DISCUSSION PAPER SERIES

DP17447

Evidence on Expectations of Household Finances

Joâo Cocco, Francisco Gomes and Paula Lopes

FINANCIAL ECONOMICS

MACROECONOMICS AND GROWTH

CEPR

ISSN 0265-8003

Evidence on Expectations of Household Finances

Joâo Cocco, Francisco Gomes and Paula Lopes

Discussion Paper DP17447
Published 07 July 2022
Submitted 06 July 2022

Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
www.cepr.org

Evidence on Expectations of Household Finances

Abstract

We use panel data on expected and realized changes in household finances to study the process of expectation formation and expectation errors. Households extrapolate from improvements in financial situation, but a deterioration in their finances is associated with an increased dispersion of forecasts. This increased dispersion leads to higher probabilities of both negative and positive forecast errors. Individuals who expect negative earnings shocks to revert too quickly save less and have a higher likelihood of being financially worse off again in the future. A calibrated life-cycle model quantifies the consumption smoothing and welfare implications of belief distortions.

JEL Classification: D84, G40, G50

Keywords: N/A

Joâo Cocco - jcocco@london.edu
London Business School and CEPR

Francisco Gomes - fgomes@london.edu
London Business School and CEPR

Paula Lopes - p.v.lopes-cocco@lse.ac.uk
London School of Economics

Evidence on expectations of household finances*

João F. Cocco† Francisco Gomes‡ Paula Lopes§

May 20, 2022

Abstract

We use panel data on expected and realized changes in household finances to study the process of expectation formation and expectation errors. Households extrapolate from improvements in financial situation, but a deterioration in their finances is associated with an increased dispersion of forecasts. This increased dispersion leads to higher probabilities of both negative and positive forecast errors. Individuals who expect negative earnings shocks to revert too quickly save less and have a higher likelihood of being financially worse off again in the future. A calibrated life-cycle model quantifies the consumption smoothing and welfare implications of belief distortions.

JEL Codes: D84, G40, G50

*We would like to thank Can Karabulut, Camelia Kuhen, Yueran Ma, Christos Makridis, Stefan Nagel, Michaela Pagel, Andrei Shleifer, Rui Silva, Nathanael Vellekoop, and seminar participants at the Frankfurt School of Finance, Insead, the London School of Economics, University of Colorado at Boulder, the 2020 AFA meetings, and the 2019 NBER Summer Institute (Household Finance) for their comments.

†London Business School and CEPR. Email: jcocco@london.edu

‡London Business School and CEPR. Email: fgomes@london.edu

§London School of Economics and Netspar. Email: p.v.lopes-cocco@lse.ac.uk

1 Introduction

How do the changes that individuals experience in their financial situation impact their expectations for the future? How are these expectations reflected in their saving and borrowing decisions? And what are the welfare implications of belief distortions? We provide evidence on the process of expectation formation regarding household finances using almost two decades of panel data and solve a calibrated life-cycle model that evaluates the consumption smoothing and welfare effects of belief distortions.

Our data source, the British Household Panel Survey, provides information on realized changes in household finances and on expectations regarding future changes. More precisely, in each year, individuals are asked whether they are financially better off, about the same, or worse off than they were one year before, and their expectations for the following year. These questions are similar to those in the US Michigan Survey of Consumers, but unlike the Michigan Survey which is a rotating panel, our data is a full panel. It allows us to measure expectation errors over time, and to control for unobserved individual heterogeneity, including in the interpretation of the survey questions (Manski (2018)). Another advantage is that our data provide detailed information on many other individual characteristics and decisions, including on saving and borrowing, that we relate to the expectations. Crucially, we also have information on income, so that we can relate the qualitative nature of the survey to actual quantitative measures of the shocks.

There is a growing literature that studies the importance of personal experiences for the formation of expectations (e.g. Malmendier and Nagel (2011)). With this in mind, we study how realized changes in financial situation shape future expectations. When doing so we distinguish between the main reasons that led to the change in household finances: higher/lower earnings/expenditure. Consistent with the papers that find evidence of extrapolative expectations in financial markets (e.g. Greenwood and Shleifer (2014), Gennaioli et al. (2015) and Bordalo et al. (2019)), we first show, controlling for individual fixed effects, that there is an overall positive relationship between the change experienced in financial situation and the expectation of future changes.

Interestingly, we show that this overall relationship hides considerable diversity, that de-

pends on the nature of the change experienced in financial situation. Following an improvement, the expectation of a further improvement increases (and the expectation of a future deterioration declines), again consistent with extrapolative expectations. However, following a deterioration in household finances, there are increases in both the subjective probability of a further deterioration (consistent with extrapolative expectations) and that of a future improvement (consistent with mean reversion).[1] Thus, following negative events, there is an increase in the dispersion of forecasts that occurs whether the deterioration in financial situation is due to lower earnings or to higher expenditure.

A possible interpretation of this result is that individuals face greater uncertainty about the future after bad events. This interpretation would be consistent with the evidence in Fermand et al. (2018), who show that individuals are more uncertain about their expectations in bad times, and behave accordingly by increasing their precautionary savings. While this channel may also be at work in our data, we show that it cannot be the full explanation: in our sample, those individuals who expect mean reversion reduce their savings and borrow more.

This analysis gives rise to the interesting economic question of why, following a deterioration in household finances, individuals sometimes expect mean reversion while at other times they extrapolate. We show that it is related to the reason for the worse financial situation: although there is an increase in the dispersion of forecasts following both lower earnings and higher expenditure, individuals are relatively more likely to expect mean reversion when the reason for the deterioration in finances is lower earnings (as opposed to higher expenditure).

The expectation of mean reversion may arise from motivated beliefs (Bénabou and Tirole (2002), Bénabou and Tirole (2011), Brunnermeier and Parker (2005)). Individuals may be feeling down because of the deterioration in their finances, and they may form expectations of mean reversion that allow them to psychologically cope with the situation. Our results are consistent with a motivated beliefs interpretation in which such beliefs are more likely to occur among those who experience an earnings decline.

With these results in mind, we turn our attention to expectation errors. Since our data is a panel, we can use the year t expectations and the year $t+1$ realizations to construct, for each year/individual, an ex-post expectation error, which we classify into optimism, pessimism or

[1] With a compensating decline in the number of individuals who expect an unchanged financial situation.

correct forecast. An optimistic observation corresponds to an individual i/year t for whom the expectation is better than his/her year $t+1$ realized change. On the other hand, a pessimistic observation corresponds to an individual/year for whom the expected change is worse than the realized one. It is important to note that we construct optimism and pessimism using expectation errors, and not raw expectations. An observation with a better off expectation and a better off subsequent realization is classified as a correct forecast.

Naturally, the expectation errors could simply reflect the ex-post realizations of ex-ante unpredictable shocks. However, our analysis shows that the degrees of both extrapolation and mean reversion are excessive relative to the future realizations. When after an improvement in financial situation, individuals extrapolate from their current experience, they expect too much persistence compared to what the data actually show. For instance, after higher earnings (lower expenditures) only 0.05 (0.06) of the individuals expect to be worse off in the following year, when in realization 0.17 (0.16) of them are actually worse off. Similarly, when following a decline in earnings individuals expect mean reversion, they expect too much mean reversion: 0.42 of them expect to be better off in the following year when in realization only 0.24 of them are actually better off.

The expectation of too much mean reversion following lower earnings is particularly important since these are times when household finances tend to be stretched. If households are too optimistic about the future they may not cut back on consumption, and may instead reduce their savings and/or increase borrowing. This could prolong the impact of the initial event, and thus have significant negative implications for future household finances. We show that those individuals who expect the deterioration in their finances to mean revert are indeed more likely to cut back on savings and/or take on an extra loan than those who do not have such optimistic expectations. Importantly, we find that they are also more likely to be financially worse off again in the future for reasons other than a further decline in earnings.

In order to analyze the consumption and welfare implications of excessive optimism, we solve a life-cycle consumption/savings model with borrowing constraints and uninsurable income shocks. We solve the model for three types of agents: optimists, pessimists and correct expectations. Consistent with our empirical results, optimists (pessimists) overestimate the probability that negative income shocks will revert (persist). We calibrate their probability

distortions by fitting the savings behavior that we observe in the data for each of the groups. Simulation results show that, following a negative income shock, optimists have a significantly higher likelihood of cutting consumption again in the future. Furthermore, we show that this behavior has significant welfare implications.

A final contribution of our paper is to relate our results to the literature that studies the importance of accumulated personal lifetime experiences in shaping individual beliefs (early contributions include Vissing-Jorgensen (2003), Greenwood and Nagel (2009), and Malmendier and Nagel (2011)).[2] We follow Malmendier and Nagel (2011) in constructing a cohort variable that measures major past negative experiences (economic recessions and wars). Consistent with this literature, we find that individuals who have experienced a greater incidence of such events tend to be more pessimistic (less optimistic) about their future finances. In other words, their subjective probability distribution is shifted towards pessimism. These cohort results are about the (subjective) estimates of the unconditional distribution of outcomes, whereas the results on optimism/pessimism for the year ahead are about the (subjective) estimates of the serial correlation of the shocks.

Our paper is related to the growing literature on financial expectations (e.g. Greenwood and Shleifer (2014), Gennaioli et al. (2015), Bordalo et al. (2019), Giglio et al. (2021)) and, in particular, to those papers that focus on the role of personal experiences in shaping expectations and individual decisions (see also the contributions of Kaustia and Knupfer (2008), Kuhnen (2015), Malmendier and Shen (2018), and Das et al. (2020)). Most of these papers focus on the expectations of aggregate variables, such as stock returns or inflation.[3] Our paper differs from these in that we provide evidence on expectations of household finances using panel data.

With respect to expectations of household finances, our paper is closest to Rozsypal and Schlafmann (2018) and Brown and Taylor (2006). Relative to these, our main contribution is to link the changes experienced in finances to expectations and to expectation errors in a panel setting, controlling for individual fixed effects. Rozsypal and Schlafmann (2018) are able to

[2] See Malmendier et al. (2011), Kuchler and Zafar (2019), Malmendier et al. (2021).

[3] Kaustia and Knupfer (2008) study expectations of the individual's own investment ability and Kuhnen (2015) presents experimental evidence on how individuals form expectations differently following gains and losses.

measure only one expectation error for each individual, so they cannot control for fixed effects. Brown and Taylor (2006) have a longer panel, but their focus is on average optimism and pessimism across individuals, and they do not study the links between the changes experienced in household finances and expectations. The novel results that we uncover include the increase in the dispersion of forecasts following a deterioration in finances, the expectation of too much mean reversion following lower earnings, and how this optimism leads to lower savings and an increase in the likelihood that households will be financially worse off again in the future. Finally, our paper contributes to the literature on individual sentiment and financial decisions (Souleles (2004), Puri and Robinson (2007)), and the household finance literature more generally (see Campbell (2006), Guiso and Sodini (2013), and Guiso et al. (1997) for overviews).

The paper is organized as follows. In Section 2, we describe the data and the realized changes in financial situation. Section 3 focuses on expectations, and how they are affected by the changes experienced in financial situation. In Section 4, we study the expectation errors by constructing the optimism and pessimism measures, and relating them to the changes experienced in financial situation. Section 5 provides evidence on the implications for the future financial situation. Section 6 includes the model. The final section concludes.

2 The data

2.1 Data sources

Our main data source is the British Household Panel Survey (BHPS), which is a representative panel of U.K. households (of Essex, 2010). The sample starts in 1991 and there is annual data available up to (and including) 2008. After 2008, the BHPS became part of a new survey entitled Understanding Society, but at this time several of the questions that are crucial for our study were dropped from the survey, so we focus on the data contained in waves 1 through 18. The nature of the data, both in terms of the data collection process and the information available, is similar to that in the U.S. Panel Study of Income Dynamics (PSID). The panel nature of the data allows us to control for individual fixed effects in the regressions.

Each year, individuals are asked a wide range of questions about their circumstances, in-

cluding income, demographics, financial situation, and expectations about their future financial situation. The first wave contains information for around 5,500 households. In subsequent years more households were added to the survey, bringing the total number to around 9,000. We use the answers of the household head. Not all households appear in each of the eighteen waves, meaning that we use an unbalanced panel. The per year average number of households is 6,793 and the median household appears 11 times in the sample. The data also include yearly information on income, expenditures, and demographic variables such as age, education, gender, and race. Wealth information is also available but only every five years, which means that we only have two observations for the median household in the sample. We use retail price indices from the U.K. Office of National Statistics to construct real variables.

2.2 Changes in financial situation

The data provide information on significant changes in household finances. In each year, individuals are asked whether they are financially better off, about the same, or worse off than they were one year ago. The exact question is: "Would you say that you yourself are better off or worse off financially than you were a year ago?" This question, and the possible answers, are similar to the question in the University of Michigan Consumer Survey that asks respondents to compare their current financial situation with that of a year ago.

The answers naturally represent changes in financial situation as perceived by the individuals themselves. An advantage is that they capture the state of the world as evaluated by the agents when they are making their consumption/saving decisions. In Panel A of Table 1 we report the number and the proportion of responses for each category, for all years in the sample. Thus, the unit of observation is household/year. Roughly half of the responses are for about the same, and the remainder are equally split between better off and worse off.

The data include information on the reason for the change in household finances. More precisely, from 1993 onward, those participants who responded that they were better or worse off than in the previous year were asked to provide the main reason for the change. The exact question is "Why is that? (financially better or worse off)." Panel B.1 of Table 1 tabulates the reasons for being (significantly) better off. Unsurprisingly, the main reason is higher earnings

(54%). The second highest category is lower expenditure, with a response rate of 15%. Panel B.2 tabulates the reasons for being worse off. The main one is higher expenditure (53%), a reason that is given twice as often as lower earnings (24%).[4]

Since our data also provides detailed income information, we can use this to evaluate the magnitudes associated with the answers to the previous qualitative questions. More specifically, we calculate annual real labor income for each respondent. We then compute the realized change in income when individuals answered that they were either better off due to higher earnings and worse off due to lower earnings. For those individuals who report being better off due to higher earnings, the median income growth is 6.2%. By comparison, being worse off due to lower earnings is associated with a median income growth of -5.0%.[5]

In order to gain some initial insights into life-cycle effects, in Panel A of Table 2 we report responses by age. There is a marked age decline in the proportion of individuals who are financially better off, from 0.39 for the 20 to 34 age group to 0.11 for those over 65. This decline is mirrored by an increase in the proportion of those who are about the same, while the fraction of those who are worse off remains stable over the life cycle.

In Panel B we report the reasons given for better off, as a fraction of the total of better off. Early in life, the main reason is higher earnings. During this part of the life cycle earnings profiles are upward sloping, and this is naturally reflected in the answers given. As individuals age and labor income profiles flatten, the proportion of those who report being better off declines, and so does the relevance of higher earnings as the reason for being better off. For the over 65 age group, the main reason is higher benefits.

Panel C tabulates the reasons for the worse off event. Higher expenditure is the main reason for all age groups, and particularly so for those aged over 65. For those below retirement age, lower earnings also constitute an important reason, with a fraction of roughly 0.30.

In the last three columns of Table 2, we focus on the role of income. In each year $t-1$, we divide the households in our data into three groups based on their income (household income includes the income of household head and partner, if present). The low (high) income group

[4]The number of observations for better off/worse off in Panel A add up to 58,585, whereas in Panel B they add up to 51,839. This happens because information on the reason is only available from 1993 onward.

[5]For individuals who report no change in financial situation the corresponding value is 2.0%.

includes those households in the bottom (top) third of the income distribution for that year. We then study the changes in year t financial situation. High (low) income households are more (less) likely to become significantly better off, an event which occurs with probability 0.29 (0.17). For those in the high-income group, an increase in earnings is the main reason for being better off. In contrast, among the low-income group, increases in benefits are as important as increases in earnings (Panel B). Higher expenditure is a more important reason for being worse off for the low income group, with a proportion of answers equal to 0.63, but it is also the most important category for the high income group, with 0.46 (Panel C).

2.3 Cross validation and sample attrition

The BHPS also contains information on income in the month prior to the interview, which could arguably provide a better measure of the household's financial situation at the time that the survey was carried out. In fact, those who state that they are better off (worse off) due to higher (lower) earnings have a median change in their last-month's income relative to the one obtained thirteen months prior of 10.6% (-21%). These numbers tell of the importance of self-reported changes in financial situation in reflecting significant events for household finances.

The BHPS sample was chosen to be representative of the overall population. Nevertheless, one potential concern is that sample attrition may not be random. For example, those individuals who become financially worse off may be more or less likely to drop out of the sample. We test this hypothesis by calculating the probability that an individual is no longer in the data set in year t, conditional on them being there in year $t-1$. Across the full sample this probability is 8.5%. For all four of our major categories the attrition rates are very similar. For those who report being significantly better off due to higher earnings (lower expenditure), the corresponding number is 8.4% (8.6%). For those who report being significantly worse off due to a a higher expenditure (lower earnings), the attrition rate is 8.2% (8.1%). This shows that selection due to attrition is not a particular concern for our analysis.

3 Expectations

In this section, we study how changes in experienced financial situation affect expectations.

3.1 Summary statistics

In each year, individuals are asked about their expectations regarding their future financial situation (in one year's time). The exact question is: "Looking ahead, how do you think you will be financially a year from now, will you be:" The answers that are read out to the individual are: "better than now, worse than now, and about the same."[6]

Table 3 reports summary statistics. The second column reports the unconditional distribution. The unit of observation is individual/year. The majority of responses (almost two thirds) are for the expectation of an unchanged financial situation. One in four expect to be significantly better off, and only one in ten expect to be significantly worse off. If we compare these proportions with the unconditional distribution of the realized changes shown in Panel A of Table 1, it seems that individuals are remarkably good at anticipating improvements in their finances: the average expectation and realization are both equal to 24%. On the other hand, individuals appear to under-estimate the probability of becoming worse-off: 12% in expectation compared to 24% in realization. The latter result is consistent with theories of over-confidence. It may also arise from motivated beliefs, as being optimistic about the future may allow individuals to cope psychologically with adversity. We investigate this further below.

Naturally, the higher proportion of worse off realizations compared with the expectations could also be the result of our sample including a significant proportion of unexpected negative events. For example, if individuals tend to be worse off in recessions, and there was a relatively large proportion of unexpected recessions in our sample, this could potentially explain the difference. In the regressions we control for this using year fixed effects.

The remaining columns of Table 3 report expectations by age and income. The patterns are broadly similar to those for the realizations shown in Table 2: the proportion of individuals who expect to be better off declines with age, and it is larger for higher income groups. The proportion of individuals who expect to be worse off increases from 0.08 for the 20-34 age group, to 0.16 for those over 65 years of age.

The University of Michigan Consumer Survey includes a similar expectations question, in which respondents are asked about their expected change in financial situation in a year's time.

[6] Respondents are not asked the reason for their expectation (earnings, expenditure, etc.).

However, there is a fundamental difference between the Michigan Consumer Survey and the BHPS data that we use. The former is a rotating panel, whereas our data is a panel. Therefore, we can include individual fixed effects in the regressions that control, among other things, for the fact that different respondents may interpret verbal questions differently (Manski (2018)). This is particularly important in light of the evidence presented by Giglio et al. (2021), who show that beliefs are characterized by large and persistent individual heterogeneity. In our econometric analysis, we model this heterogeneity using individual fixed effects.

3.2 Changes experienced and expectations

In this section, we study how current changes in financial situation affect expectations. We use the individual i/year t change in financial situation to construct a variable (ΔFS_t^i) that takes one of three possible values:

$$\Delta FS_t^i = \begin{cases} 1 & \text{if individual } i \text{ is financially better off at } t \\ 0 & \text{if individual } i \text{ is financially about the same at } t \\ \text{-1} & \text{if individual } i \text{ is financially worse off at } t \end{cases}$$

Similarly, we construct another variable ($E_t^i[\Delta FS_{t+1}^i]$) that measures the individual i's year t expectations of future changes in financial situation:

$$E_t^i[\Delta FS_{t+1}^i] = \begin{cases} 1 & \text{if individual } i \text{ expects to be better off at } t+1 \\ 0 & \text{if individual } i \text{ expects to be about the same at } t+1 \\ \text{-1} & \text{if individual } i \text{ expects to be worse off at } t+1 \end{cases}$$

In order to study the relationship between changes experienced and expectations, we first estimate the following regression:

$$E_t^i[\Delta FS_{t+1}^i] = \alpha + \beta \Delta FS_t^i + f^i + \epsilon_t^i, \tag{1}$$

where f^i are the individual fixed effects and ϵ_t^i is the residual. The fixed effects control for unobserved individual heterogeneity, including in the way that different individuals interpret the survey questions. We estimate the equation using ordinary least squares, but the main conclusions are similar when we estimate a multinomial logit model.

Column (1) of Table 4 shows the results. We estimate a positive coefficient β equal to 0.07, with a t-statistic of 27.6. Therefore, individuals who have experienced an improvement (a deterioration) in their financial situation are more likely to expect, for the following year, another improvement (deterioration). In other words, the positive statistically significant estimated β coefficient is evidence of extrapolative expectations.

In column (2), we report the results for a regression where we also control for the income group and year fixed effects. The estimated β coefficient is almost unchanged and it is again highly significant (t-statistic of 23.1). These results are consistent with the previous literature that finds evidence of extrapolative expectations in financial variables (e.g. Greenwood and Shleifer (2014), Gennaioli et al. (2015) and Bordalo et al. (2019)), and they show that such an expectation formation process is also at work in the context of household finances.

In column (3) of Table 4, we report the results for a more flexible specification, in which we allow the degree to which individuals form extrapolative expectations to depend on the nature of the change experienced in financial situation. We do so by decomposing the ΔFS_t^i variable into two different dummies: one that takes the value of one for positive changes ($\Delta FS_t^i = 1$) and zero otherwise, and another that takes the value of one for negative changes ($\Delta FS_t^i = -1$) and zero otherwise.[7]

The results show an estimated positive (negative) coefficient following an improvement (deterioration) in household finances. Therefore, after an improvement (deterioration), $E_t^i[\Delta FS_{t+1}^i]$ is more likely to be positive (negative). This is again consistent with extrapolative behavior. However, the absolute value of the estimated coefficient for positive changes is almost five times larger than that for negative changes (0.09 versus 0.02), which shows that on average the extrapolative behavior is stronger after an improvement than after a deterioration in household finances. We build on this result next.

3.3 Changes experienced and the distribution of expectations

We now move from studying average expectations to the distribution of expectations.

[7]The no change in financial situation is captured by the (unreported) constant in the regression.

3.3.1 Variable construction and econometric approach

In order to characterize the distribution of expectations and how it relates to the realized changes in financial situation, we construct three dummy variables. Expect Better$_{it}$ is equal to one if the individual expects an improvement in his/her t+1 finances ($E_t^i[\Delta FS_{t+1}^i] = 1$), and zero otherwise. Expect Same$_{it}$ is equal to one if the expectation is of an unchanged financial situation ($E_t^i[\Delta FS_{t+1}^i] = 0$), and zero otherwise. Finally, Expect Worse$_{it}$ takes a value of one when individuals expect a deterioration ($E_t^i[\Delta FS_{t+1}^i] = -1$), and zero otherwise.

For our econometric analysis, we use a standard binary choice model. In our baseline specification we estimate separate regressions where the outcome variables y_{it} are the three expectations dummy variables.[8] We model:

$$Prob(y_{it} = 1|\mathbf{x}_{it}, u_i) = F(\mathbf{x}_{it}, u_i) \tag{2}$$

where $\mathbf{x}_{it}$ is a vector of observable covariates and u_i is an unobserved individual specific effect. One common approach to modeling the unobserved individual heterogeneity (u_i) is the random effects model. An alternative approach, which does not require us to make assumptions on how the individual effects are related to the covariates $\mathbf{x}_{it}$, is the fixed effects model. This model cannot generally be estimated due to the incidental parameters problem. One important exception is the logit distribution. Under this specification, the fixed effects are removed from the estimation to avoid the incidental parameters problem, and the analysis is thus conditional on the unobserved u_i which are not estimated.

The fixed effects logit estimator of the regression parameters (β) gives us the effect of each element of $\mathbf{x}_i$ on the log-odds ratio:

$$Ln\left[\frac{Prob(y_{it} = 1|\mathbf{x}_{it} = x^{''})}{Prob(y_{it} = 0|\mathbf{x}_{it} = x^{''})} \Big/ \frac{Prob(y_{it} = 1|\mathbf{x}_{it} = x')}{Prob(y_{it} = 0|\mathbf{x}_{it} = x^{'})}\right] = \beta(x'' - x^{'}) \tag{3}$$

We are mainly interested in evaluating the extent to which the changes in financial situation

[8]The null set for each of these dummy variables combines two alternative outcomes. For instance, the expect better dummy takes the value of zero for those who expect no change and for those who expect to be worse off. Below, we estimate alternative specifications where we only compare expectations of improvement or of deterioration with expectations of no change.

that individuals experience affect their expectations going forward. However, we also investigate the extent to which other variables (such as income) are related to these expectations. Because we control for individual fixed effects, the regressions capture variation over time for the same individual. We also control throughout for year fixed effects, since aggregate economic conditions will naturally influence individuals' expectations of their future financial situation. Finally, even though we focus on the conditional fixed effects logit model, the results are similar when we estimate a linear probability model.

3.3.2 Results

Table 5 shows the estimation results. In columns (1) to (3), we regress the expectations variables on the dummy variables that measure the change experienced in financial situation.

The positive coefficient in the first row of column (1) shows that, following a time t improvement in financial situation, individuals increase their subjective probability of a subsequent (time $t+1$) improvement. The negative coefficients in the first row of columns (2) and (3) reveal that the increase in the probability of a further improvement is counterbalanced by declines in the probabilities of a t+1 deterioration and, particularly, of no change. The values of the estimated coefficients are economically significant: the log-odds ratio for the increase in the subjective probability of being better off the following year is 0.64, and those for the subjective probability of being worse off and no change are -0.08 and -0.52, respectively. These estimates show that the extrapolative pattern is not the outcome of a parallel shift in the subjective probability distribution of future changes, but is driven by an increase in the mass in the right tail offset largely by a reduction of the mass in the middle of the distribution. This can clearly be seen in the right-hand columns of Panel B of Figure 1, which plot the estimated log-odds ratios associated with the better off event (the top panel plots the probability of the different expectations in the raw data).

Interestingly, the expectation responses to a deterioration in financial situation, shown in the second row of Table 5, reveal a different pattern. The estimated coefficient on the worse off dummy is positive in the regression for the expectations of a future improvement (column (1)), and in the regression for the expectations of a future deterioration (column (2)).

In the previous section, we showed that, on average, following a deterioration, individuals

increased their expectation of a further deterioration (extrapolative behavior). However, by separately studying the revisions in the subjective probabilities of the three different categories, we uncover a more complex pattern. Following a worse off event, there are increases in the subjective probability of being worse off again (consistent with extrapolative expectations), and in the subjective probability of being better off (mean reversion).[9] Therefore, there is an increase in the dispersion of expectations following negative events, which can clearly be seen in the left-hand part of Panel B of Figure 1.[10]

One possible explanation for the increase in the dispersion of forecasts is that individuals are more uncertain about what negative events mean for their future finances. Such an explanation would be consistent with the results of Fermand et al. (2018), who show that, in bad times, agents are more uncertain about the future, and they behave more conservatively by saving more (higher precautionary savings) and by making more cautious investment decisions. Although this effect could also be present in our data, the evidence on savings behavior that we show in Section 3.4 reveals that in our sample a different mechanism is at work.[11]

Internet Appendix A reports several robustness tests. In the baseline specification, we have controlled for individual and year fixed effects, hence we cannot include age dummies in the regression (age is co-linear with individual and year). We replace the year fixed effects with age fixed effects to show that the estimated coefficients on the better off/worse off dummies are not sensitive to the set of fixed effects that is included. In the regressions in this section, the null set of the dependent variables combines two alternative outcomes. For example, those who do not expect to be better off can expect to be either the same or worse off. In the appendix we show that the results are similar when we estimate an alternative specification where the expect

[9]These increases are counterbalanced by a decline in the number of those who expect no future changes in their financial situation (column (3)).

[10]The results in the previous section show an extrapolative pattern in average expectations that is much weaker following a deterioration than following an improvement in financial situation. This can be understood from the results in the second row of Table 5. After a negative change, there is an increase in both the left and the right tail of the distribution of future expectations. The increase is slightly larger in the left than in the right tail (0.99 versus 0.74), giving rise to a small average negative change.

[11]Furthermore, as we explain in Section 3.4, to the extent that higher uncertainty in bad times leads to an increase in precautionary savings, that would work against us finding the savings responses that we identify in our data.

better and expect worse responses are only compared to the expectation of no change. Finally, we reports results for regressions without individual fixed effects. The qualitative conclusions are similar. We observe extrapolative behavior following improvements in financial situation, and an increase in the dispersion of expectations following deteriorations.[12]

3.3.3 Disaggregating by reason for the change in financial situation

We now disaggregate the effects by reason for the change in financial situation. We focus on the main categories: higher/lower earnings/expenditure. Table 5 shows that the effects of an improvement in financial situation on expectations are similar whether the improvement was due to higher earnings or to lower expenditure. The values of the estimated coefficients are also economically important. The log-odds ratios for the increase in the subjective probability of being better off next year are 0.65 and 0.55 for an earnings increase and an expenditure decline, respectively (column (4)). As before, the improvements in financial situation do not have an impact on the expectations of a future deterioration (column (5)). Finally, the results in column (6) show that the increase in the expectation of future improvements is offset by a decline in the expectation of an unchanged financial situation. We say offset because naturally the dummies for the expectations of being better off, worse off, and the same add up to one.

As before, expectation responses to deteriorations in financial situation reflect a different pattern. Following either lower earnings or higher expenditure at time t, there are increases in both the number of individuals who expect to be better off at time t+1 (column (3)), and in the number of individuals who expect to be worse off at time t+1 (column (4)). Thus, following either of these negative events, there is a significant increase in the dispersion of expectations.

The increase in the probability that individuals expect to be better off following a negative event (expectation of mean reversion) could arise from some agents having motivated beliefs. In bad times, those with motivated beliefs believe that in the future they will be better off, as this belief increases their current utility and it allows them to cope with the negative event. This, combined with heterogeneity in how individuals react to negative events, could explain the patterns: some individuals have motivated beliefs, hence the positive coefficient on the

[12]The inclusion of individual fixed effects makes a substantial difference to the qualitative conclusions for regressions in which the dependent variables measure expectation errors, as shown later in the paper.

lower earnings and higher expenditure dummies in column (3); others are extrapolative, giving rise to the positive estimated coefficient on the same variables in column (4).[13] It is important to note that the individual fixed effects that we include in the regression do not necessarily control for this heterogeneity that arises during bad times.

3.4 Expectations and actions

One potential shortcoming of expectation surveys is that the responses may be affected by framing and/or by some individuals not actually meaning what they say. As discussed in Greenwood and Shleifer (2014), this concern can be addressed by showing that individuals behave in line with the expectations that they report. This is an approach that has been followed by several papers in the literature. Giglio et al. (2021) show that beliefs influence both portfolio allocations and trading behavior. Fermand et al. (2018) show that individuals with more uncertain expectations exhibit more precautionary behavior.[14] In this section, we show that, in our data, expectations are related to savings behavior.

3.4.1 Savings and borrowing variables

The BHPS data provide information on whether individuals are currently saving. The question is: "Do you save any amount of your income for example by putting something away now and then in a bank, building society, or Post Office account other than to meet regular bills?" The possible answers are: "Yes, No, or Refused" (only a very small proportion, of less than one percent, refuse to answer). We construct a dummy variable that takes the value of one for individual/years who respond Yes, and zero for those who respond No.

Individuals in the survey are also asked about the amount they save. The exact question is: "About how much on average do you personally manage to save a month?" We multiply the amount stated by twelve to obtain an annual figure,[15] and divide by gross household income to

[13] The extrapolative behavior can also arise from motivated beliefs in the presence of self-control problems. The individual expects to be worse off in the future to incentivize himself/herself to save more today.

[14] See also Makridis (2019) who finds that investors self-reported expectations of future economic activity have a causal impact on their consumption, and Vellekoop and Wiederholt (2019) who show that households with higher inflation expectations save less.

[15] For couples, we multiply this amount by two.

calculate a saving rate. For those who report that they do not currently save, we set the saving rate to zero. To reduce the influence of outliers we winsorize at the one percent level.

The last variable that we consider captures borrowing decisions. The homeowners in the data are, in each year, asked whether they have taken out an additional mortgage on their home. The question is: "Have you taken out any additional mortgage or loan on this house/flat since (date of the previous interview)?". We use the answers to this question to construct a dummy variable that takes the value of one in the case of an affirmative answer, and zero otherwise. Naturally, we are only able to do this for the sample of homeowners.

3.4.2 Results

We regress the savings variables on the expectation dummies, controlling for the current change in financial situation, since the decision to save is likely to also depend on whether individuals experienced an improvement or a deterioration in their financial situation. As before, we include individual and year fixed effects in the regressions.

Column (1) of Table 6 shows the results of an FE logit regression with the dummy for current saver as the dependent variable. The statistically significant and positive (negative) coefficient on the better off (worse off) dummy shows that individuals who experience an improvement (deterioration) in their financial situation are more (less) likely to be active savers. Turning our attention to the expectation variables, we estimate a statistically significant and negative (positive) coefficient on the dummy variable for expect to be better off (worse off). This shows that individuals who expect an improvement (deterioration) in their financial situation are less (more) likely to be savers today, and do indeed act in line with their reported expectations.

In columns (2) and (3) of Table 6, we report the results of regressions with the savings rate as the dependent variable. In column (2) we include all available observations, while in column (3) we restrict the sample to observations with a strictly positive savings rate. In both cases, the results confirm that individuals' savings behavior is consistent with their reported expectations: those who expect to be better off (worse off) decrease (increase) their saving rate.

Finally, in column (4), we report the results of a regression with the new home loan dummy as the dependent variable. We do not find any statistically significant results for either expectations or realizations. As explained before, this variable is only defined for homeowners.

Furthermore, even among these, only a small number of individuals actually take a new home loan in a given year (the variable takes the value of one for only 3.6% of the observations).

4 Expectation errors

In the previous section, we studied how expectations respond to changes experienced in financial situation. We now exploit the panel dimension of our data further, to study the forecast errors.

4.1 Variables construction

Panel A of Table 7 compares the time t expectations ($E_t^i[\Delta FS_{t+1}^i]$) with the subsequent realizations, i.e. the actual changes in time $t+1$ financial situation (ΔFS_{t+1}^i). For example, the first row shows that 45% of the individuals who at time t expected to be financially better off at time $t+1$ had their expectation confirmed by the realization. On the other hand, also at $t+1$, 35% of them were in the same financial situation, and 20% were actually worse off.

A first conclusion from Table 7 is that agents tend to form correct expectations, as shown by the fact that, in each row, the main diagonal values are the highest. The second important conclusion is that, in spite of the fact that the majority have the correct expectations, there is a significant number of individuals who fail to make accurate forecasts. Naturally, this could be due to either incorrect expectations or realizations of unforecastable shocks.

In order to investigate the source of the errors, we construct individual specific measures of optimism and pessimism that require us to observe the same individual in each two consecutive years. Panel B presents a graphical representation of their construction. An individual i is, at time t, optimistic if his/her expectation of the time $t+1$ change in financial situation ($E_t^i[\Delta FS_{t+1}^i]$) is better than the realized time $t+1$ change in financial situation (ΔFS_{t+1}^i). As is clear from Table 7, this happens when: (i) the individual expects to be better off but the realized change is the same or worse off; or (ii) the individual expects an unchanged financial situation but the realization is worse off.

We construct a dummy variable (optimist) that takes the value of one for individual/year observations in which the individual is optimistic, and zero otherwise:

$$\text{Optimist}_{it} = \begin{cases} 1 & \text{if } E_t^i[\Delta FS_{t+1}^i] > \Delta FS_{t+1}^i, \\ 0 & \text{Otherwise.} \end{cases} \tag{4}$$

Similarly, an individual i is, at time t, pessimistic if he/she expects a worse change in financial situation than the subsequent realization. This happens when: (i) the individual expects to be worse off but the realized change is the same or better off; or (ii) the individual expects the same, but the realization is better off. We construct a dummy variable (pessimist) that takes the value of one for individual/year observations in which the individual is pessimistic, and zero otherwise:

$$\text{Pessimist}_{it} = \begin{cases} 1 & \text{if } E_t^i[\Delta FS_{t+1}^i] < \Delta FS_{t+1}^i, \\ 0 & \text{Otherwise.} \end{cases} \tag{5}$$

It is important to note that the optimist and pessimist variables are based on the realized forecasting error, and not simply on the expectation. An individual i who at time t expects to be better off at time $t+1$, and who indeed is better off when time $t+1$ arrives has the correct time t expectations (the individual is not optimistic).

4.2 Summary statistics

The second column of Panel A of Table 8 reports the overall averages of the optimist and pessimist dummies, and of the residual neither category (corresponding to correct expectations). There are more individual/year observations with optimism than with pessimism: 0.26 and 0.17 of the total number of observations, respectively.

The remaining columns of Panel A report the average values of the optimist and pessimist dummies by age and income. There is a very significant decline with age in the average level of optimism, from 0.32 for individuals in the 20-34 age group, to 0.16 for those over 65 years of age. This decline is offset by an increase in the proportion of individuals who had the correct expectations. On the other hand, the proportion of pessimist observations is relatively stable over the life cycle. The last three columns show that the proportion of optimist observations tends to be higher for individuals in higher income groups. Recall that individuals are assigned

to income groups based on the time $t-1$ distribution of labor income, one year prior to the time t expectations that we use to construct the expectation errors.

Panel B of Table 8 shows summary statistics for several variables of interest, for individual/year observations corresponding to optimism, pessimism, and neither. The average age is 46 years for observations for which the optimist dummy is equal to one, compared to 49 years for observations for which the pessimist dummy is equal to one. Positive values for the optimist dummy are associated with a higher average number of children than positive values for the pessimist dummy, although this could be related to the age differences among the two groups.

The last three rows of Table 8 report the proportion of individuals who are better off, have no change in financial situation, and are worse off at t, conditional on the optimist and pessimist dummies taking the value of one at time t.

Of the individuals who are optimistic at t, a larger proportion have experienced a deterioration than an improvement in financial situation: 0.33 compared to 0.24, respectively. On the other hand, of those who are pessimistic at t, a smaller proportion have experienced a deterioration than an improvement in their finances: 0.22 compared to 0.32, respectively. These proportions suggest that, after negative changes in financial situation, individuals may incorrectly expect some form of mean reversion. However, these unconditional means capture both differences across individuals and changes over time for the same individual. Therefore, we turn our attention to regression analysis.

4.3 Changes experienced and optimism/pessimism

We estimate fixed effects logit regressions similar to the ones for the expectations, but in which the left-hand side variables are the optimist and pessimist dummies. As before, we control for individual and year fixed effects. An unexpected negative aggregate economic shock in a given year $t+1$ (e.g. a recession) will naturally lead to a large proportion of individuals being classified as optimist at time t. This, along with other aggregate time series variation, is captured by the year fixed effects.

4.3.1 Baseline results

Table 9 shows the regression results. Column (1) shows the results for the regression with the optimist dummy as dependent variable (pessimist in column (2)), on the dummy variables that measure the change experienced in financial situation.

Previously, in Table 5, we showed that individuals tend to expect improvements in financial situation to be persistent. The statistically significant positive coefficient on the better off dummy in column (1) of Table 9 shows that individuals extrapolate too much and are thus more likely to be optimistic. The estimated coefficient, a log-odds ratio of 0.13, is economically meaningful. This increased optimism is accompanied by a reduction in pessimism, as shown by the statistically significant estimated -0.10 coefficient on the better off dummy in column (2).

The second row shows the estimated coefficients for the worse off dummy. Recall that for the expectations regressions there was, after these worse off events, an increase in the dispersion of forecasts, i.e. there were increases in the likelihood of better off expectations (mean reversion) and in the likelihood of worse off expectations (extrapolation). The estimated positive coefficient for the worse off dummy in regression (1) of Table 9 shows that agents are being too optimistic when forming their mean reversion expectations, i.e. they expect more mean-reversion than there is in the data.[16] On the other hand, the estimated positive coefficient in column (2) shows that those who extrapolate are over-extrapolating from their current experience, i.e. the future is (on average) not as bad as they expect it to be.[17]

In summary, the results in the first two columns of Table 9 show that individuals tend to react too strongly, relative to the true data generating process, both when they expect mean reversion and when they expect persistence.[18] These results are also displayed graphically in the bottom panel of Figure 2 (the top panel shows the results for the raw data).

It is important to emphasize that these results are by no means implied by the results in the previous section. For example, it could have been the case that following an improvement

[16] By definition, individuals who expect to be better off can only be optimistic or correct in their expectations.

[17] Note that, by definition, individuals who expect to be worse off can only be pessimistic or correct in their expectations.

[18] In Internet Appendix A we replace the year fixed effects with age fixed effects to show that the estimated coefficients on the better off/worse off dummies are not sensitive to the set of fixed effects that is included.

in their financial situation agents increase their expectation of a further improvement, but that the increase: (i) is perfectly consistent with the actual persistence in the underlying variable; or (ii) actually under-estimates the true persistence. In the first case, the estimated coefficients on the better off dummy in columns (1) and (2) would be (statistically) zero, and in the second case they would be negative and positive, respectively.

In columns (3) and (4) of Table 9, we report the estimates for a linear probability model. The larger number of observations, compared to columns (1) and (2), is due to the fact that the fixed effects logit estimator drops those observations for which there is no variation over time for the same individual (instead of estimating the fixed effects). Naturally, the interpretation of the FE OLS estimates is different from the one in columns (1) and (2) (they are no longer log-odds ratios), but the estimated signs, economic and statistical significance are similar. For example, column (3) shows that the probability of being optimistic after a better off event increases by 0.024, which is roughly 10% of the unconditional mean of the optimism dummy. The estimated log-odds ratio on the better off dummy in column (1) is of a similar order of magnitude, and equal to 0.13.

In columns (5) and (6), we report the results for a logit model without controlling for individual fixed effects. When studying the expectation formation process, we concluded that controlling for individual fixed effects only led to moderate changes in the quantitative estimates, and it did not affect the qualitative conclusions. However, this is not the case for the optimism/pessimism regressions. The failure to control for individual fixed effects leads to significantly larger estimated coefficients, and some sign changes.

For example, the estimated coefficient on the better off dummy is negative in the pessimist regression with fixed effects (column (2)), but positive in the corresponding regression without fixed effects. Therefore, the failure to control for individual fixed effects would lead us to conclude that after a better off event individuals become more pessimistic, when in fact their pessimism is reduced. This can also be seen in Figure 2, when comparing the raw data (Panel A) with the estimated log odds ratios (Panel B): conditional on a better off event, the red column is positive in the top panel but negative in the bottom one.

Several of the estimated coefficients on the income group dummies are statistically significant. Recall that we define these groups using the distribution of year $t-1$ earnings (before

the year t change in financial situation), so that there is variation over time for the same individual, and we are able to estimate the coefficients in spite of the individual fixed effects. The base group includes those in the bottom third of the income distribution. We find that higher income individuals are more likely to be optimistic. This result is consistent with the evidence in Rozsypal and Schlafmann (2018).

In Internet Appendix B we show that our results are robust to alternative definitions of "optimism" and "pessimism." Our survey data only provide a discrete range of answers for both realizations and expectations, and the classification of an underlying continuous variable (change in financial situation) into three discrete categories (better off, the same, or worse off) may introduce predictable patterns in the expectation errors. The fact that the results are robust to different methods of group construction is reassuring.

4.3.2 Disaggregating by reason for the change in financial situation

In Table 10 we report the results of similar regressions, but where we disaggregate better off/worse off into the reasons for the change in financial situation. As before, we focus on the two main reasons: higher/lower earnings and lower/higher expenditure.

Consistent with the estimated coefficients for the better off dummy in the previous regressions, we find that both higher earnings and lower expenditure lead individuals to become more optimistic and less pessimistic going forward. The estimated economic magnitudes are similar to those for the better off dummy, although the estimated coefficient on the lower expenditures variable in the pessimist equation is not significant.

There are however interesting differences in the results for lower earnings and higher expenditure variables. Individuals who are worse off due to an increase in expenditures are less likely to be optimistic and more likely to be pessimistic going forward. On the other hand, individuals who are worse off due to lower earnings are more likely to be optimistic and less likely to be pessimistic going forward. In other words, individuals who are worse off due to higher expenditure extrapolate too much, whereas those who are worse off due to lower earnings expect too much mean reversion.

4.4 Cumulative experiences and cohort effects

We have studied the impact of *current* changes in financial situation on expectations and expectation errors. Interestingly, we have found that, after a deterioration in financial situation due to lower earnings, individuals tend to expect too much mean reversion and are too optimistic for the following year. A natural question is how this result relates to the literature that has documented the importance of *accumulated* personal experiences for the shaping of individual beliefs (e.g. Vissing-Jorgensen (2003); Greenwood and Nagel (2009); Malmendier et al. (2011); Malmendier and Nagel (2016, 2011); Kuchler and Zafar (2019); Malmendier et al. (2021)). We investigate the importance of accumulated experiences in our data.

4.4.1 Variable construction

In order to capture lifetime experiences, which may have happened before the start of our sample period, we follow Malmendier and Nagel (2011) and construct a cohort variable measuring cumulative past experiences. More precisely, we construct a variable equal to the ratio of the number of years in which the individual, aged 18 or over, experienced a major negative economic event, divided by the individual's current age minus 18. This variable therefore measures the percentage of (adult) years during which the individual experienced such an event.[19]

The events that we consider are years with negative aggregate economic conditions (as mentioned above, some of these events are not included in the BHPS sample period).[20] The years that we include are: (i) the UK recession years of 1973-1975, 1980-1981 and 1990-1991; and (ii) the years corresponding to World War I (1914-1918) and World War II (1939-1945). The cohort variable has a mean of 0.15 and a median of 0.14, with a standard deviation of 0.07. It takes a value of zero for 10% of the observations and it reaches a value of 0.24 (0.30) at the 95th (99th) percentile. We add this variable to the explanatory variables that we have previously used to explain optimism and pessimism, and estimate fixed effects logit regressions.

[19] We obtain similar results if we consider a "starting age" of 16.

[20] In addition, one can also conjecture that individuals may learn about the frequency of the events by observing the realizations for other individuals, i.e. if the frequency of negative events is particularly high in a given year, that might still lead those individuals who have not been significantly affected by the events to increase their subjective unconditional expectation of their occurrence.

4.4.2 Results

Table 11 shows the results. With the inclusion of the cohort variable, the significance of the estimated coefficients on the better off/worse off dummies remains essentially unchanged, and the point estimates are almost identical. Turning to the cohort variable itself, we find that it has a statistically negative coefficient in the optimist regression. This is consistent with the hypothesis that individuals who have experienced a higher fraction of major negative events during their adult life have been "traumatized" by such events, and are less likely to be optimistic about the future.

It is important to remember that we include individual fixed effects among the explanatory variables in our regressions. Since the value of the cohort variable changes only slowly over time, especially for those individuals who are older, its effects are partly captured by the individual fixed effects. This helps to explain why the cohort variable is not statistically significant in the pessimist regression (column (2)). The same result holds when the reported reasons for financial change are included as explanatory variables (column (4)).

As an alternative approach, we estimate cross-sectional regressions in which we regress the average of the optimist and pessimist dummy variables for each individual on the average of their cohort variable. Thus, each observation corresponds to one individual. The results are reported in columns (5) and (6) of Table 11. The cohort variable is now statistically significant in both regressions, and it has the predicted signs: individuals who have experienced a higher frequency of negative events throughout their adult lives are both less likely to be optimistic and more likely to be pessimistic about the future. These regressions also confirm that the individual fixed effects included in the optimist and pessimist regressions (1) and (2) capture, at least in part, the cohort effects.

It is interesting to contrast the results for the cohort variable with those for the current change in financial situation. Accumulated bad experiences, as measured by the cohort variable, decrease optimism. On the other hand, the estimated coefficient on the worse off dummy in column (1) shows that some of the individuals who face a negative event are more likely to become optimistic for the following year. We interpret these as individuals under-estimating the short-term persistence of earnings declines, and provide further evidence in the next section.

5 Implications for future financial situation

We have shown that, following a deterioration in financial situation, there is an increase in the dispersion of the expectations of future changes. More importantly, when studying the expectation errors, we have found that this leads to an increase in the probability that individuals will have beliefs that are too optimistic after an earnings decline. We have also found that individuals become more optimistic after positive changes in financial situation. However, at these times they tend to have more financial resources (due to the events that triggered the improvement in financial situation). By contrast, being too optimistic at times when the financial situation has deteriorated may be more problematic, if it leads individuals to adjust their savings and/or borrowing behavior in the expectation that their financial situation will recover faster than it actually will. In this section, we explore this possibility.

5.1 Expectations and future realizations

We study expectations and future realizations following an earnings decline. More precisely, we take all the individual/year observations for which there is an earnings decline, and calculate the distribution of year t expectations and year $t+1$ realizations. The third row of Panel B of Table 12 shows that the distribution of the expectations of individuals who at time t reported an earnings decline is such that 0.42 expect to be better off at t+1, 0.44 expect an unchanged financial situation, and only 0.14 expect to be worse off.

In comparison, the distribution of year $t+1$ realizations is such that 0.24 of the observations are for better off, 0.37 for the same, and 0.39 for worse off (third row of the right hand table in Panel B of Table 12). Thus, in the year following an earnings decline, the majority of observations are for no change and for an even worse financial situation. This shows that individuals who experience lower earnings tend to be too optimistic going forward: they expect a degree of mean reversion that is not matched by the subsequent realizations of the variable.

5.2 Income dynamics

We evaluate the economic significance of the earnings decline event. We take advantage of the panel dimension of the data, and calculate average log income over time for individuals who

in a given year report being in a worse financial situation due to an earnings decline. Year t is the time at which they report the earnings decline, years $t-1$ and $t+1$ refer to one year before and one year after this event, and so on. Panel A of Table 13 reports average log income conditional on whether individuals are optimistic or pessimistic at time t.

The survey does capture an event that is economically meaningful: there is a significant decline in average log income in year t compared to year $t-1$. The T-test of the difference in the means of log income between these two years has a p-value of less than 0.001 for the optimists and 0.039 for the pessimists. The average levels of log income between these two groups in each of the years from $t-2$ to t are not significantly different from each other, confirming the assumption of parallel trends between the two groups. Table 13 also shows that, going forward, the log real income of the time t pessimistic group is slightly higher than that of the time t optimistic group (although the differences are still not statistically significant). This happens, to some extent, by construction: the individuals who are pessimistic at time t are those who at time $t+1$ experienced an unexpected improvement in their financial situation.

5.3 Savings and borrowing responses

We now turn our attention to the individuals' actions following an earnings decline. We focus on those individuals who at time t reported that they were worse off due to an earnings decline, and calculate the means of the save dummy variable in this year, and in the years before and after the event. Again, we distinguish between those individuals who are optimistic and those who are pessimistic at time t.

The second panel of Table 13 reports the mean values for the save dummy variable for each of these groups, and the p-values for tests of the equality of means. The differences in the proportions of savers are not statistically significant prior to year t, but they become statistically significant at time t (and in subsequent years). Furthermore, these differences are economically meaningful. Thus individuals' expectations and their degree of optimism influence their decision to save in an economically significant manner.

Focusing now on average saving rates, we see that they are equal to roughly 0.05 before year t, and they decline at this time to 0.029 (0.025) for pessimistic (optimistic) individuals (Table

13). The year t differences are economically meaningful but not statistically significant. In subsequent years, the differences are statistically significant, confirming the result that individuals who become more optimistic save less following an income decline. These average differences in saving rate also reflect the extensive margin of the saving decisions.

In the last panel of Table 13 we report the results for the decision to take an extra loan. The proportion of individuals doing so is around 0.10 prior to t. The average differences between optimists and pessimists are not statistically significant. At time t there is a decline for both groups. This may be due to a loan supply side effect: the ability of individuals to take out an additional loan on their house may be restricted at times of income declines. Interestingly, however, the decline is larger for those individuals who are pessimistic going forward (from 0.104 to 0.041) than for those who are optimistic going forward (from 0.108 to 0.082). The average time t difference between optimists and pessimists is statistically significant at the five percent level. We cannot rule out the possibility that this differential decline is also due to a supply side channel affecting pessimists and optimists differently (what we observe are equilibrium outcomes). However, we note that the average year t incomes of optimists and pessimists are almost identical, so it is unlikely that they would be treated in a significantly different manner by lenders in their credit decisions (Panel A of Table 13).

The fact that optimistic individuals are more likely to take a loan in response to an income decline may have implications for their future household finances. Their underestimation of the degree of persistence of the earnings decline means that they are not likely to have the higher future earnings on which they may be relying to repay the debt. This is most problematic in the case of loans that carry a high interest rate, such as payday loans (Bhutta et al., 2015; Melzer, 2011; Morse, 2011).

5.4 Future financial situation

The previous section showed that the savings and debt responses to an earnings decline depend on whether individuals are optimistic or pessimistic. An interesting question is whether there is a relationship between this potentially suboptimal savings and borrowing behavior, and the subsequent changes in financial situation. We provide evidence on this question in Table 14.

More precisely, in this table we again take the sample of individuals who are in a worse financial situation due to an earnings decline at time t, and calculate the proportion of these individuals who are better off (Panel A) and worse off (Panel B) in each year from $t-2$ to $t+2$. As before, we distinguish between those individuals who are optimistic and pessimistic at time t.

The results in the table show that, prior to the event time t, there are no significant statistical or economic differences in the proportions of optimists and pessimists who are better/worse off. At event time t, by construction, all individuals are worse off, hence the 1 in the bottom panel. The results for year $t+1$ are also, to a large extent, due to the way we construct the variables: individuals are classified into pessimists and optimists based on their year t expectations and their subsequent year $t+1$ realizations. Pessimists are those for whom the year $t+1$ realized financial situation is better than the year t expectation. This explains the large proportion of pessimists who are better off in Panel A (equal to 0.696), and the fact that none of them are worse off (as shown in Panel B). Similarly, optimists are those for whom the year $t+1$ realized financial situation is worse than the year t expectation.

The interesting results are those for year $t+2$. The classification of individuals into pessimists and optimists at time t does not use the year $t+2$ realized change in financial situation. The penultimate column in Panel B of Table 14, shows that those individuals who are more optimistic at time t are much more likely to find themselves in a worse financial situation in year $t+2$ than those individuals who are pessimistic at time t. This is consistent with the interpretation that their savings/borrowing behavior at time t was suboptimal. The differences are economically significant. Those who were pessimistic in year t have a 0.266 probability of being worse off at $t+2$, compared with 0.356 for those who were optimistic. The 0.09 difference corresponds to 38% of the unconditional probability of being worse off (0.24).

It may also be the case that those individuals who are optimistic at t are more likely to underestimate the persistence of the shocks, and that the higher persistence of the original shock explains why they are again more likely to be worse off in year $t+2$. In other words, the differences in year $t+2$ could simply be due to the persistence of the underlying shocks and not the individual saving responses to those shocks. We investigate this hypothesis in the last column of Table 14. In this column, we report the proportions of individuals who are better off and worse off in year $t+2$, but excluding those who are better off in year $t+2$ due to an

earnings increase at this time (in Panel A) and those who are worse off in year $t+2$ due to an earnings decline (in Panel B).[21] Crucially, we still find a large difference in the proportion of worse off between pessimists and optimists, showing that the effects are at least in part due to their differential responses to the original shock and do not arise solely from the persistence of the original earnings shock.

6 Welfare implications

We solve a calibrated structural model to study the welfare implications of the optimism patterns that we have identified in the data. Our framework is the standard life-cycle consumption model (Gourinchas and Parker (2002), Carroll (1997) Hubbard et al. (1995)), but with some important modifications that allow us to better map the model to the data, and to analyze the role of expectations and expectation errors on savings and welfare.

6.1 Model set-up

6.1.1 Time horizon and preferences

Agents live for a maximum of T periods, of which they work the first K. We let $p_{t,t+1}$ denote the conditional probability of surviving from age t to $t+1$. Agents have power utility preferences over the consumption of a non-durable good (C_t), which they choose so as to maximize:

$$V_1 = \underset{\{C_t\}_{t=1}^{T}}{\text{Max}} \, E_1 \sum_{t=1}^{T} \beta^{t-1} (\prod_{s=1}^{t} p_{s,s+1}) \frac{C_t^{1-\gamma}}{1-\gamma} \tag{6}$$

where V denotes the value function, γ is the coefficient of relative risk aversion, β is the subjective discount factor, and $p_{1,1} = 1$.

6.1.2 Income process

During their working live agents receive labor income Y_t (with $y_t \equiv log(Y_t)$) according to:

[21] Recall, that the original year t shock that we are conditioning upon is a decline in earnings, so by excluding those with earnings changes in year $t+2$ we are removing observations that could be potentially due to the persistence of the year t shock.

$$y_t = f_t(Z_t) + \varepsilon_t^y \tag{7}$$

$$\varepsilon_t^y = \phi \varepsilon_{t-1}^y + \eta_t \tag{8}$$

Log labor income is equal to the sum of a deterministic function (f_t), that captures age effects and other individual characteristics (Z_t), and a stochastic component (ε_t^y). For the purposes of mapping the model to the data, it is useful to think of income in first differences:

$$\Delta y_t = y_t - y_{t-1} = f_t - f_{t-1} + \varepsilon_t^y - \varepsilon_{t-1}^y \tag{9}$$

We model changes in income (Δy_t) using a three-state Markov chain with low (L), intermediate (S), and high (H) income growth. In other words, Δy_t can take one of three possible values: g_t^L, g_t^S and g_t^H. The values for the growth rates of income are age-dependent allowing us to capture life-cycle variation. A transition probability matrix Θ_t governs the changes between $t-1$ and t states:

$$\Theta_t = \begin{bmatrix} \theta_t^{LL} & \theta_t^{LS} & \theta_t^{LH} \\ \theta_t^{SL} & \theta_t^{SS} & \theta_t^{SH} \\ \theta_t^{HL} & \theta_t^{HS} & \theta_t^{HH} \end{bmatrix} \tag{10}$$

where θ_t^{ij} denotes the probability of a transition from g_{t-1}^i to g_t^j for $i, j = L, S, H$. As the notation above makes clear, we let the transition probabilities be age dependent.

Relative to the more commonly used income process formulation with purely temporary and permanent shocks, our formulation requires more state variables, namely the level of current (log) income (y_t) and the current growth rate of income (g_t). Although more costly in terms of state variables, this process allows a better mapping between model and data (as the model parameterization below makes clear).

Since the level of income is a state variable in our model, we do not need to impose the common assumption that retirement income is a fixed fraction of age-K (permanent) income. We model retirement income as being equal to a constant (λ_0) plus a fraction of the income (λ_1) in the last year year of working life:

$$Y_t = \lambda_0 + \lambda_1 Y_K, \ t > K. \tag{11}$$

The constant λ_0 captures retirement benefits that do not depend on working life income.

6.1.3 Expenditures and budget constraint

The empirical analysis revealed that higher/lower earnings/expenditures are the main reasons for changes in financial situation. Therefore, we also introduce expenditure shocks in the model. Since our main focus is on income changes, we model age-t expenditure shocks (X_t) as a simple i.i.d. process with three possible values: low, same and high.[22] Their values are denoted X_t^L, X_t^S and X_t^H, respectively, and the corresponding probabilities are ω_t^L, ω_t^S and ω_t^H.

Agents invest their savings in a riskless asset with gross return R, and are not allowed to borrow against future labor income, so that their budget constraint evolves according to:

$$W_{t+1} = (W_t - C_t)R + Y_{t+1} - X_{t+1} \tag{12}$$

$$W_t \geq 0, \forall_t \tag{13}$$

where W_t denotes cash-on-hand.

6.1.4 Expectations

We are interested in studying the role of expectation errors regarding future income growth on consumption and savings decisions. We first solve our model for agents who have the correct expectations, that is for whom the subjective probabilities of their future income growth (denoted $\widetilde{\Theta}$) are equal to the objective probabilities (Θ). These agents therefore maximize (6), where the expectation is computed using the actual probabilities of the events.

The empirical analysis identified households who, following an earnings decline, were too optimistic about the future changes in earnings. In other words, they were too optimistic about the persistence of negative income shocks. We compared them to those who were too pessimistic. We model the behavior of these two groups of agents by adjusting the subjective probabilities. More precisely, optimistic (O) agents are those who underestimate the value of θ^{LL}, so that

[22] A Markov chain formulation for expenditure shocks, similar to the one for income, would require two additional state variables: the current level and the lagged growth rate of expenditures.

$$\widetilde{\theta}_t^{O,LL} = \theta_t^{LL} - \delta^O \tag{14}$$

with $\delta^O > 0$. Similarly, pessimistic (P) agents overestimate its value:

$$\widetilde{\theta}_t^{P,LL} = \theta_t^{LL} + \delta^P \tag{15}$$

with $\delta^P > 0$. Since the probabilities must sum to one, these adjustments require a compensating change in probabilities. We assume that the adjustment is done through the subjective probability of the LH event:

$$\widetilde{\theta}_t^{O,LH} = \theta_t^{LH} + \delta^O \tag{16}$$

$$\widetilde{\theta}_t^{P,LH} = \theta_t^{LH} - \delta^P \tag{17}$$

so that the subjective probabilities of LS are equal to the objective ones. Naturally, other assumptions would have been possible and tractable, but the results in Panel B of Table 14 show that following an earnings decline agents are more likely to expect to be better off and less likely to expect to be worse off than the subsequent realizations (the differences in the expectation and the realization of the same event are an order of magnitude smaller). An optimistic (pessimistic) agent solves the life-cycle problem using $\widetilde{\theta}^O$ ($\widetilde{\theta}^P$) to calculate expected values and make consumption decisions.

6.1.5 Model solution, simulated data and welfare calculations

We solve the model separately for each of the three types of agents (correct expectations, optimists, and pessimists). For each type, the state variables of the problem (S_t) are: cash-on-hand (W_t), age (t), income (Y_t), and the growth rate of income (g_t). The numerical solution techniques that we use to solve the model are fairly standard, and include a discretization of the state space and the variables over which the choices are made, dynamic programming, and interpolation over values that do not lie on the grid. We use the agents' optimal choices to generate simulated data, and the model statistics that we report weigh the simulated data for the different ages using the age distribution observed in the data.

We are interested in calculating the welfare losses arising from the wrong beliefs. We use the simulated consumption choices of optimistic agents and the objective probabilities of the events

to calculate the expected value of their lifetime utility as of the initial date. This is different from the value function obtained from solving the agent's problem which uses the subjective probabilities. We then calculate the constant consumption stream that makes agents as well off (under the correct probabilities) as their optimal choices. We also calculate an equivalent consumption stream for agents with the correct expectations. The welfare loss of optimistic agents is the percentage difference in the two consumption equivalent streams, i.e the one for optimistic agents and the one for those with correct expectations.

6.2 Parameterization

We parametrize the model using a combination of parameter values taken from the literature, estimated and calibrated. The starting age is 23, the retirement age 65, and the maximum age 90. We use UK national life tables based on the data for the years 1991-1993 (corresponding to the beginning of our sample period) to parameterize the survival probabilities. In order to simplify the analysis, and since our focus is in estimating the probability distortions, we set γ equal to 2, a value for which there is support in the literature (e.g. Gourinchas and Parker (2002)).

6.2.1 Income

The parameterization of the income process requires estimates of the growth rates and the respective transition probabilities. For each age, we divide individuals in our data into three groups: those who are better off/worse off due to higher/lower earnings, and those who report an unchanged financial situation. The high/same/low growth rates are equal to the median percentage change in income for that age for individuals in each of the groups.

Panel A of Figure 3 plots the age-dependent growth rates of income. In addition to the median changes, the figure plots the fit of a second-order polynomial of age. We use the latter to parameterize the model. There is an age decline in the growth rate of earnings for those individuals who report higher earnings. In other words, the percentage increase is higher early in life compared to late in life. In addition, young individuals are more likely to report lower earnings for a smaller percentage earnings decline.

Panel B plots the estimated transition probabilities conditional on an earnings increase. The figure plots the estimated age profile and the fit of a linear regression which we use as model input. After an earnings increase, there are higher probabilities of another increase and of an unchanged financial situation than of an earnings decline. Furthermore, the probability of consecutive earnings increase events declines over the life-cycle, compensated by an increase in the likelihood of an unchanged financial situation. The conditional probability of low earnings is fairly stable over the life-cycle. The model uses as input these probabilities and the conditional probabilities after a same and a lower earnings event (not shown in the figure). As Figure 3 makes clear, our model parameterization captures life-cycle variation in income levels and risk through the parameterization of the age-dependent income changes and transition probabilities.

In order to parameterize retirement income we use the panel dimension of our data, namely those observations for individuals in the data in the year prior to and in the first year of retirement. We then regress their log retirement income on their pre-retirement income. We provide additional details in Internet Appendix C.

6.2.2 Expenditures and other parameters

The probabilities of high/low expenditures are equal to the frequency of each of these events at each age.[23] The probability of high expenditure is higher than that of low expenditure and it increases with age. (Internet Appendix C shows the probabilities.)

In the data we do not have information on the magnitude of the expenditures associated with each of the events. Therefore, we make the assumption that the magnitude of the expenditure shock that is associated with a better off/worse off expenditures event is equal in pounds to the magnitude of the earnings change for a better off/worse off earnings event (for each age). An argument in support of this approach is that earnings and expenditure changes are treated symmetrically in the budget constraint.

For the riskless rate we use the yield on 1-year UK Treasury bonds over the sample period (1990-2008), deflated using the consumer price index. Its average value is equal to 3%.

[23] Recall that we model expenditure shocks as being i.i.d.

6.3 Results

6.3.1 Calibrated parameters

The data parameters targeted by our parameterization are the average savings rate during working life, the savings rate of optimists and pessimists in the periods prior to an earnings decline, and in the periods of earnings declines (shown in Panel C of Table 13). The model parameters that we calibrate to target these data moments are the discount factor and the probability distortions of optimists and pessimists $\{\beta, \delta^O, \delta^P\}$. When calculating the overall saving rate in the simulated data we use the the proportions of agents with correct expectations, optimists and pessimists shown in the first column of Panel A of Table 8. Therefore, we have five data moments that we target with three parameters.

Panel A of Table 15 reports the data moments, the simulated model moments, and the calibrated parameter values. Although all of the calibrated parameters affect the simulated model moments, the value of β is more important for the overall saving rate and the values of δ^O (δ^P) are more important for the savings response of optimists (pessimists) to an earnings decline. The model matches fairly well the overall savings rates in the data, the saving rates in periods prior to an earnings decline, and the lower saving rates at times of earnings declines. The model generates lower saving rates for optimists than pessimists, as in the data, but it tends to slightly overestimate the value for pessimists in periods of lower earnings.

The distortion for optimists is larger than the one for pessimists. This is consistent with the empirical analysis that identified optimism after an earnings decline as an important feature of the data. If we were to reduce the value of δ^P further, say to a value close to zero, we would bring the value of the pessimists' saving rate after an earnings decline closer to the data, but these agents would then behave similarly to those with correct expectations. In order to illustrate the effects of pessimism in the model, we keep the value of δ^P equal to 0.05.

6.3.2 Implications of optimism for consumption and welfare

Panel A of Figure 4 plots the simulated life-cycle profiles of consumption and wealth accumulation of optimistic agents, and compares them to those of agents with the correct expectations. All series are scaled by the level of starting income. Consumption tracks income closely early

in life as agents face an increasing income profile and borrowing constraints. Agents start accumulating more wealth in their thirties. Optimists tend to consume more on average early in life and they accumulate less wealth. This means that, on average, they then consume less later in life.

The empirical analysis focused on events following an earnings decline. We perform a similar analysis in the context of our model using the simulated data. More precisely, we identify periods of earnings decline and evaluate the consumption responses of agents both in that period and in subsequent periods. The first row of Panel B of Table 15 shows the percentage change in consumption in the period of the earnings decline, which we denote by t. Given their expectations about the persistence of the realized income shock, optimists cut their consumption by less than pessimists. The next row shows the percentage change in consumption at $t+1$, which is significantly smaller for optimists than for pessimists. Therefore, the consumption of optimistic agents, who underestimate the persistence of the negative income shock, takes longer to recover from the event. This is more so when agents are then hit by a high expenditure shock: the percentage increase in consumption at $t+1$ is even smaller (and negative for optimists).

The bottom part of Panel B shows the fraction of agents cutting consumption relative to the previous period. As a result of their more significant reduction in savings at time t, a larger proportion of optimists have to cut their consumption (again) in period $t+1$. The difference relative to pessimists, and relative to those with the correct expectation, is particularly large when agents are also hit with a high expenditure shock at time $t+1$. Therefore, optimistic agents are particularly vulnerable to further negative shocks, and more likely to be worse off in periods after a negative earnings event. The effects are still significant at time $t+2$: the fraction of optimists cutting consumption is 0.184 compared to 0.149 for pessimists. There is a close parallel between these model results and the empirical ones.[24]

Panel B of Figure 4 shows the welfare losses, in the form of consumption equivalent variations, of optimists relative to agents who have the correct expectations. First, although not clearly visible in the figure, as of the starting age optimists are worse off relative to agents with

[24]In the empirical analysis we used the time $t+1$ realizations to identify optimists/pessimists. For that reason, we focused on the time $t+2$ realizations only. In the model we know who the optimists and pessimists are, so that we study both time $t+1$ and $t+2$ events.

the correct expectations. The percentage difference is fairly small, equal to -0.007%. Early in life, borrowing constrained agents consume almost all their wealth, so that having the incorrect expectations has a small impact on their choices. The effects become more significant in mid-life. Optimistic agents have accumulated less wealth than those with the correct expectations, and are less able to smooth shocks (both income and expenditures). Consequently they are significantly worse-off, with welfare loss exceeding 1% of certainty equivalent consumption for a wide range of ages.

7 Conclusion

We have used almost two decades of panel data to study household finances, and to examine how changes experienced in these finances affect the way in which households form expectations. The panel nature of the data allows us to include individual fixed effects in the regressions that control for unobserved individual heterogeneity, including in the interpretation of the survey questions. We have shown evidence consistent with extrapolative expectations, both unconditionally and following an improvement in household finances. However, we have also shown that, following a deterioration in household finances, there is an increase in the dispersion of forecasts, with increases in the expectation of a further deterioration (consistent with extrapolative behavior) and of a future improvement (mean reversion). We have calculated expectation errors to show that individuals who face lower earnings tend to expect too much mean reversion. In other words, they tend to underestimate the persistence of the lower earnings event and its effect on household finances.

The evidence that we present is important for two reasons. First, and although we also find support for extrapolative expectations, it shows that the process of expectations formation is more complex than a simple extrapolative model. Second, times of earning declines tend to be times of stretched household finances. We have shown that those who are too optimistic at such times save less and borrow more, and they are more likely to subsequently find themselves in an even worse financial situation. A final contribution of our paper is to solve a calibrated life-cycle consumption model that captures these patterns and shows that the excessive optimism has significant consumption and welfare effects.

References

Bénabou, R. and J. Tirole (2002). Self-confidence and personal motivation. *Quarterly Journal of Economics 117*(3), 871–915.

Bénabou, R. and J. Tirole (2011). Identity, morals and taboos: Beliefs as assets. *Quarterly Journal of Economics 126*(2), 805–855.

Bhutta, N., P. M. Skiba, and J. Tobacman (2015). Payday loan choices and consequences. *Journal of Money, Credit and Banking 47*, 223–261.

Bordalo, P., N. Gennaioli, R. L. Porta, and A. Shleifer (2019). Diagnostic expectations and stock returns. *Journal of Finance 74*(6), 2839–2874.

Brown, S. and K. Taylor (2006). Financial expectations, consumption and saving: A microeconomic analysis. *Financial Studies 27*, 313–338.

Brunnermeier, M. and J. Parker (2005). Optimal expectations. *American Economic Review 95*(4), 55–80.

Campbell, J. Y. (2006). Household finance. *Journal of Finance 61*(4), 1553–1604.

Carroll, C. (1997). Buffer-stock saving and the life cycle/permanent income hypothesis. *The Quarterly Journal of Economics 112*(1), 1–55.

Das, S., C. Kuhnen, and S. Nagel (2020). Socioeconomic status and macroeconomic expectations. *Review of Financial Studies 33*(1), 395–432.

Fermand, E., C. M. Kuhnen, G. Li, and I. Ben-David (2018). Expectations uncertainty and household economic behavior. *Working Paper*.

Gennaioli, N., Y. Ma, and A. Shleifer (2015). Expectations and investment. *NBER Macroeconomics Annual 30*, 379–442.

Giglio, S., M. Maggiori, J. Stroebel, and S. Utkus (2021). Five facts about beliefs and portfolios. *American Economic Review 111*(5), 1481–1522.

Gourinchas, P.-O. and J. A. Parker (2002). Consumption over the life cycle. *Econometrica 70*(1), 47–89.

Greenwood, R. and S. Nagel (2009). Inexperienced investors and bubbles. *Journal of Financial Economics 93*(2), 239 – 258.

Greenwood, R. and A. Shleifer (2014). Expectations of returns and expected returns. *Review of Financial Studies 27*(3), 714–746.

Guiso, L., M. Haliassos, and T. Jappelli (1997). *Household Portfolios*. MIT Press.

Guiso, L. and P. Sodini (2013). Household finance: an emerging field. *Handbook of the Economics of Finance, Constandinides, G., M. Harris and R. Stulz, Elsevier*, 1397–1532.

Hubbard, R. G., J. Skinner, and S. P. Zeldes (1995). Precautionary saving and social insurance. *Journal of Political Economy 103*(2), 360–399.

Kaustia, M. and S. Knupfer (2008). Do investors overweight personal experience? Evidence from IPO subscriptions. *Journal of Finance 63*(6), 2679–2702.

Kuchler, T. and B. Zafar (2019). Personal experiences and expectations about aggregate outcomes. *Journal of Finance 74*(5), 2491–2542.

Kuhnen, C. M. (2015). Asymmetric learning from financial information. *Journal of Finance 70*, 2029–2062.

Makridis, C. (2019). Sentimental business cycles and the protracted great recession. *Working Paper*.

Malmendier, U. and S. Nagel (2011). Depression babies: Do macroeconomic experiences affect risk-taking. *Quarterly Journal of Economics 126*(1), 373–416.

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

Malmendier, U., S. Nagel, and Z. Yan (2021). The making of hawks and doves. *The Journal of Monetary Economics 117*, 19–42.

Malmendier, U. and L. S. Shen (2018). Scarred consumption. *NBER Working Paper 24696*.

Malmendier, U., G. Tate, and J. Yan (2011). Overconfidence and early-life experiences: The effect of managerial traits on corporate financial policies. *Journal of Finance 66*(5), 1687–1733.

Manski, C. F. (2018). Survey measurement of probabilistic macroeconomic expectations: Progress and promise. *NBER Macroeconomics Annual 32*(1), 411–471.

Melzer, B. (2011). The real costs of credit access: Evidence from the payday lending market. *Quarterly Journal of Economics 126*(1), 517–555.

Morse, A. (2011). Payday lenders: Heroes or villains? *Journal of Financial Economics 102*(1), 28–44.

of Essex, U. (July 2010). Institute for social and economic research, British household panel survey: Waves 1-18, 1991-2009. *7th Edition. Colchester, Essex: UK Data Archive*, SN: 5151.

Puri, M. and D. T. Robinson (2007). Optimism and economic choice. *Journal of Financial Economics 86*, 71–99.

Rozsypal, F. and K. Schlafmann (2018). Overpersistence bias in individual income expectations and its aggregate implications. *Working Paper*.

Souleles, N. S. (2004). Expectations, heterogeneous forecast errors, and consumption: Micro evidence from the Michigan consumer sentiment surveys. *Journal of Money, Credit and Banking 36*(1), 39–72.

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

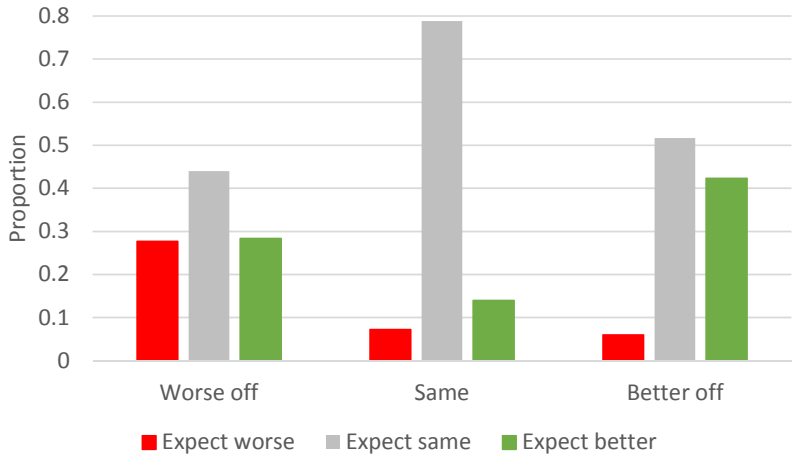
Vissing-Jorgensen, A. (2003). Perspectives on behavioral finance: Does irrationality disappear with wealth? Evidence from expectations and actions. *NBER Macroeconomics Annual*, 139–194.

FIGURES AND TABLES

Figure 1: Expectations

Panel A shows the probability of the different expectations conditional on the change experienced in financial situation using the raw data. Panel B shows the log odds ratios estimated using the fixed effects logit regressions.

Panel A: Raw data.

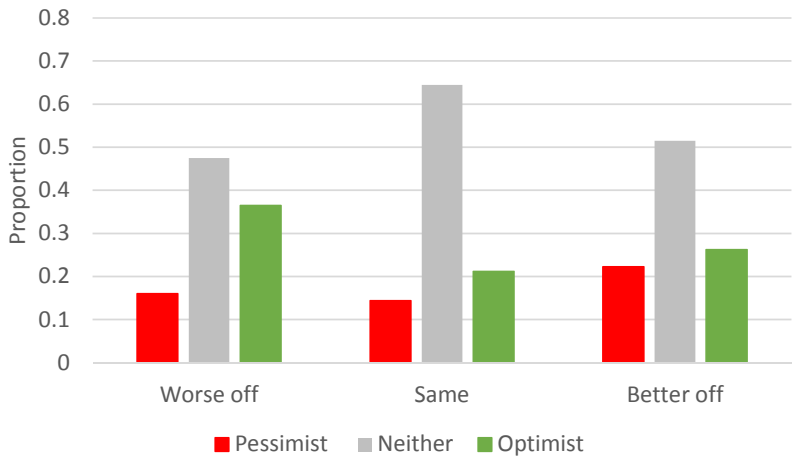


Panel B: Fixed effects logit regressions.

Figure 2: Expectation errors

Panel A shows the probability of optimism/pessimism conditional on the change experienced in financial situation using the raw data. Panel B shows the log odds ratios estimated using the fixed effects logit regressions.

Panel A: Raw data.

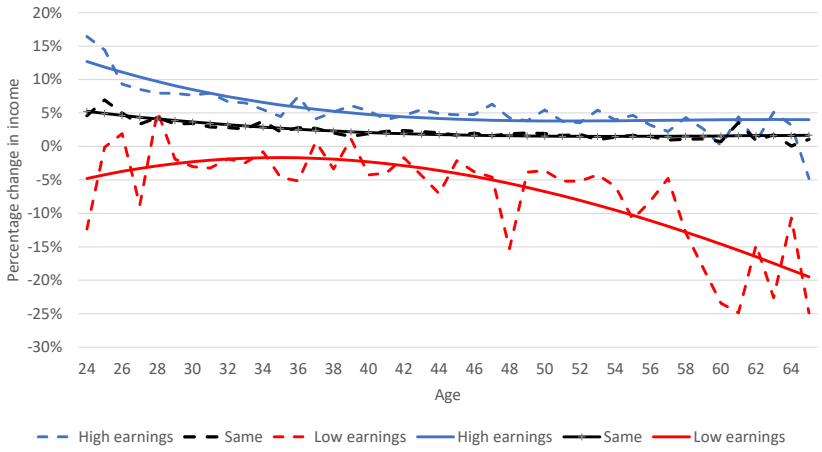


Panel B: Fixed effects logit regressions.

Figure 3: Earnings parameterization

Panel A shows median percentage changes in earnings at each age for individuals who report being better off due to higher earnings, worse off due to lower earnings and an unchanged financial situation. Panel B plots the age-dependent probabilities of higher earnings, lower earnings and unchanged financial situation in the period after a higher earnings event.

Panel A: Percentage change in earnings.



Panel B: Probabilities following a higher earnings event.

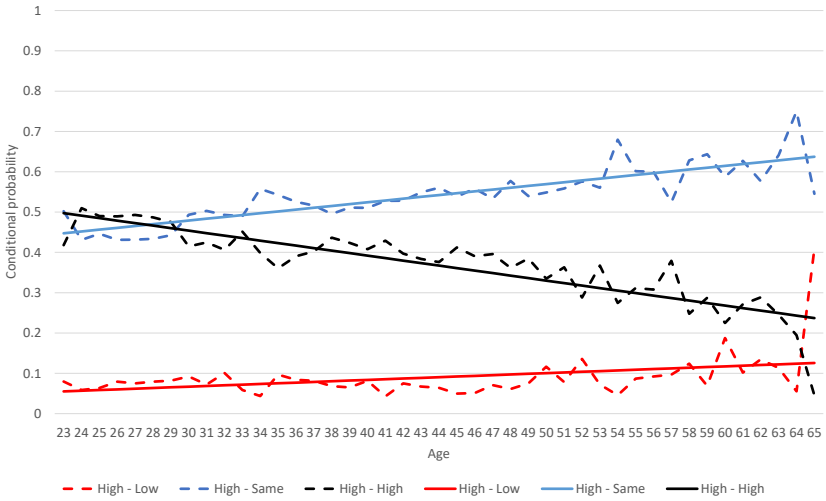
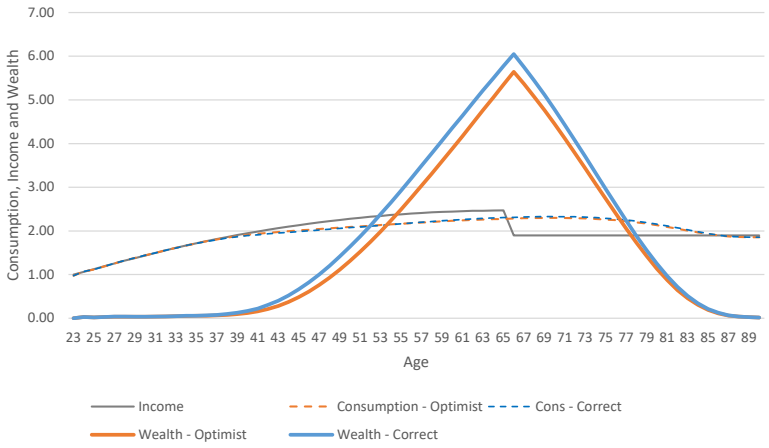


Figure 4: Simulated life-cycle profiles and welfare effects of excessive optimism
Panel A plots the simulated life-cycle profiles of consumption, wealth accumulation and income of agents with optimistic beliefs and compares them to those with the correct expectations. Panel B shows the welfare gains, under the form of consumption equivalent variations, of the excessive optimism.

Panel A: Simulated life-cycle profiles.



Panel B: Welfare effects of excessive optimism.

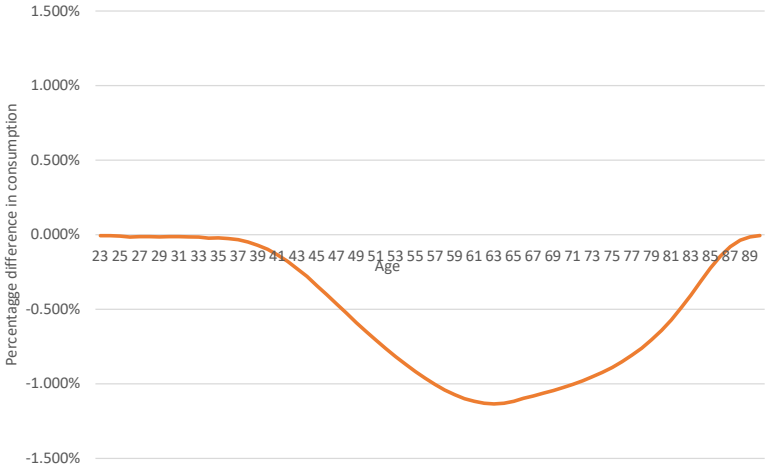


Table 1: Financial situation

Panel A reports the number of observations for which individuals in year t reported that they were financially better off, about the same, and worse off than in year t-1, for t=1991,...,2008. Panel B tabulates the reasons given by individuals for being better off/worse off. The latter are available from 1993 onward.

Panel A: Changes in financial situation.

	Financial situation in year t			
	Better off at t	No change at t	Worse off at t	Total
Number of obs.	28,830	63,695	29,755	122,280
Fraction of total	0.24	0.52	0.24	1.00

Panel B: Reasons for change in financial situation.

Panel B.1	Better off		Panel B.2	Worse off	
Reason better off	# obs.	Fraction	Reason worse off	# obs.	Fraction
Earnings ↑	14,080	0.54	Earnings ↓	6,206	0.24
Expenditure ↓	3,883	0.15	Expenditure ↑	13,530	0.53
Benefits ↑	2,739	0.10	Benefits ↓	990	0.04
Inv income ↑	749	0.03	Inv income ↓	878	0.03
Windfall payment	781	0.03	One-off expend.	513	0.02
Good management	1,310	0.05			
Other reasons	2,508	0.10	Other reasons	3,672	0.14
Total better off	26,050	1.00	Total worse off	25,789	1.00

Table 2: Financial situation by age and income

This table reports the proportion of better off/same/worse off observations and the reason for the year t change in financial situation, by age of the household head and by income group. Low (high) income are those in the bottom (top) third of the distribution of household incomes for that year. We divide the sample into income groups using year t-1 income.

	Age group				Income group		
	20-34	35-49	50-64	≥65	Low	Medium	High
Panel A: Change in financial situation, fraction of total							
Better off	0.39	0.28	0.18	0.11	0.17	0.23	0.29
Same	0.37	0.47	0.56	0.67	0.60	0.53	0.47
Worse off	0.24	0.25	0.26	0.22	0.23	0.24	0.24
Panel B: Reason for better off, as a fraction of better off							
Earnings ↑	0.66	0.63	0.45	0.06	0.35	0.56	0.62
Expenditure ↓	0.13	0.14	0.19	0.17	0.14	0.15	0.16
Benefits ↑	0.02	0.03	0.13	0.55	0.30	0.08	0.02
Inv Income ↑	0.02	0.02	0.04	0.07	0.03	0.03	0.03
Windfall payment	0.02	0.03	0.06	0.04	0.03	0.03	0.03
Good management	0.06	0.05	0.04	0.04	0.05	0.05	0.05
Other reasons	0.09	0.10	0.09	0.07	0.10	0.10	0.12
Panel C: Reason for worse off, as a fraction of worse off							
Earnings ↓	0.30	0.28	0.31	0.07	0.12	0.26	0.33
Expenditure ↑	0.50	0.48	0.46	0.67	0.63	0.50	0.46
Benefits ↓	0.03	0.05	0.04	0.03	0.06	0.04	0.02
Inv Income ↓	0.00	0.01	0.04	0.10	0.04	0.04	0.03
One-off expenditure	0.04	0.02	0.01	0.01	0.01	0.02	0.03
Other reasons	0.14	0.16	0.14	0.13	0.14	0.14	0.13

Table 3: Expectations by age and income

This table reports the proportion of observations for which individuals expect their financial situation in one year's time to be better, about the same, and worse. The table also shows the proportions by age of the household head and by income group. The unit of observation is individual/year.

	Overall	Age group				Income group		
		20-34	35-49	50-64	≥65	Low	Medium	High
Better off	0.24	0.46	0.30	0.17	0.05	0.16	0.25	0.29
Same	0.64	0.46	0.60	0.70	0.79	0.71	0.64	0.60
Worse off	0.12	0.08	0.10	0.13	0.16	0.13	0.11	0.11

Table 4: Financial expectations: fixed effects regressions

This table reports the results of ordinary least squares panel fixed effects regressions in which the dependent variable is the time t expectation of future changes in financial situation, $E_t^i[\Delta FS_{t+1}^i]$. The independent variable in specifications (1) and (2) is the change experienced in financial situation at time t, ΔFS_{t+1}^i. In specification (3) we measure the change experienced in financial situation at time t using two dummy variables: (i) one that takes the value of one for positive changes in financial situation, i.e. for $\Delta FS_{t+1}^i > 0$, and zero otherwise, and (ii) another that takes the value of one for negative changes in financial situation, i.e. for $\Delta FS_{t+1}^i < 0$, and zero otherwise.

	(1)	(2)	(3)
	$E_t^i[\Delta FS_{t+1}^i]$	$E_t^i[\Delta FS_{t+1}^i]$	$E_t^i[\Delta FS_{t+1}^i]$
Change in Fin. Sit. (ΔFS_t^i)	0.07***	0.06***	
	(27.63)	(23.13)	
Dummy for pos. change ($\Delta FS_t^i > 0$)			0.09***
			(20.90)
Dummy for neg. change ($\Delta FS_t^i < 0$)			-0.02***
			(-5.68)
Control variables			
Income group 2		0.01	0.01
		(1.06)	(1.14)
Income group 3		-0.02***	-0.02***
		(-3.66)	(-3.53)
Year FE	No	Yes	Yes
Ind. FE	Yes	Yes	Yes
Number of obs.	116,895	115,543	115,543

Table 5: Expectations

This table shows the estimated coefficients of Logit regressions that explain expectations using the changes experienced in financial situation and the reasons for the change. The dependent variables are dummy variables for expect better off, expect worse off, and expect the same. The independent variables are dummy variables that capture the change experienced in financial situation at time t (columns (1) to (3)) and the reason for the change (columns (4) to (6)). The unit of observation is individual/year. All regressions include individual and year fixed effects.

	(1)	(2)	(3)	(4)	(5)	(6)
	Expect	Expect	Expect	Expect	Expect	Expect
	Better$_{it}$	Worse$_{it}$	Same$_{it}$	Better$_{it}$	Worse$_{it}$	Same$_{it}$
Better off$_{it}$	0.64***	-0.08*	-0.52***			
	(28.27)	(-2.29)	(-25.49)			
Worse off$_{it}$	0.74***	0.99***	-1.09***			
	(30.23)	(37.17)	(-54.44)			
Earnings ↑				0.65***	-0.02	-0.61***
				(22.70)	(-0.32)	(-22.59)
Expenditure ↓				0.55***	-0.12	-0.46***
				(11.82)	(-1.46)	(-10.53)
Earnings ↓				1.08***	0.43***	-1.04***
				(27.27)	(8.35)	(-29.37)
Expenditure ↑				0.47***	1.22***	-1.12***
				(13.78)	(35.93)	(-41.40)
Income group 2	0.03	-0.10**	0.04	-0.02	-0.08*	0.08**
	(0.94)	(-2.48)	(1.64)	(-0.56)	(-1.81)	(2.48)
Income group 3	-0.05	0.05	0.06	-0.11**	0.06	0.11***
	(-1.45)	(1.04)	(1.90)	(-2.54)	(1.06)	(2.97)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind. FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	74,723	59,674	93,591	57,038	44,800	73,782

Table 6: Expectations and actions

The dependent variable is a dummy variable that measures whether the individual is currently saving (in (1)), the saving rate calculated as a proportion of income (in (2) and (3)), and a dummy variable that takes the value of one if the individual took out a new home equity loan (in (4)). The independent variables are the dummy variables that measure the time t expectations and the dummy variables that measure the time t realized change in financial situation. In column (2) we include observations for which the saving rate is zero, but in (3) we restrict the sample to those observations for which the saving rate is strictly positive. All the regressions include year and individual fixed effects.

	(1)	(2)	(3)	(4)
	Current Saver$_{it}$	Saving Rate$_{it}$	Saving Rate$_{it}$	New Home Loan$_{it}$
Expect Better$_{it}$	-0.15***	-0.24***	-0.11	-0.02
	(-6.20)	(-3.68)	(-0.82)	(-0.49)
Expect Worse$_{it}$	0.07**	0.48***	0.82***	-0.02
	(2.33)	(6.02)	(4.73)	(-0.21)
Better off$_{it}$	0.47***	1.73***	1.83***	-0.01
	(20.69)	(27.53)	(14.89)	(-0.28)
Worse off$_{it}$	-0.53***	-1.00***	-1.20***	0.02
	(-22.21)	(-15.93)	(-8.26)	(0.36)
Year FE	Yes	Yes	Yes	Yes
Ind. FE	Yes	Yes	Yes	Yes
Number of obs.	83,181	109,300	39,953	23,766
Estimation	FE Logit	FE OLS	FE OLS	FE Logit

Table 7: Expectations compared to realizations

Panel A reports the proportion of observations for individual/years with a given time $t+1$ realized change in financial situation (ΔFS^i_{t+1}) as a function of the time t expectation of that financial situation ($E^i_t[\Delta FS^i_{t+1}]$). Panel B presents a graphical representation of the definition of the optimist and pessimist dummies, based on the time t expectations of individual i ($E^i_t[\Delta FS^i_{t+1}]$) and on his/her time $t+1$ realizations (ΔFS^i_{t+1}).

Panel A:	Realization at t+1		
Expectation at t	Better off	Same	Worse off
Better off	0.45	0.35	0.20
Same	0.17	0.63	0.20
Worse off	0.12	0.35	0.53
Panel B:	Realization at t+1		
Expectation at t	Better off	Same	Worse off
Better off	—	Optimist	Optimist
Same	Pessimist	—	Optimist
Worse off	Pessimist	Pessimist	—

Table 8: Optimism and pessimism: summary statistics

Panel A reports the proportion of observations for which individuals are optimistic and pessimistic by age and income. An individual is optimistic at time t if at this time he/she expects a change in financial situation that is better than the realized time $t+1$ change. An individual is pessimistic at time t if at this time he/she expects a change in financial situation that is worse than the realized time $t+1$ change. The table reports the proportion of observations that were neither optimistic nor pessimistic, corresponding to correct expectations. The table also reports the proportions by age and by income group. The unit of observation is individual/year. Panel B reports summary statistics for several variables of interest for individual/year observations in which individuals are optimistic, pessimistic and neither optimistic nor pessimistic. The unit of observation is individual/year.

Panel A: Optimism and pessimism by age and income

	Overall	Age group				Income group		
		20-34	35-49	50-64	≥65	Low	Medium	High
Optimist	0.26	0.32	0.31	0.25	0.16	0.21	0.27	0.28
Pessimist	0.17	0.18	0.18	0.16	0.15	0.16	0.16	0.18
Neither	0.57	0.50	0.51	0.59	0.69	0.63	0.57	0.54

Panel B: Additional summary statistics

	Optimist		Pessimist		Neither	
	Mean	Stdev	Mean	Stdev	Mean	Stdev
	Demographic variables					
Age	45.83	15.97	49.10	17.59	52.68	18.19
Male	0.55	0.50	0.54	0.50	0.55	0.50
Married	0.64	0.48	0.62	0.49	0.59	0.49
Number of children	0.67	1.01	0.55	0.95	0.49	0.91
Log real income	9.93	0.78	9.90	0.83	9.82	0.81
	Financial change					
Better off at t	0.24	0.43	0.32	0.47	0.22	0.41
No change at t	0.43	0.50	0.45	0.50	0.59	0.49
Worse off at t	0.33	0.47	0.22	0.42	0.19	0.39

Table 9: Optimism and pessimism: regressions

Columns (1) and (2) report the estimated coefficients of fixed effects Logit regressions that explain optimism/pessimism using the changes experienced in financial situation. Columns (3) and (4) report the results of fixed effects ordinary least squares regressions. The unit of observation is individual/year. The last two columns report the results of Logit regressions. All the regressions include year fixed effects.

	(1)	(2)	(3)	(4)	(5)	(6)
	$\underline{\text{Optimist}_{it}}$	$\underline{\text{Pessimist}_{it}}$	$\underline{\text{Optimist}_{it}}$	$\underline{\text{Pessimist}_{it}}$	$\underline{\text{Optimist}_{it}}$	$\underline{\text{Pessimist}_{it}}$
Better off$_{it}$	0.13***	-0.10***	0.024***	-0.016***	0.24***	0.51***
	(5.95)	(-3.96)	(6.04)	(-4.65)	(13.20)	(25.12)
Worse off$_{it}$	0.09***	0.05**	0.016***	0.007*	0.77***	0.10***
	(4.24)	(1.98)	(4.10)	(1.94)	(43.31)	(4.33)
Income group 2	0.13***	-0.08**	0.02***	-0.010**	0.30***	-0.06***
	(4.49)	(-2.29)	(4.51)	(-2.29)	(16.06)	(-2.58)
Income group 3	0.19***	-0.04	0.03***	-0.006	0.31***	0.10***
	(5.59)	(-0.91)	(5.72)	(-1.06)	(16.69)	(4.93)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind. FE	Yes	Yes	Yes	Yes	No	No
Number of obs.	79,204	70,941	98,095	98,095	98,095	98,095
Estimation	FE Logit	FE Logit	FE OLS	FE OLS	Logit	Logit

Table 10: Optimism and pessimism by reason for change in financial situation
Columns (1) and (2) report the estimated coefficients of fixed effects Logit regressions that explain optimism/pessimism using the reported reasons for the changes experienced in financial situation. Columns (3) and (4) report the results of fixed effects ordinary least squares regressions. The unit of observation is individual/year. The last two columns report the results of Logit regressions. All the regressions include year fixed effects.

	(1)	(2)	(3)	(4)	(5)	(6)
	Optimist_{it}	Pessimist_{it}	Optimist_{it}	Pessimist_{it}	Optimist_{it}	Pessimist_{it}
Earnings ↑	0.14***	-0.12***	0.03***	-0.02***	0.28***	0.47***
	(4.62)	(-3.67)	(4.80)	(-4.25)	(11.59)	(17.72)
Expenditure ↓	0.12**	-0.07	0.02*	-0.01*	0.25***	0.54***
	(2.38)	(-1.46)	(2.41)	(-1.69)	(5.94)	(12.19)
Earnings ↓	0.34***	-0.31***	0.07***	-0.04***	1.03***	-0.18***
	(9.30)	(-6.05)	(10.32)	(-6.05)	(32.80)	(-4.02)
Expenditure ↑	-0.10***	0.25***	-0.02***	0.03***	0.66***	0.24***
	(-3.46)	(6.93)	(-4.42)	(7.12)	(27.32)	(8.20)
Income group 2	0.11***	-0.09**	0.02***	-0.01**	0.27***	0.01
	(3.16)	(-2.29)	(3.17)	(-2.29)	(12.90)	(0.56)
Income group 3	0.15***	-0.04	0.03***	-0.01	0.26***	0.20***
	(3.78)	(-0.84)	(3.84)	(-1.01)	(12.56)	(8.48)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind. FE	Yes	Yes	Yes	Yes	No	No
Number of obs.	62,618	54,935	81,744	81,744	81,744	81,744
Estimation	FE Logit	FE Logit	FE OLS	FE OLS	Logit	Logit

Table 11: Cohort effects

Columns (1) and (2) report the estimated coefficients of FE logit regressions of optimism and pessimism on changes in financial situation and on the cohort variable. Columns (3) and (4) report the estimated coefficients of FE logit regressions of optimism and pessimism on the reported reasons for change in financial situation and on the cohort variable. The unit of observation is individual/year. In columns (5) and (6) we regress the average of the optimist and pessimist dummy variables for each individual on the average of their cohort variable. The unit of observation is the individual.

	(1)	(2)	(3)	(4)	(5)	(6)
	Opt.$_{it}$	Pess.$_{it}$	Opt.$_{it}$	Pess.$_{it}$	Avg. Opt.$_i$	Avg. Pess.$_i$
Better off$_{it}$	0.13***	-0.10***				
	(5.97)	(-3.96)				
Worse off$_{it}$	0.09***	0.05**				
	(4.23)	(1.99)				
Earnings ↑			0.14***	-0.12***		
			(4.57)	(-3.64)		
Expenditure ↓			0.12**	-0.07		
			(2.37)	(-1.46)		
Earnings ↓			0.34***	-0.31***		
			(9.23)	(-6.03)		
Expenditure ↑			-0.10***	0.25***		
			(-3.50)	(6.96)		
Cohort variable$_{it}$	-1.34**	0.18	-2.67***	1.12		
	(-2.34)	(0.26)	(-3.19)	(1.18)		
Avg. cohort var$_i$					-0.61***	0.17***
					(-12.79)	(3.81)
Income group 2	0.13***	-0.08**	0.10***	-0.09**		
	(4.34)	(-2.27)	(2.98)	(-2.23)		
Income group 3	0.18***	-0.04	0.13***	-0.03		
	(5.29)	(-0.87)	(3.41)	(-0.71)		
Year FE	Yes	Yes	Yes	Yes		
Ind. FE	Yes	Yes	Yes	Yes		
Number of obs.	79,204	70,941	62,618	54,935	13,369	13,369
Estimation	FE Logit	FE Logit	FE Logit	FE Logit	Tobit	Tobit

Table 12: Realizations and expectations transition matrices

Panel A reports the proportions of observations for individual/years with a given time t expectation and a given time $t+1$ realization of their financial situation, as a function of the time t realized change in financial situation. Panel B presents similar information, but as a function of the reason for the change in the time t financial situation.

Panel A: Changes in financial situation.

	Expectation at t			Realization at t+1		
Realization at t	Better off	Same	Worse off	Better off	Same	Worse off
Better off	0.42	0.52	0.06	0.44	0.39	0.17
Same	0.14	0.79	0.07	0.16	0.67	0.17
Worse off	0.28	0.44	0.28	0.18	0.37	0.45

Panel B: Reasons for change in financial situation.

	Expectation at t			Realization at t+1		
Realization at t	Better off	Same	Worse off	Better off	Same	Worse off
Earnings ↑	0.49	0.46	0.05	0.49	0.34	0.17
Expenditure ↓	0.40	0.54	0.06	0.44	0.40	0.16
Earnings ↓	0.42	0.44	0.14	0.24	0.37	0.39
Expenditure ↑	0.22	0.45	0.33	0.17	0.37	0.46

Table 13: Test of the equality of the means

This table reports the t-test of the equality of the means for several variables of interest for individuals who, at time t, were worse off due to an earnings decline and are optimistic, and those who were worse off due to the same earnings decline but are pessimistic. The sample of individuals is restricted to those who did not report an earnings decline in years $t-2$ and $t-1$.

	$(t-2)$	$(t-1)$	(t)	$(t+1)$	$(t+2)$
		Panel A: Log income			
Pessimist	10.12	10.11	10.01	9.97	10.03
Optimist	10.13	10.15	10.02	9.92	9.97
Difference	-0.01	-0.03	-0.01	0.05	0.06
p-value	0.77	0.43	0.83	0.18	0.12
		Panel B: Proportion savers			
Pessimist	0.457	0.467	0.332	0.410	0.431
Optimist	0.449	0.454	0.288	0.293	0.340
Difference	0.008	0.012	0.044	0.118	0.091
p-value	0.77	0.65	0.06	0.00	0.00
		Panel C: Saving rate			
Pessimist	0.051	0.054	0.029	0.054	0.055
Optimist	0.050	0.051	0.025	0.025	0.032
Difference	0.002	0.003	0.004	0.029	0.022
p-value	0.79	0.59	0.18	0.00	0.00
		Panel D: Proportion extra loan			
Pessimist	0.102	0.104	0.041	0.072	0.096
Optimist	0.107	0.108	0.082	0.080	0.097
Difference	-0.005	-0.004	-0.041	-0.008	-0.001
p-value	0.84	0.84	0.03	0.66	0.97

Table 14: Worse off and better off, conditional on worse off due to earnings decline at t

This table reports the difference between the proportions of optimistic and pessimistic individuals who are better off (worse off in Panel B) in each year, conditional on them being worse off at time t due to an earnings decline. Individuals are classified into optimists and pessimists based on year t expectations and year $t+1$ realizations. The last column reports the difference in the proportions of those who are better off and worse off, but excluding those who are better off due to an earnings increase in year $t+2$ (Panel A) and excluding those who are worse off due to an earnings decline in year $t+2$ (Panel B). The sample of individuals is restricted to those who did not report an earnings decline in years $t-2$ and $t-1$.

	$(t-2)$	$(t-1)$	(t)	$(t+1)$	$(t+2)$	$(t+2)$ (excl. earn.)
			Panel A: Better off			
Pessimist	0.304	0.298	0.000	0.696	0.279	0.134
Optimist	0.321	0.302	0.000	0.000	0.249	0.096
Difference	-0.017	-0.004	0.000	0.696	0.030	0.038
p-value	0.524	0.8643		0.000	0.199	0.037
			Panel B: Worse off			
Pessimist	0.237	0.235	1.000	0.000	0.266	0.190
Optimist	0.234	0.238	1.000	0.697	0.356	0.270
Difference	0.004	-0.003	0.000	-0.697	-0.090	-0.080
p-value	0.880	0.893		0.000	0.000	0.001

Table 15: Model results

Panel A compares the data and model moments. They include the overall average savings rate (across all agents and events), the savings rate for optimistic agents in the period prior to and in the period of an earnings decline, and the savings rate for pessimistic agents in the period prior to and in the period of an earnings decline. In the period prior to the earnings decline we also condition on a unchanged financial situation, similarly to what we done in the data. The bottom part of Panel A reports the calibrated parameter values. Panel B shows the consumption implications of distorted expectations. It shows the percentage change in consumption in the period of earnings decline and in the subsequent periods, also conditional on a higher expenditures event. The last three rows report the fraction of agents who cut consumption relative to the previous period.

Panel A: Data versus model moments and calibrated parameter values.

Moment description	Data	Model
Saving rate, overall	4.27%	4.45%
Saving rate, optimists, period prior to Earnings ↓	5.10%	4.76%
Saving rate, optimists, period of Earnings ↓	2.50%	2.48%
Saving rate, pessimists, period prior to Earnings ↓	5.40%	5.01%
Saving rate, pessimists, period of Earnings ↓	2.90%	3.92%
Parameter description	**Parameter**	**Value**
Discount factor	β	0.99
Probability distortion, optimists	δ^O	0.15
Probability distortion, pessimists	δ^P	0.05

Panel B: Consumption implications.

Variable	Optimists	Pessimists	Correct
Cons. change at t when Earnings ↓	-4.59%	-5.83%	-5.45%
Cons. change at t+1	0.74%	2.18%	1.74%
Cons. change at t+1, with Expenditures ↑	-0.12%	1.44%	0.98%
Cons. change at t+2, with Expenditures ↑	0.03%	0.06%	0.05%
Fraction cutting cons. at t+1	0.224	0.209	0.210
Frac. cutting cons. at t+1, with Expenditures ↑	0.281	0.207	0.213
Frac. cutting cons. at t+2, with Expenditures ↑	0.184	0.149	0.150

Internet Appendix to
"Evidence on expectations of household finances"

A Additional results on expectations

A.1 Alternative definitions of the expectation dummies

In the main body of the paper, the null set of the expect better and expect worse dummy variables combines two alternative outcomes. For example, those who do not expect to be better off can expect to be either the same or worse off. In Table A1 we estimate an alternative specification where the expect better and expect worse responses are only compared to the expectation of no change:

$$\text{Expect Better vs Same}_{it} = \begin{cases} 1 & \text{if } E_t^i[\Delta FS_{t+1}^i] = 1, \\ 0 & \text{if } E_t^i[\Delta FS_{t+1}^i] = 0, \end{cases} \tag{18}$$

and

$$\text{Expect Worse vs Same}_{it} = \begin{cases} 1 & \text{if } E_t^i[\Delta FS_{t+1}^i] = -1, \\ 0 & \text{if } E_t^i[\Delta FS_{t+1}^i] = 0. \end{cases} \tag{19}$$

They deliver the same conclusions as their counterparts shown in the main body of the paper. The estimated coefficient on the better off dummy in the expect worse vs same regression is not statistically different from zero, but this leads to a similar overall conclusion: following an improvement in financial situation, individuals form on average extrapolative expectations, due to an increase of the mass in the right tail of the distribution and a decrease of the mass in the center of the distribution.

A.2 Alternative sets of fixed effects

In Table A2, we report the results for the expectation dummies, for regressions without individual fixed effects. Although the magnitudes of the estimated coefficients are significantly different from those obtained in the main paper, the qualitative conclusions are the same.

In the main body of the paper, we have shown that there are important life-cycle patterns in the changes in financial situation. In the regressions, we have controlled for individual and for year fixed effects. This means that we cannot simultaneously include age dummies in the regressions (age is co-linear with individual and year). In Tables A3 and A4, we replace the

year fixed effects with age fixed effects to show that the estimated coefficients on the better off/worse off dummies are not sensitive to the set of fixed effects that is included. In Tables A5 and A6, we do the same for the regressions in which the dependent variables are the expectation errors. The results are not sensitive to the inclusion of age dummies among the explanatory variables.

B Categorical answers and expectation errors

A prediction of the rational expectations hypothesis is that the future expectation errors are uncorrelated with any information available today. Therefore, the relationships between expectation errors and the changes experienced in financial situation that we have estimated seem to be at odds with the hypothesis. We say "seem," because our survey data only provide a discrete range of answers for both realizations and expectations, and the classification of an underlying continuous variable (change in financial situation) into three discrete categories (better off, same, or worse off) may introduce predictable patterns in the expectation errors. We explore several ways to address this particular concern.

If the results are biased by the group formation process, then one might expect different methods of group construction to lead to different results. We exploit this logic and construct two alternative measures of "optimism" and "pessimism." These alternative classification methods are illustrated in the bottom two panels of Table A7.

In the first alternative classification, shown in Panel B, we only classify observations as optimist (pessimist) if at time t the individual expects an improvement (deterioration) in financial situation that fails to materialize. In other words, relative to the previous classification, we now assign a value of zero to observations with an expectation of an unchanged financial situation. We denote these alternative dummy variables optimist2 and pessimist2. In the third classification, shown in Panel C, and denoted optimist3 and pessimist3, we also exclude observations for which the realized $t+1$ financial situation is unchanged. In other words, optimist3 (pessimist3) is only equal to one when individuals expect to be better off (worse off), but they are actually worse off (better off) in the following year. It is important to note that the three classification methods differ along two dimensions: in how they treat the time t expectations, and in how

they treat the time $t+1$ realizations.

We repeat the FE logit estimations, but with these alternative measures of optimism/pessimism as dependent variables. Table A8 shows the results. To facilitate the comparison, in columns (1) and (2) we again report the estimates for the original optimist/pessimist dummies. Before discussing the results, it is important to point out that the number of observations differs significantly across the columns. In the FE logit estimation only those observations referring to individuals for whom there is variation in the endogenous variable over the sample are included. The variation in the number of observations across the columns therefore confirms that the alternative classification methods make a difference for the sample and provide different definitions of optimism/pessimism.

In spite of the differences in sample size, for both alternative definitions the estimated coefficients on the better off and worse off dummies show that our previous conclusions remain solid. First, following an improvement in financial situation, there is an increase in the likelihood of optimism and a reduction in the likelihood of pessimism. Second, following a deterioration the likelihoods of both optimism and pessimism increase. The economic magnitudes of the estimated coefficients differ across specifications because of the differences in mean of the left hand side variables.

Additional evidence against our findings being driven by the qualitative nature of the data has already been presented in Table 9. There, we have shown that the estimated coefficients in the regressions without individual fixed effects (columns (5) and (6)) are very different from those in the baseline specification (columns (1) and (2)). The inclusion/exclusion of individual fixed effects does not change the qualitative classification of the data. If the baseline results were solely due to a bias implied by the classification, then we would not expect the estimated coefficients to change sign when we remove the fixed effects from the regression.

Another possible way to evaluate the hypothetical bias that may be created by the use of discrete data is to estimate the underlying stochastic process for the true (continuous) variable (for example, expenditure), then estimate the cut-offs for the different groups, use the cut-offs to classify the observations into groups, and finally perform the estimation. In our setting, this approach is not feasible for two main reasons.

First, the individuals are not forecasting a single variable, such as inflation or aggregate stock

returns. They are forecasting their future financial situation which, as shown in Section 2, is affected by multiple factors: income, expenditure, transfers, etc. The estimation of stochastic processes for all of these represents a significant statistical challenge.[25] A second difficulty lies in the estimation of the cut-offs for the better off/worse off categories. These cut-offs will almost certainly vary across individuals (see Manski (2018)), and may also vary over time for the same individual, as macroeconomic conditions or other relevant circumstances change. Therefore, it is not feasible to estimate individual thresholds.

C Additional details on the model parameterization

In the main text we have described the model parameterization. In this section we provide additional details. Table A9 summarizes several of the the model parameters, including the initial age, retirement age, and number of model periods. Each period in the model corresponds to one year. There are two estimated retirement (log) income parameters, the intercept (λ_0) and the sensitivity of retirement income to income in the last year of working life (λ_1) . The estimated intercept is 1.20 which corresponds to a value of 3.3 thousands pounds. The second component of retirement income is a fraction 0.28 of income in the last year of working life.

In order to parameterize the interest rate, we use one-year nominal treasury rates deflated using the consumer price index. During the sample period, particularly during the nineties, interest rates were fairly high, which explains the value of 3% that we use in the model.

Figure A1 plots the age-dependent probabilities of higher and lower expenditures. The values are equal to the proportion of individuals in the data who at each age report that they are better off/worse off due to lower/higher expenditures. In addition to these averages, the figure plots the fit of a linear regression that we use in the model solution. For each age, the probability of high expenditures is significantly larger than that of low expenditures. For instance, early in life the probabilities of are roughly 0.12 and 0.06, respectively. In addition, the probability of high (low) expenditures increases (decreases) with age.

[25] This would be the case even if we restricted ourselves to the two largest categories, namely earnings and expenditure. While we could follow previous literature and assume the same income growth process for individuals with the same education and occupation, the stochastic process for expenditure is likely to be more complex.

Table A1: Expectations: alternative definitions of the better off and worse off dummies

This table shows the estimated coefficients of Logit regressions that explain expectations using the changes experienced in financial situation. The dependent variables are the dummy variables for expect better off and expect worse off that take the value of zero only when individuals expect the same. The independent variables are dummy variables that capture the change experienced in financial situation at time t. The unit of observation is individual/year. The regressions also differ in the set of fixed effects included (individual and year or year only in the last two columns).

	(1)	(2)
	Expect Better	Expect Worse
	vs Same$_{it}$	vs Same$_{it}$
Better off$_{it}$	0.64***	-0.01
	(27.71)	(-0.37)
Worse off$_{it}$	0.91***	1.17***
	(35.26)	(41.68)
Income group 2	-0.02	-0.07*
	(-0.67)	(-1.71)
Income group 3	-0.08**	0.04
	(-2.15)	(0.75)
Year FE	Yes	Yes
Ind. FE	Yes	Yes
Number of obs.	66,598	48,131

Table A2: Expectations: no individual fixed effects

This table shows the estimated coefficients of Logit regressions that explain expectations using the changes experienced in financial situation and the reasons for the change. The dependent variables are dummy variables for expect better off and expect worse off. The independent variables are dummy variables that capture the change experienced in financial situation at time t (columns (1) and (2)) and the reason for the change (columns (3) to (4)). The unit of observation is individual/year. The regressions include year fixed effects.

	(1)	(2)	(3)	(4)
	Expect	Expect	Expect	Expect
	Better$_{it}$	Worse$_{it}$	Better$_{it}$	Worse$_{it}$
Better off$_{it}$	1.43***	-0.18***		
	(67.94)	(-5.51)		
Worse off$_{it}$	0.91***	1.51***		
	(41.47)	(57.75)		
Earnings ↑			1.66***	-0.16***
			(62.91)	(-3.65)
Expenditure ↓			1.33***	-0.14*
			(33.89)	(-1.92)
Earnings ↓			1.45***	0.79***
			(43.06)	(17.09)
Expenditure ↑			0.61***	1.83***
			(21.31)	(58.23)
Income group 2	0.47***	-0.25***	0.38***	-0.16***
	(18.65)	(-8.17)	(13.77)	(-4.73)
Income group 3	0.60***	-0.16***	0.46***	-0.04
	(21.97)	(-5.16)	(15.55)	(-1.16)
Year FE	Yes	Yes	Yes	Yes
Ind. FE	No	No	No	No
Number of obs.	115,543	115,543	96,527	96,527

Table A3: Expectations: age fixed effects

This table shows the estimated coefficients of Logit regressions that explain expectations using the changes experienced in financial situation. The dependent variables are dummy variables for expect better off and expect worse off. The independent variables are dummy variables that capture the change experienced in financial situation at time t. The unit of observation is individual/year. The regressions differ in the set of fixed effects included.

	(1)	(2)	(3)	(4)
	Expect	Expect	Expect	Expect
	$\underline{\text{Better}_{it}}$	$\underline{\text{Worse}_{it}}$	$\underline{\text{Better}_{it}}$	$\underline{\text{Worse}_{it}}$
Better off$_{it}$	0.68***	-0.09**	0.64***	-0.07**
	(30.59)	(-2.44)	(28.47)	(-1.95)
Worse off$_{it}$	0.74***	1.09***	0.72***	1.07***
	(30.82)	(41.96)	(29.69)	(40.96)
Income group 2	0.03	-0.07*	-0.03	-0.04
	(0.83)	(-1.92)	(-1.15)	(-1.12)
Income group 3	-0.09**	0.07	-0.13***	0.14***
	(-2.46)	(1.56)	(-3.55)	(2.94)
Year FE	No	No	No	No
Ind. FE	Yes	Yes	Yes	Yes
Age FE	No	No	Yes	Yes
Number of obs.	74,723	59,674	74,723	59,674

Table A4: Expectations: age fixed effects

This table shows the estimated coefficients of Logit regressions that explain expectations using the reported reasons for the change in financial situation. The dependent variables are dummy variables for expect better off and expect worse off. The independent variables are dummy variables that capture the reason for the time t change in financial situation. The unit of observation is individual/year. The regressions differ in the set of fixed effects included.

	(1)	(2)	(3)	(4)
	Expect	Expect	Expect	Expect
	$\underline{\text{Better}_{it}}$	$\underline{\text{Worse}_{it}}$	$\underline{\text{Better}_{it}}$	$\underline{\text{Worse}_{it}}$
Earnings ↑	0.70***	-0.08	0.66***	-0.04
	(24.83)	(-1.61)	(23.40)	(-0.88)
Expenditure ↓	0.59***	-0.18**	0.57***	-0.16**
	(12.80)	(-2.23)	(12.31)	(-1.97)
Earnings ↓	1.09***	0.42***	1.08***	0.43***
	(27.91)	(8.46)	(27.53)	(8.50)
Expenditure ↑	0.44***	1.30***	0.48***	1.30***
	(13.07)	(39.94)	(14.07)	(39.39)
Income group 2	-0.03	-0.06	-0.08**	-0.02
	(-0.79)	(-1.26)	(-2.25)	(-0.54)
Income group 3	-0.16***	0.09	-0.18***	0.17***
	(-3.79)	(1.65)	(-4.27)	(2.97)
Year FE	No	No	No	No
Ind. FE	Yes	Yes	Yes	Yes
Age FE	No	No	Yes	Yes
Number of obs.	57,038	44,800	57,038	44,800

Table A5: Optimism and pessimism: age fixed effects

The table reports the estimated coefficients of fixed effects Logit regressions that explain optimism/pessimism using the changes experienced in financial situation. The unit of observation is individual/year. The regressions differ in the set of fixed effects included.

	(1)	(2)	(3)	(4)
	$\underline{\text{Optimist}_{it}}$	$\underline{\text{Pessimist}_{it}}$	$\underline{\text{Optimist}_{it}}$	$\underline{\text{Pessimist}_{it}}$
Better off$_{it}$	0.13***	-0.08***	0.13***	-0.09***
	(5.49)	(-3.39)	(5.59)	(-3.67)
Worse off$_{it}$	0.09***	0.07***	0.09***	0.05*
	(4.48)	(2.81)	(4.30)	(1.93)
Income group 2	0.13***	-0.07**	0.12***	-0.08**
	(4.67)	(-2.11)	(4.24)	(-2.37)
Income group 3	0.19***	-0.04	0.17***	-0.05
	(5.62)	(-1.00)	(4.81)	(-1.24)
Year FE	No	No	No	No
Ind. FE	Yes	Yes	Yes	Yes
Age FE	No	No	Yes	Yes
Number of obs.	79,204	70,941	79,204	70,941
Estimation	FE Logit	FE Logit	FE Logit	FE Logit

Table A6: Optimism and pessimism: age fixed effects

The table reports the estimated coefficients of fixed effects Logit regressions that explain optimism/pessimism using reported reasons for the the changes experienced in financial situation. The unit of observation is individual/year. The regressions differ in the set of fixed effects included.

	(1)	(2)	(3)	(4)
	Optimist_{it}	Pessimist_{it}	Optimist_{it}	Pessimist_{it}
Earnings ↑	0.11***	-0.10**	0.11***	-0.10***
	(3.66)	(-3.13)	(3.69)	(-3.20)
Expenditure ↓	0.08*	-0.05	0.09*	-0.05
	(1.69)	(-1.06)	(1.80)	(-1.05)
Earnings ↓	0.31***	-0.28***	0.31***	-0.29***
	(8.58)	(-5.49)	(8.56)	(-5.79)
Expenditure ↑	-0.11***	0.27***	-0.12***	0.26***
	(-3.95)	(7.59)	(-3.93)	(7.40)
Income group 2	0.11***	-0.08**	0.10***	-0.10**
	(3.32)	(-2.11)	(3.06)	(-2.45)
Income group 3	0.15***	-0.04	0.13***	-0.06
	(3.86)	(-0.97)	(3.25)	(-1.23)
Year FE	No	No	No	No
Ind. FE	Yes	Yes	Yes	Yes
Age FE	No	No	Yes	Yes
Number of obs.	62,618	54,935	62,618	54,935
Estimation	FE Logit	FE Logit	FE Logit	FE Logit

Table A7: Optimism and pessimism: definitions

Panel A presents a graphical representation of the definition of the optimist and pessimist dummies used in the main body of the paper, based on the time t expectations of individual i ($E_t^i[\Delta FS_{t+1}^i]$) and on his/her time $t+1$ realizations (ΔFS_{t+1}^i). Panels B and C show alternative definitions of the optimist and pessimist dummies.

Panel A:	Realization at t+1		
Expectation at t	Better off	Same	Worse off
Better off	—	Optimist	Optimist
Same	Pessimist	—	Optimist
Worse off	Pessimist	Pessimist	—
Panel B:	**Realization at t+1**		
Expectation at t	Better off	Same	Worse off
Better off	—	Optimist2	Optimist2
Same	—	—	—
Worse off	Pessimist2	Pessimist2	—
Panel C:	**Realization at t+1**		
Expectation at t	Better off	Same	Worse off
Better off	—	—	Optimist3
Same	—	—	—
Worse off	Pessimist3	—	—

Table A8: Optimism and pessimism: regressions with alternative definitions

This table reports the estimated coefficients of fixed effects Logit regressions that explain optimism/pessimism using the changes experienced in financial situation. The unit of observation is individual/year. The regressions differ in the definition of optimism and pessimism that is used for the dependent variable, described in Table A7. All the regressions include individual and year fixed effects.

	(1)	(2)	(3)	(4)	(5)	(6)
	$\underline{\text{Optimist}_{it}}$	$\underline{\text{Pessimist}_{it}}$	$\underline{\text{Opt2}_{it}}$	$\underline{\text{Pess2}_{it}}$	$\underline{\text{Opt3}_{it}}$	$\underline{\text{Pess3}_{it}}$
Better off$_{it}$	0.13***	-0.10***	0.56***	-0.12**	0.20***	-0.27***
	(5.95)	(-3.96)	(19.95)	(-2.36)	(4.17)	(-3.28)
Worse off$_{it}$	0.09***	0.05**	0.68***	0.83**	0.43***	0.54***
	(4.24)	(1.98)	(23.22)	(21.70)	(9.96)	(7.09)
Income group 2	0.13***	-0.08*	0.10***	-0.17**	0.13**	-0.29***
	(4.49)	(-2.29)	(2.70)	(-3.02)	(2.35)	(-2.68)
Income group 3	0.19***	-0.04	0.17***	-0.07	0.23***	-0.20
	(5.59)	(-0.91)	(3.78)	(-1.05)	(3.35)	(-1.60)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind. FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	79,204	70,941	56,298	35,652	29,858	12,859
Estimation	FE Logit	FE Logit	FE Logit	FE Logit	FE Logit	FE Logit

Table A9: Model parameterization

This table summarizes several of the the model parameters described in the main text.

Description	Parameter	Value
Initial age		23
Retirement age	K	65
Number of periods	T	68
Maximum age		90
Risk aversion	γ	2
Retirement income, intercept	λ_0	1.20
Retirement income, slope	λ_1	0.28
Real interest rate	R-1	3%

Figure A1: Expenditures parameterization

The figure plots the age-dependent probabilities of higher and lower expenditures.