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Gorodnichenko

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Abstract

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JEL Classification: E3, E4, E5

Keywords: Expectations, Surveys, anchoring, rational inattention, Managers

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“Do we need new measures of expectations or new surveys? Information on the price expectations of businesses--who are, after all, the price setters in the first instance--as well as information on nominal wage expectations is particularly scarce.” Ben Bernanke, July 10, 2007

I Introduction

Firms’ inflation expectations affect their economic decisions, and therefore broader macroeconomic outcomes, both in theory (e.g., Afrouzi and Yang 2020 for a recent example) and in practice (e.g., Coibion, Gorodnichenko and Kumar 2018 and Coibion, Gorodnichenko and Ropele 2020). But the absence of systematic survey data on the macroeconomic expectations of U.S. firms, and their inflation expectations in particular, has limited our understanding of how these expectations are formed as well as their use for policymaking. In this paper, we begin to fill this gap by introducing the new Survey of Firms’ Inflation Expectations (“SoFIE”) that has been running since 2018.¹ We show that these new data provide striking evidence on just how uninformed U.S. firms are with respect to both inflation and monetary policy, a finding which complements earlier evidence from other advanced economies with long histories of low and stable inflation.

The potential importance of measuring the inflation expectations of firms is grounded in macroeconomic theory, which commonly ascribes a central role to firms’ expectations of inflation in accounting for macroeconomic dynamics of both nominal and real variables. Initially formalized in Friedman (1968) and Phelps (1968), the role of firms’ inflation expectations is typically summarized by an expectations-augmented Phillips curve, a predicted relationship linking inflation and the real side of the economy *conditional* on firms’ expectations of inflation. Such a relationship famously arises in sticky price models as the New Keynesian Phillips Curve (see e.g. Woodford 2003, Gali and Gertler 1999) but is also a feature of a much wider class of models ranging from the

¹ Detailed information about the survey as well as updated survey results can be found at <http://firm-expectations.org/index.html>.

seminal island model of Lucas (1972) to modern imperfect information variants such as sticky information (Mankiw and Reis 2002, Reis 2006), noisy information (Woodford 2002), dispersed information (Nimark 2014), rational inattention (Afrouzi and Yang 2020) or behavioral models like Gabaix (2020). While the specific timing of the inflation expectations in the Phillips curve depends upon the underlying model, all these models make the common prediction that firms' inflation expectations are central to understanding the link between the nominal and real sides of the economy and therefore play a fundamental role in determining the nature of optimal monetary policy. Indeed, policymakers themselves have long emphasized the importance of firms' inflation expectations in how they think about optimal policy, as illustrated in the initial quote.

Despite the fact that both economic theory and policymaking point toward the importance of measuring and understanding firms' inflation expectations, the ability to do so in the world's largest economy has been severely limited by data constraints. Few surveys of U.S. firms exist, and those that do tend to focus either on expectations about firm-specific outcomes (e.g., firm level uncertainty in Altig et al. (2020) or firm level costs in the Atlanta Fed's Business Inflation Expectations survey). The few surveys that extract firm-level expectations about aggregate conditions are either very small/non-representative (e.g., Livingstone Survey) or qualitative (Duke CFO Survey). As discussed in detail in Coibion et al. (2020), the same is true in most other advanced economies. The few countries that have been successful in creating systematic and quantitative surveys of firms' macroeconomic expectations have mostly been in developing economies with high and/or volatile inflation (e.g., Ukraine, Uruguay).

SoFIE therefore makes progress in measurement for the U.S. It does so by providing the first time series of firms' quantitative inflation expectations from a broad survey of U.S. firms. This survey meets the characteristics of a well-designed survey of firms' inflation expectations highlighted in Coibion et al. (2020). It does so by building upon a pre-existing privately-run survey of chief

executive officers (CEOs) that provides a broadly representative *panel* of U.S. firms of different sizes and industries. Each quarter, this panel of respondents is asked two quantitative questions about inflation and monetary policy. One consistently measures their quantitative expectations about U.S. inflation over the next twelve months. The second rotates across different formulations investigating long-run inflation expectations, perceived recent levels of inflation, uncertainty about future inflation risk, as well as knowledge of the Federal Reserve's inflation target. SoFIE also utilizes a panel dimension of the survey, which allows us to observe the evolution of expectations for a given firm. While this time series is still short, beginning in 2018, the survey provides a starting point for the more systematic long-term measurement of firms' inflation expectations in the U.S. As such, we hope that it will serve to stimulate further research into firms' expectations and how they affect their decisions as well as being of immediate practical use to policymakers.

This survey provides a number of new facts about the inflation expectations of U.S. firms. The available time series for firms' inflation expectations deviates significantly from those of both households and professional forecasters, indicating that neither is a perfect substitute for a survey of firms' inflation expectations. In terms of their general characteristics, however, firms' inflation expectations exhibit many of the characteristics of households' inflation expectations and depart dramatically from the inflation expectations of professional forecasters. This is true for mean forecasts, which were higher than inflation on average during the sample, as well as the amount of disagreement across firms in their expectations about future inflation, a characteristic which again has long been identified with households relative to professionals (e.g., Mankiw, Reis and Wolfers 2003). While some of the cross-sectional disagreement is systematically related to observable characteristics, such as industry (e.g., financial services have significantly lower inflation expectations than firms in telecommunications), much of it is uncorrelated with observable firm characteristics.

This widespread disagreement extends into forecasts of the distant future. Firms disagree not just about price movements over short horizons like the next year, but also about inflation over much longer horizons like five years. This profound disagreement about the long-run dynamics of future inflation, as well as the fact that most firms predict long-run levels of inflation significantly different from the Federal Reserve's inflation target of 2 percent indicates that the inflation expectations of U.S. CEOs are anything but anchored. We also document that firms are generally uncertain in their inflation forecasts, they regularly revise both their short- and long-run forecasts by large amounts despite the general stability of U.S. inflation, and the revisions between their short-run and long-run forecasts are strongly positively correlated. All of these features are at odds with anchored expectations but closely mirror those documented elsewhere for U.S. households, which are in sharp contrast to those observed for U.S. professional forecasters.

What lies behind this lack of anchoring in firms' inflation expectations? One factor at work seems to be systematic inattention to monetary policy: we find that most CEOs are unaware of the Federal Reserve's inflation target. The fraction of CEOs that correctly identifies 2 percent as the inflation target is less than 20 percent. Nearly two thirds of CEOs are unwilling to even guess what the target is. Of those who dare, less than 50 percent think it is between 1.5 and 2.5 percent. Another factor is the systematic inattention on the part of firms to recent inflation dynamics: managers disagree just as much about what inflation has been over the last twelve months as they do about what it will be in the future, even though the former is publicly and freely available. While both forms of inattention are correlated with firms' inflation expectations, we document that firms' long-run expectations are more closely related to their beliefs about the inflation target while their short-run expectations are better explained by their perceptions of recent inflation. We interpret these results as indicating that both forms of inattention, i.e., inattention to monetary policy as well as to recent inflation dynamics, shape the inflation expectations of firms.

Inattention on the part of firms to both recent inflation and monetary policy objectives is not unique to the U.S. but rather seems to be characteristic of advanced economies with a history of low and stable inflation. Kumar et al. (2015), for example, investigate whether inflation expectations of firm managers in New Zealand are well anchored. They find that the inflation expectations of firms in New Zealand display little anchoring under any of the definitions of anchored expectations considered: their inflation expectations have been higher, more dispersed, and more volatile than those of professional forecasters, at both short-run horizons and long(er)-run horizons. Moreover, managers display large forecasts revisions, high correlation between short-run and long-run inflation expectations, and high uncertainty about the inflation outlook. Consistent with Kumar et al. (2015), we also find that many U.S. CEOs devote little attention to both inflation and monetary policy: managers are uninformed about recent inflation dynamics and they are unaware of the central bank's inflation target, despite the fact that the Federal Reserve set its inflation target at 2 percent in 2012.

Inattention to inflation and monetary policy need not imply, however, that inflation expectations play no role in firms' decisions. Coibion, Gorodnichenko and Kumar (2018) and Coibion, Gorodnichenko and Ropele (2020) show in New Zealand and Italy respectively that randomized information treatments in which publicly available information about inflation is provided to some firms have large effects on those firms' inflation expectations and subsequently on their investment and employment decisions. These papers therefore provide direct causal evidence that even inattentive firms respond to changes in their expectations of inflation.

Inattention also has implications for how central banks should communicate with firms. An early literature on central bank communications (see Blinder et al. 2008 for a survey) focused almost exclusively on central banks' interactions with financial markets, primarily due to data limitations. Since Blinder (2009), the effect of central bank communications on the expectations of the general public has been an active area of research. Using existing survey and polling data, Binder (2017b),

for example, shows that central bank communications are not received and understood by a significant part of U.S. households, who lack basic knowledge about monetary policy and central bank objectives. Accordingly, Lamla and Vinogradov (2019) find that central bank announcements (FOMC press conferences) have no measurable direct effect on households' expectations. While this inattention by the general public may reflect the past success of monetary policy (the public does not pay attention to inflation because inflation is not a problem), it poses additional challenges on central banks when they seek to stabilize the economy through expectations channels (Coibion et al. 2020).

This is not to say that the central bank is powerless in reaching the public or affecting their beliefs. Available evidence shows that households and firms revise their inflation expectations once they are exposed to information about inflation or monetary policy (past inflation, inflation target, FOMC projection, etc.) which implies that central bank can affect inflation expectations and that economic agents then react to changes in inflation, updating their consumption, employment, pricing and investment decisions.² Furthermore, Haldane and McMahon (2018), Bholat et al. (2019), Haldane, Macaulay and McMahon (2020) emphasize that more straightforward communication boosts the chances of aligning the expectations of the “general public” with the central bank’s forecasts. Pedemonte (2020) shows that President Franklin D. Roosevelt’s radio chat announcing important social policies in 1935 had a stronger expansionary effect in areas with larger penetration of radio. This paper contributes new evidence on the degree of attention that U.S. firms pay to actions and objectives of the central bank.

Finally, this paper also relates to the literature on the expectation formation process among different agents and their impact on macroeconomic dynamics. To ensure internal consistency, the assumption of full information rational expectations (FIRE) under which economic agents know

² See Kamdar (2018), Coibion, Georgarakos, Gorodnichenko, and van Rooij (2019), Coibion, Gorodnichenko and Weber (2020) for evidence that changes in inflation expectations affect consumption decisions of households.

all the information about the state of the economy has been widely used in modern macroeconomic models. Theoretical and empirical work has however repeatedly questioned this assumption, advocating the need for departures from full information or rationality. Mankiw and Reis (2002), Woodford (2002), Sims (2003), Gorodnichenko (2008), Mackowiack and Wiederholt (2009), Alvarez, Lippi, and Paciello (2011), Gabaix (2014, 2020), Matějka (2016), Bordalo, Gennaioli and Shleifer (2018), Angeletos and Lian (2018) and Farhi and Werning (2019) all develop theories that explore the macroeconomic implications of different ways of modelling deviations from full information rational expectations. Using survey forecast data, Andrade and Le Bihan (2013), Coibion and Gorodnichenko (2012, 2015b) and Fuhrer (2018) provide empirical support for deviations from full-information rational expectations. More recently, empirical work has focused on distinguishing what type of deviation from FIRE seems to be most relevant to explain business cycles (see Coibion et al. 2021, Bordalo, Gennaioli, and Shleifer 2018, Angeletos, Huo, and Sastry 2020, Reis 2020). The low level of knowledge that U.S. firm managers have about the Federal Reserve's inflation target or inflation dynamics documented in this work supports the criticism that full information is a poor approximation for price-setters.

II Description of the survey

Surveying firms is challenging, particularly when it requires contacting CEOs of major corporations. There is typically an army of people between the surveyor and the desired respondent. Achieving reasonable response rates therefore requires appealing to the authority of a government institution or central bank in the background or engaging in a time-consuming process of developing a panel of willing respondents. In this case, our survey questions were added to a pre-existing private survey of firms that has a long history of collecting CEO's and top executives' perceptions and expectations for various firm-specific outcomes. Based on the quality of its

surveys, this firm provides consulting services to multinational corporations, financial institutions, businesses, technical professionals, and governments around the world.

In 2018, this survey firm agreed to add two inflation-related questions to its quarterly survey. By expanding on this pre-existing survey, we can benefit from the extensive panel of firms that have been participating in prior waves without reconstructing such a panel from scratch. However, one limitation is that we only have access to the inflation responses from the survey. Another limitation is that we are only provided with basic demographic information for firms, including industry and company size, to ensure that their anonymity is preserved. Firms are classified into small, medium, and large. Small companies have between 1 and 19 employees, medium companies have between 20 and 249 employees while large companies have over 250 employees. Firms were randomly chosen from manufacturing and services industries to represent the underlying structure of each sector in the economy according to its contribution to the gross value added.³

Table 1 provides a breakdown of respondents to the survey by size and sector. Relative to their share of national payroll, there is a disproportionate share of manufacturing firms which reflects the historical background of the pre-existing survey. Despite this limitation, the panel is heterogeneous across sectors and firm sizes, thus providing a good coverage of the U.S. economy. As a result, the relative importance of different sectors and sizes can be adjusted by constructing weights to replicate the distribution of employment across industries/size in the U.S. We do so for subsequent results but in practice using weights has little effect.

We executed thirteen waves of the survey over the period running from April 2018 through April 2021. Between 300 and 600 firms participated in each wave on average, a sizeable sample

³ Within the manufacturing sector, companies are classified into Food and Drink; Textiles and Clothing; Electrical; Chemicals and Plastics; Transport; Timber and Paper; Basic Metals; Mechanical Engineering; and Other Manufacturing. Within the services sector, the companies are classified into Hotels and Restaurants; Transport and Storage; Post and Telecommunication; Financial Intermediation; Renting and Business Activities; and Other Services.

for a firm survey. From its first launch, 1,198 firms have participated in the survey. About thirty percent of firms participate only once. Firms, on average, participate in 3.3 waves (standard deviation 2.5), so a panel dimension is reasonably large.

In each survey wave, we are able to ask two inflation-related questions to participants. The first question is common across all waves and focuses on 12-month ahead inflation expectations. Specifically, respondents are asked:

Q1: *“What do you think will be the inflation rate (for the Consumer Price Index) over the next 12 months? Please provide an answer in an annual percentage rate.”*

There are three important elements of the question to note. First, respondents are asked to provide a point estimate rather than assign probabilities to different possible outcomes. One advantage of asking for point estimates is that it avoids possible priming effects that come from seeing the specific bins that are presented. However, point estimates can lead to bunching of answers around specific numbers when respondents are uncertain about their forecasts (Binder 2017a). Second, we ask about the inflation rate rather than the general level of prices. The latter is used in some household surveys (e.g., the Michigan Survey of Consumers) in case respondents are not familiar with the notion of inflation. Kumar et al. (2015) however document that managers and CEOs generally understand what inflation means. Third, we refer to a specific price index (CPI) to avoid any confusion about which inflation rate respondents should refer to in their forecasts.

The second question posed to respondents rotates across four different possible questions, each asked once a year:

Q2A (April wave). *“What annual inflation rate do you think the U.S. Federal Reserve is trying to achieve on average?”*

Q2B (July wave). *“What do you think has been the annual inflation rate (for the Consumer Price Index) over the last twelve months? Please provide an answer in annual percentage rate.”*

Q2C (October wave). *“What do you think will be the average inflation rate (for the Consumer Price Index) over the next 5 years? Please provide an average annual percentage rate.”*

Q2D (January wave). *“What do you think is the probability that the annual inflation rate (for the Consumer Price Index) over the next 12 months will exceed 5%?”*

Question Q2A is asked every year in the April wave and aims to measure perceptions of the Fed’s inflation target. This provides a simple metric for measuring the extent to which CEOs are familiar with the objectives of policy-makers and is therefore useful for gauging the credibility of the Fed as well as its ability to influence inflation dynamics. Question Q2B (asked in every July wave) elicits perceptions of recent inflation, which are often a strong predictor of inflation expectations. Because inflation statistics are publicly available, this question also provides a simple measure of the degree of inattention to inflation on the part of participants. Question Q2C (asked in every October wave) measures longer-run inflation expectations. As discussed in section IV, these can be used to assess how anchored inflation expectations are. Finally, question Q2D (asked in every January wave) provides a measure of uncertainty in inflation expectations. Notice that in contrast to survey questions eliciting distributions of future inflation by asking respondents to assign probabilities to various ranges (“bins”) of inflation, we effectively ask respondents to assign a probability to only one bin (inflation of greater than 5 percent). This question provides a simple and tractable way to quantify the inflation uncertainty perceived by respondents while also limiting the time required of them to participate in the survey.

Jointly, this survey has several attributes that should be emphasized. First, it covers a wide range of firms of different sizes and industries, which allows us to create a time series of firms’ inflation expectations representative of the U.S. economy. Second, we provide a *quantitative*, rather than just qualitative, measure of inflation expectations. Third, we focus specifically on measuring the expectations of firms with respect to *aggregate* inflation, not just their own prices

or costs. Fourth, we complement the time series of inflation expectations with additional measures of perceived inflation, inflation uncertainty, long-run expectations, and knowledge of the Fed's inflation target. Jointly, these provide the most comprehensive view of what U.S. firms know and expect about inflation and monetary policy.

For comparison, existing surveys of firms fall short along some of these dimensions. Many existing surveys do not measure expectations of aggregate inflation at all, often by design (e.g., the Survey of Business Uncertainty⁴ focuses on the uncertainty firms perceive about their own conditions). Some do focus on inflation expectations but measure only expectations about firm-specific outcomes (e.g., the Atlanta Fed's Business Inflation Expectations survey asks respondents about what will happen to their firm's unit costs, the Conference Board's Survey of CEOs asks about firms' prices). The few surveys that do focus on expectations about aggregate inflation are either not representative (e.g., the Livingston Survey uses only about 50 very large firms) or ask only qualitative questions. Thus, our new survey of firms' inflation expectations fills an important gap in the literature.

III The Inflation Expectations of U.S. Firms

With this new survey, we can now measure the inflation expectations of firms in the U.S. since 2018. We plot the time series of the mean 1-year ahead inflation expectations of firms in Panel A of Figure 1, along with corresponding measures of expectations for households, professionals and financial markets.⁵ Household expectations are measured using the mean 1-year ahead inflation forecast from the Michigan Survey of Consumers (MSC). Professional forecasts are mean 1-year forecasts of CPI inflation. Financial market inflation forecasts are extracted from asset prices by the Federal Reserve Bank of Cleveland following Haubrich, Pennachi and Ritchken (2012).

⁴ See <https://www.atlantafed.org/research/surveys/business-uncertainty> for a description of this survey.

⁵ Underlying values are presented in Table 2. Results using SoFIE data for 2018Q2 were first reported in Coibion, Gorodnichenko, Kumar and Pedemonte (2020).

Inflation expectations of professional forecasters and financial markets participants are highly correlated over time. In the late 2000s they stabilize at 2 percent, close to the Federal Reserve's long-run objective. However, household inflation expectations follow a different pattern. In the early part of the sample the correlation between inflation expectations of households and professional forecasters was very high, but since the early 1990s household inflation expectations have been consistently higher than those of professional forecasters, with the wedge between the two exceeding 2 percentage points on several occasions. Since the early 2000s household expectations have averaged around 3.5 percent while those of professional forecasters averaged around 2.1 percent. One key question that we address in this paper is where firms lie along this spectrum.

At the beginning of our sample in 2018, firm managers in the United States reported inflation forecasts similar to those of households, around 3-3.6 percent, while professionals were predicting inflation of just over 2 percent. In 2018Q2, firm managers' forecasts exceeded the inflation forecasts of *all* other agents. Their inflation forecasts then experienced a precipitous decline, falling to 2.1 percent by 2019Q2, a decline that significantly exceeds the slight fall in inflation expectations of professionals over the same period (of 0.3 percentage points) while household inflation forecast remained relatively stable. Firm inflation forecasts then remained stable for several quarters, close to those of professionals and significantly below those of households.

During the pandemic, firm inflation forecasts again behaved somewhat differently from others. Professional forecasters initially interpreted the pandemic as a demand-side shock and significantly reduced their inflation expectations in the first months of the pandemic. Households, in contrast, immediately raised their inflation expectations from 2.9 percent in 2020Q1 to 4.0 percent in 2020Q2, and these have remained high through 2021Q1. This suggests that households viewed the pandemic as much more of a supply-side shock (see Candia, Coibion, and Gorodnichenko 2020 for more discussion). Firms initially displayed little change in their inflation expectations but

ultimately raised them to 2.8 percent by 2021Q1 and 3.2 percent in 2021Q2, thereby displaying a response closer to that of households than to professional forecasters.

What can explain the instability in firms' forecasts? One explanation may be the changing composition of firms' willingness or ability to respond to the question. Between 2018Q2 and 2019Q1, for example, firm expectations averaged around 0.9 percentage point higher than those of professional forecasters and only 39.7 percent of firm managers reported a point forecast for CPI inflation over the next twelve months (around 45.6 percent reported that they did not know).⁶ In contrast, between 2019Q2 and 2020Q1 when firm expectations averaged only 0.075 percentage points more than those of professional forecasters, 66.8 percent of top executives reported a point forecast (10.6 percent did not know). In 2020Q2, the difference between firms' and the professionals' forecasts increased slightly to 0.3 percentage points and the fraction of firm managers that reported a point forecasts dropped to 33.1 percent (25.6 percent did not know), probably due to the uncertainty generated by the COVID-19 pandemic. In 2020Q4, the difference between firms 'and the professionals' forecasts narrowed again to 0.2 percentage points, during which a striking 80.1 percent of firm managers reported a point forecast and only 8.1 percent answered that they did not know. In short, there is a negative correlation between the willingness of managers to provide an inflation forecast and the size of the gap between firm forecasts and professional forecasts. It seems that when firm managers pay more attention to inflation dynamics, they make predictions more similar to those of professional forecasters, but what explains the difference in the level of attention between the periods 2018Q2-2019Q1 and 2019Q2-2020Q1 (before the COVID-19 pandemic) remains an open question. But regardless of its source, one clear implication of the time series of firms' expectations documented in Figure 1 is that the dynamics

⁶ The remaining forecasters provide a range of values, of which we take the midpoint as their point forecast.

of their expectations cannot be fully proxied by professional forecasters' or households' expectations: measuring the expectations of firms via specifically-designed surveys is therefore the only way to properly characterize these beliefs.

The uniqueness of firm inflation expectations is not limited to their mean forecasts. Panel B of Figure 1 and Table 2 present the cross-sectional standard deviation in firm forecasts, along with comparable measures of dispersion for households and professionals. Professional forecasters display very little disagreement in their inflation forecasts, with cross-sectional standard deviations of 0.3 or 0.4 percentage points prior to the pandemic. During the pandemic, disagreement increased among professionals, rising to 1.1 percentage points in 2020Q3 before falling back to 0.3 percentage points by 2021Q2. Disagreement among households, in contrast, is notoriously high: the cross-sectional standard deviation is around 3.3 percentage points on average during our sample. It also increases significantly during the pandemic. When it comes to firms, the amount of disagreement lies squarely between professional forecasters and households. The average level of disagreement is around 1.4 percentage points on average during our sample, about midway between the two. It increases during the pandemic, with a particularly pronounced increase in 2021Q1 that is consistent with a K-shaped recovery in which some firms do very well while others continue to struggle. Thus, the dispersion in forecasts also suggests that firms are distinct from both households and firms in their beliefs about inflation.

We can consider whether some of the cross-sectional differences in firms' forecasts are related to observable characteristics, such as size and industry. We do so by regressing firms' inflation forecasts on a time fixed effect and indicator variables for size and industries, with results of these regressions in Table 3. There is little evidence that size is systematically related to firms' inflation expectations in the U.S.: small (less than 20 employees) and medium (20-249 employees) firms do not report inflation expectations that are statistically significantly different from those of

larger firms. However, there are some notable differences across industries. For example, firms in the Telecommunications industry and in the Food and Drinks industry report higher inflation expectations. Firms themselves are therefore not interchangeable when it comes to their inflation expectations, so measuring the average inflation expectations of firms requires a representative sample of firms across industries.

The results of our survey of firms can be compared to other recent attempts to survey U.S. firms' inflation expectations. For example, the Atlanta Fed's Business Inflation Expectations (BIE) survey tracks the expectations of firms in the 6th Federal Reserve's district about their own unit cost growth. Using additional questions in select surveys (September 2014, July 2015, January 2019, and April 2019) focusing on the expectations of these firms about aggregate inflation (rather than firm-specific unit costs as typically measured by the BIE), they provide occasional measures of firms' aggregate inflation expectations (see Meyer, Parker and Sheng 2020). Table 4 presents values from these occasional surveys, as well as comparable values from our survey of firms. The two surveys reach similar conclusions about inflation expectations of firms in overlapping samples, both in terms of mean forecasts and forecast dispersion.

Another comparison that can be made is to a survey of middle- and low-ranking managers from the Nielsen Homescan Panel (as in Coibion, Gorodnichenko, and Weber 2020b). This is based on a quarterly survey of U.S. households in which respondents are asked about their professional responsibilities. We classify individuals who participated in this large household survey as managers if they perform at least one of the following activities: set prices or wages, fire/hire personnel, supervise personnel (1-10 people, 11-50 people, more than 50 people), make decisions about capital expenditures, or make decisions about marketing/sales. Results from this alternative survey are also included in Table 4. Mean forecasts and dispersion are much closer to those of all households (see Table 2), indicating that the inflation expectations of middle and low-ranking managers are not

directly comparable to those of CEOs and other top executives. This is in line with other evidence on how job positions affect reported inflation expectations (Savignac et al. 2021).

Our new survey therefore provides the beginnings of a time series of the inflation expectations of firms in the U.S. We find that these expectations exhibit some of the features of households' inflation expectations, such as displaying significantly more disagreement than what is seen among professional forecasters, yet are distinct from them. In particular, their dynamics over time range from higher values seen in household expectations to the 2 percent level typical of professionals. We view this variation as providing an important justification for surveying firms' expectations: corresponding surveys of households and professional forecasters are no substitute for a representative survey of firms' beliefs.

IV Are managers' inflation expectations anchored in the United States?

As illustrated in Figure 1, the inflation expectations of firms look volatile. They range from the high levels observed for households to values almost identical to the Federal Reserve's long-run objective. Should we consider these expectations "anchored?" In this section, we consider the five distinct definitions of "anchored" expectations discussed in Kumar et al. (2015) and assess the extent to which they apply to the inflation expectations of firms in our survey. These definitions of anchored expectations include: (1) average beliefs should be close to the inflation target of the central bank, (2) beliefs should not be too dispersed across agents, (3) agents should be confident in their forecasts, (4) agents should display small forecast revisions, especially at longer horizons and (5) there should be little comovement between revisions in long-run inflation expectations (which should be pinned down by the inflation target) and in short-run inflation expectations (which should move with transitory shocks).

Prediction 1: *Average beliefs should be close to the inflation target.*

Figure 1 already illustrated periods in which the inflation expectations of firms deviated significantly from the Federal Reserve's inflation target, both early in the sample (2018) as well as again at the very end of the sample (2021). But there were also periods during which those same inflation forecasts were very close to the inflation target. Because inflation is subject to many transient shocks, short-run expectations can be volatile even when they are ultimately anchored to the inflation target. Long-run expectations can therefore speak to the question more directly since they should be less sensitive to the effects of transitory inflation shocks. We report the long-run inflation expectations from our survey in Table 5. In 2018Q4, the average long-run forecast among firms was 3.7 percent. It fell to 2.3 percent in 2019Q4, closer to the inflation target, but rose again to 3.3 percent in 2020Q4. These are therefore broadly similar to those of households, whose long-run forecasts were consistently just under 3 percent over this time period. In contrast, the average long-run inflation expectation across FOMC members was reassuringly 2.0 percent while the average forecast of professionals remained very close to 2 percent. Unlike those agents, firms therefore do not seem to have well-anchored inflation expectations by this metric and are much more closely aligned with households.

Prediction 2: *Beliefs should not be too dispersed across agents.*

A limitation of the first definition of anchored inflation expectations is that it is possible for the average expectation to be exactly equal to the target because half of agents expect high long-run inflation while half of agents expect very low/negative long-run inflation, with very few actually expecting the target to be achieved. Intuitively, one would not interpret this as inflation expectations being well anchored. An additional restriction of anchored expectations is therefore that the cross-sectional dispersion of forecasts be quite low. For example, Table 5 shows that the

dispersion of long-run forecasts among FOMC members is zero: they all agree that inflation will be 2 percent in the long-run. Professional forecasters similarly display very little disagreement in their long-run forecasts: the cross-sectional standard deviation in forecasts is around 0.2-0.3 percentage points. Households, in contrast, display pervasive disagreement about long-run inflation: the dispersion in their forecasts is around 2.5 percentage points. Firms are again closer to households in displaying significant disagreement about long-run inflation: the dispersion in their forecasts ranges from about 1 to 2 percentage points, close to that of households and far more than what is observed for professionals. By this second definition, it is again difficult to argue that firms' inflation expectations appear well-anchored.

Prediction 3: *Agents show confidence in their forecasts*

Suppose that all agents believe that inflation could be 4 percent with probability 0.5 or 0 percent with probability 0.5. In this setting, the first two conditions describing anchored inflation expectations would be satisfied, yet no specific individual would actually expect the target to be achieved with any confidence, hardly a sign of anchored inflation expectations. One might therefore impose an additional restriction for anchored expectations to be that agents are confident in their forecasts. We can measure this in our survey through the question asking what probability managers assign to inflation exceeding 5 percent over the next 12 months. Figure 2 plots the resulting distribution of answers across the three waves when this question was asked (2019Q1, 2020Q1 and 2021Q1). Managers in 2019Q1 (Panel A of Figure 2) assigned a 25 percent probability on average to the possibility that inflation would exceed five percent over the next twelve months. Around 40 percent of respondents assigned very low probability (ten percent or less) to this outcome, but the majority of respondents instead placed a positive probability to this outcome. For comparison, the figure also plots the corresponding probability distributions for households and professional

forecasters respectively. The former are based on distributional inflation questions asked of households participating in the New York Federal Reserve's Survey of Consumer Expectations (SCE) while the latter are from distributional questions asked of participants in the Survey of Professional Forecasters. In both cases, the possible bins presented to respondents only allow us to measure the probability that inflation would exceed 4 percent. Professional forecasters essentially dismiss the possibility that inflation could exceed 4 percent over the next twelve months. Households, on the other hand, view this as a realistic outcome: less than 30 percent are willing to dismiss this possibility out of hand and about half of households give this outcome a probability of 30 percent or more. Again, the contrast between households and professionals is striking, and firms present forecasts that are qualitatively much closer to those of households along this metric as well.

Prediction 4: *Agents should display small forecast revisions.*

Kumar et al. (2015) propose another, related, characteristic of well-anchored expectations: revisions in individuals' inflation forecasts should tend to be small, since agents expect the central bank to be able to keep inflation stable over long enough horizons. In Panel A of Figure 3, we plot the distribution of revisions of managers' 1-year-ahead and 5-year ahead inflation forecasts from our survey. Panels B and C plot corresponding distributions for households (from the MSC) and professional forecasters (from the SPF) respectively for comparison. Professional forecasters display very small revisions in their forecasts, at either long or short horizons, consistent with the notion of anchored expectations. In contrast, households display very large revisions, both upward and downward for both short and long horizons. The distributions of firms' revisions in inflation expectations again look broadly similar to that of households' albeit somewhat less dispersed. The average absolute size of the revisions in firms' expectations (1.0 percent at the 12-month horizon and 1.4 percent at the 5-year horizon) are smaller than those of households on average (2.4 percent

and 1.6 percent at the 1-year and 5-year horizons respectively) but are an order of magnitude larger than those observed for professional forecasters (0.4 percent and 0.2 percent at the 1-year and 5-year horizons respectively). These numbers are again difficult to reconcile with the notion that firms' inflation expectations are anchored expectations.

Prediction 5: *There should be little comovement between revisions in long-run and short-run inflation expectations.*

A final commonly used approach to assess whether expectations are anchored is to examine the comovement of changes in short-run and long-run inflation expectations. The idea is that transitory economic shocks can affect short-run expectations but not long-run inflation expectations when the latter are anchored. The correlation between changes in the two sets of expectations should therefore be very low. Panel A of Figure 4 shows that this prediction does not hold for firms' inflation expectations: there is a strong positive relationship between managers' long-run and short-run inflation expectations. The slope for the relationship between changes in 1-year-ahead and 5-year-ahead inflation forecast is 0.71.⁷ Even though one might expect to find a positive slope between revisions at the two horizons if shocks to inflation are sufficiently persistent, this degree of pass-through from 1-year to 5-year expectations is far too large to be reconcilable with empirical evidence on U.S. inflation persistence (e.g., Stock and Watson 2007).

For comparison, Panels B and C in Figure 4 plot the corresponding correlations between changes in one-year ahead and five-year ahead inflation forecasts of households in the MSC and professional forecasters in the SPF respectively. Even with the latter, there is a positive correlation between the two sets of expectations, indicating that even professional forecasters believe that some shocks to inflation have very long-lasting effects, a feature that is difficult to square with

⁷ To maximize the sample size, we compute revisions for 1-year and 5-year ahead inflation forecasts for each firm and then compute averages for each calendar year. We use the same approach for households and professional forecasters.

anchoring of expectations. Households display a higher slope coefficient of 0.34 but the relationship between short-run and long-run revisions is weaker (R^2 is 0.12 while it is 0.60 for firms and 0.48 for professional forecasters).

In summary, consistent with what was found by Kumar et al. (2015) for the managers of firms in New Zealand, the inflation expectations of U.S. firms' managers display little anchoring: high and dispersed inflation expectations, high levels of uncertainty in their inflation forecasts, large revisions in both short-run and long-run expectations, and a strong correlation between the changes in short-run and long-run inflation expectations.

V What Determines Long-Run Expectations?

In typical monetary models used by central banks for policy analysis, agents' long-run inflation expectations are equal to the central bank's target, which determines the steady-state rate of inflation. But as documented in the previous section, this anchoring of inflation expectations is the case neither for households nor firms in the U.S. If long-run inflation expectations are not pinned down by the central bank's inflation target, what then determines what firms believe about longer run inflation dynamics? One possibility is that firms have misconceptions about what level of inflation the central bank is targeting but believe that the central bank will achieve its target. This would be an environment in which the central bank has high credibility (agents believe it will hit its target) but has failed to communicate its target (agents may have incorrect beliefs about the target). Another possibility could be that firms do not perceive the central bank as credible, and instead view long-run inflation as dependent on recent inflation shocks. Differences in beliefs about long-run inflation would therefore stem from differences in beliefs about recent inflation. In this environment, agents' beliefs about the inflation target would be uncorrelated with their beliefs about longer-run inflation and instead would be closer linked to their views about recent inflation.

In this section, we provide some tentative evidence on what lies behind the lack of anchoring in firms' inflation expectations. We do so by characterizing both their knowledge about the Fed's inflation target (and its perceived link to longer-run inflation) as well as their perceptions of recent inflation and the extent to which those translate into longer-run inflation movements. Both are ultimately explanations built on inattention by firms: inattention to the central bank's inflation target in one explanation and inattention to recent inflation in the other.

In the April waves, managers were asked about what inflation rate they thought the Federal Reserve was trying to achieve on average. We report the resulting distribution of responses to that question in Table 6 for each wave. The response rate to this question is generally low. For example, in the first wave (2018Q2), 65 percent of survey respondents answered that they did not know. Of those who answered, the average response was 2.9 percent, much higher than the correct answer of 2 percent. Only 15.6 percent of managers responded with an answer between 1.5 and 2.5 percent. Similar results obtained in the 2019Q2 and 2020Q2 waves that included this question, with relatively few respondents able to provide an answer or one close to the correct value. This mirrors results for U.S. households: less than 20 percent of surveyed participants in the Nielsen Homescan Panel gave answers in the correct range of 1.5-2.5 percent. Comparable results for professional forecasters are not available since this question is not asked them, putatively because they are all expected to be fully aware of the Federal Reserve's inflation target. Interestingly, the share of firms reporting a usable numeric inflation target increased from 31 percent in 2018Q2 to 66 percent in 2021Q2, when concerns about future inflation were extensively covered by the media (see Appendix Figure 2). As we discuss below, this pattern is consistent with state-dependence in how much attention managers allocate to tracking aggregate inflation rate.

Although Table 6 makes clear that most firms do not know the specific inflation rate that the Federal Reserve is targeting, can these differences in views about the inflation target explain

the dispersion in opinions about long-run inflation among U.S. firms? Figure 5 plots a binscatter of the relationship between firms' beliefs about the inflation target against their beliefs about longer-run inflation. There is a clear positive relationship, indicating that managers who believe the Fed is targeting higher levels of inflation also tend to think inflation will be higher in the future, consistent with some perceived credibility of the central bank. While the slope coefficient is much less than one (approximately 0.29), the explanatory power of the perceived inflation target is quite high, with an R^2 of 0.59. The correlation between perceived inflation targets and firms' one-year ahead inflation forecasts is similar. Differential beliefs about the inflation target therefore seem like one likely source behind the disparities in firms' longer-run inflation forecasts.

A second potential explanation stems from inattention to recent inflation dynamics: if firms have different perceptions about what has happened to inflation recently and believe inflation is subsequently persistent, this could potentially account for differential beliefs about long-run inflation. Figure 6 plots the distribution of firm beliefs about inflation over the *previous* 12 months in each of the three waves when this question was asked, along with the actual inflation rate at the time. We can immediately observe significant dispersion in perceptions about recent inflation, even though this information is publicly and freely available. This indicates that inattention to recent inflation is pervasive among firms, as proposed in rational inattention models such as Sims (2003), Mackowiak and Wiederholt (2009), Afrouzi (2019), and Yang (2020). Figure 7 then plots a binscatter of the relationship between firms' perceptions about recent inflation versus their beliefs about long-run future inflation. The explanatory power of perceived inflation is quite high, with an R^2 of 0.45 and a statistically significant positive relationship between the two measures.

One might imagine that firms' beliefs about recent inflation and their beliefs about the inflation target are themselves not uncorrelated: managers who believe the Fed targets a high rate of inflation may be more likely to think that inflation has recently been high and vice-versa. As a

result, we want to consider the joint effect of these beliefs in accounting for firms' inflation expectations. We do so by regressing firms' 5-year ahead and 1-year ahead inflation expectations respectively on their perceived level of inflation and their beliefs about the inflation target aggregated to the annual frequency. We report results from OLS and Huber-robust regressions for each in Table 7. With short-run (12-month ahead) expectations, Huber-robust estimates suggest a somewhat stronger role for perceived inattention than the perceived Fed target. With longer-run expectations, the results are reversed: the perceived Fed target seems to have the strongest predictive power. We find little additional role for the inflation rate in the firm's sector in driving firms' aggregate inflation expectations. In a quantitative sense, differences in firms' beliefs about longer-run inflation are therefore more strongly tied to differences in firms' perceptions of the long-run inflation target of the Federal Reserve. At the same time, the broader picture that emerges from Table 7 is one in which firms recognize that recent changes in inflation may be persistent—and therefore still present within 12 months—but view these as relatively transitory, such that their long-run inflation expectations are primarily a reflection of their perceived inflation target of the Federal Reserve. As a result, firms' inflation expectations are shaped by both their inattention to recent inflation dynamics as well as their inattention to the longer-run objectives of the central bank, with the relative importance of the two changing over the forecasting horizon.

How should we interpret the systematic inattention that firms pay to inflation and monetary policy, as well as the resulting unanchored inflation expectations that they report? First, it is worth emphasizing that U.S. firms are not alone in this respect. Surveys of firms in other advanced economies have similarly found firms' aggregate inflation forecasts to appear disconnected from recent inflation dynamics and actual monetary policy objectives, e.g., in New Zealand (Coibion, Gorodnichenko and Kumar 2018), Switzerland (Hunziker et al. 2018), France (Andrade et al. 2020), etc. Second, this characteristic does not extend to all countries. Evidence from developing

economies with a history of high and volatile inflation indicates that firms there are much more attentive to inflation and monetary policy, as illustrated in Uruguay (Frache and Lluberas 2019, Borraz, Mello, and Zacheo 2020), Ukraine (Coibion and Gorodnichenko 2015a), or Iran (Afrouzi et al. 2021). This suggests that the now long history of low and stable inflation in most advanced economies has removed much of the incentive that firms may have had to pay much attention to monetary policy and inflation.

Indeed, other recent survey evidence confirms this point. In October 2015, the Atlanta Fed BIE survey asked firms to indicate what level of influence the inflation rate and other factors such as labor costs or sales levels have on their pricing decisions. 38 percent of the firms responded that the aggregate inflation rate had a significant level of influence. For comparison, the fraction of firms that assigned the same (significant) level of influence to other factors was: industry trends (52 percent), labor costs (51 percent), non-labor costs (48 percent), sales levels (48 percent), margin adjustments (36 percent) and productivity (25 percent). In another wave of the BIE implemented in November 2015, approximately 55 percent of the firms responded that forecasts of future aggregate inflation occasionally affect the prices that they set while approximately 15 percent of the firms responded that these forecasts often affect their pricing decisions. In the long list of factors that managers must pay attention to in guiding their firms, aggregate inflation is not a top priority in advanced economies like the U.S. This relegation in priority is then reflected in firms' knowledge about aggregate inflation and the resulting inflation forecasts that they report.

But the fact that inflation is not a priority in managers' eyes does not mean that it is irrelevant to their decisions. In fact, a growing body of work documents how changes in the inflation expectations of firms do in fact alter their economic decisions. Two examples include Coibion, Gorodnichenko and Kumar (2018) for firms in New Zealand and Coibion, Gorodnichenko and Ropele (2020) for firms in Italy. In each case, exogenously provided

information about inflation to a subset of firms leads them to alter their inflation expectations relative to a control group, and this variation in inflation expectations is then found to have persistent effects on, at a minimum, the employment and investment decisions of firms. Reconciling the fact that firms do not find it worthwhile to keep track of inflation with the fact that it still enters their decision-making process requires the profit function of firms to be quite (but not perfectly) flat with respect to information about inflation.

VI Conclusion

We present results from a new Survey of Firms' Inflation Expectations (SoFIE) in the U.S. This survey is representative, quantitative in nature, and available over an increasingly long sample. We document that U.S. firms' inflation expectations deviate from those of households and professional forecasters over time, although they exhibit many of the qualitative features of household expectations. Like the latter, the inflation expectations of U.S. firms are anything but anchored.

These results can be useful along several dimensions. Most practically, it provides the first consistent real-time measure of firms' inflation expectations in the U.S. This can be an invaluable input into the central bank decision-making process, which has long emphasized the importance of measuring firms' inflation expectations. In addition, having a measure of firms' inflation expectations can be used to study the expectations formation process of firms, an important component of any macroeconomic model. By complementing surveys of other types of agents available, SoFIE therefore fills an important gap.

More generally, this survey contributes to a growing list of surveys of firms around the world which will provide researchers with new insight on how the expectations of CEOs, managers and executives affect their decision-making. The inherent forward-looking nature of most firm decisions, such as price-setting, employment, and capital expenditures, implies a key role for

expectations about the future. These new surveys of firms' expectations will therefore enable economists to better understand how these expectations are formed as well as the extent and manner in which they affect decisions.

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Table 1. Distribution of firms by sector and size.

Industry	Survey (SoFIE)				Actual US by:	
	Large (1)	Medium (2)	Small (3)	Total (4)	count (5)	payroll (6)
Basic Metals	0.90	3.24	4.49	8.63	1.26	1.87
Chemicals & Plastics	1.79	3.86	3.11	8.76	0.47	2.15
Electrical	0.76	2.21	4.62	7.59	0.37	1.68
Financial Intermediation	1.45	2.14	3.11	6.69	5.51	12.05
Food & Drink	1.31	2.28	1.59	5.18	0.71	1.49
Hotels & Restaurants	1.24	0.76	0.90	2.90	12.21	5.15
Mechanical Engineering	0.48	2.21	3.80	6.49	0.49	1.23
Other Manufacturing	0.97	3.04	3.31	7.32	1.68	1.71
Other Services	4.07	5.24	2.35	11.66	36.33	26.29
Post & Telecommunication	0.41	0.35	0.90	1.66	1.75	6.25
Renting & Business Activities	3.86	6.56	9.32	19.74	34.11	32.67
Textiles & Clothing	0.07	0.21	0.41	0.69	0.35	0.24
Timber & Paper	0.55	1.04	1.38	2.97	0.35	0.74
Transport Manufacturing	1.52	2.76	2.35	6.63	0.22	1.98
Transport & Storage	0.55	1.45	1.10	3.11	4.20	4.51
Total	19.94	37.34	42.72	100.00	100.00	100.00
US actual by count	1.50	11.16	87.34	100.00		
US actual by payroll	68.33	19.81	11.87	100.00		

Notes: the authors' calculations. U.S. actuals are from the Census Bureau's Statistics of US Businesses (SUSB).

Table 2. Inflation Forecasts of Firm Managers and Other Agents for the United States.

Survey wave	Survey Date	Recent data	1-Year Ahead Inflation Forecasts								
			Central Bank		Professional forecasters		Households		Firms (SoFIE)		
			Mean	SD	Mean	SD	Mean	SD	Mean	SD	N
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)		
1	2018Q2	2.5	2.1	0.15	2.4	0.4	3.4	3.0	3.6	2.0	189
2	2018Q3	2.9	2.0	0.10	2.3	0.4	3.6	3.3	2.9	1.6	191
3	2018Q4	2.5	1.9	0.30	2.3	0.3	3.5	3.2	3.4	1.6	234
4	2019Q1	1.5	1.9	0.10	2.3	0.3	3.1	2.9	3.0	1.0	292
5	2019Q2	2.0	1.7	0.10	2.1	0.3	3.3	3.1	2.1	1.1	301
6	2019Q3	1.8	1.8	0.18	2.1	0.3	3.4	3.2	2.3	0.5	192
7	2019Q4	1.8	1.9	0.10	2.1	0.3	3.1	3.0	2.1	1.5	207
8	2020Q1	2.5	-	-	2.1	0.4	2.9	2.9	2.2	1.1	231
9	2020Q2	0.0	1.2	0.35	1.8	0.7	4.0	4.0	2.1	1.5	127
10	2020Q3	1.0	1.6	0.28	1.6	1.1	3.8	3.7	2.0	1.2	328
11	2020Q4	1.2	1.8	0.20	2.1	0.5	3.4	3.5	2.3	1.0	330
12	2021Q1	1.4	2.3	0.23	2.2	0.3	4.1	3.8	2.8	2.1	408
13	2021Q2	4.1	-	-	2.5	0.5	4.6 [†]	-	3.2	1.3	416

Notes: The table reports mean and standard deviation (SD) for 12-month-ahead inflation expectations (point predictions) as well as actual inflation rate. Data are for the first month of each quarter. Recent data (column 1) shows CPI inflation rate over the last 12 months. Central Bank forecasts (columns 2 and 3) are from Economic Projections of Federal Reserve Board Members and Federal Reserve Bank Presidents. Inflation expectations are reported for PCE inflation. SD in column (3) is the upper end of the central tendency (excludes the three highest projections) minus the lower end of the central tendency (excludes the three lowest projections). 12-month-ahead forecast is constructed as a weighted average of current and next-year projects where weights are the number of quarters from each year one needs to take to cover the next 12 months. Professional forecasters' expectations (columns 4 and 5) are from the Survey of Professional Forecasters. Households' expectations (columns 6 and 7) are from the Michigan Survey of Consumers (MSC). We exclude responses of consumers that are greater than 15 percent or less than -2 percent. [†] denotes preliminary data. Firms' inflation expectations (columns 8 and 9) are from the authors' survey. We exclude responses of firms' managers that are greater than 15 percent or less than -2 percent. All moments are computed using survey weights. Results for nontruncated data and without sampling weights are reported in the Appendix Table A1.

Table 3. Inflation Forecast Variation by Size and Industry

	Dependent variable: one-year-ahead inflation forecast		
	(1)	(2)	(3)
<i>Firm Size [omitted category: Large]</i>			
Medium	-0.082 (0.088)		-0.075 (0.086)
Small	0.036 (0.128)		0.042 (0.128)
<i>Sector [omitted category: Basic Metals]</i>			
Chemicals & Plastics		0.101 (0.177)	0.093 (0.179)
Electrical		0.015 (0.211)	0.002 (0.213)
Financial Intermediation		-0.234* (0.131)	-0.255* (0.137)
Food & Drink		0.527** (0.207)	0.515** (0.208)
Hotels & Restaurants		0.037 (0.152)	0.026 (0.153)
Mechanical Engineering		0.277 (0.221)	0.282 (0.221)
Other Manufacturing		0.185 (0.122)	0.177 (0.123)
Other Services		0.141 (0.127)	0.124 (0.126)
Post and Telecommunication		0.846** (0.423)	0.826** (0.421)
Renting & Business Activities		0.203 (0.142)	0.190 (0.140)
Textiles & Clothing		-0.181 (0.367)	-0.204 (0.368)
Timber & Paper		-0.034 (0.134)	-0.047 (0.137)
Transport Manufacturing		-0.089 (0.211)	-0.108 (0.214)
Transport & Storage		-0.310* (0.185)	-0.320* (0.186)
Observations	3,446	3,446	3,446
R-squared	0.107	0.137	0.137

Notes: Fixed effects for survey waves are included but not reported. We exclude responses of firms' managers that are greater than 15 percent or less than -2 percent. Sampling weights are used in estimation. Robust standard errors in parentheses. ***, **, * indicate statistical significance at 1, 5 and 10 percent.

Table 4. Alternative U.S. Firm-Level Inflation Forecasts

Survey Date	Firm Forecasts of One-Year Ahead Inflation					
	This survey (SoFIE)		Atlanta Fed BIE		Households with managerial duties	
	Mean	SD	Mean	SD	Mean	SD
	(1)	(2)	(3)	(4)	(5)	(6)
September 2014	-	-	3.9	2.8	-	-
July 2015	-	-	2.7	2.2	-	-
January 2019	3.0	1.0	2.8	1.0	2.5	2.0
April 2019	2.1	1.1	2.6	-	-	-
January 2020	2.2	1.1	-	-	3.2	1.8
April 2020	2.1	1.5	-	-	3.8	3.0
July 2020	2.0	1.2	-	-	3.5	2.4

Notes: The table reports mean and standard deviation (SD) for 12-month-ahead inflation expectations (point predictions). Firms' inflation expectations (columns 1-4) are from the authors' survey and Federal Reserve Bank of Atlanta's Business Inflation Expectations (BIE). We exclude responses of firms' managers that are greater than 15 percent or less than -2 percent. Results for non-truncated data are reported in the Appendix Table A1. Households with managerial duties are from Nielsen Homescan Panel (NHP) (column 5 and 6). All moments are computed with survey weights.

Table 5. Long-Run Forecasts of Firm Managers and Other Agents for the United States.

Survey Date	Recent data	5-year-ahead forecasts							
		Central Bank		Professional forecasters		Households		Firms (SoFIE)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
2018Q4	1.6	2.0	0.0	2.3	0.2	2.9	2.5	3.7	2.0
2019Q4	1.6	2.0	0.0	2.1	0.2	2.8	2.4	2.3	1.5
2020Q1	2.0	-	-	2.2	0.2	2.8	2.2	-	-
2020Q2	1.6	2.0	0.0	1.9	0.4	2.9	2.4	-	-
2020Q3	1.7	2.0	0.0	1.9	0.3	3.0	2.4	-	-
2020Q4	1.8	2.0	0.0	2.0	0.3	2.9	2.5	3.3	1.2

Notes: Data are for the first month of each quarter. Recent data (column 1) shows average annual CPI inflation rate over the last 5 years. Central Bank forecasts (columns 2 and 3) are from Economic Projections of Federal Reserve Board Members and Federal Reserve Bank Presidents. Inflation expectations are reported for PCE inflation. SD in column (3) is the upper end of the central tendency (excludes the three highest projections) minus the lower end of the central tendency (excludes the three lowest projections). 5-year ahead forecast corresponds to longer run projection. Professional forecasters' expectations (columns 4 and 5) are from the Survey of Professional Forecasters. Households' expectations (columns 6 and 7) are from the Michigan Survey of Consumers (MSC). We exclude responses of consumers that are greater than 15 percent or less than -2 percent. Firms' inflation expectations (columns 8 and 9) are from the authors' survey (SoFIE). We exclude responses of firms' managers that are greater than 15 percent or less than -2 percent. All moments are computed with survey weights. Results for nontruncated data and without sampling weights are reported in the Appendix Table A1.

Table 6. Perceived Fed Inflation Target and Managers' Inflation Forecasts.

Perceived Inflation target of the Fed	Firms (SoFIE)				Households (Nielsen Homescan Panel)		
	2018Q2	2019Q2	2020Q2	2021Q2	2018Q2	2018Q3	2018Q4
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average	2.9	2.2	1.8	2.8	3.7	3.9	4.2
St. Dev.	1.4	0.9	0.8	1.1	2.6	3.3	3.2
Distribution, share (%)							
(-∞, 0.5]	0.04	1.24	1.08	0.41	1.45	12.14	8.25
(0.5, 1.5]	1.55	12.61	10.88	1.81	3.35	3.65	3.12
(1.5, 2.5]	15.64	33.41	17.11	27.93	16.33	15.29	15.00
(2.5, 3.5]	8.38	10.46	3.04	24.64	11.30	11.05	11.24
(3.5, 4.5]	0.77	5.12	0.02	5.34	3.39	5.64	4.97
(4.5, 5.5]	1.66	0.70	0.04	4.97	6.48	9.01	9.92
(5.5, 6.5]	1.85	0.02	0.00	0.06	0.70	1.95	1.35
(6.5, 7.5]	0.00	0.00	0.21	0.09	0.67	0.88	1.04
(7.5, 8.5]	0.37	0.00	0.00	0.00	0.47	1.86	1.69
(8.5, 9.5]	0.00	0.00	0.00	0.00	0.19	0.21	0.16
(9.5, +∞)	0.45	0.01	0.00	0.20	15.28	38.33	43.26
DNK	65.04	13.37	27.75	17.02	40.37	-	-
NA	4.25	23.05	39.88	17.52	-	-	-

Notes: Results in columns (1)-(4) are from the U.S. surveys of CEOs, see Candia, Coibion, and Gorodnichenko (2020). The survey question is “What annual inflation rate do you think the U.S. Federal Reserve is trying to achieve on average?”. Results in columns (5)-(7) are for households participating in the Nielsen Homescan Panel. The survey question is “What is your best guess about the annual inflation rate that the Federal Reserve tries to achieve on average over long periods of time? Please use a percent between -100 and 100”. In the 2018Q2 wave (column 5), households were allowed to choose “do not know” option. In other waves, this option was not available. When computing averages and standard deviations, we exclude responses that are less than 2 percent or greater than 15 percent. DNK stands for “do not know” or “prefer not to answer.” NA stands for “not available” or “unusable response,” i.e., a respondent did not provide an estimate or a usable numeric estimate for the inflation target.

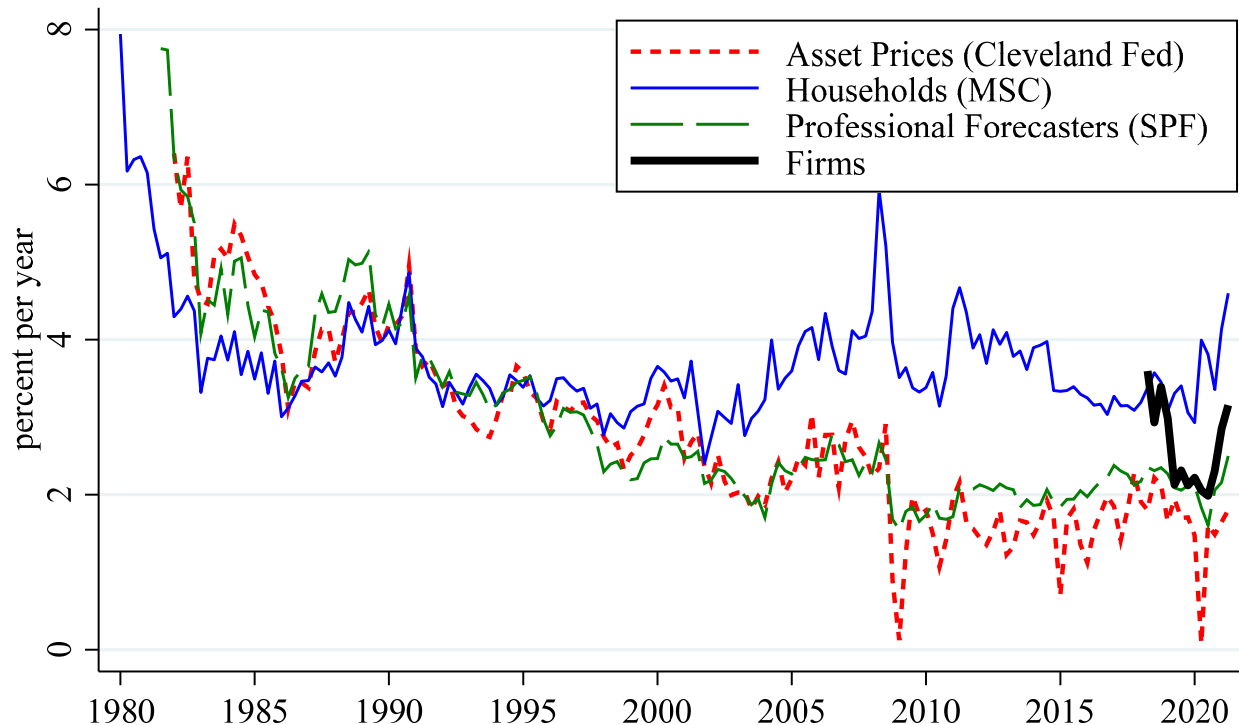
Table 7. The effect of knowing about inflation and monetary policy on expectations.

VARIABLES	Dependent variable:			
	1-year ahead expected inflation		5-year ahead expected inflation	
	OLS	Huber	OLS	Huber
	(1)	(2)	(3)	(4)
Fed target	0.57*** (0.12)	0.25*** (0.04)	0.54* (0.30)	0.37*** (0.08)
Perceived inflation	0.33*** (0.08)	0.43*** (0.05)	0.37*** (0.14)	0.07 (0.05)
Recent PPI inflation	0.02 (0.04)	-0.03** (0.01)	0.20 (0.14)	0.01 (0.03)
Observations	195	185	107	99
R-squared	0.61	0.62	0.26	0.38

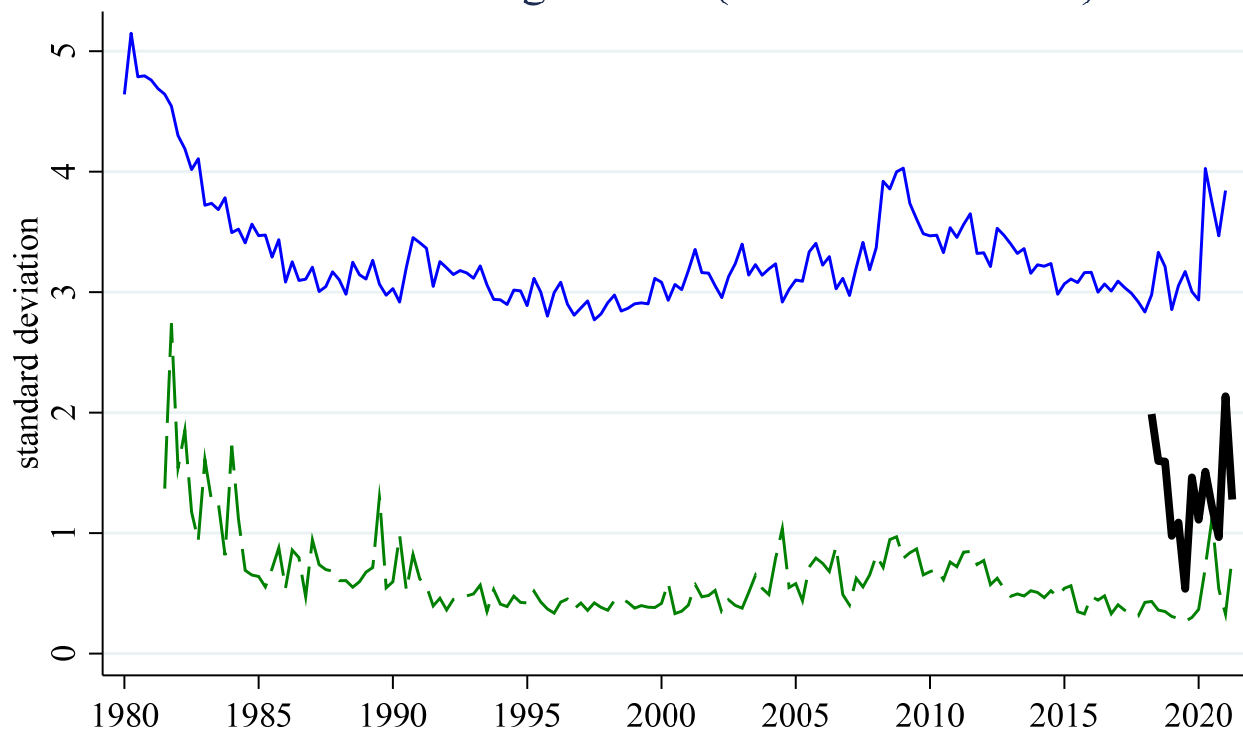
Notes: The dependent variable is 1-year ahead inflation rate (columns 1 and 2) and 5-year ahead inflation rate (columns 3 and 4). Recent PPI inflation rates (from the BLS) are quarter-on-quarter inflation rates (annualized, percent) at the industry level. The regressors and regressands are annual averages. Year fixed effects are included but not reported. Standard errors in parentheses. ***, **, * indicate statistical significance at 1, 5 and 10 percent.

Figure 1. One-Year-Ahead Inflation Expectations for Different Agents.

Panel A: Mean forecast

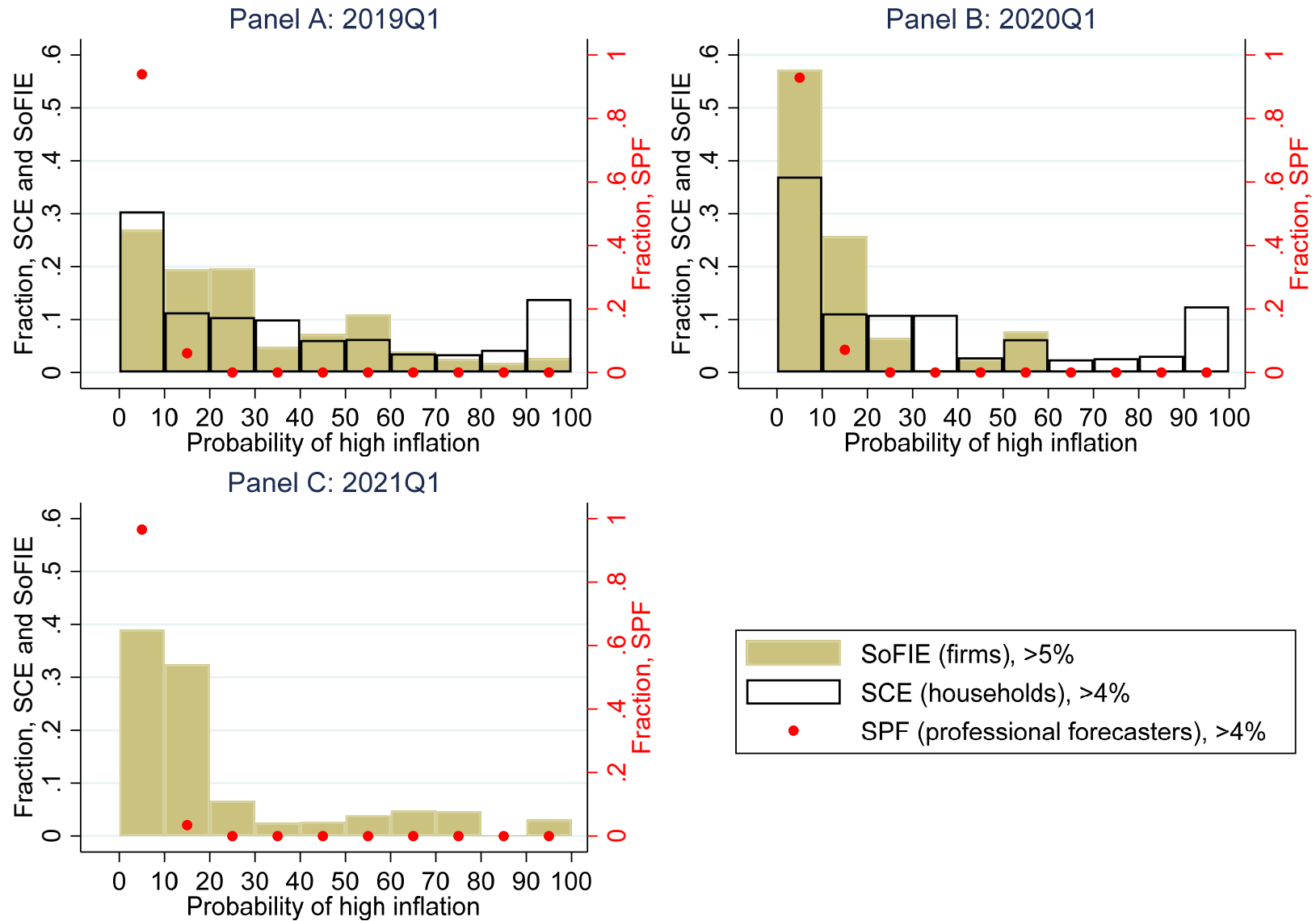


Panel B: Disagreement (standard deviation)



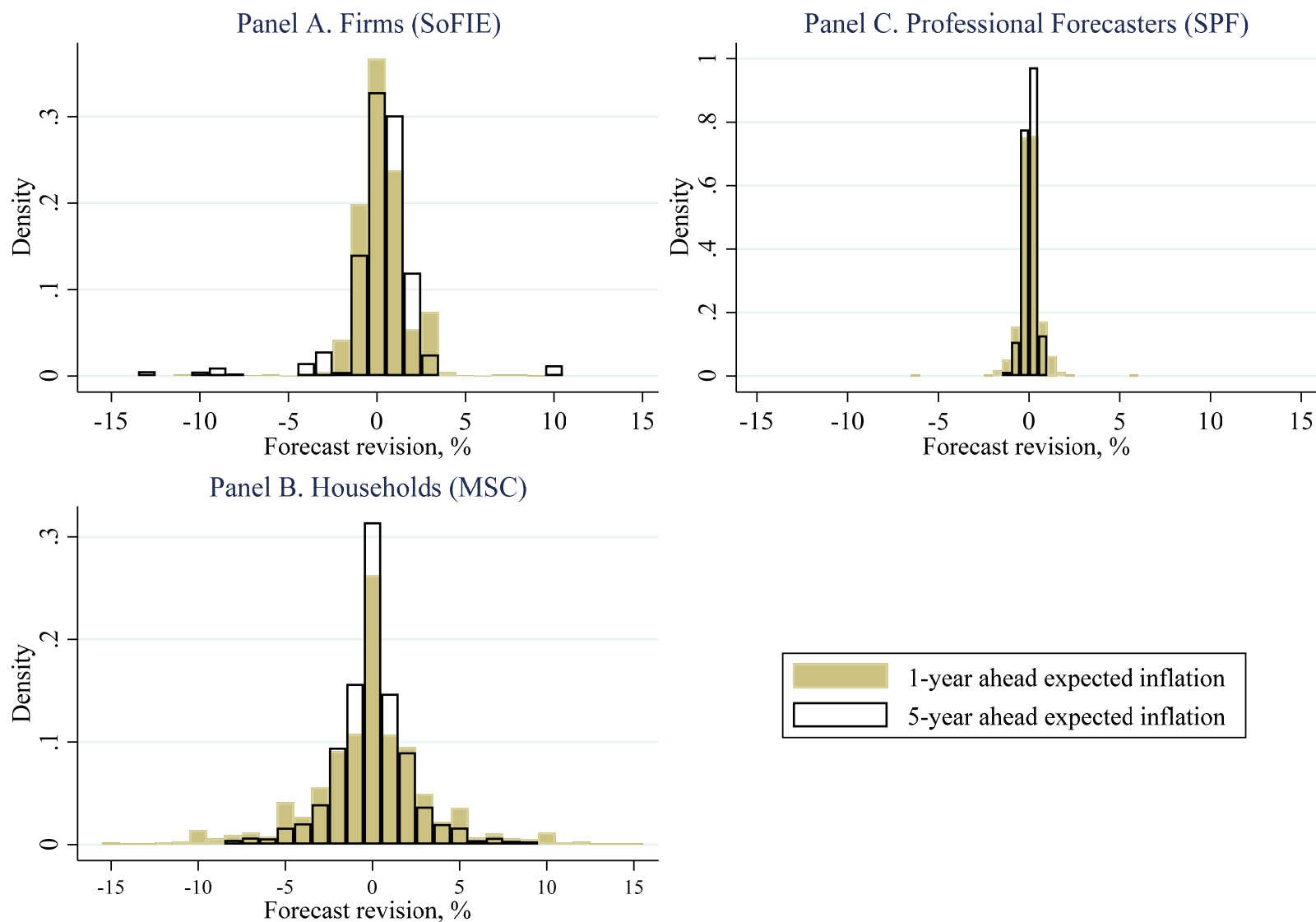
Notes: Financial markets' expectations are from the Federal Reserve Bank of Cleveland, households' expectations are from the Michigan Survey of Consumers (MSC) and professional forecasters' expectations are from the Survey of Professional Forecasters run by the Federal Reserve Bank of Philadelphia. We 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.

Figure 2. Uncertainty in Inflation Forecasts.



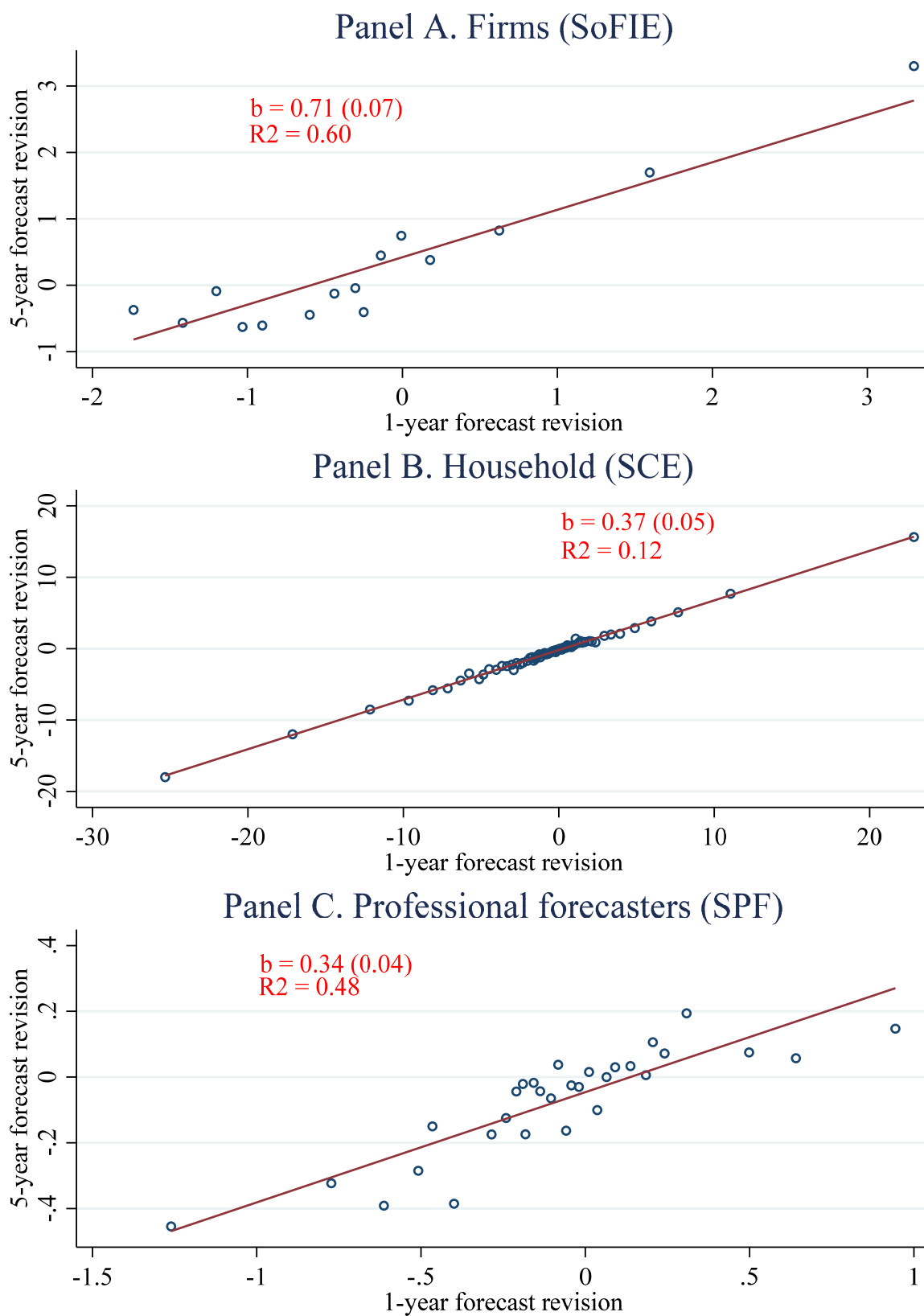
Notes: SoFIE reports the distribution of the probability that inflation over the next 12 months will exceed 5% while SCE and SPF report the distribution of the probability that inflation over the next 12 months will exceed 4%. Panel A shows results for 2019Q1, panel B shows results for 2020Q1, while panel C shows results for 2021Q1. The distributions are computed using survey weights. Sources: Authors' survey of United States firms (SoFIE), Federal Reserve Bank of New York's Survey of Consumer Expectations (SCE) and Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters (SPF).

Figure 3. Forecast Revisions by U.S. Firms, Households and Professional Forecasters.



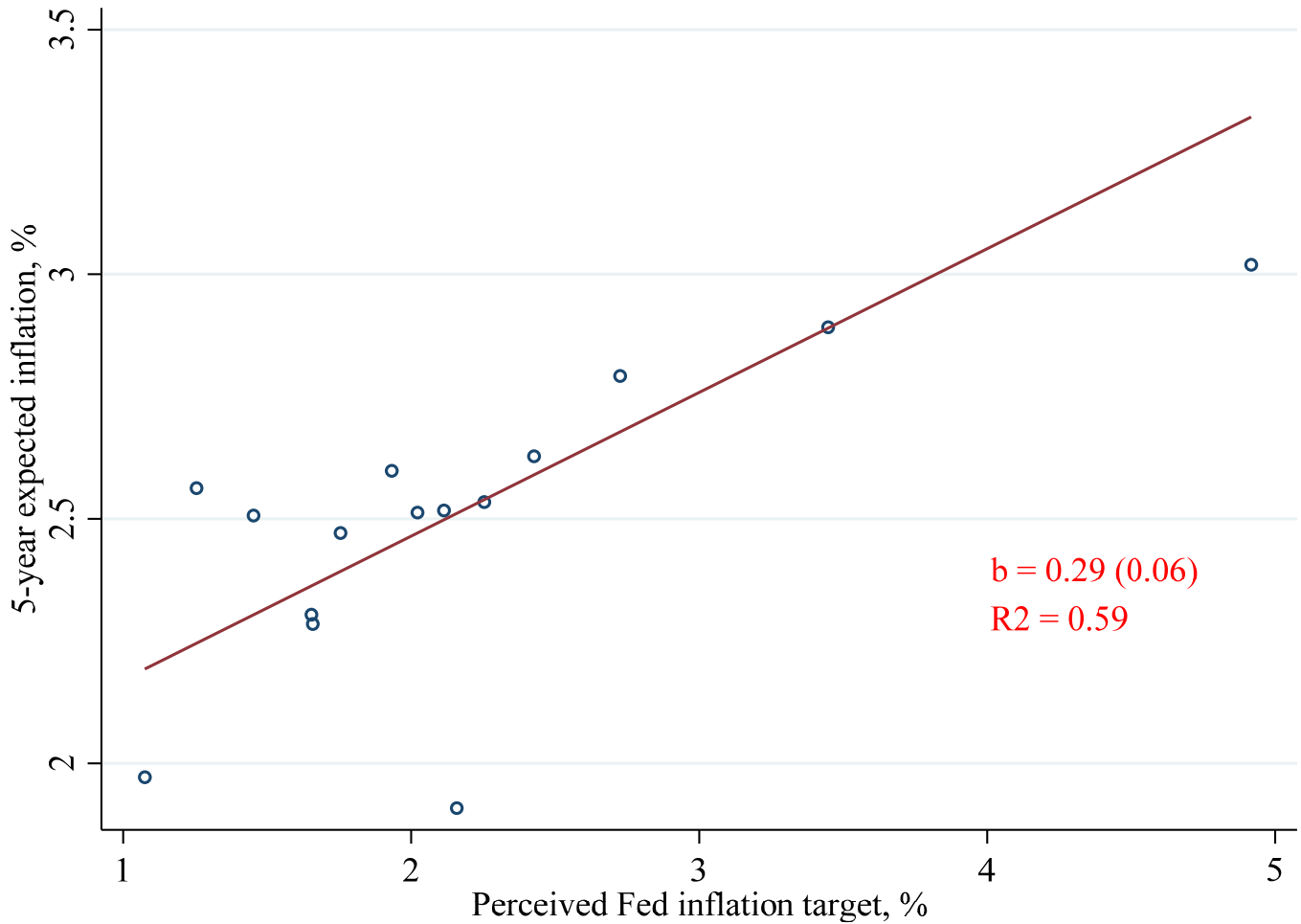
Notes: The figure reports the distribution of revisions in long-term (5-years-ahead) inflation forecasts (empty bars) and the distribution of revisions in short-term (1-year-ahead) inflation forecasts (filled bars). Panel A: shows results for firms (SoFIE), 6-month revision for 1-year-ahead and 1-year revision for 5-year-ahead inflation forecasts. Panel B: shows results for households (MSC), 6-month revision for 1-year-ahead and 5-year-ahead inflation forecasts. Panel C: shows results for professional forecasters (SPF), 6-month revision for 1-year-ahead and 5-year-ahead inflation forecasts. The distributions are computed using survey weights. The sample period covers 2018Q2-2021Q1.

Figure 4. Correlation of Changes in Short-Run and Long-Run Inflation Expectations.



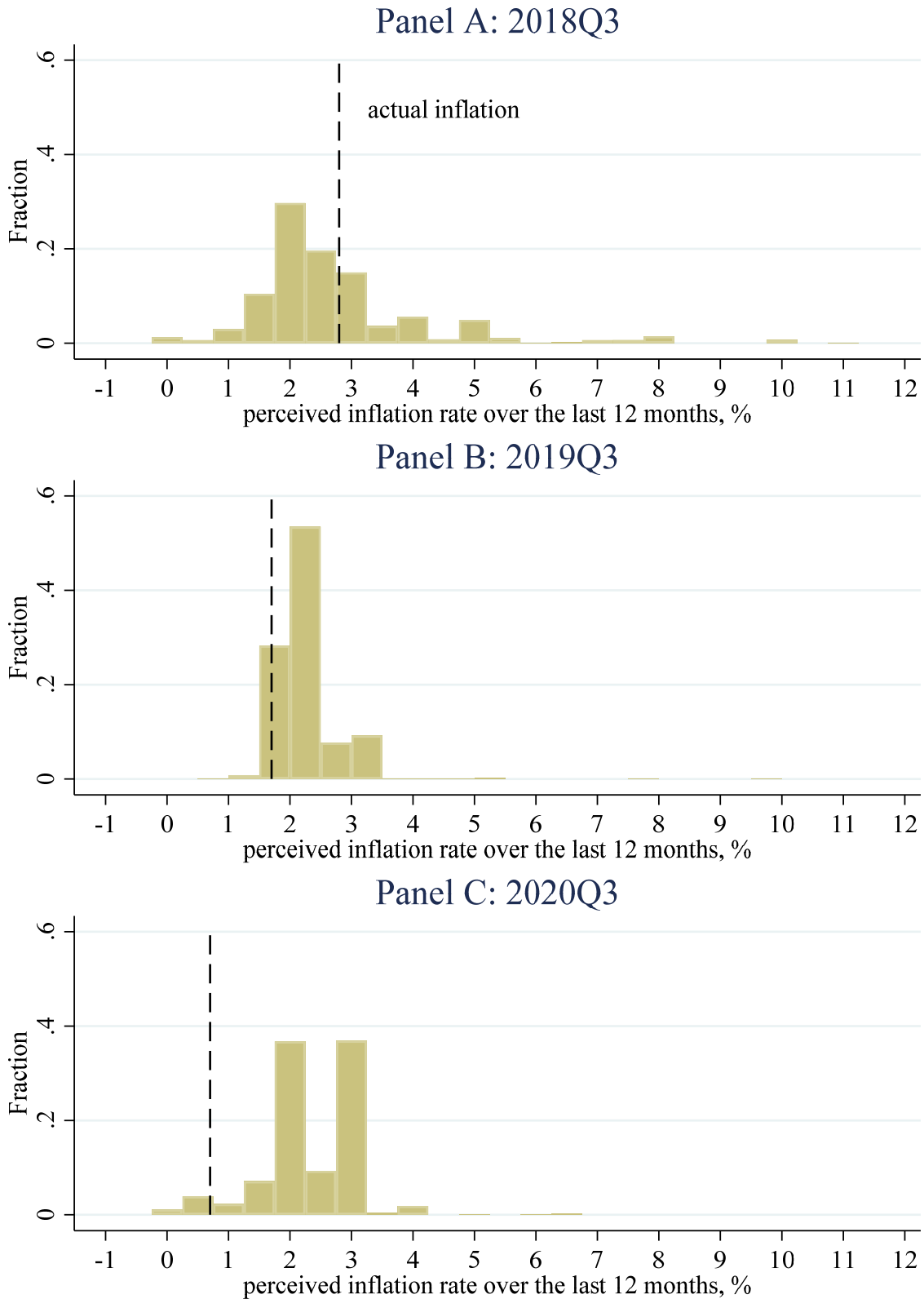
Source: The figure shows the relationship between 1-year-ahead and 5-year-ahead inflation forecasts. The sample period covers waves 2018Q4, 2019Q4 and 2020Q4 for SoFIE, 2017Q1-2020Q2 for SCE, and 2018Q1-2021Q1 for SPF. Huber robust regression is used to downweight the importance of outliers and influential observations.

Figure 5. Inflation expectations over the next 5 years vs Fed's inflation target.



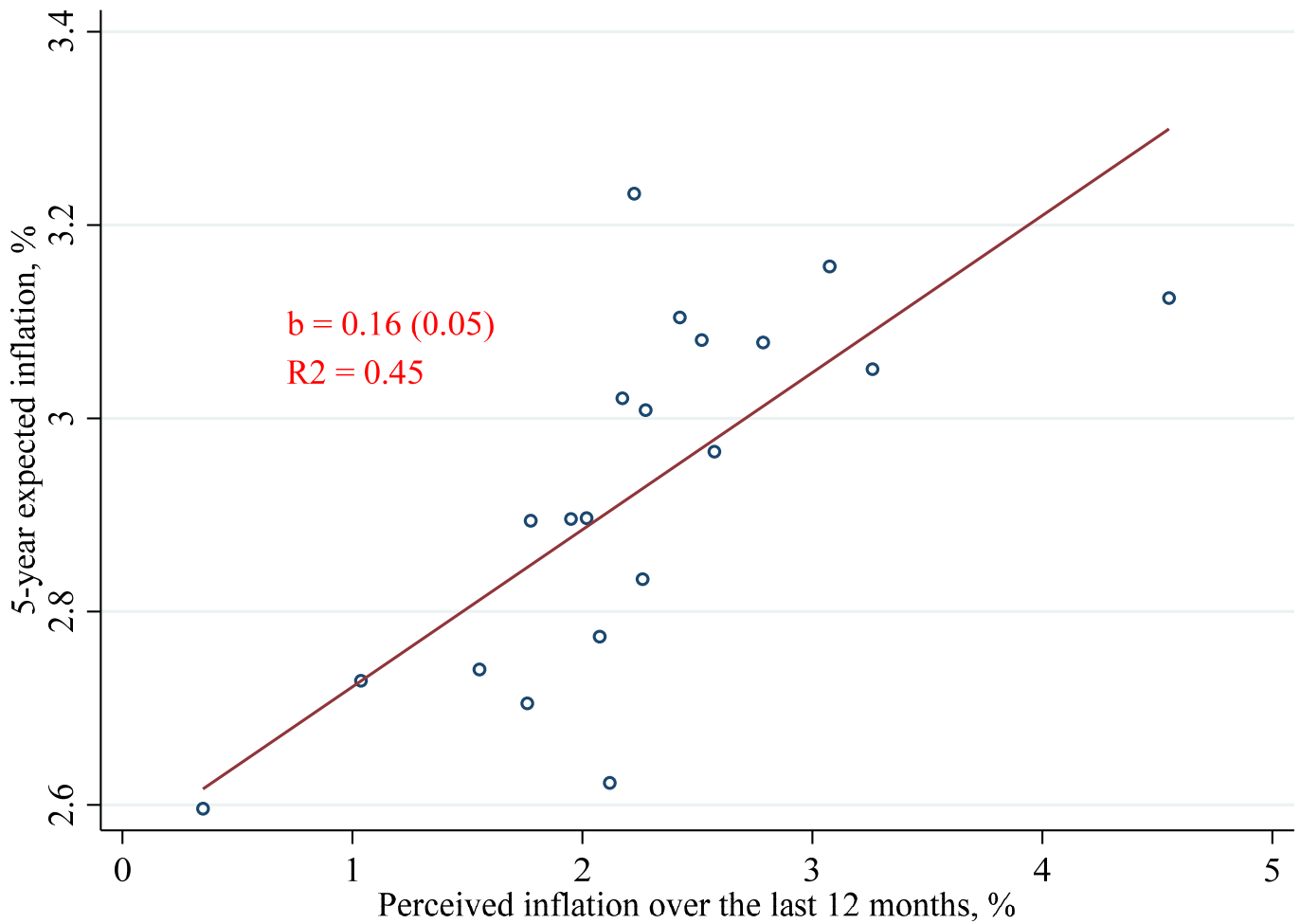
Notes: The figure plots the bin scatter between 5-year-ahead expected inflation reported in wave 2018Q4, 2019Q4 and 2020Q4 and Fed's inflation target reported in wave 2018Q2, 2019Q2 and 2020Q2, respectively. Uses Huber robust regression to downweight the importance of outliers and influential observations. Regression uses sampling weights. We take out time fixed effect. Robust standard error is in parentheses. The survey questions are: "What do you think will be the inflation rate (for the Consumer Price Index) over the next 5 years? Please provide an answer in an annual percentage rate." and "What annual inflation rate do you think the U.S. Federal Reserve is trying to achieve on average?"

Figure 6. Distribution of Firms' Perceived Inflation Rate over the Last 12 Months.



Notes: Reports the distribution of perceived inflation rate over the last 12 months in the second (panel A: 2018Q3), sixth (panel B: 2019Q3) and tenth (panel C:2020Q3) waves of the survey. The vertical bold line indicates the most recent available value of annual inflation. The distributions are computed using survey weights. The survey question is: “What do you think has been the annual inflation rate (for the Consumer Price Index) over the last twelve months? Please provide an answer in annual percentage rate.”

Figure 7. Inflation expectations over the next 5 years vs perceived inflation over the last 12 months.



Notes: The figure plots the bin scatter between 5-year-ahead expected inflation reported in wave 2018Q4, 2019Q4 and 2020Q4 and perceived inflation over the last 12 months reported in wave 2018Q3, 2019Q3 and 2020Q3, respectively. Uses Huber robust regression to downweight the importance of outliers and influential observations. Regression uses sampling weights. We take out time fixed effect. Robust standard error is in parentheses. The survey questions are: “What do you think will be the inflation rate (for the Consumer Price Index) over the next 5 years? Please provide an answer in an annual percentage rate.” and “What do you think has been the annual inflation rate (for the Consumer Price Index) over the last twelve months? Please provide an answer in annual percentage rate.”

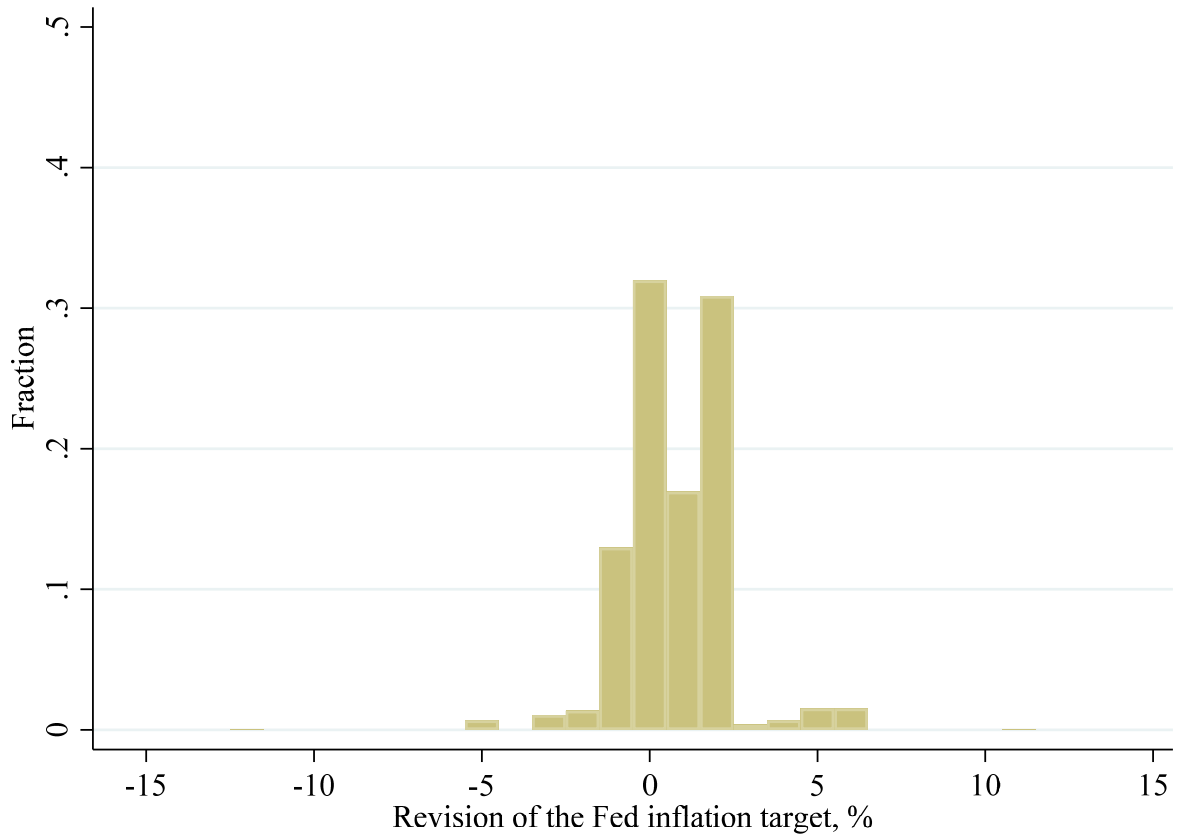
ONLINE APPENDIX
ADDITIONAL FIGURES AND TABLES

Appendix Table 1. Effect of using weights and truncation of the sample on basic moments for inflation forecasts and perceived inflation in United States.

Survey Date	Sample and weights					
	Full sample without sample weights		Truncated sample without sample weights		Full sample with sample weights	
	Mean	SD	Mean	SD	Mean	SD
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: 1-year-ahead inflation forecasts, percent						
2018Q2	4.0	4.1	3.4	1.7	4.4	5.2
2018Q3	3.6	3.2	3.3	2.0	3.0	1.8
2018Q4	3.6	3.6	3.3	1.7	3.7	4.0
2019Q1	3.1	2.0	3.0	1.4	3.1	1.7
2019Q2	2.2	1.1	2.2	1.1	2.1	1.1
2019Q3	2.4	1.0	2.4	1.0	2.3	0.5
2019Q4	2.1	1.2	2.1	1.2	2.1	1.5
2020Q1	2.3	0.9	2.3	0.9	2.2	1.1
2020Q2	2.9	3.8	2.7	2.5	2.5	4.1
2020Q3	1.9	1.2	2.0	1.2	2.0	1.2
2020Q4	2.3	0.9	2.3	0.9	2.3	1.0
2021Q1	2.6	1.8	2.5	1.4	3.0	2.4
2021Q2	3.1	1.3	3.1	1.3	3.2	1.3
Panel B: 5-year-ahead inflation forecast, percent						
2018Q4	4.1	3.3	3.7	2.2	3.8	2.2
2019Q4	2.5	1.7	2.5	1.7	2.3	1.5
2020Q4	3.1	1.5	3.0	1.1	3.3	1.2
Panel C: 1-year inflation nowcasts and backcasts, percent						
2018Q3	3.4	3.6	2.9	2.0	2.8	1.8
2019Q3	2.3	1.0	2.3	1.0	2.1	0.5
2020Q3	2.1	1.0	2.2	0.9	2.3	0.9

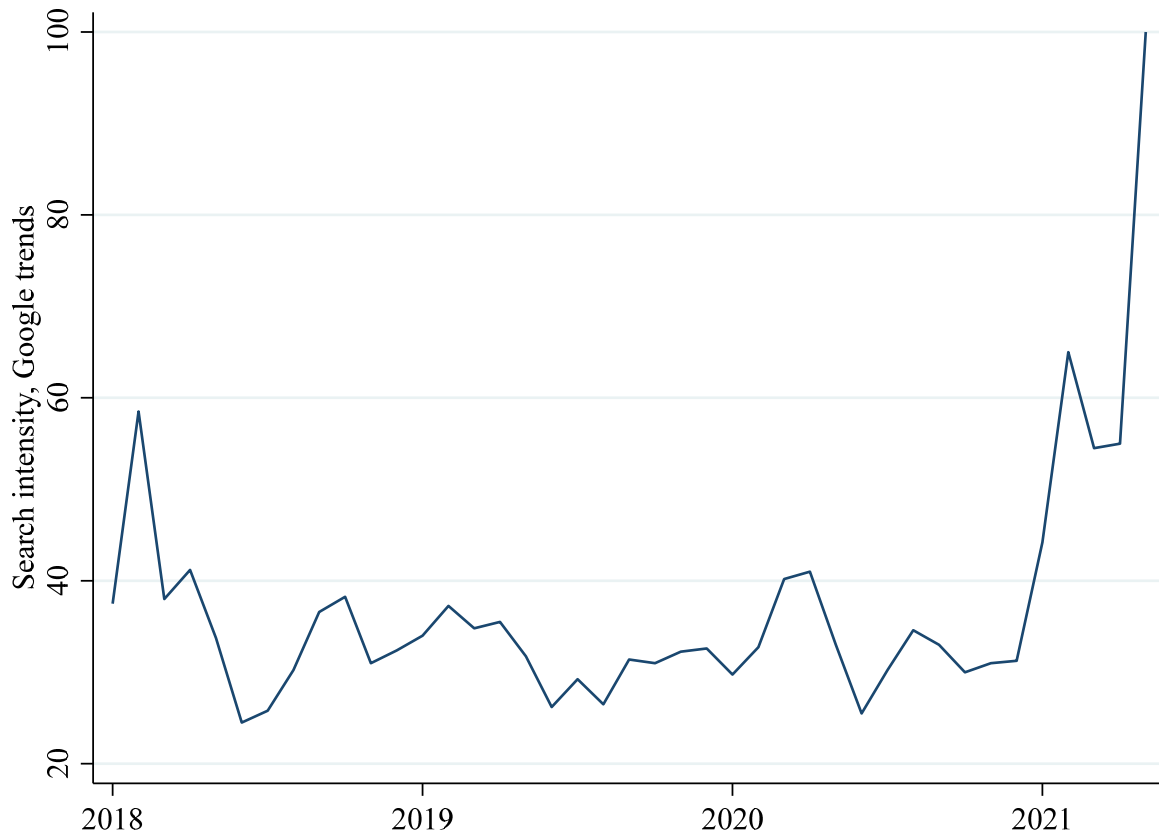
Notes: The table presents inflation forecasts/nowcasts/backcasts of firms' managers. *Truncated sample* refers to when we exclude responses that are greater than 15 percentage points or less than -2 percentage points. *Full sample* includes all observations. Moments in columns (5)-(6) are constructed using sample weights. See the text and note to Table 1 for more details.

Appendix Figure 1. Revisions of the perceived inflation target of the Fed.



Notes: Reports the distribution of 1-year revisions in the perceived inflation target reported in SoFIE.

Appendix Figure 2. Search intensity for “inflation”.



Notes: data are from Google trends. Weekly series are aggregated to monthly data. The maximum value of the series is normalized to 100.