# Inflation Expectations and Portfolio Rebalancing of Households: Evidence from Inflation Targeting in India

Sumit Agarwal, Yeow Hwee Chua, Pulak Ghosh and Changcheng Song*

This version: 10th January 2022

**Abstract**

This paper exploits a natural experiment in India – Inflation Targeting to study how changes in inflation expectations influence households' consumption, savings, and investments in risky assets. Using regional heterogeneity in inflation expectations by city and city-age-gender bins due to the Inflation Targeting policy, we provide evidence of portfolio rebalancing. A decrease in inflation expectations by 100 basis points led to a decrease in risky investments by 2 percent and a larger increase in bank deposits by 22 percent. This suggest that households shift their assets away from risky assets to safe assets when there is a fall in inflation expectations. Households with more liquid wealth have larger decreases in both consumption and risky investment. We attribute our findings to the nominal rigidity of the savings deposit rate: changes in inflation expectation have asymmetric impact on nominal returns, and thus leads to the asymmetric impact on real returns of risky and risk-free assets. These results highlight the relationship between inflation expectation and nominal rigidity in household balance sheet.

Keywords: Expectations, Inflation Targeting, Household Finance, Household Balance Sheet, Consumption, Savings, Reach for Yield

JEL Classification: D12, D84, D91, E21, E31, E52

* Agarwal, ushakri@yahoo.com, Department of Economics, Finance and Real Estate, National University of Singapore; Chua, yeowhwee@gmail.com, Department of Economics, Nanyang Technological University; Ghosh, pulak.ghosh@iimb.ac.in, India Institute of Management Bangalore; Song, ccsong@smu.edu.sg, Lee Kong Chian School of Business, Singapore Management University

# 1. Introduction

With a recent increase in inflation expectations worldwide, there has been much attention in examining the impact of inflation expectations on households (Schnabel (2021)). Theoretically, the Euler equation model for consumption suggest that an increase in inflation expectations with a constant nominal interest rate could lead to a fall in real interest rate, boosting economic activity. Nonetheless, there has been no consensus on the causal effect of inflation expectations on consumption spending empirically (Burke and Ozdagli (2020), D'Acunto et al. (2019), Coibion et al. (2019)). Moreover, there has been a lack of empirical evidence studying the effect of inflation expectations on household's financial portfolio decisions. When real interest rates fall, it is possible that households rebalance their portfolio from risk-free assets towards risky assets as they "reach for yield" (Borio and Zhu (2012)). This is particularly relevant for households due to the nominal rigidities in the savings deposit rate (Neumark and Sharpe (1992), Driscoll and Judson (2013)). As sticky bank deposit rates provide households with their primary source of safe and liquid returns (Drechsler et al. (2017)), an increase in inflation expectations reduce their real interest rate directly.

In this paper, we seek to contribute to the empirical literature of household's inflation expectations in two ways. First, we study the impact of inflation expectations on households' portfolio rebalancing decisions, a channel which is relatively unexplored in the inflation expectations literature. Second, we show that the household balance sheet is a key factor in driving heterogeneous response of consumption and portfolio rebalancing. While existing studies have shown that investors who have overestimated inflation tend to invest more in real assets such as housing as an inflation hedge (Malmendier and Nagel (2016), Brunnermeier and Julliard (2008)), we focus on another important asset class – bank deposits and risky assets. In the U.S, bank deposits to GDP ratio is approximately 80 percent. Furthermore, equity holdings

amount to $32 trillion and form the largest proportion of financial assets on the households' balance sheet. This is comparable to the stock of housing wealth (Di Maggio et al. (2020)).

Nonetheless, little work has been done in documenting the causal relationship between inflation expectations and portfolio rebalancing of households directly. This can be attributed to several challenges. First, inflation expectations and households' decisions are potentially endogenous. They could be driven by omitted factors such as personal experiences. It is also challenging to study changes in inflation expectations due to information rigidities in macroeconomics (Coibion and Gorodnichenko (2015)), behavioural inattention (Gabaix (2019)), or lack of common knowledge (Angeletos and Lian (2018)). To overcome these issues, we exploit a large-scale natural experiment in India: inflation targeting[1]. Inflation targeting was introduced by the Reserve Bank of India (RBI) in February 2015 as a new monetary policy strategy. For the first time, the central bank explicitly set a specific inflation target as its objective. As the policy change is unexpected and is large in scale, this allows us to overcome the key challenge of generating exogenous changes in inflation expectations of households.

Another key issue lies in data availability. To study how households respond to changes in inflation expectations in different domains, we will require data of households' inflation expectations, as well as their consumption and portfolio decisions. We address the challenge by combining two different sets of data. The first set of data comes from the Inflation Expectations Survey of Households conducted by RBI in different cities. The quarterly survey of inflation expectations is conducted quarterly with 6,000 households in 18 cities. The second set of data is a comprehensive proprietary dataset from an India financial institution. This unique individual-level panel data on 250,000 individuals from different cities across India has detailed information on monthly credit card, debit card, savings and stock market investments.

[1] Historically, inflation targeting in many countries has been shown to be able to anchor the public's inflation expectations (See Blinder et al. (2018) for a comprehensive review).

We also have their personal information such as their gender, age group and city. While we cannot map the subjects at the individual level, we can link them at the city level. By putting the two datasets together, we have 6 cities that are common. They include Ahmedabad, Bhubaneshwar, Chennai, Delhi, Kolkata and Mumbai.

Inflation targeting in India have led to a decrease in inflation expectations. Our identification strategy exploits the changes in inflation expectations across cities due to inflation targeting. Changes in expectations in each city is calculated by estimating an OLS regression from the RBI's Inflation Expectations Survey of Households. Recent work has identified priors and perceptions of inflation, shopping experience, media and understanding of economic policies to be factors that could influence inflation expectations of households (Coibion et al. (2020)). As households in the same cities are most likely to be exposed to the same information and experiences, we can assume that they have a similar fall in inflation expectations. The key assumption is that households in both datasets are representative of each city. Here, we follow the literature that focused on regional heterogeneity[2].

One potential concern with this specification is that our results could be driven only by other common shocks within the same city (and not due to changes in inflation expectations). To address this concern, we tighten our specification further by exploring the cross-sectional variation of changes in inflation expectations in each city by age group and gender. We divide the age group into 2 categories (younger and older) based on the average age from the inflation expectations survey. Consequently, we seek to examine changes in inflation expectations by city-age group-gender bins. Since we have 6 cities, 2 age groups and 2 gender groups, we have 24 bins. We can then back out changes in inflation expectations in each bin before and after

[2] For instance, Beraja et al. (2019) showed how time-varying regional distribution of housing equity impact the monetary policy passthrough through mortgage refinancing. Agarwal et al. (2017) exploited regional variation in the intensity of Home Affordable Modification Program.

the inflation targeting policy. For instance, a male older respondent in Delhi has a fall in inflation expectations by 720 basis points, while a female younger respondent in Kolkata has a fall in inflation expectations by 171 basis points. This is our preferred specification.

Using the changes in inflation expectations as a measure of treatment intensity, we then employ a difference-in-differences strategy by comparing the impacts of households in different city-age-gender bins from the administrative dataset provided by the Indian financial institution. We have two main findings. First, we find evidence of portfolio rebalancing. A decrease in inflation expectations by 100 basis points led to a decrease in risky investments by 170 rupees (2 percent) and an increase in bank deposits by 1,085 rupees (22 percent). Second, we find that overall changes in inflation expectations have no statistically significant impact on total consumption. This suggest that households shift their assets away from risky assets to safe assets when there is a fall in inflation expectations. Moreover, we find that investors who experienced a fall in inflation expectations are more likely to purchase shares with higher dividend yield and sell shares with higher beta.

Next, we highlight the importance of the household balance sheet across different dimensions. We build on the literature that highlights the role of liquidity and income on consumption (Misra and Surio (2014), Broda and Parker (2014)) and examine its impact on portfolio rebalancing. We find that changes in portfolio rebalancing occurs only for households with high liquid savings and high income. Furthermore, households with higher liquid savings decreased their consumption when faced with a fall in inflation expectations. The simultaneous impact of an increase in bank deposits and fall in risky investments occurs amongst households with high liquid savings and high income. Hand-to-mouth households or households that are constrained by their budget are not able to response to changes in real interest rates.

Why do households rebalance their portfolio when faced with lower inflation expectations? One possible explanation is that changes in inflation expectation have

asymmetric impact on **nominal** returns, and thus leads to the asymmetric impact on **real** returns of risky and risk-free assets. In particular, changes in inflation expectations have larger effects on the nominal return of risky investment than the nominal return of risk-free assets. Figure 1 Panel A presents the changes in interest rate in India during this period. This could be due to the nominal rigidity of the savings deposit rate. While the RBI discount rate, treasury bill yields and the term deposit rate offered by the financial institution has decreased over time, the savings deposit rate offered by the financial institution remained unchanged at 4 percent. Consequently, the real savings deposit rate increased when there is a fall in inflation expectations. On the contrary, nominal returns of the equity markets are more responsive to changes in inflation expectations as the real returns are expected to be unchanged (Campbell and Vuolteenaho (2004)). This can be seen in Figure 1 Panel B, whereby there is a fall in nominal returns of the leading stock market index in India after the announcement of the inflation targeting policy in February 2015.

We provide additional evidence to show that portfolio rebalancing is due to the nominal rigidity of savings deposit rate. First, we find that households with a larger proportion of investments in risky assets relative to their total wealth (risky assets and bank deposits) respond more to changes in inflation expectations. As these households stand to benefit the most from the increase in real savings deposit rate, there is larger rebalancing from risky assets to bank deposits. Second, we find that the increase in bank deposits is attributed to savings account and not term deposits. We further conducted a battery of robustness tests to allay concerns of other alternative explanations. For instance, we checked that our results are not driven by stock market participation rate in each city, allaying concerns that portfolio rebalancing occurs due to different stock market participation rate. Finally, we conducted several placebo and falsification tests.

**Related Literature:** This paper contributes to several strands of research. First, we speak directly to the literature studying the relationship between inflation expectations, consumption and savings. Theoretical models show that inflation expectations are expected to play an important role in the monetary policy passthrough, especially in a zero lower bound environment (Krugman et al. (1998), Eggertsson and Woodford (2003)). Nonetheless, the results are relatively mixed empirically (Burke and Ozdagli (2013), D'Acunto et al. (2019), Coibion et al. (2019)). Our paper builds on the work above by highlighting the role of savings and the importance of the household balance sheet. Other papers that have highlighted the role of the household balance sheet and inflation expectations include Vellekoop and Wiederholt (2019), Lieb and Schuffels (2019), as well as Ichiue and Nishiguchi (2015). The contribution of this paper is to focus on another potential friction: sticky savings deposit rates (Neumark and Sharpe (1992), Driscoll and Judson (2013)) and highlight the importance of liquidity.

Second, we contribute to the literature of inflation and investments in risky assets. While earlier work has examined the relationship between inflation and equities returns (Fama (1981), Fama and Schwert (1977), Barnes et al. (1999)), as well as the presence of money illusion in equity markets (Modigliani and Cohn (1979), Sharpe (2002)), this paper focus on household's inflation expectations *ex ante* and not the actual inflation *ex post*. We also take on a different approach by focusing on household's portfolio rebalancing decisions. In doing so, this paper seeks to contribute to the risk-taking channel of monetary policy, whereby investors developed a greater appetite for taking risk when nominal interest rates are low (Borio and Zhu (2012), Lian et al. (2018)). Recent studies have showed that when there is a fall in nominal interest rate, investors "reach for income" by increasing their demand towards income-generating assets (Daniel et al. (2021), Jiang and Sun (2020)) and that term depositors rebalanced their portfolio towards risky investments when faced with a fall in nominal interest rate (Agarwal et al. (2020)). In this paper, we examine how households decrease their

investments into risky assets when faced with a fall in inflation expectations. The main difference from previous literature is that we are focusing on changes in inflation expectations and not nominal interest rate.

The remainder of the paper is organised as follows. Section 2 provides information about inflation targeting in India and the data used in this paper. Section 3 explains the empirical methodology. Section 4 presents the main results. Finally, Section 5 concludes.

# 2. Background and Data

## 2.1 Inflation Targeting in India

Inflation targeting is a monetary policy strategy adopted by central banks in managing the general rise in the price level towards a targeted inflation rate. Over the years, inflation targeting has grown in popularity and has been adopted by many countries worldwide. 17 of the G20 countries, as well as 35 out of 36 OECD members have adopted inflation targeting. (Rose (2020)). Using cross country analysis, Johnson (2002) and Capistran and Ramos-Francia (2010) showed that countries that employed inflation targeting experienced a fall and convergence in inflation expectations. In this paper, we focus on India's adoption of inflation targeting as its monetary policy strategy on February 2015. This led to the subsequent anchoring of inflation expectations (Asnani, et al. (2019), Eichengreen et al. (2020)).

On February 2015, India's Central Bank, the Reserve Bank of India (RBI) announced that it was formally adopting inflation targeting as its monetary policy strategy. Under the Monetary Policy Framework Agreement signed between the Reserve Bank of India and the Government of India, it was specified that the central bank will seek to bring inflation below 6 percent by January 2016. Thereafter, it will adopt a central target of 4 % for the inflation rate with bands of +/- 2 percent. Prior to that, they have adopted a 'Multiple Indicators Approach',

focusing on a range of macroeconomic indicators. While inflation targeting has been suggested previously, there was no consensus about its desirability between the Government and Central Bank until the announcement. The policy change was unexpected as highlighted in the local media. (See Mohan and Ray (2019) for a history of Indian Monetary Policy).

The announcement of the inflation targeting policy seek to provide clarity and reduce inflation volatility in India. As a major policy change, the news was published in both mainstream and social media. Nonetheless, the inflation targeting policy is expected to affect inflation expectations of households in different cities differently. This is due to a few reasons.

First, there is a wide dispersion in the actual inflation rate experienced by different cities (Figure A1). Globally, there have been many studies documenting regional inflation disparities in different countries. (See Beck et al. (2009) for a comparison of regional inflation differentials between the euro-zone and the U.S., Nagayasu (2011) for a study of regional inflation in Japan, Brown et al. (2018) for a study of variational inflation across seventy-one Russian regions). In India, Kundum et al. (2018) highlighted in the RBI Bulletin that there is a large dispersion in inflation across different states in India. This can be attributed to different economic, geographic and structural reasons.

Second, inflation expectations can be affected by many factors. These include consumer's priors and perceptions of inflation (Malmendier and Nagel (2015), Cavallo et al. (2017)), personal experiences (D'Acunto et al. (2021a), Agarwal et al. (2021)), media (Carroll (2003), Pfajfar and Santoro (2013)) and knowledge about monetary policy (Christelis et al. (2020)). In addition, studies have shown that females and older households tend to report higher inflation expectations and that gender roles play a role in inflation expectations ((D'Acunto et al. (2021b)). Consequently, the inflation expectations of households in different cities, gender and age could respond differently to the inflation targeting policy.

## 2.2 RBI Inflation Expectations Survey of Households

We use the RBI Inflation Expectations Survey of Households to measure changes in inflation expectations of households in India. The inflation survey is conducted quarterly in 18 major cities across India. Around 900 representative households are interviewed in each city every quarter. To ensure random sampling, each city is separated into three major areas. Each major area is further divided into three sub-areas. 100 respondents are selected randomly from each sub-round. In each survey, households are asked about their inflation expectations as well as product wise expectations of prices for different types of goods in different time periods. In this paper, we focus primarily on the current inflation expectations reported by the households. We also obtain information of their age group and gender.

To measure changes in inflation expectations from the inflation targeting policy, we make use of the current inflation expectations from the first quarter of 2014 to the first quarter of 2016. This is one year before and after the announcement of the inflation targeting policy (first quarter of 2015). After mapping with our proprietary dataset from the India financial institution, we have 6 cities that are common. They include Ahmedabad, Bhubaneshwar, Chennai, Delhi, Kolkata and Mumbai. These are large cities and can be considered to be good comparison groups. Table 1 presents the summary statistics of the survey. From Table 1, we note that there are 19,530 households with an average age of 39. 44 percent of the respondents are female. On average, the current inflation expectation is around 13.58.

Figure A2 presents the changes in inflation expectations across these cities during this time period. The sample is winsorized at 99 percent based on the size of inflation expectations. Overall, there is a fall in inflation expectations across the cities across time. In addition, there is evidence of regional variation in inflation expectations pre and post announcement of inflation targeting (2015Q1).

## 2.3 Administrative Bank Data

To study the impact of households' consumption and portfolio rebalancing decisions, we use a unique, proprietary dataset obtained from a major bank in India. It is one of the top four banks in India by assets and market capitalisation. The bank has more than 18,000 branches and ATMs across India, offering a wide of banking products and financial services. They include credit and debit cards, savings account, term deposit accounts and mutual funds. Our sample contains consumer financial transaction data of 250,000 individuals, which is a random, representative sample of the bank's customers from 2014 to 2017 across different 12 cities in India. We focus on households in the 6 cities: Ahmedabad, Bhubaneshwar, Chennai, Delhi, Kolkata and Mumbai (that are common with the RBI Inflation Expectations Survey of Households).

In this dataset, we have information of their monthly credit and debit card spending, ATM withdrawals, investments in mutual funds and equities as well as bank deposits balances. We also have demographic information of individual households, such as their occupation, city, gender and age. With reference to consumption spending through credit card and debit cards, we have transaction level information about the transaction amount, date and merchant category of each credit and debit card spending. In terms of bank deposits, we have monthly statements of their savings account, as well as term deposits. We also have information of the loans that they took from the bank.

In this paper, we focus on the time period November 2014 to May 2015, which is 3 months before and 3 months after the inflation targeting policy (February 2015). During this time period, changes in spending, risky investments and savings vary across cities. (See Figure A3 for an illustration of the raw data across cities). There had also been no change to the interest rate offered in the regular savings account. It remained constant at 4%. We focus on this time period for a few reasons. First, there are several interest rates cut in 2015. For instance, the

central bank cut the interest rate by 50 basis points in September 2015 (Figure 1). To prevent the interest rate cuts from driving our results, we would like to focus on a shorter time period. In addition, we would like to conduct a falsification analysis before our main sample period. Notwithstanding, our results are robust when we use a longer time period.

Table 2 shows basic descriptive statistics of our sample. To prevent outliers from driving our results, we winsorized the sample at 1% and 99% based on the size of risky investments, as well as 1% based on the size of consumption spending (this is to remove those without any spending). There are 153,071 households with an average age of 48. For these households, the average monthly consumption is around 16,930 rupees (219 USD) during this time period. This can be broken down to credit card spending (3,030 rupees), debit card spending (2,175 rupees) and ATM withdrawals (11,724 rupees). The average monthly investment into financial assets is around 7,191 rupees (103 USD). From our sample, the average amount of bank deposits is 508,346 rupees (7,262 USD), with 297,683 from Term Deposits and 210,663 rupees from Savings Account.

# 3. Methodology

## 3.1 Changes in Inflation Expectations

We first measure changes in inflation expectations across cities by estimating the following ordinary least square (OLS) regression from the RBI Inflation Expectations Survey of Households:

$$\pi_{it} = \sum_{j=1} (\delta_j Y_j + \gamma_j Y_j * Post) + \beta_1 Post + \beta_2 X_i + \varepsilon_{it} \qquad (1)$$

where $\pi_{it}$ refers to the inflation expectations of individual respondent i at time period t. $Y_j$ relates to the cities: Ahmedabad, Bhubaneshwar, Chennai, Kolkata and Mumbai. Delhi is the

omitted city. We include city level fixed effects. Post is an indicator which is defined as the time period on and after 2015 Q1. For controls, we include $X$, which is a vector of 2 variables: Females, which is an indicator variable for females and Age, the actual age of the respondent. We cluster at the city level. This is our benchmark specification.

To allay concerns that the mapping of city level inflation expectations into the households' outcomes could be driven only by common shocks at the city level, we further explore cross-sectional variation based on the gender and age group. Here, we divide them into 24 bins (by city-age-gender). We define age group as an indicator variable for older households (which is larger than the average age of 39 years old from the inflation expectations survey). Table A1 in the Online Appendix shows the classification of the different bins. For instance, Bin 1 refers to a younger male in Delhi, while Bin 12 refers to an older female in Kolkata. In this specification, we seek to study how changes in inflation expectations vary across different households by gender, age group and city after the inflation targeting policy. Here, $Y_j$ relates to the individual bins and we include bin level fixed effect. Bin 1 is the omitted bin and we cluster at the bin level. This is our preferred specification.

In our benchmark specification, we use the regional change in inflation expectations as a measure of treatment intensity. Table A2 presents the results from Equation (1) for our benchmark specification. We find that females and older households reported higher inflation expectations which is consistent with findings in the literature ((D'Acunto et al. (2021b)). Comparing across cities post inflation targeting, we find that households in Delhi (the omitted city in this regression) have the largest fall in inflation expectations by 660 basis points. This is followed by households in Mumbai (312 basis points), Chennai (240 basis points), Kolkata (133 basis points) and Bhubaneshwar (9 basis points). On the other hand, households in Ahmedabad increased their inflation expectations by 126 basis points.

Table 3 presents the results from Equation (1) for our preferred specification (city-age-gender bin). Here, we can estimate the fall in inflation expectations based on city, age group and gender. The bins classifications are available in Table A1. We highlight a few changes. The omitted bin is Bin 1 (male, younger respondent in Delhi) which have a fall in inflation expectations of 572 basis points (significant at 1 percent). As compared to Bin 1, households in Bin 12 (female younger respondent in Kolkata) have a smaller fall by 414 basis points (significant at 1 percent). As compared to Bin 1, households in Bin 18 (female younger respondent in Chennai) have a smaller fall by 332 basis points (significant at 1 percent). After backing out all the changes in inflation expectations by bin, we then use the fall in inflation expectations as a measure of treatment intensity in our difference in differences regressions (for our preferred specification).

## 3.2 Empirical Methodology

In this paper, we compare the outcomes of households with different changes in their inflation expectations (treatment intensities) during the time period November 2014 to May 2015 using a difference-in-differences strategy. Formally, we run the following regression:

$$Y_{it} = \gamma_i + \lambda_t + \beta_1 Treat_j * Post + \epsilon_{it} \qquad (2)$$

$Treat_j$ refers to the changes in inflation expectations at the bin level (treatment intensity) from the previous regression in Equation (1), while $Post$ refers to the time period after the Inflation Targeting Policy in February 2015. The dependent variables are as follows: For consumption, the dependent variable $Y_{it}$ refer to credit card spending, debit card spending, total card spending (defined as the sum of credit card and debit card spending), ATM withdrawals, and total consumption (defined as the sum of card spending and ATM withdrawals). For risky assets,

the dependent variable $Y_{it}$ refer to mutual fund investments, direct (equity) investments, and total risky investments (defined as the sum of mutual fund investments and direct investments). For bank deposits, the dependent variable $Y_{it}$ refer to changes in savings balances, change in term deposits balance, and total change in bank deposits (defined as the sum of the change in savings balances and term deposits balance). We abstract from taking logarithms as changes in investment and savings could potentially be negative. $\gamma_i$ is the individual dummy variable to absorb differences in individual preferences while $\lambda_t$ is the month dummy variable to control for time fixed effects.

We then make use of the following distributed lag model to study the dynamics across different months. This can be interpreted as an event study analysis.

$$Y_{it} = \gamma_i + \lambda_t + \sum_{\tau=-3}^{3} \beta_\tau \, Treat_j * I_{t+\tau} + \varepsilon_{it} \qquad (3)$$

$Treat_j$ refers to the changes in inflation expectations (treatment intensity) from the previous regression in Equation (1), while $I_{t+\tau}$ is an indicator variable relating to the months before and after the Inflation Targeting Policy in February 2015 (Time Period 0). The coefficients of the lag variables $\beta_1$ ... $\beta_3$ measure the response after the announcement of the inflation targeting policy. Conversely, the coefficient of the leads variable $\beta_{-1}$ ... $\beta_{-3}$ measure the relationship between the treatment and control group before the inflation targeting policy. $\gamma_i$ is the individual dummy variable to absorb differences in individual preferences while $\lambda_t$ is the month dummy variable to control for time fixed effects. The lead variables will enable us to examine the presence of common trend between the households with different treatment intensity (prior to the inflation targeting policy). If there is a common trend, the lead variables are expected to be statistically insignificant from one another.

To further shed light on changes in consumption spending and households' preferences for different type of risky assets, we conducted the following exercise. First, we study the composition of consumption expenditure. Using the Merchant Category Code (MCC) of the debit and credit card transactions available in our data set, we classify the consumption expenditure into 8 different categories: apparel, dining, durables, education and health, entertainment, service, supermarkets and travel. This allows us to study the heterogeneous effect of changes in inflation expectations on the different categories of goods by examining the types of goods and services consumed. We then repeat Equation (2) based on the individual categories of goods.

Next, we investigate how households rebalance the type of equities in their portfolio by exploring our rich data in the individual-stock-month level. Here, we repeat Equation (2) and study the heterogenous impact based on the properties of the stock. We let the dependent variable $Y_{ikt}$ be the "Net Buy" indicator variable for stock *k* held by household *i* at time period *t*. Similar to Daniel et al. (2021), the indicator variable "Net Buy" indicates whether the holding of stock *k* by household *i* has increased or decreased during the time period. The variable Net Buy is equal to 1 if the stock k's position for household i has increased as compared to the previous month, -1 if the stock k's position for household i has decreased and 0 if it remains unchanged. We are interested in the interaction term between the treatment intensity $Treat_j$ and the characteristics of the stock. In this paper, we include the following characteristics: dividend yield and stock beta. For instance, if the coefficient between the treatment intensity (fall in inflation expectations) and dividend yield is positive, it will suggest that households with a fall in inflation expectations will demand for stocks with higher dividend yield. We include individual, time, stock fixed effects and individual-stock fixed effects.

Finally, we study heterogeneous effects due to the household balance sheet. First, we examine the responses by liquid wealth position. To do so, we divide the 250,000 households

into deciles based on their savings balance on September 2014, before re-estimating the following difference-in-differences equation from November 2014 to May 2015:

$$Y_{it} = \gamma_i + \lambda_t + \beta_1 Treat_j * Post + \sum_{k=2}^{10} \beta_k Treat_j * Post * Z_k + \delta_k Z_k * Post + \varepsilon_{it} \quad (4)$$

$Z_k$ is a binary variable that is equal to 1 if the household belongs to the k$^{th}$ decile. For instance, $Z_{10}$ refers to households in the 10$^{th}$ decile (highest amount of savings). We then repeat the above exercise by focusing on the income (of the salaried households), as well as the impact of borrowers. For the latter, $Z_k$ is a binary variable that is equal to 1 if the household has an outstanding loan and 0 otherwise.

# 4 Empirical Results

## 4.1 Baseline Difference-in-Differences Regressions

We test for common trends before the inflation targeting policy by estimating the distributed lag model in Equation (3). These graphs can be considered as difference-in-differences coefficients from an event-study point of view. The x-axis represents the months prior to announcement (-3 to -1), point of announcement (0) and the months after announcement (1 to 2) of the inflation targeting policy.

Figure 2 presents the results from our preferred specification (city-age-gender bin), while Figure A4 in the Online Appendix presents the results for our benchmark specification (city). Both figures show similar results. We can see that before the announcement of inflation targeting, all the coefficients are not statistically significant, validating the use of the difference-in-differences strategy. After the announcement of inflation targeting, there are no statistically significant changes in total spending (Panel A), an increase in savings into bank deposits (Panel B) and a fall in risky investments (Panel C).

Formally, we turn to the difference-in-differences regressions results in Table 4 which is based on our regressions of the preferred specification (city-age-gender bin) in Equation (2). Panel A of Table 4 presents the regression results of consumption. Column 1 shows that a fall in inflation expectations by 100 basis points led to a fall in total consumption by 22 rupees (not statistically significant). This is around 0.1 percent of the average consumption during this time period [3]. This suggests that changes in inflation expectations have a weak impact on consumption, which is consistent with the findings of Burke and Ozdagli (2013). Nonetheless, we find different impacts based on ATM withdrawals (cash spending) and card spending. Column 2 shows that there is an increase in ATM withdrawals of 2 rupees (not statistically significant). In comparison, Column 3 shows that there is a fall in card spending by 21 rupees (significant at 5 percent). In terms of card spending, it is driven primarily by credit card spending. Column 4 shows that a fall in inflation expectations by 100 basis points led to a fall in debit card spending by 3 rupees (not statistically significant), while Column 5 show that a fall in inflation expectations by 100 basis points led to a fall in credit card spending by 18 rupees (significant at 5 percent). This suggest that there could be heterogenous impact on consumption. Changes in consumption take place primarily through credit card spending. It is possible that households respond differently based on their individual balance sheet as households with access to credit are generally wealthier with more financial resources. We study the heterogenous impact in the following section.

We now turn to investments in safe assets, banks deposits. Panel B of Table 4 present the regression results of bank deposits. In Column 1, we find that a fall in inflation expectations by 100 basis points led to an increase in bank deposits by 1,085 rupees (significant at 1 percent). This is around 22 percent of the increase in average savings during this time period. This is

[3] We compute the percentage changes by dividing the treatment effects in Table 3 with the average value in Table 2. See Table A3 in the online appendix for the workings.

attributed to an increase in their savings balances by 986 rupees in Column 2 (significant at 5 percent) and an increase in term deposits by 99 rupees in Column 3 (not statistically significant). In comparison, Panel C of Table 4 presents the regression results of household's investments into risky assets. In Column 1, the difference-in-difference estimators show that on average, there is a decrease in total risky investments by 170 rupees (significant at 5 percent) for every fall in inflation expectations by 100 basis points. This is around 2 percent of the average investments in risky assets during this time period. This is attributed to a decrease in household's investments into mutual funds of 129 rupees (significant at 1 percent) in Column 2 rather than direct investments into stock market of 41 rupee (not statistically significant) in Column 3.

Our findings suggest that households shift their assets away from risky assets to safe assets when there is a fall in inflation expectations. As equities are claims of real assets, households treat equities as an inflation hedge. This led to a fall in demand of risky assets. We obtain similar results when we use the benchmark specification that exploit city level variation in inflation expectations. From our benchmark specification, we find that a fall in inflation expectations by 100 basis points led to a fall in total consumption by 23 rupees (not statistically significant), increase in bank deposits by 1416 rupees (significant at 1 percent) and decrease in risk investments by 195 rupees (significant at 1 percent). Table A4 in the online appendix presents the results. For the rest of the paper, we will just focus on the preferred specification.

To study how changes in inflation expectations impact the consumption of different types of goods, we run our baseline regressions in Equation (2) based on the Merchant Codes Categories (MCC). Table A5 presents the results. We find that there is a fall in spending in apparel, services and supermarkets when there is a fall in inflation expectations. The rest of the categories of goods (dining, durables, education and health, entertainment, and travel) are not economically and statistically significant. This suggests that changes in inflation expectations

do have an impact on consumer staples (such as supermarkets and apparel) vis-à-vis consumer discretionary goods (such as durables, entertainment and travel). This stands in contrast to the current literature that focus primarily on consumer durables.

Next, we examine how households rebalance across different types of equities. Table A6 presents the results. Here, we find that investors who experienced a fall in inflation expectations are more likely to purchase shares with higher dividend yield and sell shares with higher beta. Consequently, they are less willing to take risks when there is a fall in inflation expectations. In addition, dividends are more attractive when inflation expectations decreased.

## 4.2 Heterogeneity

In this section, we seek to study the importance of the household balance sheet in influencing households' respond to a fall in inflation expectations. First, we study the role of household's liquidity constraints in changing their consumption, bank deposits and investments into risky assets. As households can only influence their intertemporal consumption-savings decisions when they have sufficient liquid assets, we would like to examine the consumption and portfolio rebalancing response by liquid wealth position. Based on the amount of savings they have prior to the policy change; we separate them in 10 different bins (based on the representative sample of 250,000 individuals). Using Equation (4), we then estimate the coefficients from each bin and examine their differential responses. Figure 3 presents the coefficients of each bin. Figure 3 Panel A shows that across the savings deciles, there is a decrease in consumption spending. Households in the lowest deciles increased their consumption spending, while households in the highest deciles decreased their spending. This could partly explain why the results of inflation expectations on consumption is inconclusive to date. Panel B shows that across the savings deciles, there is an increase in savings only for households in the highest savings deciles. There is no statistically significant difference

between deciles 1 to 8. Finally, we find that only households in the highest deciles decreased their investments in risky assets in Panel C. For households in the lower savings deciles, there is an increase in investments into risky assets.

We now turn to income. Based on their salary prior to the policy change, we separate the households in 10 different bins and repeated Equation (4). As shown in Figure A5 in the Online Appendix, we obtained similar results. Our findings highlight the importance of the household balance sheet in using inflation expectations as a policy tool. We find that households who hold little or no liquid wealth, as well as no income are not affected by changes in their inflation expectations. Hence, it is important to consider households' liquidity and income in the use of inflation expectations as a policy tool.

Next, we examine how borrowers respond to the changes in inflation expectations. With a fall in inflation expectations and a constant nominal interest rate, the real interest rate increase. This suggest that borrowers will be worst off. It is of interest to study how they respond vis-à-vis savers. Table A7 reports the regression results. We find that there is an increase in investments into risky assets for households with outstanding loans vis-à-vis those without loans. This suggest that households with loans increased their investment into risky assets. One possible explanation is that households with loans are worst off when there is a decrease in inflation expectations and constant fixed interest rates. Consequently, they would like to invest in risky assets to obtain higher returns.

## 4.3 Possible Explanations

Why do households rebalance their portfolios from risky assets to risk free assets when there is a fall in inflation expectations? We reconcile this with the classical Merton (1969) portfolio choice model. In Merton's model, the fraction of wealth $(W_t)$ allocated to the risky assets can be presented in the following closed form solution: $W_t = \frac{\mu - r}{\sigma^2 \gamma}$. Here, $\gamma$ refers to the constant

relative risk aversion, while r refers to the constant real interest rate for the risk-free rate. Given a risky asset, $S_t$ that evolves according to the stochastic differential equation: $dS_t = \mu.S_t.dt + \sigma.S_t.dz_t$ , $\mu$ and $\sigma$ relates to the expected real return and standard deviation of the risky asset respectively. Subsequently, any policy change that affects $\mu$, the real returns of risky asset and r, the real returns of the risk-free rate asymmetrically will change $W_t$, the fraction of wealth allocated to risky asset.

For households, the risk-free rate can be determined from the savings deposit rate. Unlike institutional investors, they do not have access to bond markets. Furthermore, government securities are highly inaccessible to households in India due to the competitive bidding process. In India, majority of households save directly through bank deposits (which are liquid) and are insured up to a maximum of 500,000 rupees in a bank. Worldwide, there is low participation by household investors in the bond markets. Even in a developed country like the U.S, direct household participation in the bond markets is approximately 1.3 percent according to the 2016 Survey of Consumer Finances.

Changes in inflation expectations are expected to affect the nominal returns of risky assets and the risk-free rate (savings deposit rate) asymmetrically. This is attributed to the rigidity of savings deposit rate (Neumark and Sharpe (1992), Craig and Dinger (2011), Driscoll and Judson (2013). From our administrative bank dataset, there are no changes in the nominal interest rate offered by the bank (risk-free rate). It remains unchanged at 4 percent. Despite changes in the RBI discount rate, treasury yield, changes in actual inflation rate and inflation expectations, the nominal interest rate offered by the commercial bank to savings account holders remain unchanged (Figure 1). Only the term deposit rate change with the bank rate. Hence, due to the nominal rigidity of the savings deposit rate, the nominal return of households' risk-free assets does not change 1 to 1 with changes in inflation expectations. In terms of real

returns, a decrease in inflation expectations (with a constant nominal interest rate) would lead to an increase in the real interest rate of the risk-free assets directly from the Fisher equation.

On the other hand, the impact on the real returns on the stock market is expected to remain unchanged since equities are claims to the productive capital of the real economy (Campbell and Vuolteenaho (2004)). Recent studies have also highlighted that inflation risk is priced in stock returns (Boons et al. (2020)). Consequently, a fall in inflation expectations will lead to a corresponding fall in the nominal rate of return for the risky asset, *ceteris paribus*. In sum, we will expect households rebalance their portfolios from risky assets to safe assets when faced with a fall in inflation expectations due to the asymmetric impact of inflation expectations on the real returns of risk-free assets and risky assets.

We provide the following evidence that portfolio rebalancing is likely to be driven by the nominal rigidity in the savings deposit rate. First, we focus on heterogeneous effects based on the proportion of risky assets held by households. To do so, we repeat Equation (4), and define the interaction term $Z_j$ as the ratio between the households' stock holdings and the total wealth (sum of stock holdings and bank deposits). As households with a high proportion of risky assets in their portfolios stand to gain the most from portfolio rebalancing, we should expect to see more portfolio rebalancing from these households. Table 5 presents the results. Column 2 and 3 show that for households who hold their entire portfolio in risky assets, an increase in inflation expectations by 100 basis points led to a larger increase in bank deposits by 4845 rupees (significant at 1 percent) and a larger fall in risky investments by 2067 rupees (significant at 10 percent) respectively. This is consistent with the hypothesis that portfolio rebalancing is driven by the nominal rigidity of savings deposit rate. Households who hold lesser savings deposits in their portfolio respond to a larger extent.

Second, we compare the outcomes between savings deposits and term deposits. The difference between savings deposits and term deposits is that the interest rate of the latter

changes across time (Figure 1). Consequently, if portfolio rebalancing is due to the nominal rigidity of the savings deposit rate, portfolio rebalancing from risky assets to bank deposits will be driven primarily through savings deposits, and not term deposits. Indeed, we find that the increase in term deposits is economically and statistically insignificant (Table 4). Households increased their savings primarily through their savings account (which offer a constant nominal interest rate) and not term deposits.

## 4.4 Robustness

For robustness, we seek to allay several concerns. First, we conducted a falsification test based on the time period April 2014 to September 2014. This was before the announcement of the inflation targeting policy. We repeat the regressions in Equation (2) and find that the impact on consumption, savings and risky investments are all statistically insignificant and economically negligible. Table 6 presents the results.

One concern of our interpretation would be that the stock market participation rate could be different for households with different inflation expectations. For instance, households in a specific city participate more actively in financial markets. This could drive our results of portfolio rebalancing. To mitigate this concern, we use our dataset from the India financial institution to calculate a new variable "Investor" to determine the percentage of households who have mutual fund accounts or a dematerialization account (an account that is needed to purchase equities directly from the stock market in India) in each city. Using this variable as a treatment intensity, we repeat the regressions in Equation (2). Table A8 presents the results. The impact on savings and risky investments are both statistically insignificant and economically negligible. This allay concerns that portfolio rebalancing is driven by the stock market participation rate in each city. In addition, we would like to highlight that in our preferred specification through city-age group-gender bins, the results remained unchanged.

We also conducted several placebo tests by randomising the treatment in different bins and find most of them statistically insignificant. We highlight one example. Table A9 presents the results of treating the following bins with the actual intensity of the bins in parenthesis: Bin 1 (23), Bin 2 (24), Bin 3 (21), Bin 4 (22), Bin 5 (19), Bin 6 (20), Bin 7 (1), Bin 8 (2), Bin 9 (3), Bin 10 (4), Bin 11 (5), Bin 12 (6), Bin 13 (7), Bin 14 (8), Bin 15 (9), Bin 16 (10), Bin 17 (11), Bin 18 (12), Bin 19 (13), Bin 20 (14), Bin 21 (15), Bin 22 (16), Bin 23 (17), Bin 24 (18). We find that the impact on consumption, savings and risky investments are all statistically insignificant and economically negligible. We then make use of the full sample. Table A10 presents the results. The coefficient for bank deposits is 1,276 rupees (statistically significant at 1 percent) which is similar to our main results of 1,085 rupees. Nonetheless, the coefficient for risky investments are much larger at -2,069 rupees and not statistically significant. This is driven by the top 1% and bottom 1% of households with large changes in risky investments.

We acknowledge that there are some limitations in our paper. For instance, we are unable to track households' purchases of real assets (such as gold or real estate), or international portfolio rebalancing. Households could potentially transfer their savings from foreign countries back to India (when faced with lower inflation expectations). Notwithstanding the above, the key contributions of this paper remain unchanged. Due to nominal rigidities in the savings rate, households increase their bank deposits when there is a fall in inflation expectations. They do so by rebalancing their portfolios. One way is by reducing their investments in risky assets. Furthermore, the household balance sheet matters.

Finally, we note that there could be potential confounding factors that could be driving changes in the outcomes. For instance, there could be changes in concurrent macroeconomic economic changes such as changes in interest rates, foreign currency or stock market fluctuations. Nonetheless, we would like to highlight that we have conducted our analysis using

the difference-in-differences methodology. To the extent that the impact on the different groups is constant during this time, it is unlikely to bias our results.

# 5 Conclusion

This paper seeks to contribute to the growing body of literature studying the impact of inflation expectations on household behaviour. By exploiting a natural experiment in India – Inflation Targeting, we document that households rebalance their portfolios by switching from risky assets to bank deposits when faced with a fall in inflation expectations. While the overall impact on consumption is statistically insignificant, there is a decrease in consumption spending as the savings and income deciles increase. Moreover, portfolio rebalancing takes place primarily for households with large amount of liquid assets. This highlights the importance of the household balance sheet in the study of inflation expectations.

Our study is among the first to study the impact of inflation expectations and portfolio rebalancing. This is important as policymakers seek to contend with the idea of using inflation expectations as a policy tool. For inflation expectations to be an effective policy management tool, it is important to have a better understanding of both household's consumption and portfolio decisions. Recent policy changes such as the U.S Federal Reserve's new strategy of having a "flexible form of average inflation targeting" (Powell (2020)) is expected to raise inflation expectations and impact growth. Nonetheless, our findings highlight that it could potentially elevate risk-taking as households rebalance their portfolios from bank deposits to risky assets, as well as across different type of equities when there is an increase in inflation expectations with fixed nominal rate of returns. This serves as a cautionary note for monetary policymakers.

**References**


Agarwal, S., Chua, Y.H. Ghosh, P. and Song, C., 2020. Consumption and Portfolio Rebalancing Response of Households to Monetary Policy. *Working Paper*

Agarwal, S., Chua, Y.H. and Song, C., 2021. Inflation Expectations of Households and the Upgrading Channel. *Working Paper*

Agarwal, S., Amromin, G., Ben-David, I., Chomsisengphet, S., Piskorski, T. and Seru, A., 2017. Policy intervention in debt renegotiation: Evidence from the home affordable modification program. *Journal of Political Economy*, *125*(3), pp.654-712

Angeletos, G.M. and Lian, C., 2018. Forward guidance without common knowledge. *American Economic Review*, *108*(9), pp.2477-2512

Asnani, S., Kumar, P. and Tomar, S., 2019. Does Inflation Targeting Anchor Inflation Expectations? Evidence from India. *Working Paper*

Barnes, M., Boyd, J.H. and Smith, B.D., 1999. Inflation and asset returns. *European Economic Review*, *43*(4-6), pp.737-754

Beck, G.W., Hubrich, K. and Marcellino, M., 2009. Regional inflation dynamics within and across euro area countries and a comparison with the United States. *Economic Policy*, *24*(57), pp.142-184

Beraja, M., Fuster, A., Hurst, E. and Vavra, J., 2019. Regional heterogeneity and the refinancing channel of monetary policy. *The Quarterly Journal of Economics*, *134*(1), pp.109-183

Blinder, A.S., Ehrmann, M., Fratzscher, M., De Haan, J. and Jansen, D.J., 2008. Central bank communication and monetary policy: A survey of theory and evidence. *Journal of Economic Literature*, *46*(4), pp.910-45

Boons, M., Duarte, F., De Roon, F. and Szymanowska, M., 2020. Time-varying inflation risk and stock returns. *Journal of Financial Economics*, *136*(2), pp.444-470

Borio, C. and Zhu, H., 2012. Capital regulation, risk-taking and monetary policy: a missing link in the transmission mechanism?. *Journal of Financial stability*, *8*(4), pp.236-251

Broda, C. and Parker, J.A., 2014. The economic stimulus payments of 2008 and the aggregate demand for consumption. *Journal of Monetary Economics*, *68*, pp.S20-S36

Brown, M., De Haas, R. and Sokolov, V., 2018. Regional Inflation, Banking Integration, and Dollarization. *Review of Finance*, *22*(6), pp.2073-2108

Brunnermeier, M.K. and Julliard, C., 2008. Money illusion and housing frenzies. *The Review of Financial Studies*, *21*(1), pp.135-180

Burke, M.A. and Ozdagli, A., 2020. Household inflation expectations and spending: Evidence from panel data. *FRB of Boston Working Paper*

Campbell, J.Y. and Vuolteenaho, T., 2004. Inflation illusion and stock prices. *American Economic Review*, *94*(2), pp.19-23

Capistrán, C. and Ramos-Francia, M., 2010. Does inflation targeting affect the dispersion of inflation expectations?. *Journal of Money, Credit and Banking*, *42*(1), pp.113-134

Carroll, C.D., 2003. Macroeconomic expectations of households and professional forecasters. *the Quarterly Journal of Economics*, *118*(1), pp.269-298

Cavallo, A., Cruces, G. and Perez-Truglia, R., 2017. Inflation expectations, learning, and supermarket prices: Evidence from survey experiments. *American Economic Journal: Macroeconomics*, *9*(3), pp.1-35

Christelis, D., Georgarakos, D., Jappelli, T. and Van Rooij, M., 2020. Trust in the central bank and inflation expectation, *International Journal of Central Banking*

Coibion, O. and Gorodnichenko, Y., 2015. Information rigidity and the expectations formation process: A simple framework and new facts. *American Economic Review*, *105*(8), pp.2644-78

Coibion, O., Georgarakos, D., Gorodnichenko, Y. and van Rooij, M., 2019. *How does consumption respond to news about inflation? Field evidence from a randomized control trial* (No. w26106). National Bureau of Economic Research

Coibion, O., Gorodnichenko, Y., Kumar, S. and Pedemonte, M., 2020. Inflation expectations as a policy tool?. *Journal of International Economics*, p.103297

Craig, Ben R., and Dinger V., 2011. The Duration of Bank Retail Interest Rates. *Federal Reserve Bank of Cleveland Working Paper 10-01R.*

Daniel, K., Garlappi, L. and Xiao, K., 2021. Monetary policy and reaching for income. *The Journal of Finance*, *76*(3), pp.1145-1193

D'Acunto, F., Hoang, D. and Weber, M., 2019. Managing Households' Expectations with Salient Economic Policies. *University of Chicago, Becker Friedman Institute for Economics Working Paper*, (2019-106)

D'Acunto, F., Malmendier, U., Ospina, J. and Weber, M., 2021a. Exposure to grocery prices and inflation expectations. *Journal of Political Economy*, *129*(5), pp.1615-1639

D'Acunto, F., Malmendier, U. and Weber, M., 2021b. Gender roles produce divergent economic expectations. *Proceedings of the National Academy of Sciences*, *118*(21)

Di Maggio, M., Kermani, A. and Majlesi, K., 2020. Stock market returns and consumption. *The Journal of Finance*, *75*(6), pp.3175-3219

Drechsler, I., Savov, A. and Schnabl, P., 2017. The deposits channel of monetary policy. *The Quarterly Journal of Economics*, *132*(4), pp.1819-1876

Driscoll, J.C. and Judson, R., 2013. Sticky deposit rates. *FRB Working Paper*

Eggertsson, G.B. and Woodford, M., 2003. *Optimal monetary policy in a liquidity trap* (No. w9968). National Bureau of Economic Research

Eichengreen, B., Gupta, P. and Choudhary, R., 2020. Inflation Targeting in India: An Interim Assessment, *World Bank Policy Research Paper WPS9422.*

Fama, E.F. and Schwert, G.W., 1977. Asset returns and inflation. *Journal of financial economics*, *5*(2), pp.115-146

Fama, E.F., 1981. Stock returns, real activity, inflation, and money. *The American economic review*, *71*(4), pp.545-56

Gabaix X. 2019 Behavioral Inattention In: Handbook of Behavioral Economics, edited by D Bernheim, S DellaVigna and D Laibson. Vol. 2. Elsevier. pp. 261-343

Ichiue, H. and Nishiguchi, S., 2015. Inflation expectations and consumer spending at the zero bound: Micro evidence. *Economic Inquiry*, *53*(2), pp.1086-1107

Jiang, H. and Sun, Z., 2020. Reaching for dividends. *Journal of Monetary Economics*, *115*, pp.321-338

Johnson, D.R., 2002. The effect of inflation targeting on the behavior of expected inflation: evidence from an 11 country panel. J*ournal of Monetary Economics*, *49*(8), pp.1521-1538

Krugman, P.R., Dominquez, K.M. and Rogoff, K., 1998. It's baaack: Japan's slump and the return of the liquidity trap. *Brookings Papers on Economic Activity*, *1998*(2), pp.137-205.

Kundum, S., Kishore., V. and Bhoi, B., 2018 Regional Inflation Dynamics in India, *RBI Bulletin*, November 2018

Lian, C., Ma, Y. and Wang, C., 2019. Low interest rates and risk-taking: Evidence from individual investment decisions. *The Review of Financial Studies*, *32*(6), pp.2107-2148

Lieb, L. and Schuffels, J., 2019. Inflation expectations and consumer spending: the role of household balance sheets, *Working Paper*

Malmendier, U. and Nagel, S., 2016. Learning from inflation experiences. *The Quarterly Journal of Economics*, *131*(1), pp.53-87

Misra, K. and Surico, P., 2014. Consumption, income changes, and heterogeneity: Evidence from two fiscal stimulus programs. *American Economic Journal: Macroeconomics*, *6*(4), pp.84-106

Modigliani, F. and Cohn, R.A., 1979. Inflation, rational valuation and the market. *Financial Analysts Journal*, *35*(2), pp.24-44

Mohan, R. and Ray, P., 2019. Indian monetary policy in the time of inflation targeting and demonetization. *Asian Economic Policy Review*, *14*(1), pp.67-9

Nagayasu, J., 2011. Heterogeneity and convergence of regional inflation (prices). *Journal of Macroeconomics*, *33*(4), pp.711-723

Neumark, D. and Sharpe, S.A., 1992. Market structure and the nature of price rigidity: evidence from the market for consumer deposits. *The Quarterly Journal of Economics*, *107*(2), pp.657-680

Pfajfar, D. and Santoro, E., 2013. News on inflation and the epidemiology of inflation expectations. *Journal of Money, Credit and Banking*, *45*(6), pp.1045-1067

Powell. J. 2020. New Economic Challenges and the Fed's Monetary Policy Review. *Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming*

Rose, A., 2020. iPhones, iCrises and iTargets: Inflation Targeting is eradicating International Financial Crises in the iPhone era. *CEPR Policy Insight No 100*

Schnabel. I. 2021. New narratives on monetary policy- the spectre of inflation. *Speech by Isabel Schnabel, Member of the Executive Board of the ECB,148th Baden-Baden Entrepreneurs' talk*

Sharpe, S.A., 2002. Re-examining stock valuation and inflation: The implications of analysts' earnings forecasts. *Review of Economics and Statistics*, *84*(4), pp.632-648

Vellekoop, N. and Wiederholt, M., 2019. Inflation expectations and choices of households, *Working Paper*

**Table 1. Summary Statistics of Inflation Expectations Survey**

| | Number | Mean | SD |
|---|---|---|---|
| | (1) | (2) | (3) |
| Age | 19.530 | 38.7 | 14.44 |
| Female | 19.530 | 0.44 | 0.50 |
| Current Inflation Expectations | 19.530 | 13.58 | 11.47 |

Notes: This table reports descriptive statistics of the Inflation Expectations Survey of Households conducted by the Reserve Bank of India in 6 cities: Ahmedabad, Bhubaneshwar, Chennai, Delhi, Kolkata and Mumbai. The results presented in this table are obtained using quarterly data from 2014Q1 to 2016Q1. The sample is winsorized at 99% based on the Inflation Expectations.

**Table 2. Summary Statistics of Administrative Bank Data**

| | Number | Mean | SD |
|---|---|---|---|
| | (1) | (2) | (3) |
| **Panel A: Demographics** | | | |
| Age | 153,071 | 48.1 | 15.6 |
| Female | 153,071 | 0.25 | 0.44 |
| Married | 153,071 | 0.61 | 0.49 |
| **Panel B: Consumption** | | | |
| Credit Card Spending | 1,071,497 | 3,030 | 12,475 |
| Debit Card Spending | 1,071,497 | 2,175 | 9,486 |
| Total Card Consumption | 1,071,497 | 5,206 | 15,714 |
| ATM Withdrawals | 1,071,497 | 11,724 | 22,794 |
| Total Consumption | 1,071,497 | 16,930 | 29,666 |
| **Panel C: Bank Deposits** | | | |
| Total Savings | 1,071,497 | 210,663 | 883,023 |
| Total Term Deposits | 1,071,497 | 297,683 | 4,881,455 |
| Total Deposits | 1,071,497 | 508,346 | 5,033,866 |
| Change in Savings | 1,071,497 | 1,898 | 573,069 |
| Change in Term Deposits | 1,071,497 | 3,003 | 542,252 |
| Change in Total Bank Deposits | 1,071,497 | 4,900 | 664,084 |
| **Panel D: Investments in Risky Assets** | | | |
| Mutual Funds Investment | 1,071,497 | 4,685 | 63,086 |
| Direct Investment | 1,071,497 | 2,505 | 46,024 |
| Total Investments in Risky Assets | 1,071,497 | 7,191 | 78,087 |

Notes: The results presented in this table are obtained using data from November 2014 to May 2015. We present the summary statistics of households in 6 cities: Ahmedabad, Bhubaneshwar, Chennai, Delhi, Kolkata and Mumbai. The sample is winsorized at 1% and 99% based on the size of risky investments and 99% based on the size of consumption. This table reports the summary statistics of basic demographic information (Panel A), consumption expenditure (Panel B), Bank Deposits (Panel C), as well as the amount of investments in risky assets (Panel D). All the data are reported in India rupee. To convert to USD, the exchange rate of 70 Indian Rupee to 1 USD (as of January 2020) can be used.

**Table 3. Variation in Inflation Expectations (by city-age group-gender bin)**

| Dep. Var.: | Current Inflation Expectations |
|---|---|
| | (1) |
| Post | -5.720*** |
| | (0.517) |
| Bin2 * Post | -0.175 |
| | (0.817) |
| Bin3 * Post | -1.502* |
| | (0.832) |
| Bin4 * Post | -3.766*** |
| | (1.022) |
| Bin5 * Post | 2.530*** |
| | (0.730) |
| Bin6 * Post | 2.842*** |
| | (0.771) |
| Bin7 * Post | 2.854*** |
| | (0.859) |
| Bin8 * Post | 2.141** |
| | (0.954) |
| Bin9 * Post | 4.574*** |
| | (0.787) |
| Bin10 * Post | 4.010*** |
| | (0.836) |
| Bin11 * Post | 4.587*** |
| | (0.775) |
| Bin12 * Post | 4.144*** |
| | (1.022) |
| Bin13 * Post | 6.060*** |
| | (0.968) |
| Bin14 * Post | 7.932*** |
| | (1.065) |
| Bin15 * Post | 7.029*** |
| | (1.059) |
| Bin16 * Post | 7.314*** |
| | (1.286) |
| Bin17 * Post | 2.167*** |
| | (0.836) |
| Bin18 * Post | 3.324*** |
| | (0.738) |
| Bin19 * Post | 3.486*** |
| | (0.859) |
| Bin20 * Post | 4.762*** |
| | (0.948) |
| Bin21 * Post | 5.446*** |
| | (0.933) |
| Bin22 * Post | 6.455*** |
| | (0.892) |
| Bin23 * Post | 4.639*** |
| | (1.028) |
| Bin24 * Post | 5.826*** |
| | (1.404) |
| Observations | 19,525 |
| R-squared | 0.094 |
| Bin Level Fixed Effects | Y |

Notes: The results presented in this table are obtained using quarterly data from 2014Q1 to 2016Q1 based on the Inflation Expectations Survey of Households. The sample is based on the cities (Ahmedabad, Bhubaneshwar, Chennai, Delhi, Kolkata and Mumbai) and is winsorized at 99% based on the Inflation Expectations. This table presents the OLS estimation of Inflation Expectations with key demographics, the indicator, Post (which is defined as the time period on and after 2015 Q1), as well as the interaction term between the city-age group-gender bins (Refer to Appendix Table A1) and Post. We use bin level fixed effects. The robust standard errors are reported in parenthesis. *,**,*** denote statistically significant levels at 10%, 5% and 1% respectively.

## Table 4. DID Regression Estimates

**Panel A: Consumption**

| Dep. Var.: | Total Consumption | ATM Withdrawals | Total Card Spending | Debit Card Spending | Credit Card Spending |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Treat * Post | -22.74 | -1.804 | -20.93** | -3.292 | -17.64** |
| | (15.77) | (9.558) | (10.09) | (5.690) | (7.415) |
| Obs. | 1,071,497 | 1,071,497 | 1,071,497 | 1,071,497 | 1,071,497 |
| R Square | 0.571 | 0.561 | 0.481 | 0.391 | 0.539 |
| Individual Fixed Effects | Y | Y | Y | Y | Y |
| Month Fixed Effects | Y | Y | Y | Y | Y |

**Panel B: Changes in Bank Deposits**

| Dep. Var.: | Δ Total Bank Deposits | Δ Savings Balance | Δ Term Deposits Balance |
|---|---|---|---|
| | (1) | (2) | (3) |
| Treat * Post | 1,085*** | 985.8** | 99.38 |
| | (328.0) | (386.3) | (314.5) |
| Obs. | 1,071,497 | 1,071,497 | 1,071,497 |
| R Square | 0.065 | 0.045 | 0.053 |
| Individual Fixed Effects | Y | Y | Y |
| Month Fixed Effects | Y | Y | Y |

**Panel C: Investments in Risky Assets**

| Dep. Var.: | Risky Investments | Mutual Fund Investments | Direct Investments |
|---|---|---|---|
| | (1) | (2) | (3) |
| Treat * Post | -170.3** | -129.4*** | -40.86 |
| | (77.62) | (42.59) | (45.41) |
| Obs. | 1,071,497 | 1,071,497 | 1,071,497 |
| R Square | 0.169 | 0.180 | 0.152 |
| Individual Fixed Effects | Y | Y | Y |
| Month Fixed Effects | Y | Y | Y |

Notes: The results presented in this table are obtained using data from November 2014 to May 2015. This table reports the impact of a fall in inflation expectations on consumption (Panel A), changes in bank deposits (Panel B) and investments in risky assets (Panel C). The sample is winsorized at 1% and 99% based on the size of risky investments and 99% based on the size of consumption. The treatment intensity refers to the fall in inflation expectations (by city-age-gender bin) after inflation targeting was introduced in India. Post is an indicator for the time period on and after February 2015. Each column represents the estimation of its corresponding dependent variable that is indicated in the first row. For all the regressions, individual fixed effects and month fixed effects are imposed. Standard errors are clustered at the bin level. The robust standard errors are reported in parenthesis. *,**,*** denote statistically significant levels at 10%, 5% and 1% respectively.

**Table 5. Heterogeneous Effects based on Proportion of Risky Assets**

| Dep. Var.: | Total Consumption | Δ Total Bank Deposits | Risky Investments |
|---|---|---|---|
| | (1) | (2) | (3) |
| Treat * Post | -29.34 | 504.2 | -73.71* |
| | (17.21) | (325.5) | (38.24) |
| Treat * Post * Proportion of Risky Assets | 41.27 | 4,845*** | -2,067* |
| | (37.99) | (1,229) | (1,012) |
| Observations | 1,071,497 | 1,071,497 | 1,071,497 |
| R-squared | 0.571 | 0.065 | 0.170 |
| Individual Fixed Effects | Y | Y | Y |
| Month Fixed Effects | Y | Y | Y |

Notes: The results presented in this table are obtained using data from November 2014 to May 2015. This table reports the impact of changes in inflation expectations on consumption, changes in bank deposits and investments in risky assets. The sample is winsorized at 1% and 99% based on the size of risky investments and 99% based on the size of consumption. The treatment intensity refers the fall in inflation expectations (by city-age-gender bin) after inflation targeting was introduced in India. Post is an indicator for the time period on and after February 2015. Proportion of Risky Assets is the ratio between stock holdings in the Demat account and the total wealth (sum of stock holdings in the Demat account and total bank deposits). Each column represents the estimation of its corresponding dependent variable that is indicated in the first row. For all the regressions, individual fixed effects and month fixed effects are imposed. We also include the fixed effects for Post x Proportion of Risky Assets, as well as Treatment Intensity x Proportion of Risky Assets. Standard errors are clustered at the bin level. The robust standard errors are reported in parenthesis. *,**,*** denote statistically significant levels at 10%, 5% and 1% respectively.

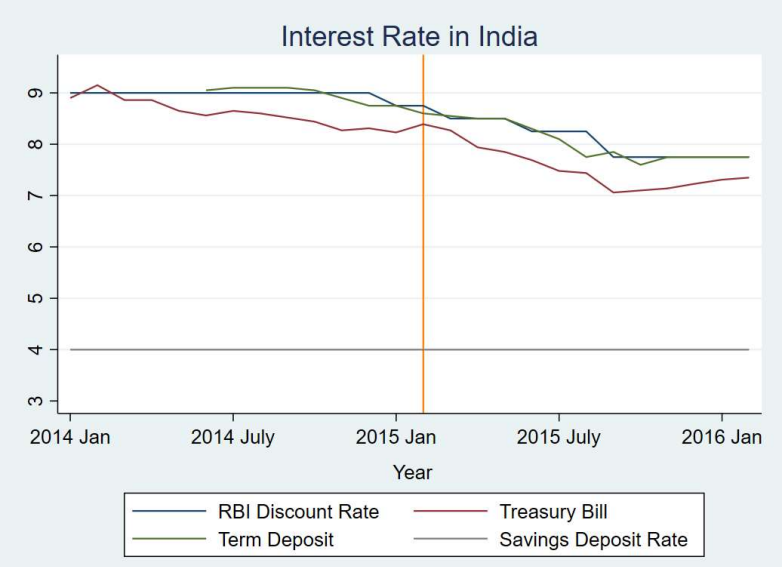
**Table 6. Falsification Analysis (March to August 2014)**

| Dep. Var.: | Total Consumption | Δ Total Bank Deposits | Risky Investments |
|---|---|---|---|
| | (1) | (2) | (3) |
| Treat * Post | 130.2 | -448.2 | 423.1 |
| | (105.6) | (571.7) | (300.2) |
| Observations | 918,426 | 918,426 | 918,426 |
| R-squared | 0.507 | 0.094 | 0.105 |
| Individual Fixed Effects | Y | Y | Y |
| Month Fixed Effects | Y | Y | Y |

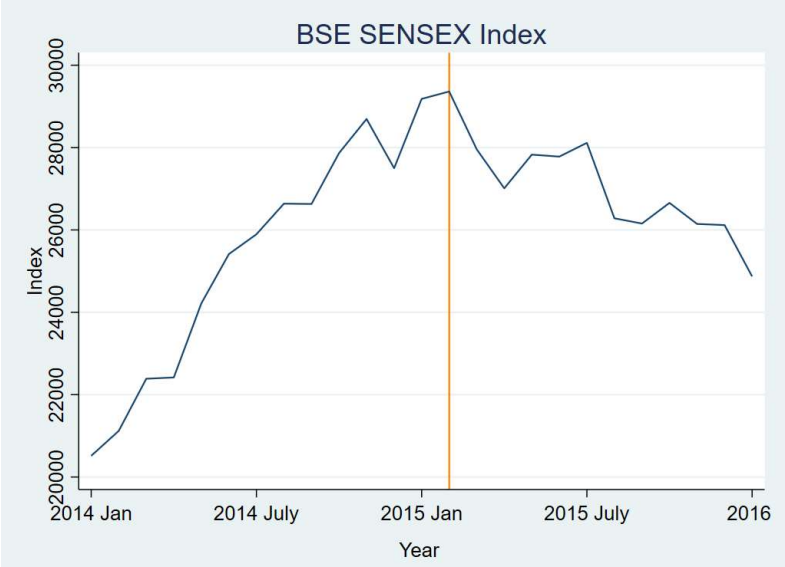
Notes: The results presented in this table are obtained using data from April 2014 to September 2014. This table reports the impact of changes in inflation expectations on consumption, changes in bank deposits and investments in risky assets. The sample is winsorized at 1% and 99% based on the size of risky investments and 1% based on the size of consumption. The treatment intensity refers to the fall in inflation expectations (by city-age-gender bin) after inflation targeting was introduced in India. For the placebo exercise, Post is an indicator for the time period on and after June 2014. Each column represents the estimation of its corresponding dependent variable that is indicated in the first row. For all the regressions, individual fixed effects and month fixed effects are imposed. Standard errors are clustered at the bin level. The robust standard errors are reported in parenthesis. *,**,*** denote statistically significant levels at 10%, 5% and 1% respectively.

**Figure 1. Interest Rate in India**

Panel A:



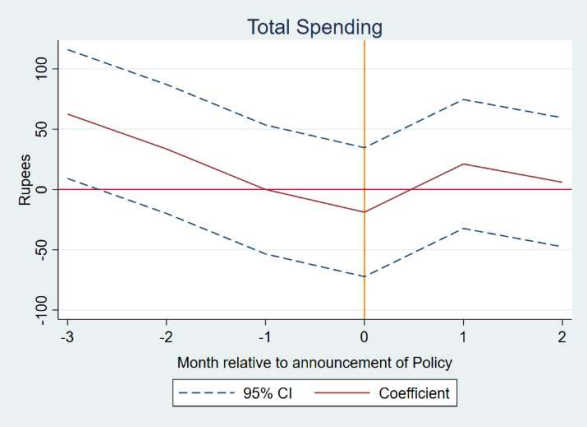

Panel B:



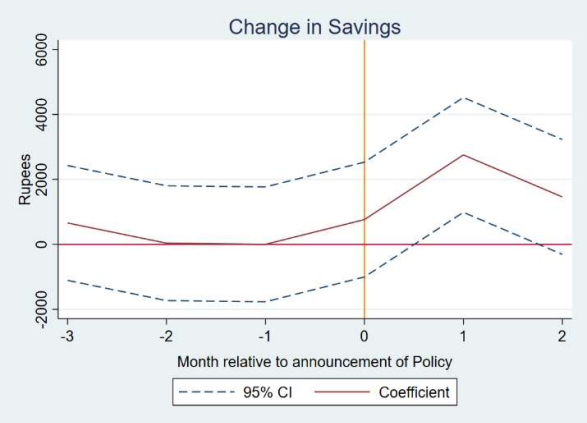

Note: Panel A shows the Reserve Bank of India (RBI) Discount Rate, India Treasury Bill 91-day yield, as well as the 1-year term deposit rate and savings deposit rate offered by the commercial bank described in this paper. Panel B presents changes in the BSE SENSEX, India's most tracked bellwether index over the same time period.

## Figure 2: Event Study

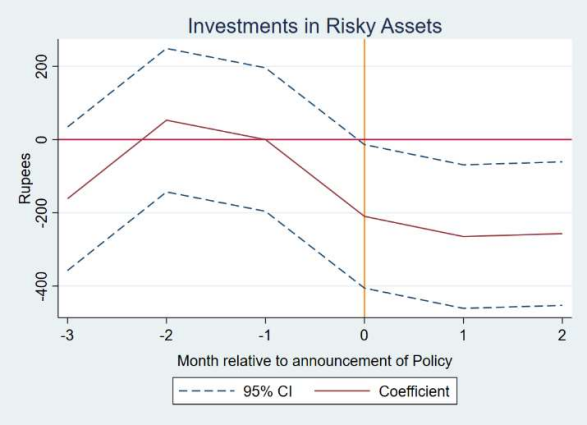
Panel A:




Panel B:



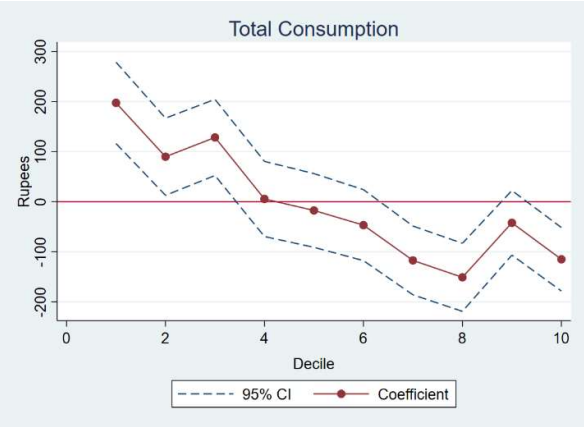

Panel C:




Notes: This figure shows the dynamics of the average treatment effect on consumption (Panel A), changes in bank deposits (Panel B) and investments in risky assets (Panel C). The x-axis denotes the month after the announcement of inflation targeting based on Equation (2). The identification strategy is based on changes in inflation expectations by city-age group-gender bins.

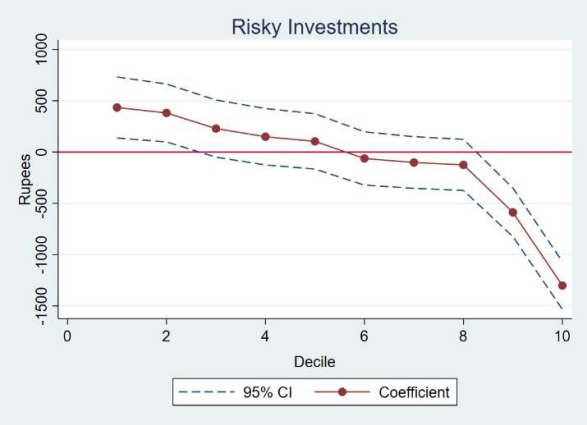
## Figure 3: Heterogenous Effects by Liquid Savings deciles

Panel A:




Panel B:


Panel C:

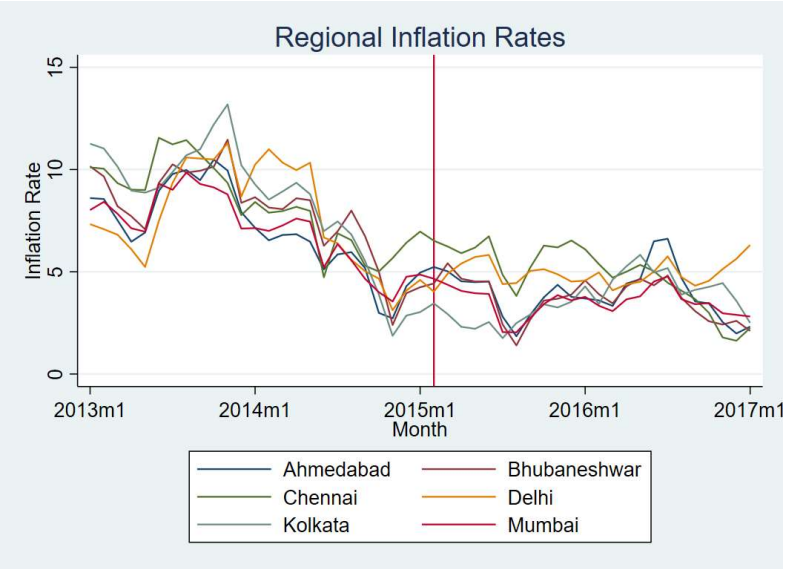



Notes: This figure shows the heterogenous impact of the average treatment effect on consumption (Panel A), changes in bank deposits (Panel B) and investments in risky assets (Panel C) by savings deciles. The identification strategy is based on changes in inflation expectations by city-age group-gender bins.

# Internet Appendix

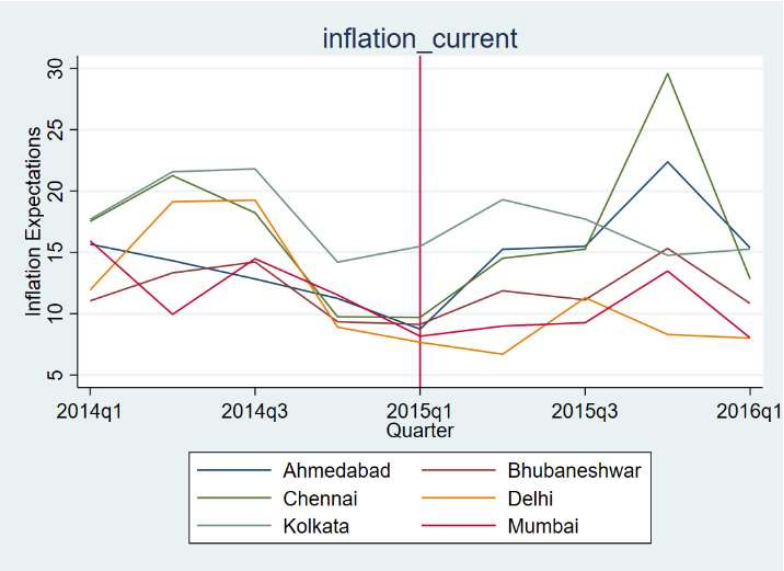
# Not Intended for Publication

**Figure A1. Inflation Rate across cities in India**




Notes: This figure shows the regional inflation rates in 6 different cities: Ahmedabad, Bhubaneshwar, Chennai, Delhi, Kolkata and Mumbai. This is calculated based on the state level (Urban) Consumer Price Index.

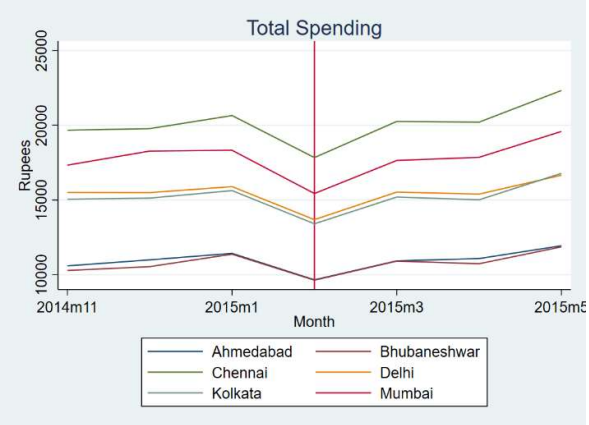
**Figure A2. Inflation Expectations across cities in India**



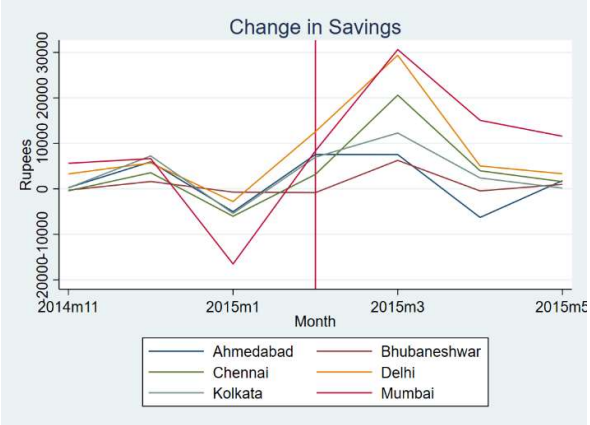

Notes: This figure shows the changes in inflation expectations of households in 6 cities: Ahmedabad, Bhubaneshwar, Chennai, Delhi, Kolkata and Mumbai from 2014Q1 to 2016Q1. The sample is winsorized at 99% based on the size of inflation expectations.

**Figure A3. Raw Data of Spending, Risky Investments and Change in Savings**

Panel A:




Panel B:

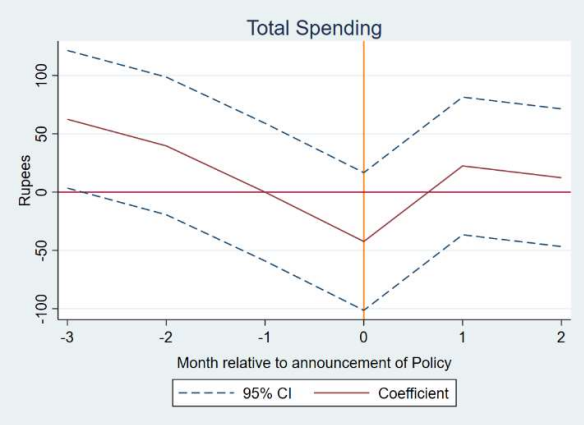



Panel C:

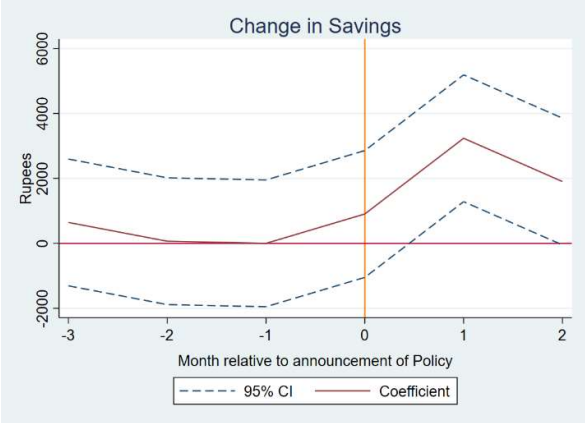

Notes: This figure plots the raw data of the average level of consumption (Panel A), changes in bank deposits (Panel B) and investments in risky assets (Panel C).

## Figure A4. Event Study (by city)

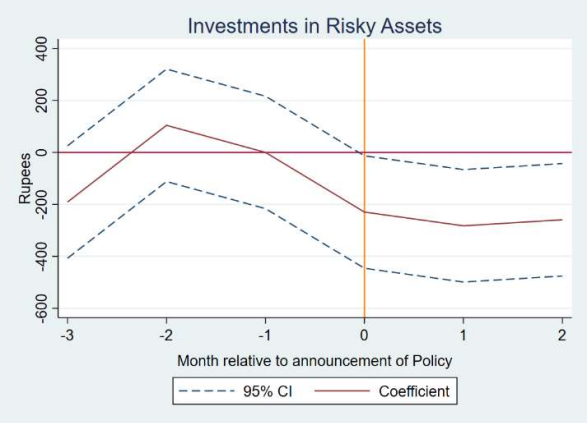
Panel A:




Panel B:



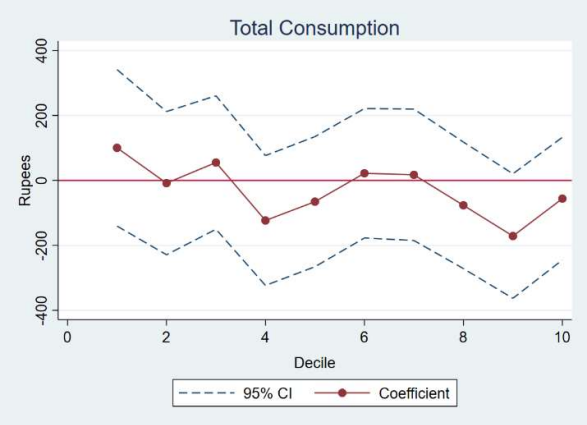

Panel C:




Notes: This figure shows the dynamics of the average treatment effect on consumption (Panel A), changes in bank deposits (Panel B) and investments in risky assets (Panel C). The x-axis denotes the month after the announcement of inflation targeting based on Equation (2). The identification strategy is based on changes in inflation expectations by city.

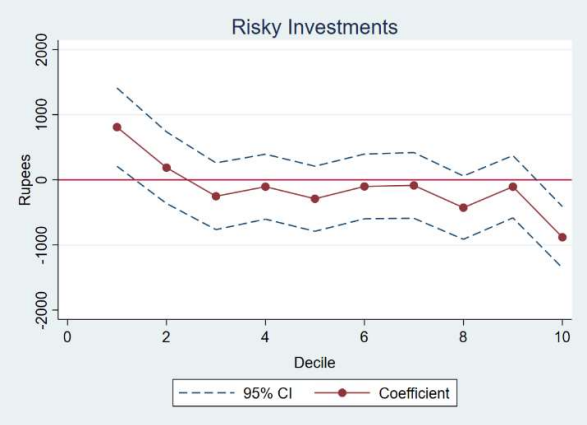
## Figure A5: Heterogenous Effects by Salary deciles

Panel A:




Panel B:


Panel C:




Notes: This figure shows the heterogenous impact of the average treatment effect on consumption (Panel A), changes in bank deposits (Panel B) and investments in risky assets (Panel C) by salary deciles. The identification strategy is based on changes in inflation expectations by city-age group-gender bins.

**Table A1. Classification of Bin Numbers**

| Bin Number | City | Age Group | Gender |
|---|---|---|---|
| 1 | Delhi | Below average | Male |
| 2 | Delhi | Below average | Female |
| 3 | Delhi | Above average | Male |
| 4 | Delhi | Above average | Female |
| 5 | Mumbai | Below average | Male |
| 6 | Mumbai | Below average | Female |
| 7 | Mumbai | Above average | Male |
| 8 | Mumbai | Above average | Female |
| 9 | Kolkata | Below average | Male |
| 10 | Kolkata | Below average | Female |
| 11 | Kolkata | Above average | Male |
| 12 | Kolkata | Above average | Female |
| 13 | Ahmedabad | Below average | Male |
| 14 | Ahmedabad | Below average | Female |
| 15 | Ahmedabad | Above average | Male |
| 16 | Ahmedabad | Above average | Female |
| 17 | Chennai | Below average | Male |
| 18 | Chennai | Below average | Female |
| 19 | Chennai | Above average | Male |
| 20 | Chennai | Above average | Female |
| 21 | Bhubaneswar | Below average | Male |
| 22 | Bhubaneswar | Below average | Female |
| 23 | Bhubaneswar | Above average | Male |
| 24 | Bhubaneswar | Above average | Female |

Notes: This table shows the classification of each city, age group and gender in the different bins.

**Table A2. Regional Variation in Inflation Expectations (by city)**

| Dep. Var.: | Current Inflation Expectations | Current Inflation Expectations |
|---|---|---|
| | (1) | (2) |
| Post | -6.599*** | -6.615*** |
| | (0.319) | (0.318) |
| Mumbai * Post | 3.529*** | 3.497*** |
| | (0.444) | (0.443) |
| Kolkata * Post | 5.214*** | 5.290*** |
| | (0.456) | (0.455) |
| Ahmedabad * Post | 7.889*** | 7.871*** |
| | (0.568) | (0.567) |
| Chennai * Post | 4.233*** | 4.211*** |
| | (0.453) | (0.452) |
| Bhubaneswar * Post | 6.465*** | 6.523*** |
| | (0.535) | (0.534) |
| Female | | 0.369** |
| | | (0.144) |
| Age | | 0.0452*** |
| | | (0.00493) |
| Observations | 19,525 | 19,525 |
| R-squared | 0.090 | 0.093 |
| With Controls | N | Y |
| City Level Fixed Effects | Y | Y |

Notes: The results presented in this table are obtained using quarterly data from 2014Q1 to 2016Q1 based on the Inflation Expectations Survey of Households conducted by the Reserve Bank of India. The sample is based on the cities (Ahmedabad, Bhubaneshwar, Chennai, Delhi, Kolkata and Mumbai) and is winsorized at 99% based on the Inflation Expectations. This table presents the OLS estimation of Inflation Expectations with key demographics, the indicator, Post (which is defined as the time period on and after 2015 Q1), as well as the interaction term between the 5 cities (Ahmedabad, Bhubaneshwar, Chennai, Kolkata and Mumbai) and Post. We use city level fixed effects. The robust standard errors are reported in parenthesis. *,**,*** denote statistically significant levels at 10%, 5% and 1% respectively.

**Table A3. Calculation of Percentage Changes**

| Variables | Treat | Average Value | Percentage Change |
|---|---|---|---|
| Consumption | -22.74 rupees | 16,930 rupees | - 0.1% |
| Change in Bank Deposits | 1,085 rupees | 4,900 rupees | 22 % |
| Risky Investment | -170.3 rupees | 7,191 rupees | - 2% |

Notes: This table reports the workings to calculate the percentage changes. It is derived from the results in Table 2 and Table 3.

## Table A4. DID Regression Estimates (by city)

**Panel A: Consumption**

| Dep. Var.: | Total Consumption (1) | ATM Withdrawals (2) | Total Card Spending (3) | Debit Card Spending (4) | Credit Card Spending (5) |
|---|---|---|---|---|---|
| Treat * Post | -23.65 | 1.197 | -24.85*** | -6.418 | -18.43*** |
| | (16.27) | (12.64) | (9.481) | (6.199) | (7.093) |
| Obs. | 1,071,497 | 1,071,497 | 1,071,497 | 1,071,497 | 1,071,497 |
| R Square | 0.571 | 0.561 | 0.481 | 0.391 | 0.539 |
| Individual Fixed Effects | Y | Y | Y | Y | Y |
| Month Fixed Effects | Y | Y | Y | Y | Y |

**Panel B: Bank Deposits**

| Dep. Var.: | Δ Total Bank Deposits (1) | Δ Savings Balance (2) | Δ Term Deposits Balance (3) |
|---|---|---|---|
| Treat * Post | 1,416*** | 1,221*** | 195.2 |
| | (537.7) | (468.8) | (441.8) |
| Obs. | 1,071,497 | 1,071,497 | 1,071,497 |
| R Square | 0.065 | 0.045 | 0.053 |
| Individual Fixed Effects | Y | Y | Y |
| Month Fixed Effects | Y | Y | Y |

**Panel C: Risky Assets**

| Dep. Var.: | Risky Investments (1) | Mutual Fund Investments (2) | Direct Investments (3) |
|---|---|---|---|
| Treat * Post | -194.9*** | -155.9*** | -38.95 |
| | (59.61) | (47.84) | (35.49) |
| Obs. | 1,071,497 | 1,071,497 | 1,071,497 |
| R Square | 0.169 | 0.180 | 0.152 |
| Individual Fixed Effects | Y | Y | Y |
| Month Fixed Effects | Y | Y | Y |

Notes: The results presented in this table are obtained using data from November 2014 to May 2015. This table reports the impact of a fall in inflation expectations on Consumption (Panel A), Bank Deposits (Panel B) and Risky Assets (Panel C). The sample is winsorized at 1% and 99% based on the size of risky investments and 99% based on the size of consumption. The treatment intensity refers to the regional fall in inflation expectations (by city) after inflation targeting was introduced in India. Post is an indicator for the time period on and after February 2015. Each column represents the estimation of its corresponding dependent variable that is indicated in the first row. For all the regressions, individual fixed effects and month fixed effects are imposed. Standard errors are clustered at the bin level. The robust standard errors are reported in parenthesis. *,**,*** denote statistically significant levels at 10%, 5% and 1% respectively.

**Table A5. Heterogeneous Analysis of Consumption: By Spending Category**

| Dep. Var.: | Apparel | Dining | Durables | Education and Health | Entertainment | Service | Supermarkets | Travel |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Treat * Post | -12.75*** | 0.320 | 0.991 | 2.458 | 1.008 | -3.785** | -4.053*** | -5.659 |
| | (2.440) | (0.953) | (2.628) | (2.891) | (3.727) | (1.654) | (0.983) | (3.469) |
| Observations | 1,071,497 | 1,071,497 | 1,071,497 | 1,071,497 | 1,071,497 | 1,071,497 | 1,071,497 | 1,071,497 |
| R-squared | 0.341 | 0.380 | 0.294 | 0.212 | 0.214 | 0.268 | 0.468 | 0.292 |
| Individual Fixed Effects | Y | Y | Y | Y | Y | Y | Y | Y |
| Month Fixed Effects | Y | Y | Y | Y | Y | Y | Y | Y |

Notes: The results presented in this table show the average total card spending response by spending category from November 2014 to May 2015. The dependent variables are apparel, dining, durable goods, education and health, entertainment, service, supermarkets and travel for each individual in our sample. Merchant type descriptions are provided in the debit and credit card transactions, in which we group them into the corresponding eight categories. The sample is winsorized at 1% and 99% based on the size of risky investments and 99% based on the size of consumption. The treatment intensity refers to the fall in inflation expectations (by city-age-gender bin) after inflation targeting was introduced in India. Post is an indicator for the time period on and after February 2015. For all the regressions, individual fixed effects and month fixed effects are imposed. Standard errors are clustered at the bin level. The robust standard errors are reported in parenthesis. *,**,*** denote statistically significant levels at 10%, 5% and 1% respectively.

**Table A6. DID Regression Estimates for Individual Stocks**

| Dep. Var.: | Net Buy | Net Buy |
|---|---|---|
| | (1) | (2) |
| Treat * Post | -0.000410 | 0.00197*** |
| | (0.000249) | (0.000273) |
| Dividend Yield * Treat * Post | 0.000234*** | |
| | (0.0000444) | |
| Beta * Treat * Post | | -0.00148*** |
| | | (0.000215) |
| Observations | 2,989,896 | 2,989,896 |
| R-squared | 0.178 | 0.178 |
| Individual Fixed Effects | Y | Y |
| Month Fixed Effects | Y | Y |
| Stock Fixed Effects | Y | Y |
| Individual-Stock Fixed Effects | Y | Y |

Notes: The results presented in this table are obtained using data from November 2014 to May 2015. The data structure is at individual-stock-month level. This table reports the impact of changes in inflation expectations on different types of stocks. The sample is winsorized at 1% and 99% based on the size of risky investments and 99% based on the size of consumption. Net Buy is an indicator variable to indicate whether the stock holding has increased (1), decreased (-1) or unchanged (0). The variables Dividend Yield and Beta (derived from CAPM) are obtained from two leading stock exchanges in India, NSE and BSE. Each column represents the estimation of its corresponding dependent variable that is indicated in the first row. For all the regressions, individual fixed effects, month fixed effects, stock fixed effects and individual-stock fixed effects are imposed. Standard errors are clustered at the bin level. The robust standard errors are reported in parenthesis. *,**,*** denote statistically significant levels at 10%, 5% and 1% respectively.

**Table A7. Heterogeneous Effects based on those with loans**

| Dep. Var.: | Total Consumption | Δ Total Bank Deposits | Risky Investments |
|---|---|---|---|
| | (1) | (2) | (3) |
| Treat * Post | -14.36 | 1,015*** | -197.8** |
| | (16.17) | (319.2) | (81.82) |
| Treat * Post * Loans | -83.86 | 765.8 | 308.2* |
| | (59.63) | (474.9) | (167.6) |
| Observations | 1,071,497 | 1,071,497 | 1,071,497 |
| R-squared | 0.571 | 0.065 | 0.169 |
| Individual Fixed Effects | Y | Y | Y |
| Month Fixed Effects | Y | Y | Y |

Notes: The results presented in this table are obtained using data from November 2014 to May 2015. This table reports the impact of changes in inflation expectations on Consumption, Bank Deposits and Risky Investments. The sample is winsorized at 1% and 99% based on the size of risky investments and 99% based on the size of consumption. The treatment intensity refers the fall in inflation expectations (by city-age-gender bin) after inflation targeting was introduced in India. Post is an indicator for the time period on and after February 2015. Loans Indicator is equal to 1 if the household have loans at that point in time (and 0 otherwise). Each column represents the estimation of its corresponding dependent variable that is indicated in the first row. For all the regressions, individual fixed effects and month fixed effects are imposed. Standard errors are clustered at the bin level. The robust standard errors are reported in parenthesis. *,**,*** denote statistically significant levels at 10%, 5% and 1% respectively.

**Table A8. Stock Market Participation as Treatment Intensity**

| Dep. Var.: | Total Consumption | Δ Total Bank Deposits | Risky Investments |
|---|---|---|---|
| | (1) | (2) | (3) |
| Investor * Post | -3,657*** | 16,659 | -549.4 |
| | (1,311) | (43,349) | (4,806) |
| Observations | 1,071,497 | 1,071,497 | 1,071,497 |
| R-squared | 0.571 | 0.065 | 0.169 |
| Individual Fixed Effects | Y | Y | Y |
| Month Fixed Effects | Y | Y | Y |

Notes: The results presented in this table are obtained using data from November 2014 to May 2015. This table reports the impact of city level participation rate in equity markets on Consumption, Bank Deposits and Risky Investments. The sample is winsorized at 1% and 99% based on the size of risky investments and 99% based on the size of consumption. Investor refers to proportion of households in each city that participates in the equity markets. Post is an indicator for the time period on and after February 2015. Each column represents the estimation of its corresponding dependent variable that is indicated in the first row. For all the regressions, individual fixed effects and month fixed effects are imposed. The robust standard errors are reported in parenthesis. *,**,*** denote statistically significant levels at 10%, 5% and 1% respectively.

**Table A9. Placebo Treatment Intensity**

| Dep. Var.: | Total Consumption | Δ Total Bank Deposits | Risky Investments |
|---|---|---|---|
| | (1) | (2) | (3) |
| Treat * Post | -12.25 | 732.8 | -248.1 |
| | (21.06) | (1,205) | (177.4) |
| Observations | 1,071,497 | 1,071,497 | 1,071,497 |
| R-squared | 0.571 | 0.065 | 0.169 |
| Individual Fixed Effects | Y | Y | Y |
| Month Fixed Effects | Y | Y | Y |

Notes: The results presented in this table are obtained using data from November 2014 to May 2015. We conduct a placebo test by randomising the treatment intensity in different bins. In this specification, we treat the following bins with the actual intensity in parenthesis: Bins 1 (23), Bin 2 (24), Bin 3 (21), Bin 4 (22), Bin 5 (19), Bin 6 (20), Bin 7 (1), Bin 8 (2), Bin 9 (3), Bin 10 (4), Bin 11 (5), Bin 12 (6), Bin 13 (7), Bin 14 (8), Bin 15 (9), Bin 16 (10), Bin 17 (11), Bin 18 (12), Bin 19 (13), Bin 20 (14), Bin 21 (15), Bin 22 (16), Bin 23 (17), Bin 24 (18). The sample is winsorized at 1% and 99% based on the size of risky investments and 99% based on the size of consumption. Post is an indicator for the time period on and after February 2015. Each column represents the estimation of its corresponding dependent variable that is indicated in the first row. For all the regressions, individual fixed effects and month fixed effects are imposed. Standard errors are clustered at the bin level. The robust standard errors are reported in parenthesis. *,**,*** denote statistically significant levels at 10%, 5% and 1% respectively.

**Table A10. DID Regression Estimates with full sample**

| Dep. Var.: | Total Consumption | Δ Total Bank Deposits | Risky Investments |
|---|---|---|---|
| | (1) | (2) | (3) |
| Treat * Post | 3.695 | 1,276*** | -2,069 |
| | (26.39) | (447.9) | (2,217) |
| Observations | 1,107,288 | 1,107,288 | 1,107,288 |
| R-squared | 0.914 | 0.056 | 0.142 |
| Individual Fixed Effects | Y | Y | Y |
| Month Fixed Effects | Y | Y | Y |

Notes: The results presented in this table are obtained using data from November 2014 to May 2015. This table reports the impact of changes in inflation expectations on Consumption, Risky Investments and Bank Deposits. We did not winsorize this sample. The treatment intensity refers to the change in inflation expectations after inflation targeting was introduced in India. Each column represents the estimation of its corresponding dependent variable that is indicated in the first row. For all the regressions, individual fixed effects and month fixed effects are imposed. Standard errors are clustered at the bin level. The robust standard errors are reported in parenthesis. *,**,*** denote statistically significant levels at 10%, 5% and 1% respectively.