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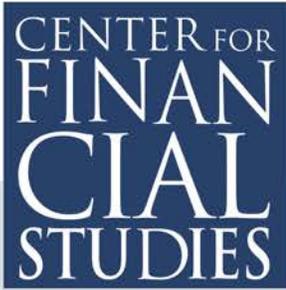
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No. 554

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Investor Financial Literacy in the Workplace

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INVESTOR FINANCIAL LITERACY IN THE WORKPLACE

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Abstract

The dramatic shift from traditional pension plans to participant-directed 401(k) plans has increased the decision-making responsibility of individual investors for their own retirement planning. With this shift comes increasing evidence that investors are making poor decisions in choosing how much to save for retirement and in selecting among their investment options. Studies question the value of efforts to improve these decisions through regulatory reforms or investor education.

This article posits that deficiencies in workplace retirement savings cannot be adequately addressed until the reasons for poor investment decisions are better understood. We report the results of an exploratory study that asked subjects to complete a simulated retirement investment task and collected information about their financial knowledge and preferences. The study enabled us to measure financial literacy and evaluate its relationship to retirement investment decision-making. In line with existing research, we found a strong relationship between financial literacy and successful retirement investing. Our results suggest, however, that the relevant understanding in this context is not about math so much as it is a basic knowledge of the relative costs and benefits of the major investment categories. Finally, we present results suggesting that financial literacy is separate from investment preferences—specifically, that tolerance for risk is a separate and highly predictive variable in estimating retirement planning success.

* Perry Golkin Professor of Law, University of Pennsylvania Law School. Preliminary and incomplete draft – please do not distribute without permission. We are grateful for thoughtful comments from Jonah Gelbach and the extensive research assistance provided by Jackie Hamilton, Penn Law Class of 2014. A draft of this paper was presented at the ETH - Paris 1/ESCP Law & Finance Seminar, and we received many helpful comments from the seminar participants.

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Our research suggests that individual employees are likely to lack the skills necessary to support the current regulatory model of participant-directed retirement investing. The structure and regulation of retirement plans ought to take this fact seriously. We explore the potential for investor education and professional advice, respectively, to overcome the limitations of individualized choice.

I. Introduction

The workers of the next generation face a new challenge – saving for their own retirement. In the past, workers were able to rely on a combination of employer-provided pensions and social security. Today the vast majority of workers will have to depend in retirement on the balances in their 401(k) plans, plans in which they are individually responsible for choosing both how much money to save for retirement and how to allocate that money among a range of investment options. Participant-directed retirement saving plans may increase employee autonomy and reduce the potential that employees will be the victim of pension plan underfunding or employer conflicts of interest. There are reasons to think, however, that the task is so complex that most retail investors make predictable and systematic mistakes at real cost to their financial well-being.¹ In addition, professional advisors, who might be able to address these mistakes, have been criticized for conflicts of interest that can lead to investors paying excessive fees and earning lower returns.²

Solutions to these problems are highly contested. One possible response is improved disclosure. Disclosure is the traditional approach to investor protection reflected in the federal securities laws. In recent years, both the SEC and the Department of Labor have repeatedly strengthened disclosure requirements applicable to retirement investing.³ Yet it is unclear that disclosure is useful to investors who do not understand the task at hand or the material that they are being asked to evaluate. Some commentators have called for improving investor financial literacy. Many studies suggest, however, that education efforts, at least to date, have

¹ See, e.g., Jodi DeCenzo, Behavioral Finance and Retirement Plan Contributions: How Participants Behave, and Prescriptive Solutions, EBRI Issue Brief No. 301 (2007), at 7, (“Optimal retirement saving and investing are complex tasks that may easily exceed boundaries of rational capability.”).

² See Definition of the Term “Fiduciary”; Conflict of Interest Rule--Retirement Investment Advice, EBSA Proposed Rules 80 Fed. Reg. 21927 (4/20/2015) (“DOL Proposed Fiduciary Rule”) (“In the current marketplace for retirement investment advice, however, advisers commonly have direct and substantial conflicts of interest, which encourage investment recommendations that generate higher fees for the advisers at the expense of their customers and often result in lower returns for customers even before fees.”). See also The Effects of Conflicted Investment Advice on Retirement Savings (“White House Report”).

³ See, e.g., recent amendments to DOL regulations to mandate disclosure of the costs of 40(k) plans.

limited value in improving investing performance. Another option is direct regulation of retirement plans or investing options. Examples of this approach include Department of Labor regulations permitting employers to default their employees into saving for retirement and further specifying the permissible investment options into which these employees' contributions may be invested as a means of overcoming employee reluctance to participate in their employers' plans.

ERISA also attempts to protect employees by imposing fiduciary duties on plan sponsors in connection with the 401(k) plans that they offer. In its most recent decision, the Supreme Court interpreted these fiduciary duties broadly. Recognizing that individual employees may be powerless if their employer provides a plan containing low-quality or high-cost investment options, the Court recognized a "continuing duty" on the part of employers to monitor and improve the investment options that they offer in 401(k) plans.⁴ The Department of Labor recently introduced a proposal to extend these fiduciary obligations beyond employers to reach brokers who provide advice to retirement plan sponsors and participants. The DOL was motivated, in part, by a concern that plan participants pay excessive fees or are directed to inferior investment options because of their advisors' conflicts of interest. Critics of the proposal have challenged the DOL's claims of advisor self-dealing as overstated and warned that the proposal may reduce employee access to professional education and advice.

Indeed, retirement savings presents particular challenges because the core principles are themselves contested. Scholars do not agree on how much retirement savings is sufficient, an acceptable degree of risk for a retirement portfolio, or the return that workers should expect to earn over the course of their lifetime. Economic fluctuations can change the relative pay-offs of different investment choices, and financial innovation continues to produce new and complex products for investors to evaluate.⁵ At the same time, a particular employee's needs may be driven by individualized factors. In light of these challenges, it is difficult to set appropriate objectives for workplace financial literacy, to determine what type of guidance to provide to workers, or even to evaluate the quality of an individual worker or retirement plan's investment choices.

⁴ Tibble vs. Edison International. See also WalMart decision.

⁵ Example of target date funds.

Retirement investing thus presents an example of a complex task in which the limitations of individual employees create challenges in implementing an autonomy-based approach but reliance on professional advisors presents potential agency costs. Determining how to regulate the decision-making process and adopting an appropriate level of responsibility for professional advisors is critical – not just for retirement investing but for many other similar decisions.⁶

In prior research we documented the failure of investors to pay attention to the cost in choosing among retirement investment options.⁷ Even when subjects were provided with simplified cost information that was easy to find and compare, they rarely accessed this information and gave it little weight.⁸ We further found that subjects altered their behavior when instructed to consider fees, suggesting to us that the importance of fees was new information to our subjects. Our research led us to question the efficacy of a fee-disclosure requirement, hypothesizing that retirement investors may have limited capacity to use the fee information that is presented to them.

In this follow-up effort, we are particularly concerned with individual differences in retirement planning—that is, how does investment decision-making vary across the population? This question is important because it helps identify the most vulnerable subsets of workers, and also potentially informs our understanding of which interventions will help (or hinder) whom. Existing research shows that a key contributor to poor retirement investing is the limited financial literacy of the employees who are forced to engage in self-directed retirement investing. To document this, this paper reports the effect of financial literacy and other investor characteristics on the behavior of 200 participants in an interactive investment game. The game, which simulates retirement investing choices and pays subjects based on their portfolio’s simulated 30-year earnings, offers a snapshot of retail investing choices.

In this paper, we focus on our analysis on two themes. First, we argue that the relevant financial literacy for retirement investing is highly task-specific – it entails what our subjects know about financial instruments and retirement planning. Second, we identify an important

⁶ Compare to the provision of medical care.

⁷ Jill E. Fisch & Tess Wilkinson-Ryan, *Why do Investors Make Costly Mistakes? An Experiment on Mutual Fund Choice*, 162 U. Pa. L. Rev. 605 (2014).

⁸ *Id.* at ___.

role for investor risk preferences and show that these preferences have an independent and significant effect on investment decision-making.

We construct a novel measure of financial literacy using questions that are tailored to the task of choosing among investment options in an employer-sponsored retirement plan. We consider the role of financial literacy in addition to standard demographic characteristics, investor numeracy and risk-aversion. Our study confirms, consistent with other research, that age, gender, education, and investing experience are each, respectively, associated with financial literacy. However, even holding constant these demographic variables, financial literacy is highly predictive of investment performance. That is, financial literacy matters even within demographic categories: men or women, young or old, people make better retirement investment choices when they know something about the options available to them--what an index fund is, what a bond fund is, which investments are associated with higher or lower risk or returns.

Our study confirms the critical explanatory power of financial literacy reported by other work in this field. Financial literacy, measured through our index, is the strongest predictor of investment performance across two different outcome variables. Importantly, our analysis refines the construct of financial literacy as applied to the task of retirement investing. We find that retirement investing success is best predicted by specific understanding of financial products and what they do—stocks, index funds, and bond funds in particular. In our panel, this knowledge is only barely related to understanding or misunderstanding the basic math of investing. What appears to matter more for investment success is knowledge of the products and their bottom lines.

Our second core finding is the important of risk preferences. Risk aversion is associated with lower financial literacy, but risk aversion has strong independent effects on investment success. For both our high-literacy and our low-literacy subjects, aversion to risk was a strong negative predictor of success. This finding is especially startling in the context of a low-stakes simulation game. The role of risk-aversion in retirement investing has received only limited attention. Importantly, although experts do not agree on the optimal asset allocation for retirement investors, they do agree that retirement savings, particularly in a worker's early years, should include a substantial equity component in order to take advantage of the historically higher returns of equity as well as the effect that higher returns produce through compounding. Workers who seek to

minimize risk may be sacrificing substantial investment returns over a lifetime of retirement savings.

Finally, consistent with our previous work,⁹ we note that our subjects failed to minimize fees, and indeed appeared to ignore fee information. Even financially literate investors failed to search for fee information, to minimize fees paid and to reject higher cost investment options. This finding is consistent with our hypothesis, from an earlier experiment, that even for knowledgeable investors, the importance of minimizing fees constitutes new information.¹⁰

Our research has implications for three important policy debates – the role of mandatory disclosure in retirement investing, the consequences of broadening fiduciary obligations in connection with the provision of investment advice, and the value of direct regulation of the composition of employer-sponsored retirement plans. In particular we document the striking absence of the type of task-specific knowledge necessary to navigate the process of investing for retirement.

In a pending project, we extend our analysis to the financial services industry to compare the financial literacy levels of average workers with those of industry professionals. By documenting the knowledge gap, we highlight the potential value of professional advice in connection with retirement planning. Our results will have important implications for the Department of Labor’s proposed changes to the regulation of this advice.

Our findings also provide a basis for a more targeted study of the role of investor education.¹¹ Because our study suggests that targeted financial literacy is critical, we may be able to improve on prior efforts at investor education with simple instructions tailored to the retirement context. To make appropriate retirement investments, investors do not need sophisticated math skills or to be provided with a calculator so that they can compute compound interest. Instead, they need to know what differentiates a mutual fund from an index fund from a bond fund and what they can expect from each investment in terms of long term risk and reward.

The Article is organized as follows. Part II situates this Article in the academic literature about the role of financial literacy in investor

⁹ Jill E. Fisch & Tess Wilkinson-Ryan, Why do Investors Make Costly Mistakes? An Experiment on Mutual Fund Choice, 162 U. Pa. L. Rev. 605 (2014).

¹⁰ Id.

¹¹ We are in the process of designing this study.

decision-making and in the effort to improve financial literacy through investor education. Part III describes our study structure and the construct of our financial literacy index. Part IV reports our findings about the role of financial literacy in investor decision-making. Part V considers the implications of our findings for future policy.

II. The Role of Financial Literacy in Consumer Financial Behavior – the Literature

An extensive body of research reports that consumers lack basic financial literacy.¹² At the outset, as scholars in this area concede, this observation is overly simplistic. Financial literacy can be defined in various ways.¹³ As one paper has observed, many definitions incorporate both knowledge of financial concepts and the skills necessary to apply that knowledge to the task at hand.¹⁴ Evaluating financial literacy may also be context-specific, as the necessary skills and knowledge will vary according to the task. Some studies focus on consumers' ability to manage credit cards and bank accounts. Some look at consumer understanding of mortgage products. This Article examines financial literacy in the context of investment decision-making, and in particular the context of retirement investing.

Annamaria Lusardi and Olivia Mitchell have conducted the most extensive and best known research on financial literacy. They measure financial literacy with a test consisting of three questions addressing numeracy, inflation, and diversification.¹⁵ Lusardi and Mitchell, working

¹² Op-Ed: Improving Financial Literacy Is Essential to Our Nation's Economic Health, Time, Apr. 9, 2012, <http://business.time.com/2012/04/09/op-ed-improving-financial-literacy-is-essential-to-our-nations-economic-health/>

¹³ See, e.g., Annamaria Lusardi & Olivia Mitchell, The Economic Importance of Financial Literacy: Theory and Evidence, 52 J. Econ. Lit. 5, 6 (2014) (defining financial literacy as "peoples' ability to process economic information and make informed decisions about financial planning, wealth accumulation, pensions, and debt").

¹⁴ See Angela Hung, Andrew M. Parker, and Joanne Yoong, Defining and Measuring Financial Literacy (September 2, 2009), <http://ssrn.com/abstract=1498674>.

¹⁵ See, e.g., Annamaria Lusardi & Olivia S. Mitchell. Financial Literacy and Planning: Implications for Retirement Wellbeing. In Financial Literacy: Implications for Retirement Security and the Financial Marketplace. Eds. O. S. Mitchell and A. Lusardi.

together and with others, have incorporated these three questions into a large number of surveys both in the United States and around the world.¹⁶

A test of financial literacy that consists of only three questions is of course only a proxy measurement of true understanding.¹⁷ Nonetheless, even the simple three question test has proven highly influential and other scholars have incorporated it, even while recognizing its limitations.¹⁸ Lusardi and Mitchell and others have also added to these questions in some cases.¹⁹ For example, Lusardi, working with Alessi and Rooij, has conducted several surveys²⁰ using five simple financial literacy questions plus additional questions that the authors describe as “advanced.”²¹

Oxford, Oxford University Press: 17-39 (2011); Annamaria Lusardi & Olivia S. Mitchell. Planning and Financial Literacy: How Do Women Fare?, 98 *Am. Econ. Rev.* 413 (2008).

The questions are:

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? Do not know, refuse to answer.]

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 not know; refuse to answer.]

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.’[[Do not know; refuse to answer.]

¹⁶ Lusardi & Mitchell, supra note __ 2014 (describing the use of these three questions in various surveys).

¹⁷ Maarten C.J. van Rooij, Annamaria Lusardi, & RobAlessie, Financial literacy and stock market participation, 101 *J. Fin. Econ.* 449 (2011) (describing this test as “crude”).

¹⁸ Find cite

¹⁹ See, e.g., Antonia Grohmann, Roy Kouwenberg and Lukas Menkhoff., Financial Literacy and Its Consequences in the Emerging MiddleClass (working paper dated July 2014), <https://www.ifw-members.ifw-kiel.de/publications/financial-literacy-and-its-consequences-in-the-emerging-middle-class/KWP%201943.pdf> (using three question test to measure financial literacy in Bangkok but adding a fourth question asking subject s to name foreign banks that operate in Thailand).

²⁰ See Maarten C.J. van Rooij, Annamaria Lusardi & Rob J.M. Alessie, 2012.

“Financial Literacy, Retirement Planning and Household Wealth, 122 *Econ. J. Royal Econ. Soc.* 449 (2012); Maarten C.J. van Rooij, Annamaria Lusardi, & RobAlessie, Financial literacy and stock market participation, 101 *J. Fin. Econ.* 449 (2011)

²¹ *Id.* at 454-55.

Mitchell, working with Behrman, et al., expands the three basic questions to a “rich set of 12 questions” to study financial literacy in Chile.²² Other studies use different measures and varying levels of detail.²³ One study of German mutual fund investors measured financial literacy using an eight question quiz.²⁴ Another incorporated 28 pass/fail questions.²⁵ A Jumpstart survey to test the financial literacy of young American adults used 56 questions.²⁶ A recent study by Fernandes et al argued that previous measures of financial literacy had not been adequately validated and substituted its own 13 question scale.²⁷

Regulators have also conducted research on financial literacy. FINRA’s Investor Education Foundation attempted to measure financial literacy through a five question study, the National Financial Capability

²² Jere R. Behrman, Olivia S. Mitchell, Cindy K. Soo, and David Bravo, How Financial Literacy Affects Household Wealth Accumulation, 2012 AER Papers and Proceedings (Jan. 6, 2012),

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=2&ved=0CCcQFjAB&url=https%3A%2F%2Fwww.aeaweb.org%2Faea%2F2012conference%2Fprogram%2Fretrieve.php%3Fpdfid%3D284&ei=9iQTV0auC5f_sASviLIBQ&usg=AFQjCNGiD4FIxJ5xqh4u5n5LNKEgYROAUw&sig2=tM-yGr2hqlyH00JTCM69kg&bvm=bv.75097201.d.aWw

²³ See generally Hung et al., *supra*, Table 2 (Table 2, listing studies measuring financial literacy and describing structure of assessment and number of questions asked.).

²⁴ Sebastian Müller & Martin Weber, Financial Literacy and Mutual Fund Investments: Who Buys Actively Managed Funds?, 62 *Schmalenbach Bus. Rev.* 126 (2010), <http://ssrn.com/abstract=1093305>

²⁵ Marianne A. Hilgert, Jeanne M. Hogarth, and Sondra G. Beverly, Household Financial Management: The Connection between Knowledge and Behavior, Fed. Res. Bull. 309 (2003), <http://www.google.com/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&cad=rja&uact=8&ved=0CB4QFjAA&url=http%3A%2F%2Fwww.federalreserve.gov%2Fpubs%2Fbulletin%2F2003%2F0703lead.pdf&ei=KSYTVLijHdD8oQTd74D4Bg&usg=AFQjCNHncDMSENKXJ6VSPeu5IUUKXdirfA&sig2=-21DHJcSfBtYsCQWVQtNAw>

²⁶ See Lewis Mandell, The financial literacy of young American adults: Results of the 2008 national Jumpstart Coalition Survey of high school seniors and college students. 2008, <http://www.jumpstart.org/assets/files/2008SurveyBook.pdf>

²⁷ See Daniel Fernandes, John G. Lynch, Jr. & Richard G. Netemeyer, The Effect of Financial Literacy and Financial Education on Downstream Financial Behaviors June 2, 2013, <http://www.nefe.org/Portals/0/WhatWeProvide/PrimaryResearch/PDF/CU%20Final%20Report.pdf>.

Study, which is simply the Lusardi five-question survey.²⁸ Of the five multiple choice questions, which address compounding, inflation, mortgages, diversification and the relationship between interest rates and bond prices, FINRA's subjects answered an average of 2.88 questions correctly.²⁹ From these results, FINRA concluded that "Americans demonstrate relatively low levels of financial literacy and have difficulty applying financial decision-making skills to real life situations."³⁰

Dodd-Frank directed the Securities & Exchange Commission to examine investor financial literacy, and the SEC reported its results in a report in 2012.³¹ The report relied upon a review of existing quantitative studies of financial literacy conducted by the Library of Congress³² as well as on-line testing, conducted by a consultant, of investor understanding of various SEC-mandated disclosure documents.³³ The SEC, like FINRA, concluded that "American investors lack basic financial literacy."³⁴

Internationally, the Organization for Economic Co-operation and Development (OECD)³⁵ has constructed a financial literacy survey designed to measure and compare financial literacy internationally.³⁶ The survey consists of eight literacy questions, plus a variety of additional demographic questions that are designed to be answered orally in individual face-to-face interviews. The literacy questions cover

²⁸ FINRA Investor Education Foundation, National Financial Capability Study, <http://www.usfinancialcapability.org/quiz.php> (last visited Sept. 12, 2014).

²⁹ See also Kimberly Palmer, How to Measure Your Financial Literacy, US News & World Report Money, June 20, 2014, <http://money.usnews.com/money/blogs/alpha-consumer/2014/06/20/how-to-measure-your-financial-literacy> (describing results of FINRA's survey of 25,000 adults in 2009 and 2012, using these questions).

³⁰ See FINRA Investor Education Foundation, National Financial Capability Study, U.S. Survey Data at a Glance, <http://www.usfinancialcapability.org/results.php?region=US> (reporting survey results).

³¹ Office of Investor Educ. & Advocacy, SEC Staff Study Regarding Financial Literacy Among Investors, 15 (2012), available at <http://www.sec.gov/news/studies/2012/917-financial-literacy-study-part1.pdf>.

³² Id. at vii.

³³ Id. at ix.

³⁴ Id.

³⁵ The OECD is an organization currently consisting of 34 member countries dedicated to global development. See OECD Website, Members and Partners, <http://www.oecd.org/about/membersandpartners/>

³⁶ OECD INFE (2011) Measuring Financial Literacy: Core Questionnaire in Measuring Financial Literacy: Questionnaire and Guidance Notes for conducting an Internationally Comparable Survey of Financial literacy. Paris: OECD.

numeracy, interest, fees, inflation, and diversification.³⁷ The pilot study, which was used in fourteen countries, reported varying but overall low levels of financial literacy in all countries.³⁸ For example, researchers who defined a high level of financial literacy as the ability to answer 6 of eight questions correctly found that in none of the countries surveyed could more than 70% of subjects answer at least six questions correctly. Subjects were particularly deficient in the ability to understand simple and compound interest.³⁹

Commentators attribute a variety of costly financial decisions to a lack of financial literacy, including failure to save adequately, use of expensive sources of credit and failure to obtain and use information about various financial products.⁴⁰ For example Lusardi and Mitchell found that women who exhibit lower levels of financial literacy are less likely to plan for retirement.⁴¹ Behrman et al. find that financial literacy is positively correlated with household wealth, and that the effects of literacy are “more important than schooling for explaining variation in household wealth and pension contributions.”⁴² Rooj, Lusardi and Alessi find those with lower levels of financial literacy are less likely to invest in stocks.⁴³

The relationship between financial literacy and poor retirement planning may be especially complex in ways not previously discussed. First, the vast majority of the studies include numeracy as a component of financial literacy. Thus subjects who are unable to perform calculations involving interest and compounding will not be able to answer the test questions accurately and will receive a low literacy score. While basic math skills and a level of comfort with numbers may improve financial

³⁷ Adele Atkinson & Flore-Anne Messy, *Measuring Financial Literacy: Results of the OECD / International Network on Financial Education (INFE) Pilot Study*, OECD Working Papers on Finance, Insurance and Private Pensions, No. 15, OECD Publishing, 2012 <http://dx.doi.org/10.1787/5k9csfs90fr4-en>

³⁸ *Id.*

³⁹ See *id.* (reporting that in every country except Norway at least half the subjects failed to identify the effect of compounding).

⁴⁰ See William Gale & Ruth Levine, *Financial Literacy: What Works? How Could It Be More Effective* (working paper dated 2010 at 8) (describing some of the “abundant evidence” relating financial literacy to financial mistakes).

⁴¹ Lusardi & Mitchell, *supra* note __ (2008).

⁴² Behrman, et al. *supra* note __.

⁴³ Rooj, et al. *supra* note __ (stock market participation).

decision-making, it is not clear that the study questions accurately measure conceptual understanding as opposed to basic math.⁴⁴

Second, a variety of psychological traits may also affect financial decision-making.⁴⁵ Among the traits that scholars have identified are cognitive ability,⁴⁶ confidence,⁴⁷ ability to plan and willingness to take financial risks.⁴⁸ Some or all of these traits may also be correlated with financial literacy, making it unclear whether the existing literature is accurately capturing the effect of literacy or something else. Fernandes et al, for example, run regressions in which they control for numeracy, confidence, willingness to plan long term and willingness to take investment risks. They find that these traits, rather than financial literacy, have significant effects on various types of financial behavior.⁴⁹

Understanding more clearly the relationship between financial literacy and investor decision-making is critical to formulating a policy for improving investor decisions. Scholars and policymakers are attempting to respond to evidence of poor consumer investment decisions by improving consumer financial education.⁵⁰ Thus, for example, the

⁴⁴ See Hung, et al. supra note __, at 7 (arguing that numeracy should be distinguished conceptually from financial literacy).

⁴⁵ Financial literacy is also correlated with certain demographic characteristics such as age, gender, education level and income. See, e.g., Cf. SEC STAFF STUDY, supra note 3, at 15 (“In particular, surveys demonstrate that certain subgroups, including women, African-Americans, Hispanics, the oldest segment of the elderly population, and those who are poorly educated, have an even greater [lack] of investment knowledge than the average general population.”). Studies have shown that these factors also correlate with financial behavior. See also Sandra J. Huston, Measuring Financial Literacy, J. Consumer Affairs at t 305-306 (distinguishing between financial literacy and financial knowledge).

⁴⁶ Shawn Allen Cole, Anna I. Paulson, & Gauri Kartini Shastry, Smart Money: The Effect of Education on Financial Behavior, 24 (April 11, 2012). Harvard Business School Finance Working Paper No. 09-071. <http://ssrn.com/abstract=1317298> (finding “that cognitive ability itself is an important determinant of financial behavior”).

⁴⁷ Andrew M. Parker, Wandu Bruine de Bruin, Joanne Yoong, & Robert Willis, Inappropriate Confidence and Retirement Planning: Four Studies with a National Sample, 25 J. Behav. Dec. Making 382 (2012) (finding that confidence in knowledge predicts self-reported retirement planning and savings, as well as performance on a hypothetical investment task).

⁴⁸ See Fernandes at 17.

⁴⁹ See id. at __.

⁵⁰ See, e.g., William G. Gale, Benjamin H. Harris & Ruth Levine, Raising Household Saving: Does Financial Education Work?, Social Security Bulletin, Vol. 72, No. 2, 39,

Consumer Financial Protection Bureau has identified one of its objectives as developing tools for more effective investor education.⁵¹ Similarly on June 25, 2013, President Obama signed an executive order establishing the President's Advisory Council on Financial Capability for Young Americans.⁵² The Council, led by the US Treasury Department is devoted to evaluating financial capability and developing tools to improve it.⁵³

For investor education to improve financial decision-making, however, two things must be true. First, a lack of financial literacy must be a contributing cause of poor investor decisions. Second, investor education must be effective in improving financial literacy. This Article focuses primarily on the first question; future will work focus on the second. At the same time, the striking limitations in financial literacy that we document below suggest that, as currently constructed, the task of retirement investing is almost impossible for the average employee. Even if investor education can improve investor performance, the deficiencies revealed in this article suggest a need to pay greater attention to alternative means of investor protection such as improving access to reliable investment advice or imposing more stringent obligations on plan sponsors.

The role of financial literacy is particularly important in the context of retirement savings. Over the past forty years, retirement savings plans have shifted almost entirely from employer-directed plans to those in which individual workers make their own savings and investment decisions.⁵⁴ A variety of studies report that the shift to employee-directed

2012. <http://ssrn.com/abstract=1953629> (surveying requests of studies on the effectiveness of investor education).

⁵¹ See Prepared Remarks of Richard Cordray, Director of the Consumer Financial Protection Bureau FINRA Investor Education Conference, Washington, DC May 29, 2013, <http://www.consumerfinance.gov/newsroom/director-cordray-remarks-at-the-finra-investor-education-conference/> (describing CFPB's investor education efforts).

⁵² Executive Order--Establishing the President's Advisory Council on Financial Capability for Young Americans, June 25, 2013, <http://www.whitehouse.gov/the-press-office/2013/06/25/executive-order-establishing-presidents-advisory-council-financial-capab>

⁵³ Cyrus Amir-Mokri, President Obama Creates New Advisory Council Focused on the Financial Capability of Young Americans, Treasury Notes, June 25, 2013, <http://www.treasury.gov/connect/blog/Pages/President-Obama-Creates-New-Advisory-Council-Focused-on-the-Financial-Capability-of-Young-Americans.aspx>.

⁵⁴ Fisch & Wilkinson-Ryan Costly Mistakes at 614.

retirement savings has resulted in “the greatest retirement crisis in history” in which many elderly Americans will have insufficient retirement savings to meet their needs.⁵⁵ Critics attribute the crisis, in part, to poor decisions by plan participants.⁵⁶ Studies suggest that participants in these plans make numerous mistakes including saving too little,⁵⁷ choosing suboptimal investment options,⁵⁸ and paying excessive fees.⁵⁹ The role of financial literacy is contributing to poor investment decisions is critical to the policy choice of whether to subject retirement savings to greater regulation as well as the form that such regulation should take.

III. Study Design and Financial Literacy Index

A. Study Design

We examined financial literacy in the context of a specific investment decision – choosing investments in a 401(k) plan. Drawing upon our prior work, we constructed a web-based interface that allowed subjects to allocate a hypothetical \$10,000 among ten investment options as part of a 401(k) plan. Subjects were told to assume that they were not going to be retiring for at least 30 years, and that an algorithm would simulate their portfolio’s value at the end of thirty years based on their investment choices. They were incentivized to maximize the value of their portfolio by being told that they would be paid a percentage of their portfolio’s total value at the end of thirty years.

⁵⁵ See, e.g., Edward Siedle, *The Greatest Retirement Crisis In American History*, *Forbes*, March 20, 2013, <http://www.forbes.com/sites/edwardsiedle/2013/03/20/the-greatest-retirement-crisis-in-american-history/>

⁵⁶ See, e.g., Jeff Rose, *4 Serious Retirement Plan Errors to Avoid*, *US News & World Report*, *Money*, Mar. 9, 2015, <http://money.usnews.com/money/blogs/on-retirement/2015/03/09/4-serious-retirement-plan-errors-to-avoid>

⁵⁷ See James J. Choi, David Laibson, & Brigitte C. Madrian, *\$100 Bills on the Sidewalk: Suboptimal Investment in 401(k) Plans*, 93 *Rev. Econ. & Stat.* 748 (2011)

⁵⁸ Tang, et al., *The efficiency of sponsor and participant portfolio choices in 401(k) plans*, 94 *J. Pub. Econ.* 1073 (2010) (finding that investors construct inefficient portfolios, reducing their potential retirement wealth by one-fifth); Alicia A. Munnell & Annika Sunden, *401(k) Plans Are Still Coming Up Short*, Issue Brief dated March 2006, Center for Retirement Research at Boston College, <http://crr.bc.edu/briefs/401k-plans-are-still-coming-up-short/>

⁵⁹ Josh Boak & Paul Wiseman, *High fees eroding many 401(k) retirement accounts*, *AP*, Spr. 13, 2014, <http://bigstory.ap.org/article/savers-beware-fees-may-be-shrinking-your-401k>

Our investment options included a bank savings account, a money market fund and eight domestic mutual funds. Each of the options was modeled upon a real world example. We provided our subjects with an allocation page that listed all ten funds along with a label of their investment type (i.e. equity index fund). The study offered the subjects the opportunity to obtain more detailed information by clicking through a series of user-initiated links. Clicking on a fund name provided the subject with a brief description of the fund and four additional links labeled performance, holdings, risk and fees. Clicking any of the four links revealed simplified fund-specific information derived from the attributes of the real world analog on which the fund was based. The click-through structure allowed us to track the precise information accessed by each subject.

After our subjects completed the allocation exercise, we asked them to answer a series of questions including demographic information, attitudes about investing, questions about their objectives while completing their allocation and questions seeking to assess their financial literacy. We describe the financial literacy analysis in more detail below.

At the end of the questionnaire we calculated a predicted value of the selected portfolio, using an algorithm to simulate the performance of each of our investment options over thirty years.⁶⁰ Our algorithm relied on basic assumptions about the long term return for each asset class and adjusted those returns to reflect the quoted fees of each of the options in our menu. The value of a subject's portfolio was heavily influenced by the investment decisions. A portfolio that was invested 100% in the FDIC insured bank account would have had a value of \$13,478.49 at the end of the thirty year period. A portfolio that was invested 100% in our low cost equity index fund would have had a value of \$132,676.78. Accordingly, our subjects' investment choices potentially affected the value of their portfolios, and their own incentive payment, by a factor of 10.

We measured our subjects' performance in the allocation exercise in two different ways.⁶¹ The first measure is the simulated thirty-year value of a subject's portfolio.⁶² Because the subjects were instructed to

⁶⁰ The value of a subject's portfolio was only disclosed to that subject at the conclusion of the full study.

⁶¹ An analysis of the reasons for our approach is described in the results section.

⁶² Our algorithm calculated returns according to asset class and provided similar returns for all funds within a single asset class, based on the theory that, over time, a fund is

attempt to maximize this value and were being paid incentives based on this value we believe that this measure provides a good fit with the subjects' perception of the task at hand.⁶³ As indicated above, depending on a subject's allocation decision, the final value of his or her portfolio could range from \$13,478.49 to \$132,676.78. Our second outcome measure was the percentage of the portfolio invested in Fund D, our low cost index fund. We designed Fund D, based on the information that we provided to our subjects, to dominate the other investment options on every dimension, on the theory that the most appropriate investment option for a retirement investor with a thirty-year time horizon is a low cost diversified equity fund.⁶⁴

Our subject group consisted of people who signed up through Amazon Mechanical Turk (MTurk) to participate in internet-based research for compensation.⁶⁵ In all, 695 subjects participated in the study.⁶⁶ We report demographic information on the full group in Table 1.

Table 1
Demographic Statistics

	Full Study	Control Group
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likely to revert to the market rate of return. We then adjusted each fund's return to reflect the disclosed fee, so that funds with higher fees yielded lower returns. Our algorithm provided subjects with higher payouts for choosing equity over fixed income (the equity risk premium) and with higher payouts for choosing funds with lower fees. Given the thirty year time-frame of the study, we did not reduce the value of portfolios that incorporated a higher level of risk, recognizing that the literature on the appropriate level of risk for investments with a long time horizon is complex. See, e.g., Christian Gollier & Richard J. Zeckhauser, Horizon Length and Portfolio Risk, 24 J. Risk & Uncertainty, 195 (2002)

⁶³ Indeed, our measure is perhaps a more accurate measure of the quality of subjects' allocation decisions than studies that look at the real world value of employee's retirement accounts because those studies cannot capture other potential sources of retirement wealth such as investments in a primary residence, non-retirement savings, and insurance.

⁶⁴ Cf. Ian Ayres and Barry Nalebuff, Lifecycle Investing: A New, Safe, and Audacious Way to Improve the Performance of Your Retirement Portfolio. See also comment criticizing DOL for preferring low cost passive investing.

⁶⁵ See our earlier paper describing MTurk.

⁶⁶ A small number of participants were removed because of they had participated in a prior pilot study (based on matching MTurk Worker IDs) or because their survey IDs did not match completed MTurk HITs. 695 participants remained after these removals.

Male	54%	57%
Median Age	31	31
Four Year College Degree or more	49%	46%
Employed full or part time	63%	62%
Annual Household Income <\$50,000	58%	60%

Note: The full study consisted of 695 participants recruited on Amazon MTurk. The analysis in this Article focuses on the control group, which contained 201 participants.

Subjects ranged in age from 18 to 79, with a median age of 31. 44.6% of subjects in this group were female. Over half of the subjects (57.7%) reported that their household income was less than \$50,000 per year. Subjects had a range of educational backgrounds, and only two subjects reported completing less than a high school degree or GED. 40% had completed high school or some college. 38.4% had a four-year college degree, and 10.2% had an advanced degree.

Each participant in our full group of 695 was randomly assigned to a control group or a group that received some form of experimental intervention in the form of financial education or an investment instruction. For purposes of this article, our analysis is about the control group, a group that encountered the task with no such intervention, which consisted of 201 participants. There are no significant demographic differences between the control group subjects and those assigned to other forms of the task.

B. The Financial Literacy Index

We measured financial literacy by using fifteen questions about financial knowledge about the investment options our subjects faced.⁶⁷ The questions varied in complexity and were designed to test financial knowledge that is specific to the asset allocation decision. We also included four questions that tested subject numeracy.⁶⁸ Sensitive to the claims by some scholars that numeracy is distinct from financial literacy, we analyzed our results using both an expanded measure of financial

⁶⁷ Our questions, listed in Table 10 to Table 12 explore the difference and attributes of stocks, bonds and mutual funds as well as the expected long term performance of equity and fixed income and the meaning of diversification.

⁶⁸ We test numeracy using four questions about the effect of compounding and incorporating increasing degrees of complexity.

literacy that included all nineteen questions and one that excluded tests of numeracy. We thus constructed a general measure of financial literacy consisting of a nineteen-point scale. For reasons detailed below, we view the issue of numeracy as distinct from financial literacy; accordingly, we result our primary results based on the fifteen point scale (and then a reduced three-question instrument) that excludes the numeracy questions.

The index was constructed by giving subjects one point for each correct answer. The fifteen financial literacy questions are set out in the Appendix. There were seven multiple choice questions and eight true or false questions. The questions were intended to evaluate the extent to which subjects understand the basic facts of investing and the characteristics of common investment products that would be considered by an employee selecting an investment portfolio for retirement. The four numeracy questions are set out in the Appendix.

Subjects in our control group received an average score of 8.45 on the fifteen point scale and 9.48 on the nineteen point scale. The percentage of subjects answering a question correctly ranged from a low of 6.5% to a high of 83.6%. The percentage of subjects answering the question correctly was not a measure of how strongly a correct answer to that question correlated with performance.

To determine the validity of our questions in measuring financial literacy, we analyzed independently the correlation between each question and our outcome variables. The results, as shown in Table 2 below, demonstrate a high degree of correlation between most of the financial literacy questions and the 30 year simulated portfolio value, and weaker correlations with our second outcome measures.

Table 2
Covariance of Outcome Variables with Financial Literacy Questions

Question	Number of Correct Answers	Total Return	Cheap Index Fund Investment
MC1	152 (75.6%)	0.2**	0.12
MC2	134 (66.7%)	0.25***	0.17*
MC3	131 (65.2%)	0.22**	0.17*
MC4	74 (36.8%)	0.19**	0.08
MC5†	73 (36.3%)	0.38***	0.30***
MC6	48 (23.9%)	0.14*	0.13

MC7	40 (19.9%)	0.18*	0.16*
TF8	88 (43.8%)	0.23***	0.21**
TF9†	165 (82.1%)	0.26***	0.16*
TF10	81 (40.3%)	0.18**	0.12
TF11	170 (84.6%)	0.07	0.03
TF12†	122 (60.7%)	0.16*	0.19**
TF13	168 (83.6%)	0.07	0.03
TF14	97 (48.3%)	0.07	0.04
TF15	155 (77.1%)	0.04	0.04
N16	53 (26.4%)	0.01	0.08
N17	42 (20.9%)	0.05	0.00
N18	13 (6.5%)	-0.01	0.02
N19	21 (10.4%)	0.08	0.05
15-point Score	Average=8.45	0.42***	0.32***
19-point Score	Average=9.09	0.40***	0.30***
3-point Score	Average=1.79	0.45***	0.37***

*p<.05, **p<.01, ***p<.001. † in three question score

We explore these correlations further in our regression analysis. Importantly, in contrast to the importance of financial literacy, we found very little correlation between the answers to the numeracy questions and any of our outcome variables. Moreover the nineteen-point financial literacy index that included the numeracy questions showed a weaker correlation with our outcome variables than the fifteen question index.

We then examined more closely the predictive value of our fifteen questions. We found that a reduced financial literacy score comprised of only three questions performed similarly if not marginally better than our fifteen point score. The three questions are:

1. Over the past twenty years, the best average returns have been generated by investments in [stocks, bonds, money market funds, cds, precious metals, unsure].
2. An index fund is designed to track the performance of a market index such as the S&P 500 index. [True, False]

3. It is possible to lose money by investing in a bond fund. [True, False]

Table 3 shows an initial regression assessing the predictive power of the longer- or shorter-form financial literacy quiz. We move forward with the shorter-form score below.

Table 3
Comparing Financial Literacy Scores – Total Return Regressions

	15-point Financial Literacy (1)	15-point With All Scores (2)	3-point Financial Literacy (3)	3-point With All Scores (4)
Intercept	79630*** (1438)	79569*** (1319)	79617*** (1410)	79566*** (1298)
15-point Fin. Lit.	7767*** (1626)	5640*** (1638)		
3-point Fin. Lit.			8666*** (1551)	6728*** (1585)
Risk Tolerance		7398*** (1414)		7358*** (1392)
Experience		3133* (1584)		2483 (1581)
Numeracy		-1893 (1409)		-1957 (1382)
Age	4029** (1492)	2642 (1394)	4015** (1451)	2709* (1363)
Male	2044 (1515)	1205 (1409)	1866 (1478)	1069 (1383)
Education	1864 (1579)	2102 (1470)	2806 (1508)	2820* (1421)
Income ⁶⁹	1351 (1494)	-65 (1406)	1274 (1465)	6 (1385)
Adjusted R ²	0.22	0.345	0.25	0.365

⁶⁹ The income level for subjects who chose that they would "rather not say" is coded as missing data for this and future regressions.

F-Test	F(5,187) =11.81	F(8,184) =13.63	F(5,187) =13.78	F(8,184) =14.79
p-value	<.001	<.001	<.001	<.001

n=201. *p<.05, **p<.01, ***p<.001 The dependent variable, total return, is measured in dollars. All independent variable raw scores have been scaled by subtracting the mean and dividing by the standard deviation.

We then examined the relationship of our financial literacy index to standard demographic characteristics. Our results are reported in Table 4. As this table shows, our results are consistent with the prior literature. In our pool, male subjects and those with more investment experience show higher levels of financial literacy. Education strongly correlates with only our fifteen and nineteen point scales. Age is weakly correlated, again with the 15- and 19-point scales; income is not.

Table 4
Risk and Financial Literacy Scores Regressions

	DV=risk score (1)	DV=3 question fin. lit. score (2)	DV=15 question fin. lit. score (3)	DV=19 question fin. lit. score (4)
Intercept	2.9*** (0.1)	1.8*** (0)	8.5*** (0.2)	9.1*** (0.2)
Risk Tolerance		0.1 (0.1)	0.2 (0.2)	0.2 (0.2)
Experience	0.4*** (0.1)	0.3*** (0.1)	1*** (0.2)	1*** (0.2)
Age	0.2 (0.1)	0.1 (0.1)	0.4* (0.2)	0.4* (0.2)
Male	0.2* (0.1)	0.2** (0.1)	0.6*** (0.2)	0.7*** (0.2)
Education	0 (0.1)	0.1 (0.1)	0.6** (0.2)	0.8*** (0.2)

Income	0.1 (0.1)	0 (0.1)	-0.1 (0.2)	-0.1 (0.2)
Adjusted R ²	0.117	0.265	0.303	0.315
F-Test	F(5,187) =6.09	F(6,186) =12.56	F(6,186) =14.94	F(6,186) =15.74
p-value	<.001	<.001	<.001	<.001

n=201. *p<.05, **p<.01, ***p<.001 The dependent variables are a risk score on a 7 point scale and various financial scores on 3, 15, and 19 point scales. All independent variable raw scores have been scaled by subtracting the mean and dividing by the standard deviation.

C. Investment Task: Descriptive Statistics

In this study, we were interested not just in the nature of financial literacy as explored above, but specifically in the relationship between financial literacy and retirement investment. Each subject chose a mock portfolio out of ten funds in our online game protocol. Basic descriptive statistics for the behavior and investment allocations made by our control group of 201 subjects are reported in Table 5 and Table 6.

Table 5
Descriptive Statistics: Outcome Variables

	Total Return	Cheap Index Fund Investment
Mean	\$79,312.63	13.3%
Median	\$79,999.07 ⁷⁰	10%
Minimum	\$13,478.49	0%
Maximum	\$13,2676.8	100%
Standard Deviation	\$23,142.5	17.5

Table 6
Descriptive Statistics: Percentages Invested By Fund

	Mean	Median

⁷⁰ The value of \$79,999.07 is the return from investing exactly 10% into each of the ten available funds

Cash	9.6%	5%
Money Market	8.5%	5%
Fixed Income Fund	9.7%	5%
Cheap Balanced Fund	15.8%	10%
Expensive Balanced Fund	12.9%	10%
Cheap Equity Index Fund	13.3%	10%
Expensive Equity Index Fund	7.8%	5%
Cheap Managed Equity Fund	9.5%	10%
Expensive Managed Equity Fund	7.5%	5%
Closet Index Fund (Managed)	5.4%	0%

As an initial matter, we make three observations about these results:

- The mean and median investment for each fund hovers between 5% and 10% of the total. Subjects were spreading their money around. This is consistent with our earlier finding that investors view their objective as to diversify widely among all the alternatives offered rather than attempting to select the best option offered.
- Within categories, subjects clearly distinguished between high- and low-fee funds. Collectively they invested significantly less money in the higher-fee alternatives than in their respective lower-fee counterparts. However, investors seemingly responded to a price difference by investing less money rather than choosing not to invest in the higher cost fund.
- Significantly, investors did not reject investment options that were clearly dominated. In particular, our study offered investors a choice between two index funds that were identical except for the fact that one charged higher fees. Most participants invested money in both index funds rather than rejecting the higher cost option
- Subjects invested substantial sums in low-risk options that offered negligible returns—i.e., cash and money market accounts, despite the instruction to invest for a thirty year time horizon.

B. The Role of Financial Literacy

One question posed by the literature is the extent to which financial literacy is serving as a proxy for other investor characteristics or demographics. To examine this question, we assessed the relative contributions of financial literacy (as measured by the three-question instrument), risk tolerance, and investor experience, for predicting total returns and cheap index investments, respectively. As a preliminary matter, we observe the obvious point that these constructs are highly interrelated. Table 7 shows the covariance of the scores.

Table 7
Covariance of Scores

	Financial Literacy Score	Risk Tolerance Score	Experience Score
Risk Tolerance Score	.24***		
Experience Score	.44***	.33***	
Numeracy Score	.24***	.14	.15*

*p<.05, **p<.01, ***p<.001

We then ran regressions using four main independent variables (financial literacy, risk tolerance, experience, and numeracy) as well as demographic variables, on the main DVs—total returns and investments in the cheap index fund, respectively. Table 8 and Table 9 show the results.

Table 8
Total Return Regressions

	Financial Literacy Score (1)	Add Risk Tolerance Score (2)	Add Experience Score (3)	All Scores (4)
Intercept	79617*** (1410)	79538*** (1306)	79515*** (1301)	79566*** (1298)
Financial Literacy	8666*** (1551)	7297*** (1457)	6359*** (1567)	6728*** (1585)

Risk Tolerance		7733*** (1368)	7267*** (1394)	7358*** (1392)
Experience			2508 (1585)	2483 (1581)
Numeracy				-1957 (1382)
Age	4015** (1451)	3078* (1354)	2723* (1367)	2709* (1363)
Male	1866 (1478)	845 (1381)	826 (1376)	1069 (1383)
Education	2806 (1508)	2519 (1397)	2400 (1394)	2820* (1421)
Income ⁷¹	1274 (1465)	400 (1366)	-37 (1388)	6 (1385)
Adjusted R ²	0.25	0.356	0.361	0.365
F-Test	F(5,187) =13.78	F(6,186) =18.71	F(7,185) =16.52	F(8,184) =14.79
p-value	<.001	<.001	<.001	<.001

n=201. *p<.05, **p<.01, ***p<.001 The dependent variable, total return, is measured in dollars. All independent variable raw scores have been scaled by subtracting the mean and dividing by the standard deviation.

Table 9
Cheap Index Fund Investment Regressions

	Financial Literacy Score (1)	Add Risk Tolerance Score (2)	Add Experience Score (3)	All Scores (4)
Intercept	13.0*** (1.1)	12.9*** (1.1)	12.9*** (1.1)	13.0*** (1.1)
Financial Literacy	5.6*** (1.2)	5.0*** (1.2)	4.9*** (1.3)	5.1*** (1.3)

⁷¹ The income level for subjects who chose that they would "rather not say" is coded as missing data for this and future regressions.

Risk Tolerance		3.6** (1.1)	3.6** (1.2)	3.6** (1.2)
Experience			0.2 (1.3)	0.2 (1.3)
Numeracy				-0.9 (1.2)
Age	1.5 (1.1)	1.1 (1.1)	1.0 (1.1)	1.0 (1.1)
Male	0.6 (1.2)	0.1 (1.1)	0.1 (1.1)	0.2 (1.2)
Education	0.4 (1.2)	0.3 (1.2)	0.3 (1.2)	0.5 (1.2)
Income	3.1** (1.1)	2.7* (1.1)	2.7* (1.2)	2.7* (1.2)
Adjusted R ²	0.166	0.206	0.202	0.2
F-Test	F(5,187) =8.65	F(6,186) =9.29	F(7,185) =7.93	F(8,184) =6.99
p-value	<.001	<.001	<.001	<.001

n=201. *p<.05, **p<.01, ***p<.001 The dependent variable, cheap index fund investment, is the percentage of the investment that was allocated into the cheap index fund. All independent variable raw scores have been scaled by subtracting the mean and dividing by the standard deviation.

Our first finding is that financial literacy, as measured by our three question instrument,⁷² was a strong predictor of a subject's ability to maximize the size of their hypothetical retirement portfolio. This was true when we included demographic controls (age, sex, education, and income) and also when we included risk tolerance, investment experience, and the numeracy score. In other words, financial literacy is not just a measure of gender, investment experience or risk tolerance – even holding those variables constant, financial literacy is a strong predictor of performance.

We also measured task performance by looking just at investment in the most lucrative fund, the cheap index fund. Table 12 shows the strong

⁷² We find similar but slightly less strong results using our fifteen question measure of financial literacy.

relationship between financial literacy and investment in the index fund, holding constant other variables.

Notably, we do not find the same predictive value for numeracy. Numeracy and financial literacy are highly correlated, which we should certainly expect given their relationship to other underlying variables (education, job experience, etc.) as well as their strong conceptual connection. What we highlight in this paper, however, is that the ability to solve math problems related to investing—problems involving compounding, specifically—is not predictive of success in navigating the investment choices. When other variables are accounted for, numeracy has no relationship to investment decisions—This absence of predictive value persists even if financial literacy, a highly correlated construct, is left out of the regression. Even on a bare correlation analysis, numeracy is just not significantly correlated with total returns ($r=.06$, $p=.393$).

When we think about the role of arithmetic in retirement planning, it is perhaps unsurprising that numeracy is not a particularly predictive trait. Many of our subjects (around 28%) could answer a basic two-year compounding question correctly in free-response format. That is, they knew how to compound and how to add the compound interest to the principal correctly. But that skill did not translate into the questions that asked for estimates of 30-year returns, much less for the effects of fee differences over 30 years. The reason appears to be that, even for people who understand compounding conceptually, the magnitude of the difference in value over a long time horizon is hard to estimate. This suggests that retirement planning places unusual cognitive demands on investors, even investors who understand the relevant math concepts.

Finally, we drew on our results to get an initial impression of the relationship between financial literacy and the search for relevant information, and then, in particular, information about fund fees.

Table 10. Clicks and Fees Paid, Low vs. High Financial Literacy sub-groups

	Low Financial Literacy	High Financial Literacy
Total Clicks ($p=.03$)	14.3*	19.6
Total Clicks on Fees ($p=.01$)	1.51*	2.70
Total equity fees ($p=.000$)	.85***	.76

We found that high-literacy subjects searched for more information generally, more fee information specifically, and paid lower fees overall.

D. The Independent Importance of Risk Tolerance

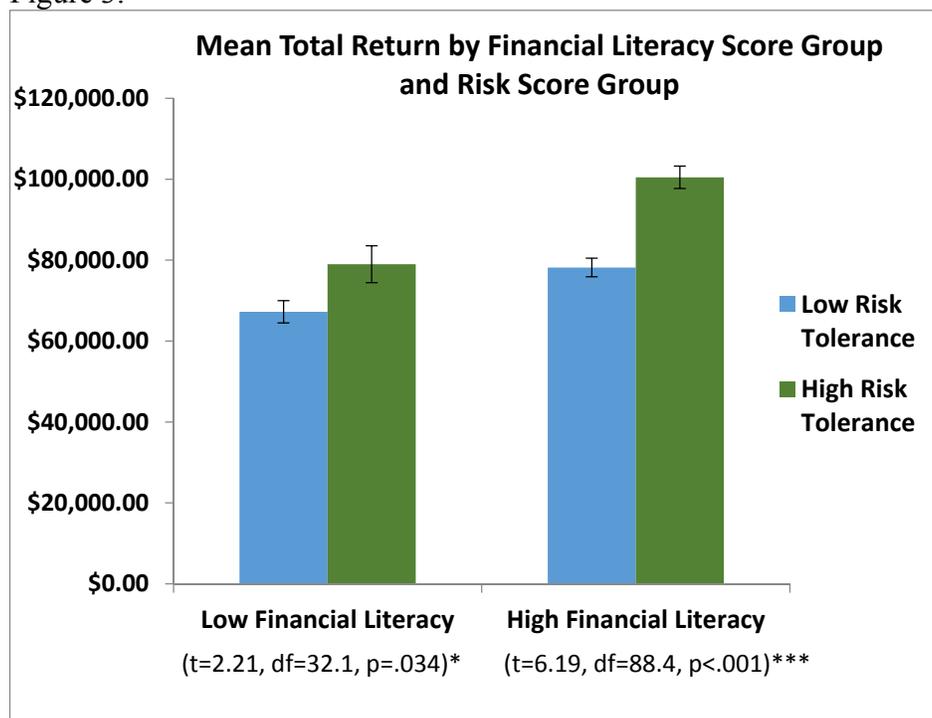
We asked subjects in this study one simple question about risk tolerance -- to indicate the extent to which minimizing risk was an important priority in their investment decision-making. As one might expect, risk tolerance is correlated with financial literacy ($r=.24$, $p<.001$). People who are more financially literate indicate a greater tolerance for risk. In our study, the connection is likely enhanced by the fact that one of our financial literacy questions asked if subjects knew that stocks had the highest returns over time. In theory, this question should identify those subjects who understand the overall relationship between risk and return.

Despite this strong relationship, we found a disjunction between risk tolerance and financial literacy. In our regression models, risk tolerance was as important a predictor of success on the investment task as financial literacy, even when both factors are included in the regression, as seen in tables 11 and 12. Greater risk tolerance predicted greater overall returns and more willingness to invest in the fund with the highest payout, in this case an index fund—even holding financial literacy constant.

Figure 3 offers a different visualization of this effect. We bifurcated our sample and classified every subject as either high or low financial literacy and also either high or low risk tolerance. For each subgroup, we calculated the total returns. The chart shows the pronounced effect of risk tolerance in both groups. Notably risk tolerance had a particularly strong effect on the high financial literacy subjects. It appears that, even those subjects who understood the potential for riskier equity investments to earn a higher return did not privilege that information over their risk aversion in constructing a portfolio.⁷³

⁷³ This result is particularly surprising in the context of a simulation in which the subjects were not risking their own money.

Figure 3.



It appears that in this sample, even subjects with an objectively reasonable level of financial literacy do worse on the task if they also have a preference for avoiding risk.

As we can see from the allocation tables, it was common for our subjects to make very conservative allocation decisions despite being instructed to try to maximize the value of their portfolios and despite the fact that they were investing for a 30 year time horizon. Studies have shown that conservative investment options can dramatically reduce the value of employees' retirement portfolios. Moreover, because of the long time horizon associated with retirement savings, even large fluctuations in stock prices are unlikely to eliminate this effect.

Our understanding of risk aversion is supplemented by a qualitative analysis of some free-response answers to questionnaire probes. One such question asked investors to describe their investment strategy in a general way. Many subjects reported a deliberate desire to minimize risk in their

portfolio, suggesting that conservatism was not simply the product of a failure to understand the characteristics of the different options. For example, two subjects put all of their money into cash. As they explained: “I would not like to risk my money on any funds” and “I chose the safest policy to make sure i didn't loose [sic] any money.” Many investors took similar albeit less extreme positions. As one investor, stated: “For 30 years, risk seems like a short-term strategy. Conservatism will win the day here.” Another explained: “I chose my allocation strictly based on risk as top priority and then fees. Fund I had the lowest risk and fees so that's where the majority of my funds went.”

Investor risk aversion seemed to be an important driver of investment decisions, yet these investors seemingly have not incorporated into their analysis the opportunity cost of foregoing the higher return associated with a riskier portfolio. Notably, this appears to hold true even for those subjects who acknowledge that riskier investments are associated with higher returns.

From a policy perspective, our subjects' behavior raises an important question – are investors' 401(k) balances too low because they are excessively risk averse in their investment choices? There is little question that employees who invested the majority of their savings in equities over the past 30 years have much larger portfolios now, as they are nearing retirement, than employees who invested in less risky alternatives. For example, an employee who earns 50,000 per year and contributes 10% of his or her annual salary on a monthly basis to a 401(k) plan will have an account balance of more than \$375,000 at the end of thirty years if the account is invested in equities earning an average return of 8%. That same employee will only have an account balance of \$123,000 if the plan is invested in low risk investments such as money market funds earning an average rate of 2%.

In contrast to risk aversion, other investor characteristics appear to play a limited role, if any, in predicting performance. We had hypothesized that investor experience, confidence, or desire to delegate decision-making responsibility would correlate with our subjects' ability to maximize the size of their portfolios. Instead we found that, when we included financial literacy as an independent variable, none of the three had predictive value. Our ability to understand these attributes may have been limited by the nature of the particular questions that we asked or the characteristics of our sample population. Nonetheless our impression is that the regressions are meaningful—that knowing about historic market

trends and understanding the available investment products matters more than dimensions like self-confidence and self-doubt in this context.

E. Limited Use of Information

We found in our earlier research that our study participants used a very small proportion of the information that was provided to them. Although our findings were consistent with other research showing that investors do not make use of disclosures, we found this result surprising given the fact that the information in our study was easy to find, simplified, and readily comparable across funds, attributes that are far less characteristic of real world investment information.

We found similar results here – investors made very limited use of the information available to them about their investment options. In order to uncover all of the available information, a subject would have needed to click 50 times – one click on each fund name and then 4 additional clicks on each fund attribute. Yet the average number of clicks per subject were only 17.5 (median) and 11 (mean) and only six subjects clicked on every single link. More than 20% of our subjects did not click on anything. This may of course be an artifact of the design or the simulated nature of the task – Turk subjects may simply seek to complete the task as quickly as possible in order to earn their payment. We do have some evidence from other studies, however, that Turk subjects are typically quite motivated to earn additional money.⁷⁴ We suspect that if they knew that there was information available that would yield a greater payout, they would have accessed it.

A critical question, given the SEC’s regulatory objective of protecting investors through mandated disclosure is why investors do not make greater use of information. One possible reason might be investor inability to understand the disclosure – there is little reason for investors to seek out information if they do not know how to use it. Using our measure of financial literacy, we sought to determine if financial literacy was correlated with investor use of information.

We found that financial literacy was somewhat associated with the number of clicks, but the effect was modest. Significantly, even the most financially literate subjects only clicked an average of about 20 times. Our

⁷⁴ cite

findings suggest that a lack of financial literacy is not a complete explanation for investor failure to use information.

More financially literate investors of course, may have the capacity to ignore unnecessary information or information that they already possess. For example, a financially literate investor may have found it unnecessary to click to learn the risk associated with investing in an FDIC-insured bank account. At the same time, critical information about our funds, including the similarity of their holdings as well as their costs, was only available by clicking. An investor who did not obtain the information available through clicks would have had no basis for rejecting the fund options that were clearly dominated in our study. It is not clear why subjects fail to use the available information, but we suspect that this phenomenon generalizes into higher-stakes real-world contexts. If investors do not search for the information necessary to reject inferior choices, they will be unable to reject those choices even if they have the capacity to do so. This possibility has important implications for the composition of 401(k) plans in that it suggests that the provision of inferior options in a plan is not mitigated by the availability of participant choice.

F. Fees

In prior work, we explored investor awareness of the importance of fees. We found that investors were generally unaware of the importance of fees for investment performance and that an instruction increased both investor perception of this importance and investor consideration of fee information in their investment choices.⁷⁵ We questioned whether our subjects' failure to search for and use fee information was due, in part, to a lack of financial literacy.⁷⁶ Our construction of a financial literacy index was motivated, in part, by an effort to test that connection.

Financial literacy was certainly associated with different fee results (note that this may be in part because more financially literate subjects chose index funds). That said, although financial literacy was associated with lower fees paid and more attention to fee information, even the high-literacy group clicked on an average of only 2 to 3 (out of 10) fund fee links, and paid over 75 basis points on equity funds. Subjects in this study were given the option of choosing a low cost equity index fund with a fee

⁷⁵ Costly Mistakes

⁷⁶ *Id.* at 643-44.

of 0.17%. The alternative equity fund options – passive and actively managed – offered similar holdings, investment objectives and returns, but charged higher fees. Given these options, our subjects preferred to invest in across the mix of equity fund options, including a more expensive index fund, even though this investment strategy caused them to pay higher fees.

IV. Implications

Our subjects' financial literacy was starkly limited, perhaps not surprising given other surveys along these lines. In particular, with respect to the specific task of retirement planning, the participants in our study lacked fundamental knowledge necessary to execute that task adequately. Indeed, the lack of financial literacy was reflected in our participants' poor performance with respect to the task of allocating a hypothetical retirement portfolio. They did not identify which of our ten funds were most suited to meeting their objectives, did not reject inferior funds and did not calibrate their risk tolerance to a level appropriate for a retirement portfolio.

A. Choice-Based Regimes

These findings ought to raise serious questions about the efficacy of a regime designed around investor choice. Specifically, the employer-sponsored 401(k) plan privileges participant autonomy and, to a substantial degree, limits the liability of the employer or plan sponsor with respect to the investment alternatives provided in the plan so long as the plan gives the participants sufficient control to choose and offers a minimum number of different investment options.⁷⁷ The regulatory standards are supplemented by court decisions that have viewed participant choice as protection against plan deficiencies.⁷⁸

In fact, even where regulators have made a policy judgment in favor of a particular approach to retirement investing, participant choice is the failsafe designed to safeguard investor interests. Thus, for example, Department of Labor regulations authorize employers to default their employees into contributing money to their 401(k) plans and limit employer liability so long as the contributions are invested in a

⁷⁷ See <http://www.dol.gov/ebsa/publications/fiduciaryresponsibility.html> ERISA specifies that the minimum number of such options is three.

⁷⁸ Cite *Hecker v. Deere*, *Renfro v. Unisys*

“qualified default investment alternative.” Under current regulations, a QDIA may be a lifecycle fund, a balanced fund or a professionally managed account. Studies suggest that the vast majority of participants never shift assets from the default option that their employer has chosen,⁷⁹ yet their theoretical ability to do so shields the employer from liability. Far worse is the fact that there are reasons to doubt whether investors can adequately determine whether the default option is truly in their best interests.⁸⁰ Policymakers have recognized that investors may be losing substantial potential retirement returns due to their failure to avoid high fee investments.⁸¹ The possibility that investors are losing similar amounts, if not more, due to risk aversion, warrants similar attention.⁸²

Finally, regulators ought to be particularly concerned about investors we classify as low financial-literacy. These vulnerable investors cannot be protected by choice if they cannot distinguish between debt and equity much less between index and managed funds.

B. Mandatory Disclosure

For investors who do not know the difference between debt and equity, do not understand the magnitude of the cost of fund fees over time, and mistake the nature of risk in the retirement context, disclosures are not likely to be helpful. Even fee information, which ought to be something that consumers can use—after all, most consumers are quite adept at shopping for other goods on price—is little use if investors do not realize that it matters. Indeed, for investors with high risk aversion will use simplified fee information to execute their confused strategy more effectively and at cost to themselves. Disclosure regimes are akin to, and often paired with, choice regimes—and both make assumptions about investors that appear to be in conflict with the facts on the ground.

C. Fiduciary Obligations

⁷⁹ Cite Vanguard white paper

⁸⁰ Cite to literature questioning the value of lifecycle funds.

⁸¹ DOL Proposed Fiduciary Rule

⁸² . In a recent white paper, Vanguard reported that 6 of ten investors increased their retirement savings over a ten year horizon by an average of 30% by using managed advice. Notably, a key factor in the higher return was increased equity exposure. See Vanguard, *The Value of Managed Account Advice*, Aug. 2015.

Finally, we suggest that these results should encourage regulators to rethink the scope of employer obligations with respect to the structure of 401(k) plans and, in particular, the selection of investment alternatives. If investor choice is not a panacea, the inclusion of inferior options, duplicative options or simply too many choices may reduce the quality of employees' decisions. Similarly, regulators should consider requiring employers to undertake greater efforts to provide low cost options and may view the provision of high cost investment choices as problematic, even when lower cost alternatives are also included, based on the inability of investors to be sufficiently attentive to fees.

In keeping with this argument, regulators need to rethink the value and role of professional advice. The knowledge gap between the average worker and the average retail broker is substantial.⁸³ Professional advice offers a practical means of overcoming financial illiteracy, yet little research has determined whether investors are well-served by the advice that they are receiving or whether it is being provided at a reasonable cost. Although the Department of Labor's concerns about the potential effect of advisors' conflicts of interest are not unfounded, the recently-proposed regulations raise complex compliance issues and heightened liability exposure that are likely to make access to professional advice more expensive for both small investors and small business retirement plans.⁸⁴ The effect is likely to limit access to advice from those who need it the most. Providing access to reliable advice, either from employers or from professional advisers, may be the most efficient means of facilitating sound retirement planning.

Conclusion

Participant-directed retirement saving plans are now the norm, but many people lack the ability to make the best choices for their own retirement. Understanding the obstacles to better investment strategies is critical for the future financial independence of today's workers.

We have shed light on some of the relationships between these potential obstacles and investment behaviors. Primarily, we showed that financial literacy is a strong predictor of investment outcomes. While

⁸³ We seek to document this gap in pending research.

⁸⁴ See DOL Proposed Fiduciary Rule, *supra* note 2

demographic factors appear to play a role in financial literacy, they do not independently predict investment behavior. We also showed the independent significance of risk tolerance, even for the more financially literate investors. At the same time, financial literacy does not appear to require complex computational skills or deep understandings of capital market complexities.

The strikingly limited financial literacy of our subject pool offers reasons to rethink the current regulatory preference for enhancing the autonomy participant-directed retirement investing. Moving forward, we posit that the knowledge gap – at a fundamental level – between professional advisors and the average worker is too substantial to justify constraining the availability of professional advice in the name of reducing conflicts of interest.⁸⁵

⁸⁵ See DOL Proposed Fiduciary Rule, *supra* note 2.

Appendix

Table 10
Financial Literacy Instrument – Multiple Choice Question

Question	Answers
MC1: If you buy a company's stock:	<ul style="list-style-type: none"> - You own a part of the company (1) - The company will return your original investment to you with interest - You have lent money to the company - You are liable for the company's debts - Don't know
MC2: If you buy a corporate bond:	<ul style="list-style-type: none"> - You own a part of the company - You can vote on shareholder resolutions - You have lent money to the company (1) - You are liable for the company's debts - Don't know
MC3: Which type of bond is the safest?	<ul style="list-style-type: none"> - Municipal bond - Treasury bond (1) - Corporate bond - Junk bond - Don't know
MC4: If interest rates go up, bond prices:	<ul style="list-style-type: none"> - Go up - Go down (1) - Are not affected - Unsure
MC5: Over the past twenty years, the best average returns have been generated by investments in	<ul style="list-style-type: none"> - Stocks (1) - Bonds - Money market funds - CDs - Precious metals - Unsure
MC6: What is the average annual return that can be expected from a diversified US stock mutual fund over the long run?	<ul style="list-style-type: none"> - 2% - 4% - 8% (1) - 15% - 25%

MC7: What is the average annual return that can be expected from a diversified US bond fund over the long run?	- 2% - 4% (1) - 8% - 15% - 25%
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Table 11
Financial Literacy Instrument – True/False Questions

Question	Correct Answer
TF8: Professionally managed funds tend to perform better than index funds.	False
TF9: An index fund is designed to track the performance of a market index such as the S&P 500 index fund.	True
TF10: Index fund performance can vary substantially depending on the expertise of the fund managers.	False
TF11: It is possible to lose money by investing in a mutual fund.	True
TF12: It is possible to lose money by investing in a bond fund.	True
TF13: Expenses do not vary substantially among mutual funds.	False
TF14: Diversification reduces the variability of my portfolio.	True
TF15: The difference between a money market fund and a bank account is that the bank account is FDIC insured.	True

Table 12
Financial Literacy Instrument – Numeracy Questions

Question	Correct Answer ¹
N16: An investment pays a 5% rate of return. Imagine you put in \$1000 today, please estimate how much money in dollars you would have two years from now?	\$1102.50 Accepted: 1100-1150

¹ We graded as correct answers that fell within a range of the correct answer for each numeracy question.

N17: An investment pays a 5% rate of return. Imagine you put in \$1000 today, please estimate how much money in dollars you would have 30 years from now?	\$4321.94 Accepted: 3800-5000
N18: An investment charges 1% in annual fees and pays a 5% rate of return after fees. Imagine you put in \$1000 today, please estimate the total amount of fees you would pay in dollars over 30 years.	\$584 Accepted: 500-750
N19: An investment charges 2% in annual fees and pays a 5% rate of return after fees. Imagine you put in \$1000 today, please estimate the total amount of fees you would pay in dollars over 30 years.	\$983.05 Accepted: 800-1200

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