_{i,t|t+1}$ is household i's perceived ex-ante real rate which is equal to $r_{i,t} - \pi^e_{i,t|t+1}$ with $r_{i,t}$ the nominal interest rate perceived at date t, and $x_{i,t}$ denotes individual observable characteristics. Here, inflation expectations play a role as they impact the perceived real rate.

Note that this setup can accommodate imperfect information as we do not make any assumption on the information set of households.

Empirical specification We estimate the marginal effect of individual i's expected inflation, $\pi^e_{i,t|t+1}$ on her/his individual consumption decisions as observed in the survey of households.

For the decision variable $b_{i,t}$, our dataset provides two measures that were widely used by the literature.

First, we consider individuals' *own* decision to make major purchases (answers to Question 5) as our dependent variable. This gives us information on whether household i bought some durable goods over the past year (between $t-1$ and t).

Second we consider as an alternative measure of consumption whether households think that it is the right time to consume durables (answers to Question 6).

Remark (Proxies for consumption)**.** *It is important to note that both proxies for consumption have pros and cons. $b_{i,t} = 1$ in our setting means that households have **currently** modified their **own** stock of durables. Question 6 does better on the first dimension as it is about the current view of households . Question 5 does better on the second dimension as it is about households' own consumption but performs less on the first dimension as it is about the consumption about the last 12 months.*

Moreover, we postulate that the latent variable $z^*_{i,t}$ follows

$$z^*_{i,t} = \alpha + \beta\pi^e_{i,t|t+1} + \gamma X_{i,t} + \lambda_t + \mu z_i + \epsilon_{i,t} \tag{3}$$

with $\pi^e_{i,t|t+1}$ the inflation expectation formed at date t by household i over the next year (between t and $t+1$) (Questions 1 and 2). X_{it} is a set of controls which include households answers to other questions on the macroeconomic environment (unemployment, general French economic situation (past and future), living standard in France (past and future)) and also their personal plans (plan for buying durable goods), on the opportunity for people to save and financial situation (past, current and future) and we also include the household inflation perception over the last year, π^p_{it}. λ_t are fixed time effects controlling for all aggregate variations, z_i is a set of household observed controls such as age, composition of the household, job occupation, income, working regime, education, gender, region, city size.[10]

Finally, we estimate this Probit model via a maximum likelihood technique, and standard errors are clustered at the month level.

Controlling for potential endogeneity We do not have exogenous variations in ($\pi^e_{i,t|t+1}$) so that we cannot be sure that a positive correlation with consumption decisions ($z^*_{i,t}$) does not stem from omitted variables correlated with both variables. That being said, we can control for three important potential endogeneity problems.

To start with, households that decide to consume more can also expect other households to consume more, thus pushing up inflation and inflation expectations. Likewise, households who decided to buy recently might have paid more attention to inflation that others and, because inflation is persistent, declare a higher expected inflation that others. We can attenuate these endogeneity biases by controlling for individuals' perceived inflation.

Potentially, households who are willing to consume may potentially pay more attention to future inflation. Controlling for perceived inflation is also a way to account for this. We also provide evidence in Appendix D.5 that households consuming more do not necessarily pay more attention to future inflation. More precisely, we show that the forecast errors on inflation – which is arguably a measure of the degree of attention to future inflation – between households who consume and those who do not consume durables are not

[10]In our baseline regression, we do not introduce unobserved household heterogeneity. Below, we discuss how we can introduce household effects u_i to use the very short panel dimension of the data.

statistically significant.

Additionally, higher inflation expectations could be associated to shocks that also affect (positively of negatively, depending on the shock) households' future income, hence current consumption. To deal with this potential reverse causality, we control for consumption plans. We also control for expected own financial situation as well as expected future macroeconomic expectations.

Finally, because of monetary policy, higher expected inflation could be correlated with different perceptions of the nominal interest rate, which also affect durable consumption choices. We address this concern by controlling for the household's subjective view on whether it is a right time to save, which is related to the nominal interest rate (see in Appendix Figure D.5).[11] We also estimate the link between consumption and inflation expectation on the ELB period assuming households did not expect any Central Bank reaction to inflation at that time.

4.2 What matters for adjusting durables consumption

Table 5 reports our baseline results when we use the question on household purchases of durable goods over the last 12 months as a proxy for consumption decision. In particular, we report marginal effects obtained from this model and estimated at the mean, marginal effects are reported for values corresponding to a positive decision to make purchases. Marginal effects should be read as the effect (in pp.) of a 1% deviation of an exogenous variable on the probability to answer positively to have made major purchases over the last 12 months. In this Table, we use the quantitative answer for inflation expectations (Question 2).

Inflation expectations do not seem to matter We first find no significant effect of expected inflation on the decision to buy durable goods when we consider all answers to

[11]Note that right time to save may also be interpreted as a measure of the willingness to save. In this view, this variable can be simply negatively correlated with consumption for the same reason that savings can be negatively correlated with consumption. As this will become clearer, this control is not critical to obtain our results.

the question about inflation expectations (even implausible ones).[12]

The extensive margin matters Second we investigate where this significant connection is coming from. In a third regression, we show that, when excluding all the households expecting prices to remain stable, the connection between inflation expectations and durable consumption is not significant. In contrast, when regressing (fourth regression) durable consumption decision on a dummy variable that equals 1 when expected inflation is positive, we find a strongly significant connection.

The intensive margin does not To provide a more detailed analysis of the role of expectations, we recode the quantitative variable into a qualitative variable taking 6 values: below 0, 0%, between 0 and 3%, between 3 and 5%, between 5 and 10% and higher than 10%. We obtain (fifth regression) that, compared to answering stable prices, the probability to adjust the stock of durable goods is higher by about 1.2 to 1.5 pp when inflation expectations are between 0 and 10%. However, the effect of higher inflation expectations is not different when the household answers a value between 0.5 and 3% or a value between 5 and 10%. Finally, answering a value larger than 10% has the same effect on consumption decisions as answering stable prices.

The role of outliers We also estimate the baseline regression for answers below 10%. More precisely, we still consider the quantitative inflation expectation but in interaction with a dummy variable equal to 1 if the inflation value is below 10%. We find a positive and significant effect of expected inflation on the decision to buy durable goods. However, this effect is rather limited a 1% increase in inflation expectations raises the probability of buying durable goods by about 0.2 pp.

Do other regimes matter? To confirm our findings, we consider the qualitative answer for inflation expectations (Question 1). The results are reported in Table 6.

[12] In Appendix Table D.2, we report results on the determinants of answering inflation expectations higher than 10%. Low-income households, less educated households, younger people are more likely to answer that their inflation perception/expectation exceeds 10%

The previous results hold when we extend the sample to households reporting only a qualitative answer to the inflation expectation questions. We first consider a dummy variable equal to 1 if the household answers prices to "stay about the same" to the question on future development of inflation. We obtain that, when a household expects something different than "stay about the same", she is more likely to make major purchases. In that case, the probability of making major purchases is higher by about 1 pp. compared to the case where the household answers "stay about the same".

Second, when taking into account the five different answers to the qualitative question (Question 1), we do not find a monotonic relationship. Overall, the main effect of inflation expectations on durable good consumption comes through an extensive margin of inflation expectations. Households are more likely to consume when they expect non-stable prices but the propensity to consume is less sensitive to the value of inflation when they expect a positive inflation rate.

But these differences are of second order compared to the difference between expecting stable prices or positive inflation. So, even if households think there exists different sub-regimes in the positive inflation regime, the distinction that really matters when it comes to consumption decisions is between the "prices stay about the same" and the positive inflation regimes.

"Right time to purchase" We now consider the alternative question on "Do you think it is the right time for people..." (Question 6) as is often done in previous studies (see e.g. Bachmann et al., 2015; D'Acunto et al., 2016). Overall, we do not find qualitative differences but only a smaller magnitude for the effects of inflation expectations. This shows that our results on the importance of the extensive margin does not hinge on the specific question on consumption that we use.

Table 7 reports the results of the same regressions as in our benchmark case but for Question 6. Overall, we find that the qualitative response of this question to inflation expectations is the same as for the question on own consumption: when inflation expectation shifts from 0 to positive, households do not only consume more, they also think that it is the right time for others to consume durable goods.

More precisely, we find a small positive but non-significant effect of the quantitative inflation expectation on the probability to answer Yes to the question. Once we have re-coded the quantitative variable into a qualitative one, we find again the positive effect of positive inflation expectations on the probability to answer that it is the right time to make major purchases. As before, we find that the main effect of inflation expectations is coming from the fact that households expect a positive inflation instead of answering that prices "stay about the same".

Quantitatively, the response of this variable to inflation expectations is smaller. Multiple reasons can potentially account for this, depending on how survey respondents understand the question. To start with, the question may lead households to think that they are asked about a shorter time period with Question 6 than with Question 5, which corresponds to a period of 12 months. Second, the question does not make clear whether this is the right time to consume based on the respondent's own beliefs and, in particular, on their own views on future inflation or based on other people's views. The second interpretation opens the door to high-order beliefs, that, due to cognitive limits, may attenuate the reaction of this variable to inflation expectations, consistent with for example Angeletos and Lian (2018).

Panel regressions In our benchmark regressions, we use the cross-section of households to identify the effects of inflation expectations on households' decisions to consume. In this paragraph, we provide further evidence using the (short) panel dimension of our dataset.

There are several challenges to use this panel dimension. First, households are interviewed only three times and during consecutive months. Moreover, households may not answer when they are contacted for the second or the third interview (in our sample only 40% of households answer three times to the questionnaire). Overall, our panel dimension is very short, which limits the possibility to obtain consistent and precise panel estimates. Second, the dataset does not report any household identifiers and we use several characteristics of households which are arguably fixed over time (geographical location, year of birth (head of household and partner), job occupation (household head and partner), household composition, edcuation) to identify households and reconstruct the panel dimension.

Our main set of regressions consists of Probit models with household random effects. We report the results of these regressions in Table 8. The overall picture does not substantially differ with what we obtain with our benchmark regressions. To further confirm these results, we also report in Appendix D.6 the results of Logit models with fixed household effects but only for the qualitative answers to keep the sample sufficiently large, we compare the results with a Probit model with households random effects. All these results are consistent and very similar with our benchmark regressions: households are more likely to consume when they expect "non-stable" prices.

Main fact Overall, there is some link between inflation expectations and the decision to consume durables, but only when households' inflation expectations shift from stable prices to positive inflation.

In the end, the following fact summarizes our findings:

Fact 4. *The extensive margin of individual inflation expectations is positively linked with individual durable consumption decisions. In contrast, durable consumption does not vary in a statistically significant way with the intensive margin of inflation expectations.*

Another way to phrase Fact 4 is that the decision to consume durable goods is uniform across households expecting positive inflation as this appears in Table 5 or Table 7. Households then do not seem to give value to the exact level of inflation expectation that they report, provided that it leads to non-stable prices.

Indeed, in models featuring durable good consumption subject with fixed costs as for example Berger and Vavra (2015) or McKay and Wieland (2019), the extensive margin of durable good consumption is decreasing with the real interest rate. If agents do put value on their exact level of inflation expectation, under the assumption that households share the same perception of current nominal interest rates, Fact 1 implies that agents should have very different perceptions of the real rate (with a difference of more than 7%). Households should then have very different willingness to consume durables, but this is not what we observe in Fact 4.

Going back to the model Let us reinterpret our findings through the lens of our consumption model – equation (2). To this purpose, let us rewrite the willingness to consume durable goods but with a modified dependence with respect to inflation expectations:

$$d^*_{i,t} = f\left(c^e_{i,t|t+1},\, r_{i,t} - g(\pi^e_{i,t|t+1});\; x_{i,t}\right) \tag{4}$$

where $g(.)$ is a function. A function that would make Equation (4) consistent with Fact 4 is:[13]

$$g(\pi) = \bar{\pi}_i 1_{\pi>0} \text{ with } \bar{\pi}_i > 0.$$

$\bar{\pi}_i$ is a constant that is specific to individual but does not depend on time nor on business cycle conditions.

In Appendix B, we provide an interpretation of such function based on information-processing costs.[14] More precisely, we show that, when it is unconditionally very likely that prices remain constant and information-processing costs are sufficiently large, it is optimal to focus on such approximation of inflation.

5 Further results

In this section, we further qualify our results. To start with, we discuss the importance of the set of controls that we use in our benchmark regression. Second, we provide further evidence on the impact of inflation expectations across years, households, and for another euro area country: Germany.

[13] An alternative using the qualitative question is $g(Answer) = \bar{\pi}_i 1_{Answer \neq \bar{\pi}\text{prices stay about the same.}}$ with a constant $\bar{\pi}_i > 0$.

[14] In contrast, the evidence reported in Appendix D.5 show that attention does not vary with households' decisions, which suggests that limited attention is not the main driving force of the dispersion of consumption decisions and inflation expectations.

5.1 The role of controls

What controls in our benchmark regression results reported in Table 5 are important for our baseline result? To address that question, we decompose our baseline estimate by progressively including controls about perceived and expected own and macroeconomic variables: future consumption, the intention to save, perceived inflation, expected business cycle conditions and, finally, expected business cycle conditions and unemployment.

Table 9 reports the results. Interestingly, when removing every control about the future macroeconomic outcomes and personal situation, we get results that are consistent with Coibion et al. (2019a): expected inflation has a negative impact on durable consumption. This means that higher future inflation is associated with worse perceived economic conditions and prospects, consistent with the stagflation view of inflation. As a consequence, policies which aim at more accommodation by increasing expected inflation should make sure they are perceived as being expansionary instead of being detrimental to the economic situation.[15]

Adding controls progressively reveals that expected future consumption contributes to 20% of the effect of the extensive margin. Adding the expected financial situation leads to 60% of the total impact. While controlling for past and current financial situation adds to 70% of the total effect. Finally, adding controls for the expected macroeconomic conditions (business conditions and unemployment) make up for another 30% of the total effect. This means that the interest rate control does not add much to all this, probably because if agents think this is an important determinant of macroeconomic outcomes they already incorporate the central bank reaction into their macroeconomic forecasts.[16]

[15] Another related challenge is that forward guidance policies might be interpreted as bad news that the trap will last longer than expected. For instance, Andrade et al. (2019) show that US forward guidance announcements led some households to revise downward, instead of upward, expected inflation and growth.

[16] One can also show that none of these controls are critical for our results: when removing one of these regressors from the benchmark regression, we obtain at most small and weakly significant differences. For example without controlling for perceived inflation, the coefficient in the regression is larger, consistently with the endogeneity bias resulting from the fact that agents consuming more experience higher prices and may therefore also expect higher inflation. However, controlling for perceived inflation as in our benchmark regression still leads to a positive and significant relation between consumption and inflation expectations. The same holds true for future consumption. Not controlling for it would lead to overestimate the influence of inflation expectation on consumption. However, here again, taking into account such control still leads to a positive and significant relation between consumption and inflation

Another interesting result is that adding controls reduces the negative effect of the intensive margin. This becomes non-significant again showing that higher inflation expectations are seen as bad macroeconomic news.

5.2 The response to inflation expectations across years

In this subsection, we investigate whether the connection between inflation expectations and consumption decisions is stable across years. Our sample covers years both before and after the 2008 financial crisis, periods where effective lower bound arguably bind as well as periods where the European Central Bank made forward guidance announcements.

To this purpose, we run regressions by year to test whether the effect of inflation expectations on consumption decisions has moved over the sample period. In particular, we would like to test whether the effect of inflation expectations is stronger during the period during which the ECB signaled it was at the ELB and gave explicit forward guidance on future rates.

Figure 6 reports the evolution of the coefficient in the regression for inflation expectations. As it can be observed, the patterns that we identified in Table 5 are relatively stable across our sample.

If anything, we find that the effect of quantitative inflation expectations on the decision to make large purchases has increased, especially since 2014, which corresponds to the ELB/FG period.

5.3 Heterogeneity across households

In this subsection, we provide further evidence on the link between inflation and consumption decisions across households. In Table 11, we report how the answer to Question 5 – "Did you make large purchases over the 12 past months?" – correlates with inflation expectations, depending on age, education, gender and income. Our main finding is that the connection between inflation expectations and consumption decisions holds mainly for a subset of households that are less likely to be borrowing constrained.

expectations.

Overall, we find a stronger effect of inflation expectations for richer, older (but not too old) and more educated households. There is no statistically significant difference between men and women. In contrast, for younger, low-educated, poorer – in the bottom quartile of the income distribution – households inflation expectations do not have a statistically significant effect on durable consumption.

Combined with Table 4, this means that, even though all households adjust their inflation expectations depending on the inflation regime that they perceive, all of them do not necessarily use these expectations to make consumption decisions. This is consistent with younger, low-educated and/or poorer households being more borrowing constrained: as a result, their consumption decisions respond less to their own perceptions of the evolution of the real interest rate. Overall, this finding then suggests that the deviations from the aggregate Euler equation do not only come from information frictions but also from incomplete market frictions as argued by Farhi and Werning (2019).

Let us note that the precision of households' expectations about inflation is correlated with their use: younger, low-educated and/or poorer households have less precise expectations and they use them less for consumption decisions. It is for them less valuable to form accurate expectations. On the other hand, as they are less educated, their ability to form precise expectations may also be more costly.

5.4 Additional country evidence: Germany

To further check the robustness of our results, we also have investigated the case of Germany. We report the corresponding results in Appendix E.

To start with, an important difference with the French survey is that the German one does not include Question 5 on households' own consumption but only Question 6 on whether it is the right time to make durable good purchases. As we put forward, the connection to inflation expectations of the answer to such a question can be than the answer to Question 5.

On the set of variables that are common for the two surveys, the results that we obtain are qualitatively – and, to some extent, quantitatively – similar. More precisely, we also obtain a extensive margin of inflation expectations that responds to business cycle fluctuations and which also drives the answer to the question of whether it is the right time to purchase durable goods.

An important point is that our results hold true also when excluding the period where Germany announced a VAT change. This then suggests that the findings by D'Acunto et al. (2016) using the VAT change as an instrument are not peculiar to that period.

6 Policy implications

The importance of the extensive margin of inflation expectations has several implications. In this section, we clarify these for the missing deflation puzzle, forward guidance and de-anchoring risk. To structure this discussion, we first introduce a New-Keynesian (NK) model where we allow agents 1) to have heterogeneous views about inflation and 2) in which consumption decisions react only to shifts between 0- and strictly positive inflation expectations.

A NK model with heterogeneous and sparse households We illustrate our discussion with simulations of a simple three-equation NK model featuring a ZLB constraint and households that are heterogeneous because of their inflation expectations as in Andrade et al. (2019).

In addition to this heterogeneity across households we assume that households have sparse inflation expectations and consumption decision akin to our previous evidence so that:

$$c_{it} = E_t c_{it+1} + \sigma^{-1}(r_t) + \delta_t + dc_{it}$$

with r_t the nominal interest rate, δ_t is a common preference shock, and $dc_{it} = dc^+$ if individual i at date t thinks inflation is going to be positive over the next period, and $dc_{it} = 0$ if individual i at date t thinks prices will remain broadly stable. Our setup implies an aggregate Euler equation of the following kind:

$$c_t = E_t c_{t+1} + \sigma^{-1}(r_t) + \delta_t + s_t dc^+$$

with s_t the share (in deviation from steady-state) of households who, at date t, expect a positive inflation regime over next year.

We contrast the reaction of the SPNK (SParse New Keynesian) model with the usual NK setup with no heterogeneity which features a standard Euler equation

$$c_t = E_t c_{t+1} + \sigma^{-1}[r_t - E_t(\pi_{t+1})] + \delta_t.$$

In what follows, we calibrate the model using standard parameter values and compute the equilibrium path for inflation and output under three different scenarios. First, we consider that a deterministic preference shocks puts the economy at the ZLB for T_{ZLB} periods and lowers the fraction of households thinking that inflation is positive by $d\bar{s}^-\%$. Then we consider that in addition to this shock, the central bank gives forward guidance that it will keep its interest rate at zero for T_{MP} additional period of accommodation and convince a fraction $d\bar{s}^+\%$ of households that inflation is going to be positive. Finally, we investigate the case where, in addition to the preference shock, inflation expectations de-anchor and are at $d\bar{\pi}\%$ below the target (here 0%) for the last T_{DA} periods of the ZLB period.

In these exercises we calibrate the preference shock to $\delta_t = -10\%$ for the periods where the ZLB is binding and zero otherwise. We chose $dc^+ = .08\%$ consistent with our estimation results on annual durable goods.[17] We also assume that the intensive margin of durable consumption does not change over time and that non-durable goods do not react to changes in the real interest rate. See Andrade et al. (2019) for details on the NK model with heterogenous beliefs.

[17] More precisely, our back-of-the-envelope computation is based on Table 5, using the fact that 31% of households report a durable good purchase over the last 12 month (Table 2).

Missing deflation Figures 7a and 7b illustrate the reaction of the two economies to a shock putting the economy at the ZLB for 12 quarters and lowering the share of household expecting a positive inflation expectation by $d\bar{s}^- = 10\%$ during the trap (which correspond to a one standard deviation shock in s_t). In the standard NK model, this shock is extremely detrimental. The ZLB constraint induces a deflationary spiral which makes the output contraction and the initial deflation quite dramatic with a quarterly output loss of more than 10% and a quarterly deflation of about 7% at impact. This reaction seems to be extreme compared to what happened during the Great Recession. By contrast, the presence of sparse households makes this deflationary spiral much less potent so that the recession to the same shock while significant is more than two times lower at impact both for inflation and output. This reaction seems much more comparable to what happened during the Great Recession.

From this point of view, the importance of extensive margin limits the extend to which expected inflation becomes negative in a trap. This is consistent with the fact that individuals' inflation expectations helped to stabilize the economy during the Great Recession as emphasized in e.g. Coibion and Gorodnichenko (2015). Note that this mitigation of the inflation could be reinforced if one assumed that firms have the same behavior than households, as assumed in e.g. Coibion and Gorodnichenko (2015), so that their sparse view on aggregate inflation expectation imperfectly transmits to pricing decisions in ones of firms.

Forward guidance The importance of the extensive margin for consumption decisions has also implications for monetary policy as our results draw limits to the expectation channel. In particular, this applies to policies such as forward guidance.

Let us assume that the central bank has the ability to steer households' expectations – which is not a foregone conclusion.[18] As figures 7a and 7b also illustrate forward guidance on interest rates is much less potent in the model with heterogeneous and sparse households than in the standard NK model. A central bank committing to keep interest rates at zero for 4 extra periods at the end of the trap has an extremely expansionary

[18] Andrade et al. (2019) and Coibion et al. (2019b) discuss the difficulties and means for a central bank to affect these expectations.

impact on the economy. This is the well-known FG puzzle underlined in e.g. Del Negro et al. (2015).

By contrast, the expectation channel hence forward guidance are much less potent with sparse households. Note that to be effective, forward guidance policies need to convince a substantial share households expecting prices to remain stable to switch to a positive inflation regime. The conditions under which such policies will achieve this remain to be explored but we assume that $d\bar{s}^+ = 10\%$ for the 12+4 quarters during which interest rates are at zero.

Another consequence of our results is that when households already expect positive inflation, a further increase in their expectations would not translate into more households purchasing durable goods. This finding thus suggests that forward guidance can be effective when it has an impact on the households expecting prices to remain stable. Once all households are out of this regime, there is no possibility to raise consumption by increasing inflation expectations further. More generally, the expectation channel of policies is limited and less powerful: once it has been used, it cannot be further used. This finding is illustrated in 7a and 7b under the FG max SPNK scenario which assumes that 100% of households expect a positive inflation regime at the end of the trap. This limit in the impact of FG is consistent with McKay and Wieland (2019) who obtained it in a model with sticky prices and adjustment costs on durable consumption.

Another important implication of our robustness checks is that forward guidance needs to be communicated to households both in terms of higher future inflation and higher future economic activity. Forward guidance policies can otherwise be contractionary as higher inflation expectations tend to lower expectations of future income growth of an individual because the stagflation view dominates across households (see also Coibion et al., 2019a).

De-anchoring risk Persistently low realizations of inflation led to the fear that inflation expectations themselves can adjust downward, thus leading to even lower current realizations of inflation – the de-anchoring risk. Our findings shed some light on this risk.

Figures 8a and 8b illustrate the reaction of the two economies to a shock putting the economy at the ZLB for 12 quarters and lowering the inflation expectation of households by 2% for the last 4 quarters of the trap. This is extremely detrimental in the NK model because again of the power of the expectation channel . Somehow this is the reverse face of the same coin than the FG puzzle.

We contrast that reaction with the one of a NK economy with sparse households who on average also have an expectation that is 2% lower than steady state for the 4 last periods of the trap. Using that the average of inflation expectation is roughly 3% among households reporting positive inflation expectation, this corresponds to an additional drop in $s_t = 2/3$. The figures illustrates that even when the whole de anchoring is explained by a change in the extensive margin of inflation expectation, the detrimental impact to the economy is much more realistic than for standard NK model.

Still even though it is more realistic, the impact of de-anchoring is significantly detrimental. Importantly, this de-anchoring and the associated depressed aggregate demand can happen, even though households do not expect a deflation. Actually, it is possible to have a large and persistent share of households expecting prices to "stay about the same" and average inflation expectations to remain positive.

7 Conclusion

In this paper, we provide new evidence on how households form their inflation expectations and how these matter for their consumption decisions. Our findings point out that what matters in households' inflation expectations is the subjective and broad inflation regime that households expect. More precisely, we show that the most important component in the French survey is the share of households that expect prices to "stay about the same". We provide evidence that such findings extend to the German survey. Finally, we draw implications for the expectation channel of monetary policy.

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Tables

Table 1: Simple Statistics on Inflation Expectations

	Aggregate Moments	Correlation with Headline π	π excl. Energy
Average Expectation	2.82 (0.64)	0.79	0.48
% of Stable Prices	0.33 (0.11)	-0.68	-0.26
Average of non-zero inflation	4.15 (0.46)	0.63	0.63

Note: this table reports simple statistics calculated using individual answers to the quantitative question on inflation expectations. We first calculate statistics date by date and then compute the average of this time series. The first column reports simple average of the time series. Second and third columns report correlation coefficients of the aggregate moment calculated date by date and the headline HICP inflation (source Eurostat) and HICP inflation excluding energy and unprocessed food (source Eurostat). "Average" is the simple average of all answers (including zeros) to the quantitative question. "% of Stable Prices" is the average proportion of answers exactly equal to 0. "Average of Non-Zero Inflation" is the average of inflation expectations when not equal to 0.

Table 2: Stylised Facts on Durable Consumption

	Frequency	Corr. with consumption	
		Overall	Durables
Right Time to Purchase			
Yes	0.15	0.38	0.44
Neutral	0.51	0.68	0.64
No	0.34	-0.66	-0.67
Own Major Purchases - Past 12 Months			
Yes	0.31	0.45	0.41
No	0.69	-0.45	-0.41

Note: this table reports simple aggregate statistics using the answers to the 2 questions on durable consumption ("Have you made major purchases during the last 12 months?" and "Do you think it is the right for people to make large purchases?"). We first compute the average proportion of answers for every answer category date by date and then compute the average of these time series. The first column reports the average proportion of answers in a given category. The other columns report correlation over time of the proportion of answers in a given category and annual growth rate of: col 2. overall monthly consumption (source Insee), col 3. durable expenditures (source Insee).

Table 3: Aggregate Expectation Time Variations: Extensive vs Intensive Margins

	Variance	Intensive margin	Extensive margin	
			Freq.	Cov.
All	0.41	0.10	0.20	0.11
Low inflation	0.41	0.09	0.26	0.06
High inflation	0.42	0.11	0.15	0.16

Note: this table reports results of the variance decomposition exercise; col (1): time variance of aggregate inflation expectation; col(2) contribution of the intensive margin (ie. non-zero average inflation expectations) ; cols (3) and (4) contribution of the extensive margin decomposed into variance of the frequency of positive inflation expectations and into the covariance between the average non-zero inflation expectation and the frequency of positive inflation expectations. Low inflation: HICP (headline) below the median inflation over the period; High inflation: headline inflation above the median inflation

Table 4: Drivers of Answering "‘Increase of Prices"’

		Average statistics			Correlation with HICP infl.		
		All	Freq. zero	Av. non-zero π^e	All	Extensive	Intensive
All		2.97	32.0	4.48	0.388***	3.05***	0.405***
	High inflation	3.44	26.6	4.79	0.406***	0.71***	0.537***
	Low inflation	2.56	36.9	4.16	0.519***	6.16***	0.485***
Gender	Female	3.03	35.4	4.87	0.353***	2.63***	0.377***
	Male	2.97	30.2	4.34	0.456***	3.26***	0.420***
Age	16-29	3.23	29.9	4.75	0.222***	2.54***	0.202***
	30-49	3.29	27.9	4.69	0.409***	2.80***	0.417***
	50-64	3.15	28.6	4.51	0.458***	2.99***	0.474***
	65+	2.40	40.6	4.11	0.314***	2.81***	0.337***
Education	Primary	2.66	40.2	4.63	0.275***	2.73***	0.263***
	Secondary	3.03	32.8	4.65	0.420***	2.55***	0.470***
	Further	3.04	29.1	4.37	0.402***	3.51***	0.395***
Income	$< Q1$	2.94	36.6	4.84	0.318***	2.53***	0.335***
	$]Q1 - Q2]$	3.01	34.0	4.70	0.366***	2.77***	0.385***
	$]Q2 - Q3]$	3.12	30.4	4.58	0.407***	3.13***	0.417***
	$> Q3$	2.88	28.2	4.06	0.437***	3.70***	0.445***

Note: the three first columns report average statistics on expected inflation by categories of households. "All" refers the average calculated using all values of expected inflation collected by the survey including 0s. "Freq. zeros" refers the proportion of households reporting "stable prices" or 0 expected inflation. "Av. non-zero π^e" is the average of expected inflation calculated only on non-zero values. The three last columns report results of simple regressions where the endogenous variable corresponds to: i) all expected inflation values (OLS model), ii) a dummy variable equal to 1 if a given household expects a non-zero inflation (Probit model) iii) non-zero inflation expectations marginal effect (OLS model). In all equations, we have reported the coefficient or marginal effect associated with the exogenous variable HICP inflation. Each cell corresponds to the result of a model where the sample is restricted to a given household category. Control variables include year and month dummies, household characteristics (age, location (city, region) education, job, income, survey wave (1,2 or 3), answers to other question on French economic conditions (standard living, unemployment...), answers to the question about future plans for major purchases and a dummy variable for perceived inflation. Regressions also include random household effects and standard errors are corrected for possible heteroscedasticity. *p<0.1; **p<0.05; ***p<0.01.

Table 5: Marginal Effects of Inflation Expectations on Own Major Purchases Over the Last 12 Months

	All	Intensive (Excl. 0)	Extensive	All Quali.	All Excl. outliers
π^e	0.005	-0.045			0.226***
	(0.027)	(0.037)			(0.074)
$\pi^e \neq 0$			1.021***		
			(0.337)		
π^e by intervals:					
$[10\%; +\infty[$				0.043	
				(0.574)	
$[5\%; 10\%[$				1.491***	
				(0.462)	
$[3\%; 5\%[$				1.257***	
				(0.492)	
$]0\%; 3\%[$				1.240***	
				(0.417)	
0%				Ref.	
$< 0\%$				-0.258	
				(1.332)	
Controls	Yes	Yes	Yes	Yes	Yes
Obs.	136,574	92,002	136,574	136,574	114,786

Note: this table reports marginal effects (in percentage points) from Probit regressions where the endogenous variable is a dummy variable equal to 1 if the household 'YES' to the question "Have you made major purchases during the last 12 months?". Control variables include year and month dummies, household characteristics (age, location (city, region) diploma, job, income, survey wave (1,2 or 3), answers to other question on French economic conditions (standard living, unemployment...), answer to the question about future plans for major purchases, right time to save and perceived inflation. Standard errors are clustered at the date level. *p<0.1; **p<0.05; ***p<0.01.

Table 6: Marginal Effects of Inflation Expectations on Own Major Purchases Over the Last 12 Months: Qualitative Answer

	All Answers		Non-Missing	
	-		Quantitative Answers	
	(1)	(2)	(3)	(4)
$\pi^e \neq 0$	0.835***		1.021***	
	(0.213)		(0.337)	
Increase more rapidly		1.721***		1.442***
		(0.333)		(0.522)
Increase at the same rate		0.727***		0.924***
		(0.231)		(0.361)
Increase at a slower rate		1.277***		1.339***
		(0.284)		(0.464)
Stay about the same		Ref.		Ref.
Fall		0.821		-0.243
		(0.763)		(1.333)
DK		-0.677		-
		(0.447)		-
Controls	Yes	Yes	Yes	Yes
Obs.	312,921	312,921	136,574	136,574

Note: this table reports marginal effects (in percentage points) from Probit regressions where the endogenous variable is a dummy variable equal to 1 if the household 'YES' to the question "Have you made major purchases during the last 12 months?". The first two columns report results for all answers to the qualitative question on expectations. The last two columns report results excluding households with missing observations on the quantitative question on both inflation expectations and perceptions. Control variables include year and month dummies, household characteristics (age, location (city, region) diploma, job, income, survey wave (1,2 or 3), answers to other question on French economic conditions (standard living, unemployment...), answer to the question about future plans for major purchases, right time to save and perceived inflation. Standard errors are clustered at the date level. *p<0.1; **p<0.05; ***p<0.01.

Table 7: Marginal Effects of Inflation Expectations on Right Time to Purchase

	All	Excl. 0	Extensive	Quali.	All excl. outliers
π^e	0.006	-0.021			0.096**
	(0.015)	(0.019)			(0.045)
$\pi^e \neq 0$			0.632***		
			(0.185)		
π^e by intervals:					
$[10\%; +\infty[$				-0.096	
				(0.296)	
$[5\%; 10\%[$				0.790***	
				(0.280)	
$[3\%; 5\%[$				1.176***	
				(0.300)	
$]0\%; 3\%[$				0.848***	
				(0.251)	
0%				Ref.	
$< 0\%$				-0.070	
				(0.821)	
Controls	Yes	Yes	Yes	Yes	Yes
Obs.	134,117	90,566	134,117	134,117	112,676

Note: this table reports marginal effects (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 'It is neither the right time nor the wrong time', 2 '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". Control variables include year and month dummies, household characteristics (age, location (city, region) diploma, job, income, survey wave (1,2 or 3), answers to other question on French economic conditions (standard living, unemployment...), answer to the question about future plans for major purchases, right time to save and perceived inflation. Standard errors are clustered at the date level. *p<0.1; **p<0.05; ***p<0.01.

Table 8: Marginal Effects of Inflation Expectations on Own Major Purchases Over the Last 12 Months - Probit with Random HH Effect

	All	Intensive (Excl. 0)	Extensive	All Quali.	All Excl. outliers
π^e	0.002	-0.027			0.143**
	(0.023)	(0.033)			(0.065)
$\pi^e \neq 0$			0.636**		
			(0.285)		
π^e by intervals:					
$[10\%; +\infty[$				0.186	
				(0.490)	
$[5\%; 10\%[$				0.685	
				(0.421)	
$[3\%; 5\%[$				0.953**	
				(0.425)	
$]0\%; 3\%[$				0.674*	
				(0.391)	
0%				Ref.	
$< 0\%$				0.160	
				(1.210)	
Controls	Yes	Yes	Yes	Yes	Yes
Obs.	136,574	92,002	136,574	136,574	114,786

Note: this table reports marginal effects (in percentage points) from panel probit regressions with random HH effect, where the endogenous variable is a dummy variable equal to 1 if the household 'YES' to the question "Have you made major purchases during the last 12 months?". Control variables include year and month dummies, household characteristics (age, location (city, region) diploma, job, income, survey wave (1,2 or 3), answers to other question on French economic conditions (standard living, unemployment...), answer to the question about future plans for major purchases, right time to save and perceived inflation. *p<0.1; **p<0.05; ***p<0.01.

Table 9: Marginal Effects of Inflation Expectations on Own Major Purchases Over the Last 12 Months: Robustness

	All π^e Excl. outliers	π^e excl 0 Intensive	$\pi^e \neq 0$ Extensive
No Perceived / Expected Variables	-0.125**	-0.543***	-0.000
	(0.052)	(0.072)	(0.297)
+ Perceived Inflation	0.051	-0.400***	-0.057
	(0.057)	(0.084)	(0.338)
+ Expected Own Durable Consumption	0.022	-0.284***	0.197
	(0.057)	(0.084)	(0.335)
+ Expected Own Financial Situation	0.108*	-0.197**	0.636*
	(0.058)	(0.085)	(0.337)
+ Past and Current Own Financial Situation	0.147**	-0.137	0.732**
	(0.058)	(0.085)	(0.332)
+ Expected Business Cycle & Unemployment	0.200***	-0.062	1.020***
	(0.058)	(0.085)	(0.330)
+ Good Time to Save (Baseline)	0.206***	-0.043	1.021***
	(0.060)	(0.087)	(0.337)

Note: this table reports marginal effects (in percentage points) from Probit regressions where the endogenous variable is a dummy variable equal to 1 if the household 'YES' to the question "Have you made major purchases during the last 12 months?". In all regressions, we keep basic control variables such as year and month dummies, household characteristics (age, location (city, region) diploma, job, income, survey wave (1,2 or 3). Other control variables include answers to other question on French economic conditions (standard living, unemployment...), answer to the question about future plans for major purchases, right time to save and perceived inflation. In the first regression we remove all the other control variables whereas in other regressions, we add control variables one by one. Standard errors are clustered at the date level. *p<0.1; **p<0.05; ***p<0.01.

Table 10: Marginal Effects of Inflation Expectations on Consumption - Household Heterogeneity

		All	Only $\pi^e \neq 0$	Extensive
Gender	Female	0.355***	0.137	1.317**
		(0.103)	(0.159)	(0.550)
	Male	0.122*	-0.152	0.725**
		(0.074)	(0.107)	(0.368)
Age	16-29	-0.187	-0.237	-0.719
		(0.232)	(0.344)	(1.190)
	30-49	0.219**	0.140	0.512
		(0.100)	(0.155)	(0.539)
	50-64	0.297***	-0.081	1.831***
		(0.098)	(0.168)	(0.518)
	65+	0.113	-0.291	0.944*
		(0.122)	(0.187)	(0.543)
Education	Primary	-0.008	-0.471**	0.200
		(0.153)	(0.236)	(0.702)
	Secondary	0.334***	0.156	1.689***
		(0.096)	(0.132)	(0.527)
	Further	0.192**	-0.052	0.832*
		(0.085)	(0.124)	(0.443)

Note: the two first columns report marginal effects (in percentage points) from Probit models where the endogenous variable is a dummy variable equal to 1 if the household answers Yes to the question "Did you make major purchases over the last 12 months?", each cell corresponds to the result of model where the sample is restricted to a given household category. Col. 1 "All" we include quantitative answer to the question on inflation expectations, col. 2 we consider only non zero answers to the question on inflation expectations, col. 3 we use a dummy variable equal to 1 if the HH answers 0 to the quantitative question on inflation expectations. Control variables include year and month dummies, household characteristics (age, location (city, region) education, job, income, survey wave (1,2 or 3), answers to other question on French economic conditions (standard living, unemployment...), answer to the question about future plans for major purchases and perceived inflation. Standard errors are clustered at the date level. *p<0.1; **p<0.05; ***p<0.01.

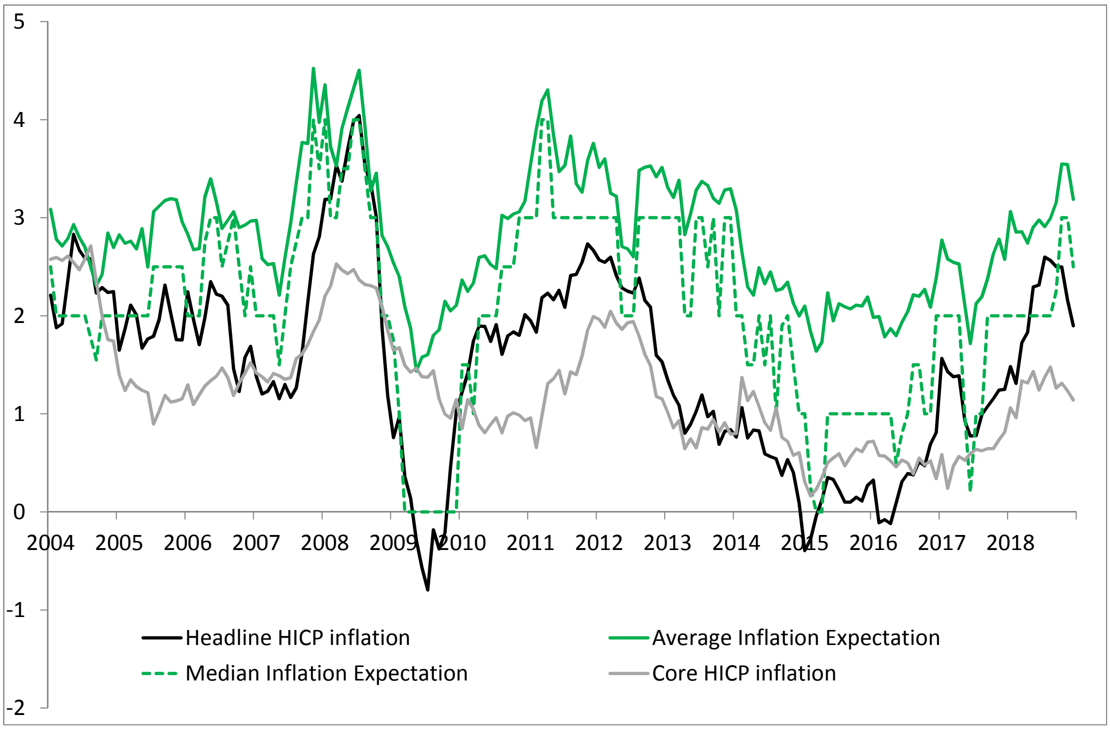
Table 11: Marginal Effects of Inflation Expectations on Consumption - Household Heterogeneity - Continued

		All	Only $\pi^e \neq 0$	Extensive
Income	$< Q1$	0.176*	-0.173	0.508
		(0.103)	(0.154)	(0.556)
	$]Q1 - Q2]$	0.153	-0.255	1.039*
		(0.116)	(0.172)	(0.622)
	$]Q2 - Q3]$	0.262**	0.188	0.973
		(0.110)	(0.171)	(0.624)
	$> Q3$	0.200*	0.021	1.154**
		(0.120)	(0.184)	(0.584)
HH Financial Situation	2	0.108	-0.225	-0.536
		(0.115)	(0.165)	(0.554)
	1	0.367***	0.180	1.569***
		(0.089)	(0.130)	(0.486)
	0	0.046	-0.169	0.615
		(0.099)	(0.158)	(0.560)

Note: In the two first columns, we report marginal effects from Probit models where the endogenous variable is a dummy variable equal to 1 if the household answers Yes to the question "Did you make major purchases over the last 12 months?", each cell corresponds to the result of model where the sample is restricted to a given category. Col. 1 "All" we include quantitative answer to the question on inflation expectations, col 2 we consider only non zero answers to the question on inflation expectations, col 3 we use a dummy variable equal to 1 if the HH answers 0 to the quantitative question on inflation expectations. Control variables include year and month dummies, household characteristics (age, location (city, region) education, job, income, survey wave (1,2 or 3), answers to other question on French economic conditions (standard living, unemployment...), answer to the question about future plans for major purchases and perceived inflation. Standard errors are clustered at the date level. *p<0.1; **p<0.05; ***p<0.01.

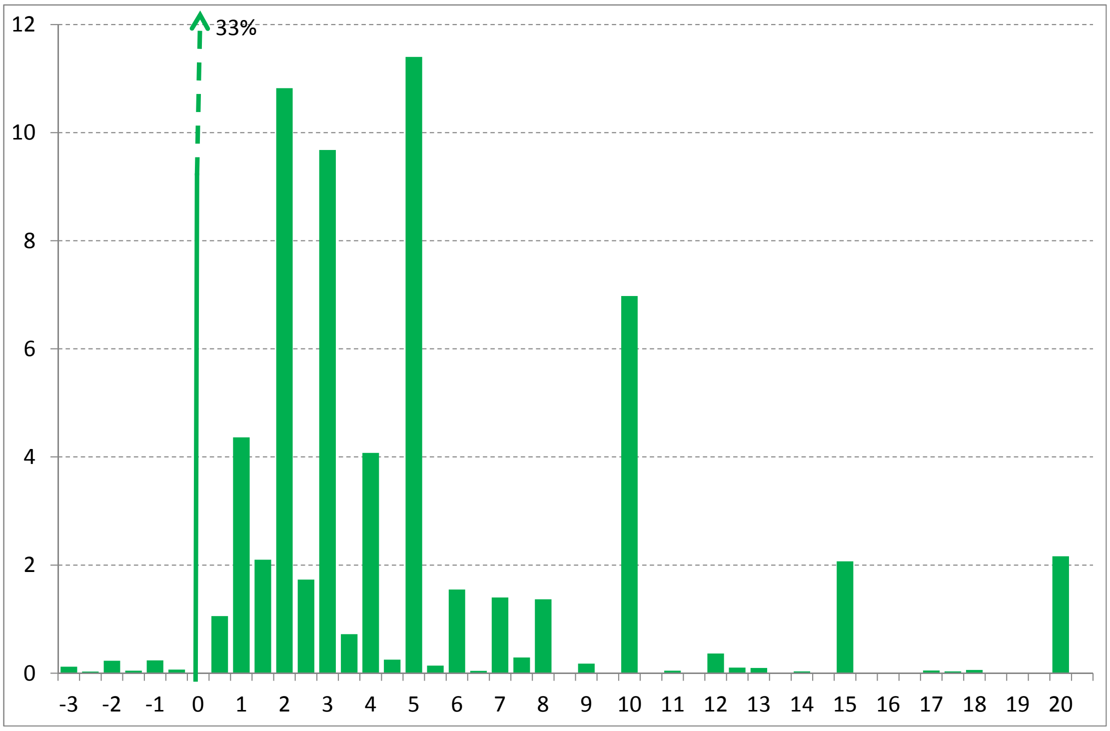
Figures

Figure 1: Expected Inflation and Headline HICP inflation



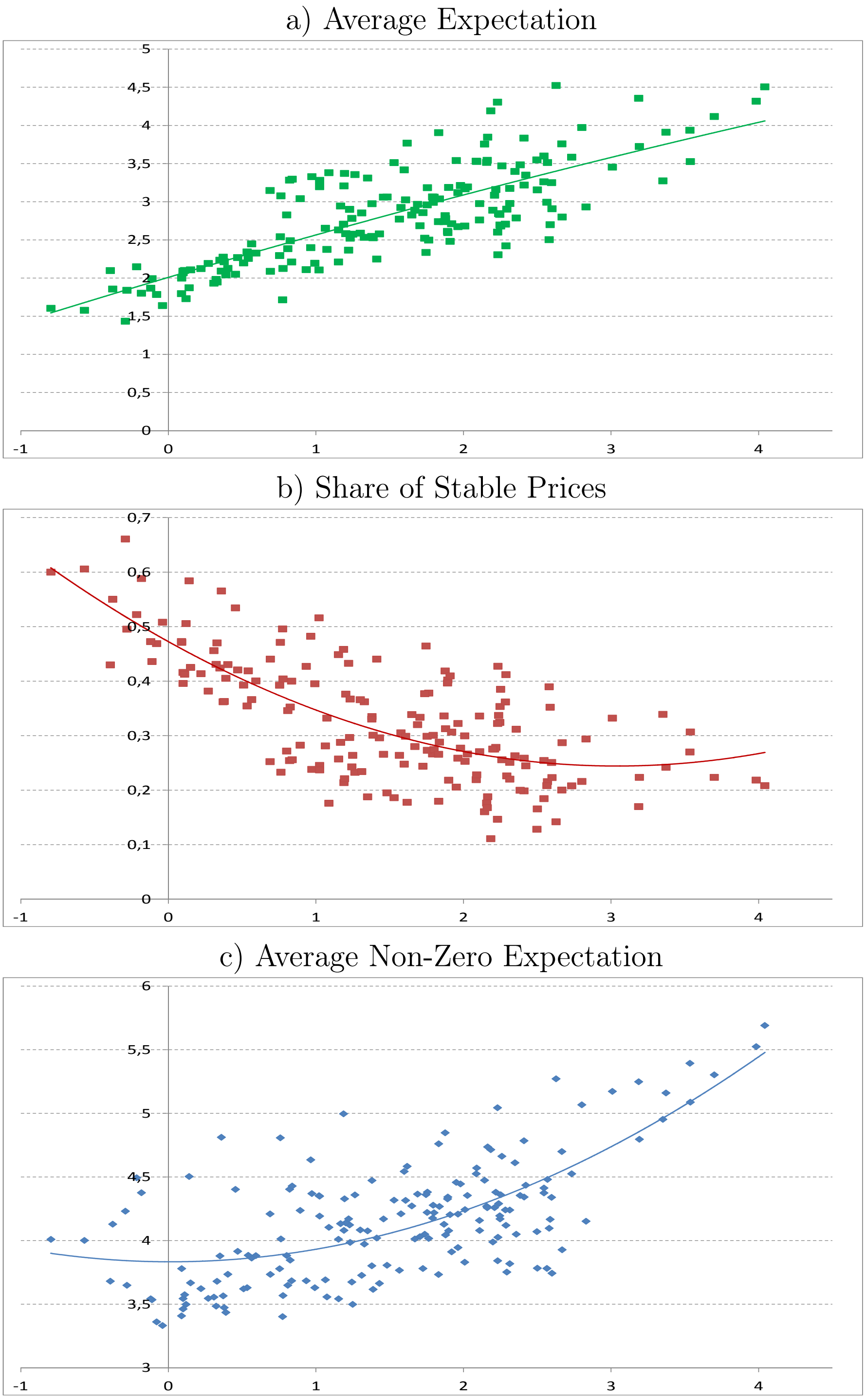
Note: using answers to the quantitative questions on inflation expectations (we have dropped quantitative inflation perceptions larger than 20%), we have computed the simple average/median of all answers date by date. Before 2008, the survey was not conducted in August, in that case, we have replaced aggregate statistics by a simple interpolation between July and September. We have also plotted as benchmarks headline HICP inflation (source Eurostat) and HICP inflation excluding energy (source Eurostat).

Figure 2: Cross Distribution of Inflation Expectations



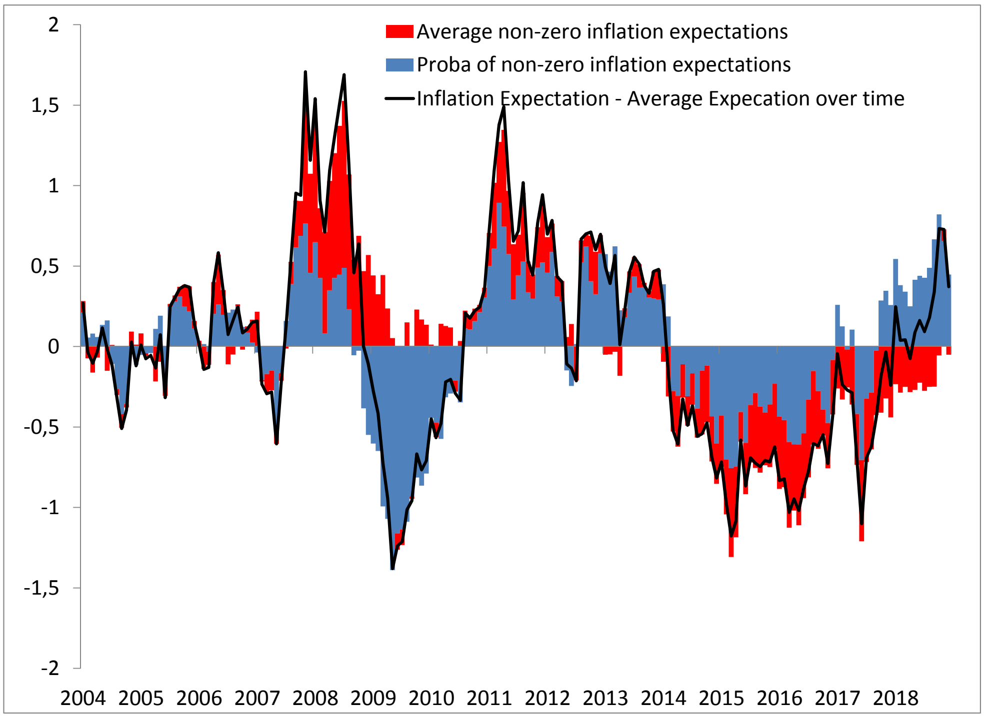
Note: we here represent the distribution of inflation expectations across households computed over the period Jan. 2004 - Dec. 2018. The proportion of answers above 20% is not reported. The distribution is unweighted.

Figure 3: Share of Stable Prices, Average Non-Zero Expected Inflation and Headline CPI Inflation



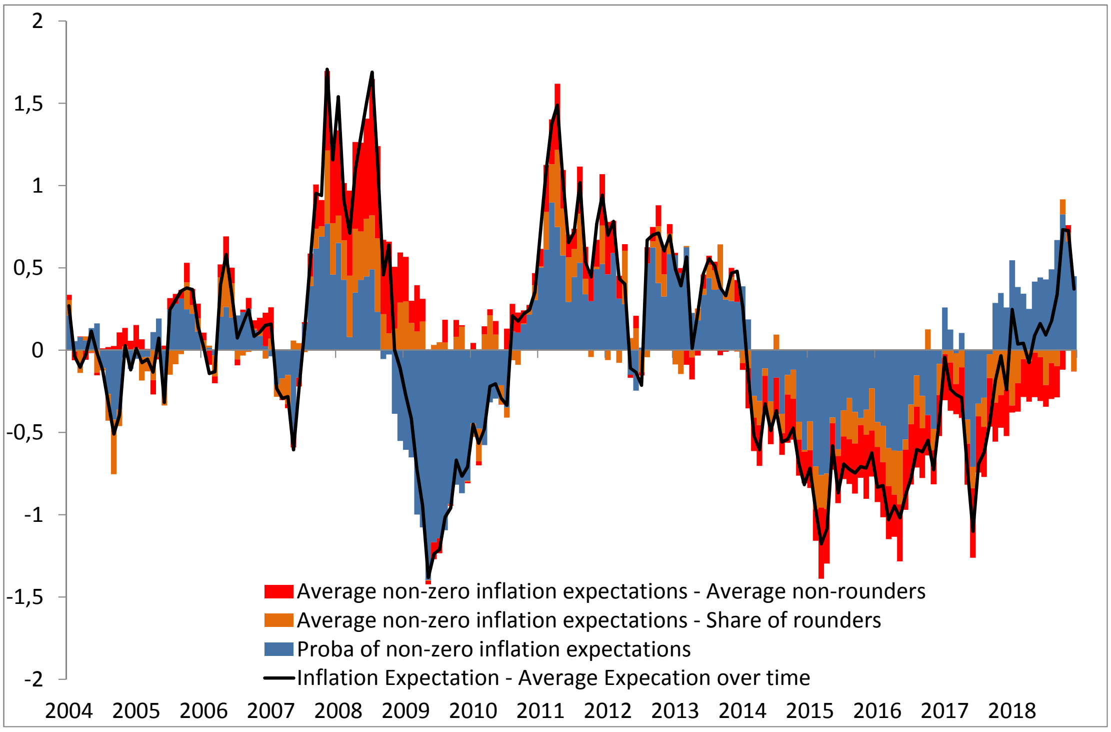
Note: Panel (a) is the scatter plot of average expectation and headline CPI inflation (monthly data). The green line is simple polynomial of degree 2 fitting the data. Panel (b): we have first computed date by date the proportion of individuals reporting expected stable prices (i.e. 0% inflation) and (b) is the scatter plot of this monthly proportion and headline CPI inflation. In red, each dot represents the share of individual answering expecting stable prices over the next 12 months for a given month (and so inflation rate). The red line is simple polynomial of degree 2 fitting the data. Panel (c): we have computed the average inflation expectation (when individuals do not answer stable prices) date by date. The figure is the scatter plot of this monthly average and headline CPI inflation. The blue line is simple polynomial of degree 2 fitting the data.

Figure 4: Aggregate Inflation Expectations Decomposition - Extensive vs Intensive Margins



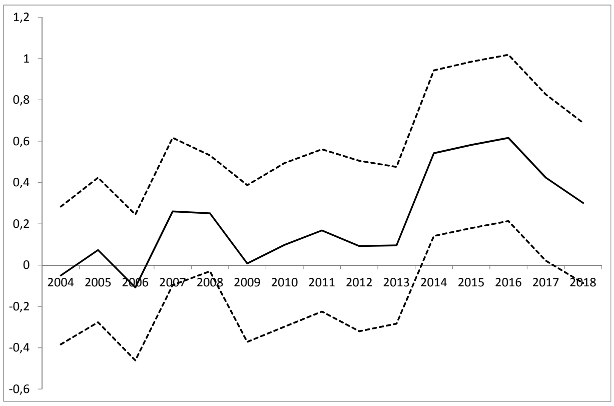
Note: we plot contributions to aggregate inflation expectations. Black line: aggregate average expected inflation - mean aggregate average expected inflation; blue histogram: contribution of time variations of the probability of non-zero answers (extensive margin); red histogram: contributions of time variations in the average expected inflation (intensive margin).

Figure 5: Aggregate Inflation Expectations Decomposition - Contribution of Implausible Values

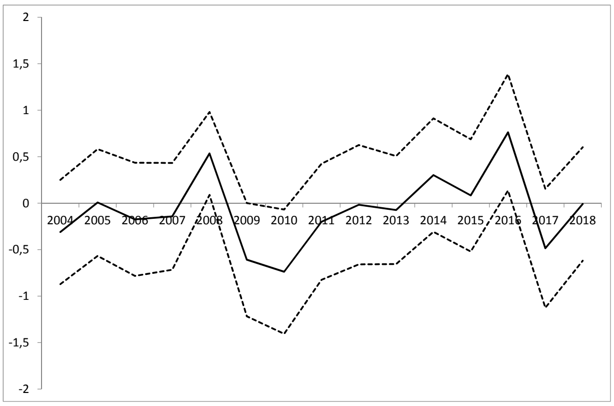


Note: this figure plots contributions to aggregate inflation expectations. Black line: aggregate average expected inflation - mean aggregate average expected inflation; blue histogram: contribution of time variations of the probability of non-zero answers; light orange histogram: contributions of time variations of the probability of answers multiple of 5; dark orange histogram: contribution of time variations in the average expected inflation for answers not multiple of 5. The contributions of the share of non-multiple of 5 or the average size of answers multiple of 5 are very small and not reported on this graph.

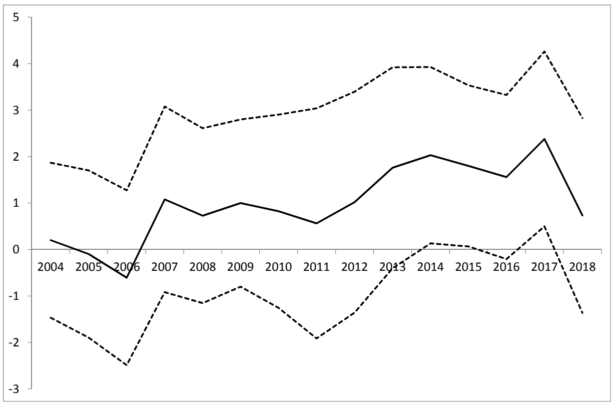
Figure 6: Marginal Effects of Inflation Expectations Over Time



(a) All



(b) Intensive margin

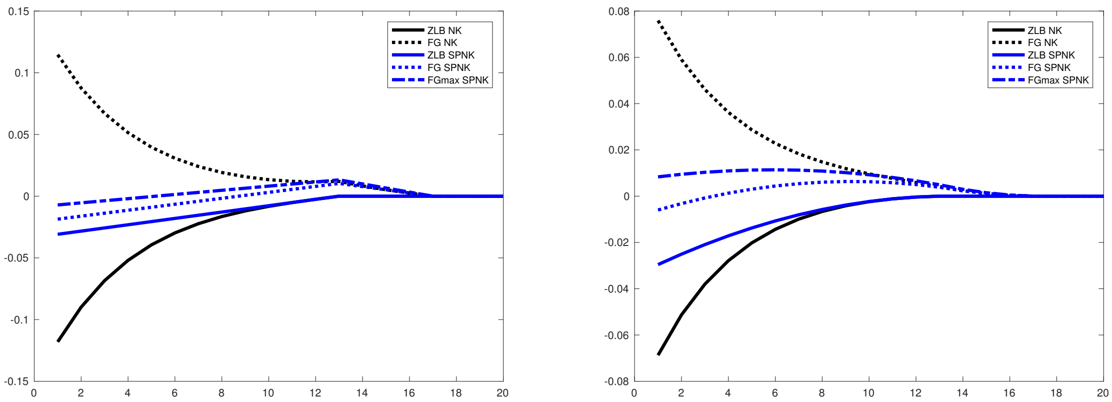


(c) Extensive margin

Note: black solid lines report marginal effects from Probit models estimated year by year where the endogenous variable is a dummy variable equal to 1 if the household answers Yes to the question "Did you make major purchases over the last 12 months?"; "All" we include all quantitative answers to the question on inflation expectations; "Intensive margin" we only use non-zero answers; "Extensive margin" we use a dummy variable equal to 1 if the answer is different from 0, 0 otherwise. Control variables include year and month dummies, household characteristics (age, location (city, region) education, job, income, survey wave (1,2 or 3), answers to other question on French economic conditions (standard living, unemployment...), answer to the question about future plans for major purchases, right time to save, and perceived inflation. Regressions also include random household effects and standard errors are corrected for possible heteroscedasticity. Dashed black lines correspond to the 90% confidence intervals.

Figure 7: ZLB and FG with sparse households

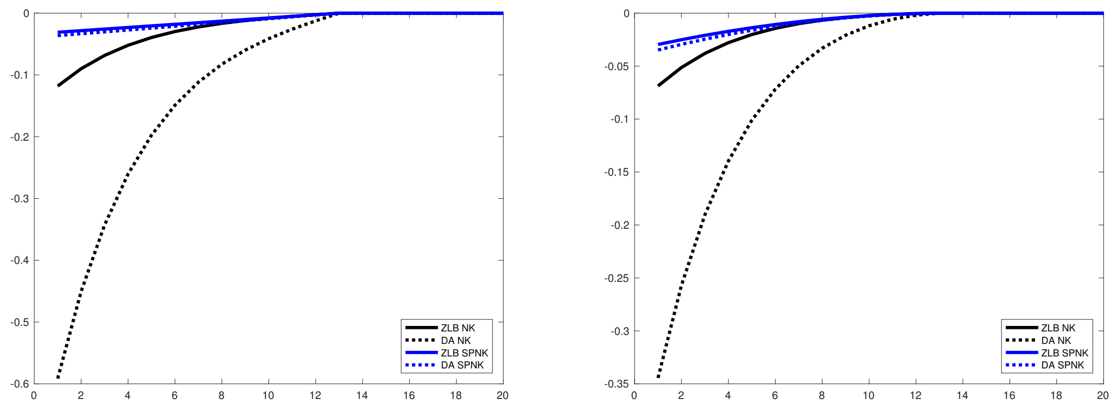
(a) Output gap (b) Inflation



Note: The plain black line (ZLB NK) corresponds to the reaction of the standard NK model to a shock pushing the economy to the ZLB and the dotted black line (FG NK) to a forward guidance shock. The plain blue line (ZLB SPNK) corresponds to the reaction of the sparse NK model to a shock pushing the economy to the ZLB and the dotted blue line (FG SPNK) to a forward guidance shock. Finally the dashed blue line (FG max SPNK) corresponds to a case where 100% of households expect positive inflation after the shock. See Section 6 for further explanations.

Figure 8: ZLB and Deanchoring with sparse households

(a) Output gap (b) Inflation



Note: The plain black line (ZLB NK) corresponds to the reaction of the standard NK model to a shock pushing the economy to the ZLB and the dotted black line (DA NK) to a deanchoring shock. The plain blue line (ZLB SPNK) corresponds to the reaction of the sparse NK model to a shock pushing the economy to the ZLB and the dotted blue line (DA SPNK) to a deanchoring shock. See Section 6 for further explanations.

Appendix

A Model of durable good consumption

In this appendix, we introduce a model of a continuum of agents consuming both non-durable and durable goods but allowing for households' individual beliefs on future inflation. We derive from this model the equation that we use to estimate the extensive margin of durable consumption.

Households We consider a continuum of a mass 1 of agents indexed by $i[0,1]$. Each agent i consumes both durable and non-durable goods so as to maximize the following expected lifetime utility function:

$$\mathbb{E}_{i,0}\left\{\sum_{t\geq 0}\beta^t\left[\frac{\left(c_{i,t}^{\gamma}d_{i,t}^{1-\gamma}\right)^{1-\theta}-1}{1-\theta}\right]\right\}$$

where $\beta\in(0,1)$ is the discount factor and γ and θ are positive parameters. $E_{i,0}$ denotes the expectation operator at date-0 given agent i information set.

Agents can trade risk-free nominal bonds that yields a nominal interest rate i_t between periods t and $t+1$. We denote by $a_{i,t}$ the amount of these risk-free assets purchased at date-t. Agents inelastically supply one unit of labor. Agents can differ in terms of productivity and we denote the nominal wage received by agent i at date t by $W_{i,t}$.

Modifying the stock of durable goods entails a real cost that we denote by $\Xi(d_{i,t},d_{i,t-1})$. The stock of durable goods depreciates at a rate δ.

By denoting the price level in period t by P_t, we can then write the budget constraint faced by household i at date t as:

$$P_t(c_{i,t}+d_{i,t})+a_{i,t}+P_t\Xi(d_{i,t},d_{i,t-1})\leq W_{i,t}+(1+r_{i,t-1})a_{i,t-1}+P_t d_{i,t-1}(1-\delta)$$

At date-t, we denote the information set available to agent i by $\mathcal{I}_{i,t}$ and we adopt the following notation:

$$E\left(.|\mathcal{I}_{i,t}\right)=E_{i,t}\left(.\right).$$

Assumption A.1. *Households perfectly observe current macroeconomic variables, i.e. the nominal interest rate and the current price level* $\{r_t,P_t\}$.

Despite observing the current price level, households cannot directly observe the future price level P_{t+1} and, thus, have to form belief on the future inflation rate $E_{i,t}\left(\pi_{t+1}\right)$.

Recursive formulation The recursive problem solved by agents is:

$$V(a_{-1},d_{-1},W,\mathcal{I})=\max\left[V^{adjust}(a_{-1},d_{-1},W,\mathcal{I}),V^{noadjust}(a_{-1},d_{-1},W,\mathcal{I})\right]$$

with

$$V^{adjust}(a_{-1}, d_{-1}, W, \mathcal{I})) = \max_{c,d,a} \frac{(c^{\gamma} d^{1-\gamma})^{1-\theta}}{1-\theta} + \beta E\left(V(a, d, W', \mathcal{I}))|\mathcal{I})\right)$$

$$\text{s.t.}$$

$$c + d + a = W + \frac{1+r}{1+E_{-1}\pi} a_{-1} + d_{-1}(1-\delta) + \Xi(d, d_{-1})$$

$$a \geq -(1-\delta)d.$$

and

$$V^{noadjust}(a_{-1}, d_{-1}, W, \mathcal{I}) = \max_{c,a} \frac{(c^{\gamma} d_{-1}^{1-\gamma})^{1-\theta}}{1-\theta} + \beta E\left(V(a, d_{-1}(1-\delta), W', \mathcal{I})\right)|\mathcal{I})$$

$$\text{s.t.}$$

$$c + a = W + \frac{1+r}{1+E_{-1}\pi} a_{-1}.$$

Connection with our reduced form formulation Let us label by $\delta^* (a_{-1}, d_{-1}, W, \mathcal{I}))$ the solution to the maximization of $V^{adjust}(a_{-1}, d_{-1}, W, \mathcal{I}))$.

Lemma A.1. *There exists $\kappa < \infty$ such that if $d^* (a_{-1}, d_{-1}, W, \mathcal{I})) \geq (1-\delta)d_{-1} + \kappa$ then*

$$V^{adjust}(a_{-1}, d_{-1}, W, \mathcal{I})) \geq V^{noadjust}(a_{-1}, d_{-1}, W, \mathcal{I})$$

Proof. Let us first note that when $\Xi(d, d_{-1}) = 0$,

$$V^{adjust}(a_{-1}, d_{-1}, W, \mathcal{I})) \geq V^{noadjust}(a_{-1}, d_{-1}, W, \mathcal{I}).$$

when $d^* (a_{-1}, d_{-1}, W, \mathcal{I})) \geq (1-\delta)d_{-1}$. When $\Xi(d, d_{-1}) \to \infty$, $V^{adjust}(a_{-1}, d_{-1}, W, \mathcal{I})) < V^{noadjust}(a_{-1}, d_{-1}, W, \mathcal{I})$ for any $d^* (a_{-1}, d_{-1}, W, \mathcal{I}))$ or, equivalently when $d^* (a_{-1}, d_{-1}, W, \mathcal{I})) \geq (1-\delta)d_{-1} + \kappa$ with $\kappa \to \infty$.

Given that $V^{adjust}(a_{-1}, d_{-1}, W, \mathcal{I}))$ is a continuous and monotone of $\Xi(d, d_{-1})$ (the derivative of $V^{adjust}(a_{-1}, d_{-1}, W, \mathcal{I}))$ with respect to $\Xi(d, d_{-1})$ is $-\lambda$ where λ is the Lagrange multiplier associated with the budget constraint), we can use the intermediary value theorem to conclude that there exists $\zeta(a_{-1}, d_{-1}, W, \mathcal{I})$ so that $V^{adjust} \geq V^{noadjust}$ if and only if $\Xi(d, d_{-1}) \leq \zeta(a_{-1}, d_{-1}, W, \mathcal{I})$. In particular, $V^{adjust}(\zeta) = V^{noadjust}$. Let $d^*(\zeta)$ be the solution for durables of the maximization of $V^{adjust}(\zeta)$. Let us denote by $\kappa = d^*(\zeta) - (1-\delta)d_{-1}$.

By increasing the cost $\Xi(d, d_{-1})$ above ζ, we obtain that $d^*(\Xi(d, d_{-1}) - (1-\delta)d_{-1}$ is smaller than κ as d^* is an decreasing function of the cost and $V^{adjust}(\Xi(d, d_{-1}) < V^{noadjust}$ by the definition of ζ.

Conversely, by decreasing the cost $\Xi(d, d_{-1})$ below ζ, we obtain that $d^*(\Xi(d, d_{-1}) - (1-\delta)d_{-1}$ is higher than κ as d^* is an decreasing function of the cost and $V^{adjust}(\Xi(d, d_{-1}) > V^{noadjust}$ by the definition of ζ.

In the end, $d^*(\Xi(d, d_{-1}) \geq (1-\delta)d_{-1} + \kappa$ is sufficient to ensure that:

$$V^{adjust}(a_{-1}, d_{-1}, W, \mathcal{I})) \geq V^{noadjust}(a_{-1}, d_{-1}, W, \mathcal{I})$$

$\square$

Let us note that it is also possible that $V^{adjust}(a_{-1}, d_{-1}, W, \mathcal{I})) \geq V^{noadjust}(a_{-1}, d_{-1}, W, \mathcal{I})$ when $d^*\left(a_{-1}, d_{-1}, W, \mathcal{I}\right))$ is sufficiently low compared to $1-\delta)d_{-1}$, which corresponds to a case where the household is willing to sell and not buy durable goods. In this regard, Lemma A.1 focuses only on purchases of durables.

Finally, let us note that the functional form assumed for d^* in equation (2) is in line with the problem solved and $V^{adjust}(a_{-1}, d_{-1}, W, \mathcal{I}))$. This choice is indeed a function of the nominal interest rate $E_{i,t}(r_t)$, the evolution of the price level $E_{i,t}(\pi_{t+1})$ – more precisely, the problem depends on the real rate $E_{i,t}(r_t) - E_{i,t}(\pi_{t+1})$ – and the household's future situation.

Identification assumption As noted above, households' decisions depend on the real rate $E_{i,t}(r_t) - E_{i,t}(\pi_{t+1})$ and not only on inflation expectations $E_{i,t}(\pi_{t+1})$. The following lemma clarifies how we can identify the effect of inflation expectations in our setting:

Lemma A.2. *Under Assumption A.1, $E_{j',t}(r_t) = E_{j,t}(r_t)$ for any j and j'.*

As a result, any difference in willingness to consume durable goods only result from differences in inflation expectations.

Let us emphasize that Assumption A.1 requires that agents can observe current but not future macroeconomic variables. As this can be observed in Lemma A.2, a milder condition for this Lemma would be to assume that agents can perfectly observe the nominal interest rate only. In general, our identification builds on the idea that it is easier to observe nominal interest rates – that are observable today on markets or through banks – rather than future inflation rates – that has to be computed and will be observable only in the future.

B A costly information-processing interpretation – In Progress

In this appendix, we provide a costly information-processing interpretation of the way people take into account inflation expectations in their consumption decision. More precisely, we build a model in which agents have to make decisions based on their beliefs on future inflation, but computing the optimal decision rule given an expected level of inflation is costly. We show that such costs to process information leads households to react in the same way to different levels of inflation expectations. When the most likely state is that inflation remains constant and information-processing costs are sufficiently large, we obtain that households modify their consumption only when their inflation expectations move between constant inflation and positive inflation.

More precisely, we first show how costly information processing leads to restrict attention to a coarse partition of the information set. Second, we embed this mechanism in a problem where an agent has to decide on consumption based on inflation expectations.

B.1 The inflation process

To this purpose, let us suppose that inflation π_t follows a first order Markov process taking values in $\Pi = \{\pi_1, ...\pi_,\}$, with n the number of states. The transition matrix is $\{P_{i,j}\}$ and the ergodic distribution is $\{\mu_j\}$. Here we assume that the Markov chain is irreducible and aperiodic, so that the ergodic distribution exists and is unique.

We assume that n can be arbitrarily large.

The entropy rate of this process is:

$$H(\pi_t) = \sum_i \mu_i \left(- \sum_j P_{i,j} \log P_{i,j} \right).$$

Let us define $\mathcal{P}(\Pi)$ that is the partition set of Π. A partition $X_1 \in \mathcal{P}(\Pi)$ is finer than X_2 when every $x \subseteq X_1$ satisfies $x \subseteq X_2$. On the other hand, X_2 is said to be coarser. It is well known that finer/coarser is a partial order on $\mathcal{P}(\Pi)$.

Let us define $\pi(X)$ the process generated by the partition X, that is, for any set $x \in X$, $\pi(X)$ defines a first-order Markov process with states X, a transition matrix $P(X)$ and an ergodic distribution $\mu(X)$ satisfying for all $x \in X$ and $x' \in X$:

$$\mu(x) = \sum_{i \in x} \mu_i \text{ and } P_{x,x'} = \sum_{i \in x, j \in x'} P_{i,j}.$$

In particular, $\pi(\Pi) = \pi$.

Lemma B.1 (Monotonicity)**.** *Let us consider a sequence X_1, X_2, ... X_m with X_j finer than $X_{j'}$ for any j and j' such that $j \geq j'$. $H(\pi(X_j))$ is increasing with j.*

Proof. Without loss of generality, let us focus on a process with 3 states. The coarsest partition is the set of three states. Then, an intermediate partition is when two states are bundled together and the finest partition is the set of singletons. First, the entropy rate of the set of three states is 0. Second, the entropy rate of an intermediate partition is:

$$\begin{aligned} H_{int} = \mu_1 \left(P_{1,1} \log P_{1,1} + (1 - P_{1,1}) \log(1 - P_{1,1})\right) + \cdots \\ \cdots (\mu_2 + \mu_3) \left(1 - \frac{\mu_2 P_{2,1} + \mu_3 P_{3,1}}{\mu_2 + \mu_3}\right) \log \left(1 - \frac{\mu_2 P_{2,1} + \mu_3 P_{3,1}}{\mu_2 + \mu_3}\right) + \\ \cdots (\mu_2 + \mu_3) \frac{\mu_2 P_{2,1} + \mu_3 P_{3,1}}{\mu_2 + \mu_3} \log \left(\frac{\mu_2 P_{2,1} + \mu_3 P_{3,1}}{\mu_2 + \mu_3}\right) \end{aligned}$$

which is strictly positive. The entropy rate of the set of singletons is:

$$\begin{aligned} H_{singletons} = \mu_1 \left(P_{1,1} \log P_{1,1} + P_{1,2} \log P_{1,2} + P_{1,3} \log P_{1,3}\right) + \cdots \\ \mu_2 \left(P_{2,1} \log P_{2,1} + P_{2,2} \log P_{2,2} + P_{2,3} \log P_{2,3}\right) + \cdots \\ \mu_3 \left(P_{3,1} \log P_{3,1} + P_{3,2} \log P_{3,2} + P_{3,3} \log P_{3,3}\right) \end{aligned}$$

Let us show that this is larger than the entropy rate of the intermediate partition. First, let us note that, due to the convexity of $x \log x$, we have:

$$\begin{aligned} \frac{\mu_2 P_{2,1} + \mu_3 P_{3,1}}{\mu_2 + \mu_3} \log \left(\frac{\mu_2 P_{2,1} + \mu_3 P_{3,1}}{\mu_2 + \mu_3} \right) \geq \cdots \\ \cdots \frac{\mu_2}{\mu_2 + \mu_3} P_{2,1} \log P_{2,1} + \frac{\mu_3}{\mu_2 + \mu_3} P_{3,1} \log P_{3,1} \end{aligned}$$

and:

$$\begin{aligned} \frac{\mu_2(1 - P_{2,1} - +\mu_3(1 - P_{3,1})}{\mu_2 + \mu_3} \log \left(\frac{\mu_2(1 - P_{2,1}) + \mu_3(1 - P_{3,1})}{\mu_2 + \mu_3} \right) \geq \cdots \\ \cdots \frac{\mu_2}{\mu_2 + \mu_3} (1 - P_{2,1}) \log(1 - P_{2,1}) + \frac{\mu_3}{\mu_2 + \mu_3} (1 - P_{3,1}) \log(1 - P_{3,1}). \end{aligned}$$

Using these inequalities as well as the fact that

$$(P_{1,2} + P_{1,3}) \log(P_{1,2} + P_{1,3}) \geq P_{1,2} \log P_{1,2} + P_{1,3} \log P_{1,3}$$

we find that $H_{int} \leq H_{singletons}$.

Iterating on the number of states would give the result for N states. $\square$

Let us consider the set of partitions $X_{\pi_j} = \{\{\pi_j\}, \Pi \setminus \{\pi_j\}\}$ for all $\pi_j \in \Pi$.

The entropy rate of the corresponding process $\pi(X_{\pi_j})$ is:

$$H(\pi(X_{\pi_j})) = -\mu_j \left(P_{j,j} \log P_{j,j} + P_{j,-j} \log P_{j,-j}\right) - \mu_{-j} \left(P_{-j,j} \log P_{-j,j} + P_{-j,-j} \log P_{-j,-j}\right).$$

In the case where the process is i.i.d. so that $P_{ij} = P_j = \mu_j$. Under this assumption, the entropy rate simplifies into:

$$H(\pi(X_{\pi_j})) = -\mu_j \log \mu_j - (1 - \mu_j) \log(1 - \mu_j).$$

Note that

$$\lim_{\mu_j \to 1} H(\pi(X_{\pi_j})) = 0.$$

With a first order Markov process, we have that $\mu_j = P_{-j,j}/(P_{-j,j} + P_{j,-j})$. $\mu_j \to 1$ if and only if $P_{-j,j} \to 1$ and $P_{j,-j} \to 0$. As a result, we also find that $H(\pi(X_{\pi_j})) \to 0$ when $\mu_j \to 1$.

As a result, we obtain the following lemma:

Lemma B.2. *Suppose that there is a state that is sufficiently likely, μ_j close to 1, the* *entropy rate $H(\pi(X_{\pi_j}))$ is arbitrarily close to 0.*

B.2 Optimal consumption decision

Let us suppose that households have to choose the information structure that they use to make decision. A finer information structure comes at the cost of a higher information-processing cost.

At each date t, a household has to make a decision on consumption based on his inflation expectation $E_t\pi_{t+1}$. This inflation expectation takes value in Π and follows a Markov process as described above with a transition matrix $\{P_{i,j}\}$ and an ergodic distribution $\{\mu_j\}$.

We denote the ideal decision for consumption by $d^*(E_t\pi_{t+1})$. We denote the decision based on a partition $X \in \mathcal{P}(\Pi)$ by $d^*(E_t\pi_{t+1}(X))$. Of course, when the partition $X = \Pi$, we have $d^*(E_t\pi_{t+1}(\Pi)) = d^*(E_t\pi_{t+1})$.

$$\min_{X\in\mathcal{P}(\Pi)} Ea\left(d^*(E_t\pi_{t+1}(X)) - d^*(E_t\pi_{t+1})\right)^2$$
$$\text{s.t.} \quad \lim_{T\to\infty}\frac{1}{T}I(E_0\pi_1(X),\cdots,E_T\pi_{T+1}(X)) \le \kappa$$

with κ and a strictly positive constants. κ can be interpreted as the cognitive cost. The constraint is then a constraint on processing information on inflation expectation to decide on consumption.

By definition, $\lim_{T\to\infty}\frac{1}{T}I(E_0\pi_1(X),\cdots,E_T\pi_{T+1}(X))$ is the entropy rate. Based on the previous subsection's results, we find:

Proposition B.1. *Suppose that information-processing ability is sufficiently limited (κ sufficiently low) and that there exists a state π_j that is sufficiently likely, then the optimal information structure is the partition $X_{\pi_j} = \{\{\pi_j\}, \Pi \setminus \{\pi_j\}\}$.*

Proof. In steady state, for a partition X, let us compute $Ea\left(d^*(E_t\pi_{t+1}(X)) - d^*(E_t\pi_{t+1})\right)^2$:

$$Ea\left(d^*(E_t\pi_{t+1}(X)) - d^*(E_t\pi_{t+1})\right)^2 = a\sum_{X_i\in X}\sum_{\pi_j\in X_i}\mu_j\left(d^*(X_i) - d^*(\pi_j)\right)^2$$

Suppose that there exists a state π_j so that μ_j is arbitrarily low and κ is arbitrarily close to 0. By considering a partition X_{π_j}, one can find that $Ea\left(d^*(E_t\pi_{t+1}(X)) - d^*(E_t\pi_{t+1})\right)^2$ is arbitrarily close to 0, which is the minimum of this expression and, given Lemma B.2, this choice of partition satisfies the information processing constraint.

□

C Questionnaire

We here provide a translation of the full questionnaire of the survey. all socio demographic questions are only asked during the first interview and are pretty standard (age, occupation, diploma, income, number of members in the HH, marital status, region, city size...), the wording is not reported here. Since the wording of the questionnaire is harmonized across European Union countries, for the questions which are common to all countries, we use the wording of the UK survey (see https://ec.europa.eu/info/sites/info/files/questionnaires_uk_cons_en.pdf), the French version is highly similar. We have grouped questions by general topics (general eco. situation, prices, consumption/saving and own financial situation) and this order does not follow the actual order in which questions are asked to households.

General Economic Situation

Q1. How do you think the general economic situation in France has changed over the past 12 months? It has...

1. Got a lot better, **2.** Got a little better, **3.** Stayed the same, **4.** Got a little worse, **5.** Got a lot worse, **6.** Don't Know.

Q2. How do you expect the general economic situation in France to develop over the next 12 months? It will...

1. Get a lot better, **2.** Get a little better, **3.** Stay the same, **4.** Get a little worse, **5.** Get a lot worse, **6.** Don't Know.

Q3. How do you think the quality of life in France, as a whole has changed over the past 12 months? It has...

1. Got a lot better, **2.** Got a little better, **3.** Stayed the same, **4.** Got a little worse, **5.** Got a lot worse, **6.** Don't Know.

Q4. How do you expect the quality of life in France to develop over the next 12 months? It will...

1. Get a lot better, **2.** Get a little better, **3.** Stay the same, **4.** Get a little worse, **5.** Get a lot worse, **6.** Don't Know.

Q5. How do you expect the number of people unemployed in this country will change over the next 12 months? The number will...

1. Increase sharply, **2.** Increase slightly, **3.** Remain the same, **4.** Fall slightly, **5.** Fall sharply, **6.** Don't Know.

Prices

Q6. How do you think consumer prices have developed over the last 12 months? They have...

1. Risen a lot, **2.** Risen moderately, **3.** Risen slightly, **4.** Stayed about the same, **5.** Fallen, **6.** Don't Know.

(If answer different than "Stayed about the same" at Q6, ask:)

Q7. By how many percent do you think consumer prices have gone up/down over the past 12 months? Please give an estimate. Record up to one decimal place.
Consumer prices have increased/decreased by XX.X%

Q8. 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.

(If answer different than "Stayed about the same" at Q8, ask:)

Q9. By how many percent do you think consumer prices will go up/down over the next 12 months? Please give an estimate. Record up to one decimal place.
Consumer prices will increase/decrease by XX.X%

Consumption / Savings

Q10. 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, washing machines, electronic or computer equipment ...)?

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.

Q11. In view of the general economic situation, do you think that now is?

1. A very good time to save, **2.** A fairly good time to save, **3.** Not a good time to save, **4.** A very bad time to save, **5.** Don't know.

Q12. Over the next 12 months, how likely will you be to save any money?

1. Very likely, **2.** Fairly likely, **3.** Not likely, **4.** Not at all likely, **5.** Don't know.

Q13. Have you made any major purchases over the last 12 months? (washing machine, refrigerator, furniture, dishwasher, ...)

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

Q14. How likely are you to make major purchases over the next 12 months?

1. Very likely, **2.** Fairly likely, **3.** Not likely, **4.** Not at all likely, **5.** Don't know.

Q15. How likely are you to buy a car over the next 12 months?

1. Very likely, **2.** Fairly likely, **3.** Not likely, **4.** Not at all likely, **5.** Don't know.

Q16. Are you planning to buy or build a home over the next 12 months (to live in yourself, for a member of your family, as a holiday home, to let etc.)?

1. Very likely, **2.** Fairly likely, **3.** Not likely, **4.** Not at all likely, **5.** Don't know.

Q17. How likely are you to spend any large sums of money on home improvements or renovations over the next 12 months?

1. Very likely, **2.** Fairly likely, **3.** Not likely, **4.** Not at all likely, **5.** Don't know.

Own Financial Situation

Q19. Which of these statements best describes the current financial situation of your household?

1. We are saving a lot, **2.** We are saving a little, **3.** We are just managing to make ends meet on our income, **4.** We are having to draw on our savings, **5.** We are running into debt, **6.** Don't know.

Q20. How has the financial situation of your household changed over the last 12 months? It has...

1. Got a lot better, **2.** Got a little better, **3.** Stayed the same, **4.** Got a little worse, **5.** Got a lot worse, **6.** Don't Know.

Q21. How do you expect the financial position of your household to change over the next 12 months? It will...

1. Get a lot better, **2.** Get a little better, **3.** Stay the same, **4.** Get a little worse, **5.** Get a lot worse, **6.** Don't Know.

D Additional evidence

D.1 Statistics on response rates

As illustrated by Table D.1, non-response rates are very low for the questions regarding one's household own consumption (less than 1% in general). There is less frequent answer to the questions on the right time to make purchases of durable goods in general (the non-response rate is about 5%).

Table D.2 provides estimates of a qualitative model of the main determinants of the non-response probability for the quantitative questions on inflation expectations (as well as perceptions). Households with a higher income and better educated are more likely to respond. Older people and women are more likely not to respond.

Table D.1: Non-response Rates (in %) to Price and Consumption Questions

	Non-Response		
	Quali.	Quanti.	Outlier ($\geq$ 10%)
Perceived Inflation	0.96	52.21	29.60
Expected Inflation	5.22	59.83	21.88
Right Time to Purchase	4.05	-	-
Own Major Purchase			
Past 12 Months	0.07	-	-
Next 12 Months	0.75	-	-
Car - Next 12 Months	0.21	-	-

Note: this table reports the percentage of non-response calculated as the ratio between the number of households who answer "do not know" to a question. We also report the percentage of outliers or implausible values for quantitative inflation expectations, we set a threshold at 10% of inflation and the percentage is calculated as the number of answers above or equal to 10% over the total number of answers (among households answering to the question).

Table D.2: Determinants of Non-Response / Outliers to Quantitative Price Questions - Marginal Effects

		Non-Response		Outlier (more than 10%)	
		Perception	Expectation	Perception	Expectation
HH Income	$[Q1; Q2]$	-1.460***	-0.786***	-5.242***	-5.452***
(Ref: $< Q1$)		(0.214)	(0.210)	(0.424)	(0.488)
	$[Q2; Q3]$	-3.182***	-1.328***	-8.922***	-9.292***
		(0.242)	(0.228)	(0.452)	(0.514)
	$> Q3$	-5.390***	-1.750***	-15.629***	-14.969***
		(0.272)	(0.250)	(0.472)	(0.529)
Education	Secondary	-5.255***	-2.230***	0.631	0.356
(Ref: Primary)		(0.224)	(0.228)	(0.428)	(0.486)
	Further	-6.833***	-2.904***	-3.158***	-3.171***
		(0.226)	(0.228)	(0.420)	(0.474)
Age	30-49	1.162***	-0.015	-0.422	-1.908***
(Ref: 16-29)		(0.373)	(0.312)	(0.594)	(0.646)
	50-64	2.579***	1.049***	-2.407***	-3.233***
		(0.377)	(0.318)	(0.607)	(0.663)
	65+	8.782***	2.676***	-6.646***	-7.708***
		(0.447)	(0.392)	(0.732)	(0.789)
Gender	Female	5.643***	1.750***	10.441***	8.988***
(Ref: Male)		(0.180)	(0.165)	(0.317)	(0.350)
Occupation	No, Unemployed	-1.726***	0.211	3.567***	2.963***
(Ref: Yes)		(0.610)	(0.568)	(1.030)	(1.094)
	No Retired	-0.367	0.076	-1.996**	-0.862
		(0.450)	(0.440)	(0.790)	(0.869)
	No Inactive	3.217***	0.908**	3.249***	1.805**
		(0.414)	(0.407)	(0.732)	(0.782)
HH Size	2	-1.224***	-0.384	3.997***	3.774***
(Ref = 1)		(0.317)	(0.292)	(0.515)	(0.533)
	3	-1.595***	0.050	6.459***	5.150***
		(0.358)	(0.326)	(0.584)	(0.604)
	> 3	-1.499***	0.532	8.407***	7.585***
		(0.376)	(0.343)	(0.617)	(0.645)
Survey Wave	2	0.196	-0.763***	-4.398***	-3.520***
(Ref: 1)		(0.281)	(0.263)	(0.499)	(0.545)
	3	0.240	1.279***	-6.057***	-4.376***
		(0.342)	(0.316)	(0.597)	(0.649)
Controls		Yes	Yes	Yes	Yes
Obs		262,113	211,674	126,378	211,674

Note: this table reports marginal effects (in percentage points) from Probit regressions where the endogenous variable is a dummy variable taking the value 1 in case on non-response to the quantitative price question. Control variables include date dummies, household characteristics (age, location (city, region) diploma, job, income, survey wave (1,2 or 3). *p<0.1; **p<0.05; ***p<0.01.

D.2 Descriptive statistics on qualitative and quantitative inflation expectations

Table D.3: Inflation Expectations: Qualitative vs. Quantitative Answers

	Quantitative answers				
	%	Mean	Q1	Q2	Q3
Qualitative answers					
Increase more rapidly	9.1	4.93	3	4.5	7
Increase at the same rate	44.6	4.35	2	3.5	5
Increase at a slower rate	13.8	3.15	2	2.5	4.5
Stayed about the same	26.1	0	0	0	0
Fall	1.2	-3.59	-5	-2	-1
Don't know	5.2	-	-	-	

Note: this table reports the main statistics on quantitative inflation expectations according to the answer given to the qualitative question on inflation expectation. The first column reports the share of households answering to the different qualitative categories. The second to fifth columns report the moments of the distribution of quantitative inflation expectations conditional on providing a given answer to the qualitative question.

D.3 The contribution of large expectations to the average inflation expectations

In this appendix, we document how large inflation expectations (more than 10%) contribute to the average inflation expectations, both to its mean value and to the correlation with headline inflation.

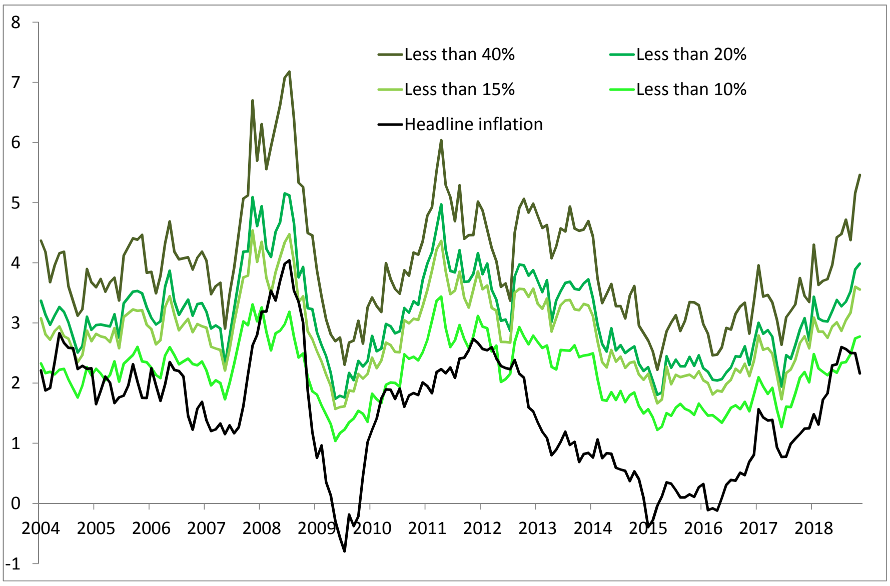
In Table D.4, we present simple statistics on the average inflation expectation when we exclude sufficiently large individual expectations. In Figure D.1, we plot the resulting graphs over the time period of our sample.

Table D.4: Simple Statistics on Inflation Expectations - Implausible Values

	Aggregate Moments	Correlation with Headline π	Correlation with π excl. Energy
Less than 40%	3.96 (0.97)	0.77	0.62
Less than 20%	3.12 (0.74)	0.79	0.59
Less than 15%	2.83 (0.65)	0.79	0.57
Less than 10%	2.15 (0.52)	0.77	0.54

Note: this table reports simple statistics calculated using individual answers to the quantitative question on inflation expectations. We first calculate statistics date by date and then compute the average of this time series. Each line corresponds to a specific restriction defining our sample used for the calculation. 'Less than 40%' means that we only consider inflation expectations less than 40%.

Figure D.1: Aggregate Inflation Expectation - Sensitivity to Outlier Definition

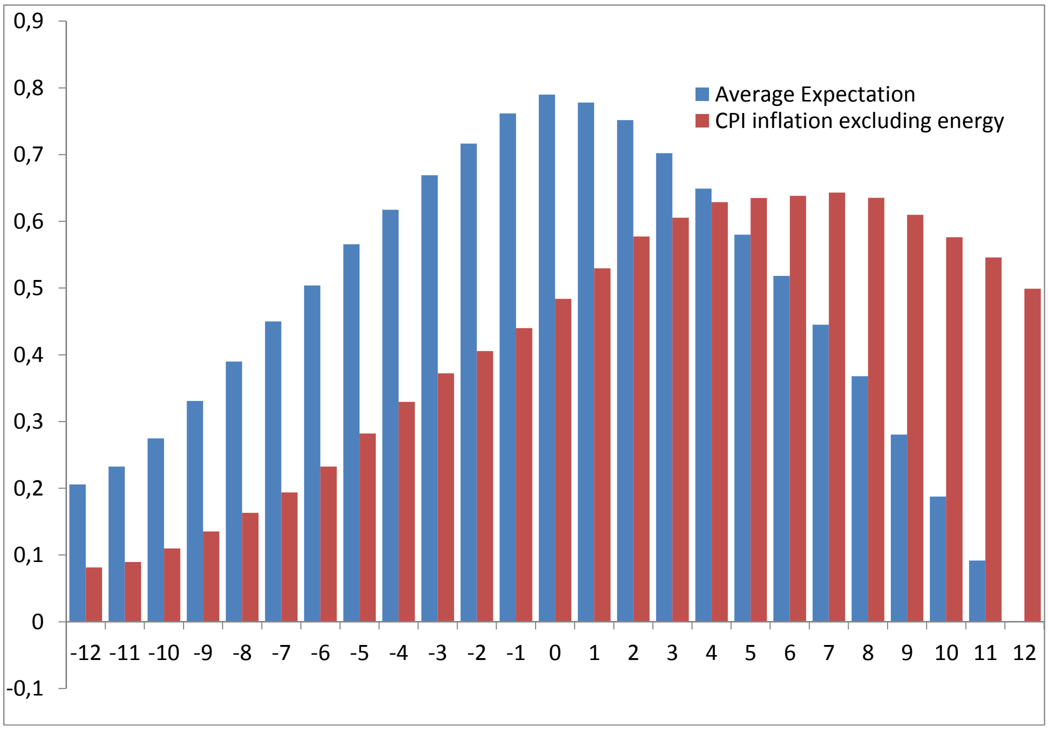


Note: using answers to the quantitative questions on inflation expectations, we have computed the simple average of all answers date by date. Each green line corresponds to a specific restriction defining our sample used for the calculation. 'Less than 40%' means that we only consider inflation expectations less than 40%.

D.4 Dynamic correlations

Inflation expectations Figure D.2 shows the dynamic correlations between the average expected rate of inflation with the actual headline or core inflation rates. The maximum correlation of average expectation with inflation is obtained for dates t - $t+1$. Part of this correlation comes from large fluctuations of energy prices but even when we exclude energy prices, this correlation is still quite strong (about 0.6). In terms of dynamic correlations, the largest correlation is obtained for dates between $t+3$ and $t+6$. Excluding large inflation expectations does not modify this strong correlation between average expectation and actual inflation as shown by Figure D.1 and Table D.4.

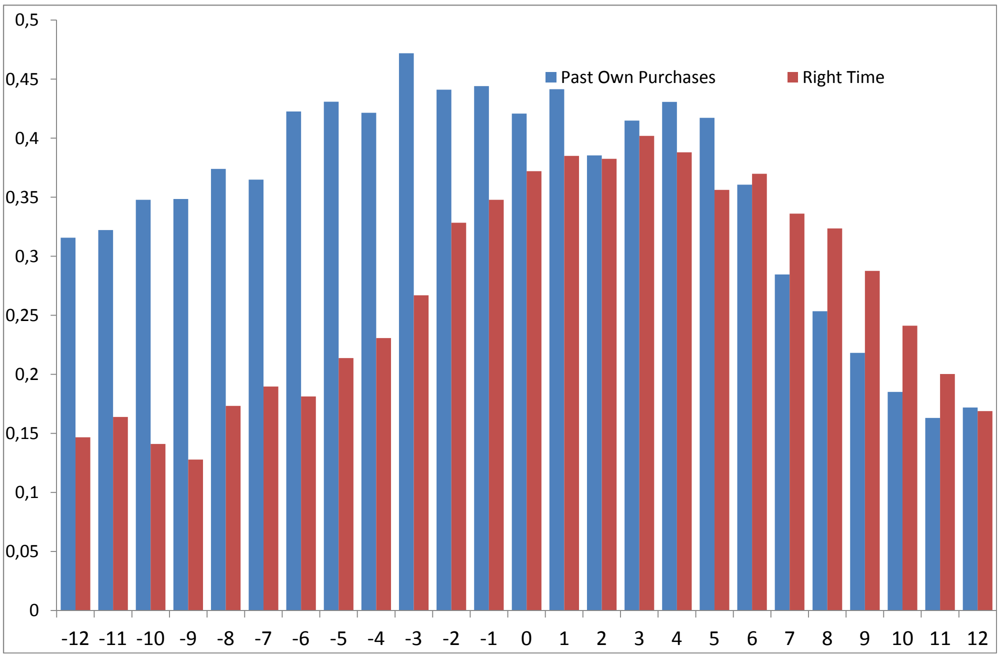
Figure D.2: Dynamic Correlation Between Inflation and Average Inflation Expectation



Note: we have first computed date by date the simple average answer to the quantitative questions on inflation expectations. This figure plots the dynamic correlation between the average expected rate of inflation and actual headline CPI inflation / CPI inflation excluding energy. Dynamic correlations are calculated using lagged and forwarded values of actual inflation (between t-12 months until t+12 months).

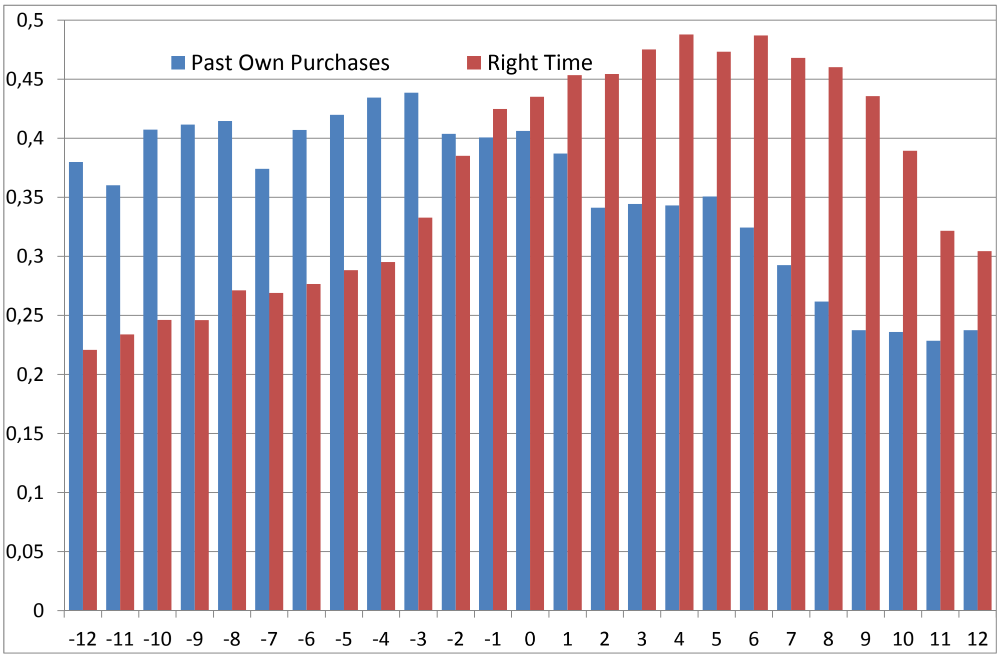
Durable consumption Figures D.3 and D.4 plot the dynamic correlation between actual durable consumption growth rate and the share of individuals answering positively to survey questions on consumption. The correlation between aggregate durable consumption growth is a little higher for the lagged series of past own purchase decisions whereas for the question "Right time to purchase", the maximum correlation with aggregate consumption growth is obtained at $t+6$, suggesting that the question 'right time to purchase' captures better intentions of future purchases. The main conclusions are quite similar if we look at the correlation with aggregate consumption growth excluding transport equipment.

Figure D.3: Dynamic Correlation Between Aggregate Actual Durable Expenditures and Aggregate Answers on Durable Expenditure in the Survey



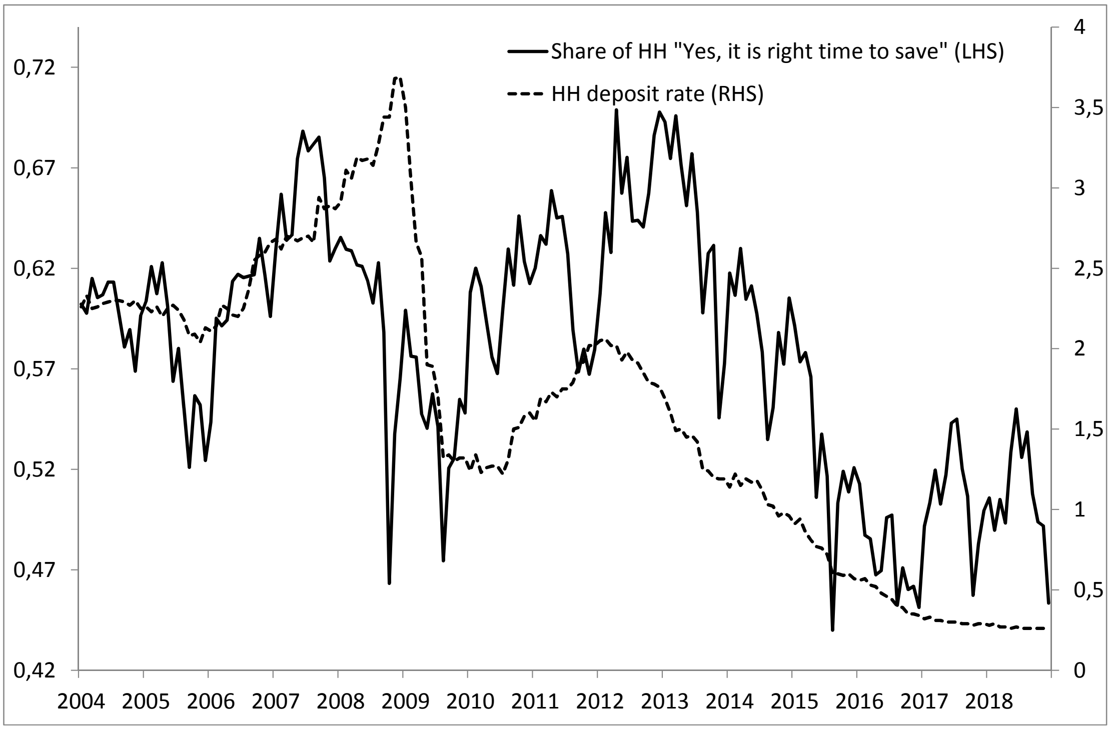
Note: we have first calculated date by date the proportion of individuals answering: Yes to the question "Over the last 12 months, have you made durable expenditures?", and Yes to the question, "Is it the right time to make large purchases?". Then, we have calculated the correlation between these time-series of share of individuals answering Yes to questions on durable consumption and the annual growth rate of monthly durable expenditures (source Insee). Dynamic correlations are calculated using lagged and forwarded values of the actual growth rate of durable consumption between t-12 months and t+12 months.

Figure D.4: Dynamic Correlation Between Aggregate Actual Durable Consumption (excluding Cars) and Aggregate Answers on Durable Expenditure in the Survey



Note: we have first calculated date by date the proportion of individuals answering: Yes to the question "Over the last 12 months, have you made durable expenditures?", and Yes to the question, "Is it the right time to make large expenditures?". Then, we have calculated the correlation between these time-series of share of individuals answering Yes to questions on durable consumption and the annual growth rate of monthly durable expenditures (source Insee). Dynamic correlations are calculated using lagged and forwarded values of the actual growth rate of durable consumption between t-12 months and t+12 months.

Figure D.5: Right Time to Save and the Deposit Interest Rate



Note: we have calculated date by date the share of households answering "'Yes, this is the right time for people to save"' using individual answers of survey and we plot the monthly nominal interest on households' short-term deposits over the same period (source: Banque de France)

Table D.5: Simple Statistics on Inflation Expectations - Multiple of 5

	Aggregate Moments	Correlation with Headline π	Correlation with π excl. Energy
Average	2.81	0.79	0.57
% of Stable Prices	0.33	-0.66	-0.36
% of Multiple of 5	0.20	0.72	0.50
% of Other Answers	0.47	0.52	0.20
Average Size - Multiple of 5	6.75	-0.06	-0.06
Average Size - Other Answers	3.10	0.74	0.74

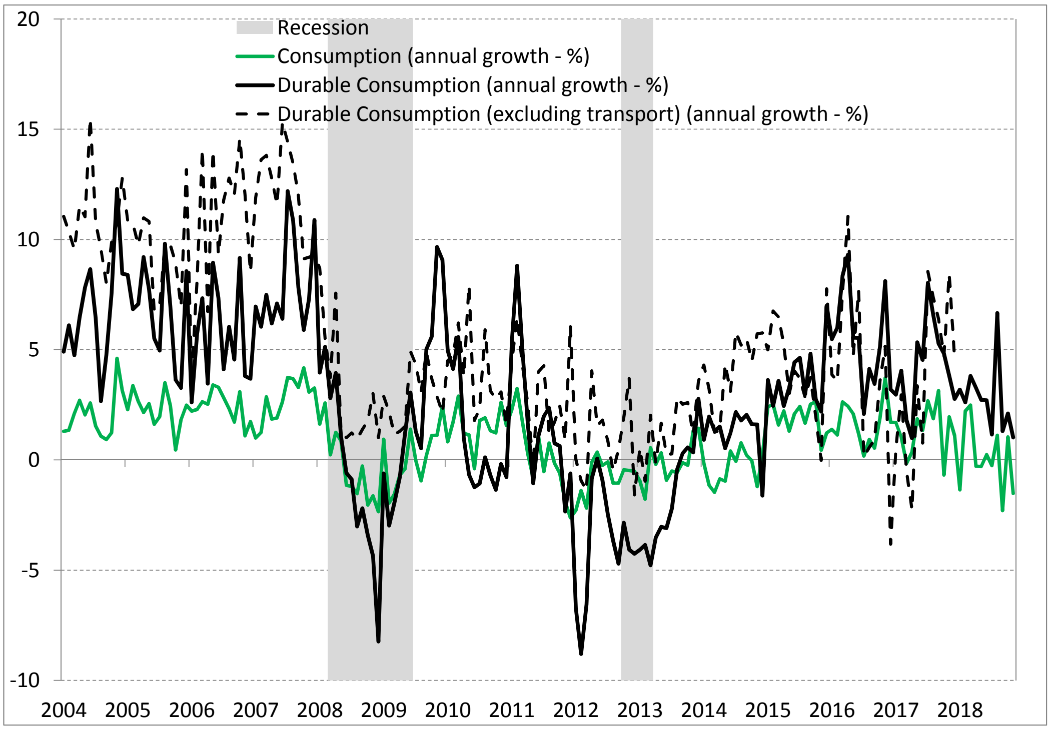
Note: this table reports simple statistics calculated with answers to the quantitative question on inflation expectations.

Table D.6: Simple Statistics on Inflation Expectations - Multiple of 5 HH Heterogeneity

		Share of Answers - in %		
		Stable Prices	Multiple of 5	Other Answers
Gender	Male	22.0	14.9	63.1
	Female	25.9	15.7	58.4
Age	16-29	21.4	18.8	59.8
	30-49	20.7	17.9	61.4
	50-64	21.3	15.9	62.8
	65+	27.9	10.9	61.3
Education	Primary	33.4	11.8	54.8
	Secondary	21.7	16.0	62.2
	Further	20.8	15.7	63.5
HH Income	$< Q1$	29.1	14.4	56.5
	$[Q1; Q2]$	23.5	15.3	61.3
	$[Q2; Q3]$	20.3	16.4	63.3
	$> Q3$	21.4	14.4	64.2

Note: for each household category, we have computed the share of answers equal to 0, equal to a multiple of 5 (excluding 0) and different from 0 and multiple of 5 among all quantitative answers to the question on inflation expectations over the next 12 months.

Figure D.6: Aggregate Consumption Growth in France - Total and Durables



Note: Annual growth rate of household consumption of goods (including, food, manufactured goods and energy), durables (including transport equipment, housing equipment and other durables), durables excluding transport equipment (source Insee)

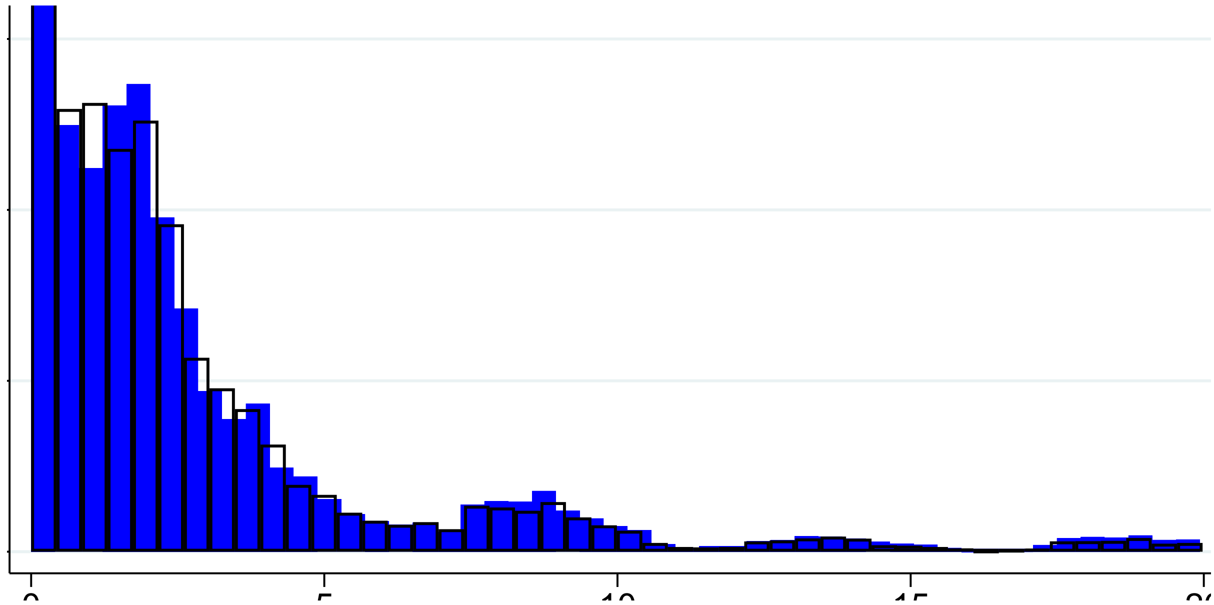
Table D.7: Distribution of Durable Consumption 2005-2011

	Year	Freq.	Moments - in euros			
			Q1	Q2	Q3	P90
Overall						
	2005	0.59	340	740	1559	2941
	2011	0.62	400	749	1450	2605
Home Appliances	2005	0.27	270	458	744	1213
	2011	0.30	280	422	700	1103
TV, computers, phones...	2005	0.35	200	416	990	1600
	2011	0.41	269	500	850	1370
Furniture	2005	0.30	240	531	1260	2846
	2011	0.28	270	549	1200	2570

Note: this table reports some moments of the distribution of durable spending over a year. Individual data comes from the survey "Enquete Budget des Familles", every 5 years Insee collects individual data on consumption for more than 10,000 households, HH report their durable spending over the last 12 months, product by product. We have dropped individual product spending less than 100 euros. We have calculated for every household in the survey the total durable spending. Freq. reports the share of households reporting durable spending over the last 12 months. The four last columns report moments of the distribution conditional of having reported a positive durable consumption.

D.5 Additional Regressions - Forecast Error and Purchases

Figure D.7: Distribution of Forecast Errors by Anwer to the Question on Own Durable Purchase



Note: we have calculated the difference in absolute value between the quantitative expectation of inflation (over the next 12 months) with the actual value of inflation 12 months after the date of the survey. This figure plots the distribution of this error forecast according to the answer to the question "Did you make major purchases over the last 12 months?" (Yes / No).

Table D.8: Effect of Durable Consumption Decisions on Forecast Errors

	All (1)	Less than p99 (2)	All (3)
Yes, Durable Purchase	0.013	0.014	0.018
	(0.012)	(0.012)	(0.012)
Perception error	-	-	0.320***
			(0.004)
Controls	Yes	Yes	Yes
Obs.	141,123	134,093	136,574

Note: this table reports fixed effect panel regressions where the endogenous vairable is the log difference between household level inflation expectation at date t for the horizon t+12 and the actual inflation at date t+12; exogenous variables include a dummy variable equal to 1 if the household answers Yes to the question "Did you make major purchases over the last 12 months?" and the perception error which is the log difference between perceivezd inflation at date t and actual inflation at date t, we have included controls for date and household fixed effects. Standard errors are clustered at the date level. *p<0.1; **p<0.05; ***p<0.01.

D.6 Additional Regressions - Panel Dimension

Panel construction - Methodology

Each household is surveyed at maximum during three consecutive months but the survey does not contain any household identifier provided by the statistical office.

To construct the unique household identifier, we use all the variables describing the characteristics of the head of household (location (region, size of the city), gender, year of birth, education, but also the same characteristics for the partner and also varaibles describing the composition of the household. We consider that 3 observations are associated with the same household over time if all these variables characterizing the household are the same over the period.

This identification of household through time might quite conservative, in particular if over the 3-month period some characteristics changed. Overall, we find that our sample contains about 159,000 different households, 66,475 are surveyed three times, 39,492 twice and 52,771 only once.

Table D.9: Marginal Effects of Inflation Expectations on Own Major Purchases Over the Last 12 Months: Qualitative Answer - Panel Regressions

	Fixed Effect Logit		Random Effect Probit	
	(1)	(2)	(3)	(4)
$\pi^e \neq 0$	0.551		0.584***	
	(0.383)		(0.179)	
Increase more rapidly		0.744		1.040***
		(0.648)		(0.294)
Increase at the same rate		0.556		0.531***
		(0.448)		(0.198
Increase at a slower rate		0.937*		0.951***
		(0.553)		(0.245)
Stay about the same		Ref.		Ref.
Fall		-0.033		0.578
		(1.430)		(0.670)
DK		-0.552		-0.775*
		(0.926)		(0.412)
Controls	Yes	Yes	Yes	Yes
Obs.	71,099	71,099	312,921	312,921

Note: this table reports marginal effects (in percentage points) from Panel Probit regressions with Random HH effects and Conditional logit where the endogenous variable is a dummy variable equal to 1 if the household 'YES' to the question "Have you made major purchases during the last 12 months?". Control variables include year and month dummies, (when including random effects: household characteristics (age, location (city, region) diploma, job, income), but also survey wave (1,2 or 3), answers to other question on French economic conditions (standard living, unemployment...), answer to the question about future plans for major purchases, right time to save and perceived inflation. *p<0.1; **p<0.05; ***p<0.01.

Table D.10: Marginal Effects of Inflation Expectations on Consumption - Past Purchases - By Interview

	1	2	3
π^e Quantitative	0.182**	0.278***	0.138
	(0.084)	(0.107)	(0.126)
π^e Quanti. by intervals:			
$[10\%; +\infty[$	0.267	0.514	-1.393
	(0.759)	(1.072)	(1.181)
$[5\%; 10\%[$	1.237*	2.204***	1.073
	(0.699)	(0.818)	(0.983)
$[3\%; 5[$	1.304**	1.955**	-0.016
	(0.655)	(0.795)	(0.973)
$]0\%; 3\%[$	1.623**	1.413*	0.208
	(0.632)	(0.741)	(0.838)
0%	Ref.		
$< 0\%$	0.862	-0.429	-2.831
	(1.801)	(2.513)	(2.766)
π^e Quali. - Increase	1.166**	1.421**	0.053
	(0.466)	(0.567)	(0.641)
π^e Quali - by intervals:			
Increase more rapidly	1.271**	2.303***	1.813**
	(0.494)	(0.614)	(0.754)
Increase at the same rate	0.456	1.326***	0.386
	(0.321)	(0.396)	(0.461)
Increase at a slower rate	1.294***	1.195***	1.285**
	(0.438)	(0.458)	(0.558)
Stay about the same	Ref.		
Fall	0.556	1.231	0.940
	(1.094)	(1.408	(1.968)
Controls	Yes	Yes	Yes
Obs.	149,203	100,407	63,311
Obs.	62,839	44,814	28,921

Note: this table reports marginal effects from Ordered Probit regressions is a dummy variable equal to 1 if the household answers Yes to the question "Did you make major purchases over the last 12 months?". Marginal effects are calculated for the value "Yes, definitely". Control variables include year and month dummies, household characteristics (age, location (city, region) diploma, job, income, survey wave (1,2 or 3), answers to other question on French economic conditions (standard living, unemployment...), answer to the question about future plans for major purchases and perceived inflation. Standard errors are clustered at the date level. *p<0.1; **p<0.05; ***p<0.01.

Table D.11: Marginal Effects of Inflation Expectations on Consumption - Right Time to Purchase - By Interview

	1	2	3
π^e Quantitative	0.056	0.032	0.141*
	(0.053)	(0.059)	(0.077)
π^e Quanti. by intervals:			
$[10\%; +\infty[$	0.006	-0.628	0.400
	(0.429)	(0.552)	(0.679)
$[5\%; 10\%[$	0.794**	0.206	1.764***
	(0.402)	(0.433)	(0.561)
$[3\%; 5[$	1.227***	0.581	1.969***
	(0.409)	(0.492)	(0.557)
$]0\%; 3\%[$	0.974**	0.666*	0.878*
	(0.417)	(0.386)	(0.521)
0%	Ref.		
$< 0\%$	0.043	-0.920	0.824
	(1.222)	(1.565)	(1.647)
π^e Quali. - increase	0.718**	0.183	1.104***
	(0.277)	(0.314)	(0.374)
π^e Quali - by intervals:			
Increase more rapidly	0.036	-0.313	0.259
	(0.301)	(0.348)	(0.402)
Increase at the same rate	0.327*	0.194	0.355
	(0.194)	(0.222)	(0.267)
Increase at a slower rate	1.010***	0.658**	0.445
	(0.243)	(0.274)	(0.360)
Stay about the same	Ref.		
Fall	0.152	-0.142	1.049
	(0.723)	(0.863)	(1.181)
Controls	Yes	Yes	Yes
Obs.	143,320	97,313	61,643
Obs.	61,505	44,086	28,526

Note: In this table, we report marginal effects 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 'It is neither the right time nor the wrong time', 2 '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". Control variables include year and month dummies, household characteristics (age, location (city, region) diploma, job, income, survey wave (1,2 or 3), answers to other question on French economic conditions (standard living, unemployment...), answer to the question about future plans for major purchases and perceived inflation. Standard errors are clustered at the date level. *p<0.1; **p<0.05; ***p<0.01.

E Germany

DATA SET

We use the underlying individual data from the monthly consumer confidence survey conducted by GFK in Germany. This survey is part of the harmonized European household confidence indicators released by the European Commission for all countries in the European Union. The micro data are collected at a monthly frequency over the period January 2004 – December 2018.[19] Every month about 2,000 interviews are carried out via phone calls. The sample contains a little more than 360,000 individual observations over the 15-year period, i.e. about 2,000 observations per month on average. The questionnaire is very similar to the French questionnaire except that the German questionnaire does not include any question on the houshold's own consumption of durables.

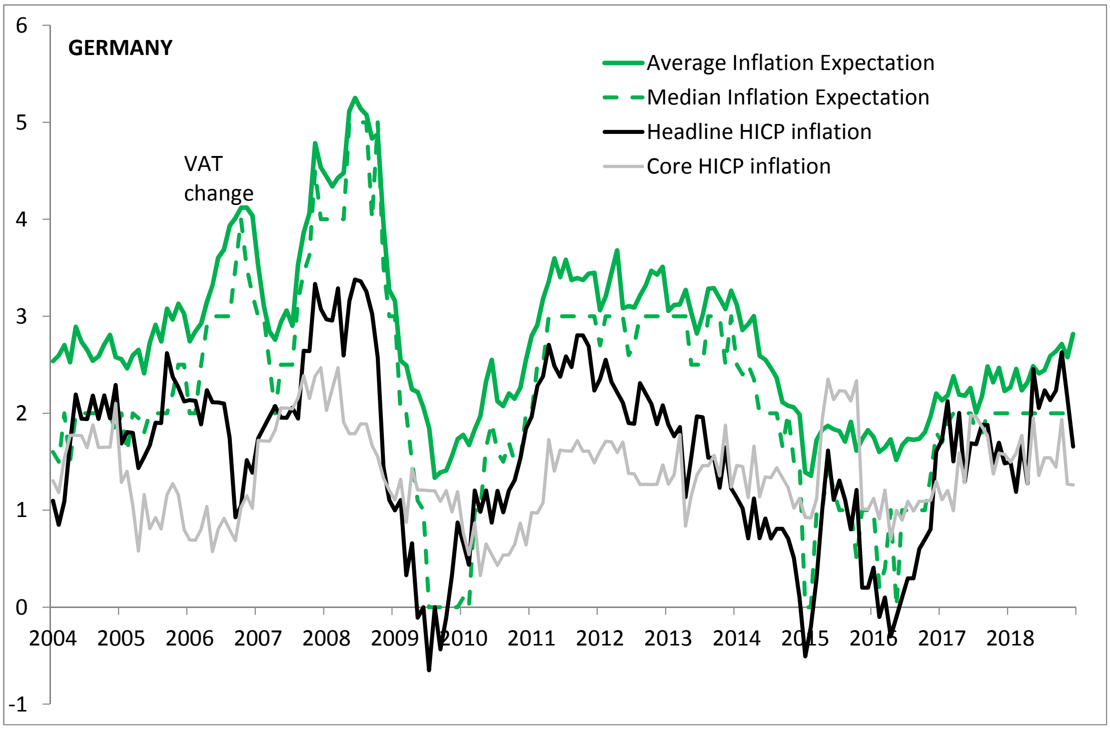
Table E.1: Simple Statistics on Inflation Expectations

	Aggregate Moments	Correlation with Headline π	Correlation with π excl. Energy
Average Expectation	2.76 (0.84)	0.75	0.30
% of Stable Prices	0.31 (0.10	-0.76	-0.31
Average of non-zero inflation	3.91 (0.65)	0.72	0.25

Note: In this table, we report simple statistics calculated using individual answers to the quantitative question on inflation expectations. We first calculate statistics date by date and then compute the average of this time series. The first column reports simple average of the time series. Second and third columns report correlation coefficients of the aggregate moment calculated date by date and the headline HICP inflation (source Eurostat) and HICP inflation excluding energy and unprocessed food (source Eurostat). "Average" is the simple average of all answers (including zeros) to the quantitative question. "% of Stable Prices" is the average proportion of answers exactly equal to 0. "Average of Non-Zero Inflation" is the average of inflation expectations when not equal to 0.

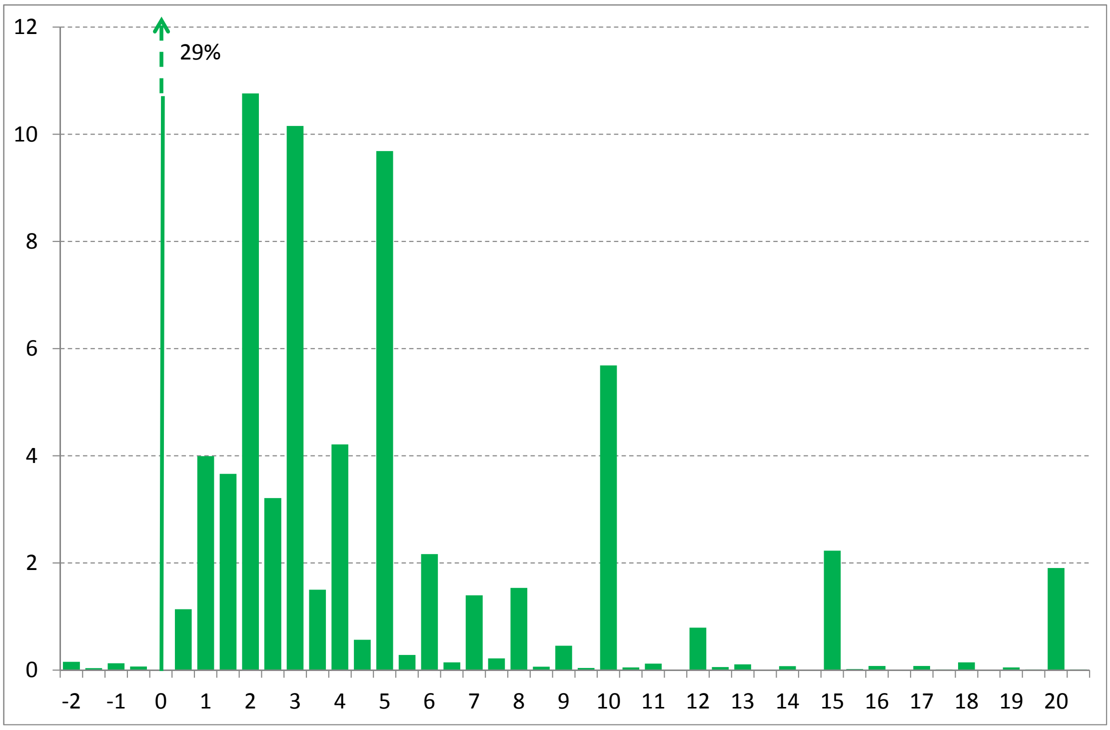
[19] Between Aug and Oct. 2007, quantitative answers to inflation are not available.

Figure E.1: Expected Inflation and Headline HICP inflation



Note: using answers to the quantitative questions on inflation expectations (we have dropped quantitative inflation perceptions larger than 20%), we have computed the simple average/median of all answers date by date. Between Aug to Oct 2007, quantitative answers are not available, we have replaced aggregate statistics by a simple interpolation. We have also plotted as benchmarks headline HICP inflation (source Eurostat) and HICP inflation excluding energy (source Eurostat).

Figure E.2: Cross Distribution of Inflation Expectations



Note: we here represent the distribution of inflation expectations across households computed over the period Jan. 2004 - Dec. 2017. The proportion of answers above 20% is not reported. The distribution is unweighted.

Table E.2: Aggregate Expectation Time Variations: Extensive vs Intensive Margins

	Variance	Intensive margin	Extensive margin	
			Freq.	Cov.
All	0.69	0.20	0.16	0.33
Low inflation	0.64	0.17	0.20	0.27
High inflation	0.75	0.23	0.11	0.41

Note: Variance decomposition exercise; col (1) time variance of aggregate inflation expectation; col(2) contribution of the intensive margin (ie. non-zero average inflation expectation) ; cols (3) and (4) contribution of the extensive margin decomposed into variance of the frequency of positive inflation expectations and into the covariance between the average non-zero inflation expectation and the frequency of positive inflation expectations. Low inflation: HICP (headline) below the median inflation over the period; High inflation: headline inflation above the median inflation

Table E.3: Stylised Facts on Durable Consumption

	Frequency	Corr. with consumption	
		Overall	Durables
Right Time to Purchase			
Yes	0.25	0.46	0.28
Neutral	0.58	0.06	0.16
No	0.17	-0.45	-0.16

Note: in this table we report simple aggregate statistics using the answers to the questions on durable consumption. We first compute the average proportion of answers in every answer category date by date and then compute the average of these time series. The first column reports the average proportion of answers in a given category. The other columns report correlation over time of the proportion of answers in a given category and annual growth rate of: col 2. overall quarterly consumption, col 3. durable expenditures.

Table E.4: Marginal Effects of Inflation Expectations on Right Time to Purchase: Germany

	All	Excl. outliers	Excl. 0	Extensive	Quali.
π^e	-0.073***	-0.118***			0.144*
	(0.019)	(0.018)			(0.074)
$\pi^e \neq 0$			0.832***		
			(0.277)		
π^e by intervals:					
$[10\%; +\infty[$				0.128	
				(0.474)	
$[5\%; 10\%[$				1.134***	
				(0.402)	
$[3\%; 5\%[$				1.710***	
				(0.251)	
$]0\%; 3\%[$				2.364***	
				(0.380)	
0%				Ref.	
$< 0\%$				2.620**	
				(1.144)	
Controls	Yes	Yes	Yes	Yes	Yes
Obs.	256,540	182,714	256,540	256,540	217,308

Note: In this table, we report marginal effects (in percentage points) from Ordered Probit regressions where the endogeneous variable is a variable taking 3 different values 0 if the household answers 'No, it is the wrong time', 1 'It is neither the right time nor the wrong time', 2 '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". Control variables include year and month dummies, household characteristics (age, location (city, region) diploma, job, income, survey wave (1,2 or 3), answers to other question on German economic conditions (standard living, unemployment...), answer to the question about future plans for major purchases, right time to save and perceived inflation. Standard errors are clustered at the date level. *p<0.1; **p<0.05; ***p<0.01.

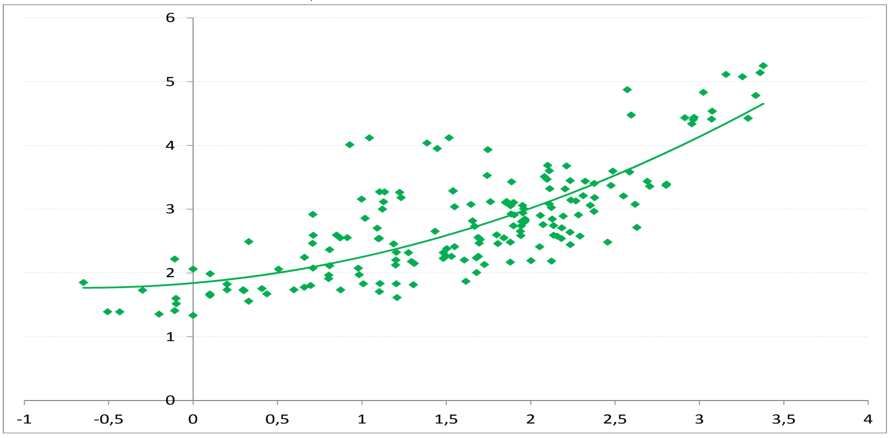
Table E.5: Marginal Effects of Inflation Expectations on Right Time to Purchase: Germany excluding VAT change

	All	Excl. 0	Extensive	Quali.	Excl. outliers
π^e	-0.101***	-0.140***			-0.032
	(0.017)	(0.017)			(0.054)
$\pi^e \neq 0$			0.377		
			(0.244)		
π^e by intervals:					
$[10\%; +\infty[$				-0.819**	
				(0.372)	
$[5\%; 10\%[$				0.233	
				(0.314)	
$[3\%; 5\%[$				0.950***	
				(0.313)	
$]0\%; 3\%[$				2.530***	
				(0.296)	
0%				Ref.	
$< 0\%$				2.429**	
				(1.136)	
Controls	Yes	Yes	Yes	Yes	Yes
Obs.	241,294	170,269	241,294	241,294	205,053

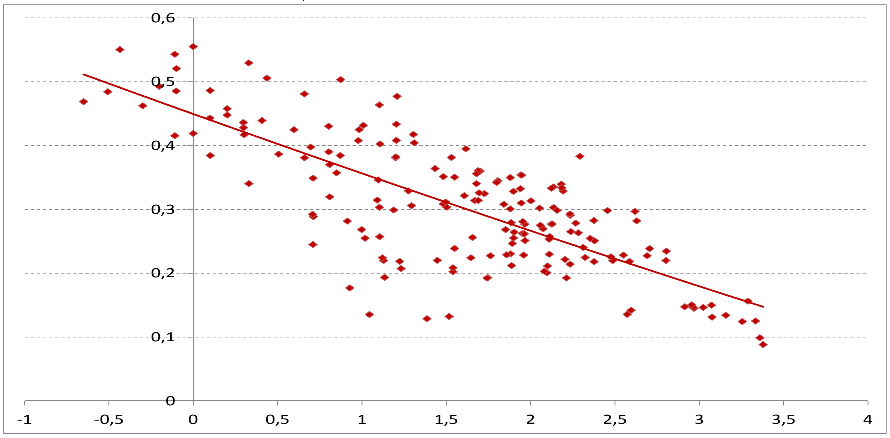
Note: In this table, we report marginal effects (in percentage points) from Ordered Probit regressions where the endogeneous variable is a variable taking 3 different values 0 if the household answers 'No, it is the wrong time', 1 'It is neither the right time nor the wrong time', 2 'Yes, now is the 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". Control variables include year and month dummies, household characteristics (age, location (city, region) diploma, job, income, survey wave (1,2 or 3), answers to other question on German economic conditions (standard living, unemployment...), answer to the question about future plans for major purchases, right time to save and perceived inflation. Standard errors are clustered at the date level. *p<0.1; **p<0.05; ***p<0.01.

Figure E.3: Share of Stable Prices, Average Non-Zero Expected Inflation and Headline CPI Inflation

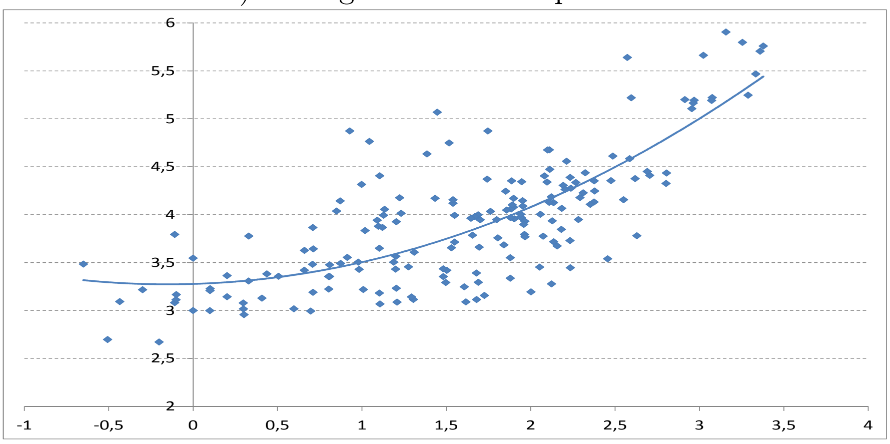
a) Average Expectation



b) Share of Stable Prices

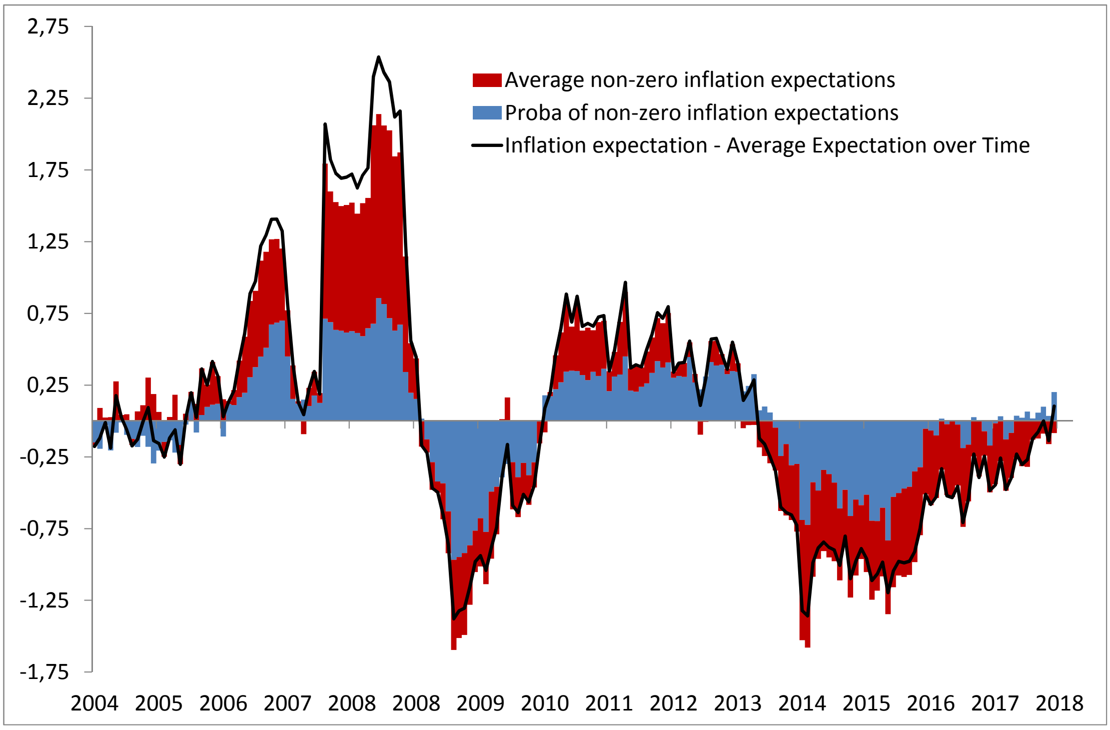


c) Average Non-Zero Expectation



Note: Panel (a) is the scatter plot of average expectation and headline CPI inflation (monthly data). Panel (b): we have first computed date by date the proportion of individuals reporting expected stable prices (i.e. 0% inflation), (b) is the scatter plot of this monthly proportion and headline CPI inflation. In red, each dot represents the share of individual answering expecting stable prices over the next 12 months for a given month (and so inflation rate). The red line is simple polynomial of degree 2 fitting the data. Panel (c): we have computed the average inflation expectation (when individuals do not answer stable prices) date by date. The figure is the scatter plot of this monthly average and headline CPI inflation.

Figure E.4: Aggregate Inflation Expectations Decomposition - Extensive vs Intensive Margins



Note: Contributions to aggregate inflation expectations. Black line: aggregate average expected inflation - mean aggregate average expected inflation; blue histogram: contribution of time variations of the probability of non-zero answers (extensive margin); red histogram: contributions of time variations in the average expected inflation (intensive margin).