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Abstract

This study investigates whether information provision on inflation influences household inflation expectations and actual spending in Japan. Using a randomized controlled trial with approximately 2,500 bank account holders, I find that information provision significantly shapes inflation expectations, with respondents adjusting their expectations in line with the information received. However, this adjustment in expectations does not translate into changes in actual spending behavior, as observed through outflow transactions. These findings underscore the challenge of managing inflation expectations.

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*Waseda University (E-mail: kozo.ueda@waseda.jp). The data were made available through a strict contract between Mizuho Bank and Waseda University, and were analyzed in a setting where measures such as masking and other anonymous processing were taken to prevent the identification of individuals. The RCT survey was approved by the Ethics Review Committee on Research with Human Subjects of Waseda University (2023-440) and registered in the American Economic Association Registry (AEARCTR-0012631). The author would like to thank the staff of Mizuho Bank, Fei Gao, Munechika Katayama, Junichi Kikuchi, John Ho Kim, and seminar participants at Osaka University. The author is also grateful for the financial support from the JSPS (19H01491, 23K17562, 23H00046). The views and opinions expressed in this paper are solely those of the author and do not reflect those of Mizuho Bank.

1 Introduction

Central bank communications are critical for enhancing the effectiveness of monetary policy, particularly through the setting of explicit inflation targets. This approach is widely believed to help lower or stabilize inflation, motivating central banks around the world to adopt inflation targeting. Despite this, Japan has experienced chronically low inflation for nearly three decades since the collapse of its asset market bubble in the early 1990s. Japanese households have consistently maintained low inflation expectations, as if minimal price changes were the norm. Even unprecedented monetary easing and the Bank of Japan's adoption of a 2% inflation target in 2013 have failed to anchor inflation at this level. From fiscal year 2010 to 2019, Japan's average inflation rate, based on the Consumer Price Index (CPI), remained at a mere 0.5%.

In this study, I empirically investigate whether providing information about inflation can influence household inflation expectations and actual spending in Japan. I conducted a survey using a randomized controlled trial (RCT) approach with approximately 2,500 bank account holders. In the RCT, respondents were divided into three groups, each receiving different information about inflation. The first part of my study examines whether and how this information provision affects respondents' inflation expectations. The second, and more prominent, aspect of my research investigates how this information influences respondents' actual spending, utilizing bank account transaction data.

The survey was conducted in February 2024 and focused on questions related to expectations. Each respondent received one of three pieces of true information about inflation: (i) the average household inflation expectation is 10%, (ii) the inflation target is 2%, and (iii) the past inflation rate was 0.5%. Prior to and following this information provision, I elicited respondents' prior and posterior expectations concerning inflation and other economic variables. The timing of this survey was particularly unique and valuable for researchers. After years of global inflationary pressures beginning in 2021, Japan's inflation rate finally began to rise, peaking at 4.0% in December 2022 and reaching 2.6% by December 2023, just before the survey in February 2024. The survey also took place one month before the Bank of Japan raised its policy rate to $0 \sim 0.1\%$ in March 2024, the first increase in 17 years. As such, the information provided could either increase or decrease inflation expectations: an increase might occur if the information aligns with the Bank of Japan's 2% target under chronic deflation, while a decrease might occur if respondents had excessively high expectations due to global inflation.

I merge the survey data with transaction data from one of Japan's major banks, using changes in outflows as a proxy for spending (nominal consumption). The primary focus of my analysis is whether and how the information provided leads to different spending responses among respondents.

Main findings are twofold. First, concerning the impact of inflation information on expectations, my analysis yields positive results. Specifically, when respondents are provided with information about higher inflation, they tend to form higher inflation expectations; conversely, information about lower inflation leads to lower inflation expectations. Additionally, I find evidence consistent with the concept of intertemporal substitution, where respondents adjust their expectations on spending in the same direction as they modify their inflation expectations.

Second, despite the positive results observed in expectation formation, respondents do not seem to alter their actual spending in response to the information provided. Across various estimation methods, the effect of information provision on spending consistently appears to be insignificant. Comparing the minimum detectable effect size and sample standard deviation, I confirm that the lack of significance is unlikely due to insufficient statistical power. Only respondents with higher wealth and exposed to higher inflation information show a tendency towards a significantly positive change in spending. This outcome suggests that influencing inflation expectations is far from straightforward. While survey respondents may quickly adjust their expectations, possibly influenced by the experimenter's demand effect, this adjustment does not translate into changes in their actual consumption or saving behaviors based solely on the information provided.

Related Literature This study contributes to growing literature on how household inflation expectations influence their behaviors, particularly consumption. See Coibion et al. (2020), Weber et al. (2022) and D'Acunto, Malmendier, and Weber (2023) for excellent surveys on recent growing studies. For example, Bachmann, Berg, and Sims (2015) examine relationships between inflation expectations and spending using the Michigan Survey in the US. D'Acunto et al. (2023) investigate whether individuals adjust their consumption plans in a consistent manner with their inflation expectation adjustments by focusing their IQ differences. Jiang et al. (2024) also emphasize heterogeneous impacts on consumption, by reporting that, when inflation expectations increase, 63% of households do not change their consumption basket, while 20% and 6% answer that they will decrease and increase spending, respectively. While empirical literature on the ef-

fects of inflation expectations on spending is still inconclusive, a positive relationship is frequently found, for example, by Ichiue and Nishiguchi (2015), Vellekoop and Wiederholt (2019), Duca-Radu, Kenny, and Reuter (2021), Binder and Brunet (2022), and Andrade et al. (2023). By contrast, an insignificant or mixed relationship is reported by Bachmann, Berg, and Sims (2015a) and Jiang et al. (2024). D'Acunto, Malmendier, and Weber (2023) argue that "a growing body of work using high-quality micro data convincingly shows that inflation expectations do guide the economic choices of households and firms."

Early studies including the ones cited above encounter two main challenges. The first is an endogeneity problem. Expectation formations are endogenous, and thus, causality from expectations to behaviors cannot be clearly analyzed. The second challenge is reliance on self-reporting surveys regarding both inflation expectations and behaviors such as spending, borrowing, and investment. Surveyed consumption does not necessarily coincide with actual consumption. Further, by asking consumption, respondents' answers on consumption may be affected by experimenter demand effects.

D'Acunto, Hoang, and Weber (2022), Coibion, Gorodnichenko, and Weber (2022), Galashin, Kanz, and Perez-Truglia (2022), Coibion et al. (2023, 2024), and Kostyshyna and Petersen (2024) overcome one or both of these challenges. To address the first challenge of endogeneity, Coibion et al. (2023) conduct an RCT survey to Dutch households to examine how an exogenous change in inflation expectations affects consumption. Respondents in a treatment group are provided information about recent inflation, which helps lower their inflation expectations. By conducting follow-up surveys, they find that lowered inflation expectations increase spending on durable goods. D'Acunto, Hoang, and Weber (2022) exploit the unexpected increase in a value-added tax (VAT) in Germany as a natural experiment. By using a difference-in-differences strategy, they evaluate this policy change on household inflation expectations and spending. Although spending is measured by a survey, which is self reported, the survey is regularly conducted and isolated from the event of the VAT increase, so that respondents are exempt from experimenter demand effects. Bachmann et al. (2021) exploit the event of VAT cut in Germany. Galashin, Kanz, and Perez-Truglia (2022) find that expert forecasts influence inflation expectations, but not spending or self-reported consumption plans by using an RCT survey and administrative data on credit card transactions. Coibion et al. (2024) and Kostyshyna and Petersen (2024) study the effect of uncertainty on spending by the RCT survey.

Coibion, Gorodnichenko, and Weber (2022) is probably the closet to my study. They conduct a large-scale RCT survey of around 20,000 respondents in the US to study the causal effect of information on inflation expectations and spending. Their spending is measured by not just follow-up surveys but also spending data from Nielsen Homescan panel, in which respondents record their grocery purchases by scanning the barcodes of the products they purchase. Coibion, Gorodnichenko, and Weber (2022) find that providing the inflation target and alike lowers inflation expectations by approximately 1% points. Furthermore, it has the real effect, increasing spending over the next 6 months.

This study has several similarities and differences, compared with Coibion, Gorodnichenko, and Weber's (2022) study. The most important similarity is that both studies conduct an RCT survey regarding respondents' inflation expectations and measure their actual spending thereafter. This enables us to make a sharp causal inference from an external change in inflation expectations to consumer spending. There are three notable differences. First, this study is conducted in Japan with low inflation records, while Coibion, Gorodnichenko, and Weber's (2022) study is in the US. Inflation expectations of Japanese households were staggeringly low, and thus, information provision about inflation may well have different effects on inflation expectations and spending. Weber et al. (2024) show that households in low-inflation economies are less attentive to inflation information, leading to larger impacts from information experiments. Second, my survey is smaller scaled in terms of the number of respondents and questions. The number of respondents and questions are approximately 2,200 and 20 in this study, respectively, while they are 20,000 and 40 in their study. My survey respondents are Mizuho bank account users, who are unfamiliar to surveys unlike those in Nielsen. In order to ensure the quantity and quality of surveys, I aim to reduce the number of questions at minimum. Although the number of questions is 19, a repeated format is used to ask questions on inflation, interest rate, mortgage rate, income, and spending, which helps decrease respondents' burden. By contrast, Coibion, Gorodnichenko, and Weber (2022) help uncover the effects of a wide range of information treatments. Third, the measurement of spending is different. I measure spending by tracking the monetary outflows from respondents' bank accounts, which encompasses a broader range of spending compared to that in Coibion, Gorodnichenko, and Weber (2022), where spending is primarily focused on groceries. However, my method lacks the ability to distinguish between different components of spending, potentially including expenditure beyond consumption. Moreover,

while bank transaction data are automatically collected data, homescan typically rely on respondents' voluntary participation. This could increase their awareness (salience) of spending, potentially amplifying the effect of information provision on consumption behaviors.

My results are consistent with Coibion, Gorodnichenko, and Weber's (2022) in showing significant effects of information provision on inflation expectations, but not consistent in not finding significant effects on actual spending. In this regard, my results are in line with Galashin, Kanz, and Perez-Truglia (2022), suggesting that managing inflation expectations as a policy tool is by no means easy.

In terms of an analytical framework, Schnorpfeil, Weber, and Hackethal (2023) is also close to this study. They conduct an RCT information provision experiment on a major German bank account holders to study how it changes expectations and consumption. Emphasizing a channel, through which inflation erodes household asset and debt, they find that information provision on the debt-erosion channel increases both planned and actual consumption. Schnorpfeil, Weber, and Hackethal (2024) conduct another RCT to examine how information provision on inflation and asset returns influences actual trading behaviors. They conclude that learning about past asset returns has an effect on actual trading.

Studies on information effects on other types of economic behaviors include Bailey et al. (2018) and Armona, Fuster, and Zafar (forthcoming) on housing and Coibion, Gorodnichenko, and Kumar (2018), Coibion, Gorodnichenko, and Ropele (2020), and Hunziker et al. (2022) on firms decisions. Coibion, Gorodnichenko, and Ropele (2020) conduct an RCT survey to firms in Italy and report that higher inflation expectations induce firms to raise their prices and reduce employment and capital.

While the main contribution of this study is to estimate the causal effect of information provision about inflation on respondents' actual spending, it also has contribute to literature on the causal effect of information provision on inflation expectations. For example, Armantier et al. (2016) conduct an RCT survey in the US and find that new information makes respondents revise their inflation expectations in a consistent manner with Bayesian updating. Cavallo, Cruces, and Perez-Truglia (2016) investigate how individuals change their inflation expectations when the Argentina government manipulated official inflation statistics. Roth and Wohlfart (2020) conduct a survey RCT experiment in the US, where different professional forecasts about the likelihood of a recession are provided. They find that information provision influences respondents' expectations

on economic outlook, consumer plans, and stock purchases. Further, by conducting a two-week follow-up survey, they find that this information provision has a persistent effect. See also Armantier et al. (2015), Abe and Ueno (2016), Cavallo et al. (2017), Binder and Rodrigue (2018), Diamond, Watanabe, and Watanabe (2020), Andre et al. (2022), Coibion, Gorodnichenko, and Weber (2022), Roth, Settele, and Wohlfart (2022), D'Acunto et al. (2023), Binetti, Nuzzi, and Stantcheva (2024) and Stantcheva (2024) for inflation expectation formations.

This study contributes to the literature on Japan's chronic low inflation. Key works on inflation expectations in Japan include Ueda (2010), Abe and Ueno (2016), Diamond, Watanabe and Watanabe (2020), and Kikuchi and Nakazono (2023). The relationship between inflation expectations and consumer spending is studied by Ichiue and Nishiguchi (2015).

There has been a steady increase in studies using bank transaction data. Baker and Kueng (2022) provide a review of household financial transaction data. Kubota, Onishi, and Toyama (2021) and Ueda (2024) use the same Mizuho Bank data as I do. I follow Kubota, Onishi, and Toyama (2021) in most of the analysis, where the largest difference is that I combine the RCT survey data.

The remainder of this paper is structured as follows. Section 2 explains experiment design and data. Section 3 discusses results, and Section 4 concludes.

2 Experiment Design and Data

I use RCT survey and transaction data thanks to the collaboration with Mizuho Bank, which is one of the three largest banks in Japan, with approximately 24 million accounts held by individual customers (one out of every five people).[1]

2.1 RCT Survey

I conducted an RCT survey from February 13 to 19, 2024. Mizuho bank sent 200,000 bank account users an email to ask them to answer the survey, stating that we would give an Amazon gift card worth 1,000 Japanese yen (JPY) to 500 respondents.[2] The 200,000 bank account users were selected randomly from those who received their salary

[1] https://www.mizuho-fg.co.jp/investors/individual/strength/index.html

[2] 1 US dollar was 150 JPY as of February 15, 2024.

regularly. I collected 2,626 responses, where the response rate was 1.31%.[3]

In the RCT survey, I ask respondents questions mainly about their expectations regarding inflation and other economic variables such as spending, income, and interest rates. Following the methodology of Roth and Wohlfart (2020, 2022), I first elicit respondents' prior expectations before providing them with one of three true pieces of information on inflation. Afterward, I ask for their posterior expectations. An alternative design, which involves providing no information to a control group, is discussed by Roth and Wohlfart (2020), who caution against this approach due to the risk of shifting unrealistic priors simply due to information provision. Useful surveys on designing information provision experiments are provided by Haaland, Roth, and Wohlfart (2023) and Stantcheva (2023). In Online Appendix A, I include the English translation of the RCT survey. The survey consists of the following steps:

1. Provision of Information on Past Economic Outcomes: All respondents receive information on past economic outcomes before I elicit their prior expectations. This step aims to anchor their expectations at a common level, ensuring that their responses to prior expectations are meaningful (Ansolabehere, Meredith, and Snowberg 2013; Roth and Wohlfart 2023).

2. Elicitation of Prior Expectations: I ask respondents for their prior expectations on inflation and other economic variables, requesting point estimates.

3. Provision of Information on Inflation: Respondents are given one of three pieces of information on inflation:

   (a) "According to a survey of individuals, prices are expected to rise by about 10% in one year compared to now (as of December 2023, median expectation, Opinion Survey on the General Public's Views and Behavior)."

   (b) "The Bank of Japan has set a price stability target of a 2% year-on-year increase in the consumer price index and has promised to achieve this as soon as possible."

   (c) "The inflation rate over the past 10 years was about 0.5% (fiscal years 2010–2019, year-on-year increase in the consumer price index)."

[3]Schnorpfeil, Weber, and Hackethal (2023) conduct a survey to account users of a German bank and the overall response rate is 1.8%. They further argue that this response rate is comparable to other surveys of the bank.

Although all three statements are true, the first conveys higher inflation expectations than the second, followed by the third.

4. Elicitation of Posterior Expectations: I then elicit respondents' posterior expectations, asking them to assign probabilities to around ten brackets of possible scenarios (probability estimate). This approach is similar to the one used by the Federal Reserve Bank of New York in their Survey of Consumer Expectations (Armantier et al. 2017).

In the RCT, respondents were randomly divided into three groups with similar characteristics based on age, income, and gender. Specifically, wage earners targeted by the survey were divided into 8 groups based on age (45 and under, over 45), income (under 4 million yen, over 4 million yen), and gender (male, female). Each group was then randomly assigned to receive one of three pieces of information. This assignment was carried out in advance, so there was no guarantee that the resulting respondents would perfectly adhere to this even distribution.

Median response time was 8.6 minutes. Although there were 19 questions, a repeated format was used to inquire about inflation, interest rates, mortgage rates, income, and spending. This design helped reduce respondents' burden.

2.2 Mizuho Transaction Data

Transaction data record all transactions involving Mizuho Bank, including automatic teller machine (ATM) cash withdrawals, payroll receipts, and bank transfers, all of which are assigned identification codes and remarks in Japanese. The time frame ranges from -3 to 4 months, with the base month 0 covering the four weeks starting from the week that includes February 13, when the survey was conducted. When the time unit is measured in weeks, the time frame spans from -12 to 19 weeks, with the base week 0 being the week that includes February 13.

I define spending as total outflows excluding those related to savings. Outflows are defined as all transactions that decrease the amount of deposits. While the data lack detailed information on spending components, some outflows may be directed toward investments and loan repayments, which are not strictly considered consumption. To refine the definition, I exclude outflows marked as either "shoken" (securities) or "gohensai" (repayment), indicative of transfers to securities companies and loan (mortgage)

repayments, respectively. For robustness, I also proxy spending by cash withdrawals from ATMs or total outflows including savings. As discussed in Ueda (2024), cash remains a major payment method in Japan. Note that this measure of spending corresponds to nominal consumption.

Several caveats regarding this transaction data need to be clarified. First, although all outflows are recorded, the purpose of these outflows is not specified. Second, the data are captured at the individual level rather than the household level. Third, many individuals hold accounts at institutions other than Mizuho Bank, meaning the transactions recorded in this data do not necessarily capture all of an individual's financial activities.

In addition to the transaction data, monthly updates on wealth and annualized income are provided. Wealth is defined as the balance of deposits at Mizuho Bank, which includes the sum of demand deposits, time deposits, other banking accounts, public bonds, mutual funds, and balances from life and non-life insurance. Annualized income refers to labor earnings, either based on the actual amount of salary and bonuses received in the past year (after tax and social contributions) deposited into users' accounts or the self-reported amount. Wealth and annualized income are reported in thousands of JPY. Additionally, I have access to information on personal characteristics such as year of birth, gender, and registered address data at the municipal level.

2.3 Data Properties

While I have a total of 2,626 respondents initially, this number decreases to 2,594 when focusing on the subset of respondents who possess both transaction records and appropriate survey answers, resulting in the exclusion of 1.2% of the initial sample. Respondents are excluded if a respondent's prior inflation expectations exceeds an absolute value of 100% (Q4), if the sum of probabilities across approximately ten possible scenarios regarding posterior expectations does not total 100% (Q10), or if a respondent consistently assigns a probability of 100% to the first scenario across all questions (Q10 to Q14). This approach ensures that only respondents who appear to have understood and seriously engaged with the survey questions are included in the analysis.

In Online Appendix B, I present the more detailed number of respondents and the descriptive statistics for both the survey and bank transaction data. A critical question in such surveys is the representativeness or unbiasedness of the sample. This issue has two main dimensions.

First, general representativeness examines whether the survey respondents are representative of the broader population in Japan. My analysis indicates that, while the respondents are largely representative, there is a noticeable concentration of respondents around the age of 50, and they tend to have greater wealth and higher incomes because they are more elderly.

Second, group comparability concerns whether there are any significant differences in characteristics between the three information groups to which respondents were randomly assigned. My findings confirm that there are no discernible differences among respondents across the different groups, ensuring that any observed effects are attributable to the information provided rather than pre-existing differences between the groups.

3 Results

3.1 Effects of Information on Expectations

Inflation Expectations I calculate prior expectations directly from respondents' point estimates. Throughout this study, posterior expectations are determined by the weighted average of expectations, calculated from respondents' probability estimates. For variables other than inflation, it is possible that the sum of probabilities across possible scenarios for posterior expectations does not total 100%. In such cases, I normalize the probabilities by dividing each by the total sum of probabilities.

Figure 1 displays the distribution of inflation expectations. While no discernible differences between the groups are observed for prior inflation expectations, posterior inflation expectations show variation. Specifically, the provision of 10% inflation expectations results in higher inflation expectations compared to other types of information provided.

When comparing prior and posterior inflation expectations, I observe that the former tends to be higher than the latter. This finding is consistent with D'Acunto, Malmendier, and Weber (2023), who report that the average inflation expectations implied by point-estimate questions are systematically higher by about 2 percentage points than those obtained from probability-estimate questions.

Formally, I run the regression of the following equation:

$$\mathbb{E}_i^{post}[Y] - \mathbb{E}_i^{pre}[Y] = c + \beta D_i^T + \varepsilon_i, \tag{1}$$

where $\mathbb{E}_i^{post}[x]$ and $\mathbb{E}_i^{pre}[x]$ represent respondent i's posterior and prior expectations, respectively, on variable x, and D_i^T denotes the type of information provision that respondent i receives. A base group is provided with 10% inflation expectations.

Table 1 presents the estimation results. The intercept is negative at -1.0%, indicating a baseline decline in inflation expectations. Information provision of both 2% and 0.5% inflation further reduces inflation expectations by 1.7 percentage points and 1.0 percentage points, respectively. These results demonstrate the effectiveness of information provision in influencing inflation expectations, at least in the short term during the survey period.

I further investigate the effects of information provision on the uncertainty and disagreement of inflation expectations. In this context, uncertainty refers to the confidence level of individual respondents in their expectations, while disagreement reflects the variation in expectations among different respondents. As detailed in Online Appendix C, my analysis indicates that the provision of information does not significantly influence either the uncertainty or the disagreement surrounding inflation expectations.

Expectations Other than Inflation In addition to inflation expectations, I analyze respondents' expectations regarding other economic variables, including interest rates, income, and spending. According to the Taylor rule, which serves as a guideline for monetary policy, higher inflation should be accompanied by higher interest rates, leading to corresponding increases in the interest rate on demand deposits and mortgage rates. Furthermore, based on the real-nominal dichotomy, higher inflation should also result in greater nominal spending and income.

However, as shown in Table 1, the impact of information provision on these expectations is generally insignificant. One exception is the case where the provision of 0.5% inflation information leads to a modest reduction in interest rate expectations by 0.16 percentage points. This suggests that while inflation expectations can be influenced by targeted information, other economic expectations remain largely unaffected under similar conditions.

Euler Equation To further explore the relationship between inflation expectations and consumption (spending) expectations, I start with the standard intertemporal optimization (Euler) equation:

$$C_t = \mathbb{E}[C_{t+1}] - \sigma(i_t - \mathbb{E}[\pi_{t+1}] - r_t^*),$$

where C_t, i_t, and r_t^* represent log real consumption, nominal interest rate, and the natural rate of interest, and σ denotes the parameter of the elasticity of intertemporal substitution. Then, log nominal spending P_tC_t, which respondents are supposed to answer in the survey, is described as

$$\mathbb{E}[P_{t+1}C_{t+1}] - P_tC_t = (1-\sigma)\mathbb{E}[\pi_{t+1}] + \sigma(i_t - r_t^*)$$

This equation suggests that inflation expectations (the right-hand side) increase an expected change in nominal spending (the left-hand side) positively and negatively, when σ is smaller and larger, respectively, than one. Further, the nominal interest rate increases nominal spending expectations, while the natural rate of interest decreases it, as long as σ is positive.

Based on this equation, I run the regression of the following equation:

$$\begin{aligned}\mathbb{E}_i^{post}[P_{t+1}C_{t+1}] - \mathbb{E}_i^{pre}[P_{t+1}C_{t+1}] = c + \beta\left(\mathbb{E}_i^{post}[\pi_{t+1}] - \mathbb{E}_i^{pre}[\pi_{t+1}]\right) \\ + \gamma\left(\mathbb{E}_i^{post}[Z_{t+1}] - \mathbb{E}_i^{pre}[Z_{t+1}]\right) + \varepsilon_i, \qquad (2)\end{aligned}$$

where Z_{t+1} represents surveyed variables other than inflation. While the estimation of this type of Euler equation often faces a challenge of endogeneity, in this analysis, changes in inflation expectations are exogenous, driven by information provision, which helps estimate one minus the elasticity of intertemporal substitution. I estimate the above equation not only by the ordinary least squares (OLS) but also using the instrument variable (IV) of information treatments (2% or 0.5% inflation provision). In the IV regression, the first-stage F statistics is significant, as shown in Table 1.

Table 2 shows the estimation results. The coefficient β is estimated approximately 0.25 and significant in the OLS estimates (columns (1) and (2)), although it becomes insignificant at the 5% level in the IV (column (3)). The estimated value of 0.25 implies that the elasticity of intertemporal substitution (σ) is 0.75, which is consistent with the empirical literature, where σ typically centers around one.

Regarding other coefficients besides inflation expectations, column (1) shows that the coefficient on the interest rate is positive, which is consistent with a positive σ, but insignificant at the 5% level. Additionally, the coefficient on income is significantly positive, which likely reflects the income effect.

3.2 Effects of Information on Spending

In this subsection, I tackle my main question as to whether information provision influences actual spending by combining the RCT survey data with bank transaction data.

Panel Data Analysis First, I estimate the following difference-in-differences (DID) type equation:

$$Y_{it}/\bar{Y}_i = \beta D_{it}^T + \gamma Z_{it} + \alpha_i + \alpha_t + \varepsilon_{it}, \tag{3}$$

where Y_{it} represents an outcome variable (e.g., outflows) for respondent i in month t, and D_{it}^T denotes a dummy variable that equals one if respondent i receives treatment T (i.e., 10% or 2% inflation information) and month t is during or after the survey. Otherwise, D_{it}^T equals zero. The individual and month fixed effects are incorporated by α_i and α_t, respectively. Control variables Z_{it} include inflows during month t, the logarithm of (wealth plus 0.001), and the logarithm of (annual income plus 0.001) at the end of month $t-1$. The time frame ranges from -3 to 4 months, with the base month 0 covering the four weeks starting from the week that includes February 13. Outflows Y_{it} and inflows in Z_{it} are standardized by dividing by their time means from -2 to 3 months, accounting for cases where Y_{it-1} may be zero, making simple rate-of-change calculations impossible. Further, the sample is restricted to individuals with monthly mean outflows and inflows exceeding 10,000 JPY (1,000 JPY when analyzing cash withdrawals as Y_{it}) to exclude inactive bank accounts and mitigate excessive fluctuations in these variables.

Columns (1) to (4) of Table 3 present the estimation results for the DID model. The coefficients β across all columns are statistically insignificant at the 5% level. Only the coefficient on the 0.5% inflation information provision treatment is significant at the 10% level, with a value of -0.11. This suggests that providing information about a 0.5% inflation rate reduces spending by 11%.

The lack of significance may be due to low statistical power. To evaluate this, I calculate the minimum detectable effect (MDE) size following Bloom (1995) and Coles, Heath, and Ringgenberg (2022). The MDE is expressed as $(Z_{1-\alpha/2}+Z_{1-\beta})\cdot\sqrt{(1-R^2)/(T(1-T)N)}\sigma_Y$, where Z_x represents the inverse of the normal cumulative distribution for probability x; R^2 is the regression's explanatory power; T is the proportion of the sample that is randomly assigned to the treatment group; N is the number of observations; and σ_Y is the sample standard deviation of outcome variable Y_{it}. The term $Z_{1-\alpha/2}+Z_{1-\beta}$ ensures that the true effect is likely (i.e., with the statistical power of $1-\beta$) to be statistically signifi-

cant at significance level α, given a unit standard error. The standard error is computed as $\sqrt{(1-R^2)/(T(1-T)N)}\sigma_Y$. For this study, I set $\alpha = 0.05$, $1-\beta = 0.8$, and $T = 1/3$, while R^2, N and σ_Y vary depending on the specific regression.

In Table 3, I display the MDE size and sample standard deviation below each estimate. In column (1), the estimated treatment effects (0.0012 and -0.11 for 2% and 0.5% inflation information provision, respectively) are considerably smaller than the size of sample standard deviation, which is 3.41. Additionally, the MDE size is 0.13, which is only 4% of the sample standard deviation. This suggests that the RCT experiment can detect a treatment effect of 4% of one standard deviation. However, no significant effect is found at the 5% significance level. Similarly, when the outcome variable is cash withdrawals, the estimated coefficients on information treatments remain insignificant, as indicated in column (2). Both the estimated treatment effect and the MDE size are again much smaller than one standard deviation of the outcome variable.

In columns (3) and (4), I attempt to reduce the MDE size by using a more restrictive sample. Based on the results of surveyed expectations shown in Table 1, spending changes are expected to be around 1%, necessitating a smaller MDE of approximately 0.01. Therefore, I select observations with limited fluctuations, specifically those where the absolute value of outflow deviations from their sample mean ($Y_{it}/\bar{Y}_i - 1$) is less than 0.5. This strategy effectively reduces the MDE size to about 0.01, enabling the detection of spending changes as small as 1%. Despite this, the estimated coefficients remain insignificant.

Therefore, the lack of significant effects is unlikely due to insufficient statistical power. Online Appendix C demonstrates that the insignificance of the coefficients remains robust when the outcome variable is expressed in levels or when the data are analyzed on a weekly basis. The coefficient on information provision is only significant at the 5% level when 0.5% inflation information is provided and the data are analyzed weekly.

IV Analysis Second, I follow Coibion, Gorodnichenko, and Weber (2022) to estimate the following equation:

$$Y_{it}/\bar{Y}_i = \beta \mathbb{E}_i^{post}[\pi_{t+1}] + \delta \mathbb{E}_i^{prior}[\pi_{t+1}] + \gamma Z_{it} + \alpha_t + \varepsilon_{it}, \tag{4}$$

where $\mathbb{E}_i^{post}[\pi_{t+1}]$ is instrumented using the treatment of 2% or 0.5% inflation provision. This method focuses on the transmission mechanism from information provision

to spending through inflation expectations. Given that inflation expectations are time-invariant, individual fixed effects α_i are not included in this regression.

Column (5) of Table 3 shows that the coefficient on posterior information expectations is found to be insignificant. Although the first-stage F statistic is significant, confirming the validity of the instrument used for posterior inflation expectations, the lack of a significant coefficient indicates that information provision does not appear to influence spending in this context. Again, the insignificance of the coefficients is robust when the outcome variable is expressed in levels or when the data are analyzed on a weekly basis.

Dynamic Analysis Third, I use the following equation to explore the effect of information provision on spending over time:

$$(Y_{it+h} - Y_{it-1})/\bar{Y}_i = \beta_h D_i^T + \gamma(Z_{it+h} - Z_{it-1}) + \varepsilon_{it+h} \tag{5}$$

or

$$(Y_{it+h} - Y_{it-1})/\bar{Y}_i = \beta_h \left(\mathbb{E}_i^{post}[\pi_{t+1}] - \mathbb{E}_i^{pre}[\pi_{t+1}]\right) + \gamma(Z_{it+h} - Z_{it-1}) + \varepsilon_{it+h}. \tag{6}$$

This equation is estimated for each h ranging from -2 to 3 months, excluding $h = -1$. In the previous analyses, I assessed the impact of information provision on spending by comparing spending five months after the survey with that in the three months before the survey. However, the effect of information provision might be transient and could disappear within about a month. This regression allows me to evaluate the effect of information provision on spending (β_h) across multiple time horizons h. I use the difference in spending with the base month set at -1 and do not include individual or month fixed effects due to the cross-sectional nature of the data. In the first equation, D_i^T denotes the type of information provision that respondent i receives. In the second equation, the change in inflation expectations is instrumented using the treatment of 2% or 0.5% inflation provision. The control variable Z_{it} is inflows for respondent i in month t.

Figure 2 shows β_h across different months, with the horizontal axis representing month h. The figure reveals that all β_h values are insignificant, even in the month immediately following the survey ($h = 0$).

Online Appendix C offers additional robustness checks. First, I confirm that the insignificance remains consistent when the time unit is a week. Second, I examine the level of change in spending, rather than the rate change, by calculating $Y_{it+h} - Y_{it-1}$. Once again, the estimated coefficients remain insignificant. I also confirm that this lack

of significance is not due to low statistical power, as both the estimated treatment effects and the MDE sizes are much smaller than the sample standard deviation of the outcome variable.

The insignificant effects of information provision on individuals' spending in my study, compared to the positive evidence found by Coibion, Gorodnichenko, and Weber (2022), can be attributed to three key differences, as I discussed in Introduction. First, my study takes place in Japan, a country with historically low inflation, while their study focuses on the US, where inflation has been better anchored at the 2% target but rose significantly after the COVID-19 pandemic. Second, my survey is smaller in scale, both in terms of the number of respondents and the range of questions asked. Third, the methods of measuring spending differ. In my study, I track actual monetary outflows from respondents' bank accounts, while Coibion, Gorodnichenko, and Weber (2022) use homescan data.

Heterogeneity Survey respondents exhibit considerable heterogeneity, as highlighted by studies such as Armantier et al. (2016) and D'Acunto, Malmendier, and Weber (2023), which underscore the diverse ways in which inflation expectations are formed.

To explore whether certain subgroups of respondents demonstrate a notable change in spending following information provision, I categorize respondents by their characteristics such as age, education, liquidity constraints, wealth, borrowing, and prior knowledge about inflation information.

While detailed findings are discussed in Online Appendix C, my analysis reveals no strong evidence of a significant impact of information provision on spending across these groups. However, a tentative observation is that respondents with higher wealth and exposed to higher inflation information (i.e., 10%) show a tendency towards a significantly positive change in spending. This pattern likely reflects that wealthier individuals, facing fewer liquidity constraints, are better positioned to engage in optimal intertemporal substitution, increasing spending in response to higher inflation expectations. Despite the plausibility of this mechanism, it is important to note that other related factors, such as liquidity constraints and borrowing, do not show significant effects. Schnorpfeil, Weber, and Hackethal's (2023) highlight the role of wealth and borrowing channels in the relationship between inflation expectations and spending.

4 Concluding Remarks

This study highlights the difficulty of managing inflation expectations, as respondents show resistance to changing their consumption behaviors based on the information provided. Given the simplicity of the information used in this study, future research should explore what types of information might enhance the effectiveness of such interventions. Additionally, considering that previous studies, such as Coibion, Gorodnichenko, and Weber (2022), have documented positive effects of information on actual behavior, it is crucial to examine factors that may explain these differing results, such as country-specific contexts (e.g., Japan versus the US) and methodological differences.

References

[1] Abe, Naohito, and Yuko Ueda. 2016. "The Mechanism of Inflation Expectation Formation among Consumers." RCESR Discussion Paper Series DP16-1.

[2] Andre, Peter, Carlo Pizzinelli, Christopher Roth, and Johannes Wohlfart. 2022. "Subjective Models of the Macroeconomy: Evidence from Experts and Representative Samples." *Review of Economic Studies* 89(6): 2958–2991.

[3] Andrade, Philippe, Erwan Gautier, and Eric Mengus. 2023. "What Matters in Households' Inflation Expectations?" Journal of Monetary Economics 138: 50–68.

[4] Ansolabehere, Stephen, Marc Meredith, and Erik Snowberg. 2013. "Asking about Numbers: Why and How." Political Analysis 21(1): 48–69.

[5] Armantier, Olivier, Giorgio Topa, Wilbert van der Klaauw, and Basit Zafar. 2017. "An Overview of the Survey of Consumer Expectations" FRBNY Economic Policy Review, December 2017, 51–72.

[6] Armantier, Olivier, Wandi Bruine de Bruin, Giorgio Topa, Wilbert van der Klaauw, and Basit Zafar. 2015. "Inflation Expectations and Behavior: Do Survey Respondents Act on Their Beliefs?" International Economic Review 56:2, 505–536.

[7] Armantier, Olivier, Scott Nelson, Giorgio Topa, Wilbert van der Klaauw, Basit Zafar. 2016. "The Price Is Right: Updating Inflation Expectations in a Randomized Price Information Experiment." *Review of Economics and Statistics* 98(3): 503–523.

[8] Armona, Luis, Andreas Fuster, and Basit Zafar. forthcoming. "Home Price Expectations and Behavior: Evidence from a Randomized Information Experiment." *Review of Economic Studies.*

[9] Bachmann, Rüdiger, Tim O. Berg, and Eric R. Sims. 2015. "Inflation Expectations and Readiness to Spend: Cross-Sectional Evidence." *American Economic Journal: Economic Policy* 7(1): 1–35.

[10] Bachmann, Rüdiger, Benjamin Born, Olga Goldfayn-Frank, Goergi Kocharkov, Ralph Luetticke, and Michael Weber. 2021. "A Temporary VAT Cut as Unconventional Fiscal Policy." NBER Working paper 29442.

[11] Bailey, Michael, Ruiqing Cao, Theresa Kuchler, and Johannes Stroebel. 2018. "The Economic Effects of Social Networks: Evidence from the Housing Market." *Journal of Political Economy* 126, 2224–2276.

[12] Baker, Scott R., and Lorenz Kueng. 2022. "Household Financial Transaction Data." *Annual Review of Economics* 14: 47–67.

[13] Binder, Carola, and Alex Rodrigue. 2018. "Household Informedness and Long-Run Inflation Expectations: Experimental Evidence." *Southern Economic Journal* 85(2): 580–598.

[14] Binder, Carola Conces and Gillian Brunet. 2022. "Inflation Expectations and Consumption: Evidence from 1951." *Economic Inquiry* 60(2): 954–974.

[15] Binetti, Alberto, Francesco Nuzzi, and Stefanie Stantcheva. 2024. "People's Understanding of Inflation." NBER Working Paper 32497.

[16] Bloom, Howard S. "Minimum Detectable Effects: a Simple Way to Report the Statistical Power of Experimental Designs." *Evaluation Review* 19(5): 547–556 .

[17] Cavallo, Alberto, Guillermo Cruces, and Ricardo Perez-Truglia. 2016. "Learning from Potentially Biased Statistics," *Brookings Papers on Economic Activity* 47(1), 59–108.

[18] Cavallo, Alberto, Guillermo Cruces, and Ricardo Perez-Truglia. 2017. Inflation Expectations, Learning, and Supermarket Prices: Evidence from Survey Experiments," *American Economic Journal: Macroeconomics* 9(3): 1–35.

[19] Coibion, Olivier, Yuriy Gorodnichenko, and Saten Kumar. 2018. "How Do Firms Form Their Expectations? New Survey Evidence." *American Economic Review* 108(9): 2671–713.

[20] Coibion, Olivier, Yuriy Gorodnichenko, and Tiziano Ropele. 2020. "Inflation Expectations and Firm Decisions: New Causal Evidence." *Quarterly Journal of Economics* 135(1): 165–219.

[21] Coibion, Olivier, Yuriy Gorodnichenko, and Michael Weber. 2022. "Monetary Policy Communications and Their Effects on Household Inflation Expectations." *Journal of Political Economy* 130(6): 1537–84.

[22] Coibion, Olivier, Dimitris Georgarakos, Yuriy Gorodnichenko, and Maarten van Rooij. 2023. "How Does Consumption Respond to News about Inflation? Field Evidence from a Randomized Control Trial." *American Economic Journal: Macroeconomics* 15(3): 109–52.

[23] Coibion, Olivier, Dimitris Georgarakos, Yuriy Gorodnichenko, Geoff Kenny, and Michael Weber. 2024. "The Effect of Macroeconomic Uncertainty on Household Spending." *American Economic Review* 114 (3): 645–77.

[24] Coles, Jeffrey L., Davidson Heath, and Matthew C. Ringgenberg. 2022. "On Index Investing." *Journal of Financial Economics* 145(3): 665–683.

[25] D'Acunto, Francesco, Daniel Hoang, and Michael Weber. 2022. "Managing Households' Expectations with Unconventional Policies." *Review of Financial Studies* 35(4): 1597–642.

[26] D'Acunto, Francesco, Daniel Hoang, Maritta Paloviita, and Michael Weber. 2023. "IQ, Expectations, and Choice." *Review of Economic Studies* 90: 2292–2325.

[27] D'Acunto, Francesco, Ulrike Malmendier, and Michael Weber. 2023. "What do the Data Tell us about Inflation Expectations?" In *Handbook of Economic Expectations*, 133–161.

[28] Diamond, Jess, Kota Watanabe, and Tsutomu Watanabe. 2020. "The Formation of Consumer Inflation Expectations: New Evidence From Japan's Deflation Experience." *International Economic Review* 61(1): 241–281.

[29] Duca-Radu, Ioana, Geoff Kenny, and Andreas Reuter. 2021. "Inflation Expectations, Consumption and the Lower Bound: Micro Evidence from a Large Multi-Country Survey." *Journal of Monetary Economics* 118(C):120–134.

[30] Galashin, Mishia, Martin Kanz, and Ricardo Perez-Truglia. 2022. "Macroeconomic Expectations and Credit Card Spending." NBER Working Paper 28281.

[31] Haaland, Ingar, Christopher Roth, and Johannes Wohlfart. 2023. "Designing Information Provision Experiments." *Journal of Economic Literature* 61(1): 3–40.

[32] Hunziker, Hans-Ueli, Christian Raggi, Rina Rosenblatt-Wisch, and Attilio Zanetti. 2022. "The Impact of Guidance, Short-term Dynamics and Individual Characteristics on Firms' Long-term Inflation Expectations." *Journal of Macroeconomics* 71: 103380,

[33] Ichiue, Hibiki, and Shusaku Nishiguchi. 2015. "Inflation Expectations and Consumer Spending at the Zero Bound: Micro Evidence." *Economic Inquiry* 53(2): 1086–1107.

[34] Jiang, Janet Hua, Rupal Kamdar, Kelin Lu, and Daniela Puzzello. 2024. "How do Households Respond to Expected Inflation? An Investigation of Transmission Mechanisms." CAEPR Working Paper 2024-004.

[35] Kaneda, Michiru, So Kubota, and Satoshi Tanaka. 2021. "Who Spent Their COVID-19 Stimulus Payment? Evidence from Personal Finance Software in Japan." *Japanese Economic Review* 72(3): 409–37.

[36] Kikuchi, Junichi, and Yoshiyuki Nakazono. 2023. "The Formation of Inflation Expectations: Micro-data Evidence from Japan." *Journal of Money, Credit and Banking* 55(6): 1609–1632.

[37] Kostyshyna, Olena, and Luba Petersen. 2024. "The Effect of Inflation Uncertainty on Household Expectations and Spending." NBER Working Paper 32939.

[38] Kubota, So, Koichiro Onishi, and Yuta Toyama. 2021. "Consumption Responses to COVID-19 Payments: Evidence from a Natural Experiment and Bank Account Data." *Journal of Economic Behavior & Organization* 188: 1–17.

[39] Roth, Christopher, and Johannes Wohlfart. 2020. "How Do Expectations about the Macroeconomy Affect Personal Expectations and Behavior?" *Review of Economics and Statistics* 102(4): 731–48.

[40] Roth, Christopher, Sonja Settele, and Johannes Wohlfart. 2022. "Risk Exposure and Acquisition of Macroeconomic Information." *American Economic Review: Insights* 4(1): 34–53.

[41] Schnorpfeil, Philip, Michael Weber, and Andreas Hackethal. 2023. "Households' Response to the Wealth Effects of Inflation." NBER Working Paper 31672.

[42] Schnorpfeil, Philip, Michael Weber, and Andreas Hackethal. 2024. "Inflation and Trading." University of Chicago Becker Friedman Institute for Economics Working Paper 2024-61.

[43] Stantcheva, Stefanie. 2023. "How to Run Surveys: A Guide to Creating Your Own Identifying Variation and Revealing the Invisible." *Annual Review of Economics* 15(1): 205-234.

[44] Stantcheva, Stefanie. 2024. "Why Do We Dislike Inflation?" NBER Working Paper 32300.

[45] Ueda, Kozo. 2010. "Determinantsof Households' Inflation Expectations in Japan and the United States." *Journal of the Japanese and International Economies* 24(4): 503–518.

[46] Ueda, Kozo. 2024. "Effects of Bank Branch/ATM Consolidations on Cash Demand: Evidence from Bank Account Transaction Data in Japan." *Journal of the Japanese and International Economies* 71: 101305.

[47] Vellekoop, Nathanael and Mirko Wiederholt. 2019. "Inflation Expectations and Choices of Households." SAFE Working Paper No. 250.

[48] Weber, Michael, Francesco D'Acunto, Yuriy Gorodnichenko, and Olivier Coibion. 2022. "The Subjective Inflation Expectations of Households and Firms: Measurement, Determinants, and Implications." *Journal of Economic Perspectives* 36(3): 157–184.

[49] Weber, Michael, Bernardo Candia, Tiziano Ropele, Rodrigo Lluberas, Serafin Frache, Brent Meyer, Saten Kumar, Yuriy Gorodnichenko, Dimitris Georgarakos, Olivier Coibion, Geoff Kenny, Jorge Ponce, and Hassan Afrouzi. 2024. Tell Me Something I Don't Already Know: Learning in Low and High-Inflation Settings." *Econometrica*, forthcoming.

Table 1: Effects on Expectations

Dependent variable	(1)	(2)	(3)	(4)	(5)
	Expectation change (postrior − prior)				
	Inflation	Spending	Income	Interest rate	Mortgage rate
Intercept	-1.0015***	-1.7651**	0.7628**	-0.017	-8.8307**
	(0.352)	(0.854)	(0.386)	(0.046)	(3.972)
2% inflation treat	-1.6551***	-0.211	-0.347	-0.022	5.6161
	(0.494)	(1.199)	(0.541)	(0.065)	(5.578)
0.5% inflation treat	-1.0389**	0.917	-0.586	-0.1629**	4.6793
	(0.497)	(1.207)	(0.546)	(0.065)	(5.616)
Observations	2,594	2,594	2,581	2,594	2,594
R^2	0.0044	0.0004	0.0005	0.0028	0.0004

Note: Figures in parentheses indicate standard errors. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 2: Spending Changes and Expectations Changes

	Dependent variable:		
		PC	
	(1)	(2)	(3)
π	0.249^{***}	0.263^{***}	0.723^{*}
	(0.025)	(0.026)	(0.420)
w	0.270^{***}		
	(0.023)		
i	0.329^{*}		
	(0.191)		
mor	-0.101		
	(0.084)		
Constant	-0.510^{*}	-0.350	0.537
	(0.263)	(0.268)	(0.856)
	OLS	OLS	IV
Observations	2,570	2,570	2,570
R^2	0.091	0.039	-0.081
First-stage F			5.44

Note: Variables PC, π, w, i, and mor represent a change in expectations (posterior − prior) on nominal spending, inflation, income (wage), the deposit rate, and the mortgage rate, respectively Figures in parentheses indicate standard errors. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3: Effects on Spending

	(1)	(2)	(3)	(4)	(5)
	Dependent variable (divided by sample mean)				
			Less volatile sample		
	Outflows	Cash withdrawals	Outflows	Cash withdrawals	Outflows
2% inflation T after provision	0.0012	0.0712	0.0036	0.0049	
	(0.1287)	(0.1817)	(0.0111)	(0.0182)	
0.5% inflation T after provision	-0.1125*	-0.1040	0.0112	0.0017	
	(0.0576)	(0.2197)	(0.0111)	(0.0168)	
Post inflation expectations					-0.0428
					(0.0340)
Prior inflation expectations					0.009
					(0.008)
Inflows	0.1786***	0.033	0.0167***	0.0097***	0.1745***
	(0.0592)	(0.0210)	(0.0054)	(0.0032)	(0.058)
Log wealth	0.1098***	0.0365*	0.0028	-0.0011	0.0227**
	(0.0247)	(0.0221)	(0.0028)	(0.0036)	(0.011)
Log annual income	-0.1151	0.0126	0.0019	-0.0043	-0.0242
	(0.1282)	(0.0116)	(0.0019)	(0.0028)	(0.0282)
Fixed effects		Individual, month			month
Observations	20,136	15,928	13,014	5,708	20,136
R^2	0.15	0.13	0.29	0.37	0.02
MDE	0.1315	0.2282	0.0119	0.0184	
Sample S.D.	3.409	5.192	0.270	0.295	3.189
First-stage F					11.85

Note: Figures in parentheses indicate standard errors. MDE and sample S.D. are the minimum detectable effect size and the sample standard deviation of each outcome variable. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

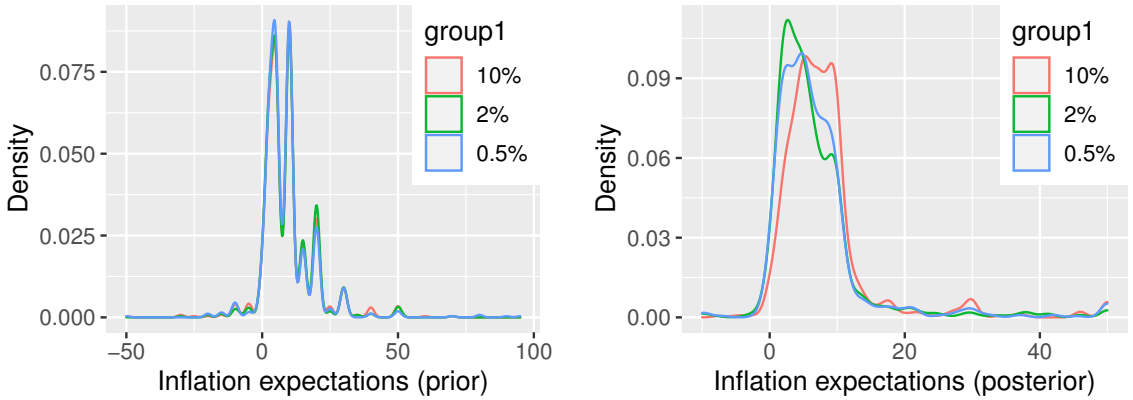

Figure 1: Distribution of Inflation Expectations

Note: The posterior inflation expectations are calculated as the mean of each respondent's distributional inflation expectations.

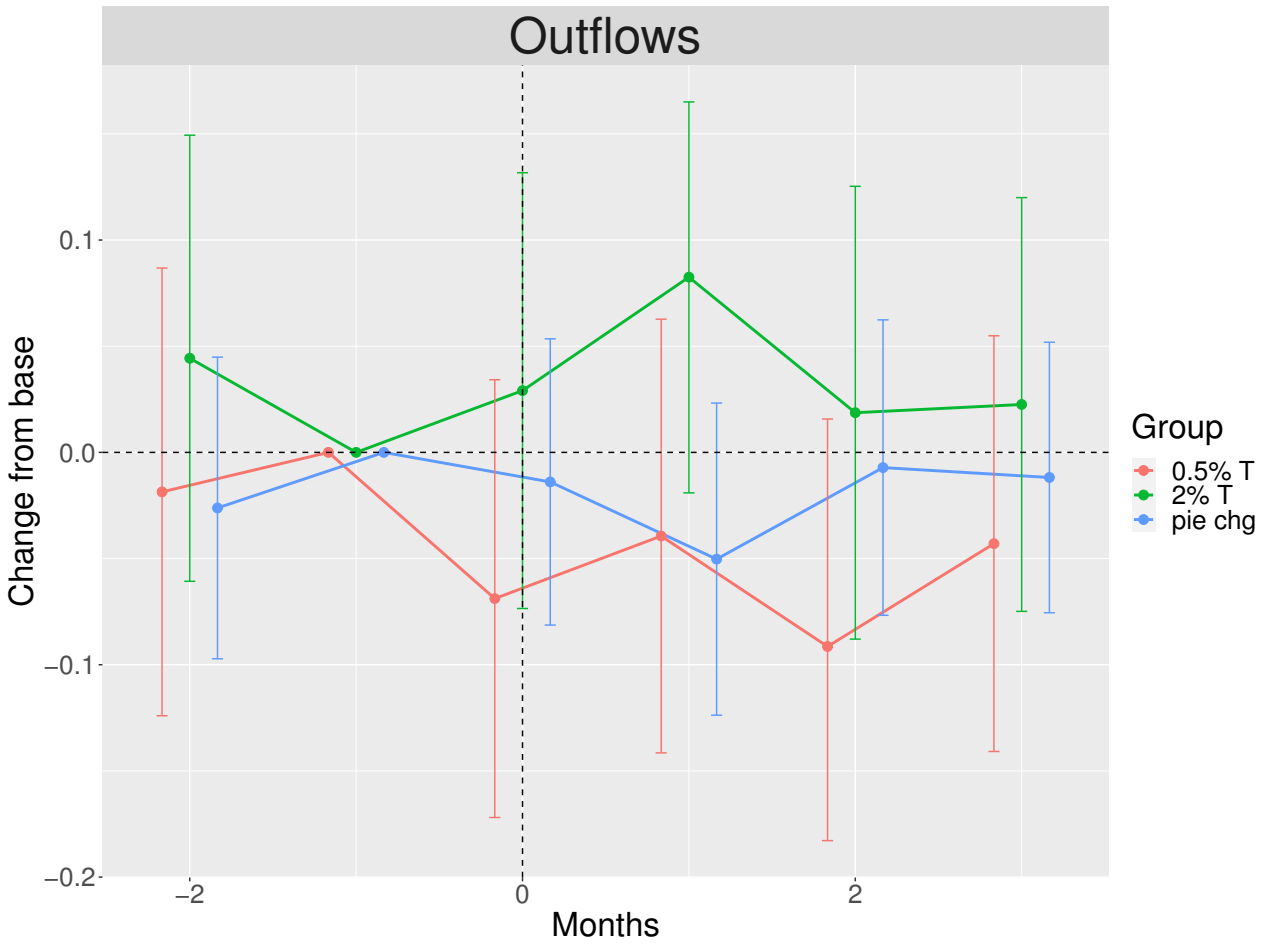

Figure 2: Spending Changes

Note: The dependent variable is the rate change in outflows from those in the base period (−1 month). The coefficients on the treatment group of 2% or 0.5% inflation information provision or those on the change in inflation expectations instrumented by treatments are displayed. Bars indicate 95% confidence intervals.

Appendix for "Inflation Expectations and Spending: Evidence from an Experiment and Bank Transaction Data in Japan"

Kozo Ueda

2024

A Survey

I conducted the RCT survey from February 13 to 19, 2024. Mizuho bank sent 200,000 bank account users an email to ask them to answer the survey, stating that we would give an Amazon gift card worth 1,000 JPY to 500 respondents. The 200,000 bank account users were selected randomly from those who received their salary regularly.

In doing the RCT, users were randomly divided into three groups with similar characteristics based on age, income, and gender. Specifically, wage earners targeted by the survey were divided into 8 groups based on age (45 and under, over 45), income (under 4 million yen, over 4 million yen), and gender (male, female). Each group was randomly assigned to one of three cases (Case 1 to 3). This assignment was carried out in advance, so there was no guarantee that the resulting respondents would perfectly adhere to this even distribution.

In total, I collected 2,626 responses (the response rate is 1.31%).

A.1 Survey Questions "Survey on Economy and Price Perceptions Amid Recent Price Increases"

This appendix provides an English translation of the survey questions.

Introduction

Thank you for your continued use of Mizuho Bank. We are conducting a survey as part of a joint research project with Waseda University. The survey responses will be used solely for research purposes and will be handled anonymously, ensuring that individual identities will not be disclosed, nor will the data be used for commercial purposes. The survey results will be published widely in the form of a report and will contribute to better policy-making and societal design. We appreciate your understanding of the purpose of this survey and ask for your cooperation in completing it.

Among those who answer all questions, 1,000 participants will be selected by lottery to receive a 500-yen Amazon gift card. Please complete the survey by 12:00 p.m. on February 19.

Q1 Hypothetical Question: Suppose you suddenly have to pay an amount equal to your or your family's monthly income due to unforeseen circumstances. If you were to liquidate your savings, sell assets, or borrow from a financial institution, friends, or relatives, do you think you could pay the full amount?

- Yes
- Probably, with some difficulty
- Difficult, but possible with significant effort
- Impossible
- Don't know, prefer not to answer

Q2 Hypothetical Question: If the government provided a one-time payment of 100,000 yen, how much would you increase your spending that month? Please answer in increments of 10,000 yen, using whole numbers equal to or greater than zero.

(Insert page break here to prevent returning to the previous page)

As of the end of December 2023, the interest rate on demand deposits was 0.001%, the interest rate on mortgage (variable rate) was 2.475%, the inflation rate was 2.6%, and the wage growth rate was 0.2%. Here, the inflation rate refers to the year-over-year change in the consumer price index, and the wage growth rate refers to the year-over-year change in cash earnings (Monthly Labour Survey). Please use this information to help provide your views on past trends and outlooks for the next year. There are no right or wrong answers; please respond with approximate figures.

Q3 How much has your spending changed compared to a year ago? Note: Please answer as a percentage. Enter numbers in half-width characters only (do not include units such as % or "percent"). If spending decreases, please enter a negative value (example: -15).

Q4 How much do you think "prices" will change in one year compared to now? "Prices" refer to the overall prices of the goods and services you purchase. (Note) Please answer as a percentage. Enter numbers in half-width characters only (do not include units such as % or "percent"). If prices decrease, please enter a negative value (example: -15).

Q5 How much do you think your income (after taxes) will change in one year compared to now? (Note) Please answer as a percentage. Enter numbers in half-width characters only (do not include units such as % or "percent"). If income decreases, please enter a negative value (example: -15).

Q6 How much do you think your spending will change in one year compared to now? (Note) Please answer as a percentage. Enter numbers in half-width characters only (do not include units such as % or "percent"). If spending decreases, please enter a negative value (example: -15).

Q7 What do you think the interest rate on demand deposits will be in one year? (Note) Please answer as a percentage. Enter numbers in half-width characters only (do not include units such as % or "percent").

Q8 What do you think the interest rate on mortgage (variable rate) will be in one year? (Note) Please answer as a percentage.

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Randomized Information Experiment: One of the following three types of information is provided.

- Case 1: According to a survey of individuals, prices are expected to rise by about 10% in one year compared to now (as of December 2023, median expectation, Opinion Survey on the General Public's Views and Behavior).
- Case 2: The Bank of Japan has set a price stability target of a 2% year-on-year increase in the consumer price index and has promised to achieve this as soon as possible.

- Case 3: The inflation rate over the past 10 years was about 0.5% (fiscal years 2010–2019, year-on-year increase in the consumer price index).

Q9 Were you aware of this information? Please choose the option that best applies to you.

- I knew
- I mostly knew
- I had heard of it, but had almost forgotten
- I didn't know, but it's not surprising
- I didn't know

The following questions are somewhat complex and may take some time to answer. Please respond carefully. You will be asked to estimate the probability of various scenarios in percentages. Use whole numbers between 0 and 100, where 0 means there is no chance of it happening, and 100 means it is certain to happen. For example:

- 0 to 10 indicates very little chance
- 11 to 30 indicates a slight chance
- 45 to 55 indicates a roughly equal chance
- 70 to 80 indicates a high probability
- 90 to 99 indicates near certainty

Q10 For the change in "prices" one year from now compared to now, how likely do you think each of the following cases is? Please answer with integers from 0 to 100, ensuring the total equals 100 percent. "Prices" refers to the overall prices of goods and services you purchase.[1]

- 50% or more increase
- Around 10% increase
- Around 5% increase
- Around 2% increase
- Around 1% increase
- Around 0% with little change
- Around 1% decrease
- Around 2% decrease
- Around 5% decrease

[1] In this type of question, I provide the sum of all options to help respondents verify that the total adds up to 100 percent.

- Around 10% or more decrease

Q11 For the change in your income (after taxes) one year from now compared to now, how likely do you think each of the following cases is? Please answer ensuring the total equals 100 percent.

- 50% or more increase
- Around 10% increase
- Around 5% increase
- Around 2% increase
- Around 1% increase
- Around 0% with little change
- Around 1% decrease
- Around 2% decrease
- Around 5% decrease
- Around 10% or more decrease

Q12 For the change in your spending one year from now compared to now, how likely do you think each of the following cases is? Please answer ensuring the total equals 100 percent.

- 50% or more increase
- Around 10% increase
- Around 5% increase
- Around 2% increase
- Around 1% increase
- Around 0% with little change
- Around 1% decrease
- Around 2% decrease
- Around 5% decrease
- Around 10% or more decrease

Q13 What percentage do you think the interest rate on demand deposits will be one year from now? Please answer ensuring the total equals 100 percent.

- Around 2% or more
- Around 1%
- Around 0.5%
- Around 0.1%
- Around 0%

Q14 What percentage do you think the interest rate on mortgage (variable-rate) will be one year from now? Please answer ensuring the total equals 100 percent.

- Around 5% or more
- Around 4%
- Around 3%
- Around 2%
- Around 1%
- Around 0%

Thank you for answering the difficult questions. Now, please select one option for each of the following questions that best applies to you.

Q15 What is the composition of the family members currently living with you?

- Single-person household (living alone, single assignment)
- Household with only a couple (partner only)
- Household with a couple and children
- Three-generation household with a couple, children, and grandparents (both or one of the grandparents)
- Single-parent household (including single assignment of spouse)
- Single-parent household with children and grandparents (both or one of the grandparents)
- Other (only siblings, friends, grandparents and grandchildren, etc.)
- Prefer not to answer

Q16 Is your residence owned or rented?

- Owned
- Rented
- Other
- Don't know, prefer not to answer

Q17 Do you have large loans such as a mortgage?

- Yes, I have loans
- No, I don't have loans
- Don't know, prefer not to answer

Q18 What was the last school you graduated from? Please select one. If you are currently enrolled or have dropped out, consider it as graduated.

- Junior high school
- High school
- Vocational school
- Junior college/technical college
- University
- Graduate school
- Other
- Prefer not to answer

Q19 What is your occupation?

- Agriculture, forestry, and fisheries
- Self-employed or freelance
- Regular employment (company employee, public servant, including company executives)
- Temporary or daily labor (part-time, casual work)
- Other (housewife, student, pensioner, unemployed, etc.)
- Prefer not to answer

Thank you for taking the time to complete the survey.

B Data

B.1 Number of Respondents

Table 1 shows the number of respondents. Initially, I have a total of 2,626 respondents. This number decreases to 2,594 when focusing on the subset of respondents who possess both transaction records and appropriate survey answers, resulting in the exclusion of 1.2% of the initial sample.

Table 1: Number of Respondents

Group	Raw	w/ transaction records	w/ appropriate answers	Our sample
10%	870	869	857	856
2%	891	888	884	881
0.5%	865	864	858	857
Total	2,626	2,621	2,599	2,594

Note: "Raw" represents the number of respondents in our initial dataset. "w/ transaction records" and "w/ appropriate answers" indicate the number of respondents who could be matched with bank account transaction data showing positive transaction records and who provided valid responses in the survey. "Our sample" refers to the subset of respondents who possess both transaction records and appropriate survey answers.

B.2 Descriptive Statistics of the Survey Data

Table 2 shows the descriptive statistics of the survey data.

Table 2: Descriptive Statistics of the Survey Data

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
$\pi 0$	2,599	9.108	9.710	3	8	10
$\pi 1$	2,599	7.202	7.456	3.2	5.7	9
πd	2,599	−1.906	10.305	−5	−1	1
$PC0$	2,599	5.723	25.692	0	5	10
$PC1$	2,599	4.187	10.413	0.1	3.8	8.2
PCd	2,599	−1.536	24.948	−4	0	2.8
$w0$	2,599	383.666	19,615.420	0	0	3
$w1$	2,599	−1.309	12.236	0	0.2	2.2
wd	2,599	−384.975	19,616.370	−1	0	1.4
$i0$	2,599	0.260	1.415	0.001	0.002	0.020
$i1$	2,599	0.182	0.334	0.000	0.060	0.160
id	2,599	−0.078	1.354	−0.001	0.015	0.099
$mor0$	2,599	7.966	116.113	2.000	2.500	3.000
$mor1$	2,599	2.598	1.089	2.000	2.700	3.100
mord	2,599	−5.368	116.093	−0.400	0.000	0.400

Note: Variables π, PC, w, i, and mor represent expectations on inflation, nominal spending, income (wage), the deposit rate, and the mortgage rate, respectively, while 0, 1, and d represent prior, posterior, and the difference (posterior - prior), respectively. I do not report the maximum or minimum values to maintain anonymity.

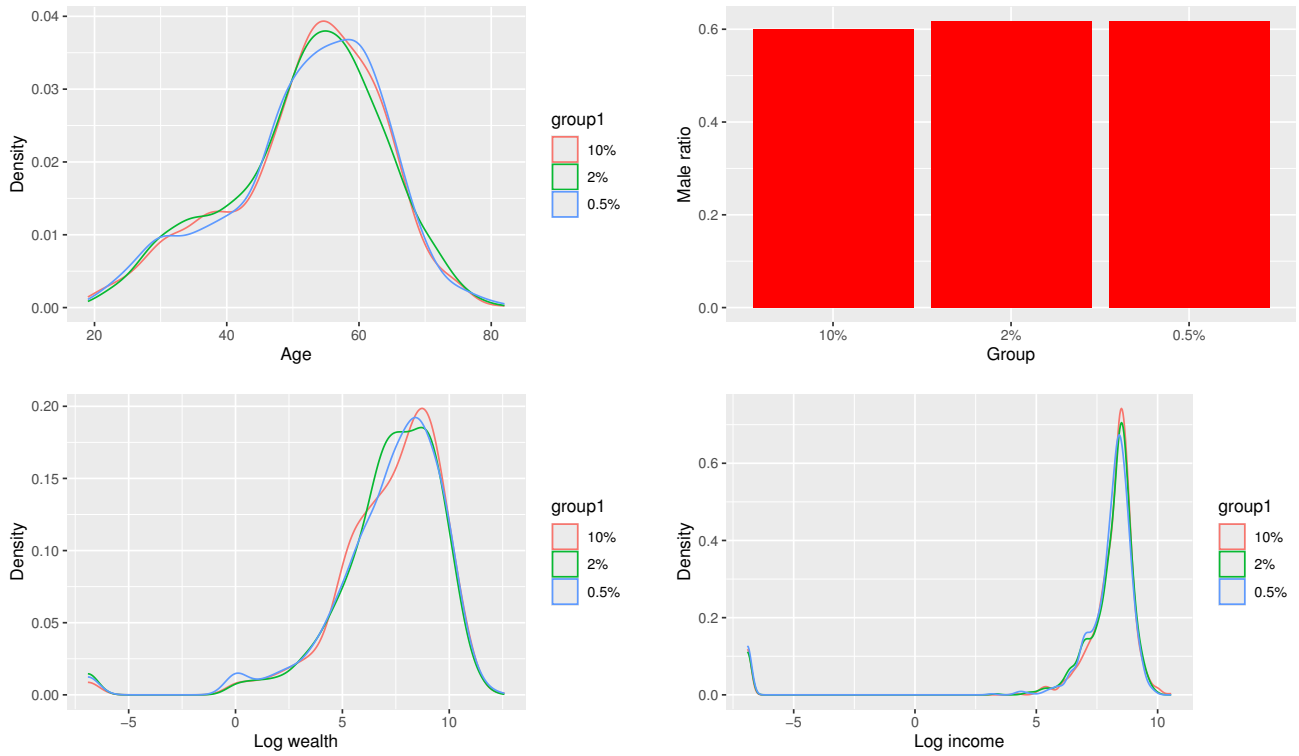

Figure 1: Respondent Distribution by Groups

Note: Log wealth and income represent the logarithm of (the balance of deposits (in thousand yen) plus 0.001) and the logarithm of (annualized income (in thousand yen) plus 0.001), respectively. All data correspond to the week in which the survey was conducted.

B.3 Comparisons between Groups

Figure 1 displays the distribution of respondents across the control and treatment groups, indicating no discernible differences between the groups.

Figure 2 displays the distribution of inflation expectations. While no discernible differences between the groups are observed for prior inflation expectations, posterior inflation expectations show variation. Specifically, the provision of 10% inflation expectations results in higher inflation expectations compared to other types of information provided.

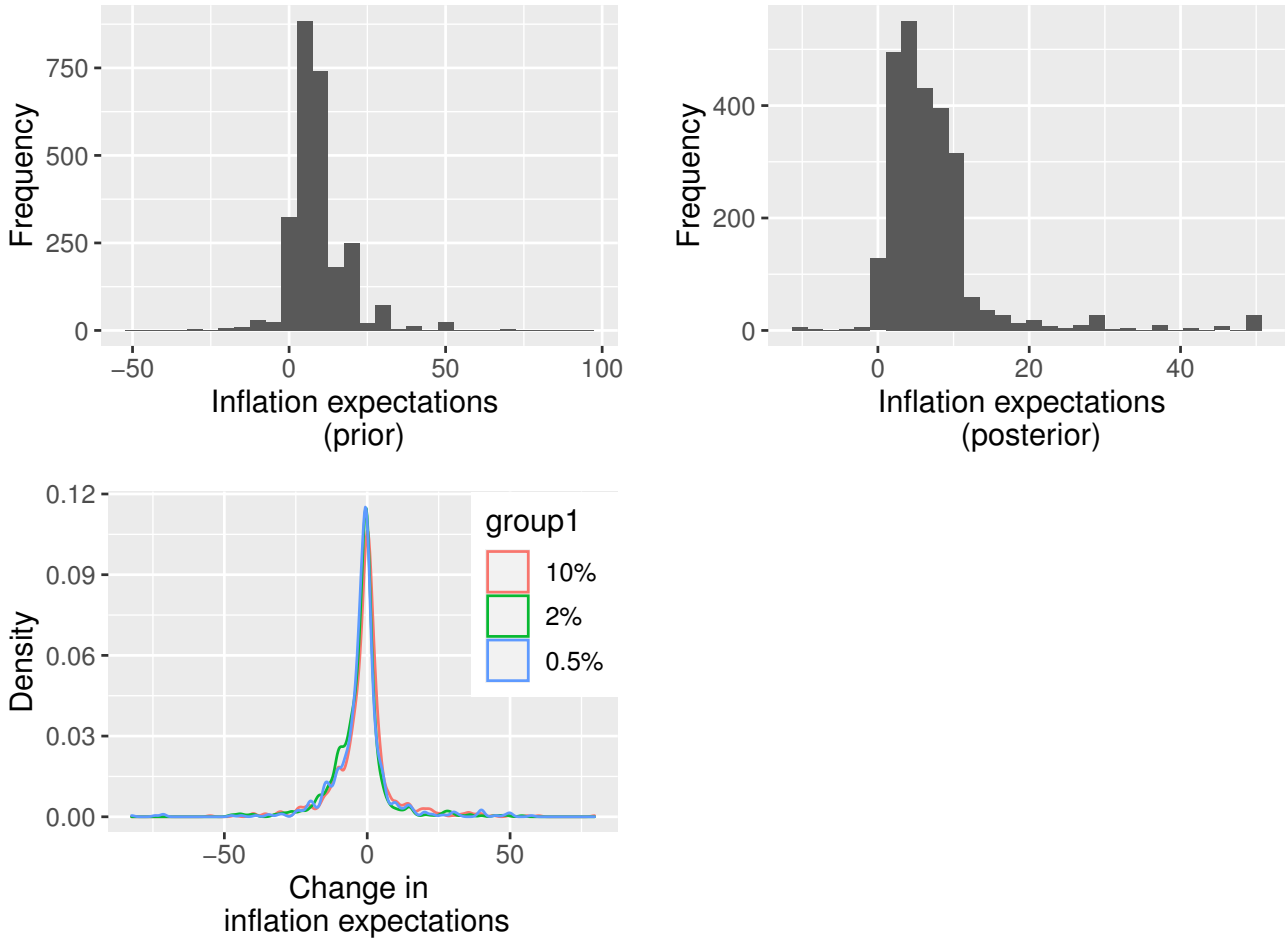

Figure 2: Distribution of Inflation Expectations

B.4 Descriptive Statistics of the Bank Account Transaction Data

Table 3 and 4 show the descriptive statistics of the bank account transaction data at the individual-month and individual-week levels, respectively. The time frame spans from −3 to 4 months or −12 to 19 weeks. Table 5 shows the descriptive statistics of respondents for age, gender, wealth, and income.

Table 3: Descriptive Statistics of the Transaction Data (Monthly)

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
Outflows	20,136	573,996.300	2,242,647.000	162,601	313,315	534,693.5
Outflows inc. saving	20,136	611,606.600	2,326,119.000	166,990.2	321,632.5	554,564.2
Inflows (rate)	20,136	748,516.100	4,060,050.000	211,750.5	360,630.5	640,471.5
Cash withdrawals	20,136	94,832.530	211,933.700	0	16,000	110,000
Outflows (rate)	20,136	1.108	3.188	0.595	0.909	1.220
Outflows inc. saving (rate)	20,136	1.105	3.124	0.580	0.902	1.222
Inflows (rate)	20,136	1.287	3.043	0.702	0.968	1.311

Note: The data are on an account and weekly (−3 to 4 months) basis. The unit of measurement for transaction amounts is one Japanese yen. The rate represents the amount of transactions divided by their time means over the specified period. I do not report the maximum or minimum values to maintain anonymity.

Table 4: Descriptive Statistics of the Transaction Data (Weekly)

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
Outflows	81,088	142,768.200	1,086,955.000	0	30,000	127,705.2
Outflows inc. saving	81,088	152,107.800	1,115,032.000	0	30,978.5	130,956.8
Inflows	81,088	186,067.000	1,780,237.000	0	0	164,488
Cash withdrawals	81,088	23,579.550	91,605.820	0	0	0
Outflows (rate)	81,088	1.000	1.978	0.000	0.317	1.269
Outflows inc. saving (rate)	81,088	1.000	1.992	0.000	0.316	1.252
Inflows (rate)	81,088	1.000	2.084	0.000	0.000	1.442
Cash withdrawals (rate)	66,304	1.000	3.023	0.000	0.000	0.494

Note: The data are on an account and weekly (−12 to 19 weeks) basis. The unit of measurement for transaction amounts is one Japanese yen. The rate represents the amount of transactions divided by their time means over the specified period. I do not report the maximum or minimum values to maintain anonymity.

Table 5: Descriptive Statistics of Respondents' Other Characteristics

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
Age	2,594	52.084	11.605	46	54	60
Male	2,594	0.611	0.488	0	1	1
Log wealth	2,594	7.141	2.808	5.990	7.635	8.976
Log income	2,594	7.385	3.404	7.650	8.322	8.643

Note: The data are on an account basis as of February 2024. Male is a dummy that takes 1 for male and zero for female. Wealth and annualized income are reported in thousands of Japanese yen and taken a logarithm after adding 1. I do not report the maximum or minimum values to maintain anonymity.

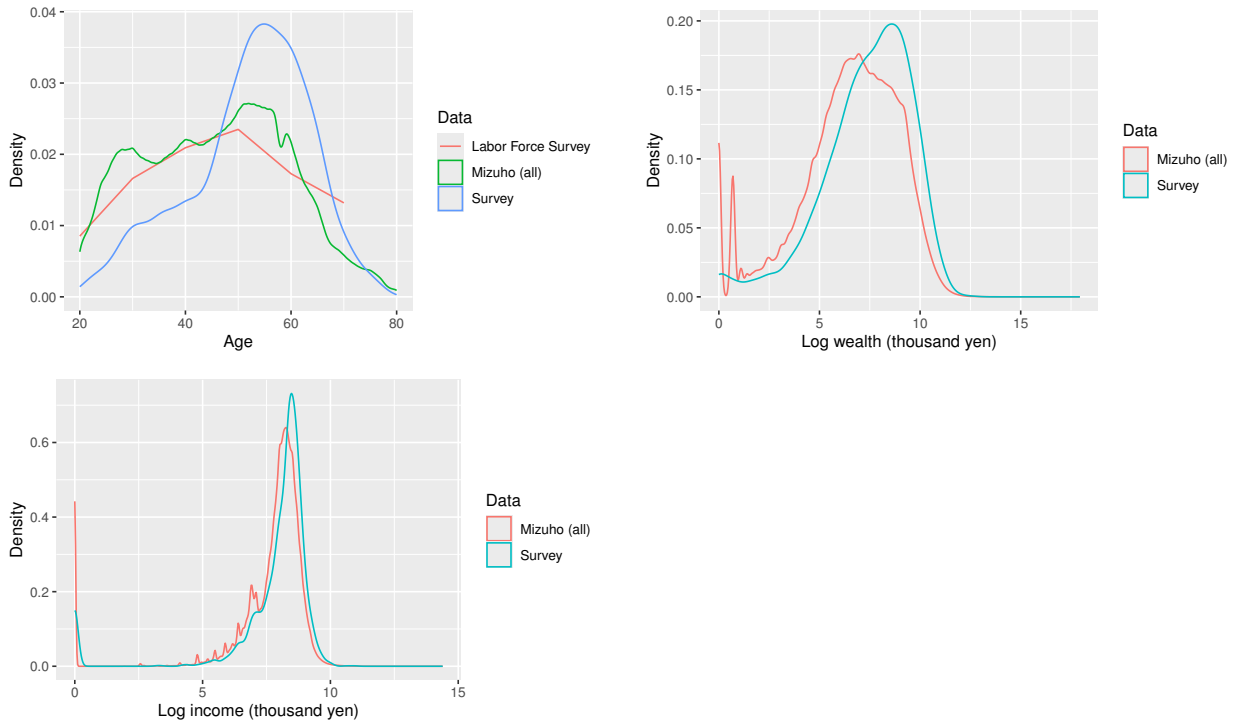

Figure 3: Distribution of Survey Respondents

Note: The Labor Force Survey is compiled by the Statistics Bureau. "Mizuho (all)" represents the distribution of all the bank account users (approximately 3.5 million) who regularly receive salary at their accounts. "Survey" represents the distribution of the survey respondents.

B.5 Representativeness

To check the representativeness of the data, I compare the age, wealth and income distribution of survey respondents with that of all the Mizuho bank account users (specifically, salary recipients) and that of employed people based on the representative Labor Force Survey (Statistics Bureau, as of 2019).[2] The Mizuho Bank account users are salary recipients, consistent with my selection criteria for the RCT survey, which helps exclude dormant or secondary bank accounts. The total number of users is approximately 3.5 million.

Figure 3 illustrates the distributions of age, log wealth, and log income among survey respondents, Mizuho Bank users, and individuals in the Labor Force Survey. The age distribution of survey respondents is highly concentrated around 50, indicating an overrepresentation of middle-aged individuals compared to the broader Mizuho user base and the Labor Force Survey. Consequently, younger individuals, particularly those in their 20s and 30s, are relatively underrepresented in the survey. Additionally, survey respondents tend to be wealthier than the average Mizuho user, which aligns with the fact that the survey population skews older.

[2]Age is grouped into bins of 10 years, that is, from 15 to 24, from 25 to 34, $\cdots$, from 55 to 64, and above. I calculate age distribution by dividing the figures by 10 for each age group. See https://www.stat.go.jp/data/roudou/sokuhou/nen/ft/pdf/index1.pdf

C Further Estimation Results

C.1 Effects on Expectation Uncertainty and Disagreement

Table 6 presents the estimation results where the dependent variable is the standard deviation of posterior inflation expectations for each respondent. This standard deviation is derived from the probability-estimate questions. The results indicate that the coefficients for the two information groups are insignificant, suggesting that the provision of information does not significantly affect the uncertainty surrounding inflation expectations.

While the previous measure focuses on expectation uncertainty for individual respondents, an alternative approach is to assess expectation disagreements among respondents. I calculate the standard deviation of prior and posterior (point estimate) inflation expectations within each group as a proxy for disagreement. Table 7 indicates that disagreement decreases by approximately 25% across all three information groups. When comparing the groups, the decrease is most pronounced in the 0.5% inflation group at 26%, followed by 23% in the 10% inflation group, and 21% in the 2% inflation group. However, the differences between these groups are relatively small. Furthermore, the inflation rate provided to each group does not exhibit a monotonic relationship with the change in disagreement.

Table 6: Effects on Expectation Uncertainty

	Dependent variable:
	S.D. of posterior inflation expectations
2% inflation treat	−0.008
	(0.008)
0.5% inflation treat	0.002
	(0.008)
Constant	0.233***
	(0.006)
Observations	2,599
R^2	0.001

Note: Figures in parentheses indicate standard errors. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7: Effects on Expectation Disagreement

	(1) S.D. of prior	(2) S.D. of posterior	(3) (2)/(1)
10% inflation treat	9.89	7.65	0.77
2% inflation treat	9.03	7.09	0.79
0.5% inflation treat	10.20	7.53	0.74

C.2 Robustness on the Effect of Information Provision on Spending

In Levels Table 8 presents the estimation results when outflows and inflows are expressed in levels. There is no evidence supporting a significant real effect of information provision on spending.

Table 8: Effects on Spending in Levels

	(1)	(2)	(3)	(4)
	Dependent variable (level)			
	Outflows	Outflows inc. saving	Cash withdrawals	Outflows
2% inflation T after provision	18,297	-2,977	-737	
	(37,348)	(38,658)	(6,229)	
0.5% inflation T after provision	4,191	-13,702	-4,563	
	(43,310)	(44,942)	(6,426)	
Post inflation expectations				-4,965
				(11,928)
Prior inflation expectations				247.7
				(2,787)
Inflows	0.4609***	0.4783***	0.001	0.4719***
	(0.024)	(0.018)	(0.001)	(0.023)
Log wealth	63351.9999***	65013.2656***	6056.3563**	18783.6853***
	(12,189.7)	(12,527.1)	(3,034.1)	(4,273)
Log annual income	4406.298	6207.876	-38.308	10030.5264***
	(6,306.0)	(6,322.0)	(446.3)	(2,521)
Fixed effects		Individual, month		month
Observations	20,752	20,752	20,752	20,752
R^2	0.77	0.78	0.41	0.73
MDE	46,710	47,739	7,077	
Sample S.D.	2,364,972	2,453,052	224,118	2,212,191
First-stage F				13.12

Note: Figures in parentheses indicate standard errors. MDE and sample S.D. are the minimum detectable effect size and the sample standard deviation of each outcome variable. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Weekly Basis Table 9 presents the estimation results on a weekly basis. Overall, there is no strong evidence supporting a significant real effect of information provision on spending. Only the coefficient on the 0.5% inflation information provision treatment in columns (1) and (2) is significantly negative at the 5% level.

Table 9: Effects on Spending (Weekly Basis)

	(1)	(2)	(3)	(4)	(5)
	Dependent variable (divided by sample mean)				
				Less volatile sample	
	Outflows	Outflows inc. saving	Cash withdrawals	Outflows	Outflows
2% inflation T after provision	0.0050	-0.0041	0.0542	-0.0168	
	(0.0289)	(0.0288)	(0.0603)	(0.0105)	
0.5% inflation T after provision	-0.0715**	-0.0725**	0.0207	-0.0160	
	(0.0289)	(0.0290)	(0.0608)	(0.0104)	
Post inflation expectations					-0.0007
					(0.0007)
Prior inflation expectations					5e-04***
					(0.0002)
Inflows	0.3122***	0.3254***	0.1368***	0.0095***	0.3124***
	(0.014)	(0.014)	(0.010)	(0.001)	(0.014)
Log wealth	0.0766***	0.0737***	0.0605***	0.0041	0.0093***
	(0.008)	(0.008)	(0.012)	(0.003)	(0.001)
Log annual income	0.003	0.006	0.005	0.0015	-0.0008
	(0.005)	(0.005)	(0.009)	(0.002)	(0.001)
Fixed effects			Individual, week		week
Observations	81,088	81,152	65,888	17,106	81,088
R^2	0.13	0.14	0.02	0.26	0.13
MDE	0.039	0.039	0.070	0.012	
Sample S.D.	2.010	2.025	3.053	0.308	1.978
First-stage F					12.43

Note: Figures in parentheses indicate standard errors. MDE and sample S.D. are the minimum detectable effect size and the sample standard deviation of each outcome variable. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Outflows including Saving Table 10 presents the estimation results when the outcome variable is outflows including savings. The coefficient on the 0.5% inflation information provision treatment is significant in columns (1); however, it becomes insignificant when a less volatile outcome variable is used as shown in column (2).

Table 10: Effects on Spending (Outflows including Saving)

	(1)	(2)
	Dependent variable (divided by sample mean)	
		Less volatile sample
	Outflows	Outflows
	inc. saving	inc. saving
2% inflation T after provision	0.0126	0.0090
	(0.1225)	(0.0111)
0.5% inflation T after provision	-0.1223**	0.0123
	(0.0569)	(0.0113)
Post inflation expectations		
Prior inflation expectations		
Inflows	0.187***	0.0172***
	(0.0630)	(0.0057)
Log wealth	0.1069***	0.0030
	(0.0245)	(0.0027)
Log annual income	-0.1152	0.0022
	(0.1282)	(0.0019)
Fixed effects	Individual, month	
Observations	20,152	12,837
R^2	0.15	0.30
MDE	0.1285	0.0120
Sample S.D.	3.339	0.272
First-stage F		

Note: Figures in parentheses indicate standard errors. MDE and sample S.D. are the minimum detectable effect size and the sample standard deviation of each outcome variable. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

On-impact Effects on Spending Table 11 and Figure 4 show the robustness of my estimation results on the immediate effect of information provision on spending ($h = 0$). Here, I examine both the rate change and the level change in spending.

Table 11: On-imapct Effects on Spending (h=0)

	(1)	(2)	(3)	(4)	(5)
	Dependent variable				
	Rate change from previous month				
				Less volatile sample	
	Outflows	Outflows inc. saving	Cash withdrawals	Outflows	Outflows
2% inflation treat	0.0291	0.0351	0.0010	0.0230	
	(0.051)	(0.052)	(0.104)	(0.015)	
0.5% inflation treat	-0.0689	-0.0770	-0.0667	0.0363**	
	(0.052)	(0.053)	(0.104)	(0.015)	
Inflation expectation change					-0.0139
					(0.034)
Inflows	0.448***	0.4563***	0.1595***	0.0287***	0.4528***
	(0.018)	(0.019)	(0.0410)	(0.0072)	(0.021)
Observations	2,517	2,519	1,991	1,514	2,517
R^2	0.19	0.19	0.008	0.015	0.18
MDE	0.125	0.127	0.252	0.036	
Sample S.D.	1.172	1.198	1.902	0.240	
First-stage F					4.77

	(6)	(7)	(8)	(9)
	Dependent variable			
	Level change from previous month			
	Outflows	Outflows inc. saving	Cash withdrawals	Outflows
2% inflation treat	-63,595.5	-49,522.7	565.7	
	(56,979)	(64,679)	(10,101)	
0.5% inflation treat	-45,230.9	-43,301.5	-450.2	
	(57,364)	(65,116)	(10,169)	
Inflation expectation change				38,830
				(36,113)
Inflows	0.4919***	0.4953***	-0.0002	0.4915***
	(0.003)	(0.003)	(0.0005)	(0.003)
No. of observations	2,594	2,594	2,594	2,594
R^2	0.93	0.91	0.000	0.92
MDE	138,437	157,145	24,541	
Sample S.D.	4,531,492	4,605,314	210,436	
First-stage F				5.74

Note: Figures in parentheses indicate standard errors. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

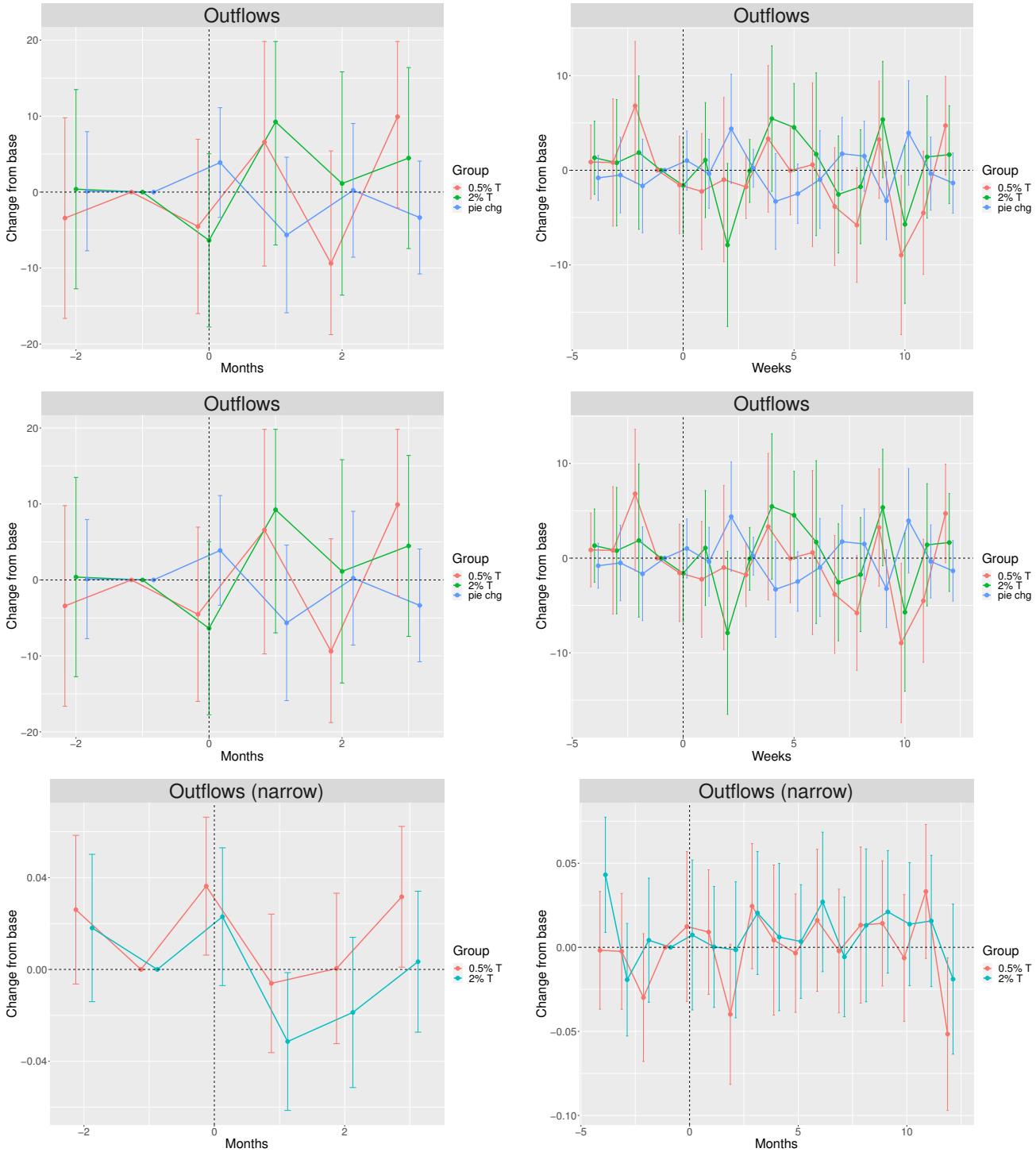

Figure 4: Changes in Outflows by Groups

Note: The left-hand panels present estimation results on a monthly basis, while the right-hand panels present results on a weekly basis. Month 0 and week 0 correspond to the time when the survey was conducted. In the top panels, the dependent variable is the rate change in outflows, whereas in the middle panels, it represents the level change in outflows. In the bottom panels, a restrictive sample is selected so that the absolute value of outflow deviations from their sample mean is smaller than 0.5.

C.3 Effect of Information Provision on Spending by Respondents' Characteristics

I explore whether certain subgroups of respondents demonstrate a notable change in spending following information provision. I categorize respondents based on various characteristics, such as age, education, liquidity constraints, and wealth. The equation I estimate is

$$Y_{it} - Y_{it-1} = \beta_h D_i^T + \delta_h D_i^T \times X_{it} + \gamma(Z_{it} - Z_{it-1}) + \varepsilon_{it+h}, \tag{1}$$

where Y_{it} and Z_{it} represent outflows (excluding saving) and inflows, respectively, for respondent i in month t. Respondents' characteristics are denoted by X_{it}, which is interacted with D_i^T. Thus, coefficient δ_h captures how these characteristics influence the effect of information provision on spending.

For X_{it}, I use the following variables one by one.

1. Gender: A binary variable where one indicates that the respondent is male.
2. Age: Two dummy variables—one for respondents in their 40s or 50s and another for those in their 60s or older.
3. Education: An ordinal variable ranging from one (junior high school) to five (graduate school), derived from Q18 in the survey.
4. Liquidity Constraint: A variable from Q1 in the survey, where respondents indicate their ability to pay an urgent amount of money, ranging from one (yes) to four (impossible), with higher values indicating greater liquidity constraints.
5. Log Wealth: The logarithm of respondents' wealth.
6. Categorical Dummy for Wealth: Wealth divided into quantiles, represented by categorical dummies.
7. Borrow: A binary variable where one indicates that the respondent is currently borrowing money. This information is obtained from Q19 in the survey.
8. House Own: A binary variable where one indicates that the respondent owns a house. It comes from Q18 in the survey.
9. Know: An ordinal variable ranging from zero (I didn't know) to four (I knew), derived from Q9 in the survey.

Tables 12 to 14 present the results of my subgroup analyses. The overall findings indicate that there is no strong evidence of a significant impact of information provision on spending across different groups.

However, I observe some interesting patterns in specific subgroups. Specifically, columns (9) and (10) show significantly positive coefficients for the interaction between 10% inflation information and log wealth. Similarly, columns (11) and (12) show significantly positive coefficients for the

interaction between 10% inflation information and the highest wealth quantile group. These results suggest that respondents with higher levels of wealth, when exposed to higher inflation information (i.e., 10%), are more likely to exhibit a significant increase in spending.

Table 12: Effects on Spending by Groups (1)

	(1)	(2)	(3)	(4)	(5)	(6)
			Outflows			
	Level change	Rate change	Level change	Rate change	Level change	Rate change
Cross-term coefficients						
	Male	Male	Age 40-50s	Age 40-50s	Education	Education
10% inflation T	30,519	-0.0190	81,032	0.1925*	11,019	0.0119
	(82,802)	(0.080)	(101,532)	(0.108)	(47,778)	(0.045)
2% inflation T	-105,828	-0.1559**	51,804	0.0732	-32,337	0.0153
	(82,295)	(0.079)	(99,801)	(0.106)	(47,370)	(0.046)
0.5% inflation T	93,681	0.0394	12,008	-0.0027	45,283	0.0618
	(83,432)	(0.080)	(102,325)	(0.108)	(45,721)	(0.043)
			Age 60s-	Age 60s-		
10% inflation T			141,692	0.1536		
			(115,456)	(0.123)		
2% inflation T			-126,333	-0.0396		
			(114,291)	(0.122)		
0.5% inflation T			-49,402	-0.1611		
			(115,215)	(0.122)		
Observations	2,594	2,566	2,492	2,466	2,546	2,519
R^2	0.93	0.22	0.95	0.24	0.93	0.22

Note: Figures in parentheses indicate standard errors. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 13: Effects on Spending by Groups (2)

	(7)	(8)	(9)	(10)	(11)	(12)
			Outflows			
Cross-term coefficients	Level change Liquidity constraint	Rate change Liquidity constraint	Level change Log wealth	Rate change Log wealth	Level change Wealth $25-50\%$	Rate change Wealth $25-50\%$
10% inflation T	-86733.911*	-0.0731*	33071.8215**	0.0352**	79,891	0.1218
	(44,926)	(0.043)	(15,233)	(0.015)	(116,081)	(0.111)
2% inflation T	1,354	-0.0077	-970	0.0199	-94,315	0.0059
	(47,053)	(0.046)	(14,035)	(0.013)	(111,742)	(0.107)
0.5% inflation T	-42,849	-0.0332	7,751	0.0152	68,902	0.1611
	(45,820)	(0.044)	(13,960)	(0.013)	(114,770)	(0.110)
					$50-75\%$	$50-75\%$
10% inflation T					16,561	0.1086
					(113,950)	(0.109)
2% inflation T					79,695	0.1773
					(114,219)	(0.110)
0.5% inflation T					207523.563*	0.1436
					(113,950)	(0.110)
					$75-100\%$	$75-100\%$
10% inflation T					308973.6819***	0.3351***
					(112,919)	(0.109)
2% inflation T					-33,249	0.1905*
					(115,151)	(0.111)
0.5% inflation T					63,941	0.1312
					(113,958)	(0.109)
Observations	2,561	2,533	2,594	2,566	2,594	2,566
R^2	0.93	0.22	0.93	0.22	0.93	0.22

Note: Figures in parentheses indicate standard errors. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 14: Effects on Spending by Groups (3)

	(13)	(14)	(15)	(16)	(17)	(18)
			Outflows			
	Level change	Rate change	Level change	Rate change	Level change	Rate change
Cross-term coefficients			House	House		
	Borrow	Borrow	own	own	Know	Know
10% inflation T	-129,181	-0.1308	17,585	-0.0480	-32,747	0.0100
	(88,586)	(0.085)	(87,920)	(0.084)	(45,745)	(0.044)
2% inflation T	13,353	-0.0799	-53,422	-0.0327	10.54	-0.0204
	(84,678)	(0.081)	(88,703)	(0.085)	(35,611)	(0.034)
0.5% inflation T	106,396	0.1839**	27,721	0.0229	95266.6485**	0.0695
	(87,418)	(0.084)	(88,125)	(0.084)	(45,205)	(0.043)
Observations	2,496	2,470	2,479	2,452	2,594	2,566
R^2	0.93	0.22	0.93	0.22	0.93	0.22

Note: Figures in parentheses indicate standard errors. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.