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Contents lists available at ScienceDirect

Journal of Economic Behavior and Organization

journal homepage: www.elsevier.com/locate/jebo

How economic crises affect inflation beliefs: Evidence from the Covid-19 pandemic[☆]

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ARTICLE INFO

Article history:

Received 24 November 2020

Revised 12 March 2021

Accepted 28 April 2021

Available online 24 July 2021

JEL Classification:

E31

E21

Keywords:

Inflation expectations

Inflation uncertainty and disagreement

Covid-19 pandemic

ABSTRACT

This paper studies how inflation beliefs reported in the New York Fed's Survey of Consumer Expectations have evolved over the first six months of the Covid-19 pandemic. We find that household inflation expectations responded slowly and mostly at the short-term horizon. In contrast, the data reveal immediate and unprecedented increases in individual inflation uncertainty and in inflation disagreement across respondents. Consistent with precautionary saving, the rise in inflation uncertainty is shown to be associated with how respondents used the stimulus checks they received as part of the 2020 CARES Act. We also find evidence of a strong polarization in inflation beliefs and we identify differences across demographic groups.

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1. Introduction

In macroeconomic models, inflation expectations drive a wide range of decisions including consumption, saving, borrowing, wage bargaining, and thus have a direct impact on realized inflation. Inflation expectations therefore represent a key variable, closely monitored by policy makers. At the onset of an economic crisis, when an immediate policy response has to be designed, inflationary risks typically are not a first order concern. Nevertheless, monitoring how inflation expectations change during a crisis is important to anticipate how effective the transmission of monetary and fiscal policy interventions to the real economy can be. For instance, theory predicts that (all else equal) households should shift consumption from the future into the present if they expect inflation to be high in the future. Further, inflation beliefs should be monitored to ensure they remain consistent with long-term monetary policy objectives. In particular, if inflation expectations start drifting away from the central bank's implicit or explicit objective, they could become permanently “un-anchored” which may prevent a central bank from achieving its objectives of stable prices and maximum employment.¹ Similarly, inflation could become unmoored if the public starts disagreeing about the expected future path of inflation or if agents become

[☆] The views expressed in this paper are our own and do not necessarily reflect the views of the Federal Reserve Bank of New York or the Federal Reserve System.

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¹ On August 27, 2020, the Federal Reserve moved to a “flexible form of average inflation targeting” according to which it “will seek to achieve inflation that averages 2 percent over time.” The policy change did not alter the importance of keeping inflation expectations well-anchored: “Well-anchored inflation

more uncertain about what inflation will be in the future. In this paper, we use the New York Fed's Survey of Consumer Expectations (SCE hereafter) to study how U.S. households' inflation beliefs, including inflation expectations, uncertainty and disagreement, were affected during the first six months of the Covid-19 pandemic.

The economic crisis associated with the Covid-19 pandemic has been exceptional in many regards. First, it started as a health crisis rather than a financial or economic crisis, and it generated an unusual set of disruptions (e.g. stay-at-home mandates, temporary business closures, a part of the workforce being infected). Second, the impact of the pandemic on the economy was extremely sudden and brutal. Notably, within a span of four weeks starting in the second half of March 2020, a record 22 million U.S. workers filed for unemployment. In comparison, the financial crisis of 2007 was slow moving, and its impact on the real economy did not fully materialize for several months. Third, the Covid-19 crisis was characterized by high uncertainty as to its duration and its medium and long-term impact on the economy. In particular, various commentators initially mentioned the possibility of a V, U, L or even K shape recovery (Guerrieri et al., 2020). Finally, the Covid-19 crisis sparked rapid and strong monetary and fiscal responses by policy makers. Notably, within days after the World Health Organization (WHO hereafter) officially declared the Covid-19 outbreak to be a pandemic, the Federal Reserve (the Fed hereafter), in a surprise move, lowered its target rate to the effective lower bound on March 15, while the CARES Act was signed into law on March 27 to provide over \$2 trillion in stimulus to small businesses and lower to middle-income households.

Because of these unique features, it was difficult to immediately characterize Covid-19 as either deflationary or inflationary (Cochrane 2020; Binder 2020). On the one hand, weak consumer demand (e.g. for travel, entertainment, or leisure and hospitality) and a prolonged economic slowdown may have been expected to put downward pressure on inflation. Evidence of this effect was immediately visible: The month-over-month core Consumer Price Index fell 0.1%, 0.4% and 0.1% in March, April and May 2020, respectively. The drop in March was only the 10th time since 1957 that core prices had ever registered a decline. On the other hand, some may have expected supply chain disruptions triggered by Covid-related shutdowns, the rising levels of government debt and the unprecedented expansion of the Fed's balance sheet to put upward pressure on future inflation. Further, it has been suggested that households tend to associate deteriorating economic outcomes with higher future inflation (Kamdar 2019; Candia et al., 2020). These opposing forces may have had an impact not only on aggregate inflation expectations, but also on the level of inflation disagreement between individuals, as well as the degree of uncertainty one may express about the future path of inflation.

The SCE is ideally suited to study how Covid-19 affected the public's inflation beliefs. First, the SCE is a well-established monthly survey, designed to be representative of U.S. household heads, and the wording of its inflation expectations questions has been rigorously tested (Bruine de Bruin et al., 2011a, 2011b, 2012). Second, the fact that the SCE has been collecting data well before the pandemic (i.e. since June 2013) enables us to conduct a *before-after* comparison. Third, SCE data are collected continuously within a month, which allows us to explore how inflation expectations responded after specific health-related events (e.g. the WHO pandemic declaration), or after monetary and fiscal policy announcements (e.g. the signature of the CARES Act). Fourth, while other surveys (such as the Michigan Survey of Consumers) collect only point predictions for inflation, the SCE elicits each respondent's entire distribution of belief, thereby providing a measure of individual inflation uncertainty. Hence, the SCE provides a unique opportunity to understand how inflation uncertainty changes during an economic crisis. Fifth, special questions are fielded on an ad-hoc basis in the SCE to address timely questions. In particular, respondents were asked questions specific to the Covid-19 pandemic, including how they used the *Economic Impact Payments* ("stimulus checks" hereafter) they may have received as part of the 2020 CARES Act. These data allow us to test how changes in inflation beliefs affected households' behavior during the pandemic. Sixth, one of the unique features of the SCE (compared to e.g. the Michigan Survey of Consumers) is that it is a rotating panel. This allows us to examine how the inflation beliefs of a given respondent changed before and after the outbreak of Covid-19. This ensures that our results are not driven by changes in the composition of the respondents' sample, nor by unobserved individual characteristics (such as time preference or risk attitude). Seventh, the SCE collects a rich array of demographic characteristics for each respondent. This allows us to assess the extent to which the pandemic had a heterogeneous impact on households' inflation beliefs.

Our analysis shows that households' average inflation expectations responded to the Covid-19 outbreak slowly and mostly at the short-term horizon. In contrast, the data reveal immediate and unprecedented increases in inflation uncertainty and disagreement. The apparent muted response in average inflation expectations at the onset of the pandemic, however, is slightly misleading. Indeed, we document a sharp polarization in inflation expectations, i.e. an increase in the proportion of respondents with deflationary inflation expectations, combined with a simultaneous increase in the proportion of respondents with unusually high inflation expectations. We also illustrate how inflation uncertainty can influence consumers' behavior by documenting how, consistent with precautionary saving, an increase in a household's inflation uncertainty during the pandemic was associated with a significant increase in the share of the stimulus checks the household saved. Finally, we show there is substantial heterogeneity in inflation expectations and uncertainty across demographic groups before the pandemic. However, we find little evidence that the outbreak of Covid-19 either exacerbated or diminished this heterogeneity.

expectations are critical for giving the Fed the latitude to support employment when necessary without destabilizing inflation" (Powell 2020 <https://www.federalreserve.gov/newsevents/speech/powell20200827a.htm>)

The paper is structured as follows. The related literature is summarized in [Section 2](#). [Section 3](#) describes the SCE and the measures of inflation expectations, disagreement and uncertainty we study in the paper. In [Section 4](#), we document how the Covid-19 pandemic affected each of these measures. We offer an additional perspective in [Section 5](#) based on the evolution of the aggregate belief distribution and on changes in the probability respondents assign to extreme inflation outcomes. The association between changes in inflation beliefs and uses of the 2020 stimulus checks is investigated in [Section 6](#). In [Section 7](#), we contrast how inflation beliefs changed during the pandemic with the experience of the Great Recession of 2007–2009. We explore in [Section 8](#) possible heterogeneity in these different measures across demographic groups before and after the start of the outbreak of Covid-19. [Section 9](#) concludes.

2. Related literature

This paper belongs to the rapidly expanding literature that uses surveys to study how economic expectations, and in particular inflation expectations, have responded to the Covid-19 pandemic. Early studies in the U.S. include [Binder \(2020\)](#) who used Amazon Mechanical Turk to conduct a survey on March 5 and 6, 2020 (i.e. before the virus spread widely and before lockdowns were imposed). [Binder \(2020\)](#) documents that greater concerns about Covid-19 were initially associated with higher inflation expectations. [Dietrich et al. \(2020\)](#) report on daily surveys they conducted in the second half of March 2020. Although the median respondent reported that the pandemic should have an inflationary effect, [Dietrich et al. \(2020\)](#) find that short-term inflation expectations actually declined slightly in their surveys. Similarly, [Coibion et al. \(2020\)](#) compare two surveys conducted in January and April 2020 and find a decrease in year-ahead inflation expectations and an increase in short-term inflation uncertainty. Using the next wave of the same quarterly survey, [Candia et al. \(2020\)](#) report that households' inflation expectations had subsequently increased in July 2020. The authors argue that this result is consistent with consumers associating a worsening economy with higher future inflation.

Two papers focus on the inflation expectations of U.S. firms during Covid-19 and report conflicting results. [Candia et al. \(2020\)](#) suggest that, similar to households, firms see the pandemic as an inflationary supply shock. In contrast, [Meyer et al. \(2020\)](#) report that, similar to market participants and professional forecasters, firms have responded to Covid-19 by lowering their one-year-ahead inflation expectations as they see the pandemic as a demand shock. Further, [Meyer et al. \(2020\)](#) find that, as of June 2020, firms' longer-run inflation expectations have changed little throughout the pandemic and remained reasonably well anchored.

Our paper complements this literature in several ways. First, having access to daily expectations for a period that extends before and after the outbreak of Covid-19 allows us to provide a unique perspective on the evolution of inflation beliefs in response to the pandemic. Second, we focus on changes to the *entire distribution* of inflation beliefs, that is inflation expectations, uncertainty, disagreement and the probability assigned to extreme inflation outcomes. Third, the unique panel structure of the SCE allows us to estimate more precisely (i.e. within respondent) how Covid-19 shifted inflation beliefs. Fourth, while the link between inflation expectations and demographic characteristics is now well established in the literature (see e.g. [Bruine de Bruin et al., 2010](#)), few papers have studied how individual inflation uncertainty differs across demographic groups ([Ben-David et al., 2019](#)). Further, the literature is essentially silent on the extent to which consumers' inflation beliefs responds differentially across demographic groups to shocks like the Covid-19 outbreak. Taking advantage of the demographic characteristics collected in the SCE, we add to the literature by assessing how individual inflation expectations and uncertainty differ across demographic groups before and after the outbreak of Covid-19.

In addition to shedding light on how inflation expectations, disagreement and uncertainty have changed due to Covid-19, this paper also contributes more broadly to the literature on inflation expectations formation during an economic crisis. How individuals form and update their inflation beliefs has been the focus of several studies over the last decade (see e.g. [Coibion et al., 2018](#) for a review). However, only a handful of papers have studied how households update their inflation beliefs in times of crisis. In particular, [Galati et al. \(2011\)](#) document an increase in inflation expectations during the 2007–2009 Great Recession, while [Gerlach et al. \(2011\)](#) or [Trehan and Zorilla \(2012\)](#) find that this effect vanished quickly once the recession subsided. Several questions, however, still remain unanswered. In particular, how do inflation uncertainty and disagreement change during a crisis? Are these adjustments long lasting or short lived? Do the inflation beliefs of specific demographic groups respond homogeneously to a crisis? Are the revisions in beliefs (if any) associated with changes in behavior? This study provides new evidence that helps answer some of these important questions.

We also contribute to the long empirical literature on precautionary savings (for recent reviews see [Lugilde et al., 2019](#), or [Baiardi et al., 2020](#)). In particular, [Ben-David et al. \(2019\)](#) used data from the SCE to show that consumers who report higher forecast uncertainty (about inflation, national home price changes and wage growth) tend to have more cautious consumption, investment, and borrowing behaviors. We build on this earlier work in two distinct ways. First, we exploit the panel dimension of the SCE to control for potential unobserved individual and time-invariant effects (e.g. time preference) that may otherwise act as confounding factors. Second, we focus on a singular event by investigating how inflation uncertainty is linked to the way consumers used the stimulus checks they received in the spring of 2020.

Finally, our paper is related to the literature that studies empirically the link between inflation beliefs and behavior. While most of this literature focuses on the relationship between inflation expectations and households' economic behavior (e.g. [Armantier et al., 2015](#), [Crump et al., 2020](#), [D'Acunto et al., 2020](#), [Coibion et al., 2019](#), [Candia et al., 2020](#)), a few papers have investigated the role of inflation uncertainty. This includes [Binder \(2017\)](#), who finds that consumers with higher inflation uncertainty are more reluctant to purchase durable goods, which is consistent with a precautionary savings channel.

Armantier et al. (2015) report experimental evidence showing that, consistent with expected utility theory, people make investment decisions based on their inflation expectation and uncertainty. Finally, Ben-David et al. (2019) show that higher inflation uncertainty is associated with more caution in households' consumption, investment and borrowing behaviors. Our paper complements this literature by exploring the role played by inflation uncertainty in the way consumers used their 2020 stimulus checks.

3. The data

The Survey of Consumer Expectations (SCE) is a monthly, internet-based survey produced by the Federal Reserve Bank of New York since June 2013. It is a 12-month rotating panel (respondents are asked to take the survey for 12 consecutive months) of roughly 1300 nationally representative U.S. household heads. The main objective of the survey is to collect expectations (both point predictions and density forecasts) for a wide range of economic outcomes (e.g. inflation, income, spending, household finance, employment and housing). Data from the SCE have been used widely to address both policy and research questions.²

The SCE elicits different measures of inflation beliefs.³ This study focuses on short and medium-term inflation density forecasts. The short-term horizon corresponds to the year ahead rate of inflation (“*Over the next 12 months*”), while the medium-term horizon corresponds to the three-year ahead one-year rate of inflation (“*Over the 12-month period between M+24 and M+36*”, where M is the month in which the respondent takes the survey). For instance, a respondent taking the survey in March 2020 is asked about inflation “*Over the 12-month period between March 2022 and March 2023.*” For each horizon, SCE respondents are asked to report their density forecasts using a menu of pre-specified bins. More specifically, a respondent is asked to state the percent chance that the rate of inflation at the given horizon will be within each of the following intervals: (–12% or less), [–12%,–8%], [–8%,–4%],[–4%,–2%], [–2%,0%], [0%,2%], [2%,4%], [4%,8%], [8%,12%], [12% or more].⁴ A visible running sum gives respondents the ability to verify that their answers add to 100%.

The density forecasts are used to calculate the three inflation measures we focus on in this paper: the *individual inflation density mean*, the *individual inflation uncertainty* and the *inflation disagreement across respondents*. Following Engelberg et al. (2009), a generalized beta distribution is fitted to each respondent's density forecast. The mean of a respondent's fitted distribution is the *individual inflation density mean*, while the interquartile range of a respondent's distribution is used as a measure of the respondent's *individual inflation uncertainty*.⁵ Finally, we use the interquartile range of the distribution of *individual inflation density means* as a measure of the *inflation disagreement across respondents* during that period.⁶

We study how these three inflation measures have evolved almost in real time over the first six months of the pandemic using daily responses. As explained in Armantier et al. (2017), SCE respondents are invited to complete the survey on different dates spread out throughout the month in order to capture consumers' expectations uniformly over time.⁷ For each inflation measure, we construct figures showing daily predictions of a local linear regression. To quantify precisely the effect of the pandemic, we also carry out regression analyses in which we estimate how the various inflation beliefs' measures changed before and after the outbreak of Covid-19. To identify possible changes *during* the pandemic, we also partition the post-pandemic data in 5 periods:

- The *pre-pandemic declaration* period starts on January 1, 2020 and ends on March 10, the day before the WHO pandemic declaration.
- The *initial* period starts on March 11 and ends on March 26, the day before the CARES Act was signed into law.
- The *lockdown* period is between March 27 and May 15, when most U.S. states were under some form of social distancing restrictions.
- The *reopening* period goes from May 16 to June 30 when most states lifted or reduced social distancing restrictions.

² See e.g. Armantier et al. (2015, 2016, 2020a), Armona et al. (2018), or Crump et al. (2020).

³ In the paper, we distinguish an individual's *inflation belief*, which is characterized by a probability distribution, from his/her *inflation expectation* which is the mean of this distribution.

⁴ For instance, the question asked for the interval [8%,12%] at the 1-year ahead horizon is: “*In your view, what would you say is the percent chance that over the next 12 months the rate of inflation will be between 8% and 12%: ___%*”.

⁵ While most SCE analyses (e.g. Bruine de Bruin 2011b) follow Engelberg et al. (2009) *interquartile range* approach to characterize individual uncertainty, others (e.g. Coibion et al., 2020) have used the *standard deviation* of the individual density forecast. As discussed below, our conclusions remain unchanged when we use the standard deviation approach to measure individual inflation uncertainty.

⁶ An older literature in economics used to consider inflation disagreement to be a proxy for average (across respondents) inflation uncertainty. As pointed out by Zarnowitz and Lambros (1987) or Manski (2004) among others, there is no theoretical nor empirical support for this practice. It is now widely recognized that the two measures are different, they can move independently, and they provide distinct information about inflation beliefs. In particular, it is easy to show that an all else equal increase in individual uncertainty (i.e. a mean preserving spread in individual density forecasts) across some or all respondents does not affect inflation disagreement. Likewise, an all else equal increase in inflation expectations can affect inflation disagreement (if it modifies the interquartile range of individual density means), but it has no bearing on individual (or average) inflation uncertainty.

⁷ New SCE respondents are initially partitioned randomly in three batches of roughly equal sizes. The first, second, and third batches receive an email invitation to fill out the survey on the second, eleventh, and twentieth of the month, respectively. Respondents who have not yet completed the survey receive two reminders, three and seven days after their initial invitation. Except under rare circumstances (e.g. to rebalance the size of the batches), respondents stay in their initial batch throughout their 12-months tenure to ensure that they receive survey invitations roughly 30 days apart. As documented in Armantier et al. (2017), this approach results in surveys being completed by respondents almost uniformly throughout the month.

- Finally, the *resurgence in cases* period is from July 1 to August 31, 2020, when the number of Covid-19 cases in the U.S. spiked.

There are potential issues to consider when interpreting shifts in inflation measures as the causal impact of the pandemic. First, other factors could have affected inflation beliefs simultaneously. The Covid-19 pandemic, however, was relatively sudden, and its impact on the economy was massive. Thus, significant confounding factors appear to be highly unlikely.

Second, to identify precisely the impact of a pandemic that stretches over several months, one must control for possible seasonality effects in inflation beliefs. Because the SCE has been conducted since June 2013, we can address this concern by estimating regressions with several years of data and controlling for month-of-year fixed effects.

Third, one must be cognizant of possible pre-pandemic trends. While there are many ways to control for such pre-trends, we do so in two ways. First, we restrict the sample period to recent history, i.e. from January 1, 2017 to August 31, 2020. As we show below, the data exhibit little to no visible pre-trend in the three years between January 2017 and December 2019. However, we also show that expanding the sample period to January 2014 does not affect the results presented below. Second, to control for any recent shifts in inflation measures, we add a *Post-2018* dummy variable equal to 1 for any data collected on or after January 1, 2019. The five pandemic period dummies described above can then be interpreted as shifts relative to the *Post-2018* dummy.

Fourth, the pandemic outbreak may have affected the composition of SCE respondents over time. While we find no evidence of changes in the SCE sample composition with respect to respondents' observable characteristics, one cannot rule out completely that participation in the survey was affected by the pandemic. To address this issue, we exploit the unique rotating panel structure of the SCE and include individual fixed effects in the regressions that use individual-level observations. Further, we control for each respondent's SCE experience (i.e. how many SCE surveys they completed) using twelve dummy variables (one for each month of participation) so as to control for possible learning or "panel conditioning" effects.

Finally, identifying a precise start date for the Covid-19 crisis is challenging. While there is no objective way to do so, March 11, 2020, the day Covid-19 was officially declared a pandemic by the WHO, seems like a natural choice. We acknowledge, however, that the virus had been identified since at least December 2019. To test whether Covid-19 affected our three inflation measures before it was declared a pandemic, we also include in the regression a *pre-pandemic declaration* dummy variable for the period between January 1, 2020 and March 10.

4. The impact of the pandemic on inflation beliefs

We study in this section how the Covid-19 pandemic affected three measure of consumers' inflation beliefs: inflation expectations, inflation uncertainty and inflation disagreement.⁸

4.1. Individual inflation density means

We plot in Fig. 1 the daily inflation density means at the one- and three-year horizons as predicted by a local linear regression.⁹ The figure in the top panel focuses on the period around the Covid-19 pandemic, from December 15, 2019 to August 31, 2020. The figure in the bottom panel covers a longer time period, from January 1, 2014 to August 31, 2020.¹⁰ In the top panel, we also draw vertical bars to mark the different pandemic periods we consider, as well as some of the key dates in the development of the pandemic.

Five points are worth noting on Fig. 1. First, there is no clear evidence of a pre-trend prior to the Covid-19 outbreak. The bottom panel of Fig. 1 shows that, with the exception of a few short episodes, short- and medium-term inflation expectations have been fairly stable since 2016. Second, the Covid-19 outbreak had no clear impact on inflation expectations at both horizons before the pandemic declaration on March 11, and a relatively modest impact during what we called the *initial* period (March 11 to March 26). These results are consistent with the early analyses of Dietrich et al. (2020) or Coibion et al. (2020). Third, short-term and, to a lesser extent, medium-term inflation expectations, have been generally above their 2019 averages after the pandemic declaration on March 11, 2020. Fourth, inflation expectations have been unusually volatile during the first six months of the pandemic as indicated by the large upward and downward swings in the top panel of Fig. 1. Fifth, neither of the early policy interventions, i.e. the Federal Reserve surprise rate cut on March 15 or the signature of the CARES Act on March 27, appeared to have had a substantial or a lasting effect on average inflation density means.

⁸ See Table A1 in appendix for descriptive statistics.

⁹ As is standard when using inflation expectations collected in surveys (see e.g. Coibion, Gorodnichenko and Kumar 2018), outliers are excluded from the analysis. In the paper, we trim inflation expectations and uncertainty differently for the figures and for the regressions. Because the figures show daily estimates, they are quite sensitive to outliers. Hence, to avoid large daily jumps caused by the undue influence of outliers, we trim the bottom and top 10% of the data biweekly for the figures. In contrast, inflation expectations and uncertainty are trimmed only at the top and bottom 2% biweekly for the regressions. As we shall see, however, the estimation results presented below are robust to alternative trimming thresholds (including no trimming).

¹⁰ Although the SCE was officially launched in June 2013, we actually started collecting data in January 2013. The 12-month rotating panel, however, was not complete and balanced until January 2014 (i.e. 12 months after we started collecting data). Hence, for consistency and panel stability, we ignore the data collected in 2013 for the analysis.

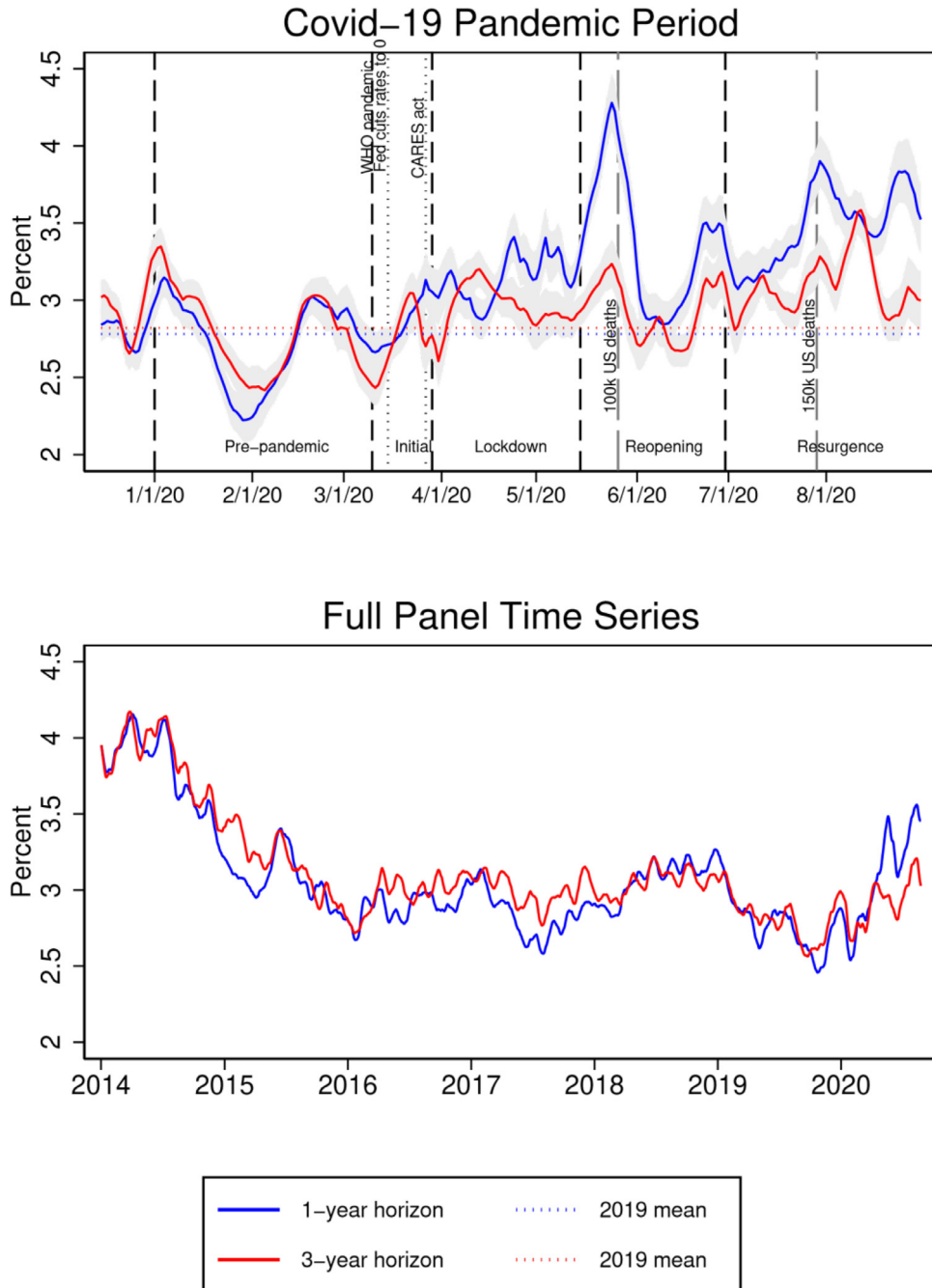


Fig. 1. Evolution of individual density means.
 Notes: The figures in the two panels show daily inflation density means at the one-year and three-year horizons as predicted by a local linear regression using an Epanechnikov kernel with a bandwidth of 3 days for the figure in the top panel and with a bandwidth of 10 days for the figure in the bottom panel. The shaded areas indicate the 95% confidence interval for the daily local regression estimates. In each figure the data are trimmed biweekly at the top and bottom 10% to control for the undue influence of outliers. In the top panel figure, we denote with vertical bars the five pandemic periods we consider, as well as key dates in the development of the Covid-19 pandemic: health related events are marked by long dashed vertical bars, and policy related events are marked by dotted vertical lines.

Table 1
Impact of Covid-19 pandemic on inflation expectations, uncertainty, and disagreement.

	Inflation expectations		Inflation uncertainty		Inflation disagreement	
	(1)	(2)	(3)	(4)	(5)	(6)
	1-yr	3-yr	1-yr	3-yr	1-yr	3-yr
Pre-pandemic	−0.11 (0.14)	0.05 (0.15)	−0.06 (0.13)	0.00 (0.13)	−0.26 (0.18)	0.00 (0.21)
Initial period	0.33 (0.30)	0.17 (0.26)	1.02*** (0.20)	0.80*** (0.19)	2.51*** (0.69)	1.46** (0.61)
Lockdown	0.42* (0.24)	0.46** (0.21)	1.32*** (0.17)	0.94*** (0.16)	2.47*** (0.48)	1.01*** (0.35)
Reopening	0.66*** (0.24)	0.27 (0.23)	1.19*** (0.19)	0.75*** (0.17)	2.21*** (0.33)	1.14*** (0.29)
Resurgence	0.61*** (0.23)	0.38* (0.22)	1.16*** (0.20)	0.92*** (0.20)	1.90*** (0.31)	0.81*** (0.23)
N	53,250	53,320	53,096	53,150	1286	1287
R ²	0.53	0.54	0.69	0.69	0.18	0.05
Dependent variable mean	3.28	3.29	4.27	4.33	3.57	3.75
Constant	X	X	X	X	X	X
Month-of-year FE	X	X	X	X	X	X
Post-2018 dummy	X	X	X	X	X	X
Individual FE	X	X	X	X		
Survey tenure FE	X	X	X	X		

Notes: The table shows the estimated impact of the Covid-19 pandemic on i) inflation density means at the one-year and three-year horizons (columns 1 and 2); ii) individual inflation uncertainty at the one-year and three-year horizons (columns 3 and 4); 3) inflation disagreement across respondents at the one-year and three-year horizons (columns 5 and 6). The sample consists of individual survey responses for columns 1 to 4 and daily data for columns 5 and 6 covering the period from January 1, 2017 through August 31, 2020. The number of observations in columns 1 to 4 is the number of person-day observations, and the number of observations in columns 5 and 6 is the number of day observations. The pre-pandemic period is from January 1, 2020 through March 10, 2020. The initial period is from March 11, 2020 through March 26, 2020. The lockdown period is from March 27, 2020 through May 15, 2020. The reopening period is from May 16, 2020 through June 30, 2020. The resurgence period is from July 1, 2020 through August 31, 2020. The Post-2018 dummy is equal to 1 for survey responses recorded after 2018 (January 1, 2019 through August 31, 2020). The data are trimmed biweekly at the top and bottom 2% to remove outliers. Standard errors (in parentheses) are clustered at the individual level in columns 1 to 4, and robust in columns 5 and 6. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

To confirm these observations statistically and to measure the exact impact of the pandemic, we regress individual inflation density means at both horizons on the five pandemic period dummies, controlling for individual, seasonal, survey experience and pre-trend effects. The results reported in column 1 of [Table 1](#) confirm the absence of a significant pandemic effect on short-term inflation expectations during both the *pre-pandemic* period (January 1, 2020 to March 10) and *initial* period (March 11 to March 26). [Table 1](#) also indicates that after March 27 (the start of the *lockdown* period), short-term inflation expectations became significantly higher than they were prior to the pandemic, consistent with the findings of [Candia et al. \(2020\)](#). The magnitude of the effect (between 42 and 66 basis points), although substantial, is not unprecedented as can be seen in the bottom panel of [Fig. 1](#). Turning now to column 2 of [Table 1](#), we can see that while the pandemic had a positive impact on medium-term inflation expectations throughout the pandemic, the effect is only significant at the 5% level during the *lockdown* period when the average inflation density mean increased by 46 basis points.

Summing up, we find that inflation expectations at both horizons did not immediately respond to the pandemic outbreak, and that subsequently, only short-term inflation expectations experienced a sustained increase.

4.2. Individual inflation uncertainty

We plot in [Fig. 2](#) the daily individual inflation uncertainty measures at both horizons. Unlike inflation expectations, inflation uncertainty exhibited a sharp, immediate and monotonic increase right around the date of the WHO pandemic declaration (see the top panel of [Fig. 2](#)). In fact, one-year ahead inflation uncertainty reached levels in March not seen since the inception of the SCE (see the bottom panel of [Fig. 2](#)). After remaining elevated throughout the spring, inflation uncertainty at both horizons briefly returned to levels close to their 2019 averages by the end of the *reopening* period (i.e. by the end of June 2020), but then sharply increased again over the summer as the U.S. was experiencing a resurgence in new Covid-19 cases.

[Fig. 2](#) reveals another interesting pattern. As can be seen in the bottom panel, uncertainty has been historically higher for three-year ahead inflation than for one-year inflation, reflecting the fact that predicting inflation further in the future may be more difficult. In contrast, the top panel of [Fig. 2](#) shows that uncertainty was uncharacteristically higher for one-year ahead inflation than for three-year ahead inflation over the first six months the pandemic. This pattern suggests that

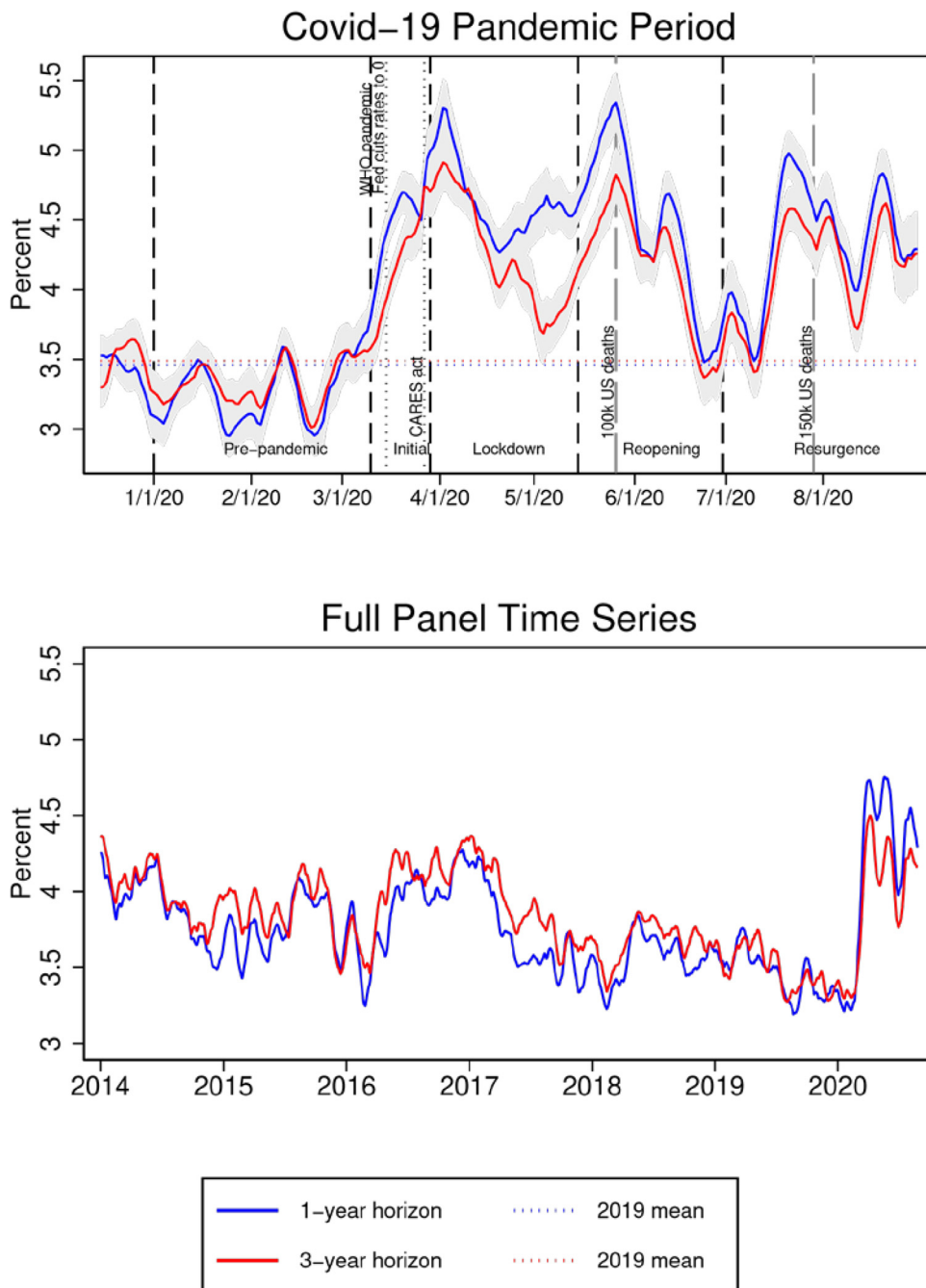


Fig. 2. Evolution of individual uncertainty.
 Notes: The figures in the two panels show daily individual inflation uncertainty (the interquartile range within an individual's density forecast distribution) at the one-year and three-year horizons as predicted by a local linear regression using an Epanechnikov kernel with a bandwidth of 3 days for the figure in the top panel and with a bandwidth of 10 days for the figure in the bottom panel. The shaded areas indicate the 95% confidence interval for the daily local regression estimates. In each figure the data are trimmed biweekly at the top and bottom 10% to control for the undue influence of outliers. In the top panel figure, we denote with vertical bars the five pandemic periods we consider, as well as key dates in the development of the Covid-19 pandemic: health related events are marked by long dashed vertical bars, and policy related events are marked by dotted vertical lines.

respondents were more uncertain about predicting the economic consequences of the pandemic in the short-term than in the medium-term.

The regression coefficients in columns 3 and 4 of [Table 1](#) confirm the immediate, large (at least 1.0 and 0.75 percentage point at the one- and three-year ahead horizons, respectively) and sustained increase in inflation uncertainty at both horizons. In fact, we cannot reject the null hypothesis that the time dummy parameters in each of columns 3 and 4 are jointly equal across the four post-March 11 pandemic periods.

To sum up, in contrast with inflation expectations, we find that the pandemic led to an immediate and substantial increase in inflation uncertainty, especially at the short-term horizon. This result has important policy implications. Indeed, [Kumar et al. \(2015\)](#) consider high inflation uncertainty about long-term inflation to be one of the metrics indicating un-anchored inflation expectations. Thus, even if, on average, inflation expectations (i.e. density means) have changed little during the pandemic, a sustained increase in medium-term inflation uncertainty could be a sign of inflation un-anchoring by households. Further, as shown in [Section 6](#), an increase in inflation uncertainty can affect household's financial decisions and lead to precautionary savings.

4.3. Inflation disagreement across respondents

We plot in [Fig. 3](#) daily measures of inflation disagreement across respondents for the short and medium-term horizons. The patterns in the top panel of [Fig. 3](#) are relatively similar to those observed for inflation uncertainty in the top panel of [Fig. 2](#). Inflation disagreement increased sharply through the month of March, especially at the one-year horizon. In fact, the bottom panel of [Fig. 3](#) indicates that disagreement at the one-year ahead horizon quickly reached levels not seen since the inception of the SCE. After peaking toward the end of May 2020, inflation disagreement at both horizons gradually subsided, but remained elevated compared to their 2019 averages, especially at the one-year horizon. [Fig. 3](#) also shows that disagreement has been larger for short-term inflation than for medium-term inflation during the first six months of the pandemic. This is in contrast with historical trends, which show that respondents usually disagree more about the path of inflation in the medium- than in the short-term (see the bottom panel of [Fig. 3](#)).

The estimation results reported in columns 5 and 6 of [Table 1](#) confirm the large and statistically significant increases in inflation disagreement at both horizons during the first six months of the pandemic. The magnitude of the estimated shifts in inflation disagreement are quite sizable, especially for short-term inflation. The effect corresponds to an increase of around 1.4 standard deviations of inflation disagreement (during our sample period) at the one-year horizon, and 0.9 standard deviation at the three-year horizon.¹¹

To summarize, the Covid-19 crisis has been characterized by high levels of inflation disagreement across respondents, especially at the one-year horizon. Similar to the increase in inflation uncertainty, this finding potentially raises policy concerns because elevated inflation disagreement about long-term inflation is another metric suggesting the possible un-anchoring of inflation expectations (see [Kumar et al., 2015](#)).¹²

5. A different perspective on inflation beliefs

To take a different perspective, we now examine how the *aggregate density forecast* (i.e. the average of the respondents' individual density forecasts), and the *distribution of individual inflation expectations* (i.e. density means) evolved during the first six months of the pandemic.

5.1. The aggregate distribution of inflation beliefs

Using the same local regression approach we used to construct previous figures, we plot in [Fig. 4](#) the predicted probability mass that respondents assign to different inflation buckets when they report their density forecasts. We start with the top panel showing the daily one-year ahead *aggregate density forecast*. Note that [Fig. 4](#) captures how both inflation disagreement and inflation uncertainty have varied during the pandemic. Indeed, the aggregate density forecast is affected by any change in the location (e.g. density means) or in the dispersion (e.g. interquartile ranges) of the respondents' individual inflation distribution. During the month of March, the probability mass assigned to the two buckets around the Federal Reserve's inflation target (i.e. [0%,2%] and [2%,4%]) fell precipitously, as indicated by the grey and green areas in [Fig. 4](#). In contrast, the average respondent assigned a much higher likelihood to extreme inflation outcomes over the next year, i.e. deflation (the red area in [Fig. 4](#)) and the possibility that inflation will be greater than 4% (the blue area in [Fig. 4](#)). In particular, the perceived chance of deflation one-year ahead roughly doubled between the end of February and the end of March.

¹¹ As shown in [Tables A2](#) and [A3](#) in appendix, the estimation results presented in this section remain essentially unchanged when the trimming threshold is reduced from 2% to 0.5%, and when no trimming is applied. Further, [Table A4](#) in appendix shows that measuring inflation uncertainty and inflation disagreement using the standard deviation (instead of the interquartile range) yields similar conclusions. Finally, [Table A5](#) in appendix shows that starting the sample period on January 1, 2014 (instead of January 1, 2017) does not affect the nature of our results.

¹² Inflation disagreement can also affect macroeconomic outcomes. [Ehling et al. \(2018\)](#) find that separate from the impact of expected inflation, disagreement in inflation expectations raises real and nominal yields and their volatilities, and that this effect is distinct from the impact of expected inflation. In their model, inflation disagreement affects yields because it leads to heterogeneity in consumption and investment decisions.

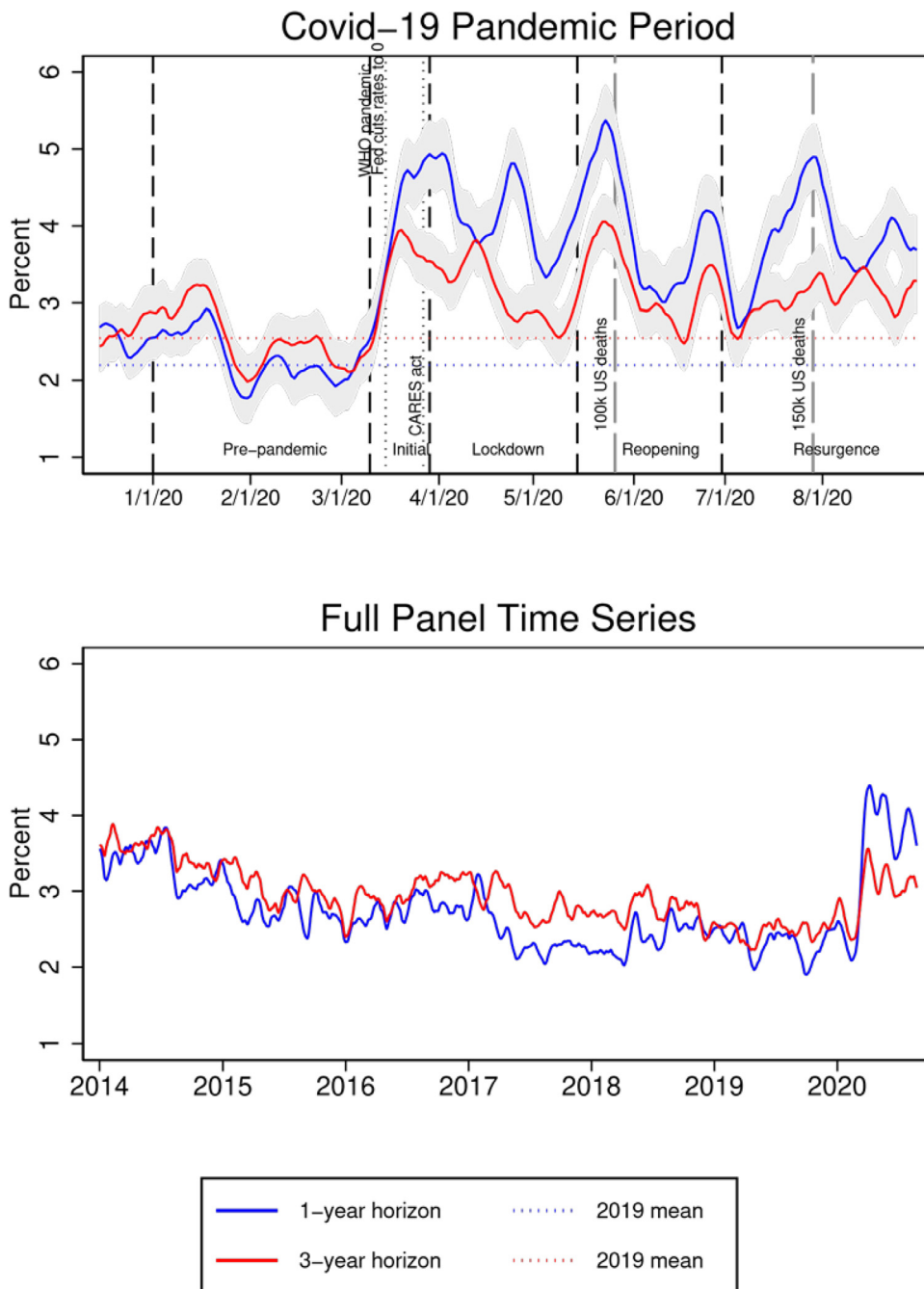


Fig. 3. Evolution of inflation disagreement. Notes: The figures in the two panels show daily inflation disagreement (the interquartile range of the distribution of density means across individuals within one day) at the one-year and three-year horizons as predicted by a local linear regression using an Epanechnikov kernel with a bandwidth of 3 days for the figure in the top panel and with a bandwidth of 10 days for the figure in the bottom panel. The shaded areas indicate the 95% confidence interval for the daily local regression estimates. In each figure the data are trimmed biweekly at the top and bottom 10% to control for the undue influence of outliers. In the top panel figure, we denote with vertical bars the five pandemic periods we consider, as well as key dates in the development of the Covid-19 pandemic: health related events are marked by long dashed vertical bars, and policy related events are marked by dotted vertical lines.

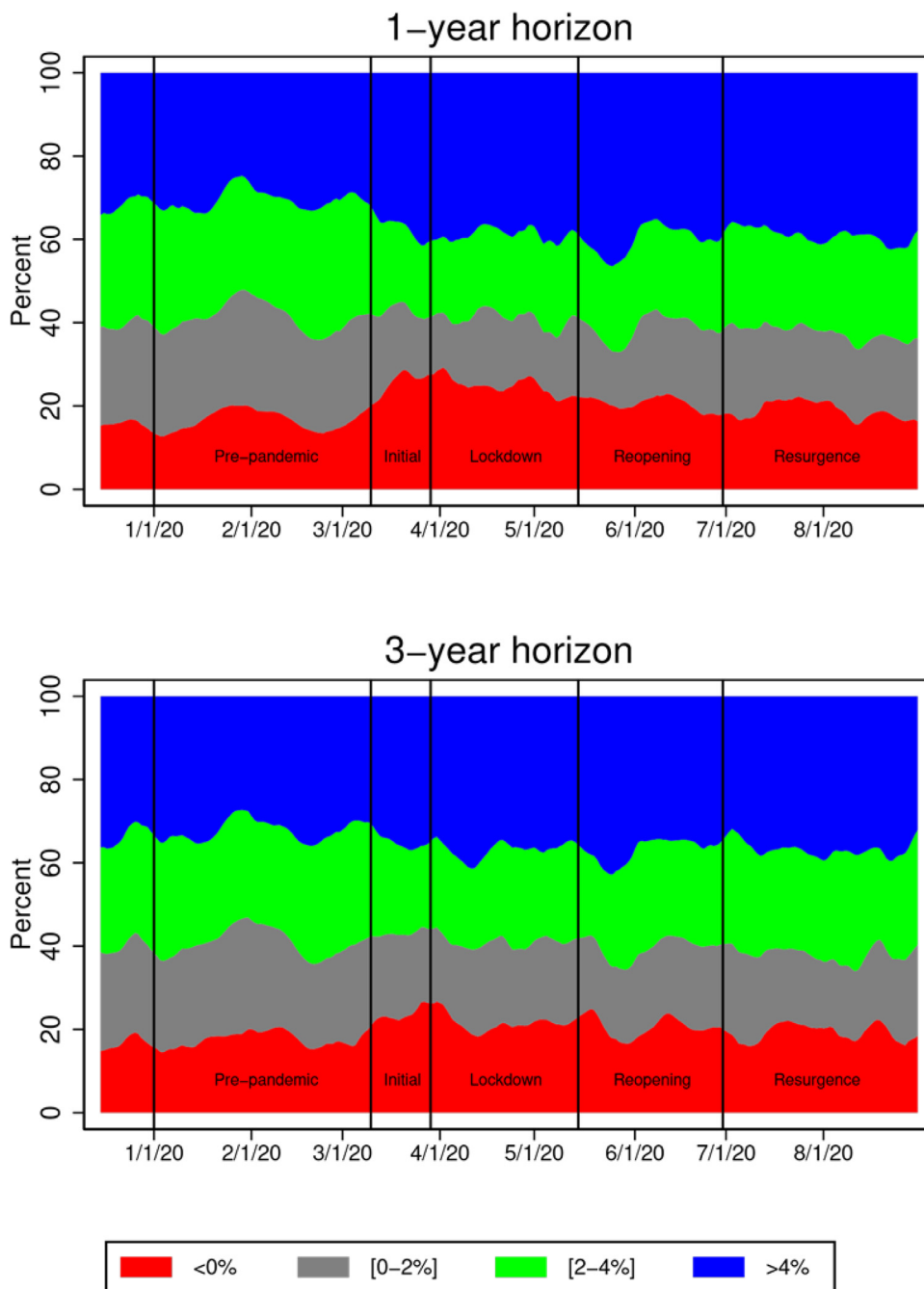


Fig. 4. Aggregate inflation density forecast.

The figure shows the aggregate inflation density forecast (i.e. the average of the individual density forecast across respondents) at the one-year ahead (top panel) and three-year ahead (bottom panel) horizons as predicted by a local linear regression using an Epanechnikov kernel and a bandwidth of 3 days. The data are not trimmed. We denote with vertical bars the five pandemic periods we consider.

After peaking in the first week of April, the likelihood given to deflation in the next year gradually returned to pre-Covid-19 levels. In contrast, the mass assigned to high inflation remained elevated until the end of August 2020. As indicated in the first four columns of Table 2, the patterns just described are all confirmed statistically with a regression analysis.

Turning now to the bottom panel of Fig. 4, we can see that the aggregate three-year ahead density forecast exhibits relatively similar patterns as the one just described for year-ahead inflation, except that the magnitude of the changes during the pandemic are substantially more muted for medium-term expectations. Nevertheless, as indicated in the last four columns of Table 2, most of the changes are also statistically significant for three-year ahead inflation.

Table 2
Individual-level reported probability of inflation within stated interval.

	1-yr				3-yr			
	(1) < 0%	(2) [0%, 2%]	(3) [2%, 4%]	(4) > 4%	(5) <0%	(6) [0%, 2%]	(7) [2%, 4%]	(8) >4%
Pre-pandemic	-0.14 (0.92)	2.52*** (0.94)	-0.75 (0.97)	-1.63 (1.21)	-0.80 (1.00)	1.78* (0.91)	-0.61 (1.01)	-0.37 (1.21)
Initial period	8.80*** (1.68)	-5.37*** (1.32)	-9.42*** (1.35)	5.99*** (1.89)	5.49*** (1.44)	-1.71 (1.35)	-6.74*** (1.40)	2.96* (1.76)
Lockdown	8.33*** (1.32)	-6.17*** (1.16)	-10.24*** (1.11)	8.08*** (1.53)	2.51** (1.27)	-2.58* (1.32)	-5.64*** (1.25)	5.71*** (1.49)
Reopening	4.56*** (1.51)	-4.63*** (1.25)	-8.15*** (1.24)	8.22*** (1.68)	2.23 (1.40)	-1.99* (1.18)	-4.52*** (1.35)	4.28*** (1.62)
Resurgence	3.11** (1.39)	-5.63*** (1.30)	-5.54*** (1.38)	8.05*** (1.68)	0.33 (1.26)	-3.62*** (1.26)	-1.94 (1.48)	5.24*** (1.69)
N	54,946	54,946	54,946	54,946	55,082	55,082	55,082	55,082
R ²	0.55	0.51	0.46	0.58	0.52	0.49	0.44	0.56
Dependent variable mean	16.45	22.27	28.13	33.15	17.85	21.30	26.78	34.07
Constant	X	X	X	X	X	X	X	X
Month-of-year FE	X	X	X	X	X	X	X	X
Post-2018 dummy	X	X	X	X	X	X	X	X
Individual FE	X	X	X	X	X	X	X	X
Survey tenure FE	X	X	X	X	X	X	X	X

Notes: The table shows the estimated impact of the Covid-19 pandemic on the probability assigned by individual respondents to different buckets for one-year and three-year inflation. The sample consists of individual survey responses covering the period from January 1, 2017 through August 31, 2020. The pre-pandemic period is from January 1, 2020 through March 10, 2020. The initial period is from March 11, 2020 through March 26, 2020. The lockdown period is from March 27, 2020 through May 15, 2020. The reopening period is from May 16, 2020 through June 30, 2020. The resurgence period is from July 1, 2020 through August 31, 2020. The Post-2018 dummy is equal to 1 for survey responses recorded after 2018 (January 1, 2019 through August 31, 2020). The data are not trimmed. Standard errors (in parentheses) are clustered at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

To sum up, SCE respondents initially expressed more uncertainty about short and medium-term inflation by assigning higher likelihoods to both low and high inflation outcomes. Such a change in the aggregate density forecast again may signal potential un-anchoring of inflation expectations (Grishchenko et al., 2019). As the crisis progressed, deflation expectations subsided while the perceived risk of high inflation remained elevated. The patterns just described are more pronounced for short-term than for medium-term inflation expectations. The higher likelihood assigned to extreme inflation outcomes during the pandemic is consistent with the increase in inflation uncertainty documented in Section 4.2. Further, the fact that only the probability of deflation returned close to pre-pandemic levels contributes to explaining the increase in average inflation expectations during the latter part of the pandemic we identified in Section 4.1.

5.2. The distribution of individual density means

To understand better how inflation disagreement across respondents has evolved during the pandemic, we plot in Fig. 5 the daily distribution of individual inflation density means. We start with the top panel, which focuses on year ahead inflation expectations. The proportion of respondents who expect there will be deflation in the next year (i.e. with a density mean below zero) jumped from less than 10% at the end of February 2020 to more than 20% a month later as indicated by the red area in Fig. 5. After peaking in early April, this proportion abated slowly back to its pre-pandemic level. The proportion of respondents who expect short-term inflation to be higher than 4% (the blue area in Fig. 5) initially followed a similar pattern: It increased sharply, from 22% at the end of February to almost 45% by the end of March. However, the proportion of respondents who expect high inflation did not decline over time and remained higher than its pre-pandemic average until the end of our sample period.

Finally, in part by construction, the proportion of respondents with inflation expectations in the two buckets around the Fed's inflation target (i.e. 0% to 2%, and 2% to 4%), denoted by the grey and green areas in Fig. 5, followed an opposite pattern during the crisis (i.e. a sharp decline followed by a slow and incomplete return to normal levels). The bottom panel of Fig. 5 shows that the distribution of three-year ahead inflation density means experienced similar, although substantially more muted, patterns during the pandemic. The regression results reported in Table 3 confirm that the changes in the density means distributions are indeed statistically significant.

To summarize, as the pandemic started, respondents became substantially more polarized in their inflation expectations in the sense that both tails of the distribution of individual inflation density means expanded simultaneously. Thus, consistent with the hypothesis of Candia et al. (2020) under which households see the pandemic primarily as a supply shock, we find that a substantial proportion of respondents expected the pandemic to produce high inflation. However, we also find that another group of respondents simultaneously expected the pandemic to yield low inflation or even deflation. Al-

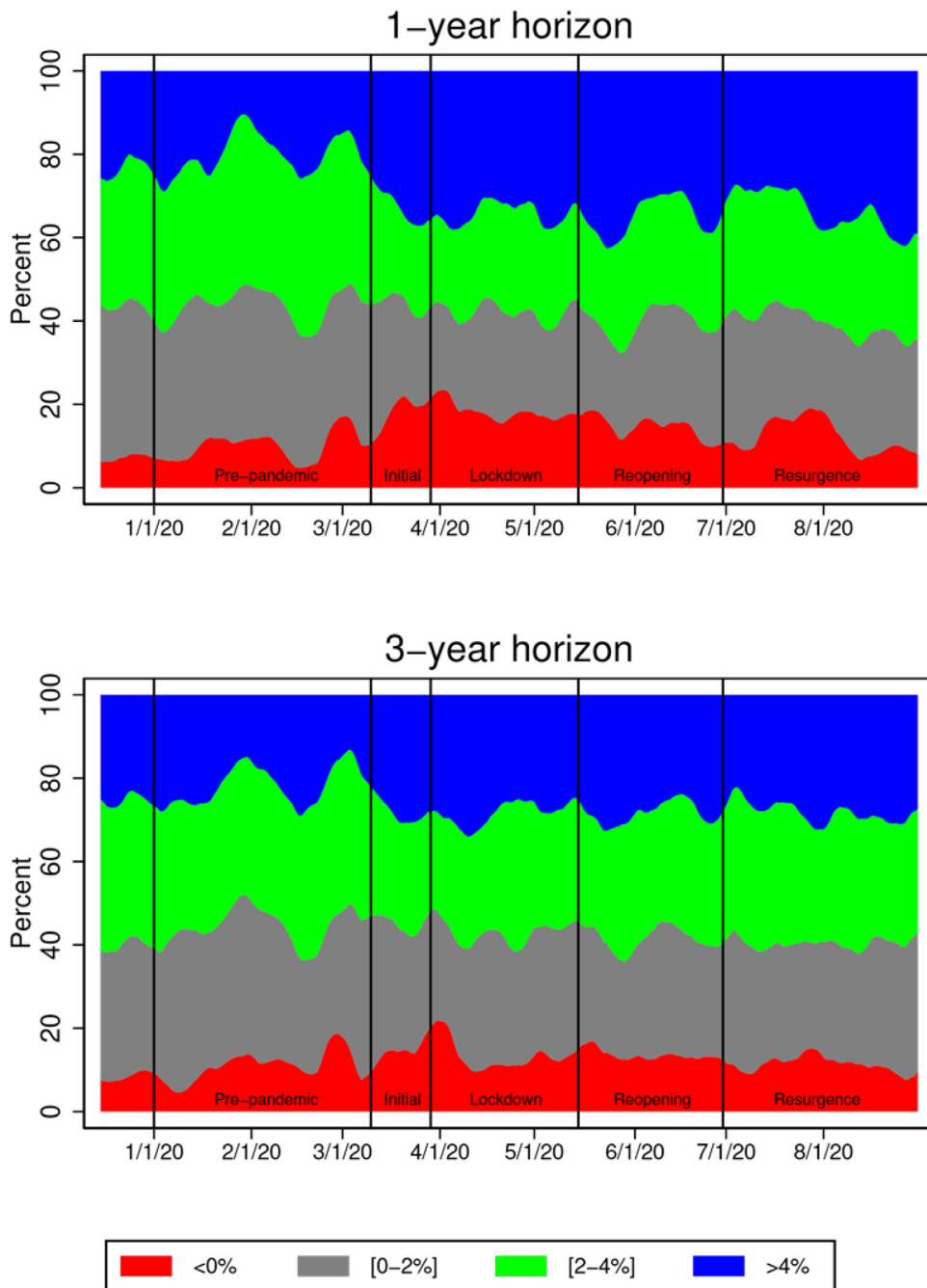


Fig. 5. Distribution of individual density means. The figure shows the daily proportion of respondents with an individual density mean at the one-year (top panel) and three-year (bottom panel) horizons within certain buckets as predicted by a local linear regression using an Epanechnikov kernel and a bandwidth of 3 days. The data are not trimmed. We denote with vertical bars the five pandemic periods we consider.

though this polarization subsided somewhat by the end of August 2020, it remained elevated. Further, inflation expectation polarization was less pronounced for medium-term inflation than for short-term inflation.

These results show that the increase in inflation disagreement (the interquartile range of the distribution of individual inflation expectations) we identified in Section 4.2 is not explained by a simple one-sided shift by some respondents toward (e.g.) higher inflation expectations as suggested by Candia et al. (2020). Instead, the increase in disagreement reflects growing inflation expectation polarization during the pandemic: A higher proportion of respondents moved simultaneously

Table 3
Proportion of Respondents with Density Mean within Stated Interval.

	1-yr				3-yr			
	(1) < 0%	(2) [0%, 2%]	(3) [2%, 4%]	(4) > 4%	(5) <0%	(6) [0%, 2%]	(7) [2%, 4%]	(8) >4%
Pre-pandemic	0.32 (1.34)	4.08*** (1.43)	-0.98 (1.62)	-1.62 (1.63)	-0.53 (1.34)	4.66*** (1.59)	-0.14 (1.43)	-2.30 (1.48)
Initial period	9.17*** (1.90)	-4.85*** (2.19)	-15.36*** (2.31)	9.03*** (2.45)	3.83* (2.16)	-0.07 (2.78)	-8.22*** (1.70)	4.08* (2.31)
Lockdown	8.80*** (1.64)	-7.51*** (1.78)	-13.56*** (1.83)	11.52*** (2.06)	2.81* (1.53)	-1.12 (1.99)	-5.96*** (1.58)	4.13** (1.67)
Reopening	4.98*** (1.52)	-7.45*** (1.80)	-10.67*** (1.84)	12.45*** (2.14)	3.23* (1.67)	-4.29** (1.89)	-2.56 (1.97)	3.29* (1.96)
Resurgence	3.05** (1.34)	-6.61*** (1.66)	-8.56*** (1.55)	11.28*** (1.72)	0.85 (1.02)	-3.20* (1.76)	-1.79 (1.69)	4.43*** (1.64)
N	1286	1286	1286	1286	1287	1287	1287	1287
R ²	0.08	0.06	0.12	0.10	0.02	0.04	0.02	0.03
Dependent variable mean	10.34	29.19	34.94	28.39	11.29	29.17	32.72	29.66
Constant	X	X	X	X	X	X	X	X
Month-of-year FE	X	X	X	X	X	X	X	X
Post-2018 dummy	X	X	X	X	X	X	X	X

Notes: The table shows the estimated impact of the Covid-19 pandemic on the proportion (reported out of 100) of respondents with inflation density mean in different buckets for one-year and three-year inflation. The sample consists of daily data covering the period from January 1, 2017 through August 31, 2020. The number of observations is the number of day observations. The pre-pandemic period is from January 1, 2020 through March 10, 2020. The initial period is from March 11, 2020 through March 26, 2020. The lockdown period is from March 27, 2020 through May 15, 2020. The reopening period is from May 16, 2020 through June 30, 2020. The resurgence period is from July 1, 2020 through August 31, 2020. The Post-2018 dummy is equal to 1 for survey responses recorded after 2018 (January 1, 2019 through August 31, 2020). The data are not trimmed. Standard errors (in parentheses) are robust. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

to both tails of the distribution of density means. The increase in inflation expectation polarization also sheds light on why inflation expectations remained little changed on average during a large part of the pandemic.

6. Inflation uncertainty and precautionary saving

In this section, we illustrate the role inflation uncertainty may play in the study of consumer behavior. To do so, we investigate the link between inflation uncertainty and how SCE respondents used their 2020 stimulus checks. In particular, we examine whether, consistent with precautionary saving motives, those reporting increases in inflation uncertainty between February and June saved a larger share of their stimulus payments.

In a special module of the SCE that was fielded in June 2020, 89% of the respondents reported receiving a stimulus check. This is in line with the 159 million checks (or 82% out of an expected 194 million checks) that had been disbursed as of June 5.¹³ These respondents were also asked what share of the stimulus checks they spent, saved, or used to pay down debt. The special module therefore gives us a unique opportunity to test the extent to which a shift in inflation expectations and in inflation uncertainty at the individual level affects a consumer's saving decision. Importantly, the panel dimension of the SCE enables us to look at the effect of changes in inflation beliefs on behavior, thus abstracting from level differences in uncertainty that may be related to unobservable characteristics of the respondents.

Of course, differences in demographic characteristics and many circumstances other than a change in inflation beliefs may have influenced the decision of how to use the stimulus payments, including whether the respondents or someone in their household lost their job or experienced a significant income shortfall. The June SCE special module allows us to condition on these circumstances, since in addition to information on how they used the stimulus payments, we asked respondents whether their household suffered a negative employment shock or experienced a drop in their household income between February and June.¹⁴ To test the robustness of our results, we also control for individuals' demographic characteristics, attitudes towards financial risks,¹⁵ and year-ahead expectations regarding household income growth, which may all affect the way in which households allocate the stimulus payments they receive.

¹³ See House Committee on Ways and Means, "Economic Impact Payments Issued to Date," June 5, 2020, <https://waysandmeans.house.gov/sites/democrats.waysandmeans.house.gov/files/documents/2020.06.04%20EIPs%20Issued%20as%20of%20June%204%20FINAL.pdf>.

¹⁴ A negative labor market shock is defined here as a dummy variable equal to 1 when the respondent experienced a forced leave, furlough, or layoff since the onset of the pandemic. The drop in household income is also a dummy variable equal to 1 when the respondent reports that her/his household income has declined between February and June 2020. Note that not all employment shocks imply a drop in income, given the \$600 increase in weekly unemployment benefits under the CARES Act.

¹⁵ Respondents are asked to assess their willingness to take risk regarding financial matters using a Likert scale ranging from 1 (not willing at all) to 7 (very willing). This instrument has been shown to produce meaningful measures of risk preferences. In particular, Dohmen et al. (2011) find that the risk tolerance reported on this scale is consistent with the risk preference elicited with a financially incentivized lottery-type experiment (Holt and Laury 2002) and correlates with actual (i.e. non-experimental) financial behavior.

Table 4

Inflation uncertainty and precautionary saving, focusing on 2020 CARES Act stimulus check.

	(1)	(2)	(3)
1-yr inflation expectation change	−0.49 (0.46)	−0.44 (0.45)	−0.27 (0.46)
1-yr inflation uncertainty change	1.77*** (0.57)	1.55*** (0.58)	1.55*** (0.58)
N	474	474	473
R ²	0.02	0.07	0.09
Dependent variable mean	39.08	39.08	39.03
Constant	X	X	X
Demographic characteristics		X	X
Additional controls			X

Notes: The dependent variable is the share saved out of the respondent's stimulus check, as reported in the June SCE special module. Column 1 reports results for a specification which includes as covariates only the change (between February and June) in inflation expectations and in inflation uncertainty at the one-year ahead horizon. Column 2 adds dummy variables for the following self-reported demographic characteristics: female, greater than 40 years old, residing in a household with children under 18 years old, white, education level of bachelor's degree or higher, household income greater than or equal to \$60,000, and high numeracy. High numeracy is defined as correctly answering at least 4 out of 5 financial literacy questions. Finally, column 3 controls for receiving a negative labor market shock and experiencing an income drop, the respondent's attitude towards financial risk, and the expected change in household income at the one-year ahead horizon. A negative labor market shock is defined as a dummy variable equal to 1 for having experienced a forced leave, furlough, or layoff since the onset of the pandemic. An income drop is defined as a dummy variable equal to 1 for having experienced a decrease in household income from February to June. The respondent's attitude towards financial risk is a Likert scale from 1 (not willing at all to take risks regarding financial matters) to 7 (very willing to take risks regarding financial matters). The sample consists of those who took both the February SCE monthly survey and the June SCE special module and reported receiving a stimulus check in June. The data are trimmed weekly at the top and bottom 2% to remove outliers. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The regression results are reported in Table 4. The dependent variable is the share saved out of the stimulus checks, as reported in the June special module. Column 1 reports results for a specification which includes only the *change* (between February and June) in inflation expectations and in inflation uncertainty at the one-year-ahead horizon as covariates. Column 2 adds a set of demographic variables, namely age, gender, race, family composition, education, household income, and financial literacy (see Section 8 for details). Finally, column 3 adds our measures of labor market shock and income drop, attitude towards financial risk, and the expected change in household income (also at the one-year-ahead horizon).

The results are robust across specifications and indicate that an increase in inflation uncertainty is associated with a significant increase in the share saved out of the stimulus checks. In contrast, the coefficient estimates for the change in inflation expectations are statistically indistinguishable from zero. Observe however, that the negative sign of the point estimate is consistent with a standard consumption Euler equation, where, all else equal, an increase in inflation expectations is equivalent to a decline in the expected real rate of return and should therefore be associated with a decline in savings. In terms of magnitudes and looking across specifications, a one percentage point increase in inflation uncertainty is associated with about a 1.6 to 1.8 percentage points increase in the share saved, which are all economically significant effects.

Overall, the empirical results reported here indicate that an increase in inflation uncertainty is associated with a higher share saved out of a one-time transfer such as the one received by households through the CARES Act of 2020. This finding provides support for the theory of precautionary saving behavior, under which agents facing higher uncertainty about the future should save more today (see e.g. Carroll and Kimball 2008 for a review).¹⁶

7. Comparison with the 2008 crisis

As discussed in the introduction, the economic crisis that followed the Covid-19 outbreak has been unique along several dimensions. So, to what extent did inflation beliefs respond to the Covid-19 pandemic differently from the way they responded to previous economic crises? To address this question, we now focus on the most recent economic crisis prior to the pandemic, namely the Great Recession of 2007–2009. As mentioned earlier, however, the SCE was officially launched in 2013.¹⁷ Thus, to compare the two crises, we turn to a different survey, the Michigan Survey of Consumers (MSC hereafter).

¹⁶ We conducted a similar analysis using changes in three-year ahead inflation expectations and uncertainty. As shown in Table A6 in appendix, the results are qualitatively similar, although the significance of the point estimates is weaker. This is consistent with Bachmann et al. (2015) or Crump et al. (2020), who argue that a relationship between inflation expectations and spending or saving decisions is more likely to emerge over the short-term horizon.

¹⁷ As documented in Bruine de Bruin et al. (2010), an experimental version of the SCE was launched toward the end of 2007. We do not use these data to compare the two crises because the wording of the questions and the sample of respondents were somewhat different from the one now used for the SCE. More importantly, data on inflation uncertainty in this experimental survey were only available after the Great Recession had started (i.e. after June 2008).

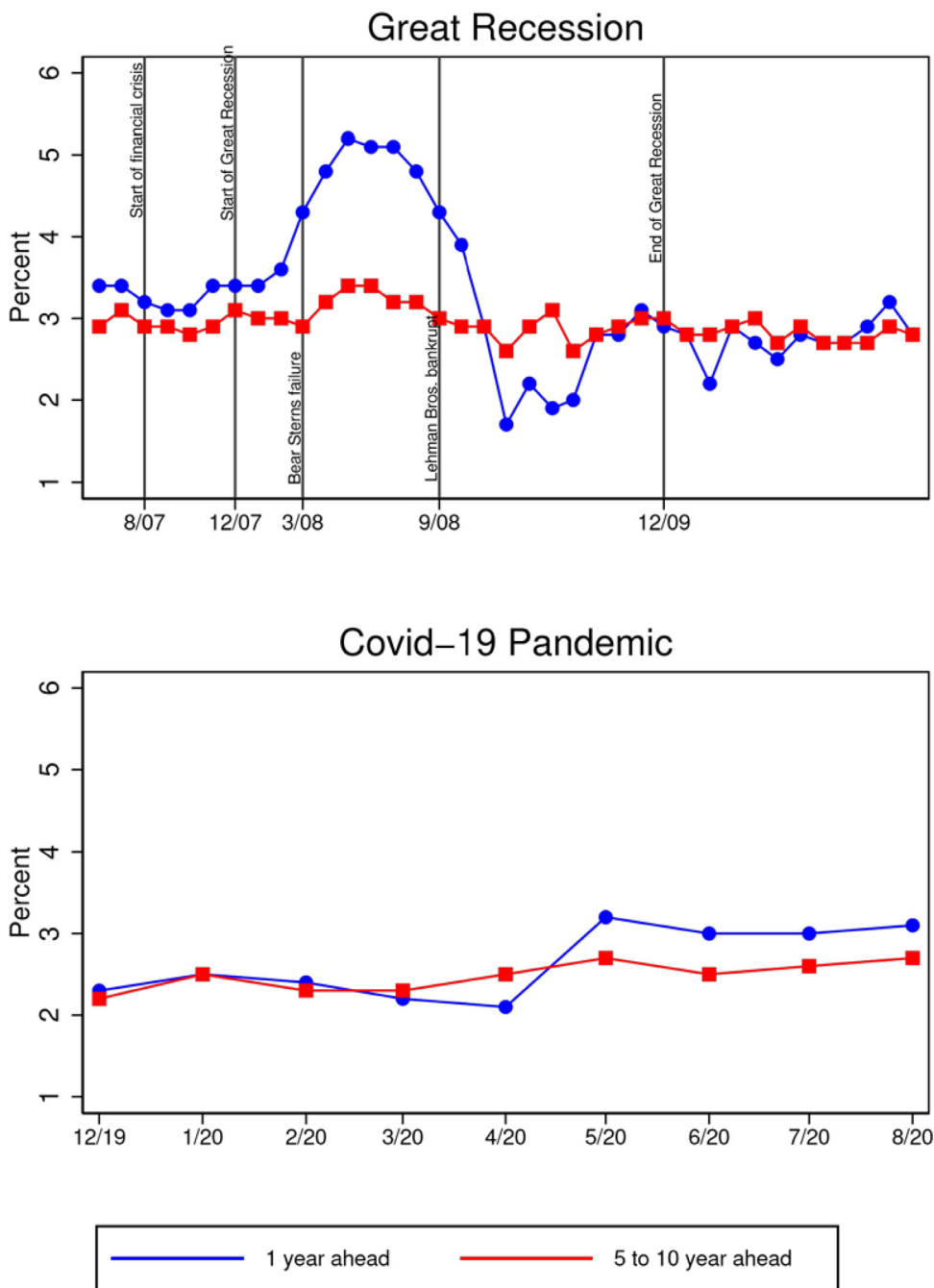


Fig. 6. Median inflation point prediction in the Michigan Survey of Consumers.
 Notes: The figures in the two panels show the median monthly inflation point prediction in the Michigan Survey of Consumers at the one-year and five-to-ten year horizons. The data are not trimmed.

There are a number of differences between the SCE and the MSC. First, MSC respondents are only asked to report a point prediction for future inflation, whereas the SCE also asks respondents to report a density forecast. Thus, we are unable to calculate an inflation uncertainty measure for the Great Recession. Second, the public data from the MSC do not have a timestamp. Hence, we can only calculate monthly averages for the MSC, not daily measures. Third, while both surveys capture expectations at the one-year horizon, the SCE elicits medium-term inflation beliefs (i.e. three-year ahead), whereas the MSC asks about a longer horizon, defined to respondents as “5 to 10 years from now.”

With these differences in mind, we plot in Fig. 6 the MSC median point forecast for each month between June 2007 and June 2010 in the top panel, and between December 2019 and August 2020 in the bottom panel. Two points are worth

noting. First, the impact of both crises on long-term inflation expectations were muted. During the Great Recession, long-term inflation expectations only increased slightly and only for a few months after the failure of Bear Sterns in March 2008 (see top panel of Fig. 6). Similarly, long-term inflation expectations increased only by a few basis points between March and August 2020 (see bottom panel of Fig. 6). Second, short-term inflation expectations from the MSC have followed different patterns in the two crises. As indicated in the top panel of Fig. 6, average short-term inflation expectations increased sharply (by roughly 2 percentage points) in the few months that followed the official start of the Great Recession (December 2007), they then declined over the summer 2008, before plunging after the bankruptcy of Lehman Brothers. In contrast, the bottom panel of Fig. 6 shows that in the six months that followed the WHO pandemic declaration, short-term inflation expectations have increased by much less (by roughly 1 percentage point), and they have remained more stable from month-to-month until the end of our sample period. As the pandemic and its impact on the economy are still in progress at the time of writing this paper, it is clearly too early to state whether these initial differences in patterns will still be present once the pandemic is resolved.

Fig. 7 shows the monthly inflation disagreement measure in the MSC (i.e. the interquartile range of inflation point predictions across respondents) during the Great Recession (top panel) and during the Covid-19 pandemic (bottom panel). We can see that disagreement about short-term inflation increased sharply in the wake of two of the most prominent events of the Great Recession (the failure of Bear Sterns and the bankruptcy of Lehman Brothers), and only partially subsided over the next 18 months, remaining higher than their pre-recession levels even after the official conclusion of the Great Recession in July 2009. In contrast, disagreement about long-term inflation increased only very slightly during the Great Recession.

Relatively similar patterns can be observed in the bottom panel of Fig. 7. Short-term inflation disagreement rose sharply in the months that followed the WHO declaration, whereas long-term inflation disagreement changed little during the pandemic in the MSC. The latter result contrasts with our finding in Section 4.3, that disagreement about medium-term inflation rose significantly during the pandemic in the SCE. This difference may be explained by several factors, including a difference in the horizons considered by respondents in the two surveys (three-year ahead in the SCE versus “5 to 10 years” in the MSC), and a difference in the individual inflation measures (the density mean in the SCE versus the point prediction in the MSC). Finally, it is interesting to note in Fig. 7 that the magnitude of the increase in short-term inflation disagreement (from around 3 percentage points to almost 7 percentage points) has been roughly similar during the Great Recession and during the Covid-19 pandemic.

To sum up, the MSC provides evidence suggesting that inflation disagreement responded similarly to the Great Recession and the Covid-19 pandemic. Namely, disagreement increased early, sharply, but temporarily for short-term inflation, whereas it remained essentially stable for long-term inflation. In contrast, the increase in median inflation expectations at both horizons appears to have been more muted so far during the Covid-19 pandemic compared to during the Great Recession. As discussed in conclusion, we believe this result reflects in large part the fact that the origins of the two crises were fundamentally different.

8. Heterogeneity analysis

In this section, we start by investigating how the different individual inflation belief measures we have studied in Sections 4 and 5 differ across demographic groups before the Covid-19 crisis started. Then, we explore the extent to which the pandemic had a heterogenous impact on the inflation beliefs expressed by specific demographic groups. To do so, we exploit the rich array of socio-demographic variables collected in the SCE which include the respondent’s age, gender, race, education, household income, and family composition (i.e. whether or not the household includes children). In addition, we include a measure of the respondent’s financial literacy skills (adapted from Lusardi 2007).¹⁸

8.1. Heterogeneity in inflation beliefs before the Covid-19 crisis

To identify the heterogeneity in inflation beliefs that may have existed before the Covid-19 crisis started, we restrict the sample to SCE waves between January 1, 2017 and December 31, 2019. We then regress our individual inflation measures on demographic variables, controlling for month-of-the-year and survey-tenure fixed effects as in previous regressions. The results are reported in Table 5.

We start in columns 1 and 5 with one-year and three-year ahead inflation density means. Consistent with Souleles (2004), Pfajfar and Santoro (2009), Bruine de Bruin et al. (2010), D’Acunto et al. (2020) and Armantier et al. (2020a), we find that age, gender and income are significantly correlated with inflation expectations at both horizons. Namely, we find that women and household heads above age 40 tend to report higher inflation expectations. Conversely, having a higher household income (above \$60,000) is associated with lower inflation expectations.

Inflation uncertainty is increasingly studied in the literature but, so far, only a few papers have explored the extent to which inflation uncertainty differs across demographic groups (Bruine de Bruin et al., 2011b; Ben-David et al., 2019;

¹⁸ Here is an illustration of the type of questions we asked to elicit financial literacy: “If you have \$100 in a savings account, the interest rate is 10% per year and you never withdraw money or interest payments, how much will you have in the account after: one year? two years?”. See Bruine de Bruin et al. (2010) for details on our financial literacy measure. Respondents who answer at least 4 out of the 5 questions we ask correctly are classified as “high numeracy.”

Table 5
Heterogeneity in inflation beliefs before 2020.

	1-yr (1) Inflation expectation	(2) Inflation uncertainty	(3) Probability infl. > 4	(4) Probability infl. < 0	3-yr (5) Inflation expectation	(6) Inflation uncertainty	(7) Probability infl. > 4	(8) Probability infl. < 0
Age > 40	0.51*** (0.10)	-0.33*** (0.12)	3.83*** (0.91)	-2.70*** (0.70)	0.55*** (0.11)	-0.30** (0.12)	4.47*** (0.92)	-2.81*** (0.73)
Female	0.48*** (0.10)	0.70*** (0.12)	6.17*** (0.92)	1.81*** (0.69)	0.36*** (0.11)	0.69*** (0.12)	4.90*** (0.91)	2.29*** (0.71)
Has kids	-0.02 (0.11)	0.40*** (0.13)	0.25 (0.93)	1.66** (0.72)	0.10 (0.12)	0.31** (0.13)	0.17 (0.96)	1.47* (0.77)
White	-0.21 (0.14)	-1.78*** (0.19)	-4.91*** (1.14)	-3.71*** (0.91)	-0.12 (0.15)	-1.67*** (0.18)	-4.40*** (1.13)	-3.81*** (0.92)
College	-0.10 (0.08)	-1.02*** (0.09)	-4.14*** (0.83)	-4.37*** (0.56)	-0.14 (0.08)	-0.98*** (0.09)	-3.57*** (0.83)	-4.08*** (0.60)
Income ≥ \$60k	-0.30*** (0.10)	-1.18*** (0.11)	-5.71*** (0.94)	-3.44*** (0.65)	-0.31*** (0.11)	-1.18*** (0.11)	-5.21*** (0.95)	-3.03*** (0.69)
High numeracy	0.04 (0.12)	-1.94*** (0.15)	-5.83*** (1.06)	-8.18*** (0.83)	0.10 (0.13)	-1.90*** (0.15)	-4.60*** (1.06)	-8.17*** (0.87)
N	45,271	45,037	46,640	46,640	45,316	45,131	46,756	46,756
R ²	0.01	0.20	0.06	0.08	0.01	0.19	0.04	0.06
Dependent variable mean	3.25	4.28	32.80	16.00	3.31	4.38	34.19	17.73
Constant	X	X	X	X	X	X	X	X
Month-of-year FE	X	X	X	X	X	X	X	X
Survey tenure FE	X	X	X	X	X	X	X	X

Notes: The table shows the estimated heterogeneity across demographic groups in one-year and three-year inflation expectations, uncertainty and the probability assigned to extreme inflation outcomes before the Covid-19 outbreak. The sample consists of individual survey responses covering the period from January 1, 2017 through December 31, 2019. The demographic covariates are dummy variables for being greater than 40 years old, female, residing in a household with children under 18 years old, white, education level of bachelor's degree or higher, household income greater than or equal to \$60,000, and high numeracy. High numeracy is defined as correctly answering at least 4 out of 5 financial literacy questions. The data corresponding to columns 1, 2, 5 and 6 are trimmed biweekly at the top and bottom 2% to remove outliers. The data corresponding to columns 3, 4, 7 and 8 are not trimmed. Standard errors (in parentheses) are clustered at the individual level * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

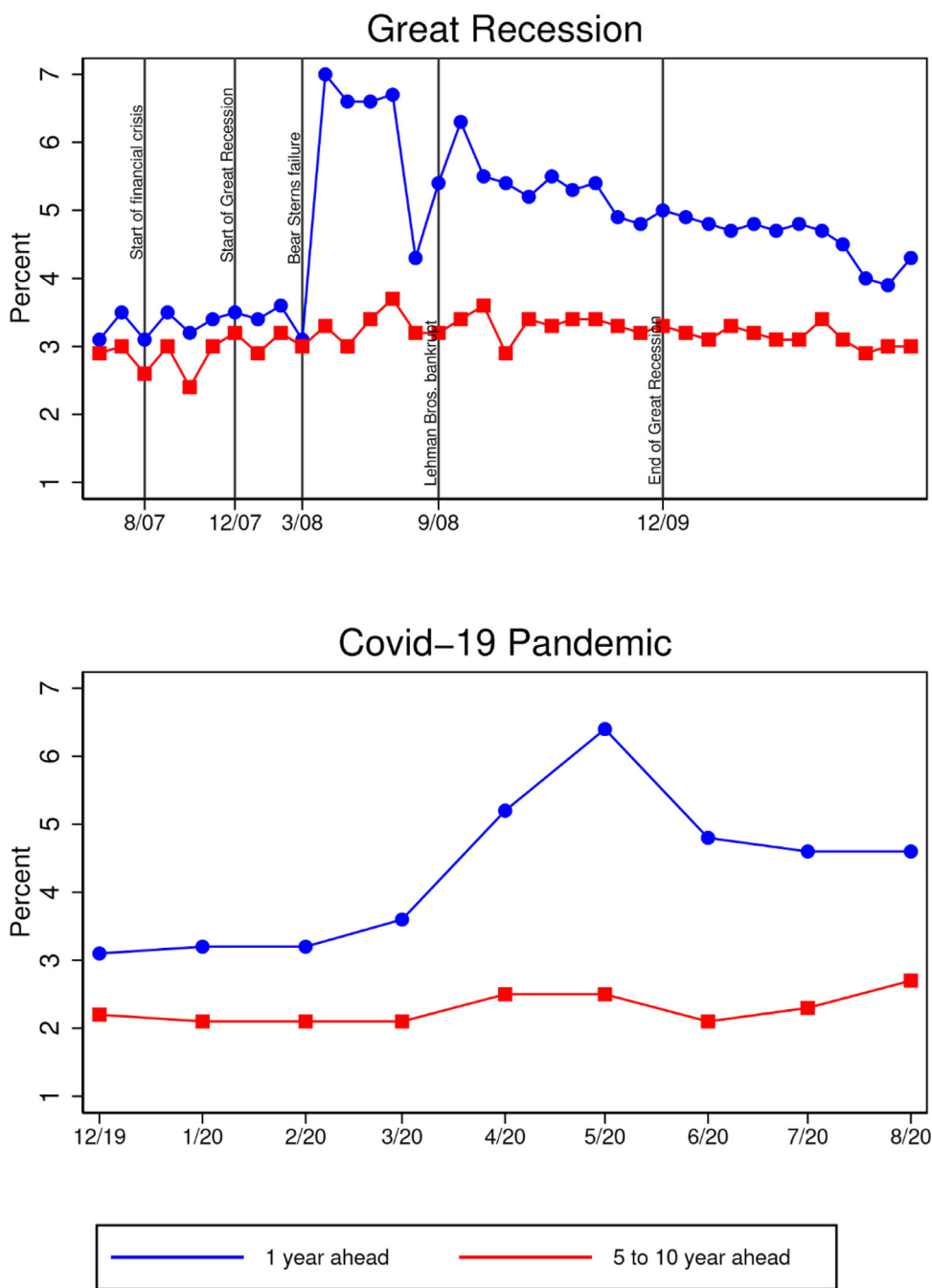


Fig. 7. Median inflation disagreement in the Michigan Survey of Consumers. Notes: The figures in the two panels show the monthly inflation disagreement (the interquartile range of the distribution of point prediction within a month) in the Michigan Survey of Consumers at the one-year and five-to-ten year horizons. The data are not trimmed.

Armantier et al., 2020a). The individual density forecasts elicited in the SCE give us a unique opportunity to fill this gap. Consistent with Armantier et al. (2020a), we find several dimensions of heterogeneity that apply to both short- and medium-term inflation uncertainty (see columns 2 and 6 of Table 5). In particular, women and respondents with children appear significantly more uncertain about inflation. In contrast, respondents who identify as white, those with a college degree, high numeracy or a relatively high household income tend to be less uncertain. Note that the significance and the magnitude of these effects are remarkably similar for one-year ahead and three-year ahead inflation uncertainty.

We similarly analyze the heterogeneity in the probability assigned by each respondent to extreme inflation outcomes at both horizons. To the best of our knowledge, such an analysis is new to the literature. Starting with the results for

the short-term horizon in columns 3 and 4 of Table 5, we see that older respondents assign a higher probability to high inflation (above 4%), and a lower probability to deflation. This result is consistent with the inflation learning model of Malmendier and Nagel (2016) who argue that past personal experiences with high inflation (e.g. during the 1970s) lead older agents to have persistently higher inflation expectations. Respondents who self-identify as white, those with a college degree, high numeracy or a relatively high household income have more moderate inflation beliefs as they put significantly less weights on both high inflation and deflation. In contrast, we find that women have more diffuse inflation beliefs as they put more weight both on high inflation and on deflation. Here again, the patterns are remarkably similar for beliefs about inflation at the three-year horizon (columns 7 and 8).

8.2. The effect of the Covid-19 crisis on the heterogeneity in inflation beliefs

We have just documented substantial heterogeneity in inflation beliefs before the pandemic started. Did Covid-19 exacerbate or diminish this heterogeneity, or did differences across demographic groups remain unchanged during the pandemic? To address this question and avoid small sample size issues, we now collapse our four pandemic periods into one. Based on the results in Section 4, where we found that Covid-19 affected inflation beliefs mostly after it was declared a pandemic, we set a *Pandemic* dummy equal to 1 for data collected between March 11 and August 31, 2020. We then regress the different inflation beliefs measures on the *Post-2018* and *Pandemic* dummies, each interacted with individual covariates, while also controlling for individual covariates, month-of-the-year and survey tenure effects (consistent with the specifications in previous sections).¹⁹ The heterogeneity of the impact of the Covid-19 crisis is then identified by the coefficients associated with the interaction between individual covariates and the *Pandemic* dummy.

The results reported in column 1 of Table 6 reveal that the impact of the crisis on year-ahead inflation expectations has been relatively homogenous across demographic characteristics, except for education. Namely, holding other individual characteristics constant, we find that the year ahead inflation expectations of respondents with a college degree were significantly smaller (by 0.58 percentage points) during the pandemic. This result suggests that the Covid-19 crisis created some heterogeneity in short-term inflation expectations by education level that did not exist before the pandemic (as shown in column 1 of Table 5). Further, columns 3 and 4 of Table 6 indicate that, relative to other respondents, the short-term inflation beliefs of college graduates shifted downward after the start of the pandemic, with a lower mass assigned to high inflation and a significantly higher mass assigned to deflation. Note also in column 4 that respondents with high numeracy assigned a significantly higher weight to year-ahead deflation once the pandemic started. There are at least two, non-mutually exclusive, explanations for these results. First, college graduates and high numeracy respondents may be more informed about the expectations of markets participants and professional forecasters, who all predicted a sharp decline in future inflation when the pandemic started.²⁰ Second, unlike other households who may associate Covid-19 to an inflationary supply shock (as suggested by Candia et al., 2020), college graduates and high numeracy respondents may see the pandemic largely as a deflationary demand shock. Other than education, however, it is interesting to note that Covid-19 did not exacerbate nor reduce any of the substantial heterogeneity we identified along other socio-demographic dimensions for year-ahead inflation expectations before the pandemic started.

Similarly, the results in column 2 of Table 6 indicate that the Covid-19 crisis did not affect the heterogeneity in uncertainty about short-term inflation for any of the individual characteristics we analyze. This result is remarkable since we identified a sharp increase in uncertainty during the pandemic (Table 1) and substantial heterogeneity in uncertainty before the crisis (Table 5). Hence, it appears that the increase in short-term individual inflation uncertainty caused by Covid-19 was essentially uniform across demographic groups.

Columns 5 through 8 of Table 6 present the estimates of the heterogeneity in the effect of the Covid-19 crisis on three-year ahead inflation beliefs. The results in column 5 show that, all else equal, Covid-19 had a significantly smaller effect on three-year ahead inflation expectations for respondents with children, and a larger effect for respondents with a higher household income. Turning now to column 6 of Table 6, we see that the Covid-19 crisis exacerbated some of the heterogeneity in medium term inflation uncertainty that existed before the pandemic. In particular, women, who already tend to be more uncertain in normal times, responded to the pandemic with significantly more uncertainty. Conversely, the pandemic had a smaller impact on the medium-term uncertainty of older respondents, who already tend to be less uncertain.

To sum up, we find that there was substantial heterogeneity in inflation beliefs across demographic groups before the pandemic. However, except for a few notable demographic characteristics (e.g. education, gender), we find little evidence that the Covid-19 outbreak exacerbated or reduced this pre-existing heterogeneity. As discussed in the conclusion, these results may have implications for how central banks should communicate to the public (e.g. to lower disagreement or reduce uncertainty) in normal times and in times of crises.

¹⁹ The results presented below remain virtually unchanged if we add a separate time dummy for the pre-pandemic period (i.e. a dummy for the period between January 1st and March 10, 2020), or if the *Pandemic* dummy is set equal to 1 for data collected between January 1st (instead of March 11) and August 31st, 2020.

²⁰ See e.g. Federal Reserve Bank of St. Louis, 5-Year, 5-Year Forward Inflation Expectation Rate [T5YIFR], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/T5YIFR>, October 8, 2020.

Table 6
Effect of Covid-19 pandemic on heterogeneity in inflation beliefs.

	1-yr (1) Inflation expectation	(2) Inflation uncertainty	(3) Probability infl. > 4	(4) Probability infl. < 0	3-yr (5) Inflation expectation	(6) Inflation uncertainty	(7) Probability infl. > 4	(8) Probability infl. < 0
Pandemic	0.53 (0.55)	0.83 (0.55)	4.41 (3.84)	−0.01 (3.03)	0.25 (0.49)	1.09** (0.55)	3.25 (3.45)	−2.25 (3.04)
Pandemic X Age > 40	0.23 (0.29)	−0.38 (0.30)	0.45 (2.06)	−0.41 (1.73)	0.22 (0.26)	−0.65** (0.30)	0.63 (1.92)	−0.82 (1.67)
Pandemic X Female	0.11 (0.29)	−0.43 (0.27)	0.13 (2.08)	1.81 (1.59)	0.05 (0.26)	0.58** (0.26)	−0.79 (1.95)	3.98** (1.57)
Pandemic X Has kids	−0.35 (0.31)	−0.07 (0.31)	−3.45 (2.18)	0.99 (1.74)	−0.68** (0.30)	−0.10 (0.31)	−3.38 (2.12)	2.74 (1.72)
Pandemic X White	0.16 (0.43)	−0.01 (0.40)	1.73 (2.95)	0.09 (2.20)	−0.38 (0.39)	−0.39 (0.41)	−0.78 (2.74)	2.03 (2.11)
Pandemic X College	−0.58** (0.24)	−0.07 (0.24)	−3.12 (1.91)	5.02*** (1.49)	−0.33 (0.21)	−0.30 (0.25)	−3.99** (1.82)	1.16 (1.41)
Pandemic X Income ≥ \$60k	0.10 (0.30)	0.08 (0.27)	2.55 (2.15)	0.36 (1.62)	0.61** (0.27)	0.30 (0.26)	3.88* (2.02)	−1.20 (1.56)
Pandemic X High numeracy	−0.18 (0.36)	0.22 (0.33)	2.97 (2.51)	3.94** (1.88)	0.03 (0.32)	0.05 (0.32)	2.54 (2.36)	2.85 (1.89)
N	54,781	54,560	56,511	56,511	54,869	54,693	56,663	56,663
R ²	0.02	0.20	0.06	0.08	0.01	0.19	0.05	0.06
Dependent variable mean	3.30	4.36	33.39	16.69	3.31	4.41	34.30	18.07
Constant	X	X	X	X	X	X	X	X
Month-of-year FE	X	X	X	X	X	X	X	X
Survey tenure FE	X	X	X	X	X	X	X	X
Demographic Characteristics	X	X	X	X	X	X	X	X
Post-2018 dummy	X	X	X	X	X	X	X	X

Notes: The table shows the estimated heterogeneity in response to the Covid-19 outbreak in one-year and three-year inflation expectations, uncertainty and the probability assigned to extreme inflation outcomes. The sample consists of individual survey responses covering the period from January 1, 2017 through August 31, 2020. The pandemic period is from March 11, 2020 through August 31, 2020. The Post-2018 dummy is equal to 1 for survey responses recorded after 2018 (January 1, 2019 through August 31, 2020). Demographic characteristics are dummy variables for being greater than 40 years old, female, residing in a household with children under 18 years old, white, education level of bachelor's degree or higher, household income greater than or equal to \$60,000, and high numeracy. High numeracy is defined as correctly answering at least 4 out of 5 financial literacy questions. The demographic characteristics are also interacted with the Post-2018 dummy. The data corresponding to columns 1, 2, 5 and 6 are trimmed biweekly at the top and bottom 2% to remove outliers. The data corresponding to columns 3, 4, 7 and 8 are not trimmed. Standard errors (in parentheses) are clustered at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

9. Conclusion

In this paper we examined the evolution of inflation beliefs of households during the first six months of the Covid-19 pandemic. We find a relatively muted impact of the pandemic on average inflation expectations, with only short-term expectations showing a sustained and statistically significant increase. In contrast, we find that the pandemic led to an immediate and substantial increase in inflation uncertainty and inflation disagreement at the medium-term horizon, and even more so at the short-term horizon. While qualitatively similar to the evolution of inflation expectations and disagreement observed during the Great Recession, the increase in inflation expectations appears has been more muted during the first six months of the Covid-19 pandemic.

When we consider individual heterogeneity in inflation beliefs, we find that the muted response in average inflation expectations masks substantial polarization in beliefs, especially at the short-term horizon. A substantial share of households initially saw the pandemic as inflationary, consistent with the pandemic representing a supply shock. However, in contrast to [Candia et al. \(2020\)](#), we find that other households, and in particular those college educated, initially expected the pandemic to lead to low inflation or even deflation. Such a view is more closely aligned to that of firms, market participants and professional forecasters, who largely saw the pandemic as a deflationary demand shock. Although this polarization in beliefs subsided somewhat by the end of August 2020, it remained elevated.

Our analysis also points to important behavioral responses to the observed changes in inflation beliefs, and to the sharp rise in inflation uncertainty in particular. Consistent with precautionary savings behavior, we find that a one percent increase in inflation uncertainty is associated with a 1.6 to 1.8 percentage point increase in the share saved out of the stimulus checks distributed in the spring of 2020. These results point to the broader role played by inflation uncertainty in affecting the impact of policy interventions meant to influence household spending, borrowing and investing, such as the stimulus checks. As uncertainty varies over time, so does the impact of interventions. For instance, our findings imply that the sharp rise in inflation uncertainty observed over the first six months of the pandemic may help explain the relatively low MPC out of stimulus checks, with an average of 29% used for consumption ([Armantier et al., 2020](#)).²¹ They also suggest that the increase in uncertainty may have contributed to the sharp increase in the personal saving rate during the pandemic. At the same time, the large heterogeneity in inflation uncertainty that we unveiled suggest that households are differentially affected and respond differently to the economic impact payments.

We also explored the extent to which inflation beliefs are heterogeneous across different demographic groups (i.e. age, gender, race, family composition, household income, education and financial literacy). While we identify substantial heterogeneity in inflation expectations, inflation uncertainty and in the probability assigned to extreme inflation outcomes, we find little evidence that the outbreak of Covid-19 exacerbated or reduced this pre-existing heterogeneity. These results suggest that while central banks may want to tailor their communication to specific demographic groups in normal times (e.g. to lower disagreement or reduce uncertainty), they may not need to change their communication strategy differentially across groups during a crisis.

Overall, these results provide mixed evidence about the possible risk of inflation expectations un-anchoring due to Covid-19 (as of August 31, 2020). While the relatively muted response so far in medium-term inflation expectations is reassuring, the increases in medium term inflation uncertainty and disagreement could become concerning if they were to persist. If the public starts disagreeing about the expected future path of inflation or if agents become more uncertain about what inflation will be in the future, inflation expectations could become unmoored. Although the increases in inflation uncertainty, disagreement and polarization receded somewhat during the summer 2020, they remained relatively elevated as of February 2021. Indeed, the additional federal fiscal support packages signed into law in late 2020 and being discussed in Congress in early 2021 have spurred concerns that further fiscal action may lead to an overheating of the economy, a surge in inflation and a de-anchoring of inflation expectations on the upside.²²

Finally, we discuss the extent to which our results may generalize to other economic crises. As documented by e.g. [Gali \(1992\)](#), recessions often involve both a negative aggregate deflationary demand shock and a negative aggregate inflationary supply shock. In most cases however, one of the two shocks clearly dominates the other. For instance, the main source of 1973–75 recession was the large supply shock that resulted from the OPEC oil embargo. Similarly, most economists agree that the Great Recession was predominantly a large negative demand shock caused by falling house and stock prices (see [Mian and Sufi 2014](#), [Bekaert et al., 2020](#), or [Pichler and Farmer 2021](#)). In contrast, multiple studies have now shown Covid-19 to be a rare example of large and nearly simultaneous supply and demand shocks to the economy ([Baqae and Farhi 2020](#); [Chetty et al., 2020](#); [Del Rio-Chanona et al., 2020](#); [Bekaert et al., 2020](#); [Brinca et al., 2020](#); [Guerrieri et al., 2020](#), or [Pichler and Farmer 2021](#)). In particular, the measures taken to curtail the pandemic (lockdowns, travel restrictions, social distancing) forced many firms to lower or stop production, while they also prevented the consumption of goods and services that require human contacts and they reduced the income of many workers who suddenly became jobless. This relatively unique combination of supply and demand shocks likely explain some of the patterns we identified in the paper, that is, a muted response in average consumers' inflation expectations, an increase in individual uncertainty and in population dis-

²¹ <https://libertystreeteconomics.newyorkfed.org/2020/10/how-have-households-used-their-stimulus-payments-and-how-would-they-spend-the-next.html>

²² See, for instance, [Blanchard \(2021\)](#) for a discussion.

agreement, and a polarization in inflation beliefs across respondents. Thus, we do not necessarily expect identical patterns to emerge in the future for more traditional (supply or demand induced) crises.

Declaration of Competing Interest

None.

Appendix

[Tables A1, A2, A3, A4, A5, A6](#)

Table A1
Summary statistics.

	Average	StandardDeviation	25thPercentile	Median	75thPercentile	Obs.	Ids.
<i>Full Sample</i>							
1 year inflation expectations	3.28	3.83	1.11	2.74	4.47	53,250	8410
3 year inflation expectations	3.29	3.94	1.00	2.75	4.79	53,320	8437
1 year inflation uncertainty	4.27	4.30	1.17	2.29	5.38	53,036	8416
3 year inflation uncertainty	4.33	4.28	1.19	2.34	5.50	53,150	8447
1 year inflation disagreement	3.57	1.76	2.38	3.26	4.32	1286	
3 year inflation disagreement	3.75	1.63	2.74	3.55	4.50	1287	
<i>Pre-pandemic</i>							
1 year inflation expectations	3.23	3.62	1.19	2.73	4.29	46,872	7516
3 year inflation expectations	3.29	3.86	1.00	2.78	4.74	46,919	7541
1 year inflation uncertainty	4.18	4.27	1.17	2.19	5.22	46,644	7514
3 year inflation uncertainty	4.28	4.27	1.17	2.34	5.41	46,725	7547
1 year inflation disagreement	3.28	1.43	2.29	3.07	4.00	1113	
3 year inflation disagreement	3.65	1.57	2.68	3.49	4.40	1114	
<i>Pandemic</i>							
1 year inflation expectations	3.64	5.07	0.71	2.79	5.92	6378	2063
3 year inflation expectations	3.31	4.49	1.00	2.61	5.17	6401	2069
1 year inflation uncertainty	4.93	4.42	1.69	3.07	6.87	6392	2066
3 year inflation uncertainty	4.65	4.28	1.52	2.76	6.29	6425	2077
1 year inflation disagreement	5.40	2.45	3.75	5.00	6.39	173	
3 year inflation disagreement	4.37	1.91	3.13	4.08	5.00	173	
Age > 40	0.70					55,303	8672
Female	0.48					55,303	8683
Has kids	0.30					55,303	8683
White	0.85					55,303	8683
College	0.56					55,303	8682
Income ≥ \$60k	0.55					55,303	8683
High numeracy	0.73					55,303	8683

Notes: The table shows summary statistics for the inflation beliefs and demographic variables. The sample consists of individual survey responses covering the period from January 1, 2017 through August 31, 2020. "Obs." is the number of person-day observations, except for inflation disagreement, where the number of observations is the number of day observations. "Ids." is the number of individuals. The inflation beliefs data are trimmed biweekly at the top and bottom 2% to remove outliers. The demographic covariates are dummy variables for being greater than 40 years old, female, residing in a household with children under 18 years old, white, education level of bachelor's degree or higher, household income greater than or equal to \$60,000, and high numeracy. High numeracy is defined as correctly answering at least 4 out of 5 financial literacy questions.

Table A2
Impact of Covid-19 pandemic on inflation expectations, uncertainty, and disagreement.

	0.5% Trimming					
	Inflation expectations		Inflation uncertainty		Inflation disagreement	
	(1)	(2)	(3)	(4)	(5)	(6)
	1-yr	3-yr	1-yr	3-yr	1-yr	3-yr
Pre-pandemic	-0.03 (0.17)	0.16 (0.17)	-0.09 (0.14)	-0.06 (0.14)	-0.20 (0.21)	-0.06 (0.22)
Initial period	0.19 (0.35)	0.12 (0.31)	1.04*** (0.23)	0.70*** (0.21)	3.24** (1.34)	1.10* (0.66)
Lockdown	0.54** (0.27)	0.49** (0.24)	1.25*** (0.18)	0.90*** (0.17)	2.50*** (0.49)	1.09*** (0.36)
Reopening	0.87*** (0.30)	0.47* (0.27)	1.15*** (0.20)	0.65*** (0.18)	2.62*** (0.47)	1.11*** (0.29)
Resurgence	0.78*** (0.28)	0.45* (0.25)	0.98*** (0.22)	0.79*** (0.21)	2.39*** (0.44)	1.08*** (0.40)
N	54,520	54,618	54,474	54,608	1286	1287
R ²	0.52	0.53	0.73	0.73	0.15	0.04
Dependent variable mean	3.40	3.40	4.51	4.56	3.82	3.98
Constant	X	X	X	X	X	X
Month-of-year FE	X	X	X	X	X	X
Post-2018 dummy	X	X	X	X	X	X
Individual FE	X	X	X	X		
Survey tenure FE	X	X	X	X		

Notes: The table shows the estimated impact of the Covid-19 pandemic on i) inflation density means at the one-year and three-year horizons (columns 1 and 2); ii) individual inflation uncertainty at the one-year and three-year horizons (columns 3 and 4); 3) inflation disagreement across respondents at the one-year and three-year horizons (columns 5 and 6). The sample consists of individual survey responses for columns 1 to 4 and daily data for columns 5 and 6 covering the period from January 1, 2017 through August 31, 2020. The number of observations in columns 1 to 4 is the number of person-day observations, and the number of observations in columns 5 and 6 is the number of day observations. The pre-pandemic period is from January 1, 2020 through March 10, 2020. The initial period is from March 11, 2020 through March 26, 2020. The lockdown period is from March 27, 2020 through May 15, 2020. The reopening period is from May 16, 2020 through June 30, 2020. The resurgence period is from July 1, 2020 through August 31, 2020. The Post-2018 dummy is equal to 1 for survey responses recorded after 2018 (January 1, 2019 to August 31, 2020). The data are trimmed biweekly at the top and bottom 0.5% to remove outliers. Standard errors (in parentheses) are clustered at the individual level in columns 1 to 4, and robust in columns 5 and 6. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A3
Impact of Covid-19 pandemic on inflation expectations, uncertainty, and disagreement.

	No Trimming					
	Inflation expectations		Inflation uncertainty		Inflation disagreement	
	(1)	(2)	(3)	(4)	(5)	(6)
	1-yr	3-yr	1-yr	3-yr	1-yr	3-yr
Pre-pandemic	0.06 (0.19)	0.25 (0.20)	-0.12 (0.15)	-0.05 (0.16)	-0.15 (0.23)	-0.08 (0.22)
Initial period	0.22 (0.36)	-0.02 (0.34)	1.02*** (0.24)	0.72*** (0.23)	3.36** (1.36)	1.17* (0.67)
Lockdown	0.46 (0.29)	0.47* (0.26)	1.25*** (0.20)	0.95*** (0.20)	2.80*** (0.61)	1.11*** (0.37)
Reopening	0.92*** (0.30)	0.56** (0.28)	1.16*** (0.22)	0.69*** (0.21)	2.58*** (0.48)	1.02*** (0.30)
Resurgence	0.86*** (0.29)	0.52* (0.28)	0.99*** (0.24)	0.78*** (0.24)	2.39*** (0.45)	1.13*** (0.40)
N	54,946	55,082	54,946	55,082	1286	1287
R ²	0.50	0.51	0.74	0.75	0.15	0.04
Dependent variable mean	3.47	3.46	4.66	4.70	3.92	4.06
Constant	X	X	X	X	X	X
Month-of-year FE	X	X	X	X	X	X
Post-2018 dummy	X	X	X	X	X	X
Individual FE	X	X	X	X		
Survey tenure FE	X	X	X	X		

Notes: The table shows the estimated impact of the Covid-19 pandemic on i) inflation density means at the one-year and three-year horizons (columns 1 and 2); ii) individual inflation uncertainty at the one-year and three-year horizons (columns 3 and 4); 3) inflation disagreement across respondents at the one-year and three-year horizons (columns 5 and 6). The sample consists of individual survey responses for columns 1 to 4 and daily data for columns 5 and 6 covering the period from January 1, 2017 through August 31, 2020. The number of observations in columns 1 to 4 is the number of person-day observations, and the number of observations in columns 5 and 6 is the number of day observations. The pre-pandemic period is from January 1, 2020 through March 10, 2020. The initial period is from March 11, 2020 through March 26, 2020. The lockdown period is from March 27, 2020 through May 15, 2020. The reopening period is from May 16, 2020 through June 30, 2020. The resurgence period is from July 1, 2020 through August 31, 2020. The Post-2018 dummy is equal to 1 for survey responses recorded after 2018 (January 1, 2019 to August 31, 2020). The data are not trimmed. Standard errors (in parentheses) are clustered at the individual level in columns 1 to 4, and robust in columns 5 and 6. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A4
Robustness check - alternate definition of inflation uncertainty and disagreement standard deviations.

	Inflation uncertainty		Inflation disagreement	
	(1) 1-yr	(2) 3-yr	(3) 1-yr	(4) 3-yr
Pre-pandemic	-0.07 (0.08)	-0.04 (0.08)	-0.42*** (0.15)	-0.25* (0.15)
Initial period	0.59*** (0.12)	0.45*** (0.12)	2.11*** (0.53)	1.17*** (0.41)
Lockdown	0.79*** (0.11)	0.55*** (0.10)	1.96*** (0.30)	1.12*** (0.31)
Reopening	0.66*** (0.12)	0.41*** (0.11)	1.06*** (0.25)	0.44** (0.21)
Resurgence	0.68*** (0.13)	0.52*** (0.13)	0.94*** (0.21)	0.39** (0.20)
N	53,032	53,111	1279	1279
R ²	0.71	0.71	0.17	0.06
Dependent variable mean	2.88	2.91	3.55	3.69
Constant	X	X	X	X
Month-of-year FE	X	X	X	X
Post-2018 dummy	X	X	X	X
Individual FE	X	X	X	X
Survey tenure FE	X	X	X	X

Notes: The table shows the estimated impact of the Covid-19 pandemic on i) inflation uncertainty, defined here as the standard deviation of the individual inflation beliefs distribution, (columns 1 and 2) and ii) inflation disagreement, defined here as the standard deviation of the distribution of inflation expectations within a day, (columns 3 and 4) at the one-year and three-year ahead horizons. The sample consists of individual survey responses for columns 1 and 2 and daily data for columns 3 and 4 covering the period from January 1, 2017 through August 31, 2020. The number of observations in columns 1 and 2 is the number of person-day observations, and the number of observations in columns 3 and 4 is the number of day observations. The pre-pandemic period is from January 1, 2020 through March 10, 2020. The initial period is from March 11, 2020 through March 26, 2020. The lockdown period is from March 27, 2020 through May 15, 2020. The reopening period is from May 16, 2020 through June 30, 2020. The resurgence period is from July 1, 2020 through August 31, 2020. The Post-2018 dummy is equal to 1 for survey responses recorded after 2018 (January 1, 2019 to August 31, 2020). The data are trimmed biweekly at the top and bottom 2% to remove outliers. Standard errors (in parentheses) are clustered at the individual level in columns 1 and 2, and robust in columns 3 and 4. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A5
Impact of Covid-19 pandemic on inflation expectations, uncertainty, and disagreement.

Full Panel	Inflation expectations		Inflation uncertainty		Inflation disagreement	
	(1)	(2)	(3)	(4)	(5)	(6)
	1-yr	3-yr	1-yr	3-yr	1-yr	3-yr
Pre-pandemic	0.14 (0.12)	0.14 (0.12)	-0.07 (0.10)	-0.12 (0.10)	-0.29 (0.18)	-0.08 (0.20)
Initial period	0.50* (0.29)	0.20 (0.25)	1.04*** (0.18)	0.74*** (0.17)	2.53*** (0.68)	1.47** (0.60)
Lockdown	0.58*** (0.22)	0.48** (0.20)	1.22*** (0.15)	0.75*** (0.13)	2.43*** (0.46)	1.00*** (0.34)
Reopening	0.80*** (0.22)	0.27 (0.21)	1.00*** (0.17)	0.52*** (0.15)	2.18*** (0.33)	1.14*** (0.28)
Resurgence	0.74*** (0.21)	0.39** (0.20)	0.95*** (0.18)	0.69*** (0.18)	1.82*** (0.29)	0.74*** (0.22)
N	96,251	96,379	95,831	96,014	2344	2345
R ²	0.54	0.55	0.68	0.68	0.09	0.03
Constant	X	X	X	X	X	X
Month-of-year FE	X	X	X	X	X	X
Post-2018 dummy	X	X	X	X	X	X
Individual FE	X	X	X	X		
Survey tenure FE	X	X	X	X		

Notes: The table shows the estimated impact of the Covid-19 pandemic on i) inflation density means at the one-year and three-year horizons (columns 1 and 2); ii) individual inflation uncertainty at the one-year and three-year horizons (columns 3 and 4); 3) inflation disagreement across respondents at the one-year and three-year horizons (columns 5 and 6). The number of observations in columns 1 to 4 is the number of person-day observations, and the number of observations in columns 5 and 6 is the number of day observations. The sample consists of individual survey responses for columns 1 to 4 and daily data for columns 5 and 6 covering the period from January 1, 2014 through August 31, 2020. The pre-pandemic period is from January 1, 2020 through March 10, 2020. The initial period is from March 11, 2020 through March 26, 2020. The lockdown period is from March 27, 2020 through May 15, 2020. The reopening period is from May 16, 2020 through June 30, 2020. The resurgence period is from July 1, 2020 through August 31, 2020. The Post-2018 dummy is equal to 1 for survey responses recorded after 2018 (January 1, 2019 to August 31, 2020). The data are trimmed biweekly at the top and bottom 2% to remove outliers. Standard errors (in parentheses) are clustered at the individual level in columns 1 to 4, and robust in columns 5 and 6. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A6

Inflation uncertainty and precautionary saving, focusing on 2020 CARES Act stimulus check.

	(1)	(2)	(3)
3-yr inflation expectation change	−0.47 (0.53)	−0.57 (0.52)	−0.49 (0.53)
3-yr inflation uncertainty change	1.21* (0.74)	1.02 (0.73)	0.96 (0.74)
N	475	475	474
R ²	0.01	0.06	0.08
Dependent variable mean	38.61	38.61	38.56
Constant	X	X	X
Demographic characteristics		X	X
Additional controls			X

Notes: The dependent variable is the share saved out of the respondent's stimulus check, as reported in the June SCE special module. Column 1 reports results for a specification which includes as covariates only the change (between February and June) in inflation expectations and in inflation uncertainty at the three-year-ahead horizon. Column 2 adds dummy variables for the following self-reported demographic characteristics: female, greater than 40 years old, residing in a household with children under 18 years old, white, education level of bachelor's degree or higher, household income greater than or equal to \$60,000, and high numeracy. High numeracy is defined as correctly answering at least 4 out of 5 financial literacy questions. Finally, column 3 adds dummy variables for receiving a negative labor market shock and experiencing an income drop, attitude towards financial risk, and the expected change in household income at the one-year-ahead horizon. A negative labor market shock is defined as having experienced a forced leave, furlough, or layoff since the onset of the pandemic. An income drop is defined as having experienced a decrease in household income from February to June. Attitude towards financial risk is a Likert scale from 1 (not willing at all to take risks regarding financial matters) to 7 (very willing to take risks regarding financial matters). The sample consists of those who took both the February SCE monthly survey and the June SCE special module and reported receiving a stimulus check in June. The data are trimmed weekly at the top and bottom 2% to remove outliers. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

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