Attention allocation, macroeconomic expectations, and consumption behavior*

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January 8, 2021

Abstract

This paper empirically investigates individuals' attention allocation behavior and its economic implications on expectation formation and consumption choice. We measure attention with data from the Michigan Survey of Consumers (MSC), in which respondents were asked to report what economic news they heard recently. We first show that individuals' wealth, education level, and the current economic environment play important roles in determining their attention allocation behavior. We also find that paying attention to specific news groups affects individuals' macroeconomic expectations, their forecasting biases and attitudes towards purchasing durable goods and homes.

JEL classification: D14, D83, D84, E31

Key words: Rational inattention, Expectation formation, Forecasting bias, Consumption spending

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"We cannot deny that an object once attended to will remain in the memory, while one inattentively allowed to pass will leave no traces behind." (James, W: The Principles of Psychology. Dover Publications; 1980)

1 Introduction

Recent rational inattention (RI) studies show that attention allocation plays an important role in household's and firm's decision-making.[1] However, empirically validating predictions of RI models is difficult, as this would require measuring attention using economic data, which is not obvious how to do. Therefore, our main contribution in this paper is to generate a novel measure of (in)attention from monthly survey data and to use it to study individuals' attention allocation and the ways it affects their macroeconomic expectations, forecasting biases and consumption decisions. To our knowledge we are the first to explore households' attention-consumption behavior by using the long time series of the MSC dataset, which is unique and has three advantages: (i) it includes information about which economic news individuals paid attention to, macroeconomic expectations, as well as their consumption spending attitudes; (ii) its rotating panel structure allows us to mitigate omitted variable bias due to unobservable fixed personal characteristics: (iii) samples are heterogeneous across many dimensions such as wealth, education, etc.

To be more specific, we measure attention using data from the MSC, which is conducted monthly since January 1978. In the survey, respondents were asked to report what news regarding business condition they heard recently. We use their answers to infer what economic dimensions they paid attention to. For our analysis, we divide news into seven dimensions: goods and labor markets, financial markets, government, prices, exchange rate, agriculture, and social stability. Each respondent is allowed to report two news items at most, and we measure attention to each news dimension by a of dummy variable, which takes value one if at least one of his/her reported news belongs to this dimension. In addition, the MSC also collects individuals' expectations regarding business conditions, unemployment, inflation and others. The MSC also includes responses concerning their attitudes towards purchasing durable goods. Therefore, this dataset allows us not only to study individual's attention choice but also how consumption behavior is affected by

[1]Following Sims (2003), entropy-based RI is used in many fields. For example, Luo (2008) solves optimal consumption choices under RI framework. Mackowiak and Wiederholt (2009) and Matějka (2016) study the sticky price for rational inattentive decision-maker in a firm. Van Nieuwerburgh and Veldkamp (2010) solves portfolio choice problems for investors with limited information-processing capacity. Some economists also work on monetary policy models with rational inattentive agents, such as Maćkowiak and Wiederholt (2015). Gabaix (2014) developed a sparsity-based RI and employs it to discuss optimal policy in a New Keynesian model in Gabaix (2020).

both attention allocation and expectations.

Behavioral New Keynesian model under RI. To motivate our empirical analyses, we set up a behavioral consumption-savings model, in which households decide on their consumption path, while they are subject to income risk and stochastic interest rates. The model is a simplified version of the behavioral New Keynesian model of Gabaix (2020), in which households are not perfectly aware of present and future states of the world. As in Gabaix (2014), we assume that agents face many considerations when making decisions, and they decide which variables to pay attention to and which variables to discard. The optimal attention devoted to a variable depends on information-processing costs, prior belief, agent's wealth or income level, etc. These insights help us to link attention allocation, forecasting and consumption behavior. We formalize these links using a "behaviorally discounted Euler Equation", as in Gabaix (2020), where consumption today depends on expected future income, expected future interest rates and attention allocation.

Main findings. We first investigate how attention allocation is determined by households' socioeconomic status (SES) including wealth, education level, stock market participation, and recession status. Regression results suggest that an increase in wealth, which is measured by cash-on-hand, is positively correlated with attention allocated to goods and labor markets, government policies, and financial markets. Higher levels of education are associated with more attention to all news. One potential explanation is that more educated households are able to process information more easily. During recessions, individuals on average are more likely to pay attention to news relating to government actions, goods and labor markets, and social stability. However, we find that households are less likely to pay attention to financial markets, prices, the exchange rate and agriculture when the economy is in a slump. To deal with unobservable fixed personal characteristics that may lead to omitted variable bias, we use a sub-sample of rotating panel dataset, in which respondents were re-interviewed after six months. From results of first-difference regressions, we still find that changes in attention devoted to goods and labor markets, government actions and financial market are positively correlated with changes in wealth.

We then turn to studying the link between paying attention to economic news and updating of macroeconomic expectations. We use the sub-sample panel dataset and create a dummy variable, which takes the value one if an individual reports different expectations in the second interview, and zero otherwise. An example for changes in expectations would be that an individual answered that she thought business condition would be better in the future in the first interview but reported a different answer in the second interview six months later. We run linear probability regressions and show that paying attention to

news about economic conditions, goods and labor markets, prices and financial markets are positively associated with the likelihood of updating expectations on business condition, unemployment, price, and interest rate. However, only the effects of goods and labor markets news on unemployment expectations and financial markets news on interest rate expectations are statistically significant.

Furthermore, according to theories of RI, by paying more attention agents will observe a more precise signal or be better informed about the true state of the world. This implies that individuals who pay more attention to, for example unemployment, should make forecasts that are, on average, closer to the median of Survey of Professional Forecasters (SPF) than those who pay less attention. Indeed, we find that paying more attention to economic news, goods and labor markets, prices and financial markets helps to reduce forecasting bias for real GDP growth, unemployment, inflation and interest rate, respectively. These results support predictions of the RI literature.

Finally, we study how consumption choices are affected by business condition expectations and how that correlation interacts with attention. As will be shown in Section 2, one of the main insights of both Gabaix (2014) and Gabaix (2020) is that the relevance of a variable for individuals' actions determines the degree to which agents pay attention to that variable. In this case, we would expect that as business condition expectations become more relevant for consumption choices, attention to business conditions should also increase. We use individuals' purchasing attitudes towards durable goods and homes as a proxies for their consumption behavior and indeed find that individuals reacting more strongly to expectations of business condition pay more attention to economic news, which is in line with predictions of a behavioral consumption-savings model. Similar to Bachmann et al. (2015) and Draeger and Nghiem (2020), we also find negative correlation between inflation expectation and readiness of spending in durable goods. Potential explanations could be decreasing sensitivity of durable purchases toward real interest rate, or individuals do not understand the relationship between inflation expectation and consumption choice as derived in New Keynesian models.

Related literature. We contribute to the previous literature that studies the role of rational inattention in macroeconomic expectation formation of professional forecasters (Coibion and Gorodnichenko (2012, 2015)). In their seminal paper, Coibion and Gorodnichenko (2012) show that models of information rigidities, models of rational inattention being among them, in Mankiw and Reis (2002), Sims (2003) and Mackowiak and Wiederholt (2009) are more successful in fitting survey expectations from various sources than alternative models. They also find that information frictions are larger for less volatile macroeconomic variables, that information frictions were more severe during the Great

Moderation, and that the rigidity of expectations reduces during recessions. However, there is a lack of panel evidence for how consumers allocate their limited attention. Using the rotating panel structure of MSC dataset, this paper complements this literature by making use of a large sample of individuals with varying levels of wealth and education.

Our paper relates to recent papers that study how information acquisition affects expectations about inflation (Armantier et al. (2015), Armantier et al. (2016), Binder (2020), Carroll (2003), Cavallo et al. (2017), Coibion et al. (2018) Coibion et al. (2020a), and Coibion et al. (2020b)), the unemployment rate (Roth et al. (2020)), GDP growth (Roth and Wohlfart (2020)), house prices (Armona et al. (2019) and Fuster et al. (2020)), and stock returns (Hanspal et al. (2020)). However, our paper differs from these studies in that we do not exclusively analyze the attention agents pay to a single state variable. We explicitly take note of the fact that agents choose the state variable they would like to pay attention to out of a multitude of possibilities. So the attention problem we analyze empirically is a multidimensional one. In that we follow closely the logic in Gabaix (2014, 2020), where agents optimally choose what information to pay attention to and what to neglect when facing vast amount of information.

Additionally, this paper is also close to papers that use survey data to investigate how households' macroeconomic expectations affect their decisions (Andre et al. (2019), Bachmann et al. (2015), Bailey et al. (2019), D'Acunto et al. (2020), Das et al. (2019), Draeger and Nghiem (2020), Goldfayn-Frank and Wohlfart (2020), and Kuchler et al. (2019)). For example, Draeger and Nghiem (2020) use German survey data and find a significantly positive correlation between consumer's spending and inflation expectations, and a negative correlation between spending and current normal interest rate, which is in line with the Euler Equation. They also show that hearing news about monetary policy and inflation can strengthen the correlations discussed above. By making use of the long time series in the MSC dataset that includes large heterogeneous samples, our paper contributes to this literature by linking attention allocation with expectation formation, forecasting biases as well as consumption behavior.

The remainder of this paper is organized as follows. Section 2 provides the theoretical motivation for this paper. Section 3 introduces our news-recall based measure of (in)attention, describes the datasets and key variables. Section 4 discusses characteristics that determine individual's attention allocation behavior, and how does it affect macroeconomic expectation updating, forecasting biases and consumption spending decisions. Section 5 presents robustness checks. Section 6 discusses some policy implications and Section 7 concludes.

2 A sparsity RI model: Linking reported news, attention, and economic behaviors

In this section, we motivate our regression specifications by presenting an economic model based on Gabaix (2020) that links information choice and economic actions. More specifically we set up a behavioral version of the consumption-savings model.

2.1 Model

Objective reality. First, we describe the model under full information. We assume that the representative agent admits a CRRA utility function

$$U = \mathbb{E} \sum_{t=0}^{\infty} \beta^t \frac{c_t^{1-\gamma} - 1}{1-\gamma}, \tag{1}$$

where c_t is consumption and γ is the degree of relative risk aversion. Real financial wealth k_t evolves as

$$k_{t+1} = (1 + r_t)(k_t - c_t + y_t), \tag{2}$$

with r_t being the real rate of interest and y_t is income. Exogenous processes for income and the interest rate are given by

$$y_t = \bar{y} + \hat{y}_t \tag{3}$$

$$r_t = \bar{r} + \hat{r}_t, \tag{4}$$

where $\bar{y}$ and $\bar{r}$ are steady state values for income and interest rate; $\hat{y}_t$ and $\hat{r}_t$ follow uncorrelated AR(1) processes with persistences ρ_y, ρ_r and unconditional variances σ_y^2, σ_r^2 respectively;

The rational agent now maximizes U over future paths of c_t with respect to the evolution of financial wealth, which yields the linearized Euler Equation

$$\hat{c}_t = \mathbb{E}_t[\hat{c}_{t+1}] - \frac{1}{\gamma(1+\bar{r})}\hat{r}_t, \tag{5}$$

where $\hat{c}_t = c_t - c_t^d$, and c_t^d is the deterministic steady state consumption.

Reality perceived by the behavioral agent. In reality, the real rate of interest and the agent's income today and in the future are not perfectly known to her. We model this imperfect knowledge by making use of the cognitive discounting framework in Gabaix (2014). More specifically, we assume that the agent is boundedly rational in the sense that she is only aware of the present real rate of interest $\hat{r}_t^{BR}$ and present income $\hat{y}_t^{BR}$

subject to

$$\hat{r}_t^{BR} = m_r \hat{r}_t \tag{6}$$

$$\hat{y}_t^{BR} = m_y \hat{y}_t, \tag{7}$$

where $m_r, m_y \in (0,1)$ govern the attention to present values of interest rates and income, respectively. If the agent can have infinite attention capacity both parameters are equal to one, but under limited attention the agent chooses values between zero and one. As in Gabaix (2020), the agent also discounts future values of both variables, meaning that she is not able to form rational expectation forecasts based on the true laws of motion. More precisely, for a variable x_t governed by the actual law of motion $x_{t+1} = g(x_t; \epsilon_{t+1})$, the agent is cognitively discounting the actual forecast by setting

$$x_{t+1}^{BR} = \bar{m} g(x_t; \epsilon_{t+1}), \tag{8}$$

where $\bar{m} \in (0,1)$. Forming expectations based on both cognitive discounting of present and future values, we arrive at the following links between boundedly rational and objective expectations[2]

$$\mathbb{E}_t^{BR}\left[\hat{r}_{t+k}^{BR}\right] := \bar{m}^k m_r \mathbb{E}_t\left[\hat{r}_{t+k}\right], \tag{9}$$

$$\mathbb{E}_t^{BR}\left[\hat{y}_{t+k}^{BR}\right] := \bar{m}^k m_y \mathbb{E}_t\left[\hat{y}_{t+k}\right]. \tag{10}$$

The rational Euler Equation can then be written in its behavioral form

$$\hat{c}_t = \mathbb{E}_t^{BR}\left[\hat{c}_{t+1}\right] - \frac{1}{\gamma r}\hat{r}_t^{BR}. \tag{11}$$

Adapting Proposition (29) in the appendix paper to Gabaix (2020) one can show that the agent's consumption function is then given by

$$\hat{c}_t = (1-\beta) k_t + \bar{y} + \sum_{k \geq 0} \beta^k \mathbb{E}_t^{BR}\left[b_r \hat{r}_{t+k}^{BR} + b_y \hat{y}_{t+k}^{BR}\right], \tag{12}$$

with $b_r = 1-\beta$ and $b_y = -\frac{\beta^2}{\gamma}$.[3] Using representations of the behavioral expectations operators in (9) and (10) then yields

$$\hat{c}_t = (1-\beta) k_t + \bar{y} + \sum_{k \geq 0} \beta^k \left(b_r \bar{m}^k m_r \mathbb{E}_t\left[\hat{r}_{t+k}\right] + b_y \bar{m}^k m_y \mathbb{E}_t\left[\hat{y}_{t+k}\right]\right). \tag{13}$$

[2]For income (same for interest rate): perceived deviation in k periods $= m_y \bar{m} \times$ (True deviation in k periods).
[3]See Appendix A for more details.

From (13) we can conclude, that current consumption choices are driven by both present and future discounted expectations about the real rate of interest rate and income. Specifically the less attention to present and future variables is, the less strongly does consumption react to changes in macroeconomic fundamentals and individual income.

2.2 Endogenizing attention

Attention parameters in (13) can themselves be represented as functions of deeper model parameters. Gabaix (2014) endogenizes agent's attention choice by assuming that attention is chosen via means of minimizing the expected utility loss from not acting under full information. We endogenize the attention choice in the consumption-savings model above similar to Gabaix (2020).

Attention to the future $\bar{m}$, attention to income m_y, and attention to the interest rate m_r, can then be written as

$$\bar{m} = \mathcal{A}\left(\frac{\Lambda_{\bar{m}}}{\kappa}, \bar{m}^d\right) = \max\left(1 - \frac{\kappa}{\Lambda_{\bar{m}}}, \bar{m}^d\right) \tag{14}$$

$$m_y = \mathcal{A}\left(\frac{\Lambda_{m_y}}{\kappa}, m_y^d\right) = \max\left(1 - \frac{\kappa}{\Lambda_{m_y}}, m_y^d\right) \tag{15}$$

$$m_r = \mathcal{A}\left(\frac{\Lambda_{m_r}}{\kappa}, m_r^d\right) = \max\left(1 - \frac{\kappa}{\Lambda_{m_r}}, m_r^d\right), \tag{16}$$

where $\bar{m}^d$, m_y^d, and m_r^d are "default" amounts of attention, processed for free by the agent and κ represents cognition costs that agents have to pay in utils if they attempt to choose attention closer to one. Further $\Lambda_{\bar{m}}$, Λ_{m_r}, and Λ_{m_y} are functions of model parameters given by[4]

$$\Lambda_{\bar{m}} \equiv \Lambda_{\bar{m}}\left(\gamma, \beta, \rho_r, \rho_y, \sigma_r^2, \sigma_y^2\right) \tag{17}$$

$$\Lambda_{m_r} \equiv \Lambda_{m_r}\left(\gamma, \beta, \rho_r, \sigma_r^2\right) \tag{18}$$

$$\Lambda_{m_y} \equiv \Lambda_{m_y}\left(\gamma, \beta, \rho_y, \sigma_y^2\right). \tag{19}$$

$\mathcal{A}$ is increasing in its first argument, thus when cognition costs decrease, attention increases. Moreover, $\Lambda(m_y)$ represents how much consumption changes if the consumer pays more attention to income. Therefore, attention devoted to income is more if it matters more. More specifically as persistences and variances of income and interest rate increase, consumer pay more attention to present and future realizations of these variables.

[4]For a detailed derivation see Appendix A.

2.3 Behavioral expectation formation

Using Equations (9) and (10), we can obtain representations of belief updating and changes in forecasting biases. In the following, the state x_t will represent either the real rate of interest r_t or income y_t. Suppose one time period spans six months and that $\mathbb{E}_t^{BR}\left[x_{t+2}^{BR}\right] = \bar{m}^2 m_t^x \mathbb{E}_t\left[x_{t+2}\right]$ represents expectations about x in one year starting at t. And similarly $\mathbb{E}_{t+1}^{BR}\left[x_{t+3}^{BR}\right] = \bar{m}^2 m_{t+1}^x \mathbb{E}_t\left[x_{t+3}\right]$ represents expectations about x in one year standing at t plus six months.[5] As $x_{t+1} = \rho x_t + \epsilon_{t+1}$, we have

$$\mathbb{E}_t^{BR}\left[x_{t+2}^{BR}\right] = \bar{m}^2 m_t^x \rho^2 x_t, \tag{20}$$

$$\mathbb{E}_{t+1}^{BR}\left[x_{t+3}^{BR}\right] = \bar{m}^2 m_{t+1}^x \rho^2 x_{t+1}. \tag{21}$$

Then the linearized change of expectations on x is then given by

$$\mathbb{E}_{t+1}^{BR}\left[x_{t+3}^{BR}\right] - \mathbb{E}_t^{BR}\left[x_{t+2}^{BR}\right] = \frac{m_{t+1}^x - m_t^x}{m_x^d} + \frac{x_{t+1} - x_t}{\bar{x}}, \tag{22}$$

where $\bar{x}$ is the steady state level of variable x. Here we can see that the change of expectations is positively correlated with the change in attention and the change in states.

The corresponding forecasting error regarding x in one year is

$$\Delta\text{Forecasting error} = \frac{x_{t+1} - x_t}{\bar{x}} - \bar{m}^2(m_{t+1}^x - m_t^x). \tag{23}$$

This implies that the forecasting error is negatively correlated with changes in attention.

2.4 From model to econometric specification

Here, we use the main results from the model showed above to motivate our empirical strategy. First, the agent's attention choice is endogenous, and might very well be determined by the state of the world, either individually or in the aggregate. It is not difficult to see that the optimal attention devoted to variable x is negatively correlated with information cost that is potentially determined by agent's education, wealth and other personal characteristics, but positively correlated with its prior variance. Given, that we estimate

$$\text{Attention}_{x_{j,t}} = \alpha_0 + \alpha_1 SES_{j,t} + \alpha_1 \text{Recession\_index}_{j,t} + \mathbf{\Gamma}_1 \mathbf{X}'_{\mathbf{j,t}} + \epsilon_{j,t}, \tag{24}$$

[5] We assume that the cognitive discounting factor regarding future variable is constant, but amounts of attention to each variable m_r and m_y are time varying.

where $\text{Attention}_{x_{j,t}}$ is the binary measure of attention to be explained below, $SES_{j,t}$ is individual j's socioeconomic status, $\text{Recession\_index}_{j,t}$ indicates whether individual j has experienced recession in past three months standing at t. $\mathbf{X'_{j,t}}$ is an additional set of control variables including demographic characteristics (age, gender, etc.), region and year-month time dummies. $\epsilon_{j,t}$ is the error term. In the MSC, we will only be able to observe if a household pays attention or not, the true amount of attention is unknown. However the observed quantity in the MSC an be mapped to the amount of attention m in the model specification using a latent variable model, where

$$P(\text{Attention}_{x_{j,t}} = 1|\cdot) = P(\text{Attention}^*_{x_{j,t}} > \bar{m}|\cdot). \tag{25}$$

This can be interpreted as the conditional probability that an individual reported recalling news regarding variable x if the amount of attention paid to x is larger than a threshold $\bar{m}$. In the necxt section, we will introduce our measure of attention in more detail.

Second, agents' expectations and forecasting biases are affected by "perceived" knowledge about the present state of the world, proxied by the individual's attention, and the state of the world itself. This leads to

$$\Delta\text{Expectations}_{x_{j,t}} = \beta_0 + \beta_1 \Delta\text{Attention}_{j,t} + \beta_2 \Delta x_{j,t} + \mathbf{\Gamma}_2 \mathbf{Y'_{j,t}} + u_{j,t}, \tag{26}$$

$$\Delta\text{Forecasting\_error}_{x_{j,t}} = \theta_0 + \theta_1 \Delta\text{Attention}_{j,t} + \theta_2 \Delta x_{j,t} + \Gamma_3 \mathbf{Z'_{j,t}} + \nu_{j,t}, \tag{27}$$

where $\mathbf{Y'_{j,t}}$ and $\mathbf{Z'_{j,t}}$ are sets of control variables; $u_{j,t}$ and $\nu_{j,t}$ are error terms.

Third, agent's consumption decisions are affected by her attention allocation behavior. Cutting off expectations for time horizons larger than one in (13) and using a behavioral version of the Fisher Equation, i.e $r^{BR}_t = i^{BR}_t - E^{BR}_t \pi^{BR}_{t+1}$,[6] we can motivate regression specifications for consumer's choices. Consequently, we state the corresponding regressions specifications as follows:

$$c_{j,t} = \alpha_0 + \alpha_1 i^{BR}_{j,t} + \alpha_2 \mathbb{E}^{BR}_{j,t} i^{BR}_{j,t+1} + \alpha_3 \pi^{BR}_{j,t} + \alpha_4 \mathbb{E}^{BR}_{j,t} \pi^{BR}_{j,t+1} + \alpha_5 y^{BR}_{j,t} + \alpha_6 \mathbb{E}^{BR}_{j,t} y^{BR}_{j,t+1} + \Gamma_4 \mathbf{Q'}_{j,t} + \xi_{j,t}, \tag{28}$$

where $\mathbf{Q'}_{j,t}$ represents additional control variables and $\xi_{j,t}$ is the error term. Equation (28) implies that current consumption is correlated with discounted expectations/nowcasts regarding income, inflation, and nominal interest rates.

[6] In our model derivation we did not explicitly model behavioral inflation expectations as to not further complicate the analysis.

3 Data

The MSC is conducted monthly starting in January 1978. But in order to include information regarding individual's stock market participation, we concentrate on MSC data spanning January 1990 to December 2019. In each month, about 400 households in the US are interviewed about their beliefs about future values of several macroeconomic variables. In addition, from July 1980, in each survey a random fraction of individuals is re-interviewed after six months.

3.1 Reported news and attention allocation

To analyze households' attention behavior we employ a question in the MSC:

> A6. 'During the last few months, have you heard of any favorable or unfavorable changes in business conditions?'

If the question is answered with 'yes', an open question is then asked to which the respondent can give at most two answers.

> A6a. 'What did you hear? (Have you heard of any other favorable or unfavorable changes in business conditions?)'

Answers to the open question A6a are coded using several news categories.[7] As mentioned, some respondents may provide two news items (e.g. one about stock market, one about the presidential election). Our aim is to test what determines individuals' attention allocation between differing news categories. For this purpose, we divide all news items into seven groups by the following themes: goods and labor markets, financial markets, government, prices, exchange rate, agriculture, social stability.[8] We now measure attention to a specific news group by a dummy variable which takes on the value one if the respondent reported news in this group, and zero otherwise. For example, we will say that respondents who reported hearing news about stock markets pay more attention to stock markets than respondents who did not report such news.

To our knowledge, using news-recall in a survey to proxy for attention is novel in the literature that attempts to explore the relevance of attention allocation on economic expectations and actions (see Draeger and Lamla (2017)).[9] Therefore, we want to provide three reasons why using news-recall in the MSC measures attention. First, many neurological and psychological studies provide evidence on the relationship between attention and

[7] Details can be found in https://data.sca.isr.umich.edu/sda-public/sca/Doc/sca.htm or Appendix B.
[8] Details can be found in Appendix C.
[9] Note that our measure of attention allocation tracks the quantity of news items heard by households. For example concerning business conditions, we do not make a distinction between favorable and unfavorable news items on business conditions.

memory. For example, Chun and Turk-Browne (2007) use lab experiment and show that attending to a fact or event will increase the likelihood of later memory recall. Following this logic, if a respondent recalls something from memory, she was more likely to pay more attention to this fact before. Second, we focus on endogenous information acquisition regarding a large number of economic dimensions. In reality, when making economic decisions the agent is interested in a vector of state variables, such as personal income, inflation, interest rate etc. Various answers to the question A6a can help to study individuals' attention allocation among different economic dimensions. Third, our attention proxy closely reflects changes of news recall with respect to changes in current economic conditions. As will be shown in the next section, paying more attention to specific news groups is correlated with updating of expectations and a lower forecasting bias.

However, using reporting news regarding certain economic topics as a proxy for attention has its weaknesses. First, the wording of the survey questions is not directly linked to the measure of attention defined in the RI literature. As discussed in Sims (2003) and Gabaix (2014), attention is the reduction of entropy or the difference between perceived state and true state. However, given the relation of our attention measures to the news-recall literature, one could argue that if an individuals recalls news regarding some state of the world, that news items thereby reduces her uncertainty about the current state. Second, the survey question asks specifically about news concerning business conditions. This implies that we do not measure household's overall attention allocation behavior, but that related to business conditions. However, given that in the economic literature attention allocation is used to explain economic decision making, we do not think that neglecting non-economic news will have large consequences for our results. Last, the news heard responses are top-coded at two news items that households can report in the MSC. This might lead to crowding out of some news items as other news items become more important to the household. For example, if a household does not report that she remembers hearing news about inflation, this might either mean that there was actually no news on inflation, or that two other pieces of news were more important to the household. To the extent that households value the omitted news items as less important, we argue that these are also less relevant for economic decision making. The following subsection provides some evidence on the pass-through of information from changes in macroeconomic data to households news recall.

3.2 Discussion on news agencies, information acquisition, and macroeconomic data

We make use of news heard responses in the MSC to construct a proxy for household's attention allocation behavior. However changes in news heard responses might not be exclusively driven by changes in households' attention preferences, i.e. changes in information demand by households. In principle, there is a clear channel of information supply going from macroeconomic data releases or events reflecting changes in economic conditions, i.e. banking collapses, firm closures etc., to news agencies which preselect information and report about it to households. While controlling for actual changes in economic conditions is not difficult given real-time data at the time of surveys, accounting for changes in news reporting is more difficult. Over time, news agencies may change their own preferences concerning topics to report news, which might create unwanted variation in the news heard responses in the MSC and represent a change of the information supply but not demand. To the extend that these variations in information supply via news agencies change over time, and as long as they are uncorrelated with observable household characteristics, we control for these in our econometrics setup using time dummies. However, changes in reporting by news agencies could affect household characteristics, such as stock market participation. To deal with this problem, we also compute results using a sub-panel in which respondents got re-interviewed after six months. As we find it unlikely that changes in news reporting affect characteristics within a six month time period and our results are robust using the sub-panel, we believe this channel to be of minor importance.

To further show that participants in the MSC reported hearing about specific news items in a way that is consistent with changes in macroeconomic data, we compute net shares of the direction of responses for unemployment, inflation, and interest rate news. For example considering unemployment, out of all survey participants in one survey round, we count how many report hearing news about increasing unemployment and subtract how many report hearing news about decreasing unemployment. The resulting net share of unemployment news is positive if more households reported news about increasing unemployment than decreasing unemployment, and vice versa. We conjecture that such a measure is positively correlated with actual unemployment data. Figure 1 shows the net share for unemployment news compared to U.S. unemployment, Figure 2 shows net shares for inflation news compared to CPI inflation, and Figure 3 shows net shares for interest rate news compare to the three-month treasury bill (T-bill). For all variables, we can observe that news attention is correlated with the respective economic measures. This

is especially pronounced for unemployment during initial increases of unemployment at the onset of recessions. Taken together, these results imply that news heard responses co-move strongly with macroeconomic news, qualifying these survey responses as a potential measure of households' attention to the macroeconomic environment.

3.3 SES, macro beliefs, consumption, and control variables

In this paper, we measure SES by computing the level of wealth that is measured by "cash-on-hand" (sum of income and stock investment)[10] and the level of education. We transform nominal income and investment into real terms (in 2019 dollars).

The macroeconomic belief variables we use are BEXP, UNEMP, PX1Q1 and RATEX.[11] BEXP are respondents' expectations about US business conditions, and whether these will be better or worse than they are at present. UNEMP measures respondents' subjective beliefs about the national unemployment rate in the next 12 months. PX1Q1 is respondents' expectations on the qualitative change of price in 12 month compared to the price level during the survey period. RATEX indicates respondents' expectations on future borrowing interest rate in the next 12 months.[12] We also discuss consumers' spending behavior, such as buying attitudes regarding durable goods and home. In terms of buying attitudes, respondents were asked to report whether it is a good or bad time to buy a house or other major household items.

We control for several demographic variables, such as gender, number of children, age[13], from the dataset. Especially, we control for a stock market participation dummy, i.e. whether respondent held any stock shares. We believe this to be an important control variables, as we conjecture that households with higher income and education level are more likely to invest in stock market, and households that hold stock shares are more likely to pay attention to news about macroeconomics and firms than those who do not participate in the stock market.Another important explanatory variable is a NBER recession index. We control for the NBER recession index because as shown in Kacperczyk et al. (2016) during recession periods and non-recession periods investors' attention allocation strategies are different. We also control for individuals' personal financial experience, i.e. if they are better off financially than they were a year ago.[14]

[10]Because in MSC we do not have information about household's debt, we exclude both asset and debt of housing and vehicles.
[11]Detailed survey questions can be found in Appendix D.
[12]For our empirical exercises we equate the behavioral expectations in Section 2 with survey data in expectations in the MSC. For more details see Appendix E.
[13]We exclude households who have zero income and individuals who are younger than 20 or older than 95.
[14]Table 1 documents summary statistics for key variables in the paper.

3.4 Other data sources

In addition to the microdata from the MSC, we also use quarterly data of expectations on US real GDP, GDP deflator, unemployment, and the three-month T-bill rate from the Survey of Professional Forecasters (SPF). One-year-ahead real GDP and unemployment are available from the forth quarter of 1968 onward, GDP deflator and the one-year-ahead three-month T-bill rate forecasts are available from the third quarter of 1981 onward. In Section 4, we will use median professional forecasts as benchmarks to compute forecasting biases for MSC expectations on business conditions, unemployment, inflation and interest rate. The rationale follows Carroll (2003), who argues that information is distributed via professional forecasters, which is picked by household paying attention to news on economic conditions.

We create variables of forecasting biases by combining data from MSC and SPF following Das et al. (2019). First, expectations on business condition (BEXP) in the MSC are closely reflect growth rates of real GDP, and therefore we match BEXP with RGDP forecasts in the SPF.[15] We calculate the average forecasted change in logarithm of GDP over the four quarters from the end of the current quarter t to quarter $t+4$ and then we compute the difference between this value and the change from the end of the prior quarter $t-1$ to t. We assign three values to the change of professional expectation regarding real GDP growth 1, 0, and -1 if the difference is positive, 0 and negative respectively. Second, expectations on unemployment (UNEMP) can be matched with the unemployment forecast in the SPF. Since the MSC asks about the change in unemployment over the next 12 months, we compare it with the difference between the three-quarter ahead forecast, $t+3$ of the level of unemployment and the end of prior quarter $t-1$ "nowcast".[16] Finally, similar to unemployment, we use the annual level of chain-weighted GDP price index (PGDP) and three-month T-bill rate from SPF data to match consumers' forecasted price changes and borrowing interest rate changes.

4 Results

In this section, we will discuss (1) how socioeconomic status and other factors affect attention allocation behavior, i.e. what economic news do individuals pay attention to; (2) how attention allocation behavior affects individuals' macroeconomic expectation and

[15] Expectations on business conditions were collected by asking individuals their opinions if business condition in the country will be better, or worse than present, or the same in one year. We follow Das et al. (2019) and argue that when business conditions are good, we expect high real GDP growth rate and vice versa.

[16] As argued in Das et al. (2019), using the prior quarter rate from the SPF rather than from published unemployment series avoids the problem that current versions of the unemployment series have been revised ex-post and do not represent information that was available in real time.

forecasting bias; (3) how consumption choices are affected by macroeconomic expectations and attention.[17]

4.1 Factors of attention allocation behavior

4.1.1 Unconditional statistics

Table 2 shows that respondents with more wealth pay more attention to news about financial markets, goods and labor markets, government, prices, financial market, and exchange rates. However for agriculture and social stability, we do not observe this pattern. Table 3 presents shares of individuals that pay attention to different economic topics across education groups. We can observe that higher educated individuals, on average, are more likely to pay attention to many different groups of economic news except for agriculture. Table 4 presents the degree of attention that individuals pay to different news groups during recession and non-recession periods. It is interesting to see that compared to non-recession periods, respondents are more likely to pay attention to financial markets, goods and labor markets, and price changes during recession periods. Table 5 shows the difference in information acquisition behavior of individuals from different regions. MSC only provides four regions where respondents are living, namely west, north-central, northeast, south. The most outstanding economic aspect here is agriculture. As we can imagine, individuals who live in the northern-central area care much more about agriculture than other areas. We can also observe people from the western and northeastern regions on average are more likely to pay attention to news about financial markets than the other two regions. Table 6 reports that stock-holders pay more attention to all economic and social news than those who hold no stocks. This is can be potentially interpreted as such that in order to make better portfolio decisions, investors need to pay attention to all kinds of economic news.

4.1.2 Baseline results

Turning to regression results, we use regression specification (25) to study what determines individuals' attention allocation decisions. Table 7 shows regression results for the probability of paying attention to seven groups of news. More precisely, in each column, the dependent variables are dummy variables which take value one if respondents paid attention to some specific economic or social aspect. The main explanatory variables again include individuals wealth (in log-term), education level, stock participation, and the NBER recession index. First, let us start the discussion with the effect of wealth on

[17]Robustness checks for all regressions can be found in Appendix F.

attention allocation, as shown in the first row of Table 7. We can see that individuals with more wealth are more likely to pay attention to news about goods and labor markets, government policy, financial markets, and exchange rates, but has no significant effect on attention to price, agriculture and social stability. For example, increasing wealth by 1% leads to an increase in the likelihood of paying attention to goods and labor markets by 0.016 percentage points and to financial market by about 0.02 percentage points. One possible explanation can be that wealthier households pay attention to news which provides them with information that might affect the future evolution of their own wealth.

Second, the results show that the level of education has a positive effect on attention paid to any news items. Similar to other empirical RI studies such as Fuster et al. (2020) and Yin (2018), one possible explanation is that more educated individuals face smaller costs when acquiring information, and as a result they pay more attention compared to less educated individuals. However we also notice that the magnitudes of these effects are different. Education has larger effects on the likelihood of paying attention to goods and labor markets, government news, and financial market than on prices, exchange rates, agriculture, and social topics. This may be due to that higher education level leads to larger reduction in the cognitive cost of processing information regarding goods and labor markets, financial market and government policy.

Third, we analyze the effect of recessions on attention allocation. We use the an adjusted NBER recession index that tracks if the US is either experiencing a recession in this month or has experienced a recession in the past three months. We find that individuals pay more attention to news regarding goods and labor markets, government actions, and social stability. More specifically, recent experience of recession increases the probability of paying attention to goods and labor markets by 0.23 percentage points, to government policies by 0.06 percentage points and to social stability news by 0.01 percentage points. On the other hand, we can observe that experiencing recessions is negatively correlated with attention paid to prices ($\beta = -0.0302$), financial markets ($\beta = -0.008$)[18], exchange rates ($\beta = -0.0368$), and agriculture ($\beta = -0.0309$). The largest effect size can be found for attention to goods and labor markets and government interventions. This is not surprising as during recessions, business condition becomes more volatile and as a result households reallocate their attention to news items which affect the economy as a whole.[19] These results support theories of RI, meaning that due to the psychic cost of

[18]One potential explanation is the "ostrich behavior" of investors as discussed in Sicherman et al. (2016), who also find that when stock market go down, investors pay less attention to their asset holdings.

[19]This implies that when individuals have experienced a recession recently, changes in prices, exchange rates, and farm situations become relatively less important for decision-makers than other economic dimensions. For example, during recession periods households feel more uncertain about goods and labor markets, and government's business-improving policies, to the end that they would like to pay more attention to news about

acquiring information, individuals optimally decide what information to pay attention to and what information to ignore. In this case, individuals usually pay more attention to the information that matters more to their decision making.

Fourth, these two tables also show that stock market participation is an important factor in attention allocation. More precisely, stockholders are more likely to pay attention to news about financial markets, government actions, labor and goods markets, prices and agriculture as well. For example, participating stock markets increases the probability of paying attention to goods and labor markets by about 0.033 percentage points and to financial market by about 0.026 percentage points. We also see that stock market participation has no significant effects on attention paid to exchange rate and social stability. Some may also argue that stockholders read news regarding stock prices everyday such that they are less likely to report such news in a survey. But we do not find supporting evidence for this argument from the result in the forth column of Table 7.

4.1.3 First-difference regression results

So far we have investigated the relationship between SES and information acquisition as well as the information acquisition behavior during recession periods. However, the uncovered relationships could also be explained by alternative channels. For example, some unobservable fixed personal characteristics such as preference to news about stock markets or news agencies' coverage preferences might cause both the acquisition of stock market information via news and a high SES.

To address the unobserved personal fixed effect or news agencies' preference effect, we use the panel sub-sample of the MSC,[20] with which we run first-difference regressions and study the relationship between changes in SES and changes in information acquisition behavior. As shown in Table 8, with the change in attention allocation as dependent variable, we still obtain significantly positive effect of changes in wealth on the change of of likelihood of paying attention to news. In addition, we find an increase in the change of wealth leads to an increase in the change of attention to all economic news except for agriculture. In terms of magnitude, the coefficients of goods and labor markets, government, financial market are slightly smaller than those in Table 7, implying that the change in personal wealth over a short period of six months accounts for a substantial portion of the levels effect that we presented in Table 7. Therefore, the fixed effects alternative mecha-

these aspects and less attention to others.

[20] To construct the panel dataset, we restrict our sample to households where the same person answered both interviews. We thus only keep pairs of observations, where the respondent had the same sex and month and year of birth in both interviews, and additionally control for plausible age differences, number of kids differences, and education differences between interviews.

nism is relatively less important in explaining the SES-attention relationship. As shown in Table 8, we find no significant effects on the change of attention to prices, agriculture, and social stability.

These results from first-difference regressions also address a potential reverse causality story for our findings. Paying more attention to economic news could perhaps directly cause better economic choices (e.g., portfolio choice and human capital investment decisions) that affect the SES that we use as explanatory variables. However, given the differenced panel regression results, this type of story seems a highly implausible explanation. The short time period of six months in between interview does not offer enough time for the majority of people to substantially change their individual wealth due to attention allocation.[21] Therefore, this story is unlikely an explanation for the contemporaneous correlation of attention changes and SES changes that we find in Table 8.

4.2 Information acquisition and macroeconomic expectation updating

Usually we think of information acquisition affecting economic behavior through changes in agents' information sets. For example, a common thinking in (New) Keynesian economics is that a change in real interest rates will directly affect agent's consumption behavior. But if the agent pays no attention to the change of real interest rates, her information set does not include such a change and as a result her consumption behavior would remain the same. In this section we again use the sub-sample panel dataset to investigate whether information acquisition affects agent's information set by checking whether they update their expectations on business condition, unemployment, price and interest rate in the second interview compared to the first interview. Here, if individuals changed their answer to the questions relating to her expectations in the second interview, we say that they adjusted or updated their expectations.[22]

Now let us link the updating behavior regarding macroeconomic expectations to information acquisition as discussed in Section 2. More precisely, we compute a linear-probability model for the propensity to update expectations on business condition, unemployment, inflation and interest rate in the second interview. The main explanatory variables are changes in attention and changes of the corresponding state variable (i.e.real

[21] One exception may happen for financial market. When investors paid more attention to stock prices, they may change their portfolio and wealth.

[22] As discussed in Draeger and Lamla (2017), the MSC asks for forecasts for a fixed horizon of 12 months instead of a fixed target date. As a result, 12-month-ahead expectations after six months have an overlapping forecasting horizon of six months with the previous 12-month-ahead expectations and six non-overlapping months, and changes may occur even if the consumer acquired no extra information. This may lead to an overestimation of the updating frequency.

GDP, unemployment rate, inflation, and treasury bill rate, respectively). We also control for the change in wealth, stock market participation, recession status, as well as demographic factors. Table 9 reports main results. We first notice that increasing attention to general economic news raises the likelihood of updating expectations regarding these macroeconomic variables. The positive coefficients are in line with our results of the sparsity RI model: by paying more attention, agents are more likely update expectations based on their posterior beliefs. However we only find significant coefficient for the change in attention to goods and labor market and financial market in regressions for business condition expectation and interest rate expectation respectively. We also observe that the larger the change of realized real GDP, unemployment, inflation and interest rate, the higher the probability that individuals change their expectations regarding these variables. This result is also consistent with the prediction of our model in Section 2.3.

To summarize, there are two main factors that determine whether individuals update their macroeconomic expectations or not. The first one is change of attention to these variables: if an individual increases her attention to e.g. labor market, she is more likely to update her expectation on unemployment rate even if there is a small change in this variable. The second one is the change in macroeconomic variables: if e.g. unemployment rate increases a lot, individuals will still change their expectations even if they do not increase their attention to this variable.

4.3 Information acquisition and forecasting bias

In the previous subsection we discussed the effects of varying degrees of attention on whether individuals update their expectations or not. Another important standard by which to test the role of paying attention in decision-making is how it affects predictions. Therefore, in this part we want to investigate how well MSC expectations perform when compared to professional forecasts. A key argument in theories of RI is that paying more attention to a certain unobservable variable will help an agent to arrive at a more precise signal, which enables the agent to compute better predictions regarding this variable. In other words, paying more attention can help the agent to know more about the true state. Therefore, using MSC data, we can also investigate whether it is true that paying attention to specific news groups can help decrease the forecasting bias for various variables. In order to investigate the forecasting bias, we follow Das et al. (2019) and use median forecasts from Philadelphia Fed's Survey of Professional Forecasters (SPF) as benchmarks for respondents' forecasts about business conditions, unemployment, prices, and interest rates.

To investigate the effects of increasing attention on forecasting biases, we again employ the sub-sample panel dataset and run the following regressions. Dependent variables are the differences between consumers' expectations and SPF benchmarks. Explanatory variables are different across regressions. For business condition expectations, we use attention to all economic and social news as explanatory variables, but for expectations on unemployment, inflation and interest rate, we use the change of attention to goods and labor markets, prices, and financial market respectively. The choice of all news items to compute attention relevant to business conditions was driven by the fact, that the question on news items heard in the MSC specifically relates to business conditions. For unemployment, inflation, and interest rates we chose to narrow the news items categories such that they closely fit the respective expectations.

Table 10 presents correlations between changes in the forecasting bias and changes in attention. Here, negative coefficients imply that an in attention lowers the forecasting biases for all analyzed expectations, i.e. business conditions, unemployment, inflation, and interest rates. We find statistically significant coefficients for unemployment and inflation forecasting biases. This means that an increase in attention to goods and labor markets leads to a reduction in the forecasting bias regarding unemployment, and an increase in attention to news about price leads to a reduction in the forecasting bias about price.

4.4 Attention, expectation and consumption

In order to study how attention allocation affects consumers' actions empirically, we employ individuals' attitudes on purchasing durable goods and home as the dependent variables.[23] Purchasing attitudes equal to 1 if individuals reported that they thought it is a good time to conduct purchases, and -1 if they thought it is a bad time to buy and 0 if they provided a neutral answer. Main explanatory variables in our exercises are macroeconomic expectations on business condition as a whole and price changes in 12 months. We motivate our regression specification, i.e Equation (28). using the behavioral consumption function in Section 2.4. Here, consumption choices depend on the agent's behavioral income, real interest rate expectations, and additional controls. The sparsity RI model by Gabaix (2014, 2020) now provides predictions concerning the attention that is paid to a specific variable in relation to the relevance of that variable for consumption choices. As can be gathered from Section 2 concerning the endogenization of attention, as the relevance of a state x for consumption decision increases, the agent also starts to pay more

[23]The survey only asks about spending conditions for durables, not about non-durables and services. However, as argued in Bachmann et al. (2015), although durables are usually a relatively small part of the current spending budget of households, they are also the most sensitive to both idiosyncratic and aggregate economic conditions. Therefore, we do not think the 'limited' data availability in the survey as a problem.

attention to that state. So for example in our case, as business conditions expectations become more relevant for consumption decisions, we would expect that attention to business conditions also increases. We can test this hypothesis by adding interaction terms of the individual business condition expectations with the relevant attention variables. For business condition expectations we interact expectations with attention to economic news, for inflation expectations with news on inflation, and for interest rates with news on financial markets.

From the first column of Table 11, we see that individuals have more optimistic attitudes for buying durable goods if they have more optimistic expectations concerning business conditions. Similar to Das et al. (2019), we find that individuals with more wealth exhibit more optimistic buying attitudes. We also account for the specific role of attention in shaping individuals' consumption behavior, by adding an interaction term of future business condition expectation and attention. In column 3, we observe a positive and significant coefficient for that interaction term. This implies that paying more attention to economic news is associated with a stronger consumption reaction expectation of business conditions. This results is consistent with the behavioral consumption-savings presented in Section 2.

In line with findings in Bachmann et al. (2015) and Draeger and Nghiem (2020), in column 1 also find that individuals who had higher inflation expectation would like to consume less durable goods today. One potential reason is provided in Van Zandweghe and Braxton (2013), who argue that in recent times the real interest rate sensitivity of durable purchases has declined, which would mean that whatever positive effect expected inflation might have on durables spending through the interest rate channel might have been weakened in recent times and other negative effects might have become stronger.[24] Another potential reason could be the measure of consumption. Here in the MSC we use "readiness of spending" as a proxy variable for consumption of durable goods. This is different from the measure in Draeger and Nghiem (2020) who use realized consumption spending of respondents. Interestingly, as shown in column 3 the interaction effect of inflation expectations and attention to price is also significant and negative. This implies a stronger reaction to inflation expectations is again associated with an increase of attention paid to prices. Although the consumption response to inflation expectation is not economically intuitive, the change in attention is consistent with a behavioral consumption-savings model.

We also check the robustness by using purchasing attitudes of homes as a dependent

[24] If including observations from 1978 to 1990, we find positive effect of higher inflation expectation on durable goods purchasing attitudes.

variable. In the second column of Table 11 we conduct a similar exercise with the same explanatory and control variables. Here we also find that households that have more optimistic expectations of future business conditions and those with more wealth have more optimistic buying attitudes toward homes. The interaction of attention with business condition expectations is again significant and positive. We do not find a significant effect of inflation expectations on spending for homes. Finally, higher expected interest rates decrease the readiness for spending for homes but did not decrease the readiness to spend for durable goods. This is reasonable as lending rates are supposedly more relevant for purchasing higher valued durable goods.[25] The interaction term for interest rate expectations and attention is positive and significant, implying that a stronger consumption reaction to interest rate expectations is associated with more attention to financial news.

5 Robustness checks

In this section, we provide multiple robustness checks for our results. First, Das et al. (2019) use income instead of cash on hand to measure SES. Here, we also check the robustness of our results by using real total income. From Table 12, we can still show that individuals with more income, on average pay more attention to both economic and social news, such as goods and labor markets, financial markets, government fiscal policy, and exchange rates. Then we run first-difference regressions with the sub-sample panel data and income as a measure of SES. We also use log of income in regressions of expectation update and forecasting bias on change of attention. As can be seen in Table 13 and 14, our main results do not change compared to those in our baseline estimations. We still find that paying more attention to business condition, unemployment, price and financial market is positively correlated with the likelihood of updating the corresponding expectations, whereas it is negatively correlated with the corresponding forecast biases. Table 15 shows that individuals who have more optimistic macroeconomic expectations also have more optimistic attitudes in buying durable goods and home. These purchasing attitudes respond to macroeconomic expectations more strongly if individuals pay more attention to economic news. Individuals who expect an increase in price in 12 months have more optimistic buying attitudes toward durable goods and homes, however we do not find a significant coefficient of the interaction term between inflation expectation and attention to price news.

Second, as we mentioned in Section 3, a share of respondents in each survey since July

[25] In Table 19 in the robustness section, we test if the dependence of expectations with readiness to spend depends on some measure of wealth. We find that as wealth increases, the relevance of interest rate expectations decreases.

1981 got re-interviewed after six months. This implies that the full MSC sample includes repeated observations for time-fixed variables such as education level, age, gender etc. Therefore, in order to avoid any issues arising from the effect of repeated observations on estimation significance, we delete observations created during a second interview.[26] From 16, we can see that significance levels of estimations are very similar to those in baseline estimations.[27] With this sub-sample we also check the robustness of effects of expectations and attention on consumption behavior in our baseline estimation in Section 5. From Table 17, we find that magnitudes of coefficients of macroeconomic expectations and that of their interaction terms with attention are very similar to those in Table 11.

Finally, in the baseline estimations for effects of inflation and business condition expectations on spending we run standard OLS regressions. Here we check the robustness of these results following Bachmann et al. (2015) and control for a zero-lower bound dummy, which takes the value one from December 2008 to November 2015, and zero otherwise. We also run ordered probit regressions, since spending is a categorical variable in the MSC. From Table 18 we observe that results from ordered probit regressions are very similar to those from OLS in Table 11 and the introduction of ZLB does not change our main results.[28] In addition, in the baseline estimation in Table 11 we notice that expectations on interest rates have negative effects on attitudes of purchasing homes, and positive but not significant effects on the purchase of durable goods. We think this may be related to financial constraints. More precisely, wealthier individuals should be affected less by borrowing rates when buying durable goods or homes. As shown in Table 19, when controlling for an interaction terms of interest rate expectations and wealth, we find that the interaction term is negative. Therefore, as wealth increases, spending on homes starts to react less to interest rate expectations. These results are in line with our conjecture.

6 Policy implications

In this section, we briefly discuss some policy implications based on the empirical results presented above. We split our discussion into two parts, communication target and communication perception. Whereas the former provides some insights into which groups of households can be targeted most efficiently using information provisions, the latter discusses how households perception of information might matter.

[26] Another argument is that people who have participated in the Michigan survey of consumers a second time might have some extra information than those who participate the first time.

[27] As we delete second observations of individuals who were re-interviewed after six months, it is not possible to run first-difference regressions as shown in the baseline estimations.

[28] This is not surprising as we already control for the year-month dummy.

Communication target. When policy-makers attempt to convey information that is aimed to alter household consumption decisions, policy-makers have to know whether households pay attention to related news or not. For example, as shown in Section 4, wealthier and more educated individuals pay more attention to economic and social news, and they are therefore more likely to update and form more precise expectations. There might be multiple reasons for this phenomenon. For example, some poor and less-educated individuals exhibit less financial literacy, such that when economic news relevant to them is reported, they might have some difficulty in internalizing new information. Therefore, when policy-makers aim at providing information to the public, this must be taken into account.

Communication perception. Using answers to question A6a in the MSC, we can find that individuals have different perceptions of economic news. For example, during the same month, some households might perceive prices as being high but others might think they are low. Moreover, from MSC we also find that individuals have different evaluations of economic news item. For example, some households perceive increasing prices as unfavorable news, whereas others treat higher prices as favorable news. More puzzling, some individuals even report higher unemployment rates as favorable news. Therefore, how economic news affect individuals' actions might depend on the way they perceive news. We conjecture that this has implications for empirical tests of the relevance of expectations for consumption decisions. For example, in recent studies such as Bachmann et al. (2015) and Draeger and Nghiem (2020), the authors use survey data (from the US and Germany respectively) and find that consumers' spending does not follow an Euler Equation when using "readiness of purchasing durable goods" as a measure for consumption. We confirm this in Section 5 and also show that on average, higher inflation expectations are negatively correlated with the "readiness of purchasing" durable goods. However in Table 20, where we use the same specification as in Bachmann et al. (2015), once we focus on the sub-sample of individuals who reported inflation as favorable news and deflation as unfavorable news, we find that inflation expectations are positively correlated with the likelihood of more optimistic purchasing attitudes in durable goods, which would again be line with consumption Euler Equation of New Keynesian model.

7 Conclusion

This paper makes use of monthly data from the MSC and its sub-sample panel dataset including individuals who were re-interviewed after six months. We ask three distinct questions. First, what are the determining factors of households' attention allocation

behavior? Second, to what degree are expectations and forecasting biases affected by attention? Finally, what roles do attention and expectations play in households' consumption decisions?

Our first empirical exercise shows that wealth and education level play important roles in individuals' attention allocation with respect to different economic and social dimensions. During recession periods, people pay on average more attention to news regarding goods and labor markets, government policy, and social stability, but pay less attention to other news.

The second exercise implies that paying more attention increases the likelihood of updating beliefs regarding future business conditions, unemployment, prices and interest rates. When using median forecasts from the SPF as benchmarks, our third exercise shows that paying more attention also helps to reduce forecasting biases. These results are consistent with predictions of the RI literature. In the final exercise, we show that individuals with more optimistic expectation regarding future business condition tend to have more optimistic attitudes toward buying durable goods, but the magnitude of the effect is related to how much attention is paid to this variable.

Finally we want to mention several potential extensions of this paper. First, currently we use whether households heard some specific news as a measure of attention to different economic states. In the previous literature, there are studies that try to use survey questions to extract information on e.g. to what degree individuals update their prior beliefs if provide them with some extra information (see Roth and Wohlfart (2020). In future research projects, we can use survey and ask respondents directly if they would derive any consumption decisions from the news they heard, and this could be helpful in understanding how household use information for consumption decisions. Second, we use purchasing attitudes regarding durable goods and homes as proxy variables for consumption. This could be problematic when studying consumers' spending behavior, but the problem can be solved if one can collect respondents realized spending behavior and their corresponding expectations (see Draeger and Nghiem (2020)). Third, in the MSC when respondents answered questions regarding the news they heard, they also reported whether they thought these were favorable or unfavorable news. In our view, this reported distinction deserves more consideration and will be part of our future research agenda.

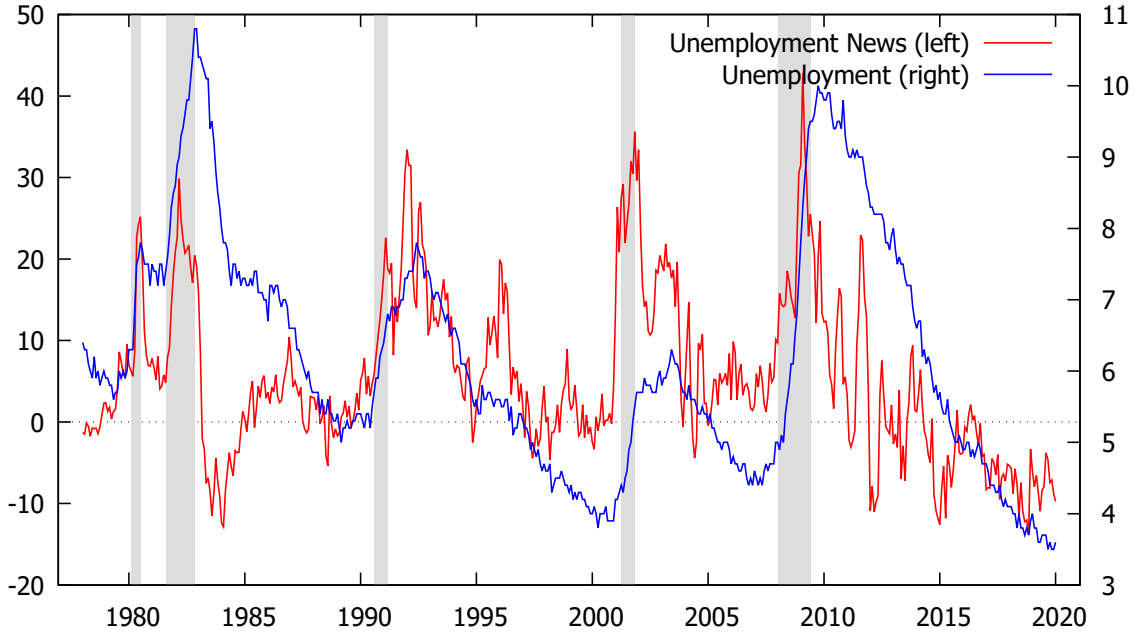

Figure 1: Attention to Unemployment News (red, left axis) computed using the net share of households that have reported hearing news on rising unemployment during the respective month and U.S. Unemployment rate in percent (blue, left axis) from January 1978 to January 2020. Gray shaded area indicates U.S. recessions as dated by the NBER. Given a rise of the unemployment rate, the ratio of households that report hearing about a rise of unemployment differs depending on the time period in which the increase was observed. For example, while unemployment rose from 5 % to around 8 % during the first half the 1990s, the net shares for news about increasing unemployment went from 0 to almost 30 %. Unemployment rose again after 1995 by a very small amount, i.e. less than one percent, however the net share rose by 20 %. There are multiple explanations for this observation. For example, either households or news agencies were overreacting to news on renewed upwards pressures on unemployment after the first half the 1990s or changes of net shares are actually quite similar, however during the first half of the 1990s other news items were crowding out responses of unemployment news in news heard responses.

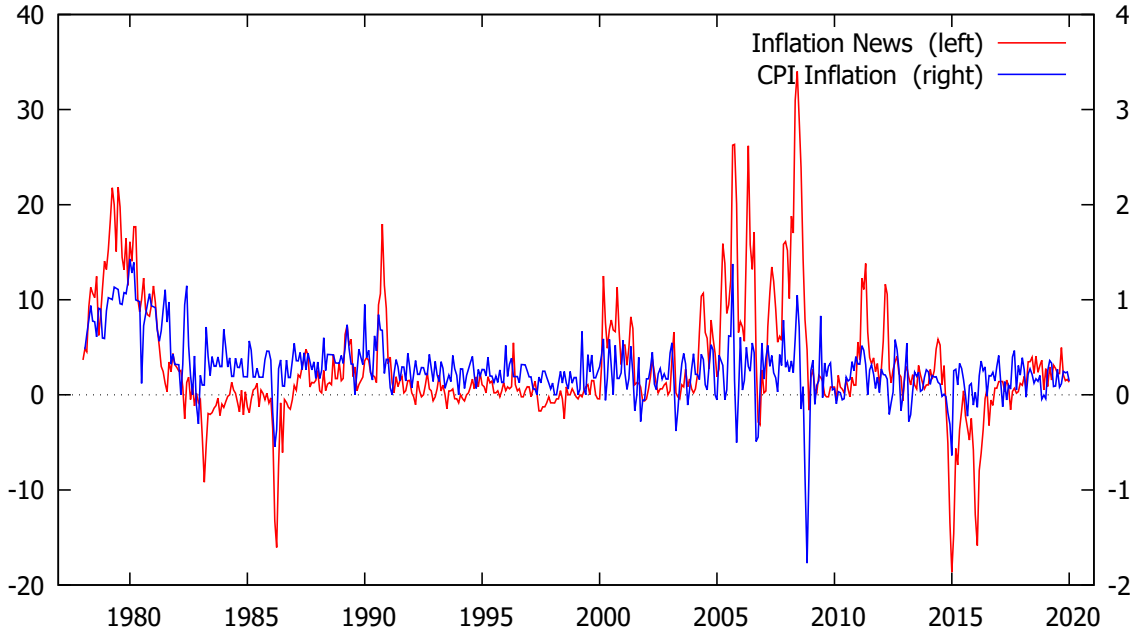

Figure 2: Attention to Inflation News (red, left axis) computed using the net share of households that have reported hearing news on rising prices during the respective month and U.S. CPI inflation rate in percent (blue, left axis) from January 1978 to January 2020. Households react most strongly to sudden changes in inflation. One exception is the time period during the beginning of the sample, during the later stages of the second oil crises, where recalling news relating to rising prices might have been a pervasive theme for survey respondents.

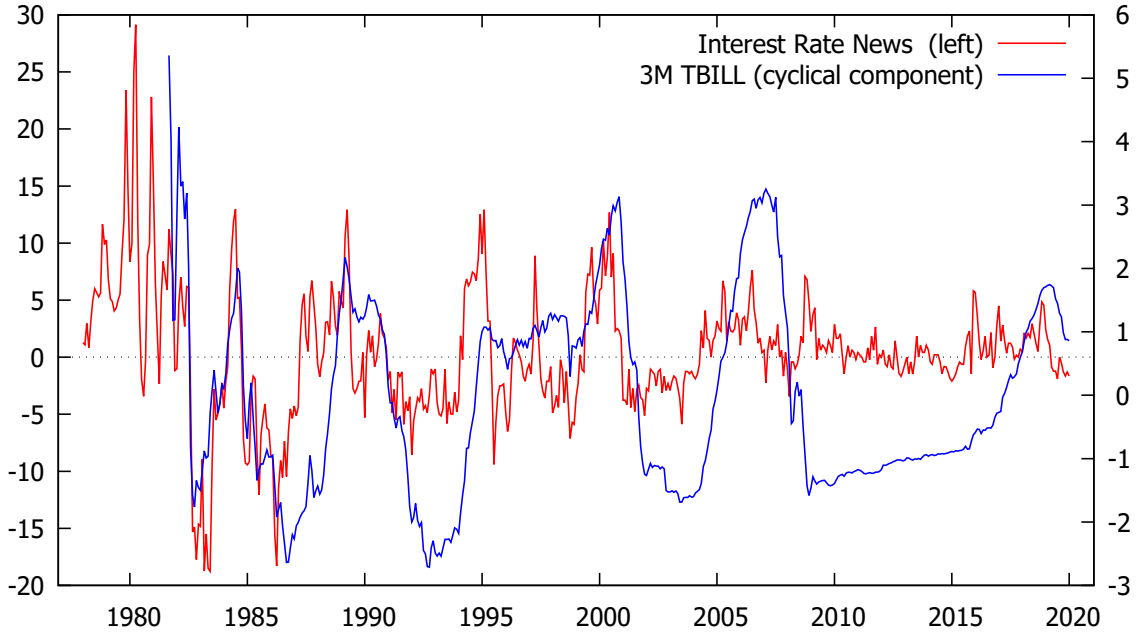

Figure 3: Net share of attention to interest rate news (red, left axis) computed using the share of households that have reported hearing news on interest rates during the respective month and the three-month T-Bill rate in percent (blue, left axis) from September 1981 to January 2020. To compare net shares for interest rate news with the three-month T-bill, we de-trended the T-bill rate using a second order polynomial. Net shares for interest rate news were moving closely with the T-bill rate until the start of the Great Recession. We can observe that changes in net shares of interest rate news are always based on some perceived benchmark rate of interest for the specific time period, i.e. the second order polynomial trend. To be more exact, while an increase of 0.1% might seem hardly newsworthy during times of high nominal rates of interest such as the 1980, these become newsworthy at times of low interest rates.

	(1)				
	count	mean	sd	max	min
Real income	168723	89458.18	81020.65	990127.8	2500
Real investment	119234	189188.7	636458.8	1.59e+07	0
Education	180272	4.157662	1.245331	6	1
Male	181236	.4846278	.499765	1	0
Age	181236	50.11299	16.77664	89	22
Married	181236	.6119369	.4873104	1	0
Number of kids	181107	.6356905	1.046774	5	0
Stock market participation	134749	.6253924	.4840232	1	0
Attention to economics	181236	.8820047	.8403489	2	0
Attention to social news	181236	.0580955	.2427452	2	0
Expectation on business	177343	.0836571	.6975682	1	-1
Expectation on unemployment	179332	-.152042	.6979746	1	-1
Expectation on stock price	103982	.4944727	.3003416	1	0
Car purchase attitude	171747	.3926007	.9057442	1	-1
Durable-goods purchase attitude	172355	.5271968	.8241304	1	-1
House-purchase attitude	177658	.5381801	.8349617	1	-1

Table 1: Summary table of main variables

	(1)							
	Good & Labor Market	Government	Price	Financial market	Exchange Rate	Agriculture	Social stable	Any news
1	.0441027	.3522913	.0994299	.050422	.0113129	.0038888	.0123293	.4645367
2	.0820592	.4012815	.1132567	.055148	.0176315	.0046399	.0147592	.541361
3	.1147961	.4468471	.1345627	.061997	.0251172	.0042894	.0146812	.6170956
4	.153547	.480663	.1572155	.0718232	.0302762	.006232	.016	.6824751
5	.1918844	.5075808	.2193785	.0752332	.050126	.0053927	.0204217	.7594926

Table 2: Share of respondents that heard news about each topic for different wealth quintiles

	(1)							
	Good & Labor Market	Government	Price	Financial market	Exchange Rate	Agriculture	Social stable	Any news
1	.0233743	.2542204	.0424533	.049046	.0076915	.010888	.0183798	.33633
2	.0450368	.2956495	.0515319	.0536152	.0123162	.0075368	.0213848	.398652
3	.0733717	.367576	.0669135	.0508579	.0169783	.0081496	.0246921	.4893325
4	.1136914	.4301166	.111953	.0629374	.0257782	.0079637	.0276354	.5997177
5	.1710373	.459804	.1364319	.072432	.0392937	.0084321	.0294956	.6780613
6	.2179401	.4959374	.1687415	.0839607	.0573984	.0085228	.032327	.7551746

Table 3: Share of respondents that heard news about each topic for different education groups

	(1)							
	Good & Labor Market	Government	Price	Financial market	Exchange Rate	Agriculture	Social stable	Any news
0	.1175288	.395076	.1101034	.0592234	.0323103	.0086124	.0276689	.5697444
1	.150694	.5190655	.0829478	.0892521	.0113885	.0062535	.0240988	.6763181

Table 4: Share of respondents that heard news about each topic for recession and non-recession months

	(1)							
	Good & Labor Market	Government	Price	Financial market	Exchange Rate	Agriculture	Social stable	Any news
1	.1399573	.4194979	.1220264	.0654024	.0360043	.0069444	.0287749	.6112179
2	.112326	.4155156	.0964049	.0586836	.0270307	.0151642	.0285985	.5779294
3	.124034	.4305835	.0999034	.0638717	.0309892	.0039026	.0285162	.5960587
4	.1185471	.396776	.1079606	.0661384	.0260734	.0059917	.0242289	.568605

Table 5: Share of respondents that heard news about each topic for different regions.
Note: 1=West, 2=North-central, 3=Northeast, 4=South.

	(1)							
	Good & Labor Market	Government	Price	Financial market	Exchange Rate	Agriculture	Social stable	Any news
0	.0628343	.365007	.101711	.0511318	.0142482	.0041245	.0135378	.4901624
1	.1494072	.4791477	.1669845	.0685444	.0341242	.0051287	.0168311	.6817132

Table 6: Share of respondents that heard news about each topic for different stock market participation status

	(1) Goods & labor markets news	(2) Government news	(3) Financial market news	(4) Price news	(5) Exchange rate news	(6) Agriculture news	(7) Social stable news
log of cash on hand	0.0162***	0.0123***	0.0194***	0.000854	0.00496***	-0.000426	0.000508
	(7.96)	(7.45)	(15.18)	(1.00)	(6.59)	(-1.52)	(1.08)
Education	0.0339***	0.0175***	0.0295***	0.00693***	0.00738***	0.000442*	0.00286***
	(18.49)	(12.25)	(27.36)	(7.33)	(9.85)	(1.83)	(8.35)
Recession in past 3 months	0.233***	0.0607***	-0.00826***	-0.0302***	-0.0368***	-0.0309***	0.0124***
	(117.41)	(33.24)	(-7.47)	(-30.42)	(-48.47)	(-113.96)	(30.38)
Stock participation	0.0336***	0.00826***	0.0262***	0.00384*	0.00202	0.00103*	-0.0000203
	(7.41)	(2.77)	(8.87)	(1.94)	(1.45)	(1.75)	(-0.02)
Age	0.0118***	0.00292***	0.00263***	0.00256***	0.000133	0.000104	0.000350**
	(20.69)	(7.22)	(8.29)	(8.71)	(0.86)	(1.45)	(2.36)
Age^2	-0.000104***	-0.0000236***	-0.0000266***	-0.0000242***	-0.00000165	-0.000000235	-0.00000305**
	(-19.27)	(-6.14)	(-9.11)	(-8.69)	(-1.17)	(-0.34)	(-2.23)
Male	-0.0300***	0.0228***	0.0294***	0.0139***	0.0141***	0.000941**	0.00189**
	(-8.25)	(9.70)	(14.73)	(8.53)	(11.32)	(2.10)	(2.03)
Married	0.00238	0.00137	-0.0102***	-0.000505	-0.000895	0.00130***	-0.00187**
	(0.66)	(0.59)	(-4.78)	(-0.28)	(-0.82)	(2.69)	(-2.18)
Number of Kids	-0.00329**	0.000100	-0.00247***	0.00108	-0.000589	-0.0000576	-0.000664
	(-2.06)	(0.09)	(-2.64)	(1.37)	(-1.05)	(-0.23)	(-1.53)
Observations	110592	110592	110592	110592	110592	110592	110592

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Relationship between wealth, stock market participation and attention in levels. The table presents results from OLS regressions. Dependent variable is attention that is measured by dummy variables that indicate whether reported news about goods and labor markets, government, financial market, price, exchange rate, agriculture, and social stability. Main explanatory variables are log of cash on hand, education, and NBER recession index. For each specification, we control for stock market participation indicator, age, gender, one-year change in personal financial situation, the year-month dummy and residence location dummy. t-statistics are clustered in year-month level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δ Goods & labor markets news	Δ Government news	Δ Price news	Δ Financial market news	Δ Exchange rate news	Δ Agriculture news	Δ Social stable news
Δlog of cash on hand	0.00586	0.0113***	0.00138	0.00634*	0.00327*	-0.000620	0.000606
	(0.99)	(2.97)	(0.49)	(1.66)	(1.76)	(-0.84)	(0.51)
d_RECESSION_1	0.145***	0.0306***	0.0523***	-0.00233***	0.0106***	0.00284***	-0.00536***
	(140.90)	(42.56)	(90.41)	(-3.48)	(38.73)	(18.96)	(-10.65)
Observations	34559	34559	34559	34559	34559	34559	34559

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Relationship between wealth, stock market participation and attention in first differences based on the panel sub-sample, where survey respondents got interviewed twice over a time period of six months. The table presents results from OLS regressions. Dependent variables differences of amounts of attention that is measured by dummy variables that indicate whether reported news about goods and labor market, government, financial market, price, exchange rate, agriculture, and social stability. Main explanatory variables are changes in log of cash on hand, education, stock market participation and recession status. For each specification, we control for age, gender, marriage status, number of kids,one-year change in personal financial situation, and the year-month dummy and residence location dummy. Standard errors are clustered in year-month level.

	(1) Business condition	(2) Unemployment	(3) Inflation	(4) Interest rate
Δ Any news	0.00148			
	(0.35)			
Δ realized real GDP	0.000184***			
	(7.97)			
Δ Goods & labor markets news		0.00687*		
		(1.66)		
Δ realized unemployment		0.699***		
		(19.60)		
Δ Price news			0.00171	
			(0.18)	
Δ realized inflation			1.625***	
			(3.39)	
Δ Financial market news				0.0106*
				(1.68)
Δ realized interest rate				0.231***
				(8.90)
Observations	38887	40141	25147	39166

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Relationship between changes in macroeconomic expectations and amount of attention. The table presents results from LPM regressions. Dependent variables are dummy variables which take value zero if respondents have no change in their expectations on business condition, unemployment, price and interest rate. Main explanatory variables are changes of attention to different economic and social news between two interviews and changes of realized corresponding states (real GDP, unemployment rate, GDP deflator and interest rate). We also control for log of cash on hand, stock market participation status, NBER recession index. For each specification, we control for age, gender, education, marriage status, number of kids, one-year change in personal financial situation, the year-month dummy and residence location dummy. Standard errors are clustered in year-month level.

	(1) Real GDP forecast bias	(2) Unemployment forecast bias	(3) Inflation forecast bias	(4) Interest rate forecast bias
Δ Any news	-0.00475			
	(-0.61)			
Δ Goods & labor markets news		-0.0196**		
		(-2.57)		
Δ Price news			-0.0264**	
			(-2.44)	
Δ Financial market news				-0.00840
				(-0.97)
Observations	38887	39553	31236	39166

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Relationship between changes in macroeconomic forecast bias. The table presents results from probit regressions. Dependent variables are differences between consumers' macroeconomic expectations and professional forecasts regarding real GDP, unemployment, inflation and interest rate. Main explanatory variables are changes of attention to different economic and social news between two interviews. We also control for changes in log of cash on hand, stock market participation status, NBER recession index. For each specification, we control for age, gender, education, marriage status, number of kids, one-year change in personal financial situation, the year-month dummy and residence location dummy. Standard errors are clustered in year-month level.

	(1) Durable goods	(2) Home	(3) Durable goods	(4) Home
Expectation_business condition	0.135***	0.167***	0.117***	0.160***
	(28.64)	(32.41)	(17.36)	(21.90)
Expectation_inflation	-0.0222***	-0.00973	-0.0207***	-0.00884
	(-3.23)	(-1.47)	(-3.00)	(-1.33)
Expectation_interest rate	0.00735	-0.0391***	0.00588	-0.0423***
	(1.53)	(-7.90)	(1.16)	(-8.36)
log of cash on hand	0.0415***	0.0634***	0.0414***	0.0631***
	(12.33)	(17.62)	(12.24)	(17.51)
Education	0.00101	0.0411***	0.000912	0.0408***
	(0.39)	(15.12)	(0.35)	(15.04)
Recession in past 3 months	-0.542***	0.151***	-0.542***	0.150***
	(-133.39)	(37.41)	(-133.35)	(37.28)
Stock participation	0.00648	0.0674***	0.00622	0.0671***
	(0.83)	(8.40)	(0.80)	(8.36)
Expectation_business condition*Attention			0.0274***	0.01000
			(3.57)	(1.24)
Expectation_inflation*Attention			-0.0263**	-0.0163
			(-2.03)	(-1.28)
Expectation_interest rate*Attention			0.0109	0.0269***
			(1.11)	(2.79)
Observations	102771	105281	102771	105281

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Relationship between economic actions and amount of attention. The table presents results from OLS regressions. Dependent variable is purchase attitude toward durable goods. Main explanatory variables are expectation on business condition, log of cash on hand, education, NBER recession index. For each specification, we control for stock market participation indicator, age, gender, education, marriage status, number of kids, one-year change in personal financial situation, the year-month dummy and residence location dummy. Standard errors are clustered in year-month level.

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Appendix

Appendix A: Consumption function and endogenizing attention

In this section, we show how to endogenize all three attention parameters in our behavioral consumption-savings model. Here, we follow closely the approach in Gabaix (2020) and cite appendix paper. As first step we will make use of a representation of the consumption function of the consumption-savings problem. Given the model presented in the model section of the main paper, one can show that the subjective consumption choice takes the following form

Lemma 1 *Optimal consumption is, up to second order terms:*

$$\hat{c}_t = (1-\beta)\, k_t + \bar{y} + b_r m_r r_t \frac{1}{1-\beta\bar{m}\rho_r} + b_y m_y y_t \frac{1}{1-\beta\bar{m}\rho_y}, \tag{29}$$

where $b_r := -\frac{\beta^2}{\gamma}$, *and* $b_y := 1-\beta$.

Proof.

This follows directly proposition (29) in the appendix paper to Gabaix (2020). Differently to Gabaix (2020), we express the steady state interest rate in terms of time preferences β.

$$\hat{c}_t = (1-\beta)\, k_t + \bar{y} + \sum_{k\geq 0} \beta^k \mathbb{E}_t^{BR} \left[b_r \hat{r}_{t+k}^{BR} + b_y \hat{y}_{t+k}^{BR} \right]. \tag{30}$$

Note that in our model, we exclude the labor-leisure choice from the consumer's maximization and that we concentrate on random shocks to income and the real of interest instead to a single shock to productivity. This choice does not effect the form of (30).

Substituting the behavioral expectations operators by Equations (9) and (10) as in the main text, we can write

$$c_t = (1-\beta)\, k_t + \bar{y} + \sum_{k\geq 0} \beta^k \mathbb{E}_t \left[b_r \bar{m}^k m_r \hat{r}_{t+k} + b_y \bar{m}^k m_y \hat{y}_{t+k} \right] \tag{31}$$

$$= (1-\beta)\, k_t + \bar{y} + \sum_{k\geq 0} \beta^k \bar{m}^k \left[b_r m_r \mathbb{E}_t \hat{r}_{t+k} + b_y m_y \mathbb{E}_t \hat{y}_{t+k} \right]. \tag{32}$$

Further utilizing the exogenous laws of motion for income and real rate of interest, the 'rational' expected values are given by

$$\mathbb{E}_t \hat{y}_{t+k} = \rho_y^k \hat{y}_t \tag{33}$$

$$\mathbb{E}_t \hat{r}_{t+k} = \rho_r^k \hat{r}_t. \tag{34}$$

Plugging this into (32) yields

$$\hat{c}_t = (1-\beta)\, k_t + \bar{y} + \sum_{k\geq 0} \beta^k \bar{m}^k \left[b_r m_r \rho_r^k \hat{r}_t + b_y m_y \rho_y^k \hat{y}_t \right] \tag{35}$$

$$= (1-\beta)\, k_t + \bar{y} + b_r m_r \hat{r}_t \sum_{k\geq 0} \left(\beta \bar{m} \rho_r\right)^k + b_y m_y \hat{y}_t \sum_{k\geq 0} \left(\beta \bar{m} \rho_y\right)^k . \tag{36}$$

Since persistences ρ_r, ρ_y, time preference β, and all three attention coefficients are smaller than one in absolute value, we can compute the limit of each individual geometric series:

$$\hat{c}_t = (1-\beta)\, k_t + \bar{y} + \frac{b_r m_r}{1-\beta \bar{m} \rho_r} \hat{r}_t + \frac{b_y m_y}{1-\beta \bar{m} \rho_y} \hat{y}_t. \tag{37}$$

■

Propositions (13) and (14) in the appendix to Gabaix (2020) lay out how to set up the quadratic approximation of the loss in utility which results from inattentive actions evaluated at the consumers actual utility. We adopt these propositions for our purposes, which leads to the following proposition:

Proposition 1 *In the consumer problem, attention is*

$$\bar{m} = \mathcal{A}\left(\frac{\Lambda_{\bar{m}}}{\kappa}, \bar{m}^d \right), \tag{38}$$

$$m_r = \mathcal{A}\left(\frac{\Lambda_{m_r}}{\kappa}, m_r^d \right), \tag{39}$$

$$m_y = \mathcal{A}\left(\frac{\Lambda_{m_y}}{\kappa}, m_y^d \right) \tag{40}$$

with $\left(\Lambda_{\bar{m}}, \Lambda_{m_r}, \Lambda_{m_y}\right) = \gamma\left(\mathbb{E}\left[\hat{c}_{\bar{m}}^2\right], \mathbb{E}\left[\hat{c}_{m_r}^2\right], \mathbb{E}\left[\hat{c}_{m_y}^2\right]\right)$*, where* κ *is the consumer's cost of cognition, the attention function* $\mathcal{A}$ *is in proposition (13) in Gabaix (2020), and the coefficients* $\Lambda_{\bar{m}}, \Lambda_{m_r}, \Lambda_{m_y}$ *are computed below.*

Proof.

The following computations are closely following p. 34ff. in the appendix paper to Gabaix (2020).

Endogenizing $\bar{m}$

The loss from attention from $\bar{m}$ is given by

$$\Lambda_{\bar{m}} = \gamma \mathbb{E}\left[\hat{c}_{\bar{m}}^2\right], \tag{41}$$

With the derivate of the consumption function in proposition 1 given by

$$\hat{c}_{\bar{m}} := \frac{\partial \hat{c}_t}{\partial \bar{m}} = \frac{\beta \rho_r b_r m_r}{(1 - \beta \bar{m} \rho_r)^2} \hat{r}_t + \frac{\beta \rho_y b_y m_y}{(1 - \beta \bar{m} \rho_y)^2} \hat{y}_t, \tag{42}$$

which yields

$$\mathbb{E}\left[\hat{c}^2_{\bar{m}}\right] = \frac{(\beta \rho_r b_r m_r)^2}{(1 - \beta \bar{m} \rho_r)^4} \sigma_r^2 + \frac{(\beta \rho_y b_y m_y)^2}{(1 - \beta \bar{m} \rho_y)^4} \sigma_y^2. \tag{43}$$

Endogenizing m_r

The loss from attention from m_r is given by

$$\Lambda_{m_r} = \gamma \mathbb{E}\left[\hat{c}^2_{m_r}\right], \tag{44}$$

With the derivate of the consumption function in proposition 1 given by

$$\hat{c}_{m_r} := \frac{\partial \hat{c}_t}{\partial m_r} = \frac{b_r}{1 - \beta \bar{m} \rho_r} \hat{r}_t \tag{45}$$

which yields

$$\mathbb{E}\left[\hat{c}^2_{m_r}\right] = \frac{b_r^2}{(1 - \beta \bar{m} \rho_r)^2} \sigma_r^2 \tag{46}$$

Endogenizing m_y

The loss from attention from m_y is given by

$$\Lambda_{m_y} = \gamma \mathbb{E}\left[\hat{c}^2_{m_y}\right], \tag{47}$$

With the derivate of the consumption function in proposition 1 given by

$$\hat{c}_{m_y} := \frac{\partial \hat{c}_t}{\partial m_y} = \frac{b_y}{1 - \beta \bar{m} \rho_y} \hat{y}_t \tag{48}$$

which yields

$$\mathbb{E}\left[\hat{c}^2_{m_y}\right] = \frac{b_y^2}{(1 - \beta \bar{m} \rho_y)^2} \sigma_y^2 \tag{49}$$

■

Appendix B: News category

0: Has heard of no changes

10: FAV Elections, admin, Congress, President

11: FAV More military spending, more war/tensions

12: FAV Less military spending, few tensions

13: FAV Government programs improved

14: FAV Specific government programs increase/continue

15: FAV Specific government programs decrease/end

16: FAV Taxes, changes/reforms, rebates

17: FAV Other references to government

18: FAV Fiscal policy, budgets, deficits

19: FAV Government improving business condition

20: FAV Opening of plants, factories, stores

21: FAV Consumer/auto demand high

22: FAV Purchase power high, wages high

23: FAV Employ is high, plenty of jobs

24: FAV Population increase, more people to buy

25: FAV Low debts, higher savings/assets, invest up

27: FAV Other references to employ and purchase power

28: FAV Production increasing, GNP is up

29: FAV Unemp has risen, good for economy

30: FAV Tight money, interest rates high

31: FAV Lower/stable prices, less inflation

32: FAV Higher prices, inflation is good

33: FAV Easier money, credit easy to get, low int rates

35: FAV Profits high/rising

36: FAV Stock market, rise in price of stocks

37: FAV Other references to prices/credit

38: FAV Balance of payments, dollar devalue

39: FAV Controls (price or wage)

40: FAV Better race relations, less crime

41: FAV Union disputes settled, relations good

42: FAV Times/business is good in the coming year

43: FAV Bad times can't last, due for good times

44: FAV Respondent sees sign of improvement already

45: FAV Improvements in specific industries

46: FAV Farm situation good, crops good

47: FAV Other good factors or favorable references

48: FAV Economy more stable, optimism

49: FAV Energy crisis, pollution

50: UNFAV Election, new admin/President

51: UNFAV More military spending, more war/tensions

52: UNFAV Less military spending, few tensions

53: UNFAV Specific government spend programs changed

54: UNFAV Specific government spend programs eliminated

55: UNFAV Government programs begun/increased

56: UNFAV Taxes, changes/reforms, rebates

57: UNFAV Other references to government

58: UNFAV Fiscal policy, budgets, deficits

59: UNFAV Government not improving business conditions

60: UNFAV Closing of plants, factories, stores

61: UNFAV Consumer/auto demand low

62: UNFAV Lack of purchase power, no money to spend

63: UNFAV Drop in employ, less overtime

64: UNFAV Population increase, immigration

65: UNFAV High(er) debts, lower savings/assets

67: UNFAV Other references to employ/purchase power

68: UNFAV Production decreasing, GNP down

71: UNFAV Prices falling, deflation

72: UNFAV Prices high, inflation

73: UNFAV Tight money, int rates high

74: UNFAV Profits low, falling

75: UNFAV Profits high, too high

76: UNFAV Stock market decline

77: UNFAV Other price/credit references

78: UNFAV Balance of payments, dollar devalue

79: UNFAV Controls (price or wage)

80: UNFAV Bad race relations; more crime

81: UNFAV Excessive wage demands by unions; labor unrest

82: UNFAV Times are bad now and will not change in next year

83: UNFAV Good times can't last, due for a fall

84: UNFAV Respondent sees downward trends, has heard business is bad

85: UNFAV Decline in specific industries

86: UNFAV Farm situation is bad, low farm prices, drought

87: UNFAV Other unfavorable/bad factors

88: UNFAV Economy in general less stable, lack of confidence

89: UNFAV Energy crisis, pollution, less natural resources

Appendix C: Selected News Groups

- Government: NEWS=10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59.
- Goods and labor markets: NEWS=20, 21, 22, 23, 24, 25, 27, 28, 29, 35, 42, 43, 44, 45, 60, 61, 62, 63, 64, 65, 68, 69, 74, 75, 82, 83, 84, 85.
- Price: NEWS=30, 31, 32, 33, 37, 39, 70, 71, 72, 73, 77, 79.
- Stock market: NEWS=36, 76.
- Exchange rate: NEWS=38, 78.
- Social stability: NEWS=40, 41, 48, 49, 80, 81, 88, 89.
- Agriculture: NEWS=46, 86.

Appendix D: Survey questions on macroeconomic expectations and economic attitudes

- **BEXP:** How about a year form now, do you expect that in the country as a whole business conditions will be better, or worse than they are at present, or just about the same?
- **UNEMP:** How about people out of work during the coming 12 months-do you think that there will be more unemployment than now, how the same, or less?
- **PX1Q1:** During the next 12 months, do you think that prices in general will go up, or go down, or stay where they are now?
- **RATEX:** No one can say for sure, but what do you think will happen to interest rates for borrowing money during the next 12 months–will they go up, stay the same, or go down?
- **HOM:** Generally speaking, do you think now is a good time or a bad time to buy a house?
- **DUR:** Generally speaking, do you think now is a good time or a bad time to buy a major household items?

Appendix E: Mapping survey expectations to Gabaix (2020)

Here we discuss why we equate survey expectations in the MSC with the behavioral expectation operator in Gabaix (2020) or in our model Section 2. When expanding his original model environment in Gabaix (2020)[p. 29 ff.], Gabaix (2020) introduces the so-called term structure of attention. Here, additionally to the cognitive discounting of future variables, the author introduces limited attention to contemporaneous variables. To be more formal, suppose that agent is interested in computing expectations about the future values of some variable x_t.[29] Further suppose that the objective law of motion for x_t is given by

$$x_{t+1} = \rho x_t + \epsilon_{t+1}, \tag{50}$$

with $\mathbb{E}_t \epsilon_{t+1} = 0$. However, following Gabaix (2020) and Angeletos et al. (2020)[p. 29], if the agent cognitively discounts the future, her subjective law of motion becomes

$$x_{t+1}^{BR} = \bar{m}\rho x_t^{BR} + \epsilon_{t+1}, \tag{51}$$

where $\bar{m} \in (0,1)$ measures the degree of inattention regarding future values of x_t.[30] Further, taking inattention to contemporaneous values into account, we can substitute x_t by $m_x x_t$ in the subjective law of motion. The degree of inattention to contemporaneous variables is measures by the parameter $m_x \in (0,1)$. Plugging this into the subjective law of motion results in

$$x_{t+1} = \bar{m}\rho m_x x_t + \epsilon_{t+1}. \tag{52}$$

The agent's behavioral expectation, following the notation by Gabaix (2020), now becomes

$$\mathbb{E}_t^{BR} x_{t+1}^{BR} = \bar{m} m_x \mathbb{E}_t x_{t+1}. \tag{53}$$

As we assume that survey participants in the MSC exhibit both inattention about present of future values of relevant states, we set

$$\mathbb{E}_t^{MSC} x_{t+1} := \mathbb{E}_t^{BR} x_{t+1}^{BR}. \tag{54}$$

Appendix F: Robustness checks

[29] It is not relevant if x_t is exogenous or endogenous.

[30] Differently to Angeletos et al. (2020) we refer to the state x_t in the subjective law of motion by x_t^{BR} to emphasize the difference to the true state x_t. BR refers to the boundedly rational agent.

	(1) Goods & labor markets news	(2) Government news	(3) Financial market news	(4) Price news	(5) Exchange rate news	(6) Agriculture news	(7) Social stable news
log of income	0.0235***	0.0132***	0.0226***	0.00154	0.00483***	-0.000184	0.000304
	(9.77)	(6.75)	(14.44)	(1.40)	(6.21)	(-0.52)	(0.50)
Education	0.0329***	0.0182***	0.0307***	0.00650***	0.00788***	0.000303	0.00277***
	(18.69)	(12.43)	(29.68)	(6.88)	(10.46)	(1.30)	(8.25)
Recession in past 3 months	0.227***	0.0470***	-0.0285***	-0.0294***	-0.0387***	-0.0265***	0.00456***
	(119.33)	(27.31)	(-27.04)	(-32.32)	(-54.71)	(-96.43)	(11.92)
Stock participation	0.0431***	0.0172***	0.0394***	0.00379**	0.00668***	0.000629	0.000556
	(11.63)	(6.46)	(16.93)	(2.20)	(5.41)	(1.34)	(0.65)
Age	0.0118***	0.00314***	0.00315***	0.00250***	0.000301*	0.0000639	0.000392***
	(21.85)	(8.29)	(10.36)	(8.69)	(1.90)	(0.83)	(2.76)
Age^2	-0.000102***	-0.0000244***	-0.0000291***	-0.0000238***	-0.00000253*	0.000000130	-0.00000342***
	(-19.99)	(-6.76)	(-10.42)	(-8.72)	(-1.75)	(0.17)	(-2.60)
Male	-0.0301***	0.0230***	0.0289***	0.0146***	0.0149***	0.000741*	0.00178**
	(-8.52)	(9.99)	(14.83)	(8.98)	(12.01)	(1.72)	(2.09)
Married	-0.00199	0.000818	-0.0109***	-0.000513	-0.00128	0.000933*	-0.00151*
	(-0.56)	(0.37)	(-5.21)	(-0.29)	(-1.24)	(1.91)	(-1.83)
Number of Kids	-0.00361**	-0.000222	-0.00241**	0.000920	-0.000559	0.0000386	-0.000749*
	(-2.38)	(-0.21)	(-2.58)	(1.20)	(-1.03)	(0.16)	(-1.79)
Observations	122727	122727	122727	122727	122727	122727	122727

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Relationship between wealth, stock market participation and attention in levels. The table presents results from OLS regressions. Dependent variable is attention that is measured by dummy variables that indicate whether reported news about goods and labor market, government, financial market, price, exchange rate, agriculture, and social stability. Main explanatory variables are log of cash on hand, education level, and NBER recession index. For each specification, we control for stock market participation indicator, age, gender, marital status, number of kids, one-year change in personal financial situation, the year-month dummy and residence location dummy. t-statistics are clustered in year-month level.

	(1) Business condition	(2) Unemployment	(3) Inflation	(4) Interest rate
Δ Any news	0.00148			
	(0.35)			
Δ realized real GDP	0.000184***			
	(7.97)			
Δ Goods & labor markets news		0.00687*		
		(1.66)		
Δ realized unemployment		0.699***		
		(19.60)		
Δ Price news			0.00171	
			(0.18)	
Δ realized inflation			1.625***	
			(3.39)	
Δ Financial market news				0.0106*
				(1.68)
Δ realized interest rate				0.231***
				(8.90)
Observations	38887	40141	25147	39166

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 13: Relationship between changes in macroeconomic expectations and amount of attention. The table presents results from LPM regressions. Dependent variables are dummy variables which take value zero if respondents have no change in their expectations on business condition, unemployment, price and interest rate. Main explanatory variables are changes of attention to different economic and social news between two interviews and changes of realized corresponding states (real GDP, unemployment rate, GDP deflator and interest rate). We also control for log of income, stock market participation status, NBER recession index. For each specification, we control for age, gender, education, marriage status, number of kids, one-year change in personal financial situation, the year-month dummy and residence location dummy. Standard errors are clustered in year-month level.

	(1) Real GDP forecast bias	(2) Unemployment forecast bias	(3) Inflation forecast bias	(4) Interest rate forecast bias
Δ Any news	-0.00475			
	(-0.61)			
Δ Goods & labor markets news		-0.0196**		
		(-2.57)		
Δ Price news			-0.0264**	
			(-2.44)	
Δ Financial market news				-0.00840
				(-0.97)
Observations	38887	39553	31236	39166

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 14: Relationship between changes in macroeconomic forecast bias. The table presents results from probit regressions. Dependent variables are differences between consumers' macroeconomic expectations and professional forecasts regarding real GDP, unemployment, inflation and interest rate. Main explanatory variables are changes of attention to different economic and social news between two interviews. We also control for changes in log of income, stock market participation status, NBER recession index. For each specification, we control for age, gender, education, marriage status, number of kids, one-year change in personal financial situation, the year-month dummy and residence location dummy. Standard errors are clustered in year-month level.

	(1) Durable goods	(2) Home	(3) Durable goods	(4) Home
Expectation_business condition	0.138***	0.167***	0.120***	0.159***
	(30.14)	(34.48)	(18.67)	(23.74)
Expectation_inflation	-0.0219***	-0.00924	-0.0206***	-0.00850
	(-3.32)	(-1.47)	(-3.10)	(-1.34)
Expectation_interest rate	0.00717	-0.0361***	0.00535	-0.0399***
	(1.61)	(-7.66)	(1.14)	(-8.25)
log of income	0.0412***	0.0835***	0.0411***	0.0832***
	(9.78)	(16.35)	(9.74)	(16.28)
Education	0.00337	0.0377***	0.00319	0.0373***
	(1.34)	(14.64)	(1.28)	(14.54)
Recession in past 3 months	-0.502***	0.138***	-0.502***	0.138***
	(-122.19)	(34.19)	(-122.00)	(33.80)
Stock participation	0.0385***	0.109***	0.0380***	0.109***
	(5.91)	(15.11)	(5.87)	(15.01)
Expectation_business condition*Attention			0.0262***	0.0121*
			(3.56)	(1.66)
Expectation_inflation*Attention			-0.0241*	-0.0132
			(-1.92)	(-1.10)
Expectation_interest rate*Attention			0.0136	0.0310***
			(1.49)	(3.53)
Observations	113686	116662	113686	116662

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 15: Relationship between economic actions and amount of attention. The table presents results from OLS regressions. Dependent variable is purchase attitude toward durable goods. Main explanatory variables are expectation on business condition, log of cash on hand, education, NBER recession index. For each specification, we control for stock market participation indicator, age, gender, marital status, number of kids, education level, one-year change in personal financial situation, the year-month dummy and residence location dummy. Standard errors are clustered in year-month level.

	(1) Goods & labor markets news	(2) Government news	(3) Financial market news	(4) Price news	(5) Exchange rate news	(6) Agriculture news	(7) Social stable news
log of Cash on hand	0.0165***	0.0125***	0.0191***	0.000889	0.00493***	-0.000514	0.000956
	(6.11)	(6.13)	(11.36)	(0.81)	(5.41)	(-1.58)	(1.58)
Education	0.0335***	0.0190***	0.0276***	0.00616***	0.00737***	0.000695**	0.00285***
	(15.40)	(11.20)	(22.41)	(6.06)	(9.66)	(2.31)	(5.87)
Recession in past 3 months	0.246***	0.0626***	0.00610***	-0.0387***	-0.0415***	-0.0423***	0.0288***
	(108.42)	(31.74)	(4.51)	(-35.37)	(-48.91)	(-155.11)	(51.28)
Stock participation	0.0355***	0.0122***	0.0257***	0.00151	0.000737	0.00146*	-0.000393
	(6.06)	(2.97)	(7.80)	(0.64)	(0.45)	(1.87)	(-0.28)
Age	0.0115***	0.00295***	0.00277***	0.00219***	0.000125	0.0000174	0.000309
	(15.86)	(5.68)	(7.06)	(6.08)	(0.60)	(0.21)	(1.61)
Age^2	-0.000103***	-0.0000236***	-0.0000265***	-0.0000197***	-0.00000144	0.000000813	-0.00000277
	(-14.77)	(-4.76)	(-7.31)	(-5.75)	(-0.76)	(0.98)	(-1.52)
Male	-0.0247***	0.0238***	0.0255***	0.0126***	0.0149***	0.00125**	0.00179
	(-5.77)	(8.64)	(10.28)	(6.20)	(10.48)	(2.11)	(1.47)
Married	0.00298	0.00144	-0.00889***	0.000382	-0.00216*	0.00166**	-0.00216*
	(0.66)	(0.48)	(-3.42)	(0.17)	(-1.73)	(2.56)	(-1.87)
Number of Kids	-0.00228	0.000266	-0.00274**	0.00229**	-0.000530	0.000196	-0.000177
	(-1.17)	(0.19)	(-2.35)	(2.42)	(-0.84)	(0.60)	(-0.32)
Observations	66122	66122	66122	66122	66122	66122	66122

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 16: Relationship between wealth, stock market participation and attention in levels. The table presents results from OLS regressions. Dependent variable is attention that is measured by dummy variables that indicate whether reported news about goods and labor market, government, financial market, price, exchange rate, agriculture, and social stability. Main explanatory variables are log of cash on hand, education level, and NBER recession index. For each specification, we control for stock market participation indicator, age, gender, marital status, number of kids, one-year change in personal financial situation, the year-month dummy and residence location dummy. t-statistics are clustered in year-month level.

	(1) Durable goods	(2) Home	(3) Durable goods	(4) Home
Expectation_business condition	0.139***	0.171***	0.119***	0.161***
	(25.07)	(28.50)	(14.30)	(18.59)
Expectation_inflation	-0.0181**	-0.0167**	-0.0156*	-0.0146*
	(-2.06)	(-2.01)	(-1.77)	(-1.76)
Expectation_interest rate	0.00414	-0.0387***	0.00350	-0.0422***
	(0.68)	(-5.58)	(0.54)	(-5.96)
log of Cash on hand	0.0417***	0.0698***	0.0417***	0.0695***
	(9.78)	(15.31)	(9.74)	(15.26)
Education	-0.000712	0.0387***	-0.000604	0.0385***
	(-0.21)	(11.08)	(-0.18)	(11.08)
Recession in past 3 months	-0.546***	0.214***	-0.547***	0.213***
	(-111.84)	(42.93)	(-111.80)	(42.67)
Stock participation	0.00775	0.0706***	0.00750	0.0702***
	(0.79)	(7.00)	(0.76)	(6.96)
Expectation_business condition*Attention			0.0297***	0.0133
			(3.08)	(1.32)
Expectation_inflation*Attention			-0.0463***	-0.0397**
			(-2.80)	(-2.33)
Expectation_interest rate*Attention			0.00462	0.0324**
			(0.36)	(2.29)
Observations	61020	62657	61020	62657

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 17: Relationship between economic actions and amount of attention. The table presents results from OLS regressions. Dependent variable is purchase attitude toward durable goods. Main explanatory variables are expectation on business condition, log of cash on hand, education, NBER recession index. For each specification, we control for stock market participation indicator, age, gender, marital status, number of kids, education level, one-year change in personal financial situation, the year-month dummy and residence location dummy. Standard errors are clustered in year-month level.

	(1) Durable goods	(2) Home	(3) Durable goods	(4) Home
Expectation_business condition	0.231***	0.289***	0.202***	0.261***
	(29.72)	(35.08)	(17.72)	(21.28)
Expectation_inflation	-0.0371***	-0.0156	-0.00880	0.00757
	(-3.15)	(-1.32)	(-0.66)	(0.54)
Expectation_interest rate	0.0129	-0.0575***	0.00956	-0.0630***
	(1.60)	(-6.93)	(1.11)	(-7.46)
ZLB dummy	-0.213***	0.283***	-0.151***	0.341***
	(-43.52)	(56.79)	(-7.00)	(16.86)
log of Cash on hand	0.0744***	0.114***	0.0741***	0.113***
	(12.38)	(17.08)	(12.30)	(16.98)
Education	-0.000936	0.0689***	-0.00124	0.0684***
	(-0.21)	(14.82)	(-0.28)	(14.80)
Recession in past 3 months	-0.686***	-0.0242***	-0.699***	-0.0348***
	(-132.16)	(-4.55)	(-101.92)	(-5.79)
Stock participation	0.00795	0.102***	0.00773	0.101***
	(0.58)	(7.65)	(0.57)	(7.60)
Expectation_business condition*Attention			0.0434***	0.0437***
			(3.23)	(3.09)
Expectation_inflation*Attention			-0.0399*	-0.0254
			(-1.85)	(-1.24)
Expectation_interest rate*Attention			0.0264	0.0492***
			(1.46)	(2.67)
Expectation_inflation*ZLB			-0.0713***	-0.0689***
			(-2.84)	(-2.86)
Observations	102771	105281	102771	105281

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 18: Relationship between economic actions and amount of attention. The table presents coefficients from ordered probit regressions. Dependent variable is purchase attitude toward durable goods. Main explanatory variables are expectation on business condition, zero-lower bound (ZLB) dummy, log of cash on hand, education, NBER recession index. For each specification, we control for stock market participation indicator, age, gender, marital status, number of kids, education level, one-year change in personal financial situation, the year-month dummy and residence location dummy. Standard errors are clustered in year-month level.

	(1) Durable goods	(2) Home	(3) Durable goods	(4) Home
Expectation_business condition	0.136***	0.337***	0.142***	0.342***
	(3.76)	(9.10)	(3.93)	(9.26)
Expectation_inflation	-0.0840	-0.0855	-0.0839	-0.0852
	(-1.57)	(-1.43)	(-1.57)	(-1.43)
Expectation_interest rate	-0.112***	-0.157***	-0.109***	-0.150***
	(-2.71)	(-4.09)	(-2.65)	(-3.89)
log of cash on hand	0.0325***	0.0548***	0.0326***	0.0550***
	(5.92)	(10.19)	(5.94)	(10.27)
Expectation_business condition*log(Cash-on-hand)	-0.000114	-0.0147***	-0.00229	-0.0163***
	(-0.04)	(-4.72)	(-0.75)	(-5.21)
Expectation_inflation*log(Cash-on-hand)	0.00537	0.00663	0.00550	0.00669
	(1.16)	(1.30)	(1.19)	(1.32)
Expectation_interest rate*log(Cash-on-hand)	0.0104***	0.0104***	0.0102***	0.00950***
	(2.99)	(3.13)	(2.89)	(2.85)
Education	0.000853	0.0408***	0.000808	0.0406***
	(0.33)	(14.99)	(0.31)	(14.93)
Recession in past 3 months	-0.543***	0.149***	-0.544***	0.149***
	(-134.87)	(37.11)	(-134.78)	(36.86)
Stock participation	0.00666	0.0671***	0.00635	0.0667***
	(0.86)	(8.35)	(0.82)	(8.29)
Expectation_business condition*Attention			0.0290***	0.0197**
			(3.75)	(2.44)
Expectation_inflation*Attention			-0.0267**	-0.0161
			(-2.06)	(-1.26)
Expectation_interest rate*Attention			0.00591	0.0220**
			(0.60)	(2.28)
Observations	102771	105281	102771	105281

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 19: Relationship between economic actions and amount of attention. The table presents coefficients from ordered probit regressions. Dependent variable is purchase attitude toward durable goods. Main explanatory variables are expectation on business condition, zero-lower bound (ZLB) dummy, log of cash on hand, education, NBER recession index. For each specification, we control for stock market participation indicator, age, gender, marital status, number of kids, education level, one-year change in personal financial situation, the year-month dummy and residence location dummy. Standard errors are clustered in year-month level.

	(1)	(2)
	Durable goods	Durable goods
Expectation_business condition	0.222***	0.214***
	(3.47)	(3.53)
Expectation_inflation	0.123	0.0888
	(1.53)	(1.09)
Expectation_interest rate	0.00202	-0.00453
	(0.03)	(-0.06)
ZLB dummy	0.0141	-0.0800
	(0.10)	(-0.37)
log of Cash on hand	-0.0742	-0.0728
	(-1.35)	(-1.30)
Education	0.0231	0.0252
	(0.43)	(0.47)
Recession in past 3 months	-2.419***	-2.399***
	(-10.39)	(-9.50)
Stock participation	-0.0455	-0.0440
	(-0.40)	(-0.39)
Expectation_business_condition*ZLB		0.131
		(0.64)
Observations	385	385

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 20: Relationship between economic actions and amount of attention. The table presents coefficients from OLS regressions by using a sub-sample of individuals who reported hearing news regarding inflation and higher inflation as unfavorable news. Dependent variable is purchase attitude toward durable goods. Main explanatory variables are expectation on business condition, log of cash on hand, education, NBER recession index. For each specification, we control for stock market participation indicator, age, gender, marital status, number of kids, education level, one-year change in personal financial situation, the year-month dummy and residence location dummy. Standard errors are clustered in year-month level.