

THE EFFECTS OF FINANCIAL EDUCATION AND FINANCIAL LITERACY[‡]

How Financial Literacy Affects Household Wealth Accumulation[†]

By JERE R. BEHRMAN, OLIVIA S. MITCHELL, CINDY K. SOO, AND DAVID BRAVO*

Traditional economic theory posits that forward-looking individuals maximize expected lifetime utility using economic information to build retirement assets over their work lives. Yet fewer than half of Americans have even attempted to estimate how much money they might need in retirement, and many older adults face significant retirement saving shortfalls (Lusardi and Mitchell 2007a,b). Economic explanations for these shortfalls include dispersion in discount rates, risk aversion, and credit constraints, but the empirical literature thus far has been unable to account for much of observed

wealth differentials (Bernheim, Skinner, and Weinberg 2001).

Here we evaluate whether people who find it difficult to understand their financial environment are also less likely to accumulate wealth; our approach examines links between wealth accumulation and financial literacy, by which we mean the ability to process economic information and make informed decisions about household finances. Others report positive correlations between financial literacy and asset accumulation, but questions have been raised about whether these associations reflect causality (Lusardi and Mitchell 2008; Lusardi, Mitchell, and Curto 2010). For example, individuals who fail to save due to some underlying and usually unobservable factor such as impatience may also be financially illiterate due to the same factor, making it difficult to assess whether boosting financial education would, in fact, enhance household wealth accumulation.¹ Moreover, in simple bivariate associations of financial literacy with wealth, financial literacy might be proxying, in part, for other factors such as schooling attainment.

This paper makes three important contributions. First, we develop a new measure of financial literacy that aggregates a more complete set of financial literacy questions, and that can also be disaggregated to examine which aspects of financial literacy have greater marginal influences on household wealth. Second, we draw on a unique microeconomic dataset, the Chilean Social Protection Survey (Encuesta de Protección Social, EPS), to evaluate the effects of financial literacy for a richer range of ages and schooling than heretofore available. Third,

[‡]Discussants: Justine Hastings, Brown University; William Walstad, University of Nebraska-Lincoln; Urvi Neelakantan, Federal Reserve Bank of Richmond; Annamaria Lusardi, George Washington University.

* Behrman: Dept. of Economics and Sociology, School of Arts and Sciences, University of Pennsylvania, 3718 Locust Walk, 160 McNeil, Philadelphia, PA 19104 (e-mail: jbehrman@econ.upenn.edu); Mitchell: Wharton School of the University of Pennsylvania, 3620 Locust Walk, 3000 SH-DH, Philadelphia, PA 19104 (e-mail: mitchelo@wharton.upenn.edu); Soo: Wharton School, University of Pennsylvania, 3620 Locust Walk, 3000 SH-DH, Philadelphia, PA 19104 (e-mail: cssoo@wharton.upenn.edu); Bravo: Centro de Microdatos, Universidad de Chile, Diag Paraguay #257, Torre 26, Santiago, Chile (e-mail: dbravo@econ.uchile.cl). The authors acknowledge support from the TIAA-CREF Institute, the Pension Research Council and Boettner Center at the Wharton School of the University of Pennsylvania, Inciativa Científica Milenio Project NS 100041, and NIH/NIA grant AG023774-01 (P.I. Petra Todd) on “Life cycle health, work, aging, insurance and pensions in Chile.” They also thank Luc Arondel, Alex Gelber, Jeremy Tobacman, Javiera Vasquez, and participants in the Wharton Applied Economics doctoral workshop as well as the 2010 LBS TransAtlantic Doctoral Conference for helpful comments, and Richard Derrig for sharing his PRIDIT code. We thank the Chilean Subsecretaría de Previsión Social for allowing the use of EPS data. Opinions and errors are solely those of the authors and not of the institutions providing funding for this study or with which the authors are affiliated.

[†]To view additional materials, visit the article page at <http://dx.doi.org/10.1257/aer.102.3.300>.

¹ For example, Hastings and Mitchell (2011) show that both impatience and financial literacy are strongly correlated with retirement saving.

we use a set of plausibly exogenous instrumental variables to control for both omitted variable and random measurement error biases and show that financial literacy is still positively, significantly, and substantially associated with wealth outcomes even after controlling for schooling.

Our results are relevant for financial educational policy, in that we find that improved financial literacy can make a significant difference for financial behavior, above and beyond regular schooling. This rigorous analysis of the impact of financial literacy on wealth accumulation should be useful in informing governments and their policy advisers, as they consider new initiatives for financial education.

I. Financial Literacy Metrics

We measure financial literacy using a rich set of 12 questions. The “core” first three financial literacy queries were developed and implemented in the United States Health and Retirement Study (HRS); they have also been adopted by several other international surveys. A second, more “sophisticated,” set of three questions was devised for a special HRS module (Lusardi and Mitchell 2007c) to measure more complex concepts such as compound interest, inflation, and risk diversification. A final set of questions touches on key aspects of the Chilean retirement system, including the mandatory contribution rate, minimum male and female retirement ages, how pension benefits are computed, whether people know about the welfare program for the elderly, and whether people know they can contribute to a Voluntary Pension system (precise question wording and a full explanation of the approach is provided in Behrman et al. 2010).

As found in the United States, the Chilean EPS reveals that many respondents possess little understanding of basic economic concepts and know little about the pension system. Only half knew the correct answers to the core questions, and fewer could answer the sophisticated financial literacy questions. Patterns are more variable for questions regarding knowledge of pension system benefit rules and provisions: most knew the legal retirement ages, but only about one-third knew contribution rates and only 10 percent could explain how benefits are computed. About half the sample knew about both the guaranteed minimum benefit and the Voluntary Savings plan.

While prior authors measure financial literacy by coding a binary outcome to one or two key questions, we seek to use all the rich information available. Accordingly, we aggregate responses using a two-step weighting approach called PRIDIT.² The first step weights each question by difficulty, applying a greater penalty for not answering correctly a question that more of the population answers correctly but greater credit for answering correctly questions that more respondents answer incorrectly. The second step applies principal components analysis to take into account correlations across questions. The resulting PRIDIT scores indicate how financially literate an individual is in relation to the average population and to specific questions asked; it takes into account the fact that questions are more informative, *ceteris paribus*, the less their answers are correlated with other questions. The final PRIDIT weights indicate how “informative” any given question is regarding the underlying latent financial literacy variable, relative to other questions. We find that the “core” HRS financial literacy questions receive the greatest weights, while the next most informative are the queries on pension system knowledge. Some of the least informative include detailed knowledge on how to calculate pension benefits.

II. Data and Background

Our primary data source is the Social Protection Survey (see www.proteccionsocial.cl) we developed in collaboration with the Microdata Center of the University of Chile for the Chilean Ministry of Labor and Social Security (Bravo et al. 2006). Comparable to the HRS, it provides a nationally representative stratified random survey covering wealth, schooling, financial literacy, work history, childhood background, and selected personality traits. In contrast to the HRS, however, the EPS covers all adults, not just respondents age 50+. In what follows, we limit our attention to 13,054 prime-age respondents surveyed in 2006, namely men age 24–65 and women age 24–60.³

² The PRIDIT approach was developed by Brockett et al. (2002) to handle binary or categorical indicators that proxy for a difficult-to-observe dependent variable.

³ In Chile the legal retirement age is 60 for women but 65 years for men.

Our outcomes of interest are *total net wealth* and its components: pension wealth, net housing wealth, and other wealth. *Pension wealth* averages \$38,600, or 54 percent of total net wealth. In 1981, the Chilean government adopted a national, mandatory defined-contribution scheme known as the AFP system; the reform required all new formal sector employees to contribute at least 10 percent of their salaries to one of several licensed defined-contribution pension plans.⁴ We believe pension wealth is reported relatively accurately because respondents receive annual government statements outlining their pension system accruals. Net housing wealth is based on self-reported data on market values minus estimated mortgage debt. *Other net wealth* includes self-reported business wealth, agricultural assets, other real estate assets, and financial investments, subtracting all forms of household debt.

In addition to these wealth measures, we also explore two possible channels via which financial literacy and schooling might affect pension wealth, in particular. The first is an indicator of worker attachment to the pension saving, or the “*density of pension contributions*” defined as the fraction of months an individual contributed to the pension system from age 18 to the survey date. A second channel is whether the individual had attempted to calculate the money needed for retirement.

Our primary explanatory variable in addition to financial literacy is schooling attainment (measured conventionally). Primary school refers to grades 1–8, secondary school to grades 9–13, and postsecondary school to grades beyond that, to a maximum of 20. The average schooling attainment in our sample is 10.4 grades, with a standard deviation of 3.9 grades. We also control for a rich set of demographic characteristics. Behrman et al. (2010) provide further detailed summary statistics.

III. Empirical Findings

We first use ordinary least squares (OLS) to investigate the relationship between financial literacy and wealth accumulation. Consistent with previous reports, we find that financial literacy is positively and significantly associated with

⁴ Those who started working prior to 1980 could elect to join the new scheme or remain in the previous system.

total net wealth and each of its components. Controlling for the effect of schooling reduces the magnitude of the effect of financial literacy by almost half, suggesting that financial literacy does proxy in part for schooling.

To address concerns of bias created by omitted variables or measurement error⁵ in the OLS coefficients, we also instrument for financial literacy and schooling using a set of candidate variables that should predict financial literacy and schooling well but are likely not to affect wealth directly or indirectly through other unobserved factors. For example, we posit that respondents’ exposure to national schooling voucher policy changes or pension fund marketing efforts likely affects their level of schooling and financial literacy, but do not have any direct effects on wealth accumulation decisions. We consider three broad sets of candidate instruments: *Age-Dependent* variables, *Family Background* factors, and *Respondent Personality* traits.⁶ Despite plausible arguments, we acknowledge that any of these variables could still affect wealth directly,⁷ and we use Hansen’s *J* test of overidentifying restrictions to determine which instruments appear truly independent of the second-stage disturbance term. We conclude that the Hansen *J* statistic does have power in identifying problematic candidate instruments and use only the variables that survive tests for both instrument strength and exogeneity.

The empirical analysis provides estimated impacts of financial literacy and schooling using the above instrumental variable (IV) strategy. When only the PRIDIT financial literacy index is included and instrumented, the coefficient estimates are positive, significant, substantial, and twice to three times larger than comparable OLS estimates. When only schooling is included and instrumented, the coefficient estimates are positive, significant, substantial, and 16–84 percent larger than the comparable OLS estimates. Including both instrumented schooling and the

⁵ Estimates of noise-to-signal ratios for schooling attainment are often about 10 percent, producing a bias towards zero of almost that magnitude (Behrman, Rosenzweig, and Taubman 1994).

⁶ Detailed descriptions of each of these variables are provided in Behrman et al. (2010).

⁷ For example, family background variables such as maternal schooling could also proxy for factors such as intergenerationally correlated ability endowments that directly affect wealth (Behrman and Rosenzweig 2002).

PRIDIT financial literacy variables, the schooling effects mostly become statistically insignificant and negative, whereas the financial literacy effects are positive, significant, and substantial, and larger than comparable OLS estimates.

This pattern suggests that OLS estimates greatly underestimate the effect of financial literacy on wealth accumulation. The IV estimates imply that a 0.2 standard deviation increase in the PRIDIT financial literacy score would, on average, raise net wealth by \$13,800, broken down into about a \$5,200 boost in pension wealth, a \$1,600 rise in net housing wealth, and a gain of \$6,900 in other wealth. The same 0.2 standard deviation increase in the PRIDIT financial literacy score would also boost the density of pension contributions by an average of 3 percent and the probability of calculating retirement monetary needs by an average of 0.5 percent.

Next we add a financial literacy–schooling interaction term to the linear model; results show that the interaction term is positive for all wealth components and substantially more precisely estimated than the linear financial literacy and schooling terms. These findings suggest a specification that includes only the interaction between financial literacy and schooling. In all cases, the estimated effects for financial literacy–schooling interactions are positive and substantial for wealth and actually somewhat bigger than in the linear model for pension and housing wealth.

Finally, our PRIDIT measure of financial literacy allows us to assess the marginal impacts of correct responses of the individual questions on each of the wealth outcomes. We simulate the impact for the “core” and “sophisticated” HRS questions and find that knowing the correct answers to the HRS “core” questions has a nearly 1.5 times greater impact than knowing the correct answers to the sophisticated questions.⁸

III. Discussion

Our findings imply, first, that using OLS to estimate the effects of financial literacy and schooling will likely be misleading due to measurement error and unobserved factors. IV estimates indicate that financial literacy is more important than schooling for explaining

variation in household wealth and pension contributions. Second, our improved estimates of financial literacy impacts are substantial and potentially quite important; indeed they are large enough to imply that investments in financial literacy could well have high payoffs. Third, we show that some components of financial literacy, such as the HRS “core” questions, are particularly important. This insight was not available from prior representations of financial literacy. Fourth, we contribute to a growing body of research on the factors influencing peoples’ links with financial markets. Households that build up more net wealth, particularly via the pension system, may be better able to smooth consumption in retirement and thus enhance risk sharing and well-being in old age. Our finding that financial literacy enhances peoples’ likelihood of contributing to their pension saving suggests that this is a valuable pathway by which improved financial literacy can build household net wealth.⁹

In future work we hope to evaluate in more detail the costs as well as the benefits of enhancing financial literacy levels. Meanwhile, we view as very important the central finding of this paper: that by investing in financial literacy, individuals, firms, and governments can enhance household wealth and well-being. As Federal Reserve Board Chairman Ben Bernanke (2010) stated in a recent speech to the National Bankers’ Association, “[H]elping people better understand how to borrow and save wisely and how to build personal wealth is one of the best things we can do to improve the well-being of families and communities.”

REFERENCES

- Behrman, Jere R., Mark R. Rosenzweig, and Paul Taubman.** 1994. “Endowments and the Allocation of Schooling in the Family and in the Marriage Market: The Twins Experiment.” *Journal of Political Economy* 102 (6): 1131–74.
- Behrman, Jere R., and Mark R. Rosenzweig.** 2002. “Does Increasing Women’s Schooling

⁸ Detailed marginal effects for each question are available in Behrman et al. (2010).

⁹ Hastings, Mitchell, and Chyn (2011) show that financial literacy can also affect retirement saving through other channels such as the choice of investment fund or pension manager.

- Raise the Schooling of the Next Generation?" *American Economic Review* 92 (1): 323–34.
- Behrman, Jere R., Olivia S. Mitchell, Cindy Soo, and David Bravo.** 2010. "Financial Literacy, Schooling, and Wealth Accumulation." National Bureau of Economic Research Working Paper 16452.
- Bernanke, Ben S.** 2010. "Fostering Financial Literacy." Presented for the National Bankers' Association Foundation Financial Literacy Summit, Washington, DC, April 2010.
- Bernheim, B. Douglas, Jonathan Skinner, and Steven Weinberg.** 2001. "What Accounts for the Variation in Retirement Wealth among U.S. Households?" *American Economic Review* 91 (4): 832–57.
- Bravo, David, Jere Behrman, Olivia Mitchell, and Petra Todd.** 2006. "Encuesta de Protección Social 2004: Presentación General y Principales Resultados." Centro de Microdatos, Universidad de Chile y Subsecretaría de Previsión Social, January.
- Brockett, Patrick L., Richard A. Derrig, Linda L. Golden, Arnold Levine, and Mark Alpert.** 2002. "Fraud Classification Using Principal Component Analysis of RIDITs." *Journal of Risk and Insurance* 69 (3): 341–71.
- Hastings, Justine S., and Olivia S. Mitchell.** 2011. "How Financial Literacy and Impatience Shape Retirement Wealth and Investment Behaviors." National Bureau of Economic Research Working Paper 16740.
- Hastings, Justine, Olivia S. Mitchell, and Eric Chyn.** 2011. "Fees, Framing, and Financial Literacy in the Choice of Pension Manager." In *Financial Literacy: Implications for Retirement Security and the Financial Marketplace*, edited by Olivia S. Mitchell and Annamaria Lusardi, 101–15. New York: Oxford University Press.
- Lusardi, Annamaria, and Olivia S. Mitchell.** 2007a. "Baby Boomer Retirement Security: The Roles of Planning, Financial Literacy, and Housing Wealth." *Journal of Monetary Economics* 54 (1): 205–24.
- Lusardi, Annamaria, and Olivia S. Mitchell.** 2007b. "Financial Literacy and Retirement Planning: New Evidence from the Rand American Life Panel." Pension Research Council Working Paper WP2007-33.
- Lusardi, Annamaria, and Olivia S. Mitchell.** 2007c. "Financial Literacy and Retirement Preparedness: Evidence and Implications for Financial Education." *Business Economics* 42 (1): 35–44.
- Lusardi, Annamaria, and Olivia S. Mitchell.** 2008. "Planning and Financial Literacy: How Do Women Fare?" *American Economic Review* 98 (2): 413–17.
- Lusardi, Annamaria, Olivia S. Mitchell, and Vilma Curto.** 2010. "Financial Literacy among the Young." *Journal of Consumer Affairs* 44 (2): 358–80.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.