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# SAVING REGRET

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## ABSTRACT

We define saving regret as the wish in hindsight to have saved more earlier in life. We measured saving regret and possible determinants in a survey of a probability sample of those aged 60-79. We investigate two main causes of saving regret: procrastination along with other psychological traits, and the role of shocks, both positive and negative. We find high levels of saving regret but relatively little of the variation is explained by procrastination and psychological factors. Shocks such as unemployment, health and divorce explain much more of the variation. The results have important implications for retirement saving policies.

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## Introduction and Literature

A large body of literature advocates paternalistic nudging to foster saving, especially to provide for old age (Thaler 1994; Laibson 1997, 1998; Thaler and Sunstein 2003, 2009; Lewis 2008; Chetty et al. 2014). One prominent justification for these approaches is the belief that many people procrastinate when it comes to saving decisions and that individuals' preferred choice, in hindsight, would be to have saved more than they actually did.

An alternative explanation for such a shortfall in savings has to do with individuals' uncertainty about their future life circumstances. Saving decisions are made in an uncertain environment, and individuals may fail to assess adequately the probabilities of various shocks: for example, they may overestimate the probability that life will continue as always without major positive or negative shocks, and sometimes they will ignore or entirely deny the possibility of facing major life-course disasters such as prolonged unemployment, divorce, or a health shock that limits the ability to work. Even if individuals correctly assess the probability of facing a major shock, in a world with imperfect insurance, those who experience negative shocks may wish after the fact that they had saved more.

If procrastination, economic shocks or both are important determinants of low levels of retirement savings, most individuals would regret later in life the saving paths they took, and interventions by policymakers would be justified. However, the empirical observation that asset levels seem to be inadequate at retirement does not, by itself, indicate the relative importance of these causes. Gabaix and Laibson (2017) provide a model in which personality traits such as patience or procrastination and prediction errors about future shocks can lead to observationally equivalent behavioral outcomes. A key contribution of this paper is that we have obtained indicators for procrastination and life-time shocks which permit us to separate the explanations, and to distinguish between the potential causes for low wealth at retirement.

This distinction matters for public policy. If the root cause is shocks accompanied by misperceptions of the likelihood of the shocks, the preferred policy course might involve information and education to help individuals better assess the probability of major life-

course events. Another option would be to strengthen social insurance against unemployment and work disability. However, if the root cause is procrastination, more appropriate policies would likely involve automatic enrollment in retirement accounts or even mandatory saving programs.

There is little empirical evidence on the saving behavior that individuals would have chosen in hindsight, nor do we know much about how strongly procrastination and probability misperception (or, more broadly, limitations on individuals' ability to use probabilities and think probabilistically) affect regret over past saving decisions. To fill this empirical gap, we fielded a survey in the RAND American Life Panel. We asked persons aged 60 to 79 whether, if they were given the chance to live their lives over again, they would have saved differently earlier in their lives. As we will show in this paper, depending on how the question was framed, some 61 percent to 67 percent said they should have saved more ("had saving regret"). We asked respondents to tell us which spending categories would have been targets for reduction in spending earlier in life. Respondents who could not name a spending category for reduction were permitted to revise their earlier expression of saving regret, but just 6.3 percent to 9 percent of those who had expressed saving regret revised their answers, reducing the observed prevalence of saving regret by between 4 and 5 percentage points. Accounting for those revisions, we found that 59 percent of the population aged 60 to 79 wished they had saved more.

We realize that it is easy for respondents to *wish* they had saved more: no difficult action such as reducing consumption is required. We have taken care in our survey design to reduce such "cheap talk," and one goal of our analyses of the data is to establish the face validity of our regret measures by relating them to other measures that reflect the actual financial situation. Thus, we measured wealth, income, living standard, psychological and social factors and found that saving regret varies plausibly with those characteristics. For example, high-wealth and high-income people have below-average levels of saving regret. We asked about potential causes that could have precipitated deviations from an anticipated saving path, such as positive and negative shocks, some of which are difficult or impossible for individuals to anticipate. As will be discussed in more detail below, among those with saving regret, 66 percent reported experiencing a

shock earlier in life leading to adverse economic consequences, compared with just 43 percent among those without saving regret. A gap between Social Security expectations and realizations was also associated with saving regret: among those with regret, 38 percent reported that Social Security benefits were less than expected compared with just 26 percent among those without regret.

A main conclusion from our evidence on saving regret and its correlates is that, while our psychometric variables measuring personality traits associated with procrastination are jointly significant, their contribution to the explained variation in saving regret is small, and there are few consistent patterns in how regret varies with them. In particular, direct measures of procrastination have only modest explanatory power for regret. Positive and negative shocks, in turn, explain much more of the variation and are widespread, indicating that they are a major cause for saving regret. Their associations with saving regret have a consistent and plausible pattern; the most obvious ones (e.g., unemployment and work-limiting health events) are highly significant.

The paper is related to the controversial question of whether households *undersave*. In the US where public pension benefits are relatively low and private pensions are increasingly of the defined contribution type, many economists (e.g., Laibson et al.1998; Madrian and Shea 2001; Poterba, Venti, and Wise 2011; Stanford Center on Longevity 2016) argue that households undersave. However, this view is not undisputed. Scholz, Seshadri, and Khitatrakun (2006) argue that 80 percent of U.S. households are saving at least as much as an augmented life-cycle model would predict, and that the saving gap for the remaining 20 percent is small. Hurd and Rohwedder (2012) estimate that 75 percent of retirees have sufficient savings to reach the end of their lives with positive wealth. Börsch-Supan et al. (2001), Brugiavini and Padula (2001), and Kitamura, Takayama, and Arita (2003) have argued that the older cohorts in Germany, Italy, and Japan, respectively, have actually *oversaved*, given the generous public pension levels that these cohorts can still enjoy. The frequency of saving regret at older ages indicates that from a subjective and ex-post point of view a majority of US households think that they have undersaved.

This paper also helps to answer another fundamental question: what is an appropriate

way to model saving decisions? The life-cycle hypothesis of Modigliani and Brumberg (1954) is the most widely used model to describe how people make such decisions. It has been extended to include uncertainty about income and mortality (Skinner 1988; Yaari 1965). An early alternative model is based on myopia and time inconsistency (Strotz 1955; Phelps and Pollak 1968; Pollak 1968) and has later been framed as a model of insufficient self-control (Thaler and Shefrin 1981; O'Donoghue and Rabin 1999; Rabin 2013a & b) and of hyperbolic discounting (Laibson 1997, 1998). Our finding of wide-spread saving regret is compatible with a life-cycle model augmented by the presence of major life-course shocks and prediction errors.

The psychology literature provides ample support for an important role for misjudging the frequency and consequences of major shocks. *Over-optimism* is "expecting future outcomes that are better than reasonably likely" (Shepperd, Pogge, and Howell 2017) and documented widely beginning with Weinstein (1980). When individuals update their beliefs more in response to good news than to bad news, they might fail to prepare for potential future problems or take too much risk.

Jefferson, Bortolotti, and Kuzmanovic (2017) point to two further phenomena, which are related to over-optimism, namely the *illusion of control*, which is an exaggerated belief in one's capacity to control independent, external events, and the *better than average effect* (also called the superiority illusion), which is the perception of oneself, one's past behavior, and one's lasting features as more positive than is the case. Thus, even if individuals know in principle that risks are present, they may underestimate the probability that a negative event will happen to them personally either because they have a superiority illusion, or because they hold unrealistic beliefs about their level of control over external events.

Overconfidence and related phenomena may also increase an individual's propensity to underestimate the probability of shocks and/or the negative consequences of the shocks. Literature reviews conducted by Barberis and Thaler (2003) and Dunning, Heath and Suls (2004) found that overconfidence can lead an individual to think incorrectly that they can control both the occurrence and the consequences of a shock, thus leading them to assign too little likelihood to very costly outcomes.

Yet another mechanism to explain undersaving may be that individuals lack information to form beliefs about the likelihood of some or even most adverse events. In that case, working out an optimal saving plan is difficult if not impossible. Yet the lifetime risk of important negative events is substantial: estimates from the NLSY79 of the population-based observed risks show that baby boomers experienced an average of 5.6 periods of unemployment from age 18 to age 48 and had an almost 70 percent likelihood of experiencing at least three periods of unemployment during that span (U.S. Bureau of Labor Statistics 2018). The probability of divorce within 20 years after first marriage was 48 percent for women and 44 percent for men in 2006-2010 (Copen et al. 2012). We know of no data on individuals' subjective beliefs about the lifetime likelihood of such major adverse life events,[1] but one piece of evidence is that individuals tend to be overly optimistic with respect to their own health risks (Weinberg 1980; Dunning, Heath and Suls 2004).

The remainder of this paper is structured as follows. Section I sets up our theoretical framework, while Section II describes how we collected our data and defined our key variables. Section III presents the results, starting with the prevalence of saving regret, and explains how it varies with socio-economic characteristics, personality traits, and events in the past ("shocks"). The implications of these results are discussed in Section IV while Section V concludes.

## I. Theoretical Framework

Our analysis of the data is guided by the framework depicted in Figure 1, which illustrates two broad sets of mechanisms (represented by the arrows B and C) governing the accumulation of wealth at older ages. Accumulated wealth, in turn, is an important determinant of saving regret (represented by Arrow A).

One set of mechanisms (Arrow B) illustrates how personality traits ("personality"),

[1] The recent OECD "Risks that matter" survey (OECD 2018) emphasizes the main life-course risks (unemployment, divorce, disability) but does not provide subjective probabilities for these events.

which are relatively stable over time,[2] affect wealth. Some of these traits, such as conscientiousness and planning time horizon, may be labelled "positive" because they lead to positive lifetime outcomes, while others, such as impulsiveness, may be labelled "negative" because they lead to negative outcomes. Personality traits determine how consistently decisions are made; how consistently plans are followed; whether people procrastinate or not; whether they invest in financial literacy (Bucher-Koenen and Lusardi 2011; Lusardi and Mitchell 2014); and how well they are informed about Social Security benefits (Chan and Stevens 2008; Lamla and Gasche 2013) and life expectancy (Smith, Taylor, and Sloan 2001). These traits are important determinants of life-cycle choices such as education and career and savings rates, and therefore of accumulated wealth at older ages. Personality traits may also have a direct effect on the way individuals perceive their current economic situation (Arrow D), e.g., an optimistic individual may see less reason for regret than a pessimistic individual with the same amount of wealth.

[Figure 1 about here]

The second set of determinants of old-age wealth (Arrow C) represents external factors or events that impinge on individuals, particularly positive or negative "shocks." Unanticipated shocks on the individual level might include, for example, unemployment, health problems, and divorce. They may be unanticipated due to lack of knowledge (e.g., insufficient information about Social Security and pension benefits) or computational ability (e.g., low level of cognition and/or numeracy). Such shocks affect wealth in positive and negative ways and, thus, via wealth, affect the prevalence of saving regret. It is less clear whether shocks directly affect regret after an individual takes the shock-

[2] Personality traits have been found to be largely rank-order stable in later adulthood (Deary et al. 2000; Anusic and Schimmack 2016; Roberts and DelVecchio 2000; Cobb-Clark and Schurer 2012; Lucas and Donnellan 2011), that means that while personality may change somewhat with age, the ranking of individuals in the population will be preserved so that those who scored high along some trait will continue to score high relative to others. There is some evidence, however, that certain major life events can affect personality traits (Löckenhoff et al. 2009; Specht, Egloff and Schmukle 2011). Yet, Cobb-Clark and Schurer (2012) found that intra-individual changes in personality are generally unrelated to adverse life events and small in magnitude.

induced change in wealth into account (represented by the dashed Arrow E).

Both types of deviations from a simple life-cycle model interact. Individuals with a preponderance of positive traits are likely to pursue behaviors that increase the probability of positive events and reduce the probability of negative events (Arrow F).[3] By virtue of accumulating higher savings, such individuals are better able to buffer the effects of negative shocks on wealth (Arrow C). However, the effects of shocks can lead to changes in personality (Arrow G), so causality can run in both directions.[4,5]

The theoretical framework illustrates how an individual could deviate from the conventional life-cycle model.

1. The individual procrastinates, i.e., sets up a life plan according to the life-cycle model but then fails to execute this plan by postponing saving in favor of higher consumption. Such a self-control problem constitutes a form of time-inconsistent behavior which persists over time and leads to saving regret in hindsight.
2. The individual faces uncertainty over the future income path. He or she could underestimate the probability of shocks that cause deviations from the average income path.[6] While the precautionary saving motive would increase saving in the face of uncertainty, underestimating the probability and the effect of shocks will yield lower than optimal savings levels, which individuals then regret at older ages. An extension is that the individual may not have well-formed probabilities of the shocks, and so is not able to formulate even an approximation to an optimal saving plan.

The first type of deviation, procrastination, can be modeled according to Thaler and Shefrin (1981) as a continuing game between current and future self, where the

[3] See for example Hampson (2017) for a review of the relationship between personality and health.
[4] Reverse causality may also be present in the mechanisms that are represented by arrows B and C. For example, being wealthy may reduce the size and probability of shocks by living in a healthier environment (Currie et al. 2015).
[5] See Bleidorn, Hopwood and Lucas (2018) for an overview of the psychology literature and empirical findings on life events and personality change.
[6] There could also be shocks to assets. For illustrative purposes we focus in the model on shocks to the income path.

immediate future is discounted more strongly relative to the present than two equally distant events further in the future. The current self at age j maximizes the objective function

(1) $\max \{ u(c_j) + \delta \cdot \beta \cdot \sigma_j \cdot \hat{V}(z_{j+1}) \}$

by choosing current consumption $c_j$, subject to a budget constraint and his or her beliefs $\hat{V}(z_{j+1})$ about the behavior of the future self for the future state described by $z_{j+1}$. $u(c_j)$ is the instantaneous utility function. Intertemporal discounting has three elements: $\beta$ is the pure time discount factor. In addition, the parameter $0 \leq \delta \leq 1$ expresses the extent of shortsightedness or present bias. Complete myopia corresponds to $\delta=0$. In this extreme case, households focus on current utility only and ignore future utility. Finally, households discount future utility with their unconditional survival probability $\sigma_j$, expressing the uncertainty about the time of death. The value function $\hat{V}(z)$ for future beliefs is computed recursively by

(2) $\hat{V}(z_j) = u(\hat{c}_j) + \beta \cdot \sigma_j \cdot \hat{V}(z_{j+1})$.

Note that the present bias $\delta$ of the current self does not appear in the value computation. The future self who is at age $j + 1$ will solve the standard program

(3) $\max \{ u(\hat{c}_{j+1}) + \beta \cdot \sigma_{j+1} \cdot \hat{V}(z_{j+2}) \}$

by choosing future consumption $\hat{c}_{j+1}$.[7]

This model of procrastination has three key features: (a) the addition of a present bias parameter $\delta$ which discounts the immediate future in addition to the standard discount factor $\beta$ and mimics hyperbolic discounting; (b) the distinction between the present bias $\delta$ of the current self from the belief that the future self has no present bias; and, consequently, (c) the distinction between actual consumption behavior $c_j$ from beliefs

[7] In the language of O'Donoghue and Rabin (1999), this is a "naïve" hyperbolic household.

about future consumption behavior $\hat{c}_{j+1}$. The conflict between preferences and future beliefs may occur for various reasons such as the monetary and psychic costs of decision making; we therefore refrain from calling such behavior "irrational."

The second deviation from the conventional life-cycle model, mis-estimation of the probability of shocks, affects the expected budget constraint. We assume that households expect an exogenously given age-specific wage income *w* until retirement age *R* and will then receive a public pension *b*. With probability *p*, there will be a shock with effect *S* at time *J* that puts the household on a higher or lower income path for the ages *j*>*J*. Hence, expected disposable non-asset income $y_j$ is

(4) $y_j = w$ for $j=0,\ldots,J$

$y_j = w + pS$ for $j=J+1,\ldots, R\text{-}1$

$y_j = b$ for $j \geq R$.

Denoting total assets by $a_{t,j}$, maximization of the household's intertemporal utility is subject to a dynamic budget constraint given by

(5) $$a_{j+1} = a_j(1+r_j) + y_j - c_j$$

The literature on precautionary saving shows that $a_R$ is a monotonically declining function of *pS* for *S*>0, i.e., the probability times the effect of a shock that permanently reduces current income.[8]

We summarize the predictions of the model. A procrastinating person has a low value of $\delta$. The literature on present bias shows that $a_R$ is a monotonically increasing function of the parameter $\delta$ and thus that person will have low wealth at retirement. [9] Such a person will have saving regret. There is no need for uncertainty in the model.

Someone with a value of $\delta$ of 1.0 is not a procrastinator. Operating under uncertainty

[8] Leland (1968); Skinner (1988); Kimball (1990); Aiyagari (1994); Lusardi (1998).
[9] Strotz (1955); Phelps and Pollak (1968); Pollak (1968); Thaler (1994); Laibson (1997, 1998); Angeletos et al. (2001); Madrian and Shea (2001); Choi et al. (2002); Rabin (2013a,b); DellaVigna and Malmendier (2006).

with incomplete insurance, such a person may correctly estimate the probability of a (negative) shock and engage in the proper amount of buffer stock saving. If the person is unlucky, he or she will have low wealth at retirement but whether the person has saving regret depends on the level of rationality: A hyper-rational person will not have regret because the saving was optimal, given the information available at the time. However, many (or all) people may use the *ex post* (negative) outcome when evaluating the saving choice, and express regret. Underestimation of the probability of a (negative) shock or of the effects of the shock will lead to the same predictions: a hyper-rational person will not have saving regret (but will express regret about not knowing the true distribution or the effects of the shock), but probably few persons are so hyper-rational and we would expect that those experiencing negative shocks, whether or not they correctly assessed the probabilities of the shocks, would express regret.

Both a high present bias (low $\delta$; procrastination) and an underestimation of the probability of shocks or their effects (low *pS*) can lead to saving regret. And in both cases, wealth level at retirement, $a_R$, is depressed. If we only have data on $a_R$, but not the savings history and the relevant subjective and objective probabilities of shocks, we cannot identify how much of a (regretted) low level of $a_R$ is due to high present bias (low $\delta$) and how much due to an underestimation of the probabilities and the effect of future shocks (low *pS*).[10] This paper uses data on indicators associated with present bias $\delta$ and direct questions about actual shocks *S* to shed light on the question of whether regret over low levels of $a_R$ is due to procrastination or shocks.

## II. Data and Methods

*A. The Sample*

Our data come from the RAND American Life Panel (ALP). The ALP maintains a sample of about 6,000 respondents who are interviewed regularly over the Internet. To avoid selection due to lack of Internet access, any participant without such access was

[10] This corresponds to Gabaix and Laibson (2017).

provided a laptop or an Internet service subscription. The sample is representative of the U.S. population when applying weights. It has been recruited in several waves over time. Seventy-five percent of the respondents were recruited using probability-based sampling, while 25 percent were recruited through other efforts (Baird and Pollard 2017).

We designed ALP survey MS455, which was fielded from August through December 2016.[11] The sample was restricted to those aged 60 or older and the survey was administered only in English. A total of 2,391 ALP panel members were selected to participate; 1,728 completed the survey during the field period, corresponding to a response rate of 72.3 percent. Of these, 90 percent pertain to the probability sample. We confined our analytical sample to those aged 60 to 79 to reduce bias due to differential mortality. On average, participants in the sample are 68 years old.[12] The sample size used for our analysis is about 1,590 observations and varies slightly, depending on the covariates used from earlier ALP waves.

*B. Questionnaire and Measuring Saving Regret*

The questionnaire began with items on socio-demographic and economic characteristics, a battery of psychometric questions on personality traits, including procrastinating behavior, and a set of questions about respondents' assessment of their income and living standards. See Appendix A for more details on the variables and for the exact wording of critical questions. We also asked respondents about negative and positive shocks in their earlier lives. Only after that did we ask households whether – looking back to when they were around 45 years old – they would have saved more, about the same, or less earlier in their lives if they were given the chance to re-do their saving and spending. We randomly assigned two versions of this question. One version was unframed ("would you save more over the years") and the other, framed. The objective of the framed version was to remind respondents that saving more requires an effort: less consumption.

**Measuring Saving Regret.** The specific wording of these questions was:

[11] In order to validate our results, we fielded a second survey about one and a half years later, see Subsection IV.B.

[12] Sample statistics are displayed in the Appendix Table A1.

*Again please think back to when you were around 45 years old. Suppose you could re-do your spending and saving from then to now, would you…*

*Version A: Save more over the years? / Save about the same over the years? / Save less over the years?* (unframed version)

*Version B: Spend less and save more over the years? / Spend and save about the same over the years? / Spend more and save less over the years?* (framed version)

If respondents answered that they wished they had saved more, there was a follow-up question asking for the categories of goods they would have spent less on. They were also given the opportunity to revise their previous answer and choose *"No way I could have cut spending. I could not have saved more."*

**Measuring Positive and Negative Income Shocks.** We asked respondents if they experienced unexpected positive or negative shocks during their lives. We asked about negative shocks in the following way:
*Sometimes people have negative surprises earlier in life that cause their finances to turn out worse than expected. Did any of the following happen to you? Please check all that apply.*

A similar question was posed about positive shocks. See Appendix A for a full list of answering options.

**Psychometrics.** We asked respondents to evaluate themselves along several dimensions, such as a self-view on their general and financial planning behavior and motivations. Several questions asked directly about procrastination, such as "*How often do you put things off you should do but aren't really interested in?*" Other questions asked about time horizon or discounting, such as "*Do you agree or disagree with the following statements? People should do what they like today rather than putting it off until tomorrow.*" In total, we posed 19 self-assessments, but in this paper we reduced the number analyzed to 12 because some had little explanatory power for saving regret.[13]

[13] See Appendix A for a complete listing and wording.

## III. Results

*A. Prevalence of Saving Regret*

Table 1 presents the prevalence of saving regret among respondents given, respectively, the unframed and the framed formats. For those viewing the unframed format, 66.6 percent said they would save more if they could re-do their earlier life. We did not use the word "regret" in the survey itself, but we will refer to this as "having saving regret" as it appears in hindsight. The percentage of those having saving regret was reduced to 60.9 percent when we framed the question by adding that saving more implies spending less. This difference is statistically significant. We probed respondents having saving regret to tell us which spending categories would have been targets for reduction in spending earlier in life. The most frequently mentioned targets for spending cuts earlier in life were "car" and "vacation" among men, and "clothing" and "vacation" among women. For one answering option, we let them revise their earlier answer if they could not think of a spending category they could have reduced. In the unframed version, 6.3 percent of those who voiced saving regret revised their answer, as did 9.0 percent in the framed version of the question – leading to a reduction in the observed levels of saving regret by 4.2 and 5.5 percentage points, respectively.

[Table 1 about here]

Combining the results from both versions of the question (Column 'Total'), 63.6 percent of the 1,590 respondents voiced saving regret (Column 'Before Revision'), and 58.5 percent maintained this answer even after probing for specific spending cuts (Column 'After Revision'). Saving regret was far from universal: More than a third of the respondents are satisfied with their saving decisions earlier in life (34.7 percent before revision and 39.8 percent after revision); a very small fraction would have saved less if they could re-do their earlier life (1.7 percent).

*B. Saving Regret by Socio-Demographic, Health, and Financial Status*

Overall, the correlations between saving regret and socio-demographic and financial variables are strong and exhibit plausible patterns. This is documented in Table 2. Column 4 reports the combination of the framed and unframed versions of the saving

regret question after revision. Using results for saving regret before the revision changes the level of regret but not the patterns of correlation.

[Table 2 about here]

The fraction reporting that they should have saved more was higher for those who are younger; have separated or divorced; and have a low socio-economic status measured in terms of income, wealth, and education. Respondents self-reporting fair or poor health and memory problems also expressed saving regret more often. We note that, even among those in the highest wealth quartile, 38.9 percent expressed saving regret; among those in the lowest wealth quartile, 71.9 percent did so.

*C. Personal Characteristics, Personality Traits, and Financial Literacy*

As described in Section I, our analysis is guided by a broad classification into two sets of mechanisms governing wealth at older ages. This subsection presents the first set, which includes personal traits that are usually assumed to be relatively stable over time (Arrow B in Figure 1). The underlying conjecture is that saving regret could emerge from individuals' inability to plan ahead and save sufficiently for their old age. This type of behavior would be related to procrastination, the inability to motivate oneself to take action, and/or lack of financial literacy. Table 3 displays how saving regret is related to personal psychological characteristics. The questions on personality traits were asked before the saving regret question in the course of the interview or in earlier ALP waves that were targeted at financial planning horizon and financial literacy.

[Table 3 about here]

Responses to the items in Table 3, Panels A and B, were permitted in five categories: strongly disagree, disagree, neither agree or disagree, agree, or strongly agree. Because of (almost) empty cells or little difference in outcomes between some of the categories, we have aggregated the two disagree categories and the two agree categories, respectively, into one category each. In four of the five items in Panels A and B, the frequencies of saving regret are not monotonic in the response categories. For example, the percentage expressing regret among those that (strongly) disagreed with the statement "life is about having fun" is 60.8 percent, the percentage among those who neither agreed or disagreed is 52.3 percent, and the percentage among those who (strongly) agreed is 60.5 percent.

The one item exhibiting monotonicity is "do what you like today," where the variation between the low and high categories is about seven percentage points. This corresponds approximately to the variation in average regret between wealth quartiles one and two (Table 2), but is considerably less than the variation between quartiles three and four.

In Panel C, five out of seven items display non-monotonicity, and the last item "put off difficult things" has little variation across the first two response categories, which comprise 93 percent of the sample. That leaves the item "put things off you should do." There is substantial variation between "never" and the other categories, but just 5 percent of respondents never "put things off." The remaining item "give up before starting" has considerable variation in average saving regret across the three categories that comprise 99.5 percent of the sample. Particularly the first two categories display considerable discriminatory power: approximately half the sample is in each category, and the average saving regret varies by 6.4 percentage points.

We conclude that there is quite limited and scattered systematic variation in saving regret with the psychometric variables. Furthermore, the items in Panel C would, according to their plain language, address procrastination; yet, among the seven items, there is really only one that suggests procrastination leads to saving regret.[14]

We merged information from other ALP waves about the financial planning horizon (N= 1,206), financial literacy (N=922), and numeracy (N=1,056) (see Table 4).[15]

[Table 4 about here]

Respondents have substantially different financial planning horizons: 4.4 percent stated that they do not plan and 14.7 percent only planned for the next couple of months. Yet, 16.3 percent of respondents planned for the next five to ten years and 11.9 percent for more than ten years. The financial planning horizon and saving regret are significantly correlated. Saving regret was highest among respondents who stated that they do not have a financial plan (68 percent) or who only planned for the next few months (64.8 percent).

[14] We also used the Big 5 personality traits (neuroticism, extroversion, agreeableness, conscientiousness, openness) as an alternative to the psychometric scales, see Subsection IV.D.
[15] See Appendix A for the list of questions used to construct the financial literacy and numeracy scales.

It declines monotonically with the length of the planning horizon: among respondents with a planning horizon that exceeds ten years, 50.8 percent expressed having saving regret.

The relationship between saving regret and financial literacy is also strong. Respondents with high or very high levels of financial literacy had significantly lower saving regret (44.6 percent) compared to those with low or very low financial literacy, where 68.2 percent and 81.0 percent, respectively, wished they had saved more.

Cognition may also play a role in saving regret. The bottom panel of Table 4 shows the variation of saving regret by probability numeracy. For the bulk of the sample we have data on numeracy (those with two, three or four correct answers). Saving regret was lower among those who scored higher on numeracy, lending support to the hypothesis that facility in probabilistic thinking is an important skill to successfully manage uncertainties over the lifecycle.

*D. Unanticipated Shocks*

The second set of determinants of old-age wealth (Arrow C in Figure 1) is the collection of external impingements on the individual, particularly positive or negative shocks. Many households experienced shocks to their labor market status, earnings, family situation and/or health. Some of these shocks may be hard to anticipate either in their likelihood of occurring or in the financial burden they might cause. Feeling regret about saving decisions may therefore also be related to the failure to anticipate shocks and/or the tendency to underestimate their probability and impact due to overconfidence, ignorance, or denial.

The shocks queried and the responses are displayed in Table 5. More than 55 percent of respondents reported a shock with negative consequences for their wealth (‘any negative shock’) and 43 percent reported a shock with positive consequences for their wealth (‘any positive shock’). More than 20 percent experienced health limitations to their work and 13.8 percent incurred large health expenses, 13.7 percent experienced unemployment and 11.1 percent, a divorce or separation. For almost 20 percent of our sample, investments turned out better than expected, and almost 15 percent received an inheritance. It should be noted that the frequencies of these events are not necessarily the

population lifetime frequencies because we asked respondents about events that caused their finances to turn out worse or better than expected. Some spells of unemployment, for example, may have had little effect on finances and so would not have been reported. Nonetheless, the lifetime frequency is substantial.

[Table 5 about here]

The prevalence of saving regret was much higher among those who experienced a negative shock and substantially lower among those who experienced a positive shock. This was particularly pronounced for those who suffered from unemployment (77.3 percent express regret) or a work-limiting health problem (79.4 percent express regret) or large health-related expenses (68.1 percent with saving regret). All negative shocks, except death in the family, show a highly significant relationship with saving regret.

In contrast, saving regret was substantially reduced among those whose earnings turned out to be higher than expected (52.8 percent have saving regret), those whose investments did better than expected (36.4 percent express regret), and those who received an inheritance (46 percent with regret).

There is a modest negative correlation between having a positive shock and having a negative shock (Table 6, Panel A). Among those who did not experience a negative shock, 48 percent experienced a positive shock; among those who experienced a negative shock, 41 percent experienced a positive shock. Some 23 percent experienced both positive and negative shocks.

[Table 6 about here]

Panel B shows the corresponding percentage with saving regret. The variation is substantial: 73.4 percent of those with a negative shock but not a positive shock (33.2 percent of the population) expressed regret while just 36.2 percent of those with a positive shock but not a negative shock (21.1 percent of the population) expressed regret. Thus, positive and negative shocks are discriminatory in predicting saving regret for about half the population.

*E. Multivariate Analysis*

We estimated linear probability models where the outcome was whether saving regret was reported. We combined versions A and B of the saving regret question (Section II.B)

and applied revisions if respondents decided to do so. The explanatory variables were demographics, income, and wealth quartiles, personality traits, and indicator variables for negative and positive shocks.

Table 7 shows extracts from two specifications, one that excludes the wealth quartiles and one that includes them in order to separate the effects represented by Arrows A, B, and C in Figure 1.[16] Following the idea that saving regret should be increasing in some of the psychological variables and decreasing in others, they are entered as scalars. We find that only two of the variables are significant at the 1 percent level in both specifications and two others are marginally significant in model 1 but not in model 2. A change in "Works best under pressure" from neither "agree" nor "disagree" to" (strongly) agree" would change the frequency of expressing regret by 0.037. "Do what you like today" is significant only at the 10 percent level when not including the wealth variables. This item is not very discriminatory because 79 percent of the population (strongly) agrees. Among the variables that are more directly interpretable as expressing procrastination, the item "Put off things you should do" is not very discriminatory: 77 percent of the sample said they put off things "some time," and 16 percent "most of the time." A movement between those categories is associated with an increase in regret of 0.046. The effect is marginally significant when not controlling for wealth. "Try several tasks, don't complete many" is associated with an increase in regret by 0.053, but is also not very discriminatory as 89 percent of the sample is in the first two categories. Other seemingly direct measures of the tendency to procrastinate such as "put off difficult things" have only small and insignificant predictive power for the expression of regret.

[Table 7 about here]

Having had a negative shock increases the probability of expressing regret by 0.145 or 0.132, and having had a positive shock reduces that probability by 0.131 or 0.114. Both are quite discriminatory in the population: 56 percent had a negative shock and 44 percent a positive shock. Having had only a positive shock rather than a negative shock changes the probability of expressing regret by about 25 percentage points. This

[16] See Appendix Table A2 for complete results.

difference is about the same as the difference between being in the top wealth quartile rather than the second wealth quartile (see Table 2). When the shocks are entered individually, the most important negative shock involves health problems that limit the ability to work and unemployment, while the most important positive shock is having had good investments (see Table A2 Columns 3 and 4).

## IV. Discussion

We discuss our results in light of the following questions: Do our results have face validity or do they simply reflect "cheap talk" in a survey? Are they stable over time and how does saving regret compare with other regrets? How is saving regret related to uncertainty about future events? What have we learned about the causes of saving regret and their policy implications? Our discussion also includes robustness checks and corroborating evidence.

*A. Face Validity vs. "Cheap Talk"*

It is easy for respondents to wish they had saved more: no difficult action such as reducing consumption is required. Perhaps this question is similar to asking whether respondents would like to have more wealth, in which case we would expect 100 percent affirmation. Affirmation in the survey of the desire to have saved more, however, was substantially less, about 58.5 percent (Table 1, Total After Revision). We aimed to reduce "cheap talk" in our survey through our framing and probing design. The difference between the framed and the unframed versions (67 percent vs. 61 percent prior to probing) is statistically significant but economically small. Moreover, while probing and giving respondents the opportunity to revise their initial responses resulted in a lower prevalence of saving regret, the prevalence of revisions (6.3 percent and 9 percent in the unframed and framed versions, respectively) was small relative to the initial prevalence of saving regret.

There may still be some skepticism regarding the validity of the stated responses in that they do not represent an assessment of respondents' achieved economic position. Our method of assessing validity was, first, to relate saving regret to other measures that reflect the actual financial situation. We found that regret was strongly related to

economic position, especially wealth itself (Table 2). We found similar, albeit weaker, correlations with income. The stronger correlation with wealth than with income is to be expected because, of course, wealth itself is a measure of prior saving. Possibly stronger evidence of validity was found by comparing variation across persons having regret with other self-assessed measures of saving relative to actual needs or expectations of needs.

In the context of asking about negative shocks, we included an item "saved less than expected." We did not include this item in Table 5 because it is not itself an external shock, although it could be the result of one or more external shocks. Some 15 percent of the sample reported saving less than expected and 18 percent reported saving more than expected. These seem like rather low rates of saving less or more than expected, but we note that, when querying about shocks, we asked about surprises that caused "their finances to turn out worse than expected," or "better than expected," which we interpret to mean that the shock made a meaningful difference. Of the 15 percent who stated that they saved less than expected, 82 percent expressed saving regret. Of the 18 percent who saved more than expected, 40.5 percent expressed saving regret. An obvious question is, why would someone who saved more than expected have regret? A possible answer is that, when the saving was underway, the respondent did not have an accurate idea of the wealth levels that would be required 15 or 20 years in the future. Or perhaps their saving plan was flawed because they did not understand the frequency of shocks and/or the consequences of shocks.

We asked our respondents whether their present income is sufficient for their present needs (Table 8 – Panel A). Overall, 43.9 percent reported that income is always sufficient to meet present needs; yet, 44.5 percent of that group wished they had saved more. This finding also points to the role of uncertainty. Whether present income is sufficient for present needs is known largely from day-to-day experience. But the amount of wealth needed for future spending needs is uncertain. We addressed that issue by asking whether respondents' financial resources are adequate for future needs (Table 8 – Panel B). Notably, about 23 percent answered either "uncertain" or "don't know," reflecting the difficulty of predicting future needs due to uncertainties about both future shocks and future tastes for consumption over a long retirement period. This is in sharp contrast with

the results shown in Panel A, where no respondents expressed uncertainty about present needs. About 23 percent said that their financial resources are not enough or not nearly enough to meet future needs, and around 80 percent of these respondents had saving regret. We therefore find the same very strong relationship between adequate resources and saving regret. Yet, among those with "more than enough" financial resources to meet future needs, some 31 percent still wished they had saved more.

[Table 8 about here]

A more direct measure of uncertainty is the subjective probability of running out of money. Table 8 – Panel C shows the subjective probability of running out of money and saving regret. The subjective probability is divided into bins of width 10 percent probability (except for the focal point of exactly 50 percent). The percentage of respondents with regret increases with the subjective probability until it reaches the 70 percent to 90 percent range, after which there is no trend. In the lowest bin (0-10 percent), which comprises 30 percent of the sample, 44 percent reported saving regret. Even among those with relatively small self-assessed chances of running out of money, almost half express regret. One may interpret this as rather direct evidence of the role of risk and of the desire to be protected against risky (bad) outcomes.

An additional indicator of the relationship between saving regret and the achieved economic situation is subjective well-being with respect to the economic situation. A remarkable 77 percent of our respondents are satisfied or neutral with respect to their economic situation (Table 8 – Panel D). Among the dissatisfied respondents, 80 percent expressed saving regret, compared to only 24 percent among the very satisfied.

Social Security is an important income source for most retired persons, so expectations about the benefit level should be an important determinant of saving. We asked respondents who are receiving Social Security to compare their benefit level with expectations. The distribution of answers is shown in Table 8 – Panel E. There was a general tendency for individuals to overestimate their Social Security benefits: the sum of "a bit less" than expected and "a lot less" is 32.4 percent whereas the sum of "a bit more" than expected and "a lot more" is 10.2 percent. There is a monotonic relationship between overestimation of Social Security benefits and saving regret (Table 8 – Panel E),

and the level of regret in the top categories is substantially greater than in the other categories.

Overall, we obtained a very consistent picture. The majority of our respondents (53.4 percent) said that they have enough resources to meet future needs, and even more were satisfied with their economic situation. Saving regret was strongly related to the present financial situation, the adequacy of an individual's resources for future needs, and the subjective probability of running out of money. While we cannot entirely rule out the presence of "cheap talk," the consistent pattern of correlations with measures of economic status demonstrates the face validity of our regret measure.

*B. Validation, Stability and Other Types of Regret*

The psychological literature on experienced regret (Valenti, Libby, and Eibach 2011)[17] provides little guidance to judge whether our measure of the prevalence of saving regret is large or small; whether individuals who express saving regret feel strongly about the regret; whether the reports are stable over time; and how reliable they are. To address these issues, we launched a second survey to provide evidence about whether regret is strong or mild, and to determine whether people have regrets over a wide range of prior choices. If the latter were the case, people who experienced bad outcomes might lack the ability to place themselves *ex ante* and affirm that a good choice was made previously, given the incomplete knowledge they had at the time. We fielded the second survey in the ALP about one and a half years after the first, partly to the same people and partly to other people. The overlap between the two ALP surveys includes 1,198 respondents. In the second survey, we only used version B; that is, we reminded respondents that saving more would require that they spend less. Additionally, we asked respondents about the intensity of their regret:

*How strongly do you wish you could redo your spending and saving? (1 – very strongly,*

[17] *Experienced regret* is a different concept from *anticipatory regret.* The latter is the base for a theory of *ex ante* decision making (Loomes and Sugden 1982). The theory of anticipatory regret was created in parallel to prospect theory (Kahneman and Tversky 1979). Croy, Gerrans, and Speelman (2015) apply anticipatory regret theory to describe retirement savings intentions in Australia.

*2- strongly , 3- somewhat strongly, 4- not at all strongly)*

Respondents were also asked about other types of regrets they might have. Specifically, they were asked if they felt regret with respect to their educational and occupational choices, their family life, the amount of time spent with friends and family, or other areas they could specify freely.

The prevalence of saving regret remained remarkably stable – with 61 percent expressing regret before revision in the first survey compared to 62.5 percent in the second survey (Table 9). In both surveys, 77.3 percent gave the same answer to the main saving regret question; 12.2 percent reported saving regret in the earlier survey and said they "would save about the same" in the later survey; and 8.9 percent reported they would "save about the same" in the earlier survey but reported saving regret in the later survey.

In the second wave of data collection in which we asked respondents about the intensity of their regret, 38 percent categorized their regret as "very strong," 29 percent as "strong," 24 percent as somewhat strong, and only 8.4 percent as "not strong at all." Thus, about two-thirds of those expressing regret felt their regret strongly. Were we to characterize the population prevalence of regret as those feeling strongly or very strongly, the level would be about 40 percent (Table 9).

[Table 9 about here]

We compared the prevalence of regret in our survey with that measured in the scarce literature about experienced regret. Morrison and Roese (2011) found that regrets related to partnership and family are the most common (18 percent), less so regrets regarding work and education (14 percent), and even less so regarding finance (10 percent). In stark contrast, a recent nationwide survey by Bankrate (Bell 2016) found that 75 percent of Americans experience regrets about their retirement savings. The percentage is higher among those of retirement age than among younger people. In our second survey we asked in the same format about other subjects of regret related to important decisions in life: "*if you could redo your choices would you want to*?" We mentioned educational choices, choice of partner, and choice of job, among others. In response, 39.7 percent regretted their educational choices, 34.9 percent wished that they had spent more time

with family or friends, 27.8 percent regretted their occupational choices, and 25.6 percent regretted their choice of partner (Table 9). Thus, according to our second survey, people expressed regret at a relatively high frequency and across a number of domains. Saving regret was expressed most frequently among all types of regrets discussed.

*C. Saving Regret and Financial Situation*

Our results display an apparent contradiction: By a number of measures, individuals judged their current economic resources to be adequate, yet the expression of regret was fairly widespread. A large fraction (43.9 percent) stated that their household income is always sufficient for spending needs, yet 44.5 percent of those persons expressed regret. One explanation may be that the question specifically refers to the present situation but, at retirement age, people may better understand risk. A more forward-looking measure is whether financial resources are enough for future needs (Table 8 – Panel B). Regarding future needs, 53.4 percent stated that their resources are either "more than enough" or "just enough" and 31 percent and 59 percent, respectively, expressed regret. These two groups expressed uncertainty about running out of money. To quantify the subjective view of risk, we asked about the subjective probability of running out of money with the question "*What are the chances that you will run out of money sometime in the future?*" The average probabilities are shown in Figure 2. Among those who, in Table 8, stated that their economic resources were not nearly enough to meet future spending needs, the average subjective probability of running out of money was 59 percent. Even among those whose economic resources were more than enough, the average subjective probability of running out of money was 14 percent. One might think that, for the latter group, the subjective probability should be zero, but the open-ended comments showed the effects of uncertainty: "We are fine now but, if one of us should need long-term care…." (paraphrased to preserve anonymity).

[Figure 2 about here]

Some evidence for the role of risk is apparent in the age pattern of whether people have enough resources to meet future needs (Figure 3). Among those in their early 60s, about 30 percent stated they had not enough or not nearly enough; among those in their late 70s, fewer than 15 percent made such an affirmation. Besides the resolution of

uncertainty that occurs with age, consumption may have declined more than expected, e.g., due to deteriorating health (Börsch-Supan and Stahl 1991).

[Figure 3 about here]

*D. Potential Causes of Saving Regret and Their Policy Implications*

The multivariate regressions reported in Table 7 can be used to decompose the variance in saving regret with respect to four groups of variables: demographics, wealth, psychometric indicators for procrastination and related personality traits, and indicators for positive and negative shocks whose probability and effect may have been underestimated (Figure 4). The surprising result is that the psychometric variables related to personality traits are able to explain only 1.6 percent of the total variance in saving regret, while each of the other variable groups explains substantially higher fractions of the variance than personality traits and is highly significant.

[Figure 4 about here]

One problem may be the model specification: regret is linear in the response categories of the psychometric variables. However, the goodness of fit was not significantly improved (or even decreased) when we entered the psychometric variables as a set of dummy variables for each answer category (see Table A2, Column 8) or other groups of answer categories than those shown in Table 7. We also replaced our set of psychometric variables by the "Big 5" (John and Srivastava 1999).[18] Saving regret was significantly higher among individuals with high values on the agreeableness scale and lower for individuals with high values of openness. However, the overall explanatory power of the Big 5 was relatively low; they did not perform significantly better than the psychometric scales.

We can distinguish several ways in which uncertainty can lead to saving regret. First, *ex ante*, individuals may adequately assess the probabilities of various shocks, but remain unable to insure against them. Among those who experienced the negative outcome, increased buffer stock saving would have increased overall utility. The expression of

[18] The "Big 5" core dimensions of personality are openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. Results of our analysis are available upon request.

regret would then be natural even among those who undertook the correct *ex ante* saving plan. Second, individuals may correctly estimate the mean of the distribution of outcomes such as the mean of the distribution of the costs of unemployment. However, they may underestimate the variance of the distribution. More generally, they may underestimate the number and magnitude of the various uncertainties in life. On reaching retirement, those who experienced negative outcomes would likely express saving regret (due to too little buffer-stock saving) but this regret would be due to a lack of knowledge about the distribution of uncertain outcomes. Third, because of changes in the environment, the actual distribution of positive and negative shocks might be different from the *ex-ante* distribution. In this situation, individuals might have correctly engaged in buffer-stock saving, given the existing distribution of outcomes, but the level of saving might be inadequate due to increases in uncertainty.

The relationship between saving regret and experienced shocks that we have documented does not allow us to distinguish between these three ways in which uncertainty can lead to regret. A type of data outside of our study that may shed light on the issue is subjective probability data. Such data can reveal whether the measured probabilities of individuals are "rational" in the sense that they conform to historical frequencies, but such an assessment is likely to be unsatisfactory because of the weak and unknown link between the historical frequencies and the process of generating outcomes in the future.

Distinguishing among the causes of saving regret matters for public policy. If the root cause for regrettably low savings levels at retirement is found to be unanticipated shocks whose probabilities and effects have been underestimated, preferred policies would include information and education to help people better anticipate and understand the effects of changes in the environment. Given the difficulty of accurately forecasting external changes, another option would be social insurance against unemployment and work disability. However, if the root cause is found to be procrastination, more appropriate policy responses would include mandatory saving programs or paternalistic nudging such as automatic enrollment in retirement plans.

## V. Summary and Conclusions

Our survey found fairly high levels of saving regret, and the variation across individuals is consistent with valid reporting. Thus, although we cannot rule out the occurrence of "cheap talk" in the surveys, we believe that the data have face validity and provide useful and novel insights.

A first conclusion is that we found only modest evidence for a relationship between our measures of procrastination and the desire to re-optimize saving. Our psychometric variables are jointly significant and they contribute to the explained variation in saving regret, but their explanatory power is relatively low, the patterns of the variation are inconsistent, and they do not match well an ex-ante description of procrastination.

A second conclusion is that shocks explain much more of the variation, and their associations with saving regret have a consistent pattern from an *ex-ante* point of view. The failure to anticipate negative shocks, i.e., underestimating their probability and effects, may point to the larger relative importance of the lack of information compared to procrastination.

A third conclusion is that, by a number of self-assessed measures, a substantial percentage of respondents view their economic preparation to be adequate, yet they nonetheless express saving regret. A psychological explanation for this result would focus on ignorance and/or denial. An alternative, economic-focused explanation in the context of difficult-to-know and changing uncertainties is that the risk environment changed since an individual's choices were initially made. Many may now think that Social Security is genuinely risky whereas it may have been viewed as safe 10 to 20 years ago; Medicare is facing funding problems; the provision of long-term care has become more expensive and perhaps more risky due to an increased probability of extreme longevity; in a world of defined contribution pensions, individuals must manage risky investments and choose a rate of drawdown of wealth in the face of changing longevity; and people have had fewer children who can act as intra-family insurance. Some additional evidence about the importance of risk is that saving regret is high at the time of or shortly before retirement but is much lower at older ages. We explain this shift by the resolution of uncertainty and changes in consumption patterns as respondents age.

Independent of any actual increase in risk is the individual's perception of risk.

Perhaps regret or the wish to re-do past decisions is part of the human condition. In a stochastic environment, people must make an *ex ante* choice. If *ex post* the choice was mistaken, fully rational people will still not regret the choice, thinking they made the best choice, given the environment and uncertainty. But it is unlikely people are this rational. Most people will use the information about the actual outcome when thinking about re-doing that past choice. Thus, many people will have regret even though they chose well *ex ante*; and even those with substantial economic resources can experience such regret.

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# Tables

**Table 1: Prevalence (in Percent) of Saving Regret by Framing (N= 1,590), Before and After Revision**

| | Unframed | | Framed | | Total | |
|---|---|---|---|---|---|---|
| Wish to have | Before Revision | After Revision | Before Revision | After Revision | Before Revision | After Revision |
| …saved more | 66.6 | 62.4 | 60.9 | 55.4 | 63.6 | 58.5 |
| …about the same | 32.4 | 36.6 | 36.8 | 42.3 | 34.7 | 39.8 |
| …saved less | 1.1 | 1.1 | 2.3 | 2.3 | 1.7 | 1.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| N | 776 | | 814 | | 1590 | |

Note: Only respondents expressing saving regret were invited to revise. Those who no longer expressed regret were assigned in this table to the category ”wish to have saved about the same” rather than to “saved more.” Data are weighted.

**Table 2. Saving Regret by Sociodemographic Characteristics**

| | | | Saving Regret (After Revision) | | |
|---|---|---|---|---|---|
| | N | In percent | Mean | Std. | T-test |
| **Female** | | | | | |
| 0 | 741 | 46.6 | 0.567 | 0.496 | ref |
| 1 | 849 | 53.4 | 0.601 | 0.490 | * |
| **Age** | | | | | |
| 60-64 | 528 | 33.2 | 0.649 | 0.478 | ref |
| 65-69 | 478 | 30.1 | 0.634 | 0.482 | ns |
| 70-74 | 310 | 19.5 | 0.549 | 0.498 | *** |
| 75-84 | 274 | 17.2 | 0.417 | 0.494 | *** |
| **Marital status** | | | | | |
| married | 997 | 62.7 | 0.571 | 0.495 | ref |
| separated or divorced | 278 | 17.5 | 0.673 | 0.470 | *** |
| widowed | 221 | 13.9 | 0.518 | 0.501 | ns |
| never married | 93 | 5.9 | 0.622 | 0.487 | ns |
| **Education level** | | | | | |
| 1.HS or less | 739 | 46.5 | 0.607 | 0.489 | ref |
| 2.some coll or degr | 391 | 24.6 | 0.652 | 0.477 | ns |
| 3.BA,BS | 223 | 14.0 | 0.534 | 0.500 | * |
| 4.MA etc. to PhD | 238 | 15.0 | 0.453 | 0.498 | *** |
| **Wealth quartiles** | | | | | |
| 1 | 211 | 13.3 | 0.719 | 0.451 | ref |
| 2 | 207 | 13.1 | 0.659 | 0.476 | ns |
| 3 | 210 | 13.2 | 0.554 | 0.498 | *** |
| 4 | 205 | 12.9 | 0.389 | 0.489 | *** |
| missing | 756 | 47.6 | 0.589 | 0.492 | *** |
| **Income quartiles** | | | | | |
| 1 | 393 | 24.7 | 0.674 | 0.469 | ref |
| 2 | 404 | 25.4 | 0.627 | 0.484 | ns |
| 3 | 379 | 23.8 | 0.568 | 0.496 | *** |
| 4 | 389 | 24.5 | 0.464 | 0.499 | *** |
| missing | 26 | 1.6 | 0.634 | 0.494 | ns |
| **Poor self-reported health** | | | | | |
| 0 | 1202 | 75.6 | 0.543 | 0.498 | ref |
| 1 | 388 | 24.4 | 0.715 | 0.452 | *** |
| **Memory problems** | | | | | |
| 0 | 1394 | 87.7 | 0.574 | 0.495 | ref |
| 1 | 196 | 12.3 | 0.666 | 0.473 | ** |

Note: We are reporting the mean and standard deviation of saving regret pooled. The t-test refers to a t-test of the indicated category vs. the reference category (ref). Ns= not significant, *,**, *** refer to significance at the 10 percent, 5 percent, 1 percent significance level, respectively. Data are weighted.

**Table 3: Saving Regret by Personality Traits**

| | N | In percent | Saving Regret (After Revision) | | |
|---|---|---|---|---|---|
| | | | Mean | Std. | T-test |
| **Panel A: Self-View** | | | | | |
| Self-confident | | | | | |
| (Strongly) disagree | 123 | 7.8 | 0.581 | 0.496 | ref |
| Neither | 284 | 17.9 | 0.607 | 0.489 | ns |
| (Strongly) agree | 1182 | 74.4 | 0.58 | 0.494 | ns |
| Works best under pressure | | | | | |
| (Strongly) disagree | 455 | 28.6 | 0.617 | 0.487 | ref |
| Neither | 639 | 40.2 | 0.556 | 0.497 | ** |
| (Strongly) agree | 496 | 31.2 | 0.593 | 0.492 | ns |
| **Panel B: Financial View** | | | | | |
| Do what you like today | | | | | |
| (Strongly) disagree | 88 | 5.5 | 0.526 | 0.502 | ref |
| Neither | 251 | 15.8 | 0.551 | 0.498 | ns |
| (Strongly) agree | 1251 | 78.7 | 0.596 | 0.491 | ns |
| Life about having fun. | | | | | |
| (Strongly) disagree | 850 | 53.5 | 0.608 | 0.488 | ref |
| Neither | 420 | 26.4 | 0.523 | 0.5 | *** |
| (Strongly) agree | 320 | 20.1 | 0.605 | 0.49 | ns |
| Avoid unhealthy food or behaviors | | | | | |
| (Strongly) disagree | 440 | 27.7 | 0.569 | 0.496 | ref |
| Neither | 546 | 34.3 | 0.628 | 0.484 | ** |
| (Strongly) agree | 604 | 38.0 | 0.558 | 0.497 | ns |
| **Panel C: Motivation** | | | | | |
| Put off things you should do | | | | | |
| 1 Never | 76 | 4.8 | 0.459 | 0.502 | ref |
| 2 Sometimes | 1232 | 77.5 | 0.589 | 0.492 | ** |
| 3 Most of the time | 258 | 16.2 | 0.599 | 0.491 | ** |
| 4 Always | 24 | 1.5 | 0.639 | 0.49 | ns |
| Give up before starting | | | | | |
| 1 Never | 750 | 47.2 | 0.547 | 0.498 | ref |
| 2 Sometimes | 760 | 47.8 | 0.611 | 0.488 | *** |
| 3 Most of the time | 72 | 4.6 | 0.711 | 0.458 | *** |
| 4 Always | 8 | 0.5 | 0.524 | 0.53 | ns |
| Try several tasks, don't complete many | | | | | |
| 1 Never | 564 | 35.5 | 0.537 | 0.499 | ref |
| 2 Sometimes | 855 | 53.8 | 0.625 | 0.484 | *** |
| 3 Most of the time | 132 | 8.3 | 0.569 | 0.497 | ns |
| 4 Always | 39 | 2.4 | 0.459 | 0.51 | ns |
| Settle for mediocre results | | | | | |
| 1 Never | 715 | 45.0 | 0.588 | 0.493 | ref |
| 2 Sometimes | 802 | 50.4 | 0.591 | 0.492 | ns |
| 3 Most of the time | 69 | 4.4 | 0.471 | 0.503 | * |
| 4 Always | 3 | 0.2 | 0.858 | 0.403 | ns |
| Put off things not good at | | | | | |
| 1 Never | 230 | 14.5 | 0.585 | 0.494 | ref |

| | N | In percent | Saving Regret (After Revision) | | |
|---|---|---|---|---|---|
| 2 Sometimes | 1044 | 65.6 | 0.574 | 0.495 | ns |
| 3 Most of the time | 293 | 18.4 | 0.607 | 0.489 | ns |
| 4 Always | 23 | 1.5 | 0.798 | 0.411 | ** |
| Put off difficult things | | | | | |
| 1 Never | 697 | 43.8 | 0.567 | 0.496 | ref |
| 2 Sometimes | 776 | 48.8 | 0.592 | 0.492 | ns |
| 3 Most of the time | 106 | 6.7 | 0.62 | 0.488 | ns |
| 4 Always | 11 | 0.7 | 0.882 | 0.354 | ** |
| Lose motivation during tasks | | | | | |
| 1 Never | 534 | 33.6 | 0.601 | 0.49 | ref |
| 2 Sometimes | 993 | 62.4 | 0.58 | 0.494 | ns |
| 3 Most of the time | 55 | 3.5 | 0.526 | 0.504 | ns |
| 4 Always | 8 | 0.5 | 0.579 | 0.524 | ns |

Note: We are reporting the mean and standard deviation of saving regret pooled. The t-test refers to a t-test of the indicated category vs. the reference category (ref). Ns= not significant, *,**, *** refer to significance at the 10 percent, 5 percent, 1 percent significance level, respectively. Data are weighted.

**Table 4: Saving Regret, Financial Planning, Financial Literacy, and Numeracy**

| | | | Saving Regret (After Revision) | | |
|---|---|---|---|---|---|
| | N | In percent | Mean | Std. | T-test |
| **Financial Planning Horizon** | | | | | |
| 1.Next few months | 234 | 14.7 | 0.648 | 0.479 | ref |
| 2.Next year | 155 | 9.7 | 0.640 | 0.482 | ns |
| 3.Next few years | 299 | 18.8 | 0.593 | 0.492 | ns |
| 4.Next 5-10 years | 260 | 16.3 | 0.565 | 0.497 | * |
| 5.Longer than 10 years | 189 | 11.9 | 0.508 | 0.501 | *** |
| 6.I don't plan | 70 | 4.4 | 0.680 | 0.472 | ns |
| Missing | 384 | 24.1 | 0.552 | 0.498 | ** |
| **Financial Literacy** | | | | | |
| 1 Very high & high | 137 | 8.6 | 0.446 | 0.498 | ref |
| 2 Moderate | 511 | 32.2 | 0.641 | 0.48 | *** |
| 3 Low | 201 | 12.6 | 0.682 | 0.467 | *** |
| 4 Very low | 73 | 4.6 | 0.810 | 0.396 | *** |
| Missing | 668 | 42.0 | 0.517 | 0.500 | ns |
| **Numeracy** | | | | | |
| 0 correct answers | 43 | 2.7 | 0.450 | 0.508 | ** |
| 1 correct answer | 103 | 6.5 | 0.529 | 0.502 | ** |
| 2 correct answers | 272 | 17.1 | 0.659 | 0.475 | ref |
| 3 correct answers | 491 | 30.9 | 0.581 | 0.494 | ** |
| 4 correct answers | 147 | 9.3 | 0.461 | 0.500 | *** |
| Missing | 534 | 33.6 | 0.607 | 0.489 | ns |

Note: We are reporting the mean and standard deviation of saving regret pooled. The t-test refers to a t-test of the indicated category vs. the reference category (ref). Ns= not significant, *,**, *** refer to significance at the 10 percent, 5 percent, 1 percent significance level, respectively. Financial planning, financial literacy and numeracy were merged from other ALP surveys. That is why we have missing values for individuals who did not participate in both survey waves. Data are weighted.

**Table 5: Saving Regret and Negative/Positive Shocks**

| | N | In percent | Saving Regret (After Revision) | | |
|---|---|---|---|---|---|
| | | | mean | Std. | T-test |
| **Negative Shocks** | | | | | |
| Health limited work | 357 | 20.7 | 0.794 | 0.405 | *** |
| Large health expense | 238 | 13.8 | 0.681 | 0.467 | *** |
| Unemployment | 237 | 13.7 | 0.773 | 0.420 | *** |
| Salary/earnings less than expected | 192 | 11.1 | 0.759 | 0.429 | *** |
| Bad investments | 145 | 8.4 | 0.699 | 0.460 | ** |
| Divorce or separation | 197 | 11.4 | 0.744 | 0.438 | *** |
| Death in family | 190 | 11.0 | 0.606 | 0.490 | ns |
| Large (non-health) expense | 231 | 13.5 | 0.691 | 0.463 | *** |
| Other | 40 | 2.3 | 0.698 | 0.464 | ns |
| Any negative shock | 957 | 55.5 | 0.684 | 0.465 | *** |
| **Positive Shocks** | | | | | |
| Respondent salary/earnings more than expected | 244 | 14.2 | 0.528 | 0.500 | * |
| Spouse salary/earnings more than expected | 132 | 7.7 | 0.478 | 0.501 | ** |
| Worked more than expected | 173 | 10.0 | 0.591 | 0.493 | ns |
| Good investments | 343 | 19.9 | 0.364 | 0.482 | *** |
| Received an inheritance | 256 | 14.9 | 0.460 | 0.499 | *** |
| Other | 48 | 2.8 | 0.486 | 0.504 | ns |
| Any positive shock | 742 | 43.1 | 0.492 | 0.500 | *** |

Note: We are reporting the mean and standard deviation of savings regret pooled. The t-test refers to a t-test of those reporting the respective shock vs. those not reporting such a shock. Ns= not significant, *,**, *** refer to significance at the 10 percent, 5 percent, 1 percent significance level, respectively. Data are weighted.

**Table 6: Saving Regret and the Experience of at Least One Negative/Positive Shock**

**Panel A: Distribution of Population According to Whether Positive or Negative Shock Was Experienced (Weighted)**

| | Negative | | |
|---|---|---|---|
| Positive | No | Yes | Total |
| No | 22.74 | 33.19 | 55.92 |
| Yes | 21.14 | 22.94 | 44.08 |
| Total | 43.87 | 56.13 | 100.00 |

**Panel B: Mean Saving Regret According to Positive or Negative Shock (Weighted)**

| | Negative | | |
|---|---|---|---|
| Positive | No | Yes | Total |
| No | 0.548 | 0.734 | 0.658 |
| Yes | 0.362 | 0.612 | 0.492 |
| Total | 0.458 | 0.684 | 0.585 |

Note: Data are weighted.

**Table 7: Extracts from Regressions. Effect on Probability of Expressing Saving Regret**

| | Model 1 | Model 2 |
|---|---|---|
| **Self View/Financial View (Scaled 1-5 from "Strongly Disagree" to "Strongly Agree")** | | |
| Self-confident | -0.008 | -0.002 |
| Works best under pressure | 0.037*** | 0.036*** |
| Do what you like today | 0.026* | 0.023 |
| Life about having fun | -0.020 | -0.020 |
| Avoid unhealthy food or behaviors | 0.011 | 0.011 |
| **Motivation (Scaled 1-4 from "Never" to "Always")** | | |
| Put off things you should do | 0.046* | 0.040 |
| Give up before starting | -0.007 | -0.004 |
| Try several tasks, don't complete many | 0.053** | 0.053** |
| Settle for mediocre results | -0.025 | -0.021 |
| Put off things not good at | -0.011 | -0.012 |
| Put off difficult things | 0.026 | 0.030 |
| Lose motivation during tasks | -0.036 | -0.038 |
| **Negative Shock** | 0.145*** | 0.132*** |
| **Positive Shock** | -0.131*** | -0.114*** |
| Wealth included | No | Yes |
| Observations | 1589 | 1589 |
| R2 | 0.117 | 0.129 |
| **F-tests** | | |
| Joint significance psychometric scales | F(12,1558) = 2.06<br>Prob>F = 0.0171 | F (12, 1554) = 1.90<br>Prob>F = 0.0299 |
| Joint significance full model | F(30,1558) = 6.87<br>prob>F = 0.000 | F(34, 1554)=6.76<br>prob>F = 0.000 |

Note: Regressions also include demographics (age, sex, marital status, education, race/ethnicity, health, memory, and income). *,**,*** significant at 10 percent, 5 percent and 1 percent, respectively. The full regression results are reported in Appendix C Table A2.

**Table 8. Saving Regret and Current and Future Financial Situation**

| | | | Saving Regret (After Revision) | | |
|---|---|---|---|---|---|
| | N | In percent | Mean | Sd | T-test |
| **Panel A. Saving regret according to whether household income is sufficient** | | | | | |
| Yes, always | 698 | 43.9 | 0.445 | 0.497 | ref. |
| Most of the time | 669 | 42.18 | 0.671 | 0.470 | *** |
| Rarely | 223 | 14.0 | 0.765 | 0.425 | *** |
| Total | 1590 | 100.0 | 0.585 | 0.493 | |
| **Panel B. Financial resources to meet future needs** | | | | | |
| More than enough to meet your future needs | 328 | 20.7 | 0.310 | 0.463 | ref. |
| Just enough to meet your future needs | 522 | 32.8 | 0.589 | 0.492 | *** |
| Not enough to meet your future needs | 238 | 15.0 | 0.792 | 0.407 | *** |
| Not nearly enough to meet your future needs | 132 | 8.3 | 0.826 | 0.381 | *** |
| Uncertain | 273 | 17.2 | 0.617 | 0.487 | *** |
| Don‘t know | 96 | 6.0 | 0.563 | 0.500 | *** |
| Total | 1590 | 100.0 | 0.585 | 0.493 | |
| **Panel C. Probability of running out of money** | | | | | |
| 0-10 | 472 | 29.9 | 0.438 | 0.497 | ref. |
| 11-20 | 219 | 13.9 | 0.565 | 0.497 | *** |
| 21_30 | 209 | 13.2 | 0.626 | 0.485 | *** |
| 31-40 | 99 | 6.37 | 0.656 | 0.478 | *** |
| 41-49 | 21 | 1.4 | 0.734 | 0.455 | *** |
| 50 | 262 | 16.6 | 0.641 | 0.481 | *** |
| 51-60 | 73 | 4.6 | 0.856 | 0.353 | *** |
| 61-70 | 74 | 4.7 | 0.706 | 0.459 | *** |
| 71-80 | 62 | 3.9 | 0.722 | 0.452 | *** |
| 81-90 | 53 | 3.4 | 0.600 | 0.495 | ** |
| 91-100 | 37 | 2.3 | 0.732 | 0.448 | *** |
| Total | 1581 | 100.0 | 0.587 | 0.493 | |
| **Panel D. Economic satisfaction** | | | | | |
| Very satisfied | 171 | 10.8 | 0.244 | 0.431 | *** |
| Satisfied | 723 | 45.5 | 0.522 | 0.500 | *** |
| Neither satisfied , nor dissatisfied | 334 | 21.0 | 0.666 | 0.473 | *** |
| Very dissatisfied/dissatisfied | 362 | 22.7 | 0.798 | 0.402 | ref. |
| Total | 1590 | 100.0 | 0.585 | 0.493 | |
| **Panel E. Social Security receipt compared with expectations (respondents age 65 or older)** | | | | | |
| A lot more than you expected | 25 | 2.7 | 0.464 | 0.510 | ref. |
| A bit more than you expected | 69 | 7.5 | 0.552 | 0.501 | ns |
| About the amount you expected | 526 | 57.56 | 0.513 | 0.500 | ns |
| A bit less than you expected | 191 | 20.95 | 0.658 | 0.476 | * |
| A lot less than you expected | 105 | 11.5 | 0.692 | 0.464 | ** |
| Total | 916 | 100.0 | 0.566 | 0.496 | |

Note: The data in Panel E. Social Security receipt compared with expectations are only reported for respondents age 65 and older. Data are weighted.

**Table 9: Comparing Saving Regret with Other Regrets and Intensity of Regret**

| | Population Expressing Regret | | Intensity of Regret | | | | |
|---|---|---|---|---|---|---|---|
| | N | In percent | Very Strongly | Strongly | Somewhat Strongly | Not at All Strongly | Total |
| Spend less and save more | 749 | 62.5 | 38.3 | 29.0 | 24.3 | 8.4 | 100.0 |
| Get different education | 473 | 39.7 | 39.6 | 27.1 | 30.9 | 2.4 | 100.0 |
| Spend more time with family and friends | 416 | 34.9 | 43.4 | 30.1 | 22.5 | 4.2 | 100.0 |
| Choose different occupation | 332 | 27.8 | 29.9 | 29.3 | 38.3 | 2.6 | 100.0 |
| Marry differently /or not at all | 306 | 25.6 | 39.9 | 22.1 | 31.6 | 6.5 | 100.0 |
| Have kids | 120 | 10.1 | 17.3 | 36.0 | 36.1 | 10.6 | 100.0 |
| Have no/fewer kids | 62 | 5.2 | 17.1 | 23.4 | 27.1 | 32.5 | 100.0 |
| Other regret | 66 | 5.6 | 47.7 | 35.0 | 16.3 | 1.0 | 100.0 |

Note: This refers to the subsample of N=1,193 respondents who also participated in the second survey. Intensity of regret refers to the subsample of individuals expressing regret. Data are weighted.

# Figures

**Figure 1: Theoretical Framework**

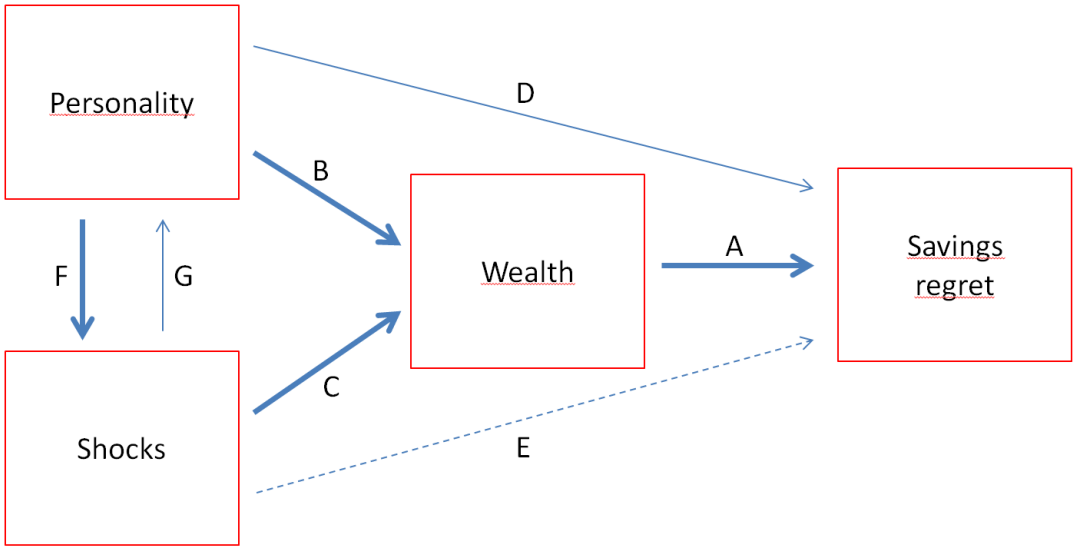
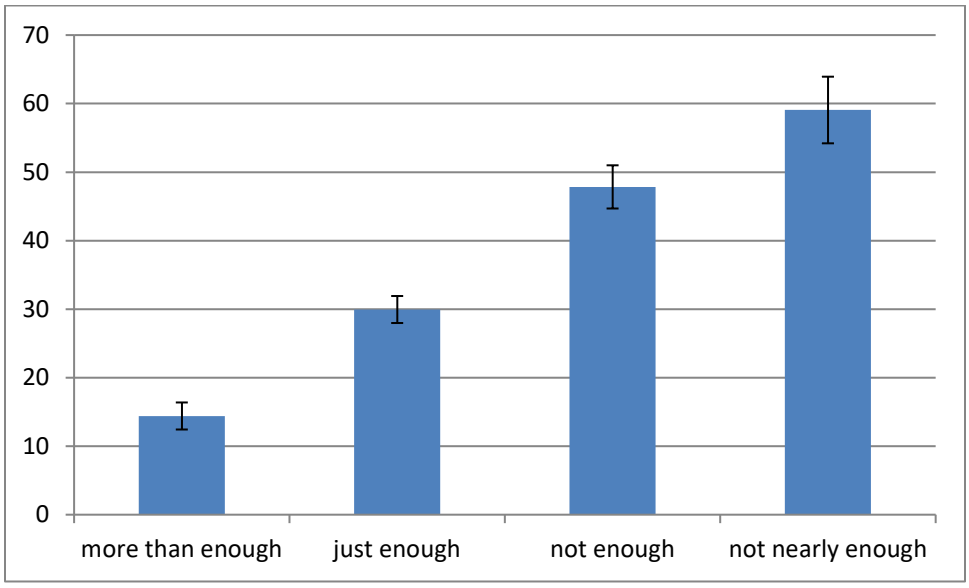
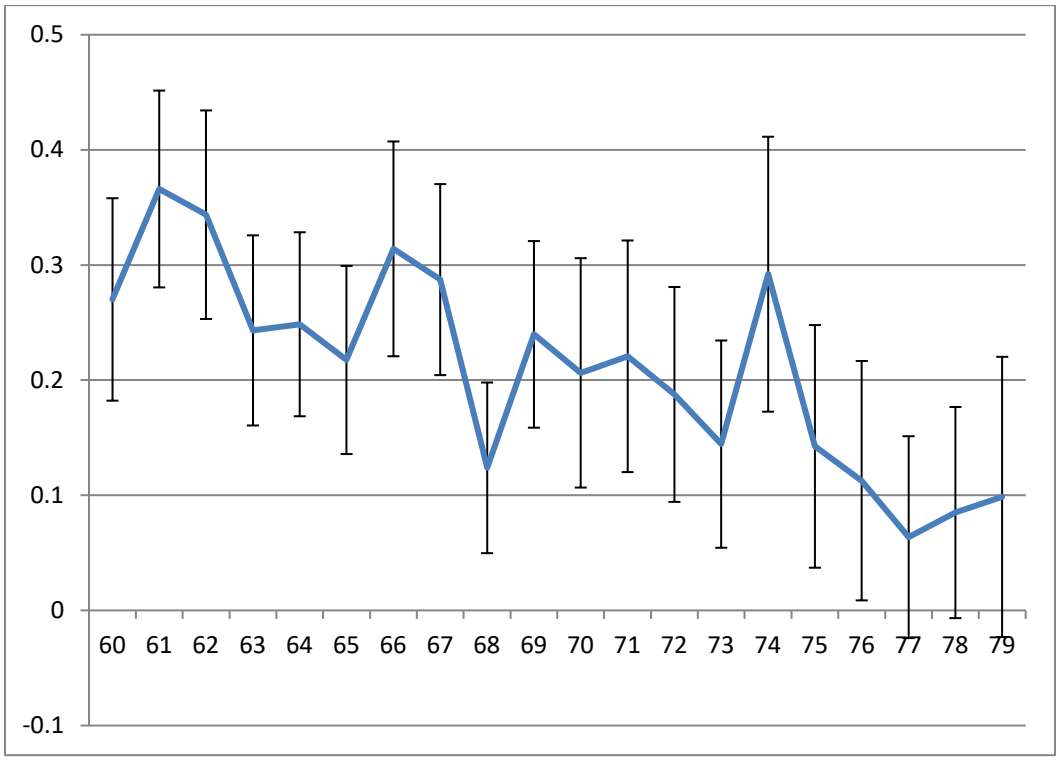


**Figure 2. Subjective Probability of Running Out of Money According to Whether Financial Resources Are Adequate to Meet Future Spending Needs (N=1,221)**



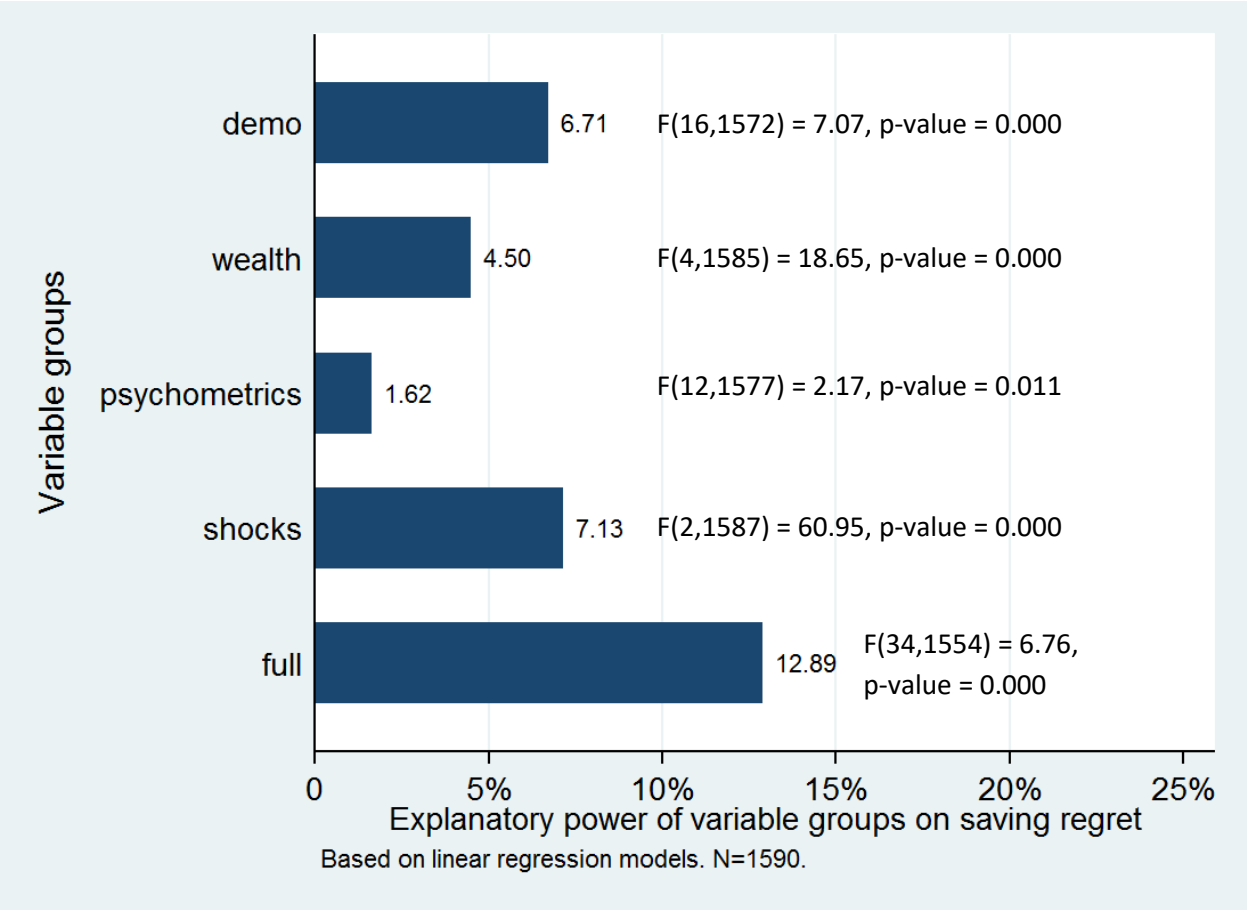

Note: Bands refer to 95 percent confidence intervals. Data are weighted.

**Figure 3. Percent with Financial Resources Not Enough or Not Nearly Enough by Age (N=1,590)**




Note: Bands refer to 95 percent confidence intervals. Data are weighted.

**Figure 4. Variance Decomposition: R-Squared, F-Statistic and P-Values**




Note: The full model refers to the model specified in Table 7 “Model 2”. The other models are defined by including only the respective variable groups as explanatory variables.

# Appendix: For Online Publication

### A. Variables and Survey Questions

| Variable | Survey Question /Coding |
|---|---|
| **Saving regret** | |
| Wish saved more (before revision) | Indicator if respondent wished to have saved more (version a) / spend less and saved more (version b) over the years |
| Wish saved more (after revision) | Wish saved more set to 1 if respondents answered "No way I could have cut spending. I could not have saved more." |
| **Sociodemographic characteristics** | |
| Age | respondent age in years |
| Female | respondent gender |
| Married or marriage-like relationship | respondent household status |
| High school or less | indicator for respondents education |
| (some) College education | indicator for respondents education |
| Bachelor's degree | indicator for respondents education |
| Master's degree of higher | indicator for respondents education |
| Households assets | Total household assets in $US |
| Household income | Total household income in $US |
| Black | indicator for respondent race/ethnicity |
| Hispanic | indicator for respondent race/ethnicity |
| Poor self rated health | Indicator if respondents rates own health as poor |
| Poor self rated memory | Indicator if respondent rates own memory as poor |
| **Positive and negative shocks** | |
| Negative shocks | Sometimes people have negative surprises earlier in life that cause their finances turn out worse than expected. Did any of the following happen to you? Please check all that apply: |
| Health limited work | indicator if respondents experienced this shock |
| Large health expense | indicator if respondents experienced this shock |
| Unemployment | indicator if respondents experienced this shock |
| Salary/earnings less than expected | indicator if respondents experienced this shock |
| Bad investments | indicator if respondents experienced this shock |
| Divorce or separation | indicator if respondents experienced this shock |
| Death in family | indicator if respondents experienced this shock |
| Large (non-health) expense | indicator if respondents experienced this shock |
| Other | indicator if respondents experienced this shock |
| Positive shocks | Sometimes people have positive surprises earlier in life that cause their finances turn out worse than expected. Did any of the following happen to you? Please check all that apply: |
| Respondent salary/earnings more than expected | indicator if respondents experienced this shock |

| Variable | Survey Question /Coding |
|---|---|
| Spouse salary/earnings more than expected | indicator if respondents experienced this shock |
| Worked more than expected | indicator if respondents experienced this shock |
| Good investments | indicator if respondents experienced this shock |
| Received an inheritance | indicator if respondents experienced this shock |
| Other | indicator if respondents experienced this shock |
| Any negative shock | indicator if respondent experienced any negative shock |
| Any positive shock | indicator if respondent experienced any positive shock |
| **Psychometric variables** | |
| Psychometric scales | Evaluated on a five-point Likert scale: Strongly disagree/disagree/neither/agree/strongly agree |
| Self-view: self-confident | I am a self-confident person. |
| Self-view: works best under pressure | I am a person who works best under pressure. |
| Financial-view: do what you like today. | Do you agree or disagree with the following statements? "People should do what they like today rather than putting it off until tomorrow" |
| Financial-view: life about having fun | Do you agree or disagree with the following statements? "Life is about having fun and spending all affordable money on that" |
| Financial-view: avoid unhealthy food or behaviors. | Do you agree or disagree with the following statements? "For the sake of my health, I stay away from unhealthy foods or behaviors that I might enjoy" |
| Motivation: put off things you should do | How often do you put things off you should do but aren't really interested in? Never/Sometimes/Most of the time/Always |
| Motivation: give up before starting | How often do you give up before you start a task because you don't know where to start? Never/Sometimes/Most of the time/Always |
| Motivation: try several tasks, don't complete many | How often do you try to do several things at once, not completing many? Never/Sometimes/Most of the time/Always |
| Motivation: settle for mediocre results | How often do you settle for mediocre results when you could do better? Never/Sometimes/Most of the time/Always |
| Motivation: put off things not good at | How often do you put things off you are not good at? Never/Sometimes/Most of the time/Always |
| Motivation: put off difficult things | How often do you give up a task when it gets difficult? Never/Sometimes/Most of the time/Always |
| Motivation: lose motivation during tasks. | How often do you lose motivation in the middle of a task? Never/Sometimes/Most of the time/Always |
| Probability Numeracy | Score ranging from 0 to 4 depending on the number of correctly answered numeracy questions:<br><br>First, suppose this bowl has 10 white balls and no red balls. You will be asked to draw one ball without looking. On a scale from 0 percent to 100 percent, what is the percent chance that the ball you draw is red? |

| Variable | Survey Question /Coding |
|---|---|
| | Now suppose that the bowl has 7 white balls and 3 red balls. You will be asked to draw one ball without looking. What is the percent chance that the ball you draw is white?<br><br>Imagine that the weather report tells you that the chance it will rain tomorrow is 70 percent. Assuming the weather report accurately reports the chance of rain, what is the chance it will NOT rain tomorrow?<br><br>Imagine that whether it rains in your town and whether it rains in Paris are unrelated. The chance that it will rain in your town tomorrow is 50 percent. The chance that it will rain in Paris is also 50 percent. What is the chance that it will rain both in your town and in Paris tomorrow? |
| Financial literacy | Score ranging from 0 to 3 depending on the number of correct answers to the financial literacy questions: |
| Interest rate | Suppose you had $100 in a savings account and the interest rate was 2 percent per year. After 5 years, how much do you think you would have in the account if you left the money to grow: [more than $102, exactly $102, less than $102? Don't know.] |
| Inflation | Imagine that the interest rate on your savings account was 1 percent per year and inflation was 2 percent per year. After 1 year, would you be able to buy: [more than, exactly the same as, or less than today with the money in this account? Don't know.] |
| Investment risk | Do you think that the following statement is true or false? "Buying a single company stock usually provides a safer return than a Unit Trust. [True, False, Don't know.] |
| Financial planning horizon | Financial planning horizon: next few months/ next year/ next few years/ next 5-10 years/ longer than 10 years/ I don't plan |
| HH total income sufficient | Is [fill for total income] sufficient to meet your spending needs each month? Yes, always/ Most of the time / Rarely/ Never |
| HH resources for future financial needs | And now a view into the future: Taking into consideration all of your household's wealth and future income and comparing them to your needs in the future, do you think that your household's total financial resources are…? More than enough to meet your future needs/ Just enough to meet your future needs/ Not enough to meet you future needs/ Not nearly enough to meet your future needs/ Uncertain/ Don't know |
| Probability of running out of money | What are the chances that you will run out of money sometime in the future? Please click a point on the scale. [Rabge 0 … 100] |
| Economic condition satisfaction | How satisfied are you with your overall economic situation? Very satisfied/satisfied/neither/dissatisfied/very dissatisfied |
| Respondent actual vs expected income from social security | When you received Social Security income for the first time, did you receive…? A lot more than expected/ a bit more than expected/ about the amount you expected/ a bit less than expected/ a lot less than expected |

**B Summary Statistics**

**Table A1. Summary Statistics**

| | N | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| Wish saved more (before revision) | 1590 | 0.636 | 0.481 | 0 | 1 |
| Wish saved more (after revision) | 1590 | 0.585 | 0.493 | 0 | 1 |
| Age | 1590 | 68.0 | 5.6 | 60 | 79 |
| Female | 1590 | 0.534 | 0.499 | 0 | 1 |
| Married or marriage-like relationship | 1589 | 0.619 | 0.486 | 0 | 1 |
| High school or less | 1590 | 0.465 | 0.499 | 0 | 1 |
| (some) College education | 1590 | 0.246 | 0.431 | 0 | 1 |
| Bachelor's degree | 1590 | 0.140 | 0.347 | 0 | 1 |
| Master's degree of higher | 1590 | 0.150 | 0.357 | 0 | 1 |
| Households assets | 815 | 542858 | 1085240 | -250000 | 1.33E+07 |
| Household income | 1570 | 55375 | 75282 | 0 | 2000000 |
| Black | 1590 | 0.096 | 0.294 | 0 | 1 |
| Hispanic | 1590 | 0.101 | 0.301 | 0 | 1 |
| Poor self-rated health | 1590 | 0.244 | 0.429 | 0 | 1 |
| Poor self-rated memory | 1590 | 0.123 | 0.329 | 0 | 1 |
| Negative shocks: health limited work | 1590 | 0.217 | 0.413 | 0 | 1 |
| Negative shocks: large health expense | 1590 | 0.138 | 0.345 | 0 | 1 |
| Negative shocks: unemployment | 1590 | 0.149 | 0.357 | 0 | 1 |
| Negative shocks: salary/earnings less than expected | 1590 | 0.120 | 0.325 | 0 | 1 |
| Negative shocks: bad investments | 1590 | 0.085 | 0.278 | 0 | 1 |
| Negative shocks: divorce or separation | 1590 | 0.118 | 0.323 | 0 | 1 |
| Negative shocks: death in family | 1590 | 0.095 | 0.294 | 0 | 1 |
| Negative shocks: large (non-health) expense | 1590 | 0.134 | 0.341 | 0 | 1 |
| Negative shocks: other | 1590 | 0.023 | 0.149 | 0 | 1 |
| Positive shocks: respondent salary/earnings more than expected | 1589 | 0.149 | 0.356 | 0 | 1 |
| Positive shocks: spouse salary/earnings more than expected | 1589 | 0.079 | 0.270 | 0 | 1 |
| Positive shocks: worked more than expected | 1589 | 0.101 | 0.302 | 0 | 1 |
| Positive shocks: good investments | 1589 | 0.199 | 0.399 | 0 | 1 |
| Positive shocks: received an inheritance | 1589 | 0.147 | 0.354 | 0 | 1 |
| Positive shocks: other | 1590 | 0.029 | 0.169 | 0 | 1 |
| Any negative shock | 1590 | 0.561 | 0.496 | 0 | 1 |
| Any positive shock | 1590 | 0.441 | 0.497 | 0 | 1 |
| Psychometric scales | | | | | |
| Self-view: self-confident | 1590 | 3.854 | 0.838 | 1 | 5 |
| Self-view: works best under pressure | 1590 | 3.024 | 0.977 | 1 | 5 |
| Financial-view: do what you like today | 1590 | 3.954 | 0.828 | 1 | 5 |
| Financial-view: life about having fun | 1590 | 2.557 | 1.053 | 1 | 5 |
| Financial-view: avoid unhealthy food or behaviors | 1590 | 3.138 | 0.981 | 1 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| Motivation: put off things you should do | 1590 | 2.144 | 0.500 | 1 | 4 |
| Motivation: give up before starting | 1590 | 1.583 | 0.603 | 1 | 4 |
| Motivation: try several tasks, don't complete many | 1590 | 1.777 | 0.697 | 1 | 4 |
| Motivation: settle for mediocre results | 1590 | 1.598 | 0.583 | 1 | 4 |
| Motivation: put off things not good at | 1590 | 2.069 | 0.619 | 1 | 4 |
| Motivation: put off difficult things | 1590 | 1.642 | 0.636 | 1 | 4 |
| Motivation: lose motivation during tasks | 1590 | 1.709 | 0.554 | 1 | 4 |
| Numeracy | 1173 | 2.565 | 0.982 | 0 | 4 |
| Financial literacy | 986 | 3.207 | 0.838 | 1 | 5 |
| Financial planning horizon | 1202 | 3.187 | 1.495 | 1 | 6 |
| HH total income sufficient | 1590 | 1.701 | 0.700 | 1 | 3 |
| HH resources for future financial needs | 1590 | 3.047 | 2.024 | 1 | 9 |
| Probability of running out of money | 1581 | 27.904 | 26.431 | 0 | 91 |
| Economic condition satisfaction | 1590 | 3.443 | 0.958 | 2 | 5 |
| Respondent actual vs expected income from social security | 1115 | 3.314 | 0.887 | 1 | 5 |

## C Full results from Multivariate Regressions

We ran linear regressions where the dependent variable is saving regret ("wish I had saved more" with framed and unframed versions combined and revisions included). The number of observations varies slightly depending on the covariates included.

We added covariates stepwise. Model (1) and model (2) are the same models as reported in Table 7. Model (1) includes demographic controls (age, gender, marital status, education, income, race/ethnicity, health and memory problems), the psychometrics scales, and two indicators for any positive or negative shock. We add wealth quartiles in model (2). In models (3) and (4) we add all positive and negative shocks individually. Models (5), (6) and (7) include controls for numeracy, financial planning horizon and financial literacy, respectively. Since these variables are matched from earlier waves we include indicators if the variables are missing. In model (8) all psychometric indicators are added to the model as dummy variables.

**Table A2: Multivariate regressions on saving regret (OLS)**

| | (1) **Without Wealth** | (2) **With Wealth** | (3) **With Ind. Shocks Without Wealth** | (4) **With Ind. Shocks With Wealth** | (5) **With Numera-cy** | (6) **With Financial Planning** | (7) **With Financial Literacy** | (8) **With Psycho Ind.** |
|---|---|---|---|---|---|---|---|---|
| **Age (ref: age 60 to 64)** | | | | | | | | |
| Age 65 to 69 | -0.0173 | -0.0115 | -0.0112 | -0.0066 | -0.0130 | -0.0093 | -0.0134 | -0.0176 |
| | (0.029) | (0.029) | (0.029) | (0.029) | (0.029) | (0.029) | (0.029) | (0.029) |
| Age 70 to 74 | -0.0598* | -0.0546 | -0.0633* | -0.0593* | -0.0551* | -0.0521 | -0.0588* | -0.0593* |
| | (0.033) | (0.033) | (0.033) | (0.033) | (0.033) | (0.033) | (0.034) | (0.033) |
| Age 75 to 79 | -0.162*** | -0.154*** | -0.144*** | -0.141*** | -0.147*** | -0.169*** | -0.170*** | -0.156*** |
| | (0.041) | (0.041) | (0.042) | (0.042) | (0.042) | (0.042) | (0.047) | (0.042) |
| Female | -0.0235 | -0.0227 | -0.0211 | -0.0197 | -0.0280 | -0.0168 | -0.0324 | -0.0205 |
| | (0.025) | (0.025) | (0.025) | (0.025) | (0.025) | (0.025) | (0.025) | (0.025) |
| Spouse | -0.0247 | -0.0343 | -0.0152 | -0.0236 | -0.0300 | -0.0324 | -0.0322 | -0.0390 |
| | (0.026) | (0.026) | (0.028) | (0.028) | (0.026) | (0.026) | (0.026) | (0.026) |
| **Education (ref: less than college)** | | | | | | | | |
| Some college | 0.0375 | 0.0401 | 0.0352 | 0.0356 | 0.0341 | 0.0349 | 0.0421 | 0.0435 |
| | (0.037) | (0.036) | (0.037) | (0.037) | (0.037) | (0.036) | (0.037) | (0.037) |
| Bachelor's degree | -0.0131 | 0.00300 | -0.0149 | -0.00403 | 0.00889 | -0.00243 | 0.00734 | 0.00685 |
| | (0.041) | (0.041) | (0.042) | (0.042) | (0.042) | (0.041) | (0.041) | (0.042) |
| Master's degree of higher | -0.0750* | -0.0605 | -0.0887** | -0.0784* | -0.0469 | -0.0652 | -0.0521 | -0.0545 |
| | (0.043) | (0.043) | (0.043) | (0.043) | (0.044) | (0.043) | (0.043) | (0.043) |
| **Income (ref: 1 Q)** | | | | | | | | |
| Income 2 Q | -0.0020 | -0.0045 | -0.0040 | -0.0064 | -0.0024 | -0.0050 | -0.0084 | -0.0001 |
| | (0.039) | (0.039) | (0.039) | (0.039) | (0.039) | (0.039) | (0.039) | (0.039) |
| Income 3 Q | 0.00885 | 0.0240 | 0.0146 | 0.0285 | 0.0201 | 0.0283 | 0.0216 | 0.0310 |
| | (0.038) | (0.038) | (0.038) | (0.038) | (0.039) | (0.038) | (0.038) | (0.039) |
| Income 4 Q | -0.0565 | -0.0284 | -0.0376 | -0.0132 | -0.0300 | -0.0267 | -0.0274 | -0.0179 |
| | (0.039) | (0.040) | (0.039) | (0.040) | (0.040) | (0.040) | (0.040) | (0.040) |
| Income missing | -0.138 | -0.147 | -0.159 | -0.165 | -0.151 | -0.163 | -0.152 | -0.126 |
| | (0.110) | (0.109) | (0.109) | (0.108) | (0.109) | (0.109) | (0.109) | (0.109) |
| Black | 0.0547 | 0.0428 | 0.0561 | 0.0462 | 0.0485 | 0.0436 | 0.0424 | 0.0482 |
| | (0.049) | (0.049) | (0.049) | (0.049) | (0.050) | (0.049) | (0.049) | (0.049) |
| Hispanic | 0.0953* | 0.0847* | 0.0785 | 0.0719 | 0.0833* | 0.0887* | 0.0765 | 0.0914* |
| | (0.050) | (0.050) | (0.050) | (0.050) | (0.050) | (0.050) | (0.050) | (0.050) |
| Fair or poor health | 0.0758** | 0.0671** | 0.0637* | 0.0571 | 0.0740** | 0.0702** | 0.0636* | 0.0607* |
| | (0.034) | (0.034) | (0.036) | (0.036) | (0.034) | (0.034) | (0.034) | (0.034) |
| Memory problems | -0.0494 | -0.0533 | -0.0599 | -0.0637 | -0.0533 | -0.0510 | -0.0556 | -0.0398 |
| | (0.044) | (0.043) | (0.044) | (0.043) | (0.043) | (0.043) | (0.044) | (0.044) |

| | (1) **Without Wealth** | (2) **With Wealth** | (3) **With Ind. Shocks Without Wealth** | (4) **With Ind. Shocks With Wealth** | (5) **With Numera-cy** | (6) **With Financial Planning** | (7) **With Financial Literacy** | (8) **With Psycho Ind.** |
|---|---|---|---|---|---|---|---|---|
| **Self view /Financial view:** | | | | | | | | |
| Self confident | -0.0080 | -0.0020 | -0.0060 | -0.0014 | -0.0015 | -0.0023 | 0.0001 | |
| | (0.016) | (0.016) | (0.016) | (0.016) | (0.016) | (0.016) | (0.016) | |
| Works best under pressure | 0.037*** | 0.036*** | 0.039*** | 0.037*** | 0.034*** | 0.036*** | 0.035*** | |
| | (0.013) | (0.013) | (0.013) | (0.013) | (0.013) | (0.013) | (0.013) | |
| Do what you like today | 0.0259* | 0.0227 | 0.0270* | 0.0242 | 0.0221 | 0.0227 | 0.0225 | |
| | (0.015) | (0.015) | (0.015) | (0.015) | (0.015) | (0.015) | (0.015) | |
| Life about having fun | -0.0199 | -0.0198 | -0.0162 | -0.0162 | -0.0204 | -0.0214* | -0.0204 | |
| | (0.013) | (0.013) | (0.013) | (0.012) | (0.013) | (0.013) | (0.013) | |
| Avoid unhealthy food or behaviors | 0.0113 | 0.0106 | 0.0122 | 0.0115 | 0.0112 | 0.00989 | 0.0111 | |
| | (0.013) | (0.013) | (0.013) | (0.013) | (0.013) | (0.013) | (0.013) | |
| **Motivation** | | | | | | | | |
| Put off things you should do | 0.0458* | 0.0395 | 0.0384 | 0.0333 | 0.0363 | 0.0396 | 0.0404 | |
| | (0.027) | (0.027) | (0.027) | (0.027) | (0.027) | (0.027) | (0.027) | |
| Give up before starting | -0.00653 | -0.00412 | -0.00387 | -0.00210 | -0.00191 | -0.00280 | -0.00429 | |
| | (0.025) | (0.025) | (0.025) | (0.025) | (0.025) | (0.025) | (0.025) | |
| Try several tasks, don't complete many | 0.0533** | 0.0526** | 0.0473** | 0.0470** | 0.0539** | 0.0519** | 0.0530** | |
| | (0.021) | (0.021) | (0.021) | (0.021) | (0.021) | (0.021) | (0.021) | |
| Settle for mediocre results | -0.0245 | -0.0209 | -0.0199 | -0.0173 | -0.0188 | -0.0193 | -0.0202 | |
| | (0.025) | (0.025) | (0.025) | (0.025) | (0.025) | (0.025) | (0.025) | |
| Put off things not good at | -0.0114 | -0.0117 | -0.00751 | -0.00770 | -0.0125 | -0.0107 | -0.0145 | |
| | (0.024) | (0.024) | (0.024) | (0.024) | (0.024) | (0.024) | (0.024) | |
| Put off difficult things | 0.0256 | 0.0297 | 0.0196 | 0.0238 | 0.0303 | 0.0277 | 0.0294 | |
| | (0.026) | (0.026) | (0.026) | (0.025) | (0.026) | (0.026) | (0.026) | |
| Lose motivation during tasks | -0.0363 | -0.0376 | -0.0235 | -0.0258 | -0.0375 | -0.0405 | -0.0393 | |
| | (0.027) | (0.027) | (0.027) | (0.026) | (0.027) | (0.027) | (0.027) | |
| Any negative shock | 0.145*** | 0.132*** | | | 0.132*** | 0.130*** | 0.133*** | 0.137*** |
| | (0.025) | (0.025) | | | (0.025) | (0.025) | (0.025) | (0.025) |
| Any positive shock | -0.131*** | -0.114*** | | | -0.114*** | -0.114*** | -0.108*** | -0.113*** |
| | (0.026) | (0.026) | | | (0.026) | (0.026) | (0.026) | (0.026) |
| **Wealth (ref: 1Q)** | | | | | | | | |
| Wealth Q2 | | -0.0022 | | -0.0121 | -0.0055 | -0.0002 | -0.0009 | -0.0004 |
| | | (0.053) | | (0.053) | (0.053) | (0.053) | (0.053) | (0.053) |
| Wealth Q3 | | -0.0617 | | -0.0644 | -0.0622 | -0.0613 | -0.0582 | -0.0622 |
| | | (0.049) | | (0.049) | (0.049) | (0.050) | (0.049) | (0.050) |
| Wealth Q4 | | -0.199*** | | -0.182*** | -0.199*** | -0.194*** | -0.186*** | -0.202*** |
| | | (0.052) | | (0.052) | (0.052) | (0.052) | (0.052) | (0.052) |
| Wealthmissing | | -0.0790* | | -0.0732* | -0.0775* | -0.0977** | -0.0791* | -0.0782* |
| | | (0.042) | | (0.043) | (0.043) | (0.045) | (0.044) | (0.042) |
| **Negative shocks:** | | | | | | | | |
| Health limited work | | | 0.0883** | 0.0814** | | | | |
| | | | (0.034) | (0.034) | | | | |
| Large health expense | | | 0.0410 | 0.0437 | | | | |
| | | | (0.036) | (0.036) | | | | |
| Unemployment | | | 0.0791** | 0.0720** | | | | |
| | | | (0.034) | (0.034) | | | | |
| Salary/earnings less than expected | | | 0.0181 | 0.0168 | | | | |
| | | | (0.038) | (0.037) | | | | |
| Bad investments | | | 0.0771* | 0.0869** | | | | |
| | | | (0.040) | (0.040) | | | | |
| Divorce or separation | | | 0.0700** | 0.0639* | | | | |
| | | | (0.035) | (0.035) | | | | |
| Death in the family | | | -0.0595 | -0.0565 | | | | |
| | | | (0.042) | (0.042) | | | | |
| Large (non-health) expense | | | 0.0367 | 0.0324 | | | | |
| | | | (0.035) | (0.035) | | | | |
| Other negative shock | | | 0.147** | 0.151** | | | | |
| | | | (0.067) | (0.067) | | | | |
| **Positive shocks:** | | | | | | | | |
| Respondent salary/earnings more than expected | | | 0.0157 | 0.0170 | | | | |
| | | | (0.035) | (0.035) | | | | |
| Spouse salary earning more than expected | | | -0.0960** | -0.101** | | | | |
| | | | (0.046) | (0.046) | | | | |

| | (1) **Without Wealth** | (2) **With Wealth** | (3) **With Ind. Shocks Without Wealth** | (4) **With Ind. Shocks With Wealth** | (5) **With Numera-cy** | (6) **With Financial Planning** | (7) **With Financial Literacy** | (8) **With Psycho Ind.** |
|---|---|---|---|---|---|---|---|---|
| Worked more than expected | | | 0.0454 | 0.0464 | | | | |
| | | | (0.039) | (0.039) | | | | |
| Good investments | | | -0.186*** | -0.157*** | | | | |
| | | | (0.029) | (0.030) | | | | |
| Received an inheritance | | | -0.0593* | -0.0554* | | | | |
| | | | (0.031) | (0.031) | | | | |
| Other positive shock | | | -0.128* | -0.131** | | | | |
| | | | (0.066) | (0.066) | | | | |
| **Numeracy (ref: no correct answer)** | | | | | | | | |
| 1 correct | | | | | 0.0653 | | | |
| | | | | | (0.108) | | | |
| 2 correct | | | | | 0.0868 | | | |
| | | | | | (0.101) | | | |
| 3 correct | | | | | 0.0862 | | | |
| | | | | | (0.100) | | | |
| 4 correct | | | | | -0.0148 | | | |
| | | | | | (0.104) | | | |
| Numeracy missing | | | | | 0.0254 | | | |
| | | | | | (0.099) | | | |
| **Financial planning horizon (ref: next couple of months)** | | | | | | | | |
| Next year | | | | | | 0.0375 | | |
| | | | | | | (0.052) | | |
| Next cuple of years | | | | | | 0.0484 | | |
| | | | | | | (0.044) | | |
| Next 5-10 years | | | | | | 0.0638 | | |
| | | | | | | (0.045) | | |
| Longer than 10 years | | | | | | -0.0553 | | |
| | | | | | | (0.049) | | |
| I do not plan | | | | | | 0.0286 | | |
| | | | | | | (0.079) | | |
| Finplan missing | | | | | | 0.0763 | | |
| | | | | | | (0.046) | | |
| **Financial literacy (ref: very high & high)** | | | | | | | | |
| Moderate | | | | | | | 0.100** | |
| | | | | | | | (0.040) | |
| Low | | | | | | | 0.0904* | |
| | | | | | | | (0.052) | |
| Very low | | | | | | | 0.142* | |
| | | | | | | | (0.077) | |
| Missing | | | | | | | 0.0988** | |
| | | | | | | | (0.043) | |
| **Self view/Financial view (ref. "neither)** | | | | | | | | |
| Self confidence (disagree) | | | | | | | | -0.0535 |
| | | | | | | | | (0.053) |
| Self confidence (agree) | | | | | | | | -0.0187 |
| | | | | | | | | (0.033) |
| Works best under pressure (disagree) | | | | | | | | 0.00792 |
| | | | | | | | | (0.031) |
| Works best under pressure dis(agree) | | | | | | | | 0.079*** |
| | | | | | | | | (0.028) |
| Do what you like today (disagree) | | | | | | | | -0.0134 |
| | | | | | | | | (0.056) |
| Do what you like today (agree) | | | | | | | | 0.0341 |
| | | | | | | | | (0.033) |
| Life about having fun (disagree) | | | | | | | | 0.0351 |
| | | | | | | | | (0.028) |
| Life about having fun (agree) | | | | | | | | 0.00717 |
| | | | | | | | | (0.037) |
| Avoid unhealthy food or behaviors (disagree) | | | | | | | | -0.0460 |
| | | | | | | | | (0.031) |
| Avoid unhealthy food or behaviors (agree) | | | | | | | | -0.0338 |
| | | | | | | | | (0.028) |
| **Motivation (ref: never/some time)** | | | | | | | | |

| | (1) **Without Wealth** | (2) **With Wealth** | (3) **With Ind. Shocks Without Wealth** | (4) **With Ind. Shocks With Wealth** | (5) **With Numera-cy** | (6) **With Financial Planning** | (7) **With Financial Literacy** | (8) **With Psycho Ind.** |
|---|---|---|---|---|---|---|---|---|
| Put off things you should do. (most of the time/always) | | | | | | | | 0.0256 |
| | | | | | | | | (0.034) |
| Give up before starting. (most of the time/always) | | | | | | | | 0.0281 |
| | | | | | | | | (0.071) |
| Try several tasks, don't complete many. (most of the time/always) | | | | | | | | 0.0171 |
| | | | | | | | | (0.044) |
| Settle for mediocre results. (most of the time/always) | | | | | | | | -0.0791 |
| | | | | | | | | (0.070) |
| Put off things not good at (most of the time/always) | | | | | | | | -0.0311 |
| | | | | | | | | (0.035) |
| Put off difficult things. (most of the time/always) | | | | | | | | 0.0891 |
| | | | | | | | | (0.061) |
| Lose motivation during tasks. (most of the time/always) | | | | | | | | -0.0344 |
| | | | | | | | | (0.074) |
| Constant | 0.361*** | 0.420*** | 0.338*** | 0.398*** | 0.369** | 0.402*** | 0.333** | 0.651*** |
| | (0.131) | (0.134) | (0.131) | (0.133) | (0.163) | (0.136) | (0.138) | (0.078) |
| N | 1589 | 1589 | 1588 | 1588 | 1589 | 1589 | 1589 | 1589 |
| R-sq | 0.117 | 0.129 | 0.140 | 0.149 | 0.135 | 0.136 | 0.133 | 0.128 |