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Author(s): SATEN KUMAR, OLIVIER COIBION, HASSAN AFROUZI and YURIY GORODNICHENKO

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SATEN KUMAR
Auckland University of Technology

OLIVIER COIBION
University of Texas, Austin

HASSAN AFROUZI
University of Texas, Austin

YURIY GORODNICHENKO
University of California, Berkeley

Inflation Targeting Does Not Anchor Inflation Expectations: Evidence from Firms in New Zealand

ABSTRACT Using a new survey of firm managers, we investigate whether inflation expectations in New Zealand are anchored or not. In spite of 25 years of inflation targeting by the Reserve Bank of New Zealand, firm managers display little anchoring of such expectations. We document this finding along a number of dimensions. Managers are unaware of the identities of central bankers or of central banks' objectives, and they are generally poorly informed about recent inflation dynamics. Their forecasts of future inflation reflect high levels of uncertainty and are extremely dispersed, and they are volatile along both short-run and long-run horizons. Similar results can be found for the United States using currently available surveys.

The effects of monetary policy on the economy today depend importantly not only on current policy actions, but also on the public's expectations of how policy will evolve. . . . Indeed, expectations matter so much that a central bank may be able to help make policy more effective by working to shape those expectations.

—Ben Bernanke (2013)

Central bankers increasingly emphasize the importance of the public's expectations. One reason is that unanchored inflation expectations are commonly viewed (Solow 1979) as having played an important role in the Great Inflation of the 1970s and the subsequent large costs of bringing down inflation over the course of the 1980s. Maintaining low and stable "well-anchored" inflation expectations has become a mantra of modern central banking. But with the onset of the zero bound on interest rates, expectations have also taken a new role as a potential instrument of

monetary policy. By trying to raise inflation expectations when they are very low, central bankers can immediately lower real interest rates and thereby stimulate economic activity even when nominal rates are constrained, a strategy actively pursued by the Bank of Japan, for example.

In this paper, we investigate both the question of whether inflation expectations are indeed well “anchored” and whether monetary policies designed to influence inflation expectations are likely to be successful. To do so, we rely primarily on a recent survey of managers of firms in New Zealand, the country that pioneered inflation targeting in 1989. In this survey, we asked managers a wide range of questions about their inflation expectations and their individual and firm’s characteristics as well as their knowledge and understanding of monetary policy. Following Carola Binder (2015), we argue that many of our results extend to the United States using existing survey data. The New Zealand survey fills an important gap in our understanding of expectations. Previously, the only quantitative macroeconomic surveys available were those covering professional forecasters, very large firms, or households. The first two categories of respondents are, obviously, extremely well informed, but the latter tend to be poorly informed. Our survey focuses on decisionmakers within a wide range of firms and therefore provides a much-needed middle ground for assessing the economic knowledge and understanding of individuals who make pricing, hiring, and investment decisions in the economy.

Our results are not favorable to policymakers. Despite 25 years of inflation targeting in New Zealand, managers of firms there have been forecasting much higher levels of inflation than has actually occurred, at both short-run horizons and very long-run horizons. Their average perception of recent inflation is also systematically much higher than actual inflation. There is tremendous disagreement in forecasts among managers, at all horizons, as well as disagreement about recent inflation dynamics. Managers also express far more uncertainty in their inflation forecasts than do professional forecasters.

Other characteristics of firms’ forecasts are also at odds with even weaker definitions of “anchored” expectations. Because managers were surveyed on multiple occasions, one can consider the revisions in their forecasts. One would expect individuals whose forecasts are anchored to display only small revisions in the forecasts they make over time. Instead, we find that managers commonly report large revisions in their forecasts. Similarly, we find that managers who expect high inflation in the short run also tend to expect higher inflation in the long run, whereas the anchoring of expectations around a well-known target should imply little (or at

least much less) co-movement between short-run inflation expectations and longer-run inflation expectations. We show formally that each of these results corresponds to different definitions of anchored expectations, but our data from managers' inflation expectations systematically reject *all* definitions of anchoring that we consider.

How could 25 years of inflation targeting have so little effect on managers' inflation expectations? We find little evidence that managers question the credibility of the Reserve Bank of New Zealand (RBNZ): the vast majority of respondents believe that the central bank can control inflation at both long-run and short-run horizons. However, many respondents display surprisingly little knowledge about the institution itself. When asked who the governor of the RBNZ is, only 30 percent chose the correct answer (out of four possible answers). Very few respondents knew that the RBNZ has inflation targeting in its mandate, and even fewer could name the specific inflation target of the RBNZ. All of this suggests that knowledge about the RBNZ and its objectives remains very limited in New Zealand, even among firm managers.

Those managers who know more about the objectives of the RBNZ have much better information about recent inflation dynamics, make forecasts that are much closer to those of professional forecasters, and have less uncertainty in their inflation forecasts than others. They follow the news more closely than do other managers and report that the news is more important to their business decisions. Significantly, these managers also report that they would be willing to pay much more for inflation forecasts (both in nominal terms and as a share of their firm's sales) than would managers who display less knowledge about monetary policy. This suggests that managers differ in their perceptions of the value of acquiring information about inflation and that these differences are reflected ex post in their knowledge of both the central bank's actions and actual inflation dynamics.

What might explain these differences? Not surprisingly, managers who are more educated have systematically better knowledge of monetary policy. More interestingly, we find that some firm characteristics help predict a manager's knowledge of monetary policy in ways that are intuitive once interpreted in a rational inattention perspective (Sims 2003). For example, when firms face more competitors, managers have more incentive to collect information about economic conditions and tend to make smaller errors about monetary policy. When firms sell a larger share of their products outside of New Zealand, managers have less incentive to track conditions in New Zealand and make larger errors about monetary policy in New Zealand. Olivier Coibion, Yuriy Gorodnichenko, and Saten

Kumar (2015) similarly find that rational inattention motives can account for a nontrivial share of the size of errors that firm managers make about recent inflation dynamics.

While these observable firm characteristics clearly play an important role in accounting for differences in managers' knowledge about monetary policy and inflation, much of the heterogeneity in beliefs remains unexplained. To get at these deeper underlying differences, we conducted a smaller wave of the survey to extract narrative responses from managers about how they form and use their inflation expectations. These responses showed that differences in managers' inflation forecasts and perceptions do not reflect confusion about what inflation means. When asked to define inflation in open-ended questions, almost 90 percent do so correctly. Nor are managers prey to conspiracy theories about statistical agencies misrepresenting inflation numbers: The vast majority report that they believe that statistical agencies correctly measure inflation. They also agree to a surprising extent about inflation rates at the level of individual categories of goods. In fact, they agree *more* with each other about recent price changes for most categories of goods than they do about recent aggregate price changes. We document that the wide disagreement about the latter is instead driven primarily by disagreement among managers about the relative importance of different categories in constructing price indexes (such as weights on house prices versus food prices versus gasoline prices).

We also asked managers about how they form their inflation expectations and what sources of information they use. In open-ended questions, most managers responded (in almost equal proportion) either that they relied on the media or that they relied on their personal shopping experience to inform them about prices. Those for whom the media was the primary source made smaller errors, on average, when asked about recent inflation dynamics. We also asked managers to quantitatively rank a wider set of information sources about inflation. This revealed that while only 20 percent of managers relied on professional forecasts, they had by far the best information about inflation.

Perhaps most strikingly, almost 90 percent of managers rated their personal shopping experience as very or extremely important to them in informing them about inflation, and 76 percent rated gasoline prices the same way. Hence, the vast majority of managers, even those who also follow newspapers and professional forecasts, report that their personal exposure to the individual prices they face (and gasoline prices in particular) plays a large role in accounting for their inflation expectations. The majority of managers also report that the primary use of their inflation expectations is for their personal shopping decisions rather than in

business decisions. The fact that most managers cite their personal shopping experience as both the primary source and the primary use of their inflation knowledge provides one rationale for why managers' expectations resemble those of households and why they disagree so much about the relevant weights to apply to different categories of goods in aggregating across them.

This is not to say that inflation expectations are irrelevant to managers' business decisions. When asked if higher inflation expectations on their part would specifically affect any of their business decisions (such as pricing and wages), most managers report that they would change some element of their business. Coibion, Gorodnichenko, and Kumar (2015) found in an experiment that when managers were presented with information about the central bank's inflation target, they tended to significantly revise their inflation forecasts toward the target, especially if they were initially very uncertain about their forecast. Jointly, these results suggest that if central banks could more successfully communicate their objectives to the firm managers, it would have repercussions on managers' economic decisions. The challenge for monetary policymakers, however, is that most managers currently appear to devote very little effort to tracking macroeconomic information, much less information from the central bank. Very few ever read monetary policy reports, receive Twitter feeds from the RBNZ, or receive other forms of direct communication used by the RBNZ. This absence of even basic knowledge about the central bank of New Zealand on the part of business leaders suggests that monetary policies designed to operate through changes in the public's expectations, as induced primarily through communications policies, are unlikely to be very successful under current conditions.

New Zealand, because of its exceptionally long history of inflation targeting and stable inflation, is a particularly apt place to stage a survey to gauge the extent to which anchoring of expectations can be achieved. Our finding that the inflation expectations of business leaders are no more anchored than those of households in New Zealand is therefore particularly striking, as is the finding that few business leaders are even slightly knowledgeable about monetary policy. But as documented in Binder (2015) and further extended here, many of our results carry over to the United States, at least for the broader population. Using the University of Michigan's Survey of Consumers and the Federal Reserve Bank of New York's Survey of Consumer Expectations, we find all the same patterns in inflation expectations as we previously documented for managers of firms (as well as households) in New Zealand. Expectations in the United States, therefore, appear to be just as unanchored as they appear to be in New Zealand.

In addition, polling data similarly confirm that the public in the United States shows no more knowledge of monetary policy than the public in New Zealand. Americans have great difficulty in identifying the chair of the Federal Reserve Board of Governors and are generally unable to identify recent inflation dynamics with any degree of precision. When asked about inflation over 10 years, few are willing to confidently predict low levels of inflation, a finding that speaks either to the low credibility of the Federal Reserve or, more likely, to the fact that most people do not know what reasonable ranges of inflation rates are. Nor do they seem to show much interest in learning about monetary policy. Twitter and Facebook followers of the entire Federal Reserve System are outnumbered by followers of the FBI and the CIA, and they barely outnumber the followers of former congressman Ron Paul or Senator Rand Paul. Paul Krugman single-handedly has almost twice as many Twitter followers as the entire Federal Reserve System. Google searches confirm this paucity of interest: Online searches for macroeconomic variables like GDP, unemployment rate, and inflation are consistently topped altogether by online searches for puppies.

This paper builds on a growing literature on central bank policies and communication and their effects on expectations, yielding mixed evidence on the degree to which inflation targeting anchors expectations (for example, see the recent survey by Alan Blinder and others [2008]). However, this literature has focused almost exclusively on the expectations of financial markets or professional forecasters, primarily due to data limitations. One particularly remarkable exception is Binder (2015), who uses existing survey and polling data to assess what the U.S. public knows about monetary policy and on whose work we build explicitly. One implication of our results, along with Binder's, is that future theoretical work should focus on models in which different types of agents, such as financial market participants, consumers, and managers, form their expectations differently from one another. Only with this type of model will we be able to fully understand how large the potential benefits might be from anchoring the expectations of consumers and managers.

Also particularly relevant to our work is the seminal firm-level survey of Blinder and others (1998). We closely follow the approach they pioneered, in the sense that we aim to build a nationally representative quantitative survey of firm managers. But while their survey focused primarily on the price-setting decisions and cost structure within U.S. firms, we focus on the expectations of firm managers in New Zealand, as well as on their acquisition of information and their knowledge about monetary policy. This paper also builds on the work of Coibion, Gorodnichenko, and Kumar (2015),

which first utilized the New Zealand survey of firms. We differ from the latter primarily in that we focus on previously unexplored survey questions bearing on managers' knowledge of monetary policy. We also make use of a new wave of the survey that extracts, among other new questions, narrative answers from managers about the formation of their expectations.

Finally, our work relates closely to the literature on the nature of the formation of expectations among different economic agents. This literature explores the need for moving beyond the assumption of full-information rational expectations. Robert Lucas (1972), Greg Mankiw and Ricardo Reis (2002), Michael Woodford (2003), Christopher Sims (2003), Gorodnichenko (2008), Bartosz Mackowiack and Mirko Wiederholt (2009), and Fernando Alvarez, Francesco Lippi, and Luigi Paciello (2011) all provide models that explore the implications of different ways of incorporating deviations from full-information rational expectations. Empirically, such deviations have already found repeated support. Mankiw, Reis, and Justin Wolfers (2004), for example, emphasize the time variation in disagreement across agents, while Coibion and Gorodnichenko (2012, 2015a) emphasize the predictability in different agents' forecast errors. Philippe Andrade and Hervé Le Bihan (2013) provide evidence that European forecasters update their forecasts infrequently and in a manner consistent with imperfect-information models. Christopher Carroll (2003) argues that information diffuses only gradually from professional forecasters to households. The direct evidence in this paper on how little firm managers know about the weights applied to different categories of goods in measuring aggregate price levels or about the inflation target of the RBNZ confirms that, at least for these agents, full information is also likely a poor approximation.

This paper is organized as follows. In section I we describe the survey. In section II we present evidence on the degree to which managers' expectations in New Zealand are anchored. In section III we study how much firm managers in New Zealand know about monetary policy. In section IV we focus on the sources of the differences in managers' inflation perceptions and forecasts, and in section V we extend those results to the United States. Section VI concludes.

I. Description of the Survey

We implemented a quantitative survey of firm managers' expectations about macroeconomic conditions in New Zealand, a comprehensive description of which may be found in Coibion, Gorodnichenko, and Kumar (2015). In this paper we discuss only the key features of the survey.

We executed the survey in five waves between September 2013 and August 2015. The first and largest wave was conducted between September 2013 and January 2014. After contacting around 15,000 firms, we attained a response rate of around 20 percent, and then recruited a sample of 3,153 firms to participate. Subsequent waves were accomplished by recontacting firms from the first wave. The second wave, implemented between February and April 2014, received 714 responses. The third and fourth waves, conducted in August–September 2014 and December 2014–January 2015, received 1,607 and 1,257 responses, respectively. In August 2015, we implemented a much smaller fifth wave (50 firms), aiming to collect responses to open-ended questions.

The main survey (first wave) focused on collecting a wide range of information on the characteristics of the firms, their price-setting decisions, and their expectations about recent and future inflation. Follow-up waves included some repeat questions from the main survey as well as new questions. The second wave, for example, not only asked firms about their beliefs of inflation but also about other macroeconomic indicators such as real GDP growth, unemployment, and interest rates. The third wave focused on collecting individual characteristics of the respondents, and the fourth wave explored how managers acquire and process new information. The smaller, fifth wave explored views on central bank credibility and knowledge about inflation and asked respondents to give narrative answers. With the exception of a handful of cases, the survey collected responses across waves from the *same* person within a given firm.

Firms were randomly chosen from four broad industries: manufacturing, retail and wholesale trade, construction and transportation, and professional and business services.¹ Phone interviews were done with the

1. The firm names and their basic details were purchased from the Kompas New Zealand and Knowledge Management Services databases. Prior to acquiring these, we used Statistics New Zealand data for 2012 to compute the proportion of firms that fall into each employment size group (6 to 19 workers, 20 to 49 workers, and more than 50 workers) for each sector so that we could match our population with the population of firms in the economy. For example, in the manufacturing industry in 2012, around 67 percent of firms had 6 to 19 workers, 21 percent had 20 to 49 workers, and 12 percent had more than 50 workers. Our survey population in the manufacturing industry contained similar proportions. For other industries, their respective employment size proportions were computed and our population was constructed accordingly.

general managers² approximately 10 days after the questionnaires had been emailed to them. Since manufacturing and professional and business services account for relatively large shares of GDP (according to 2012 Statistics New Zealand data), we aimed to have two-thirds of our sample from these two industries. The remaining third is a combination of firms from other industries. We excluded from the sample industries related to the government, community service, agriculture, fishing, mining, energy, gas, and water, since objectives and constraints of firms in these industries may differ from those of other firms due to differences in governance, regulation, and so on. The combined employment of firms in our sample represents about 5 percent of total employment in New Zealand. While our sample is not drawn to be perfectly representative of the New Zealand economy, we can use sampling weights to adjust for the size distribution of firms and the industrial composition.³ For the smaller, fifth wave, we first grouped firms into four bins based on their inflation forecasts (0 to 3 percent, 4 to 6 percent, 7 to 10 percent, and more than 10 percent) in the previous waves. We then randomly selected firms from each group. Each group includes a similar number of firms and they are broadly representative of industry and size composition of firms in the overall sample.

The survey is unique both in its breadth of coverage and in the quantitative nature of the questions asked. While many surveys of firms exist, most tend to ask only qualitative questions. The few that ask quantitative questions tend to survey only a small and very unrepresentative group. For example, the RBNZ conducts a quarterly survey (namely, its Survey of Expectations) of a sample of economists and business and industry leaders. That survey started in the late 1980s, and its objective was to

2. Our objective was to contact top-level leaders at each firm. Of all respondents in our surveys, 97 percent are classified as managers, a category that includes managers, managing directors, directors, chief executive officers, and principal legal executives. The other respondents (3 percent) are marketing officers, industrial relations executives, product development officers, and so on.

3. See Coibion, Gorodnichenko and Kumar (2015) for more details, such as response rates, for each wave of the survey. Using sample weights makes little difference for our results. See table 1 and online appendix table A1. The distribution of firms by size across industries in the sample and in the population is given in online appendix tables A2 and A3. Online appendixes for papers in this volume may be found at the Brookings Papers web page, www.brookings.edu/bpea, under "Past Editions."

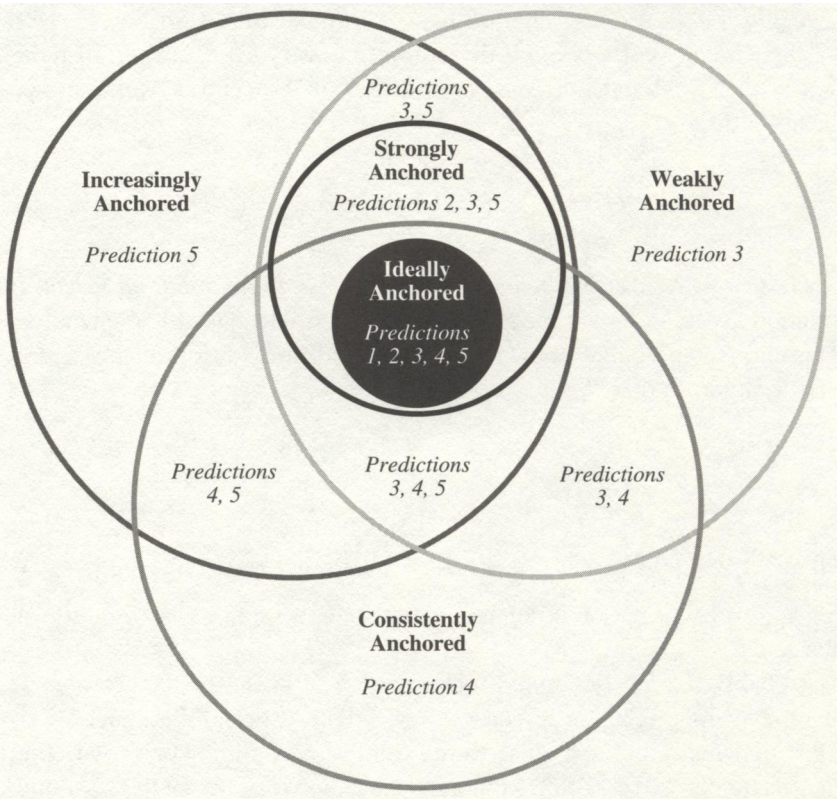
establish a database that might be useful for policy and research. Lars Svensson (2015) notes that inflation expectations reported in the RBNZ survey have been only slightly above actual levels of inflation for much of the inflation targeting period. However, the survey suffers from several issues. First, its sample size is very small and targets respondents mainly from the financial and business services industry.⁴ Second, it is not purely at the firm level, since it also includes professional economists, market analysts, and public commentators, albeit those individuals make up a low proportion of the total. Third, the firms involved are typically very large ones, which is not at all representative of the New Zealand economy. For example, while firms with more than 100 employees represent less than 1 percent of all firms in New Zealand, they account for nearly all participants in the Survey of Expectations. Lastly, the sample is not random but, instead, is largely convenience-based.

II. Are Managers' Inflation Expectations Anchored in New Zealand?

Because there is no widely agreed-upon definition of “anchored” expectations, we consider five characteristics of inflation expectations that one expects to observe depending on the specific definition or extent of anchoring of expectations. As we show below, these predictions allow us to test five distinct definitions of anchored expectations, some of which are stronger than others. The first characteristic is average beliefs being close to the inflation target of the central bank. The second is beliefs not being too dispersed across agents. The third characteristic is that agents should be fairly confident in their forecasts and display little uncertainty, especially over the long run. Fourth, revisions in forecasts should tend to be small, especially at longer horizons. Fifth and finally, there should be little co-movement between long-run inflation expectations (which should be pinned down by the inflation target) and short-run inflation expectations (which should move with transitory shocks). In this section we assess each of these five predictions in turn and relate them to specific definitions of anchored inflation expectations. Figure 1 illustrates how the definitions are related to each of the five predicted characteristics in Venn diagram form.

4. The breakdown of the sample in the last quarter (2015Q2) is as follows: 91 respondents from financial and business services; 11 respondents from agriculture; 4 respondents from labor; and 8 respondents from other industries.

Figure 1. Definitions of Anchored Expectations and Associated Predictions^a



a. This diagram shows how the five definitions of anchored expectations, and their predictions, relate to one another. Causality is established in the sense that if expectations are ideally ϵ_τ -anchored for all $\tau \geq 0$ given an arbitrary sequence of $\{\epsilon_\tau\}_{\tau=0}^\infty$, then expectations are also strongly, weakly, consistently, and increasingly anchored according to $\{\epsilon_\tau\}_{\tau=0}^\infty$, up to a scale.

For concreteness, suppose we have a measure of agents indexed by $i \in [0,1]$. Let π_t denote inflation in this economy at time t . Let $F_{t+\tau|i}^i(\cdot)$ be the cumulative distribution function of i 's time t belief about inflation at horizon $\tau \in \{0, \pm 1, \pm 2, \dots\}$. Finally, let π^* be the central bank's inflation target. In this model, we only focus on bounded domain distributions for individuals, first because it is a reasonable assumption that no one assigns positive probability to infinite inflation or deflation, and second because it makes the analysis more intuitive. Nevertheless, the results can be extended to unbounded distributions with proper adjustments of definitions. Proofs for all lemmas and propositions that relate the definitions with predictions may be found in the online appendix.

II.A. Ideally Anchored Expectations

Definition 1. We say inflation expectations at time t for any horizon $\tau \geq 0$ are *ideally ε -anchored* if the support of every agent's belief of inflation at that time and horizon lies within ε of the central bank's target, meaning that

$$F_{t+\tau|t}^i(\pi^* + \varepsilon) - F_{t+\tau|t}^i(\pi^* - \varepsilon) = 1, \forall i \in [0, 1].$$

Prediction 1: Average beliefs should be close to the inflation target. If inflation expectations at time t for any horizon $\tau \geq 0$ are ideally ε -anchored, then the average belief about inflation should lie within ε of the central bank's target, so that

$$\text{bias}_{t+\tau|t} \equiv \left| \overline{\pi_{t+\tau|t}} - \pi^* \right| < \varepsilon,$$

where $\overline{\pi_{t+\tau|t}} = \int_0^1 \pi_{t+\tau|t}^i di$ is the average belief across agents and $\pi_{t+\tau|t}^i \equiv E_t^i\{\pi_{t+\tau}\} = \int_{\mathbb{R}} x dF_{t+\tau|t}^i(x)$ is agent i 's time t expectations of inflation at horizon τ .

Probably the most common interpretation of anchored expectations is that the average inflation forecast across agents, especially at longer horizons, remains stable and close to the central bank's inflation target (Ball and Mazumder 2014). Table 1 reports the average forecasts at the 12-month and the 5-to-10-year horizons for New Zealand firms in each survey for which these forecasts are available, as well as average managers' beliefs about inflation over the preceding 12 months. For comparison, we also report forecasts from the RBNZ, professional forecasts from Consensus Economics, and household forecasts from the Survey of Households produced by the RBNZ.

For each forecast horizon, firm managers' forecasts significantly exceed the inflation target as well as the forecasts of all other agents. They even exceed the forecasts of households, at least at 12-month horizons although not at long horizons.⁵ Nor does the average manager forecast

5. The RBNZ first asks households if they understand what inflation means. Only those households who do (approximately half) are then asked to provide inflation forecasts. In the firm survey, all firm managers are asked to provide inflation forecasts. However, as documented in section IV, most managers can correctly explain the meaning of inflation.

Table 1. Inflation Forecasts of Firm Managers and Others for New Zealand, 2013Q4–2014Q4^a

Survey date	Recent data ^c (1)	Central bank (2)	Forecasts ^b								Nowcasts/Backcasts ^d			
			Professional forecasters		Households		Firms		Mean (9)	SD (10)	Mean (11)	SD (12)		
			Mean (3)	SD (4)	Mean (5)	SD (6)	Mean (7)	SD (8)						
1-year inflation														
2013Q4	1.5	1.3	2.0	0.2	3.4	2.0	5.3	3.1	2.9	1.8	4.8	3.5	3.3	3.3
2014Q1	1.5	1.9	2.0	0.3	3.6	1.8	5.9	2.8	2.9	1.6	5.3	n.a.	n.a.	2.5
2014Q3	1.6	1.6	1.9	0.2	3.5	2.2	4.3	2.5	2.9	1.9	n.a.	4.3	4.3	2.5
2014Q4	1.0	1.1	1.7	0.3	3.1	1.9	4.7	2.8	2.8	1.8	4.3	4.3	4.3	2.5
5-to-10-year inflation														
2014Q3	2.1	2.1	2.1	n.a.	4.1	2.8	3.4	2.4	—	—	—	—	—	—

Source: Consensus Economics, and the RBNZ's Survey of Households and Monetary Policy Reports.
a. Consistent with how the RBNZ calculates moments of household expectations, we exclude responses of firms' managers that are greater than 15 percent or less than -2 percent. Results for nontruncated data are reported in the online appendix table A1. Moments for firms are calculated without weights. Results with sample weights are also reported in the online appendix table A1. Standard deviations are expressed as percentage points, and all other values are expressed as percents.
b. Reports inflation forecasts of the RBNZ (column 2), mean forecasts from surveys, and the cross-sectional standard deviations of these forecasts (columns 3–8).
c. Reports most recently available inflation data at the time of the surveys.
d. Reports nowcasts/backcasts of inflation over the last 12 months.

appear particularly stable over time. Over the course of 2014, the average 1-year-ahead forecast of inflation fell by anywhere between 0.6 percentage point and 2.2 percentage points, depending on how one truncates the sample.⁶ In contrast, professional forecasters, on average, reduced their forecasts by 0.3 percentage point over the same period, and households reduced them by 0.4 percentage point. While one must bear in mind the short time frame, this survey evidence suggests that the average forecast across firms is neither close to the inflation target nor stable over time.

It is possible that managers' average inflation beliefs were temporarily driven higher in New Zealand at the time of the survey by transitory changes in economic conditions that disproportionately affected their expectations relative to those of central bankers and those of households. For example, a boom in commodity prices could have raised inflation expectations temporarily. A weaker definition of anchored expectations could allow for time variation in average beliefs, but restrict the cross-sectional distribution of those beliefs.

II.B. Strongly Anchored Expectations

Definition 2. We say inflation expectations at time t for any horizon $\tau \geq 0$ are *strongly ε -anchored* if the support of every agent's inflation expectations at that time and horizon lies within ε of the average belief, so that,

$$F_{t+\tau|t}^i(\overline{\pi_{t+\tau|t}} + \varepsilon) - F_{t+\tau|t}^i(\overline{\pi_{t+\tau|t}} - \varepsilon) = 1, \forall i \in [0, 1].$$

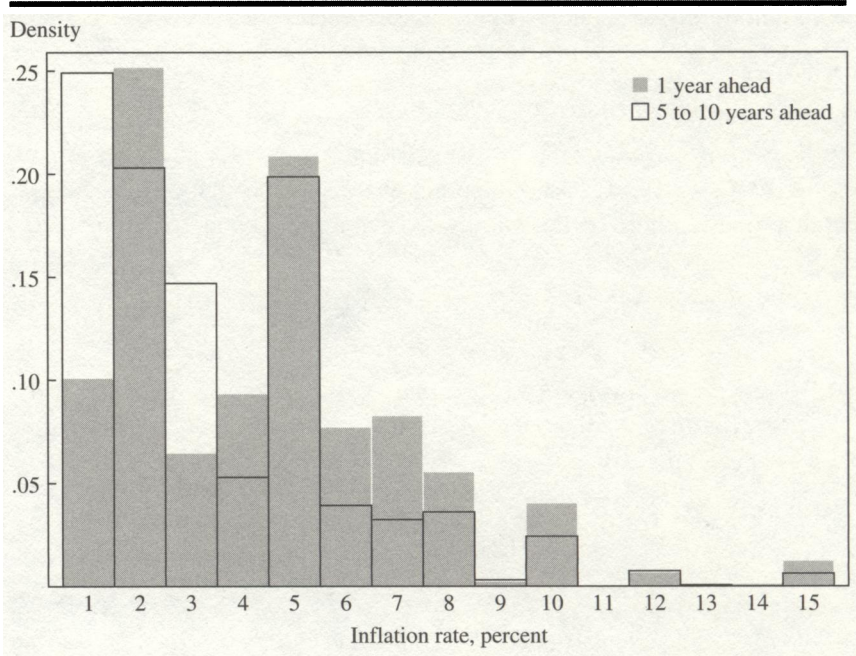
Prediction 2: Beliefs should not be too dispersed across agents. If inflation expectations at time t for horizon τ are strongly ε -anchored, then the dispersion of agents' beliefs about inflation should be less than ε , meaning that

$$sd_{t+\tau|t} \equiv \left[\int_0^1 (\pi_{t+\tau|t}^i - \overline{\pi_{t+\tau|t}})^2 di \right]^{\frac{1}{2}} < \varepsilon.$$

Lemma 1. If inflation expectations are ideally $\varepsilon/2$ -anchored, then they are strongly ε -anchored.

6. The RBNZ's survey of households drops all forecasts above 15 percent and below -2 percent. Our "truncated" sample applies the same restrictions, whereas our full sample includes all forecasts.

Figure 2. Distributions of Inflation Forecasts^a



Source: Authors' survey of New Zealand firms.
a. Reports the distribution of 1-year-ahead and 5-to-10-years-ahead inflation forecasts in the third wave of the survey (2014Q3). The survey questions are: "During the *next twelve months*, by how much do you think overall prices in the economy will change? Please provide an answer in percentage terms." and "Over the next five to ten years, at what average percentage rate *per year* do you think that overall prices in the economy will be changing?"

Note that, as established by lemma 1, this is a weaker definition of anchored expectations. Table 1 reports the cross-sectional standard deviation in inflation forecasts at the same horizons as before. The dispersion in managers' 12-month-ahead inflation forecasts exceeds the dispersion among households every quarter, which is already an order of magnitude larger than that of professional forecasters. Hence, there is little concentration of managers' beliefs about one-year inflation forecasts. The distribution of forecasts for inflation at the 5-to-10-years horizon is illustrated in figure 2. While approximately 20 percent of managers forecasted a 2 percent rate, consistent with the RBNZ's long-run target, another 20 percent picked a much higher long-run forecast of 5 percent, and another 20 percent predicted that inflation over the next 5 to 10 years would average between 5 and 10 percent. This dispersion in beliefs about long-run inflation is particularly difficult to reconcile with anchored inflation expectations.

We now consider three additional predicted characteristics and associated definitions of anchored expectations, each of which is conceptually distinct and weaker than strongly ε -anchored expectations.

II.C. Weakly Anchored Expectations

Definition 3. We say inflation expectations at time t for any horizon $\tau \geq 0$ are *weakly ε -anchored* if the support of every agent's inflation expectations at that time and horizon lies within ε of that agent's belief, meaning that,

$$F_{t+\tau|t}^i(\pi_{t+\tau|t}^i + \varepsilon) - F_{t+\tau|t}^i(\pi_{t+\tau|t}^i - \varepsilon) = 1, \forall i \in [0, 1].$$

Moreover, we say agent i is *ε -confident* of her forecast/backcast if her own perception of the degree to which her inflation expectation has varied is less than ε^2 , that is:

$$E_i \{ (\pi_{t+\tau} - \pi_{t+\tau|t}^i)^2 \} < \varepsilon^2.$$

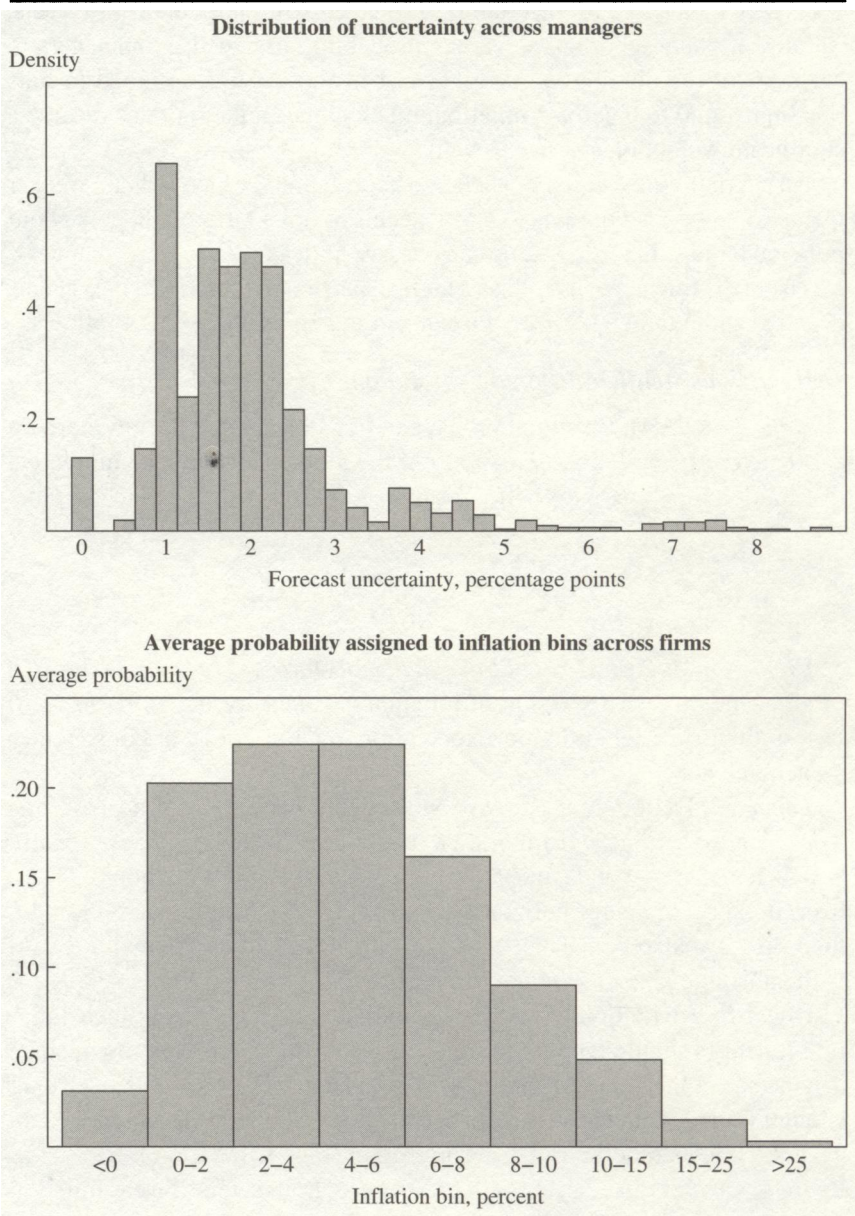
Prediction 3: Agents should show confidence in their forecasts. If inflation expectations are weakly ε -anchored for a given time and horizon, then all agents are ε -confident of their forecasts.

Lemma 2. If inflation expectations are ideally or strongly $\varepsilon/2$ -anchored, then they are also weakly ε -anchored.

Under weakly anchored expectations, we now make no restrictions about agents having similar beliefs about long-run inflation or the central bank's target. Instead, the notion of targeting is now that each agent should be confident that inflation will be stabilized around whatever value each agent believes is the target. That is, one should perceive little risk of either high or low inflation in the future, so that the range of possible outcomes for inflation considered realistic by agents should be quite limited. Lemma 2 shows that this notion of anchoring is weaker than the previous two definitions.

In the fourth wave of the survey, we asked managers to assign probabilities to a wide range of possible inflation outcomes, allowing us to characterize the degree of uncertainty in their forecasts. From these distributional answers, we computed the standard deviation of each manager's forecast, and we report the distribution of these standard deviations in the upper panel of figure 3. The average standard deviation is 2 percentage points, so the firm managers on average report a lot of uncertainty around their

Figure 3. Uncertainty in Managers' Inflation Forecasts^a



Source: Authors' survey of New Zealand firms.
a. The survey question asks managers to assign probabilities to nine bins. For each respondent, we construct a measure of uncertainty as the standard deviation of the reported distribution.

forecasts. As the upper panel also makes clear, there is considerable heterogeneity in the degree of uncertainty associated with individuals' forecasts. The lower panel reports the average probability assigned by managers to each bin of the distribution. While most of the mass is assigned to bins ranging from 0 to 6 percent inflation, much higher inflation rates receive a significant weight on average as well.

An alternative definition of anchored expectations, which is again weaker than strongly ε -anchored, is to allow agents to have different beliefs about inflation targets. In this case one can observe both a mean forecast that deviates from the true target as well as a high dispersion in forecasts (since agents disagree about targets). This is formalized in definition 4, which follows.

II.D. Consistently Anchored Expectations

Definition 4. We say inflation expectations of agent i for any horizon $\tau \geq 0$ are *consistently ε -anchored* at t , if the total change in the cumulative distribution function of his belief from $t - 1$ to t is less than ε in magnitude:

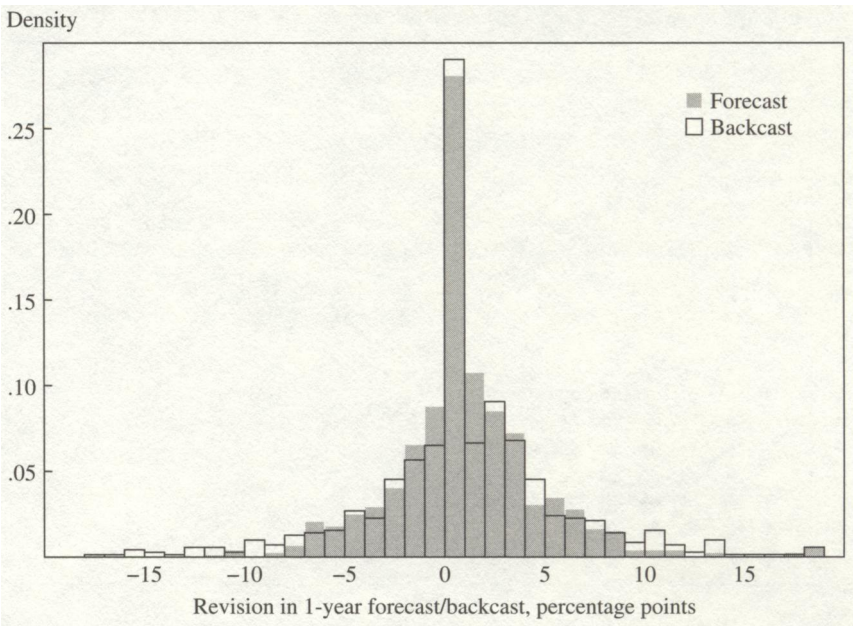
$$\int_{\mathbb{R}} |F_{i+\tau|t}^i(x) - F_{i+\tau-1|t-1}^i(x)| dx < \varepsilon.$$

Prediction 4: Agents should display small forecast revisions. The size of an agent's forecast revision of inflation at time t for any horizon $\tau \geq 0$ is less than ε if her inflation expectation for horizon τ is consistently ε -anchored at t .

Lemma 3. Define forecast revision for agent i at time t for horizon τ as $FR_{i+\tau|t}^i = \pi_{i+\tau|t}^i - \pi_{i+\tau-1|t-1}^i$. If inflation expectations for horizon τ are ideally $\varepsilon/2$ -anchored at $t - 1$ and t , then they are also consistently ε -anchored. Moreover, if expectations for horizon τ are strongly $\varepsilon/2$ -anchored at $t - 1$ and t , then they are also consistently $(\varepsilon + \delta')$ -anchored where $\delta' \equiv \left| \int_0^1 FR_{i+\tau|t}^i di \right|$ is the absolute size of average forecast revision across agents.

Under this definition of anchoring, individuals' revisions in their inflation forecasts should tend to be small, as established in prediction 4, since agents expect the central bank to be able to keep inflation stable over long enough horizons. Because our survey includes a panel dimension, we can examine this prediction using revisions in managers' inflation forecasts. In figure 4, we plot the distribution of revisions of managers' 1-year inflation forecasts along with (for comparison) the distribution of revisions in their views about inflation over the previous 12 months. While one might expect the latter to display significantly more dispersion, the figure illustrates that the dispersion in revisions of forecasts at the 1-year horizon is almost as

Figure 4. Revisions of Managers' One-Year Inflation Forecasts and Backcasts



Source: Authors' survey of New Zealand firms.

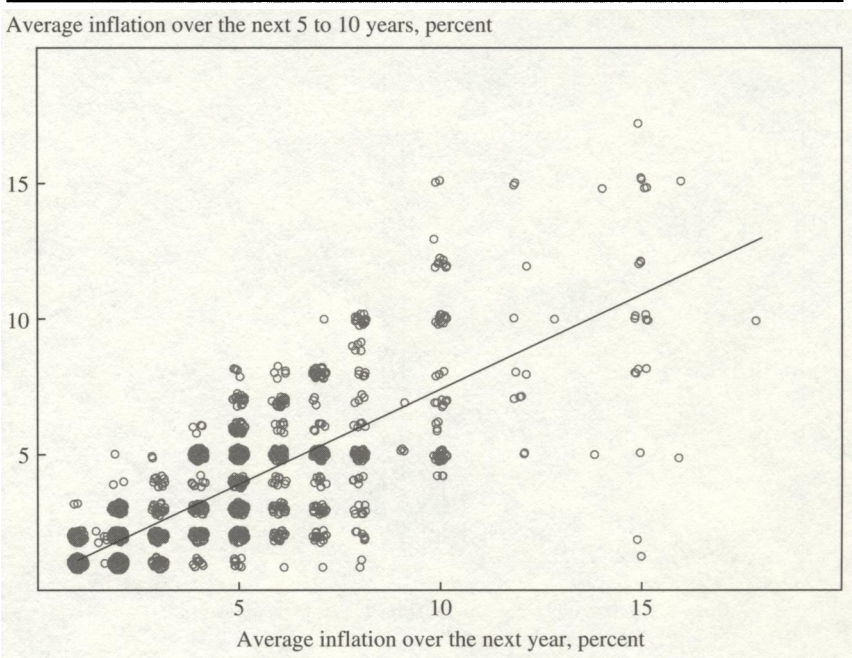
large: it is common in the survey to see revisions in 1-year forecasts of inflation that are 5 percentage points or more in absolute value. Given the stability of inflation in New Zealand over this period, it is difficult to reconcile such dramatic revisions with any notion—weak or strong—of well-anchored expectations.

II.E. Increasingly Anchored Expectations

A final interpretation of anchored expectations comes from looking at the correlation of short-run and long-run expectations. Consider an extreme example of anchoring: if central banks are able to successfully stabilize beliefs about long-run inflation to a target, then short-run and transitory fluctuations in inflation and short-run inflation expectations should be unrelated to these longer-run beliefs. This is established more formally in the following definition and prediction.

Definition 5. Given a sequence $\{\epsilon_\tau\}_{\tau=0}^\infty$ at time t , we say inflation expectations are *increasingly T -anchored* at time t if for any $\tau \geq T$, expectations are strongly ϵ_τ -anchored.

Figure 5. Short-Term vs. Long-Term Inflation Expectations^a



Source: Authors’ survey of New Zealand firms.
a. Shows the relationship between 1-year-ahead and 5-to-10-years-ahead inflation forecasts in the third wave of the survey (2014Q3). The survey questions are: “During the *next twelve months*, by how much do you think overall prices in the economy will change? Please provide an answer in percentage terms.” and “Over the next five to ten years, at what average percentage rate *per year* do you think that overall prices in the economy will be changing?”

Notice that increasingly T -anchored expectations are weaker than strongly anchored expectations when they are required to be strongly ϵ_τ -anchored for $\tau \geq 0$, since this condition does not impose any restrictions on expectations over short-run horizons.

Prediction 5: Long-run expectations should be unpredictable using short-run expectations. Consider the following regression for time t data:

$$\pi^i_{t+\tau|t} = \alpha_\tau + \beta_\tau \pi^i_{t+1|t} + error_i.$$

Now, given the sequence $\{\epsilon_\tau\}_{\tau=0}^\infty$ such that $\lim_{\tau \rightarrow \infty} \epsilon_\tau = 0$, suppose expectations are increasingly T -anchored for an arbitrary $T \geq 1$. Then $\lim_{\tau \rightarrow \infty} \beta_\tau = 0$.

Figure 5 documents that this prediction does not hold in our data: Managers who expect higher short-run inflation also tend to expect higher

long-run inflation. While one might still expect to find a positive slope between the two sets of expectations simply because the time horizon of the long-run expectations is not long enough (τ is too small), the size of the slope coefficient that we find is too large to be explained by this feature of the data. For example, if agents set their 5-to-10-years-ahead forecasts equal to a weighted average of their 1-year-ahead expectation and their expectation about long-run inflation, the implied slope of the relationship should be small (between 0.1 and 0.2 for the 5-to-10-years-ahead forecasts), whereas figure 5 illustrates a slope of 0.70. Consequently, the strength of the relationship between managers' long-run and short-run inflation expectations is much greater than one would expect to see under well-anchored expectations.

In short, the survey of firm managers in New Zealand suggests that no matter which definition of anchoring we adopt, and even using much weaker versions than commonly considered, the inflation expectations of firm managers do not conform in the least bit to the properties one would expect from agents with well-anchored expectations.

III. Credibility vs. Knowledge of the Central Bank's Objectives

That inflation expectations in New Zealand appear to be unanchored despite 25 years of inflation targeting and relatively stable inflation is puzzling. One reason so many managers' long-run inflation forecasts are so high might be that they do not view the RBNZ as a credible institution, that is, they do not believe in the RBNZ's ability or willingness to achieve its long-run inflation objective. Another possibility is that many managers are unaware of the objectives of the central bank and of recent inflation dynamics. In this section, we try to differentiate between these two potential explanations.

III.A. Managers' Knowledge

In the fourth and fifth waves of the survey, we asked managers several questions designed to assess their knowledge of the objectives of the central bank and of monetary policy more generally. First, we posed the following question to them in the fourth wave of the survey:

- What is the main objective of the Reserve Bank?
- a. Keep the exchange rate stable [23 percent]
 - b. Promote full employment [25 percent]
 - c. Keep interest rates low and stable [11 percent]
 - d. Keep inflation low and stable [31 percent]
 - e. Help the government finance its spending [10 percent]

The percent figures in square brackets show the shares of responses.⁷ Only 31 percent of respondents correctly chose answer (d). Given that there were five choices available, this suggests that very few people know even in a broad sense the main objective of the RBNZ. We then asked the following question:

What annual percentage rate of change in overall prices do you think the Reserve Bank of New Zealand is trying to achieve?

Answer: percent

We present a detailed distribution of the responses to that question in table 2. Of the respondents, only 12 percent correctly responded 2 percent, although an additional 25 percent said either 1 percent or 3 percent, the bottom and top of the target range of the RBNZ. At the same time, 15 percent of respondents said the RBNZ’s target inflation rate was 5 percent and 36 percent of them said it was higher than 5 percent, including 5 percent of respondents who said it was 10 percent or more.

Finally, we asked managers the following:⁸

What is the name of the Governor of the Reserve Bank of New Zealand?

- a. Graeme Wheeler [30 percent]
- b. Alan Bollard [39 percent]
- c. Bill English [17 percent]
- d. Charles Cowley [9 percent]
- e. I don’t know [4 percent]

In that list, only two people (Wheeler and Bollard) are or were affiliated with the RBNZ, and they obtained 69 percent of the responses. The correct answer (a) was again chosen by only 30 percent of respondents. The most popular response was the name of the governor (Bollard) who had actually stepped down from the office more than two years before the survey.

Jointly, these questions point toward a pervasive lack of knowledge about monetary policy on the part of firm managers. In fact, only 10 percent of respondents answered all three questions exactly correctly. But those who answered all questions correctly displayed significantly

7. Because of the large sample size, both here and in the remainder of the paper we can reject the null hypothesis that the share of managers picking a given option is equal to $1/N$, where N is the number of options in a multiple choice question.

8. Graeme Wheeler was the governor of the RBNZ at the time of the survey (2015Q1). He had been the governor since September 2012. Alan Bollard had been the governor of the RBNZ until September 2012. Bill English was the minister of finance at the time of the survey. Charles Cowley is a randomly chosen person in New Zealand.

Table 2. Perceived RBNZ Inflation Target and Managers' Inflation Forecasts

Perceived inflation target of the RBNZ	Percent of managers reporting a target (1)	Inflation forecast								Average inflation backcast ^d (9)
		Mean ^a		Standard deviation ^b				Average uncertainty ^c		
		1 year, wave 4 (2)	1 year, wave 3 (3)	5–10 years, wave 3 (4)	1 year, wave 4 (5)	1 year, wave 3 (6)	5–10 years, wave 3 (7)	1 year, wave 4 (8)		
1	14.96	3.1	2.7	2.2	2.2	2.0	1.8	1.64	2.6	
2	12.41	2.8	2.5	2.1	1.5	1.4	1.3	1.68	2.3	
3	10.26	4.1	3.6	3.0	2.4	2.1	1.9	1.91	3.1	
4	11.46	5.7	5.2	4.1	3.2	2.9	2.7	2.24	5.6	
5	14.96	5.9	5.3	4.1	3.2	2.7	2.4	2.10	6.1	
6	8.91	5.4	5.0	3.9	2.9	2.7	2.8	2.05	6.1	
7	7.80	5.8	5.4	3.7	3.6	2.8	2.2	2.16	6.3	
8	8.75	6.7	6.2	4.8	3.6	3.0	3.2	2.38	6.6	
9	5.49	5.7	5.2	4.0	3.1	2.5	2.6	2.02	7.3	
10+	5.01	6.4	6.0	5.0	2.9	2.8	3.0	2.05	8.2	

Source: Authors' survey of New Zealand firms.

a. Reports mean inflation forecasts at different horizons for various waves of the survey.

b. Reports cross-sectional standard deviation of inflation forecasts at different horizons for various waves of the survey.

c. Reports average (across firms) standard deviation of inflation forecast implied by the probability distribution reported by firms' managers.

d. Reports the average perceived inflation rate over the previous 12 months.

better-behaved forecasts (in the sense of being closer to those of professionals): Their mean long-run inflation forecast was exactly 2 percent with a cross-sectional standard deviation of just 1.2 percentage points, whereas all other respondents had a mean forecast of 3.7 percent with a standard deviation of 2.6 percentage points. Likewise, the mean short-term forecast of these all-correct-answer respondents was 2.6 percent (standard deviation of 1.4 percentage points), while all other respondents had a mean of 5.2 percent (standard deviation of 3.2 percentage points). These respondents also had much better knowledge of recent inflation dynamics, with average backcasts of just 1.5 percent (standard deviation of 0.6 percentage point) compared with 4.6 percent (standard deviation of 2.4 percentage points) for other respondents.

III.B. Managers' Views of the Central Bank's Credibility

Additional evidence does not suggest that the RBNZ suffers from a significant credibility problem. For example, among respondents who knew that the target inflation rate was centered at 2 percent, 89 percent forecasted that inflation over the next 5 to 10 years would range from 1 to 3 percent, as illustrated in table 2. Among those who knew that the main objective of the central bank was to keep inflation low and stable, the average long-run forecast of inflation was again 2 percent. This suggests that from the point of view of those agents who know the central bank's objective, that objective is credible, and it is embedded in their forecasts.

The credibility of the RBNZ extends even to many of those who were incorrect about its actual inflation target: managers who thought that the RBNZ's target was 3 percent reported an average long-run inflation forecast of 3 percent, and those who thought the target was 4 percent reported an average long-run inflation forecast of 4 percent.⁹ So while those two clusters of respondents were incorrect about the value the RBNZ was trying to achieve, their forecasts were consistent with the notion that the RBNZ would be able to achieve what they perceived to be its objective.

In the fifth wave of the survey, we posed two additional questions meant to directly address the credibility of the central bank. One question was this:

Do you think the central bank can control inflation over the next 5 to 10 years?

9. For higher RBNZ inflation targets believed by respondents, the relationship between the target and managers' forecasts becomes flatter, with forecasts no longer rising one-for-one with targets but still increasing.

The point was to assess whether managers believed the central bank could achieve its inflation target over a medium to long time horizon. Out of the 50 respondents in the fifth wave, 49 responded *yes*. This indicates broad support on the part of managers for the view that monetary policy-makers can achieve their medium- to long-run policy objectives. We also asked respondents the following question:

Do you think the central bank can control inflation in the next 12 months or so?

Strikingly, 47 of the 50 respondents answered *yes*. Thus, the vast majority of firm managers assign tremendous credibility to the central bank, since they believe it can control inflation even at short horizons.

We interpret these results as suggesting that the credibility of the RBNZ is well established in New Zealand. The issue appears not to be one of credibility but, instead, that many managers are relatively uninformed about the practical objectives and targets of the central bank. This lack of quantitative information is reflected in the forecasts they report. Indeed, as documented in table 2, managers who were uninformed about the RBNZ's target inflation rate also tended to be much less informed about recent inflation dynamics, and their forecasts were also associated with much more uncertainty. Given the ease with which information about monetary policy can be accessed, it may seem surprising that so many managers of firms are not more informed about it.

III.C. Accounting for the Lack of Knowledge

What could account for these differences in knowledge about monetary policy? One possibility could be that better-educated managers simply know much more about monetary policy than others, but as column 7 of table 3 reveals, there are few differences in the average education levels across groups. Another possibility is that different types of managers place different values on information about monetary policy or about inflation more generally. To assess this, we asked managers about their willingness to pay for monthly forecasts of inflation as well as for forecasts of other macroeconomic variables. The results, presented in columns 2 and 3 of table 3, indicate that on average, firm managers who correctly reported low values of the RBNZ's inflation target also reported being willing to pay much more for inflation forecasts, both in dollar terms and as a share of firm sales, than managers who reported higher target values. By contrast, no such striking pattern exists for other macroeconomic variables (columns 4 and 5). This finding confirms that managers do indeed seem to

Table 3. Value of News for Firm Managers in New Zealand

Perceived inflation target of the RBNZ	Willingness to pay for having access to professional forecast, by variable ^a					Absolute slope of the profit function ^b	Average years of schooling	Frequency of following media news about the economy ^c	Frequency of reading public sources about the economy ^d
	Percent of managers reporting a target (1)	Inflation		GDP (dollars per year) (4)	Unemployment (dollars per year) (5)				
		Dollars per year (2)	Percent of sales (3)						
1	14.96	195	0.018	125	118	1.08	15.74	3.7	6.7
2	12.41	202	0.017	130	121	1.13	15.61	4.2	7.3
3	10.26	172	0.015	126	126	1.13	15.22	6.9	10.1
4	11.46	126	0.010	149	129	1.01	15.63	9.8	12.9
5	14.96	110	0.007	151	127	1.01	15.24	10.9	14.6
6	8.91	106	0.008	143	136	0.98	15.16	11.7	14.8
7	7.80	104	0.007	149	137	1.00	15.36	11.4	14.3
8	8.75	107	0.008	150	134	0.89	15.35	11.5	14.5
9	5.49	101	0.007	165	132	0.93	15.12	11.8	14.6
10+	5.01	98	0.006	141	127	1.01	15.35	11.5	15.0

Source: Authors' survey of New Zealand firms.

a. Columns 2, 4, and 5 report the average dollar amount managers are willing to pay per year for monthly professional forecasts of economic variables. Column 3 reports the average percent of annual sales managers are willing to pay for monthly professional forecasts of inflation.

b. Reports the average absolute slope of the profit function with respect to the price of a firm's main product.

c. Reports the frequency (months) at which managers update their information about the state of the economy using media news.

d. Reports the frequency (months) at which managers check public sources about the state of the economy.

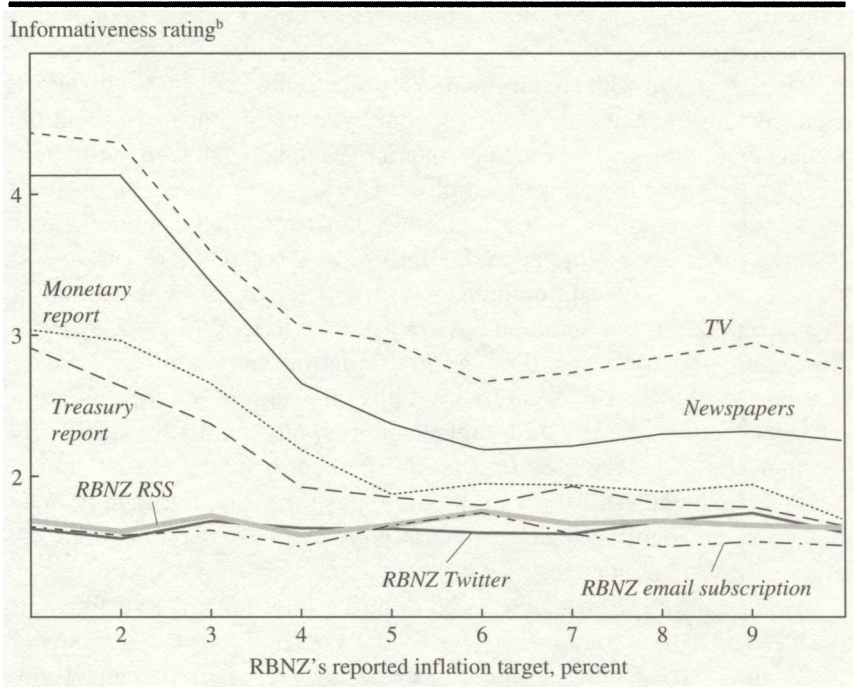
assign very different values to information about inflation, and that these valuations are reflected in their knowledge of both monetary policy and inflation dynamics.

Also consistent with an information channel is the frequency with which managers follow news about the economy. We asked managers about the frequency (daily, weekly, monthly, quarterly, semiannually, annually, less than annually) with which they followed news about the economy from media sources as well as, in a separate question, from official public sources (such as monetary policy reports). Our results, converted into answers in months, are presented in columns 8 and 9 of table 3 for each group of managers that gave a common answer as to the RBNZ's inflation target. Managers who were aware of the low inflation target followed media reports closely (once every 3 to 5 months on average) but this attention to news declines sharply with higher inflation targets, before stabilizing for managers who reported targets of 5 percent or more, for whom the average frequency in following media reports was approximately once per year. An identical pattern occurs with news from public sources, albeit at lower frequencies.

We also asked firm managers to describe how informative for their business decisions (on a scale of 1 for "irrelevant" to 6 for "extremely worthwhile") they found different types of news reports to be: television, newspapers, monetary policy reports, and different kinds of direct communications from the RBNZ. Results are plotted in figure 6, averaged across managers depending on their answers about the RBNZ's target rate of inflation. Managers who said the target was either 1 or 2 percent reported that television and newspapers were quite useful to their business decisions, consistent with their frequent use of these media as documented in table 3, and also reported that monetary and Treasury reports were somewhat useful. However, the perceived usefulness of all these media for business decisions declines sharply for managers who reported higher inflation targets. Meanwhile, none of the managers, regardless of their belief about the inflation target, reported finding much utility for their business decisions from direct communications by the central bank via email, RSS, or Twitter.

Why might different managers perceive the value of information about inflation to be different? One possibility is that the characteristics of the firms in which they work influence their perception of the value of information. For example, as column 6 of table 4 documents, there are pronounced differences in the average absolute slope of the firm's profit function with respect to firm's price, as defined in Coibion, Gorodnichenko, and Kumar (2015), depending on how managers responded to questions about the

Figure 6. Informativeness of Different Types of Media^a



Source: Authors' survey of New Zealand firms.
a. Plots the mean informativeness for decisions of each type of media for all managers who reported that the inflation target for the RBNZ was one of the values on the x-axis.
b. Based on a survey rating scale of 1 to 6, with 1 being "irrelevant" and 6 being "extremely worthwhile."

RBNZ's inflation target.¹⁰ Steeper profit functions imply that information should be more valuable to the firm and, consistent with this incentive effect, we find that managers who report low values of the RBNZ's target rate (and therefore have better information about monetary policy) also tend to work for firms whose profit functions are steeper and therefore where information is more valuable. This suggests that the characteristics of their own firms might be important in explaining the underlying differences in how managers value information about inflation and monetary policy.

We investigate whether the characteristics of managers and firms are correlated with a manager's knowledge of monetary policy more formally,

10. The slope of the profit function is calculated as follows: A firm is asked to report by how much (in percent) it would change the price of its main product if it were to do so for free and by how much this price change would translate into increased profits as a share of firm's revenue. The slope is the change in profit divided by the percent change in the price.

Table 4. Correlates of Knowledge of Monetary Policy^a

	Absolute error in the perception of the central bank's target rate of inflation			Count of wrong answers about the objective, target, and governor of the RBNZ ^b		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Firm characteristics</i>						
Log (age)	0.086 (0.077)		0.052 (0.129)	0.077 (0.059)		0.129* (0.074)
Log (employment)	0.216** (0.092)		0.259** (0.128)	0.259*** (0.070)		0.210*** (0.073)
Labor's share of costs	-0.010 (0.007)		-0.014 (0.010)	-0.010 (0.006)		-0.014** (0.006)
Foreign trade share	0.021*** (0.004)		0.018*** (0.005)	0.009*** (0.003)		0.008*** (0.003)
Number of competitors	-0.011** (0.005)		-0.017*** (0.006)	-0.006 (0.004)		-0.008** (0.004)
Average profit margin	0.013* (0.007)		0.006 (0.010)	0.001 (0.006)		-0.000 (0.006)
Price relative to competitors	0.011* (0.006)		0.011 (0.008)	0.004 (0.005)		0.004 (0.005)
Absolute slope of profit function	-0.226*** (0.087)		-0.142 (0.138)	-0.056 (0.075)		-0.081 (0.080)

(continued on next page)

Table 4. Correlates of Knowledge of Monetary Policy^a (Continued)

	Absolute error in the perception of the central bank's target rate of inflation			Count of wrong answers about the objective, target, and governor of the RBNZ ^b		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Manager characteristics</i>						
Age		-0.014* (0.007)	-0.014 (0.009)		-0.008 (0.005)	-0.007 (0.005)
Years of schooling		-0.069*** (0.023)	-0.051* (0.030)		-0.042** (0.018)	-0.041** (0.019)
Tenure		0.038*** (0.008)	0.001 (0.014)		0.026*** (0.006)	-0.006 (0.008)
Income		0.003* (0.001)	0.001 (0.002)		0.001 (0.001)	0.001 (0.001)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	1,253	1,138	1,141	1,256	1,141	1,141
R ²	0.243	0.194	0.179	0.154	0.122	0.161

Source: Authors' survey of New Zealand firms.

a. Reports results of regressing errors about objectives, target, and governor of the RBNZ on a set of firm and manager characteristics indicated in the left column. Robust standard errors in parentheses. Statistical significance at the *** 1 percent, **5 percent, and *10 percent levels.

b. Survey asked respondents about the RBNZ's objective, inflation target, and current governor (see subsection III.A). If all answers are correct, the count is equal to 0; if all answers are wrong, the count is equal to 3.

as follows. We consider two types of errors made by managers: errors specific to the target (the absolute deviation of their perception of the RBNZ target rate from 2 percent) and overall errors in answering questions (the sum of the number of answers they got wrong on the three survey questions on monetary policy). We then regress each of these manager-specific errors on a set of firm-specific characteristics, including the firm's age, employment at the firm, labor's share of total costs, foreign sales as a share of total revenues, the number of competitors reported by the manager, the firm's average profit margin, the price of the firm's main product relative to that of its competitors, and the absolute slope of the firm's profit function. All but the last variable come directly from survey questions asked of managers, and the slope is constructed from other questions asked of the managers. We also control for individual characteristics of the manager, such as their age, years of schooling, income, and tenure at the firm. Finally, we include industry fixed effects.

A few results (table 4) stand out as particularly robust. First, the number of competitors faced by a firm is systematically associated with smaller errors about the RBNZ's inflation target and about monetary policy more generally. One might interpret this as higher competition inducing managers to pay more attention to economic conditions, including monetary policy, to avoid being driven out of business. We also find that firms that receive more of their sales from abroad make bigger errors about monetary policy in New Zealand, which likely reflects their reduced incentive to track New Zealand's economy relative to that of their trading partners. Having more years of schooling on the part of managers is systematically associated with smaller errors about monetary policy. Interestingly, managers of larger firms make larger errors both about the RBNZ's inflation target as well as about monetary policy more broadly. Hence, these results confirm that characteristics of the firm play some role in accounting for the knowledge of monetary policy and inflation that managers display. However, because much of the variation remains unexplained, we turn to a more narrative approach to assess in greater depth how managers form and use their inflation expectations.

IV. What Managers Know about Inflation, How They Learn It, and Whether It Matters

Since the properties of firm managers' inflation expectations and perceptions appear to be so at odds with anchored expectations, we consider in this section three general sets of questions. First, what do managers actually

know about inflation? Perhaps many are confused about the concept or do not understand how it is measured. Second, where do managers get the information that goes into their beliefs about inflation and inflation expectations? Does it come from professional forecasters and statistical agencies, or from the media, or is it based on their daily experience with prices, either through their professional experience with competitors and clients or through their own shopping experience? Third, do their inflation expectations matter for any of the decisions that they make as managers? We address each of these in turn.

IV.A. What Do Managers Know?

Given the properties of firm managers' perceptions and expectations of inflation described in the previous sections, one might wonder to what extent they are knowledgeable about what inflation means or how it is measured as well as what sources of information they rely on to formulate their inflation expectations. The smaller, fifth wave of the survey was designed to address these points, using a combination of quantitative and narrative questions. Because narrative questions are much harder to implement on a vast scale, we restricted the sample to 50 firms drawn from different bins of the inflation expectation distribution (roughly 12 firms each from bins of firms that had previously forecasted inflation of 0–3 percent, 4–6 percent, 7–10 percent, and greater than 10 percent). As before, we asked managers of these firms to state their inflation expectations over the next 12 months and their perceptions of inflation over the previous 12 months.

We first assessed their basic knowledge of the term “inflation” by asking them “What is your understanding of the term inflation?” This is the same open-ended question that is posed to households in the RBNZ survey. We graded managers' narrative answers on a scale ranging from 0 to 2 points. Our reference answer was this: “Inflation is *the increase (or change)* [1 point] *in the general (average) price level of goods and services* [1 point] *in the economy.*” Hence, managers received one point for recognizing that inflation captures a change in price levels and a second point for recognizing that it measures economy-wide prices.

Using this grading scheme, no managers received a grade of 0. Only eight managers received a score of 1, leaving 84 percent of managers in this sample as able to correctly define inflation. Of the eight who made a mistake, three stated that inflation measured food or “basic” commodity prices. The remaining five made statements inconsistent with inflation

capturing the change in prices.¹¹ There was little difference in the perceived inflation rates or expectations of managers across the two groups, suggesting that these differences in understanding of the concept of inflation play little role in accounting for the heterogeneity in managers' forecasts. In contrast, households in the RBNZ survey fail to correctly identify inflation at much higher rates. For example, in the May 2015 survey, only 52 percent of respondents could identify inflation. So firm managers display a much better understanding of the meaning of the term *inflation* than households.

Another reason why firm managers might hold inflation expectations and perceptions so at odds with recent inflation measurements is that they do not believe the official inflation statistics. To address this possibility, we asked firm managers in the fifth wave of the survey the following question:

Do you think official inflation data are credible in the sense that it reflects the true rate at which overall prices in the economy change? [Yes/No]

Eighty-six percent of managers responded that official inflation data are credible, and 14 percent expressed skepticism. The average inflation forecast among managers who did not believe the official inflation data is only 1 percentage point higher than that among managers who did believe the official data. As a result, skepticism about the quality of official inflation statistics can explain neither the high mean of managers' inflation forecasts nor the dispersion in those forecasts.

If firm managers understand the concept of inflation and believe that government officials correctly measure it, how can they then perceive levels of inflation so different from what is measured by statistical agencies? Given that aggregate inflation is a weighted average for different categories of goods, two nonexclusive explanations are possible. One is that managers assign different weights to categories of goods from those assigned by statistical agencies (such as overweight gasoline price movements). Another is that managers are mistaken about the sizes of price changes for certain categories of goods (for example, they might think food prices went up more than they did). To assess these two explanations, we asked managers in the fifth wave to report how much weight they believe statistical agencies assign to different categories of goods and services when constructing

11. For example, one manager stated that inflation is the average price in the economy. The others said something akin to "when prices change, inflation changes."

overall price measures for New Zealand.¹² The specific set of categories includes housing prices, stock prices, food prices, health care costs, gasoline prices, the cost of rent, and car prices. We then asked managers to report their beliefs about price changes over the last 12 months for each of the same categories.

The results are presented in table 5, along with the actual weights applied to these categories in the construction of the Consumer Price Index (CPI) and the actual inflation rates for each category of goods. Managers' average beliefs about the weights on housing prices (22 percent, rounding to the nearest whole number), stock prices (8 percent), and gasoline prices (19 percent) far exceed the true values (4, 0, and 5 percent respectively). In contrast, managers significantly underestimated the weight assigned to food prices (believing it to be 9 percent whereas its true weight in the CPI is 19 percent). There are also some notable differences between managers' beliefs about inflation at the category levels and actual inflation rates. Managers significantly underestimated inflation in stock prices (believing it to be 4 percent whereas the actual change was 13 percent) but overestimated inflation in car prices (by 7 percentage points) and food prices (by 4 percentage points).

To quantify the relative importance of these two channels, it is useful to introduce some notation. We denote the actual weight for subcategory s with w_s^a and perceived weight for firm i with $w_{s,i}^p$. Likewise, we define the actual inflation rate for subcategory s with π_s^a and perceived inflation for firm i with $\pi_{s,i}^p$.

The contribution of price changes in these specific categories to actual aggregate inflation is

$$\tilde{\pi}^a = \sum_s w_s^a \pi_s^a.$$

Equivalently, we construct firm i 's perceived contribution of these categories to aggregate inflation as

$$\tilde{\pi}_i^p = \sum_s w_{s,i}^p \pi_{s,i}^p.$$

12. The specific phrasing of the question was, "How much weight do you think statistical agencies place on each of the following categories of prices when constructing overall price measures for New Zealand? (these do *not* need to sum to 100 percent). Please provide percentage answers."

Table 5. Managers’ Perceptions of Construction of Inflation Index vs. Actual Construction^a

	<i>Perceived</i>		<i>Actual</i>	
	<i>Weight</i>	<i>Inflation rate</i>	<i>Weight</i>	<i>Inflation rate</i>
Housing prices	21.7 (14.3)	7.5 (1.6)	4.4	5.3
Stock prices	8.4 (5.7)	3.7 (2.8)	0.0	13.3
Food prices	8.9 (8.1)	4.0 (2.0)	18.8	0.2
Health care costs	8.4 (6.4)	0.7 (1.7)	4.0	1.8
Gasoline prices	18.9 (12.7)	−6.3 (6.0)	4.7	−7.4
Cost of rent	9.4 (6.4)	3.5 (1.8)	9.4	2.3
Car price	10.3 (9.7)	3.3 (1.6)	3.3	−3.8
Implied inflation contribution ^b	1.79 (2.12)		0.08	
Error ^c	1.71 (2.12)			
Of which:				
$\sum_s w_s^a (\pi_{s,i}^p - \pi_s^a)$	1.18 (0.48)			
$\sum_s (w_{s,i}^p - w_s^a) \pi_s^a$	0.78 (1.48)			
$\sum_s (w_{s,i}^p - w_s^a) (\pi_{s,i}^p - \pi_s^a)$	−0.24 (1.85)			

Source: Statistics New Zealand and authors’ survey of New Zealand firms.
a. The top panel of the table shows perceived and actual weights and inflation rates for the subcategories of the CPI in the left column. In all panels, standard deviations are in parentheses.
b. Shows the total perceived ($\tilde{\pi}^p$) and actual ($\tilde{\pi}^a$) percentage-point contribution of the subcategories in the left column to aggregate CPI inflation.
c. Shows the difference between total perceived and actual contribution to aggregate CPI inflation and its decomposition.

The error that firm i makes about this contribution can be decomposed as:

$$\begin{aligned} \tilde{\pi}_i^p - \tilde{\pi}^a &= \sum_s w_{s,i}^p \pi_{s,i}^p - \sum_s w_s^a \pi_s^a \\ &= \left\{ \sum_s w_s^a (\pi_{s,i}^p - \pi_s^a) \right\} + \left\{ \sum_s (w_{s,i}^p - w_s^a) \pi_s^a \right\} + \left\{ \sum_s (w_{s,i}^p - w_s^a) (\pi_{s,i}^p - \pi_s^a) \right\}. \end{aligned}$$

The first term captures the contribution of the manager’s errors about category-specific inflation rates. The second term captures the contribution of the manager’s errors about the weights applied to each category. The

final term captures the covariance between errors in weights and errors in inflation rates across categories.

Results of this decomposition are reported in table 5. First, we report the average values of the error across all firms as well as the average values of each of the terms in the decomposition. The average manager error is 1.7 percentage points, implying that on average, managers overestimated the positive effect of these categories on aggregate inflation. Errors about category-level inflation rates contributed about 1.2 out of the 1.7 percentage points. Therefore, much of the average error can be explained by the fact that, on average, managers significantly overestimated the increase in food prices. The contribution of errors about weights is smaller, 0.8 percentage point out of the 1.7 percentage points, and comes primarily from the fact that managers overestimated the weights on housing and stock prices. The negative covariance term is driven largely by stock prices and food prices, in which respondents over(under)estimated the weights but under(over)estimated the inflation rate. These results suggest that managers' errors about recent inflation rates for specific categories of goods, particularly food prices, can account for much of their average misperceptions of aggregate inflation.

However, another feature worth noting in table 5 is that the cross-sectional standard deviations of inflation perceptions for most categories of goods are relatively low. In fact, for all but stock prices and gasoline prices (two very volatile price series), there is actually less disagreement among managers about inflation at the category level than there is about aggregate inflation. This suggests that disagreement about category-level inflation rates among managers is unlikely to account for the amount of disagreement that we observe in managers' beliefs about aggregate inflation rates. Consistent with this, we report in table 5 the cross-sectional standard deviations of each term in the decomposition of the errors above. Disagreement among managers about the weights assigned to different categories accounts for three times more of the dispersion in inflation errors than disagreement about category-specific inflation rates.

This last result suggests that the primary source of the large disagreement that we observe in managers' perceptions of recent inflation rates is differences in opinion about the relative importance of different categories of goods in the measurement of inflation.¹³

13. This result is not sensitive to the particular decomposition we used. For example, another decomposition is $\tilde{\pi}_i^p - \tilde{\pi}^a = \{\sum_s w_s^a (\pi_{s,i}^p - \pi_s^a)\} + \{\sum_s (w_{s,i}^p - w_s^a)(\pi_{s,i}^p - \tilde{\pi}_i^p)\} + \{\sum_s \tilde{\pi}_i^p (w_{s,i}^p - w_s^a)\}$, where the first term is the same as before, the second measures the

Table 6. Narrative Responses to How Managers Form Their Inflation Expectations^a

<i>“How do you typically form your inflation expectations?”</i>	<i>Percent of managers</i> <i>(1)</i>	<i>Absolute backcast error</i>		<i>Inflation forecast</i>	
		<i>Mean</i> <i>(2)</i>	<i>SD</i> <i>(3)</i>	<i>Mean</i> <i>(4)</i>	<i>SD</i> <i>(5)</i>
Media	47	2.61	1.78	3.65	2.45
Meetings and discussions	10	3.10	1.52	4.00	1.22
Shopping experience	43	4.27	1.47	4.95	1.12
Prices of competitors and suppliers	10	4.50	2.17	5.20	2.39
Total	—	3.31	1.81	4.24	1.95

Source: Authors’ survey of New Zealand firms.
a. Narrative responses may be classified into several categories. Of all the survey responses, only one response did not fit into any of the four groups indicated in the left column. For columns 1 and 4, the values are expressed as percents; all other values are expressed as percentage points..

IV.B. How Do Managers Form Inflation Expectations?

For managers to hold such different expectations about inflation, they must rely on different sources of information to form their expectations. We investigate the sources of managers’ inflation expectations in two ways. First, in the fifth wave of the survey, we asked managers the following open-ended question:

How do you typically form your inflation expectations?

Managers provided four general types of responses, as summarized in table 6.

First, 47 percent of respondents stated that they relied primarily on media sources for their information about inflation. These respondents tended to have much better information about recent inflation dynamics than others, with average absolute backcast errors being smaller by one percentage point on average; inflation forecast errors were lower as well. The second

extent to which agents place too much (too little) weight on categories of goods for which inflation is higher (lower) than average, and the third term captures potential errors from assigning too much or too little cumulative weights to all of the listed categories of goods (since the weights do not need to sum to one). This decomposition also implies that average errors primarily reflect errors in category-level inflation rates (since the first term in this decomposition is identical to ours). It similarly implies that the cross-sectional dispersion in inflation forecast errors is largely due to differences in beliefs about weights, since the cross-sectional standard deviation of the second term is almost three times that of the first term, about the same ratio as in our original decomposition. We are grateful to David Romer for suggesting this alternative way of decomposing forecast errors.

Table 7. Quantitative Responses to How Managers Form Their Inflation Expectations^a

	Share of managers (1)	Importance of information source			
		Family and friends (2)	Employees and colleagues (3)	Customers and suppliers (4)	Gas prices (5)
All firms	1.00	2.12	1.88	1.68	4.14
<i>If response is “very important” or “extremely important”</i>					
Family and friends	0.06	4.67	4.00	1.67	4.00
Employees and colleagues	0.08	3.25	4.50	2.00	4.25
Customers and suppliers	0.04	1.00	1.50	4.50	4.00
Gas prices	0.76	2.24	1.82	1.74	4.53
Personal shopping experience	0.88	2.07	1.77	1.68	4.25
Media	0.54	2.00	1.81	1.59	4.07
Professional forecasts	0.20	2.00	2.10	1.30	3.90
<i>Correlation matrix</i>					
Family and friends		1.00			
Employees and colleagues		0.34	1.00		
Customers and suppliers		−0.13	0.15	1.00	
Gas prices		0.11	−0.14	−0.07	1.00
Personal shopping experience		−0.14	−0.27	−0.01	0.65
Government agencies		−0.10	0.09	0.31	0.15
Business associations, fairs		−0.11	0.12	0.31	−0.21
Media		−0.15	−0.06	−0.05	0.02
Professional forecasts		0.03	0.10	0.01	−0.14

Source: Authors’ survey of New Zealand firms.
a. Respondents were asked to assess importance of various sources of information for their formation of inflation expectations. The scale runs from 1 (“not important”) to 5 (“extremely important”). Columns 2–10 report average responses, collected in the fifth wave of the survey. Columns 11 and 12 report the average absolute backcast error (percentage point) and average inflation forecast (percent) of the respondents..

most common answer, accounting for 43 percent of respondents, was that they relied on their personal shopping experience to inform them about price changes. Many respondents emphasized housing prices as a particularly important source of information. In comparison with managers who relied on media, those who relied on their personal shopping experience tended to have larger errors about recent inflation dynamics and higher inflation forecasts. The remaining two answer categories account for much smaller shares of respondents, approximately 10 percent each. One answer is that managers discuss inflation with coworkers or family members (“meetings and discussions”). Respondents who chose this answer tended to have relatively good information about inflation. The other answer states that they rely on their competitors’ or suppliers’ prices to make inferences about aggregate inflation. This group had the largest average errors about

<i>Personal shopping experience</i> (6)	<i>Government agencies</i> (7)	<i>Business associations, fairs</i> (8)	<i>Media</i> (9)	<i>Professional forecasts</i> (10)	<i>Average absolute backcast error</i> (11)	<i>Average inflation forecast</i> (12)
4.42	1.74	1.82	3.54	2.42	3.27	4.18
3.67	1.67	2.00	2.33	2.67	3.37	4.67
4.00	2.00	1.75	2.75	2.75	2.95	3.75
4.50	2.50	3.00	4.00	2.50	2.70	4.50
4.63	1.79	1.76	3.50	2.42	3.03	3.95
4.64	1.77	1.86	3.64	2.48	3.14	4.11
4.44	1.70	1.81	4.81	2.96	2.42	3.59
4.30	1.30	1.50	4.80	4.40	1.65	2.20
1.00						
0.09	1.00					
-0.07	0.38	1.00				
0.21	-0.05	-0.02	1.00			
-0.11	-0.29	-0.07	0.48	1.00		

recent inflation. While there are differences in beliefs within each group, these results do suggest that the average effect of the main source of information for inflation can be very large: the average difference in inflation backcast errors can be as large as 1.6 percentage points.

To investigate this insight in more detail, we also asked respondents to rank the importance of nine different sources of information to them in forming their inflation expectations on a scale of 1 (lowest) to 5 (highest). The specific sources were (i) family and friends, (ii) employees and colleagues, (iii) customers and suppliers, (iv) gas prices, (v) personal shopping experience, (vi) government agencies, (vii) business associations, chambers of commerce, and trade fairs, (viii) media (television, newspapers, and so on), and (ix) professional forecasts. The average ranks given by managers are listed in the first row of table 7.

Consistent with the narrative responses, two of the most highly ranked categories were personal shopping experience and media. In addition, these results highlight the particular importance of gasoline prices as a reference point to managers for making inferences about broader inflation movements: 76 percent of managers rank gasoline prices as very important or extremely important (rank of 4 or 5) to them in forming their inflation expectations. This is consistent with the argument of Coibion and Gorodnichenko (2015b) that households place a disproportionate amount of weight on oil or gasoline prices in forming their inflation expectations.

Table 7 also presents the average ranks assigned to categories by managers who rated specific categories as very or extremely important to them, the average backcast errors and inflation forecasts for these groups of firms, and the correlation matrix of ranks given by respondents to different sources of information. These jointly yield several results. First, managers who rated professional forecasters as very or extremely important to them had much more accurate perceptions and forecasts of inflation, on average, than other managers. They also tended to rely on media and on employees or colleagues more than others did. However, only 20 percent of managers rate professional forecasts as being this important. Second, as we found with the narrative questions, managers who rated media as very or extremely important also had more accurate information about inflation than others, on average. Approximately 54 percent of managers rated media as very or extremely important to them.

Third, and perhaps most strikingly, 88 percent of managers rated their personal shopping experience as very or extremely important. Even among those respondents who utilized professional forecasts and media reports extensively, the average ratings on personal shopping experience continue to be very high. This suggests that personal shopping experience is a more important source of information to most managers than might have been implied by the narrative approach, in which managers seem to generally report only their first source of information. Because shopping experiences are likely to be so heterogeneous across agents, both in the prices managers pay and the share of expenditures they allocate to different categories of goods, the systematic importance of an individual's shopping experience suggests a very natural source for the wide variation that we observe in beliefs about inflation across managers.

IV.C. Do Managers' Inflation Expectations Affect Their Decisions?

Does it make any difference to managers' decisions whether they expect inflation to be 1 percent or 5 percent? One way to answer this would

Table 8. Narrative Responses to How Managers Use Their Inflation Expectations^a

<i>“How do you typically use your inflation expectations?”</i>	<i>Percent of managers</i> (1)	<i>Absolute backcast error</i>		<i>Inflation forecast</i>	
		<i>Mean</i> (2)	<i>SD</i> (3)	<i>Mean</i> (4)	<i>SD</i> (5)
Personal use	67	3.35	1.78	4.15	1.82
Price-setting decisions	12	2.20	1.64	3.33	2.88
Wage-setting decisions	14	4.27	2.07	4.43	1.51
Investment decisions	18	3.03	1.58	5.11	2.15
Total	—	3.26	1.84	4.18	2.01

Source: Authors’ survey of New Zealand firms.
a. Narrative responses may be classified into several categories. For all columns, the values are expressed as percentage points.

be to compare the decisions of different managers who hold different inflation expectations, but that approach would require us to be able to control for a wide array of factors relevant to each manager’s decision. Instead, we used hypothetical questions to investigate how managers would respond to changes in their expectations. In the fifth wave of the survey, we asked managers an open-ended question about how inflation expectations affect their decisions. They were asked:

How do you typically use your inflation expectations?

Managers gave four general types of answers, as summarized in table 8. Twelve percent of managers responded that inflation expectations mattered for their pricing decisions, 14 percent mentioned their wage-setting decisions, and 18 percent specified their investment decisions. Strikingly, two-thirds of managers reported that the primary use of their inflation expectations was for their own personal use, in terms of consumption and savings. Hence, similarly to how most managers relied on their personal experience as consumers to inform them about aggregate inflation developments, we now find that managers report that the primary use of their inflation expectations is for their personal decisionmaking rather than for the economic decisions of the firm. This provides a novel justification for why managers’ inflation expectations resemble those of households in so many ways: their primary use is for their personal consumption and saving decisions.

Of course, the fact that managers respond to an open-ended question by saying that they use their inflation expectations mainly for their own

consumption and saving decisions, as did the majority of the respondents, does not imply that these managers do not use their inflation expectations at all for their business decisions, only that the latter are secondary to their use for personal decisions. In the third wave of the survey, we asked managers more restrictive hypothetical questions, focusing separately on prices, wages, employment, and investment decisions:

If you thought overall prices in the economy over the next 12 months were going to rise by more than what you are currently forecasting, would you be more likely to [increase/decrease/no change] your [prices/employment/investment/wages]?

Only 25 percent of managers reported that higher inflation expectations would have no effect on any of their economic decisions, whereas 75 percent responded along at least one margin. Hence, most managers do report that changes in their inflation expectations would induce them to alter some of the economic choices made by their firm.

The responses for each individual variable are presented in table 9. Approximately 35 percent of firm managers report that they would charge higher prices, whereas between 25 percent and 30 percent of firms report that they would raise wages, employment, or investment. Almost no managers would decrease any of these variables. Table 9 also considers pairs of answers across variables. Few managers would adjust along more than one margin in these pairings: Just 13 percent of managers would raise prices and wages, 8 percent of managers would raise employment and wages, and 9 percent of managers would raise investment and employment. Instead, the majority of firms would pursue adjustment along a single margin, although the specific margin they choose is difficult to predict. The key result from this survey question is that most firm managers appear to treat their inflation expectations as one of the inputs into their decision process. This implies that *if* policymakers can change managers' inflation expectations, then one should expect some economic repercussions through pricing, wage, employment, and investment decisions to occur.

V. Results for the United States

While New Zealand presents a particularly interesting case study for inflation expectations given its long experience with inflation targeting, one would like to know whether the characteristics documented in the previous section extend to other countries. In this section, we revisit whether the inflation expectations of the U.S. public also appear

Table 9. How Managers Would Respond to Higher Inflation Expectations

<i>Variable^a</i>	<i>All responses^a</i>		
	<i>Increase</i>	<i>No change</i>	<i>Decrease</i>
Price	0.354	0.604	0.042
Wage	0.253	0.727	0.019
Employment	0.274	0.715	0.011
Investment	0.293	0.694	0.013

<i>Wage vs. price^b</i>		<i>Wage response</i>		
<i>Price response</i>		<i>Increase</i>	<i>No change</i>	<i>Decrease</i>
Increase		0.130	0.217	0.007
No change		0.114	0.480	0.011
Decrease		0.009	0.030	0.002

<i>Employment vs. wage^b</i>		<i>Employment response</i>		
<i>Wage response</i>		<i>Increase</i>	<i>No change</i>	<i>Decrease</i>
Increase		0.082	0.167	0.004
No change		0.184	0.536	0.007
Decrease		0.007	0.012	0.000

<i>Employment vs. investment^b</i>		<i>Employment response</i>		
<i>Investment response</i>		<i>Increase</i>	<i>No change</i>	<i>Decrease</i>
Increase		0.089	0.200	0.004
No change		0.182	0.504	0.007
Decrease		0.002	0.011	0.000

Source: Authors' survey of New Zealand firms.

a. Reports shares of managers responding "increase," "decrease," or "no change" to the survey question "If you thought overall prices in the economy over the next 12 months were going to rise by more than what you are currently forecasting, would you be more likely to [increase/decrease/no change] your [prices/employment/investment/wages]?"

b. Reports breakdown of how managers responded to the named pair of actions in the questions.

unanchored, and whether the U.S. public displays the same knowledge of monetary policy as firm managers in New Zealand. Because no broad quantitative survey of firm managers exists for the United States, we focus on the University of Michigan's Survey of Consumers, the Federal Reserve Bank of New York's Survey of Consumer Expectations, and the Federal Reserve Bank of Philadelphia's Survey of Professional

Forecasters; following Binder (2015), we use additional polling data as well when available.¹⁴

V.A. Are the U.S. Public's Inflation Expectations Anchored?

First, we revisit the five predicted characteristics of anchored expectations presented in section II that failed to be present in New Zealand. First, we examine whether average beliefs are close to the inflation target of the central bank. Table 10 shows that both short-term and long-term inflation expectations of households hover between 3.1 and 4.4 percent, well above the Federal Reserve's 2 percent inflation target. In contrast, professional forecasters predict inflation to be close to the official target at all horizons. The actual rate of inflation over the 2013Q4–2014Q4 period was less than 2.4 percent. Strikingly, the magnitudes are similar to those predicted by New Zealand's counterparts.¹⁵

Second, we explore whether economic agents in the United States disagree about the future course of inflation. We find that while the cross-sectional dispersion of projections made by professional forecasters is small (approximately 0.4 percentage point), the dispersion is an order of magnitude larger for households (approximately 4 percentage points at short horizons and somewhat smaller for longer horizons). Hence, along this metric as well, the U.S. public's inflation expectations look no more anchored than those of the New Zealand public.

Third, we investigate how much confidence agents have in their forecasts. The Survey of Consumer Expectations asks respondents to assign probabilities to 10 inflation bins. Using this information, we can calculate the implied standard deviation, a measure of forecast uncertainty. We find that although there is considerable heterogeneity across U.S. consumers, they are generally very uncertain in their predictions: The mean standard deviation is approximately 3 percentage points, which is comparable to

14. The polling data reported here were obtained from searches of the iPOLL Databank and other resources provided by the Roper Center for Public Opinion Research, University of Connecticut.

15. Neither the Michigan Survey of Consumers nor the Survey of Consumer Expectations asks people to report current or past inflation. A poll by the Pew Research Center for the People and the Press asked the public about whether recent inflation data were closer to 1, 5, 10, or 20 percent. The most common answer, with 49 percent of responses, was "don't know/refused to answer" and the mean response was 7.4 percent, well above the actual inflation rate of approximately 1 percent. (See Binder [2015] for more details.) Thus, similar to consumers in New Zealand, consumers in the United States appear to have a perception of inflation well above actual figures.

Table 10. Inflation Forecasts of Firm Managers and Others, United States, 2013Q4–2014Q4^a

Survey date	Recent data (1)	Central bank (2)	Survey of Professional Forecasters		Households		Survey of Consumer Expectations	
			Michigan Survey of Consumers		Mean ^b	SD	Mean ^b	SD
			Mean	SD				
			(3)	(4)	(5)	(6)	(7)	(8)
<i>1-year-ahead inflation forecast</i>								
2013Q4	1.4	1.5	1.9	0.5	3.7	3.8	4.4	4.5
2014Q1	2.1	1.8	1.9	0.5	4.1	4.0	4.2	4.3
2014Q2	2.4	1.8	1.9	0.5	4.0	3.5	4.3	4.4
2014Q3	1.2	1.8	2.1	0.5	3.9	3.7	4.2	4.3
2014Q4	−0.9	1.3	1.9	0.5	3.1	3.6	n.a.	n.a.
<i>Long-term inflation forecast^c</i>								
2013Q4		2.0	2.1	0.4	3.4	3.2	4.4	4.5
2014Q1		2.0	2.1	0.4	3.4	3.1	4.1	4.4
2014Q2		2.0	2.2	0.3	3.5	3.0	4.3	4.6
2014Q3		2.0	2.2	0.4	3.3	2.9	4.2	4.5
2014Q4		2.0	2.1	0.3	3.1	2.7	n.a.	n.a.

Sources: Economic Projections of Federal Reserve Board Members and Federal Reserve Bank Presidents, Survey of Professional Forecasters, Michigan Survey of Consumers, and Survey of Consumer Expectations.

a. Reports actual inflation, inflation forecasts of the Federal Reserve System, mean forecasts from surveys, and the cross-sectional standard deviations of these forecasts (columns 3–8). Standard deviations are expressed as percentage points, and all other values are expressed as percents.

b. Mean inflation forecast implied by distribution of respondents' expectations about future inflation.

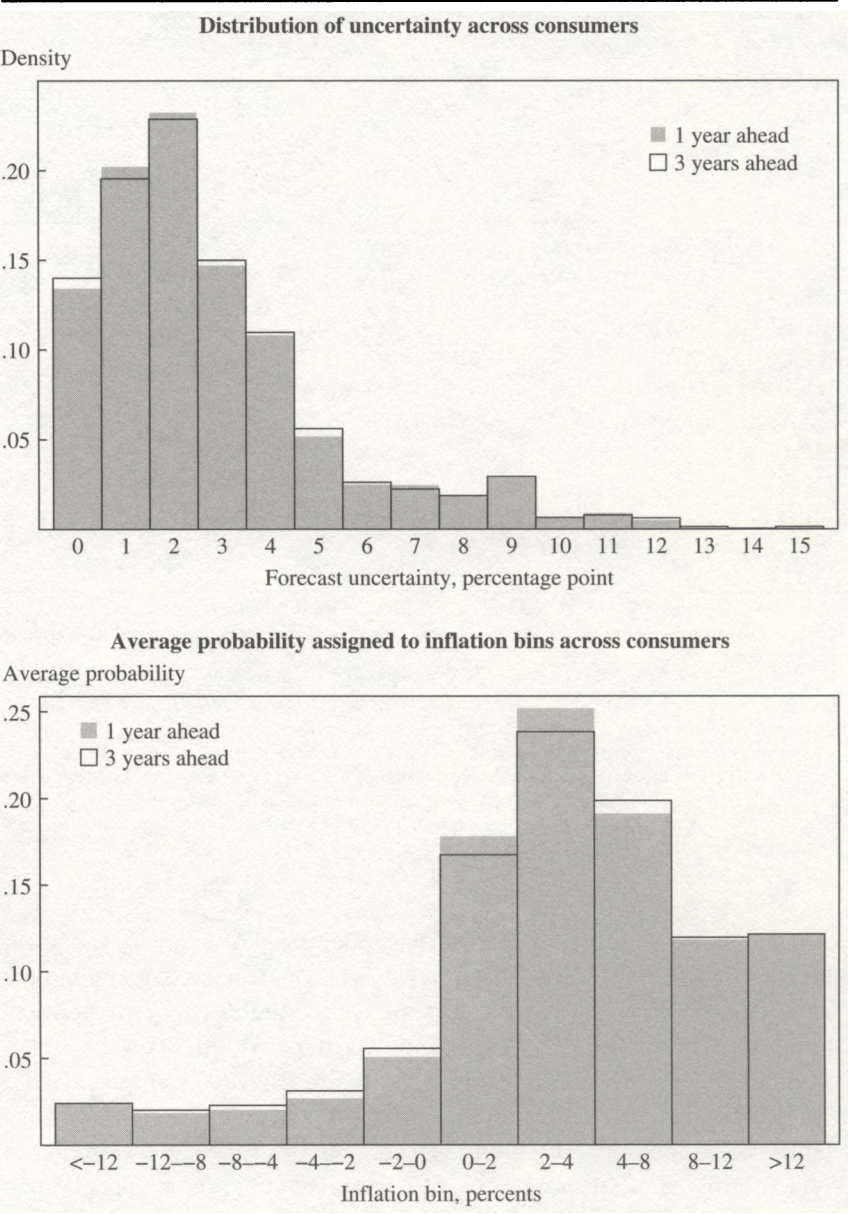
c. The horizons of the long-term forecasts are 5 years for the Survey of Professional Forecasters and the Michigan Survey of Consumers and 3 years for the Survey of Consumer Expectations. For the projections of the central bank, we use “longer run” projections in the lower panel and the middle of the central tendency range for CPI for the next calendar year.

the mean forecast of consumers; see the upper panel of figure 7. The lower panel of figure 7 also shows that, on average, consumers assign more than 50 percent probability to inflation in the United States being greater than 4 percent over the next 12 months and over the next three years.

Other survey evidence corroborates this result. For example, Binder (2015) compiles extensive poll evidence that consumers have little confidence in low and stable inflation. According to the Retirement Confidence Survey,¹⁶ in years 2012 and 2013, only 6 percent of respondents claimed to be very confident that inflation will remain moderate over the next

16. Conducted by the Employee Benefit Research Institute.

Figure 7. Uncertainty in Consumers' Inflation Forecasts in the U.S.^a



Source: Authors' survey of New Zealand firms.
a. The survey question asks managers to assign probabilities to nine bins. For each respondent, we construct a measure of uncertainty as the standard deviation of the reported distribution.

10 years and will average no more than 4 percent in the next 10 years. At the same time, approximately 60 percent of respondents stated that they are either not at all confident or not too confident in these outcomes. In addition, Binder (2014) shows that confidence in forecasts as measured by the rounding of point predictions has shown little change since the mid-1980s. These patterns are similar to those observed in New Zealand.

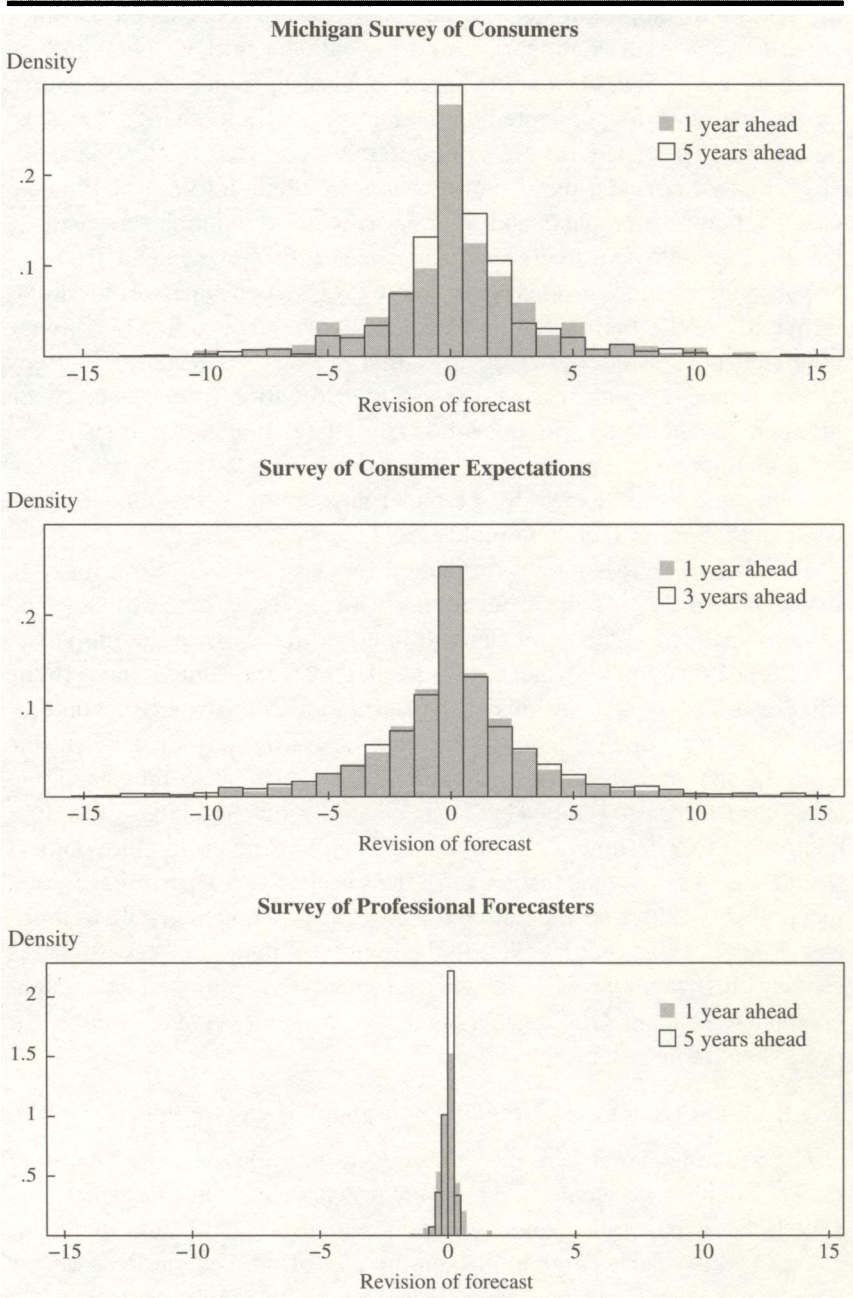
Fourth, we consider the size of revisions in inflation forecasts. Figure 8 presents both 1-year-ahead and 3- or 5-years-ahead inflation forecasts. As was the case with consumers and firm managers in New Zealand, the average absolute size of revisions is very large for U.S. consumers. Households frequently revise their inflation forecasts by as much as five percentage points or more. Binder (2015) shows that the share of Michigan Survey of Consumers respondents who revise their inflation forecasts has been between 70 and 80 percent since the early 1980s. In contrast, revisions in inflation forecasts for professional forecasters are much smaller and resemble what one would expect to see under anchored expectations, in sharp contrast to those of U.S. households.

Finally, we regress long-run inflation forecasts on short-term inflation forecasts. We do so both in levels (as with the New Zealand data) and using revisions in both short-run and long-run forecasts at the individual level, since this type of panel data is available for the United States in the Michigan Survey of Consumers, the Survey of Consumer Expectations, and the Survey of Professional Forecasters. As in New Zealand, in the United States long-term forecasts are highly sensitive to movements in short-term forecasts (table 11). This sensitivity remains large even after controlling for consumer fixed effects. Furthermore, controlling for outliers tends to yield even higher estimates of the sensitivity: A 1-percentage-point increase in the short-term inflation forecast can be associated with as much as a 1-percentage-point increase in the long-term inflation forecast. These sensitivities are broadly in line with the sensitivity estimated for managers in New Zealand. On the other hand, the sensitivity is much weaker for professional forecasters.

V.B. What Does the U.S. Public Know about Monetary Policy?

Given the apparent lack of anchoring in the inflation expectations of the U.S. public, we would like to know to what extent this reflects shortages in knowledge about monetary policy and recent inflation dynamics as opposed to a lack of credibility on the part of the Federal Reserve. As with New Zealand, we consider how well the public knows who chairs the Federal Reserve Board as a simple measure of how informed the public is

Figure 8. Forecast Revisions by U.S. Households and Professional Forecasters^a



a. In each panel, shaded bars are for the distribution of revisions in long-term (3- or 5-years-ahead) inflation forecasts. Nonshaded bars are for the distribution of revisions in short-term (1-year-ahead) inflation forecasts.

Table 11. Correlation between Short-Term and Long-Term Inflation Forecasts, United States^a

	Level			3-month revision			6-month revision		
	OLS ^b (1)	WGT ^c (2)	RREG ^d (3)	OLS ^b (4)	WGT ^c (5)	RREG ^d (6)	OLS ^b (7)	WGT ^c (8)	RREG ^d (9)
<i>Survey of Consumer Expectations, truncated sample, 3-years-ahead forecast^{e,f}</i>									
1-year-ahead forecast	0.672*** (0.012)	0.671*** (0.017)	0.932*** (0.003)	0.477*** (0.026)	0.505*** (0.030)	0.681*** (0.005)	0.507*** (0.037)	0.557*** (0.043)	0.723*** (0.008)
No. of observations	17,854	17,849	17,854	8,288	8,288	8,288	3,513	3,513	3,513
R ²	0.392	0.371	0.879	0.203	0.221	0.664	0.211	0.258	0.701
<i>Survey of Consumer Expectations, full sample, 3-years-ahead forecast^e</i>									
1-year-ahead forecast	0.562*** (0.022)	0.586*** (0.035)	0.984*** (0.001)	0.399*** (0.034)	0.412*** (0.049)	0.706*** (0.002)	0.386*** (0.046)	0.424*** (0.070)	0.857*** (0.003)
No. of observations	20,573	20,565	20,573	10,031	10,030	10,031	4,275	4,275	4,275
R ²	0.295	0.299	0.984	0.141	0.143	0.944	0.135	0.136	0.960
<i>Survey of Consumer Expectations, implied point prediction, 3-years-ahead forecast^g</i>									
1-year-ahead forecast	0.787*** (0.009)	0.783*** (0.014)	0.975*** (0.002)	0.643*** (0.019)	0.623*** (0.027)	0.815*** (0.005)	0.647*** (0.024)	0.662*** (0.034)	0.829*** (0.007)
No. of observations	20,567	20,559	20,567	10,047	10,046	10,047	4,285	4,285	4,285
R ²	0.571	0.571	0.936	0.350	0.339	0.756	0.373	0.402	0.781
<i>Michigan Survey of Consumers, truncated, 5-years-ahead forecast^f</i>									
1-year-ahead forecast	0.442*** (0.012)	0.444*** (0.014)	0.420*** (0.005)				0.349*** (0.027)	0.355*** (0.031)	0.285*** (0.011)
No. of observations	10,443	10,320	10,443				2,371	2,352	2,371
R ²	0.280	0.281	0.428				0.159	0.166	0.231

(continued on next page)

Table 11. Correlation between Short-Term and Long-Term Inflation Forecasts, United States^a (Continued)

	Level			3-month revision			6-month revision		
	OLS ^b (1)	WGT ^c (2)	RREG ^d (3)	OLS ^b (4)	WGT ^c (5)	RREG ^d (6)	OLS ^b (7)	WGT ^c (8)	RREG ^d (9)
<i>Michigan Survey of Consumers, full sample, 5-years-ahead forecast</i>									
1-year-ahead forecast	0.442*** (0.012)	0.445*** (0.013)	0.411*** (0.004)				0.336*** (0.026)	0.350*** (0.029)	0.283*** (0.009)
No. of observations	10,588	10,464	10,588				2,440	2,420	2,440
R ²	0.301	0.306	0.470				0.171	0.185	0.281
<i>Survey of Professional Forecasters, 5-years-ahead forecast</i>									
1-year-ahead forecast	0.565*** (0.035)		0.598*** (0.028)	0.169*** (0.034)		0.146*** (0.029)	0.191*** (0.035)		0.163*** (0.032)
No. of observations	286		286	244		244	238		238
R ²	0.572		0.619	0.105		0.095	0.125		0.097
<i>Survey of Professional Forecasters, 10-years-ahead forecast</i>									
1-year-ahead forecast	0.474** (0.037)		0.468** (0.033)	0.057** (0.028)		0.050** (0.021)	0.056* (0.029)		0.065** (0.026)
No. of observations	285		285	244		244	237		237
R ²	0.398		0.408	0.014		0.024	0.012		0.025

a. Reports results of regressing long-term inflation forecasts (or forecast revisions) on short-term inflation forecasts (or forecast revisions). Sample period covers 2013Q-2014Q4. Standard errors in parentheses for columns 3, 6, and 9; robust standard errors in parentheses for the remaining columns. Statistical significance at the ***1 percent, **5 percent, and *10 percent levels.

b. Does not use sampling weights in estimation.

c. Uses sampling weights in estimation.

d. Uses Huber robust regression to downweight the importance of outliers and influential observations.

e. Uses point predictions reported in the Survey of Consumer Expectations.

f. Sample includes only respondents reporting inflation forecasts less than 15 percent in absolute value.

g. Uses mean predicted inflation implied by the reported probability distribution in the Survey of Consumer Expectations.

about recent monetary policy actions and discussions. Binder (2015) documents that the public is largely unaware of who the chair of the Federal Reserve is. In a number of polls asking the public to pick the name of the chair from four options, between 20 and 50 percent of respondents simply refuse to answer these multiple choice questions, while approximately one-third tend to pick the correct answer out of four names. The lowest share of correct answers in the September 2014 poll was for Janet Yellen (24 percent), but this was only 6 months after she became chair, which may explain her lower name recognition. These relatively low shares of correct answers are very close to those observed in the survey in New Zealand, suggesting a similar lack of awareness of the leadership of the central bank in both countries among much of the broader public.

Just as we found that the general managers of firms in New Zealand did not seek out information about monetary policy, we can explore whether the U.S. public tries to access information about monetary policy directly from the source through social media. Table 12 presents numbers of Facebook and Twitter followers for each of the Federal Reserve Banks as well as for the Federal Reserve System as a whole. As of June 30, 2015, the entire Federal Reserve System had 702,955 followers on Twitter. For comparison, the U.S. State Department had nearly twice as many followers, the FBI had roughly 470,000 more, and the CIA had roughly 120,000 more. In fact, the voice of the entire Federal Reserve System on Twitter is single-handedly dwarfed by that of Paul Krugman, who has almost twice as many followers. Even former congressman Ron Paul and Senator Rand Paul each has almost as many followers as the entire Federal Reserve System. Binder (2015) documents similar evidence.

Data from Google Trends also allow us to verify the extent to which the U.S. public seeks out information about macroeconomic conditions online. Figure 9 plots the volume of online Google searches in the United States since 2004 for the macroeconomic variables “GDP,” “inflation,” and “unemployment rate” (relative to total searches). For comparison, we also plot the volume of searches for “puppies” (relative to total searches), which is roughly three to four times as high. Strikingly, with the onset of the Great Recession, there is only a slight increase in the volume of searches for macroeconomic variables, and it reverses in 2009. Binder (2015) finds a very similar pattern for an alternative but related set of searches.

But just as in New Zealand, the fact that much of the U.S. public does not actively seek out information about macroeconomic conditions or monetary policy does not mean that it necessarily views this information as unimportant. A poll from CNN and the Opinion Research Corporation in

Table 12. Social Media Following of the Federal Reserve and Others, June 2015^a

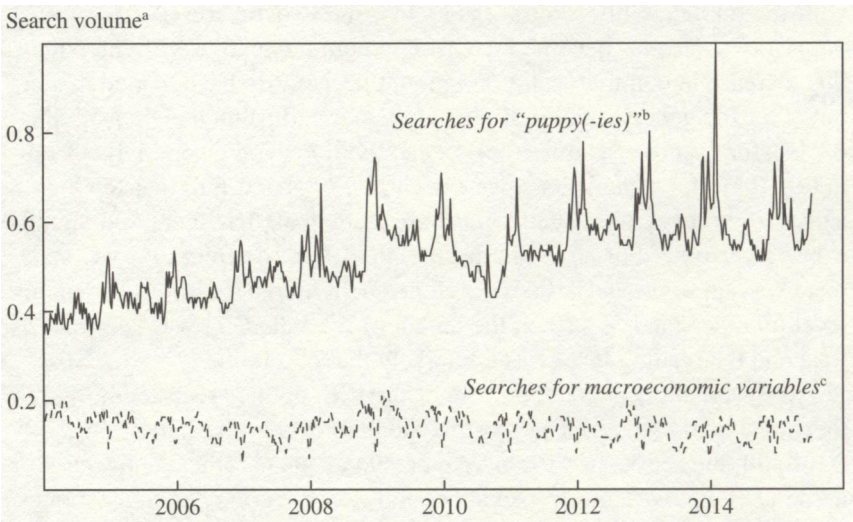
<i>Institution or person with following</i>	<i>Facebook “likes”</i>	<i>Twitter followers</i>
Federal Reserve	—	268,258
Federal Reserve Bank of Atlanta	1,854	33,932
Federal Reserve Bank of Boston	—	31,947
Federal Reserve Bank of Chicago	—	45,640
Federal Reserve Bank of Cleveland	1,506	26,920
Federal Reserve Bank of Dallas	—	31,030
Federal Reserve Bank of Kansas City	—	14,385
Federal Reserve Bank of Minneapolis	811	29,261
Federal Reserve Bank of New York	7,787	86,991
Federal Reserve Bank of Philadelphia	1,254	34,767
Federal Reserve Bank of Richmond	432	20,895
Federal Reserve Bank of St. Louis	4,416	49,411
Federal Reserve Bank of San Francisco	3,736	29,518
Total	21,796	702,955
U.S. Department of Energy	69,084	249,663
U.S. Department of Homeland Security	320,261	663,009
U.S. Department of Justice	183,507	880,396
U.S. Department of State	1,103,944	1,408,592
U.S. Department of the Treasury	41,613	275,636
Total	1,718,409	3,477,296
CIA	440,716	818,493
FBI	1,235,614	1,170,177
Paul Krugman	—	1,374,547
Ron Paul	1,287,106	549,344
Rand Paul	2,024,694	637,037

a. Facebook and Twitter pages were accessed on June 30, 2015.

2011 asked respondents to evaluate how important different issues would be to their vote in the 2012 presidential elections, and found that 68 percent of respondents rated inflation as extremely important or very important to them. This combined share of importance put inflation just below terrorism and taxes in importance to the public and above the war in Afghanistan, illegal immigration, guns, the situation in Libya at the time, abortion, and gay marriage (see figure 10), despite the fact that the president’s influence on inflation is much more limited than on any of these other issues. In a similar spirit, Binder (2015) shows that there has been an increasing trend in the share of people claiming that they are hurt by inflation.

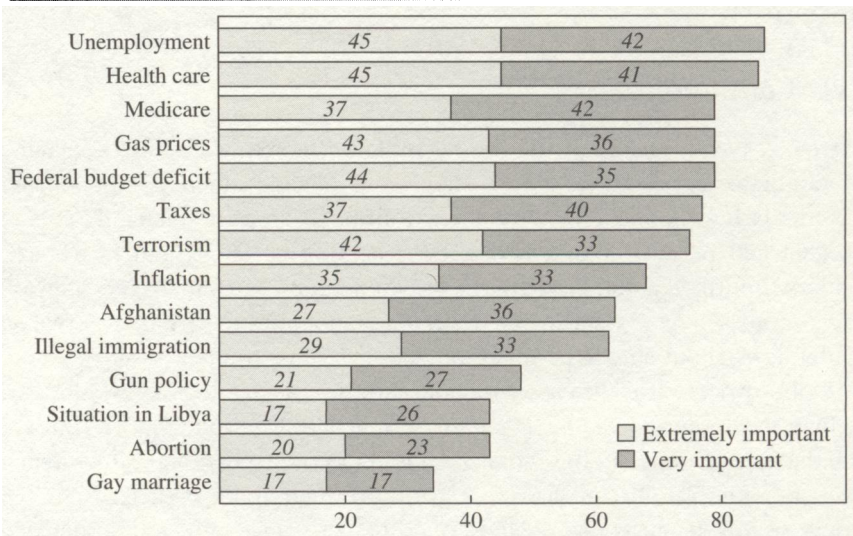
A likely reason for the apparent lack of active interest in monetary policy may be the view that it is a difficult topic to understand. The history of monetary policy communications is, of course, not one of openness

Figure 9. U.S. Google Searches for Macroeconomic Variables vs. “Puppies,” January 2004–July 2015



Source: Google Trends, accessed July 12, 2015.
a. Volume of online Google searches, relative to the highest point on the graph (normalized to 1).
b. The two search terms are “puppy” and “puppies.” The search volumes are aggregated together.
c. The three macroeconomic variable search terms are “GDP,” “inflation,” and “unemployment rate.” The search volumes are aggregated together.

Figure 10. Relative Importance of Inflation as an Issue to the U.S. Public, 2011^a



Source: June 2011 CNN and Opinion Research Corporation Poll.
a. The poll question asked, “How important will each of the following issues be to your vote for President next year (2012)?” Values are expressed as percents.

with the public. While central banks like the Federal Reserve have over the last two decades become increasingly communicative with the public, this increase in communication might not necessarily have helped matters much for the general public. Rubén Hernández-Murillo and Hannah Shell (2014), for example, analyze the complexity of Federal Open Market Committee (FOMC) statements since the early 1990s and find that the length and reading level associated with these statements has increased significantly over time. For example, in the mid-1990s, a typical FOMC statement was approximately 100 words long and required a 12th-grade reading level to understand. By 2014, the length of the statement was six times as long and the reading level was effectively that of a Ph.D.

Not surprisingly, when members of the U.S. public are asked how well they understand monetary policy, they tend to express hesitation. In a July 2014 poll, the Associated Press asked respondents to indicate how easy or hard they felt it was to understand Federal Reserve policy on interest rates. While 27 percent of respondents claimed it was very easy or somewhat easy, 70 percent expressed difficulty understanding monetary policy, and a quarter of respondents said it was “very hard.” Binder (2015) presents additional evidence documenting the complexity of the Federal Reserve’s communication. In short, despite dramatic changes in the communications strategy of the Federal Reserve over the last 20 years, the U.S. general public appears to remain profoundly uncertain about what exactly the Federal Reserve does.

VI. Conclusion

After 25 years of largely successful inflation targeting in New Zealand, the inflation expectations of households and managers there do not appear particularly well anchored. Managers of firms disagree dramatically about recent and future inflation levels, even at long horizons, and many are poorly informed about the RBNZ’s inflation target. Most managers appear to rely to a large extent on their personal shopping experience to make inferences about aggregate inflation, and they are particularly sensitive to gasoline prices, as is the case with households in the United States. Indeed, along most metrics, the expectations of managers are much more similar to the expectations of households than to those of professional forecasters. Since neither group appears to be well informed about monetary policy overall, this suggests that changes over the last 20 years in central banks’ communications strategies have not had the desired effects on this segment of the population, even if they may have been more effective with

professionals or financial market participants. In short, while this state of affairs may be better than what New Zealand had before adopting inflation targeting (we do not have data on inflation expectations covering that period), in absolute terms the properties of inflation expectations and perceptions of inflation appear to score poorly along the basic metrics of how anchored expectations are.

The lack of awareness by the general public, including firm managers, of the actions and objectives of monetary policymakers in a low-inflation environment is particularly problematic in periods when central bankers are seeking to affect inflation expectations through forward guidance. Because such policies are designed to have real effects precisely by generating changes in agents' inflation expectations and therefore in their perceived real interest rates, the fact that the public may largely be unaware of the policies or of their implications for aggregate prices implies that their effects will most likely be limited, or at least much less than predicted by models with full-information rational-expectations agents. At least some central bankers are aware of the limited power of their promises.¹⁷

Coming to terms with these limited, heterogeneous information sets on the part of households and firms, not just regarding knowledge of contemporaneous economic conditions but also regarding knowledge of the central bank's objectives, will be challenging from a modeling point of view. For example, Coibion and Gorodnichenko (2011) show that the strategic interaction of firms with different practices for pricing and acquisition of information has important implications for macroeconomic dynamics and policy design. However, this and related research abstract from heterogeneity and the interaction of expectations across firms, households, professional forecasters, financial markets, and the central bank. Indeed, most macroeconomic models do not include financial markets or professional forecasters, so exactly how these arguably better-informed agents influence macroeconomic outcomes is not well understood.

Future work should shed new light on the optimal way for central banks to release information so it is useful for not just professional forecasters and financial market analysts but also the broader public. Only then may inflation targeting finally achieve its full promise.

17. Laurence Meyer (2004, p. 211) notes, "Greenspan believes that inflation expectations can best be anchored by a history of having achieved price stability rather than by a mere promise to do so."

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