Salient Price Changes, Inflation Expectations, and Household Behavior*

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Abstract

How do households form their inflation expectations? We show the price changes individual consumers observe while shopping are a key determinant of their expectation for overall inflation. We use individual non-durable consumption choices in the Nielsen Homescan Panel to construct household-level measures of perceived inflation. We find perceived price changes help explain inflation expectations across individuals and within individuals over time. The frequency of purchases not the expenditure share determines the importance of perceived price changes for inflation expectations. The effect is stronger for individuals that shop less frequently, and hence are more likely exposed to several and larger price changes in their typical shopping trip. The effect is also stronger for individuals whose uncertainty about inflation is higher and who self report to not rely on the media when forming expectations. Because individual inflation expectations shape economic decisions, central banks' focus on core inflation instead of the heterogeneous price changes in households' non-durable bundles might lead to systematic policy mistakes.

JEL classification: C90, D14, D84, E31, E52, G11

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With trips to [...] the grocery store being some of the most frequent shopping experiences for many Americans, it is hardly helpful for the Fed credibility to appear to exclude all those prices from consideration in the formation of monetary policy.

– J. Bullard, President of the St. Louis Fed, 2011

I Introduction

Inflation expectations are central to many economic choices, from consumption and savings decisions, to portfolio allocations, as well as the uptake of mortgages. Inflation expectations also matter for the effectiveness of fiscal and monetary policy, especially in times of low interest rates. Although inflation for representative consumption baskets has been low and stable in most developed countries for decades and central banks often adopt inflation targets to anchor expectations, large dispersion exists in households' inflation expectations. Twelve-month ahead numerical expectations range between as high as 50% to as low as -30% (Bachmann, Berg, and Sims (2015)).

Despite their ubiquitous importance for households' decision-making, we still have little understanding about the formation of inflation expectations for households with similar demographics.[1] Understanding this process and what explains the cross-sectional variation in expectations is also important to foster the effectiveness of monetary and fiscal policy. In the words of Janet Yellen, "with nominal short-term interest rates at or close to their effective lower bound in many countries, the broader question of how expectations are formed has taken on heightened importance. [...] many central banks have sought additional ways to stimulate their economies, including adopting policies that are directly aimed at influencing expectations of future interest rates and inflation" (Yellen (2016)).

In this paper, we use unique microdata to test whether different inflation expectations across similar households are in part explained by different *perceptions* about inflation across households. Our tests are motivated by the notion of perceived inflation Brachinger

[1] For households that belong to different cohorts, Malmendier and Nagel (2015a) document different lifetime experiences of inflation shape the differences in inflation expectations and the reaction to inflation news over time.

(2008) formalizes for the first time at the aggregate level. Perceived inflation is the inflation rate households perceive based on the price changes to which they are exposed in their daily lives. Households on average (over-)extrapolate from the prices of specific goods and services they have in mind when abstracting to expectations about aggregate variables (e.g., see de Bruin et al. (2011) and Kuchler and Zafar (2016)). We therefore conjecture that the household-specific price changes to which households are exposed through their consumption bundles, which differ dramatically (Kaplan and Schulhofer-Wohl (2017)),[2] might help us understand the cross-sectional variation in inflation expectations observed in the data.

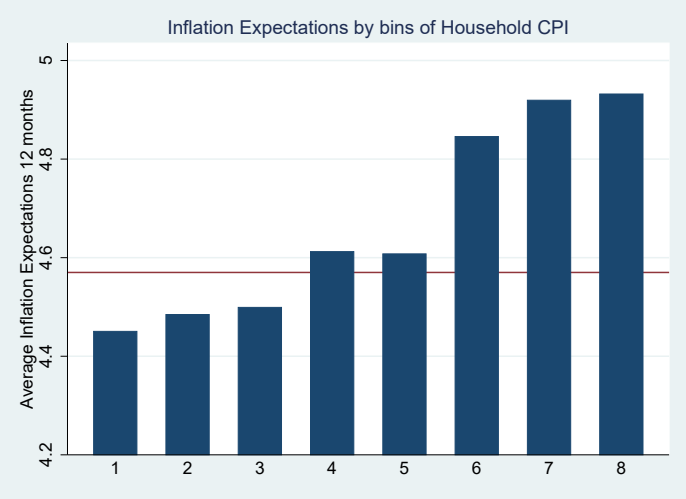
After documenting the price changes in households' consumption baskets indeed affect households' perception and expectations about inflation, we investigate two mechanisms that might underlie the formation process of inflation expectations. Research in cognitive psychology and neuroscience finds the frequency with which individuals observe a stimulus is a crucial factor that shapes individuals' perception of such stimulus.[3] In economics, Bordalo, Gennaioli, and Shleifer (2013) develop a theory in which salient characteristics of goods shape consumption choices, Hastings and Shapiro (2013) find salient price changes affect purchases using shocks to commodity prices, and Georganas et al. (2014) provide laboratory evidence that individuals put more weight on price changes they see more frequently when forming inflation expectations. Overweighing frequently-observed prices can in principle also be consistent with models of rational inattention in which individuals might face cognitive constraints and use their shopping experience to learn about overall inflation.

Based on this evidence, we first conjecture that households' inflation perceptions, and hence expectations, weigh more on the price changes of the goods households purchase more frequently and hence to which households are exposed more frequently relative to the price changes of goods households purchase less frequently. Second, we conjecture that the association between prices changes in one's consumption baskets, inflation perceptions,

[2]Households differ significantly in the type of goods they purchase and in the prices they pay, even for the same good. For example, Kaplan and Schulhofer-Wohl (2017) document that the interquartile range of realized inflation at the household level is between 6.2 to 9.0%.

[3]For instance, see Watanabe et al. (2001) and Seitz and Watanabe (2005) on the effect of frequent stimuli perceptual learning through irrespective of individuals' attention to such stimuli.

Figure 1: **Inflation Expectations by Household CPI**



Notes. Inflation expectations are from the customized *Chicago Booth Attitudes and Expectations survey* in 6/2015 and 7/2016. Household CPI is constructed using the micro data from the Nielsen homescan panel to measure of household-level grocery-bundle inflation, cf. Section II.*C.*. We use the 12 months before the June of the survey wave to measure price changes and the 12 months before that period as the base period.

and inflation expectations is higher for households that observe price changes often when they grocery shop, relative to households that observe price changes only sporadically during their grocery shopping. We find supportive evidence for both conjectures, as we discuss in detail below.

Testing for how price changes in household-specific consumption bundles relate to the formation of inflation expectations has proven difficult in past research because of the lack of viable data. The econometrician needs to observe individual consumption baskets, the prices individuals paid for each good over time, and the inflation expectations, consumption, and saving decisions of a representative set of individuals. We overcome this hurdle by combining the data on the quantity and prices of the non-durable consumption baskets of more than 90,000 households in the *Nielsen Consumer Panel* with novel survey data. In June of 2015 and July 2016, we fielded two waves of the *Chicago Booth Expectations and Attitudes Survey* to elicit the expectations regarding aggregate outcomes, consumption, saving, and investment plans of Nielsen households, as well as detailed demographics and financial literacy, numeracy, and risk aversion.

We use these unique data to construct measures of perceived inflation at the household level. Our first measure, the *Household CPI*, is constructed like the Consumer Price Index (CPI) but for each household's non-durable consumption basket instead of the representative consumption basket.[4] We find the *Household CPI* is significantly positively correlated with 12-month ahead inflation expectations. Figure 1 reports the levels of expected inflation averaged across equal-size bins of individuals sorted by the *Household CPI*. The range of Household CPI is associated with a difference in average expected inflation of 0.5 percentage points, which is economically sizable given the inflation rate was only around 1% in the period during which we fielded our surveys. A one-standard-deviation increase in the Household CPI is associated with 0.2 percentage points higher inflation expectations.

These baseline results survive when we condition on a rich set of demographics such as age, income, gender, marital status, household size, education level, employment status, and risk tolerance. Exploiting variation in inflation expectations and perceived inflation within individuals across the two survey waves confirms our baseline results, which suggests that individual-level time-invariant characteristics cannot explain our findings.

Note that the categories "food at home" (8.4%) and "other food at home" (2%) comprise only about 10% of the expenditure weights in the official CPI published by the Bureau of Labor Statistics and are excluded from the computation of Core CPI[5] – the inflation index policy makers in the US target. The fact that household-specific grocery price changes matter so much for households' expectations of overall inflation is surprising and inconsistent with the premises of inflation targeting and expectations-management in the US. Even if one thinks it is intuitive households build on the price changes in their grocery bundles to form expectations about aggregate inflation, this result suggests US policy makers' focus on Core CPI inflation rates based on representative-agent bundles is faulty and potentially prone to produce policy mistakes.

After documenting the baseline positive association between the price changes to

[4]Specifically, for the first wave we create a Laspeyres index using the expenditure shares in the period from June 2013 to May 2014 and the price changes from June 2013 to May 2015, the month before the first wave of our survey. We proceed similarly for the second wave of the survey.

[5]See www.bls.gov/opub/hom/pdf/homch17.pdf for the Handbook of Methods, chapter 17, p. 103.

which households are exposed in their consumption baskets and inflation expectations, we move on to our conjectures regarding the mechanisms that might explain this association. The first conjecture we describe above is the price changes of the goods households purchase more frequently should impact inflation expectations more than other price changes. To test this conjecture, we construct a household-level *Frequency CPI* using the frequency of purchases in the base period instead of the expenditure shares as the weights. Consistent with the conjecture that salience plays a crucial role in our setting, we find the positive association between the Frequency CPI and inflation expectations is 20% to 40% larger than the association of the Household CPI with inflation expectations. When we add both the Household CPI and the Frequency CPI as independent variables in the same specification, the coefficient associated with the Household CPI shrinks towards zero and loses any statistical significance, whereas the statistical and economic significance of the Frequency CPI barely changes. These findings suggest individuals not only use the information they observe while shopping to form inflation expectations, but they also put more weight on the price changes of goods they purchase more frequently and hence the price changes they observe more frequently.

Rational inattention models might be consistent with our baseline results, as long as the individuals in our setting incur high enough costs to gather information about general inflation. To better understand whether rational inattention might fully explain our findings, we split our sample into three groups: individuals with expectations within 1 percentage point of the official inflation target of the Federal Reserve of 2%; individuals with expectations within 2 percentage points from the first bandwidth; and all other individuals, whose expectations are beyond 3 percentage points from the official inflation target in either direction. For individuals whose expectations are close to the official inflation target we find no detectable association between the Frequency CPI and inflation expectations. For individuals whose expectations are the most extreme, instead, the association is economically large and statistically significant. The fact that only individuals with extreme inflation expectations extrapolate from observed non-durable price changes to overall inflation expectations casts strong doubts on the ability of a rational inattention framework to explain our results.

To better understand how households abstract from the frequent price changes they observe to overall inflation expectations, we propose a set of heterogeneity tests. First, we focus on the sources of information individuals use when forming inflation expectations. In the second wave of the survey, we asked individuals which sources of information they consider when forming inflation expectations. Options include the media, such as newspapers and TV; family and friends; and own experiences. The association between price changes observed while shopping and inflation expectations vanishes for individuals that use the media as a source of information or that rely on others. Individuals who rely primarily on their own experiences drive the association. Second, we find the association is smaller among individuals that have a business or quantitative major as well as individuals that hold stocks or have a mortgage, and hence are more likely to be exposed to several sources of economic news. Third, we find that the association is lower for individuals that are exposed to non-grocery prices—e.g., gas prices and restaurant prices—often relative to those that are exposed to such non-grocery prices less often.

We then consider the second conjecture we propose above, namely, that the relationship between observed price changes and inflation expectations is higher for households that are exposed to price changes in their typical grocery shopping trip, relative to households that are exposed to price changes only occasionally when they grocery shop. Intuitively, if individuals shop often, the prices they observe will be the same from one shopping trip to the next for most trips. Once in a while, these individuals will observe a price change. The share of shopping trips in which these individuals observe price changes would thus be relatively low. Instead, if individuals shop infrequently, they will be more likely to observe price changes every time they grocery shop. The share of shopping trips in which infrequent shoppers observe price changes should thus be higher than the share for frequent shoppers. Consistent with this intuition, we document that households that grocery shop less often observe on average higher price changes in their consumption baskets than households that shop more often.

We find that the correlation between the Frequency CPI and inflation expectations is substantially higher for those who shop infrequently and for those who live farther away from the main shopping outlet, and thus presumably go to the shop less often than

others. As an alternative test of this conjecture, we consider individuals that are the primary grocery shoppers for their household. Primary grocery shoppers are exposed to grocery prices more often than others and hence face fewer price changes over the total number of times they are exposed to grocery prices relative to others. Consistently, we find the effects are weaker for primary grocery shoppers.

None of our results depend on the framing of the inflation elicitation questions, which include elicitations of both point estimates and probability distributions for future inflation rates. We ask households randomly either about changes in prices or changes in inflation.[6] Our results are qualitatively similar if we use the mean of the distribution as the outcome variable; if we focus on a sample in which perceptions and expectations differ, so that respondents do not simply anchor expectations to the previously-reported perceptions; or, if we exclude individuals that report inflation expectations of zero and any other rounded value.

The results in this paper also aim to contribute to the policy debate. If perceived changes in the prices of consumption goods shape households' inflation expectations and if inflation expectations transmit into realized general inflation, the current conduct of monetary policy that neglects "volatile" price series might result in systematic policy mistakes (see the opening quotation by Mr. Bullard). Household-level surveys could represent a crucial step to create micro-based indices of perceived inflation at the household level. Such indices would provide largely different information regarding household-level expectations to policy makers compared to the extant consumer price indices, which are based on the consumption basket of a representative household in the economy. By construction, representative-agent baskets eliminate all the cross-sectional variation in the salience and perception of price changes at the micro level, but this variation is crucial to understand the heterogeneity in household choice and predict households' reaction to alternative measures of fiscal and monetary policy.

[6] Armantier et al. (2013) show survey designs matter for inflation expectations. The Michigan Survey of Consumers (MSC) asks about the changes in prices in general, whereas the new Survey of Consumer Expectations by the New York Fed directly asks about inflation rates. Asking about prices in general results in slightly higher average and more dispersed inflation expectations and might also prompt individuals to think about specific goods such as groceries. We ask both questions in our survey and randomize the question individuals face. We ask for both point estimates and distributions of expected inflation rates.

A. Related Literature

Our paper contributes to several strands of the literature. Although the rational-expectations revolution moved economists' focus away from understanding the expectations-formation processes of households and firms, a recent and growing body of work shows individual macroeconomic expectations deviate substantially and systematically from the full-information rational expectations benchmark. Coibion and Gorodnichenko (2012) and Coibion and Gorodnichenko (2015) show consensus forecasts of professional forecasters are consistent with models of informational rigidities such as Mankiw and Reis (2002) and Mackowiak and Wiederholt (2009). Fuhrer (2017) documents individuals update their forecasts to new information inefficiently, and Bordalo et al. (2018) show professional forecasters overreact to new information. For individual inflation expectations, the evidence so far documented a large degree of disagreement across individuals (e.g., see Mankiw et al. (2003)). Malmendier and Nagel (2015a) show cohorts differ in their average inflation expectations because they learn from their lifetime inflation experiences and react differently to the same macroeonomic shocks. Kuchler and Zafar (2016) show individuals extrapolate from local house-price changes to aggregate expectations about real estate. D'Acunto et al. (2019b) and D'Acunto et al. (2019a) show cognitive abilities are strongly correlated with forecast accuracy for inflation, uncertainty about future inflation, and the propensity to consume and take out loans to changes in inflation expectations and nominal interest rates. Coibion, Gorodnichenko, and Weber (2018) show central-bank communication has a large impact on individuals' inflation expectations which differs across demographic groups. D'Acunto, Malmendier, and Weber (2018) study the differences in inflation expectations across gender.

Our paper also builds on the recent literature that uses micro-level data to study the relationship between inflation expectations and households' readiness to purchase consumption goods. Bachmann et al. (2015) start this literature using survey data from the Michigan Survey of Consumer (MSC). They find an economically small and statistically insignificant association between households' inflation expectations and their readiness to spend on durables. Crump et al. (2018) use the microdata from the New York Fed Survey of Consumer Expectations and find a positive association between

consumption growth and inflation expectations. D'Acunto, Hoang, and Weber (2016) and D'Acunto, Hoang, and Weber (2018) show European households on average behave in line with the predictions of the consumption Euler equation. They also use a measure of unconventional fiscal policy – the unexpected announcement of a future VAT increase – as a natural experiment to causally identify the effect.

We follow the lead of Kaplan and Schulhofer-Wohl (2017) and use the Nielsen homescan data to construct inflation rates at the household level. Other recent papers that use Nielsen data are Argente and Lee (2017), who study the cost of living inequality during the recent Great Recession; Jaravel (2018), who studies the differences in inflation households experience due to product innovation; and Broda and Weinstein (2010), who study the role of product creation and destruction on several proxies for households' cost of living.

II Survey and Consumption Data

The main novel source of data we employ in this paper is the *Chicago Booth Expectations and Attitudes Survey*, which we fielded online in two waves in June 2015 and June 2016. We invited participation by all household members of the *Kilts-Nielsen Consumer Panel* (KNCP), on which we rely for all the information related to households' non-durable consumption baskets. Below, we describe the characteristics of these two data sets with a focus on the new survey our paper introduces to the literature.

A. Kilts-Nielsen Consumer Panel (KNCP)

The KNCP is a panel of about 40,000 - 60,000 households. These households report to Nielsen two types of information. First, their static demographic characteristics, such as household size, income, ZIP code of residence, and marital status. Panelists update their demographic information at an annual frequency to reflect changes in household composition or marital status. The second type of information panelists report are the dynamic features of their purchases. These features include categorizations of the products they purchase; information on the outlets at which the products are purchased; and

information about the per-unit price households pay for each item. To avoid measurement and reporting errors, each panelist obtains an optical scanner at home that is similar to the scanners grocery stores use to read barcodes. Households scan each item they purchase after each trip to a grocery store as well as the items they purchased online.

The sample period for which Nielsen has detailed purchase information from households cover the years 2004-2016. Geographically, the sample spans through 52 major consumer markets and 9 Census divisions. Nielsen estimates the dataset covers approximately 30% of overall household consumption in the United States. Nielsen attempts to balance the panel's demographics to make it representative of the US population along 9 dimensions: household size; income; age of the male and female household heads; education level of the female household head; education level of the male household head; presence of children; race; hispanic ethnicity; and occupation of the household head. Nielsen recruits panelists online but balances the panel using traditional mailing methodologies. Nielsen checks the sample characteristics on a weekly basis and performs adjustments to guarantee balancing whenever deemed necessary. The KNCP has a retention rate of more than 80%. The KNCP filters out households that do not report a minimum amount of spending over the previous 12 months.

Nielsen provides respondents with several incentives to guarantee the accuracy and completeness of the information respondents report. For instance, Nielsen organizes monthly prize drawings, allows households to accumulate reward points for each instance of data submission, and engages in ongoing communication with households. Panelists can use the reward points they accumulated to purchase gifts from a Nielsen-specific award catalog. Nielsen structures the incentives to not bias the shopping behavior of their panelists and validates the reported consumer spending with the scanner data of retailers on a quarterly frequency to ensure high data quality.

The KNCP dataset contains summary information for each shopping trip households make, such as the date of the trip, the retailer code, the retailer zip code, and the overall dollar amount spent. For each trip, the dataset also contains detailed information on the individual goods purchased (12-digit Universal Product Code (UPC)), quantities, prices, and the potential use of coupons and discounts that change the price the household pay

for the goods. Nielsen classifies products hierarchically into different categories with finer granularities: department (10), product group (125), product module (1,075), and UPC. For each UPC, the datasets contains information on package size, brand, and other product characteristics. The KNCP contains 1.5 million unique products. The goods in the datasets include groceries, drug products, small appliances, and electronics. For a subset of households, the dataset also contains goods without bar codes, such as fruits like bananas and apples. Nielsen refers to this type of goods as "magnet data," and panelists enter the prices of theses goods manually.

After each shopping trip, panelists scan the goods they purchased. The system then asks the panelist for the quantity. If the panelists purchased the good at a store for which Nielsen has a point of sales information (POS), then the system automatically uses the average price for the UPC during the week of purchase to minimize data entry burden for the panelist. If the panelist shopped at a store without POS information, then the system asks for the price of the goods before any discounts or coupons are applied. Lastly, the system asks the panelist to indicate explicitly whether the good was purchased on discount and the amount of the discount.

B. Chicago Booth Expectations and Attitudes Survey

Nielsen runs short surveys on a monthly frequency on a subset of panelists of the KNCP, the online panel, but also offers customized solutions to corporations and research institutions for designing longer ad hoc surveys. Retailers and fast-moving consumer-good producers typically use these services to test their product design and run market analyes through target-group marketing.

During the Spring of 2015, we designed a customized survey consisting of 44 questions in cooperation with AC Nielsen, the *Chicago Booth Expectations and Attitudes Survey*. One central feature of the survey is we target all household members of the KNCP. The survey consists of three sections.[7] Our survey design builds on the Michigan Survey of Consumers, the New York Fed Survey of Consumer Expectations, the Panel on Household Finances at the Deutsche Bundesbank as well as the pioneering work of de Bruin et al.

[7]The online appendix reports fully the original survey questions.

(2011) and Cavallo, Cruces, and Perez-Truglia (2014).

AC Nielsen fielded the first wave of the survey in June 2015 and the second wave in June 2016. The final overall survey sample included 92,511 individuals. In the first wave, 49,383 individuals completed the survey from 39,809 unique households, which amounts to a response of 43%. The average response time was 14 minutes and 49 seconds, which is close to our estimate of a response time of about 15 minutes. The second wave had 43,036 unique respondents from 36,758 unique households. The second wave included a few additional questions and consistently response times were slightly longer – the average response time was 18 minutes and 35 seconds.

The first section of the survey asked a series of questions about respondents' demographic characteristics, which were more detailed relative to the basic demographic information the KNCP provides. We collected information on narrow college majors, employment status, current occupation, income expectations, rent and mortgage information, expenses on college tuition, gas spending and gas price expectations, medical expenses, and we identified the primary shopper of the household among all the responding members.

The second section of the survey contains questions on households' expectations about prices and inflation. We randomize between two sets of questions. The first set of questions follows the design of the Michigan Survey of Consumers (MSC), and asks survey participants about the prices of things on which they typically spend money (see Bachmann et al. (2015) for a recent paper using these questions from the MSC). The second set of questions uses a design inspired by the questions of the recent New York Fed Survey of Consumer Expectations, and asks specifically about inflation, because asking about prices might induce individuals to think about specific items whose prices they recall rather than about overall inflation (see Crump et al. (2018) for a recent paper using the data).

We first ask individuals about their perception of past inflation, that is, inflation over the previous 12 months. We then ask them about their expectations for 12-month-ahead inflation (short-run inflation expectations), and for inflation in a 12-month period five years from the time of the interview (long-run inflation expectations). In addition to

asking for point estimates of the expectations, we elicit a full probability distribution of expectations by asking participants to assign probabilities to different possible levels of the inflation rate or change of the prices of things on which they typically spend money, depending on the group. To guarantee our results are not driven by households thinking about perceived inflation and then anchoring all expectations answers to the first change they provide, we will show our results are robust to excluding respondents who report the same values for perceptions and expectations of inflation.

We start both blocks of questions with a short introduction: "In the next four questions, we will ask for your opinion on a few topics. It is important to us that you reply without any external influence. In particular, please do not search the internet or other sources while going over the following questions."

Question 19 *Over the last 12 month...*

The question also has a short explanatory text: "(Please enter a number in one of the boxes below. The number you enter should be greater than 0 or equal to 0. If you do not think there was any inflation/ deflation in the last 12 months, please enter a "0" in one of the boxes.)". The answer option is structured as follow: "The rate of inflation was ... percent OR The rate of deflation (the opposite of inflation) was ... percent".

We allow for answers up to 100 and permit two decimal points. The question for expected inflation is equivalent and reads "Over the next 12 months, I expect the..." and the long term inflation expectations question reads "Please think about the one-year period from June 2020 to June 2021. I expect the ...".

The probabilistic question takes the following form. We first give a short introduction which reads as follows: "In THIS question, you will be asked about the PERCENT CHANCE of something happening. The percent chance must be a number between 0 and 100. Numbers like 2% or 5% indicate "almost no chance," 19% or so may mean "not much chance," a 47% or 55% chance may be a "pretty even chance," 82% indicates a "very good chance," and 95% or 98% mean "almost certain."

Question 21 *What do you think is the percent chance that, over the next 12 months...*

- *the rate of inflation will be 12% or more*
- *the rate of inflation will be between 8% and 12%*
- *the rate of inflation will be between 4% and 8%*
- *the rate of inflation will be between 2% and 4%*
- *the rate of inflation will be between 0% and 2%*
- *the rate of deflation (opposite of inflation) will be between 0% and 2%*
- *the rate of deflation (opposite of inflation) will be between 2% and 4%*
- *the rate of deflation (opposite of inflation) will be between 4% and 8%*
- *the rate of deflation (opposite of inflation) will be between 8% and 12%*
- *the rate of deflation (opposite of inflation) will be 12% or more*

There is also a counter "Total" that shows the sum of the probabilities and individuals can only continue the survey when the sum equals 100.

The last question in the second section asks about house-price expectations based on the question design of Kuchler and Zafar (2016).

The third section of the questionnaire combines questions about the general economic outlook, consumption, savings, portfolio choice, risk aversion, and a simple numeracy test. The economic outlook questions center around expectations for GDP growth, unemployment, and personal income expectations. We use this information to condition all our analyses on households' macroeconomic expectations not related to inflation, because Bachmann et al. (2015) and Mian, Sufi, and Khoshkhou (2015) document that households' general sentiment about the state of the economy is important for inflation expectations and consumption decisions. The questions on consumption and savings help us study the relation between the changes in the prices observed while doing the groceries and the consumer Euler equation. We also ask for a broad description of the split of households' financial portfolios, such as the portfolio shares invested in equities or bonds, to see whether survey participants act on their perceived inflation when forming investment plans. The questions on risk aversion and numeracy follow the design in Lusardi and Mitchell (2007) and attempt to measure individual-level preference for risk and financial literacy.

C. Measures of Household-level Perceived Inflation

We use the information on the prices and quantities in the KNCP households' consumption baskets to compute two alternative measures of observed inflation at the household level. For the first wave of our data, both measures use price changes from the period between June 2013 to May 2014 to the period between June 2014 to May 2015, which is the month before we ran the first wave of our survey. The timing varies accordingly for the second wave which we ran in June 2016.

We first construct our two measures as forms of household-level consumer price inflation (CPI), that is, a weighted average of the price changes to which households are exposed:

$$CPI_{j,t} = \frac{\sum_{i=1}^{n} \Delta p_{i,j,t} \times \omega_{i,j}}{\sum_{i=1}^{n} \omega_{i,j}},$$

where $\Delta p_{i,j,t}$ is the log price change of good i faced by household j at time t, and ω_i is the weight of good i in the price index.

The difference between the two measures comes from the definition of the weights ω_i for the changes in the prices to which households were exposed over the 12-month period.

The first measure – *Household CPI* – mimics the actual CPI that national statistical offices build all over the world. The typical CPI uses the consumption basket of the representative household in the economy. We define the Household CPI, instead, as a Laspeyres index that uses the expenditure shares for each item purchased by the individual household in the base period as the weights:

$$\omega_{i,j} = p_{i,j,0} \times q_{i,j,0},$$

where $q_{i,j,0}$ is the amount of good i household j purchased in the base period. In our case, we use all goods a household purchased in the base period, that is, June 2013 to May 2014 for the first wave of the survey, to construct the expenditure shares.

Defining the expenditure shares and the relevant base period at the household level poses a set of conceptual and empirical challenges that do not arise in a

representative-agent setting. First, household consumption spending is highly seasonal and households purchase certain goods several times throughout the year whereas other goods only seldom. To deal with these issues, we first calculate volume-weighted average prices during both the base year, $p_{i,j,0}$ and the year over which we measure inflation, $p_{i,j,1}$, following Kaplan and Schulhofer-Wohl (2017). We also produce an alternative version of the measures using net prices, that is, the actual prices the household paid after discounts and coupon usage.

Another issue in defining a CPI at the household level is that individual households might decide to stop purchasing certain products over time, an issue that does not arise when the CPI is based on a sticky representative-agent consumption bundle. In the case of discontinuity in purchases, we impute the prices households would have paid had they purchased the good. To impute prices, we first look for the price of the good in the county in which the household resides. If the good was not sold in the county, we look for it in the state of residence. If the UPC was not sold in the state we look for the average US price. If we still can't find the price, we assume a zero price change.[8] All the results are virtually identical if we assume a missing price or do not do any imputations. For the second wave, we move the base period forward by one year. For individuals that stay in the survey, we can thus interpret the Household CPI as a chained Laspeyres index.

The Household CPI assigns weights to price changes according to each good's expenditure shares in the base period. Individuals, though, might perceive different price changes differently even if they spend the same share of their total budget on the two goods. This different perception would be consistent with both models of limited attention and rational inattention. On the one hand, the *salience* of the price changes of different goods might vary across goods. Bordalo, Gennaioli, and Shleifer (2013) develop a theory in which salient characteristics of goods shape consumption choices, Hastings and Shapiro (2013) find salient price changes affect purchases using shocks to commodity prices, and Georganas et al. (2014) provide evidence from the laboratory that individuals assign higher weights on price changes they observe more frequently when forming inflation expectations. On the other hand, individuals likely face cognitive

[8]The last two steps virtually never arise in our setting.

constraints. In models with cognitive costs of gathering information, individuals might rationally extract information from the price changes they observe in their daily lives and put more weight on the price changes of the goods they purchase more frequently because these goods might provide more precise signals for overall inflation.

Following these arguments, we propose a second measure of household-level inflation, the *Frequency CPI*. The main idea of this measure is to allow households to assign a higher weight on the price changes of the goods they buy more frequently, and hence whose prices they observe more frequently when shopping groceries relative to changes in the prices of goods they buy infrequently. The *Frequency CPI* uses the number of times household j purchased good i in the base period as the weight:

$$\omega_{i,j} = f_{i,j,0\to1},$$

where $f_{i,j,0\to1}$ is the frequency of purchase, that is, the number of times the household purchased the good throughout the 12-month base period.

D. Summary Statistics

We report a set of summary statistics and descriptives of our data in Table 1. To avoid severe outliers might drive any of our results, we winsorize all continuous variables at the 1% and 99% level. Across the two survey waves, we have a running sample of 59,126 individuals for whom we observe complete data from both the KNCP and survey responses for expected inflation, demographics, and economic expectations.

The average age of the survey respondents is 61. About two thirds of the respondents are women. Both statistics are consistent with the composition of the KNCP. Five percent of respondents are unemployed and almost three quarters of them own a house. The average household size is 2.2 and almost half of the survey participants hold a college degree. Survey participants expect on average stable household income over the following twelve months. They are mildly positive about the economic outlook for the US and expect the economic situation of the household to stay the same. The median income bracket is between USD 45,000 and USD 60,000. In terms of racial and ethnic composition,

85% of the respondents are white, 8.5% are black, and 3.1% Asian.[9]

Overall, our survey respondents appear to be more educated and to earn a higher labor income than the average U.S. individual. These features of the survey population are important, because researchers have criticized household surveys asking about inflation expectations on the basis that too many households do not know or understand the concept of inflation. To the extent that higher education is related to a higher understanding of concepts like inflation our pool of respondents is less prone to this criticism.

Moving on to the statics for inflation expectations, the average participants expects one-year ahead inflation of 4.4%, which is slightly lower than the average perceived inflation over the previous twelve months of 4.67%. The average value for the *Household CPI* is 0.81% and for the *Frequency CPI* is 1.6%. Both variables display dramatic variation across individuals, which is a necessary condition for them to be able to help explain the substantial variation in inflation expectations across respondents. These two averages from the Nielsen grocery bundle appear to be reasonable given the official realized inflation rate for food and beverages for all urban consumers of 1.56% in May of 2015 and 0.71% in May of 2016 reported by the US Bureau of Labor Statistics.

Figure 2 is a histogram of the twelve-month ahead expected inflation rates. We see substantial mass between 0% and 5%, but also bunching at values that represent multiples of 5%. Previous research based on the Michigan Survey of Consumer has argued individuals that are uncertain about inflation report expectations for inflation at rounded threshold (e.g., see Binder (2017)) and the respondents to our survey seem to behave in a similar fashion. Lastly, consistent with evidence from the Michigan Survey of Consumers and the New York Fed Survey on Consumer Expectations, we find large dispersion in expectations across individuals ranging from -20% to +45%.

Figure 3 plots the distributions of the *Household CPI* and *Frequency CPI*. We see for both measures large mass around 0 with slightly more mass concentrated in this area for the *Frequency CPI*. At the same time, we also see large mass in the tails. The tails are

[9]We use income group fixed effects and race fixed effects in all our empirical analyses to absorb time-invariant systematic differences in the consumption bundles and expectations across income groups and racial groups.

asymmetric – more mass exists in the right tail than in the left tail. The tails are fatter for the *Household CPI* than for the *Frequency CPI*, although this slight difference is not detectable statistically.

Lastly, the x-axis of Figure 4 sorts the respondents to the survey across bins by their realized *Household CPI* and *Frequency CPI*. The y-axis reports the average expected inflation rate within each bin. Individuals with the lowest realized *Household CPI* expect an average inflation rate of 4.4%. Average expected inflation increases monotonically as the *Household CPI* increases and reaches an average expected inflation rate of slightly more than 4.9%. The range between the expected inflation rates of the highest and lowest levels of the *Household CPI* is 0.5 percentage points, which is about 11% of the average expected inflation rate and about 33% of the representative-bundle realized inflation rate in the period we consider. For the *Frequency CPI*, we see similar patterns but the spread in average expected inflation rates between low and high *Frequency CPI* is magnified to more than 0.7 percentage points, which suggests that the dispersion in expected inflation predicted the *Frequency CPI* is higher than the dispersion predicted by the *Household CPI*.

III Salient Price Changes and Expected Inflation

In this section, we study the systematic association between the inflation individuals observe in their households' shopping bundles and expected inflation after keeping constant dimensions that might affect both perceived and expected inflation.

A. Salient Price Changes and Expected Inflation: Baseline Analysis

In our baseline analysis, we study the association between the measures of household-level inflation and households' expectations regarding general inflation in the subsequent 12 months.

We estimate the following linear specification by ordinary least squares:

$$\mathbb{E}\,\pi_{i,t\to t+1} = \alpha + \beta \times \pi_{i,t-1\to t} + X_i'\gamma + \mathbb{E}_i'\,\gamma + \eta_w + \eta_q + \eta_i + \eta_I + \epsilon_i, \tag{1}$$

where $\mathbb{E}\,\pi_{i,t\to t+1}$ is the numerical inflation rate individual i expects for the following 12 months and is measured in percent; $\pi_{i,t-1\to t}$ is one of the two measures of household-level inflation computed based on household shopping bundles over the previous twelve months; X_i is a vector of characteristics of individual i, which include age, the square of age, sex, employment status, home ownership status, marital status, household size, college dummy, race dummies, and risk tolerance as elicited through survey questions; $\mathbb{E}_i$ is a vector of individual qualitative expectations about household income, the aggregate economic outlook, and the personal financial outlook for the following 12 months; η_w is a survey-wave fixed effect to allow for systematic differences in levels of expected and realized inflation between June 2015 and June 2016; η_q is an inflation-question fixed effect to allow for systematic differences in the means of inflation expectations for the case in which we ask individuals about inflation or about prices; η_i is an individual fixed effect that we include in some specifications to absorb any systematic time-invariant differences across individuals; and η_I is a set of 16 income dummies we obtain from Nielsen.[10] We cluster standard errors at the household level to allow for correlation of unknown form of the residuals across respondents in the same household, for all of whom the measures of household-level inflation are the same.

Table 2 reports the results for estimating equation (1). The measure of perceived price changes we use varies across columns. In columns (1)-(3), we use the *Household CPI*; in columns (4)-(6), the *Frequency CPI*; columns (7)-(9) include both measures jointly as independent variables. All measures of perceived inflation are standardized to allow comparison of the size of the associations across measures.

Column (1) reports the correlation between inflation expectations and the *Household CPI*, which uses expenditure shares in the base period as weights. Here, we only absorb the question-design and survey-wave fixed effects. We find a positive and statistically

[10]We do not observe the exact level of labor income as a continuous variables but rather income brackets.

significant correlation between expected inflation and the *Household CPI*. A one standard deviation increase in *Household CPI* is associated with a 0.17% increase in expected inflation. Column (2) shows the association barely changes when we partial out a rich set of demographics, individual expectations, and county fixed effects. In column (3), we restrict the variation in inflation expectations and *Household CPI* within individual and over time. In this specification, the baseline coefficient is only identified by those individuals that respond to both waves of the survey. The within-individual association is slightly higher than the estimate when allowing for systematic cross-sectional variation when estimating the specification. This result is assuring because it suggests that unobserved characteristics that vary systematically across individuals and might shape, for instance, both the types of goods individuals purchase and their inflation expectations, are an unlikely explanation for our findings.

Columns (4)-(6) document results that are qualitatively similar for the association between expected inflation and the *Frequency CPI*, but the estimated associations are between 20% and 50% larger for the *Frequency CPI* relative to the *Household CPI*.

The results so far show that the price changes individuals observe in their shopping bundles contribute to shape their inflation expectations. Given the fact that the categories "food at home" (8.4%) and "other food at home" (2%) comprise only about 10% of the expenditure weights in the official CPI published by the Bureau of Labor Statistics and are excluded from the computation of Core CPI[11] – the inflation index policy makers in the US target – the fact that household-specific grocery price changes matter so much for households' expectations of overall inflation is surprising and inconsistent with the premises of inflation targeting and expectations-management in the US. Even if one thinks it is intuitive households build on the price changes in their grocery bundles to form expectations about aggregate inflation, this result suggests US policy makers' focus on Core CPI inflation rates based on representative-agent bundles is faulty and potentially prone to produce policy mistakes.

In the last part of Table 2, we compare the extent to which our two measures of household-level observed inflation contain independent information that helps explain

[11] See Chapter 17, page 103 of the handbook of methods: https://www.bls.gov/opub/hom/pdf/homch17.pdf.

inflation expectations. On the one hand, individuals might focus more on the price changes of the goods on which they spend relatively more money when making inferences about general inflation. On the other hand, individuals might focus on the price changes of the goods they purchase frequently. Across the specifications in columns (7)-(9), we see the coefficient on the *Household CPI* shrinks towards 0 and is no longer statistically significant. The point estimate on the *Frequency CPI*, instead, barely changes compared to the corresponding specifications in columns (4)-(6) and remains highly statistically significant in all cases. Together together, it appears individuals use the price changes they observe during their shopping trips to form inflation expectations and this pattern is especially strong for goods households purchase frequently, which hints toward a role for salience and attention in explaining this phenomenon.

From now on we only report results for the *Frequency CPI* because the results are similar if we only use the *Household CPI*. Armed with the *Frequency CPI*, we want to dissect the features of our baseline results and dig deeper into the channels than might explain such results. In particular, we aim to provide evidence in favor or against two prominent alternative explanations for our findings. Individuals' focus on frequently purchased goods might arise due to a *frequency bias*, whereby individuals' limited attention is captured more extensively by salient price changes, or due to rational inattention, whereby individuals rationally extract information from the price changes they observe often and whose signal for overall inflation might be more precise.

B. Salient Price Changes and Expected Inflation: Economic Magnitudes

To better understand whether experienced inflation in the shopping bundle is an economically relevant predictor of individual's inflation expectations, we now compare the sizes of the association between perceived inflation and inflation expectations to the sizes of the associations between relevant demographics and inflation expectations.

Individuals whose *Frequency CPI* is above the median of the distribution have on average inflation expectations that are 0.3 percentage points higher than individuals below

the median of the distribution. Malmendier and Nagel (2015b) document lifetime inflation experiences matter for individuals' inflation expectations. The oldest 50% of survey participants have inflation expectations that are on average 0.075 percentage points higher than the inflation expectations of the youngest 50%. The smaller difference by age is not inconsistent with the findings in Malmendier and Nagel (2015b) who mainly focus on how inflation expectations differ across cohorts over time based on lifetime-experienced inflation and how different cohorts react to the same inflationary shocks. In fact, learning from experiences predicts small differences in expected inflation in the low and stable realized inflation environment of the last decades.

Gender is one of the strongest demographic predictors of inflation expectations. We find in our survey that women have inflation expectation that are on average 0.54 percentage points higher than for men. D'Acunto et al. (2018) document differences in shopping behavior can explain in large part the gender differences in inflation expectations.

Das et al. (2018) document income and socioeconomic status help predict individuals' macroeconomic expectations such as business conditions, the national unemployment rate, and stock returns. As for inflation expectations, we find unemployed survey participants have inflation expectations that are 1.15 percentage points higher than the inflation expectations of employed individuals. High-income individuals have inflation expectations that are on average 0.85% points lower than the expectations of the participants in the bottom 50% of the income distribution. It is conceivable that income and employment status are correlated with consumption bundles and, hence, the prices individuals that differ along these dimension see during their shopping trips (see Argente and Lee (2017) and Kaplan and Schulhofer-Wohl (2017) for differences in experienced inflation by income).

Household size only predicts differences in expected inflation of 0.15 percentage points and college-educated survey participants have average inflation expectations that are 0.38 percentage points lower than survey participants without college degree.

Taken together, shopping experiences predict differences in inflation expectations that are sizable and of comparable magnitudes to other possible demographic determinants.

C. Salient Price Changes and Expected Inflation: Robustness

Figure 2 and Figure 3 document that the modes of both expected and perceived inflation is zero. To ensure this bunching of answers at zero does not explain the positive correlation between perceived and expected inflation, we run specifications excluding individuals that expect exactly zero inflation for the following twelve months. In the first three columns of Table A.1 in the Online Appendix, the correlation between the *Frequency CPI* and expected inflation is similar in magnitude to the baseline associations, both unconditionally as well as conditional on a rich set of demographics as well as after absorbing individual fixed effects.

Inspired by the work at the New York Fed, we elicited probability distributions of expected inflation in addition to point estimates. Given the question design for the probability distributions requires us to include a finite number of bins, we observe substantially less dispersed average expectations across individuals in this question compared to the point estimates. For this reason, we would expect smaller points estimates relative to when we use the point estimates directly. Consistently, columns (4)-(6) of Table A.1 document a positive yet smaller association between expected and perceived inflation when we use the average of the full distribution instead of the point estimate. A one-standard-deviation in perceived inflation as measured by the *Frequency CPI* is associated with a 0.1% increase in expected inflation.

The perception of past inflation is highly correlated with expected future inflation (see Jonung (1981)). We argue and document below that the price changes in households' shopping bundle help explain variation in inflation expectations because they shape individuals' perceived inflation. A concern is that a spurious correlation between inflation perceptions and expectations might drive our findings. For instance, because respondents provide first their inflation perception for the previous twelve months and then their future expectations, one might worry they only think about perception and then anchor all the following answers to the value they chose for perception. In columns (7)-(9) of Table A.1, we report our baseline results when excluding individuals that report the same numerical value for perceptions and expectations. Even for this sample we confirm the positive association between the *Frequency CPI* and inflation expectations. Within individual,

the effect is no longer statistically significant but still economically large and similar in magnitude to the baseline effect.

IV Understanding the Mechanisms

The results so far show that the price changes of grocery goods households purchase more frequently have a higher explanatory power than an expenditure-share weighted average of the price changes to which households are exposed. This result opens the question of whether the patterns of expectations we documented are consistent with neoclassical models of expectations-formation or not. In this section, we first document that the *Frequency CPI* helps predict inflation expectations because it shapes inflation perceptions. We then discuss a set of possible mechanisms through which the *Frequency CPI* might predict expectations and assess these mechanisms empirically. Ultimately, the set of tests we discuss in this section cast doubts on a rational-inattention model's ability to explain our results.

A. Rational Inattention of Limited Attention?

Our results so far are consistent with two mutually exclusive explanations for why individuals use the salient price changes to which they are exposed when shopping to form expectations about overall inflation.

On the one hand, one could think of a rational-inattention explanation. Because individuals face cognitive costs when gathering and processing information about macroeconomic variables, including the inflation rate, individuals might use signals from their shopping bundles to form inflation expectations because such signals are readily available when shopping. In particular, the signals individuals observe more frequently are easier to memorize and to elaborate. The price changes of goods individuals purchase more frequently might contain more precise signals which could rationalize the stronger correlation between the *Frequency CPI* and expected inflation than between the *Household CPI* and expected inflation.

On the other hand, individuals might extrapolate from their narrow non-durable

consumption bundle to overall inflation and focus on salient price changes because of limited attention to the more representative information about overall inflation they might obtain in their daily lives. This limited attention explanation suggests individuals' expectations-formation process departs from the prescriptions of a neoclassical model.

To shed light on these alternative explanations, we propose a set of tests. The first test is based on individuals' forecast accuracy. Rational inattention suggests that individuals might not have all the relevant information that would be needed to form inflation expectations and might use readily-available signals instead. On a similar note, sticky-information models suggest that individuals do not update their information set at each instance of time, but when they do, they use all available information in a rational way.

Based on these rational-inattention interpretations, we should find that the expectations individuals form based on their shopping experience are on average correct or at least not more inaccurate than the expectations fully-informed individuals form.

In Table 3, we propose three sample splits based on the accuracy of respondents' inflation expectations. Columns (1)-(2) contain all individuals whose inflation expectations fall at most one percentage point above or below the official Fed inflation target of 2%. This group thus includes respondents who, based on the tight variation of the actual inflation rate over our time period form plausible inflation expectations. Columns (3)-(4) contain all individuals whose inflation expectations are in the neighborhood of the official Fed's target rate, even if more than one percentage point apart from it (-1% $<$ $\mathbb{E}(\pi)$ $<=$ 1% | 3% $<=$ $\mathbb{E}(\pi)$ $<$ 5%). Finally, columns (5)-(6) contain all respondents whose inflation expectations are far from the official Fed target ($\mathbb{E}(\pi)$ $<$ -1% | $\mathbb{E}(\pi)$ $>=$ 3%). For each of these groups, we study the extent to which price changes in the shopping bundle contribute to the formation of inflation expectations. Under a rational-inattention interpretation, we would expect that respondents who end up with accurate inflation expectations rely more on the perceived price changes of their baskets compared to respondents who end up with inaccurate expectations. The opposite pattern would be more consistent with a departure from neoclassical rational-inattention models.

In the first two columns of Table 3, we find that individuals whose expectations

are close to the official Fed target display no detectable correlation between inflation expectations and the *Frequency CPI*. These individuals seem to be relying on information completely unrelated to the price changes they observe in their consumption baskets when forming expectations about future inflation. Instead, the association between the *Frequency CPI* and inflation expectations is economically large and statistically significant for respondents who form extreme inflation expectations, which are far from plausible values around the official Fed target.

The evidence in Table 3 is barely consistent with models of rational inattention because individuals that have more accurate inflation expectations do not rely at all on their shopping bundles when forming inflation expectations. Instead, individuals with extreme inflation expectations relative to the realized inflation rates during our sample period use salient price changes from their grocery bundle to form expectations for general inflation.

A.1 Information Sources

Individuals that access various sources of information might rely less on their shopping bundles when forming inflation expectations. In the second wave of the survey, we asked individuals to report the sources of information they thought about when they answered the inflation-expectations questions. Specifically, we offered them the following choices and asked them for their top three picks: Newspaper, Magazine; Radio, Television; Colleagues; Friends & Family; Financial advisors; Social networking websites; Other websites; Shopping experience; Other (specify). We randomized the ordering to ensure not anchoring effect is present.

For our mechanism test, we proceed to sample splits based on a set of dummies: a media dummy that takes the value of 1 if the individual ranks Newspaper, Magazine; Radio, Television; Social networking websites; Other websites among the top 3 choices; a other people dummy that takes a value of 1 if the individuals ranks Colleagues; Friends & Family among the top 3 choices; and an own experience dummy that takes a value of 1 if the individuals ranks Shopping experience among the top 3 choices.

Table 4 reports the results. When we study the split by those that use information

from the media in forming inflation expectations, we do find a zero correlation between the *Frequency CPI* and expected inflation. For those that do not rely on media to form inflation expectation, we find a positive and statistically-significant association between perceived inflation and expected inflation. Individuals that rely on others in forming inflation expectations though rely less on the experienced price changes in their shopping bundles. Individuals that rely on their own experiences tend to strongly extrapolate from the *Frequency CPI* to overall inflation expectations.

A necessary(but not sufficient) condition for prices observed in consumption baskets to affect inflation expectations is that inflation expectations are shaped by individual inflation perceptions. To assess the viability of this condition in our setting, Table A.2 in the Online Appendix regresses individual-level numerical inflation perceptions, which we asked households for a horizon of 12 months before the interview, on the *Frequency CPI*. Columns (1)-(2) shows both the *Household CPI* and the *Frequency CPI* are positively associated to perceived inflation. Once we add both independent variables jointly in the same linear specification, though, only the correlation between the *Frequency CPI* and perceived inflation remains economically and statistically significant, whereas both the point estimate and statistical significance of the coefficient attached to the *Household CPI* become insignificant. This evidence suggest the *Frequency CPI* might help explain the variation in expected inflation because it shapes individuals' inflation perceptions (see column (4)). When we regress expected inflation on the perceived inflation from the survey and the *Frequency CPI*, we find only the association between perceptions and expectations stays significant. This result reinforces the interpretation that the effect of the *Frequency CPI* on expectations acts through inflation perceptions.

A.2 Crowding Out of Information Sources

The last dimension we consider to understand the mechanisms behind our main results is the potential for non-grocery price changes individuals might observe outside their grocery shopping trips to crowd out the salience of the information coming from grocery price changes.

In the second wave of our survey, we asked respondents to report how many times

a month they typically visit a gas station and how many times a month they typically visit restaurants. The rationale for these questions is that the more often individuals visit any of these establishments, the more the prices (and potential price changes) to which they are exposed above and beyond grocery prices. This frequent exposure to non-grocery prices and potential price changes might crowd out the information from the grocery price changes, blend with such information, and hence reduce individuals' reliance on grocery price changes when forming inflation expectations.

Consistent with the notion of crowding out across sources of price-change information, Table A.5of the Online Appendix shows that individuals who visit gas stations and/or restaurants more often rely less on the *Frequency CPI* when formation inflation expectations.

A.3 Sophistication in Economic Matters

D'Acunto et al. (2019a) and D'Acunto et al. (2019b) document high-IQ men have more accurate inflation expectations and are more likely to make economic decision in line with theoretical predictions than other men. Table 5 proposes several results to study whether proxies for economic sophistication help explain why individuals extrapolate from their shopping experiences to overall inflation.

Columns (1)-(2) split the sample into whether or not the respondent has a quantitative major. We define the quantitative major dummy to take a value of 1 if they studied one of the following majors: accounting, economics, finance, computer programming, computer science, data processing, engineering, mathematics, physical sciences. The association between expected inflation and the *Frequency CPI* is lower for individuals that have a quantitative major relative to others, although the statistical significance of this difference is sparse.

The second source of sophistication about inflation we consider is holding a mortgage. Inflation impacts on the real value of mortgages. Individuals that hold a mortgage might be more exposed to specialized sources of information regarding inflation than grocery shopping. Consistently, in columns (3)-(4) of Table 5 we find the association between the *Frequency CPI* and inflation expectations iss 45% lower for mortgage holders than the

one for non-mortgage holders.

Third, we exploit the answers to the probabilistic questions to study whether individual forecast uncertainty matters for the link between expected inflation and perceived inflation. Columns (5)-(6) of Table 5 split the sample between rounders and non-rounders. We define rounders as those respondents that report inflation expectations as a multiple of 5, such as 0, 5, 10 or -5. Rounding is commonly used as a proxy for uncertainty in one's inflation expectations (Manski and Molinari (2010); Binder (2017)).We find a correlation between the Frequency CPI and expected inflation that is substantially larger for individuals that round than for non-rounders, but for both groups the associations are different from zero both statistically and economically.

Taken together, the results in Table 5 suggest less sophisticated households tend to rely more on their shopping bundles when forming inflation expectations relative to other individuals. In Table A.3 of the Online Appendix, we propose additional proxies for respondents' sophistication in economic matters, and we document additional patterns consistent with these conclusions. Moreover, Table A.4 of the Online Appendix considers other demographic splits that might help explain the correlation between the *Frequency CPI* and inflation expectations.

B. Intensity of Exposure to Prices

To dig deeper into the mechanisms that explain why individuals use the prices changes they observe while shopping trips to form inflation expectations, we consider the effects of the frequency with which individuals are exposed to prices on their inflation expectations.

The frequency of exposure to prices might matter for at least two non-mutually-exclusive reasons. First, individuals that shop frequently will not observe any price changes during most of their shopping trips. If they observe a price change, the change might be small and not salient. Instead, individuals that shop only once in a while are more likely to observe price changes from one shopping trip to the other. These price changes are also likely to be of moderate size, because individuals might observe the new price of a good they purchase after a set of (unobserved) smaller price changes that intervened between two of their shopping trips.

A second reason why the frequency of exposure to prices might matter is that individuals that shop frequently might have a good sense for the components and expenditure shares of their overall consumption bundle, because they observe their full consumption bundle often. Instead, infrequent shoppers might only observe parts of their consumption bundles at different points in time and hence might be more likely to focus on specific, salient price changes within their consumption baskets.

To assess these potential explanations, we consider two proxies for the frequency with which individuals grocery shop. Columns (1)-(2) of Table 6 split the sample between individuals that shop more than once a week and other individuals. Column (1) shows individuals that shop less frequently display a higher correlation between the price changes they observe while shopping and their inflation expectations relative to individuals that shop more than once a week. When we split the sample based on the distance in minutes from the respondents' primary shopping outlet, we find that the longer it takes to get to the shopping outlet, the higher is the correlation between perceived inflation from shopping and expected inflation. Both pieces of evidence appear consistent with the conjectures we discussed above that lower frequency of exposure to price changes relates to a stronger reliance on observe price changes when forming inflation expectations.

To corroborate this interpretation of our results, in Table A.5 of the Online Appendix we report one additional sample cut – we divide individuals based on whether they report they are the main grocery shopper for the household or not. Consistent with the frequency-of-exposure interpretation, we find the association between observed price changes and inflation expectations is lower for the primary grocery shoppers, who are exposed to grocery prices more frequently than others.

V Concluding Remarks

The inflation individuals perceive in their grocery baskets helps explain the cross-sectional variation in inflation expectations. We document this fact using novel and unique data, which augment the information on individual consumption baskets in the Nielsen Homescan Panel with a rich set of dimensions such as inflation expectations, consumption

plans, and individual expectations.

Price changes of the goods households purchase more frequently drive our results. Moreover, individuals that are more likely to be exposed to price changes in their typical grocery shopping trip have higher expectations about overall inflation. The association is stronger for individuals that do not rely on alternative sources to obtain information about inflation, and individuals with lower sophistication in economic matters. Because those whose inflation expectations align with ex-post realized inflation do not display an association between grocery price changes and expectations, rational inattention is unlikely to explain our findings in full.

The results in this paper open new avenues of research and policy making. If perceived changes in the prices of consumption goods shape households' inflation expectations, the current conduct of monetary policy that neglects "volatile" price series might result in systematic policy mistakes. Household-level surveys could be the first step for the creation of micro-based indices of perceived inflation at the household level. Such indices would provide largely different information regarding household-level expectations compared to the extant consumer price indices (CPI), which are based on the consumption basket of a representative household in the economy, and hence neglect the variation in salience and perception of price changes at the micro level.

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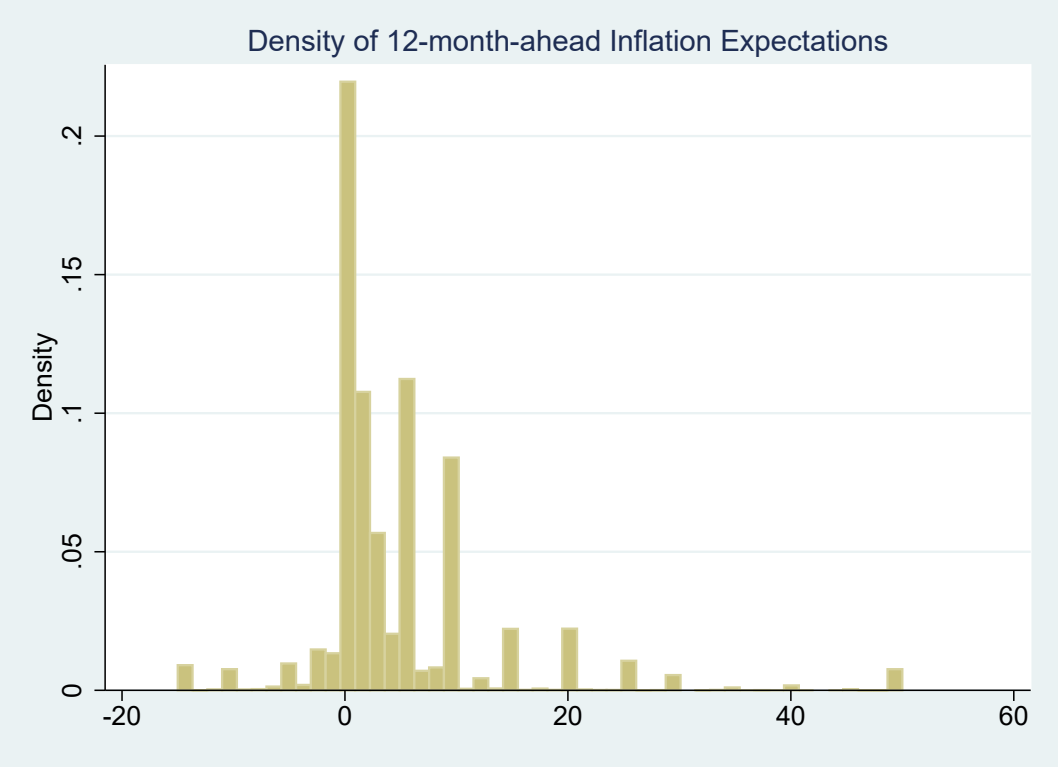
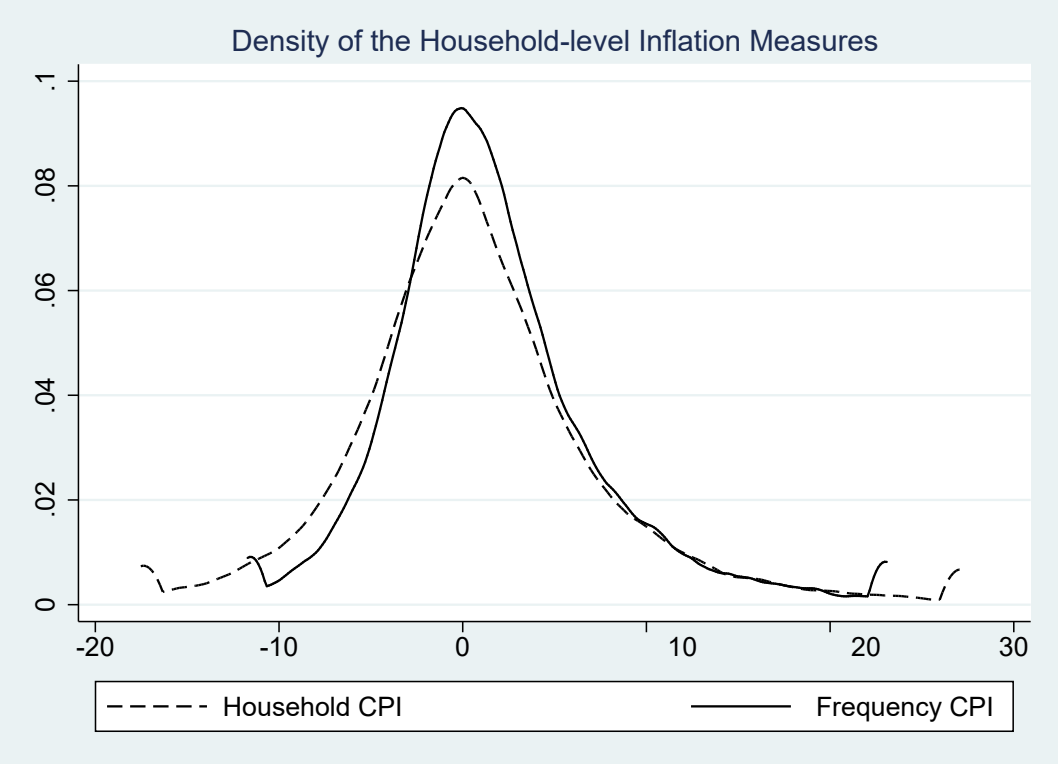
Figure 2: **Density of Inflation Expectations**



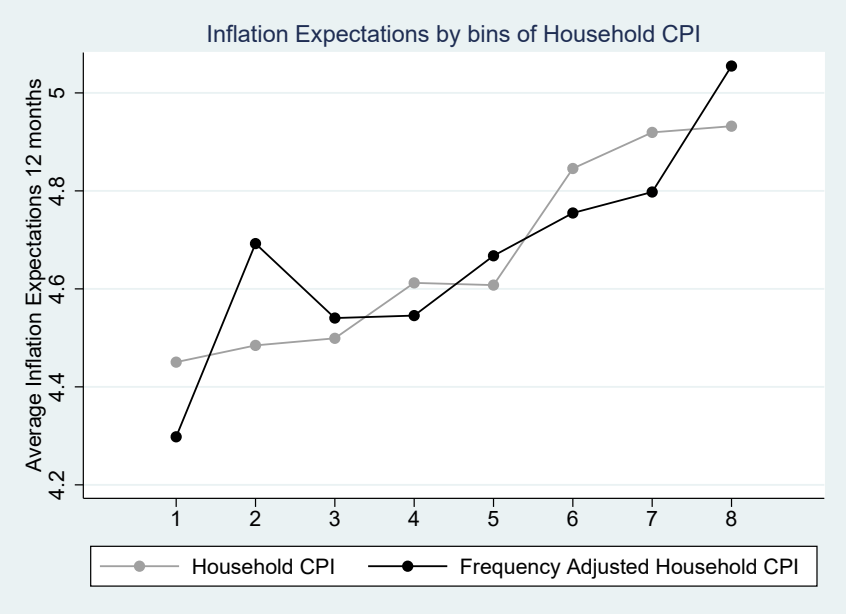
Notes. This figure plots the density of 12-month-ahead inflation expectations from the customized *Chicago Booth Attitudes and Expectations survey* we fielded in 6/2015 and 7/2016. Respondents can provide values for inflation expectations between -100 percentage points and 100 percentage points. We winsorize the numerical values at the 1-99 percentile levels.

Figure 3: **Distribution of Household CPIs**



Notes. This figure plots the distribution of household inflation experiences from the Nielsen homescan panel. We use the 12 months before June of the survey wave to measure price changes and the 12 months before that period as the base period. Household CPI uses the Nielsen expenditure shares in the base periods as weight and, Frequency CPI uses the frequency of purchases of a given good in Nielsen in the base period as weight. We detail the construction of the indices in Section II.*C.*

Figure 4: **Comparing Inflation Expectations by Measures of CPI**



Notes. This figure plots inflation expectations by measures of experienced inflation. We measure inflation expectations from the customized *Chicago Booth Attitudes and Expectations survey* we fielded in 6/2015 and 7/2016. We use the micro data from the Nielsen homescan panel to create different measures of experienced inflation. We use the 12 months before June of the survey wave to measure price changes, and the 12 months before that period as the base period. Household CPI uses the Nielsen expenditure shares in the base periods as weight and, Frequency CPI uses the frequency of purchases of a given good in Nielsen in the base period as weight. We detail the construction of the indices in Section II.*C*.

Table 1: **Summary Statistics**

This table reports summary statistics for the main independent and dependent variables in our running sample. Expected Inflation and Perceived Inflation are reported numerical expectations and perceptions of inflation rates for a 12-month period, and are bounded between -100 percentage points and 100 percentage points. Household CPI and Frequency CPI are the measures of household-level grocery inflation based on scanner data from the Nielsen Homescan Panel defined in section C.. Both measures are computed over an horizon of 12 months before the respondent took part in the Chicago Booth Expectations and Attitudes Survey. Income Outlook, Economic Outlook, and Financial Outlook are qualitative respondent expectations on the soundness of income growth, personal financial conditions, and overall economic outlook of the country for the following 12 months, and are bounded between 1 (very bad) and 5 (very good).

	Observations (1)	Mean (2)	St. dev. (3)	Min (4)	25th (5)	Median (6)	75th (7)	Max (8)
Age	59,118	61.4	12.9	21	54	63	70	102
Male	59,126	0.36	0.48	0	0	0	1	1
Unemployed	59,126	0.05	0.22	0	0	0	0	1
Home Owner	59,126	0.74	0.44	0	0	1	1	1
Household Size	56,227	2.19	1.11	1	1	2	3	9
College	59,126	0.48	0.5	0	0	0	1	1
Income Outlook [1-3]	59,126	2.18	0.9	1	1	3	3	3
Economic Outlook [1-5]	59,126	2.69	1.04	1	2	3	4	5
Financial Outlook [1-5]	59,126	3	0.88	1	2	3	4	5
Expected Inflation	59,126	4.44	8.27	-20	0	2	5	45
Perceived Inflation	59,126	4.67	8.2	-15	0	2	6	50
Household CPI	59,126	0.81	7.14	-17.5	-3.17	0.23	4.02	27.16
Frequency CPI	59,126	1.61	5.85	-11.71	-1.91	0.83	4.21	23.08

Table 2: **Inflation Expectations and Experienced Inflation: Baseline**

This table reports the estimates of regressing individuals inflation expectations on the inflation rates experienced in their household consumption bundle. We measure inflation expectations from the customized Chicago Booth Attitudes and Expectations survey which we fielded in June of 2015 and 2016. We randomize the inflation question asking one half of the survey about changes in prices following the wording in the Michigan Survey of Consumers and one half directly about inflation following the wording in the New York Fed Survey. We use the micro data from the Nielsen homescan panel to create different measures of experienced inflation. We use the 12 months before the June of the survey wave to measure price changes and the 12 months before that period as the base period. Household CPI uses the Nielsen expenditure shares in the base periods as weight and frequency CPI uses the frequency of purchases of a given good in Nielsen in the base period as weight. We detail the construction of the indices in Section C.. Standard errors are clustered at the household level. All regressions include survey wave and inflation question fixed effects. Demographic controls include: age, square of age, sex, employment status, 16 income dummies, home ownership, marital status, household size, college dummy, 4 race dummies, reported risk tolerance. Expectations controls include: household income expectations, aggregate economic outlook, and personal financial outlook.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Household CPI	0.17***	0.17***	0.21***				0.05	0.03	0.09
	(0.04)	(0.04)	(0.07)				(0.06)	(0.06)	(0.09)
Frequency CPI				0.20***	0.20***	0.31***	0.16***	0.18***	0.23**
				(0.04)	(0.04)	(0.09)	(0.06)	(0.06)	(0.12)
Nobs	59,126	57,730	57,730	59,126	57,730	57,730	59,126	57,730	57,730
R^2	0.0279	0.0952	0.7905	0.0281	0.0954	0.7905	0.0281	0.0954	0.7905
Demographics		X	X		X	X		X	X
Expectations		X	X		X	X		X	X
County FE		X	X		X	X		X	X
Individual FE			X			X			X

Standard errors in parentheses

$*p < 0.10, **p < 0.05, ***p < 0.01$

Table 3: **Inflation Expectations and Experienced Inflation: Forecast Accuracy**

This table reports the estimates of regressing individuals inflation expectations on the inflation rates experienced in their household consumption bundle. We measure inflation expectations from the customized Chicago Booth Attitudes and Expectations survey which we fielded in June of 2015 and 2016. We randomize the inflation question asking one half of the survey about changes in prices following the wording in the Michigan Survey of Consumers and one half directly about inflation following the wording in the New York Fed Survey. We use the micro data from the Nielsen homescan panel to create measures of experienced inflation. We use the 12 months before the June of the survey wave to measure price changes and the 12 months before that period as the base period. Frequency CPI uses the frequency of purchases of a given good in Nielsen in the base period as weight. We detail the construction of the indices in Section C.. Standard errors are clustered at the household level. All regressions include survey wave and inflation question fixed effects. Demographic controls include: age, square of age, sex, employment status, 16 income dummies, home ownership, marital status, household size, college dummy, 4 race dummies, reported risk tolerance. Expectations controls include: household income expectations, aggregate economic outlook, and personal financial outlook.

	1% < $\mathbb{E}(\pi)$ < 3%		-1% < $\mathbb{E}(\pi)$ <= 1% | 3% <= $\mathbb{E}(\pi)$ < 5%		$\mathbb{E}(\pi)$ < -1% | $\mathbb{E}(\pi)$ >= 3%	
	(1)	(2)	(3)	(4)	(5)	(6)
Frequency CPI	0.00	0.00	0.02***	0.03***	0.24***	0.20***
	(0.00)	(0.00)	(0.01)	(0.01)	(0.07)	(0.07)
Nobs	5,793	5,484	24,854	23,445	25,786	24,163
R^2	0.002	0.0376	0.0023	0.0722	0.0147	0.1051
Demographics		X		X		X
Expectations		X		X		X
County FE		X		X		X

Standard errors in parentheses
$*p < 0.10, **p < 0.05, ***p < 0.01$

Table 4: **Inflation Expectations and Experienced Inflation: Information Sources**

This table reports the estimates of regressing individuals inflation expectations on the inflation rates experienced in their household consumption bundle. Columns (1) to (2) split the sample by media information, columns (3) to (4) split the sample by other peoples' information and columns (5) to (6) split the sample by own experience. We measure inflation expectations from the customized Chicago Booth Attitudes and Expectations survey which we fielded in June of 2015 and 2016. We randomize the inflation question asking one half of the survey about changes in prices following the wording in the Michigan Survey of Consumers and one half directly about inflation following the wording in the New York Fed Survey. We use the micro data from the Nielsen homescan panel to create different measures of experienced inflation. We use the 12 months before the June of the survey wave to measure price changes and the 12 months before that period as the base period. Frequency CPI uses the frequency of purchases of a given good in Nielsen in the base period as weight. We detail the construction of the indices in Section C.. Standard errors are clustered at the household level. All regressions include survey wave and inflation question fixed effects. Demographic controls include: age, square of age, sex, employment status, 16 income dummies, home ownership, marital status, household size, college dummy, 4 race dummies, reported risk tolerance. Expectations controls include: household income expectations, aggregate economic outlook, and personal financial outlook.

	Media		Other People		Own Experience	
	No	Yes	No	Yes	No	Yes
	(1)	(2)	(3)	(4)	(5)	(6)
Frequency CPI	0.30***	0.08	0.28***	0.12*	0.14***	0.28***
	(0.07)	(0.07)	(0.08)	(0.07)	(0.06)	(0.08)
Nobs	13,224	12,823	12,306	13,741	16,541	9,506
R^2	0.1131	0.0517	0.1167	0.0556	0.0717	0.1243
Demographics	X	X	X	X	X	X
Expectations	X	X	X	X	X	X
County FE	X	X	X	X	X	X

Standard errors in parentheses
$*p < 0.10, **p < 0.05, ***p < 0.01$

Table 5: **Inflation Expectations and Experienced Inflation: Sophistication**

This table reports the estimates of regressing individuals inflation expectations on the inflation rates experienced in their household consumption bundle. Columns (1)-(2) split the sample by quantitative major, columns (3)-(4) by mortgage ownership, and columns (5)-(6) by whether respondents reported rounded values for their inflation expectations. We measure inflation expectations from the customized Chicago Booth Attitudes and Expectations survey which we fielded in June of 2015 and 2016. We randomize the inflation question asking one half of the survey about changes in prices following the wording in the Michigan Survey of Consumers and one half directly about inflation following the wording in the New York Fed Survey. We use the micro data from the Nielsen homescan panel to create different measures of experienced inflation. We use the 12 months before the June of the survey wave to measure price changes and the 12 months before that period as the base period. Frequency CPI uses the frequency of purchases of a given good in Nielsen in the base period as weight. We detail the construction of the indices in Section C.. Standard errors are clustered at the household level. All regressions include survey wave and inflation question fixed effects. Demographic controls include: age, square of age, sex, employment status, 16 income dummies, home ownership, marital status, household size, college dummy, 4 race dummies, reported risk tolerance. Expectations controls include: household income expectations, aggregate economic outlook, and personal financial outlook.

	Quantitative Major		Mortgage Holder		Rounders	
	No	Yes	No	Yes	No	Yes
	(1)	(2)	(3)	(4)	(5)	(6)
Frequency CPI	0.21***	0.15 * *	0.23***	0.13***	0.09***	0.24***
	(0.04)	(0.07)	(0.06)	(0.05)	(0.03)	(0.05)
Nobs	47,773	9,957	19,582	21,429	19,860	37,870
R^2	0.0938	0.1341	0.1114	0.1178	0.0683	0.1008
Demographics	X	X	X	X	X	X
Expectations	X	X	X	X	X	X
County FE	X	X	X	X	X	X

Standard errors in parentheses
$*p < 0.10, * * p < 0.05, * * *p < 0.01$

Table 6: **Inflation Expectations and Experienced Inflation: Exposure to Prices**

This table reports the estimates of regressing individuals inflation expectations on the inflation rates experienced in their household consumption bundle. Columns (1) to (2) split the sample by shopping frequency and columns (3) to (5) split the sample by distance to the primary grocery store. We measure inflation expectations from the customized Chicago Booth Attitudes and Expectations survey which we fielded in June of 2015 and 2016. We randomize the inflation question asking one half of the survey about changes in prices following the wording in the Michigan Survey of Consumers and one half directly about inflation following the wording in the New York Fed Survey. We use the micro data from the Nielsen homescan panel to create different measures of experienced inflation. We use the 12 months before the June of the survey wave to measure price changes and the 12 months before that period as the base period. Frequency CPI uses the frequency of purchases of a given good in Nielsen in the base period as weight. We detail the construction of the indices in Section C.. Standard errors are clustered at the household level. All regressions include survey wave and inflation question fixed effects. Demographic controls include: age, square of age, sex, employment status, 16 income dummies, home ownership, marital status, household size, college dummy, 4 race dummies, reported risk tolerance. Expectations controls include: household income expectations, aggregate economic outlook, and personal financial outlook.

	Shopping Frequency		Time to Primary Shopping Outlet		
	< 1 per Week	> 1 per Week	< 20 Min	> 20 Min & < 60 Min	> 60 Min
	(1)	(2)	(3)	(4)	(5)
Frequency CPI	0.24 ∗ ∗	0.17∗∗∗	0.14∗∗∗	0.27∗∗∗	0.80∗∗∗
	(0.14)	(0.06)	0.06	(0.13)	(0.24)
Nobs	4,745	21,302	18,540	5,867	1,640
R^2	0.1425	0.0895	0.0954	0.1171	0.2322
Demographics	X	X	X	X	X
Expectations	X	X	X	X	X
County FE	X	X	X	X	X

Standard errors in parentheses
$*p < 0.10, * * p < 0.05, * * *p < 0.01$

Online Appendix: Salient Price Changes, Inflation Expectations, and Household Behavior

Francesco D'Acunto, Ulrike Malmendier, Juan Ospina, and Michael Weber

Not for Publication

Table A.1: **Inflation Expectations and Experienced Inflation: Robustness**

This table reports the estimates of regressing individuals inflation expectations on the inflation rates experienced in their household consumption bundle. Columns (1) to (3) exclude inflation expectations of 0, columns (4) to (6) use the mean of the inflation expectations distribution, and columns (7) to (9) exclude individuals that report the same values for inflation perceptions and expectations. We measure inflation expectations from the customized Chicago Booth Attitudes and Expectations survey which we fielded in June of 2015 and 2016. We randomize the inflation question asking one half of the survey about changes in prices following the wording in the Michigan Survey of Consumers and one half directly about inflation following the wording in the New York Fed Survey. We use the micro data from the Nielsen homescan panel to create different measures of experienced inflation. We use the 12 months before the June of the survey wave to measure price changes and the 12 months before that period as the base period. Frequency CPI uses the frequency of purchases of a given good in Nielsen in the base period as weight. We detail the construction of the indices in Section C.. Standard errors are clustered at the household level. All regressions include survey wave and inflation question fixed effects. Demographic controls include: age, square of age, sex, employment status, 16 income dummies, home ownership, marital status, household size, college dummy, 4 race dummies, reported risk tolerance. Expectations controls include: household income expectations, aggregate economic outlook, and personal financial outlook.

	No 0 Inflation Expectations			Mean of Distribution			Perceptions != Expectations		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Frequency CPI	0.19***	0.18***	0.24 * *	0.06***	0.07***	0.14***	0.13 * *	0.14 * *	0.31
	(0.05)	(0.05)	(0.13)	(0.02)	(0.02)	(0.04)	(0.06)	(0.06)	(0.20)
Nobs	42,263	41,251	41,251	59,125	57,729	57,729	29,019	28,280	28,280
R^2	0.0205	0.125	0.8678	0.0184	0.1322	0.8145	0.0158	0.1144	0.8936
Demographics		X	X		X	X		X	X
Expectations		X	X		X	X		X	X
County FE		X	X		X	X		X	X
Individual FE			X			X			X

Standard errors in parentheses

$*p < 0.10, * * p < 0.05, * * *p < 0.01$

Table A.2: **Inflation Perception and Experienced Inflation**

This table reports the estimates of regressing individuals inflation perceptions on the inflation rates experienced in their household consumption bundle. We measure inflation expectations from the customized Chicago Booth Attitudes and Expectations survey which we fielded in June of 2015 and 2016. We randomize the inflation question asking one half of the survey about changes in prices following the wording in the Michigan Survey of Consumers and one half directly about inflation following the wording in the New York Fed Survey. We use the micro data from the Nielsen homescan panel to create different measures of experienced inflation. We use the 12 months before the June of the survey wave to measure price changes and the 12 months before that period as the base period. Household CPI uses the Nielsen expenditure shares in the base periods as weight and frequency CPI uses the frequency of purchases of a given good in Nielsen in the base period as weight. We detail the construction of the indices in Section C.. Standard errors are clustered at the household level. All regressions include survey wave and inflation question fixed effects. Demographic controls include: age, square of age, sex, employment status, 16 income dummies, home ownership, marital status, household size, college dummy, 4 race dummies, reported risk tolerance. Expectations controls include: household income expectations, aggregate economic outlook, and personal financial outlook.

	(1)	(2)	(3)
Household CPI	0.20***		−0.02
	(0.03)		(0.05)
Frequency CPI		0.28***	0.29***
		(0.03)	(0.05)
Nobs	57,730	57,730	57,730
R2	0.0878	0.0883	0.0883
Demographics	X	X	X
Expectations	X	X	X
County FE	X	X	X

Standard errors in parentheses
$*p < 0.10, **p < 0.05, ***p < 0.01$

Table A.3: **Inflation Expectations and Experienced Inflation: Sophistication (Robustness)**

This table reports the estimates of regressing individuals inflation expectations on the inflation rates experienced in their household consumption bundle. Columns (1) to (3) split the sample by the variance of the inflation expectations distribution and columns (4) to (5) split the sample by the occurence of rounders vs non-rounders of inflation expectations. We measure inflation expectations from the customized Chicago Booth Attitudes and Expectations survey which we fielded in June of 2015 and 2016. We randomize the inflation question asking one half of the survey about changes in prices following the wording in the Michigan Survey of Consumers and one half directly about inflation following the wording in the New York Fed Survey. We use the micro data from the Nielsen homescan panel to create different measures of experienced inflation. We use the 12 months before the June of the survey wave to measure price changes and the 12 months before that period as the base period. Frequency CPI uses the frequency of purchases of a given good in Nielsen in the base period as weight. We detail the construction of the indices in Section C.. Standard errors are clustered at the household level. All regressions include survey wave and inflation question fixed effects. Demographic controls include: age, square of age, sex, employment status, 16 income dummies, home ownership, marital status, household size, college dummy, 4 race dummies, reported risk tolerance. Expectations controls include: household income expectations, aggregate economic outlook, and personal financial outlook.

	Uncertainty			Business Education		Stock Market Participation	
	Low	Medium	High	No	Yes	No	Yes
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Frequency CPI	0.13***	0.14***	0.17***	0.20***	0.18***	0.23***	0.16***
	(0.05)	(0.06)	(0.08)	(0.04)	(0.08)	(0.05)	(0.05)
Nobs	15,728	14,212	13,169	47,547	10,183	19,582	21,429
R^2	0.1304	0.1082	0.0784	0.0938	0.1391	0.1114	0.1178
Demographics	X	X	X	X	X	X	X
Expectations	X	X	X	X	X	X	X
County FE	X	X	X	X	X	X	X

Table A.4: **Inflation Expectations and Experienced Inflation: Demographic Splits**

This table reports the estimates of regressing individuals inflation expectations on the inflation rates experienced in their household consumption bundle. We measure inflation expectations from the customized Chicago Booth Attitudes and Expectations survey which we fielded in June of 2015 and 2016. We randomize the inflation question asking one half of the survey about changes in prices following the wording in the Michigan Survey of Consumers and one half directly about inflation following the wording in the New York Fed Survey. We use the micro data from the Nielsen homescan panel to create measures of experienced inflation. We use the 12 months before the June of the survey wave to measure price changes and the 12 months before that period as the base period. Frequency CPI uses the frequency of purchases of a given good in Nielsen in the base period as weight. We detail the construction of the indices in Section C.. Standard errors are clustered at the household level. All regressions include survey wave and inflation question fixed effects. Demographic controls include: age, square of age, sex, employment status, 16 income dummies, home ownership, marital status, household size, college dummy, 4 race dummies, reported risk tolerance. Expectations controls include: household income expectations, aggregate economic outlook, and personal financial outlook.

	Low Income	High Income	Young	Old	Small Households	Big Households
	(1)	(2)	(3)	(4)	(5)	(6)
Frequency CPI	0.19***	0.16***	0.10	0.19***	0.16***	0.18**
	(0.05)	(0.06)	(0.07)	(0.05)	(0.04)	(0.08)
Nobs	25,394	30,833	18,194	38,026	42,192	14,118
R^2	0.0582	0.0425	0.0478	0.0576	0.0524	0.0581
Demographics	X	X	X	X	X	X
Expectations	X	X	X	X	X	X
County FE	X	X	X	X	X	X

Standard errors in parentheses
$*p < 0.10, **p < 0.05, ***p < 0.01$

Table A.5: **Inflation Expectations and Experienced Inflation: Exposure to Prices 2**

This table reports the estimates of regressing individuals inflation expectations on the inflation rates experienced in their household consumption bundle. Columns (1) to (2) split the sample by primary grocery shopper, columns (3) to (4) split the sample by frequency of gas station visits and columns (5) to (6) split the sample by frequency of restaurant visits. We measure inflation expectations from the customized Chicago Booth Attitudes and Expectations survey which we fielded in June of 2015 and 2016. We randomize the inflation question asking one half of the survey about changes in prices following the wording in the Michigan Survey of Consumers and one half directly about inflation following the wording in the New York Fed Survey. We use the micro data from the Nielsen homescan panel to create different measures of experienced inflation. We use the 12 months before the June of the survey wave to measure price changes and the 12 months before that period as the base period. Frequency CPI uses the frequency of purchases of a given good in Nielsen in the base period as weight. We detail the construction of the indices in Section C.. Standard errors are clustered at the household level. All regressions include survey wave and inflation question fixed effects. Demographic controls include: age, square of age, sex, employment status, 16 income dummies, home ownership, marital status, household size, college dummy, 4 race dummies, reported risk tolerance. Expectations controls include: household income expectations, aggregate economic outlook, and personal financial outlook.

	Primary Grocery Shopper		Frequency of Gas Station		Frequency of Restaurants	
	No	Yes	Low	High	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)
Frequency CPI	0.25***	0.15***	0.25***	0.13***	0.22***	0.20***
	(0.06)	(0.05)	(0.04)	(0.06)	(0.05)	(0.05)
Nobs	24,888	32,842	33,992	23,738	33,396	24,334
R^2	0.0972	0.1041	0.1054	0.0959	0.1025	0.0993
Demographics	X	X	X	X	X	X
Expectations	X	X	X	X	X	X
County FE	X	X	X	X	X	X

Standard errors in parentheses
$*p < 0.10, **p < 0.05, ***p < 0.01$

Table A.6: **Salient Price Changes, Levering, and Investing**

This table reports the association between the inflation rates experienced in the household consumption bundle computed overweighing the more changes in prices for the goods the household purchases more frequently (Frequency CPI) on a set of expectations about rates and households' real outcomes in terms of levering and investing choices. Columns (1) and (2) report marginal effects of a multinomial logit model of whether the individual thinks mortgage rates and nominal interest rates will decrease over the next 12 months. Columns (3) and (4) report marginal effects from a probit specification whose outcome variable is a dummy for whether the responded has a mortgage (columns (3)) and has a savings account (column (4)). Columns (5) and (6) report estimated coefficient from censored regressions on the association between the Frequency CPI and the share of wealth the individual has invested in real estate (column (5)) and in savings accounts (column (6)). We measure the outcomes from the customized Chicago Booth Attitudes and Expectations survey which we fielded in June of 2015 and 2016. We use the micro data from the Nielsen homescan panel to create the measure of experienced inflation. We use the 12 months before the June of the survey wave to measure price changes and the 12 months before that period as the base period. Frequency CPI uses the frequency of purchases of a given good in Nielsen in the base period as weight. We detail the construction of the indices in Section C.. Standard errors are clustered at the household level. All regressions include survey wave fixed effects. Demographic controls include: age, square of age, sex, employment status, 16 income dummies, home ownership, marital status, household size, college dummy, 4 race dummies, reported risk tolerance. Expectations controls include: household income expectations, aggregate economic outlook, and personal financial outlook.

	Rates Will Decrease		Holds		Share Wealth in	
	Mortgages	Nominal Int. Rates	Mortgages	Saving Accounts	Real Estate	Saving Accounts
	(1)	(2)	(3)	(4)	(5)	(6)
Frequency CPI	−0.003**	−0.005***	−0.033***	0.021***	−0.013*	0.006**
	(0.001)	(0.002)	(0.003)	(0.002)	0.008	0.003
Nobs	30,173	56,220	40,073	56,220	38,295	38,295
R^2						
Demographics	X	X	X	X	X	X
Expectations	X	X	X	X	X	X
County FE	X	X	X	X	X	X

Standard errors in parentheses

$*p < 0.10, **p < 0.05, ***p < 0.01$