

The Subjective Inflation Expectations of Households and Firms: Measurement, Determinants, and Implications

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Federal Reserve chair Jerome Powell (2021) recently said: “Inflation expectations are terribly important. We spend a lot of time watching them.” Why would these expectations be so important? The traditional policy view is that inflation expectations help central banks and other institutions predict future inflation rates and hence feed into the production of economic forecasts—one of the main tasks policy institutions perform. Indeed, the survey-based inflation expectations of professionals and households have been shown to help forecast future inflation (Ang, Bekaert, and Wei 2007). Traditionally, macroeconomic researchers have also stressed an important role for the inflation expectations of a specific group of agents, financial market participants, because such expectations have been shown to affect asset prices, such as stock prices and interest rates (Bernanke and Kuttner 2005).

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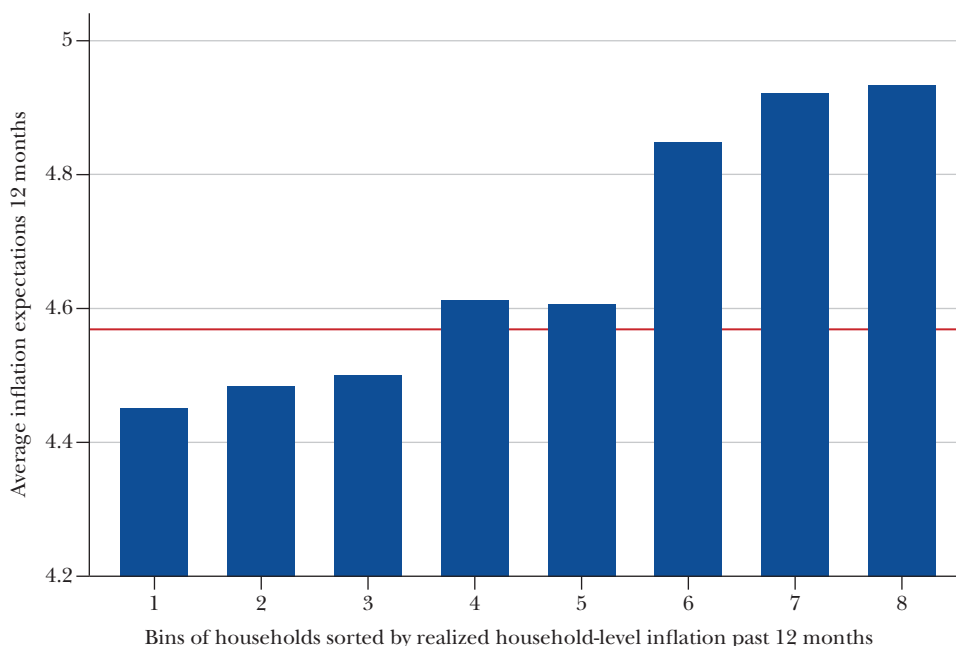
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These two traditional roles of inflation expectations, though, are *not* the ones central bankers such as Powell have been emphasizing since the Great Recession. In their view, the key reason why subjective inflation expectations matter is that they affect the prices and wages firms set as well as the consumption-saving decisions of households. This view does not focus on the expectations of financial-market participants or professional forecasters—of which most firms and households are barely ever aware—but on the subjective inflation expectations of ordinary economic agents. James Bullard (2016), President of the St. Louis Federal Reserve Bank, laid out this logic clearly in explaining why inflation expectations are important: “Firms and households take into account the expected rate of inflation when making economic decisions, such as wage contract negotiations or firms’ pricing decisions.” If subjective inflation expectations affect such important choices for individual and aggregate outcomes, understanding the patterns of inflation expectations in the cross-section and time series is crucial. The driving forces behind their heterogeneity across individuals and firms can also help us understand why otherwise similar economic decision-makers react so differently to the same business-cycle shocks and policy interventions, patterns that traditional representative-agent models cannot capture.

Why would households and firms take their subjective inflation expectations into account when making fundamental economic choices? In theory, how rapidly households expect prices to increase in the future should matter for how they allocate their spending over time. For example, expectations of much higher prices in the future should induce households to purchase more goods today while prices are still relatively low (“intertemporal substitution”). Also, because nominal prices and wages change only infrequently, high rates of inflation erode the value of sticky nominal prices and wages over time, a feature firms and workers take into account when setting prices as well as when bargaining over wage increases. Subjective inflation expectations also shape expectations of how expensive it will be to repay loans with future dollars, and such expectations are crucial to firms’ investment decisions—which typically require external financing—as well as households’ choices about how to finance the purchase of large-ticket items such as houses, cars, and other durable goods.

Despite this prominent role of subjective inflation expectations in theoretical models and the assessments of policymakers, economists still know little about how such expectations are formed and why they are so heterogeneous even across agents who appear similar based on demographic characteristics. In fact, even the ways in which subjective inflation expectations (and macroeconomic expectations in general) can be best elicited from a population of agents who are often not economically, financially, or mathematically sophisticated is still an open debate in the profession. A few facts, though, hold systematically across space and over time. For instance, on average the inflation expectations of households and firms are higher than what inflation turns out to be and the disagreement across households and firms is orders of magnitudes higher than that among professional forecasters. Understanding the causes and consequences of these distortions in the beliefs of ordinary agents relative to the inflation that later occurs has been at the center of a recently burgeoning academic literature at the intersection of economics, psychology, marketing, and related fields.

Figure 1

Personal Grocery Inflation and Inflation Expectations

Source: Weber et al. (2022).

Note: This figure plots average individual survey inflation expectations from the Chicago Booth Expectations and Attitudes Survey on the y -axis for eight groups of respondents sorted based on the inflation of their personal grocery bundle in the 12 months before the survey (x -axis). The x -axis contains bins of households with each bin containing approximately 6,250 respondents.

One of the lessons from this literature is that ordinary agents consider the specific economic signals they observe in their own environment, such as the prices households see while shopping or the prices firms see their competitors set, to form and update their own inflation expectations. Figure 1 illustrates this point. This graph plots average individual-level one-year ahead inflation expectations (y -axis) from the Chicago Booth Expectations and Attitudes Survey (see Nielsen IQ 2017) against bins of household-specific grocery inflation over the previous 12-month (x -axis) (Kaplan and Schulhofer-Wohl 2017; D'Acunto, Malmendier, Ospina, et al. 2021). The inflation agents have observed in their own grocery bundles is indeed correlated with their expectations about future inflation. The differences in average inflation expectations across the extreme bins is large—it amounts to about 0.5 percentage points for a period in which realized inflation was systematically below the 2 percent inflation target by the Federal Reserve.

The presence of systematic associations in the data is *prima facie* evidence that elicited subjective expectations are not pure noise: if they were, we would not detect systematic patterns. Yet eliciting and measuring the inflation expectations of agents

who typically know relatively little about economics poses daunting challenges and stumbling blocks. Survey respondents will always provide an answer when forced, but whether such an answer truly reflects actual beliefs will depend on whether agents understand survey questions, on the ways in which agents conceptualize inflation and other macroeconomic variables, and on the effort agents put in forming beliefs when asked, given that (contrary to the case of professional forecasters) providing accurate inflation expectations can barely be incentivized in a survey of ordinary agents. Reassuringly, researchers have learned a lot about how to design surveys for firms and households that can provide high-quality measures of their expectations about subsequent price changes—so much so that surveys of expected inflation often span decades and are available in dozens of countries.

Once consistent facts are established across space and over time, the question of how we should interpret such facts becomes compelling. Interpreting facts is ultimately a quest for the deep-rooted and underlying determinants of subjective beliefs. For instance, at least since Lucas (1972), economists have conjectured that the signals about price changes agents see explicitly around them should shape their subjective inflation expectations. Following this line of reasoning, grocery and gasoline price changes should play a particularly important role, because ordinary households observe such prices frequently in their daily lives. Relying on personal signals about price changes might also help explain the observed heterogeneity and dispersion of subjective inflation expectations, because agents purchase different bundles of goods, shop at different outlets, and engage with different sets of suppliers and customers, and hence they observe different price changes, which can feed into conflicting views about the likely path of future prices.

Ultimately, we care about subjective inflation expectations only to the extent that such expectations can help us understand heterogeneous choices and reactions observed in the data after the same shocks and policy interventions. Recent macroeconomic research using individual-level transaction data has demonstrated that subjective inflation expectations do explain heterogeneous economic decisions at the individual level and also shape macroeconomic aggregates.

The wealth of new and recent data on inflation expectations and individual-level economic choices of households and firms makes these research endeavors increasingly feasible and compelling and an exciting frontier for researchers in empirical macroeconomics, behavioral economics, finance, marketing, cognitive sciences, and many related fields. In our online Appendix, we list more than 49 survey-based sources of individual-level subjective inflation expectations that have become available across a number of countries over the last few years, with weblinks for each. These represent a wealth of data for researchers interested in the study of subjective inflation expectations.¹

¹Online Appendix Table 1 contains details on how to access microdata on inflation expectations for firms in Italy and the United States and on inflation expectations for households in the following countries: Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, Colombia, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Germany, India, Indonesia, Ireland, Italy, Greece, Hungary, France, Japan,

Challenges for Measuring the Inflation Expectations of Households and Firms

One might think that eliciting subjective inflation expectations through surveys is simple: just ask a representative sample what they think inflation will be over some horizon and then record this truthful, informed, and unbiased response. In reality, researchers have to wrestle with a number of challenges. Some of these challenges are common to the elicitation of expectations of any kind and some are specific to the measurement of inflation expectations. We highlight the issues we find most concerning in terms of survey design through the lens of the most commonly used US surveys in the literature: the Michigan Survey of Consumers and the New York Fed Survey of Consumer Expectations. For the latter survey, we refer the reader to Armantier et al. (2013) for a comprehensive description and discussion.

Question Wording

The wording of the survey question aimed at eliciting inflation expectations already poses challenges. For instance, the Michigan Survey of Consumers asks households to report their point prediction for the *change in the general level of prices*: “During the next 12 months, do you think that prices in general will go up, or go down, or stay where they are now?” In contrast, the Survey of Consumer Expectations, run by the Federal Reserve Bank of New York, asks households to report their expectations for *inflation*: “Now we would like you to think about the different things that may happen to inflation over the next 12 months.” While inflation and the change in the general level of prices may seem equivalent to economists, when asked, the general population, which typically lacks economic and financial literacy, might think about the prices in their nondurable consumption bundle rather than about the overall representative consumption bundle, might confuse levels with changes, or might be unfamiliar with the concept of inflation and have trouble using percentages (for example, see Bruine de Bruin et al. 2012).

Furthermore, neither of the surveys specifies which price index respondents should have in mind when reporting their expectations. This ambiguity allows researchers to reach a higher response rate, in part because respondents are less likely to answer “I don’t know” because they are unaware of a specific price index, but it might introduce more disagreement in survey responses. For example, respondents might form their expectations while also considering stock-market prices, which are not a part of the Consumer Price Index or other conventional price indices (Kumar et al. 2015). Some surveys do ask respondents to report their predictions for a specific price index (for example, Coibion et al. 2020), but this approach implicitly assumes that the respondents know the index and its definition.

Latvia, Lithuania, Luxembourg, Malaysia, Malta, Mexico, Montenegro, Netherlands, New Zealand, Philippines, Poland, Portugal, Republic of North Macedonia, Serbia, Singapore, Slovakia, Slovenia, Sweden, Switzerland, Spain, Turkey, the United Kingdom, and the United States.

The use of screener questions that exclude respondents who are illiterate about inflation from the survey pool have been proposed as a potential solution to this challenge, even though they open an issue of selection. The Reserve Bank of New Zealand, for instance, while collecting households' inflation expectations, uses a screener question ("What is your understanding of the term inflation?") to exclude respondents who do not understand the concept of inflation.²

Priming

Survey design can inadvertently nudge or "prime" respondents to tilt their answers in a particular direction. For example, if a respondent reports an inflation forecast that an interviewer finds unrealistic, the interviewer may probe the respondent with a clarifying question, which in turn may lead the respondent to adjust toward a "more realistic" value. For example, the Michigan Survey of Consumers provides this instruction to interviewers, "IF R GIVES AN ANSWER THAT IS GREATER THAN 5%, PLEASE PROBE WITH: 'Let me make sure I have that correct. You said that you expect prices to go (up/down) during the next 12 months by (X) percent. Is that correct?'" If probing only happens when respondents provide seemingly unrealistic forecasts of inflation, the elicitation procedure faces an undesirable asymmetry. Follow-up probing questions are meant to reduce noise in survey responses, but they may also lead to a distorted measure of what people truly think about future inflation.

Priming can take a variety of forms. For example, some surveys provide background information like levels of recent inflation. The Survey of Inflation and Growth Expectations, run by the Bank of Italy, tells managers the most recent inflation rate before asking them to report their inflation expectations: "The last [month] consumer price inflation, measured by the 12-month change in the harmonized index of consumer prices was equal to [IT] in Italy and to [EA] in the euro area. What do you think it will be in Italy?" The provision of background information affects the level and dispersion of inflation forecasts (Coibion, Gorodnichenko, and Ropele 2020).

Pre-set answer options and limited lists of possible options can also prime respondents. For instance, the Business Outlook Survey, run by the Bank of Canada, offers only four possible outcomes for inflation forecasts: "less than 1%," "1 to 2%," "2% to 3%," and "more than 3%." Coibion et al. (2020b) document that offering a limited set of choices reduces the dispersion of reported responses. Furthermore, a respondent who is uncertain about future inflation may just pick the center of the provided range if the answer is not open-ended.

Sampling

We live in an age of declining survey response rates (Bureau of Labor Statistics 2021), in part because communication has evolved in ways that bring people to pay less attention to phone calls and physical mail. In this context, reaching out to a representative group of the population and acquiring their consent to participate in

²For more details see <https://www.rbnz.govt.nz/statistics/m13>.

a survey is not easy. Online/computer-based surveys offer the greatest flexibility and can be straightforward for the computer-literate, young, and educated respondent, but often pose barriers for older individuals and those who may be less versed in technology or who evince greater mistrust from automated algorithms (D'Acunto and Rossi 2021). As a result, surveys often have to rely on a mixture of modes—online, phone, in-person—to be representative.

The opportunity cost of participating in a survey also affects enrollment. This issue is particularly stark for surveys of business executives whose time is scarce and who are only indirectly accessible through assistants. As a result, firm surveys of inflation expectations and other topics are often based on convenience samples developed via client lists, club/association members, personal contacts, and so on. In short, finding a typical and representative set of survey respondents can be difficult.

Panel Conditioning

Surveys often attempt to get participants to enroll across multiple waves. Repeated participation can be useful: for example, by looking at the evolution in views of a common set of individuals, selection due to a changing composition is not an issue. But a potential limitation of repeatedly surveying the same individuals about the same topic is that respondents may learn, from their very participation in the survey, about the topic. This effect is commonly known as “panel conditioning.” The effect is typically small in most contexts, but in the case of inflation expectations of households and firms, recent evidence indicates that it can be quite large. Kim and Binder (2021) document that households participating in the Survey of Consumer Expectations from the Federal Reserve Bank of New York reduce their inflation expectations by 2 percentage points on average after participating for a few months, which suggests that repeat participants may no longer be considered representative of the broader population.

Point Predictions versus Distributions

Manski (2004) popularized the use of survey questions that elicit subjective probability distributions about future outcomes at the micro and macro levels. For example, the Survey of Consumer Expectations from the Federal Reserve Bank of New York asks respondents to assign probabilities to ten possible ranges of future inflation: for example, “the rate of inflation will be 12% or higher,” “the rate of inflation will be between 8% and 12%,” and ranging to “the rate of deflation (opposite of inflation) will be 12% or higher.” One can use the reported probability distributions to infer not only a central tendency (like mean or mode), which is highly correlated with point forecasts, but also to capture the associated uncertainty in an individual's forecast which can signal precautionary behavior resulting in reduced consumption of households (Coibion, Georgarakos, Kenny, et al. 2021).

One concern with these types of questions is that they might be cognitively demanding for many respondents. Probabilistic elicitations induce higher dropout rates from surveys, which might bias the inference one draws from the overall survey (D'Acunto et al. 2020). Even if providing an answer, respondents who do not

understand the question format might report a level of uncertainty that differs from the actual uncertainty in their beliefs. Moreover, the ordering of the inflation bins—for example, listing the inflation bins before the deflation bins—can prime respondents toward describing higher expected inflation. Also, these questions typically center around zero and have narrower bandwidths around zero than at the extreme ranges. These design features possibly induce survey participants to perceive that values close to zero are considered more likely by the designers of the survey. Furthermore, using a fixed set of bins for possible outcomes can be constraining in times of crisis or otherwise unusual times, so that responses can end up being lumped in extreme bins. This issue has no easy solution, because adjusting the size and values of bins across survey waves, as for example the Federal Reserve Bank of Philadelphia did with the Survey of Professional Forecasters in response to the Great Recession and the COVID-19 crisis, makes it difficult to compare survey responses over time. Finally, empirical research shows that survey participants might report distributions that feature holes, which likely reflects their inability to understand a probability distribution.

To address some of these issues, Delavande and Rohwedder (2008) propose simplified visual representations of probability masses that reduce the cognitive burden for respondents who have lower numerical literacy. Alternatively, Altig et al. (forthcoming) propose asking respondents to report five possible scenarios for a given variable and then assign probabilities for these scenarios.

Addressing the Challenges

Survey designers have been creative in addressing these potential issues. For example, the response rate for a survey run by a private firm is often 10 percent or less while government-run surveys have response rates of between 50 and 80 percent, so finding a way to rely on government survey tools is useful. Visual aids can help improve the response rates and quality of responses, especially for those who struggle with understanding questions or formulating responses (for example, Delavande et al. 2011). Quantitative questions can be complemented with easier-to-answer qualitative questions. Testing various elements of survey instruments can help quantify potential biases in responses. Generally, more educated, financially literate respondents (say, managers of firms) are less sensitive to variations in the wording of questions. Some forms of priming could be addressed fairly easily by methods like randomly changing the order of questions/options or making responses more open ended. Many of these challenges are directly tackled in more ad hoc surveys that researchers design for addressing specific research questions (D'Acunto, Malmendier, et al. 2021).

Systematic Patterns in the Inflation Expectations of Households and Firms

A set of facts about subjective inflation expectations that are common to both households and firms has been documented across surveys, elicitation methods,

locations, and time periods. Hence, these facts are not artifacts of the measurement challenges we discussed above. These common patterns include: i) a systematic upward bias in numerical inflation expectations when compared to both lagged realized inflation and the average numerical expectations of professional forecasters; ii) a large amount of disagreement about future inflation, including fat tails; iii) high uncertainty in forecasts of future inflation; iv) strong correlation between the updating of expectations at the individual level in short-run and long-run inflation forecasts; and v) predictability of inflation forecasts using perceived inflation. These facts have been detected for both households and firms, even though they are more pronounced among households (Link et al. 2021). Documenting these facts and their robustness across data sets, countries, and time periods helps to guide the empirical search for the determinants of household and firms' inflation expectations and how these expectations determine real decisions, which we discuss in the following sections.

Systematic Upward Bias in Inflation Expectations

Across different data sets, countries, and time periods, researchers have documented that the average and median numerical inflation expectations of households and firms tend to be higher than the realized inflation rates that occur subsequently, and also higher than the contemporaneous inflation expectations of professional forecasters and financial-market participants.

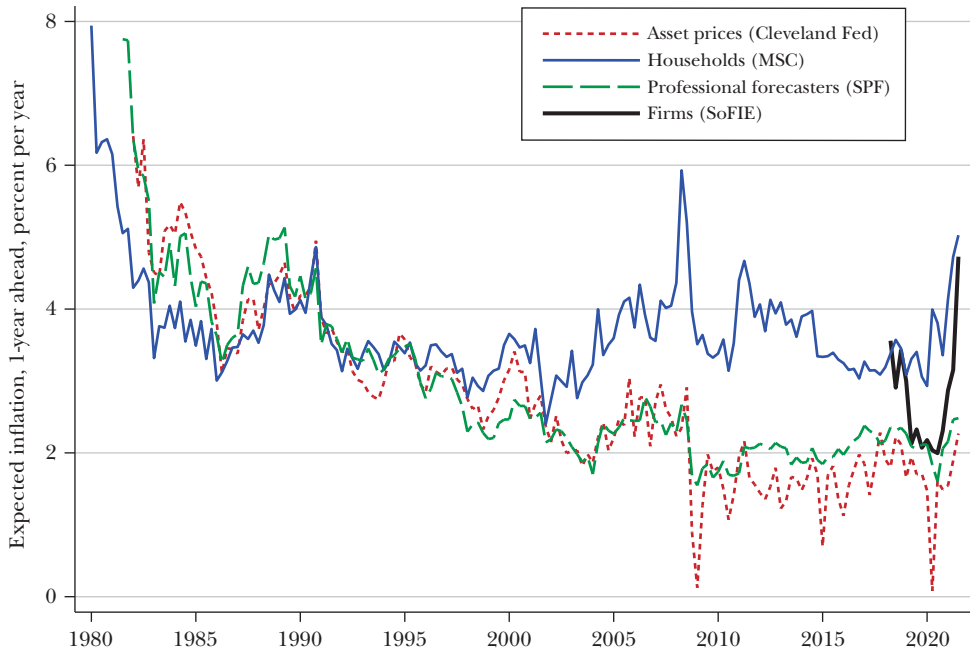
Figure 2 summarizes this pattern. The figure plots the mean of the numerical inflation expectations elicited from households each month in the Michigan Survey of Consumers as well as the mean response of top business executives participating in the Survey of Firms' Inflation Expectations.³ For comparison, the figure also includes expert forecasts of inflation from the Survey of Professional Forecasters from the Federal Reserve Bank of Philadelphia and the time series of expectations extracted from asset prices by the Federal Reserve Bank of Cleveland using "inflation swaps" (a financial derivative in which investors "swap" a fixed payment for a set of payments based on the Consumer Price Index).

As the figure illustrates, the inflation expectations of US households were systematically higher than those of either professional forecasters or financial market participants over the last two decades. The inflation expectations of firms (at the far right-hand side of the figure) also depart significantly from those of experts, although the size of the upward bias varies more over time. Other work has documented the same patterns for households and firms in many other advanced economies characterized by low and stable inflation (for example, Candia et al. 2021b). The higher inflation expectations of households and firms is one of the most robust characteristics emanating from surveys of subjective expectations.

One way to gauge information about the source of such upward bias is assessing whether the bias is systematically larger or smaller for certain demographic groups,

³For more details see <http://firm-expectations.org/>.

Figure 2
Mean Inflation Expectations



Source: Candia et al. (2021a).

Note: Financial markets' expectations are from the Federal Reserve Bank of Cleveland, households' expectations are from the Michigan Survey of Consumers (MSC), professional forecasters' expectations are from the Survey of Professional Forecasters run by the Federal Reserve Bank of Philadelphia, managers' expectations are from the Survey of Firms' Inflation Expectations (SoFIE). We exclude responses of households that are greater than 15 percent or less than -2 percent. Firms' expectations are from our new survey of CEOs. We exclude responses that are greater than 15 percentage points or less than -2 percentage points. All moments are computed using survey weights.

which could point toward potential determinants of the bias. Indeed, the bias varies systematically across specific demographic groups: for example, the upward bias is systematically higher for women than for men (Bruine de Bruin et al. 2010; D'Acunto, Malmendier, and Weber 2021), a point to which we will return. Moreover, the bias is lower for agents who have higher cognitive abilities (D'Acunto et al. 2019). Also, socioeconomic status—a combination of formal education and income levels—helps to explain cross-sectional variation in several macroeconomic expectations (Das, Kuhnen, and Nagel 2020), including the size of the upward bias in inflation expectations (Bruine de Bruin et al. 2010; Angelico and Di Giacomo 2020; Weber, Gorodnichenko, and Coibion forthcoming): households from lower socioeconomic backgrounds tend to have systematically higher inflation expectations than others.

On the firm side, systematic differences in inflation expectations have been detected across industries (Coibion, Gorodnichenko, and Kumar 2018)—again, a

point to which we will return. The position of a respondent within a firm is also predictive of their inflation expectations: chief executive officers and chief financial officers have lower inflation expectations than other managers, who in turn have lower inflation expectations than the average employee, even after controlling for differences in education and income (Savignac et al. 2021). This variation suggests that the hierarchical role of those who set prices and wages in firms can be important because their wage- and price-setting decisions depend on inflation expectations that are closer or further away from the expectations of experts.

High Disagreement about Future Inflation

Surveys of households and firms display substantial dispersion of inflation expectations even within the same survey waves (Mankiw, Reis, and Wolfers 2004). Figure 3 reports the distribution of numerical inflation expectations across all waves of the Michigan Survey of Consumers (panel A), the Survey of Firms' Inflation Expectations (panel B), and the Survey of Professional Forecasters (panel C) from 2018:II to 2021:III. For households and firms, reported inflation expectations cover an extremely wide range of values, whereas those of professional forecasters are tightly concentrated around the mean.⁴ This profound disagreement about aggregate inflation expectations might appear surprising, because all agents are asked to report expectations about the same macroeconomic variable, rather than about a personal-outcome variable. Similar patterns hold across surveys in the United States and abroad, so specific survey design features are unlikely to be the driving force of such systematic disagreement. Instead, the data point toward two potential directions in terms of determinants of aggregate expectations: variation in the information sources different agents use to form their expectations and variation in economic beliefs driven by a different interpretation of the same economic shocks that all agents face.

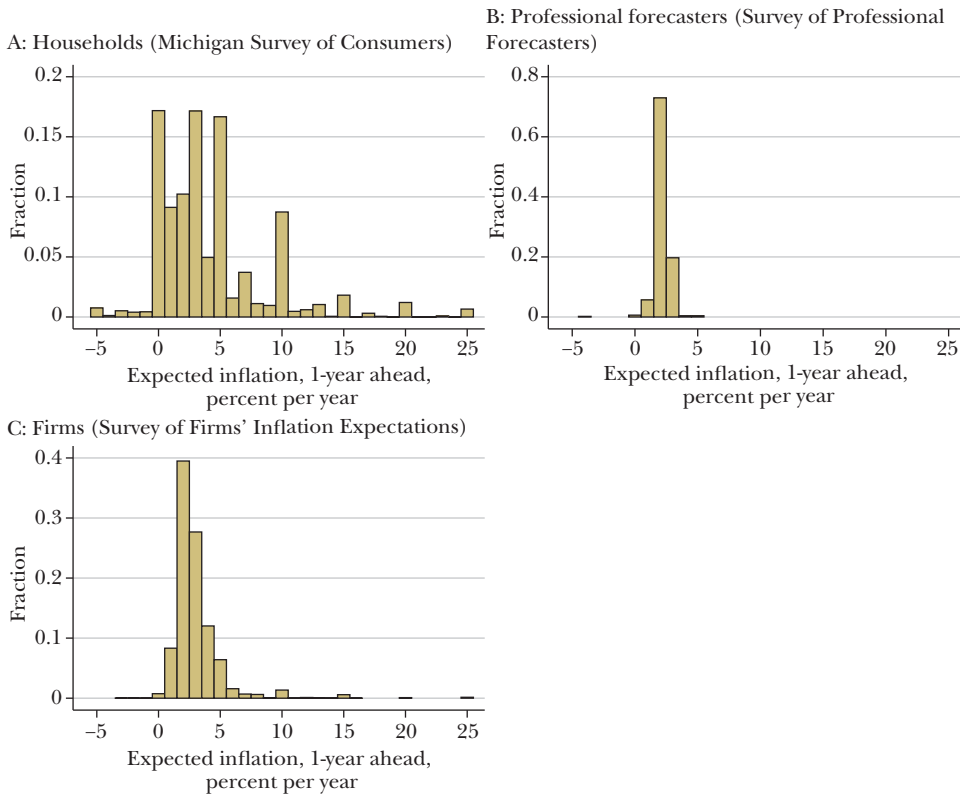
High Uncertainty in Inflation Expectations

There are several ways to gauge the level of uncertainty in inflation forecasts. Looking back at Figure 3, one feature is the extent to which households' and firms' expectations tend to be reported as multiples of five. This form of rounding has been interpreted as a proxy for respondents' uncertainty regarding the actual level of their inflation expectations (Binder 2017).

Another way to gauge the uncertainty in forecasts is having respondents assign probabilities to a range of possible outcomes for future inflation. Figure 4 presents results from doing so, focusing specifically on the probability that households in the Survey of Consumer Expectations from the Federal Reserve Bank of New York, firms in the Survey of Firms' Inflation Expectations, and professional forecasters in the Survey of Professional Forecasters assign to inflation being above either

⁴Professional forecasters might also have strategic considerations and might not want to deviate too much from an average forecast in either direction to avoid being perceived as overly pessimistic or optimistic and ultimately less credible.

Figure 3

Cross-sectional Dispersion in Expectations

Source: Weber et al. (2022).

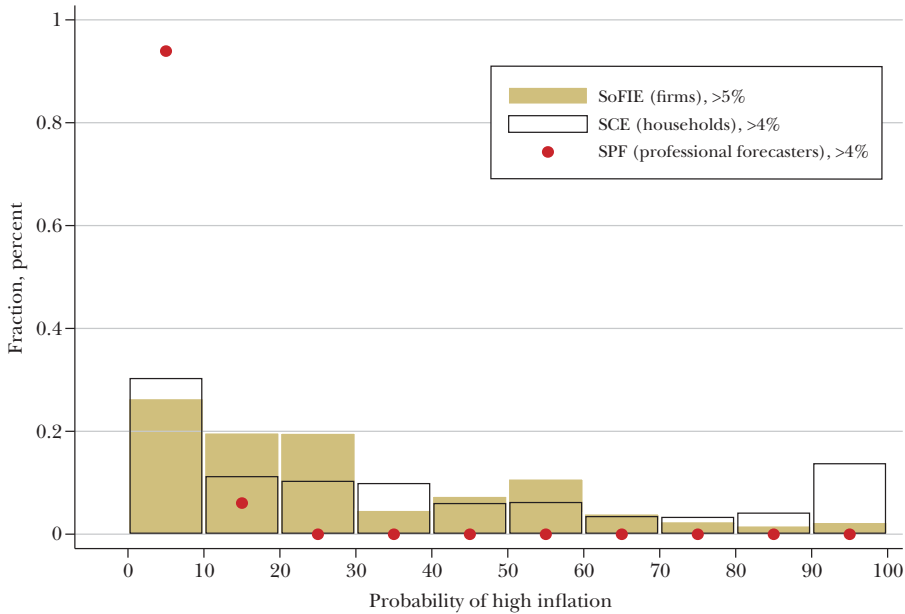
Note: The figure reports the distribution of short-term (1-year-ahead) inflation forecasts. Panel A shows results for households (Michigan Survey of Consumers). Panel B shows results for professional forecasters (Survey of Professional Forecasters). Panel C shows results for firms (Survey of Firms' Inflation Expectations). The distributions are computed using survey weights. The sample period covers 2018:II–2021:III.

4 or 5 percent in the next 12 months. For households and firms, these probabilities tend to be quite high, which indicates a wider range of uncertainty about the inflation outlook. For professional forecasters, the range of uncertainty is much lower. This relative difference in forecast confidence of professionals relative to households and firms has also been found to be a pervasive characteristic of inflation expectations for the general public.

Unanchored Inflation Expectations

We have so far restricted our attention to one-year ahead inflation forecasts, which is a relatively short horizon. Some surveys also ask respondents about inflation over longer time horizons, such as five or ten years. These longer-run expectations

Figure 4
Uncertainty in Inflation Expectations



Source: Candia et al. (2021a).

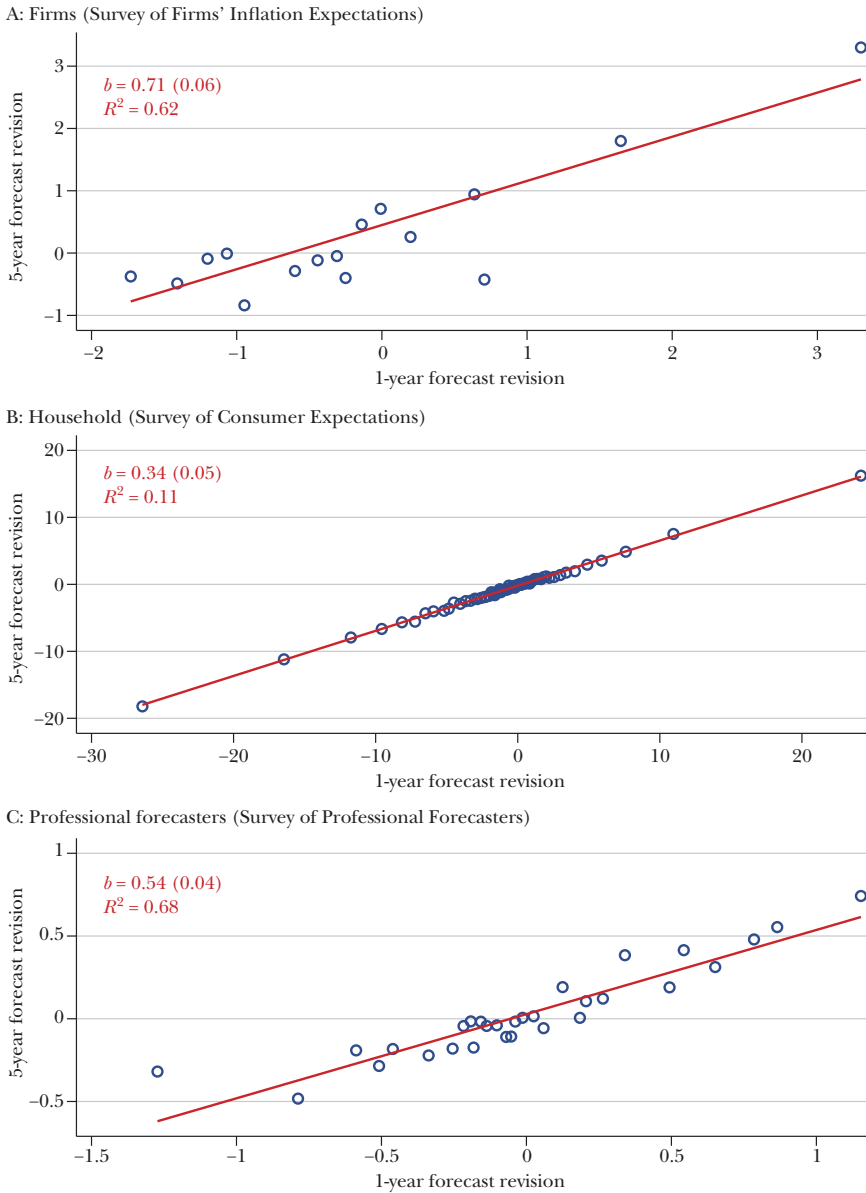
Note: The histogram shows uncertainty for expected inflation in 2019:I. The Survey of Firms’ Inflation Expectations (SoFIE) reports the distribution of the probability that inflation over the next 12 months will exceed 5 percent while the Survey of Consumer Expectations (SCE) and the Survey of Professional Forecasters (SPF) report the distribution of the probability that inflation over the next 12 months will exceed 4 percent. The distributions are computed using survey weights.

of inflation can be informative about the degree to which inflation expectations are anchored. Indeed, a common definition of “anchored” expectations is that changes in short-run inflation expectations should be largely uncorrelated with changes in long-run expectations: if one believes that the central bank is going to be successful in achieving its ongoing target for low inflation in the medium run, then current shocks to inflation should be offset by the central bank. For example, individuals trusting the central bank should expect tight monetary policy following inflationary shocks, and long-run expectations should therefore be insensitive to short-run fluctuations.

Figure 5 presents tests of this notion for households, firms, and professional forecasters by plotting the association between changes in individuals’ one-year ahead inflation expectations across two adjacent survey waves with the change in their expectations about longer-run inflation. Strikingly, there is a strong positive correlation between these revisions, indicating that inflation expectations are *not* well anchored during this period from approximately 2017–2020. Shocks to the economy that lead individuals to expect higher inflation over the next year also

Figure 5

Correlation in Short-Term and Long-Term Inflation Expectations



Source: Weber et al. (2022).

Note: The binscatters show the relationship between 1-year-ahead and 5-year-ahead inflation forecasts. The sample period covers waves 2018:IV, 2019:IV, and 2020:IV for the Survey of Firms' Inflation Expectations, 2017:I–2020:IV for the Survey of Consumer Expectations, and 2018:I–2021:III for the Survey of Professional Forecasters. Huber robust regression is used to downweigh the importance of outliers and influential observations. Robust standard errors are in parentheses.

lead those individuals to expect significantly higher inflation over the next five to ten years, indicating that people do not think that inflation shocks are short-lived or that the central banks will take actions that offset these shocks.

Perceived and Expected Inflation

Information about aggregate inflation statistics is publicly available and regularly displayed on media outlets, so one might think that most individuals are aware of it, and yet we saw substantial amounts of disagreement across individuals and firms and large degrees of uncertainty. In fact, it turns out that what people believe about recent inflation is one of the strongest predictors of what they expect about future inflation. This result was first documented for Swedish households in Jonung (1981) and has repeatedly been verified since. Figure 6 plots this result for US households and firms in panels A and B: those who think that inflation has recently been high tend to be the same people as those who believe that future inflation will be high. The association is instead substantially weaker for professional forecasters in panel C. This evidence suggests that we can explain much of the variation in people's beliefs about the future through their perceptions about the recent past. We mentioned earlier that individuals might disagree either because of different opinions about how the economy works, leading them to anticipate a different evolution of prices in the future given the current state of the economy (Andre et al. 2021), or because they hold different views about the current state of the economy.

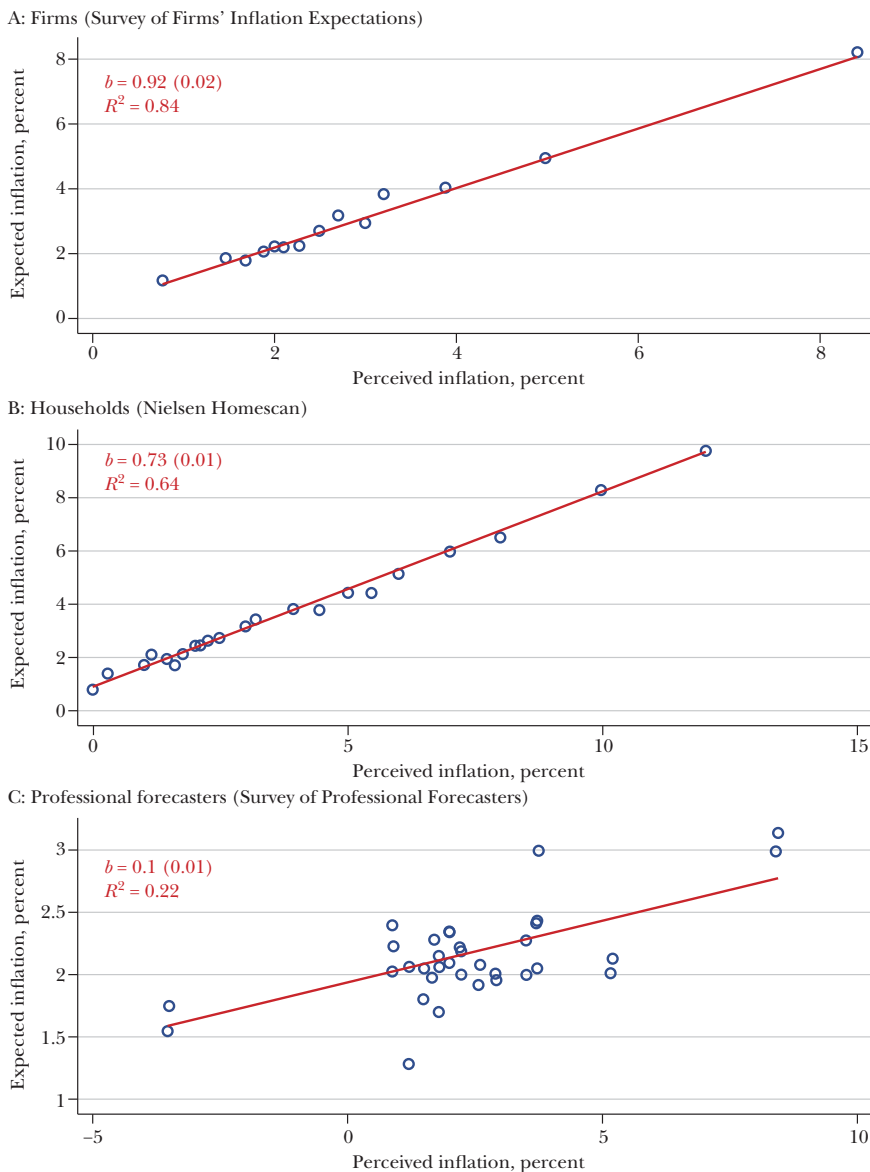
Determinants of Inflation Perceptions and Expectations for Households and Firms

If much of the differences in people's forecasts of future inflation stem from their different views about recent inflation dynamics, where does the disagreement about recent inflation dynamic arise? When households or business executives are asked about how they receive information about inflation, most report that their main source of information is their own shopping experience (D'Acunto, Malmendier, et al. 2021; Cavallo, Cruces, and Perez-Truglia 2017; Kumar et al. 2015), as well as family and friends. Another source that they emphasize is news and social media. In this section, we review existing evidence about the role these channels play in explaining underlying differences in perceived and expected inflation. We also discuss additional mechanisms that have been documented by recent research, including cognitive constraints and differences in incentives to pay attention to inflation. This research offers empirical guidance to macroeconomic theory as it seeks to understand how to model heterogeneous agents who form different expectations and hence make different economic choices.

Exposure to Heterogeneous Price Signals

Recent research on understanding inflation expectations has focused on the fact that even similar households and managers differ in the price signals they

Figure 6
Inflation Expectations and Perceptions



Source: Weber et al. (2022).

Note: The bincatters show the relationship between 1-year-ahead inflation forecasts and perceptions (nowcasts) of inflations. The sample period is 2018–2021. Panel A shows results for the Survey of Firms' Inflation Expectations. Panel B shows results for survey responses of households participating in the Nielsen HomeScan Panel; see Coibion, Gorodnichenko, and Weber (2022) for more details. Panel C shows results for the Survey of Professional Forecasters. Perceptions in the Survey of Professional Forecasters are measured as the nowcast for the most recent (or current) quarter-on-quarter annualized inflation rate. Perceptions and expectations for managers and households are restricted to [-2%,15%] range. Huber robust regression is used to downweigh the importance of outliers and influential observations. Robust standard errors are in parentheses.

observe in their environment and through daily activities, such as shopping for groceries or buying gasoline. Even if grocery bundles represent a relatively small fraction of the overall consumption basket of households, grocery price changes are quite salient, visible, and varied direct signals about price changes to which anybody who shops is exposed (D'Acunto, Malmendier, et al. 2021). Leveraging data from the Nielsen Consumer Panel for about 60,000 Americans, one can observe the nondurable goods individuals purchase and the exact prices they pay at the weekly frequency, due to the fact that these households use optical scanners to track all of their purchases. Customized surveys on this panel find that households who have observed the highest inflation rates in their own consumption bundles in the recent past have significantly higher expectations for general inflation over the following 12 months (see also Figure 1). This result holds for both point estimates and probability-distribution implied means as well as across elicitation methods, such as those in the Michigan Survey of Consumers and the New York Fed Survey of Consumer Expectations. This link is driven by the price changes of the goods that are purchased most frequently by each household, rather than by the expenditure share of goods in households' consumption bundles: someone who purchases milk frequently tends to think aggregate inflation is rising when they observe an increase in the price of the milk they purchase (D'Acunto, Malmendier, et al. 2021). Moreover, individuals tend to put a higher weight on positive price changes than negative price changes, which helps to explain the general upward bias in expected inflation. In addition, initial price pressures in narrow categories of goods that are very salient to households can result in an immediate uptick of overall inflation expectations. We observed this pattern in April 2020 when the inflation expectations of households jumped upward following an increase in grocery prices, and again in the summer of 2021 when the price of used cars skyrocketed. Both times, economic forecasters as well as the Federal Reserve predicted low inflation or only temporary price pressures in narrow categories.

Observed price changes differ across individuals who have different grocery bundles as well as across individuals who shop at different outlets (Kaplan and Schulhofer-Wohl 2017; Weber, Gorodnichenko, and Coibion forthcoming). When asked about which price signals they consider when forming inflation expectations, women tend to mention the price of milk or bread, whereas men are more likely to mention the price changes of beer and gasoline (D'Acunto, Malmendier, and Weber 2021). The amount of shopping that agents do is also important. Individuals who report doing most of the shopping for their household typically have higher inflation expectations than those who do not. Women are more likely to be the primary shopper within their household, and the difference in the average inflation expectations of men and women previously mentioned disappears once one controls for who is primarily responsible for the shopping. Indeed, men who do the shopping in their household have the same average expectations of inflation as women who do the shopping, and the same is true for men and women who are not responsible for doing the shopping for their household (D'Acunto, Malmendier, and Weber 2021).

Another dimension that might bias inflation expectations is agents' limited memory of past prices. Individuals on average are correctly informed about the current price level, but they think that prices were cheaper in the past than what they actually were; they have a downward-biased memory of past prices (D'Acunto and Weber 2021). As a result of this bias in memory, perceptions of inflation arising from shopping will tend to be biased upward (Bordalo, Gennaioli, and Shleifer 2020; Enke, Schwerter, and Zimmermann 2020). These biases are also likely to be more persistent in agents' minds in times of major shocks to their environment and the set of price signals agents observe around them (Goldfayn-Frank and Wohlfart 2020).

Observed price signals influence aggregate inflation expectations not just of households, but also of firm managers, who focus on the price signals that they observe in their industries. For example, firms in sectors that have witnessed higher inflation recently tend to form higher beliefs about aggregate inflation, even when those industry-level price changes are unrelated to aggregate price changes (Andrade et al. forthcoming). The importance of directly observed price changes as an individual-level signal that helps to explain aggregate inflation expectations is a pervasive finding in the literature.

Similarly, the average inflation expectations of US households are particularly sensitive to changes in oil prices over time, which are the main determinant of the gasoline prices that are omnipresent in American life and one of the most frequently purchased items.

Media and Policy Communication

The fact that inflation expectations are on average biased upward for households and firms and dispersed across survey respondents suggests that households (and firms) might not devote much attention to media coverage of inflation or to public announcements, like press releases by the Federal Reserve—at least in low-inflation environments. Carroll (2003) estimates a model in which individuals update their expectations probabilistically based on news coverage of inflation and finds that individuals, on average, update their inflation expectations about once a year.

Another reason individuals might not devote much attention to media coverage of inflation and monetary policy is its complexity. For instance, households did not update their inflation expectations upward to the first forward guidance announcements by the European Central Bank (as theory would suggest) but instead adjusted inflation expectations sharply upward to announcements of future increases in consumption taxes (D'Acunto, Hoang, and Weber 2021; Bachmann et al. 2021).

The salience of policy in media and its complexity play a major role in how individuals set expectations. For example, announcement of changes in consumption taxes are discussed heavily not only by specialized media but also by popular media in print and online, whereas discussions of forward guidance by a central bank are more technical and tend to be relegated to specialized media sources, which most households do not consult. Policies like forward guidance are also more complex to

understand by ordinary households, because they require that agents understand that keeping interest rates low beyond the time it is warranted by future economic conditions will generate inflation in the future, and hence they should increase inflation expectations today. In contrast, announcing higher consumption taxes in the future directly tells households that prices will rise.

Households seem unaware of the dramatic policy announcements in recent decades. In August 2020, the Federal Reserve announced that monetary policy would shift from inflation targeting to “average inflation targeting”—so that if inflation was below its target for a time, the Fed would allow inflation to be above its target for an offsetting period in the future. However, the vast majority of US households heard no news about monetary policy in the days surrounding the announcement (Coibion et al. 2020a). Moreover, those who reported having heard news were not more likely to pick the correct policy framework in a multiple choice question and their inflation expectations did not differ from the expectations of individuals who reported not having heard any news. Focusing on more standard monetary policy news, Lamla and Vinogradov (2019) show in daily event studies around announcements by the Federal Open Market Committee that announcements do not affect households’ subjective inflation expectations.

In short, the current conduct of monetary policy communication by the Federal Reserve and other central banks around the globe is likely ineffective in reaching ordinary households, contrary to more innovative forms of engagement such as the occasional use of reggae songs by the Central Bank of Jamaica or the use of Twitter as a communication tool by Olli Rehn, the Governor of the Bank of Finland (D’Acunto et al. 2020).⁵

To study the potential role of communication on the inflation expectations of households and firms in case central banks were able to reach them with their communication, a growing body of work uses information provision experiments within surveys. In fact, a stated goal of leading central banks is being heard and understood by ordinary people. Christine Lagarde (2020), president of the European Central Bank, stressed the importance of the audience at a hearing in front of the European Parliament when she said: “After all, it is the everyday economic decisions of people and companies that we seek to influence with our policy and communication. If our language is not accessible, our policy will be less effective.” A typical paper in this literature elicits inflation expectations, and then randomly splits the sample of survey participants into treatment and control groups, provides different information like inflation forecasts or inflation targets to individuals in the treatment groups, and elicits posterior inflation expectations identically for all survey participants. The updating of expectations relative to the survey participants in the control condition thus provides the causal treatment effect of the provided

⁵More generally, policy communication should be more accessible to the general public by making messages easier to understand (for example, Bholat et al. 2019; Haldane and McMahon 2018). Blinder et al. (2008) provide an early survey of the literature on the importance of policy communication for monetary policy.

information on inflation expectations. Providing information about simple summary statistics of inflation such as current, past, or expected inflation and the Fed inflation target results in large average revisions of inflation expectations in the range of 1 to 1.5 percentage points (Coibion, Gorodnichenko, and Weber 2022; Coibion, Georgarakos, Gorodnichenko et al. 2021). Providing individuals with the full Federal Open Market Committee press release, which contains these statistics, but also more technical details and context, results in an average forecast revision of similar magnitude. However, the survey participants who instead received the coverage of the Federal Open Market Committee announcement from a media source (in this case, *USA Today*) revised their expectations by less than half of the revisions of other survey participants. The need to read a text of several paragraphs and comprehend its content cannot explain this difference, because the Fed announcement includes more jargon and complexity than the media article. (A possible lack of credibility of *USA Today* relative to other newspapers is also an unlikely explanation, because *USA Today* ranks higher in terms of credibility for economics and business than the *New York Times*, *Wall Street Journal*, or *Washington Post*.) Instead, traditional news media have low credibility and attract lower trust than other sources in a representative sample of 25,000 Americans. In particular, survey participants with low income and low formal education barely react to the media treatment, whereas they do react to the Fed statement.

Overall, the muted impact of official releases, communication, and the media on inflation expectations is consistent with individuals reporting that they predominantly rely on the price changes they observe in their own shopping when forming inflation expectations—in line with the famous Lucas (1972) “islands” model.

Cognitive Constraints

In addition to the large differences in perceived inflation due to different exposure to price signals in daily life, heterogeneous cognitive abilities contribute to shape inflation expectations. Nordic countries like Finland allow the linking of measures of cognitive abilities for all men—IQ as measured by a military entrance test—at the individual level together with survey data on inflation expectations and consumption plans. Individuals at the bottom of the IQ distribution display absolute forecast errors for inflation that are larger by a factor of two relative to those at the top of the distribution. Forecast errors decline monotonically as IQ rises, and hence this systematic difference is not driven by either individuals with the lowest or highest cognitive abilities (D’Acunto et al. 2019, forthcoming). Relating consumption plans to inflation expectations reveals that only men above the median level of IQ increase their planned spending when they expect higher inflation, as intertemporal substitution would predict. Differences in financial constraints, formal education, or income, by contrast, do not matter for these associations after controlling for IQ.

D’Acunto, Hoang, et al. (2019, 2021, forthcoming) also find that respondents with different levels of cognitive abilities think about substantially different concepts of inflation when answering surveys: low-IQ respondents predominantly think about the price changes of a few concrete goods they have in mind, whereas

high-IQ respondents are more likely to think about the abstract concept of inflation and its relation with other macroeconomic variables. Moreover, low-IQ respondents think that high inflation tends to be associated with bad economic times and that persistent deflation is desirable, which helps explain why they do not increase consumption when they expect higher inflation.

Taken together, these results suggest that differences in cognitive abilities play an important role in shaping inflation expectations and help inform recent advances in macroeconomic theory on how to model heterogeneous agents and agents with limited cognition for the transmission of fiscal and monetary policy (Woodford 2019; Farhi and Werning 2019).

Incentives to Gather Information about Inflation

Some households and firms have a greater perceived return to gather information about inflation. We have already discussed one example of this incentive effect: business executives and managers tend to know more about average inflation than households, but less than professional forecasters. Moreover, households with higher incomes or who own mortgages tend to have more accurate inflation expectations. Another aspect that drives the incentive to be informed is the level and volatility of realized inflation. Households in high inflation countries tend to also be more informed about inflation (Cavallo, Cruces, and Perez-Truglia 2017). Many more examples of incentive effects have been documented in the literature.

In the case of firms, one key determinant of managers' informedness about inflation is the number of competitors their firms face. A survey of firms in New Zealand revealed that as firms face more competitors, their knowledge of inflation dynamics increases (Afrouzi 2020; Coibion, Gorodnichenko, and Kumar 2018). Firms that sell a larger and wider range of products pay more attention to aggregate inflation increases, whereas firms that sell a more limited number of products find it sufficient to be informed about prices in their own specific market (Yang 2020). Also, firms anticipating changing prices in the near future acquire more information about inflation to guide their pricing decisions, whereas firms not expecting to change prices for many months are less well-informed.

Inflation Expectations and Economic Choices

Based on standard macroeconomic and intertemporal microeconomic models, the extent to which households and firms expect prices to rise should matter for many decisions—saving and consumption choices, wage bargaining and labor supply, as well as investment, leverage, hiring, and price-setting decisions. Seeking causal evidence about whether inflation expectations do actually affect decisions has become an active area of research in recent years, because if agents use their inflation expectations when making choices, the heterogeneity in choices we observe in the data might be explained by the same determinants as those of inflation expectations.

Inflation Expectations and Household Choices

Intuitively, when households anticipate higher price growth in the future, they should choose to consume more today before those price increases materialize. Spending on durable goods should be affected most, because they are easier to substitute intertemporally than non-durable goods.

This theoretical prediction was first explored at the individual level in Bachmann et al. (2015) using data from the Michigan Survey of Consumers. On average, they found no correlation between individuals' willingness to purchase large-ticket items and their inflation expectations, although a positive correlation was detected among highly educated respondents and those who had inflation expectations close to the subsequent realization of inflation. However, this survey is largely a cross-sectional dataset—that is, the same individuals are not tracked for extended periods of time—and large dispersion in inflation expectations might complicate the empirical analysis if differences in average expected inflation rates exist across individuals. Indeed, focusing on changes in inflation expectations within individuals over time, Vellekoop and Wiederholt (2020) document a positive association between inflation expectations and consumption choices. Using data from Finland, D'Acunto et al. (forthcoming) document facts that reconcile these results in the literature. First, they find that controlling for heterogeneous characteristics is central to establishing a positive association between inflation expectations and the willingness to purchase durable goods. Second, cognitive abilities shape the strength of this association between inflation expectations and consumption decisions. This result is independent of financial constraints, formal education, or other observable characteristics and could be interpreted as a “human friction” (D'Acunto, Hoang, et al. 2021), which limits the transmission of economic policy interventions that operate through households' inflation expectations.

Recent research has used randomized control trials to identify how expectations shape decisions. Researchers randomly allocate survey participants to different groups: some groups receive information about inflation or monetary policy (the “treatment” groups) while others do not (the “control” group). By comparing the inflation expectations of the individuals who received information to the control group, researchers can determine how information changes expectations. In some cases, the background information that alters beliefs of one group in a survey about future price increases can also arise from a natural experiment, as in the case of a pre-announced increase in consumption taxes (D'Acunto, Hoang, and Weber 2022). Following the announcement of higher future consumption taxes, most individuals who expect higher inflation going forward, relative to their baseline assessment of price changes, report that now is a good time to consume and especially to purchase durable goods.

A related approach uses randomized control trials not just to create exogenous variation in inflation expectations but also to study how these changes in inflation expectations affect subsequent consumption decisions (for a recent review, see Haaland, Roth, and Wohlfart forthcoming). Coibion, Gorodnichenko, and Weber

(forthcoming) use customized surveys on the Nielsen HomeScan Panel and find that, in both survey and actual scanner data, households with higher expected inflation increase their nondurable consumption for up to six months after the survey intervention. Because the Nielsen HomeScan Panel does not contain large-ticket items, they focus on surveys three and six months after the experimental variation to study whether higher inflation expectations induced individuals to change their purchases of durable goods. Contrary to economic theory, they find that higher inflation expectations result in a lower likelihood that individuals purchased larger-ticket items in the months after treatments. Other studies also using experimental variation find similar results in the United States and the Netherlands (Coibion et al. 2019; Coibion, Georgarakos, Gorodnichenko, et al. 2021), which might be driven by individuals associating higher inflation with worse economic outcomes (Andre et al. 2021; Kamdar 2019; D'Acunto et al. forthcoming). Subjective uncertainty about inflation is also important to explain saving choices—more uncertain households, even controlling for demographic characteristics, display more precautionary consumption, credit, and investment decisions (Ferland et al. 2018).

This evidence suggests that households do in fact use their inflation expectations when making economic decisions. But the inconsistent evidence across studies and across types of goods indicates that the literature has not yet fully grasped the mechanisms and models households use when relating inflation expectations to consumption decisions.

Besides consumption and savings choices, inflation expectations should also influence individual decisions about borrowing, including their mortgage choices (Botsch and Malmendier 2020), as well as their wage bargaining and labor supply decisions. So far, systematic evidence for these outcomes is limited, in part because of a lack of viable data. Research can make progress on these questions using customized survey data linking expectations with actual decisions.

Inflation Expectations and Firms' Choices

The decisions that firms make about price-setting, labor demand, investment, and leverage directly depend on their inflation expectations. Two recent studies provide causal evidence from randomized control trials that changes in inflation expectations shape firms' decisions: one from New Zealand (Coibion et al. 2018) and one from Italy (Coibion et al. 2019). In each country, a subset of firms was provided with information about inflation or monetary policy, while a control group received no such information. The information had pronounced effects on the inflation expectations of the treated firms. These two studies then tracked the decisions of firms over time to discern if and how changes in beliefs changed their economic decisions. While conceptually similar, the two studies differed in the countries considered, the duration of the information treatments (one-time in New Zealand versus repeated over years in Italy), the monetary policy regime (Italy was at the zero interest rate lower-bound for part of the sample), how outcomes were measured (self-reported actions in New Zealand versus administrative data in Italy), and the types of firms (the New Zealand study had primarily small firms

while the Italian study had primarily larger firms). Despite these differences, both studies found decisive evidence that changes in inflation expectations, induced by randomly allocated information treatments, had pronounced effects on the economic decisions of firms. Employment and investment decisions were found to be particularly sensitive to inflation expectations, while prices were only found to respond in Italy.

Firms' price-setting decisions also directly affect overall inflation. However, little research exists for how firms' pass-through of marginal costs of inputs into their prices depends on their expectations of future inflation.

Conclusion

Inflation expectations affect the economic decisions of both households and firms and for this reason have been thrust into the limelight by policymakers for decades. Academic research has been making progress in documenting and understanding how firms and households form their beliefs about future inflation and how these beliefs feed into the economic decisions of both households and firms. Research so far has also shown that heterogeneity in the determinants of inflation expectations can help make sense of the heterogeneous economic choices of otherwise similar households and firms as well as heterogeneous reactions to the same economic shocks by different households and firms.

For central banks, inflation expectations have become a key part of the conduct of monetary policy. The Federal Reserve, for instance, has often relied on relatively stable long-run inflation expectations to assess policy choices. As Jerome Powell (2020) said, "[E]xpected inflation feeds directly into the general level of interest rates. Well-anchored inflation expectations are critical for giving the Fed the latitude to support employment when necessary without destabilizing inflation." In theory, it would even be possible for a central bank to encourage higher inflation expectations as a form of monetary stimulus, since those who expect higher inflation in the future will perceive a correspondingly lower real interest rate in the present. However, central banks that want to manage inflation expectations as a policy tool have to be cautious, because raising inflation expectations could in fact backfire if households associate higher inflation with worse economic times (Coibion et al. 2020b).

The extent to which long-run inflation expectations are anchored, and the extent to which they will remain anchored, has played an important role in monetary decision-making in 2022 in response to the surge of inflation that began in 2021. However, the ability of policymakers to shape inflation expectations is under-studied and remains a point of contention in the literature. For example, households have been shown to understand simple messages about the aims of monetary policy interventions: a common example is the "whatever it takes" speech by former European Central Bank president Mario Draghi (2012), which conveyed the commitment of the central bank to supply as much liquidity as needed in troubled markets. On the

other side, households often barely react at all to communication about monetary policy instruments such as large-scale asset purchases (D’Acunto et al. 2020). The identity of the sender matters too. D’Acunto, Fuster, and Weber (2021) show that groups that have been historically underrepresented on monetary policymaking bodies, such as women and minorities, are more likely to form expectations in line with provided official forecasts when the forecasts are associated with a female or Black policymaker. These challenges highlight that the current conduct of monetary policy communication often does not reach ordinary households and firms and calls for more innovative communication tools.

The rebound of inflation levels around the world has turned the research questions of the evolution and management of inflation expectations into urgent policy questions, too. A detailed map of the effects of inflation expectations on multiple economic choices is crucial to assess the potential role of expectations as a monetary policy tool.

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