

BPEA Conference Draft, September 10-11, 2015

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# Inflation targeting does not anchor inflation expectations: Evidence from firms in New Zealand

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

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This Draft: August 31, 2015

*Abstract:* We study the (lack of) anchoring of inflation expectations in New Zealand using a new survey of firms. Managers of these firms display little anchoring of inflation expectations, despite twenty-five years of inflation targeting by the Reserve Bank of New Zealand, a fact which we document along a number of dimensions. Managers are unaware of the identities of central bankers as well as central banks' objectives, and are generally poorly informed about recent inflation dynamics. Their forecasts of future inflation reflect high levels of uncertainty and are extremely dispersed as well as volatile at both short and long-run horizons. Similar results can be found in the U.S. using currently available surveys.

JEL: E3, E4, E5

Keywords: inflation expectations, survey, anchoring

We are grateful to Graham Howard, Rochelle Barrow and Katrina Young for sharing data from the survey of households in New Zealand. We thank Alan Blinder, David Romer, Lars Svensson, and Justin Wolfers for comments on an earlier version of the paper. Gorodnichenko thanks the NSF for financial support.

*“Indeed, expectations matter so much that a central bank may be able to help make policy more effective by working to shape those expectations. ... 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.”*

Ben Bernanke

## **1 Introduction**

Central bankers increasingly emphasize the importance of the public’s expectations. One reason is that unanchored inflation expectations are commonly viewed as having played an important role behind 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 Central 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. In this survey, we asked managers a wide range of questions about their inflation expectations, their individual and firm’s characteristics, as well as about their knowledge and understanding of monetary policy. We then show that many of our results seem to extend to the U.S. using existing survey data. The New Zealand survey fills an important gap in our understanding of expectations. Previously, quantitative macroeconomic surveys had been available only for professional forecasters, very large firms, or households. The first two types are obviously extremely well-informed, and the latter tend to be poorly informed. Our survey focuses on decision-makers 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 twenty-five 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 the forecasts of firms, at all horizons, as well as disagreement about recent inflation dynamics. Firms also express far more uncertainty in their inflation forecasts than do professional forecasters. In fact, along almost every single one of these metrics, the managers of firms resemble households in New Zealand much more than they do professional forecasters.

Other characteristics of firms' forecasts are also strongly at odds with what one might expect of "anchored" expectations. Because firms were surveyed on multiple occasions, we can consider the revisions in their forecasts. One would expect individuals whose forecasts are anchored to display only small revisions in their forecasts 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) comovement between short-run inflation expectations and longer-run inflation expectations.

These properties of managers' inflation forecasts and perceptions do not reflect confusion about what inflation means. When asked to define it in open-ended questions, almost ninety percent do so correctly and the others make relatively minor errors. 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. Managers 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 indices (e.g. house prices vs food prices vs gasoline prices).

We also asked firms about how they form their inflation expectations and what sources of information they use. In open-ended questions, most firms either responded (in almost equal proportion) 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 of information made smaller errors, on average, when asked about recent inflation dynamics. We also asked firms to quantitatively rank a wider set of information sources about inflation. This revealed that while only 20 percent of firms relied on professional forecasts, these firms had by far the best information about inflation. But, perhaps most strikingly, almost ninety percent of managers rated their personal shopping experience as very or extremely important to them in informing them about inflation, and seventy-six percent did so with gasoline prices. Hence, the vast majority of managers, even those who also follow newspapers and professional forecasts, report that their personal exposure to the individual prices that they face (and gasoline prices in particular) plays a large role in accounting for their inflation expectations.

More broadly, we find little evidence that firm managers know much at all about monetary policy in New Zealand. When asked who the Governor of the Reserve Bank of New Zealand (RBNZ) is, only 30% get the correct answer (out of 4 possible answers). Very few know that the RBNZ has inflation targeting in its mandate, and even fewer can name the specific inflation target. Nor do managers appear to

devote much effort to tracking information from the central bank. Very few ever read monetary policy reports, receive twitter feeds from the RBNZ, or 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 via communications policies, are unlikely to be very successful under current conditions.

This is not to say that such policies cannot work. 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. This suggests that *if* central banks can more successfully communicate their objectives to the broader public, then this should have a pronounced effect on the beliefs of individuals. In addition, we document that changes in managers' expectations are likely to affect their economic decisions. When asked if higher inflation expectations on their part would specifically affect any of their business (e.g. pricing, wages, etc.) decisions, very few report that they would not change any element of their business. And when asked open-ended questions about how inflation expectations affect their decisions, many managers emphasize that inflation expectations affect their personal consumption and saving decisions first and foremost. This suggests that if central banks can alter managers' expectations, we should expect to see repercussions operating not only through their business decisions but also through their consumption decisions.

New Zealand, because of its exceptionally long history of inflation targeting and stable inflation, is a particularly apt place to stage such a survey to gauge the extent to which anchoring of expectations can be achieved. The finding that the inflation expectations of business leaders are no more anchored than those of households in New Zealand and the fact that few are even slightly knowledgeable about monetary policy is therefore particularly striking. But as we also show in the paper, many of our results carry over to the U.S., at least for the broader population. Using the Michigan Survey of Consumers and the New York Fed 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 U.S., therefore, appear just as unanchored as they do in New Zealand.

In addition, as documented in this paper and much more extensively in Binder (2015), polling data for the U.S. similarly confirm that the U.S. public shows no more knowledge of monetary policy than that of New Zealand. Americans have great difficulty in identifying the chair of the Federal Reserve System 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 low credibility of the Federal Reserve or, more likely, to the fact that most

people don't 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 barely outnumber the followers of Ron Paul or Rand Paul. Paul Krugman single-handedly has almost twice as many twitter followers as the entire Fed 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 its effects on expectations, yielding mixed evidence on the degree to which inflation targeting anchors expectations. However, as described in a recent survey by Blinder et al. (2009), this work 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.

Also particularly relevant to our work is the seminal firm-level survey of Blinder et al. (1998). While their survey focused primarily on the price setting decisions and cost structure of firms, we focus on the expectations of U.S. firms, their acquisition of information, and their knowledge about monetary policy. However, in the sense that we aim to build a nationally representative quantitative survey of firm managers, we follow closely the approach pioneered by Blinder et al. (1998). This paper also builds on Coibion, Gorodnichenko and Kumar (2015), which first utilized the New Zealand survey of firms. We differ from the latter primarily in that we focus here on previously unexplored survey questions bearing on firms' knowledge about monetary policy, as well as 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 expectations formation process for different economic agents. This literature explores the need for moving beyond the assumption of full information rational expectations. Lucas (1972), Mankiw and Reis (2002), Woodford (2002), Sims (2003), Mackowiack and Wiederholt (2009), Alvarez, Lippi and Paciello (2011) 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 Wolfers (2003), for example, emphasize the time variation in disagreement across agents, while Coibion and Gorodnichenko (2012, 2015a) emphasize the predictability in forecast errors of different agents. Andrade and Le Bihan (2013) provide evidence that European forecasters update their forecasts infrequently and in a manner consistent with imperfect information models. 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 very poor approximation.

This paper is organized as follows. Section 2 describes the survey. Section 3 presents evidence on the degree of anchoring of firms' expectations in New Zealand. In Section 4, we study the sources of the differences in firms' inflation perceptions and forecasts. Section 5 focuses on how much firm managers in New Zealand know about monetary policy, while section 6 extends these results to the U.S. Section 7 concludes.

## **2 Description of the survey**

We implemented a quantitative survey of firms' expectations about macroeconomic conditions in New Zealand. Coibion, Gorodnichenko and Kumar (2015) provides a comprehensive description of the survey. In this paper we therefore discuss only the key features of the survey. We executed five waves of the survey that covers the period between September 2013 and August 2015. The first and largest wave of the survey was conducted between September 2013 and January 2014. After contacting around 15,000 firms, we attained a response rate of around 20%, therefore recruiting a sample of 3,153 firms to participate in the survey. 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 were in August-September 2014 and December 2014-January 2015 and received 1,607 and 1,257 responses respectively. In August of 2015, we also implemented a much smaller fifth wave (50 firms), which was aimed to collect responses to open-ended questions.

The main survey (wave #1) focused on collecting a wide range of information on the characteristics of the firm, their price setting decisions and expectations about recent and future inflation. Follow-up waves encompassed some repeat questions from the main survey but each also included 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 primarily focused on collecting individual characteristics of the respondents, and the fourth wave explored how firms acquire and process new information. The smaller fifth wave explored central bank credibility, knowledge about inflation, and asked narrative questions from respondents. With the exception of a handful of cases, the survey collected responses 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.<sup>1</sup> Phone interviews were

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<sup>1</sup> The firm names and their basic details were purchased from the Kompass New Zealand and Knowledge Management Services databases. Prior to doing so, we used the 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 >50 workers)

done with the general managers<sup>2</sup> approximately ten days after the questionnaires had been emailed to them. Since manufacturing and professional and business services account for relatively large shares of GDP (Statistics NZ, 2012), we aimed to have two thirds of our sample from these two industries. The remaining one third is a combination of firms from remaining industries. We excluded industries related to the government, community service, agriculture, fishing and mining, and energy, gas and water from the sample. The combined employment of firms in our sample represents about 5% 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.<sup>3</sup>

The survey is unique in its breadth of coverage and 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, Survey of Expectations) of a sample of economists, business and industry leaders. This survey started in the late 1980s and its objective was to establish a database that might be useful for policy and research. Svensson (2015), for example, notes that inflation expectations from this survey have been only slightly above actual levels of inflation for much of the inflation targeting period. However, there exist several issues with this survey. First, the sample size is very small and targets respondents mainly from the financial and business services industry.<sup>4</sup> Second, the survey is not purely at the firm-level as it includes professional economists, market analysts and public commentators, albeit low in proportion. Third, the firms involved are typically very large ones, which is not at all representative of the New Zealand economy. For example, firms with more than one hundred employees represent less than 1% of all firms in New Zealand but account for nearly all participants in the Survey of Expectations. Lastly, the sample is not random and is instead largely convenience-based.

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for each sector so that we could match our population with the population of firms in the economy. For example, the manufacturing industry in 2012 had around 67 percent of firms in the employment size group of 6 to 19 workers, 21 percent in the 20 to 49 workers and 12 percent in greater than 50 workers. Our population in manufacturing industry contained similar proportions. For other industries, their respective employment size proportions were computed and our population was constructed accordingly.

<sup>2</sup> Our objective was to contact top-level leaders of a firm. General managers, managing directors, directors, chief executive officers, principal legal executives, etc. are classified as “managers”. 97 percent of respondents are classified as managers. Other respondents (3 percent) are marketing officers, industrial relations executives, product development officers, etc.

<sup>3</sup> See Coibion, Gorodnichenko and Kumar (2015) for more details. Using sample weights makes little difference for our results. See Table 1 and Appendix Table A1. The distribution of firms by size across industries in the sample and in the population is given in Appendix Tables A2 and A3.

<sup>4</sup> The breakdown of the sample in the last quarter (Q2, 2015): financial and business services = 91 respondents; agriculture = 11 respondents; labor = 4 respondents; others = 8 respondents.



### **3 Are Firms' 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 might expect to observe depending on the specific definition or extent of anchoring of expectations. The first is whether average beliefs are close to the inflation target of the central bank. The second is whether beliefs are dispersed across agents. A third interpretation of anchored expectations is that they should imply that agents should be fairly confident in their forecasts, i.e. display little uncertainty, especially over the long-run. Fourth, revisions in forecasts should tend to be small, especially at longer horizons. And finally, there should be little comovement 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). We assess each of these in turn.

#### ***Prediction 1: Are Average Beliefs Close to the Inflation Target?***

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 (e.g. 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 are available, as well as average firms' beliefs about inflation over the preceding twelve 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, firms' 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.<sup>5</sup> Nor does the average firm forecast appear particularly stable over time. Over the course of 2014, the average 12-month ahead forecast of inflation fell by anywhere between 0.6% points and 2.2% points depending on how we truncate the sample.<sup>6</sup> In contrast, professional forecasters reduced their forecasts by 0.3% over the same time period on average and households by 0.4%. 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 does it appear to be stable over time.

#### ***Prediction 2: Are Beliefs Dispersed Across Agents?***

It is possible that firms' average inflation beliefs were temporarily driven higher in New Zealand at the time of the survey by some transitory changes in economic conditions that disproportionately affected

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<sup>5</sup> 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 4, most managers can correctly explain the meaning of inflation.

<sup>6</sup> The RBNZ's survey of households drops all forecasts above 15% and below -2%. Our “truncated” sample applies the same restrictions whereas our full sample includes all forecasts.

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. This transitory deviation however should not affect the cross-sectional distribution of beliefs of agents with well-anchored expectations. As a result, a useful second check is to consider the cross-sectional dispersion in forecasts. Table 1 also reports the cross-sectional standard deviation in inflation forecasts at the same horizons as before. The dispersion in 12-month ahead inflation forecasts of firms exceeds that of households every quarter, which is already an order of magnitude larger than that of professional forecasters. Hence, there is little concentration of beliefs.

The distribution of forecasts for inflation at the 5-10 year horizon is illustrated in Figure 2. While approximately 20% of firms correctly identified the target rate of 2%, another 20% picked a much higher long-run forecast of 5% and another 20% predicted that inflation over the next 5-10 years would average between 5% and 10%. This dispersion in beliefs about long-run inflation is particularly difficult to reconcile with anchored inflation expectations.

***Prediction 3: Do Agents Show Confidence in Their Forecasts?***

An alternative interpretation of anchored inflation expectations is that they have to do with the risks that agents perceive about future inflation. Specifically, anchored expectations should be such that one perceives little risk of either high or low inflation in the future. Hence, the range of possible outcomes for inflation considered realistic by agents should be quite limited if expectations are well anchored, and their confidence in their forecasts should therefore be relatively high. In the 4th 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 compute the standard deviation of each manager's forecast and report the distribution of these standard deviations in Panel A of Figure 3. The average standard deviation is 2%, so the firm managers on average report a lot of uncertainty around their forecasts. As Panel A also makes clear, there is considerable heterogeneity in the degree of uncertainty associated with individuals' forecasts. Panel B reports the average probability assigned by managers to each bin of the distribution. While most of the mass is assigned to bins ranging from 0-6% inflation, much higher inflation rates receive a significant weight on average as well.

***Prediction 4: Do Agents Display Small Revisions in Forecasts?***

While the mean and the cross-sectional dispersion of firms' inflation forecasts are both quite high, one can still consider weaker notions of anchored expectations based on point forecasts. For example, a high dispersion of forecasts could arise when each agent's expectations are fully anchored at different levels. In such a setting, one might still think of expectations as anchored, in the sense that they would be stable (albeit

not tied to the specific level of the target but rather to heterogeneous beliefs about the target) over time, but these expectations could display high means and levels of dispersions as observed in Table 1. However, one feature that should still be present in this weaker form of anchored expectations (and that would be present in the stronger form as well) is that individuals' revisions in their inflation forecasts, especially at longer horizons, should tend to be small. Since agents expect the central bank to be able to keep inflation stable over longer periods, they should not make large revisions in their longer-horizon forecasts.

Because our survey includes a panel dimension, we can examine this prediction using revisions in firms' 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 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 time period, it is difficult to reconcile such dramatic revisions with any notion –weak or strong– of well-anchored expectations.

***Prediction 5: Are Long-Run Inflation Expectations Independent of Short-Run Expectations?***

A fifth interpretation of anchored expectations comes from looking at the correlation and comovement of short-run and long-run expectations. Consider an extreme example of anchoring: if central banks are able to successfully stabilize long-run inflation around a target, then short-run movements in inflation should be orthogonal to the constant long-run inflation rate, and the same should be true of inflation expectations. Figure 5 documents that this is not at all the case in our data: managers who expect higher short run inflation also tend to expect higher long run inflation. One might still expect to find a positive correlation between the two sets of expectations if agents set their 5-10 year ahead forecasts equal to a weighted average of their 1-year ahead expectation and their expectation about long-run inflation. But in this case, the implied slope of the relationship should be small (between 0.1 and 0.2 for 5-10 year ahead forecasts) whereas Figure 5 illustrates a slope of 0.70. Hence, 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 along each metric, their inflation expectations do not conform in the least bit to the properties one would expect from agents with well-anchored expectations. Furthermore, Coibion, Gorodnichenko and Kumar (2015) document that managers considerably revise their inflation expectations in light of incoming information, thus violating Bernanke's (2007) definition of expectations being anchored.

## 4 What Do Managers Know about Inflation? How Do They Learn? Does It Matter?

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, 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.

### 4.1 What Do Managers Know about Inflation?

Given the properties of firm managers' perceptions and expectations of inflation described in the previous section, one might wonder to what extent they are knowledgeable about what inflation means or how it is measured as well as the sources of their information about inflation used 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 fifty firms drawn from different bins of the inflation expectation distribution (~12-13 firms each from bins of firms who had previously forecasted inflation of 0-3%, 4-6%, 7-10%, and >10%). As before, we asked managers of these firms to state their inflation expectations over the next 12 months and 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 exact same open-ended question which is posed to households in the RBNZ survey. We graded firms' narrative answers on a scale ranging from 0 to 2 points. Our reference answer was "Inflation is *the increase (or change) [1 point] in the general (average) price level of goods and services [1 point] in the economy.*" Hence, firms 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 firms received a grade of 0. Only eight firms got a score of 1, so 86% of firms in this sample were 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.<sup>7</sup> There is little difference in the perceived inflation rates or expectations of firms across the two groups, suggesting that these minor differences in understanding of the concept of inflation play little role in accounting for the

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<sup>7</sup> 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."

heterogeneity in firms' forecasts. In contrast, households in the RBNZ survey fail to correctly identify inflation at much higher rates. For example, in the May 2015 survey, 52% 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 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 firms responded that official inflation data are credible, whereas fourteen percent expressed skepticism. The average inflation forecast of managers who do not believe official inflation data is only 1% higher than that of managers who do believe official inflation 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 inflation, how can they then perceive such different levels of inflation than what is measured by statistical agencies? Given that aggregate inflation is a weighted average of inflation for different categories of goods, two non-exclusive explanations are possible. One is that firms assign different weights to categories of goods than statistical agencies (e.g. overweight gasoline price movements). Another is that firms are mistaken about the sizes of price changes for certain categories of goods (e.g. think food prices went up more than they did). To assess these two explanations, we asked firms in the fifth wave to report how much weight they believe statistical agencies assign to different categories of goods and services when constructing overall price measures for New Zealand.<sup>8</sup> The specific set of categories includes house prices, stock prices, food prices, healthcare costs, gasoline prices, the cost of rent, and car prices. We then asked firms to report their beliefs about price changes over the last twelve months for each of the same categories.

The results are presented in Table 2, 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%), stock prices (8%), and gasoline prices (19%) far exceed the true values (4%, 0%, and 5% respectively). In contrast, managers

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<sup>8</sup> 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%). Please provide percentage answers.”

significantly underestimated the weight assigned to food prices (belief of 9% vs. true value of 19%). There are also some notable differences between managers' beliefs about inflation at the category levels and actual inflation rates. They significantly underestimated inflation in stock prices (belief of 4% vs. actual change of 13%) but overestimated inflation in car prices (by 7% points) and food prices (by 4% points).

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

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

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

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 firm's errors about category-specific inflation rates. The second term captures the contribution of the firm'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 2. First, we report average values of the error across all firms, as well as average values of each of the terms in the decomposition. The average firm error is 1.7%, implying that firms overestimated on average the positive effect of these categories on aggregate inflation. Errors about category-level inflation rates contributed about 1.2% out of the 1.7%. Hence, much of the average error can be explained by the fact that, on average, firms significantly overestimated the increase in food prices. The contribution of errors about weights is smaller, 0.8% out of the 1.7%, and comes primarily from the fact that firms overestimated the weights on housing and stock prices. The negative covariance term is driven largely by stock prices and food prices, in which firms over(under) estimated the weights but under(over) estimated the inflation rate. These results suggest that firms' 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 2 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 firms 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 be able to account for the amount of disagreement that we observe in beliefs of managers about *aggregate* inflation rates. Consistent with this, we report in Table 2 the cross-sectional standard deviations of each term in the decomposition of the errors above. Disagreement among firms 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. Hence, this result suggests that the primary source of the large disagreement that we observe in firms' perceptions of recent inflation rates is differences in opinion about the relative importance of different categories of goods in the measurement of inflation.

#### **4.2 What Sources of Information Do Managers Use to Form Inflation Expectations?**

For firms to hold such different expectations about inflation, they must rely on different sources on information to form their expectations. We investigate the source of firms' inflation expectations in two ways. First, in the fifth wave of the survey, we asked firms the following open-ended question: "*How do you typically form your inflation expectations?*"

Managers provided four general types of responses, as summarized in Table 3. First, 47% 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 and lower inflation forecasts as well. The second most common answer, accounting for 43% 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 contrast to managers who rely on media for their information, respondents who use their personal shopping experience to inform them about inflation tended to have larger errors about recent inflation dynamics than other firms and higher inflation forecasts. The remaining two categories account for much smaller shares of respondents, approximately 10% each. One answer is that managers discuss inflation with coworkers or family members. These respondents tend to have relatively good information about inflation. The other group states that they rely on their competitors' or suppliers' prices to make inferences about aggregate inflation. This group has the largest average errors about 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 firms to rank the importance of different sources of information to them in forming their inflation expectations on a scale of 1 (lowest) to 5 (highest). The specific sources were a) family and friends, b) employees and colleagues, c) customers and suppliers, d) gas prices, e) personal shopping experience, f) government agencies, g) business associations, chambers of commerce and trade fairs, h) media (TV, newspapers, etc.) and i) professional forecasts. The average ranks given by firms are listed in the first row of Table 4. Consistent with the narrative responses, two of the most highly ranked categories are 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% 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/gasoline prices in forming their inflation expectations.

Table 4 also presents average ranks assigned to categories by firms who rate specific categories as very or extremely important to them, as well as average backcast errors and inflation forecasts for these groups of firms. In addition, Table 4 presents the correlation matrix of ranks given by firms to different sources of information. These jointly yield several results. First, managers who rate professional forecasters as very or extremely important to them have much better perceptions and forecasts of inflation on average than other firms. These managers also tend to rely on media and employees/colleagues more than other firms. However, only 20% of firms rate professional forecasts as being this important. Second, as found with the narrative questions, managers who rate media as very or extremely important to them also have better information about inflation than other firms on average. Approximately 54% of firms rate media as very or extremely important to them.

Third, and perhaps most strikingly, 88% of managers rate their personal shopping experience as very or extremely important to them. Even among those firms who utilize 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 terms of the prices they 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.



### 4.3 How Do Managers Use Their Inflation Expectations?

Does it make any difference to a manager's decisions whether they expect inflation to be 1% or 5%? One way to answer this would compare the decisions of different managers who hold different inflation expectations, but this approach would require us to be able to control for a wide array of factors relevant for each manager's decision. Instead, we asked managers in the 3<sup>rd</sup> wave of the survey the following hypothetical question for each of 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% of firms reported that higher inflation expectations would have no effect on any of their economic decisions, whereas 75% of firms would respond along at least one margin.

The responses for each individual variable are presented in Table 5. Approximately 35% of firms report that they would charge higher prices, whereas between 25% and 30% of firms report that they would raise wages, employment or investment. Almost no firms would decrease any of these variables. Table 5 also considers pairs of answers across variables. Few firms would adjust along more than one margin in these pairings: just 13% of firms would raise prices and wages, 8% of firms would raise employment and wages, and 9% of firms 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.

We also asked firms a similar but open-ended version of this question in the fifth wave of the survey to try and get further insight on the ways in which inflation expectations affect their decisions. They were asked

**“How do you typically use your inflation expectations?”**

Managers gave four general types of answers. Three conformed to the categories above. Namely, 12% of firms responded that inflation expectations mattered for their pricing decisions, 14% of firms mentioned their wage-setting decisions, and 18% specified their investment decisions. But two-thirds of firm managers instead stated 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 decision-making rather than for the economic decisions of the firm.

## 5 Credibility vs. Knowledge of RBNZ’s Objectives

The apparently unanchored nature of inflation expectations in New Zealand, despite 25 years of inflation targeting and relatively stable inflation, seems puzzling. One reason why so many managers’ long-run inflation forecasts might be so high is that the RBNZ is not viewed as a credible institution, i.e. managers’ simply don’t 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 and differentiate between these two potential explanations.

In the fourth and fifth waves of the survey, we asked managers several questions designed to assess the extent of managers’ 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?”

<i>a. Keep the exchange rate stable</i>	[23%]
<i>b. Promote full employment</i>	[25%]
<i>c. Keep interest rates low and stable</i>	[11%]
<i>d. Keep inflation low and stable</i>	[31%]
<i>e. Help the government finance its spending</i>	[10%]

Figures in squared brackets show the shares of responses.<sup>9</sup> Only 31% of respondents correctly chose *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: ..... %

We present a detailed distribution of responses in Table 7. Of the respondents, only 12% correctly responded 2%, although an additional 25% said either 1% or 3%, the bottom and top of the target range of the RBNZ. But 15% said the RBNZ’s target inflation rate was 5%, 36% said the target was more than 5%, with 5% of respondents saying that the RBNZ’s target inflation rate was 10% or more.

Finally, we asked managers the following:<sup>10</sup>

<sup>9</sup> Because of the large sample size, here and henceforth we can reject the null 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.

<sup>10</sup> 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 was 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.

**“What is the name of the Governor of the Reserve Bank of New Zealand?”**

- |                          |       |
|--------------------------|-------|
| <i>a.</i> Graeme Wheeler | [30%] |
| <i>b.</i> Alan Bollard   | [39%] |
| <i>c.</i> Bill English   | [17%] |
| <i>d.</i> Charles Cowley | [ 9%] |
| <i>e.</i> I don't know   | [ 4%] |

In this list, only two people (Wheeler and Bollard) are or were affiliated with the RBNZ and they obtained 69% of the responses. The correct answer (*a*) was again chosen by only 30% of respondents. The most popular response was the name of the governor (Bollard) who 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% of respondents answered all three questions exactly correctly. But those who answered all questions correctly displayed significantly better-behaved forecasts (in the sense of being closer to those of professionals): their mean long-run inflation forecast was exactly 2% with a cross-sectional standard deviation of just 1.2%, whereas all other respondents had a mean forecast of 3.7% with a standard deviation of 2.6%. Likewise, their mean short-term forecast was 2.6% (st.dev. 1.4%), while all other respondents had a mean of 5.2% (st.dev. 3.2%). They also had much better knowledge of recent inflation dynamics, with average backcasts of just 1.5% (st.dev. 0.6%) compared to 4.6% (st.dev. 2.4%) for other respondents.

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%, 89% forecasted that inflation over the next five to ten years would range from 1 and 3%, as illustrated in Table 7. 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%. This suggests that for the agents who know the central bank's objective, that objective is credible and embedded in their forecasts. The credibility of the RBNZ extends even to many of those who are incorrect about its actual inflation target: managers who think that the RBNZ's target is 3% report an average long-run inflation forecast of 3% and managers who think that the RBNZ's target is 4% report an average long-run inflation forecast of 4%.<sup>11</sup> So while they're incorrect about the value that the RBNZ is trying to achieve, their forecasts are consistent with the notion that the RBNZ will be able to achieve what they perceive to be its objective.

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

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<sup>11</sup> At higher levels of beliefs about the RBNZ's inflation target, the relationship between the target and managers' forecasts becomes flatter, with forecasts no longer rising one-for-one with targets but still increasing in the belief over the target.

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

The point was to assess whether managers believe that the central can achieve its inflation target over a medium to long time horizon. Out of the fifty respondents in the fifth wave, forty-nine responded yes and only one thought that the central bank could not control inflation over this time horizon. This indicates broad support on the part of managers for the view that monetary policymakers 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?”**

This question asks respondents whether they think central banks can control inflation over a horizon as short as one year. Strikingly, forty-seven out of fifty responded 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 appears to be well-established in New Zealand. The issue instead appears to be that many managers are relatively uninformed about the practical objectives and targets of the central bank, and this lack of quantitative information is reflected in the forecasts that they report. For example, as documented in Table 7, managers who are uninformed about the RBNZ’s target inflation rate tend to be much less informed about recent inflation dynamics. Their forecasts are also associated with much more uncertainty. Given the ease with which information about monetary policy can be accessed, it may seem surprising that managers of firms are not more informed about it.

One possible explanation could be that firms value information about inflation differently. We asked firms about their willingness to pay for monthly forecasts of inflation, as well as for forecasts of other macroeconomic variables. The results, presented in Table 8, indicate that firm managers who correctly reported low values of the RBNZ’s inflation target also report being willing to pay much more for inflation forecasts on average than managers who reported higher target values, whereas no such striking pattern exists for other macroeconomic variables. This finding is consistent with the possibility that some firms value the information about inflation more than others and therefore acquire more and better information about it.

Table 8 documents that the differences in knowledge about the RBNZ’s target can only be partly explained by education: the average education levels of managers differ little depending on their answers about the RBNZ’s target level. But they do differ more according to the slope of the firm’s profit function

with respect to firm's price, as defined in Coibion, Gorodnichenko and Kumar (2015).<sup>12</sup> 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 which have steeper profit functions and so in which information is more valuable.

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). Results, converted into answers in months, are presented in Table 8 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 3-5 months on average) but this attention to news declines sharply with higher inflation targets, before stabilizing for managers who reported targets of 5% or more at an average frequency of 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: TV, 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% report that TV and newspapers are quite useful to their business decisions, consistent with their frequent use of these media documented in Table 8, and also report some usefulness for monetary and Treasury reports. However, the perceived usefulness of all these media for business decisions declines sharply for managers who reported higher inflation targets. None of the managers report much usefulness for their business decisions from direct communications by the central bank via email, RSS, or Twitter.

We investigate the characteristics of managers and firms that are correlated with a manager's knowledge of monetary policy more formally 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%) 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: a firm's age, employment at the firm, labor's share of total

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<sup>12</sup> 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.

costs, foreign sales as a share of total revenues, the number of competitors reported by the manager, the average profit margin of the firm, 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 manager. 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 9) 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 firms to pay more attention to economic conditions, including monetary policy, to avoid being driven out of business. We also find that firms which 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. More years of schooling on the part of managers are 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.

## **6 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 a) the inflation expectations of the U.S. public also appear unanchored and b) 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 U.S., we focus primarily on the Michigan Survey of Consumers (MSC), the Survey of Consumer Expectations (SCE), and the Survey of Professional Forecasters (SPF) but use additional polling data as well when available.

### **6.1 Are the U.S. Public's Inflation Expectations Anchored?**

We revisit the five characteristics of "anchored" expectations 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%, well above the Federal Reserve's 2% inflation target. In contrast, professional forecasters predict

inflation close to the official target at all horizons. The actual rate of inflation over the 2013Q4-2014Q4 period was less than 2.4%. Strikingly, the magnitudes are similar to New Zealand's counterparts.<sup>13</sup>

Second, we explore whether economic agents in the U.S. 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%), the dispersion is an order of magnitude larger for households (approximately 4% 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 New Zealand.

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 (Panel A of Figure 7) 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%, which is comparable to the mean forecast of consumers. Panel B of Figure 7 also shows that, on average, consumers assign more than 50% probability to inflation in the U.S. being greater than 4% 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, in years 2012 and 2013, only 6 percent of respondents claimed to be very confident that inflation will remain moderate over the next 10 years and will average no more than 4% in the next 10 years. At the same time, approximately 60% 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 and 3-to-5-year 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 MSC respondents who revise their inflation forecasts has been between 70% and 80% since 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.

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<sup>13</sup> Neither the MSC nor the SCE asks people to report current or past inflation. A poll by the Pew Research Center for the People and the Press Poll asked the public about whether recent inflation data was closer to 1%, 5%, 10%, or 20%. The most common answer, with 49% of responses, was "don't know/refused to answer" and the mean response was 7.4%, well above the actual inflation rate of approximately 1%. (See Binder (2015) for more details.) Thus, similar to consumers in New Zealand, consumers in the U.S. appear to have a perception of inflation well above actual figures.

Finally, we regress long-run inflation forecasts on short-term inflation forecasts. We do so both in levels (as with the New Zealand data) but also using revisions in both short-run and long-run forecasts at the individual level since this type of panel data is available for the U.S. in the MSC, the SCE and the SPF. Similar to New Zealand, long-term forecasts are highly sensitive to movements in short-term forecasts for consumers in the U.S. (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 one percentage point increase in short-term inflation forecast can be associated with as much as one percentage point increase in 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.

## **6.2 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 the chair of the Federal Reserve as a simple measure of how informed they are about recent monetary policy actions and discussions. Binder (2015) documents that the public is largely unaware of who is the chair of the Fed. In a number of polls asking the public to pick the name of the chair from four options, between 20% and 50% 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 was for Janet Yellen in the September 2014 poll (24%), but this was only six 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 New Zealand as in the U.S. 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 via social media. Table 7 presents numbers of Facebook and Twitter followers for each of the Federal Reserve Banks, as well as the Federal Reserve System as a whole. As of June 30<sup>th</sup>, 2015, the entire Fed system had 702,955 followers on Twitter. For comparison, the U.S. State department had twice as many followers, the FBI had 470,000 more, and the CIA had 120,000 more followers on Twitter. 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 Ron Paul and Rand



Paul each have almost as many followers as the entire Federal Reserve System. Binder (2015) documents similar evidence.

Data from Google Trends also allows us to verify the extent to which the U.S. public seeks out information about macroeconomic conditions online. Figure 10 plots the volume of online Google searches for macroeconomic variables like GDP, inflation and the unemployment rate in the U.S. since January 2004. For comparison, we also plot the total volume of searches for puppies, which is approximately 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 Council in 2011 asked respondents to evaluate how important different issues would be to their vote for the 2012 presidential elections. 68% of respondents rated inflation as extremely important or very important to them. This combined share of importance put it 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 Appendix Figure A1), despite the fact that the president's influence on inflation is much more limited than on any of these other issues. In 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 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 may not necessarily have helped matters much for the general public. Hernandez-Murillo and Shell (2014), for example, analyze the complexity of 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 and required a 12<sup>th</sup> grade reading level to understand. By 2014, the length of the statement was six times as long, and the reading level was effectively for PhDs. Not surprisingly, when the U.S. public is asked how well they understand monetary policy, they tend to express some hesitation. In July 2014, a poll from 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% of respondents claimed it was very easy or somewhat easy, 70% of respondents expressed difficulty understanding monetary policy, with a quarter of respondents saying it was "very hard". In short, despite dramatic changes in the communications strategy of the Federal Reserve over the

last twenty years, the U.S. general public appears to remain profoundly uncertain about what exactly the Federal Reserve does.

## **7 Conclusion**

After twenty-five years of largely successful inflation targeting in New Zealand, the inflation expectations of households and firms there do not appear particularly well anchored. Managers of firms there 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 are particularly sensitive to gasoline prices, much as is the case with households in the U.S. Indeed, along most metrics, the expectations of managers are much more similar to those of households than those of professional forecasters. Since neither group appears to be well-informed about monetary policy overall, this suggests that central banks' communications strategy changes of the last twenty years 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 this period), in absolute terms the properties of inflation expectations and perceptions of inflation appear to score poorly along popular metrics of how anchored expectations are.

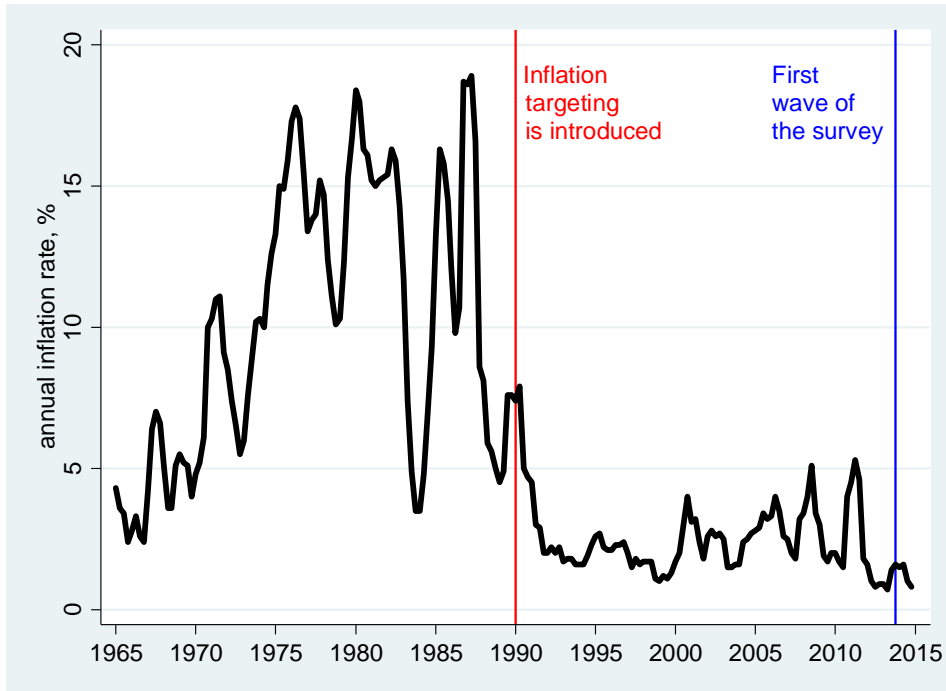
The lack of awareness by the general public, including firm managers, of the actions and objectives of monetary policymakers is particularly problematic in periods when central bankers are seeking to affect inflation expectations through forward guidance. Because such policies are designed to have real 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. Coming to terms with these limited information sets on the part of households, not just in terms of contemporaneous economic conditions but also about the objectives of the central bank, will be challenging from a modeling point of view. But doing so will allow future work to shed new light on the optimal way for central banks to release information in a way that informs not just professional forecasters and financial market analysts but also the broader public. Only then may inflation targeting finally achieve its full promise.

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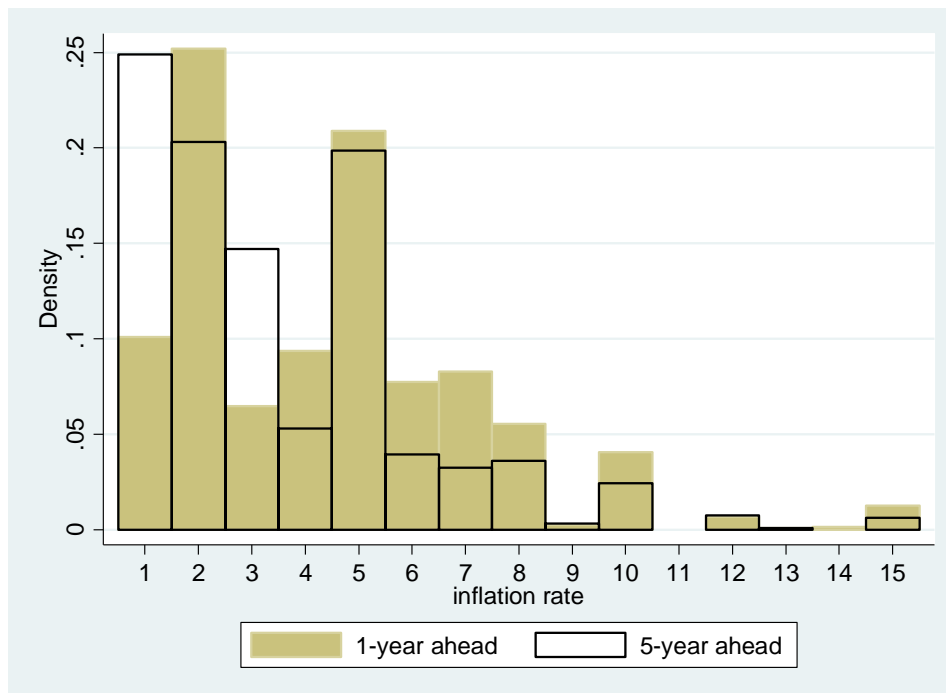
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**Figure 1: Inflation and Beliefs about Past Inflation.**



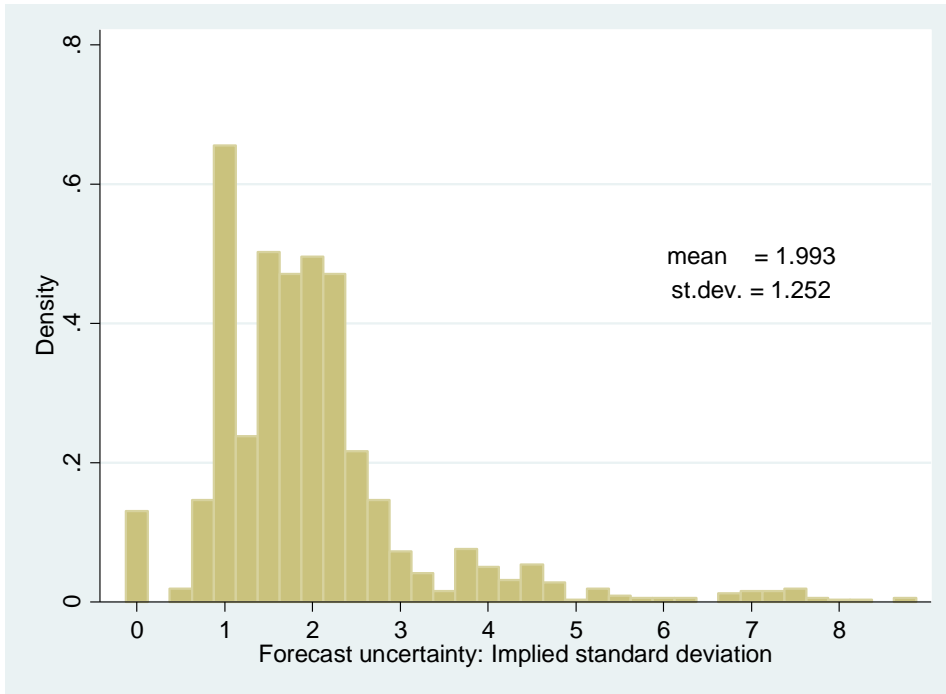
**Figure 2. Distributions of Inflation Forecasts**



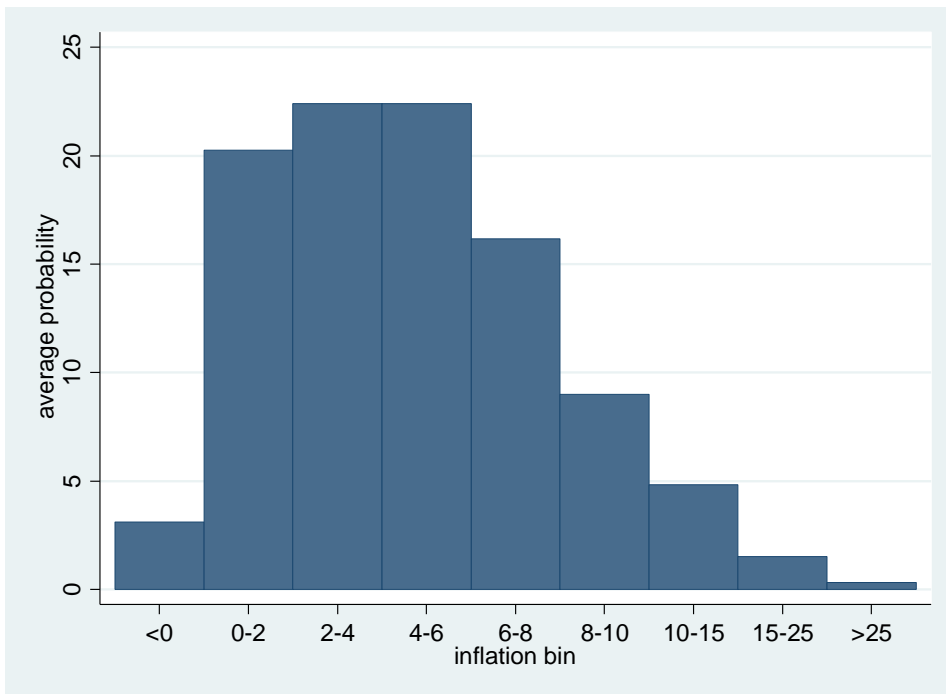
Notes: The figure reports the distribution of 1-year ahead and 5-to-10-year ahead inflation forecasts in the third wave of the survey (2014Q3). The survey questions are: “During the *next twelve* months, by how much do you think overall prices in the economy will change? Please provide an answer in percentage 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?”

**Figure 3. Uncertainty in Managers' Inflation Forecasts**

**Panel A: Distribution of uncertainty (implied standard deviation) across firms**

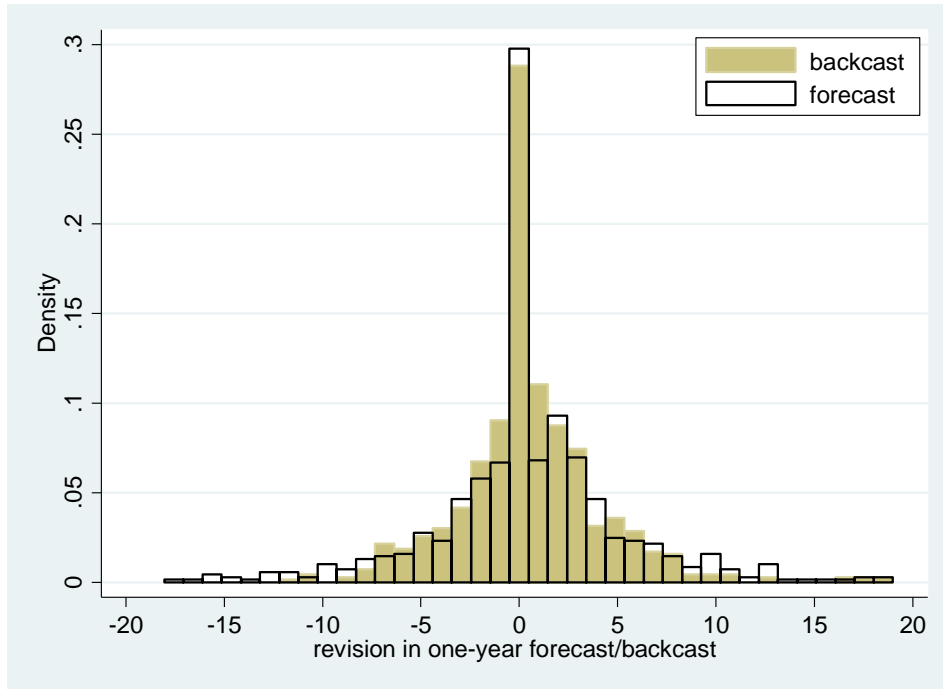


**Panel B. Average probability assigned to inflation bins**



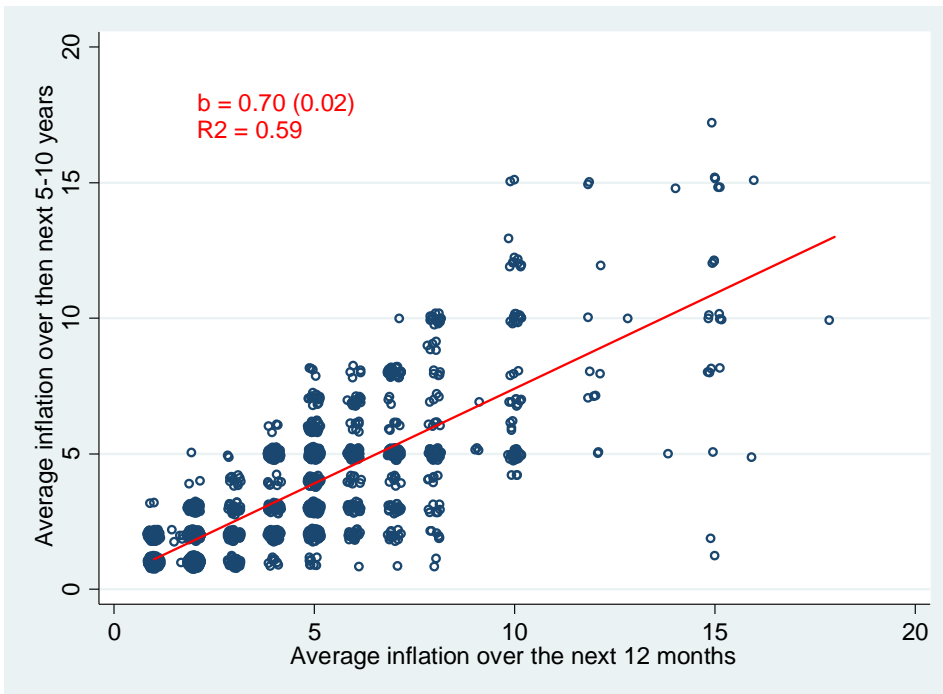
Notes: The survey question asks firms to assign probabilities to nine bins. For each firm, we construct a measure of uncertainty as the standard deviation of the reported distribution. Panel A plots the distribution of this measure of uncertainty across firms. Panel B plots the average (across firms) probability assigned for each inflation bin.

**Figure 4. Revisions of inflation forecasts and backcasts (one-year inflation)**



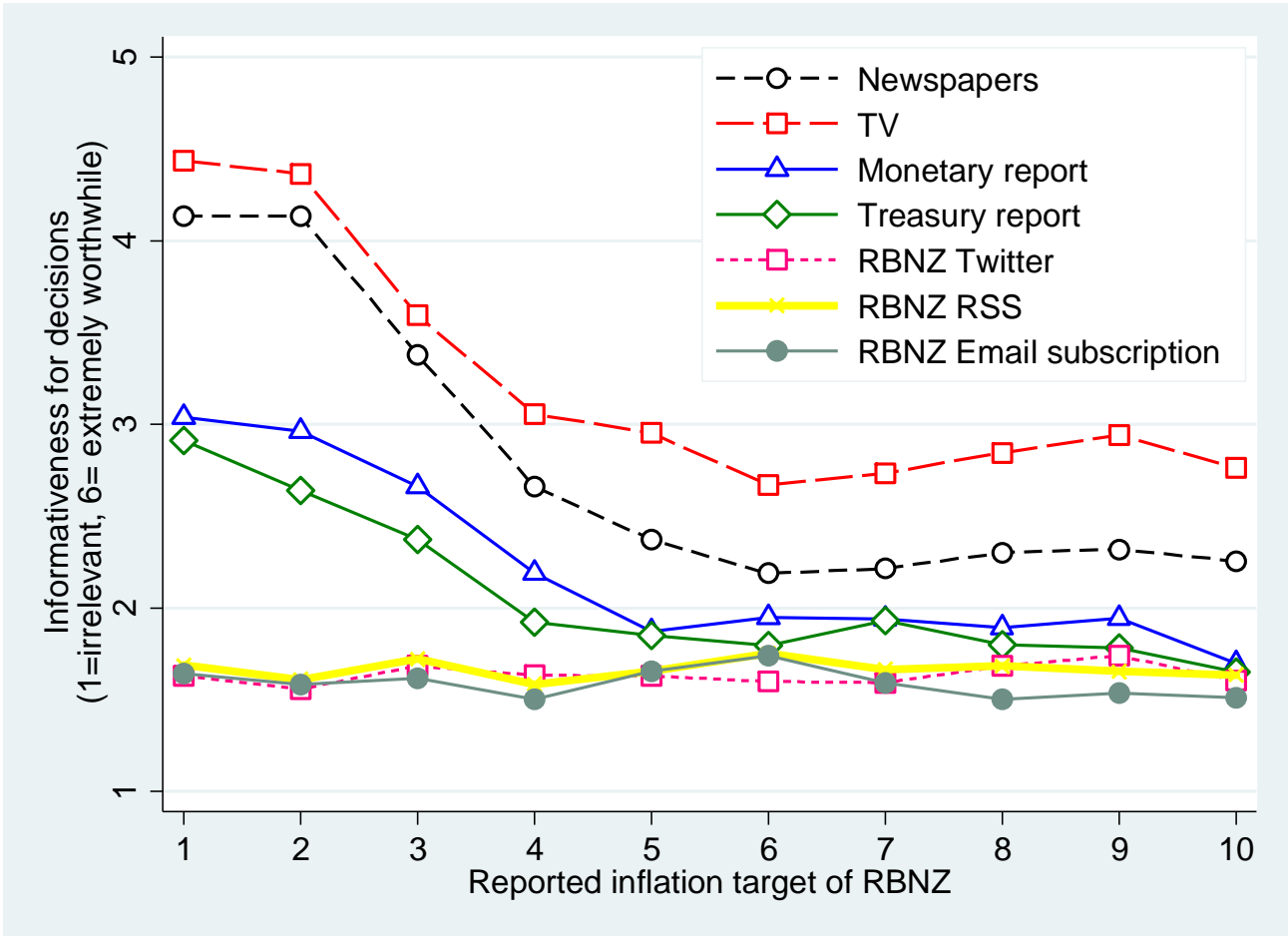
Notes: The figure plots the distribution of revisions in one-year inflation forecasts (white bars) and revisions in backcasts of inflation over last 12 months (brown bars).

**Figure 5. Short-term vs. long-term inflation expectations**



Notes: The figure shows the relationship between 1-year ahead and 5-to-10-year 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?”.

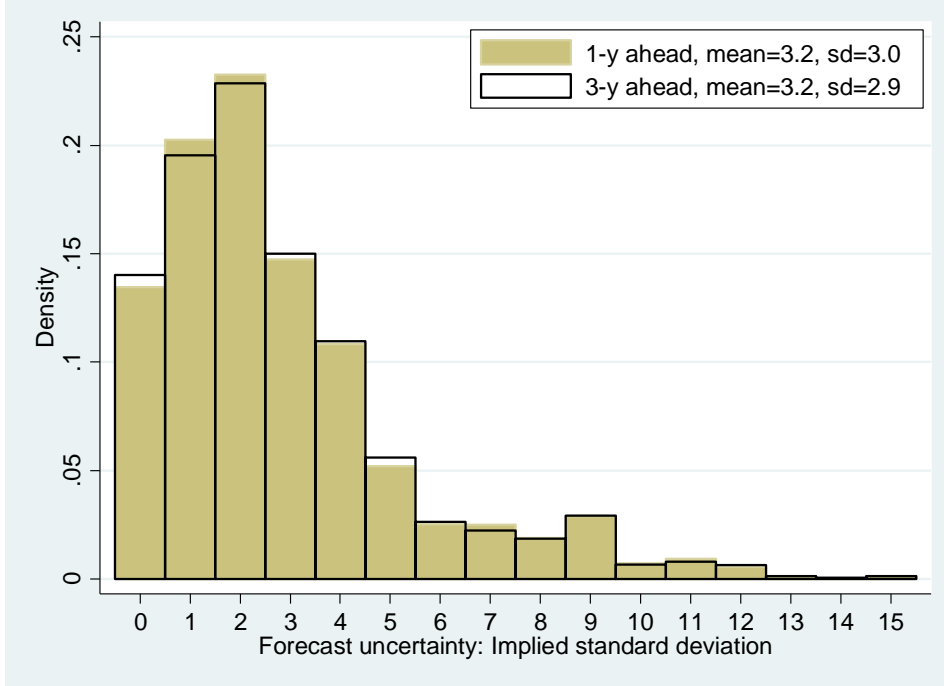
**Figure 6: Informativeness of Different Types of Media**



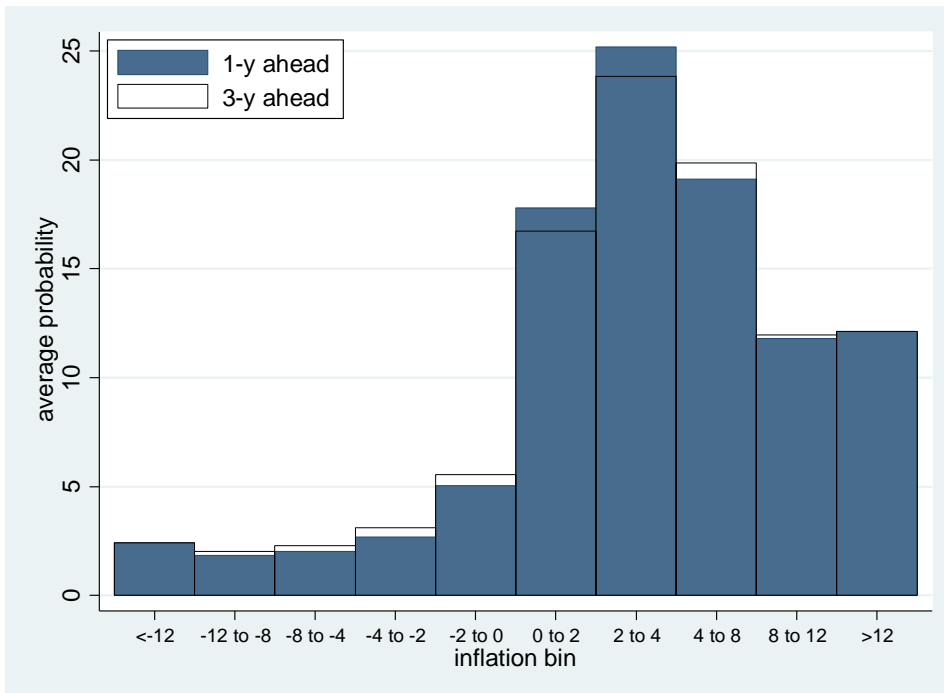
Notes: The figure plots the mean informativeness for decisions of each type of media for all managers who reported that the inflation target for the RBNZ was one of the values on x-axis.

**Figure 7. Uncertainty in Consumers' Inflation Forecasts, U.S.**

Panel A: Distribution of uncertainty (implied standard deviation) across consumers



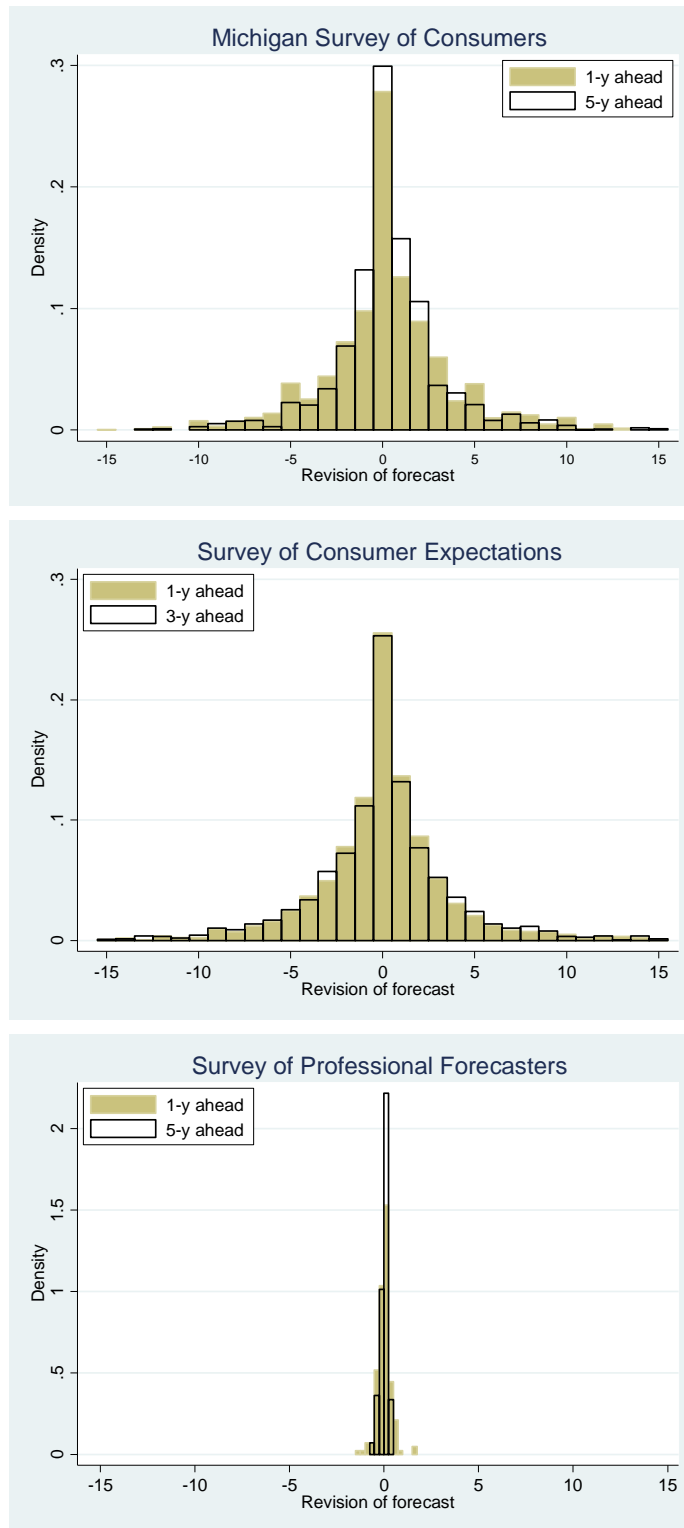
Panel B. Average probability assigned to inflation bins



Notes: A question in the Survey of Consumer Expectations asks consumers to assign probabilities to ten bins. For each consumer, we construct a measure of uncertainty as the standard deviation of the reported distribution. Panel A plots the distribution of this measure of uncertainty across consumers. Panel B plots the average (across consumers) probability assigned for each inflation bin. The sample period covers 2013Q4-2014Q4.

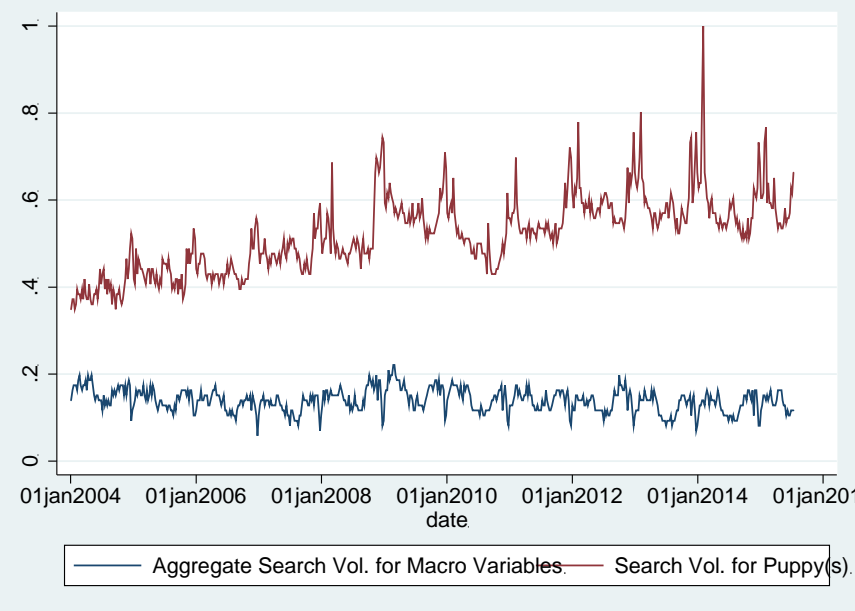


**Figure 9: Forecast Revisions by U.S. Households and Professional Forecasters**



Notes: In each panel, brown bars are for the distribution of revisions in long-term (3- or 5-year-ahead) inflation forecasts. White bars are for the distribution of revisions in short-term (1-year) inflation forecasts.

**Figure 10: U.S. Google Searches for Macroeconomic Variables vs. Puppies**



Notes: The figure plots the volume of online Google searches for macroeconomic variables (GDP, inflation and unemployment rate) vs. puppies. Source: Google Trends.

**Table 1: Inflation Forecasts of Firms and Others for New Zealand**

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

Notes: The table presents inflation forecasts of the RBNZ (column 2), mean forecasts from surveys and the cross-sectional standard deviations of these forecasts (columns 3-8). Columns 9-12 report nowcasts/backcasts of inflation over the last 12 months. Column (1) reports most recently available inflation data at the time of the surveys. Professional forecasts are from Consensus Economics. Household forecasts are from the Survey of Households produced by the RBNZ. Central Bank forecasts are from Monetary Policy Reports of the RBNZ. Consistent with how the RBNZ calculates moments of household expectations, we exclude responses of firms' managers that are greater than 15% or less than -2%. Results for non-truncated data are reported in Appendix Table A1. Moments for firms are calculated without weights. Results with sample weights are reported in Appendix Table A1.

**Table 2: Firms' Perceptions of Construction of Inflation**

	Perceived		Actual	
	weight	Inflation, %	Weight	Inflation, %
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 (6.4)	4.0 (2.0)	18.8	0.2
Healthcare 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 ( $\tilde{\pi}_i^p, \tilde{\pi}^a$ ), %		1.79 (2.12)		0.08
Error ( $\tilde{\pi}^p - \tilde{\pi}^a$ ), %			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)

Notes: The top panel of the table shows perceived and actual inflation for subcategories of the Consumer Price Index as well as perceived and actual weights for these subcategories. The middle panel shows the perceived and actual contribution of these subcategories to aggregate CPI inflation. The bottom panel decomposes the difference between the perceived and actual contributions.

**Table 3: Narrative Responses to How Firms Form their Inflation Expectations**

How do you typically form your inflation expectations?	Share of firms	Absolute backcast error, %		Inflation forecast, %	
		Mean	SD	Mean	SD
	(1)	(2)	(3)	(4)	(5)
Media	0.47	2.61	1.78	3.65	2.45
Meetings and discussions	0.10	3.10	1.52	4.00	1.22
Shopping experience	0.43	4.27	1.47	4.95	1.12
Prices of competitors and suppliers	0.10	4.50	2.17	5.20	2.39
Total		3.31	1.81	4.24	1.95

Notes: The left column of the table indicates the main source of information or way of forming expectations. Narrative responses may be classified into several categories. We could not classify one response into any of the four groups indicated in the left column of in the table.

**Table 4: Quantitative Responses to How Firms Form their Inflation Expectations**

	Importance of information source										Average abs. backcast error	Average inflation forecast
	Share of firms	Family and friends	Employees & colleagues	Customers & suppliers	Gas prices	Personal shopping experience	Government agencies	Business associations, fairs	Media	Professional forecasts		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)		
All firms	1.00	2.12	1.88	1.68	4.14	4.42	1.74	1.82	3.54	2.42	3.27	4.18
Statistics if response is “very important” or “extremely important” for												
Family and friends	0.06	4.67	4.00	1.67	4.00	3.67	1.67	2.00	2.33	2.67	3.37	4.67
Employees & colleagues	0.08	3.25	4.50	2.00	4.25	4.00	2.00	1.75	2.75	2.75	2.95	3.75
Customers & suppliers	0.04	1.00	1.50	4.50	4.00	4.50	2.50	3.00	4.00	2.50	2.70	4.50
Gas prices	0.76	2.24	1.82	1.74	4.53	4.63	1.79	1.76	3.50	2.42	3.03	3.95
Personal shopping experience	0.88	2.07	1.77	1.68	4.25	4.64	1.77	1.86	3.64	2.48	3.14	4.11
Media	0.54	2.00	1.81	1.59	4.07	4.44	1.70	1.81	4.81	2.96	2.42	3.59
Prof. forecasts	0.20	2.00	2.10	1.30	3.90	4.30	1.30	1.50	4.80	4.40	1.65	2.20
Correlation matrix												
Family and friends		1.00										
Employees & colleagues		0.34	1.00									
Customers & 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	1.00						
Government agencies		-0.10	0.09	0.31	0.15	0.09	1.00					
Bus. associations, fairs		-0.11	0.12	0.31	-0.21	-0.07	0.38	1.00				
Media		-0.15	-0.06	-0.05	0.02	0.21	-0.05	-0.02	1.00			
Prof. forecasts		0.03	0.10	0.01	-0.14	-0.11	-0.29	-0.07	0.48	1.00		

Notes: Respondents are 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”). The table reports average responses. These responses were collected in the 5<sup>th</sup> wave of the survey.

**Table 5: How Firms Would Respond to Higher Inflation Expectations**

<b>Panel A.</b>			
Variable	Response		
	increase	no change	decrease
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

<b>Panel B.</b>			
Price response	Wage response		
	increase	no change	decrease
Increase	0.130	0.217	0.007
no change	0.114	0.480	0.011
Decrease	0.009	0.030	0.002

<b>Panel C.</b>			
Wage response	Employment response		
	increase	no change	decrease
Increase	0.082	0.167	0.004
no change	0.184	0.536	0.007
Decrease	0.007	0.012	0.000

<b>Panel D.</b>			
Investment response	Employment response		
	increase	no change	decrease
Increase	0.089	0.200	0.004
no change	0.182	0.504	0.007
Decrease	0.002	0.011	0.000

Notes: Panel A presents shares of firms responding “increase”, “decrease”, or “no change” to the survey question is “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]?” Panels B-D show breakdowns of how firms responded to pairs of questions.

**Table 6: Narrative Responses to How Firms Use their Inflation Expectations**

How do you typically form your inflation expectations?	Share of firms	Absolute backcast error, %		Inflation forecast, %	
		Mean	SD	Mean	SD
	(1)	(2)	(3)	(4)	(5)
Personal use	0.67	3.35	1.78	4.15	1.82
Price-setting decisions	0.12	2.20	1.64	3.33	2.88
Wage-setting decisions	0.14	4.27	2.07	4.43	1.51
Investment decisions	0.18	3.03	1.58	5.11	2.15
Total	1.00	3.26	1.84	4.18	2.01

Notes: The left column of the table indicates the use of inflation expectations. Narrative responses may be classified into several categories. We could not classify one response into any of the four groups indicated in the left column of in the table.

**Table 7: Perceived RBNZ Inflation Target and Managers' Inflation Forecasts**

Perceived Inflation target of the RBNZ	Share of firms reporting a target	Inflation forecast							Average inflation backcast
		mean			standard deviation			average uncertainty	
		1 year, wave 4	1 year, wave 3	5-10 year, wave 3	1 year, wave 4	1 year, wave 3	5-10 year, wave 3	1 year, wave 4	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
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

Notes: Columns (2)-(4) report mean inflation forecasts at different horizons for various waves of the survey. Columns (5)-(7) report cross-sectional standard deviation of inflation forecasts at different horizons for various waves of the survey. Column (8) reports average (across firms) standard deviation of inflation forecast implied by the probability distribution reported by firms' managers. Column (9) shows the average perceived inflation rate over the previous 12 months.

**Table 8: Sources of News for Firm Managers in New Zealand**

Perceived Inflation target of the RBNZ	Share of firms reporting a target	Willingness to pay for having access to professional forecast, \$/month			Abs. slope of the profit function	Average years of schooling	Frequency of following media news about economy, "update in X months"	Frequency of reading public sources, ones in X months
		Inflation	GDP	Unempl.				
		(1)	(2)	(3)				
1	14.96	195	125	118	1.08	15.74	3.7	6.7
2	12.41	202	130	121	1.13	15.61	4.2	7.3
3	10.26	172	126	126	1.13	15.22	6.9	10.1
4	11.46	126	149	129	1.01	15.63	9.8	12.9
5	14.96	110	151	127	1.01	15.24	10.9	14.6
6	8.91	106	143	136	0.98	15.16	11.7	14.8
7	7.80	104	149	137	1.00	15.36	11.4	14.3
8	8.75	107	150	134	0.89	15.35	11.5	14.5
9	5.49	101	165	132	0.93	15.12	11.8	14.6
10+	5.01	98	141	127	1.01	15.35	11.5	15.0

Notes: Columns (2)-(4) report the average dollar amount firms are willing to pay for a profession forecast per month. Column (5) report the average slope of the profit function with respect to the price of a firm's main product. Column (6) reports the average years of schooling of respondents. Column (7) shows the frequency at which firms update their information about the state of the economy. Column (8) reports the frequency at which firms check public sources (e.g., Treasury Reports, Monetary Reports). Frequencies in columns (7) and (8) are reported in "per month" format.

**Table 9: Correlates of Knowledge of Monetary Policy**

	Absolute error in the perception of the central bank's target rate of inflation			Count of errors in the answers about the objectives, target and governor of the RBNZ		
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Firm characteristics</b>						
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)
Avg. margin	0.013* (0.007)		0.006 (0.010)	0.001 (0.006)		-0.000 (0.006)
Price rel. to competitors	0.011* (0.006)		0.011 (0.008)	0.004 (0.005)		0.004 (0.005)
Abs. slope of profit function	-0.226*** (0.087)		-0.142 (0.138)	-0.056 (0.075)		-0.081 (0.080)
<b>Manager characteristics</b>						
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 FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,253	1,138	1,141	1,256	1,141	1,141
R-squared	0.243	0.194	0.179	0.154	0.122	0.161

Notes: The table reports results of regressing errors about objectives, target and governor of the RBNZ on a set of firm characteristics indicated in the left column. In columns (1)-(3), the dependent variable is the absolute error in the perception of central bank's target rate of inflation. In columns (4)-(6), the dependent variable is the count for wrong answers for three questions asking respondents to report the RBNZ's objective, target and governor. If all answers are correct, the count is equal to zero. In all answers are wrong, the count is equal to three. Robust standard errors are reported in parentheses. \*\*\*, \*\*, \* indicate statistical significant at 1, 5, and 10 percent levels.



**Table 10: Inflation Forecasts of Firms and Others for the U.S.**

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

Notes: The table presents inflation forecasts of the Federal Reserve System (Economic Projections of Federal Reserve Board Members and Federal Reserve Bank Presidents), mean forecasts from surveys and the cross-sectional standard deviations of these forecasts (columns 3-8). For the Survey of Consumer Expectations, we use mean inflation forecast implied by distribution of respondents' expectations about future inflation. The horizons of the long-term forecasts are 5 years, 5 years, and 3 years for the Survey of Professional Forecasters, the Michigan Survey of Consumers, and the Survey of Consumer Expectations, respectively. For the projections of the central bank, we use "longer run" projections in Panel B and the middle of the central tendency range for CPI for the next calendar year.

**Table 11. Correlation between short-term and long-term inflation forecasts, USA.**

	Level			3-month revision			6-month revision		
	OLS	WGT	RREG	OLS	WGT	RREG	OLS	WGT	RREG
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<b>Panel A: SCE, truncated sample, 3-year ahead forecast</b>									
1-y 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)
N. obs.	17,854	17,849	17,854	8,288	8,288	8,288	3,513	3,513	3,513
R2	0.392	0.371	0.879	0.203	0.221	0.664	0.211	0.258	0.701
<b>Panel B: SCE, full sample, 3-year ahead forecast</b>									
1-y 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)
N. obs.	20,573	20,565	20,573	10,031	10,030	10,031	4,275	4,275	4,275
R2	0.295	0.299	0.984	0.141	0.143	0.944	0.135	0.136	0.960
<b>Panel C: SCE, implied point prediction, 3-year ahead forecast</b>									
1-y 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)
N. obs.	20,567	20,559	20,567	10,047	10,046	10,047	4,285	4,285	4,285
R2	0.571	0.571	0.936	0.350	0.339	0.756	0.373	0.402	0.781
<b>Panel D: MSC, truncated, 5-year ahead forecast</b>									
1-y 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)
N. obs.	10,443	10,320	10,443				2,371	2,352	2,371
R2	0.280	0.281	0.428				0.159	0.166	0.231
<b>Panel E: MCE, full sample, 5-year ahead forecast</b>									
1-y 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)
N. obs.	10,588	10,464	10,588				2,440	2,420	2,440
R2	0.301	0.306	0.470				0.171	0.185	0.281
<b>Panel F: SPF, 5-year ahead forecast</b>									
1-y ahead forecast	0.565*** (0.035)	0.598*** (0.028)	0.214*** (0.039)	0.170*** (0.034)	0.146*** (0.029)	0.152*** (0.038)	0.191*** (0.035)	0.163*** (0.032)	0.191*** (0.042)
N. obs.	286	286	286	244	244	244	238	238	238
R2	0.572	0.619	0.891	0.105	0.095	0.171	0.125	0.097	0.193
<b>Panel G: SPF, 10-year ahead forecast</b>									
1-y ahead forecast	0.073** (0.033)	0.467*** (0.033)	0.073** (0.033)	0.057** (0.028)	0.049** (0.021)	0.045 (0.027)	0.056* (0.029)	0.065** (0.026)	0.068** (0.033)
N. obs.	285	285	285	244	244	244	237	237	237
R2	0.888	0.407	0.888	0.014	0.023	0.083	0.012	0.025	0.114

Notes: The table reports results of regressing long-term inflation forecasts (or forecast revisions) on short-term inflation forecasts (or forecast revisions). Forecasts in panels A-C are from the Survey of Consumer Expectations (SCE). Forecasts in panels D and E are from the Michigan Survey of Consumers (MSC). Forecasts in panels F and G are from the Survey of Professional Forecasters (SPF). In Panels A and D, the sample includes only respondents reporting inflation forecasts less than 15 percent in absolute value. Panels A and B use point predictions reported in the SCE. Panel C uses mean predicted inflation implied by the reported probability distribution in the SCE. Columns (1), (4), and (7) report estimates without using sampling weights. Columns (2), (5) and (8) use sampling weights in estimation. Columns (3), (6), and (9) use Huber robust regression to downweigh the importance of outliers and influential observations. The sample period covers 2013Q-2014Q4. Robust standard errors are reported in all columns but columns (3), (6), and (9). Standard errors are reported in columns (3), (6), and (9).\*\*\*, \*\*, \* indicate statistical significance at 1, 5 and 10 percent.

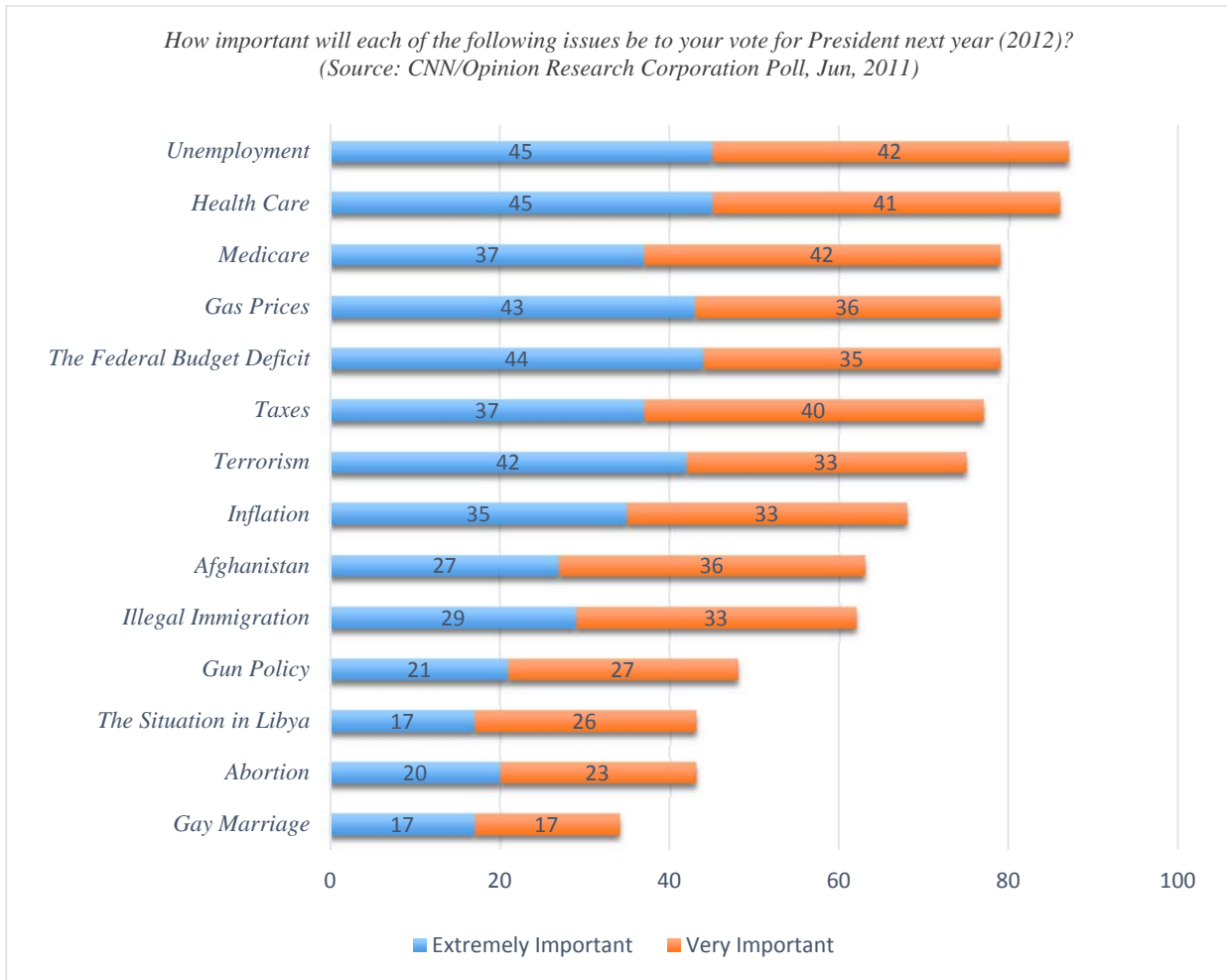
**Table 12: Social Media Following of the Federal Reserve and Others**

<i>Group</i>	<i>Facebook Likes</i>	<i>Twitter Followers</i>	<i>Name</i>	<i>Facebook Likes</i>	<i>Twitter Followers</i>
<b><i>Federal Reserve Banks</i></b>	21,796	702,955	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
<b><i>Government Branches</i></b>	1,718,409	3,477,296	U.S. Dept. of Energy	69,084	249,663
			U.S. Dept. of Homeland Security	320,261	663,009
			U.S. Dept. of Justice	183,507	880,396
			U.S. Dept. of State	1,103,944	1,408,592
			U.S. Dept. of Treasury	41,613	275,636
<b><i>CIA</i></b>	440,716	818,493			
<b><i>FBI</i></b>	1,235,614	1,170,177			
<b><i>Paul Krugman</i></b>	-	1,374,547			
<b><i>Ron Paul</i></b>	1,287,106	549,344			
<b><i>Rand Paul</i></b>	2,024,694	637,037			

Notes: Facebook and twitter pages were accessed on June 30<sup>th</sup>, 2015.

# **ONLINE APPENDIX**

**Appendix Figure A1: Relative Importance of Inflation as an Issue to the U.S. Public**



**Appendix Table A1. Effect of using weights and truncation of the sample on basic moments for inflation forecasts and perceived inflation in New Zealand.**

Survey Date	Sample and weights					
	Full sample		Truncated sample with sample weights		Full sample with sample weights	
	Mean (1)	SD (2)	Mean (3)	SD (4)	Mean (5)	SD (6)
<b>Panel A: 1-year-ahead inflation forecasts, %</b>						
2013Q4	7.1	5.9	5.3	3.3	6.5	5.0
2014Q1	7.5	5.0	6.0	2.7	8.0	5.7
2014Q3	4.4	2.8	4.3	2.5	4.5	2.9
2014Q4	4.9	3.1	4.8	2.9	5.0	3.2
<b>Panel B: 5-to-10-year-ahead inflation forecast, %</b>						
2014Q3	3.5	2.6	3.6	2.5	3.7	2.8
<b>Panel C: 1-year inflation nowcasts/backcasts, %</b>						
2013Q4	5.3	4.2	4.3	3.5	5.1	4.6
2014Q1	5.9	4.3	5.8	3.4	6.9	5.4
2014Q3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2014Q4	4.3	2.5	4.1	2.3	4.1	2.5

Notes: The table presents inflation forecasts/nowcasts/backcasts of firms' managers. *Truncated sample* refers to when we exclude responses that are greater than 15% or less than -2%. *Full sample* includes all observations. Moments in columns (3)-(6) are constructed using sample weights. See the text and note to Table 1 for more details. Sample weights are based on firm counts. Results are similar if weights are based on employment counts.

**Appendix Table A2. Distribution of firm sizes (firm count) in the survey data vis-à-vis census data.**

Employment size	Finance, Insurance, and Business services				Manufacturing				Other services			
	survey			census	survey			census	survey			census
	raw	weight A	weight B		raw	weight A	weight B		raw	weight A	weight B	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: Share in the total number of firms												
6-9	0.27	0.42	0.43	0.43	0.24	0.33	0.34	0.33	0.29	0.44	0.44	0.43
10-19	0.31	0.34	0.34	0.33	0.36	0.33	0.35	0.33	0.32	0.35	0.35	0.34
20-49	0.27	0.17	0.16	0.16	0.23	0.22	0.19	0.22	0.26	0.16	0.15	0.16
50-99	0.13	0.04	0.04	0.04	0.14	0.07	0.07	0.07	0.12	0.04	0.05	0.05
100+	0.02	0.03	0.03	0.04	0.03	0.05	0.06	0.05	0.01	0.01	0.02	0.03
Panel B: Share in the total employment												
6-9	0.07	0.13	0.13	0.13	0.06	0.08	0.08	0.08	0.09	0.18	0.18	0.15
10-19	0.15	0.20	0.20	0.18	0.15	0.14	0.14	0.14	0.18	0.27	0.26	0.22
20-49	0.31	0.23	0.22	0.20	0.25	0.24	0.21	0.20	0.36	0.29	0.26	0.24
50-99	0.31	0.11	0.12	0.12	0.31	0.17	0.17	0.16	0.32	0.16	0.17	0.15
100+	0.17	0.32	0.33	0.38	0.23	0.37	0.40	0.43	0.05	0.09	0.13	0.24
Panel C: Average firm size												
6-9	7.4	7.4	7.4	7.3	7.7	7.8	7.8	7.3	7.4	7.4	7.4	7.2
10-19	13.8	13.9	13.9	13.3	13.7	13.8	13.7	13.4	13.9	13.8	13.8	13.3
20-49	32.4	32.3	32.3	29.7	36.1	36.5	36.3	29.7	33.0	32.7	32.6	29.2
50-99	68.5	68.3	68.2	68.4	73.6	74.0	73.6	69.8	63.9	63.9	63.3	68.6
100+	247.8	246.1	241.5	260.7	220.9	243.9	241.2	252.1	128.4	119.1	118.1	191.9

Notes: Columns (1), (5), and (9) report distributions in the survey without weights. Columns (4), (8), and (12) report distributions in the population (Census). Columns (2), (3), (6), (7), (10), and (11) reports distribution after applying weights to match the distribution in the population. Sample “weight A” is based on firm count. Sample “weight B” is based on firm employment.