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ABSTRACT

We measure financial literacy in a large sample of LinkedIn members, complementing a standard set of questions with a method that allow us to isolate and distinguish optimism and self-confidence. Like previous work, we find that high literacy respondents are more likely to save for a rainy day, plan for retirement, and are more likely to pay attention to fees when choosing credit cards. However, this is mostly driven by perceived, rather than actual, financial literacy: controlling for self-perceptions, actual literacy has low power to predict financial engagement. Moreover, behavior biases drive participation among low literacy respondents and are associated with mistaken beliefs about financial products and a lower willingness to accept financial advice. This has important implications for policy and for the design of institutions aimed at increasing literacy and protecting consumers from fraud.

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1 Introduction

A growing body of empirical evidence documents the fact that many consumers lack the financial literacy required to handle the ever-increasing complexity of modern retail financial markets. This financial (il)literacy affects economic outcomes: widespread consumer financial illiteracy has been suggested as one of the culprits behind the financial crisis. Low financial literacy is especially problematic given the broad shift in pension systems away from defined benefit in favor of defined contribution plans, placing the responsibility of planning for retirement on consumers. In general, low levels of financial literacy have been shown to be correlated with low rates of financial engagement across a variety of domains (Lusardi and Mitchell, 2006).

At the same time, a large body of work in behavioral economics and psychology convincingly demonstrates that people hold systematically biased beliefs and perceptions, especially about their own abilities. Just as knowledge lowers the cost for market participation, self-confidence has shown to be another important driver for engagement in various settings.¹ Behavioral biases are likely to be especially important in the domain of household finance, where simple heuristics are commonly used in complex decision environments, and where consumers receive feedback at low frequencies. In decision environments in which feedback is noisy and infrequent, and tasks vary in difficulty, there is tremendous scope for individuals to hold (and act on) mistaken beliefs about their own ability.

This paper connects behavioral finance to household finance by studying how behavioral biases affect financial market participation. In particular, we ask how perceived financial literacy differs from actual literacy, and whether perceptions or reality are more important for financial engagement. The main message of this paper is that in many settings, perceived financial literacy is more salient for engagement than actual financial literacy. People who think they are more literate than they actually are are more likely to be engaged in a broad set of financial decisions, but they are also more likely to be wrong

¹Examples of this include Camerer and Lovallo (1999); Hong, Kubik, and Stein (2004); and Barber and Odean (2000).

about financial knowledge on matters outside the standard test.

We connect behavioral biases to household decision-making through a financial literacy survey conducted by LinkedIn, an online professional network. We administer a standard financial literacy test, augmenting the “Big 3” financial literacy questionnaire pioneered by Lusardi and Mitchell (2006, 2009) with two additional questions that have been extensively used in the previous literature, which we collectively label the “Big 5”.² Then we measure how respondents think they did on the test. We adapt the methodology of Moore and Healy (2008) by asking respondents to report how likely it is that they got all five questions, four questions, three questions, etc., correct. By effectively eliciting a probability distribution over possible outcomes, we can distinguish confidence from what Moore and Healy (2008) call overestimation. This allows us to run a horserace between actual and perceived financial literacy and participation across a wide range of financial decisions.

Three main sets of findings emerge from our analysis. First, although average financial literacy in our sample is a good deal higher than what has been found in previous work, there is certainly evidence that financial literacy is in short supply. For example, more than one-third of CFOs, CEOs, and COOs in our sample do not answer all five literacy questions correctly. Fewer than one in four students gets all five literacy questions correct, and fewer than half of Director, Managing Director or Department Head level members get all five questions correct. Surprisingly, this occurs in a sample in which about 75% of respondents answer the Big 3 questions correct. Moreover, close to 40% percent of respondents in our sample answer all of the Big 5 questions correctly, which is almost twice the average found for average U.S. citizens, as proxied by the 2012 NFCS study. Given that our sample consists of tech-savvy, white-collar professionals, a large fraction of whom make more than twice the U.S. national average income, it is reasonable to ask whether the financial literacy rates we measure should not be a great deal higher. Viewed in this way, our results reinforce the findings of previous studies.

²The five questions correspond to those included in the 2009 and 2012 U.S. National Financial Capability Study (NFCS).

Our first set of findings also connects actual and perceived literacy. On average, beliefs about literacy match up with actual literacy, but this average masks substantial cross-sectional variation both in actual and perceived literacy. Indeed, one reason the average individual's beliefs are well calibrated is that perfect scorers often attached probability to missing one question. Many respondents with intermediate scores have wildly mistaken beliefs about their literacy. In general, respondents who lack financial literacy think they are more literate than they actually are. As in many other studies, we find that women score lower on this type of tests compared to men, but unlike men, they are better calibrated of their own scores.

Our second set of results relates real and perceived financial literacy to a range of outcomes broadly connected to financial engagement. To study financial participation in a variety of domains, we ask respondents whether they have set aside funds for emergencies, whether they had attempted to compute how much they would need for retirement, whether they had considered fees when obtaining a credit card, and whether they were in favor or opposed to receiving financial advice. These correspond to questions used extensively in existing work on financial literacy.³

The main result from this section is that beliefs are more important for participation than actual literacy. In fact, when we control for beliefs, the well documented tendency for women to be less engaged in financial market decisions disappears.⁴ In general, respondents' mistaken beliefs about their financial literacy drive their participation to a much greater degree than their actual literacy.

This set of results connects to a recent paper by Fernandes, Lynch, and Netemeyer (2014). They report that survey-based correlations of actual literacy and engagement are much stronger than those obtained from studies in which actual literacy is experimentally manipulated. The fact that perceptions weigh more strongly than actual literacy in our data suggest an explanation for this. More generally, they report challenges with using education as a treatment for inducing greater financial engagement. Our results show a

³See, for example, Ameriks, Caplin, and Leahy (2003), Hilgert, Hogarth, and Beverly (2003), Lusardi and Mitchell (2011c), and Lusardi and Mitchell (2011b).

⁴See Lusardi and Mitchell (2008) for evidence on women and financial planning.

negative correlation between education and perceived literacy but a positive correlation between perceived literacy and engagement, which points to challenges using education as a tool for stimulating participation.

Our final set of results asks whether mistaken beliefs are good or bad for the people who harbor them. We introduce a new financial knowledge question about mutual funds: whether it is better to focus on fees or past performance. The language of this question closely mirrors financial advice promulgated by the SEC and other organizations with a vested interest in financial literacy. Holding constant actual literacy, people who overestimate their score are less likely to respond that they do not know the answer, but more likely to get the answer wrong. These respondents are also less likely to be receptive to financial advice.

Our data set is not the first that allows for self-perceptions and actual literacy to be compared. The NFCS includes questions about an individual's broad sense of financial knowledge.⁵ Lusardi and Mitchell (2014) report that many individuals who score low on financial literacy tests report that they think they are knowledgeable. Allgood and Walstad (2012), Parker, de Bruin, Yoong, and Willis (2012) and Van Rooij, Lusardi, and Alessie (2011) also relate actual literacy and perceived knowledge to one another. One key difference between our paper and these papers is that we explicitly anchor the respondents' self-assessment on their literacy test score, rather than a broad pre-conceived notion of their literacy.⁶ Our results are also helpful in explaining the dispersion of beliefs compared to scores, as we tie them to established results from psychology.

Although we are the first to connect actual literacy, perceived literacy and financial engagement in this manner, the relation between competence and confidence has been a long-standing topic of importance among psychologists. Kruger and Dunning (1999) argue that possession of skill is in fact necessary to make correct judgements of competence in the same domain, giving rise to systematic bias in self-assessments. Such individuals

⁵In the online appendix we develop similar results to the ones in this paper using the NFCS.

⁶Our work is also distinct from the literature that considers role of broad-based measures of optimism or other pro-social behaviors in shaping retirement planning and savings decisions. See Puri and Robinson (2007) or Hong, Kubik, and Stein (2004) and cites therein for examples.

not only reach mistaken conclusions and make regrettable errors, but their incompetence also robs them of the ability to realize it. It is noteworthy that our results obtain in a setting in which there is a high degree of average meta-cognition about performance. In light of this interpretation, our findings indicate that one explanation for the observed connection between literacy and engagement is that initial misjudgments predispose individuals towards financial engagement, but learning by doing imparts literacy to those who are engaged.

The remainder of the paper proceeds as follows. In Section 2 we detail the data collection issues surrounding our survey instrument and the sample that responded to our survey, as well as present details on the techniques we use to elicit beliefs. Section 3 presents our results on actual and perceived literacy, and Section 4 connects them to our measures of financial engagement. In Section 5 we discuss whether mistaken beliefs are good or bad for the people who hold them, while section 6 concludes.

2 Measuring Literacy, Beliefs, and Engagement

Most research in financial literacy has focused on a small set of questions that are meant to capture peoples overall financial knowledge, and cover topics such as compounding, inflation, interest, diversification, and bond pricing.⁷ These questions form the baseline starting point for our analysis.

–Table I about here–

Table I display the five (first three) questions which we refer to as the “Big 5” (“Big 3”), following the labelling of Hastings, Madrian, and Skimmyhorn (2013). A body of work links the score of these questions to different forms of financial engagement and planning, and find that more financially literate people are more likely to save, plan for retirement, pick up credit information, and have better diversified portfolios. We opt to use the same set of questions in order to be able to compare our results to the 2012 State-

⁷Lusardi and Mitchell (2014) and Hastings, Madrian, and Skimmyhorn (2013) provide overviews.

by-State National Financial Capability Study (NFCS), which is meant to be representative of the U.S. population.

2.1 *The LinkedIn Sample*

We augmented the January and July, 2014, versions of a monthly omnibus survey that LinkedIn sends to its membership base.⁸ We added the big 5 financial literacy questions to their standard omnibus survey and included additional questions that measured financial literacy, beliefs and engagement.

Subjects were invited to take the survey with an e-mail that contained a link to a webpage with the omnibus survey questions. We solicited data in two waves: on January 20 and July 18, 2014. There were 223,768 and 247,543 members invited in the two waves, respectively. This is a random sample of U.S. LinkedIn users who had logged into their account at least once in the last year and had not been asked to take a survey in the last 30 days. We deleted incomplete responses, including those who reported “Dont know” or “Prefer not to answer” to the belief question, as well as those finishing the survey under two minutes. Our final sample consists of 5,814 responses, of which 2,393 (3,421) appeared in the first (second) wave. Respondents spent 8:41 (12:18) minutes:seconds to complete the survey in the first (second) wave, on average. The response rates we received are typical for this type of survey.⁹

—Table II about here—

Table II presents the sample statistics on demographics for our LinkedIn sample, along with statistics for the U.S. population taken from the 2012 U.S. Census Bureau (denoted “U.S. Pop.”), as well as the 2012 NFCS State-by-state study (intended to be a representative sample). LinkedIn members are clearly not representative of the U.S. population. People in our sample are somewhat older (average age is 46.4 years), in which only one third are women. A striking difference to the population in general, is the higher income and education. One third of the LinkedIn members hold at least a Bachelor’s, and

⁸LinkedIn is an online professional networking website founded in 2003 in which members can post resume information and work profiles. See www.ourstory.linkedin.com for details.

⁹In the 2012 NFCS, 1.2 million people were invited, and 25,509 completed the survey.

one third a Master's degree. In the overall population, only 19% hold at least a Bachelor's, and only 8% a Master's degree. Similarly, almost a quarter of LinkedIn members have yearly household income exceeding \$150 K, whereas only 9% in the U.S. population. Through their LinkedIn profiles, we also have statistics on respondents profession, and find that 12% report that they work in the financial industry, and we identify 17% to be entrepreneurs (small business owners or self-employed).

The characteristics show that our sample is tilted towards high income, well-educated, males.¹⁰ In untabulated results, we find that women have higher representation in the higher education categories, but do not exceed 40%. The demographics between the two waves are very similar, so we combine them in the following analysis, treating them as one sample.

Table III tabulates the proportions of correct responses to the Big 3 and Big 5 questions along the same dimensions as in Table II. We include the results of the 2012 NFCS for the purpose of comparison. Average scores in our sample are higher than that of the U.S. population in every demographic category, but the differences is less pronounced for those with higher education. As in previous studies, financial literacy increases in age and income, and is higher on average for men than women, who are more likely to report "Dont know". These patterns have been documented in previous work (see Lusardi and Mitchell, 2008). We find that Entrepreneurs and those having their profession in Finance have higher scores, but also that they are less likely to report not knowing, a feature that may be related to overconfidence.

2.2 *Measuring Beliefs and Participation*

We build on the work of Moore and Healy (2008) to generate two separate measures of behavioral traits that are related to mis-calibration of beliefs. Immediately after completing the literacy questions, respondents are asked to state the probability that they got a certain number of answers correct.¹¹ Figure 1 displays a screenshot of the question used

¹⁰The demographics of our survey respondents closely match the underlying demographics of the LinkedIn population of users.

¹¹The survey software required respondents to supply a range of numbers that summed to 100%.

in our survey.

–Insert Figure 1 here–

The responses then give us a complete distribution of beliefs, which allows us to define two key concepts used in the paper:

- *Overestimation*. The difference between the subject's expected score and their actual score. Overestimation is therefore related to the mean of the distribution, and whether one expects to perform better than the actual outcome.
- *Precision*. The sum of squared weights of the belief distribution. This is similar to a Herfindahl index, and is bounded from above by one, as perfect confidence implies putting all mass in one particular category.

Asking respondents to provide a probability distribution over the total number of questions has several advantages relative to alternative scoring schemes. For example, asking respondents to assess the probability of each individual question correct would not allow us to form distinct but connected measures of optimism and confidence.

We also include a number of questions about financial engagement. In keeping with prior work, we include three questions about behavior with respect to savings, credit card usage, and retirement planning. These questions are:

- *Savings*: Have you set aside emergency or rainy day funds that would cover your expenses for 3 months, in case of sickness, job loss, economic downturn, or other emergencies?
- *Retirement*: Have you ever tried to figure out how much you need to save for your retirement?
- *Credit cards*: Thinking about when you obtained your most recent credit card, did you collect information about different cards from more than one company in order to compare them?

In the second wave of data collection, we added a number of questions that allowed us to gain insight into the mechanisms behind the connections between beliefs, literacy and engagement. We describe these in greater detail in Section 5.

3 Financial Literacy: Perception and Reality

3.1 *Comparing Actual and Perceived Literacy*

Figure 2 reports actual literacy and perceived literacy for the overall sample. The bars in the graph (right scale) show that 2,178 respondents answered correctly to all five questions, and 2,874 scored four, leaving the remaining 1,258 responses in the lower four categories zero to three. The average perceived score is computed using the probability weights across scores. These are plotted against actual scores in the same figure. The dotted 45-degree line benchmarks perfect alignment of expectations.

–Include Figure 2 here–

The fact that the solid line is above the 45-degree line for the lower-ability part of the sample illustrates the Kruger-Dunning effect, which is that those who score below average tend to overestimate their performance.¹² Moore and Healy (2008) obtain similar results from a laboratory experiment, and show that a simple Bayesian updating rule, where people weight their prior against a posterior, can predict this result. The flatness of the curve is due to people’s tendency to adjust too little with respect to the private signal obtained after having taken the test. It should also be noted that the average mis-calibration is much higher for those with lower scores, compared to those with the highest, implying a systematic rather than random effect. Kruger and Dunning (1999) attributes this feature to the fact that skills that engender competence in a certain domain are the very same skills necessary to evaluate competence.

In spite of considerable cross-sectional variation, we find that people are fairly well-calibrated on average. The dashed line crosses the 45-degree line around the mean of

¹²See also Lichtenstein, Fischhoff, and Phillips (1982) and Burson, Larrick, and Klayman (2006).

the distribution, meaning that respondents, on average, are well calibrated (the average actual score is 4.07, and the perceived score is 4.00).

To get a better sense of the distribution of perceived scores, we plot the joint distribution of beliefs and actual scores in Figure 3. The graph shows a clear pattern in which those who score very low or very high display more confidence in their assessment of beliefs. If assessments across scores were similar, we would expect a ridge going from the lower left corner of the graph to the upper right. This is clearly not the case. The intermediate categories display much more uncertainty in the outcome than the extremes. Precision is a measure of this effect, and is 0.84 and 0.79 for those who scored 5 and 4, falling to 0.58 and 0.55 for those who scored 3 and 2. Our methodology can capture this feature of precision, which is different to that of overestimation across scores.

–Include Figure 3 about here–

The graph is helpful when interpreting many of our key results with respect to explaining retirement-, savings- and credit-behavior. When we control for the effect of actual score in the regressions and include our measure of beliefs, one can think of this as holding the vertical dimension constant in Figure 3, and investigating the separate effects of beliefs in the horizontal dimension.

3.2 The Demographics of Financial Literacy in LinkedIn

Table III reports financial literacy scores and beliefs by the demographic background of respondents. Overall, 75% of LinkedIn respondents answer the Big 3 questions correctly, compared with fewer than half in the NFCS. Only 37% of LinkedIn respondents get all 5 questions correct, but this almost twice the average that are reported in the NFCS. As the previous figures illustrate, the average respondent is well calibrated in their beliefs about financial literacy.

–Include Table III about here–

Table III shows pronounced differences in literacy and beliefs across different demographic categories. Men are more financially literate than women both in our sample and

in the NFCS; our data show that they have higher overestimation and are more confident about their scores than women. These results broadly confirm that of many other studies, such as Barber and Odean (2001).

Literacy is increasing in age, education and income. As in the NFCS, on average the youngest respondents are the least literate in our sample; however, the average literacy of 18-24 year olds in our sample is about five times higher than that found in the NFCS.

Differences between our data and the NFCS are less pronounced, but we still find that in every education category our respondents are more literate than those found in the NFCS. Similarly, our results are closest to the NFCS among the highest income earners and most educated. This suggests that an important component of the large average difference between our respondents and those found in other studies is attributable to the fact that the prototypical LinkedIn subscriber is a tech-savvy, white-collar working professional. It is equally important, however, to recognize that this demographic group may be more representative of the underlying financial knowledge on a consumption- or participation-weighted basis in the economy.

Table IV puts the results of the findings of the previous tables into a multivariate regression. As found in many previous studies, actual literacy score is positively related to age, income, education, but lower for women. We also find it reassuring that having a finance career is associated with higher financial literacy.

–Include Table IV about here–

Turning to the results of our measures of beliefs we find that women display significantly lower overestimation of their own scores, and they are more uncertain of their scores. These results echo those of Lusardi and Mitchell (2008), who argue that women display less self-confidence, measured as the propensity to report not knowing the answer, compared to men. High income individuals and those with finance careers are more likely to state high precision. The university educated display less overestimation of their own result. Even if the average score on the literacy questions are considerably higher than found in other studies, the cross-sectional variation stand well in compari-

son with the stylized facts of previous research in both financial literacy and behavioral finance.

3.3 *Literacy Scores, Beliefs, and Seniority*

Another way to understand the dispersion in financial literacy and beliefs in our data is to look at the result by job qualification. Table V reports demographic traits along with literacy measures broken out by self-described employment situation. We find a tilt towards respondents having more senior positions. Around one third of the respondents report having C-level jobs (CFO, CEO, and COO). On the other hand, we do find representation in a variety of jobs. There is, for instance, 286 students, 359 retirees, and 230 currently unemployed, 531 small business owners, and 454 self-employed.

–Include Table V about here–

Table V shows that both income and education (measured as the fraction of having at least a Bachelors degree), varies substantially across employment. We also find that age varies with seniority and score of the literacy test, where younger, and less senior respondents display lower scores. Executive level employees display the highest average literacy but also the highest degree of overestimation and confidence. Perhaps surprisingly, fewer than 60% of senior-level executives get all five questions correct. Similarly, self-employed individuals and small business owners report higher perceived than actual scores, and also indicate higher precision in their estimates compared to the average. This squares with the common perception that entrepreneurs are optimistic and overconfident across a wide variety of domains (see, for example, Puri and Robinson (2013)).

4 Connecting Beliefs, Literacy and Financial Engagement

This section connects real and perceived financial literacy to a range of activities that are broadly thought to reflect financial engagement. We begin by connecting literacy to savings, retirement planning and reading the fine print on credit cards because these are areas that have received attention in previous work. Then we explore the connection

between a broader but more direct measure of financial engagement, which is whether the respondent is responsible for financial decision-making in their household.

4.1 *Saving for a Rainy Day*

Table VI examines how real and perceived financial literacy is correlated with savings decisions. The omnibus questionnaire included a question “Have you set aside emergency or rainy day funds that would cover your expenses in the event of an emergency.” Potential answers are “Yes”, “No”, “Don’t Know” and “Prefer not to Say.” About 2/3 of respondents report “Yes” to this question, and only a handful prefer not to say.¹³ While these fractions are significantly higher than those reported in Lusardi, Schneider, and Tufano (2011), this difference presumably owes to the large differences in wealth between our sample and others. Fewer than half of the respondents in our sample reporting income below \$50,000 annually have saved, and only around 1/3 of those reporting annual income of \$35,000 respond affirmatively to this question.

Column (1) of Table VI reports results from a Probit model of saving on financial literacy and demographic controls. In keeping with prior literature, financial literacy is associated with increased savings, even controlling for wealth and other demographic controls. Point estimates in Table VI are reported as marginal effects, so the point estimate indicates that at the mean, getting an additional question correct is associated with about a 7% higher savings rate. On average, about 1/3 of respondents in the lowest literacy categories set aside funds for a rainy day, while about 2/3 do at the top end of the financial literacy distribution. In all specifications, older, wealthier respondents are more likely to have saved, as are more highly educated respondents, and respondents with careers in finance. Female gender is associated with lower savings rates in some specifications, but this result is sensitive to whether overestimation is included as an independent variable, suggesting that behavioral biases are an important channel through which women have

¹³Note, it may or may not be suboptimal from a utility maximization point of view to set aside funds for the future, especially for very low income individuals; we are not concerned with whether respondents are behaving optimally. Instead, we are simply concerned with whether they follow frequently prescribed financial advice.

lower financial participation.

We add our measure of overestimation to the specification in Column (2). When we include beliefs about financial literacy, we find that the effect of actual financial literacy is cut in half. Most of the correlation between savings and financial literacy works through beliefs about one's own literacy. Because the loading on perceived literacy is roughly twice that of actual literacy, Column (2) indicates that more miscalibrated respondents, not more literate ones, are more likely to have set aside funds for a rainy day.

We introduce precision in beliefs in Column (3). All told, these results indicate that much of the propensity to save for a rainy day is driven not by financial literacy itself, but by inaccurate self-perceptions of financial literacy. Those who are more miscalibrated are more likely to have set aside funds for a rainy day, and controlling for self-perceptions cuts the participation effect of financial literacy roughly in half.

In Columns (4)-(6) we repeat this analysis but focus attention to the set of respondents who got three or fewer questions correct—the low literacy sample. There are two reasons for analyzing this subsample: one policy oriented in nature, the other statistical in nature. On the policy front, low literacy respondents are presumably those who stand the most to gain by policies aimed at making financial markets friendlier for consumers. On the statistical front, the correlation between actual and perceived literacy is negative for the high literacy respondents because the score is bounded from above. Because this runs counter to the overall correlation in the data it potentially lowers the power of our tests.

When we focus attention on the low literacy sample, we see that the results from the previous table are even more pronounced. Among low literacy respondents, the probability of saving for a rainy day is about five percent higher per question, which is about 2/3 of the effect across the whole sample. Compared to the previous table, the statistical significance of this result disappears entirely in this sample when we include beliefs.

4.2 Planning for Retirement

One of the cornerstones of financial security is appropriate retirement planning. This has taken on increasing importance across the globe in the wake of many structural changes

that shift the responsibility of retirement planning to individuals through the transition from Defined Contribution to Defined Benefit plans. Across the globe, researchers have found a positive correlation between retirement planning and financial literacy.¹⁴ Lusardi and Mitchell (2007) show that individuals who have planned more for retirement arrive at retirement with higher net worth and savings.

To understand how literacy and retirement planning are correlated in our survey, we asked respondents, “Have you tried to figure out how much you need for retirement?” Possible answers are “Yes”, “No”, “Don’t Know”, or “Prefer not to say”. By framing the question in terms of figuring out retirement rather than actually saving for it, the question is intended to hone in on retirement awareness rather than previous retirement savings, and thereby avoids obvious correlation problems with age and income. Only about 3% of the sample is non-responsive, while about 85% of high literacy respondents and around 45% of low literacy respondents reported that they had tried to determine this amount.

Table VII presents the results, which echo the findings from previous subsections. In particular, the effect of actual financial literacy is essentially cut in half when we include perceived literacy, and the relative magnitude of the loadings indicates that more miscalibrated individuals, not more literate ones, are more likely to have computed retirement needs.

Specifically, in Column (1) we find that getting one additional question correct on the actual score raises the probability of answering yes to the retirement question by about 8%. Around 40% of low literacy respondents have done this calculation; close to 85% of high scoring respondents have. When we include the perceived score in Column (2) the loading on the actual score is cut essentially in half—from 8.4% to 4.7%—while the loading on the perceived score is over 7%. To gauge the economic significance of this effect, consider only those respondents with an actual score of 3 on the literacy test: only about 40% of those who thought they scored 2 or below had done retirement calculations, whereas 63% of those who thought they scored 4 or higher had done this calculation.

¹⁴Van Rooij, Lusardi, and Alessie (2012) show that financial literacy is related to retirement planning in a sample of Dutch households. Bucher-Koenen and Lusardi (2011) finds similar evidence in Germany.

Results from the low literacy sample in Columns (4)-(6) are in line with those of the broader sample. In general, introducing beliefs alongside actual literacy cuts the effect of financial literacy in half and weakens the statistical significance of actual financial literacy. It appears that much of the connection between literacy and retirement planning operates through the channel of perceived literacy.

4.3 Choosing Credit Cards Carefully

To measure sophistication in credit card choice, we asked respondents “Thinking about when you obtained your most recent credit card, did you obtain information about fees?” Respondents could answer “Yes”, “No”, “Don’t know”, “Prefer not to say”. Roughly 54% of high literacy respondents indicated they had paid attention to fees, whereas around 44% of low literacy respondents claimed they had paid attention to fees.

Table VIII examines the link between real and perceived financial literacy and sophistication in credit card choice. The columns in Table VIII follow exactly those of Table VI, beginning first with actual literacy and then introducing moments of the subject belief distribution.

Column (1) indicates an economically small, but statistically significant correlation between credit card sophistication and financial literacy. Demographic controls have low correlation with credit card sophistication. This effect disappears altogether when we include perceived score. Greater miscalibration in financial literacy increases the likelihood that respondents pay attention to the fine print on credit cards, but controlling for beliefs, respondents with higher actual literacy are no more likely than those with lower literacy to pay attention to credit card fees when making a choice. In view of the strategic obfuscation that is thought to be endemic in this market (see Carlin and Manso, 2009) this result is particularly alarming, because it suggests that those better equipped to digest the fine print in credit cards offers are not necessarily the ones attempting to do so.

When Precision is introduced in Column (3), it has an insignificant direct effect on credit card sophistication. Precision does not change the correlation between Perceived score and credit card sophistication in any material way either.

The economic and statistical magnitudes are similar when we examine the low literacy sample in Columns (4)-(6). The main difference is that among low literacy respondents, the connection between literacy and credit card fine print is weak to begin with. Comparing these results indicates that most of the statistical power associated with actual financial literacy comes from moving from the low literacy to the high literacy group. Even still, perceived literacy is highly correlated with credit card knowledge.

4.4 Who Makes Investment Decisions in the Household?

While the previous analysis connects literacy to financial engagement along dimensions that have been stressed in prior literature, there is no way of knowing whether the behaviors in question are actually optimal or desirable for respondents. Perhaps an individual does not pay attention to credit cards details because they know the card will seldom be used or will not carry an outstanding balance; saving for a rainy day may not be optimal for individuals with high, steady income who have access to abundant liquidity in case of hardship.

To deal with these possibilities we expand our measure of financial engagement. One of the simplest measures of financial engagement is whether someone is responsible for financial decisions in their home or whether instead this is delegated to someone else. We connect the degree of actual and perceived financial literacy to whether someone has sole or joint responsibility for financial investment decision-making in their household as a way of measuring engagement that is robust to the caveats laid out above. Our survey asks “Which of the following best describes your role in making financial investment decisions?” Answers are “I am the primary . . .”, “I share responsibility”, and “Someone else in the family makes financial investment decisions.”

These results are presented in Table IX. In the first three columns we model the probability that a respondent answers as either a sole or shared decision-maker. In Column (1) we include the actual financial literacy score along with demographic controls. Higher literacy respondents are more likely to have financial decision-making responsibility in their household. Older respondents, male respondents, respondents with college degrees,

and those who work in the finance profession are also more likely to have joint or sole responsibility.

–Include Table IX here–

Column (2) shows that the connection between actual literacy and household financial engagement loses statistical significance when we include our measure of perceived literacy. In a horse-race between actual and perceived literacy, perceptions of financial literacy drive out actual literacy. Put differently, the comparison of the two point estimates on actual and perceived literacy indicates that those who think they are more literate than they actually are are the respondents most likely to have responsibility for their home finances.

In Column (3) we include the precision of respondents beliefs as a control. It is uncorrelated with investment decision-making, but perceived literacy remains significant. This highlights the distinction between over-confidence and overestimation and illustrates the distinct role that they play in shaping decision making.

In columns (4)-(6) we focus on those who have sole responsibility for investment decision-making. This amplifies the basic message from the first half of the table. Actual financial literacy is a strong predictor of sole financial decision-making. Likewise, among LinkedIn users, women are highly unlikely to be sole investment decision-makers in the household. Income is negatively correlated with sole investment decision-making, which presumably reflects a combination of the fact that high-earning individuals have both significant time constraints and more complicated investment decisions.

Although the correlation between investment decision-making and literacy is higher when we focus on sole decision-making, the horse race between actual and perceived literacy still favors perception. Holding constant actual literacy, those who think they are more literate are much more likely to be decision-makers.¹⁵ Overall, the correlation between engagement and mistaken beliefs suggests that beliefs are an important mechanism through which engagement and actual literacy are correlated.

¹⁵As a robustness check, we repeat the analysis with fixed effects and time controls presented in Column 4 of Table XI. The results are virtually the same.

4.5 *From Beliefs to Miscalibration*

In the previous tables, the fact that the loading on perceived literacy was higher than the loading on actual literacy implies that overestimation drives participation. To see this more clearly, Table X restates and extends the previous results in a manner that more clearly demonstrates the role of overestimation in driving the results.

–Include Table X about here–

Table X contains a number of controls that affect the interpretation of the overestimation variable. First, we include fixed effects for actual literacy scores. This addresses the fact that perceived scores among those with perfect actual scores can only reflect underestimation, while perceived scores for those with zero scores can only reflect overestimation. Introducing a fixed effect for actual score changes the interpretation of the overestimation variable slightly, because it essentially asks how variation along the x-axis of Figure 3 drive financial participation. Even after controlling for actual literacy non-parametrically, we see that more miscalibrated people are more likely to be engaged in financial market decisions.

In addition, we also control for the time spent on completing the survey, as well as the controls that are reported in the previous tables. These results tell us that the degree of association between overestimation and financial participation is about the same economic magnitude as the direct association between literacy and participation in models that do not include beliefs.

5 Informed Choice and Financial Advice

The results so far indicate that while respondents are well calibrated on average, there is substantial cross-sectional variation in both real and perceived financial literacy, and that perceptions more than reality drive financial participation. In this section we ask whether these mistaken beliefs that seem so important for financial participation are likely to be good or bad for the people who harbor them.

In the second wave of data collection, we added a question to gauge whether respondents were aware of common advice about financial markets:

- *When selecting a mutual fund, it is generally more important to consider past performance of the fund than it is to consider the management charges. Please select one.*
 - (a) Agree [$n=1,415$]
 - (b) Disagree [$n=1,111$]
 - (c) Don't know [$n=812$]
 - (d) Prefer not to say [$n=83$]

The wording of this question closely mirrors the language that policymakers use in attempts to make investors aware of the implication of fees and how to invest wisely. For example, the U.S. Securities and Exchange Commissions website Investor.gov advises users to pay attention to fees using almost identical language.¹⁶ The correct answer to this question according to most sources is to focus on fees, not past performance. In fact, a larger number of respondents answer “Agree,” indicating that they think past performance is more important than management fees.

In Table XI we explore how the answers to this question relate to overestimation. Holding constant the actual literacy score with fixed effects for number correct, a one standard deviation spread in overestimation induces a 6% lower probability of responding that they do not know the answer to the question. Given that about 24% of the sample does not know the answer, this effect is large. Yet in Column (2) when we run a Probit that equals 1 if the respondent got the answer wrong, 0 otherwise, we find that more miscalibrated respondents are about 2% more likely to get the answer wrong. Thus, believing that one is more financially literate than they actually are is associated with more certainty but less accuracy about domains of financial literacy not captured by the Big 5.

To push this further, we make use of questions that measure willing to accept advice. Accessing and acting on financial advice has been shown to be one method by which financially literate households plan and prepare for future events like retirement (Lusardi and Mitchell, 2011). In particular, our survey included the question “How satisfied or dissatisfied would you be if financial planning advice or information were of-

¹⁶See <http://investor.gov/investing-basics/investment-products/mutual-funds#Fees>.

ferred to you (e.g. articles, videos, infographics) occasionally appeared in your LinkedIn news stream?" Responses included "Very satisfied", "Somewhat Satisfied", "Neither satisfied nor unsatisfied", "Somewhat dissatisfied", "Very dissatisfied", and "Don't know" or "Prefer not to say". Column (3) of Table XI tabulates the results from a Probit regression where the dependent variable takes the value one if the respondent reported being somewhat or very dissatisfied with receiving advice.

We find that respondents who overestimate their scores are more likely to avoid advice. This is a problematic finding from a policy perspective because prior work has demonstrated that more financially literate people are more likely to use advisors to help with financial planning tasks. This result seems to indicate that people who wrongly think they are literate are also less likely to use potentially beneficial advice channels. In conjunction with the mistaken beliefs about mutual funds, this suggests that mistaken beliefs about financial literacy can be as problematic as low literacy itself.

6 Summary and Conclusions

Financial literacy has been placed front and center in policy discussions attempting to reform retail financial markets in the wake of the financial crisis. A growing consensus suggests that Americans have low financial literacy, and that this in turn is associated with low levels of participation in the kinds of planning and savings decisions that are needed to build a sound financial future. We study these issues using a novel dataset of largely tech-savvy, white collar professionals who use the LinkedIn professional networking website.

We find that the link between financial literacy and financial participation hinges critically on self-perceptions. People who participate in many standard financial market decisions are those who *believe* they are financially informed, not necessarily those who *are* informed. Mistaken beliefs about financial literacy tend to drive financial participation as much as actual financial literacy. For some domains of financial engagement, beliefs drive out actual literacy entirely.

Thus, our results heap more trouble onto the plate of policy makers who are interested in improving literacy in order to improve financial engagement. Our findings indicate that mistaken beliefs about financial literacy may be as problematic as financial illiteracy itself. And this occurs in a sample where individuals score about twice as high in financial literacy on average than previous studies have found.

It is important to stress the descriptive nature of our findings. Our results do not show that mistaken beliefs cause engagement. Indeed, a fascinating possibility is that engagement causes mistaken beliefs. Under this explanation for the observed correlation between beliefs and engagement, small amounts of variation in the initial level of overconfidence or optimism could cause individuals to engage in financial decisions, and their engagement leads creates a type of learning by doing that in turn both imparts literacy to those who are engaged and magnifies their self-perceptions. Understanding how beliefs, literacy and engagement play out in a dynamic context over the life cycle is a fascinating and important area for future work.

These results shed light on why efforts to improve financial engagement by increasing financial literacy have faced challenges. Education and advice are two channels often proposed for increasing participation, and our results suggest that both must confront difficulties. Because beliefs are often more important predictors of engagement than actual literacy, educational treatments that may threaten perceived literacy even as they improve actual literacy may be counterproductive in terms of their impact on increasing engagement. At the same time, perceived literacy is associated with a broader reluctance to embrace advice, even as it increases engagement.

Our findings suggest that there is much more to be learned about household financial decision-making by the ongoing work that incorporates findings from behavioral psychology and economics into studies of household finance. Planning effectively for retirement requires making long-range planning decisions, which by their very nature, offer feedback at low frequencies. Understanding how behavioral biases affect these decisions is an important question for future research.

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Table I: The Big 5 Financial Literacy Questions

1. *Compounding.* Suppose you had \$100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow? Please select one.
 - More than \$102
 - Exactly \$102
 - Less than \$102
 - Don't know
 - Prefer not to say
2. *Inflation.* Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account? Please select one.
 - More than today
 - Exactly the same as today
 - Less than today
 - Don't know
 - Prefer not to say
3. *Diversification.* Buying a single company's stock usually provides a safer return than a stock mutual fund. Please select one.
 - True
 - False
 - Don't know
 - Prefer not to say
4. *Mortgage.* A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less. Please select one.
 - True
 - False
 - Don't know
 - Prefer not to say
5. *Bond Pricing.* If interest rates fall, what should happen to bond prices? Please select one.
 - They will rise
 - They will fall
 - They will stay the same
 - There is not relationship between bond prices and the interest rate
 - Don't know
 - Prefer not to say

Table II: The Demographics of LinkedIn Respondents

This table presents summary statistics on the demographics of survey respondents. Wave 1 corresponds to averages and sample proportions for the wave conducted in January, 2014. Wave 2 corresponds to the survey conducted in July, 2014. The column labeled "NFCS" corresponds to sample averages and proportions from 24,814 responses to the 2012 NFCS State-by-State Survey. The column labeled "U.S. Pop." reports corresponding values from the U.S. Census Bureau Income survey with 122,459 observations.

	Wave 1	Wave 2	Total	NFCS	U.S. Pop.
Gender					
Male	0.66	0.64	0.65	0.45	0.49
Female	0.34	0.36	0.35	0.55	0.51
Age					
18-24	0.07	0.06	0.06	0.10	0.05
25-34	0.18	0.18	0.18	0.17	0.16
35-44	0.18	0.20	0.19	0.17	0.18
45-54	0.26	0.23	0.24	0.20	0.20
55-64	0.21	0.23	0.22	0.19	0.19
65 or Older	0.09	0.10	0.10	0.17	0.22
Education					
Associates	0.03	0.03	0.03	-	0.10
Bachelors	0.32	0.32	0.32	0.21	0.19
Masters	0.33	0.34	0.33	0.13	0.08
Other	0.32	0.31	0.32	0.66	0.63
Income					
Less than 15K	0.03	0.02	0.02	0.13	0.14
15K-24K	0.03	0.02	0.02	0.12	0.12
25K-34K	0.03	0.03	0.03	0.11	0.11
35K-49K	0.07	0.07	0.07	0.15	0.14
50K-74K	0.14	0.13	0.13	0.19	0.18
75K-99K	0.13	0.14	0.14	0.12	0.12
100K-149K	0.20	0.21	0.20	0.11	0.12
More than 150K	0.23	0.24	0.24	0.07	0.09
Profession					
Finance	0.12	0.12	0.12	-	-
Entrepreneur	0.17	0.17	0.17	-	-

Table III: The Demographics of Financial Literacy

This table reports the proportion of the 5,814 respondents answering the financial literacy questions correctly broken out by the demographics reported in Table II. Columns labeled “LinkedIn” correspond to the sample proportions of each row correctly answering the “Big 3” (questions on compounding, inflation, and diversification); and “Big 5” (adds the questions on bond prices and mortgages). The corresponding results from the 2012 State-by-State NFCS are reported in the columns labeled “NFCS” based on 25,509 responses. The last three columns report the LinkedIn sample averages of Actual score, Perceived score, and Precision. Precision is calculated as $\sum_0^5(p_j)^2$, where j subscripts the number of correct answers. This measures how tightly the distribution of beliefs is centered around the modal response.

	Proportion Correct				Average Scores		
	Big 3		Big 5		Actual	Perceived	Precision
	LinkedIn	NFCS	LinkedIn	NFCS			
Overall	0.75	0.47	0.37	0.21	4.07	4.00	0.69
Gender							
Male	0.82	0.6	0.45	0.29	4.26	4.25	0.73
Female	0.61	0.36	0.24	0.15	3.73	3.53	0.61
Age							
18-24	0.61	0.16	0.22	0.04	3.64	3.41	0.50
25-34	0.7	0.30	0.30	0.1	3.89	3.73	0.60
35-44	0.73	0.44	0.34	0.17	4.01	3.92	0.67
45-54	0.77	0.5	0.39	0.23	4.14	4.06	0.71
55-64	0.81	0.53	0.46	0.24	4.26	4.24	0.76
65 or Older	0.79	0.59	0.46	0.32	4.22	4.32	0.81
Education							
Associates	0.67	-	0.26	-	3.76	3.73	0.66
Bachelors	0.76	0.54	0.38	0.26	4.09	3.98	0.67
Masters	0.79	0.68	0.44	0.37	4.19	4.08	0.69
Other	0.71	0.38	0.31	0.15	3.95	3.94	0.71
Income							
Less than 15K	0.52	0.18	0.18	0.06	3.44	3.28	0.53
15K-24K	0.51	0.26	0.17	0.07	3.42	3.32	0.57
25K-34K	0.57	0.32	0.18	0.11	3.52	3.34	0.59
35K-49K	0.56	0.39	0.23	0.13	3.65	3.56	0.59
50K-74K	0.69	0.46	0.27	0.2	3.88	3.77	0.64
75K-99K	0.75	0.55	0.33	0.27	4.05	3.91	0.68
100K-149K	0.80	0.62	0.39	0.32	4.18	4.12	0.71
More than 150K	0.86	0.70	0.52	0.41	4.39	4.32	0.75
Profession							
Finance	0.81	-	0.52	-	4.33	4.28	0.76
Entrepreneur	0.8	-	0.44	-	4.22	4.26	0.75

Table IV: Demographics, Financial Literacy, and Self-Assessed Measures of Performance

This table reports conditional correlations by OLS-regressions of the key variables of interest on demographic variables. Literacy records the number of “Big 5” questions answered correctly. Optimism is the difference between the respondent’s subjective mean score and their actual score. Precision is calculated as $\sum_0^5 (p_j)^2$, where j subscripts the number of correct answers. This measures how tightly the distribution of beliefs is centered around the modal response.

VARIABLES	(1) Actual Score	(2) Overestimation	(3) Precision
Age	0.011*** (0.001)	0.005*** (0.001)	0.005*** (0.000)
Female	-0.473*** (0.026)	-0.183*** (0.026)	-0.096*** (0.007)
ln(Income)	0.097*** (0.010)	-0.022** (0.010)	0.010*** (0.003)
Finance Career	0.251*** (0.034)	0.025 (0.033)	0.077*** (0.010)
Degree	0.293*** (0.026)	-0.052** (0.026)	0.021*** (0.007)
Entrepreneur	0.082*** (0.030)	0.081*** (0.030)	0.025*** (0.009)
Constant	3.077*** (0.070)	-0.112* (0.068)	0.408*** (0.019)
Observations	5,814	5,814	5,814
R-squared	0.137	0.021	0.125

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table V: Financial Literacy and Employment Experience

This table presents summary statistics of key variables based on the self-reported employment status of survey respondents. Income is reported in thousands and is based on taking the midpoints of the ranges listed in Table II. Perceived literacy is the expected number of correct answers on the literacy test, where subjective probability weights are used to compute the expectation: formally, this is $\sum_0^5 I_j p_j$, where I_j is an indicator associated with getting $j \in [0, 5]$ correct answers on the test. Precision ranges from 0 to 1 and is computed as the sum of the squared probability weights assigned to each potential number of correct answers, or $\sum_0^5 p_j^2$.

	N	Age	Female	Income	Degree	% Big 5	Literacy Score		
							Actual	Perceived	Precision
Student	286	24.99	0.48	62.59	0.79	0.22	3.65	3.40	0.50
Individual contributor	757	38.49	0.49	79.40	0.70	0.26	3.84	3.65	0.60
Senior individual contributor	853	44.14	0.32	106.46	0.69	0.37	4.13	4.04	0.69
Manager or equivalent	769	43.61	0.36	106.47	0.64	0.35	4.02	3.95	0.67
Senior Manager or equivalent	366	46.77	0.27	126.57	0.65	0.39	4.15	4.02	0.69
Director or equivalent	420	46.35	0.38	149.77	0.72	0.43	4.19	4.08	0.71
Dept. Head, VP or Equiv	323	48.67	0.26	167.42	0.75	0.48	4.30	4.26	0.74
Pres., Man. Dir., or Equiv	158	55.39	0.22	204.62	0.64	0.47	4.29	4.37	0.80
C-Level Exec. or Equiv	115	51.19	0.17	228.54	0.76	0.59	4.44	4.36	0.80
Small Business Owner	531	52.21	0.25	155.61	0.60	0.48	4.33	4.36	0.76
Self-employed	454	53.00	0.39	93.70	0.61	0.40	4.09	4.14	0.73
I am retired	359	67.01	0.21	82.76	0.40	0.42	4.17	4.26	0.80
Other	193	46.64	0.56	80.72	0.52	0.27	3.66	3.55	0.64
I am not currently employed	230	44.91	0.45	65.86	0.67	0.32	3.84	3.78	0.66
Total	5814	46.37	0.35	113.21	0.65	0.37	4.07	4.00	0.69

Table VI: Savings and Financial Literacy

This table presents Probit regressions modeling the probability that the respondent answered “Yes” to the question, “Have you set aside emergency or rainy day funds that would cover your expenses in the event ...”. Independent variables are defined in Table II. Point estimates are reported as marginal probabilities. Columns (1) through (3) report results from the whole sample; Columns (4) through (6) from the low-literacy subsample, excluding those with scores higher than 3.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Actual Score	0.081*** (0.007)	0.039*** (0.008)	0.041*** (0.008)	0.048** (0.022)	0.029 (0.024)	0.033 (0.024)
Perceived Score		0.081*** (0.008)	0.068*** (0.009)		0.037** (0.014)	0.033** (0.015)
Precision			0.092*** (0.027)			0.078 (0.052)
Age	0.007*** (0.000)	0.006*** (0.000)	0.006*** (0.001)	0.007*** (0.001)	0.007*** (0.001)	0.006*** (0.001)
Female	-0.052*** (0.014)	-0.019 (0.014)	-0.018 (0.014)	-0.063** (0.030)	-0.047 (0.030)	-0.048 (0.030)
ln(Income)	0.031*** (0.005)	0.030*** (0.005)	0.030*** (0.005)	0.047*** (0.014)	0.048*** (0.014)	0.048*** (0.014)
Finance Career	0.063*** (0.019)	0.053*** (0.019)	0.049** (0.019)	0.021 (0.053)	0.017 (0.053)	0.015 (0.053)
Degree	0.083*** (0.014)	0.076*** (0.014)	0.076*** (0.014)	0.106*** (0.031)	0.104*** (0.031)	0.106*** (0.031)
Entrepreneur	-0.030* (0.018)	-0.042** (0.018)	-0.043** (0.018)	-0.016 (0.044)	-0.020 (0.044)	-0.020 (0.044)
Observations	5,814	5,814	5,814	1,249	1,249	1,249
Pseudo R ²	0.0760	0.0905	0.0920	0.0470	0.0508	0.0520

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table VII: Retirement and Financial Literacy

This table presents Probit regressions modeling the probability that the respondent answered “Yes” to the question, “Have you ever tried to figure out how much you need to save for your retirement?” Independent variables are defined in Table II. Point estimates are reported as marginal probabilities. Columns (1) through (3) report results from the whole sample; Columns (4) through (6) from the low-literacy subsample, excluding those with scores higher than 3.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Actual Score	0.085*** (0.006)	0.046*** (0.008)	0.047*** (0.008)	0.083*** (0.022)	0.049** (0.024)	0.050** (0.024)
Perceived Score		0.073*** (0.007)	0.068*** (0.008)		0.065*** (0.015)	0.064*** (0.015)
Precision			0.035 (0.025)			0.008 (0.053)
Age	0.006*** (0.000)	0.005*** (0.000)	0.005*** (0.000)	0.008*** (0.001)	0.008*** (0.001)	0.008*** (0.001)
Female	-0.013 (0.013)	0.017 (0.013)	0.018 (0.013)	-0.010 (0.030)	0.018 (0.030)	0.018 (0.030)
ln(Income)	0.034*** (0.005)	0.033*** (0.005)	0.033*** (0.005)	0.055*** (0.013)	0.057*** (0.014)	0.057*** (0.014)
Finance Career	0.060*** (0.017)	0.051*** (0.017)	0.050*** (0.017)	0.121** (0.052)	0.116** (0.052)	0.115** (0.052)
Degree	0.059*** (0.013)	0.052*** (0.013)	0.053*** (0.013)	0.044 (0.031)	0.041 (0.031)	0.041 (0.031)
Entrepreneur	0.011 (0.016)	0.001 (0.017)	0.000 (0.017)	0.007 (0.044)	-0.001 (0.044)	-0.001 (0.044)
Observations	5,814	5,814	5,814	1,249	1,249	1,249
Pseudo R ²	0.0903	0.106	0.107	0.0672	0.0789	0.0790

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table VIII: Credit Cards and Financial Literacy

This table presents Probit regressions modeling the probability that the respondent answered “Yes” to the question, “Thinking about when you obtained your last credit card, did you collect information on fees?” Independent variables are defined in Table II. Point estimates are reported as marginal probabilities. Columns (1) through (3) report results from the whole sample; Columns (4) through (6) from the low-literacy subsample, excluding those with scores higher than 3.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Actual Score	0.033*** (0.008)	0.012 (0.009)	0.013 (0.009)	0.035 (0.022)	0.012 (0.023)	0.013 (0.023)
Perceived Score		0.039*** (0.008)	0.037*** (0.009)		0.044*** (0.014)	0.043*** (0.015)
Precision			0.009 (0.029)			0.018 (0.052)
Age	-0.003*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)	-0.002* (0.001)	-0.003** (0.001)	-0.003** (0.001)
Female	-0.034** (0.014)	-0.019 (0.015)	-0.019 (0.015)	-0.019 (0.029)	-0.000 (0.030)	-0.000 (0.030)
ln(Income)	0.009 (0.006)	0.008 (0.006)	0.008 (0.006)	0.038*** (0.013)	0.039*** (0.013)	0.039*** (0.013)
Finance Career	0.003 (0.020)	-0.003 (0.020)	-0.003 (0.020)	0.019 (0.053)	0.013 (0.054)	0.013 (0.054)
Degree	-0.013 (0.014)	-0.016 (0.014)	-0.016 (0.014)	0.027 (0.030)	0.024 (0.030)	0.025 (0.030)
Entrepreneur	0.006 (0.018)	0.001 (0.018)	0.001 (0.018)	0.055 (0.043)	0.049 (0.044)	0.050 (0.044)
Observations	5,814	5,814	5,814	1,249	1,249	1,249
Pseudo R ²	0.00867	0.0113	0.0114	0.0103	0.0157	0.0158

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table IX: Who Makes Financial Decisions?

This table reports Probit analysis of a dummy variable for whether the respondent has sole or joint responsibility for financial investment decision-making in their household. The question asks "Which of the following best describes your role in making financial investment decisions?" Answers are "I am the primary . . .", "I share responsibility", and "Someone else in the family makes financial investment decisions." Point estimates are reported as marginal probabilities.

VARIABLES	(1) Joint/Sole	(2) Joint/Sole	(3) Joint/Sole	(4) Sole Only	(5) Sole Only	(6) Sole Only
Actual Score	0.009*** (0.003)	0.003 (0.004)	0.003 (0.004)	0.044*** (0.010)	0.014 (0.011)	0.015 (0.011)
Perceived Score		0.010*** (0.004)	0.009** (0.004)		0.058*** (0.011)	0.049*** (0.012)
Precision			0.011 (0.012)			0.056 (0.037)
Age	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)	0.000 (0.001)	-0.000 (0.001)	-0.001 (0.001)
Female	-0.051*** (0.009)	-0.045*** (0.009)	-0.045*** (0.009)	-0.109*** (0.019)	-0.087*** (0.019)	-0.087*** (0.019)
ln(Income)	0.001 (0.003)	0.001 (0.003)	0.001 (0.003)	-0.030*** (0.008)	-0.032*** (0.008)	-0.032*** (0.008)
Finance Career	0.017** (0.008)	0.017** (0.008)	0.016** (0.008)	0.097*** (0.025)	0.092*** (0.025)	0.090*** (0.025)
Degree	0.016** (0.008)	0.015** (0.008)	0.015* (0.007)	0.014 (0.019)	0.008 (0.019)	0.008 (0.019)
Entrepreneur	0.002 (0.010)	0.000 (0.010)	0.000 (0.010)	-0.013 (0.023)	-0.021 (0.024)	-0.021 (0.024)
Observations	3,421	3,421	3,421	3,421	3,421	3,421
Pseudo R ²	0.122	0.128	0.128	0.0217	0.0280	0.0285

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table X: Optimism and Financial Engagement

This table reports point estimates for Optimism, defined as the difference between Actual and Perceived score. In Columns (1) through (3) the dependent variable and controls corresponds to that of three measures of engagement: Saver, Retire, Credit from Tables VI through VIII. The estimates include fixed effects for Actual score and Seniority (as categorized in Table V), and a control for the survey response time measured in (log of) seconds. Point estimates are reported as marginal probabilities.

VARIABLES	(1) Saver	(2) Retire	(3) Credit	(4) Sole Only
Overestimation	0.079*** (0.008)	0.072*** (0.007)	0.039*** (0.008)	0.056*** (0.011)
Observations	5,814	5,814	5,814	3,421
Demographic controls	Yes	Yes	Yes	Yes
Survey time controls	Yes	Yes	Yes	Yes
Seniority fixed effects	Yes	Yes	Yes	Yes
Literacy fixed effects	Yes	Yes	Yes	Yes
Pseudo R ²	0.0989	0.117	0.0178	0.0431

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table XI: Optimism, Financial Knowledge, and Advice

This table presents Probit regressions of corresponding to the question “When considering mutual funds, it is more important to pay attention to past performance than to consider the management fees.” The first column model the probability that the respondent answered “Don’t know”, and the second column models the propensity to respond with the wrong answer. In Column (3), the dependent variable takes the value one if the respondent answered favorably to the question, “How satisfied or dissatisfied would you be if financial planning advice or information were offered to you ...”; zero otherwise. In Column (4), the dependent variable is Sole Only corresponding to IX, indicating whether the respondent has sole responsibility for financial investment decision-making in their household. Demographic controls include those in Tables VI through VIII, but includes fixed effects for Actual score and Seniority (as categorized in Table V), and a control for the survey response time measured in (log of) seconds. Point estimates are reported as marginal probabilities.

VARIABLES	(1) Don’t know	(2) Wrong answer	(3) No Advice
Overestimation	-0.0628*** (0.008)	0.0225** (0.011)	0.0176*** (0.006)
Observations	3,421	3,421	5,814
Demographic controls	Yes	Yes	Yes
Survey time controls	Yes	Yes	Yes
Seniority fixed effects	Yes	Yes	Yes
Literacy fixed effects	Yes	Yes	Yes
Pseudo R ²	0.173	0.0290	0.0297

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Figure 1: Questionnaire

This picture displays an actual screenshot of the question where probabilities are solicited from respondents with respect to how they think they scored. The distributions of beliefs are used to construct measures of Optimism and Precision.



51%

For the previous five multiple choice questions, you could have answered between zero and five correctly. We would like to know how many you think you got correct. Please assign a probability for each possible outcome below.

Enter whole numbers and total should add to 100.

	Total
Probability that I have all five correct	<input type="text" value="0"/> %
Probability that I have exactly four correct	<input type="text" value="0"/> %
Probability that I have exactly three correct	<input type="text" value="0"/> %
Probability that I have exactly two correct	<input type="text" value="0"/> %
Probability that I have exactly one correct	<input type="text" value="0"/> %
Probability that I have no correct answers	<input type="text" value="0"/> %
Don't know	<input type="checkbox"/>
Prefer not to answer	<input type="checkbox"/>
	Total: 0%

[Continue »](#)

Figure 2: Actual vs. Perceived Scores

This figure shows the number of respondents sorted on Actual score (bars, right scale), together with average own estimated correct score, labelled Perceived score, traced by the solid line (left scale). The dotted 45-degree line indicates a perfect match between Actual and Perceived score.

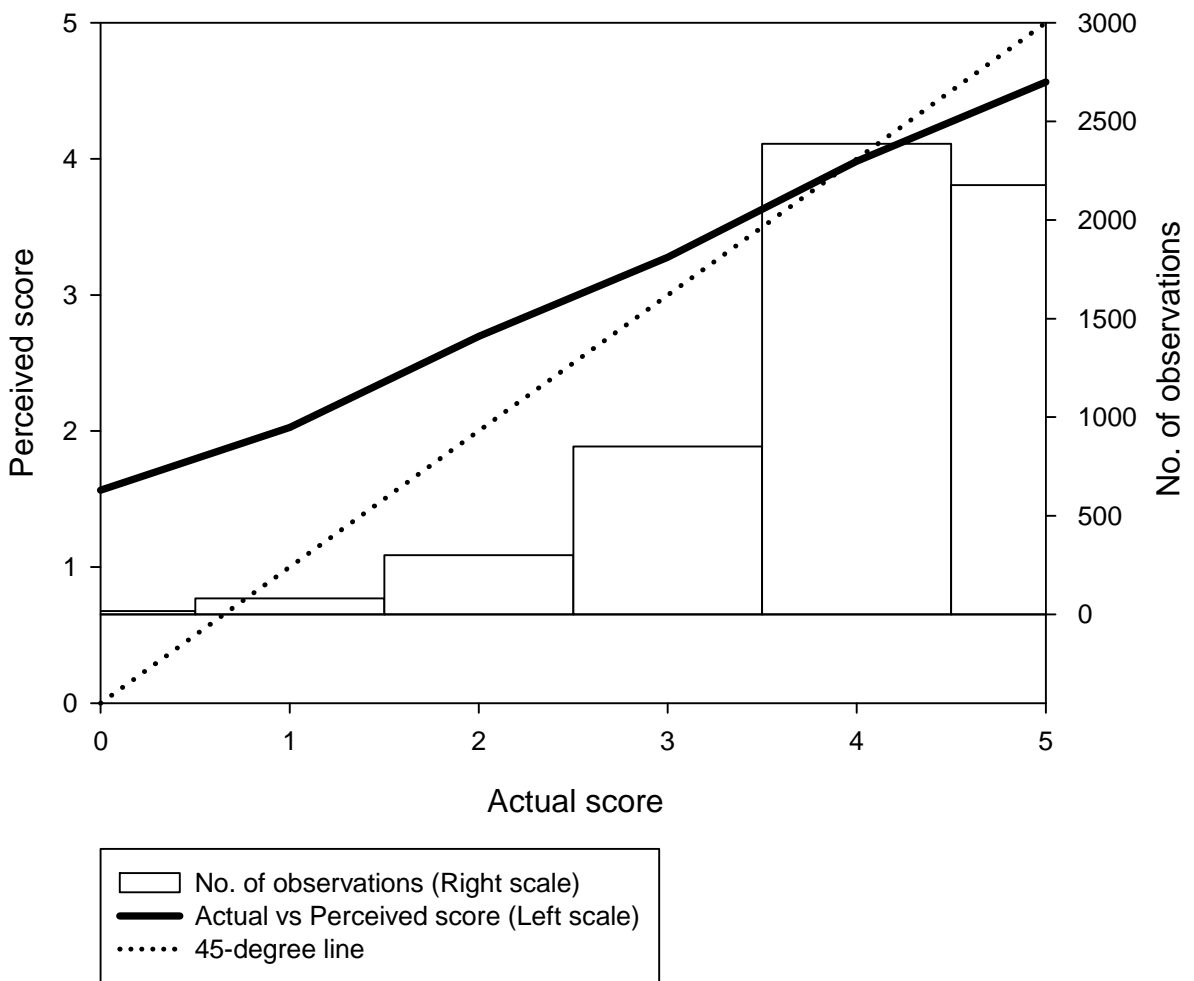
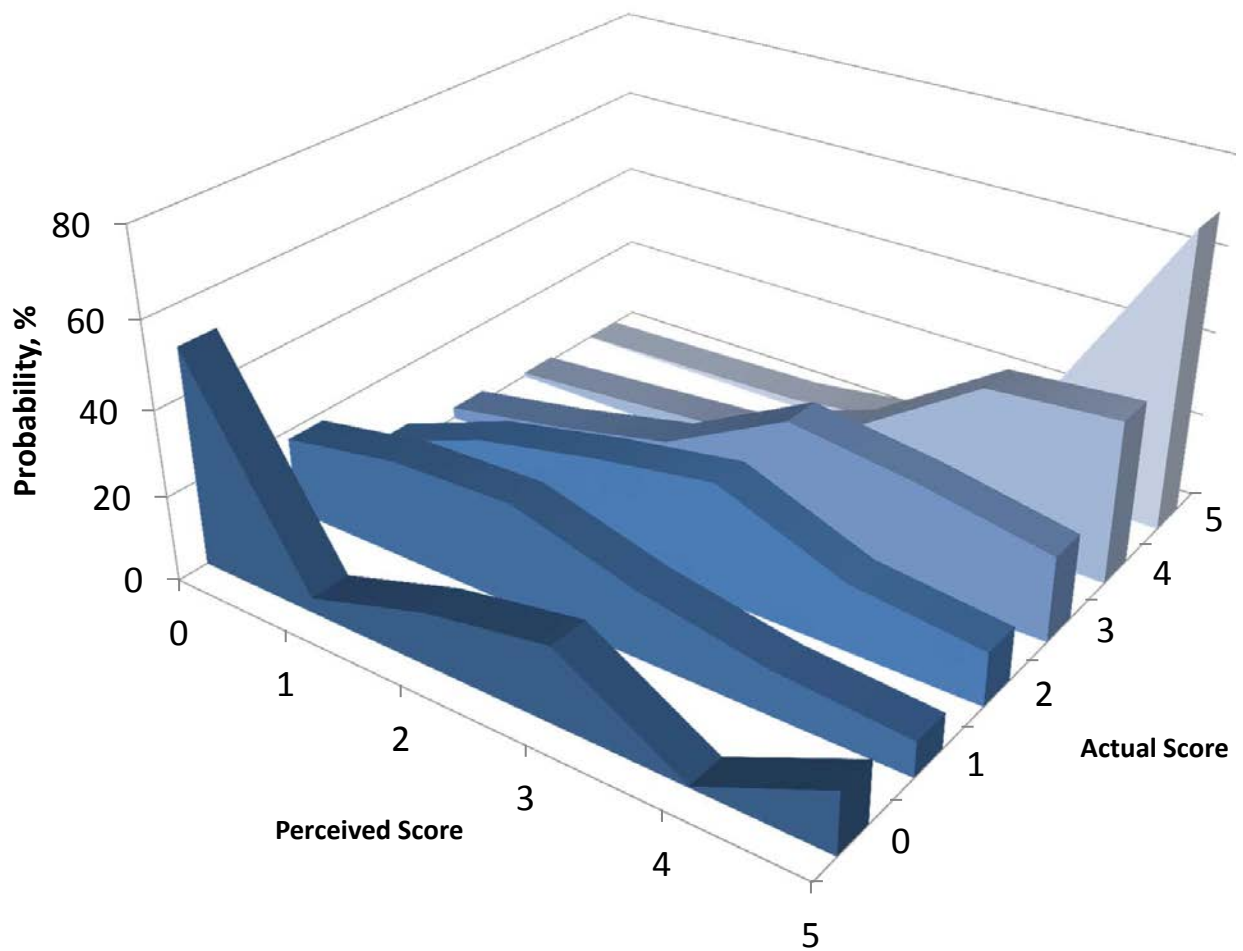


Figure 3: Distribution of Beliefs Across Scores

This graph plots average reported probabilities, sorted on actual score. The distributions of beliefs are used to construct measures of Optimism (using the average) and Precision (using the dispersion).



A Internet Appendix

1.1 Responses To The Big 5 Financial Questions

- **Compounding:** Suppose you had \$100 in a savings account and the interest rate was 2% per year. At the end of two years, you'd have

Answers	Wave 1	Wave 2	Total	Freq
More than \$102	2,244	3,183	5,427	93%
Exactly \$102	44	72	116	2%
Less than \$102	69	101	170	3%
Don't know	34	53	87	2%
Prefer not to say	2	12	14	0%

- **Inflation:** You have money in a savings account earning 1% interest. The inflation rate is 2%. At the end of one year, the money in the account will buy you

Answers	Wave 1	Wave 2	Total	Freq
More than today	81	102	183	3%
Exactly the same	70	115	185	3%
Less than today	2,161	3,049	5,210	90%
Don't know	73	145	218	4%
Prefer not to say	8	10	18	0%

- **Diversification:** A single stock generally offers a safer return than a mutual fund

Answers	Wave 1	Wave 2	Total	Freq
True	41	73	114	2%
False	2,079	2,855	4,934	85%
Don't know	257	472	729	13%
Prefer not to say	16	21	37	0%

- **Mortgage:** With a 15-yr mortgage, you typically face higher monthly payments than with a 30-yr mortgage, but the total lifetime interest payments are lower:

Answers	Wave 1	Wave 2	Total	Freq
True	2,257	3,196	5,453	94%
False	85	154	239	4%
Don't Know	47	65	112	2%
Prefer not to say	4	6	10	0%

- **Bond Prices:** If interest rates fall, what will happen to bond prices?

Answers	Wave 1	Wave 2	Total	Freq
They will rise	1,111	1,537	2,648	46%
They will fall	529	710	1,239	21%
They will stay the same	79	132	211	4%
There is no relationship between ...	167	252	419	7%
Don't know	492	770	1,262	22%
Prefer not to say	15	20	35	0%

1.2 Comparison with the NFCS

Table XII: Data Comparison

This table presents the fraction of correct answers to each of the five literacy questions in the survey along with the results from three other studies. The 2012 National Financial Capability Study (NFCS) conducted via Internet on a random sample of individuals in the U.S., the 2010 U.S. Health and Retirement Study (HRS), and the 2009 SAVE+ study conducted in Germany. The fraction of respondents who had all correct answers to the first three and all five questions are reported separately, where applicable. Sample description denote from which pool subjects were drawn, where "RS" denotes random sample.

Question	This study			NFCS	HRS	SAVE+
	Wave I	Wave II	Total	2012	2010	2009
1. Compounding	94%	93%	93%	75%	69%	82%
2. Inflation	90%	89%	90%	61%	81%	78%
3. Diversification	87%	83%	48%	63%	53%	62%
4. Mortgage	94%	93%	94%	75%	n/a	n/a
5. Bond Prices	46%	45%	46%	28%	n/a	n/a
Sample description		LinkedIn		RS	Age+50	RS
All 1-3 correct	77%	74%	75%	47%	42%	53%
All 1-5 correct	39%	37%	37%	21%	n/a	n/a
Observations	2,393	3,421	5,814	25,509	1,269	1,059

Table XIII: Financial Literacy Test Score and Self-Assessed Financial Knowledge in the 2012 NFCS Panel

This table presents Probit regressions modeling the probability that the respondent answered Yes to three questions of financial engagement in the 2012 NFCS Study: "Rainy Day": "Have you set aside emergency or rainy day funds that would cover your expenses in the event ..."; "Retirement": "Have you ever tried to figure out how much you need to save for your retirement?"; and "Fine Print": "Thinking about when you obtained your last credit card, did you collect information on fees?" Actual Score represents the number of correct answers to the financial literacy test (0 to 5), S-R Knowledge denote the self-reported level of general financial knowledge from the survey on a scale from 1 (Very low) to 7 (Very high), "Age" and "Income" are scalars from 1 to 7 that assign respondents into age and income brackets. "Female" and "College Edu." takes the value of one for female and college educated respondents, and zero otherwise. Regressions are specified with fixed effects for U.S. State responses. There are 25,509 respondents in the original panel, of which 24,814 reported self-assessed financial knowledge. Point estimates are reported as marginal probabilities with p-values reported below in parentheses.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Rainy Day	Rainy Day	Rainy Day	Retirement	Retirement	Retirement	Fine Print	Fine Print	Fine Print
Actual Score		0.0305*** (0.003)	0.0217*** (0.003)		0.0426*** (0.002)	0.0378*** (0.003)		0.0284*** (0.002)	0.0233*** (0.002)
S-A Knowledge			0.0813*** (0.003)			0.0439*** (0.003)			0.0461*** (0.002)
Females	-0.0470*** (0.007)	-0.0319*** (0.007)	-0.0216*** (0.007)	-0.0273*** (0.006)	-0.0063 (0.006)	0.0002 (0.006)	-0.0532*** (0.006)	-0.0394*** (0.006)	-0.0327*** (0.006)
Age	0.0480*** (0.002)	0.0419*** (0.002)	0.0376*** (0.002)	-0.0358*** (0.002)	-0.0447*** (0.002)	-0.0475*** (0.002)	-0.0175*** (0.002)	-0.0233*** (0.002)	-0.0260*** (0.002)
Income	0.0864*** (0.002)	0.0812*** (0.002)	0.0753*** (0.002)	0.0657*** (0.002)	0.0587*** (0.002)	0.0548*** (0.002)	0.0389*** (0.001)	0.0340*** (0.001)	0.0298*** (0.001)
College Edu.	0.0612*** (0.008)	0.0453*** (0.008)	0.0364*** (0.008)	0.1023*** (0.007)	0.0820*** (0.007)	0.0771*** (0.007)	0.0702*** (0.006)	0.0566*** (0.006)	0.0516*** (0.006)
Observations	24,814	24,814	24,814	24,814	24,814	24,814	24,814	24,814	24,814
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R ²	0.133	0.137	0.160	0.0888	0.0983	0.107	0.0510	0.0569	0.0705

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1