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Abstract

In this paper we report on several new self-assessed and objective measures of financial literacy obtained using the American Life Panel (ALP); we also link these performance measures to efforts consumer make to plan for retirement. We evaluate the causal relationship between financial literacy and retirement planning by exploiting information about respondents' financial knowledge acquired in school - before entering the labor market and certainly before starting to plan for retirement. We show that those with more advanced financial knowledge are those more likely to be retirement-ready.

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> There can hardly be a better time to make the case for economic and financial literacy. ..[A] better-educated citizenry can not only contribute to a better functioning economy, but also to a more-effective government... That's the promise of economic education. [1]

Ordinary consumers must make extraordinarily complex financial decisions on a daily basis, yet there is now growing evidence that consumers are rather poorly informed when they make many consequential economic choices. [2] Prior surveys reveal that financial illiteracy is widespread among the US population:[3] only half of Americans age 50+ can correctly answer two simple questions about compound interest and inflation; fewer still additionally get right another question on risk diversification.[4] There is also evidence that the least literate are also the least likely to plan and save for retirement (Lusardi and Mitchell, 2006, 2007a, 2008).

This paper delves further into the questions of who is financially literate, whether people accurately perceive their own economic decision-making skills, and where these skills come from. To this end, we have designed and implemented a new set of questions on both financial literacy and retirement planning for respondents to the American Life Panel (ALP), where we are able to measure financial literacy in a more sophisticated manner than heretofore feasible. This dataset also permits us to link these improved objective measures with respondents' self-assessed financial knowledge levels, to compare what people know with what they think they know. And

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[1] Speech by Federal Reserve Board Governor Frederic S. Mishkin at the Third National Summit on Economic and Financial Literacy, Washington, D.C. February 27, 2008 "The Importance of Economic Education and Financial Literacy."

[2] See Campbell (2006), Bucks and Pence (2008), Moore (2003), Gustman, Steinmeier and Tabatabai (2009), and the discussion in Lusardi (2008).

[3] See Bernheim (1995, 1998), Hilgerth, Hogarth and Beverly (2003), the National Council for Economic Education (2005), Mandell (2009), the OECD Report on Financial Literacy (2005) and Lusardi and Mitchell (2007b).

most importantly, we seek to identify the causal links between financial literacy and retirement planning by exploiting information about respondents' financial knowledge acquired in school - before entering the labor market and certainly before starting to plan for retirement.

Our results show that consumers have difficulty doing basic financial calculations, and they are also lacking fundamental financial market concepts such as risk diversification, how the stock market works, and asset pricing. We also find that people who report a higher level of knowledge of economics tend to score relatively well on the objective measures we gather. And finally, we show that financial literacy contributes importantly to retirement readiness, after correcting for potential endogeneity biases.

Background

Households are increasingly being asked to taken on the responsibility for their own retirement wellbeing; as one example, the shift from defined benefit to defined contribution pensions means that employees must now decide not only how much to save and contribute to their pension plans, but also how to invest their pension assets. Yet few consumers even know what kind or pension they have, and fewer still attempt to calculate how much they need to save for retirement.[5] This is important as retirement planning is a very strong predictor of wealth; those who fail to undertake any retirement planning calculations reach retirement age in much worse shape financially than those who do (Lusardi and Mitchell, 2006, 2007a).

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[4] Lusardi and Mitchell (2006, 2007a).

[5] Studies finding little pension knowledge include Gustman and Steinmeier (2004), Gustman, Steinmeier and Tabatabai (2009) and Mitchell (1988). Researchers reporting low levels of retirement planning including Ameriks et al. (2003), Hurst (2006), Lusardi (1999, 2002, 2003, 2008), Lusardi and Beeler (2007), Lusardi and Mitchell (2006, 2007a,b), and Yakoboski and Dickemper (1997).

Three questions have by now become standard in assessing economic literacy, implemented in the 2004 Health and Retirement Study (HRS).[6] We refer to these here as "basic literacy" questions, and they are as follows:

- 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: more than $102, exactly $102, less than $102?
- Imagine that the interest rate on your savings account was 1% per year and inflation was 2% 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?
- Do you think that the following statement is true or false? "Buying a single company stock usually provides a safer return than a stock mutual fund."

The first two items indicate whether respondents are aware of compound interest and inflation, fundamental concepts required for making saving and investment decisions. The third evaluates respondents' knowledge of risk diversification, also crucial for making informed investment decisions.

In a nationally representative sample of Americans over the age of 50 surveyed by the HRS, we found strikingly low performance on these basic financial literacy questions (Lusardi and Mitchell 2006). For instance, one-third responded incorrectly to the first question. The accuracy rate for the second question was higher (75% correct), only slightly over half (56%) got both answers correct, indicating a very poor level of basic knowledge in this older population. Moreover, only half (52%) of the respondents knew the answer to the stock diversification question, and one-third (34%) could not provide an answer. This is critical since correct responses to these simple questions are strongly associated with successful retirement planning: those who cannot do a simple interest calculation or compound interest are also much less likely to calculate how much they need to save for retirement (Lusardi and Mitchell, 2006, 2008).

[6] These questions have been added to the National Longitudinal Survey of Youth, the Dutch Household Survey, the German SAVE, the Italian Survey of Household Income and Wealth, a survey of pension funds in Mexico, and a

Several research questions remain outstanding which we address below. We believe it imperative to expand the range of measures of financial literacy, so as to better evaluate the types of problems that people find most difficult. It is also of interest to determine whether people are aware of their areas of weakness. And finally, much prior research including all our own work with the HRS focused only on those in the 50+ age group; in what follows we expand our purview to the entire population.

Data and Methodology

The Rand American Life Panel (ALP) is an Internet-based survey of respondents age 18+ recruited by the University of Michigan's Survey Research Center.[7] Using the internet to collect data is desirable in that it permits respondents to read questions on the screen and reflect upon them before responding. Moreover, this approach to data collections permits the researcher to alter how questions are framed, which helps assess whether and how people understand the questions they are posed.

The ALP survey collects many socioeconomic variables (age, sex, marital status, race and ethnicity, income). In addition we have devised a set of financial literacy and planning questions for this population aimed at households in their prime earning years, as we seek to assess the information sets available to them when they make some of these critical financial decisions. Specifically we seek to differentiate levels of financial knowledge and also collect information

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survey of entrepreneurs in Sri Lanka.

[7] This sample was recruited from former participants in the Survey of Consumer Attitudes used to generate Michigan's Index of Consumer Expectations. Before 12/06, respondents were required to be age 40 + at the time of the survey interview. The initial sample had relatively high education and income; this paper uses sample weights to make the respondents representative of the U.S. population. ALP participants use their own computers or a Web TV to log on to the Internet monthly where they are asked to complete an on-line survey lasting no more than half an hour at a time. For more information see www.rand.org/labor/roybalfd/american_life.html.

on both objective and subjective measures of literacy. Most importantly, we have variables that can help assess the effects of literacy on behavior.

We use two sets of questions to test for economic knowledge. The first set follows the HRS approach which captures peoples' capacity to handle *basic financial literacy* concepts including compound interest, inflation, and time discounting. The second set is intended to capture *sophisticated financial literacy*; here we seek to measure more advanced financial knowledge such as the risk/return difference between stocks and bonds, how the stock market and risk diversification work, and the relationship between bond prices and interest rates.

The precise wording of the five *basic* financial literacy questions we ask in the ALP is as follows:

Basic Financial Literacy Questions

1. Numeracy

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? (i) More than $102; (ii) Exactly $102; (iii) Less than $102; (iv) Do not know (DK); (v) Refuse.

2. Compound Interest

Suppose you had $100 in a savings account and the interest rate is 20% per year and you never withdraw money or interest payments. After 5 years, how much would you have on this account in total? (i) More than $200; (ii) Exactly $200; (iii) Less than $200; (iv) DK; (v) Refuse.

3. 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? (i) More than today; (ii) Exactly the same; (iii) Less than today; (iv) DK; (v) Refuse.

4. Time Value of Money

Assume a friend inherits $10,000 today and his sibling inherits $10,000 3 years from now. Who is richer because of the inheritance? (i) My friend; (ii) His sibling; (iii) They are equally rich; (iv) DK; (v) Refuse.

5. Inflation/Money Illusion

Suppose that in the year 2010, your income has doubled and prices of all goods have doubled too. In 2010, how much will you be able to buy with your income? (i) More than today; (ii) The same; (iii) Less than today; (iv) DK; (v) Refuse.

In addition, competent planning for retirement and investing of retirement assets requires several additional financial concepts, including an understanding of the risk/return relationship, risk diversification, and how stocks and bonds work. To quantify how sophisticated people are in this realm, we devised eight additional questions following van Rooij, Lusardi and Alessie (2007). The exact wording of these *sophisticated* questions is as follows:

Sophisticated Financial Literacy Questions

1. Stock Market Functioning:
Which of the following statements describes the main function of the stock market? (i) The stock market helps to predict stock earnings; (ii) The stock market results in an increase in the price of stocks; (iii) The stock market brings people who want to buy stocks together with those who want to sell stocks; (iv) None of the above; (v) DK; (vi) Refuse.

2. Knowledge of Mutual Funds
Which of the following statements is correct? (i) Once one invests in a mutual fund, one cannot withdraw the money in the first year; (ii) Mutual funds can invest in several assets, for example invest in both stocks and bonds; (iii) Mutual funds pay a guaranteed rate of return which depends on their past performance; (iv) None of the above; (v) DK; (vi) Refuse.

3. Interest Rate/Bond Prices Link
If the interest rate falls, what should happen to bond prices? (i) Rise; (ii) Fall; (iii) Stay the same; (iv) None of the above; (v) DK; (vi) Refuse.

4. Safer: Company Stock or Mutual Fund
True or false? Buying a company stock usually provides a safer return than a stock mutual fund. (i) True; (ii) False; (iii) DK; (iv) Refuse.

5. Riskier: Stocks or Bonds
True or false? Stocks are normally riskier than bonds. (i) True; (ii) False; (iii) KD; (iv) Refuse.

6. Long Period Returns
Considering a long time period (for example 10 or 20 years), which asset normally gives the highest return? (i) Savings accounts; (ii) Bonds; or (iii) Stocks; (iv) DK; (vi) Refuse.

7. Highest Fluctuation/volatility
Normally, which asset displays the highest fluctuations over time? (i) Savings accounts, (ii) Bonds, (iii) Stocks; (iv) DK; (v) Refuse.

8. Risk Diversification
When an investor spreads his money among different assets, does the risk of losing money: (i) Increase, (ii) Decrease (iii) Stay the same; (iv) DK; (v) Refuse.

To further assess whether respondents actually understand the questions posed (versus simply guessing), we take advantage of the internet format to randomly reverse the question wording order for three questions: Q5, the rather simple question about risk differences between

bonds and stocks; Q4, the more difficult question about risk diversification; and Q3, the most difficult question about the link between bond prices and interest rates. Specifically, these word reversals are as reported below:

Randomization of Word Order for Three Sophisticated Financial Literacy Questions

Q5. True or false?
(a) Stocks are normally riskier than bonds.
(b) Bonds are normally riskier than stocks.
Q4. True or false?
(a) Buying a company stock usually provides a safer return than a stock mutual fund.
(b) Buying a stock mutual fund usually provides a safer return than a company stock.
Q3. Rise/fall/stay the same/none of the above?
(a) If the interest rate falls, what should happen to bond prices?
(b) If the interest rate rises, what should happen to bond prices?

In addition to these factual questions, we also ask respondents the following summary self-assessment: *On a scale from 1 to 7, where 1 means very low and 7 means very high, how would you assess your understanding of economics?* This is intended to reflect peoples' confidence about the factual questions above, as well as what people believe they know about other financial concepts and financial instruments (e.g. mortgages, credit cards, etc.).

A very crucial question that immediately comes to mind is what might explain peoples' different levels of financial literacy. To glean a better understanding of how people might acquire financial literacy capital, we explore two possible sources of exposure to financial education during peoples' adolescence, namely their exposure in school, and in the work-place. Accordingly we ask respondents about their youthful exposure to financial training that would have occurred well before they entered the job market and begun planning for retirement with the following query: *How much of your school's education (high school, college or higher degrees) was devoted to economics? A lot, some, little, or hardly at all?* Similarly, we ask respondents about their exposure to financial education in the workplace: *Did any of the firms you worked for offer financial education programs, for example retirement seminars? i)Yes, ii)*

No, iii) Not applicable. As we show below, this enhanced set of questions provides new information over prior financial literacy surveys.

Does Financial Literacy Matter?

As mentioned earlier, one of the difficulties of assessing the effects of financial literacy on behavior is that financial literacy may itself the result of choice. Moreover, there are several channels through which literacy might affect a key outcome such as retirement saving. Rather than examining the effects of literacy on wealth or portfolio choice directly, in what follows we focus on one specific but very important determinant of saving, namely retirement planning. The prediction is that people who are more literate are more efficient at devising retirement plans; in turn, lower planning costs enhance the likelihood of people planning for retirement.

We get at the retirement planning concept devised for the HRS which has proven to be one of the strongest predictor of wealth (Lusardi 1999, 2003; Lusardi and Mitchell 2007a; Lusardi and Beeler 2007). The wording is as follows: *How much have you thought about retirement? A lot, some, little, or hardly at all?* A few papers have assessed the multivariate relationships between planning and financial literacy (Lusardi and Mitchell, 2006, 2007a and 2008), but they have not devised a successful instrumental variable approach to establishing causality. In what follows, we use a more exogenous source of variation with regard to financial literacy than has been attempted in previous work.

Empirical Results

Our evidence on basic and sophisticated literacy measures appears in Tables 1 and 2. For the empirical analysis we have 989 observations taken from the ALP; summary statistics appear

in Appendix Table 1. The average respondent age is 45; furthermore, 60% of respondents are married, 48% are male, 29% of the sample has a high school or lower degree, and 16% are fully retired.[8]

It will be recalled that the basic financial literacy questions are intended to measure simple concepts crucial for everyday financial transactions and decisionmaking. Table 1 reports response patterns by question (Panel; A), for a total basic financial literacy score which sums correct answers, (Panel B), and by respondent socioeconomic characteristics (Panel C). The results show that ALP respondents can do simple calculations regarding interest rates and they also understand the effects of inflation. Yet almost a quarter of respondents cannot give the right answer to the compound interest question and the query regarding the time value of money.[9] Similarly, a sizable fraction of respondents suffers from money illusion. Moreover, even though respondents can respond to individual questions accurately, fewer than half (47%) of the respondents can correctly answer all five questions (Panel B). In other words, in the ALP survey, knowledge of basic financial concepts is far from widespread.

Panel C offers insight into which financial literacy patterns vary by age, educational attainment, and sex. Respondents age 50+ are consistently better informed, although the age differences are often not statistically significant. Differences in financial literacy by education are more striking: those with less than college are much more likely to respond incorrectly and especially to questions on compound interest, the time value of money, and inflation. It is also clear that women exhibit much lower levels of financial literacy than men, where sex differences

[8] A handful of observations with missing data on the demographic variables are deleted along with a few cases of multiple responses.
[9] Difficulties with interest compounding are similarly documented in other papers (Lusardi and Mitchell, 2007a; van Rooij, Lusardi and Alessie 2007; and Lusardi and Tufano, 2008).

are statistically significant for all but the money illusion question. These findings are similar to those in the older sample of the HRS (Lusardi and Mitchell, 2006, 2008).

Responses to the new, more sophisticated financial literacy questions are summarized in Table 2. Panel A shows that most respondents (over three-quarters) do get most of the answers right, so they have some knowledge of how the stock market and risk diversification work. They are also more likely to be knowledgeable about fluctuations in assets than about patterns of asset returns. But the question linking bond prices and interest rates proves very difficult: only one-third knows about this relationship. There is also a wide range of incorrect and don't know (DK) responses, with the DK's ranging from 6 to 25% depending on the question. Also of interest is the fact in Panel B that only 16% of respondents can answer all eight of these sophisticated questions accurately, confirming that sophisticated financial literacy is not widespread. More detail on who can accurately answer the questions appears by socioeconomic group in Panel C. As with the basic literacy questions, younger respondents are less well informed than their older counterparts: for instance, 60% of the younger people versus 69% percent of the older ones know about mutual funds. The younger group is also 20 percentage points less likely to correctly judge that own company stock is riskier than an equity mutual fund. Once again, the better educated respondents are more knowledgeable than their less educated counterparts, with those having at least some college having much more accurate views of what the stock market does and the long run expected return advantage for stocks. Sex differences are marked, in that women know substantially less than men with regard to the stock market, risk, and bond returns versus stocks, risk diversification, and basic asset pricing.[10]

[10] See also Lusardi and Mitchell (2008) for a discussion of financial literacy among women. Moreover, see Lusardi and Tufano (2008) for evidence of lower "debt literacy" among women.

To establish whether respondents fully grasp the questions we are asking, we invert the order of three questions to evaluate this possibility; results appear in Table 3. Responses to Q5 regarding the risk of bonds versus stocks are unaffected by which asset appears first in the question. This is an important result that shows that respondents generally understand the meaning of this question and hence are unlikely to be guessing in their responses. By contrast, we see a different pattern for Q4, the more difficult query about company stock versus stock mutual funds. We previously piloted this wording in the 2004 HRS where it was asked over the telephone; in that instance, almost half of the older HRS respondents could not answer correctly or stated they did not know the answer. In the ALP, it is interesting that 74% percent of the respondents get the answer right when the question is structured so that the correct answer is *True*, but only 68% get it right when the correct answer is *False*. Thus there is confusion among respondents about this question. Answers to Q3 which is again a complex question about bond pricing, are again affected by the wording: 46% get the answer wrong when the question asks what happens when interest rates fall, while 41% get it wrong when the interest rate is stipulated to rise. What this shows is that financial knowledge is likely measured with error and accordingly, empirical analysis of such patterns must take this into account. Below we deal with this issue in more detail.

To differentiate respondents' levels of financial knowledge, we next undertake factor analysis to construct a financial literacy index with the rich information obtained about basic and sophisticated financial literacy. Our initial analysis of the complete set of 13 questions pointed to two main factors with different loading on the *basic* versus the *sophisticated* literacy questions. Therefore we performed a separate factor analysis on the two types of queries separately which

permits us to construct two literacy indices: one related to basic knowledge, and a second measuring more advanced concepts.[11]

To show that these indices measure economic knowledge, Table 4 reports the relationship between these more objective literacy measures and the respondent's subjective indicator of financial knowledge in which people self-report their own understanding of economics on a scale from 1 to 7. We note that this question was located at the beginning of the literacy module, before any of the basic and advanced financial literacy questions were posed, so respondents' views were not contaminated by the literacy questions. It is interesting that most respondents assess their economic knowledge as being above average: that is 269 (out of 989) respondents grade themselves as a 4 out of 7; 343 assign themselves a level of 5; and 165 report their level is 6 (and 44 report their knowledge of economics is very high or 7 out of 7). Most importantly, there is a very strong correlation between objective and subjective literacy. That is, the majority of respondents who report they know a lot about economics (self-reporting a score of 6 or 7) also fall in the top two quartiles of the basic literacy index. The relationship becomes even stronger when we consider the advanced literacy index, where more than 50% of respondents who report low levels of economic knowledge (scoring 1, 2 or 3) fall in the lowest quartile of the literacy index, whereas the majority of those with high knowledge fall in the top two quartiles of the literacy index. In sum, while there is some noise and measurement error affecting these indices, they clearly provide useful information about economic knowledge.

Next we seek to explore how knowledge is formed or developed by seeing how basic and sophisticated literacy compares between those who have and have not been exposed to financial literacy in high school and at work. As Tables 4.3 and 4.4 indicate, those exposed to financial education earlier in life have high levels of financial literacy during adulthood. Exposure to

[11] Additional information regarding the factor analysis appears in Appendix A.

economics in school makes respondents more likely to locate to the top quartiles of sophisticated financial literacy. Similarly those exposed to financial education in the work-place are also more likely to fall in higher quartiles of the financial literacy index (Tables 4.5 and 4.6).

Financial Literacy and Retirement Planning

Ultimately we seek to answer not only whether respondents are financially literate but also whether financial literacy matters in financial decision-making. To this end, we next assess whether literacy influences retirement planning which has previously been found to be a powerful determinant of wealth (Lusardi and Mitchell 2007a). Retirement planning is readily assessed by asking how much respondent have thought about retirement; results by socioeconomic characteristic appear in Table 5. It is interesting that most ALP respondents (68%) report that they have thought some or a lot about retirement, and that older, better educated, and male respondents are more likely to be planners. These are also the characteristics of people who have a higher level of financial knowledge.

Next we turn to a multivariate analysis where we link retirement planning to financial literacy, holding constant other socioeconomic factors. Our objective is to assess whether financial literacy has an effect on planning, above and beyond the traditional determinants of planning considered in life-cycle models of saving such as age, sex, and marital status. For instance, young respondents may not plan for retirement as they face too much uncertainty about their future. We also control on labor force status, education, and income, to account for differences in economic circumstances.

Two models appear in Table 6. The first is an ordinary linear multivariate regression (OLS; column 1). Here we see that financial knowledge is indeed influential in retirement

planning, even after controlling for a range of socioeconomic factors. In other words, our index of financial literacy still has its own independent effect, above and beyond other determinants of planning. Even more telling is that sophisticated financial knowledge is the most important factor, while basic literacy is not statistically significant. We also note that both literacy and formal education are important: thus having an advanced degree boosts the probability of retirement planning even after controlling on literacy. This confirms HRS results in models which use a similar planning measure but include only the basic financial literacy questions (Lusardi and Mitchell, 2006).[12]

The second column in Table 6 is offered to explore the question of whether financial literacy is itself endogenous. That is, if those who attempted to plan for retirement became more financially knowledgeable, then planning could be said to influence financial literacy rather than the reverse. To evaluate this possibility, we have devised a more exogenous source of variation in financial literacy as an instrument. Specifically, we note that, over the last several decades, several US states have mandated high school financial education (mostly due to political rationales rather than to stimulate retirement planning; see Bernheim, Garrett, and Maki 2001). Since the ALP reports the state in which respondents were born, we assume that they remained in their natal states until age 17 so we can infer whether the state in which the respondent lived at that time had mandated financial education.

Our model also adds additional interactions, to take into account nonlinear exposure to this financial literacy training. For instance exposure to such programs could contribute to the accumulation of knowledge later in life, so we interact the term with age to discern whether the effect grows over the life cycle. To evaluate sex differences, we interact this indicator with sex to

[12] We are aware that, to the extent our literacy questions are noisy measures, the OLS estimates may suffer from attenuation bias and therefore underestimate the full effects of financial literacy.

see whether mandating high school financial education has a differential impact between men and women. Finally, we interact the indicator with educational expenses per pupil when the respondent was age 17, to account for the fact that some schools, while mandating financial education, may not have increased their budget to accommodate this new program. These additional variables are in keeping with Card and Krueger (1992) and Burtless (1996), who show that individuals who lived in states where higher amounts of resources were devoted to education do have better outcomes (for example, higher rates of return to education) later in life.

To focus attention on the sophisticated literacy measures developed for this paper, the instrumental variables (IV) estimation is performed on the advanced literacy index only. The results appear in Table 6 where we see that the instruments are statistically significant both individual and jointly. The estimates show that the impact of the financial literacy index in the planning equation is positive, statistically significant, and larger than the OLS estimate. Consequently we conclude that financial literacy does strongly influence retirement planning, and that good instruments are needed to disentangle the causal relationships of interest between consumer financial decisionmaking and the building of financial human capital.

Alternative Empirical Specifications and Robustness Checks

We have also explored alternative specifications to help assess the robustness of our findings. For instance, as we noted earlier, there appears to be some measurement error in the answers provided to the sophisticated financial literacy questions, since responses to the questions where wording was randomized suggest some evidence of guessing. Accordingly, Panel A of Table 8 excludes from the literacy index the three questions that we randomized to help examine the sensitivity of our estimates to the type of questions included in the literacy

index. In particular, these results exclude the most difficult question about bond pricing, which means that the new financial literacy index is restricted to simpler knowledge levels. This alternative index of financial literacy is again positive and statistically significant.

Two additional robustness checks split the sample by age and retirement status, in order to focus attention on younger respondents who are likely to be most actively planning ahead for retirement. Accordingly, Panel B excludes those older than 62 and Panel C excludes respondents who report themselves as fully retired. Restricting the sample to the younger age group may permit the instruments to have stronger predictive power, since economic training acquired in high school may become obsolete over time. In any event, the importance of financial literacy remains strong in these alternative specifications, and the magnitudes of the IV coefficient estimate remain positive and statistically significant as before. In sum, we conclude that more financially knowledgeable younger and non-retired respondents are also more likely to plan for retirement.

Additional Checks: Financial Education in the Workplace

Financial education provided in high school surely trains many young people in financial decisionmaking facts and skills, but employers have also started to offer retirement seminars and financial education programs in the workplace (Berhneim and Garrett, 2003). This movement is attributable, in part, to the spread of defined contribution retirement plans where many plan sponsors acknowledge the need to provide financial education. Such initiatives represent an important source of information and a way to improve financial knowledge in the future, particularly for those who were not exposed to economics in school.

To develop some information about this alternative path to financial literacy, we have therefore also included in the ALP survey a question about whether respondents' employers offered financial education programs. Note that we explicitly ask whether the employee's firm *offered* a financial education program\, rather than whether a respondent ever *attended* a workplace-based financial education program, because the latter is likely to be endogenous. (The employer's decision to offer financial education programs might also be endogenous but some prior studies find that these programs are usually offered when workers save too little rather than too much; see Bernheim and Garrett, 2001; Bayer, Bernheim, and Scholz, 1996). In such a case workers are unlikely to be retirement planners, so using this variable would tend to understate the effect of financial literacy on planning. It is worth noting that, even when respondents do not attend firm-provided retirement seminars, they could be influenced by peer group effects (Duflo and Saez 2004).

Table 9 summarizes results when we replace the high school financial planning mandate with the indicator for company-based financial education programs, as the instrument for financial literacy. As shown in Table 10, this variable is strongly related to financial literacy, particularly advanced literacy. The IV estimates using this alternative instrument underscores that improved financial literacy due to employers' financial education programs does lead workers to plan more for their retirement. In sum, we can be confident that the positive, large, and statistically significant impact of financial literacy on retirement planning holds across a wide variety of samples and identification strategies.

Conclusion and Discussion

Policymakers are beginning to acknowledge the central importance of financial literacy for a well-functioning economy: for instance Federal Reserve Board Vice Chairman Ferguson recently noted that "when millions of educated consumers make good personal financial choices, our economy is strengthened in fundamental ways.[13] Nowehere is this more true than in the retirement preparedness arena. Yet planning for retirement is a complex undertaking, requiring the consumer to gather, process, and project data on compound interest, risk diversification, and inflation, and other assumptions about future asset market performance. This paper contributes to the literature on what consumers know and how their financial literacy capital drives their retirement planning and saving patterns.

Our research using the ALP extends prior analysis using the HRS by Lusardi and Mitchell (2006, 2007a) inasmuch as this earlier work used much simpler financial literacy questions. By contrast, here we can explore several more dimensions of the financial literacy picture. Furthermore, we create a financial literacy index and correct for possible endogeneity using some sensible instruments. By every measure, and in every sample we have examined, we conclude that financial literacy is a key determinant of retirement planning. We also find that respondent literacy is higher when consumers have been exposed to economics in school and in employer-sponsored programs.[14]

This research should be of interest to educators and employers seeking to enhance efforts to plan and save for retirement, as well as researchers interested in exploring financial literacy further. In the future, it will be critical to ask specific questions about financial knowledge as outlined here, since education, income, and age are correlated with but do not adequately capture

[13] Remarks by Federal Reserve Board Vice Chairman Roger W. Ferguson, Jr. before the National Council on Economic Education, Washington, D.C. May 13, 2002. "Reflections on Financial Literacy."
[14] Our work this extends the findings derived using more specialized samples by Bernheim, Garrett and Maki (2001) and Bernheim and Garrett (2003).

all the dimensions of respondents' financial literacy human capital. Additionally, the fact that we find more financially literate adults are also more likely to plan for retirement complements work by other analysts seeking to link financial sophistication and decisionmaking. For instance, some evidence points to the fact that financially unsophisticated households tend to avoid the stock market (van Rooij, Lusardi and Alessie, 2007; Kimball and Shumway, 2006; Christelis, Jappelli and Padula, 2006), and are less likely to choose mutual funds with lower fees (Hastings and Tejeda-Ashton, 2008). The financially unsophisticated are also less likely to refinance their mortgages in a propitious environment (Campbell, 2006), and they select less advantageous mortgages in the first place (Moore, 2003). People who cannot correctly calculate interest rates given a stream of payments tend to borrow more and accumulate less wealth (Stango and Zinman, 2008). Now our results show that the financially illiterate do not plan for retirement either.

We are cognizant of the fact that promoting financial literacy is a difficult and likely costly task, and more research is required to determine when and how to most efficiently build financial literacy. It is also clear that it is necessary to enhance financial knowledge if consumers are to do a better job navigating the complexities of the modern financial environment. Indeed very young adults receive multiple credit cards, they may take out loans, and they can readily purchase assets ranging from mutual funds to stocks and tax-favored plans such as IRAs and 401(k)s. As a result, saving for retirement is becoming more challenging but also more critical for younger consumers, requiring ever-greater levels of financial sophistication. It is thus urgent to develop, evaluate, and target effective programs to those who can put this necessary financial knowledge to work.

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Table 1. Descriptive Results for Basic Financial Literacy Questions (% of respondents)

A. Percent Correct by Basic Literacy Question

	Numeracy	*Compound Interest*	*Inflation*	*Time value of money*	*Money illusion*
Correct	91.8%	69.0%	87.1%	73.8%	78.4%
Incorrect	6.8%	29.1%	8.8%	19.6%	20.3%
DK	1.0%	1.9%	4.1%	6.6%	1.2%
Refusal	0.4%	0.0%	0.1%	0.0%	0.1%

B. Percent Correct: Summary of Responses to All Basic Literacy Questions (5 questions total)

	Number of Correct, Incorrect and DK answers						
	None	One	Two	Three	Four	All Five	Mean
Correct	1.8%	1.2%	7.3%	18.2%	27.7%	43.8%	4.0
Incorrect	47.5%	28.5%	18.1%	4.2%	1.0%	0.6%	0.8
DK	87.5%	10.9%	1.0%	0.7%	0.0%	0.0%	0.1
Refusal	99.5%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0

C. Percent Correct by Basic Literacy Question and Socioeconomic Characteristic

	Numeracy	*Compound Interest*	*Inflation*	*Time value of money*	*Money illusion*
Age > 50 (N=546)					
Correct	92.9%	74.2%	91.2%	75.8%	78.2%
Incorrect	6.5%	23.6%	5.4%	20.3%	20.3%
DK	0.6%	2.2%	3.3%	3.8%	1.3%
Refusal	0.0%	0.0%	0.2%	0.1%	0.2%
Age<=50 (N=443)					
Correct	91.3%	66.2%	84.9%	72.7%	78.5%
Incorrect	6.9%	32.1%	10.6%	19.2%	20.3%
DK	1.2%	1.7%	4.6%	8.1%	1.2%
Refusal	0.6%	0.0%	0.0%	0.0%	0.0%
Education College+ (N=526)					
Correct	96.8%	77.5%	90.7%	78.8%	84.0%
Incorrect	3.0%	22.1%	8.0%	12.4%	14.3%
DK	0.2%	0.4%	1.1%	8.7%	1.6%
Refusal	0.0%	0.0%	0.1%	0.1%	0.1%
Education LT College (N=463)					
Correct	87.8%	62.0%	84.0%	69.7%	73.7%
Incorrect	9.9%	34.9%	9.4%	25.5%	25.3%
DK	1.6%	3.1%	6.6%	4.8%	1.0%
Refusal	0.7%	0.0%	0.0%	0.0%	0.0%
Male (N=444)					
Correct	95.2%	81.3%	91.0%	85.8%	79.0%
Incorrect	3.7%	17.4%	5.8%	9.7%	20.0%
DK	0.2%	1.3%	3.1%	4.5%	0.9%
Refusal	0.8%	0.0%	0.1%	0.0%	0.1%
Female (N=545)					
Correct	88.8%	57.9%	83.5%	63.0%	77.9%
Incorrect	9.5%	39.8%	11.4%	28.5%	20.5%
DK	1.7%	2.3%	5.0%	8.5%	1.5%
Refusal	0.0%	0.0%	0.0%	0.0%	0.0%

Note: Nobs=989; weighted sample.

Table 2. Descriptive Results for Sophisticated Financial Literacy Questions (% of respondents)

A. Percent Correct by Basic Literacy Question

	Correct	*Incorrect*	*DK*	*Refusal*
Q1. Main function of the stock market	71.5%	20.2%	8.3%	0.0%
Q2. Knowledge of mutual fund.	63.0%	13.6%	23.3%	0.0%
Q3. Relation between interest rate and bond prices[b]	31.6%	43.8%	24.5%	0.1%
Q4. What is safer: company stock vs stock mutual fund[b]	71.4%	4.0%	24.5%	0.0%
Q5. Which is riskier: stocks vs bonds[b]	80.2%	5.4%	14.4%	0.1%
Q6. Highest return over long period: savings accounts, bonds or stocks	62.3%	27.5%	10.1%	0.1%
Q7. Highest fluctuations: savings accounts, bonds, stocks	88.3%	4.5%	7.1%	0.0%
Q8. Risk diversification	74.9%	18.4%	6.7%	0.1%

B. Percent Correct: Summary of Responses to Sophisticated Literacy Questions (8 questions total)

	Number of Correct, Incorrect and DK answers									
	None	One	Two	Three	Four	Five	Six	Seven	All 8	*Mean*
Correct	0.6%	3.0%	6.2%	11.0%	10.2%	15.4%	14.6%	22.6%	16.5%	5.4
Incorrect	30.2%	33.0%	18.1%	10.7%	5.2%	1.7%	1.2%	0.0%	0.0%	1.4
DK	50.0%	18.5%	12.3%	9.1%	6.1%	2.0%	0.4%	1.2%	0.4%	1.2
Refusal	99.8%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0

C. Percent Correct by Sophisticated Literacy Question and Socioeconomic Characteristic

	Q1	*Q2*	*Q3*	*Q4*	*Q5*	*Q6*	*Q7*	*Q8*
Age > 50 (N=546)								
Correct	74.0%	68.6%	31.8%	84.0%	79.9%	61.5%	87.8%	79.3%
Incorrect	17.4%	13.4%	47.2%	2.5%	6.3%	27.3%	3.7%	14.9%
DK	8.5%	17.9%	20.8%	13.4%	13.5%	11.0%	8.4%	5.7%
Refusal	0.1%	0.1%	0.2%	0.1%	0.3%	0.2%	0.1%	0.1%
Age < 50 (N=443)								
Correct	70.2%	60.0%	31.5%	64.7%	80.3%	62.8%	88.5%	72.5%
Incorrect	21.7%	13.7%	42.1%	4.8%	4.9%	27.6%	5.0%	20.3%
DK	8.1%	26.3%	26.5%	30.5%	14.8%	9.6%	6.5%	7.2%
Refusal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
Education College+ (N=526)								
Correct	80.4%	76.0%	44.4%	81.1%	88.4%	76.3%	94.5%	85.7%
Incorrect	16.6%	8.9%	31.0%	2.9%	3.9%	15.4%	2.4%	12.3%
DK	2.9%	15.0%	24.4%	15.9%	7.6%	8.2%	3.0%	2.0%
Refusal	0.1%	0.1%	0.2%	0.1%	0.1%	0.1%	0.1%	0.1%
Education <College (N=463)								
Correct	64.2%	52.2%	20.9%	63.4%	73.4%	50.7%	83.1%	65.9%
Incorrect	23.1%	17.5%	54.5%	4.9%	6.6%	37.6%	6.3%	23.5%
DK	12.7%	30.3%	24.6%	31.7%	20.0%	11.7%	10.5%	10.6%
Refusal	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	0.1%
Male (N=444)								
Correct	79.7%	76.0%	45.4%	83.1%	82.3%	78.5%	90.9%	81.3%
Incorrect	17.1%	10.0%	41.2%	2.9%	6.2%	17.1%	4.9%	15.1%
DK	3.1%	13.9%	13.3%	13.9%	11.4%	4.3%	4.2%	3.4%
Refusal	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Female (N=545)								
Correct	64.1%	51.2%	19.1%	60.9%	78.2%	47.7%	85.9%	69.0%
Incorrect	22.9%	16.9%	46.3%	4.9%	4.7%	37.0%	4.2%	21.4%
DK	12.9%	31.9%	34.7%	34.2%	17.0%	15.4%	9.9%	9.6%
Refusal	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%

Note: Nobs=989; weighted sample.

Table 3. Percent Correct for Specific Sophisticated Literacy Questions: Impact of Reverse Wording

	Correct	*Incorrect*	*DK*	*Refusal*
Q5:				
Stocks are normally riskier than *bonds*. True or false? (N=489)	80.00%	8.00%	11.90%	0.10%
Bonds are normally riskier than *stocks*. True or false? (N=500)	80.30%	2.10%	17.50%	0.10%
Pearson chi2(3) =21.1499 (p =.00009799)				
Q4:				
Buying a *company stock* usually provides a safer return than a *stock mutual fund*. True or false? (N=497)	68.40%	5.00%	26.50%	0.10%
Buying a *stock mutual fund* usually provides a safer return than a *company stock*. True or false? (N=492)	74.50%	2.90%	22.60%	0.00%
Pearson chi2(3) = 5.9377 (p =.11468091)				
Q3:				
If the interest rate *falls*, what should happen to bond prices: rise/fall/stay the same/none of the above? (N=491)	30.80%	46.30%	23.00%	0.00%
If the interest rate *rises*, what should happen to bond prices: rise/fall/stay the same/none of the above? (N=498)	32.40%	41.40%	26.10%	0.10%
Pearson chi2(3) = 3.1983 (p =.36205004)				

Table 4.1 Basic Financial Literacy Index Compared to Self-assessed Financial Literacy (row percentages shown)

	Literacy Index Quartiles (%)			
Self-assessed literacy	*1 (Low)*	*2*	*3 & 4 (top)*	*N*
1 (very low)	67.2%	9.3%	23.5%	10
2	65.3%	27.4%	7.4%	43
3	57.1%	10.2%	32.8%	115
4	40.4%	26.0%	33.6%	269
5	25.3%	19.1%	55.5%	343
6	29.6%	21.8%	48.6%	165
7 (very high)	25.0%	3.8%	71.2%	44

Table 4.2 Advanced Financial Literacy Index Compared to Self-assessed Financial Literacy (row percentages shown)

	Literacy Index Quartiles (%)				
Self-assessed literacy	*1 (Low)*	*2*	*3*	*4 (Top)*	*N*
1 (very low)	75.6%	19.1%	5.3%	0.0%	10
2	56.2%	29.7%	12.5%	1.6%	43
3	53.4%	24.6%	18.9%	3.1%	115
4	50.4%	21.0%	22.7%	6.0%	269
5	27.1%	22.4%	29.0%	21.6%	343
6	18.2%	20.3%	35.8%	25.7%	165
7 (very high)	29.1%	4.6%	13.6%	52.7%	44

Table 4.3 Basic Financial Literacy Index and School Economic Education (row percentages shown)

	Literacy Index Quartiles (%)			
School Economic Education	*1*	*2*	*3 & 4*	*N*
A lot of econ education	9.50%	39.10%	51.41%	50
Some econ education	35.97%	20.03%	43.99%	346
Little econ education	34.21%	20.04%	45.75%	397
No econ education	47.45%	14.63%	37.92%	196

Table 4.4 Advanced Financial Literacy Index and School Economic Education (row percentages shown)

	Literacy Index Quartiles (%)				
School Economic Education	*1 (Low)*	*2*	*3*	*4 (Top)*	*N*
A lot of econ education	5.41%	34.69%	16.91%	42.98%	50
Some econ education	38.45%	18.56%	27.82%	15.17%	346
Little econ education	35.99%	19.59%	23.62%	20.80%	397
No econ education	45.89%	26.60%	21.89%	5.62%	196

Table 4.5 Basic Financial Literacy Index and Firm Financial Education (row percentages shown)

	Literacy Index Quartiles (%)			
Firm Financial Education	*1 (Low)*	*2*	*3&4(Top)*	*N*
No	42.73%	14.72%	42.55%	524
Yes	27.22%	27.14%	45.64%	465

Table 4.6 Advanced Financial Literacy Index and Firm Financial Education (row percentages shown)

	Literacy Index Quartiles (%)				
Firm Financial Education	*1 (Low)*	*2*	*3*	*4 (Top)*	*N*
No	46.34%	21.75%	20.84%	11.07%	524
Yes	24.66%	19.90%	30.51%	24.93%	465

Note: See Tables 1 and 2.

Table 5. Patterns of Retirement Planning By Socioeconomic Characteristics (%)

		Age		Education		Sex	
	Full sample	*>50*	*≤50*	*≥college*	*LT College*	*Male*	*Female*
How much have you thought about retirement?							
A lot	26.5%	42.4%	17.9%	25.9%	26.9%	25.6%	27.3%
Some	43.0%	41.0%	44.0%	49.1%	37.9%	47.2%	39.1%
A little	16.6%	12.1%	19.0%	8.3%	23.5%	13.3%	19.7%
Hardly at all	14.0%	4.5%	19.0%	16.7%	11.7%	14.0%	13.9%

Note: See Tables 1 and 2.

Table 6. Multivariate Ordinary Least Squares (OLS) and Instrumental Variable (IV) Analysis of Retirement Planning

	OLS	IV
Advanced Literacy	0.163	0.493
	[0.062]***	[0.116]*
Basic Literacy	-0.093	-0.207
	[0.055]*	[0.286]*
Age	0.023	0.021
	[0.004]***	[0.006]***
Male	-0.081	-0.176
	[0.098]	[0.147]
Black	-0.02	0.019
	[0.166]	[0.211]
Hispanic	0.239	0.204
	[0.169]	[0.253]
Married/partner	-0.094	-0.022
	[0.135]	[0.146]
Separated	0.255	0.279
	[0.446]	[0.472]
Divorced	0.117	0.125
	[0.146]	[0.155]
Widowed	0.061	0.21
	[0.246]	[0.274]
Some college	0.197	0.088
	[0.127]	[0.169]
Associate degree	0.261	0.084
	[0.147]*	[0.228]
College degree	0.052	-0.125
	[0.149]	[0.242]
Masters degree	0.095	-0.021
	[0.157]	[0.244]
Doctorate degree	0.196	-0.011
	[0.166]	[0.259]
Income $25,000-49,999	0.653	0.515
	[0.163]***	[0.184]***
Income $50,000-74,999	0.831	0.682
	[0.182]***	[0.195]***
Income $75,000-99,999	0.88	0.707
	[0.180]***	[0.208]***
Income $100,000-149,999	1.005	0.815
	[0.179]***	[0.213]***
Income ≥$150,000	1.123	0.884
	[0.210]***	[0.245]***
Unemployed	0.473	0.417
	[0.200]**	[0.232]*
Disabled	0.111	0.069
	[0.302]	[0.324]
Retired	-0.002	-0.064
	[0.144]	[0.159]
Homemaker	0.05	-0.013
	[0.169]	[0.192]
Nobs	989	936
R-squared	0.37	
Hansen J test p-value		0.0404
F-statistic first stage regression		4.12

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 A control for missing income is also included.

Table 7. First-Stage Regressions

Financial Education Mandate	-1.77
	[0.646]***
Age*Education Mandate	0.031
	[0.011]***
Male*Education Mandate	-0.618
	[0.199]***
Expenditure per Pupil *Education Mandate	0.024
	[0.008]***
Basic Literacy	0.379
	[0.047]***
Age	0.01
	[0.004]**
Male	0.513
	[0.085]***
Black	-0.216
	[0.173]
Hispanic	-0.32
	[0.189]*
Married/partner	-0.107
	[0.112]
Separated	0.04
	[0.236]
Divorced	0.091
	[0.141]
Widowed	-0.094
	[0.211]
Some college	0.296
	[0.117]**
Associate degree	0.543
	[0.145]***
College degree	0.653
	[0.118]***
Masters degree	0.637
	[0.130]***
Doctorate degree	0.725
	[0.183]***
Income $25,000-49,999	0.106
	[0.125]
Income $50,000-74,999	0.219
	[0.137]
Income $75,000-99,999	0.215
	[0.135]
Income $100,000-149,999	0.253
	[0.144]*
Income ≥$150,000	0.256
	[0.188]
Unemployed	0.096
	[0.184]
Disabled	-0.08
	[0.205]
Retired	0.015
	[0.125]
Homemaker	0.115
	[0.141]
Other	0.177
	[0.194]
Nobs	936
R-squared	0.48
F-statistic first stage regression	4.12

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 A control for missing income is also included.

Table 8. Robustness Checks: Alternative Models and Samples

A. Excluding Randomized Questions

	OLS	IV
Advanced Literacy	0.122	0.397
	[0.064]*	[0.109]*
Basic Literacy	-0.08	-0.182
	[0.056]	[0.247]
Nobs	989	936
R-squared	0.37	
Hansen J test p-value		0.0396
F-statistic first stage regression		4.89

B. Restricting Sample to < Age 62

	OLS	IV
Advanced Literacy	0.2	0.407
	[0.067]***	[0.118]*
Basic Literacy	-0.13	-0.207
	[0.061]**	[0.292]
Nobs	772	729
R-squared	0.43	
Hansen J test p-value		0.0658
F-statistic first stage regression		4.26

C. Sample Excluding Completely Retired

	OLS	IV
Advanced Literacy	0.188	0.481
	[0.068]***	[0.277]*
Basic Literacy	-0.102	-0.217
	[0.063]	[0.119]*
Nobs	803	758
R-squared	0.41	
Hansen J test p-value		0.056
F-statistic first stage regression		4.28

Table 9. Multivariate OLS and IV Analysis of Retirement Planning: Firm-Provided Financial Education

	OLS	IV
Advanced Literacy	0.163	0.993
	[0.062]***	[0.443]**
Basic Literacy	-0.093	-0.421
	[0.055]*	[0.184]**
Age	0.023	0.013
	[0.004]***	[0.007]*
Male	-0.081	-0.39
	[0.098]	[0.183]**
Black	-0.02	0.177
	[0.166]	[0.268]
Hispanic	0.239	0.347
	[0.169]	[0.194]*
Married/partner	-0.094	0.033
	[0.135]	[0.170]
Separated	0.255	0.201
	[0.446]	[0.542]
Divorced	0.117	0.087
	[0.146]	[0.184]
Widowed	0.061	0.188
	[0.246]	[0.346]
Some college	0.197	-0.051
	[0.127]	[0.190]
Associate degree	0.261	-0.222
	[0.147]*	[0.300]
College degree	0.052	-0.459
	[0.149]	[0.297]
Masters degree	0.095	-0.532
	[0.157]	[0.351]
Doctorate degree	0.196	-0.379
	[0.166]	[0.341]
Income $25,000-49,999	0.653	0.562
	[0.163]***	[0.222]**
Income $50,000-74,999	0.831	0.714
	[0.182]***	[0.231]***
Income $75,000-99,999	0.88	0.71
	[0.180]***	[0.263]***
Income $100,000-149,999	1.005	0.816
	[0.179]***	[0.279]***
Income ≥$150,000	1.123	0.823
	[0.210]***	[0.338]**
Unemployed	0.473	0.396
	[0.200]**	[0.277]
Disabled	0.111	0.167
	[0.302]	[0.386]
Retired	-0.002	-0.007
	[0.144]	[0.198]
Homemaker	0.05	-0.095
	[0.169]	[0.213]
Other	-0.829	-1.064
	[0.255]***	[0.411]***
Nobs	989	989
R-squared	0.37	
Hansen J test p-value		0.0099
F-statistic first stage regression		10.14

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 A control for missing income is also included.

Table 10. First Stage Regression: Firm-Provided Financial Education

	OLS
Firm offers financial education	0.259
	[0.081]***
Basic Literacy	0.4
	[0.049]***
Age	0.011
	[0.004]***
Male	0.348
	[0.089]***
Black	-0.298
	[0.186]
Hispanic	-0.116
	[0.186]
Married/partner	-0.137
	[0.129]
Separated	0.134
	[0.229]
Divorced	0.043
	[0.148]
Widowed	-0.144
	[0.213]
Some college	0.263
	[0.125]**
Associate degree	0.527
	[0.152]***
College degree	0.592
	[0.145]***
Masters degree	0.669
	[0.137]***
Doctorate degree	0.613
	[0.154]***
Income $25,000-49,999	0.11
	[0.122]
Income $50,000-74,999	0.113
	[0.147]
Income $75,000-99,999	0.171
	[0.124]
Income $100,000-149,999	0.183
	[0.141]
Income ≥$150,000	0.285
	[0.173]
Unemployed	0.155
	[0.171]
Disabled	-0.056
	[0.193]
Retired	0.014
	[0.120]
Homemaker	0.206
	[0.137]
Other	0.285
	[0.227]
Nobs	989
R-squared	0.48
F-statistic first stage regression	10.14

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 A control for missing income is also included.

Appendix Table 1. Socioeconomic Characteristics of the American Life Panel: Descriptive Statistics

Variable	Mean	St. Dev.
Age	45.01	16.20
Male	0.48	0.50
Marital status		
Married	0.60	0.49
Separated	0.02	0.13
Divorced	0.11	0.31
Widowed	0.06	0.24
Single	0.21	0.41
Highest Education Completed		
1-12th grade no diploma (coded as 11 years)	0.06	0.24
High school graduate (12)	0.23	0.42
Some college but no degree (14)	0.18	0.39
Assoc/Occ/Voc (15)	0.07	0.25
Bachelors degree (16)	0.26	0.44
Masters degree (17)	0.17	0.37
Doctorate degree (20)	0.03	0.18
Total combined income		
< $25,000	0.20	0.40
$25,000-50,000	0.27	0.45
$50,000-75,000	0.21	0.40
$75,000-100,000	0.09	0.29
$100,000-150,000	0.12	0.33
> $150,000	0.09	0.29
Refused	0.01	0.10
Labor Force Status		
Working	0.64	0.48
Unemployed	0.03	0.18
Temporarily laid off, on leave	0.01	0.10
Disabled	0.04	0.21
Retired	0.17	0.38
Homemaker	0.06	0.24
Other	0.05	0.22
Retirement Status		
Completely retired	0.16	0.37
Partly retired	0.06	0.24
Not retired	0.70	0.46
Not applicable (homemaker, stop working < age 50 etc)	0.07	0.26

Nobs=989; sample weighted. Source: Authors' derivation from the RAND American Life Panel (ALP); see text.

Appendix Table 2: Constructing the Financial Literacy Index: Factor Loadings

The two Summary literacy indices are based on responses to the five basic and eight sophisticated financial literacy questions discussed in the text. For each question we construct a dummy variable indicating which respondents answered the question correctly. We then perform factor analysis on those binary variables using the principal component factor method; factor loadings are presented below. We retain one factor which summarizes respondent financial literacy using factor scores derived with the Bartlett (1937) method.

Basic Financial Literacy Questions	Factor loadings
Numeracy	0.6922
Compound Interest	0.6068
Inflation	0.6499
Time value of money	0.6003
Money illusion	0.4149

Sophisticated Financial Literacy Questions	Factor loadings
Function of mutual fund	0.4988
Relation between interest rates/bond prices	0.7195
Which safer: company stock vs stock mutual fund	0.388
Riskier: stocks vs bonds	0.6761
Higher LR return: stocks or bonds	0.4604
Highest fluctuations over time	0.6373
Risk diversification	0.5068