

# **How Can Central Banks Improve Monetary Policy Communication to Firms?**

**James Greet**

A thesis submitted to Auckland University of Technology in partial  
fulfilment of the requirements for the degree of Master of Business

2020

School of Economics

Auckland University of Technology

## **Abstract**

The world faced by central banks in the wake of the Global Financial Crisis has demanded new and unconventional approaches to implement monetary policy. Responding to problems like the zero-lower bound on interest rates has seen tools like forward guidance offered through central bank communication become more commonplace in many countries. The Reserve Bank of New Zealand has been an early adopter of many of these modern features of central banking, but key among them has been that they offered quantitative forward guidance since 1997—well before the crisis. Recent academic work has shown that this relatively long history of communication has not translated into informedness about monetary policy for many firms of New Zealand. This is a problem, as it is ultimately the firms who set prices and wages within the economy. By using a survey of firms from New Zealand, this thesis examines what indicates a firm is likely to have low errors in their inflation forecasting, with the goal of determining how the central bank can improve their communication to firms. Smaller firms, firms with a lower price than their competitors and firms with a low margin between sales and costs are generally more likely to have more accurate inflation forecasts. Additionally, this thesis shows that firms with at least one affiliation to an outside body, for example a trade association, are more likely to have lower error in their inflation forecast. This result provides strong potential for improving central bank communication to firms.

## Table of Contents

Abstract .....	2
List of Figures .....	4
List of Tables.....	4
Attestation of Authorship .....	5
Acknowledgements .....	6
Chapter 1 – Introduction .....	7
Chapter 2 – Literature Review .....	10
2.1 Early Work, Secrecy and The Federal Reserve .....	10
2.2 Credibility and Transparency, the Rise of Communication .....	17
2.3 Theory for Communicating to Firms.....	21
2.4 Modern Research, Empirical Work on Households and Firms .....	24
Chapter 3 – Data Analysis.....	28
3.1 Survey Data .....	28
3.2 Summary Statistics .....	30
3.3 Regression Analysis.....	42
3.4 Additional Investigation on Affiliation .....	56
Chapter 4 – Results .....	59
4.1 Discussion.....	59
4.2 Summary.....	65
4.3 Policy Implications .....	67
Chapter 5 – Conclusion.....	69
References .....	71
Appendix .....	75
Appendix A.....	75
Appendix B.....	79
Appendix C.....	81

## List of Figures

<i>Figure 1.</i> Distribution of Expected Inflation over next 12 Months .....	31
<i>Figure 2.</i> Distribution of Expected Inflation per year over next 5 to 10 Years .....	32
<i>Figure 3.</i> Mean Inflation Expectation by Industry.....	33
<i>Figure 4.</i> Mean Inflation Expectation by Firm Size .....	34
<i>Figure 5.</i> Mean Inflation Expectation by Firm Competition .....	35
<i>Figure 6.</i> Mean Inflation Expectation by Firm Price Relative to Competitor's Price ....	36
<i>Figure 7.</i> Mean Inflation Expectation by Firm's Average Margin.....	37
<i>Figure 8.</i> Mean Inflation Expectations based on media consumption frequency.....	38
<i>Figure 9.</i> Mean Inflation Expectations based on public information source consumption frequency.....	39
<i>Figure 10.</i> Distributions of Consultation Frequency, Media/Public Sources .....	40
<i>Figure 11.</i> Mean Inflation Expectation by Firm Affiliation .....	41
<i>Figure 12.</i> Mean Inflation Expectation by Firm Affiliation - Expanded.....	56

## List of Tables

<i>Table 1.</i> Survey Composition By Industry.....	30
<i>Table 2.</i> Survey Composition by Firm Size .....	30
<i>Table 3.</i> Inflation Expectations of NZ Firms .....	33
<i>Table 4.</i> Determinants of Inflation Forecast – 12 Months, Firm and Manager Characteristics .....	44
<i>Table 5.</i> Determinants of Inflation Forecast – 12 Months, Firm and Manager Characteristics, Media Frequency .....	50
<i>Table 6.</i> Determinants of Inflation Forecast – 12 Months, Firm and Manager Characteristics, Public Information Source Frequency.....	53
<i>Table 7.</i> Determinants of Inflation Forecast – 12 Months, Firm and Manager Characteristics, Media Frequency and Public Information Source Frequency.....	55
<i>Table 8.</i> Determinants of Inflation Forecast – 12 Months, Firm and Manager Characteristics, Expanded Affiliation Status .....	58

**Attestation of Authorship**

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

A handwritten signature in black ink, appearing to read 'James Greet', with a stylized, cursive script.**James Greet****5 February 2020**

**Acknowledgements**

I wish to express my sincere gratitude to my supervisor, Saten Kumar. Your guidance, encouragement and wisdom were invaluable in the journey constructing this thesis. The work you have contributed to the macroeconomic field is a true inspiration.

To my family, thank you for your patience and help in a momentous year.

I would additionally like to express my general thanks to the School of Economics, whose collegiate and cooperative environment aided me not only in crafting this thesis, but also throughout all my postgraduate study.

## **Chapter 1 – Introduction**

Central bank communication to the public has become an increasingly important tool deployed by central bankers in a post-Global Financial Crisis world. At its best, communication allows the central bank to effect monetary policy without needing to intervene with more direct or traditional instruments. It can also be a potent accompaniment to these instruments, allowing central banking committees to explain their rationales and share minutes of committee meetings to enhance the public understanding of monetary policy.

A powerful example of central bank communication is the European Central Bank (ECB) President Mario Draghi stating, “the ECB is ready to do whatever it takes to preserve the euro” (ECB, 2012) at a speech in London. This speech led to the markets restoring their faith in the Euro. The flip side is that poor central bank communication can have unintended consequences. In 2012, the Chair of the Federal Reserve (Fed) Ben Bernanke stated that the federal funds rates would continue to be low while unemployment remained over 6.5%, 12–24 month inflation expectations remained below 2.5% and that long term inflation expectations remained well anchored. This was all a bit of a mouthful, and the response in the press was commensurate – “Fed Ties Rates to Joblessness, With Target of 6.5%” (New York Times, 2012) “Fed ties interest rates to 6.5% unemployment” (USA Today, 2012). Any nuanced interpretation was gone and replaced in the public’s mind by a hard target for rates change, a situation in which no central bank would want to promote.

This places central bankers in a delicate position. Communication is a powerful way to motivate change in the market, potentially without any further accompanying action. However, once the central bank has communicated, issues of misinterpretation, context, clarity or understanding are largely beyond control. Bernanke attempted to clarify his comments later in the very same speech, but it did not counter the ripple caused by an explicit unemployment number. An obvious distinction is that Draghi offered no specific information whereas Bernanke offered conditional and quantitative information. The latter is an example of central bank communication called ‘forward guidance’. Offering communication spelling out what the bank predicts about the future has become more common, though this 2012 example from the Fed is one of their early attempts. The efforts of many central banks to improve their communication after the GFC is evident, however the Reserve Bank of New Zealand has been offering quantitative forward guidance to the public since 1997.

One of the key parameters the central bank can aim to influence by communication is the public inflation expectations. With a long history of forward guidance, one may expect the New Zealand public to be well informed on inflation expectations and to have ‘learned the language’ the central bank uses to conduct monetary policy. For those who consider forecasting inflation to be their profession this seems to be the case. But recent academic work has shown that for some sectors of the public, this is often in doubt. Kumar, Afrouzi, Coibion & Gorodnichenko (2015) document that in contrast to the Reserve Bank of New Zealand’s own limited survey of expectations, inflation expectations of New Zealand firms are widely dispersed and not particularly well anchored. Coibion, Gorodnichenko & Kumar (2018) look at how firms come to form their expectations and find, among other results, that inattention to macroeconomic variables is widespread and difficult for central bank communication to surmount.

The inference is then that central bank communication is not affecting many firms in the manner intended. This thesis will aim to contribute to the literature on central bank communication by asking what might indicate that a central bank is able to improve monetary policy communication to a firm. Much of the scope of the literature that currently exists examining central bank communication with a data focussed approach looks at surveys of households or surveys of professional inflation forecasters. By utilising a subset of the firm-level survey data used in Kumar et al. (2015) and Coibion et al. (2018), this thesis will contribute to an area of academic literature on central bank communication that is underrepresented compared to household focussed research and professional forecaster focussed research. The importance of firms in the dynamic of inflation is inherent; they are the ones who ultimately set the prices of goods and services in the economy. The reasoning then is that what firms expect inflation to be is an important variable, as it will influence the actual level of inflation. The ability of the central bank to communicate to firms is therefore a key element for the central bank to influence inflation.

This thesis seeks to examine how this channel of communication between the central bank and firms can be improved. This will be an important addition to addressing the problem identified in recent literature regarding firms and inflation expectations. Using the aforementioned firm survey this thesis aims to identify what characteristics define a firm that is making accurate inflation forecasts. If these characteristics are not widespread or endemic, it may help to identify areas in which the central bank can improve communication. If the identified traits are changeable or modifiable, it may help to



indicate areas that firms can be encouraged into behaviour that makes them more receptive to central bank communication.

Rational inattention motives (Sims, 2003; Reis, 2006) are a strongly cited reason for much of the deficiency in inflation expectations among the public. While the barrier of inattention is a problem many fields struggle to pierce, the data in this thesis doesn't suggest that no firms are paying attention—many firms do have signs of more accurate inflation expectations. The research conducted in this thesis finds significant firm and manager characteristics that indicate this fact. In what appears to be a novel result, empirical work suggests that firms with an affiliation to an entity outside the firm (for example, a business association) are more accurate in their forecasting of inflation than firms without affiliations. This is an important new link as it offers two new means by which central bank communication can be enhanced to firms: encouraging firms to join affiliations and co-opting how affiliations interact with firms. These ideas link affiliations to central bank communication, offering strong potential routes for improvement in communication.

This thesis is structured with an initial literature review of the evolution in central bank communication research up to recent empirical work into communication with firms in Section 2. Section 3 introduces the survey and summarises the statistics of the data and proceeds into the empirical regression analysis. Section 4 presents the results and summary, along with policy recommendations. Section 5 concludes the thesis.

## **Chapter 2 – Literature Review**

### **2.1 Early Work, Secrecy and The Federal Reserve**

Research into Central Bank Communication has expanded in macroeconomic literature, particularly driven by the need of central banks to find additional strategies in the post global financial crisis world. The notion however, that the central bank holds privileged information is presumably as old as central banking itself. Secrecy has been seen as one of the more obvious characteristics of central banking, even past the advent of inflation targeting and explicitly stated policy goals.

In one of the seminal pieces of central bank monetary policy criticism, Friedman (1968) assigns much of the blame to the Federal Reserve for their role in causing the Great Depression. Notably, this work deals much more with the overarching choices of monetary policy and has no bearing itself on the direction of further research into central bank communication. Yet the work is acknowledged as one of the key foundations for academic work into Monetarist theory. Lucas (1972) used Friedman's work to entrench rational expectations in macroeconomic academia. While Lucas' paper does establish expectations of future prices based on agent informedness as a variable in his model, it is based on the current price and state of the market, rather than explicitly given forward state information. We see this later as the difference between predicting the central bank's actions and being told by the central bank what their policy is. Further literature was relatively quick to begin identifying the relationship between Rational Expectations and Monetary Policy.

Sargent and Wallace (1975) link rational expectations and the central bank to the idea of information asymmetry. They argue that with the adoption of rational expectations into their macroeconomic model, rather than expectations based on forecast variables (i.e. non-rational expectations), Friedman's (1960) k-percent rule is the optimal policy for the central bank to employ. They demonstrate this through a section of the model assuming an information advantage to the central bank—additional information held in secret over the public. They show holding the informational advantage has no negative effect on the price level or other real variables in the model, and that the central bank can achieve equal results with the conditional informational asymmetry as without it. This result seems straightforward—having some secret information does not impair the central bank's ability to achieve monetary policy outcomes. However, Sargent and Wallace (1975) go on to ask if the central bank can perform better, not just equally, with this information

advantage. This question is important, as we begin to see consideration as to the value of the central bank communicating or not. This question is asking should the central bank communicate with outside agents if the central bank has a greater degree of informativeness. The authors initially state that it seems plausible, though they are doubtful of the realistic scope of the advantage to the central bank. Further work in the paper leads to the conclusion on this matter that for the central bank to act on this advantage, they would need to know what the information discrepancy is, and that “estimating the discrepancy is a very subtle and perhaps intractable econometric problem.” (Sargent and Wallace, 1975, p. 253). The conclusion that the central bank needs to know the precise details of the difference in information between itself and the public to be able to act advantageously with it seems counter-intuitive, but perhaps it is a good indication that the actual value of asymmetric information is not always straightforward.

An early criticism of the work on rational expectations in monetarism was on the notion that the expectations formed by the public about future monetary policy decisions were, necessarily, unbiased. Taylor (1975) criticised this in particular, noting that this assumption enables the outcome that monetary policy has no effect on the real variables – as seen in the previously discussed Sargent and Wallace (1975) work. Taylor develops an intertemporal model proceeding on the assumption that the public is not able to immediately make unbiased, perfect, predictions about the future results of monetary policy. He describes the conditions that would enable such decisions as “possible if people had observed the reactions of the policy makers to various economic conditions over a long period of time” (Taylor, 1975, p. 1010). It is the early stages of the observational period here that Taylor is arguing cannot be unbiased, clarifying that over time people’s beliefs would converge to the correct monetary policy assumptions. However, a footnote on this page has one criteria Taylor lists to counter a potential argument to his categorisation of biased expectation formation. Taylor acknowledges that an alternative to an experienced hawkish policy-watchers’ unbiased expectation, would be if “the [monetary] policy were announced to the public.” (p. 1010).

This is the first explicit mention of the concept of central bank communication with regards to expectation formation. Earlier work had dealt with information asymmetry, like the example given in Sargent and Wallace (1975), but that didn’t literally cover the idea that the central bank would communicate their secret information to the public. It is somewhat telling that this mention first appears in a footnote. So foreign is the idea of the

central bank communicating its' privileged information that it only rates an asterisk to indicate an unlikely alternative.

As Taylor's (1975) model involves a temporal transition of the public's beliefs from biased to unbiased, there is a point where he states that there is deception possible by the central bank. The deception is manipulation of the public's expectations to a point that enables the central bank to act on the difference between expectations and reality. In Taylor's model this deception will hypothetically reduce unemployment. He also cites the Federal Reserve's use of deceptive style tactics in 1969.

Deception is arguably the antithesis of central bank communication. On one hand, it is the central bank conducting monetary policy to what they consider to be the best ends, but on the other hand it is by misinformation and deceit that the central bank would achieve these results. Taylor, while saying that it can achieve positive results, describes central bank deception as "more politically repugnant" (p. 1020) than deliberately not meeting the public's self-made expectations.

Barro (1976) disagrees with Taylor's idea that there is some possible benefit to deception. In describing the optimal outcome for output, Barro states that the ideal difference between the public's information and central bank's information is zero. Barro continues to emphasise this point, "the best monetary policy is always the policy that is most predictable" (p. 25). Despite being a counterargument to many of Taylor's (1975) points, we yet again find in a footnote an early emphasis on the potential importance of central bank communication. In clarifying a point on the merits of predictability in monetary policy, Barro notes "more specifically, the Federal Reserve should publicize, as rapidly as possible, the proceedings of its Open Market Committee." (1976, p. 25).

This is a much more forceful endorsement of central bank communication than was seen in Taylor (1975). There was not any further continuation of this thread by Barro in this paper, but he did future academic work on the notion of deception. That work however, for example Barro and Gordon (1983), began to be framed around discretionary versus rule-based monetary policy making, and was less focused in areas that explicitly led to work on central bank communication. Later academic work circled back around to nature of deception versus transparency in communication, as is covered in section 2.3 of this literature review.

There were important developments related to central bank communication in non-academic work at the time. The most significant of these was that in 1975 the Federal

Reserve was sued under conditions outlined in the Freedom of Information Act, for failing to provide current information in response to a request for it. The initial court appearance and subsequent appeals proceedings are detailed in Goodfriend (1986). The reasoning behind the suit was that the Federal Open Market Committee (FOMC) only ever released their Record of Policy Actions roughly 3 months after the meeting they were set at (later in 1975 shortened to 6 weeks, voluntarily by the FOMC). This was well after the next monthly FOMC meeting. The case argued that by not releasing the current policy, of the current meeting period, the FOMC was in breach of the Freedom of Information Act.

To the Federal Reserve this was an assault on highly valued secrecy—the value apparent as they appealed both their losses of this case. The first loss in the District Court, and then the second in the Court of Appeals. The Supreme Court eventually found for the FOMC and defined their exemption from the Freedom of Information Act. Subsequently the District Court in 1981 allowed the FOMC to continue operating as they had prior to the court case, essentially with a policy of secrecy.

Goodfriend (1986) highlights the significance of the FOMC's Supreme Court defence. Because of the language the Supreme Court had employed in interpreting the Freedom of Information Act, the FOMC had to base the justification for their exemption from that Act in economic grounding. As Goodfriend puts it “the FOMC was required to explain in economic terms why it values secrecy.” (1986, p. 69). This explanation was significant and had six or seven fairly broad points, but one in particular is of interest. Fed Board Governor J. Charles Partee gave defence against requiring ‘disclosure’ by the FOMC. This is in effect the FOMC's argument against central bank communications. His first point raised against communication was that the FOMC has previously operated solely in its capacity without communication. (Here the term communication is used meaning the intentional distribution of ‘current’ monetary policy by the central bank, i.e. not including the 45 day delayed release of the Record of Policy Actions) The aim in raising this point was to highlight that the FOMC beginning to communicate would be experimental, with possibly unpredictable results. Partee's second general point was that communication as a new direction could necessitate new operating procedures for the FOMC. Partee's concerns are summarised in Goodfriend (1986), “the FOMC views disclosure as an additional constraint on the conduct of monetary policy”. (p. 74). The author goes on to point out later that these concerns are somewhat unfounded. The concern about disclosure is irrelevant because economic agents are by and large already predicting the content of the Policy Directive and acting on those predictions. If anything, the supposition put

forward in Goodfriend (1986) is that disclosure may enable the FOMC to better predict the markets' reaction to monetary policy. Additionally, Goodfriend (1986) cites empirical work into the value of information disclosure by the central bank, notably work by James O'Brien.

O'Brien's work is one of the early attempts to apply an empirical value to the disclosure of monetary policy, as opposed to say Sargent and Wallace (1975) that questioned the value of informational asymmetry. Working with data from 1974–1979, specifically Treasury bill rates and archived Policy Directives, O'Brien (1981) found that prompt disclosure might adjust market expectations on forward rates by a few basis points at most, in the 5–8 range. His definition of prompt in this case considered the same week, two weeks and three weeks after the FOMC meeting. This low result is somewhat unintuitive, but it aligns with what Sargent and Wallace (1975) had supposed earlier. This is a surprising result given how stridently the Fed defended their secrecy in the same year this paper was published. O'Brien (1981) offers rationale as to why this might be the case, stating that the forward rate is already a fairly accurate prediction device. This mirrors Goodfriend's (1986) explanation that economic agents are already predicting the policy directive with a good level of accuracy, so it is plausible. O'Brien does offer one further caveat that is interesting considering the modern developments in central bank communications literature. He states, "we have not considered the possible value of disclosure in terms of other non-interest rate information and its potential for reducing information-gathering costs." (p. 1061.) This is essentially a description of forward guidance, one of the important areas of central bank communication strategy post-global financial crisis, though its' aim is not solely for a reduction in information-gathering costs faced by the public.

A conflicting viewpoint on central bank secrecy was advanced in Rudin (1988), in favour of secrecy. Rudin composed a model that allowed for a difference in the state of informedness between macroeconomic agents, specifically that some engaged in 'Fed-watching' and some did not. By showing that the 'Fed-watchers' private information is not improved by the release of central bank communication while the non-Fed-watcher's private information might be, Rudin posits that a reduction in secrecy leads to increase in the number of Fed-watching agents. The model contains an expression for the average of banks interest rate forecasts, where the expectation of uninformed banks is subtracted from the expectation of informed banks. By increasing the number of informed banks at the expense of decreasing uninformed banks, the expression increases in size and

consequently increases the variability on the forecast of the future interest rate. The result of this increase is that “future interest rates will respond more strongly to unforecastable elements in future disturbances” (p. 317) and that “reducing central bank secrecy can increase the unconditional variance of the interest rate.” (p. 318.). This is an interesting conclusion, the consideration that if more people are fluent in the ‘language’ of how monetary policy is conducted by the central bank then unforeseen macroeconomic events will have greater impact. Does this idea of attributing increasing value to increasing secrecy translate from model to reality? Given secrecy has only decreased since this paper was released it is hard to say. While this appears to be another counter-intuitive conclusion, there may be some merit in considering how an increase in central bank communicativeness may have increased the macro effect the GFC had on markets.

A similar view to Rudin is modelled by Dotsey (1987). He finds a similar result for secrecy and monetary policy of the Federal Reserve Bank, that it can lower the variance of the federal funds rate. Dotsey refers to *Merill vs FOMC* (the case covered in Goodfriend (1986)) and draws the connection between his conclusion and the fact that the Fed stated that it values low variability of the funds rate. However, Dotsey also refers back to Barro (1976), stating that from the public’s point of view, disclosure is preferable, as it will decrease the variance of the forecast of the federal funds rate. It will also reduce the cost in resources the forecasters incur trying to determine the current directives of the Fed.

These two models, Dotsey (1987) and Rudin (1988) that propose similar effects for secrecy, have no empirical data work. There does not appear to be any specific follow up papers that attempt to apply these models, so it seems prudent to lean more on the conclusions of O’Brien (1981). Further empirical work of interest on secrecy and communication came from Hutchison and Judd (1992). In their study, they contrasted the more communicative style of the Bank of Japan (BoJ) to The Federal Reserve’s secrecy. Using data from 1978–1988, they compared the value of communication policy between the two banks. The two banks at the time had similar styles, save for the open/discrete nature of their disclosure, which leads to a balanced comparison. The authors summarise;

“the information value of the Fed’s projections [which they keep secret] is greater than that of the projections announced publicly by the BoJ. Thus the central bank (the BoJ) that discloses money projections provides relatively little new information to the public, while the projections that are kept secret (the Fed’s)

contain information that would be valuable in reducing money surprises.”  
(Hutchison & Judd, 1992, p. 135–136).

This would seem to indicate that part of the intrinsic value in secrecy is having it. Part of the reason that the Fed’s projections are valuable is that they would be entirely new information. The Bank of Japan releases projections that the market is incorporating the style of already. They are aware of the BoJ’s method of projection formation, therefore theoretically, the public can already expect with a reasonable degree of certainty the information the BoJ is going to communicate. It echoes Gov. Partee’s words from the defence in *Merill vs. FOMC*, that transitioning out of secrecy for the Fed would be experimental, because they would be giving up the intrinsic value of secrecy. It follows that to do so, would be letting the cat out of the bag, so to speak – a point of no return. Consider, the public in Japan can anticipate monetary policy projections because of the banks previous communications style and rely on the fact that any unanticipated movements will be immediately announced. If they were to attempt to transition back to secrecy, it would be prudent to assume that there could be unpredictable outcomes depending on the specifics of how it was conducted, but especially in a case where an economic shock effecting monetary policy was no longer interpretable by the public. While this was not an explicit defence of secrecy mentioned by the FOMC in the Supreme Court, one can assume gauging by the vigorous defence offered by the FOMC that they did not believe returning to secrecy after giving it up would be an option. This is an interesting reflection of some of the ideas being covered in modern monetary policy communication literature – with the increase in forward guidance post-global financial crisis, are central banks able to return to conducting without it? Do central banks even want to return to no forward guidance, return to less communication?

The strong theme running through early central bank communication literature is secrecy. The broad scope of most of the work done was relevant to the Federal Reserve, so this prevalent theme makes sense. A majority of the academic work was also based in theoretical modelling. O’Brien (1981, 1984) was one of the few examples of empirical work attempting to value the disclosure of information by the reserve bank. The 1990’s began to see a transition in the literature, as was seen with Hutchison and Judd (1992), in that secrecy was not necessarily an assumed condition anymore. The international comparisons between central banks begins to influence the idea that perhaps there is an amount of communication that central banks should engage in.



## 2.2 Credibility and Transparency, the Rise of Communication

As the literature related to central bank communication continued to increase in breadth, another theme became more apparent: the connection between central bank communications and central bank credibility. The link between the two is easily understandable if you consider Blinder's (2000) definition of central bank credibility, "a central bank is credible if people believe it will do what it says." (p. 1422). At this point in academic literature, a common assumption is that when a central bank communicates, the public is listening. The degree to which a central bank has credibility should influence how much communication is necessary for the public to react to that communication in a manner desired by the central bank. The trade off in this relationship is that a credible bank should, in theory, be able to communicate less to achieve monetary policy goals. However, a central bank lacking credibility, will have to communicate more, extrapolate and expound, to achieve the same monetary policy goals. The problem with this trade-off is that small, precise statements are not necessarily the ideal method through which to communicate monetary policy to the public.

Stein (1989) began examining this trade off in his paper *Cheap Talk and The Fed*. Stein's idea was that it would be ideal for the Fed to communicate its policies in advance, as this would give the public the ability to react quickly to the information in them. However, if in doing so, the Fed chose to give a precise announcement, they would be incentivised to mislead the public as that would enable a more efficient outcome for the Fed. As this is a dilemma the public would understand after the very first time it occurred, precise announcements are therefore inherently lacking in credibility, and would not be believed by the public in future. The solution Stein evaluates to this precision/credibility problem is that the Fed can make imprecise announcements (which in signalling terms are costless, hence 'cheap talk'), for example a desirable range for an interest rate, which removes their incentive to mislead. Explicitly, if they gave a range of target values, to lie they would have to misrepresent their intent by such a large margin that it would no longer be 'costless'. By communicating in this way, the Fed trades the ability to manipulate expectations for the ability to communicate information with some credibility. Here we are treading similar territory to Taylor (1975) and Barro (1976) on the nature of central bank deception. This work by Stein is further evidence towards the idea that deceptive practice by the central bank is not only "politically repugnant" (Taylor, 1975, p. 1020), but is in fact suboptimal conduct when considered economically. The context for these ideas on the central bank making precise statements and being incentivised to mislead

needs to be acknowledged, this was in 1989 and specifically about the Federal Reserve. This paper does serve as an important turning point though, as now we are explicitly exploring how the Fed should improve communications, not just if they should communicate at all.

Garfinkel and Oh (1995) build upon the idea of ‘cheap talk’ introduced in Stein (1989). They reinforce the ideas of credibility problems in communication by the central bank that Stein introduced, but they extend the analysis further. The authors find that while the central bank is able to make imprecise announcements to alleviate some of the credibility problem, they argue that this is a form of noisy communication, and unlike Stein, they state that this form of communication is not costless, or ‘cheap’. A key finding is that this noisy communication does not fully address the underlying credibility problem, rather only helps to ease it. They conclude that if Stein’s (1989) model were true, we would see all central banks communicating, only differing by the level of precision with which they communicate. However, without the ‘cheap talk’ assumption we rather see only two central banks, the first communicates “extremely ambiguously” (p. 356), and the second communicates not at all. There is an allowance for the fact that some of the silent central banks will have a monetary rule in place, for example k-percent, that reduce the need for a central bank to communicate as the monetary policy is theoretically understood by the public without constant explanation, but they also state that some of the silent central banks are able to communicate but prefer not to. One of the reasons given for elective silence is if they were to communicate, they would prefer to speak with precision, and not with noisy communication.

These early ideas exploring the credibility problem of central bank communications have been somewhat superseded since their writing. Both of these earlier models rely on the idea that the central bank holds private information and conducts monetary policy privately, and that these are unobservable by the public – only through communication is the central bank able to signal a chosen amount of this private information. This assumption began to ease, and the notion of transparency became a larger consideration. This is not to say that credibility was solved as an issue, but rather that transparency was being considered as an alternate route to credibility. Credibility was still of particular importance, especially to central bankers themselves – this was notably found in Blinder’s (2000) survey of central bankers and economists, “*Central Bank Credibility: Why do we care? How do we build it?*”. Blinder finds that central bankers like to be credible and believe that it aids in keeping the costs of disinflation down. The adoption of transparency

is a slow road though, in this survey despite central bankers on average describing transparency as “quite important” for ‘building credibility’, it only ranked 4<sup>th</sup>, behind independence, a history of honesty and a history of fighting inflation.

The rise in interest in central bank transparency seems tied to the increase in the number of central banks beginning to adopt inflation targeting approaches. It was an interesting field of research in this time period, as it was emerging at the same time as central banks were shifting to more transparent conduct of monetary policy. Contradicting the non-transparent nature of the central banks in the models of Stein (1989) and Garfinkel and Oh (1995), an inflation-targeting central bank has an explicit, publicly announced inflation target – although as if a tempered acknowledgement of that early work many of these targets are a percentage range, for example the Reserve Bank of New Zealand initially targeted 0% to 2% inflation. The setting of a public target for the central bank is an example of transparent policy, as covered in Bernanke and Mishkin (1997). In addition to this coverage of transparency, Bernanke and Mishkin also highlight that “other important features of inflation targeting include increased communication with the public” (p. 97). Bernanke and Mishkin continue, saying transparency was long cited as a feature of rule-based approaches—their example is money-growth targeting (the same ‘allowance for silence’ given in Garfinkel and Oh (1995)). They state that this transparency was not comparable to the transparency of inflation targeting because “we doubt that concepts like the growth rates of particular money aggregates are nearly so understandable to the general public as is the predicted rate of change of consumer prices.” (p. 106). This idea of the public consumption of central bank communication being predicated on what they understand of it begins to lean into the receiver side of central bank communication, which to this point had not been greatly considered. Additionally, the idea that the public would be more likely to be receptive to central bank communication because it is about CPI changes seems sensible, but more recent studies have proven that to not be the case. These are covered in section 2.4.

Transparency shares an important relationship with central bank communication. A comprehensive look into central bank communication was authored as a result of a conference titled ‘How Do Central Banks Talk’ held in Geneva in 2001 by The International Centre for Monetary and Banking Studies, and the Centre for Economic Policy Research. One of the most emphatic concepts in *‘How do Central Banks Talk’* (Blinder, Goodhart, Hildebrand, Lipton & Wyplosz, 2001) is that full transparency should be a default state for central banking, with only specific conditional exceptions –

mostly to do with foreign exchange market interventions. Even at the time this was written, 2001, not many central banks could claim this position of full transparency. Notably the Reserve Bank of New Zealand was one the authors call out for being exemplary on this point. The rationale behind the emphasis on transparency has two elements in the book: the conduct of effective monetary policy and the accountability of the central bank as a democratic institution. While accountability is an important argument for the existence of communication – “communication is at the heart of accountability” (Blinder et al., 2001, p. 23), it begins to drift too far from the area of application for this literature review, especially as the other side of the rationale becomes more specific for investigation into how the central bank communicates to firms. As an interesting point, the book asks whether or not communication actually matters, and the answer is “to date, there is no research to report on, so we can only call upon casual experience to back our claim that it does, and quite a lot” (p. 9). So, even at this relatively recent point in time, 2001, there had been no explicit research on whether communication matters. Admittedly the casual experience of the authors is anything but casual: all five have years of experience in monetary policy related government organisations if not the central bank itself, and decades in academia. The opinion that communication matters probably has an experiential basis in reality. The book draws some examples to defend the point, but it is still notable that dedicated research on the subject is absent at this point.

### **2.3 Theory for Communicating to Firms**

Blinder et al. (2001) draw an interesting conclusion from two papers on inflation dynamics (Galí & Gertler, 1999. and Galí, Gertler & Lopez-Salido, 2001). They infer from these papers that there is an increasing body of work showing a link for the central bank between the predictability of monetary policy and the efficacy of achieving inflation goals. The reason given for this is that the predictability allows the private sector to better understand the monetary policy, and the private sector are the ones who ultimately set the prices. The idea of predictability comes back to the author's emphasis on transparency—a transparent central bank offers predictable decisions around monetary policy. Blinder et al. (2001) continue on the nature of effective monetary policy communication, giving it three features. Of application here is the second feature, which is the line from interest rates to the “real economy and inflation” (p. 12). This is part of the real-world effect monetary policy has: it is the line between the interest rate controlled by the central bank and the prices and wages set by firms in the private sector. The authors state that impact on real world effects can be seen as partially coming from expectations, particularly the style of expectations seen in the New Keynesian Phillips Curve. This is the model (though modified) that was employed in Galí & Gertler (1999) and Galí, Gertler & Lopez-Salido (2001), but similar forward-looking models are also seen in Clarida, Galí and Gertler (1998) and later in Blanchard & Galí (2007). In these papers, current period inflation has a determination that includes expectations of the next future period's inflation and some account for firm activity. This might be the likelihood of updating prices, or more commonly the output gap. The idea that firms who set prices and wages are influenced by their understanding of monetary policy, by which they form their expectations of future inflation, leads to the interpretation in Blinder et al. (2001) that if firms are less in tune with the central bank, then they will only adjust their price and wage activity slowly. The corollary of this is that if a firm is fully cognisant of the central bank's goals and actions, then they will update their price and wage behaviour much more swiftly – meaning that the implementation of monetary policy by the central bank is that much more efficient. Blinder et al. (2001) tie this up all together with transparency and credibility, “transparency is likely to enhance credibility and credibility is likely to strengthen the second channel [the line between interest rates and prices & wages] – and thus improve the effectiveness, acceptability and speed of monetary policy” (p. 12). The work also addresses the fact that the regular public does not particularly engage with monetary policy. The implication is that there is not enough real effect on an average citizen, and that only large-scale abnormalities would drive them to be interested in

central bank issues – an example given is a return to pre-inflation targeting inflation rates. A key reason proposed is the average person is unlikely to consume financially specialised media, where there is natural inclination to central bank communication. Instead the average citizen is proposed to mostly consume generalised media, which is over-simplified and personality driven. The authors state this leads to a lack of nuance, which is a “key ingredient in central bank communication” (p. 24). This is something of a departure from the previous ideas put forth by the work praising full transparency and predictability, but the point does remain that in such financially specialised media it is likely that the full meaning of central bank communication is going to be faithfully transmitted. There are no studies quoted by the authors specifically reinforcing these views on firms or individuals, presumably because none existed at the time of writing. More recent studies have considered both these groups. They are covered in section 2.4.

After the publication of *How Do Central Banks Talk* there was a surge in the literature surrounding central bank communication. When this literature focused on effects of communication, it was mostly using financial markets as the receiver of the central bank communication – the ease of access to data for such is a likely reason. Research on communication to private sector firm level, or even on individuals, was rather scant. This view is also advanced by Blinder, Ehrmann, Fratzscher, De Haan & Jansen (2008) when they propose avenues for future research in their work on central bank communication to date: “virtually all the research to date has focused on central bank communication with the financial markets. It may be time to pay some attention to communication with the general public” (p. 941). There had been research in this 2001–2008 period on individuals and firms, but the work centred more on the areas around expectations. A notable example of non-expectations based work is found in Siklos & Bohl (2007). They evaluate the content of Bundesbank (the German Central Bank) staff speeches, mostly the president and vice president. With a modified Taylor rule they contrast the difference in effect between actions and ‘words’ of the Bundesbank in interest rate behaviour. While this is a paper on central bank communications, because of the Taylor rule based structure we don’t get to see a real-world impact on the public or firms, despite the authors concluding “communication with the public acts as an instrument of monetary policy” (p. 369). It is helpful to note here that this is an example of academic work breaking down the whole notion of central bank communication to look at one aspect: speeches by central bank staff. Additionally, they find that speeches are not a significant component in the modified Taylor rule, except when they are about economic policy. In the data, within the period

prior to the unification of Germany, there were 241 speeches looked at and 24% of them were about economic policy. In the later period to 1998, there were 901 speeches and only 10% were about economic policy. There is not a particular effort to hypothesise why this speech content had significant effects. It would be interesting to rank the content of central bank speeches and know what content is going to have the most considerable or desirable effect, though establishing this link from Taylor rule type interest rate effects may be difficult. Cecchetti (2003) has somewhat related work – he compared keywords in FOMC minutes and transcripts to the Equity Risk Premium, though all the data examined was before the FOMC began releasing ‘current’ minutes in 2004.

Another aspect of the content of communication was examined in Archer (2005). He wrote on the forward interest rate track that the Reserve Bank of New Zealand (RBNZ) has published in its Monetary Policy Statement since 1997. While this is not a quantitative look at RBNZ communication to the public, it is a quantitative forward guidance device of communication being analysed. The RBNZ was the sole central bank in the world offering quantitative forward guidance of interest rates at the time. Archer considers the costs and benefits of the RBNZ interest rate predictions, noting the line that the RBNZ appears to be walking between transparency and credibility. He emphasises that too much transparency about the central bank’s decision-making process is not necessarily a good thing and may end up harming credibility. He notes specifically that if the interpretation of forward interest rate paths was seen as a “policy plan” (p.10) then the RBNZ may be liable to a charge of misleading the public. Ultimately, he finds more benefit than harm for the RBNZ in its’ predictions, which signals quite an evolution in the literature from the consideration of precise announcements being sub-optimal. Archer does offer that it is for each central bank to arrive at their policies on forward guidance, and there have been mixed results for other central banks that stepped into forward guidance.

## 2.4 Modern Research, Empirical Work on Households and Firms

The Global Financial Crisis (GFC) forced the hand of many central banks into using new monetary policy tools. Blinder, Ehrmann, de Hann & Jansen (2017) give evidence found in a new survey of central bankers and economists about the GFC's effect on central banking. The authors particularly note that one of the main effects of the GFC was to push more central banks closer to the zero lower bound on interest rates, and that "FG [forward guidance] has been used by more than 50% of the central banks that responded to our survey" (p. 722). Other newly adopted tools included macro-prudential policies (78.7% of central banks) and quantitative easing (20.4%), but the applicable interest here is forward guidance, explicitly a form of central bank communication. In a probit regression, Blinder et al. report the marginal effects of the determinants of adoption of new monetary policy tools. Specifically, with reference to the adoption of forward guidance, there is a 48 percentage point increase in likelihood that a country hit by the financial crisis would adopt forward guidance and a 40.6 percentage point increase in likelihood that an inflation targeting country would adopt forward guidance (both of these results are significant at the 1% level). Additionally, the authors report that there is a significant 50.1 percentage point greater likelihood that central banks who have employed forward guidance will positively evaluate forward guidance as a tool. These are interesting results, because even though the magnitude is high and the results significant, it is surprising that the evaluation of forward guidance is not even more emphatic. Blinder et al., stress the importance by stating that for central banks in the post-GFC world, "greater communication seems to be an established fact" (p. 730) and that "FG relies *entirely* on communication." (p. 731). Using examples from the European Central Bank, the Fed and the Bank of Japan, they also highlight that most of the new tool adoptions in the wake of the GFC will be hard to reverse, that is, a bank that has adopted forward guidance as a tool would struggle to revert to not communicating in such a forward looking manner.

This new unfolding of central bank monetary policy communication instruments is an impressive expansion, but it still has to face the base problem of all forms of communication, the transmission from sender to receiver and the potential for interference in that signal. In relevant terms, this is the question of how well the communication by the central bank is received by individuals in households, firms and professional forecasters. The common measure by which many academics choose to interpret how informed an individual is as to monetary policy, or more explicitly the



central banks inflation goals, is on their inflation expectations. Early work includes Carroll (2003), who used a model with similarities to Calvo's (1983) sticky prices model. He posits that households (taken from the Michigan household survey) have a probability of accessing news media in a given quarter that will update their inflation expectations to be more in line with that of professional forecasters, who were responsible for writing the news media—a transmission of information about inflation from professional forecasters to households. Carroll's results show that the Survey of Professional Forecasters inflation expectations were superior to those of households, as we would expect, but these were the only two groups considered in this paper—firms specifically were not compared. It is also important to note that the dates of the two surveys modelled encompassed the years 1981–2000 and are specific to the US. In this time period the Fed was still largely secretive. It would be some time before its communication expanded, and 2012 before a formal public inflation target was set by the Fed.

More recent work looking at household inflation expectations was conducted by Binder (2017). Drawing from largely post-GFC academic work, she highlights that households generally are uninformed about monetary policy, central banks and central bankers, with studies ranging from the Netherlands, to South Africa and Europe. She argues that this shows households “may not be fully receptive to monetary policy communication.” (p. 242). Binder offers two general reasonings for households low informedness, the first is rational inattention and the second is the nature of political communication. Rational inattention implies that acquiring information or updating old information is not costless. Binder states that professional forecasters are likely to be attentive to central bank communications, but that this doesn't stretch to households – “central bank communications are not received and understood by a sizeable share of households, many of which lack basic knowledge about monetary policy and central banks” (p. 248). The reasoning behind political communication focuses on the idea that people are more responsive to messages from recognisable figures – the author contrasts studies showing Barack Obama's relative popularity to Ben Bernanke's relative unpopularity on matters of economic news. Also noted are the efforts by central banks to engage on new media fronts such as Twitter. There is an additional important conclusion to highlight from Binder's work that bears future reference, regarding household and professional forecaster expectations after the public formal adoption of the 2% inflation target by the Fed in 2012. Generally household expectations improved, mostly among males with a college education and stock investment. However, professional forecasters were already

well informed, “so improving the degree to which their expectations are anchored is equivalent to improving credibility. For many consumers, in contrast, improving anchoring first requires improving informedness or making communications more accessible.” (p. 248). The aforementioned group of college educated males were most receptive to improved anchoring, the communication of the Fed about the 2% inflation target improved their inflation expectations. However, Binder finds that “other groups were likely unreceptive to the Fed’s communication of it’s target.” (p. 239).

The concept of anchored inflation expectations has become more prevalent in academic work, but it does not have an exact definition. The concept is rather literal, that an individual’s expectations should be anchored to something, and that the attachment is somewhat resilient. In Binder (2017), some household’s inflation expectations became more anchored to the Fed’s 2% target when it was publicly announced. Conversely, the announcement did not have much effect on the anchoring of professional forecasters expectations, who are more likely to interpret the credibility of the Fed than its announcements. The term “well-anchored” has generally come to imply an individual having inflation expectations very close to the inflation target set by the central bank. This means that they are likely to be receptive to some form of communication from the central bank and are able to apply that communication to their own expectations. Much of the literature on inflation expectations to date focuses on households and professional forecasters. These have been some of the longer running surveys. Firm level data is not particularly common, but recent studies have begun to consider the anchoring of firm level inflation expectations.

Firms occupy an interesting place between households and professional forecasters. While they do not have the educational investment and vocational obligations of professional forecasters, they are however presumably incentivised to be more informed about inflation or even general macroeconomic conditions than households. However recent studies (Coibion, Gorodnichenko & Kumar, 2018; Kumar, Afrouzi, Coibion & Gorodnichenko, 2015) have shown that firms’ inflation expectations are not particularly well anchored. In examining how firms form their inflation expectations, Coibion et al., (2018) use survey data of New Zealand firms from 2013–2016. Rational inattention again stands out as a large impediment to many firms’ ability to keep an informed opinion about inflation. Notably the reverse is true: firms that have more incentive to track macroeconomic conditions are better informed. The examples the authors give of these firms are those with more competitors and firms with “steeper profit functions” (p. 2711).

Interestingly, the authors also show evidence that implies if a monetary policy was able to overcome a poorly informed firm's inattention, it was likely to have a real and lasting effect on the firm's decisions – "but doing so requires communication strategies that break through the veil of inattention that pervades managers' views about aggregate inflation." (p. 2674). This is not easily done, as the paper points out evidence that managers generally do not view inflation as a useful metric for business and that even when the inflation value is provided to managers it is not information that is likely to be held for long.

If inflation expectations were well anchored, the cost of inattention could be lower. A manager expecting the central bank to maintain its target inflation, believing the central bank to be credible, would not have to revise their inflation expectations exceedingly often, and would not be induced to revise them on temporary experiences. The trouble is that according to Kumar et al., (2015) firm manager inflation expectations are not well anchored, and managers' expectations are swayed by personal experiences, examples given include shopping and petrol prices. While forward guidance has been shown to be a popular new tool of central banks, it relies on the recipient of the communication to have some point of reference, whether the forward guidance is quantitative in nature or not – though it is particularly important for quantitative forward guidance. If their point of reference is constantly swayed by the latest price at the pump or unusually high shopping prices, how effective can forward guidance be?

The lack of anchored inflation expectations is a pressing problem for central banks, "to the extent that monetary policymakers have recently been relying upon policies whose key transmission mechanism is supposed to be inflation expectations, the outlook for such policies working effectively is likely limited unless policymakers find an efficient way to transmit this information to economic agents." (Coibion et al., 2018, p. 2712). This thesis seeks to address that statement, and in exploring how the central bank can improve communication to firms will hopefully identify additional efficient means for monetary policy to reach firms. If these means are found, then that will contribute to any potential policy recommendations this thesis will make.

## Chapter 3 – Data Analysis

### 3.1 Survey Data

The data to be analysed is a survey of 1,407 New Zealand firm managers conducted as a part of five survey waves in 2013–2016. It was undertaken by, and primarily used in, the papers Kumar, Afrouzi, Coibion & Gorodnichenko (2015) and Coibion, Gorodnichenko & Kumar, (2018). There is a large amount of valuable firm level data available, but of particular application to this analysis are identifiable firm characteristics, such as size, competition, firm affiliations; contrasted against the inflation expectations of these firms in a 12-month window and a 5 to 10-year window. As established in the literature, the inflation expectations of a firm are a good indicator to how well informed they are with regards to monetary policy. For the firms in this survey, their central bank is the Reserve Bank of New Zealand, whose monetary policy was explicitly and only inflation targeting at the time of this survey, so if those expectations are close to the Reserve Bank of New Zealand 2% mid-point target then they are likely well anchored inflation expectations. Recently the Reserve Bank of New Zealand has been tasked with also considering maximum sustainable employment along with inflation, though this occurred years after the survey wave was conducted and is only mentioned for clarity purposes. Additionally, for clarity, this thesis makes the same acknowledgement as Coibion et al. (2018) where the firm manager inflation expectations are shorthand to firm's inflation expectations.

The survey data consists of 1,407 firms. They are from three main industries: Manufacturing, Financial and Business Services, and an additional Other category that contains subsectors like Retail and Accommodation. Each industry makes up roughly a third of the data – Other is the lowest share at 30%. Firms from industries related to government or community services were excluded from the survey, as were firms from industries in New Zealand that are non-competitive, for example mining and energy. Firms with a size measured as 5 employees or fewer were also excluded from the dataset.

Much of the value of the dataset lies in the quantitative nature, and the fact that it is a survey of general managers, not professional forecasters. One of the intentions is that these people will ultimately be responsible, wholly or mostly, for the pricing decisions made by their firm. This makes their inflation expectations important. By their very nature, some of the firms surveyed will be large or wealthy enough to employ macroeconomic forecasters, but this does not seem to account for many of responses at all. Kumar et al. (2015) drew an important contrast with this survey dataset to the Survey

of Expectations by the Reserve Bank of New Zealand—primarily a survey of very large firms and professional forecasters, which is more anchored to the Reserve Bank of New Zealand’s own forecasting. This supports the literature that documents professional forecasters’ superior information.

It is sensible to expect professional forecasters of inflation to be well informed about inflation, and to have inflation expectations in line with what the central bank communicates. It is more interesting to examine the inflation expectations of the high-level employees of the firm, who potentially have direct control over pricing decisions of that firm—yet may not have the macroeconomic background of professional inflation forecasters. While this survey dataset being analysed in this thesis does have variables included for personal characteristics, like age, gender and education, the analysis is concerned with firm characteristics and what might identify a firm that is well informed and thus well communicated to by the Reserve Bank of New Zealand. Some personal characteristics are considered and analysed, with the obvious allowance that in searching for improved communication, asking managers to change personal characteristics is not an appropriate or helpful conclusion.

All the firms in the survey data offer goods or services in some manner. This means that the pricing decisions they make as firms are directly linked to inflation in New Zealand. As the Reserve Bank of New Zealand is mandated by monetary policy to keep inflation between 1% and 3%, it follows that the Reserve Bank is interested in communicating their goals around monetary policy and the Official Cash Rate to firms, who ultimately end up being responsible for annual inflation. As forward guidance is now an established tool for central banks to employ, this line of communication between the central bank and firms is very important. If this line of communication suffers a breakdown, either from the central bank communicating ineffectively, or from the firms end, say not being receptive to the communication or not having a point of reference, then forward guidance is seriously impaired.

This is ultimately the concern of this analysis. Continuing with the link that a firm’s expectation of inflation over the next 12 month period and also the next 5–10 year period is a good indication of how well communicated to they are by the central bank, this analysis will compare firms inflation expectations to firm characteristics, and identify if there are any significant ways the Reserve Bank of New Zealand can communicate more thoroughly to firms. Even lacking any serious macroeconomic education, we would expect firm managers who receive communication from the Reserve Bank of New

Zealand, be it through media or other sources, to at least predict future inflation in the 1%–3% range, if not exactly at the midpoint 2%, which most communications on the OCR mention every six weeks.

### 3.2 Summary Statistics

*Table 1. Survey Composition By Industry*

Industry	Respondents	Industry Subsectors
Manufacturing	483	16
Financial, Insurance, Business Services	499	9
Other	425	5

The survey aims to broadly match the make-up of the population of New Zealand firms, acknowledged in Kumar et al. (2015), with the previously mentioned exclusions by industry type and firms with five or fewer employees. Roughly two-thirds of the responses come from Manufacturing and Financial and Business Services, which corresponds to the general sectoring of the full population of New Zealand firms. A more comprehensive break down of the firms by sub-sector is found in Appendix B. While there are more overall industry subsectors in the Manufacturing industry, some of the other industries have broader subsectors, for example the Retail subsector in Other.

*Table 2. Survey Composition by Firm Size*

Firm Size	Respondents
6–19	896
20–49	311
50–99	170
>100	30

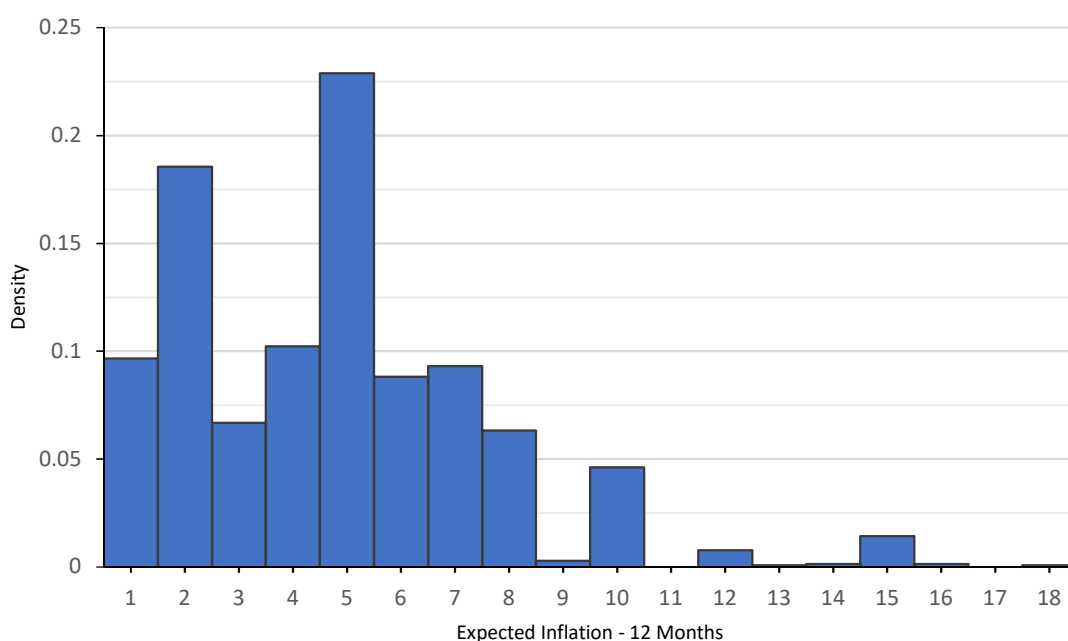
Firm size is measured in the survey by the number of employed workers in the firm. This also shows strong correspondence to the make-up of New Zealand firms, with most having fewer than 50 workers. Roughly 86% of the responses are from firms with fewer than 50 workers. The specific question put to survey respondents for this data was ‘How many workers are employed in this firm? How many are used for the main product or

product line?’. Whether these are full-time or part-time employees should not matter for this analysis.

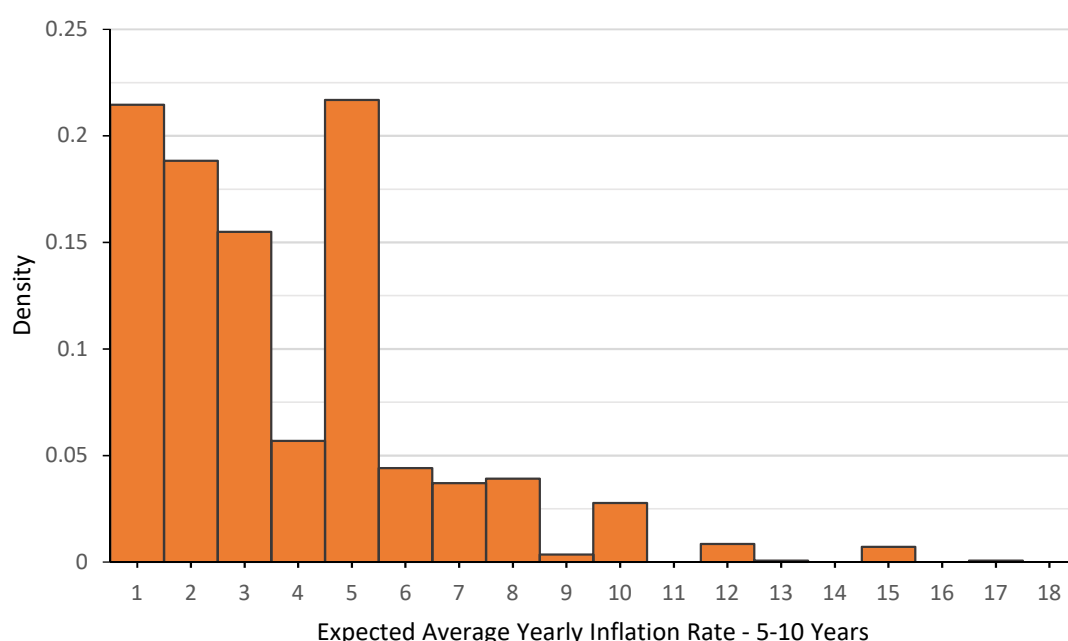
Two questions in the survey are the base for the overall analysis in this thesis; these are the two questions asking the respondent about their inflation expectations. Specifically, these questions were worded “During the next twelve months, by how much do you think overall prices in the economy will change?” 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?”.

Generally, the inflation expectations for both the next 12-month period and the next 5–10-year period are not in line with the monetary policy guidelines of the Reserve Bank of New Zealand. Kumar et al. (2015) using the same survey data found that inflation expectations of New Zealand firms were not well anchored. The following figures are a split of Figure 2 from Kumar et al. (2015).

*Figure 1. Distribution of Expected Inflation over next 12 Months*



*Figure 2. Distribution of Expected Inflation per year over next 5 to 10 Years*



For both time frames, expected inflation of 5% has the greatest number of responses. This level of inflation has only been seen in 2 quarters since inflation targeting began in New Zealand, once in 2008 and once in 2011 (Reserve Bank of New Zealand, 2019). If inflation expectations among the firms in this survey were well anchored, the responses of 1%, 2% and 3% should constitute a strong majority of responses. However, they only make up 34.9% of the 12-month expected inflation rate and 55.8% of the 5 to 10 year expected yearly inflation rate. The increase of 20 percentage points of responses falling between 1% and 3% when asked to consider inflation over a broader horizon is an interesting data point, but still more than a third of all surveyed firms predict average yearly inflation over the next 5 to 10 years to be 5% or greater. In the proceeding 5 years since this survey was conducted (to the date of this analysis) the average quarterly inflation has been 1.2% (Reserve Bank of New Zealand, 2019). It is an unlikely explanation that the responses of 5% or greater had founded beliefs constituting reasonable assumptions about the future state of macroeconomic conditions.

The overall mean and standard deviation for both inflation expectation responses are in Table 3.



*Table 3. Inflation Expectations of NZ Firms*

Inflation Expectation	Mean	Standard Deviation
Next 12 Months	4.77	2.83
Next 5–10 Years	3.74	2.61

This reflects the larger number of respondents answering from 1% to 3% in the 5 to 10-year category, with the lower mean of 3.74. Both responses are similarly volatile though, indicating widely dispersed answers. For the next 12 months the mean response seems very high considering it is a measuring how well anchored a firm's inflation expectations are. The high volatility additionally points to expectations that are not well anchored. Theoretically, paying a small amount of attention to monetary policy should mean that if a person believes in the central bank's ability to meet their mandated target that their forecast would be in line with the central bank's forecasting over this period. Kumar et al (2015) found that there was not a credibility problem for the Reserve Bank of New Zealand among firms, so the disparity must occur before the credibility of the central bank would be the issue. This is assuming that the person is not well informed enough to credibly produce an alternative forecast to the central bank – behaviour we would rather expect to see from professional forecasters.

*Figure 3. Mean Inflation Expectation by Industry*

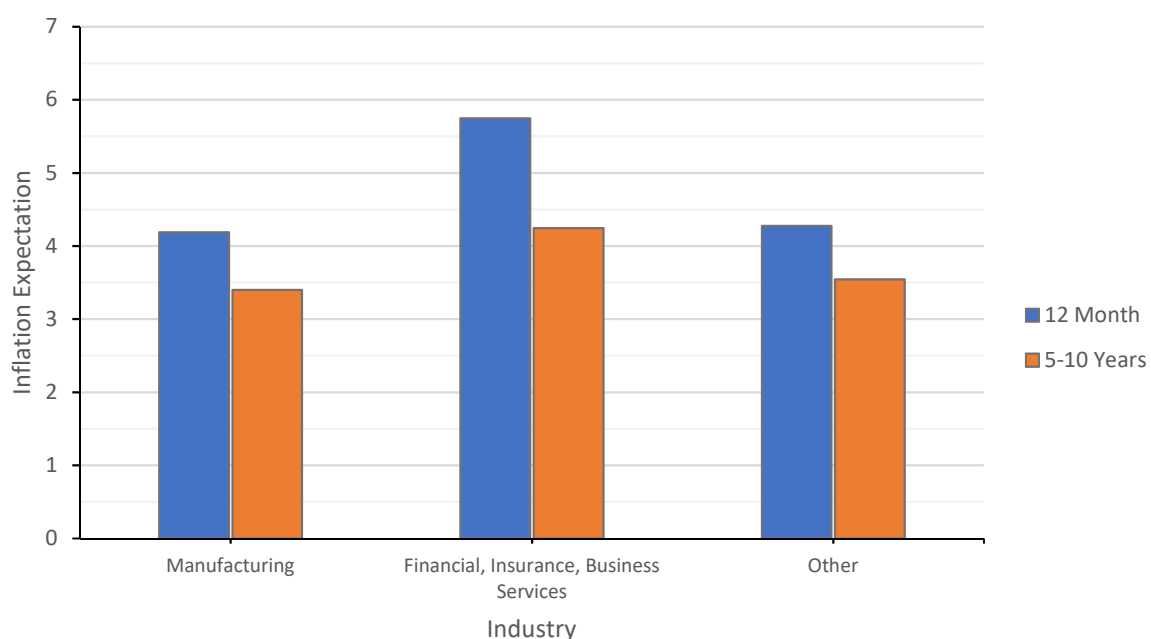


Figure 3 shows the mean inflation expectations by industry. Manufacturing and Others (the Others category consists of: construction, wholesale trade, accommodation &

restaurants, retail and transport & communication) do not differ much from the overall firm level mean, coming in just slightly lower. However, the Financial, Insurance and Business Services industry has a much higher mean than the overall value, at 5.75% for 12 months and 4.25% for 5–10 years. These values have standard deviation of 2.77 and 2.84 respectively. This seems surprising as one would expect most of the financial and finance-tangent subsectors to be well informed on monetary policy and have inflation expectations closer to central bank forecasts. In fact, the industry has no subsectors with 12-month mean inflation expectations below 5%. Of particular note the banking/finance subsector has 12-month mean inflation expectation of 5.42% (SD 2.84%). (See Appendix Table B1–3 for full subsector breakdown). The sub-sector with the most well anchored inflation expectations is accommodation and restaurants in the Others category, with mean 12-month inflation expectation of 2.72% (SD 2.05%).

The 5 to 10-year inflation expectations are not as widely dispersed as 12-month expectations, but do follow the same pattern of Financial, Insurance, Business Services being higher than the overall firm level mean and the other two industry categories being slightly lower.

*Figure 4. Mean Inflation Expectation by Firm Size*

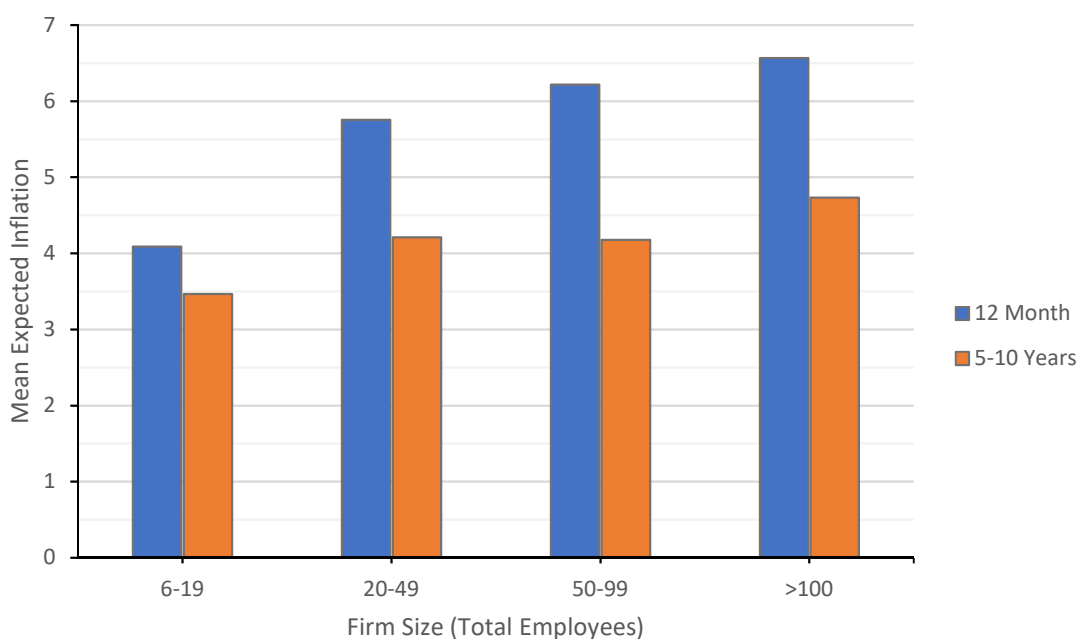
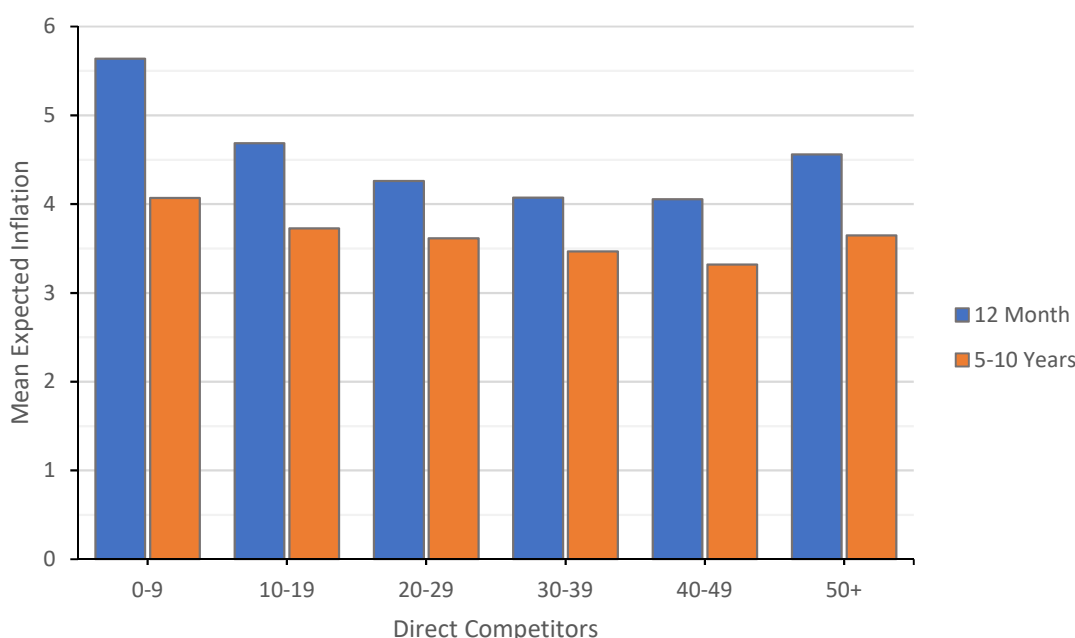


Figure 4 shows that firms with relatively fewer employees, especially under 20, are more likely to have inflation expectations closer to the 2% midpoint target. There is a clear upward trend indicating a relationship between having fewer employees and having lower inflation expectations. Large companies of over 100 workers have a very high mean 12-

month inflation expectation of 6.57% (SD 2.7%), though to refer to Table 2, there are only 30 respondents from firms of this size, so it is possible there are some outliers having an adversely large effect.

Like the comparison by industry, firm size also shows the reduced dispersal among 5 to 10-year inflation expectations, though in the three categories of greater than 20 workers, all means are above 4%. Additionally, these three categories have indicated their outlook for the next 5 to 10-years is more than 1.5 percentage points lower than the next 12-months, this is a greater difference than we saw in the Manufacturing and Other industries on average.

*Figure 5. Mean Inflation Expectation by Firm Competition*



The amount of competition a firm faces seems related to the anchoring of their inflation forecasting, showing a general trend of more competitors having lower mean inflation expectations for both categories. Firms with 50 or more competitors do not follow this general trend. At this level of competition perhaps the incentive to be informed about monetary policy is lessened for some reason, maybe related to having so many competitors. However, when broken down into brackets of five competitor firm increments, it is specifically firms with 46–50 competitors that exhibit this small increase in inflation expectations. Firms with 51 and greater competitors then reflect the overall downward trend, so it seems unlikely that it is indicating a change in the trend direction when a firm hits some threshold number of competitors. The 50+ bracket in Figure 5 contains 2.7% of the sample firms, far less than the other brackets. Evidence from the

wider survey data in Coibion et al. (2018) showed that in line with theory, firms with more competitors were more informed about inflation – this figure supports that finding, with the aforementioned anomalistic category.

Respondents that indicated the firm had nine or fewer direct competitors had the highest mean inflation expectation for the next 12 months with 5.64% (SD 3.07%). The implication is that when there is a commensurately low level of competition in their market there is also a lack of incentive to seek macroeconomic or monetary policy-based information. As with the other categorical comparisons of mean inflation expectations, responses for yearly inflation over the next 5–10 years are lower than the next 12 months. The relationship between 5–10 year inflations expectations and firm competitors is weaker than 12 month expectations, with most of the responses falling in the 3–4% range.

Figure 6 shows that firms with a price closer to their competitors had lower inflation expectations on average than those with higher price differences, both positive and negative. However, the long-term inflation expectations do not demonstrate the same trend. This might imply that firms who are in markets that do not compete aggressively on pricing are more inclined to track additional factors like inflation.

*Figure 6. Mean Inflation Expectation by Firm Price Relative to Competitor's Price*

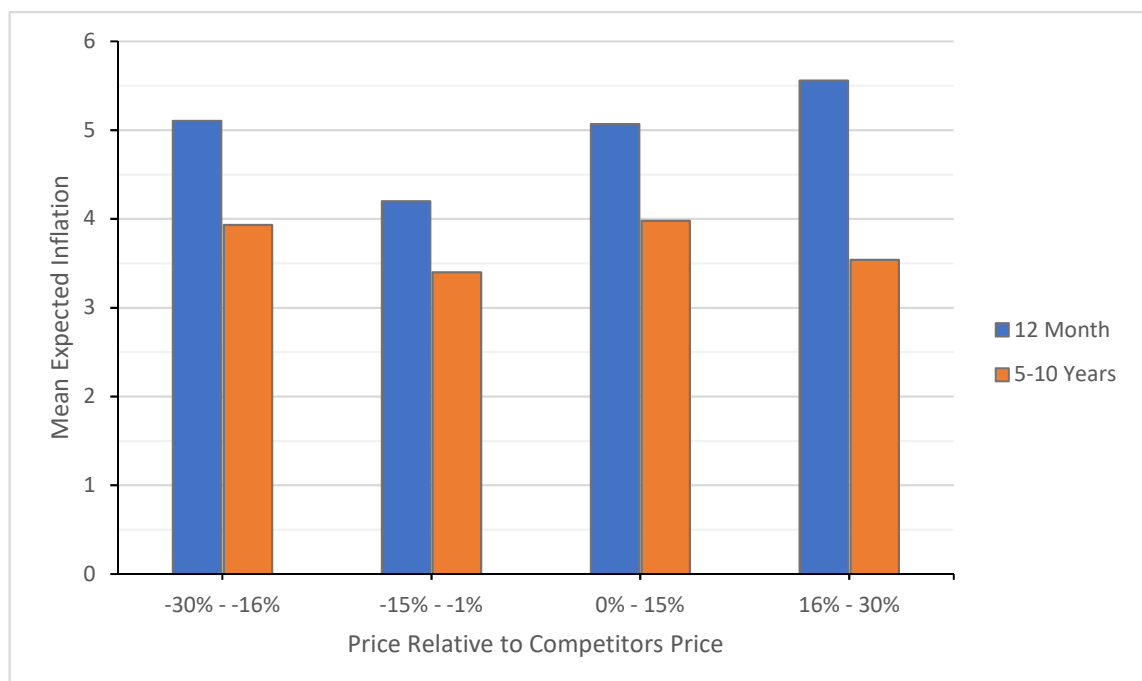


Figure 7. Mean Inflation Expectation by Firm's Average Margin

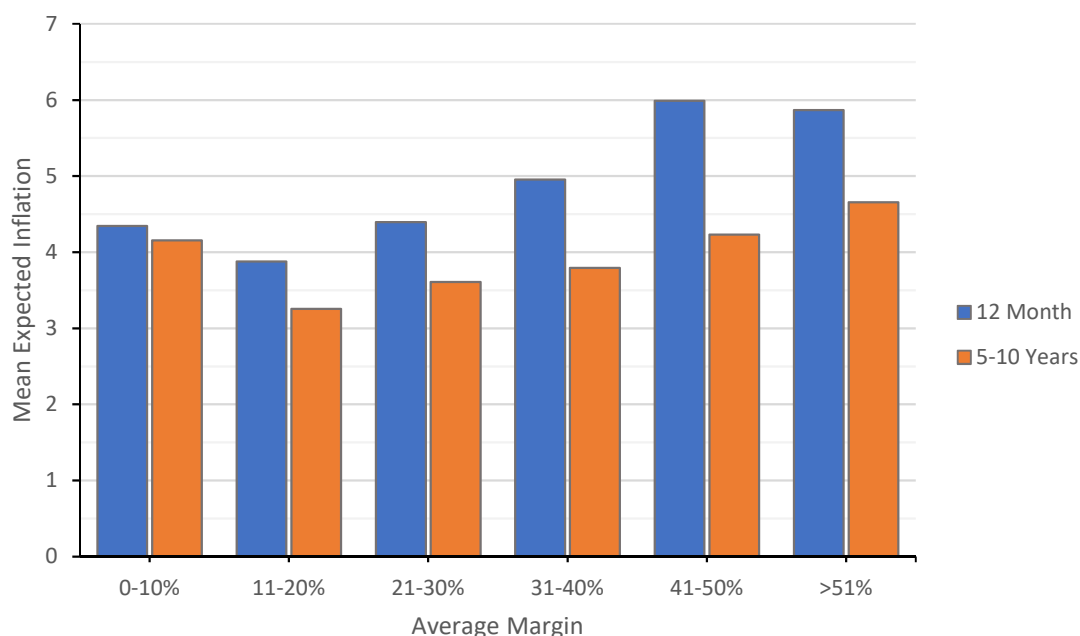
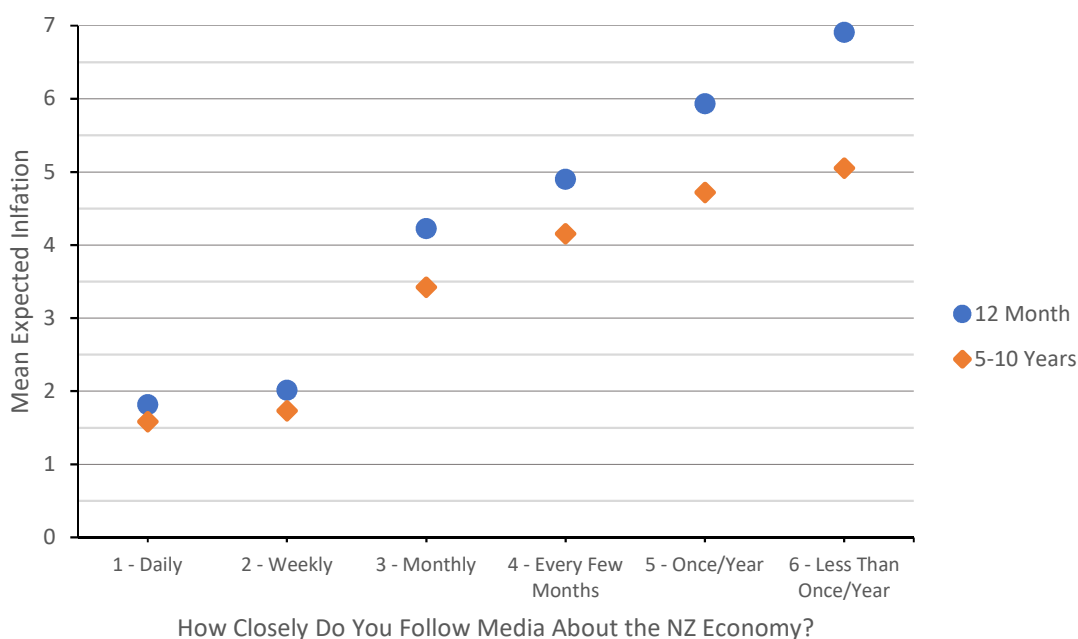


Figure 7 shows the average margin by which a firm's sales exceed their operating costs exhibits an upward trend in inflation expectations. It could be that firms who do not exceed their costs by a large amount are more sensitive to additional factors like macroeconomic conditions. These firms may be more inclined to pay attention to monetary policy than firms whose sales exceed costs by a larger margin. The mean inflation expectations of the 11–20% category is 3.87% (SD 2.76%), whereas the 41–50% category is 5.99% (SD 3.0%).

Two questions in the survey touched on the nature of information acquisition for the respondent. As Carroll (2003) shows, the idea of media being an information source for inflation expectations is well established. Carroll showed a transmission of information from professional forecasters writing the media, to households consuming the news media. In this survey, the first of these questions asked, 'How closely do you follow media news about the NZ economy'. According to Carroll's transmission, this could be seen as a vector for information passing from professional forecasters to firms. The second asked 'How often do you read information from public sources (e.g., monetary policy reports by RBNZ, Treasury country reports, etc)?'. Unlike the previous question, this would be equivalent to the firm bypassing the professional forecaster and going straight to the source of monetary policy. Both questions asked for responses on a scale of 1 – daily, 2 – weekly, 3 – monthly, 4 – every few months, 5 – once a year and 6 – less than once a

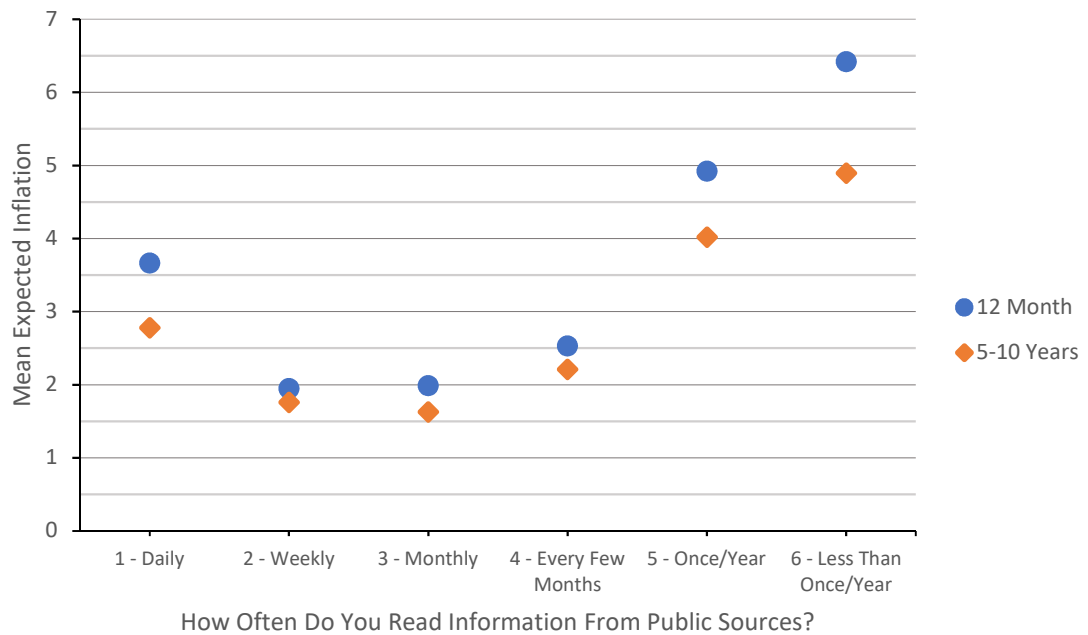
year. A plausible assumption would be that respondents who follow media daily and consult non-media sources of monetary policy information are more likely to have lower mean inflation expectations, and this is borne out in Figures 8 and 9. There is an important distinction to draw here between the previous statistics and these figures; these are not inherent firm characteristics, but questions of the respondent. As such these are likely to show a stronger relationship to the mean inflation expectations, which were also direct questions of the respondents' opinions.

*Figure 8. Mean Inflation Expectations based on media consumption frequency*



The frequency with which the firm follows media about the New Zealand economy displays one of the clearest trends in what is likely to effect inflation expectations. The firms who follow news media daily or weekly have 12-month mean inflation expectations of 1.81% (SD 1.25%) and 2.01% (SD 1.40%) respectively. This is the most accurate summary indicator so far that a firm is likely to have well anchored inflation expectations. This is a predictable relationship, as the Reserve Bank of New Zealand primarily issues its announcements about the official cash rate through press releases. Those that follow media less than once per year have mean inflation expectations for the 12-month horizon of 6.91% (SD 2.64%). The number of respondents for this bracket was 386, around 27% of all responses. The relationship between frequency of media consultation and informedness as to inflation seems explicit.

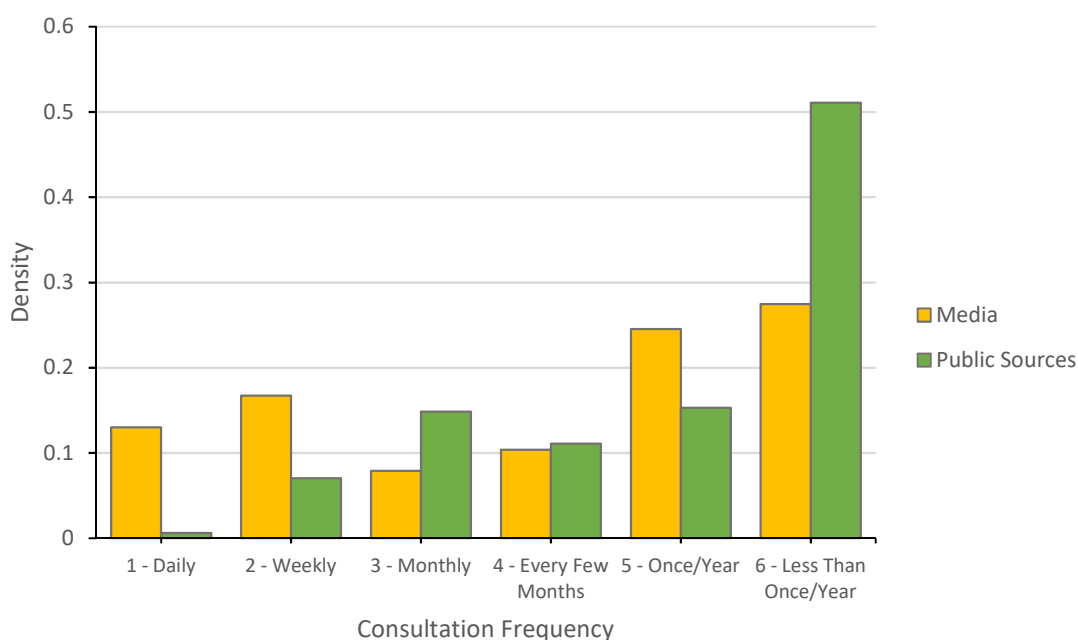
*Figure 9. Mean Inflation Expectations based on public information source consumption frequency*



Reading information from public sources entails an extra step over following media, in that the individual will need to have sought out the information – it is not delivered in the newspaper or nightly report. This means intuitively that the distribution of answers is likely to indicate less frequency than the news media question. The extra step of intent on part of the firm should realistically indicate two groups, those who are motivated enough to seek out their own information on monetary policy or macroeconomic conditions, and those who aren't. The overall trend appears predictable, with the extremely obvious outlier of those who consult public information sources daily having a 12-month inflation expectation of 3.67% (SD 4.37%), though there are some caveats for this category. In Figure 9 the '1 - Daily' bracket only had 9 respondents. Of these 9, 2 gave answers for inflation far above 5%. These outliers are having a disproportionate effect on the trend. Ignoring those responses, we see 12-month inflation expectation of 1.57% (SD 0.53%) and 5 to 10-year inflation expectations of 1.71% (SD 0.95%). These values follow the overall trend much more predictably. Those who consult weekly and monthly have 12-month inflation expectations of 1.94% (SD 1.61%) and 1.98% (1.21%) respectively. Even those who seek out public information every few months have 12-month expectations of 2.53% (SD 1.53%). These brackets would seem to indicate those who are motivated enough to seek out their own information are those who will be the most well informed

on monetary policy, have well anchored inflation expectations and are likely to be receptive to the communication the Reserve Bank of New Zealand conducts.

*Figure 10. Distributions of Consultation Frequency, Media/Public Sources*



While the general trend between Figures 8 and 9 are both upwards and predictable, the density of responses between the two questions varies a great deal. Figure 10 is a comparison. The bracket of every few months had a similar number of responses between the two questions, but over 50% of the respondents consult public information sources less than once per year. This bracket had mean 12-month inflation expectations of 6.42% (SD 2.45%), which is lower than the group who followed media less than once per year, but only by half a percentage point. For both questions, consultation frequency of less than once per year was the highest density bracket.

These two questions in the survey seem to indicate that increasing the frequency that a firm is exposed to media may lead to a better communication line from the central bank, and more well anchored inflation expectations. If the central bank is primarily communicating through press releases picked up by news media, this makes sense. Those who are motivated enough to seek out their own information on public sources up to every few months seem well informed as to inflation and on average have expectations close to the Reserve Bank of New Zealand 2% midpoint target. This suggests they are receptive to methods of central bank communication aside from solely press releases, though arguably for the scope of this thesis the amount that communication could be improved to these firms may be limited and/or unnecessary.



*Figure 11. Mean Inflation Expectation by Firm Affiliation*

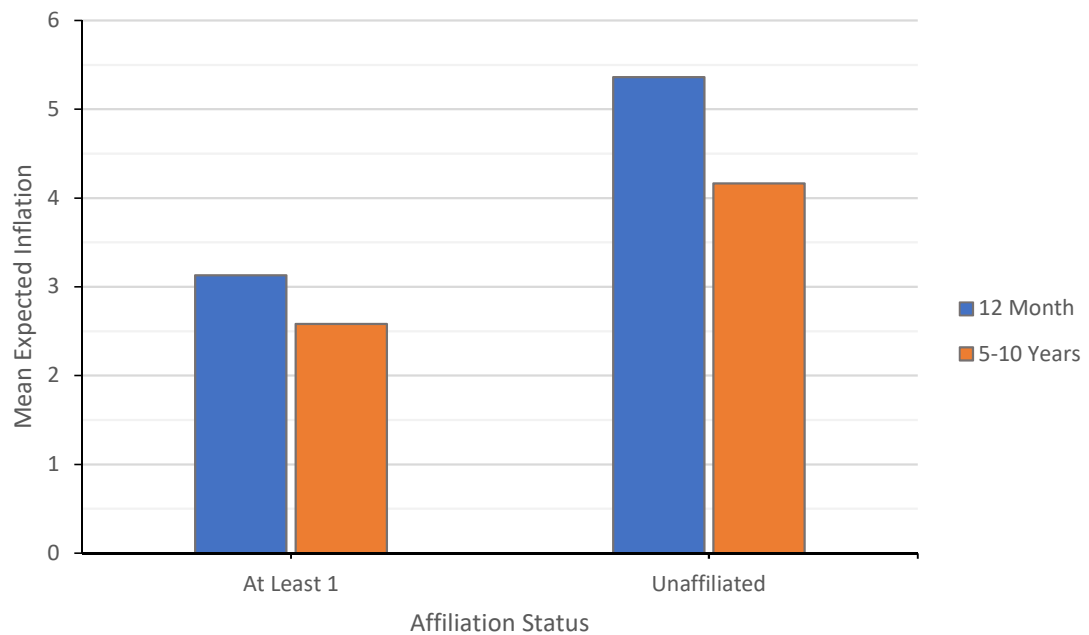


Figure 11 displays the inflation expectations conditional on whether a firm indicated they had an affiliation or not. The question specifically asked if they were affiliated with any business association, congress, government department or statutory body, and they were asked to provide details, usually the names of the affiliated entity. 374 responses indicated there was at least one firm affiliation. The 374 firms that indicated affiliation gave 218 unique responses. This bracket had mean 12-month inflation expectations of 3.13% (SD 2.64%), which is the most well anchored grouping by firm characteristic thus far. Conversely unaffiliated firms have mean 12-month inflation expectations of 5.36% (SD 2.66%), which is in the higher amounts seen. It could be that there is some attribute of affiliated firms, or benefit from being affiliated, that leads to a firm being more well informed about monetary policy, more receptive of central bank communication, and more anchored to the central bank inflation target. There has been academic research on trade associations, but not in connection to central bank communication. If a firm with an affiliation is by nature more well informed on monetary policy, it could indicate that this is another possible route of communication for the central bank to reach firms through.

### 3.3 Regression Analysis

The goal of this regression analysis is to identify the connection between both firm characteristics and manager characteristics to inflation expectations. The inflation expectations for the two time horizons of the next 12 months and the next 5–10 years have been conducted as separate sets of regressions. The following section pertains to the 12 month time horizon, and the regression results for the 5–10 year horizon can be found in Appendix A. The primary reason for segregation was that the results are mostly the same between horizons and clarity of context was desired. Following Coibion, Gorodnichenko and Kumar (2018) and Kumar, Afrouzi, Coibion and Gorodnichenko (2015), the dependent variable has been structured as the absolute value of the error of a firm's forecast inflation relative to the Reserve Bank of New Zealand's midpoint target of 2%. For example, a firm that forecast 6% inflation over the next 12 months will in this new variable show as having an absolute error of inflation forecast of 4 percentage points. The aim of this is to measure the amount by which the firm's inflation expectations are moving away from a well anchored inflation expectation of 2%.

To contribute to the improvement of central bank communications, characteristics that are potentially targetable by the central bank are of immediate interest. For example, this may mean that if old companies or large companies have identifiably lower errors in their expectation for inflation, that the central bank communication is better at reaching companies with those characteristics, and the central bank could be encouraged into differing strategies to communicate to young or small companies.

As the summary statistics indicated a very strong trend between inflation expectations and the questions 'How closely do you follow media news about the NZ Economy?' and 'How often do you read information from public sources?', they have been initially excluded from the first regression, and then later included independently and jointly in further regressions. They are treated as a set of categorical dummy variables, with monthly (categorised 3) as the base answer. With monthly as the base answer we will be able to see the effect of more frequent media and public source consumption, and the effect of less frequent. These variables are specifically a manager characteristic, in so far that the question was framed as a question about the respondents' habits and not about the firm.

Table 4 displays the first three regressions. In the first column are the baseline results from regressing firm characteristics and manager characteristics on the absolute inflation expectations error for the next 12 months. This column does not account for industry and

subsector fixed effects. The second column displays the same regression allowing for the industry fixed effects, and the third column again displays the same regression allowing for sub-sector fixed effects.

To be noted about these regressions is that there are 1,287 observations, rather than the full survey of 1,407 firms. 120 respondents refused to indicate a categorical bracket for their personal income. See Appendix C for a regression with these values imputed with Multinomial Logistic Regression. In short, the imputed values for income did not change the results substantially. The entries that have this variable missing have been ignored in this section's regressions.

*Table 4. Determinants of Inflation Forecast – 12 Months, Firm and Manager Characteristics*

	(1)	(2)	(3)
Firm Age	0.003 (0.004)	0.002 (0.004)	0.003 (0.004)
(Log)Employment	0.556*** (0.111)	0.641*** (0.110)	0.574*** (0.109)
Firm Competitors	-0.007 (0.006)	-0.008 (0.006)	-0.009 (0.006)
Average Margin	0.034*** (0.007)	0.005 (0.009)	0.013 (0.009)
Price Relative to Competitors	0.022*** (0.008)	0.010 (0.008)	0.006 (0.008)
Affiliated	-1.506*** (0.156)	-1.503*** (0.155)	-1.371*** (0.151)
Manager Age	0.005 (0.008)	-0.001 (0.008)	0.002 (0.008)
Manager Experience at Firm	0.014 (0.011)	0.012 (0.011)	0.015 (0.011)
Manager Qualification			
High School Diploma	0.157 (0.474)	0.110 (0.442)	0.479 (0.454)
Some College/Associates Degree	0.042 (0.471)	-0.024 (0.439)	0.370 (0.451)
College Diploma	0.100 (0.488)	0.038 (0.455)	0.517 (0.462)
Graduate Studies	-0.540 (0.485)	-0.539 (0.452)	-0.069 (0.466)
Managers Income	0.011 (0.064)	0.012 (0.063)	-0.004 (0.059)
Constant	0.283 (0.742)	2.114*** (0.811)	-0.429 (0.732)
Industry Fixed Effects	No	Yes	No
Sub-Sector Fixed Effects	No	No	Yes
Observations	1,287	1,287	1,287
R-squared	0.197	0.220	0.306

Note: Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The dependent variable for this set of regressions is the absolute error of a firm's inflation expectations based off the assumption that a firm that is well communicated to by the Reserve Bank of New Zealand would reasonably expect 2% inflation over the next 12 months. This is based on not only the fact that they have received this information from the Reserve Bank of New Zealand, but also that they believe it is a credible institution and is likely to meet its' monetary policy goals. It also shows that they have well anchored inflation expectations, not affected by temporary issues.

In the first regression without industry or sub-sector fixed effects, many of the firm characteristics are significant at the 1% level: log of employment, average margin, relative price and affiliation status. Log employment's coefficient indicates a positive correlation between firm size and inflation expectation error. The more valuable interpretation may be the corollary, that smaller firms are more likely on average to have lower errors in expected inflation. In a small firm, it is likely that one employee has a wider purview, in particular the manager may need to be well versed across more areas, including business pricing and relation to macroeconomic indicators. The opposite may be true at a larger firm, especially at a very large firm, with the manager feeling a reduced need to be informed across macroeconomic conditions, but the evidence to this point does not necessarily exist in this survey. It would likely not be a disadvantage to any firm for their manager to be more knowledgeable about the central bank's monetary policy, notably with regard to inflation.

Average margin is also a significant positive correlation to inflation expectation error, with a relatively high magnitude given that the variable was measured of the percentage amount sales price exceeds operating cost. The coefficient indicates that a firm with a higher average profit margin is less sensitive to being well anchored to inflation targets. It follows that a firm enjoying high profit margins is less concerned with factors that might have smaller net effects on their pricing over the next 12 months, like inflation. The assumption may then be that a firm operating with a very low margin then needs to be well informed about potential variations in price, even small ones.

Relative price to competitors is significant when industry and subsector fixed effects are not accounted for. Respondents were allowed to answer negative values if their product was cheaper than competing products. The coefficient indicates that those with cheaper products than their competition are perhaps required to be more knowledgeable about macroeconomic conditions than those who have higher prices than their competitors. It does not seem that this is an especially easy firm characteristic to incite better

communication from the central bank with. Arguably it is possible to track the firms in a market with the highest prices without privileged information, but how that in turn enables more targeted monetary policy communication is unclear.

Affiliated was a computed dummy variable, indicating whether or not the respondent had answered positively to the questions ‘are you affiliated with any business association, congress, government department or statutory body?’. The result is significant, and the magnitude is very high. The coefficient implies that a firm that has an affiliation of some kind will on average have inflation expectations for the next twelve months 1.5% points closer to the central bank target of 2% inflation. Likewise, a firm that is not affiliated will on average have an inflation expectation error 1.5% points higher than an affiliated firm. These indicate that the affiliation status of a firm is an area worth exploring later in this section.

Firm age and firm competitors are not significant in this first specification, reflecting the somewhat weak trend seen between competition and mean inflation expectations in the summary statistics. However, the coefficient for competitors is negative, which the summary statistics indicated may be the case, and is supported by the findings in Coibion et al. (2018) implying that firms with more competition have more inclination to be anchored to inflation targets.

Also, in this first regression no manager characteristics are significant at even the 10% level. Of all the variables, only having a graduate education had a negative correlation to inflation expectation error. Manager qualification is a categorical variable with the answer of ‘less than high school’ as the omitted category.

For the second and third specification of this regression, fixed effects specific to industry and specific to sub-sector were controlled for. This had the immediately noticeable effect of shifting average margin and relative price to competitors out of significance.

Log of employment remains significant at the 1% level across all three specifications with a positive coefficient. This shows that the smaller a firm is, the more likely it is on average that they will have well anchored inflation expectations, regardless of industry or sub-sector effect. The magnitude for the log variable remains somewhat even, showing a small bump when accounting for industry fixed effects.

Interestingly, the affiliated status of the firm retains its 1% significance level and also its high magnitude. When allowing for differences across industry, a firm that is affiliated

still expects inflation 1.5% points closer on average to the Reserve Bank of New Zealand's 2% target. Even when allowing for differences across sub-sector the magnitude only drops to -1.371. The fact that holding all other factors constant, an affiliated firm is far more anchored to inflation targets than an unaffiliated firm is a very interesting result, given the essential lack of coverage for this in academic literature.

When industry specific and sub-sector specific fixed effects are controlled for, no manager characteristics are significant.

The R-squared value is initially somewhat low at 0.197, showing that the model only has some explanatory power. When industry fixed effects are controlled, the R-squared increases to 0.220, and when sub-sector fixed effects are controlled, the R-squared increases to 0.306, showing an increase in the explanatory power of the model when controlling for these fixed effects.

Table 5 presents a similar regression to Table 4, only allowing for the manager characteristic of the frequency with which they follow media about the NZ Economy to be included. Predictably, how often the respondent consumes media about the economy is always significant at the 1% level. It is a very straight-forward result, the sign of the coefficient is also what would be predicted. The omitted value for the variable is 3, corresponding to those who consume media about the economy on a monthly basis. Holding other factors constant and controlling for sub-sector fixed effects, we would expect a manager who consumes media on a monthly basis to have on average inflation expectations roughly 0.7% points closer to the Reserve Bank of New Zealand 2% target than a manager who only consumes economy media every few months.

Notably, the ‘advantage’ a manager would receive in the closeness to the 2% target of their forecasts for inflation does not change much in magnitude between Daily consumption and Weekly consumption of media. This was also somewhat reflected in Figure 6.

The frequency of media consumption variable does not change much when industry and subsector fixed effects are introduced, keeping a similar magnitude and maintaining 1% significance level. This suggests a universal importance when considering the inflation expectation error a firm is likely to make. An interesting contrast to the first set of regressions is that allowing for media consumption frequency reduces the significance level of average margin, and relative price – the former by a greater degree. However, manager age becomes significant at the 5% level. This result suggests that holding all other factors equal, there is some evidence that on average an older manager has less anchored inflation expectations than a younger manager. A likely explanation would point to the fact that these older managers may have experienced longer periods of more unsettled inflation and potentially may have been operating in business before the Reserve Bank of New Zealand adopted an inflation target. This variable is no longer significant at 10% when industry and subsector fixed effects are controlled for.

Another interesting contrast to the first set of regressions is that whether or not a firm is affiliated to some external body is now only significant with sub-sector fixed effects, and at the 10% level. For all 3 specifications, the magnitude on Affiliated is far lower than in the first set of regressions.

Similar to the first regression set, log of employment is significant at 1% across all three specifications, though the magnitude is smaller on all three than it was previously. This



continues to imply that a firm with fewer employees is more likely on average to be well anchored in their inflation expectations than a firm with a greater number of employees, holding all other factors constant.

The R-squared values are 0.464, 0.475 and 0.506 for the three regressions respectively. These are all higher than any of the first set of regressions, but do not increase as much from the first specification to the inclusion of industry and sub-sector fixed effects. This suggests that the introduction of the frequency of consumption of media about the economy as a variable adds a good amount of explanatory power to the model.

*Table 5. Determinants of Inflation Forecast – 12 Months, Firm and Manager Characteristics, Media Frequency*

	(4)	(5)	(6)
Firm Age	-0.001 (0.003)	-0.000 (0.004)	0.001 (0.003)
(Log)Employment	0.339*** (0.092)	0.395*** (0.092)	0.372*** (0.093)
Firm Competitors	-0.003 (0.005)	-0.001 (0.005)	-0.003 (0.005)
Average Margin	0.005 (0.006)	-0.006 (0.007)	-0.001 (0.007)
Price Relative to Competitors	0.015** (0.007)	0.007 (0.007)	0.005 (0.007)
Affiliated	-0.170 (0.150)	-0.217 (0.149)	-0.246* (0.146)
Manager Age	0.014** (0.007)	0.008 (0.007)	0.008 (0.007)
Manager Experience at Firm	0.004 (0.010)	0.005 (0.009)	0.007 (0.009)
Manager Qualification			
High School Diploma	-0.108 (0.352)	-0.097 (0.357)	0.081 (0.372)
Some College/Associates Degree	0.036 (0.350)	0.055 (0.355)	0.250 (0.369)
College Diploma	0.101 (0.363)	0.110 (0.367)	0.356 (0.379)
Graduate Studies	-0.030 (0.362)	0.023 (0.367)	0.249 (0.380)
Managers Income	-0.033 (0.051)	-0.031 (0.051)	-0.035 (0.050)
Frequency of Media Consumption			
Daily	-1.493*** (0.219)	-1.385*** (0.218)	-1.263*** (0.219)
Weekly	-1.450*** (0.188)	-1.436*** (0.186)	-1.285*** (0.186)
Every few months	0.699*** (0.221)	0.707*** (0.217)	0.699*** (0.212)
Once a year	1.741*** (0.190)	1.756*** (0.188)	1.652*** (0.182)
Less than once a year	2.555*** (0.211)	2.564*** (0.211)	2.452*** (0.202)
Constant	0.622 (0.577)	1.352** (0.661)	0.456 (0.606)
Industry Fixed Effects	No	Yes	No
Sub-Sector Fixed Effects	No	No	Yes
Observations	1,287	1,287	1,287
R-squared	0.464	0.475	0.506

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 6 consists of the same regression as Table 5, only with the frequency of consultation of public sources of macroeconomic information being an independent variable, and media consumption frequency no longer being in the model.

There are numerous similarities in this regression to the previous specification. Log of employment continues to be significant at the 1% level as it has been in every specification of this regression thus far. This again reinforces the implication that smaller firms are more likely on average to exhibit anchoring in their inflation expectations. Manager age is significant at the 10% level in the first specification, giving slightly weaker indication that younger managers may be somewhat more anchored than older managers on average.

Affiliation status is now significant at 10% when industry specific factors are controlled for, and at 5% when sub-sector specific factors are controlled for. The magnitude is still much smaller than the regressions conducted in Table 4.

Unlike the regression with frequency of media consumption included, the frequency that a manager consults public information sources on macroeconomic information is not always significant. The base value for sources is again 3, the monthly category. From the base point, any decrease in the frequency with which a manager consults public sources (i.e. going from monthly to every few months) was significant at the 1% level, and any increase in frequency was not significant. We saw in Figure 9 that both category 2 and category 3 had very similar mean inflation expectations, this would seem to reinforce that finding. It is worth repeating the caveats on this variable about frequency of public information sourcing covered in the summary statistics section, notably that only nine respondents answered daily for this question (down to eight with the aforementioned exclusions based on missing data from the variable ‘income’), representing only slightly more than half of one percent of the respondents. This would go some way to accounting for the extreme magnitude increase on daily public source consultation, even though it was not a significant effect. The advantage, on average, in the closeness to target of inflation expectations for a manager who consults public information monthly over a manager who consults public sources less than once a year, holding other factors constant, is in the 3.2 percentage points range.

Over half of the respondents for sources answered in the less than once per year category (this was 6 on the scale of answers). If the regression were rearranged for category 6 to be the omitted category for sources, every increase in frequency would be significant at

the 1% level, except for Daily, which has the previously mentioned problems. This is an interesting outcome that has meaningful application to inducing managers to consult public information.

The R-squared when not controlling for fixed effects by industry or subsector is 0.435. This is lower than the similar previous regression with frequency of economy media consumption. It is still higher than the base regression from Table 4, showing that including the frequency of public information sourcing does add a good amount of explanatory power to the model. Controlling for industry specific fixed effects increases the R-squared to 0.450 and controlling for sub-sector specific fixed effects increases the R-squared again to 0.485.

*Table 6. Determinants of Inflation Forecast – 12 Months, Firm and Manager Characteristics, Public Information Source Frequency*

	(7)	(8)	(9)
Firm Age	-0.000 (0.003)	0.000 (0.004)	0.002 (0.003)
(Log)Employment	0.317*** (0.097)	0.382*** (0.096)	0.356*** (0.097)
Firm Competitors	-0.003 (0.005)	-0.002 (0.005)	-0.004 (0.005)
Average Margin	0.014** (0.006)	-0.002 (0.008)	0.003 (0.008)
Price Relative to Competitors	0.011 (0.007)	0.002 (0.007)	0.000 (0.007)
Affiliated	-0.233 (0.146)	-0.272* (0.144)	-0.298** (0.142)
Manager Age	0.012* (0.007)	0.005 (0.007)	0.006 (0.007)
Manager Experience at Firm	0.010 (0.010)	0.011 (0.010)	0.013 (0.010)
Manager Qualification			
High School Diploma	0.115 (0.344)	0.126 (0.337)	0.334 (0.346)
Some College/Associates Degree	0.195 (0.341)	0.209 (0.334)	0.448 (0.342)
College Diploma	0.220 (0.353)	0.226 (0.344)	0.503 (0.350)
Graduate Studies	0.132 (0.354)	0.189 (0.347)	0.458 (0.355)
Managers Income	-0.021 (0.053)	-0.019 (0.052)	-0.028 (0.051)
Frequency of Public Source Consultation			
Daily	1.931 (1.564)	1.826 (1.535)	1.603 (1.459)
Weekly	-0.071 (0.119)	-0.019 (0.125)	-0.073 (0.140)
Every few months	0.333** (0.133)	0.372*** (0.133)	0.389*** (0.135)
Once a year	2.017*** (0.164)	1.977*** (0.161)	1.722*** (0.163)
Less than once a year	3.496*** (0.153)	3.486*** (0.154)	3.232*** (0.152)
Constant	-1.147* (0.592)	-0.153 (0.675)	-1.078* (0.610)
Industry Fixed Effects	No	Yes	No
Sub-Sector Fixed Effects	No	No	Yes
Observations	1,287	1,287	1,287
R-squared	0.435	0.450	0.485

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 7 combines the previous two analyses into one set of regressions, with both frequency of economy media consumption and frequency of public source consultation included.

The frequency of media consumption variable remains significant at 1% at all category levels, as it was in Table 5. The variable for consultation of public information sources is now only significant in the less than once per year, category 6. This suggests that as long as a manager references a public information source at least once per year, or more frequently, that the frequency with which they consume media about the economy is more important in determining the anchoring of their inflation expectations. However as we know this category of public information sourcing contains over 50% of the respondents, it is worth interpreting that holding constant the media consumption frequency, if a manager be encouraged to look at public information sources at least once per year (instead of less than that, or presumably never), they are likely, on average, to have a significant impact on the anchoring of their inflation expectations.

Like the regressions in Tables 5 and 6, manager age is significant when industry and sub-sector specific fixed effects are excluded, in this case at the 5% level. Additionally, log of employment is significant at the 1% in all three specifications still.

Affiliated firms are no longer significant with the addition of both media and sources as manager characteristics. This suggests that perhaps some of the previous effect of a firm being affiliated is captured in how frequently the manager consumes media and consults public sources. The nature of affiliation status on inflation expectations bears further investigation.

The R-squared of the first specification is 0.474, then when controlling for industry specific fixed effects 0.486, and when controlling for sub-sector specific fixed effects 0.517. These are higher than the similar regressions run in Tables 5 and 6, but only by a small margin. This doesn't suggest that adding both frequency of economy media consumption and the frequency that a manager consults public sources of information adds much more explanatory power than just adding either individually. The R-squared values are barely different from Table 5 when only media consumption frequency was added.

*Table 7. Determinants of Inflation Forecast – 12 Months, Firm and Manager Characteristics, Media Frequency and Public Information Source Frequency*

	(10)	(11)	(12)
Firm Age	-0.001 (0.003)	-0.000 (0.004)	0.001 (0.003)
(Log)Employment	0.308*** (0.093)	0.364*** (0.093)	0.342*** (0.094)
Firm Competitors	-0.003 (0.005)	-0.002 (0.005)	-0.004 (0.005)
Average Margin	0.006 (0.006)	-0.005 (0.007)	-0.001 (0.007)
Price Relative to Competitors	0.012* (0.007)	0.004 (0.007)	0.003 (0.007)
Affiliated	-0.116 (0.145)	-0.164 (0.144)	-0.194 (0.141)
Manager Age	0.014** (0.007)	0.008 (0.007)	0.008 (0.007)
Manager Experience at Firm	0.004 (0.010)	0.006 (0.009)	0.008 (0.009)
Manager Qualification			
High School Diploma	-0.053 (0.343)	-0.035 (0.345)	0.167 (0.362)
Some College/Associates Degree	0.089 (0.341)	0.114 (0.344)	0.336 (0.358)
College Diploma	0.135 (0.353)	0.149 (0.354)	0.415 (0.367)
Graduate Studies	0.032 (0.353)	0.092 (0.356)	0.342 (0.371)
Managers Income	-0.039 (0.052)	-0.038 (0.051)	-0.043 (0.050)
Frequency of Media Consumption			
Daily	-1.452*** (0.231)	-1.303*** (0.233)	-1.227*** (0.233)
Weekly	-1.324*** (0.229)	-1.278*** (0.229)	-1.187*** (0.227)
Every few months	0.513** (0.243)	0.502** (0.237)	0.549** (0.236)
Once a year	1.161*** (0.244)	1.133*** (0.237)	1.071*** (0.235)
Less than once a year	1.899*** (0.263)	1.860*** (0.257)	1.780*** (0.254)
Frequency of Public Source Consultation			
Daily	2.111 (1.563)	1.950 (1.528)	1.738 (1.464)
Weekly	0.047 (0.111)	0.072 (0.117)	0.015 (0.130)
Every few months	-0.002 (0.120)	0.045 (0.123)	0.084 (0.125)
Once a year	0.149 (0.266)	0.206 (0.266)	0.054 (0.272)
Less than once a year	0.893*** (0.299)	0.994*** (0.299)	0.899*** (0.305)
Constant	0.426 (0.587)	1.132* (0.662)	0.273 (0.613)
Industry Fixed Effects	No	Yes	No
Sub-Sector Fixed Effects	No	No	Yes
Observations	1,287	1,287	1,287
R-squared	0.474	0.486	0.517

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### 3.4 Additional Investigation on Affiliation

Given the significant results on affiliation, additional research was conducted. The link between central bank communication and firm affiliations has not been explored previously in macroeconomic literature. Affiliations offer another potential route for central bank communication to reach firms other than media consumption or consultation of public information sources. How an affiliation operates as an entity is likely to have a strong relationship to how they may act as a conductor for central bank communication. The survey data set has limited information in this area, only asking if the firm had an affiliation, and if so, what that affiliation was.

Firms were assigned an additional category based on their affiliation. Firms that have some exposure to government departments or other industries indicated in their response to the question on affiliation were categorised as having an affiliation unrelated to their sub-sector. Firms who only indicated an affiliation in line with their sub-sector were categorised as having a related affiliation. An example of the former would be a firm who indicated that they were affiliated to the Ministry of Business, Innovation and Employment. An example of the latter would be a firm in the retail sub-sector indicating they are affiliated to the Retail Association of New Zealand.

*Figure 12. Mean Inflation Expectation by Firm Affiliation - Expanded*

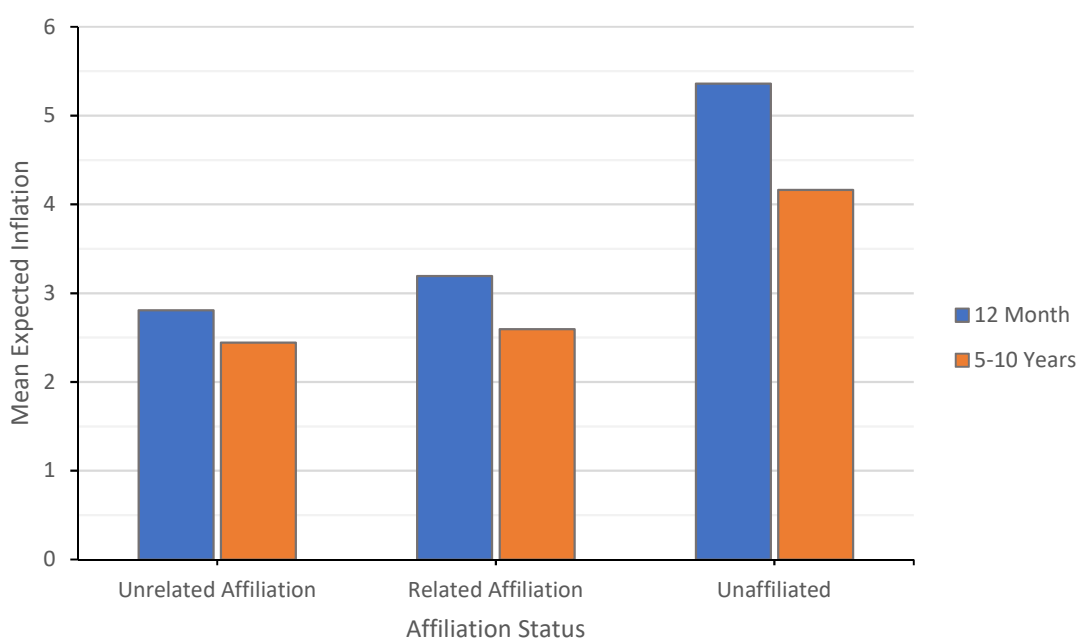




Figure 12 shows that firms with an unrelated affiliation have mean inflation expectations very close to those firms with sub-sector related affiliations. Because of this similarity, an additional regression was conducted to examine the significance of these results, and to determine if there was an actual advantage for firms that have an affiliation related to their sub-sector over firms with an unrelated affiliation.

A modified version of the regression in Table 4 was conducted, with the binary dummy variable Affiliated replaced with a categorical variable indicated either no affiliation, a related affiliation or an unrelated affiliation. The results are reported in Table 8. The omitted variable for Affiliation Relationship is ‘unaffiliated’. The coefficients for both types of affiliation continue to be significant at the 1% level and indicate that a firm with an affiliation related to their sub-sector will have inflation expectations roughly 1.35%–1.5% closer to the Reserve Bank of New Zealand 2% target than firms with no affiliation. Likewise, firms that have an affiliation unrelated to their sub-sector will have inflation expectations roughly 1.5%–1.6% closer to the Reserve Bank of New Zealand 2% target than firms with no affiliation. The R-squared value remains essentially the same as the matching specifications in Table 4.

A Wald test was performed between the Affiliation Related and Affiliation Unrelated variables to test the null hypothesis that the difference between these two coefficients was 0. The test result indicates that the null hypothesis fails to be rejected. The result of this Wald test implies that there is not a significant difference for the effect on inflation expectations over the next 12 months between a firm with an affiliation related to their sub-sector and a firm with an affiliation unrelated to their sub-sector.

*Table 8. Determinants of Inflation Forecast – 12 Months, Firm and Manager Characteristics, Expanded Affiliation Status*

	(13)	(14)	(15)
Firm Age	0.003 (0.004)	0.002 (0.004)	0.004 (0.004)
(Log)Employment	0.554*** (0.111)	0.638*** (0.110)	0.570*** (0.108)
Firm Competitors	-0.006 (0.006)	-0.008 (0.006)	-0.009 (0.006)
Average Margin	0.034*** (0.007)	0.004 (0.009)	0.013 (0.009)
Price Relative to Competitors	0.022*** (0.008)	0.010 (0.009)	0.006 (0.008)
Affiliation Relationship			
Affiliation Related to Sub-Sector	-1.476*** (0.170)	-1.492*** (0.169)	-1.344*** (0.167)
Affiliation Unrelated to Sub-Sector	-1.606*** (0.280)	-1.508*** (0.278)	-1.545*** (0.261)
Manager Age	0.006 (0.008)	-0.001 (0.008)	0.003 (0.008)
Manager Experience at Firm	0.014 (0.011)	0.012 (0.011)	0.015 (0.011)
Manager Qualification			
High School Diploma	0.314 (0.500)	0.270 (0.461)	0.623 (0.461)
Some College/Associates Degree	0.197 (0.498)	0.135 (0.459)	0.514 (0.460)
College Diploma	0.259 (0.513)	0.201 (0.473)	0.663 (0.469)
Graduate Studies	-0.381 (0.514)	-0.378 (0.475)	0.081 (0.477)
Managers Income	0.013 (0.064)	0.014 (0.063)	-0.003 (0.059)
Constant	0.105 (0.759)	1.941** (0.823)	-0.596 (0.740)
Industry Fixed Effects	No	Yes	No
Sub-Sector Fixed Effects	No	No	Yes
Observations	1,287	1,287	1,287
R-squared	0.196	0.219	0.306

Note: Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## **Chapter 4 – Discussion and Policy Implications**

### **4.1 Discussion**

For inflation expectations and central bank communication, the distinction between households and professional forecasters from recent academic literature is a well explored topic. Less popular has been the investigation into how firms fit into this dynamic, particularly on the communications front. The results in this thesis suggest that firms have widely dispersed, unanchored inflation expectations that do not suggest the majority of firms are knowledgeable of the Reserve Bank of New Zealand's goals around inflation and, more generally, monetary policy. This was also evidenced in the findings of Kumar et al. (2015) and Binder (2017), that firms tend to demonstrate inflation expectations more reminiscent of households than professional forecasters. Likewise, this thesis aligns with the findings in Coibion et al. (2018) that firms' inattention to economic variables like inflation is high. These three survey-based journal articles frame the problem of central bank communication to firms. This gives us an initial reference point through which to view the results and determine how the central bank might improve communication to firms.

Every regression performed in Section 3.3 gave significance to the variable (log)Employment. For all specifications the results suggested that on average, larger firms have higher errors in their forecast of inflation for the period of the next 12 months relative to the Reserve Bank of New Zealand 2% target. Similar results were reported in Coibion et al. (2018), who cautioned that New Zealand firms are smaller compared to global and particularly United States companies, and that international application to this finding is unclear. The summary statistics indicated that generally firms with fewer than 20 employees were possibly more well anchored than firms with greater than 20 employees. A simple hypothesis could be that in smaller firms, it is possible that the general manager is likely also the individual who is required to be most informed on monetary policy variables including inflation, whereas much larger firms may leave those responsibilities to a finance department or similar. Even if this hypothesis explains the disparity in inflation expectations among larger companies, it does not resolve that generally managers of large companies are less anchored in their inflation expectations.

Managers, presumably even those of large firms, have an important voice in the strategic direction of their firm. While the evidence does not examine specifically pricing strategies, it should be enough to go on that they are 'in control' of much of the firm's actions. So then, if these managers of large firms have unanchored inflation expectations

and are responsible for firm strategy, there is an indication here that more could be done to communicate to large firms and that doing so would likely have real effects. An interesting avenue of further investigation could ask about the transmission of macroeconomic information within firms. Are firms that are large enough to have a dedicated finance department with a macroeconomic focussed employee, acting as a professional forecaster, able to transmit that information to the manager(s) in a manner more efficient than presented in Carroll (2003). Such specific information about large firms was outside the scope of the survey presented in this thesis and may even be difficult to find among New Zealand companies.

The two variables in the investigation most directly related to a firm's prices are Average Margin and Price Relative to Competitors. They were often significant, but not always together in the same regression. Intuitively, we might expect a firm with a high margin to have less incentive to have anchored inflation expectations, as they have some 'comfort room' in their prices. The corollary is a firm with little or no margin, that would be expected to be incentivised to track additional factors that may influence their ratio of costs to revenues. The correlation on Average Margin supports this intuition, as it is always positive when the results indicate a significant difference from zero. This result shows that on average, a firm with a higher percentage margin shows less anchoring in their inflation expectations than a firm with small margins. Most firms are likely to treat the margin by which their sales price exceeds their operating costs as privileged information, so it is unlikely that this specific information will be applicable to future action on central bank communication, but fortunately the other 'pricing variable' is calculable by anyone with good knowledge of a market.

Price Relative to Competitors is sometimes significant, but the correlation to inflation expectation error is always positive. This indicates that in a market of competitors, those who have the higher prices are more likely on average to be less anchored in their inflation expectations. It seems plausible that this is also a result of the 'comfort room' idea given above. If a firm has higher prices than their closest competitors and is aware of this fact it follows that they believe there must exist some advantage in their favour that enables them to charge a higher price. We know that the firms know their price is higher as the wording on the question allows them to answer in the negative if their product is cheaper than the closest competitors. If the advantage then is something that allows for such price disparity, we can assume that the firm is also likely not incentivised to track other factors affecting pricing like inflation. Some reinforcement to these findings is given by Afrouzi

(2018) who finds that firms are willing to trade off information about “the aggregate economy” (p. 42) for information about pricing of their competition. The results in this thesis indicate that firms with prices cheaper than their competitors are better anchored to the central bank target with their inflation expectations, perhaps these firms devote less resource to tracking their competitors’ prices than firms who have higher relative prices.

Another way to consider the impact competition has on a firm’s anchoring of inflation expectations is through the number of competitors in the market. Both Coibion et al. (2018) and Afrouzi (2018) present evidence that markets with a greater number of competitors are more likely to have well anchored inflation expectations, and that firms in markets with less competition are more likely to put resources towards tracking the behaviour of their competition than to towards macroeconomic conditions. The regressions in Section 3.2 do not find the variable Firm Competitors to be significant in any specification, however the correlation to inflation expectation error is always negative, supporting the relationship between increased competition and anchoring.

Of the personal characteristics about managers (age, experience, qualification and income) only Manager Age was ever a significant variable when considering the 12-month forecast. The correlation to inflation expectation error is positive in all significant cases, which indicates that we might expect an older manager to be less anchored to the Reserve Bank of New Zealand 2% target than a younger manager. A good hypothesis for this would be that the older a manager is, the more likely they are to have been in business either when inflation was not as well controlled, or even before inflation targeting was an explicit policy of the Reserve Bank of New Zealand. It is not to say that the introduction of an inflation target has a demonstrably large effect – Binder (2017) proved that it was not the case for households in the US, but rather that these older managers simply have more bias towards assuming inflation is a much larger number.

Some of the strongest results come from the variables that measure how often a manager reads news media about the economy and how often the manager consults public sources of information. Support for the importance of media on central bank communication was found in the literature. This is a very intuitive result, as we expect those who keep up with news about the economy to have well anchored inflation expectations. Figure 10 in the summary statistics shows us that some 65% of managers consult public sources once per year or less frequently.

Frequency of media consumption was always significant when it was included in the regression. The variable was a categorical variable based on the categories of answers managers were able to provide. In the regressions the omitted, or base, category was “3 – Monthly”. The reason for regressing with this as the base variable means that the results can show the effect of more frequent or less frequent consumption. The results imply that if a manager could be incited to consume media weekly instead of monthly, they would have inflation expectations for the next 12 months over 1 percentage point closer to the Reserve Bank of New Zealand target 2%. The additional advantage from moving to daily media consumption is not as extreme, usually around 0.1 percentage points. By the same results, any decrease in the frequency with which a manager consults economy news media will have a significant effect on increasing their inflation expectation error. The additional increase in inflation forecast by those consulting news media yearly instead of monthly is in the 1 percentage point range.

When media frequency and public source frequency were included in the same regression, media frequency retained most of the significance and magnitude it had when considered alone. This result implies that if we hold constant the rate at which a manager consults sources of public information, even if that is less than once per year, if they can be incentivised to follow news media more frequently then they will likely have better anchoring of inflation expectations. Figure 10 showed us that over 50% of respondents follow news media about the economy once per year or less frequently.

The results do not imply a straight line can be drawn between well anchored and unanchored based on frequency. When industry fixed effects and sub-sector fixed effects are controlled for, and frequency of public sources is not included, the results indicate that those who consult news media weekly are more well anchored than those who consult news media daily. The magnitude difference between these two coefficients is small, and Wald tests find that both when controlling for industry fixed effects and when controlling for sub-sector fixed effects that the difference between them is not significantly different from zero. The effects when increasing frequency from monthly to either weekly or daily still remain significant.

The intuition made previously about the frequency with which firms consult public sources of information was that it would show two groups, those with the initiative to actively seek out public sources and those who do not. Figure 9 implies that the division between these two groups occurs between those who consult public sources every few months and those who consult once per year. To repeat the caveat on this variable, the ‘1

– Daily’ category has an extremely low number of responses, within which there are two large outliers. When referring to the results from the regression including this variable, we see that there is a significant increase in inflation forecast error between the base category of ‘3 – Monthly’ and ‘4 – Every Few Months’ of around 0.35 percentage points. Conversely, there is not a significant improvement in the anchoring of inflation expectations when increasing the frequency from monthly to weekly or even daily (though the very large standard deviation and unexpected correlation to the dependent variable give evidential reinforcement to the caveats on Daily). This suggests that rather the initiative is demonstrated by those who consult public sources of information at least monthly.

On the extreme end of these results, we see respondents who consult public sources less than once per year have inflation forecasts over 3 percentage points higher than the monthly category. This is a very high effect, and as we see in Figure 10, this category comprises over 50% of all the manager responses. If it were possible to incentivise these managers to look at public sources of information, for example the monetary policy statement put out by the Reserve Bank of New Zealand quarterly (every few months), it is likely there would be a real and impactful effect upon the anchoring of managers inflation expectations.

When the frequency of consulting public sources of information is included in the regression along with frequency of news media consumption, some of the significant results on categories drop away. In this specification now the only significant difference from the base category is increasing the frequency to less than once per year. This continues to support the implication that being able to incentivise managers who consult public sources of information less than once per year into reading them more frequently, even if it is only even yearly, is likely to have a meaningful impact on improving inflation expectation anchoring. This holds true even if these happened to be managers who read news media about the economy daily but do not seek out public information.

A novel result for central bank communication was found in the affiliation status of a firm. This is an area that appears to have no prior research in the literature, or at the very least is not widely disseminated in the literature. The result of the affiliation status of a firm is often significant and always the correlation to inflation expectation error is negative. As the omitted category in the dummy variable represents a firm with no affiliation, the negative correlation implies that firms with an affiliation have on average

lower differences on inflation expectations relative to the Reserve Bank of New Zealand's 2% target.

If the implication is then that firms who have an affiliation gain some informedness from that affiliation to improve their anchoring, it is definitely an area worthy of further research. Investigation into whether a firm's affiliation was specifically relevant to the sub-sector the firm operated in indicated that there was not a difference to firms with a more general affiliation. Is it therefore some more general property of affiliated firms that lends to them having better anchored inflation expectations? The very interesting implication for central bank communication would be if this affiliation opens a potential new channel of communication to the firm. Does the affiliation entity communicate with the firm? Presumably so for it to have purpose, but what is the form of this communication and can it be co-opted or utilised by the central bank? These questions could be answered in more wide research into affiliation and central bank communication.



## 4.2 Summary

The results can be considered across two categories, passive and active. Grouping the results in such a manner will help to inform any policy implications and conclusions.

The passive results contain the firm and manager characteristics that are endogenous and simply observed by the survey. An example of this is the firm size. While the results indicate large firms are generally less anchored in their inflation expectations, this has been designated a passive result because it is non-actionable by outside forces. Additional significant passive results were the average margin by which sales price exceeds operating cost, the price of a firm's product relative to the closest competitor, and the age of the manager. Not significant in these regressions but with strong academic support is the number of competitors a firm faces. All of these variables are realistically unable to be influenced from outside the firm.

The active results contain variables that are influenceable or modifiable in a realistic way. Falling into this category are the frequency of economy news media consumption and the frequency of consulting public information. These have been considered active results because they are ongoing actions undertaken by the managers, and therefore this is a behaviour that is changeable – despite the inherent difficulty that may exist. These direct actions had the largest magnitude effect on inflation expectations error, and therefore is the variable that if changed, will have the largest effect.

Straddling these two result classifications is the affiliated status of the firm. It is not a passive variable of a firm – they can theoretically join or leave whichever affiliations they so desire. Depending on the sub-sector a firm operates in, it could be that there exist some barriers to joining an affiliation, a prohibitive joining fee or ideology conflict, but it is still possible. However, neither is the variable strictly active, once this action to join (or leave) an affiliation is executed, it is not ongoing. It is an action that changes a passive state of the firm.

Not considered are the specifics of individual affiliations. For example, a firm joins a trade association that holds monthly meetings for all its members. Is this then an ongoing action? Such specific details about individual affiliations are material for a far wider investigation.

The model of rational inattention in Reis (2006) posits that acquiring and processing information is relatively expensive for firms, so they act optimally and only occasionally update that information, choosing to be inattentive at other times. There may be some

evidence for this in the non-difference of inflation forecasting between those managers who consume news media daily and those who consume weekly. Both value being informed, but the weekly media consumer perhaps has a more ideal amount of inattention – is able to spend the rest elsewhere. We also see evidence for the ‘cost’ of acquiring information in the distribution of frequency of public source consultation. The initiative to seek this information out was mentioned, and this initiative is, under Reis, a cost to be paid. That over 50% of respondents refuse to pay this cost even at least once per year is an extreme result, given the improvement in inflation expectation anchoring we saw by increasing this frequency to even every few months.

The results presented in this thesis aim to begin to address the problems raised, particularly in Kumar et al. (2015) and Coibion et al. (2018), but also generally in Binder (2017). These are large problems like pervasive inattention and unanchored inflation expectations, which will require careful, diligent solutions. This thesis finds similar evidence of the problems as the other survey literature while investigating the possibility of where solutions to improving central bank communication to firms might be targeted.

### 4.3 Policy Implications

Unconventional monetary policy tools have increased in the wake of the Global Financial Crisis. The literature documents that forward guidance has been one of the most widely adopted tools, and that it relies entirely on central bank communication. Furthermore, monetary policy generally is relying on central bank communication to be able to transmit intention to individuals in the economy that have direct effect on the economy – in this case firms. The question for the Reserve Bank of New Zealand (RBNZ) to answer is then, how can it improve communication to firms?

The results suggest that those firms at most risk of being unanchored in their inflation expectations are large firms, firms that have higher prices than competitors relatively in a market, and firms with older managers. There does not seem to be any apparent reasonable way for the RBNZ to specifically track these firms with the aim of directing communication at them.

Does knowing that these are the ‘at-risk’ groups affect how the RBNZ might construct their communication? This could be a direction worthy of consideration, Kumar et al. (2015) state that if communication is able to pierce the veil of inattention then modifying inflation expectations is likely to cause real effect. The implication then is either ‘better’ communication, or lower inattention, will have real effect.

Better communication may be a difficult barrier to hurdle for the RBNZ. They have already been one of the more talkative central banks, offering quantitative forward guidance from 1997. For those who have the initiative to seek it out, New Zealand monetary policy is relatively easy to find. A quick visit to the RBNZ website finds the current OCR and current inflation splashed in giant lettering. For those who can go further there is ultimately almost no intermediary between an individual and every communication by the RBNZ, with every Monetary Policy Statement available for streaming on YouTube or documents on any number of monetary policy areas available to download from the RBNZ website.

Inattention then emerges as the more likely of the two to be able to cause real effect. Reis (2006) says that inattention is used by agents to avoid paying the high cost of information acquisition and processing overly often. How then, might the RBNZ lower the costs for firms to acquire, update or process information on inflation? Any action that induces firms to visit the RBNZ website or read or watch the Monetary Policy Statement is likely to be successful, but that could be difficult. Over 50% of the firm managers surveyed indicated

that they sought out public sources of information less than once per year, and another 15% indicated they only sought out public information once per year. For these managers, inattention seems pervasive.

Perhaps help lies in the new information on firm affiliations. This thesis documents that firms with at least one affiliation to any extra-firm entity tend to be more well anchored in their inflation expectations. If the RBNZ was able to encourage firms joining trade associations or making affiliation connections with local or national government bodies, it may help to ease the cost of attention many firms seem to currently avoid paying. Further research is required into the effect the nature of firm affiliation has on inflation expectations, for instance perhaps the trade association physically mails a monthly newsletter that contains market information of interest to the firm, but it also contains some form of monetary policy information. The costs of information absorption may not be eased, but acquisition could certainly be far easier – the initiative to seek out specifically monetary policy public information may not be required.

Another option available to the RBNZ is mimicking the behaviour of affiliation entities rather than expending effort to encourage firms to create new affiliations. If it is newsletters these affiliations communicate with that is having an effect, perhaps the central bank could engage in a physical mail campaign with the aim of increasing macroeconomic literacy and better anchoring inflation expectations. Ultimately further research is required into why affiliated firms are more well anchored before solid policy recommendation could be given with a view to changing how the RBNZ communicates.

## **Chapter 5 – Conclusion**

This thesis sought to answer how central banks can improve communication to firms. A post-GFC world has seen many central banks around the world adopt new tools to counter new problems, for example encountering the zero-lower bound on interest rates. How effective these new tools are is still being disseminated in academic literature, and there is not a definitive consensus. The Reserve Bank of New Zealand has been using one of these tools, forward guidance, since 1997. The results of the investigation in this thesis do not give strong merit to the efficacy of this as a tool, as inflation expectations are widely dispersed and seem mostly predicated on personal initiative to overcome inattention. While the onus would appear to be on the firms to help enable better central bank communication, there are possible avenues of new research that may offer alternative opportunities.

The literature review tracked the genealogy of central bank communication to early work on rational expectations. Most of the following research on central bank communications was covered by the shadow of the Fed and its valuation of secrecy. Increasingly as more academics valued the notion of disclosure, credibility of the central bank rose – a notion we continue to see as important in modern work. As something of a turning point, in 2008 Blinder et al. pointed out that nearly all the research to date focussed on communication with financial markets and advocated increasing research on communication with the public. The expansion, particularly in the field of quantitative analysis on communication efficacy, is marked and this thesis has aimed to contribute to that field.

The empirical research completed in this thesis utilised firm-level survey data and identified various significant characteristics of the firm and manager that contributed to inflation expectations more anchored to the RBNZ 2% inflation target. These were: smaller firms, firms with a lower margin between sales price and operating cost, firms with relatively lower price than competitors in their market, and younger managers.

Strong significant evidence was found that managers who consume news media about the economy more frequently, and managers who consult public sources of information about the economy more frequently, are more likely to exhibit better anchoring in their inflation forecasts. These seem like obvious results, but the specific effects of improving the frequency at which managers do these two activities indicates there is the potential for real effects if a method can be found to induce the desired increase in frequency.

Additionally, the empirical research indicated that firms with an affiliation to a group such as a trade association, or government body, are likely to have inflation expectations closer to the RBNZ inflation target than firms without affiliations. This thesis presents this as a novel result that has not been closely examined in the literature to date. Further research was conducted on the available data which concluded that the relation of the affiliation to the sub-sector the firm operates in does not provide a significant difference, implying that having any affiliation is effective. This is an area with a very strong potential for future research.

## References

- Archer, D. (2005, June). Central bank communication and the publication of interest rate projections. In June 2005 conference on inflation targeting by Sveriges Riksbank.
- Afrouzi, H. (2018). Strategic Inattention, Inflation Dynamics and the Non-Neutrality of Money. *Department of Economics Discussion Papers, Columbia University, Academic Commons*. <https://doi.org/10.7916/d8-h1p2-ak29>
- Appelbaum, B. (2012, December 12). Fed Ties Rates to Joblessness, With Target of 6.5%. *The New York Times*. Retrieved from <http://www.nytimes.com>
- Barro, R. J. (1976). Rational expectations and the role of monetary policy. *Journal of Monetary Economics*, 2(1), 1-32. [https://doi.org/10.1016/0304-3932\(76\)90002-7](https://doi.org/10.1016/0304-3932(76)90002-7)
- Barro, R. J., & Gordon, D. B. (1983). Rules, discretion and reputation in a model of monetary policy. *Journal of Monetary Economics*, 12(1), [https://doi.org/10.1016/0304-3932\(83\)90051-X](https://doi.org/10.1016/0304-3932(83)90051-X)
- Bernanke, B. S., & Mishkin, F. S. (1997). Inflation Targeting: A New Framework for Monetary Policy?. *Journal of Economic Perspectives*, 11(2), 97-116. <https://doi.org/10.1257/jep.11.2.97>
- Binder, C. (2017). Fed speak on main street: Central bank communication and household expectations. *Journal of Macroeconomics*, 52, 238-251. <https://doi.org/10.1016/j.jmacro.2017.05.003>
- Blanchard, O., & Galí, J. (2007). Real wage rigidities and the New Keynesian model. *Journal of Money, Credit and Banking*, 39(1), 35-65. <https://doi.org/10.1111/j.1538-4616.2007.00015.x>
- Blinder, A. S. (2000). Central-Bank Credibility: Why Do We Care? How Do We Build It?. *American Economic Review*, 90(5), 1421-1431. <https://doi.org/10.1257/aer.90.5.1421>
- Blinder, A. S., Goodhart, C., Wyplosz, C., Hildebrand, P., & Lipton, D. (2001). How do central banks talk?. London, England: Centre for Economic Policy Research.
- Blinder, A. S., Ehrmann, M., Fratzscher, M., De Haan, J., & Jansen, D. J. (2008). Central Bank Communication and Monetary Policy: A Survey of Theory and

- Evidence. *Journal of Economic Literature*, 46(4), 910-945.  
<https://doi.org/10.1257/jel.46.4.910>
- Blinder, A., Ehrmann, M., De Haan, J., & Jansen, D. J. (2017). Necessity as the mother of invention: Monetary policy after the crisis. *Economic Policy*, 32(92), 707-755. <https://doi.org/10.1093/epolic/eix013>
- Calvo, G. A. (1983). Staggered prices in a utility-maximizing framework. *Journal of Monetary Economics*, 12(3), 383-398. [https://doi.org/10.1016/0304-3932\(83\)90060-0](https://doi.org/10.1016/0304-3932(83)90060-0)
- Carroll, C. D. (2003). Macroeconomic Expectations of Households and Professional Forecasters. *The Quarterly Journal of Economics*, 118(1), 269-298.  
<https://doi.org/10.1162/00335530360535207>
- Cecchetti, S. G., (2003) *What the FOMC Says and Does When the Stock Market Booms*. Paper prepared for the Conference on Asset Prices and Monetary Policy at the Reserve Bank of Australia, Sydney, Australia. Retrieved from  
<https://www.rba.gov.au/publications/confs/2003/pdf/cecchetti.pdf>
- Clarida, R., Galí, J., & Gertler, M. (1998). Monetary policy rules in practice: some international evidence. *European Economic Review*, 42(6), 1033-1067.  
[https://doi.org/10.1016/S0014-2921\(98\)00016-6](https://doi.org/10.1016/S0014-2921(98)00016-6)
- Coibion, O., Gorodnichenko, Y., & Kumar, S. (2018). How Do Firms Form Their Expectations? New Survey Evidence. *American Economic Review*, 108(9), 2671-2713. <https://doi.org/10.1257/aer.20151299>
- Davidson, P. (2012, December 12). Fed ties interest rates to 6.5% unemployment. *USA Today*. Retrieved from <http://www.usatoday.com>
- Dotsey, M. (1987). Monetary policy, secrecy, and federal funds rate behaviour. *Journal of Monetary Economics*, 20(3), 463-474. [https://doi.org/10.1016/0304-3932\(87\)90037-7](https://doi.org/10.1016/0304-3932(87)90037-7)
- Friedman, M. (1960). *A Program for Monetary Stability*. New York, NY: Fordham University Press.
- Friedman, M. (1968). The Role of Monetary Policy. *The American Economic Review*, 54(1), 1-17. [https://doi.org/10.1007/978-1-349-24002-9\\_11](https://doi.org/10.1007/978-1-349-24002-9_11)



- Galí, J., & Gertler, M. (1999). Inflation dynamics: A structural econometric analysis. *Journal of Monetary Economics*, 44(2), 195-222. [https://doi.org/10.1016/S0304-3932\(99\)00023-9](https://doi.org/10.1016/S0304-3932(99)00023-9)
- Galí, J., Gertler, M., & López-Salido, J. D. (2001). European inflation dynamics. *European Economic Review*, 45(7), 1237-1270. [https://doi.org/10.1016/S0014-2921\(00\)00105-7](https://doi.org/10.1016/S0014-2921(00)00105-7)
- Garfinkel, M. R., & Oh, S. (1995). When and how much to talk credibility and flexibility in monetary policy with private information. *Journal of Monetary Economics*, 35(2), 341-357. [https://doi.org/10.1016/0304-3932\(95\)01193-R](https://doi.org/10.1016/0304-3932(95)01193-R)
- Goodfriend, M. (1986). Monetary Mystique: Secrecy and central banking. *Journal of Monetary Economics*, 17(1), 63-92. [https://doi.org/10.1016/0304-3932\(86\)90006-1](https://doi.org/10.1016/0304-3932(86)90006-1)
- Hutchison, M., & Judd, J. P. (1992). Central Bank Secrecy and Money Surprises: International Evidence. *The Review of Economics and Statistics*, 74(1), 135-145. <https://doi.org/10.2307/2109551>
- Lucas, R. E. (1972). Expectations and the neutrality of money. *Journal of Economic Theory*, 4(2), 103-124. [https://doi.org/10.1016/0022-0531\(72\)90142-1](https://doi.org/10.1016/0022-0531(72)90142-1)
- Kumar, S., Afrouzi, H., Coibion, O., & Gorodnichenko, Y. (2015). “Inflation Targeting Does Not Anchor Inflation Expectations: Evidence from Firms in New Zealand. *Brookings Papers on Economic Activity*, (2), 151-208.
- O’Brien, J. M. (1981). Estimating the Information Value of Immediate Disclosure of the FOMC Policy Directive. *The Journal of Finance*, 36(5), 1047-1061. <https://doi.org/10.1111/j.1540-6261.1981.tb01075.x>
- O’Brien, J. M. (1984). The Information Value of the FOMC Policy Directive under the New Operating Procedures. *Journal of Money, Credit and Banking*, 16(2), 151-164. <http://doi.org/10.2307/1992541>
- Reserve Bank of New Zealand. (2019). *Inflation*. Retrieved November 17, 2019, from <https://www.rbnz.govt.nz/statistics/key-graphs/key-graph-inflation>
- Rudin, J. R. (1988). Central bank secrecy, ‘fed watching’, and the predictability of interest rates. *Journal of Monetary Economics*, 22(2), 317-334. [https://doi.org/10.1016/0304-3932\(88\)90025-6](https://doi.org/10.1016/0304-3932(88)90025-6)

- Sargent, T. J., & Wallace, N. (1975). "Rational" Expectations, the Optimal Monetary Instrument, and the Optimal Money Supply Rule. *Journal of Political Economy*, 83(2), 241-254. <https://doi.org/10.1086/260321>
- Siklos, P. L., & Bohl, M. T. (2007). Do actions speak louder than words? Evaluating monetary policy at the Bundesbank. *Journal of Macroeconomics*, 29(2), 368-386. <https://doi.org/10.1016/j.jmacro.2005.08.002>
- Sims, C. A. (2003). Implications of Rational Inattention. *Journal of Monetary Economics* 50, 665-690. [https://doi.org/10.1016/S0304-3932\(03\)00029-1](https://doi.org/10.1016/S0304-3932(03)00029-1)
- Stein, J. C. (1989). Cheap talk and the Fed: A theory of imprecise policy announcements. *The American Economic Review*, 79(1), 32-42.
- Taylor, J. B. (1975). Monetary Policy during a Transition to Rational Expectations. *Journal of Political Economy*, 83(5), 1009-1022. <https://doi.org/10.1086/260374>

## Appendix

### Appendix A

The following tables contain the same specification of regression from Section 3.3 save the dependent variable is 5-10 year annual inflation expectations.

*Table A1. Determinants of Inflation Forecast – 5-10 Years, Firm and Manager Characteristics.*

	(1)	(2)	(3)
Firm Age	-0.003 (0.005)	-0.003 (0.005)	-0.002 (0.005)
(Log)Employment	0.099 (0.107)	0.150 (0.108)	0.094 (0.108)
Firm Competitors	-0.007 (0.006)	-0.007 (0.006)	-0.006 (0.006)
Average Margin	0.015** (0.007)	0.000 (0.009)	0.005 (0.009)
Price Relative to Competitors	0.007 (0.008)	-0.001 (0.008)	-0.005 (0.008)
Affiliated	-0.817*** (0.130)	-0.827*** (0.131)	-0.729*** (0.130)
Manager Age	0.004 (0.007)	-0.000 (0.007)	0.001 (0.008)
Manager Experience at Firm	0.011 (0.011)	0.011 (0.011)	0.008 (0.011)
Manager Qualification			
High School Diploma	-0.505 (0.578)	-0.515 (0.565)	-0.213 (0.559)
Some College/Associates Degree	-0.655 (0.574)	-0.667 (0.561)	-0.373 (0.556)
College Diploma	-0.847 (0.585)	-0.860 (0.571)	-0.524 (0.568)
Graduate Studies	-0.922 (0.584)	-0.892 (0.571)	-0.551 (0.567)
Managers Income	-0.043 (0.061)	-0.041 (0.061)	-0.058 (0.060)
Constant	2.352*** (0.770)	3.278*** (0.848)	1.710** (0.784)
Industry Fixed Effects	No	Yes	No
Sub-Sector Fixed Effects	No	No	Yes
Observations	1,287	1,287	1,287
R-squared	0.051	0.062	0.118

Note: Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

*Table A2. Determinants of Inflation Forecast – 5-10 Years, Firm and Manager Characteristics, Media Frequency*

	(4)	(5)	(6)
Firm Age	-0.005 (0.005)	-0.004 (0.005)	-0.003 (0.005)
(Log)Employment	-0.022 (0.103)	0.011 (0.104)	-0.015 (0.106)
Firm Competitors	-0.005 (0.006)	-0.003 (0.006)	-0.003 (0.006)
Average Margin	-0.002 (0.007)	-0.006 (0.008)	-0.002 (0.009)
Price Relative to Competitors	0.003 (0.007)	-0.002 (0.007)	-0.005 (0.008)
Affiliated	-0.012 (0.138)	-0.047 (0.138)	-0.073 (0.138)
Manager Age	0.009 (0.007)	0.005 (0.007)	0.004 (0.007)
Manager Experience at Firm	0.006 (0.010)	0.007 (0.010)	0.005 (0.010)
Manager Qualification			
High School Diploma	-0.618 (0.477)	-0.597 (0.473)	-0.410 (0.486)
Some College/Associates Degree	-0.620 (0.475)	-0.584 (0.472)	-0.416 (0.484)
College Diploma	-0.812* (0.487)	-0.786 (0.482)	-0.595 (0.497)
Graduate Studies	-0.569 (0.486)	-0.511 (0.483)	-0.334 (0.495)
Managers Income	-0.067 (0.057)	-0.065 (0.056)	-0.074 (0.057)
Frequency of Media Consumption			
Daily	-0.920*** (0.215)	-0.837*** (0.213)	-0.724*** (0.211)
Weekly	-0.891*** (0.209)	-0.888*** (0.209)	-0.740*** (0.206)
Every few months	0.535** (0.268)	0.550** (0.266)	0.509* (0.265)
Once a year	1.089*** (0.233)	1.114*** (0.232)	1.025*** (0.231)
Less than once a year	1.379*** (0.242)	1.407*** (0.242)	1.315*** (0.239)
Constant	2.462*** (0.685)	2.745*** (0.759)	2.123*** (0.726)
Industry Fixed Effects	No	Yes	No
Sub-Sector Fixed Effects	No	No	Yes
Observations	1,287	1,287	1,287
R-squared	0.171	0.179	0.203

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

*Table A3. Determinants of Inflation Forecast – 5-10 Years, Firm and Manager Characteristics, Public Information Source Frequency*

	(7)	(8)	(9)
Firm Age	-0.005 (0.004)	-0.004 (0.005)	-0.003 (0.005)
(Log)Employment	-0.042 (0.104)	-0.004 (0.105)	-0.030 (0.106)
Firm Competitors	-0.005 (0.006)	-0.003 (0.006)	-0.003 (0.006)
Average Margin	0.002 (0.007)	-0.004 (0.008)	-0.000 (0.009)
Price Relative to Competitors	0.000 (0.007)	-0.006 (0.008)	-0.009 (0.008)
Affiliated	-0.056 (0.136)	-0.085 (0.136)	-0.108 (0.137)
Manager Age	0.008 (0.007)	0.003 (0.007)	0.003 (0.007)
Manager Experience at Firm	0.008 (0.010)	0.010 (0.010)	0.007 (0.011)
Manager Qualification			
High School Diploma	-0.533 (0.477)	-0.510 (0.468)	-0.304 (0.477)
Some College/Associates Degree	-0.564 (0.472)	-0.526 (0.464)	-0.332 (0.472)
College Diploma	-0.776 (0.484)	-0.748 (0.475)	-0.539 (0.486)
Graduate Studies	-0.518 (0.484)	-0.451 (0.476)	-0.249 (0.484)
Managers Income	-0.062 (0.057)	-0.059 (0.057)	-0.072 (0.058)
Frequency of Public Source Consultation			
Daily	0.933 (0.638)	0.850 (0.629)	0.719 (0.554)
Weekly	0.042 (0.102)	0.083 (0.103)	0.036 (0.106)
Every few months	0.170 (0.117)	0.183 (0.118)	0.173 (0.118)
Once a year	1.274*** (0.176)	1.263*** (0.174)	1.049*** (0.177)
Less than once a year	2.096*** (0.144)	2.109*** (0.145)	1.874*** (0.143)
Constant	1.488** (0.669)	1.890** (0.743)	1.338* (0.705)
Industry Fixed Effects	No	Yes	No
Sub-Sector Fixed Effects	No	No	Yes
Observations	1,287	1,287	1,287
R-squared	0.164	0.174	0.198

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

*Table A4. Determinants of Inflation Forecast – 5-10 Years, Firm and Manager Characteristics, Media Frequency and Public Information Source Frequency.*

	(10)	(11)	(12)
Firm Age	-0.005 (0.004)	-0.004 (0.005)	-0.003 (0.005)
(Log)Employment	-0.041 (0.105)	-0.008 (0.106)	-0.032 (0.107)
Firm Competitors	-0.005 (0.006)	-0.003 (0.006)	-0.003 (0.006)
Average Margin	-0.001 (0.007)	-0.005 (0.008)	-0.002 (0.009)
Price Relative to Competitors	0.001 (0.007)	-0.004 (0.007)	-0.007 (0.007)
Affiliated	0.019 (0.138)	-0.017 (0.138)	-0.045 (0.138)
Manager Age	0.010 (0.007)	0.005 (0.007)	0.004 (0.007)
Manager Experience at Firm	0.006 (0.010)	0.008 (0.010)	0.005 (0.010)
Manager Qualification			
High School Diploma	-0.583 (0.468)	-0.558 (0.463)	-0.361 (0.475)
Some College/Associates Degree	-0.585 (0.465)	-0.545 (0.460)	-0.365 (0.472)
College Diploma	-0.790* (0.475)	-0.762 (0.470)	-0.563 (0.485)
Graduate Studies	-0.528 (0.476)	-0.464 (0.472)	-0.278 (0.484)
Managers Income	-0.070 (0.057)	-0.069 (0.057)	-0.078 (0.057)
Frequency of Media Consumption			
Daily	-0.861*** (0.242)	-0.745*** (0.244)	-0.679*** (0.242)
Weekly	-0.781*** (0.237)	-0.751*** (0.238)	-0.658*** (0.236)
Every few months	0.378 (0.279)	0.375 (0.277)	0.383 (0.278)
Once a year	0.656** (0.287)	0.647** (0.285)	0.618** (0.288)
Less than once a year	0.896*** (0.297)	0.886*** (0.295)	0.852*** (0.298)
Frequency of Public Source Consultation			
Daily	1.044 (0.639)	0.915 (0.627)	0.796 (0.557)
Weekly	0.108 (0.101)	0.129 (0.102)	0.081 (0.103)
Every few months	-0.034 (0.111)	-0.014 (0.113)	-0.004 (0.115)
Once a year	0.168 (0.254)	0.218 (0.256)	0.092 (0.260)
Less than once a year	0.672** (0.285)	0.749*** (0.289)	0.625** (0.293)
Constant	2.308*** (0.681)	2.564*** (0.749)	2.004*** (0.718)
Industry Fixed Effects	No	Yes	No
Sub-Sector Fixed Effects	No	No	Yes
Observations	1,287	1,287	1,287
R-squared	0.177	0.185	0.208

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Appendix B

*Table B1. Manufacturing Industry Mean Inflation Expectations by Sub-Sector*

Sub-Sectors	Count	Inflation Expectation by Firm			
		12 Month		5-10 Years	
		Mean	Std Dev	Mean	Std Dev
Other-Petroleum & Chemical	6	3.17	1.94	2.33	1.51
Other-Plastic & Rubber product	13	3.62	1.50	3.00	1.63
Other-Printing	17	4.88	1.76	4.47	2.24
Other-Furniture	12	5.67	4.08	4.17	1.99
Other-Wood & Paper Product	21	4.71	2.85	3.29	1.85
Machinery & Equipment	76	4.63	2.74	3.83	2.49
Metal	63	3.63	2.04	3.22	2.10
Leather	9	4.00	2.12	2.56	1.33
Clothing	65	4.02	2.31	3.06	1.96
Textile	28	4.00	2.48	3.46	2.01
Food-Other	10	6.70	1.77	5.30	2.79
Food-Seafood	15	5.93	3.51	4.20	2.51
Food-Fruit, Oil, Cereal	39	3.64	2.11	3.03	1.91
Food-Beverage	19	3.89	2.16	3.11	1.70
Food-Meat & Dairy	44	4.02	2.58	3.32	2.04
Other	46	3.65	1.88	3.07	1.61
Whole Industry	483	4.19	2.47	3.40	2.09

*Table B2. Financial, Insurance, Business Services Industry Mean Inflation Expectations by Sub-Sector*

Sub-Sectors	Count	Inflation Expectation by Firm			
		12 Month		5-10 Years	
		Mean	Std Dev	Mean	Std Dev
Other Professional, Scientific & Technical Services	43	5.95	2.66	4.74	3.13
Architectural, Engineering, Design Consultancy	31	5.90	2.04	4.03	2.76
Management Advice Consultancy	15	5.73	3.53	4.20	2.48
Accounting Services	85	5.65	2.22	4.53	2.32
Legal Services	55	6.22	2.75	4.91	3.13
Real Estate Services (Rental/Property Management Services)	36	5.61	2.19	3.97	2.73
Car, Goods, Equipment Rental Hiring	35	6.06	3.18	4.40	2.92
Insurance	86	5.76	3.33	3.76	2.93
Banking/Finance	113	5.42	2.84	4.00	2.94
Whole Industry	499	5.75	2.77	4.25	2.84

*Table B3. Other Industry Mean Inflation Expectations by Sub-Sector*

Sub-Sectors	Count	Inflation Expectation by Firm			
		12 Month		5-10 Years	
		Mean	Std Dev	Mean	Std Dev
Construction	19	6.00	3.28	4.63	3.59
Wholesale trade	78	3.5	2.21	2.82	2.16
Accommodation & Restaurants	129	2.72	2.05	2.26	1.90
Retail	137	6.42	3.15	5.17	3.00
Transport & Communication	62	3.21	1.90	3.21	2.21
Whole Industry	425	4.28	2.99	3.54	2.75



## Appendix C

*Table C1. Determinants of Inflation Forecast – 12 Months, Firm and Manager Characteristics with Imputed Income Values.*

	(1)	(2)	(3)
Firm Age	0.00270 (0.00374)	0.00180 (0.00389)	0.00322 (0.00384)
(Log)Employment	0.548*** (0.106)	0.639*** (0.105)	0.564*** (0.104)
Firm Competitors	-0.00331 (0.00585)	-0.00491 (0.00594)	-0.00648 (0.00584)
Average Margin	0.0378*** (0.00679)	0.00761 (0.00858)	0.0144* (0.00819)
Price Relative to Competitors	0.0207*** (0.00766)	0.00737 (0.00800)	0.00453 (0.00750)
Affiliated	-1.558*** (0.145)	-1.564*** (0.144)	-1.436*** (0.141)
Manager Age	0.00575 (0.00773)	-0.00123 (0.00769)	0.000465 (0.00750)
Manager Experience at Firm	0.0159 (0.0109)	0.0145 (0.0107)	0.0189* (0.0105)
Manager Qualification			
High School Diploma	0.183 (0.476)	0.145 (0.444)	0.495 (0.451)
Some College/Associates Degree	-0.00332 (0.472)	-0.0585 (0.440)	0.338 (0.450)
College Diploma	0.0909 (0.487)	0.0337 (0.455)	0.511 (0.460)
Graduate Studies	-0.651 (0.485)	-0.627 (0.453)	-0.175 (0.464)
Managers Income	0.00495 (0.0626)	0.00708 (0.0614)	-0.00881 (0.0576)
Constant	0.173 (0.725)	2.024** (0.788)	-0.372 (0.708)
Industry Fixed Effects	No	Yes	No
Sub-Sector Fixed Effects	No	No	Yes
Observations	1,406	1,406	1,406

Note: Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The missing values for income were imputed from the other independent variables found in the regression in Table 4 with Multinomial Logit. The imputation was carried out in Stata. The algorithm used was Multiple Imputation by chained equations (MICE). This

method was chosen as the variable income is categorical in nature, and the data was Missing At Random. 20 imputed data sets were generated. The regression from Table 4 was then carried out again with each of the 20 sets of imputed values for income, with Stata combining the 20 regressions in Table C1.

The values are largely the same between Table 4 and Table C1. The sole significant difference is Average Margin when controlling for Sub-Sector Fixed Effects is now significant at the 10% level. It previously had a p-value of 0.152 in Table 4.