Does Inflation Targeting Anchor Inflation Expectations? Evidence from India*

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Abstract

We use a novel survey data on inflation expectations of households to evaluate the role of inflation targeting (IT) regime in achieving anchored inflation expectations. The novelty of the data is that it is available both before and after the adoption of IT by India in 2015 and allows the comparison of inflation expectations between these two periods. We find evidence of anchored inflation expectations in every component of the consumer price inflation, headline, food and non-food, only during the IT period. More importantly, there is a muted spillover from food inflation to both food and non-food inflation expectations in the IT period. The lack of spillover from food inflation, which remained equally volatile in both the periods, explains the anchored expectations and improved inflation performance under the IT regime in India.

JEL Codes: D12, D84, E31, E52

Keywords: Inflation expectations, inflation targeting, anchored expectations

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1 Introduction

The monetary policy framework of central banks across the globe has witnessed a significant change over the last few decades which has led to a change in the inflation dynamics (Clarida et al. (2000), Romer and Romer (2002), Bernanke (2004), Mishkin, (2007)). During this period, the adoption of formal inflation targeting (IT) regime has been one of the key institutional reforms implemented by many central banks. The successful achievement of an explicit inflation target is expected to anchor the inflation expectations by enhancing the credibility of the central bank. Given that so many central banks have followed this policy prescription, it raises the question whether inflation targeting really helps in anchoring the inflation expectations. We utilize the recent adoption of the IT regime by India in 2015[1] and evaluate the impact of IT on inflation expectations of households using a novel survey data collected by the Reserve Bank of India (RBI).

The contribution of this paper is three-fold. First, it exploits the availability of household level inflation expectations survey both before and after the IT adoption in India to study the impact of IT on household level expectations formation. Many countries around the world have witnessed a switch to an IT regime and many of them also collect household level inflation expectations survey, but to the best of our knowledge none has good survey information both before and after the regime switch. Our dataset allows us to sidestep this problem. Those that do have some information, Johnson (2002), aggregate the expectations at the national level and suffer from data limitations that arise due to aggregation. Kumar et al. (2015) study the impact of IT on firm managers in New Zealand, but their survey information is available only after the switch to IT regime.

Second, it provides a new way to empirically test for anchored inflation expectations and

[1]The Government of India and Reserve Bank of India signed the Monetary Policy Framework Agreement on February 20, 2015 and fixed the target inflation rate of 4 percent with an error band of +/- 2 percent (https://www.finmin.nic.in/sites/default/files/MPFAgreement28022015.pdf). The first Monetary Policy Committee was constituted on August 5, 2016 (http://pib.nic.in/newsite/PrintRelease.aspx?relid=148405). We consider the former date as the start of the inflation targeting regime as the formal inflation target was fixed and RBI was given the mandate to achieve it.

how IT helps in achieving it. We use the qualitative response section from the inflation expectations survey (as it has more detailed information) and evaluate the dependence of future inflation expectations on past expectations and realized inflation. We find that in the pre-IT regime there was a spillover from food inflation to non-food inflation expectations. The adoption of IT prevents this spillover and anchors the headline inflation expectations. This provides a channel, muted spillover from more volatile sub-components to the less volatile sub-components of inflation, through which expectations got anchored under the IT regime in India.

Third, it tests the efficacy of IT by leveraging the inflation targeting regime change in India which is a large emerging market. At a relatively low per capita income, the consumption basket of these countries has a predominant share of food items. Since food prices are generally volatile in these countries, it poses a significant challenge for inflation management. The evidence on the effectiveness of IT in an emerging market setting like India is scarce. Our paper thus fills an important void on this front and provides evidence in the favor of IT and general role of central bank communications in emerging markets.

Background: India has witnessed some dramatic changes in its inflation dynamics during the last decade. Table 1 presents the summary statistics for headline, food and non-food components of the CPI during this period. We can see that the inflation declined from over 10 percent in 2009-14 to less than 5 percent in the 2015-19 period (Panel I) and coincides with the adoption of the IT regime in India. Both food and non-food have contributed to this decline in the headline inflation. It is also interesting to note that the correlation of the food and the headline CPI remains high during both these periods suggesting a continued dominance of food in the headline inflation (Panel II). This correlation between the food and the headline inflation has actually gone up in the latter period. On the other hand, the correlation between the non-food and the headline CPI inflation has declined significantly, from 0.59 to 0.16, in the latter period suggesting some stability in the non-food inflation.

Panel I: Mean and Standard Deviation (S.D.)

CPI Inflation	Mean		S.D.	
	2009-14	2015-19	2009-14	2015-19
Headline	10.3	4.7	1.9	1.6
Food	11.1	4.1	3.6	3.0
Non-food	9.5	5.2	2.1	1.0

Panel II: Correlations

CPI Inflation	2009-14			2015-19		
	Headline	Food	Non-food	Headline	Food	Non-food
Headline	1.00			1.00		
Food	0.76	1.00		0.94	1.00	
Non-food	0.59	-0.07	1.00	0.16	-0.16	1.00

Table 1: Summary statistics for inflation in India for the two periods. Correlations based on q-o-q inflation.

Another important point to note from Table 1 is the sharp decline in the volatility of non-food inflation in the latter period. This is shown clearly in Figure 1, which gives the rolling window standard deviation for these two segments of inflation. There are two important things to note from this figure. First, the decline in inflation volatility has been more for the non-food component. The volatility in food has also reduced but the decrease is much less, 17 percent versus 66 percent for the non-food. The volatility of the non-food segment was lower than food even before 2014, but in the latter period it has almost reduced to zero. Second, the cyclicality in the food inflation remains intact post 2014, but it has disappeared completely in the non-food. If food price inflation is driven by supply-side factors, some cyclicality (and seasonality) in food prices is expected. However, something fundamentally changed for the non-food segment after 2014.

In summary, the evidence presented above suggests that there has been a broad-based decline in inflation after the adoption of the IT regime in India. Additionally, the non-food inflation has become much more stable while the food continues to remain volatile and the prime mover of the headline inflation. The stability of the non-food inflation in the midst of volatile food inflation thus suggests a fundamental change in the inflation dynamics. What

caused this break? Was it due to the adoption of the IT regime by India?

Our hypothesis is that the presence of cyclicality in the non-food inflation volatility prior to 2015 may have been due to the spillover from volatility in food. It has been documented that the household level inflation expectations in India are strongly impacted by the change in food prices (Ueda 2010). In fact, the non-food inflation expectations are also driven upward in response to food price shocks. It can be seen through spikes in non-food inflation in the periods following high food inflation before 2015. However, under the IT regime this spillover from food to non-food inflation has been curtailed. This raises the question, do we see a similar breakdown in spillover from food inflation to non-food expectations? Also, are the inflation expectations more anchored in the post IT period?

As discussed before, we use the household level inflation expectations survey data from RBI to test these hypotheses. The survey is conducted every quarter and collects data from all over the country. It collects information on both qualitative and quantitative aspects of inflation expectations. We primarily use the qualitative section of the survey to construct our main variables of interest (for example- percentage of households that expect prices to increase at the same rate as today). We do this primarily for two reasons. First, the qualitative part of the survey is more detailed and has expectations information for different sub-categories i.e. food and non-food. The quantitative part does not have this information and will therefore not allow to test for spillover. Second, we think that the surveyed households have a better sense of directional changes in inflation than its precise magnitude making the qualitative survey less susceptible to respondent bias. It has been well documented in the literature (Coibion (2018) and Binder (2017)) that even in low inflation countries, the reported inflation expectations by households and firms are substantially higher than the actual inflation. Thus, using the qualitative instead of the quantitative information from the survey, ameliorates the bias problem.

Related literature: This paper is directly related to the literature on impact of IT on inflation (see Blinder, 2008) and inflation expectations, but there has been no clear evidence

to settle the debate. Using aggregate data on a panel of countries, Johnson (2002) and Levin et al. (2004) argue that the IT adopters managed to reduce inflationary expectations and delink them from realized inflation. On the other hand, using micro survey data on firm managers in New Zealand, Kumar et al. (2015) show that IT did not anchor their expectations. More broadly, this paper is related to the growing literature on how central bank communications affect economic outcomes and inflation expectations in particular. The central bank announcements can have a direct impact on outcomes like stock market prices (Bernanke and Kuttner (2004) and Bomfim (2001)), but they can also affect the expectations formation (Coibion et al. (2019), the survey by Coibion, Gorodnichenko and Kamdar (2018), Haldane and McMohan (2018)). We contribute to this latter stand of work. Also, we evaluate the impact of IT regime on inflation, which is directly related to the credibility and learning literature (Erceg and Levine (2003), Bomfim and Rudebusch (2000)). In this literature, the endogenous learning on the part of economic agents can significantly affect inflation expectations in response to the announcement of an inflation target. Relative to the prior empirical work, our paper has the benefit of having a survey data both before and after the adoption of IT. This gives us a benchmark for comparison of expectations (Kumar et al. (2015) discuss about the un-anchored expectations of firm managers in New Zealand, but do not have a benchmark to compare the expectations under IT). Finally, the Reserve Bank of India became an inflation targeting central bank through a statutory law passed by the Indian parliament. It again gives us an explicit date of regime change from non-IT to IT, a point of contention in the case of many other studies as discussed by Blinder (2008).

Our paper is also related to the theoretical work on expectations formation and what happens if the economic agents deviate from full information rational expectations (FIRE). In the case of Mankiw and Reis (2002) this deviation from FIRE is caused by sticky information, while under Sims (2003) it is due to rational inattention. The work by Carroll (2003) provides empirical evidence for the sticky information hypothesis. Recently there has been work that utilizes randomized control trials (Coibion et al. (2018), Humziker et al. (2018)) to

explicitly study the expectations formation at the firm and household level. These papers provide empirical evidence in support of the rational inattention framework. We use the qualitative information in the expectations survey, like direction of change in prices, to show that a regime switch like IT adoption has an impact on inflation expectations. Thus the quantitative precision of inflation expectations does not seem to matter for the success of policies like IT as they can work despite deviation from FIRE.

The rest of the paper is organized as follows. Section 2 presents the data description and summary statistics on CPI and the household level expectations data. The empirical methodology to test for anchored expectations and its results are presented in the Section 3. In Section 4 we provide some robustness checks and finally Section 5 concludes.

2 CPI data and Expectations Survey

In this section, we provide information on the state level CPI data used for the analysis as well as the Reserve Bank of India's household expectations survey that forms the core of our analysis. We give the descriptive statistics and other important information about these datasets which will help in explaining the choice of empirical framework in the next section.

2.1 State Level Consumer Price Index

We use the state level consumer price index to calculate the inflation rate at the state level. It is one of the main independent variables in our analysis and can influence inflation expectations of households. We use the urban part of the CPI as the survey data is based only on the urban respondents.

India changed the CPI weights in 2013 and the inflation series with current weights is available only beginning 2011. We thus use the CPI data from January 2011 to March 2018 at a quarterly frequency. We stick to the food, non-food and headline inflation in our analysis. The weights of major sub-components in the Indian CPI basket are reported in

Table 4, and one can notice a significant heterogeneity across states. It is important to reiterate that food is one of the major components and constitutes 54 and 36 percent of the rural and urban CPI basket respectively and can cause significant volatility in inflation.

2.2 Inflation Expectations Survey Data for Households (IESH)

The Reserve Bank of India started conducting the Inflation Expectations Survey of Households (IESH) in September 2005. Since then it has expanded its sample to span households across all the regions of the country. At present, it covers 18 cities of India[2] and almost 5,500 households belonging to different occupation and age groups. The survey questionnaire is reported in the Appendix Figure 5. We match the cities with their respective states and then aggregate the expectations data at the state level to finally merge with the state-level urban CPI series. Since the survey is conducted every quarter, it gives us a repeated cross-section of quarterly frequency at the state level.

The IESH data captures both the quantitative and qualitative responses of the households. On the quantitative side, it asks households about the headline inflation expectations at the 1-quarter ahead and 1-year ahead horizon. However, the quantitative section lacks the information on sub-component level inflation expectations.

The survey however makes up for this lack of information on the qualitative side. The qualitative part of the survey contains questions not only about the general price level but also for sub-components of CPI like food, non- food, household durables and housing and services. For each sub-component of CPI and horizon, the respondents report their expectations about future prices: (a) Decline in prices (b) No change in prices (c) Price increase less than the current rate (d) Price increase similar to the current rate and (e) Price increase more than the current rate.

Since the qualitative block of the survey has more detailed information, we use it for our main analysis. For the 3-month ahead expectations, the percentage of households in different

[2]The cities are: Ahmedabad, Bangalore, Bhopal, Bhubaneshwar, Chandigarh, Chennai, Delhi, Guwahati, Hyderabad, Jaipur, Kolkata, Lucknow, Mumbai, Nagpur, Patna, Raipur, Ranchi and Thiruvananthapuram

response buckets are reported in Table 2. We report the average and standard deviation of the shares for pre and post-IT period. For both food and non-food, the average share of households in the bucket (e) Price increase more than the current rate has gone down in the post-IT period. The mean proportion of households in the 'More than' category reduced to 39.56 percent from 57.24 percent in the food and from 48.88 percent to 33.67 percent in the case of non-food category. There is bunching of households in the mid-level buckets for both food and non-food. At the same time, the standard deviation of these shares has also gone down. These two facts from qualitative data suggest that the mean level of inflation expectations have gone down as well as its volatility. This also reflects clearly from the time series of these shares as shown in Figure 2.

Inflation Category	Decline	No Change	Less Than	Similar To	More Than
	(1)	(2)	(3)	(4)	(5)
			Pre-IT		
Food	4.55	7.73	8.46	22.03	57.24
	(4.9)	(7.0)	(9.4)	(15.0)	(23.0)
Non-food	3.89	12.91	9.59	24.73	48.88
	(4.5)	(9.7)	(9.7)	(23.5)	(17.6)
			Post-IT		
Food	8.99	14.06	13.30	24.09	39.56
	(7.0)	(6.9)	(11.3)	(18.2)	(12.2)
Non-Food	7.27	22.66	13.14	23.27	33.67
	(5.6)	(8.3)	(10.2)	(10.7)	(16.7)

Table 2: Survey Data Summary: Average (Standard Deviation) of Percentage of respondents in different response buckets.

Finally, it is important to mention another benefit of using qualitative response data. It has been well documented in the literature (Kumar et al. (2015), Binder (2017)) that households and firms in developed countries misreport current inflation as well as are mostly unaware about central bank inflation target. The qualitative estimates of both inflation and inflation expectations are usually upward biased. This problem can be more acute for developing country households due to poor financial literacy. It is likely that many survey respondents do not understand inflation or put a quantitative number on their expectations.

However a question like (e) will there be a price increase more than the current rate, is easier to understand and less likely to be misunderstood by the household. Additionally it does not suffer from the upward bias, a general feature of quantitative response on inflation expectations survey. Thus, the qualitative responses are likely to be more robust under our setting[3]. But how should one use the qualitative responses to test for anchored expectations? We discuss this in the next section.

3 Impact of switch to inflation targeting regime

In this section, we describe the empirical methodology that we use to test if the switch to inflation targeting regime really helped in anchoring the inflation expectations of Indian households. Since both the inflation and the expectations data is available at the state level, we leverage the panel dimension of our data to test this hypothesis. We separately run the regressions for the two periods, pre-IT and post-IT, and compare them to evaluate the impact of IT.

3.1 Baseline results: Test for anchored expectations

To look at the change in expectations, we analyse how the share of households in various expectation buckets changes in response to past inflation and inflation expectations. More importantly, we do not combine the qualitative responses to create one single index. Instead, we directly use the share of households in the various expectations bucket as our dependent variable. We use the following baseline specification:

$$\left[\Pi^{e}_{c,b}\right]_{s,t+1|t} = \rho_{c,b}\left[\Pi^{e}_{c,b}\right]_{s,t|t-1} + \beta_{c,b}\left[\Pi_{c}\right]_{s,t-1} + \left[\varepsilon\right]_{s,t} \tag{1}$$

[3]Actually, upward bias is less of a concern in our case. Since we want to test whether the expectations got anchored in the IT period, a consistent upward bias in both the pre-IT and post-IT period will not hurt our identification. We discuss it in more detail when we present results based on the quantitative survey data.

where $\left[\Pi^e_{c,b}\right]_{s,t+1|t}$ is the share of households with inflation expectations in bucket b ((a) Decline in prices (b) No change in prices etc.) for category c i.e. food, non-food or general inflation. The subscript s denotes the state (region) and $t{+}1|t$ corresponds to the expectations for period $t{+}1$ reported in period t (three-month ahead in the baseline case). This expectations for this share of households, $\left[\Pi^e_{c,b}\right]_{s,t+1|t}$, depends on the past share of households with expectations in the same bucket $\left[\Pi^e_{c,b}\right]_{s,t|t-1}$ and past inflation, $[\Pi_c]_{s,t-1}$, for this category. The first term captures the stickiness in inflation expectations, while the latter captures the dependence of current expectations on past inflation.

There is no general and widely accepted measure of anchored expectations and even less so in the case of qualitative measures of inflation expectations. From equation 1, we can test for anchored inflation expectations in two ways. First, if the share of households $\left[\Pi^e_{c,b}\right]_{s,t+1|t}$ in a given category, bucket and state remains stable over a period of time, then the expectations don't change much over time and can be claimed to be anchored. In the case of regression equation (1) this will be captured by the coefficient $\rho_{c,b}$ on the AR(1) term, $\left[\Pi^e_{c,b}\right]_{s,t|t-1}$. If $\rho_{c,b}$ is positive and significant, it will signify the stickiness in the inflation expectations. In case this coefficient is insignificant, the past expectations do not influence the current expectations about future inflation at all. This can only happen if there are major revisions in household expectations from one survey round to the next. And major revisions every period imply unanchored expectations. Thus our choice of anchored inflation expectations definition is closest to the "small revisions in forecast measure" given in Afrouzi et al. (2015).

Second, the other important and simultaneous way to test for anchored expectations is the coefficient $\beta_{c,b}$ on past inflation. Unlike $\rho_{c,b}$, the interpretation of $\beta_{c,b}$ is slightly involved and depends on the bucket b. In the simple case of anchored expectations, the coefficient $\beta_{c,b}$ should be insignificant since the expectations should not depend on the past inflation rate. Any temporary shock to inflation (for example due to oil price shock) should not lead to major revision in the case of anchored expectations. On the other hand, under unanchored

expectations, a high inflation should move people out from the low inflation expectations bucket to high inflation expectations bucket. The summary of expected signs on $\beta_{c,b}$ is given in Table 3.

Group	Anchored $\beta_{c,b}$ (1)	Unanchored $\beta_{c,b}$ (2)
Group I (Low Inflation Expectations)	Insignificant	-ve
Group II (High Inflation Expectations)	Insignificant	+ve

Table 3: Expected sign of $\beta_{c,b}$ under anchored and unanchored inflation expectations

We group (a) Decline in prices and (b) No change in prices into Group I and the remaining three answers in Group II as shown in Table X. The Group I corresponds to the low inflation expectations as share of people in this group expect prices to decline or not change. People in Group II expect prices to increase i.e. inflation to be more than zero. In the case of anchored expectations, the number of people in Group I or II should not change depending on the past level of inflation or equivalently $\beta_{c,b}$ should be insignificant. If the households believe that any spike in inflation is temporary and that the inflation will return back to the target level of inflation set by the central bank, on average they should not revise their expectations. This is a strict test of anchored expectations since the share of people in these groups should not change even with big changes in inflation (although temporary). This is especially true in the case of India, where the inflation has come down during the inflation targeting regime period but not the volatility in the headline inflation (due to volatility in the food segment). In the opposite case of unanchored inflation expectations, the households should switch their expectations depending on the level of inflation. A high inflation should lead to a decrease in the share of households in Group I and increase in Group II. So, $\beta_{c,b}$ should be negative for Group I and positive for Group II as shown in column (2) of Table 5.

We estimate the equation 1 separately for these two groups and the results are reported in Table 5. Table 5 corresponds to the regression of three-month ahead expectations, $t+1|t$, on the past three-month ahead expectations ($t|t-1$) and past inflation in period t-1. Panel I and II report results of this estimation for food component of CPI in the pre and post-IT

period. The AR(1) term (auto-regressive term) corresponds to the coefficient on $\left[\Pi^e_{c,b}\right]_{s,t|t-1}$ i.e. $\rho_{c,b}$. We find that $\rho_{c,b}$ for food is insignificant for both Group I and II in the pre-IT period. This fails the first test for anchored inflation expectations as the current share of households in a given group does not depend on its past value. The pre-IT period also fails on the second test for anchored inflation expectations as $\beta_{c,b}$ is significantly negative and positive for Group I and Group II respectively. The results completely flip in the post-IT period as shown in Panel-II. Now, the AR(1) term, $\rho_{c,b}$, is positive for both groups I and II implying that past expectations influence current expectations about the future inflation. Also $\beta_{c,b}$ now becomes insignificant for both groups, which implies that the change in inflation does not make people change their expectations about the future inflation. The results on food inflation are specially important because as shown in Figure 1 and 2 in the introduction, the food inflation has come down in the post-IT period but not its volatility. So in the post-IT period, the food inflation moves up and down but it does not change the expectations about future food inflation. The Indian households seem to internalize the cyclicity in food prices and do not change their expectations based on it in the post-IT regime.

The results for the non-food inflation expectations are similar to the food inflation expectations and are reported in Panel III and IV of Table 5. Once again, the non-food inflation fails both the anchored expectations tests in the pre-inflation targeting period and passes them in the post-inflation targeting period.

To ensure that our results are not driven by the choice of how we aggregate Groups I and II, we do the same analysis at a more disaggregated level. Instead of grouping the five responses about inflation expectations into two groups, we run the regressions for each of the categories separately. The results for these regressions are reported in Table 6. It is important to mention that using five categories instead of two broad groups can hide some empirical results due to basic accounting. The share of households across all categories sum to one for every state. So it is possible for the intermediate bucket to gain as many households from the lower inflation expectations bucket as they lose to the higher expectations bucket.

For example- let's say the inflation expectations are unanchored and as the inflation rises it pulls up the inflation expectations along with it. In this case, households revise their inflation expectations from lower buckets to higher. So the intermediate expectations bucket (d) "Price change same as before" can gain some households from (c) "Price change less than before" and at the same time lose some to bucket (e) "Price change more than before". The aggregate impact on bucket (d) can thus be nullified due to this simultaneous adjustment. It was not a problem when we grouped these buckets into two groups I and II, since loss from I was gain for II and vice versa. We should keep this accounting feature in mind while analysing the disaggregated results.

The disaggregated results are reported in Table 6 and are similar to the baseline regressions where we had clubbed the household responses into two groups. For both the food and non-food segments, the AR(1) terms $\rho_{c,b}$ are mostly insignificant in the pre-IT period and significant and positive in the inflation targeting period. So the period *t-1* share of households in a given inflation expectations bucket did not predict period t share in the pre-IT regime but can predict now. Even at the disaggregated level, the inflation appears anchored in post-IT period according to the first test of anchored expectations.

The results on $\beta_{c,b}$ in Table 6 shed more light on how the household expectations formation has changed after the regime switch. Panel I and II report the results for food for the two periods. In the pre-IT period, s higher food inflation led to a fall in the share of (a), (b) and (c) buckets and increase in (e). So, high inflation led people to believe that future prices will rise at an even higher rate. Once we consider the accounting feature described earlier, the steep revision in expectations becomes even more apparent. The intermediate buckets lost as many or more households to their higher inflation expectations bucket than they gained from lower buckets with the end result that the bucket (e) "Price change more than before" gained the most number of households. These results get completely reversed in the post-IT regime. The lowest two buckets (a) and (b) see no significant change in their share with an increase in inflation. The more interesting result is that due to higher inflation, bucket

(e) "Price change more than before" loses its share to the two lower inflation expectations buckets (c) and (d). It thus points towards the realization by Indian households about cyclicity of food inflation. The higher the inflation, the more the households believe that price increase will be less than before. This points towards anchoring in the food inflation expectations in India, despite the cyclicity in food prices.

The results for the non-food inflation expectations are reported in Panel III and IV of Table 6. The results here are exactly similar to the aggregated group level regressions reported in Table 5. For the first test based on AR(1) term, more terms are positive and significant in the post-IT period relative to the pre-IT period. So, non-food expectations seem more anchored in the post-IT period. On the second test, we once again see that an increase in non-food inflation led to a significant loss of share by the buckets (a), (b) and (c) at the cost of gains by bucket (e) in the pre-IT period. After the adoption of inflation targeting, the non-food inflation in period *t-1* stopped having any significant impact on the share of households in all these buckets. Thus the second test again corroborates that non-food expectations got anchored in post-IT period.

3.2 Inflation targeting dampened the spillover from food to non-food inflation

The previous sub-section discussed the results of our two tests for anchored inflation expectations. We found that inflation expectations got anchored in the post-inflation targeting period. This raises the question on how or why this happened only after 2015. The level of general inflation as well as food has come down post 2015, but the volatility in food prices still persists. What stopped the general and food inflation to spiral out of control during this period, a regular feature in the pre-IT period?

We hypothesize that in the post-inflation targeting period, the spillover from food inflation to non-food inflation expectations has come down. The central bank cannot control the cyclicality in food inflation but if it can anchor the non-food inflation expectations, it can

stablize the non-food inflation. If the central bank succeeds, it can dampen the spillover of inflation from one part of the CPI basket to another. Overall, the headline inflation should not spiral away from the central bank inflation target. To test this hypothesis, we run the following regression specification:

$$\left[\Pi^{e}_{c,b}\right]_{s,t+1|t} = \rho_{c,b}\left[\Pi^{e}_{c,b}\right]_{s,t|t-1} + \beta^{food}_{c,b}\left[\Pi_{food}\right]_{s,t-1} + \beta^{non-food}_{c,b}\left[\Pi_{non-food}\right]_{s,t-1} + \left[\varepsilon\right]_{s,t} \quad (2)$$

where $\left[\Pi^{e}_{c,b}\right]_{s,t+1|t}$ is the share of households with inflation expectations in bucket b for category c i.e. food, non-food or general inflation. The difference from the equation 1 is that in specification 2 we test the dependence of expectations, $\left[\Pi^{e}_{c,b}\right]_{s,t+1|t}$, for *t+1* period inflation on past food and non-food inflation together. The coefficients $\beta^{food}_{c,b}$ and $\beta^{non-food}_{c,b}$ capture the impact of food and non-food inflation respectively on the share of households in a given expectations bucket b and category c.

The specification in the equation 2 allows us to do the two earlier tests for anchored inflation expectations as in the previous sub-section, as well as test for spillover from one inflation category to another. The first test for anchored expectations is still the autoregressive term, $\rho_{c,b}$. A positive and significant $\rho_{c,b}$ implies that the share of households in a given expectations group at period *t-1* is a good predictor for period t expectations. Hence, the expectations don't fluctuate too much and are anchored.

The second test is the dependence of expectations on both food and non-food inflation in period *t-1*. In the case of food expectations, $\beta^{food}_{food,b}$ and $\beta^{non-food}_{food,b}$ capture the impact of own and non-food inflation in period *t-1* on the share of households with food expectations in bucket b. Here a significant$\beta^{non-food}_{food,b}$ captures the spillover from non-food inflation to expectations about future food inflation. Similarly in the case of non-food expectations, $\beta^{food}_{non-food,b}$ captures the spillover from inflation in the food basket of CPI into non-food expectations. There has been some anecdotal discussion around spillover from food to non-

food inflation in the case of India and a positive and significant value of the coefficient $\beta^{food}_{non-food,b}$ will support this line of argument.

We aggregate the one-quarter ahead expectation responses into two groups I and II, low and high inflation expectations buckets, as done in the previous sub-section. The results from estimating equation 2 are presented in Table 7. We report the results for food in Panel I and II and for non-food in Panel III and IV.

In the case of food expectations, the tests on AR(1) term i.e. $\rho_{food,b}$ give the same results as in the previous sub-section. The food inflation was unanchored in the pre-IT period, but it became anchored in the later period as $\rho_{c,b}$ became positive and significant for both low and high inflation groups. The coefficient on food inflation in period *t-1* used to be significantly negative for Group I and positive for Group II earlier, but it became insignificant in the inflation targeting period. The more interesting result is that there is no spillover from non-food inflation to food expectations in both periods as $\beta^{non-food}_{food,b}$ is insignificant in all regressions. These results suggest that non-food inflation does not spillover into expectations about food inflation.

The first test for anchored expectations, sign and significance of $\rho_{non-food,b}$, once again give similar results for the non-food expectations. However, the inclusion of past food inflation in the regressions on non-food expectations completely nullify the impact of non-food inflation in period *t-1* on its own expectations. In both the pre and post-IT periods, the $\beta^{non-food}_{non-food,b}$ terms are insignificant. Instead, we see a spillover from past food inflation to non-food expectations in the pre-IT period. A high food inflation in period *t-1* pushed out the households from Group I to II, as the coefficients on food inflation are negative and positive respectively. In the post-IT period, the signs of the coefficient on food inflation are reversed. A high food inflation decreases the share of households in the high non-food expectations group and increases them in the lower expectations group at a 10 percent confidence level. This implies that in the post-IT period, a high food inflation leads to lower non-food expectations. This might unanchor the non-food expectations, but only downwards. It can also

imply that households expect some moderation in the non-food inflation when food inflation goes up, which can explain this sign reversal.

To summarize, the food inflation seems to have been the main source of keeping inflation expectations unanchored in the period before 2015. A high food inflation not only led to high food inflation expectations, but it spilled over to the non-food inflation expectations as well. This can explain why the headline as well as the category level inflation expectations remained unanchored during this period. Under the inflation targeting regime, this spillover from food inflation to non-food inflation expectations has been curtailed. Additionally, the food inflation during the inflation targeting period was fairly volatile unlike the non-food inflation. So, it removes the stabilized food prices as a potential suspect for this lack of spillover from food to non-food inflation. Overall, the cyclicity in the food prices seems to have been internalized by the households in the post-IT period and it does not unanchor their expectations any more.

3.3 Anchored sub-component level inflation and no spillover reflects in anchored headline inflation

Given the results in the previous two sub-sections, we expect that the headline inflation should also be anchored in the post-IT period. To formally test this, we again estimate equation 1 for the case of headline inflation. The results for the two groups and for all five buckets are reported in Table 9 and 10 respectively.

Lets us first analyze the results of the two groups case. The results in Table 9 show that the headline inflation passes (fails) both the tests for anchored inflation expectations in the post-IT (pre-IT) period. In the pre-IT period, the coefficient on AR(1) term is insignificant. It means that the expectations are not stable as period $t|t\text{-}1$ expectations have no explanatory power over $t+1|t$ expectations. In the post-IT period, the expectations for the headline inflation are more stable and past period expectations have some explanatory power over current period expectations. So the headline expectations pass on the first test

of anchored expectations in the post-IT period, but fail in the pre-IT period. On the second test, we find that only in the post-IT period the expectations on the headline inflation do not depend on past period inflation. In the pre-IT period, the opposite result holds. Thus, the second test for anchored inflation expectations also gives the same results as the first test. We report the results at a more dis-aggregated level in Table 10, which once again confirm that the expectations got anchored in the post-IT period.

4 Robustness

The previous section gave the results on how the switch to inflation targeting regime anchored the expectations and stopped the spillover from food inflations into non-food inflation expectations. In this section we show that our results are robust to other alternate specifications and variables.

4.1 One-year ahead inflation expectations are also anchored

The main results presented in the last section were based on the three-month ahead household expectations. It is generally argued that long run expectations are the real test of anchored inflation expectations. A temporary shock in the economy can alter the short run expectations, but if its impact lasts only for a few months or quarters it should not force the households to revise their long run inflation expectations.

We now look at the one-year ahead (or four-quarter ahead) inflation expectations, i.e. $t+4|t$ expectations, and see if they changed due to the switch to inflation targeting regime. As discussed in the data section, in the case of India the one-quarter ahead and four-quarter ahead expectations are highly correlated. We thus expect the results to be similar as in the case of one-quarter ahead inflation expectations. We use the same two specifications given in equation 1 and 2, except that now the dependent variable is based on $t+4|t$ expectations. The specifications thus become:

$$\left[\Pi^{e}_{c,b}\right]_{s,t+4|t} = \rho_{c,b}\left[\Pi^{e}_{c,b}\right]_{s,t+3|t-1} + \beta_{c,b}\left[\Pi_{c}\right]_{s,t-1} + \left[\varepsilon\right]_{s,t} \tag{3}$$

$$\left[\Pi^{e}_{c,b}\right]_{s,t+4|t} = \rho_{c,b}\left[\Pi^{e}_{c,b}\right]_{s,t+3|t-1} + \beta^{food}_{c,b}\left[\Pi_{food}\right]_{s,t-1} + \beta^{non-food}_{c,b}\left[\Pi_{non-food}\right]_{s,t-1} + \left[\varepsilon\right]_{s,t} \tag{4}$$

The results are reported in Table 11, 12, 13 and 14. The results with $t+4|t$ expectations are almost similar to the ones reported in case of $t+1|t$ expectations in the previous section. The inflation expectations are more anchored for both food and non-food in the post-IT period. The only notable difference is that AR(1) term for 3-month ahead non-food expectations is significantly positive even in the pre-IT regime (Table 7), but it is not in the case under 1-year ahead expectations (Table 13). This means that 3-month ahead non-food expectations were partially anchored by the AR(1) term but de-anchored by the food inflation term in the pre-IT period. Over a longer horizon i.e. 1-year ahead expectations the AR(1) term also loses its anchoring power. So we find that non-food expectations fail on both the tests over 1-year horizon in the pre-IT period and pass both the tests post-IT adoption.

4.2 Current period inflation has the same impact on expectations

In the previous sections, we used inflation in quarter *t-1* as the independent variable in our analysis. Since the survey is conducted in quarter t, it is possible that respondents use the current quarter inflation to form their expectations. As a robustness check, we thus replace past period inflation with current period inflation in our specifications.

The results with period t inflation are reported in Table 15 and 16. Once again the results look similar to those in the previous section and the inflation expectations seem to be anchored in the post-IT period.

4.3 Quantitative Survey Data also supports anchored expectations

The IESH survey also contains quantitative information on 3-month ahead inflation expectations. The average of reported expectations is much higher than prevailing inflation or inflation target in the case of Indian households as well, a feature noted by Blinder (2017) and others for other countries. However, even if expectations are upward biased we should see a structural break in them post-IT adoption. For the average expectations at national level, we can see this break in Figure 3. The post-IT period has seen consistently lower average inflation expecations. To formally test for the anchored expectations with quantitative data, we use:

$$[\Pi^e]_{s,t+1|t} = \rho\,[\Pi^e]_{s,t|t-1} + \beta\,[\Pi]_{s,t-1} + [\varepsilon]_{s,t} \tag{5}$$

where $[\Pi^e]_{s,t+1|t}$ is the average of 1-quarter ahead headline inflation expectations among correspondents at time t in state s. We again have the two tests for anchored expectations captured by the coefficients ρ, the coefficient on AR(1) term, and β, the coefficient on the past inflation $[\Pi]_{s,t-1}$. A positive and significant ρ while an insignificant β correpond to the case of anchored expectations. We report the estimated coefficients of equation 5 in Table 17.

5 Conclusion

This paper uses a novel dataset and empirical methodology to test for the impact of inflation targeting regime on anchoring household level expectations. We exploit the household level inflation expectations survey from India which is available for both the pre and post-IT adoption period. Most other papers in the literature do not have survey information from both these periods, which makes it difficult to formally test for anchored expectations

against some benchmark level expectations. On the methodological front, this paper's main contribution is to show how to better utilize the qualitative information in the household level expectations survey.

The main result of the paper shows that inflation expectations got anchored post-IT adoption in India. This result holds for headline inflation as well as for its sub-components, food and non-food inflation. Additionally, we also provide the potential channel that led to anchored expectations under IT regime. The headline expectations got anchored under the IT regime as the spillover from the food inflation to non-food expectations became weaker. There was sufficient volatility in the food prices during the IT period, but it never led to an inflation spiral as seen in the previous regime. The explicit IT regime seems to be an ideal candidate to explain this lack of spillover. This paper thus provides evidence in the favor of targeting headline inflation even in the case of countries with high share of food in the CPI basket and volatile food inflation.

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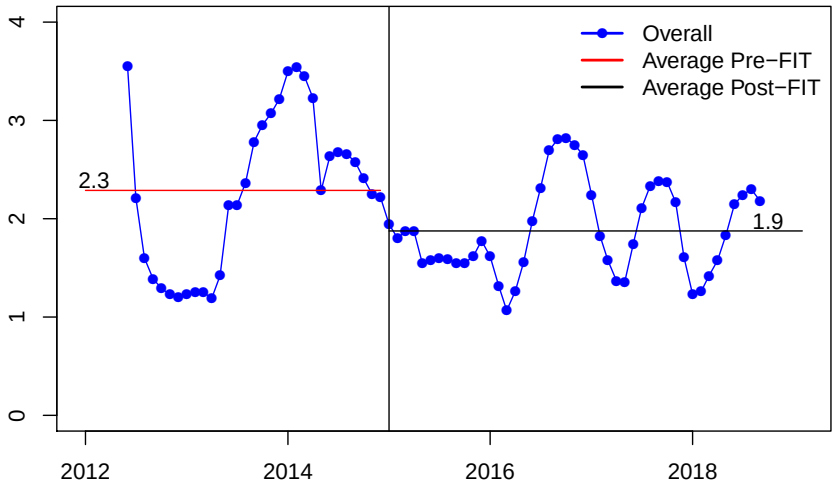
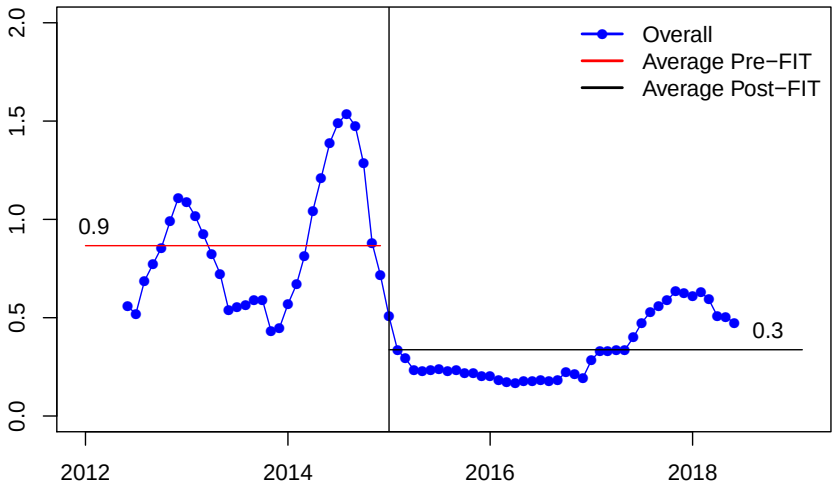
Figures

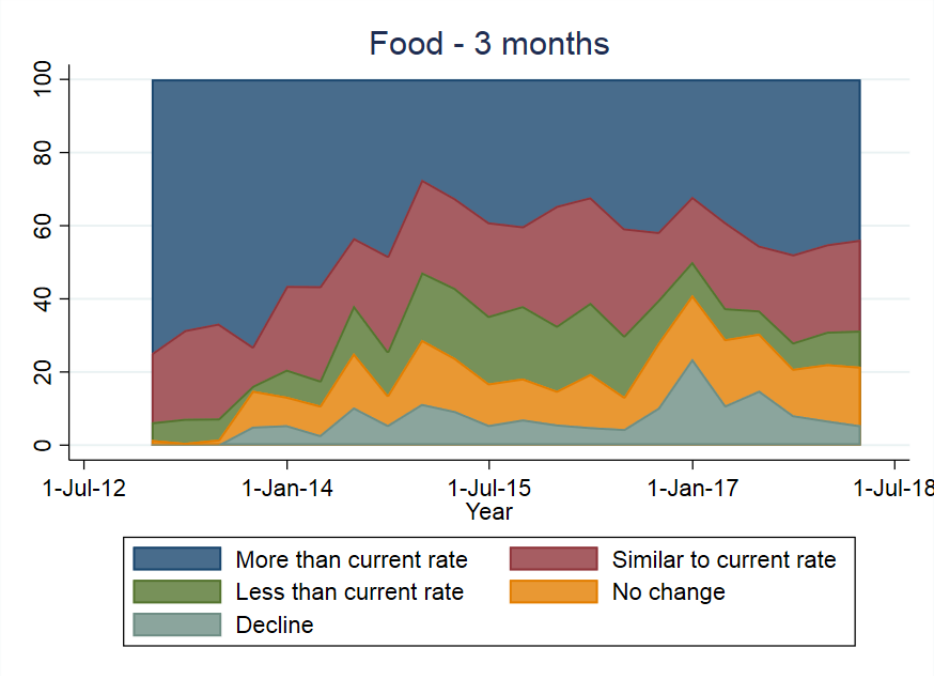


(a) Food Inflation volatility

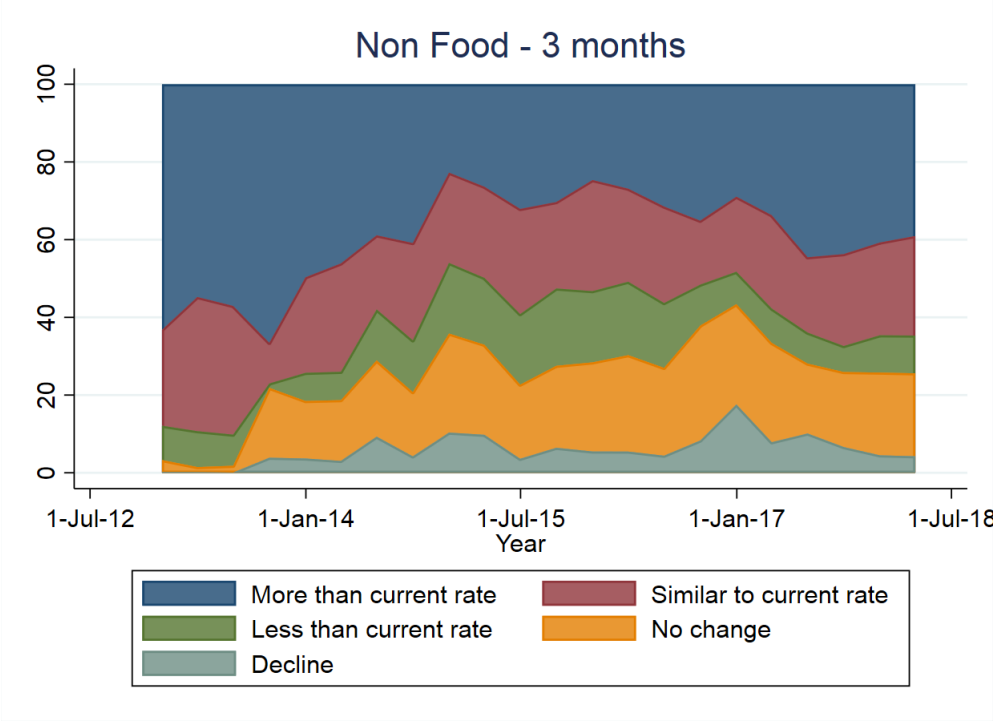


(b) Non-food inflation volatility

Figure 1: Inflation volatility (calculated as 11-month rolling standard deviation) for India. The y-axis correponds to the standard deviation of inflation (reported in %). The vertical black line corresponds to the date of adoption of IT regime.



(a) Food Expectations



(b) Non-food Expectations

Figure 2: Time series variation in the share of households in various buckets in the expectations data (3-month ahead expectations)

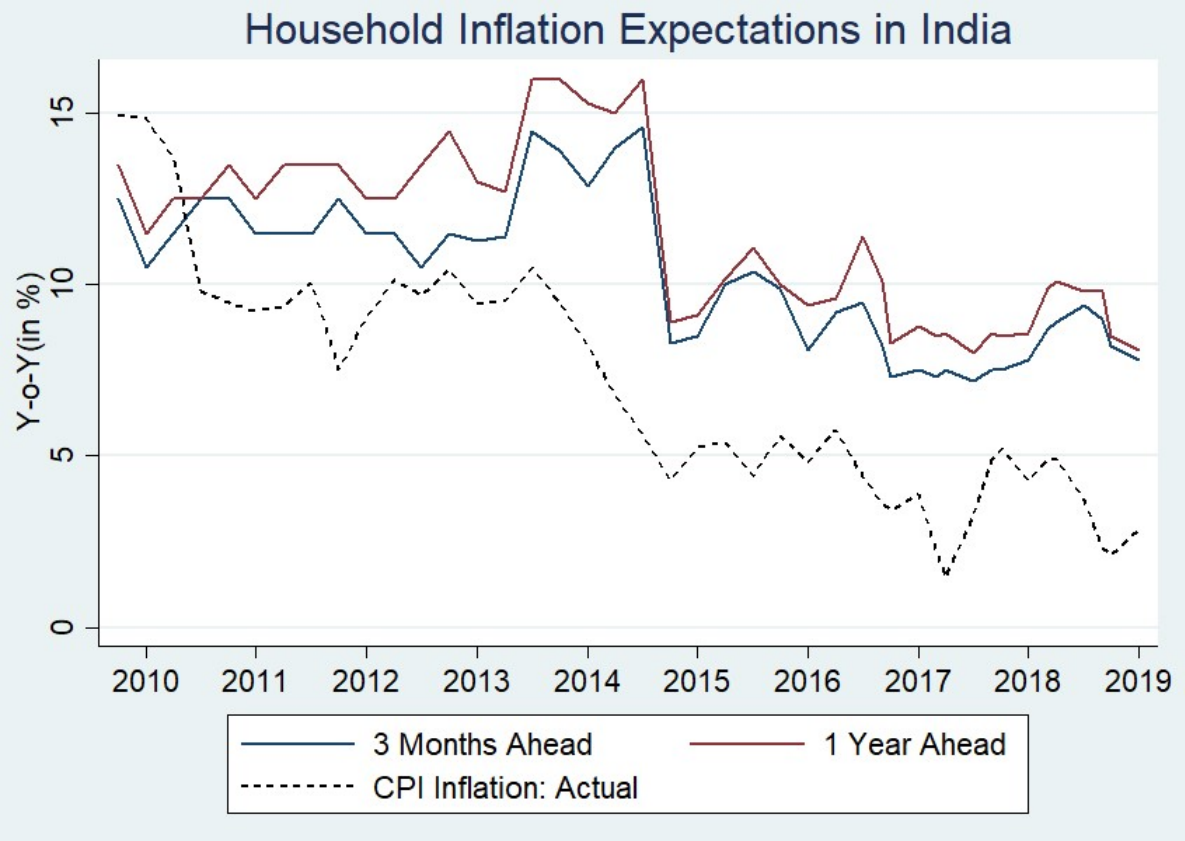
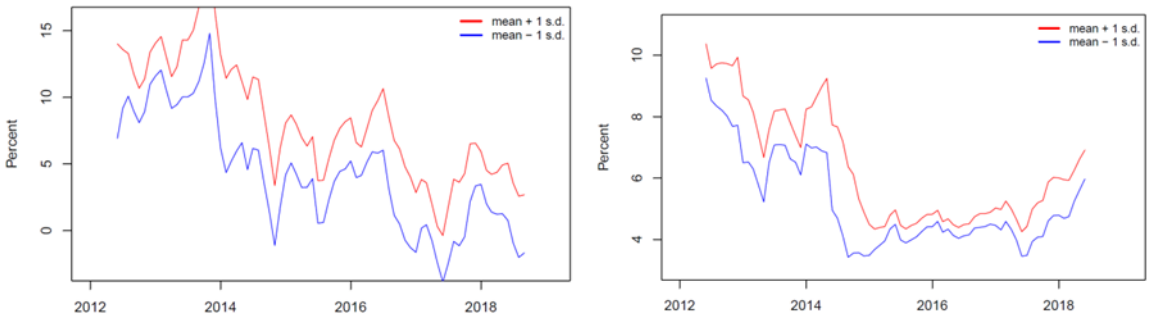


Figure 3: Time series plot of average quatitative expectations at national level



(a) Food Inflation (s.d. bands)

(b) Non-food inflation (s.d. bands)

Figure 4: Inflation over time

Tables

Group	Share in Rural (%)	Share in Urban (%)
Food and beverages	54.18	36.29
Pan, tobacco and intoxicants	3.26	1.36
Clothing and footwear	7.36	5.57
Housing	-	21.66
Fuel and light	7.94	5.58
Miscellaneous	27.26	29.53
General Index (All Groups)	100.00	100.00

Table 4: Weights of different components in the Indian CPI basket.

	Group 1	Group 2
	(1)	(2)
Panel I: Food expectations in Pre-IT period		
AR(1)	0.21	0.21
	(0.11)	(0.11)
Food inflation$_{t-1}$	-1.21***	1.21***
	(0.27)	(0.27)
Observations	104	104
R-squared	.27	.27
Panel II: Food expectations in Post-IT period		
AR(1)	0.37***	0.37***
	(0.08)	(0.08)
Food inflation$_{t-1}$	0.01	-0.01
	(0.29)	(0.29)
Observations	169	169
R-squared	.14	.14
Panel III: Non- food expectations in Pre-IT period		
AR(1)	0.45***	0.45***
	(0.10)	(0.10)
Non-food inflation$_{t-1}$	-2.27**	2.27**
	(0.84)	(0.84)
Observations	104	104
R-squared	.29	.29
Panel IV: Non- food expectations in Post-IT period		
AR(1)	0.38***	0.38***
	(0.08)	(0.08)
Non-food inflation$_{t-1}$	-0.27	0.27
	(0.89)	(0.89)
Observations	169	169
R-squared	.14	.14

Table 5: 3-month ahead expectations: Baseline Regressions with two groups. Group 1 corresponds to (a) Decline in prices (b) No change in prices and Group 2 corresponds to (c) Price increase less than the current rate (d) Price increase similar to the current rate and (e) Price increase more than the current rate.

	Decline	No change	Less than	Similar to	More than
	(1)	(2)	(3)	(4)	(5)
Panel I: Food expectations in Pre-IT period					
AR(1)	0.05	0.20	0.20	0.06	0.11
	(0.12)	(0.11)	(0.12)	(0.10)	(0.11)
Food inflation$_{t-1}$	-0.58***	-0.70***	-0.72**	-0.37	2.40***
	(0.13)	(0.17)	(0.23)	(0.35)	(0.53)
Observations	104	104	104	104	104
R-squared	0.23	0.23	0.16	0.02	0.26
Panel II: Food expectations in Post-IT period					
AR(1)	0.21*	0.36***	0.35***	0.11	0.25**
	(0.09)	(0.08)	(0.07)	(0.08)	(0.08)
Food inflation$_{t-1}$	-0.24	0.10	0.47*	0.62*	-0.87*
	(0.19)	(0.16)	(0.22)	(0.29)	(0.40)
Observations	169	169	169	169	169
R-squared	0.07	0.12	0.19	0.06	0.11
Panel III: Non-food expectations in Pre-IT period					
AR(1)	0.17	0.45***	0.26*	0.14	0.19
	(0.12)	(0.10)	(0.10)	(0.10)	(0.10)
Non-food inflation$_{t-1}$	-0.98**	-1.50*	-2.13***	0.05	5.15***
	(0.32)	(0.61)	(0.62)	(1.19)	(1.46)
Observations	104	104	104	104	104
R-squared	0.14	0.28	0.23	0.02	0.18
Panel IV: Non-food expectations in Post-IT period					
AR(1)	0.08	0.36***	0.41***	0.13	0.34***
	(0.08)	(0.08)	(0.07)	(0.08)	(0.07)
Non- food inflation$_{t-1}$	0.31	-0.47	-1.41*	0.57	1.29
	(0.50)	(0.67)	(0.67)	(0.83)	(1.28)
Observations	169	169	169	169	169
R-squared	0.01	0.12	0.23	0.02	0.13

Table 6: 3-month ahead expectations: Baseline Regressions (All buckets)

	Group 1	Group 2
	(1)	(2)
Panel I: Food expectations in Pre-IT period		
AR(1)	0.19	0.19
	(0.11)	(0.11)
Food inflation$_{t-1}$	-1.06**	1.06**
	(0.31)	(0.31)
Non food inflation$_{t-1}$	-0.82	0.82
	(0.85)	(0.85)
Observations	104	104
R-squared	.28	.28
Panel II: Food expectations in Post-IT period		
AR(1)	0.37***	0.37***
	(0.08)	(0.08)
Food inflation$_{t-1}$	0.01	-0.01
	(0.29)	(0.29)
Non-food inflation$_{t-1}$	0.61	-0.61
	(0.96)	(0.96)
Observations	169	169
R-squared	.14	.14
Panel III: Non food expectations in Pre-IT period		
AR(1)	0.36***	0.36***
	(0.11)	(0.11)
Food inflation$_{t-1}$	-0.96**	0.96**
	(0.36)	(0.36)
Non-food inflation$_{t-1}$	-0.96	0.96
	(0.95)	(0.95)
Observations	104	104
R-squared	.34	.34
Panel IV: Non food expectations in Post-IT period		
AR(1)	0.38***	0.38***
	(0.08)	(0.08)
Food inflation$_{t-1}$	0.45	-0.45
	(0.25)	(0.25)
Non-food inflation$_{t-1}$	-0.24	0.24
	(0.88)	(0.88)
Observations	169	169
R-squared	.15	.15

Table 7: 3-month ahead expectations: Regressions to test Spillover

	Decline	No change	Less than	Similar to	More than
	(1)	(2)	(3)	(4)	(5)
Panel I: Food expectations in Pre-IT period					
AR(1)	0.04	0.18	0.13	0.06	0.11
	(0.12)	(0.11)	(0.12)	(0.11)	(0.11)
Food inflation$_{t-1}$	-0.56***	-0.55**	-0.37	-0.38	1.79**
	(0.15)	(0.20)	(0.27)	(0.43)	(0.62)
Non-food inflation$_{t-1}$	-0.13	-0.74	-1.98*	0.04	3.00
	(0.40)	(0.55)	(0.75)	(1.17)	(1.58)
Observations	104	104	104	104	104
R-squared	.23	.25	.22	.02	.29
Panel II: Food expectations in Post-IT period					
AR(1)	0.20*	0.35***	0.31***	0.11	0.25**
	(0.09)	(0.08)	(0.08)	(0.08)	(0.08)
Food inflation$_{t-1}$	-0.24	0.10	0.50*	0.62*	-0.87*
	(0.19)	(0.16)	(0.22)	(0.29)	(0.40)
Non-food inflation$_{t-1}$	0.29	0.39	-1.89*	0.42	0.94
	(0.60)	(0.57)	(0.76)	(0.99)	(1.39)
Observations	169	169	169	169	169
R-squared	0.08	0.12	0.22	0.06	0.11
Panel III: Non-food expectations in Pre-IT period					
AR(1)	0.04	0.39***	0.25*	0.14	0.07
	(0.12)	(0.10)	(0.10)	(0.10)	(0.11)
Food inflation$_{t-1}$	-0.51***	-0.54*	-0.33	-0.08	1.82**
	(0.13)	(0.26)	(0.26)	(0.54)	(0.66)
Non-food inflation$_{t-1}$	-0.28	-0.75	-1.64*	0.19	2.61
	(0.35)	(0.70)	(0.73)	(1.48)	(1.68)
Observations	104	104	104	104	104
R-squared	0.26	0.31	0.24	0.02	0.24
Panel IV: Non-food expectations in Post-IT period					
AR(1)	0.06	0.33***	0.36***	0.11	0.28***
	(0.08)	(0.08)	(0.07)	(0.08)	(0.08)
Food inflation$_{t-1}$	-0.11	0.42*	0.39*	0.18	-0.99**
	(0.15)	(0.19)	(0.20)	(0.24)	(0.37)
Non- food inflation$_{t-1}$	0.31	-0.41	-1.48*	0.58	1.24
	(0.50)	(0.66)	(0.67)	(0.83)	(1.26)
Observations	169	169	169	169	169
R-squared	0.01	0.15	0.25	0.02	0.17

Table 8: 3-month ahead expectations: Regressions to test Spillover (All buckets)

	Group 1 (1)	Group 2 (2)
Panel I: Headline inflation expectations in Pre-IT period		
AR(1)	0.19	0.19
	(0.12)	(0.12)
Headline inflation$_{t-1}$	-2.48***	2.48***
	(0.45)	(0.45)
Observations	104	104
R-squared	.36	.36
Panel II: Headline inflation expectations in Post-IT period		
AR(1)	0.29***	0.29***
	(0.08)	(0.08)
Headline inflation$_{t-1}$	0.19	-0.19
	(0.52)	(0.52)
Observations	169	169
R-squared	.08	.08

Table 9: 3-month ahead expectations: Test for anchored headline inflation

	Decline	No change	Less than	Similar to	More than
	(1)	(2)	(3)	(4)	(5)
Panel I: Headline inflation expectations in Pre-IT period					
AR(1)	-0.05	0.22	0.34**	0.20*	0.13
	(0.12)	(0.11)	(0.10)	(0.10)	(0.10)
Headline inflation$_{t-1}$	-1.21***	-1.41***	-1.24**	-0.04	4.09***
	(0.22)	(0.27)	(0.44)	(0.74)	(0.93)
Observations	104	104	104	104	104
R-squared	0.27	0.34	0.21	0.05	0.24
Panel II: Headline inflation expectations in Post-IT period					
AR(1)	0.15*	0.32***	0.48***	0.18*	0.36***
	(0.07)	(0.08)	(0.07)	(0.08)	(0.07)
Headline inflation$_{t-1}$	0.11	0.05	0.60	0.56	-1.47
	(0.23)	(0.40)	(0.43)	(0.55)	(0.77)
Observations	169	169	169	169	169
R-squared	0.03	0.10	0.28	0.05	0.17

Table 10: 3-month ahead expectations: Test for anchored headline inflation (All buckets)

	Group 1	Group 2
	(1)	(2)
Panel I: Food expectations in Pre-IT period		
AR(1)	-0.22	0.12
	(0.14)	(0.12)
Food inflation$_{t-1}$	-1.06***	1.07***
	(0.23)	(0.22)
Observations	67	92
R-squared	.31	.27
Panel II: Food expectations in Post-IT period		
AR(1)	0.33***	0.35***
	(0.08)	(0.08)
Food inflation$_{t-1}$	-0.27	0.25
	(0.25)	(0.26)
Observations	163	161
R-squared	.14	.16
Panel III: Non- food expectations in Pre-IT period		
AR(1)	-0.18	0.34**
	(0.13)	(0.12)
Non-food inflation$_{t-1}$	-2.25***	2.11**
	(0.62)	(0.75)
Observations	68	90
R-squared	.19	.25
Panel IV: Non- food expectations in Post-IT period		
AR(1)	0.38***	0.38***
	(0.08)	(0.08)
Non-food inflation$_{t-1}$	0.77	-0.55
	(0.88)	(0.90)
Observations	164	161
R-squared	.15	.14

Table 11: 1-year ahead expectations: Baseline Regressions with two groups. Group 1 corresponds to (a) Decline in prices (b) No change in prices and Group 2 corresponds to (c) Price increase less than the current rate (d) Price increase similar to the current rate and (e) Price increase more than the current rate.

	Decline	No change	Less than	Similar to	More than
	(1)	(2)	(3)	(4)	(5)
Panel I: Food expectations in Pre-IT period					
AR(1)	0.03	0.32**	0.14	0.09	0.21
	(0.12)	(0.12)	(0.11)	(0.11)	(0.11)
Food inflation$_{t-1}$	-0.55***	-0.46***	-0.76**	-0.49	2.10***
	(0.12)	(0.11)	(0.24)	(0.34)	(0.53)
Observations	104	104	104	104	104
R-squared	0.24	0.25	0.14	0.04	0.25
Panel II: Food expectations in Post-IT period					
AR(1)	0.27**	0.23**	0.34***	0.16*	0.21**
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Food inflation$_{t-1}$	-0.20	-0.17	0.52*	0.46	-0.65
	(0.15)	(0.12)	(0.23)	(0.30)	(0.41)
Observations	169	169	169	169	169
R-squared	0.11	0.09	0.19	0.05	0.07
Panel III: Non- food expectations in Pre -IT period					
AR(1)	0.17	0.39***	0.13	0.12	0.27**
	(0.12)	(0.10)	(0.12)	(0.10)	(0.10)
Non-food inflation$_{t-1}$	-0.81**	-0.83	-2.56***	-0.56	4.47**
	(0.29)	(0.47)	(0.72)	(1.10)	(1.52)
Observations	104	104	104	104	104
R-squared	0.13	0.21	0.20	0.02	0.20
Panel IV: Non- food expectations in Post -IT period					
AR(1)	0.24**	0.33***	0.46***	0.22**	0.32***
	(0.08)	(0.08)	(0.07)	(0.08)	(0.08)
Non- food inflation$_{t-1}$	0.61	0.16	-1.82*	0.27	1.11
	(0.46)	(0.59)	(0.77)	(0.93)	(1.36)
Observations	169	169	169	169	169
R-squared	0.07	0.11	0.27	0.05	0.11

Table 12: 1-year ahead expectations: Baseline Regressions (All buckets)

	Group 1 (1)	Group 2 (2)
Panel I: Food expectations in Pre-IT period		
AR(1)	-0.26	0.09
	(0.15)	(0.13)
Food inflation$_{t-1}$	-0.85*	0.92**
	(0.34)	(0.28)
Non-food inflation$_{t-1}$	-0.79	0.67
	(0.93)	(0.80)
Observations	67	92
R-squared	.32	.28
Panel II: Food expectations in Post-IT period		
AR(1)	0.31***	0.34***
	(0.08)	(0.08)
Food inflation$_{t-1}$	-0.27	0.26
	(0.25)	(0.26)
Non-food inflation$_{t-1}$	1.51	-1.45
	(0.82)	(0.84)
Observations	163	161
R-squared	.16	.18
Panel III: Non- food expectations in Pre-IT period		
AR(1)	-0.11	0.30*
	(0.13)	(0.12)
Food inflation$_{t-1}$	-0.63	0.75*
	(0.32)	(0.36)
Non-food inflation$_{t-1}$	-1.07	0.83
	(0.85)	(0.96)
Observations	68	90
R-squared	.25	.29
Panel IV: Non- food expectations in Post-IT period		
AR(1)	0.39***	0.40***
	(0.08)	(0.08)
Food inflation$_{t-1}$	0.12	-0.23
	(0.25)	(0.26)
Non-food inflation$_{t-1}$	0.76	-0.55
	(0.88)	(0.90)
Observations	164	161
R-squared	.15	.15

Table 13: 1-year ahead expectations: Regressions to test Spillover

	Decline	No change	Less than	Similar to	More than
	(1)	(2)	(3)	(4)	(5)
Panel I: Food expectations in Pre-IT period					
AR(1)	0.01	0.30*	0.04	0.09	0.19
	(0.12)	(0.12)	(0.11)	(0.11)	(0.11)
Food inflation$_{t-1}$	-0.51***	-0.41**	-0.40	-0.44	1.63**
	(0.13)	(0.14)	(0.27)	(0.42)	(0.60)
Non-food inflation$_{t-1}$	-0.23	-0.29	-1.98*	-0.27	2.55
	(0.37)	(0.38)	(0.80)	(1.14)	(1.64)
Observations	104	104	104	104	104
R-squared	.24	.26	.19	.04	.27
Panel II: Food expectations in Post-IT period					
AR(1)	0.27**	0.21**	0.29***	0.16*	0.21**
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Food inflation$_{t-1}$	-0.20	-0.18	0.55*	0.47	-0.65
	(0.15)	(0.12)	(0.23)	(0.30)	(0.41)
Non-food inflation$_{t-1}$	0.58	1.01*	-2.10**	0.08	0.59
	(0.49)	(0.41)	(0.77)	(1.04)	(1.45)
Observations	169	169	169	169	169
R-squared	0.12	0.13	0.23	0.05	0.07
Panel III: Non- food expectations in Pre-IT period					
AR(1)	0.06	0.36***	0.12	0.09	0.18
	(0.12)	(0.10)	(0.12)	(0.11)	(0.11)
Food inflation$_{t-1}$	-0.40**	-0.39	-0.36	-0.49	1.53*
	(0.12)	(0.20)	(0.28)	(0.51)	(0.67)
Non-food inflation$_{t-1}$	-0.25	-0.26	-2.02*	0.23	2.48
	(0.32)	(0.55)	(0.82)	(1.37)	(1.73)
Observations	104	104	104	104	104
R-squared	0.22	0.24	0.22	0.03	0.24
Panel IV: Non- food expectations in Post-IT period					
AR(1)	0.25**	0.33***	0.39***	0.20*	0.28***
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Food inflation$_{t-1}$	0.01	0.03	0.44	0.31	-0.88*
	(0.14)	(0.16)	(0.23)	(0.27)	(0.39)
Non-food inflation$_{t-1}$	0.61	0.15	-1.94*	0.29	1.07
	(0.46)	(0.59)	(0.76)	(0.93)	(1.34)
Observations	169	169	169	169	169
R-squared	0.07	0.11	0.29	0.06	0.14

Table 14: 1-year ahead expectations: Regressions to test Spillover (All buckets)

	Decline	No change	Less than	Similar to	More than
	(1)	(2)	(3)	(4)	(5)
Panel I: Food expectations in Pre-IT period					
AR(1)	-0.03	0.21	0.19	0.09	-0.11
	(0.13)	(0.13)	(0.11)	(0.09)	(0.07)
Food inflation$_t$	-0.60***	-0.47*	-0.73***	-0.49	2.76***
	(0.14)	(0.20)	(0.21)	(0.32)	(0.45)
Observations	117	117	117	117	117
R-squared	0.23	0.18	0.18	0.04	0.27
Panel III: Food expectations in Post-IT period					
AR(1)	0.11	0.32***	0.33***	0.09	0.27***
	(0.08)	(0.08)	(0.07)	(0.08)	(0.08)
Food inflation$_t$	-0.84***	-0.26	0.71**	1.07***	-0.68
	(0.17)	(0.16)	(0.22)	(0.27)	(0.39)
Observations	169	169	169	169	169
R-squared	0.19	0.13	0.22	0.12	0.10
Panel III:Non-food expectations in Pre-IT period					
AR(1)	0.08	0.45***	0.15	0.13	-0.03
	(0.11)	(0.09)	(0.10)	(0.09)	(0.08)
Non - food inflation$_t$	-1.21***	-1.51**	-2.01***	1.16	5.06***
	(0.24)	(0.48)	(0.49)	(0.92)	(1.16)
Observations	117	117	117	117	117
R-squared	0.27	0.37	0.22	0.04	0.16
Panel IV: Non-food expectations in Post-IT period					
AR(1)	0.08	0.35***	0.43***	0.13	0.34***
	(0.08)	(0.08)	(0.07)	(0.08)	(0.08)
Non food inflation$_t$	0.24	0.39	-0.94	0.37	-0.02
	(0.43)	(0.58)	(0.59)	(0.73)	(1.13)
Observations	169	169	169	169	169
R-squared	0.01	0.12	0.22	0.02	0.12

Table 15: 3-month ahead expectations: Regressions with current inflation rate as dependent variable.

	Decline	No change	Less than	Similar to	More than
	(1)	(2)	(3)	(4)	(5)
Panel I: Food expectations in Pre-IT period					
AR(1)	-0.06	0.19	0.08	(0.09)	-0.11
	(0.13)	(0.13)	(0.11)	(0.09)	(0.07)
Food inflation$_t$	-0.34*	-0.05	-0.25	-0.88*	1.81**
	(0.15)	(0.22)	(0.25)	(0.41)	(0.56)
Non- food inflation$_t$	-0.99**	-1.62***	-2.02**	1.40	3.52**
	(0.30)	(0.43)	(0.60)	(0.96)	(1.30)
Observations	117	117	117	117	117
R-squared	.30	.28	.26	.05	.32
Panel II: Food expectations in Post-IT period					
AR(1)	0.11	0.32***	0.31***	0.09	0.27***
	(0.08)	(0.08)	(0.07)	(0.08)	(0.08)
Food inflation$_t$	-0.84***	-0.27	0.74***	1.06***	-0.68
	(0.17)	(0.16)	(0.21)	(0.27)	(0.39)
Non food inflation$_t$	0.03	0.47	-1.37*	0.36	0.53
	(0.49)	(0.50)	(0.64)	(0.83)	(1.23)
Observations	169	169	169	169	169
R-squared	0.19	0.14	0.25	0.12	0.10
Panel III: Non-food expectations in Pre-IT period					
AR(1)	-0.08	0.45***	0.15	0.13	-0.05
	(0.13)	(0.12)	(0.10)	(0.09)	(0.08)
Food inflation$_t$	-0.32*	0.01	-0.17	-0.96	2.12***
	(0.14)	(0.30)	(0.25)	(0.51)	(0.61)
Non food inflation$_t$	-0.89**	-1.52**	-1.76**	2.60*	1.95
	(0.27)	(0.56)	(0.61)	(1.18)	(1.42)
Observations	117	117	117	117	117
R-squared	0.31	0.37	0.22	0.07	0.25
Panel III: Non-food expectations in Pre-IT period					
AR(1)	0.00	0.36***	0.34***	0.10	0.30***
	(0.08)	(0.08)	(0.07)	(0.08)	(0.07)
Food inflation$_t$	-0.48***	0.43*	0.65***	0.43	-1.09**
	(0.14)	(0.18)	(0.19)	(0.23)	(0.36)
Nonfood inflation$_t$	0.31	0.34	-1.11	0.32	0.17
	(0.42)	(0.57)	(0.57)	(0.72)	(1.10)
Observations	169	169	169	169	169
R-squared	0.08	0.15	0.28	0.04	0.17

Table 16: 3-month ahead expectations: Spillover regressions with current inflation rate as dependent variable

	One quarter ahead		One year ahead	
	Pre-IT	Post-IT	Pre-IT	Post-IT
	(1)	(2)	(3)	(4)
AR(1)	0.34***	0.66***	0.32**	0.62***
	(0.10)	(0.05)	(0.11)	(0.06)
Headline inflation$_{t-1}$	0.45***	0.04	0.55***	0.13
	(0.11)	(0.08)	(0.11)	(0.09)
Observations	92	126	92	126
R-squared	0.23	0.56	0.28	0.47

Table 17: Regressions results with quantitative measure of inflation expectations. The dependent variable is the average value of inflation expectations across households.

Appendix

Appendix II

RESERVE BANK OF INDIA

DEPARTMENT OF STATISTICS AND INFORMATION MANAGEMENT

INFLATION EXPECTATIONS SURVEY OF HOUSEHOLDS

Respondent's Code						
Round No.	Zone	City	Gender	Age group	Category	Sr. No.

Block 1. Identification of the Respondent

1. Name of the Respondent: _____

2. Address of the Respondent: _____

_____

City _____ State _____ PIN [ ][ ][ ][ ][ ][ ]

3. Telephone/Mobile No.:

4. Gender of the respondent (Please tick (√) appropriate one) [1] Male [2] Female

5. Age of the respondent (in completed years, above 18 years): _____.

6. Category of the respondent (Please tick (√) appropriate one)

Financial Sector Employees	Other Employees	Self- Employed	House Wife	Retired Persons	Daily workers	Others

Block 2. Expectations of respondent on prices in next 3 months: (Please tick ( ) the relevant cell for each column

OPTIONS		General	Food Products	Non-Food Products	Household durables	Housing	Services
i	Price increase more than current rate						
ii	Price increase similar to current rate						
iii	Price increase less than current rate						
iv	No change in prices						
v	Decline in prices						

Block 3. Expectations of respondent on prices in next one year: (Please tick (√) the relevant cell for each column

OPTIONS		General	Food Products	Non-Food Products	Household durable	Housing	Services
i	Price increase more than current rate						
ii	Price increase similar to current rate						
iii	Price increase less than current rate						
iv	No change in prices						
v	Decline in prices						

Block 4: Respondent's views on the following inflation rates: (Please tick(√)the relevant cell for each row)

Parameters	Options								
Current inflation rate	Less than 1%	1 -2 %	2 -3 %	3-4 %	4 - 5 %	5 - 6 %	6 - 7%	7 - 8%	8 - 9%
	9 - 10%	10 - 11%	11 - 12%	12 - 13%	13 - 14%	14 - 15%	15 - 16 %	16 % and above	No idea
Inflation rate after 3 months	Less than 1%	1 -2 %	2 -3 %	3-4 %	4 - 5 %	5 - 6 %	6 - 7%	7 - 8%	8 - 9%
	9 - 10%	10 - 11%	11 - 12%	12 - 13%	13 - 14%	14 - 15%	15 - 16 %	16 % and above	No idea
Inflation rate after one year	Less than 1%	1 -2 %	2 -3 %	3-4 %	4 - 5 %	5 - 6 %	6 - 7%	7 - 8%	8 - 9%
	9 - 10%	10 - 11%	11 - 12%	12 - 13%	13 - 14%	14 - 15%	15 - 16 %	16 % and above	No idea

Name of the Investigator:	Signature of the Investigator:	Date of the interview

Figure 5: Inflation Expectations Survey conducted by RBI