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ABSTRACT

New surveys provide a wealth of information on how economic agents form their expectations and how those expectations shape their decisions. We review recent evidence on how changes in macroeconomic expectations, particularly inflation expectations, affect households' and firms' actions. We show that the provision of information about inflation to households and firms can sometimes backfire in terms of their subsequent decisions. Whether or not this is the case hinges on how individuals interpret the news about inflation: supply-side interpretations ("inflation is bad for the economy") lead to negative income effects, which can depress economic activity. We show that households in advanced economies, unlike professional forecasters, typically have such a supply-side interpretation, as do many firms. New communication strategies could avoid public misinterpretation of policy decisions.

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I Introduction

On its own, a rise in inflation expectations should lead households to spend more before the anticipated price increases materialize and firms to invest in more capital and hire more workers. Central bankers view this as one of the mechanisms underlying the effectiveness of quantitative easing[1] and forward guidance[2], and more generally as a direct way to provide stimulus to the economy through communication. But does this mechanism work?

In this paper, we review recent evidence on the strength of this expectational mechanism and the scope for a more systematic use of expectations management for stabilization purposes. While there is now a growing body of evidence consistent with strong expectational effects, we show that the provision of information to households and firms can sometimes backfire in terms of households' or firms' actions depending on their interpretation of that information. Consumers who associate higher inflation with a worsening economy will tend to reduce their spending when they anticipate higher inflation, while firms with the same view will reduce their employment and investment. As a result, central banks need to carefully craft their communication in order to have the desired effects.

We begin by discussing the increasing availability of survey information on the beliefs of households and firms, both in the U.S. and around the world. We have designed and fielded new surveys that have helped provide more systematic and timely measures of both the macroeconomic and microeconomic expectations of firms and households. These recently created surveys avoid many of the pitfalls that have plagued historical surveys and are offering a wealth of new data in real time to policymakers and researchers. For example, they reveal widespread inattention to inflation and monetary policy on the part of U.S. households and firms as well as a lack of

[1] Mario Draghi (2015) summarized, "*When inflation expectations go up with zero nominal rates, real rates go down. When real rates go down, investments and the economic activity improves. That's the reasoning [of QE].*"
[2] Janet Yellen (2018) observed, "*The strategy [of forward guidance] also potentially supports aggregate demand by raising inflation expectations, thereby lowering real long-term rates relative to a Taylor Rule type baseline.*"

anchoring in inflation expectations. We also illustrate how these new surveys provide timely guidance during the COVID-19 crisis.

A recent and rapidly growing body of work combines these new surveys with randomized information treatments to characterize how new information about policy or the economy affects the expectations and resulting decisions of households and firms. These studies confirm that communication can shape macroeconomic beliefs and that exogenous changes in beliefs in turn affect economic actions. However, the mechanism through which this occurs is not as simple as the typical "thought experiment" in which higher inflation expectations imply lower real interest rates, which stimulate household spending as well as firm hiring and investment. Recent evidence shows that providing information that raises households' inflation expectations sometimes leads them to *reduce*, not raise, their spending. Similarly, while some evidence finds that an exogenous increase in inflation expectations leads firms to raise their employment and investment, other evidence points in the opposite direction.

The adjustment of individuals' broader economic expectations largely determines whether inflation expectations affect decisions in the desired direction. In particular, we find that many agents interpret inflation as having supply-side origins, such that higher inflation is associated with worse economic outcomes. As a result, households who expect higher inflation may lower their spending rather than raise it, while firms with higher inflation expectations may reduce (rather than increase) their employment and investment. We provide new evidence for a range of household, firm and professional forecasts across countries that characterizes the extent to which different economic actors associate higher inflation with better or worse economic outcomes. Across all developed countries that we study, professional forecasters seem to have a view consistent with demand-driven business cycles and a Phillips curve: high inflation is associated with higher

forecasts for output growth. In sharp contrast, households across all countries systematically have the opposite view: higher inflation is associated with worse growth forecasts. For firms, the evidence is more mixed across countries: firms in New Zealand, for example, have a similar perspective to professional forecasters, while firms in Italy have a more supply-side view.

Ultimately, these results suggest that the common thought experiment in which a policymaker raises inflation expectations through communications is ill-defined: households, firms and other economic actors understand that inflation is an endogenous variable and they make inferences about *the source* of the inflation when they revise their inflation expectations. How this impacts their other macroeconomic expectations—and ultimately their actions—therefore depends on this inference.[3] Importantly, we show that households, firms and professional forecasters do not necessarily make the same inferences: *their understanding of what drives inflation appears to be fundamentally different*. As a result, providing the same information to these agents can lead them to draw very different conclusions about the state of the economy and its outlook.

Our results have several potential implications for monetary policy communications. First, despite the widespread inattention to monetary policy displayed by households and firms alike, there is scope for targeted communication that delivers simple and transparent messages to the public. Simple messages can potentially lead to large changes in beliefs and actions. Second, communication with the public may need to target more than just inflation expectations or interest rates. Instead, a more holistic message about the aggregate economy could be emphasized to prevent households and firms from erroneously interpreting demand-side monetary policies as having supply-side effects. Third, it may be better to focus on a few desired outcomes (e.g., "we

[3] A closely related interpretation is the simple heuristics view emphasized in Andre, Pizzinelli, Roth, and Wohlfart (2019). They provide evidence that consumers use simple heuristics (e.g. good vs. bad) to relate different macroeconomic variables. Inflation is a "bad" and therefore moves together with other "bads" like unemployment. Another interpretation is that households view their nominal income as fixed, so higher prices imply a reduced real income.

are putting in place policies to reduce unemployment and thereby raise inflation toward more desirable levels") rather than delve into the details of policy instruments, given the public's lack of understanding of what these entail and the dangers of information effects associated with discussions of changes in policy. The idea of emphasizing target outcomes is consistent with Angeletos and Sastry (2018), who argue that guidance about targets can be superior to guidance about instruments. As more is learned about how to frame policy communications in such a way as to move inflation-output expectations jointly in the desired direction, the potential usefulness of communications to the public will significantly increase.

This paper builds on two key and often overlapping literatures in macroeconomics. The first studies the expectations formation process for economic agents and the role this plays in macroeconomic dynamics. Much empirical work in this literature has focused on testing (and rejecting) the benchmark assumption of full-information rational expectations (FIRE) that has long been a central building block of most macroeconomic models (e.g. Coibion and Gorodnichenko 2012, 2015a, Andrade and Le Bihan 2013). Theoretical work has focused on developing theories that depart from FIRE, such as sticky information (Mankiw and Reis 2002), noisy information (Woodford 2002), rational inattention (Sims 2003, Maćkowiak and Wiederholt 2009), sparsity (Gabaix 2014), imperfect common knowledge (Angeletos and Lian 2018), level-*k* thinking (Farhi and Werning 2019) and diagnostic expectations (Bordalo, Gennaioli, and Shleifer 2018). More recently, empirical work has tried to differentiate among these competing models (e.g. Coibion, Gorodnichenko, Kumar, and Ryngaert 2018, Bordalo, Gennaioli, and Shleifer 2018, Angeletos, Huo, and Sastry 2020, Reis 2020) to provide a single and simple alternative to FIRE. Our results on differential perceived correlations between inflation and the real economy across agents

contribute to this literature by documenting a novel feature of individual expectations that can further help distinguish across models of expectations.

Our paper also relates to the literature on central bank communication (see Blinder et al. 2008 for a survey). While much of this literature has focused on central banks' interactions with financial markets, how central bankers communicate with the public has also been a primary area of interest since Blinder (2009). One conclusion from this literature is that policy communications often fail to reach the public or affect their beliefs (Lamla and Vinogradov 2019, Binder 2017) but that more targeted communications with differential language can be more successful (Haldane and McMahon 2018, Haldane, Macaulay, and McMahon 2020). Another conclusion is that successful monetary policy breeds inattention to monetary policy: households and firms in countries with long histories of low and stable inflation have little incentive to track inflation and monetary policy decisions and tend to be systematically less well informed about these than those living in countries with high or volatile inflation (Cavallo, Cruces, and Perez-Truglia 2017, Coibion, Gorodnichenko, Kumar, and Pedemonte 2020). While this indifference to monetary policy on the part of the general population in advanced economies is a gratifying reflection of the past success of monetary policy, it can also make policymaking more challenging in times of crisis, hence the need for communication strategies that can break through the veil of inattention.

II. Expectations of economic agents

At the heart of the real interest rate mechanism emphasized by central bankers are the inflation expectations of households and firms, i.e., those agents who engage in borrowing, saving, pricing, employment and investment decisions, all of which are significant drivers of economic activity. The first step to assessing the strength of this mechanism is therefore being able to measure the economic expectations of these agents. While an extensive literature exists studying surveys of the

expectations of professional forecasters (see Croushore 1998 for a survey), more recent work has exploited the increasing availability of surveys of households' and firms' expectations (see Coibion, Gorodnichenko, Kumar, and Pedemonte 2020 and Coibion, Gorodnichenko, and Kamdar 2018 for surveys). This work has extensively documented that expectations of households and firms can materially diverge from professional projections in low-inflation environments and that these differences can matter for macroeconomic dynamics and estimates of structural parameters. As a result, having surveys of each type of agent is important for understanding how policy communications are shaping expectations and aggregate outcomes.

In this section, we briefly review available surveys of household and firm macroeconomic expectations in the U.S., focusing primarily on newly created surveys that help fill important gaps relative to earlier sources. For households, the long-running Michigan Survey of Consumers (MSC) has provided a wealth of information on household expectations. This has been complemented with a more recent survey of households: the New York Fed's Survey of Consumer Expectations (SCE), which provides longer panels and more quantitative questions.[4] Even more recently, we have been running a much larger-scale quarterly survey of households participating in the Nielsen Homescan Panel in order to have an even richer basis for understanding and utilizing households' expectations.[5] In addition, in March of 2020, the Federal Reserve Bank of Cleveland launched a *daily* survey of households, which provides unprecedented high-frequency information on household views.

In contrast, information on firms' macroeconomic expectations in the U.S. is rather scarce and available surveys (e.g., the Atlanta Fed's Business Inflation Expectations survey) are limited

[4] The Bank of Canada launched a similar survey (Canadian Survey of Consumer Expectations) in 2014. The European Central Bank has recently created a comparable survey of households in a subset of the Euro-area countries. We discuss this survey in section III.

[5] More details on this new survey can be found in Coibion, Georgarakos, Gorodnichenko, and Weber (2020) and Coibion, Gorodnichenko, and Weber (2019).

in coverage or elicit information that is useful (e.g., future path of a firm's unit cost) but not directly comparable to other surveys measuring expectations for aggregate inflation. Indeed, Bernanke (2007) observed, "Information on the price expectations of businesses – who are, after all, the price setters in the first instance – … is particularly scarce." To address this challenge, we have been fielding a large quarterly survey of U.S. chief executive officers (CEOs) to gather their inflation expectations. We will use these novel data to shed new light on firms' expectations in general and on the recent dynamics during the COVID-19 pandemic specifically. In addition, we show how the large scale of our quarterly survey of consumers implies that we can also use it to measure the expectations of business managers.

A. U.S. Households

The Michigan Survey of Consumers (MSC), going back to the 1960s, has long been the primary resource for those interested in studying the expectations of U.S. households. This monthly survey of approximately five hundred households with a limited panel dimension includes a wide range of questions on their economic expectations. While most of these questions are qualitative in nature, a few, including for inflation expectations, are quantitative. The resulting historical time series for household inflation expectations has been the basis of an extensive line of research (Curtin 2019).

In Table 1, we report recent values of U.S. households' inflation expectations from the Michigan Survey of Consumers, along with comparable year-ahead inflation forecasts from the Federal Reserve and the Survey of Professional Forecasters (SPF). The latter have been forecasting inflation rates very close to 2%, with a slight drop occurring in 2020Q2 as the economy went into recession following the pervasive imposition of economic lockdowns. There is little disagreement among professional forecasters, as can be seen by the low cross-sectional standard deviation in forecasts. They are also very confident in their forecasts, and place little weight on very high or low

inflation outcomes (panel C of Table 1). In contrast, household inflation expectations have consistently been higher than those of professionals (around 3-3.5%) and display tremendous cross-sectional dispersion. In addition, households have very low levels of confidence in their forecasts. These well-known and systematic differences between household and professional forecasts of inflation have been the subject of an extensive literature (e.g. Mankiw, Reis, and Wolfers 2003) and are consistent with poorly anchored inflation expectations on the part of households.

Another striking difference that can be seen in Table 1 is that *household inflation forecasts seem to have risen in the midst of the COVID-19 pandemic*, rather than fallen like those of professional forecasters. One might think that this is a statistical aberration: data on household inflation expectations are notoriously volatile, sensitive to extreme observations, etc. However, it is not. We show this in several ways. First, the higher rate of inflation can be seen in each individual month since the onset of the COVID-19 crisis, as shown in Figure 1, so the repeated nature of the higher observations suggests it is unlikely to be a statistical anomaly. With each passing month since February 2020, inflation expectations have been rising. Second, as we discuss below, the same pattern can be seen in other surveys of U.S. households during this time period, as well as other countries experiencing COVID-19 outbreaks. Third, the pattern does not appear to be inconsistent with the historical experience. To illustrate this point, Figure 1 plots average beliefs of professional forecasters (Panel A) and households (Panel B) for both expected inflation and perceived business conditions, during both the early stages of the Great Recession and the 2020 pandemic. For professional forecasters, we can see the pattern one would expect to see in a world driven by demand shocks and a Phillips curve: as forecasters see a worsening economy, they revise their inflation forecasts downward. This was the case in the Great Recession and has been the case in 2020 as well. For households, we see the opposite pattern: as their perceived state of the

economy worsened in each episode, they raised their inflation forecasts. In other words, it's as if the "Phillips curve" perceived by households is upward-sloping.

Evidence from other surveys broadly confirms this finding. Inflation expectations from the New York Fed's Survey of Consumer Expectations also point toward a spike starting in the second quarter of 2020: the median 1-year-ahead inflation expectation was 2.5% in January 2020 but had risen to 3.0% by May 2020. As described in Armantier et al. (2020), there was also a surge in uncertainty about inflation that took place among households starting in March 2020. In a new (since 2018) quarterly survey of U.S. households participating in the Nielsen Homescan Panel, we elicit quantitative expectations from tens of thousands of households. As shown in Table 2 (column 11), average inflation expectations of all respondents rose from 2.1% in January 2020 to 3.4% in July 2020, with some increase happening as early as April 2020, immediately after the imposition of lockdowns in March. This survey also reveals a dramatic and persistent increase in uncertainty about future inflation (Panel C of Table 1).

Rising inflation expectations in the midst of a COVID-19 outbreak do not appear to be unique to the U.S. For example, Gautier, Ulgazi, and Vertier (2020) document an upsurge in the inflation expectations of French households. The European Commission survey reports that this is true more generally in Europe, with inflation expectations rising from 5.5% in the first quarter of 2020 to 6.8% in the second quarter. In Australia, the Melbourne Institute Survey of Consumer Inflationary and Wage Expectations documented an increase of 0.6% in average inflation expectations in April of 2020 as consumer sentiment collapsed, despite a lot more respondents reporting that they expected prices to fall, indicative of a sharp rise in inflation uncertainty. In the June 2020 Opinion Survey on the General Public's Views and Behavior run by the Bank of Japan, there was a dramatic increase in the fraction of respondents saying that economic conditions had worsened in the last year compared

to the March 2020 survey wave (72% vs 40% respectively). Inflation expectations in the June wave increased to 4.3% from 3.4% in the March wave, with the variance of answers also increasing sharply. Evidence from developing countries is similar: inflation expectations in South Africa shot up to 6.2% in 2020Q2 from 4.8% in 2020Q1, while median inflation expectations from the Reserve Bank of India's Inflation Expectations Survey of Households went from 9% in March 2020 to 10.2% in May 2020 as broader measures of consumer confidence collapsed.

This rise in household inflation expectations associated with the coronavirus can be seen at an even higher frequency using the newly created daily Consumers and COVID-19 Survey Project sponsored by the Federal Reserve Bank of Cleveland, as described in Dietrich, Kuester, Müller, and Schoenle (2020) and Knotek et al. (2020). While smaller in cross-section (between 50 and 200 different individuals are surveyed each day) than other surveys described above, the daily frequency provides an unprecedented view of the evolution of expectations in response to the coronavirus. Knotek et al. (2020) document that the coronavirus crisis induced a rise in inflation expectations occurring at the same time as a decline in the expected growth rate of GDP among respondents since March 10th, the start of the survey. In Figure 2, we present additional evidence that inflation expectations due to COVID-19 are associated with bad outcomes by households. For example, there is strong positive comovement between the median inflation expectation and the share of respondents that are worried about losing their jobs, the share of respondents who are delaying large purchases, the fraction who are storing extra food supplies and the fraction who are engaged in extra personal saving. The results from the Cleveland Fed survey therefore confirm that inflation expectations are closely tied to a more general sense of bad outcomes on the part of households.

B. U.S. Firms

Measuring the macroeconomic expectations of U.S. firms has long been a challenge. Indeed, conducting a high-quality survey of CEOs or other business executives is an exercise fraught with many difficulties ranging from establishing contacts with CEOs (e.g., one has to go through multiple layers of various filters, secretaries, assistants, etc.) to the very limited time that CEOs can spare on answering questions (one can hope to have responses to only a few simple questions). Constructing a representative panel of CEOs willing to repeatedly participate in a survey takes many years and a great deal of trust-building; no such survey has existed in the U.S. until recently.

However, as with households, there has been a pronounced effort in recent years to fill this gap and develop much more systematic, representative and quantitative surveys of firms' expectations. One such attempt is the Survey of Business Uncertainty. Begun in 2013, this is a monthly survey of approximately 1,750 firms across industries and firm sizes (see Altig et al. 2019 for an overview of this survey). However, the survey focuses on firm-specific conditions and does not measure expectations about the aggregate economy.

More recently, we have teamed up with a prominent survey firm that has been collecting CEOs' and top executives' perceptions and expectations for various firm-specific outcomes. The results of these surveys are widely used in business, policy and academic circles. In 2017, this survey firm agreed to add two inflation-related questions to its quarterly survey. The survey covers firms in manufacturing and services. Each wave includes responses from 300 to 600 firms, a relatively large cross-section for a firm survey. Since 2017, 1123 firms have participated in the survey and firms, on average, participate in 3.8 waves. The first of the two new questions to respondents is always about their 12-month-ahead inflation expectations. The second question rotates quarterly across one of four topics: long-term inflation expectations, perceptions of recent

inflation rates, inflation uncertainty and belief about the Federal Reserve's inflation target. Jointly, these questions provide a comprehensive assessment of firms' inflation expectations.[6]

Columns (8) and (9) in Table 1 report results of the survey. Consistent with Kumar, Afrouzi, Coibion, and Gorodnichenko (2015) documenting evidence for firms in New Zealand, American CEOs have inflation expectations higher and more dispersed than those of professional forecasters. This pattern is observed for short-run expectations (Panel A) and longer-run expectations (Panel B). Similar to Kumar et al. (2015), we find high correlation between short- and long-run inflation expectations, which contrasts with the weak (if any) correlation in professionals' forecasts. Again, in line with Kumar et al. (2015), we observe that, in normal conditions (2019Q1), CEOs are rather uncertain about inflation and assign, on average, a 26 percent probability that inflation will exceed 5 percent in the next twelve months. Hence, along these dimensions, firms' inflation forecasts are much more similar to households' than they are to professionals'.

Perhaps most strikingly, another similarity between households and firms is the behavior of their inflation forecasts during the COVID-19 pandemic: *the average inflation expectations of CEOs went up* by 0.3 percentage points between the first and second quarters of 2020 even as the economy went into a tailspin and as professional forecasters predicted a decline in inflation. The cross-sectional dispersion of inflation forecasts also rose dramatically.[7]

Of course, as with households, one must be wary of placing too much weight on the results from one survey wave, given the noise and sensitivity that a single wave displays. Unfortunately, unlike with households, there are no other directly comparable surveys of firms to verify the statistics. As a result, we consider an alternative approach that exploits the large-scale Nielsen

[6] Candia, Coibion and Gorodnichenko (2020) and http://firm-expectations.org/ provide more details on this survey.
[7] Preliminary data for July 2020 suggest that, relative to April 2020, managers have lower and less dispersed inflation expectations.

Homescan Panel. Due to the large number of respondents, the survey includes many individuals who have managerial responsibilities and also includes a question specifically designed to identify these individuals in the survey. As a result, we can create a survey of managers from the survey of households. While it is not directly comparable to a survey of CEOs and other top business executives, many decisions are made by middle- and low-ranking managers and, as a practical matter, their choices may be just as, if not more, important as the "top brass" decisions.

Specifically, we ask respondents participating in the Nielsen Homescan Panel to indicate their responsibilities at their current employment from a set of options including whether he/she sets prices or wages, fires/hires personnel, supervises personnel (1-10 people, 11-50 people, more than 50 people), makes decisions about capital expenditures or makes decisions about marketing/sales. If a respondent selects at least one of these responsibilities, we identify this respondent as a manager. To the best of our knowledge, no other household survey with inflation expectations elicits this information, and thus, we provide a new perspective. Approximately a third of employed respondents report some managerial responsibility.[8] Columns (10)-(11) of Table 1 report the average inflation expectations for managers identified in the household survey, measured using point forecasts for comparison to the other surveys in Table 1. Between the first and second quarters of 2020, we find that managers reported an increase in their inflation expectations from 3.2% to 3.8%, an increase of a similar order of magnitude as the one found for households. In short, this alternative survey of managers leads to a similar conclusion as the survey of CEOs.

In Table 2, we provide more details on the inflation expectations of respondents based on which managerial characteristics respondents identified with. Inflation expectations here are based on distributional questions in which respondents assign probabilities to various inflation ranges,

[8] More details on this survey can be found in Coibion, Gorodnichenko, and Weber (2020b).

which were included in the survey more systematically than point forecasts. We do not find any large differences across groups. Managers who supervise 10 or more individuals tend to have somewhat lower inflation expectations while those who set prices or make capital expenditures have slightly higher expectations, but the differences are relatively small.

C. Summary

There has been great interest in developing new surveys of households and firms in recent years, both in the U.S. and abroad. These surveys are providing real-time insight into the expectations of agents, insights which can be invaluable during crises. We document that since the onset of the COVID-19 pandemic, there has been a significant divergence in the evolution of inflation forecasts of professional forecasters (which have declined in line with a standard Phillips-curve view of the world) versus those of households and firms (which have risen). Rising inflation expectations on the part of households and firms, at least while at the zero lower bound, should be stimulative to the economy since they imply lower real interest rates and therefore higher consumption, hiring and investment. Are they?

III. Inflation Expectations and Decisions

The development of surveys of households and firms has led not only to better and more systematic measurement of the expectations of these agents but also to more research on how these expectations relate to individual economic decisions. A key question that this research has focused on is precisely whether higher inflation expectations of households and firms do indeed lead to higher levels of spending, employment and investment.

A. The State of the Literature

Bachmann, Berg, and Sims (2015) was the first study to exploit the availability of survey micro-data to relate the inflation expectations of households to their spending decisions or perceptions of whether now is a good time to purchase durable goods. Using data from the MSC, they found little systematic relationship between individuals' inflation expectations and their spending, except for a small subset of more educated and higher-income individuals. Subsequent work for the U.S. and other countries (Crump, Eusepi, Tambalotti, and Topa 2015, Burke and Ozdagli 2013, Ichiue and Nishiguchi 2015, Dräger and Nghiem (forthcoming)) has been more supportive of a positive relationship between inflation expectations and spending.

One limitation of this approach is the absence of clear causality: a positive relationship can reflect that higher inflation expectations induce households to spend more, but causality can also go in the opposite direction. For example, households who are spending more today may think other households are doing the same and therefore that prices will have to rise in the future. Alternatively, if the price of goods purchased by households rises today and they do not alter their spending patterns much, their spending will be higher and they will likely raise their inflation expectations, since households generally form expectations based on the prices of goods they typically purchase (D'Acunto, Malmendier, Ospina, and Weber 2019). A positive correlation between spending and inflation expectations therefore need not imply a causal relationship from expectations to spending decisions.

One approach to breaking this endogeneity is to identify a large policy change that alters inflation expectations. D'Acunto, Hoang, and Weber (2018) study one such instance: the 2005 announcement of an increase in the German value-added tax for 2007. Household inflation expectations spiked in the intermittent period, correctly anticipating the rise in prices, and

households simultaneously perceived this same period to be a good time to purchase durable goods. As no comparable change in household expected income occurred during this time period, the change in the perceived desirability of purchasing durable goods can then clearly be assigned to an inflation expectation effect.

Another approach to breaking the endogeneity of expectations is to use randomized controlled trials (RCTs). Coibion, Georgarakos, Gorodnichenko, and van Rooij (2019) do so using a survey of households in the Netherlands. A random subset of households is provided with (publicly available) information about inflation, whereas households in the control group are not provided with any additional information. The provision of information to some households induces an exogenous change in their inflation expectations, which can be used to assess the causal effects of expectations on spending decisions. Coibion et al. (2019) find that when Dutch households have exogenously higher inflation expectations, they sharply *reduce* their spending on durable goods but not non-durables and services, the opposite of the expected effect. Unlike what was observed by D'Acunto, Hoang, and Weber (2018) for German households, the provision of information about inflation to Dutch households led them to significantly revise not just their views about aggregate inflation but also about the broader economic outlook. Dutch households who raised their inflation expectations tended to become much more pessimistic about the state of the economy and their future income growth, thereby potentially explaining why their spending on durable goods went down.

This RCT approach has also been applied to the question of how firms change their decisions when they revise their inflation expectations. Coibion, Gorodnichenko, and Kumar (2018) run a survey of firms in New Zealand with an RCT in which a randomly selected subset of firms is provided with (publicly available) information about inflation. Six months later, those

firms are surveyed again to determine how their prices, employment, investment and wages have evolved. Coibion et al. (2018) find that those firms that were initially uninformed about inflation but were treated with information significantly revised their inflation expectations downward relative to the control group but did not change their other macroeconomic expectations. Over the course of the next few months, those same treated firms significantly lowered their employment and investment relative to the control group, suggesting a positive link between both employment and investment with respect to firms' inflation expectations.

Coibion, Gorodnichenko, and Ropele (2020) provide another example of an RCT approach to firms. In a long-running survey of Italian firms, a randomly selected subset of firms was given information about recent inflation while other firms in the survey were not, from 2012 to 2018, providing exogenous variation in the inflation expectations of firms across the two groups as well as over time. They find that exogenously higher inflation expectations lead firms to significantly *reduce* their employment and investment, increase their leverage, and seek out new sources of credit. As with Dutch households, however, a rise in inflation expectations on the part of firms comes with increasing pessimism about the outlook for both the broader economy and for the firm itself. But for the sub-sample during which the interest rate was constrained by the effective lower bound (ELB), this pessimistic effect dissipated: firms associated higher inflation expectations with a stronger economic outlook, leading them to raise their prices sharply and no longer cut back on employment or investment.

In short, the evidence on how inflation expectations relate to the economic decisions of households and firms is mixed. Clearly exogenous increases in inflation expectations have been found to lead to either higher or lower desired household spending, as well as either higher or lower employment and investment by firms. In each case, the differential response seems to reflect

the variation in the way households and firms interpreted the source of the news about inflation and what it meant for the broader economic outlook.

B. The Perceived Relationship between Inflation and the Real Economy

The nature of the relationship between inflation and the real side of the economy is, of course, not an easy one to decipher. Macroeconomists themselves have long argued about the importance of the Phillips curve and whether supply or demand shocks are more important. What do households and firms think about this relationship?

As a benchmark, it's useful to first look at the properties of beliefs of professional forecasters. We do so using the panel of Consensus Economics forecasters reporting predictions of output growth and inflation for not only the U.S., but also Germany, France, Italy, Spain, the Netherlands and New Zealand. For each country, we compare the cross-section of forecasts of output growth and inflation from 2001 to 2020 after removing time and country fixed effects. We present the resulting correlations in binscatter form for each country in Figure 3. The results are uniform across countries: forecasters who predict higher inflation in a given period also tend to predict higher output growth. This positive comovement is in agreement with professional forecasters using models which include a Phillips curve and demand shocks as primary sources of fluctuations.

We can then study whether this pattern applies to households as well. For the U.S., we use the micro data from the MSC from 1978 to 2020. While households are not asked to provide a quantitative forecast for the real economy, they are asked about whether they expect business conditions in the next year to improve, stay the same or deteriorate. We assign point values to each answer ranging from 1 (improve) to -1 (deteriorate). We then compare the households' responses to this question and their quantitative inflation forecasts, after taking out time fixed effects. As documented in the first panel of Figure 4, we find a strong *negative* relationship in the binscatter

summarizing these forecasts: U.S. households that predict higher inflation in any given period also tend to predict worse economic outcomes in the future. This is the opposite correlation of what we observe for professional forecasters, but it is very much consistent with the reaction of Dutch households to news about inflation in Coibion, Georgarakos, Gorodnichenko and van Rooij (2019).

Other work has also documented results in this spirit for households. Kamdar (2018), for example, documents that U.S. households in the MSC and SCE associate high inflation with high unemployment, i.e., they have a stagflationary view of inflation.[9] She furthermore finds this positive correlation between inflation and unemployment in households' expectations even during the Great Moderation, when inflation was largely demand-driven. Similarly, Dräger, Lamla, and Pfajfar (2016) argue that only a small fraction of households within the MSC have expectations that are consistent with a Phillips curve.

We extend this analysis to European countries using the newly created Consumer Expectations Survey (CES)[10] of households from the European Central Bank. This survey was launched in January 2020 and it currently includes six countries: Belgium, France, Germany, Italy, the Netherlands and Spain. The monthly survey includes a panel dimension and includes approximately 1,000 households in Belgium and the Netherlands and 2,000 households in other countries, thus providing a unique cross-country perspective. Participants are asked to answer a number of questions covering their perceptions and expectations of inflation, the general economic outlook, housing markets, labor market conditions and their personal income and consumption decisions. Specifically, households are asked about expected inflation over the next twelve months

[9] Consistent with Kamdar's (2018) interpretation, people strongly associate inflation with reduced standards of living (Shiller 1997). Andre, Pizzinelli, Roth, and Wohlfart (2019) present evidence based on households' responses to hypothetical scenarios and, like Kamdar (2018), argue that households appear to exhibit "good-bad heuristics" for inflation and treat inflation as a bad state.

[10] More detail about the survey is provided in Coibion, Georgarakos, Gorodnichenko, and Kenny (2020), and at https://www.ecb.europa.eu/stats/ecb_surveys/consumer_exp_survey/html/index.en.html.

(using the same distribution question as used in the SCE) and about the growth rate of their country's economy over the next twelve months. We use these two questions to assess how households' beliefs about the two evolve jointly. Following the approach for the MSC, we find (Figure 4) results remarkably consistent with those observed for the U.S.: households who expect higher inflation also tend to expect *worse* economic conditions in all Euro-area countries included in the survey.[11] In short, we find uniform evidence across countries that households' beliefs about inflation are consistent with a supply-side narrative in which high inflation is associated with a bad economy, not the good economy that would induce demand-driven price inflation.

Do firms hold similar beliefs? Once again, the absence of large-scale historical surveys of firms limits our ability to study the properties of firms' expectations. Our new survey of U.S. CEOs and top executives, for example, only includes questions about aggregate inflation and not the broader economic outlook. Instead, we use the Livingston survey, a long-running survey of large financial and non-financial companies in the U.S. This survey is not representative in its coverage but extends back to the 1950s on a semi-annual frequency. Using the individual forecasts for inflation and output growth of non-financial corporations, we plot (in a binscatter) the correlation between these individual forecasts over time after removing time fixed effects in the first panel of Figure 5. We find neither a strong positive relationship (as we did with U.S. professional forecasters) nor a strong negative relationship (as we did with U.S. households). Instead, the correlation is at best weakly positive but economically small. In short, U.S. firms (at least those large firms represented in the Livingston survey) do not display a clear correlation between inflation and output in their forecasts.

[11] We thank Dimitris Georgarakos for producing these figures.

A similar result holds for firms in New Zealand. Using the survey of firms in Coibion, Gorodnichenko, and Kumar (2018), in which a large and broadly representative cross-section of firms were asked about both their output growth and inflation expectations, we can consider the cross-sectional correlation in these forecasts. As reported in Figure 5, we again find a weak relationship between the two. The absence of a strong correlation between output and inflation expectations for firms in New Zealand is consistent with the experimental evidence in Coibion, et al. (2018): when a random subset of firms was provided with information about the Reserve Bank of New Zealand's inflation target, their expectations of inflation moved strongly toward that target but their views about the broader economic outlook were effectively unchanged.

This pattern is visible not only in the cross-section of firms but also *within a firm's own joint distribution over nominal and real variables*. In the survey of New Zealand firms, we asked respondents to assign probabilities to a range of outcomes defined over *both* future unemployment and future aggregate wage growth. This novel survey question comprehensively describes the joint distribution of each firm's belief about future unemployment and wages. As illustrated in Figure 6 (taken from Coibion, Gorodnichenko, Kumar, and Ryngaert 2020), there is a weak negative relationship between the expected wage growth and expected unemployment: firms perceive a weak Phillips-curve relationship between nominal and real variables. The consistency between the within-firm correlation (Figure 6) and the across-firm correlation (Figure 5) suggests that the latter is indeed informative about firms' perceived relationship between inflation and the economic outlook.

Another available survey of firms is in Italy (Bank of Italy's Survey of Inflation and Growth Expectations, SIGE), which has been running since 1999. This survey consists of a representative panel of about 2,000 firms (with employment greater than 50 employees) and includes quantitative questions about inflation over the next twelve months and qualitative

questions about the expected state of the economy in three months. After taking out time fixed effects, we plot in Figure 5 the cross-sectional correlations between expectations of inflation and business conditions both before the effective lower bound (2012-2014) and at the effective lower bound (2014-2019).[12] Consistent with Coibion, Gorodnichenko, and Ropele (2020), there is a significant change in how firms seem to view inflation before and during the lower-bound period. Prior to the lower bound, firms have a somewhat supply-side view of inflation: firms with higher inflation expectations tend to be, if anything, more pessimistic about the economic outlook. During the lower-bound period, however, firms that have higher inflation expectations tend to be more optimistic about the economic outlook. This alternative interpretation of the inflation process during the lower-bound period is consistent with New Keynesian models, which predict very different dynamics when monetary policy is constrained, but firms' supply-side view of inflation prior to the lower bound is quite different from the view taken by professional forecasters and more akin to the process perceived by households seen in Figure 4.

The final country for which there is a suitable survey of firm expectations is Ukraine, a country with a recent history of volatile, high inflation. As described in Coibion and Gorodnichenko (2015b), the National Bank of Ukraine runs a quarterly, nationally representative survey of around 1,000 firms. This survey includes a wide range of qualitative and quantitative questions about firms' macroeconomic expectations. In Figure 5, we plot a binscatter of firms' joint expectations over inflation and output growth in the next twelve months, after taking out time fixed effects. The results point toward a very strong negative correlation between the two: firms that expect higher inflation in Ukraine also tend to expect lower output growth.[13]

[12] We thank Tiziano Ropele for producing these figures.

[13] The interpretation of a negative correlation could be more nuanced for Ukraine and similar countries with histories of high, volatile inflation. Because hyperinflation (or high inflation) is so destructive for the economy, economic agents can interpret elevated inflation as an increased probability of a hyperinflation and consequently become more

C. Summary

The growing literature on the effects of expectations on decisions is almost unanimous in one respect: agents' macroeconomic expectations do ultimately affect their decisions. But the way in which agents' actions actually change when they revise their inflation expectations seems to depend crucially on whether/how they revise their broader economic outlook along with their inflation expectations. Households seem to consistently have a supply-side view of inflation, such that they become more pessimistic about the economic outlook when their inflation expectations rise. Higher inflation expectations can therefore induce not just an intertemporal substitution effect (which would raise current consumption) but also an income effect (which would lower current consumption). Firms in many, but not all, of the countries for which we have data also seem to have a supply-side view of inflation and the strength of this effect can help explain why higher inflation expectations seem to induce higher employment and investment in some places and lower employment and investment in others.

IV. Implications for Monetary Policymakers

What does all of this mean for policymakers? We emphasize two general points. First, an important lesson from the RCT approach is that simple pieces of information, when they get through to the public, can have very large effects on inflation expectations. This suggests that there is significant potential in using communication strategies to affect the expectations of the general public as a tool to help stabilize the economy. But most current policy communications do not reach the public. Hence, more work needs to be done in designing communications strategies that successfully reach the public. Second, it may not be enough just to communicate information about

pessimistic about output and employment. Given that hyperinflation undermines the productive capacity of the economy, one may still interpret the resulting correlation as reflecting supply-side factors.

inflation or interest rates. Households and firms understand that, for example, inflation is endogenous and will therefore make an inference about what is driving the new information about inflation that they receive. How they do so will depend on their understanding of the inflation process, which for many seems to reflect a supply-side view of inflation. The ultimate effect on economic decisions may therefore be different from what is desired by policymakers. Instead, it may be preferable to offer more holistic messages that describe the broader outcomes that policymakers are trying to achieve.

A. Reaching the Public

Economic expectations depend on a myriad of factors (e.g., ability and incentives of economic agents to collect, process and interpret information) and policy actions are but one of these many factors. As a result, economic agents may be largely unaware of policy actions in normal times. For example, Binder (2017) documents that the general public does not know basic facts about central banks such as leadership, objectives and even the very existence of these institutions.[14] This lack of knowledge apparently extends to firm managers, too. Table 3 reports the distribution for the perceived inflation target of the Federal Reserve for U.S. CEOs (using our survey of U.S. firms), households (using the Nielsen Homescan Panel) and professional forecasters (using the Survey of Professional Forecasters). We find that CEOs have perceptions similar to those of households participating in the Nielsen survey: there is a wide distribution with a significant mass above 2.5% and many respondents choosing "do not know." The fraction of CEOs who choose "do not know" varies across waves but is generally above 20 percent.[15] Households and firms do

[14] Detmeister, Jorento, Massaro, and Peneva (2015) document that households' inflation expectations did not react to the Fed announcing its two-percent inflation target in 2012: median one-year-ahead inflation expectations stayed constant at approximately three percent before and after the announcement.

[15] We also find large revisions in the perceived inflation target from one wave to another (the standard deviation of the revision is 2.8 percent), which is similar in magnitude to revisions in short-term inflation forecasts. These results could also signal weak credibility of the central bank, but this is an unlikely interpretation because inflation

not appear to track *changes* in policies, either. For example, Lamla and Vinogradov (2019) use high-frequency measurement of households' expectations around FOMC decisions and document little knowledge about these decisions on the part of households, as well as weak revision of their expectations in response to the decisions.

The fact that policymakers have to penetrate through a veil of inattention to reach households and firms in advanced economies might seem an insurmountable roadblock for policy communication and hence the management of expectations—but we have a more sanguine take on this matter. First, experimental evidence unambiguously indicates that providing economic agents with relevant information can shape their expectations. For example, Coibion, Gorodnichenko, and Ropele (2020) and Coibion, Gorodnichenko, and Kumar (2018) document that informing firms about current inflation—publicly available information!—significantly moves their expectations. In a similar vein, Coibion, Gorodnichenko, and Weber (2019), Binder and Rodrigue (2018) and others find that providing households with various inflation statistics (e.g., current inflation, inflation forecast, central bank target, FOMC statement)—again, publicly available information—leads to considerable revisions of inflation expectations as well as reduced disagreement and uncertainty about future inflation. One conclusion from this line of work is that even simple messages—as simple as one sentence informing agents about an inflation target or a recent inflation rate—can be much more effective in influencing beliefs than complex statements, a recommendation strongly supported by multiple RCTs (e.g., Haldane and McMahon 2018, Bholat, Broughton, Ter Meer, and Walczak 2019, Kryvtsov and Petersen 2020). Furthermore, to the extent that there is variation in awareness about policy (e.g., people with lower education or IQ scores tend to have worse expectations; D'Acunto, Hoang, Paloviita, and Weber 2019) and in

expectations are highly correlated with the perceived inflation target ($\rho = 0.5$). That is, CEOs believe that the Fed can hit its inflation target.

credibility of sources (e.g., people appear to think that social media is more trustworthy than government sources, which in turn are more trustworthy than newspapers and other conventional media; Coibion, Gorodnichenko, and Weber 2019), one can utilize targeted messages and channels to maximize the power of communication. At the same time, these "verbal" interventions tend to move expectations only for up to six months, thus underscoring the importance of sustained campaigns rather than one-off policy statements. In short, while financial markets and professional forecasters quickly absorb new information from central banks, other agents are less informed, but they do respond when they are provided with relevant information.

Second, there are examples of successful communications campaigns that have moved expectations and outcomes. In addition to famous policy statements (e.g., Mario Draghi's "whatever it takes") that moved financial markets in dramatic ways, we have direct evidence for the ability of policymakers to influence the beliefs of the general public. For instance, D'Acunto, Hoang, and Weber (2018) document that widely publicized policy announcements about future VAT increases in Germany moved inflation expectations and stimulated consumers to buy durable goods. Pedemonte (2020) finds that President Franklin D. Roosevelt was highly successful in using radio—a new technology at the time that allowed direct communication with the public, much like Twitter today—to communicate policy in his fireside chats. Specifically, areas with larger penetration of radio had, *ceteris paribus*, a stronger consumer response to Roosevelt's talks aimed to introduce new policies and to boost optimism.

While there is ample evidence (see Zhuravskaya, Petrova, and Enikolopov (2020) for a survey) that media can have a strong effect on the beliefs (especially political) of the general public, recent evidence suggests that other sources can be even more powerful. First, conventional media have a weaker effect on economic expectations than other sources even if conventional media

contain the same information. For example, Coibion, Gorodnichenko, and Weber (2019) document that providing households with an actual FOMC statement moves inflation expectations twice as much as providing households with *USA Today* (a popular newspaper in the U.S.) coverage of the same statement. Second, as discussed in Coibion, Gorodnichenko, Kumar, and Pedemonte (2020), salient prices such as the price of gasoline, food or domestic currency—easily visible, homogeneous goods—have a disproportionate effect on households' inflation expectations. Prices of recent purchases and the composition of consumption baskets also influence inflation expectations (Cavallo, Cruces, and Perez-Truglia 2017, D'Acunto, Malmendier, Ospina, and Weber 2019), thus suggesting that "local" prices are used to form expectations about aggregate variables.[16] This pattern may provide the basis for targeted communication. Indeed, households and firms can rationally choose to focus on "local" conditions (Maćkowiak and Wiederholt 2009, Afrouzi 2016), but policymakers can tailor their messages to specific audiences and circumstances to utilize this reliance on "local" conditions and influence aggregate inflation expectations.

In short, through the transmission of simple messages, especially about variables that are more transparent or relatable to individuals than aggregate statistics, and the use of social media, which reaches households more directly than traditional media, there is scope for communication strategies to more successfully reach and inform the broader public.

B. Promoting Holistic Policy Messages

A negative association between inflation and the state of the economy in households' (and many firms') expectations presents a potential challenge for policymakers. Even if they are successfully

[16] These "local" effects are also present in firms' expectations. Andrade, Coibion, Gautier, and Gorodnichenko (2020) use a large panel of French firms to document that industry-specific inflation shocks—which by construction have no aggregate implications—are strong predictors of firms' expectations for aggregate inflation. Furthermore, firms exhibit gradual learning about the aggregate conditions from firms' idiosyncratic circumstances. These findings suggest that the "island" model of expectations developed in Lucas (1972) and subsequent work (e.g., Lorenzoni 2009, Angeletos and La'O 2013, Nimark 2014) has empirical support.

able to raise the inflation expectations of, say, households through communications, they may also unintentionally trigger unemployment fears, which can suppress (rather than stimulate) consumer spending via income effects. As a result, a "verbal" intervention aimed to stimulate the economy by raising inflation expectations and thus lowering real interest rates can backfire if unintentional income effects overwhelm the desired intertemporal substitution effects. As illustrated in section III, research has found cases where this was the outcome as well as others where it was not. Ultimately, because inflation is endogenous, when agents learn new information about it, they will make an inference about the broader implications of that information for other economic conditions, which can lead to negative income effects if they believe inflation is driven by supply-side factors.[17]

From a practical point of view, this is similar to "information effects" emphasized in the literature on forward guidance. Campbell, Evans, Fisher, and Justiniano (2012), for example, observed that policy communication can not only reveal a future path of actions (Odyssean effect) but also the current state of the economy (Delphic effect). As a result, policies aimed to stimulate the economy by signaling current or future policy stimulus may be weakened because economic agents may interpret such actions as signaling a poor economy instead. Both information effects and joint inference about inflation and broader macroeconomic conditions mean that policies can have unintended consequences because of how agents interpret them. Since monetary policy is already confusing for the general public, trying to clarify the transmission mechanism is unlikely to be successful in simple messages.

Rare crises present additional challenges. For example, Maćkowiak and Wiederholt (2018) argue that economic agents may have a hard time thinking through the implications of policy

[17] The joint-inference issue is not limited to information about inflation. Coibion, Georgarakos, Gorodnichenko, and Weber (2020), for example, show that providing information to households about interest rates can also lead to large movements in beliefs about inflation.

actions during rare events (such as, e.g., COVID-19) because they do not have the incentive to invest their attention into preparing for such events in normal times. Consistent with this prediction, as well as strong information effects, Coibion, Gorodnichenko, and Weber (2020a) find in a randomized controlled trial that informing households about recent policy actions of the Fed and other government agencies (as of April 2020), as well as basic health facts about COVID-19, has minimal (if any) effect on their expectations for inflation, unemployment, mortgage rates or income. Furthermore, even weak reactions to information treatments about policy actions are effectively nullified when information treatments also include data about COVID-19 infection/mortality rate. Relatedly, Binder (2020) documents that, shortly after the massive cuts in policy rates by the Fed in early March 2020, only approximately a third of households were aware of this policy action. Furthermore, after being informed about the policy, few households (approximately 20-30 percent) revised their beliefs and, conditional on revising beliefs, roughly half of respondents became more pessimistic about unemployment.[18]

We conjecture that a more transparent approach for policymakers may be to transmit simple messages about the broader outcomes they are trying to achieve, what we refer to as "holistic" messaging. For example, when Federal Reserve officials want to raise inflation expectations, they could state that they are "putting in place new policies designed to increase employment and thereby help raise inflation toward more desirable levels." Such a message not only makes it clear that inflation will rise, which should help raise inflation expectations immediately (the desired intertemporal substitution effect), but also that this will happen with

[18] Andre, Pizzinelli, Roth, and Wohlfart (2019) provide an alternative interpretation: many households think that expansionary monetary policy actually reduces output while raising inflation.

higher employment, not lower employment as might otherwise be inferred by households and firms (positive income effect).[19]

A focus on the desired outcomes—rather than on single variables or policies, which leave much to the interpretation of the individual—could help address both information effects and the joint determination of economic beliefs as well as provide economic agents with a guiding narrative to ensure the correct interpretation of policy actions. This is conceptually similar to the recommendation of Angeletos and Sastry (2018) that guidance about targets is likely to be more successful than guidance about instruments when general-equilibrium forces are strong and common knowledge among the public is not guaranteed. Such messages can therefore remain transparent, which is necessary in order to be successfully transmitted to the general public, and achieve the desired outcomes in terms of moving expectations in the right direction. Future work should establish empirically—via RCTs or other research designs—whether this approach is preferable in practice.

V. Concluding remarks

The development of new surveys of firms and households both in the U.S. and abroad is leading to an explosion of research on the nature of the expectations formation process and the role that expectations play in economic decision-making. One result that unambiguously comes out of this research agenda is that expectations matter. They matter for the decisions that agents make, and they matter for policymaking. But the exact nature of how agents form their expectations remains ambiguous, and as a result, so does the best way to communicate with households and firms.

[19] A related, albeit weaker, strategy could be to focus communications only on the real economy, if income effects are stronger than intertemporal effects. We view our strategy as more powerful, as it aims to utilize both effects, but messages relying on income effects could be simpler to implement.

Recent evidence nonetheless makes clear that there is a role for policy communications with the public. While reaching the public may not be easy, it can have significant effects on macroeconomic outcomes and therefore provide an additional tool for policymakers in times of crisis. How to wield that tool effectively must be a central area of future research.

In particular, we suggest that simple, transparent and "holistic" messages to the broader public can break through the veil of inattention. Simplicity and transparency are needed to break through the veil of inattention. A holistic approach is needed to ensure that desired effects are not confounded with unintended income or information effects. This is especially true when it comes to inflation and monetary policy, topics that the public is notoriously uninformed about. Emphasizing the desired outcomes, rather than the instruments or the mechanisms, provides a way to inform in an effective manner.

Communicating with the public remains more of an art than a science. But the science is gradually overtaking the art.

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Table 1. Inflation Forecasts of Firm Managers and Other Agents for the United States.

Survey Date	Recent data	Forecasts								Households with managerial duties (Nielsen)	
		Central Bank		Professional forecasters		Households		Firms			
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Panel A: 1-year inflation											
2018Q2	2.4	2.1	0.15	2.4	0.4	3.1	2.7	3.4	1.7	-	-
2018Q3	2.9	2.0	0.10	2.3	0.4	3.4	3.0	3.3	2.0	-	-
2018Q4	2.5	1.9	0.30	2.3	0.3	3.4	2.8	3.3	1.7	-	-
2019Q1	1.5	1.9	0.10	2.3	0.3	3.0	2.5	3.0	1.4	2.5	2.0
2019Q2	2.0	1.7	0.10	2.1	0.3	2.9	2.6	2.2	1.1	-	-
2019Q3	1.8	1.8	0.18	2.1	0.3	3.1	2.7	2.4	1.0	-	-
2019Q4	1.8	1.9	0.10	2.1	0.3	2.9	2.6	2.1	1.2	-	-
2020Q1	2.5	-	-	2.1	0.4	2.9	2.6	2.3	0.9	3.2	1.8
2020Q2	0.0	1.2	0.35	1.8	0.7	3.2	3.4	2.6	2.2	3.8	3.0
2020Q3	-	-	-	-	-	4.1†	3.4†	2.0†	1.2†	3.5†	2.4†
Panel B: 5- year inflation											
2018Q4	1.6	2.0	0.0	2.3	0.2	2.8	2.2	3.6	1.9	-	-
2019Q4	1.6	2.0	0.0	2.1	0.2	2.6	2.2	2.4	1.1	-	-
2020Q1	2.0	-	-	2.2	0.2	2.8	2.1	-	-	-	-
2020Q2	1.6	2.0	0.0	1.9	0.4	2.9	2.2	-	-	-	-
Panel C: Uncertainty											
2018Q2	-	-	-	1.3	3.7	34.2	33.3	-	-	-	-
2018Q3	-	-	-	0.9	2.4	34.8	32.9	-	-	-	-
2018Q4	-	-	-	0.3	0.6	35.7	33.9	-	-	-	-
2019Q1	-	-	-	1.1	2.9	34.9	34.2	26.0	27.5	25.9	31.2
2019Q2	-	-	-	0.9	2.4	31.7	33.9	-	-	25.7	29.8
2019Q3	-	-	-	0.8	2.1	31.4	34.6	-	-	23.8	28.2
2019Q4	-	-	-	0.6	1.9	-	-	-	-	-	-
2020Q1	-	-	-	0.9	2.8	29.0	31.1	6.9	12.8	29.1	31.1
2020Q2	-	-	-	0.7	3.4	36.7	34.2	-	-	34.0	34.3
2020Q3	-	-	-	-	-	42.5†	36.0†	-	-	41.8†	37.1†

Notes: The table reports mean and standard deviation (SD) for 12-month-ahead inflation expectations (point predictions) as well as actual inflation rate in Panels A and B. Panel C reports mean and standard deviation for the probability that inflation in the next 12 months will be greater than four percent. Data are for the first month of each quarter. Recent data (column 1) shows CPI inflation rate over the last 12 months. Central Bank forecasts (columns 2 and 3) are from Economic Projections of Federal Reserve Board Members and Federal Reserve Bank Presidents. Inflation expectations are reported for PCE inflation. SD in column (3) is the upper end of the central tendency (excludes the three highest projections) minus the lower end of the central tendency (excludes the three lowest projections). 12-month-ahead forecast is constructed as a weighted average of current and next-year projects where weights are the number of quarters from each year one needs to take to cover the next 12 months. Professional forecasters' expectations (columns 4 and 5) are from the Survey of Professional Forecasters. Households' expectations (columns 6 and 7) are from the Michigan Survey of Consumers (MSC), Survey of Consumer Expectations (SCE), and Nielsen Homescan Panel (NHP). Data in Panels A and B are from MSC (2020Q3 results are from NHP). We exclude responses of consumers that are greater than 15 percent or less than -2 percent. Data in Panel C are from the SCE for 2018Q2-2019Q3 and NHP for 2020Q1-2020Q3. Firms' inflation expectations (columns 8 and 9) are from the survey described in Candia, Coibion, and Gorodnichenko (2020). We exclude responses of firms' managers that are greater than 15 percent or less than -2 percent. Uncertainty for firms' managers is measured as the probability that inflation in the next 12 months will be greater than five percent. All moments are computed with equal weights. Data for households with managerial responsibilities (columns 10 and 11) are from NHP. The sample includes households who report any managerial responsibility (supervise people, set prices, etc.). More details are in the notes for Table 2. Moments in columns (10)-(11) of Panel A are computed using Huber-robust methods. † indicates preliminary results.

Table 2. Implied mean, one-year-ahead inflation forecast.

Wave	Statistics	Employed										
		Managerial responsibility										
		Supervise 1 to 10 other people	Supervise 11 to 50 other people	Supervise more than 50 other people	Make decisions about hiring/firing workers	Make decisions about what prices to set	Make decisions about capital expenditures	Make decisions about wages/salaries	Make decisions about marketing or sales	Any	No managerial responsibility	Full sample
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
2019Q1	Share of respondents	10.2	2.7	1.0	4.4	3.1	2.6	2.5	3.7	16.7	36.4	100.0
wave 4	mean	1.3	1.2	0.9	1.5	1.5	1.4	1.4	1.3	1.2	1.7	1.8
03/2019	st.dev.	4.8	5.3	5.8	4.5	5.1	4.6	4.7	4.9	4.9	5.1	5.2
	uncertainty	25.5	27.6	29.1	24.8	27.0	23.1	23.2	24.3	25.9	29.6	30.0
	st.dev. (uncert.)	30.9	32.7	32.6	30.6	32.0	29.9	29.8	30.4	31.2	33.0	33.5
2019Q2	Share of respondents	10.0	2.8	0.9	4.2	3.0	2.6	2.4	3.6	16.6	32.4	100.0
wave 5	mean	1.3	1.0	1.1	1.6	1.7	1.8	1.6	1.6	1.3	1.4	1.5
06/2019	st.dev.	4.4	5.0	4.8	4.3	4.7	4.0	4.1	4.5	4.6	4.8	4.8
	uncertainty	25.5	25.1	28.3	25.2	27.2	23.6	22.8	25.3	25.7	27.8	28.6
	st.dev. (uncert.)	29.4	30.6	29.8	30.9	31.4	30.0	29.3	30.6	29.8	30.9	31.7
2019Q3	Share of respondents	10.7	3.0	1.0	4.8	3.3	3.0	2.8	4.2	17.8	35.3	100.0
wave 6	mean	1.0	0.9	0.8	1.3	1.7	1.4	1.2	1.6	1.0	1.5	1.5
09/2019	st.dev.	4.2	4.4	5.6	4.1	4.1	4.0	4.2	4.0	4.4	4.7	4.7
	uncertainty	23.2	25.2	26.1	23.7	24.6	21.7	22.2	24.7	23.8	28.9	28.9
	st.dev. (uncert.)	28.0	27.8	32.8	29.4	30.5	28.2	28.9	29.3	28.2	30.8	30.8
2020Q1	Share of respondents	10.7	2.9	0.9	4.3	3.1	2.7	2.4	3.9	17.8	34.4	100.0
wave 7	mean	2.2	1.7	2.2	2.5	2.3	2.3	2.4	2.3	2.0	2.1	2.1
01/2020	st.dev.	4.0	4.5	4.1	4.2	3.8	3.7	3.9	4.0	4.1	4.2	4.3
	uncertainty	29.8	28.3	28.8	29.8	27.6	27.4	30.0	28.6	29.1	30.1	30.3
	st.dev. (uncert.)	30.4	31.6	29.2	33.0	31.2	32.1	32.3	32.3	30.7	30.8	31.2
2020Q2	Share of respondents	10.0	3.1	1.1	4.2	3.0	2.6	2.5	3.8	17.3	34.5	100.0
wave 8	mean	2.4	2.3	2.0	2.7	1.9	3.4	2.2	2.4	2.3	2.5	2.4
04/2020	st.dev.	5.3	6.0	5.1	5.1	5.3	4.7	5.3	5.8	5.4	5.6	5.7
	uncertainty	34.2	36.1	36.5	34.0	27.1	34.0	30.5	32.7	34.0	38.0	37.1
	st.dev. (uncert.)	34.3	35.6	31.7	34.1	31.8	35.6	33.9	35.5	34.3	35.0	35.0
2020Q3†	Share of respondents	10.1	2.9	1.2	4.2	3.3	2.9	2.8	4.1	17.8	34.1	100.0
wave 9	mean	3.8	2.9	3.3	4.1	3.8	3.8	4.0	4.0	3.5	3.5	3.4
07/2020	st.dev.	5.3	5.6	5.6	5.2	5.2	4.4	5.5	5.2	5.3	5.3	5.3
	uncertainty	42.3	40.2	47.1	44.3	44.8	42.3	45.8	46.0	41.8	41.8	42.5
	st.dev. (uncert.)	38.3	35.7	37.5	37.8	37.2	36.4	37.3	37.5	37.1	35.5	36.0

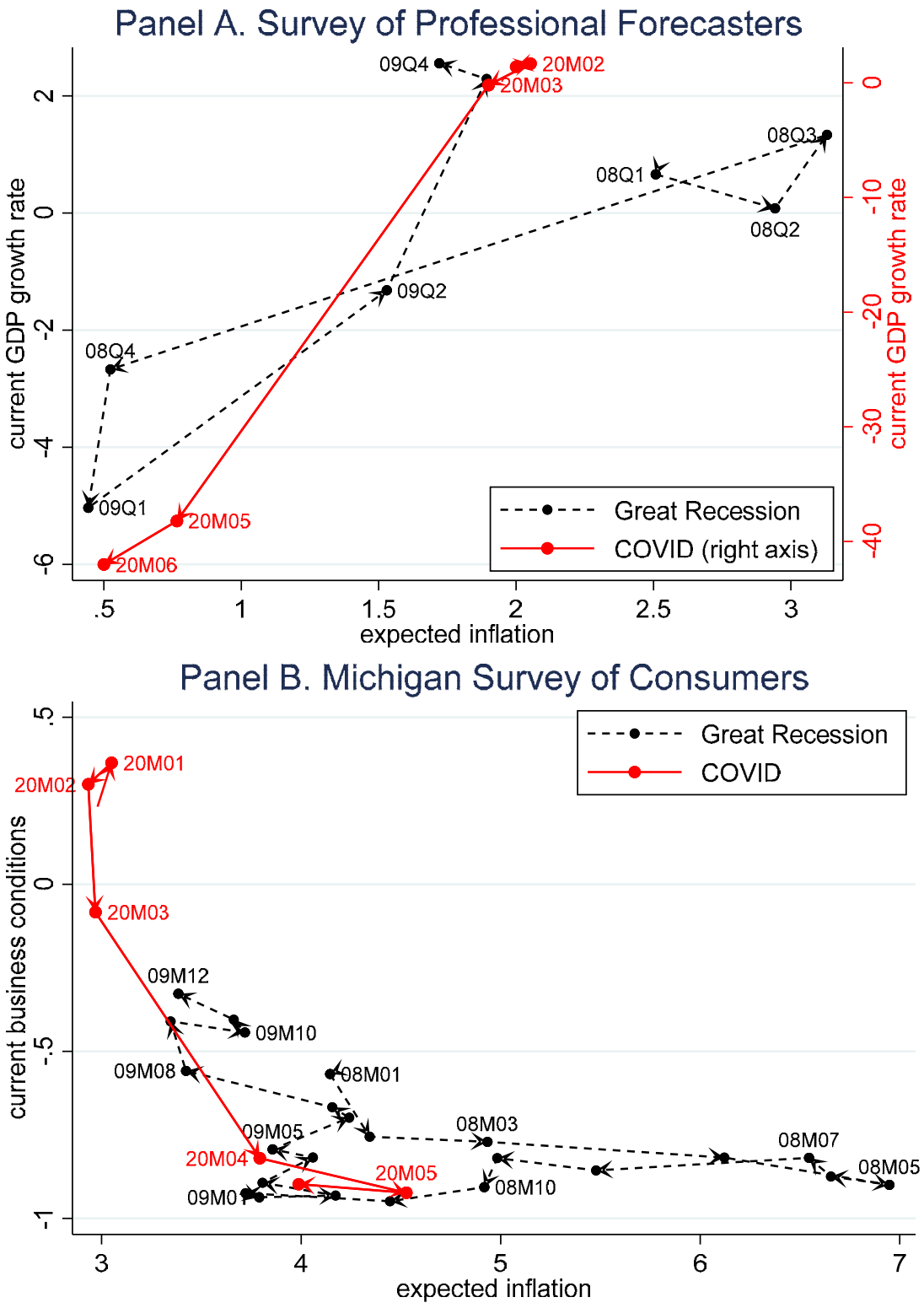
Notes: All results are based on subjective probability distribution for expected inflation (the format of the question follows the SCE). † indicates preliminary results. For each wave, MM/YYYY shows the start month when the survey was fielded. The number of respondents used for this table is 24,885 for wave 4, 28,579 for wave 5, 15,915 for wave 6, 12,092 for wave 7, 6,445 for wave 8, 5,055 for wave 9 (preliminary).

Table 3. Perceived Fed Inflation Target and Managers' Inflation Forecasts.

Perceived Inflation target of the Fed(a)	Share of responses							
	Firms (this paper)			Households (Nielsen Homescan Panel)			Survey of Professional Forecasters	Atlanta Fed BIE
	2018Q2	2019Q2	2020Q2	2018Q2	2018Q3	2018Q4	2019Q4	2017Q2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(-∞, 0.5]	0.23	0.66	4.62	1.45	12.14	8.25	0.00	5.00
(0.5, 1.5]	1.83	7.46	7.57	3.35	3.65	3.12	0.00	4.00
(1.5, 2.5]	22.15	35.75	19.08	16.33	15.29	15.00	85.19	59.00
(2.5, 3.5]	7.08	12.72	6.58	11.30	11.05	11.24	14.81	23.00
(3.5, 4.5]	2.51	3.51	0.33	3.39	5.64	4.97	0.00	2.00
(4.5, 5.5]	3.42	1.54	0.66	6.48	9.01	9.92	0.00	6.00
(5.5, 6.5]	0.46	0.22	0.00	0.70	1.95	1.35	0.00	-
(6.5, 7.5]	0.00	0.00	0.33	0.67	0.88	1.04	0.00	-
(7.5, 8.5]	0.46	0.00	0.00	0.47	1.86	1.69	0.00	-
(8.5, 9.5]	0.00	0.00	0.00	0.19	0.21	0.16	0.00	-
(9.5, +∞)	0.68	0.44	0.00	15.28	38.33	43.26	0.00	-
DNK	55.02	19.52	30.59	40.37	-	-	-	-
NA	6.16	18.20	30.26	-	-	-	-	-

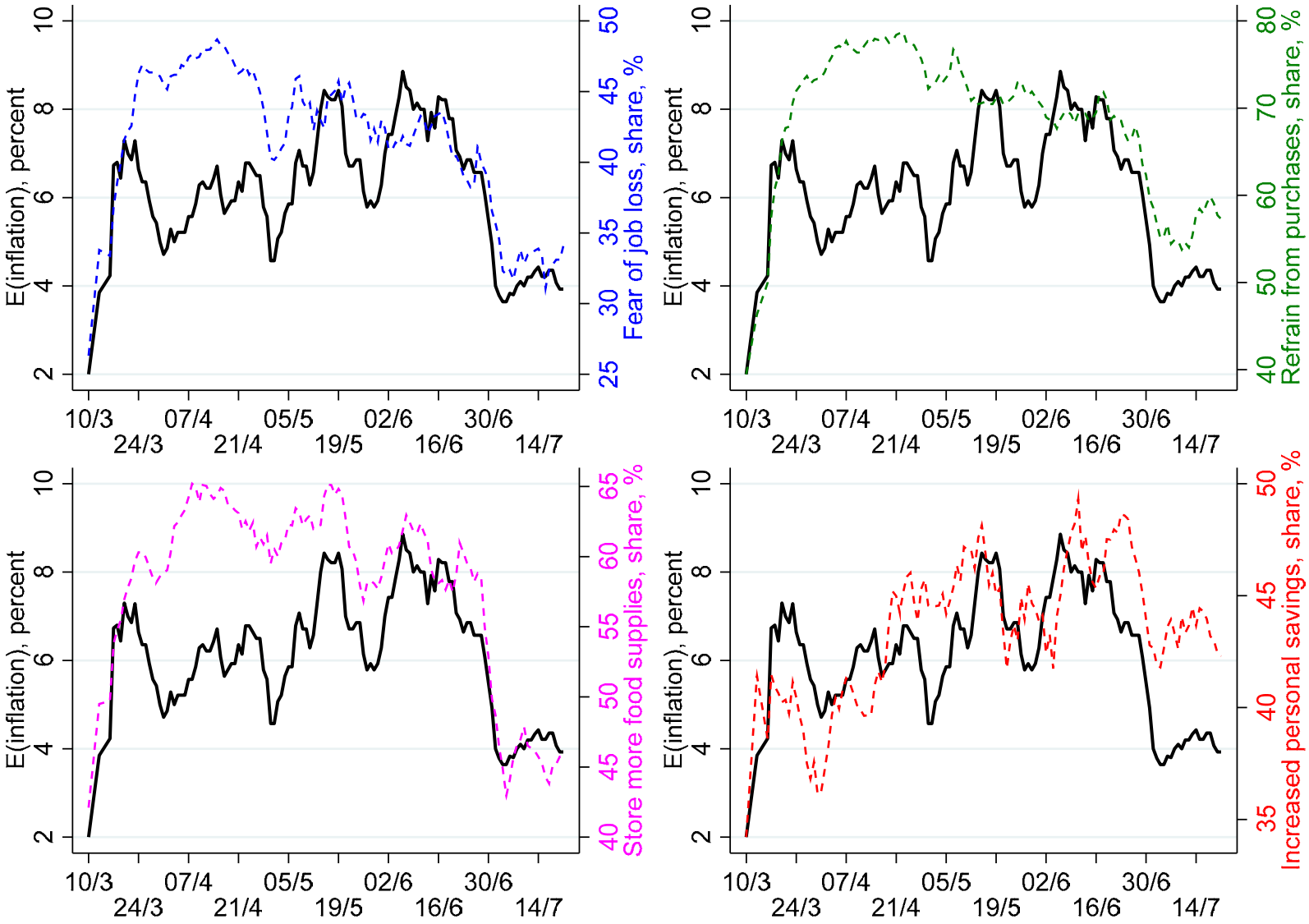
Notes: Results in columns (1)-(3) are from the U.S. surveys of CEOs, see Candia, Coibion, and Gorodnichenko (2020). The survey question is "What annual inflation rate do you think the U.S. Federal Reserve is trying to achieve on average?". Results in columns (4)-(6) are for households participating in the Nielsen Homescan Panel. The survey question is "What is your best guess about the annual inflation rate that the Federal Reserve tries to achieve on average over long periods of time? Please use a percent between -100 and 100)". In the 2018Q2 wave (column 4), households were allowed to choose "do not know" option. In other waves, this option was not available. Column (7) reports the distribution of forecasts for the 5-Year Forward 5-Year Annual-Average CPI Inflation Rate (CPIF5) in the Survey of Professional Forecasters. For the Business Inflation Expectations (BIE) Survey of the Federal Reserve Bank of Atlanta (column 8), the (occasional) survey question is: "What annual rate of inflation (inflation target) do you think the Federal Reserve is aiming for over the long run? Please provide a number in percentage terms." DNK stands for "do not know" or "prefer not to answer." NA stands for "not available" or "unusable response," i.e., a respondent did not provide an estimate or a usable numeric estimate for the inflation target.

Figure 1. Comovement of inflation expectations and economic conditions during recent recessions in the U.S.



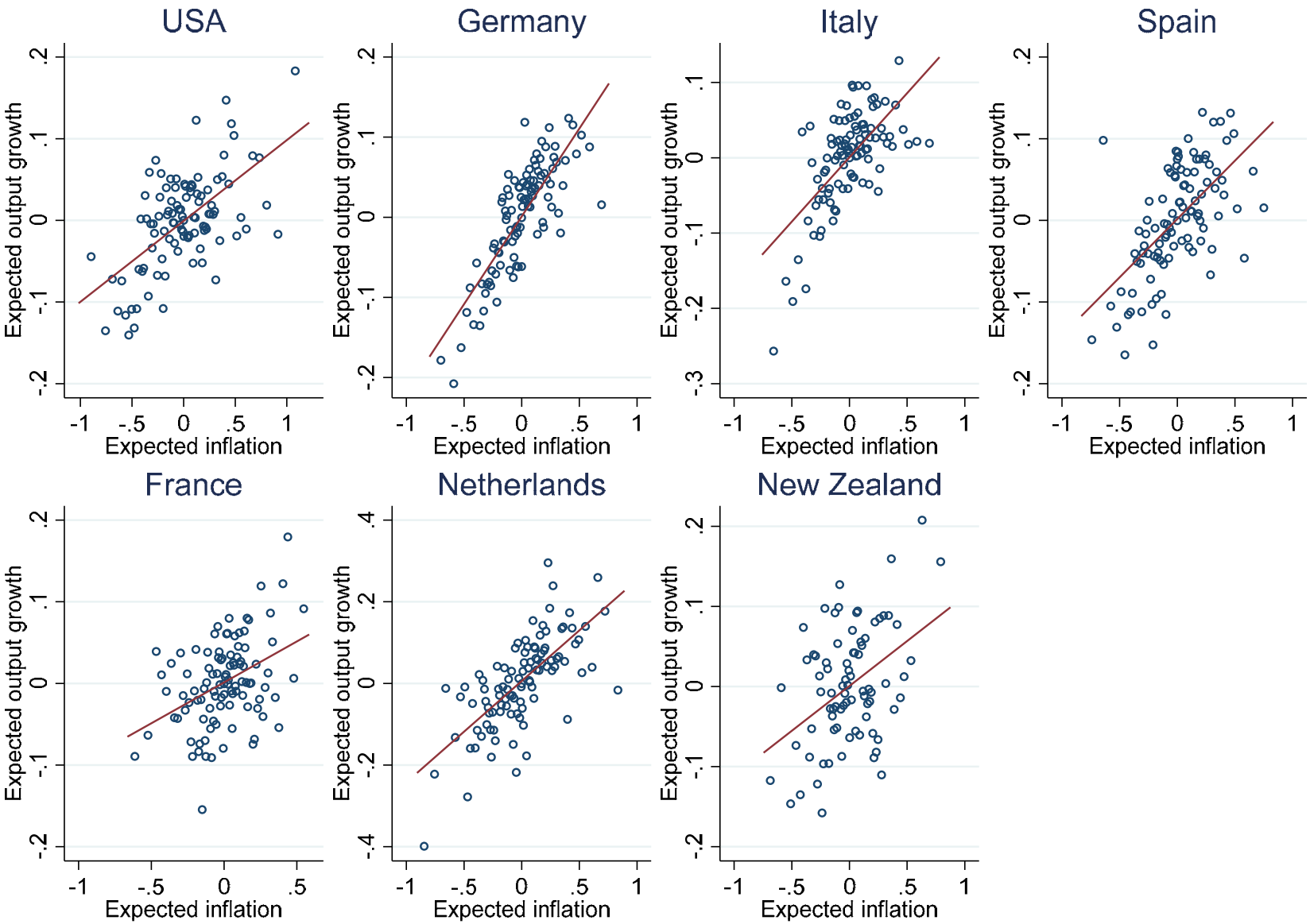
Notes: each point shows average inflation expectations and perceptions of current business conditions at the time of a survey. Arrows indicate the time flow to show the dynamics. Expected inflation is for the one-year-ahead horizon. Panel A: current GDP growth rate measures the annualized growth rate of GDP in the quarter when forecasts are reported. Observations for 2020M3 and 2020M6 are from Consensus Economics, other observations are from the Survey of Professional Forecasters. Panel B: current business conditions are measured as the average response to "Would you say that at the present time business conditions are better or worse than they were a year ago?"; responses are coded as +1 ("better now"), 0 ("about the same"), -1 ("worse now"). The sample is restricted to include responses with expected inflation between -2 and 25 percent.

Figure 2. Comovement of inflation expectations and consumer choices during the COVID-19 crisis in the U.S.



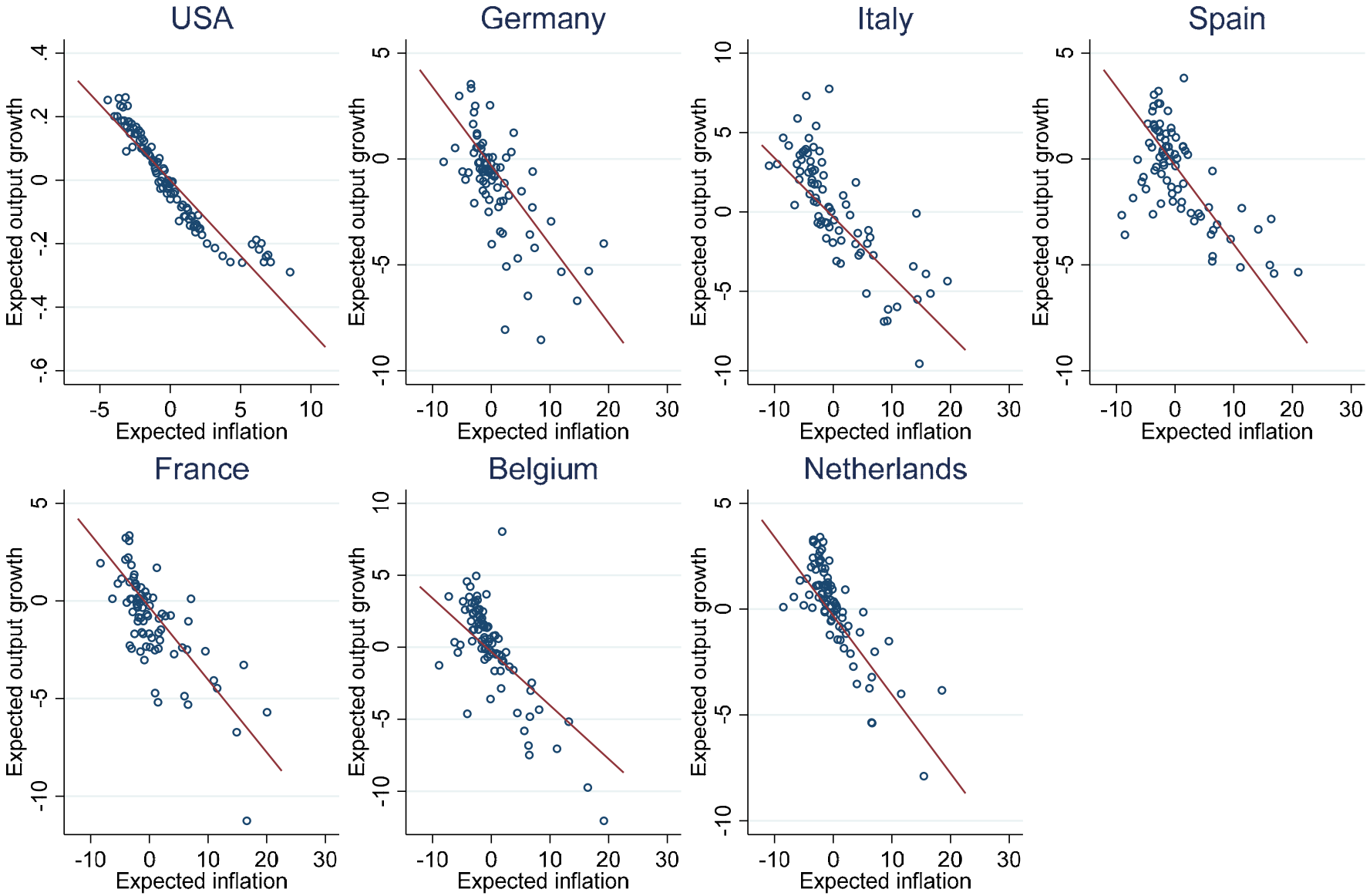
Notes: the figure uses data from the Cleveland Fed's daily survey of households. All time series are 7-day moving averages. In each panel, the black, solid line shows the time-series median for one-year-ahead expectations of inflation. In each panel, the dashed line shows the time series of the share of respondents (in percent) reporting a consumer choice indicated on the right scale.

Figure 3. Joint distribution of inflation and output growth expectations, professional forecasters (Consensus Economics).



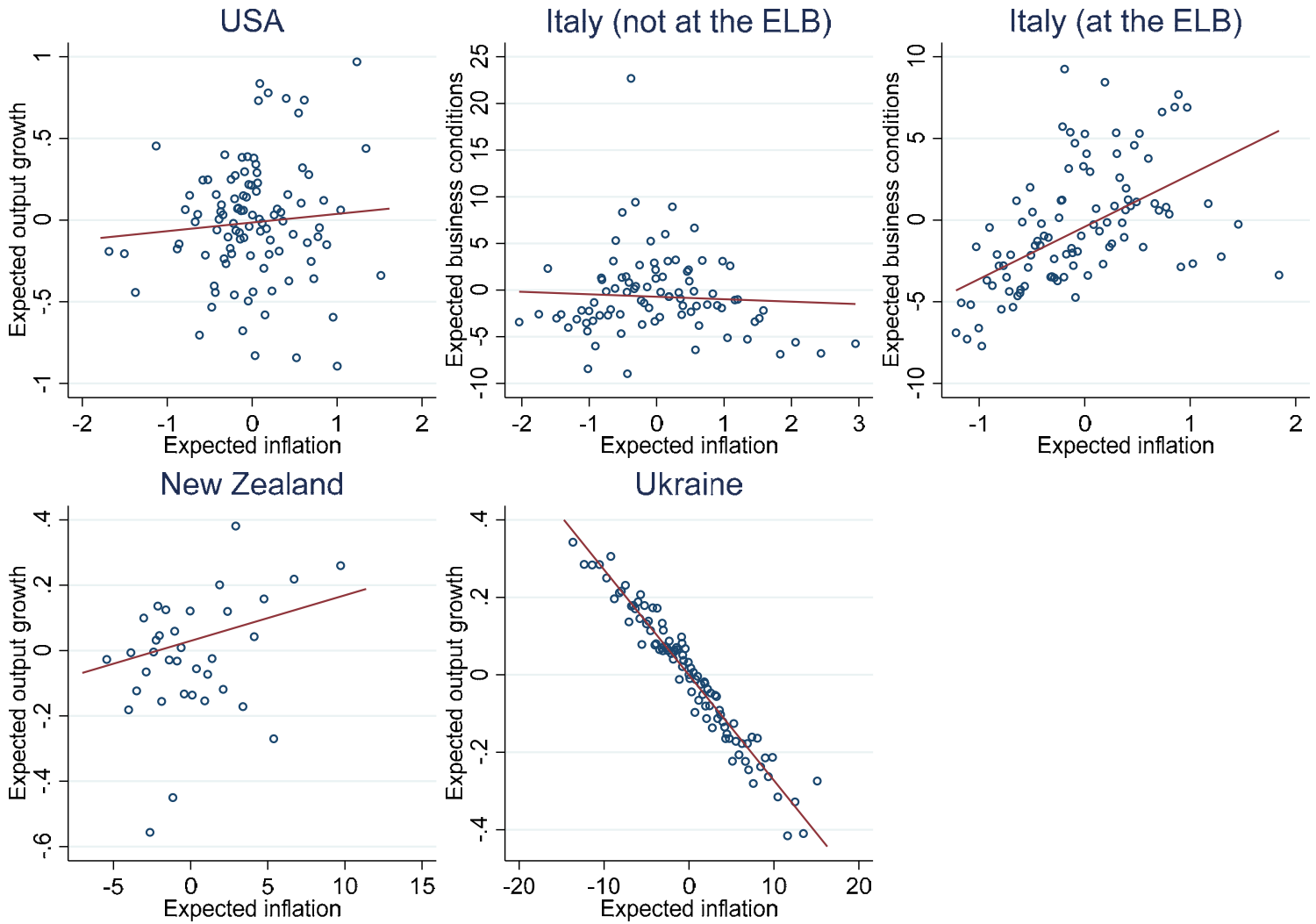
Notes: each panel plots a binscatter for the joint distribution of expectations of output growth rate and inflation in the next calendar year. For each variable, we take out the time×country fixed effect so that all variables are mean zero. The sample period is 2001-2020.

Figure 4. Joint distribution of inflation and output growth expectations, households.



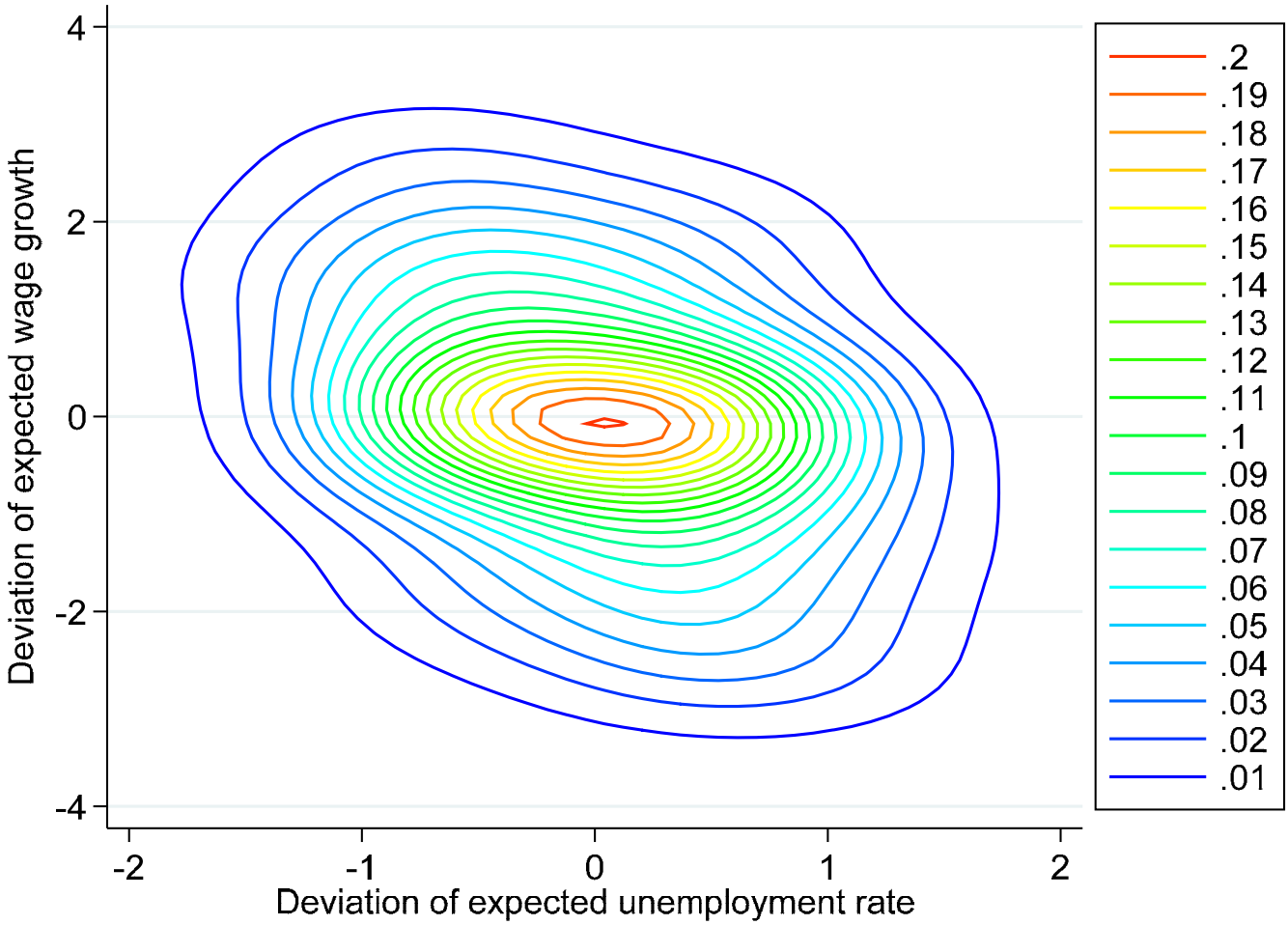
Notes: each panel plots a binscatter for the joint distribution of expectations for output growth rate and inflation in the next calendar year. For each variable, we take out the time×country fixed effect so that all variables are mean zero. The sample period for the US (Michigan Survey of Consumers) is 1978-2020. The sample period for other countries (ECB's Consumer Expectation Survey) is January-June 2020.

Figure 5. Joint distribution of inflation and output growth expectations, firms.



Notes: each panel plots a binscatter for the joint distribution of expectations for output growth rate and inflation in the next calendar year. For each variable, we take out the time×country fixed effect so that all variables are mean zero. Inflation expectations are for the one-year-ahead horizon. United States: output expectations are one-year-ahead predictions for real GDP growth rate. The Livingston survey is the source of the data. The sample is restricted to non-financial corporations. The sample period is 1992-2019. New Zealand: output expectations measure one-year-ahead projections for GDP growth. Coibion, Gorodnichenko, and Kumar (2018) is the source of the data. The sample period is 2014-2017. Italy: output expectations are responses to a multiple-choice question ("What do you think is the probability of an improvement in Italy's general economic situation in the next 3 months?") with size options: zero, 1-25 percent, 26-50 percent, 51-75 percent, 76-99 percent, 100 percent. For each option, we code responses as mid-points of the chosen ranges. Coibion, Gorodnichenko, and Ropele (2020) is the source of the data. The sample period is 2012-2019. Ukraine: inflation expectations are reported as answers to multiple-choice questions (typically 7-9 options; e.g., the bins could be "less than 5%," "5 to 10%," "10 to 15%," …, "more than 40%"). Output expectations are responses to a multiple-choice question ("What changes do you expect in the dynamics for output of goods and services in Ukraine over the next 12 months?") with three options: "increase" (coded as "+1"), "same" (coded as "0"), "decrease" (coded as "-1"). The sample period is 2007-2020. The National Bank of Ukraine is the source of the data.

Figure 6. Joint expectations of wage growth and unemployment rate, firms in New Zealand.



Notes: the figure shows negative correlation in the within-firm joint distribution of subjective expectations for future wage growth and unemployment rate in a survey of firm managers in New Zealand. The figure shows contour maps for the average joint distribution (kernel density) of expected wage growth and unemployment rate. The joint distribution is elicited by asking managers to assign probabilities to each cell in a table of wage-growth and unemployment-rate outcomes (each dimension of the table has a series of bins with a range of possible outcomes). To aggregate distributions across managers, we demean each manager's distribution using his/her implied mean for future wage growth and unemployment rate and then we take an average across managers. The horizontal axis measures deviation of manager *i*'s expectation from his/her mean forecast for unemployment rate over the next 12 months. The vertical axis measures deviation of manager *i*'s expectation from his/her mean forecast for wage growth over the next 12 months. More details are available in Coibion, Gorodnichenko, Kumar, and Ryngaert (2020).