Financial Literacy, Financial Education and Downstream Financial Behaviors

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Abstract

Policymakers have embraced financial education as a necessary antidote to the increasing complexity of consumers' financial decisions over the last generation. We conduct a meta-analysis of the relationship of financial literacy and of financial education to financial behaviors in 168 papers covering 201 prior studies. We find that interventions to improve financial literacy explain only 0.1% of the variance in financial behaviors studied, with weaker effects in low-income samples. Like other education, financial education decays over time; even large interventions with many hours of instruction have negligible effects on behavior 20 months or more from the time of intervention. Correlational studies that measure financial literacy find stronger associations with financial behaviors. We conduct three empirical studies and we find that the partial effects of financial literacy diminish dramatically when one controls for psychological traits that have been omitted in prior research or when one uses an instrument for financial literacy to control for omitted variables. Financial education as studied to date has serious limitations that have been masked by the apparently larger effects in correlational studies. We envisage a reduced role for financial education that is not elaborated or acted upon soon afterward. We suggest a real but narrower role for "just in time" financial education tied to specific behaviors it intends to help. We conclude with a discussion of the characteristics of behaviors that might affect the policy maker's mix of financial education, choice architecture, and regulation as tools to help consumer financial behavior.

1. Introduction

The financial environment that consumers face today has become dramatically more perilous just in one generation (Boshara et al. 2010). Baby boomers witnessed during their working careers the advent of exotic mortgage forms (Lacko and Pappalardo 2007; cf. Woodward and Hall 2012), much-expanded credit availability and new borrowing options such as payday loans and debt consolidation loans. They experienced five-fold increases in bankruptcies in the US in the last 30 years (White 2009). In the arena of retirement savings, defined benefit pensions of boomers' parents were replaced by defined contribution retirement systems, simplifying the balance sheets of employers but requiring employees to figure out how much to save, where to invest, and how to make lump sum payouts last throughout retirement (McKenzie and Liersch 2011).

Many experts observed the phenomena above and prescribed the same remedy: increased financial literacy and financial education (Hilgert et al. 2003, Greenspan 2005, Morton 2005, Lusardi and Mitchell 2007a, Mishkin 2008, Dodd-Frank 2013). It is a solution that appeals to all political persuasions and to all geographies. For example, the Second Annual Child and Youth Finance Summit in Istanbul in May of 2013 brought together experts describing initiatives by the US, UK, Turkey, the Philippines, Chile, Nigeria, Egypt, Ghana, Nepal, Macedonia, Spain, and the United Nations to provide financial education to millions.[1] Worldwide, employers, non-profits, and governments are creating educational interventions that have real costs and create much larger opportunity costs by supplanting some other activities, such as required high school courses that replace other electives. We estimate these real and opportunity costs to be in the billions of dollars annually.

Creating financial literacy interventions is an obvious and common sense response to the increased complexity of the financial world. There are many domains of social policy where it is obvious what should work to redress a social problem. But as Watts (2011) has admonished, "everything is obvious (once you know the answer)." For example, it is obvious that incentives should matter, e.g., to

[1] See http://www.childfinanceinternational.org/program-2013/summit-program-overview-2013

improve educational performance. But sometimes effects are surprisingly weak (Gneezy et al. 2011), and rigorous scientific approaches can shed light on which "obvious" conclusions are true and which are not.

But, what is financial literacy? And, what capabilities might financial education improve? Financial literacy is most commonly viewed as a specialized kind of consumer expertise pertaining to how one manages one's financial affairs successfully (cf. Alba and Hutchinson 1987) or a personal finance-specific form of human capital. Remund (2010) argues:

> "Financial literacy is a measure of the degree to which one understands key financial concepts and possesses the ability and confidence to manage personal finances through appropriate short-term decision-making and sound, long-range financial planning, while mindful of life events and changing economic conditions."

Though conceptually, financial literacy refers to skills, existing measures of financial literacy are dominated by measures of objective knowledge. Financial literacy is measured by percent correct on knowledge tests where each question has a right answer – e.g., "Suppose you had $100 in a savings account and the interest rate is 20% per year and you never withdraw money or interest payments. After 5 years, how much would you have on this account in total? More than $200; Exactly $200; Less than $200" (Van Rooj, Lusardi, and Alessi 2011).

Academic work has concluded that financial literacy is an antecedent to various healthy financial behaviors. But several excellent recent literature reviews have drawn sharply different conclusions about the effects of financial literacy and financial education (Adams and Rau 2011; Collins and O'Rourke 2010; Hastings, Madrian, and Skimmyhorn 2012; Hira 2010; Thaler and Sunstein 2008; Willis 2009, 2011). Adams and Rau (2011, p. 6) conclude: *"*Perhaps one of the most robust findings across the literature is that financial literacy (a cognitive factor…) plays a key role in financial preparation for retirement. Both experimental and nonexperimental studies demonstrate that understanding the basic principles of saving, such as compound interest, has a direct effect on financial preparation. This effect holds after controlling for demographic characteristics." Willis (2009, p. 456) disagrees: "What degree of

effectiveness should appropriately be claimed for the current model of financial literacy education? As yet, none, and the barriers to research that would soundly demonstrate effectiveness may be insurmountable."

We attribute disagreements about this literature to two factors. First, prior analysts like those just cited have conflated two kinds of studies. One type includes experimental and quasi-experimental studies of the effects of financial education *interventions.* A second type includes correlational and econometric studies that *measured* financial literacy by percent of correct answers on tests of financial knowledge and predicted downstream financial behaviors. We refer to these two types of studies as "manipulated financial literacy" and "measured financial literacy" below. Second, prior reviews relied on qualitative summaries rather than statistical summaries via transparent meta-analysis. Meta-analysis can test the magnitude of the average effect of an independent variable, whether there is systematic variation in effect-sizes across studies beyond what would be expected by chance and, if so, what differences among the studies could explain this variation (Lipsey and Wilson 2001). "Effect-size" refers to a measure of association in meta-analysis parlance, and is not meant to imply a causal relation.

We report the first systematic meta-analysis of this literature. Based on reading a subset of papers in this literature, we developed the working hypothesis that we would find weak effects of financial literacy in studies of financial education *interventions* intended to improve downstream financial behaviors. In contrast, we expected to find stronger effects in econometric studies that predicted downstream financial behavior based on measured financial literacy, controlling for various demographics. We have worked in the measurement of individual differences in the arena of intertemporal choice, critical to financial decision-making (Bearden, Netemeyer, and Haws 2011; Lynch, Netemeyer, Spiller, and Zammit 2010). We perceived that leading researchers working in the financial literacy arena had not considered individual difference variables that we thought were strong candidates to be correlated with financial literacy and that might plausibly cause the financial behaviors studied.

We find strong support for our hypothesis that study findings depend on study methodology, and we propose and test three explanations for the gap between the moderate effect-size of measured financial literacy and the miniscule effect of interventions that were intended to improve financial literacy. We then

follow up this meta-analysis with empirical studies suggesting that the larger effect-sizes for measured literacy studies may be due in part to the correlation of measured financial literacy with other traits that are omitted from prior research. These omitted variables might plausibly produce overestimates of the effect of financial literacy on the financial behaviors studied.

2. Meta-Analysis

2.1. Meta-Analysis Overview

In a traditional qualitative literature review, the authors may rely on a convenience sample of studies, and the rules for inclusion and treatment are often unstated. There is often room for interpretation, and flaws in studies are taken in a one-off fashion. In contrast, meta-analysis makes explicit the rules for inclusion and exclusion of studies, as well as the coding procedures to characterize similarities and differences among studies. Further, meta-analysis examines roughly the same independent variable to dependent variable relationships. The key statistic used to summarize the findings is an effect-size that varies continuously.

We examined all studies that *manipulated* financial literacy with some education intervention or that *measured* financial literacy with well-known psychometric scales. We quantified effect-sizes by the (partial) *r* of manipulated or measured financial literacy on measures of financial behaviors: saving; planning for retirement; absence of debt; stock ownership and investment decisions; cash flow management; activity in retirement plans; and financial inertia such as choice of default options and payment of unnecessary fees.

We identified studies by a computerized bibliographic search in numerous databases for the terms "financial literacy," "financial knowledge," and "financial education." We found 10650 articles published from 1969 to 2013; 267 from 1987 to 2013 were empirical tests of the effect of financial literacy, some re-analyzing the same data. We pursued all working papers referenced in any of our sources. We included in our analysis 168 papers covering 201 non-redundant studies. If multiple papers used the same study data, we included only the paper with the most inclusive sample. We included pretest-posttest

studies only if pre and post were separated by at least two weeks. We excluded studies providing insufficient statistical information to compute an effect-size if authors could not provide required details.

In Web Appendix A, we provide references for all papers included in our meta-analysis. Most studies reported multiple effect-sizes across dependent variables. We averaged the effect-sizes for each study that manipulated financial literacy and for each study that measured financial literacy. Using this approach, 201 effect-sizes were available: 90 effects of interventions (manipulated financial literacy) and 111 effects of measured financial literacy. Tables WA1-WA4 in Web Appendix A present the authors of each paper included, their respective effect-sizes, and relations investigated. Studies in these tables are sorted by whether the independent variables were manipulated or measured financial literacy and within each group and by the type of design and analysis employed. We also coded all identified studies in terms of the financial behavior dependent variable examined and sample characteristics.

Among the studies that manipulated financial literacy (Tables WA1-WA2), we coded for what type of educational intervention was conducted (high school financial education, counseling, seminar or workshop, multiple sources of education, and exposure to information such as a newsletter or a fair). In addition, when reported, we coded for the hours of instruction in the interventions and for the delay in months between the intervention and measurement of behavior. We also coded for research design. Only 15 studies in Table WA1 had better designs with randomized control trials. The majority of studies of manipulated financial literacy (75 in Table WA2) used quasi-experimental or pre-post designs. Finally, we coded for whether the decision to participate at the intervention was voluntary and for whether the study was focused exclusively on low-income students.

Among the studies that measured financial literacy, we coded for what type of analysis was performed (Tables WA3-WA4). Only 24 studies (in Table WA3) used econometric analyses with instrumental variables to control for endogeneity on the effect of measured financial literacy on financial behaviors. The majority of studies (87 in total in Table WA4) performed only Ordinary Least Squares (OLS) regressions to estimate the effect of financial literacy on downstream financial behavior. And we also coded for whether the study was focused exclusively on low-income respondents.

We followed common guidelines for meta-analysis to compute and integrate the effect-sizes (Rosenthal 1984; Hedges and Olkin 1985; Lipsey and Wilson 2001). We selected the (partial) correlation coefficient, *r*, as the effect-size metric because it is an easy-to-interpret, scale-free measure imputable from a variety of statistics. Calculation of effect-sizes was made using the statistical information in the papers. Direct calculation of effect-size from group mean contrasts or frequency distributions was difficult in cases in which means and standard deviations were not reported. Under those circumstances, we calculated effects sizes through a range of statistical information (e.g., Student's *t*, *F* ratios, χ^2) via the formulae given by Lipsey and Wilson (2001). When necessary, we solicited additional information from authors.

2.2. Meta-Analysis Results

Because sample size affects the correspondence between the estimated relationship between variables and true relationship, we first weighted effects by the inverse variance. Empirically in our sample, smaller studies reported larger effect-sizes. Given that it requires a larger effect-size to reach statistical significance with a smaller N, this might suggest a publication bias favoring significant results. We examined significance for the mean effect-size by calculating the confidence intervals of the effect-sizes to determine whether the confidence interval includes 0.

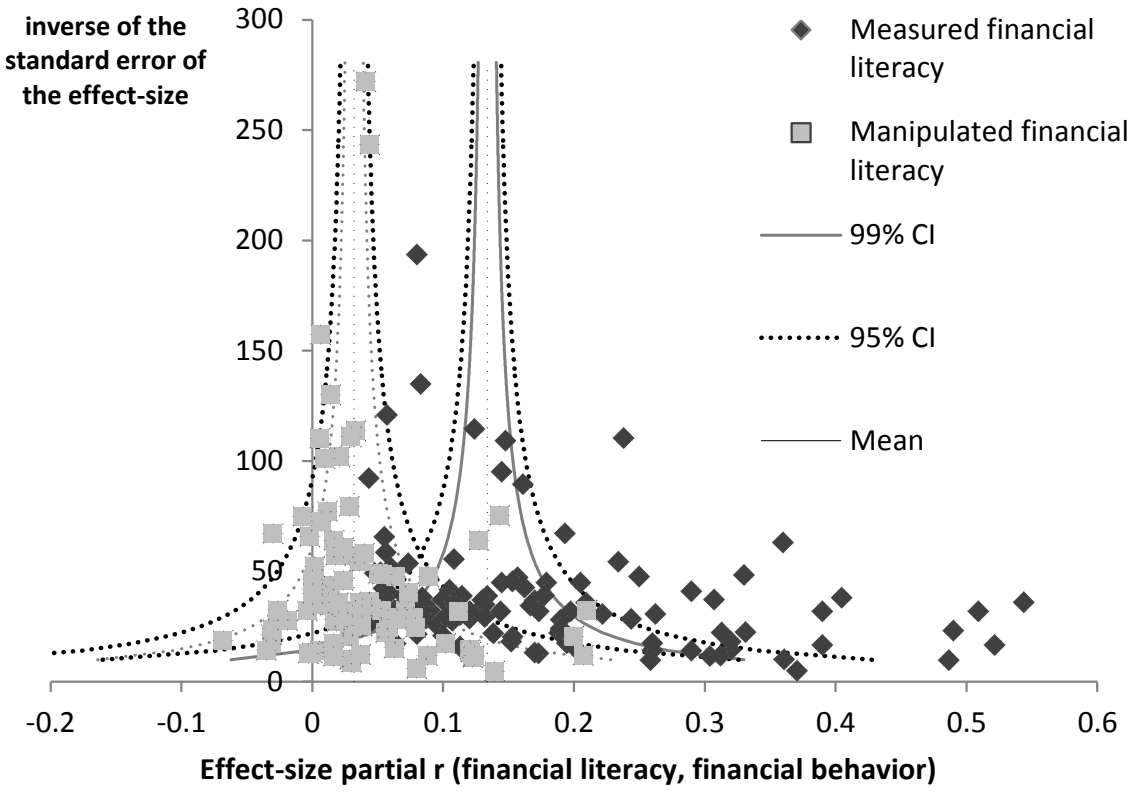
2.2.1. Measured Financial Literacy versus Financial Education Interventions

Our most striking finding was that financial education interventions have statistically significant but miniscule effects: $r^2 = .0011$, implying that interventions explained about 0.1% of the variance in downstream financial behaviors studied (90 effect-sizes, r = .032, CI_{95} = .029 to .035). By social science and education conventions, $r \leq .10$ is a small effect-size; $.10 < r < .40$ is medium; and $r \geq .40$ is large.

As hypothesized, we found a larger effect-size for measured financial literacy (111 effect-sizes, r^2 = .0179, r = .134, CI_{95} = .130 to 138) than for manipulated financial literacy. Figure 1 presents a "funnel plot" (Lipsey and Wilson 2001) that clearly depicts the separation of the two distributions and relates

effect-size to the inverse standard error (i.e., the precision of each effect-size). Q statistics confirmed that, within each type of study, there was significant variability in effect-sizes beyond what would be expected by chance if all effect sizes of each type were random draws from a common distribution. If that had been true, the symbols for all manipulated literacy studies should fall within the single-peaked distribution shown and the same for measured literacy. Effect-sizes clearly violate that assumption (for Measured Financial Literacy, Q=1464, p<.01; for Manipulated Financial Literacy, Q=310, p<.01).

Figure 1: Study Method Affects Average Partial r Effect-Size in Meta-Analysis of the Relationship between Manipulated or Measured Financial Literacy on Financial Behavior



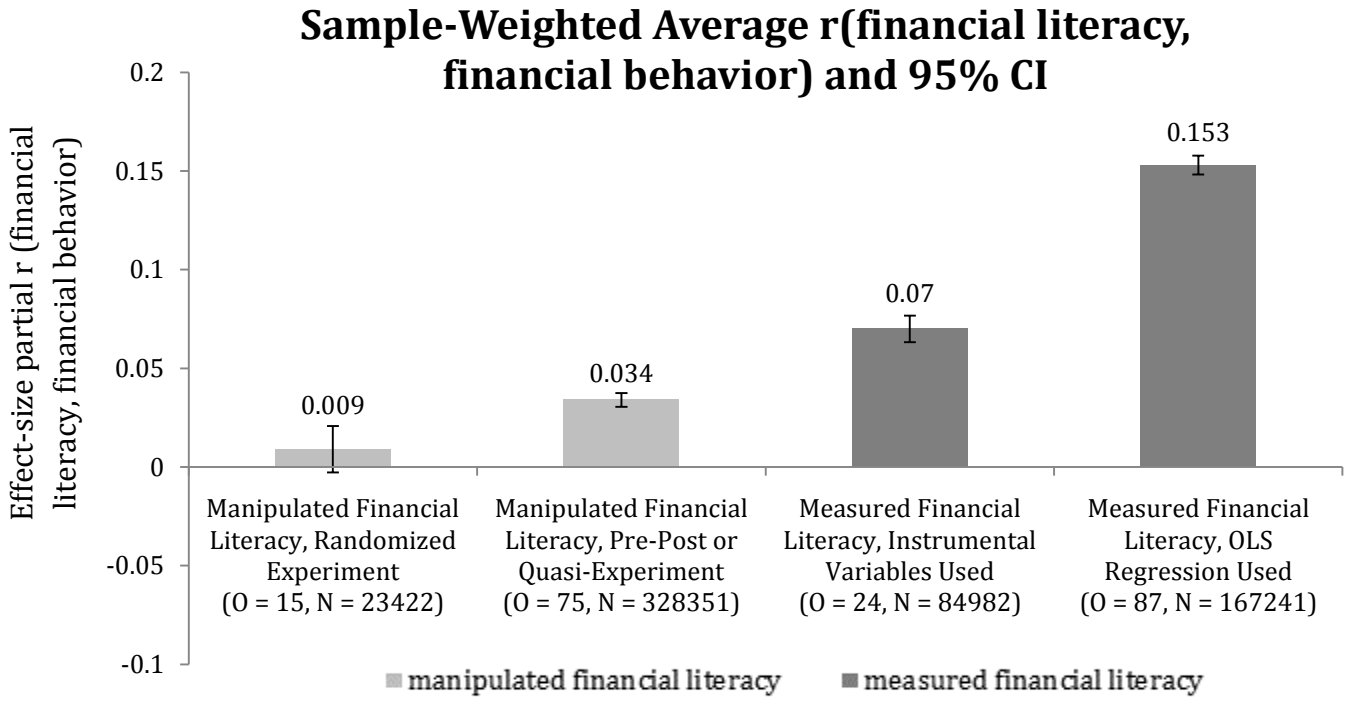
We next report a series of tests to understand what causes variation in effect sizes within each distribution. One factor is variation in the research design of the study, as shown in Figure 2. Intervention

studies with randomized control group designs in in Web Appendix Table WA1 found significantly smaller effects (15 studies: sample-weighted r = .009, CI_{95} is from -.004 to .022) than studies with weaker pre-post or quasi-experimental designs in Table WA2 (75 studies: sample weighted r = .034, CI_{95} is from .031 to .037).

Among studies of measured literacy, one might distinguish studies using simple OLS from econometric studies using instrumental variables and two-stage least squares (2SLS). (See Web Appendix A, Tables WA3 and WA4.) Arguably, properly chosen instruments can control for reverse causation and are similar to quasi-experiments when the instrument for financial literacy is not plausibly caused by the dependent variable (Angrist and Krueger 2001). A proper instrument should predict financial literacy but have no partial relationship with the financial behavior in question except through financial literacy. But it is difficult to prove the validity of an instrument (Stock and Watson 2003). Consequently many authors will use instrumental variables analyses only for robustness analysis (e.g., Morse 2011; Larcker and Rusticus 2010) or take the view that estimates using instrumental variables may, in some cases, be more rather than less biased compared to OLS estimates (Bound et al. 1995; Larcker and Rusticus 2010).

We found smaller effects for studies using instrumental variables than for OLS studies lacking those controls. For papers that used instrumental variables, the sample-weighted effect-size of measured financial literacy on behavior is significantly lower (24 studies: r = .070, CI_{95} is from .063 to .077) than for papers that did not use instrumental variables (87 studies: r = .153, CI_{95} is from .148 to .158). Moreover, OLS regressions reported in the 24 studies that used instrumental variables were larger (r = .094, CI_{95} is from .087 to .101) than the effect sizes found using instrumental variables.

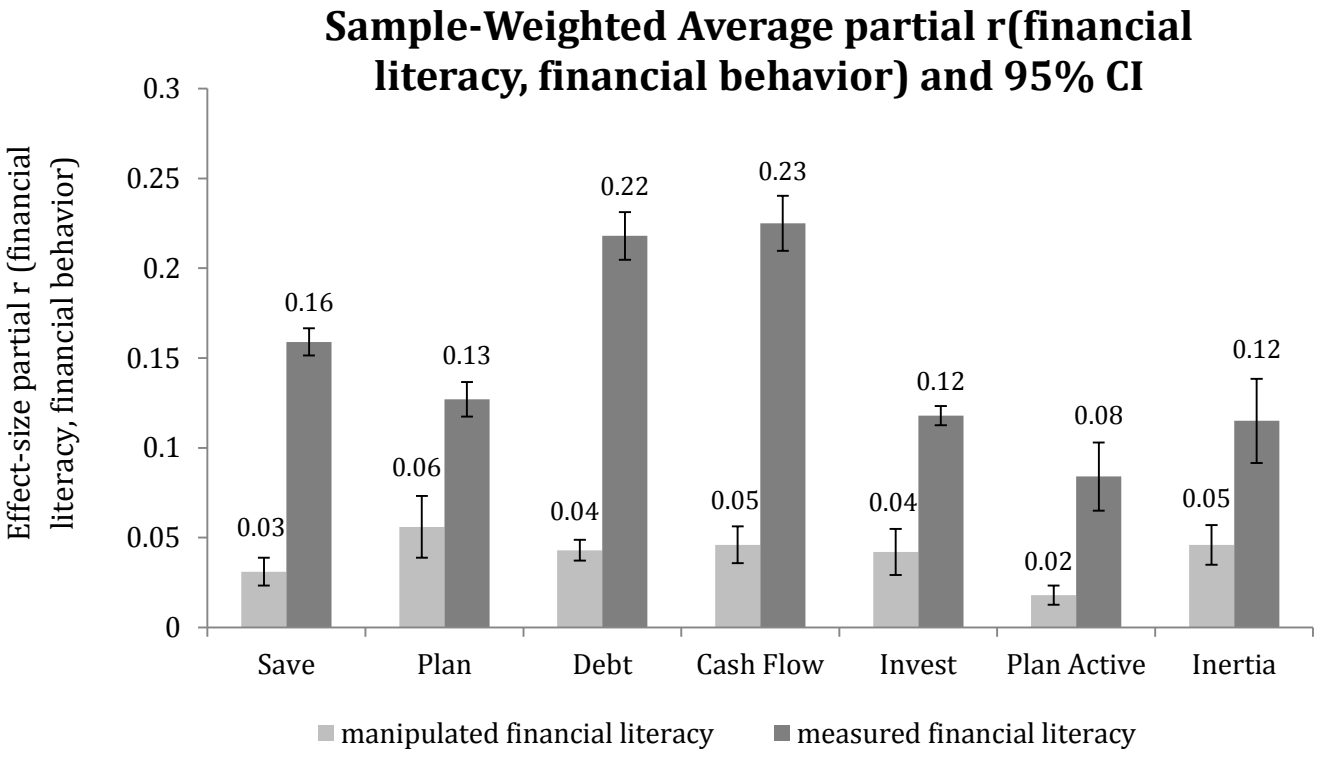
Figure 2: Study Method Affects Average Partial Effect-Size in Meta-Analysis of the Relationship between Manipulated or Measured Financial Literacy on Financial Behavior



These results indicate that studies with putatively better designs and analyses find weaker effects of manipulated and of measured financial literacy. The best designs using randomized control groups showed no significant effects -- and significantly lower effects than studies of any other type.

We performed a series of robustness tests of whether the conclusions from Figure 2 were due to some artifact or moderated by some background variable. Might the stronger effect-size for measured financial literacy compared to manipulated financial literacy depend in some way on the financial behavior studied? Figure 3 shows that, for all seven categories of financial behavior, effect-size of manipulated financial literacy is much less than that of measured financial literacy.

Figure 3: Effect-Size Partial r of Manipulated versus Measured Financial Literacy as a Function of Financial Behavior Studied



Might the low apparent treatment effects in the 15 randomized experiments result from using conservative "intent to treat" analyses? In such an analysis, those initially randomly assigned to the treatment and control groups are compared, regardless of whether some or many in the treatment group never took up the offered treatment. There were no differences in average effect size between 8 experiments using this approach and 7 experiments comparing the control group only to those who completed the treatment (so-called "treatment on treated" designs).

Might effects of interventions be lower for educational treatments not freely chosen? In 75 quasi-experimental or pre-post tests, we found no differences in average effect size between 6 studies where the students self-selected to join the intervention, 37 studies where the intervention was imposed, or 32 studies that did not specify the role of student choice in enrollment. One cannot explain the weak effects

of financial education by arguing that that effect sizes are biased downward by analyses penalizing treatment groups when those assigned to treatment interventions fail to enroll or by arguing that forced education is less effective than freely chosen education.

Table 1 shows that financial literacy interventions had smaller effects on behavior in low-income samples than in general population samples; moreover, in studies of measured literacy, effects on behavior were marginally weaker in low-income samples than in general population samples. We ran a meta-regression model with financial literacy (manipulated v. measured, coded -1, +1 respectively), income (low-income sample v. general population sample, coded -1, +1) and their interaction. The interaction was not significant (B = 0.003, $t = 0.96$, $p = .34$), and we found the expected significant effects of manipulated v. measured financial literacy (B = 0.047, SE = 0.003, $t = 14.60$, $p < .001$), and an effect of income (B = 0.008, SE = 0.003, $t = 2.37$, $p = .02$).

Table 1: Effect of Manipulated and Measured Financial Literacy by Income of Participants

Type of Intervention	Number of Raw Effects	Total N	Sample Weighted Average r	95% CI		% Variance Explained
				Lower Bound	Upper Bound	
Manipulated Literacy (Low-Income Sample)	35	80014	0.025	0.018	0.032	0.06
Manipulated Literacy (General Population Sample)	55	271759	0.035	0.031	0.038	0.12
Measured Literacy (Low-Income Sample)	8	6975	0.113	0.089	0.136	1.27
Measured Literacy (General Population Sample)	103	245248	0.134	0.130	0.138	1.80

Might effect-sizes of manipulated financial literacy depend on the type of intervention? We found statistically significant but practically small differences among: counseling, exposure to information about financial education, financial education in high school, multiple sources of financial education, participation in seminars or workshops, and participation in a program of financial education. These

intervention forms explained, respectively, 0.14%, 0.05%, 0.15%, 0.12%, 0.18%, and 0.10% of the variance in the financial behaviors studied.

Our meta-analysis so far makes three main points. First econometric and correlational studies of measured financial literacy show significantly larger effect-sizes than studies of the effects of manipulated financial education interventions. Interventions on average explain only 0.1% of the variance in the behaviors they attempt to influence.

Second, within each subset (manipulated and measured), putatively more rigorous designs lead to smaller effect-sizes. True randomized experiments lead to smaller effect-size than less rigorous quasi-experimental and pre-post designs, consistent with Collins and O'Rourke (2010). Among studies of measured literacy, studies using instrumental variables find smaller effects than studies using simple cross sectional designs and OLS. Moreover, studies that use instrumental variables find smaller effects using that estimation strategy than when they use OLS on the same data sets. Lusardi and Mitchell (2013, pp. 25-26) claim that certain studies using instrumental variables find larger effect-size estimates than were found by OLS. But our meta-analysis of the entire set of papers using instrumental variables clearly shows the opposite to be true, on average. It is true that, in some studies, unstandardized coefficients are dramatically larger with instrumental variables compared to OLS (Meier 2011), but standardized coefficients clearly show smaller average effects with instruments.

Third, one can see from Figure 2 that effect-size estimates using instrumental variables are far higher than from experiments. Econometric studies using instrumental variables for financial literacy are sometimes held up as equivalent to quasi-experiments in power to support causal claims, notwithstanding that these studies do not show a way to translate to effective educational interventions. But there is no overlap between the 95% confidence intervals for effects of financial literacy in these studies using instrumental variables and either the group of quasi-experiments or the true randomized control experiments that remain the gold standard for causal inference.

Something is causing these studies using instrumental variables to produce larger effect-sizes, even though instrumental variables seem to be partially effective in controlling for alternative

explanations present in correlational studies that do not use instrumental variables. Appendix A shows that eight of 24 studies that use instrumental variables either fail tests for non-weak instruments or do not report tests (cf. Angrist and Pischke 2009). In those 8 papers, we find no difference between average effect-size with OLS (average effect-size = .106) and instrumental variables (average effect-size = .109). In the 16 studies with good instruments, authors report stronger effects with OLS (average effect-size = .091) than with instrumental variables (average effect-size = .059). Moreover, of studies that report passing tests for non-weak instruments, a subset might cause readers to wonder whether instruments used would satisfy the requirement of no partial relationship with the financial behaviors studied except via financial literacy. We return to this issue in Section 4 of this paper.

2.2.2. Why Does Manipulated Literacy Have Weaker Effects than Measured Literacy?

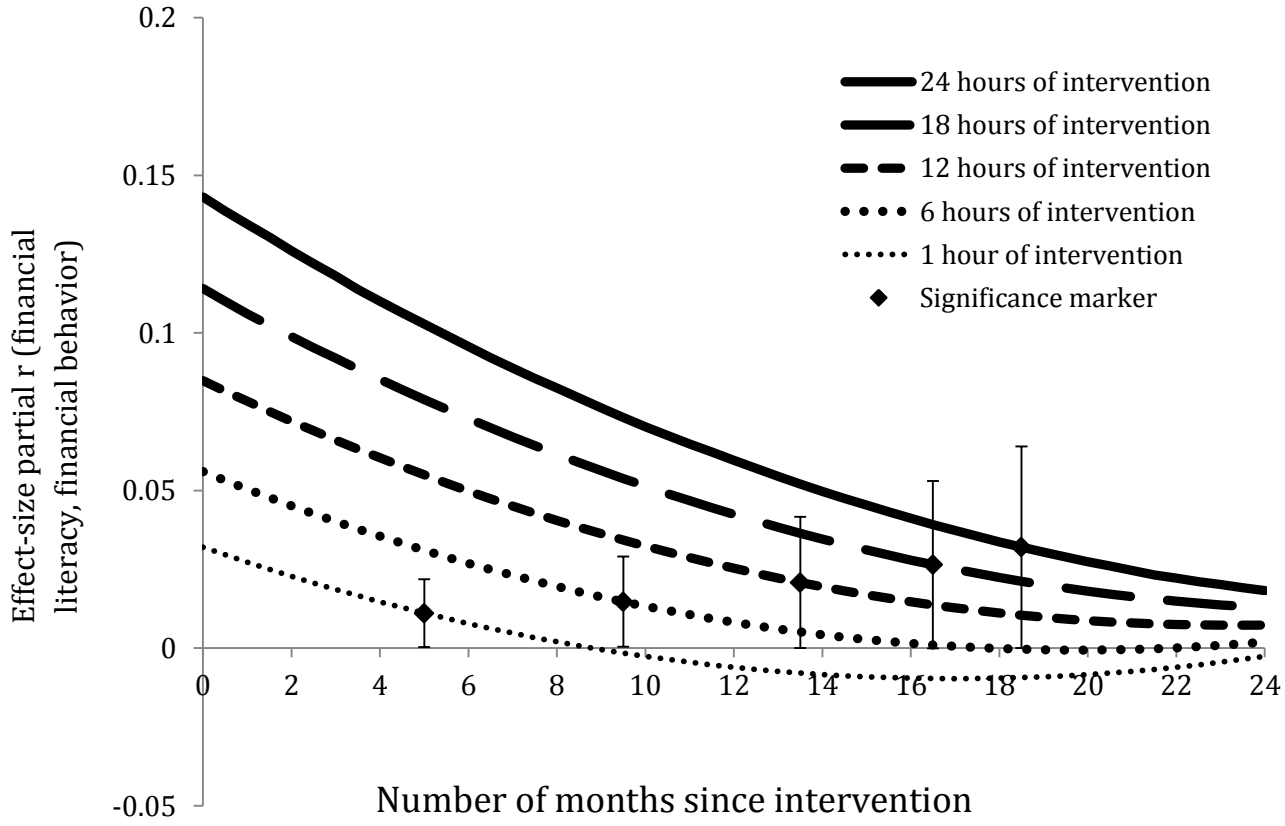
Why are effects of financial education interventions so weak, and why are effects stronger when financial literacy is measured rather than manipulated? We offer two answers to these questions pertaining to intervention studies and a third pertaining to measured literacy studies.

Explanation 1. Intervention effects decay over time: the case for "just in time" financial education. Effect-sizes for interventions may be small because effects of interventions decay. We examine the effects of the intensity of the intervention and of the delay between intervention and measurement of financial behavior using meta-regression analysis. Most studies omit key information about intervention details, but 33 papers reported a mean of 9.7 hours of instruction (SD = 11.9), and 29 papers reported a mean delay of 11 months between intervention and measurement of behavior (SD = 12.4). Our model regressed effect-size (*r* or partial *r*) on linear effects of mean-centered number of hours of instructions, linear and quadratic effects of number of months between intervention and measurement of behavior, and the interaction of their linear effects. Figure 4 shows the estimated response surface from this meta-regression model.

The meta-regression analysis revealed a positive linear simple effect of the number of hours of instruction on the effect-sizes at average delay (B = .0032, SE = .0004, $t = 8.35$, $p < .0001$). More hours

of instruction produce larger effects on downstream behaviors. For the number of months between intervention and measurement of behavior at average number of hours of instruction, there was a negative simple linear effect of delay (B = -.0033, SE = .0009, t = -3.53, p = .002) and a positive quadratic effect (B = .00014, SE = .00004, t = 3.48, p = .002) – ie., effect size of interventions decayed with delay, but at a decreasing rate. Finally, there is a significant interaction of the linear effects of hours of instruction and delay (B = -.0002, SE = .00003, t = -6.76, p < .0001).

Figure 4: Partial Correlation of Financial Education Interventions with Financial Behavior as a Function of Number of Hours of Intervention and Number of Months since Intervention



In Figure 4, decay over time is stronger for larger interventions. The significance marker on each hours-of-intervention curve indicates the number of months since intervention when the corresponding

95% CI on predicted effect size *r* no longer excludes zero. Importantly, at delays of 18.5 months or greater, there is no significant effect of even 24 hours of instruction. After 23.5 months of instruction, there are no significant effects of amount of instruction. But brief interventions at short delays have effects equal to more intensive interventions at long delays. We observe equal effects for 6 hours of intervention at no delay and 18 hours of intervention at 10 months of delay, and equal effects of one hour of instruction at no delay and 12 hours at 10 months delay. We argue below that these findings militate toward "just in time" financial education rather than lengthy education years before the behaviors it is intended to change (cf. Mandell 2006).

Explanation 2. Financial education produces weak effects on financial knowledge that is presumed to cause financial behavior. Another explanation for why the effects of interventions are much weaker than the effect of measured financial literacy is that financial education yields surprisingly weak changes in financial knowledge presumed to cause financial behavior. In 12 papers reporting effects of interventions on both measured literacy (knowledge) and some downstream financial behavior, the interventions explained only 0.44% of the variance in financial knowledge. By comparison, meta-analyses in other domains of education show interventions explain 5 to 13 times as much variance in acquired knowledge from science and math instruction (2.25%), organizational and work setting interventions (5.76%), and special topic interventions from creative thinking to career counseling (5.29%) (Lipsey and Wilson 1993). Our analysis includes only effect sizes of education on knowledge gains in studies that also measure financial behavior. If others replicated our estimated effect sizes of education on knowledge gains in the larger set of studies that include no measure of financial behavior, this would suggest that something is amiss in how financial education is now being delivered.

Explanation 3. Is there omitted variables bias in studies of effects of measured financial literacy? Perhaps measured financial literacy has larger effects than manipulated financial literacy because effect-size estimates for measured financial literacy in econometric studies may be inflated. Scores on financial literacy tests may predict behavior because of their correlation with other unmeasured variables. Our

meta-analysis indicates that the prior research that controls for omitted variable bias with instrumental variables on average finds weaker effects than studies that use OLS regression.

In our empirical studies, we replicate results found in the 87 studies in our meta-analysis that used OLS to examine links between measured financial literacy and financial behavior; we show how results change with addition of certain traits that are arguably correlated with both financial literacy and with the financial behaviors predicted by financial literacy. In addition, we attempt to control for omitted variable bias by using instrumental variables, similar to the 24 studies in our meta-analysis that examined links between measured financial literacy and financial behavior using instrumental variables. Our designs are simple cross-sectional designs typical of the 87 OLS studies, and thus do not permit strong claims about causality. Our results do however serve as a concrete evidence of the possibility of omitted variable bias in a large body of measured literacy studies just analyzed.

3. Empirical OLS Studies: Apparent Effects of Financial Literacy Due to Omitted Variables Bias?

In our meta-analysis, we found larger effect-sizes in the 87 studies that tested effects of measured financial literacy on behaviors using OLS regression than in studies using designs that many might consider "better." We conjecture that this may reflect omitted variables bias in the estimates from the OLS designs. To test this conjecture, we conducted three primary research studies of U.S. English-speaking adults. With Studies 1 and 2, we sought to develop a short, reliable, and valid measure of financial literacy from a pool of 26 financial literacy items used in prior research. With Studies 2 and 3, we also sought to replicate findings that financial literacy predicted financial behaviors, and test if the effects of financial literacy diminish in the presence of four traits correlated with financial literacy and the financial behaviors studied. Study 3 was very similar to Study 2, but used a true probability sample of US adults. Study 3 included measures of several traits that audience members suggested might be related to our four focal traits when we had presented this work. Appendix A shows all items of the measures included in all studies. Appendix C Tables C1, C2, and C3 show summary statistics and correlations among all variables for Studies 1, 2, and 3, respectively.

3.1 Deriving a Unidimensional, Reliable, and Valid Scale of Financial Literacy

Prior research on measured financial literacy had created measures that were not subjected to standard psychometric tests to establish unidimensionality, reliability, and validity, and to establish that the measures of financial literacy represented a construct that was distinct from other correlated traits (Bearden et al. 2011; cf., Knoll and Houts 2012). In Study 1 we developed a 13-item scale with excellent psychometric properties, distilled from 26 items used in numerous prior studies. See Appendix B for the final 13-item scale and Web Appendix B for Study 1 details. We replicated these findings supporting the excellent psychometric properties of our 13-item scale in Study 2. The primary purpose of Study 2, though, was to test whether the predictive effects of financial literacy changed when we controlled for four traits that we believed to be plausibly correlated with both financial literacy and five financial behaviors studied in papers covered in our meta-analysis. Study 3 replicates Study 3 with a probability sample. We present the methods of the two studies first and then their combined results. We also show very similar conclusions about the diminished effects of financial literacy on financial behaviors when one controls for omitted variables by use of instrumental variables –mirroring our meta-analysis.

3.2 Do Predictive Effects of Financial Literacy on Financial Behavior Change When Controlling for Correlated Traits?

3.2.1 Study 2 and Study 3 Method

In Study 2, we surveyed 543 U.S. adults from a QUALTRICS panel. We again included demographics, the 26 financial literacy items, and four traits that we had hypothesized would be both correlated with financial literacy and with the financial behaviors to be described below.

- First, we conjectured that numeracy might correlate with both financial literacy and with some financial behaviors. A number of financial literacy items used in past research have numerical reasoning components. More numerate consumers have been shown to be better able to retrieve numerical principles to reason numerically, e.g., about debt repayment (Peters et al. 2006; Soll, Keeney, and Larrick 2013).

- Propensity to plan for the use of money reflects setting spending goals, thinking about subgoals and means of achieving them, thinking about constraints and interdependencies, and liking planning versus spontaneity in spending. This trait has been linked to FICO scores (Lynch et al. 2010), wealth accumulation (Ameriks, Caplin, and Leahy 2003), and financial literacy (Lusardi and Mitchell 2009).
- Confidence in information search -- the degree to which an individual feels capable and assured with respect to marketplace decisions and behavior – has been linked to proactive information, processing, and consideration set formation (Bearden, Hardesty, and Rose 2001). Similar to self-efficacy it reflects a core belief that one has the power to produced desired effects, facilitating success in tasks where approach and persistence requires the self-belief that gives one an incentive to persevere (cf. Bandura and Locke 2003). Many financial mistakes are the result of inaction and avoidance that have motivated research on various kinds of auto-enrollment (Madrian and Shea 2001).
- Willingness to take prudent investment risks is a critical antecedent of accumulating wealth by investing, for example, in saving for retirement. Jianakoplos and Bernasek (1998) have shown that lower willingness to take risks by women compared to men predicts gender differences in wealth accumulation. Iyengar and Kamenica (2010) noted that proliferation of 401(k) options leads to avoidant choices of low-risk investment at the expense of equities.

Our five dependent measures were self-reported financial behaviors representative of those most heavily used in research reviewed in our meta-analysis: 1) a yes/no measure of "Saving for an Emergency Fund" (Lusardi and Mitchell 2007b); 2) a yes/no measure of "Figuring Out How Much Savings is Needed for Retirement" (Lusardi and Mitchell 2007b); 3) four yes/no questions about performing "Positive Savings / Investment Behaviors" summed to form an overall score ranging from 0 to 4 (Lusardi and Tufano 2009); 4) a rating of "How do You Think Banks or Credit Card Companies Would Rate Your Credit?" 1 =Very Poor, 10 = Excellent" found by Lynch et al. (2010) to correlate .85 with FICO credit scores; and 5) three multiple choice items assessing bouncing checks and late or incomplete credit card payments ("Credit and Checking Fees"). We summed these three items to form an overall score that could range from 3 to 14 (Mandell and Klein 2009).

In Study 3, GfK Knowledge Networks provided us a nationally representative sample of 506 English-speaking adults aged 21-65. Study 3 collected the same measures as Study 2 with the addition of four more traits: generalized self-efficacy (Chen, Gully, and Eden 2001); delayed gratification (Hoerger, Quirk, and Weed 2011); restraint; and impulsivity (Maloney, Grawitch, and Barber 2012) that have been suggested to us by other scholars as candidate "omitted variables." The rationale for generalized self-efficacy was to distinguish this presumably stable and very general trait from confidence in financial information search. Delayed gratification and impulsivity measures were included to distinguish these intertemporal traits from propensity to plan. Study 3 also collected a 5-item measure of willingness to take investment risk (Weber, Blais, and Betz 2002), and an 8-item numeracy measure (Soll et al. 2013) that arguably had better psychometric properties than the corresponding measures used in Study 2. The financial behavior dependent variables were identical to those in Study 2.

3.2.2 Study 2 and Study 3 Hierarchical OLS Regression Results

In each study, we predicted each financial behavior with demographics, a 13-item financial literacy scale, and four traits potentially correlated with both financial literacy and the financial behaviors: confidence in financial information search; planning for money-long term; willingness to take investment risk; and numeracy. We compared three hierarchical regression models: Model 1) demographics alone; Model 2) demographics + financial literacy; and Model 3) demographics + financial literacy + four correlated traits. Models 1, 2, and 3 had 21, 22, and 26 model degrees of freedom, respectively in Study 2, and 19, 20, and 24, model dfs respectively in Study 3.

Table 2 shows the fit of Models 1, 2, and 3 for each of the five behaviors predicted in Study 2, the test of the effect of financial literacy in Model 2, and the tests of the effect of financial literacy and four related traits in Model 3. Table 3 shows the corresponding statistics for Study 3. In Tables 2 and 3, we omit coefficients for demographic controls to save space; Tables WC1 and WC2 in Web Appendix C show the complete table including coefficients on demographics.

Table 2: Study2 OLS / Logistic Regression for Models 2 and 3

	Saving for Emergency Fund	**How Much is Needed for Retirement**	**Banks and Credit Card Firms Rate Credit Score**	**Credit and Checking Fees**	**Positive Savings / Investment Behaviors**
Study 2	N = 475	N = 477	N = 483	N = 373	N = 483
Model 2					
Financial Literacy	**.070*** **(.036)** ***1.073****	**.118**** **(.038)** ***1.126****	**.125**** **(.042)**	**-.076*** **(.040)**	**.116**** **(.017)**
Model 3					
Financial Literacy	**.059** **(.044)** ***1.062***	**.088** **(.046)** ***1.092***	**.061** **(.046)**	**-.053** **(.045)**	**.128**** **(.019)**
Numeracy	-.049 (.054) *.952*	-.020 (.055) *.980*	.080 (.056)	.019 (.055)	-.068** (.023)
Consumer Confidence-Investing	.574** (.144) *1.776***	.609** (.148) *1.839***	.609** (.140)	-.505** (.137)	.092 (.058)
Planning for Money–Long Term	.482** (.115) *1.620***	.244* (.114) *1.277**	.317** (.118)	-.138 (.115)	.045 (.048)
Willing to Take Investment Risks	.006 (.088) *1.006*	.221* (.091) *1.248**	-.068 (.090)	.002 (.089)	.112** (.037)
R^2 Model 1 (only demographics)	.136	.157	.255	.163	.340
R^2 Model 2 (model 1 + fin. literacy)	.143	.175	.269	.166	.400
R^2 Model 3 (model 2 + psychol. traits)	.248	.267	.330	.227	.443

Notes: * $p < .05$; ** $p < .01$. Standard errors are in parentheses below coefficients. For "Saving for an Emergency Fund" and planning "How Much is Needed for Retirement," logistic regression is used and $\mathbf{R^2}$ is Cox and Snell $\mathbf{R^2}$. Further, the odds ratio coefficients of logistic regression (Exp(β)) is presented in italics for these two dependent variables. OLS regression is used for "Banks and Credit Card Firms Rate Credit Score," "Credit and Checking Fees," and "Positive Savings / Investment Behaviors." Model 1 used just the demographic variables as predictors; Model 2 used the demographic variables and financial literacy as predictors; and Model 3 used the demographic variables, financial literacy, numeracy, consumer confidence-investing, planning for money-long term, and willing to take investment risks as predictors.

We used OLS regression for the scaled financial behaviors, but used logistic regression for the dichotomously-measured financial behaviors. We report on tables 2 and 3 the unstandardized regression coefficients, the standard errors and the Exp(β) for logistic regression. Significant Exp(β) values > 1 indicate that the odds of an outcome (being placed in the group coded as 1) increase with a unit change in the independent variable; significant Exp(β) values < 1 indicate that a unit increase in the predictor leads

to a decrease in the odds of an outcome occurring. For example, in Table 2, for Study 2, "Saving for an Emergency Fund," the predictor "planning for money-long term" has an Exp(β) equal to 1.620. Thus, for each 1-point increase on this predictor on its 1 to 6 scale, the odds (P(Yes)/P(No)) of having an emergency savings fund increased by a multiple of 1.620.

Table 3: Study 3 OLS / Logistic Regression for Models 2 and 3

	Saving for Emergency Fund	How Much is Needed for Retirement	Banks and Credit Card Firms Rate Credit Score	Credit and Checking Fees	Positive Savings / Investment Behaviors
Study 3	N = 410	N = 410	N = 455	N = 370	N = 455
Model 2					
Financial Literacy	**.115**** **(.039)** *1.116***	**.239**** **(.044)** *1.269***	**.192**** **(.042)**	**-.135**** **(.040)**	**.134**** **(.017)**
Model 3					
Financial Literacy	**.013** **(.055)** ***1.012***	**.166**** **(.056)** ***1.180****	**.089** **(.049)**	**-.070** **(.046)**	**.098**** **(.020)**
Numeracy	.111 (.078) *1.117*	.160* (.077) *1.174**	.134* (.069)	-.045 (.065)	.047 (.028)
Consumer Confidence-Investing	.195 (.159) *1.214*	-.245 (.157) *.783*	.237 (.138)	-.341** (.129)	-.011 (.057)
Planning for Money–Long Term	.805** (.143) *2.235***	.650** (.139) *1.915***	.419** (.119)	-.472** (.111)	.124* (.049)
Willing to Take Investment Risks	.672** (.175) *1.956***	.616** (.176) *1.851***	.450** (.149)	-.139 (.140)	.283** (.061)
R^2 Model 1 (only demographics)	.192	.232	.240	.161	.396
R^2 Model 2 (model 1 + fin. literacy)	.206	.286	.272	.186	.465
R^2 Model 3 (model 2 + psychol. traits)	.346	.349	.344	.295	.507

Notes: * $p < .05$; ** $p < .01$. Standard errors are in parentheses below coefficients. For "Saving for an Emergency Fund" and planning "How Much is Needed for Retirement," logistic regression is used and $\mathbf{R^2}$ is Cox and Snell $\mathbf{R^2}$. Further, the odds ratio coefficients of logistic regression (Exp(β)) is presented in italics for these two dependent variables. OLS regression is used for "Banks and Credit Card Firms Rate Credit Score," "Credit and Checking Fees," and "Positive Savings / Investment Behaviors." Model 1 used just the demographic variables as predictors; Model 2 used the demographic variables and financial literacy as predictors; and Model 3 used the demographic variables, financial literacy, numeracy, consumer confidence-investing, planning for money-long term, and willing to take investment risks as predictors.

The reader can see three things from Tables 2 and 3. First, for all five financial behaviors in both studies, our Model 2 results replicated prior findings showing significant beneficial effects of financial literacy after controlling for demographic variables. Second, in both studies adding four other traits to Model 3 caused R^2 values to increase by an average of 51% compared to Model 2. This was mostly due to propensity to plan, confidence in information search, and willingness to take investment risks. Confidence in financial information search had stronger effects than (single item) willingness to take investment risks in Study 2, but the reverse was true in Study 3 that used the psychometrically sounder Weber et al. (2002) scale. Propensity to plan for the use of money was a strong predictor for all five behaviors in Study 3 and for 3 of 5 behaviors in Study 2. Third, in Model 3, financial literacy remained significant only for our index of positive savings and investment behaviors in Study 2, and for that behavior and for determining how much savings is needed for retirement in Study 3.

Other robustness analyses of Study 3 compared Model 3 to a Model 4 that added as predictors: generalized self-efficacy (Chen, Gully, and Eden 2001); delayed gratification (Hoerger et al. 2011); restraint; and impulsivity (Maloney, Grawitch, and Barber 2012). For none of the five behaviors was the Model 4 R^2 significantly greater than Model 3 nor did one of the added traits have a significant partial effect. We concluded that predictive effects of confidence in financial information search were not plausibly caused by its correlation with general self-efficacy, and predictive effects of propensity to plan were not plausibly caused by its correlation with a delay of gratification and self-control.

Because all constructs were measured in the same surveys, it is not possible to make claims that our covariates of confidence in information search, propensity to plan, willingness to take financial risks, and numeracy are causes of the financial behaviors studied. The data are equally consistent with four interpretations: 1) those covariates cause financial behaviors, with financial literacy spuriously related to financial behaviors; 2) financial literacy causes those covariates which then in turn cause the financial behaviors; 3) financial literacy causes the financial behaviors, which in turn cause the covariates; 4) the financial behaviors cause both financial literacy and the covariates. Other papers report similar cross-sectional data to our studies and assert a causal link from financial literacy to planning and from planning

to financial behavior (e.g., Lusardi and Mitchell 2007a). Although we are not entirely persuaded by the evidence offered in these prior studies, our data similarly cannot sort this out. When two or more interpretations are consistent with an observed data pattern, all theories consistent with the data should logically have increased posterior probability in a Bayesian updating process (Brinberg et al. 1992).

Our aim here is simple - to highlight a negative point that prior investigations failed to control for those omitted traits. Thus, we are more interested in the coefficient on financial literacy than on the coefficients on those other traits. Still, given a potential concern for endogeneity, or reverse causality among financial literacy and financial outcomes in our primary research findings and the 87 OLS studies, we now present the results of robustness analyses based on two stage least squares (2SLS) with an instrumental variable for financial literacy.

4. Controlling for Omitted Variables Bias by Use of Instrumental Variables

Others have argued that designs using instruments for financial literacy and 2SLS are superior to OLS in controlling for endogeneity and omitted variables bias, and similar to quasi-experiments in ability to support causal inferences. A properly chosen instrument should satisfy the "exclusion restriction" -- there should be no partial effect of the instrumental variable on the financial behavior dependent variable controlling for the endogenous variable of financial literacy. Meier (2011) argued that instrumenting for financial literacy is difficult due to the possibility of not controlling completely for omitted stable traits.[2]

We used a scale of need for cognition (Epstein et al. 1996) as an instrument for financial literacy not plausibly caused by financial behaviors. Need for cognition is a stable personality trait referring to a person's tendencies to engage in effortful thought, to entertain and evaluate ideas and to ignore irrelevant information. Past research has shown that NFC is positively related to the Big Five personality dimensions of openness to experience and conscientiousness and negatively related to neuroticism, and positively related to rational v. experiential thinking (Sadowski and Cogburn 1997).

[2] For example, Jappelli and Padula (2011) instrumented for financial literacy with math skills at age 10. Meier (2011) asked whether it is possible that math skills might have a direct effect on outcomes due to correlation with some other stable trait such as general intelligence or intertemporal impatience.

NFC is correlated with financial literacy (r = .35 in Study 2 and r = .31 in Study 3). Second, in both Studies 2 and 3, there is no correlation between NFC and the residual of the effect of financial literacy on 4 of 5 behaviors controlling for demographics. This suggests that NFC is exogenous and a suitable instrument for 8 of 10 tests; the exceptions were for positive savings and investments in Study 2 and how much is needed for retirement in Study 3.

For all five behaviors in Studies 2 and 3, we estimated an instrumental variable equivalent to our Model 2 in our OLS estimations with only financial literacy and the demographics as independent variables. We used NFC as an instrument for financial literacy in our first stage equation, and in our second stage equation, we predicted each of the five behaviors using only the predicted value of financial literacy as an independent variable along with demographic covariates. NFC was "non-weak" instrument, with the *F*-statistic from the first stage of 2SLS > 10 (Stock, Wright, and Yogo 2002): first stage $F = 48.30$, $p < .001$ for Study 2; $F = 51.82$, $p < .001$ for Study 3.

In our second-stage models, financial literacy was not significant for any of the five behaviors in Study 2. For Study 3, financial literacy was significant for two of five behaviors (figuring out how much savings are needed for retirement, and positive savings and investment behaviors), and was marginally significant for saving for an emergency fund. See Tables WC3 and WC4 in Web Appendix C.

5. Conclusion

The widely shared intuition that financial education should improve consumer decisions has led governments, businesses, and NGOs worldwide to create interventions to improve financial literacy. These interventions cost billions of dollars in real spending and larger opportunity costs when these interventions supplant other valuable activities. Our meta-analysis revealed that financial education interventions studied explained only about 0.1% of the variance in the financial behaviors studied, with even weaker average effects of interventions directed at low-income rather than general population samples. Education effects on knowledge of material taught were also small compared to education effects on knowledge gains in other seemingly comparable domains.

5.1. Study Methodology Affects Apparent Size of Financial Literacy Effects

Our meta-analysis found much larger effects on financial behavior when financial literacy was measured rather than manipulated. We conjecture that this may reflect omitted variables bias in studies of measured financial literacy. Measured literacy studies that attempted to control for omitted variables bias using instrumental variables and 2 stage least squares (2SLS) showed much smaller effect sizes than measured literacy studies using OLS, and smaller effect sizes than the OLS estimates coming from the same studies. As consumer researchers who study individual differences, we saw from our own work and the work of others that there were plausible stable traits that might be correlated with financial literacy and with the financial behaviors studied in this literature.

To make this latter possibility more concrete, we conducted our own primary research studies that attempted to replicate the most common patterns found in the literature. In Studies 2 and 3, for all five behaviors, we replicated prior findings showing that financial literacy significantly predicted financial behavior after controlling for demographics. But in both studies, for all five behaviors, when we added to those models the measures of confidence in financial information search, propensity to plan, willingness to take financial risks, and numeracy, caused effects of financial literacy to become nonsignificant for four of five financial behaviors in Study 2 and three of five in Study 3. When we take an alternate approach to controlling for omitted variables bias – using need for cognition as an instrument for financial literacy -- we draw very similar conclusions: financial literacy remains significant in only 3 of 10 tests. Moreover, the two approaches to controlling for omitted variables bias reached the same conclusion about the significance or lack of significance of financial literacy for 8 of 10 tests. All of this suggests the presence of omitted variable bias in our Model 2 OLS estimates and those in the 87 OLS studies in our meta-analysis.

Our cross-sectional research designs do not permit positive claims that these other traits cause the financial behaviors. We instead make a negative point: past work considered to support a causal role for financial literacy might need revisiting – particularly the 87 studies in our meta-analysis that used OLS

and that produced far larger effects of financial literacy on financial behavior than studies using other methods. As in our meta-analysis, effects of financial literacy diminish dramatically when one attempts to control for omitted variables bias.

Arguably, in our meta-analysis, if the instruments were successful in producing a design comparable to a quasi-experiment, effect-sizes should match what one finds in intervention studies that manipulate financial education. But we found that intervention studies show much smaller effects than econometric studies with instrumental variables, perhaps because the instruments used for financial literacy were not entirely successful. If so, this would imply upward bias in even the small effect-sizes uncovered using instruments. It is sometimes hard to tell from published reports why a particular instrument was chosen (cf. Larcker and Rusticus 2010). Nor is it clear what other instruments might have been tried, much as it can be opaque to readers of reports of experiments what covariate combinations were tried (cf. Simmons, Nelson, and Simonsohn 2011).

The greater magnitude of effects of measured literacy in the 24 studies with instrumental variables compared to the 90 studies of manipulated financial literacy need not signal incomplete control for omitted variables bias. Measured literacy reflects the cumulative effects of all information over an individual's lifetime that affects financial knowledge. In contrast, the manipulated financial literacy studies test the effect of a small subset of that information contained in the educational "dose." This is analogous to the finding in marketing that a given advertisement may have a very small effect on behavior, but the long-term effects of cumulative advertising can be strong (Mela, Gupta, and Lehmann 1997). This "education is cumulative" interpretation is plausible, but it raises the question of how much education would be required for a specific initiative to have a measurable effect, and at what cost.

Our view is that one should not use the larger effect-sizes in 24 instrumental variables studies of measured literacy than in the 90 studies of manipulated literacy as a justification for expenditures on financial education of the same sort tried so far. We need research that demonstrates larger effects of financial education interventions. Alternatively, we need rigorous tests of the "education is cumulative" interpretation, using appropriate designs to estimate long-term cumulative effects, as in these marketing

studies. Those methods involve time series designs with panel data following a common set of individuals over time. Such designs are absent in the literature we reviewed.

5.2. Implications for Research on Financial Education

Our paper shows how much one can learn by focusing not on the individual study, but on regularities that can be meta-analyzed across a large body of studies. But one cannot meta-analyze for the effects of some study characteristic that is not reported by the authors. It is striking how many papers do not give enough details about their financial education interventions to be able to code for variables that might plausibly affect their effect sizes. For the field to accumulate knowledge more rapidly, financial education scholars must agree on a set of study characteristics that will be described in every paper. We suggest that future studies should describe in their method sections key characteristics of the instruction (e.g. contact hours, delay in measurement, curriculum details), the instructors (e.g. instructor training and financial literacy, competing sources of financial advice) and the instructed (e.g. age relative to age encountering behaviors to be influenced, income, role in family financial decision making).

In studies of measured financial literacy, there is a marked disconnect between the conceptual definition of financial literacy as a skill and form of expertise and how it has been operationalized. Alba and Hutchinson (1987, p. 411) define consumer expertise as "the ability to perform product-related tasks successfully." In contrast, the operational definition of financial literacy that has dominated the literature is knowledge of financial facts like compound interest and financial product attributes. Our meta-analysis has shown that when one attempts to control for omitted variable bias, there is a weak relationship between this "financial literacy" and behavior. Future work should develop more promising measures more connected to the conceptual definition of financial literacy as a form of consumer expertise.

5.3. Implications for Financial Education and Policy to Help Consumer Decisions

Our conclusions are about forms of financial education that have been subjected to empirical evaluation. Those wishing to draw policy conclusions from our work must understand that many

innovative forms of financial education have never been studied empirically. That said, our findings for the interventions studied so far make clear that different approaches to financial education are required if one expects to produce effects on behavior larger than the very small effects we found.

What is unclear is why educational interventions investigated thus far have been unsuccessful. Perhaps teacher training and expertise are lower than with other subjects, or education is hampered inability by to clearly state normative behavior rather than "it depends" when neither teachers not students can anticipate future circumstances. Or perhaps financial education faces unusual competition for "share of voice" versus many other sources of inexpert and biased advice.

Our findings provide hints for future directions for improving financial education. Perhaps future education should teach soft skills like propensity to plan, confidence to be proactive, and willingness to take investment risks more than content knowledge about compound interest, bonds, etc. (Hader, Sood, and Fox 2013). In our meta-analysis, measured knowledge of financial facts had a weak relation to financial behavior in econometric studies controlling for omitted variables bias.

Moreover, our findings in Figure 4 showing decay of effects of financial education interventions imply that content knowledge may be better conveyed via "just-in-time" financial education tied to a particular decision enhancing perceived relevance and minimizing forgetting. It may be difficult to retrieve and apply knowledge from education to later personal decisions with similar relevant principles but different surface details (Thompson et al. 2000), particularly decisions coming years after the education. Our findings suggest re-examining efforts at child and youth financial education, particularly if intended to affect behaviors after a significant delay. There must be some immediate opportunity to enact and put to use knowledge or it will decay. Moreover, without a ready expected use in the near future, motivation to learn and to elaborate may suffer.

Research is also needed about the effects of interventions attempting to train multiple skills and affect multiple behaviors v. interventions aimed at single behaviors. Multiple-skill, multiple behavior programs may have certain disadvantages. One might expect learners to perceive less relevance give less attention with broad-based programs, and it is less likely that what is learned is "just in time" financial

education. Moreover, insofar as an intervention attempts to change multiple behaviors rather than single behaviors, motivation to follow through may suffer (Dalton and Spiller 2012; Soman and Zhao 2011).

Thus far we have not considered alternatives to financial education. An open question is the role that financial education should play in the policy mix. Public policy tools drawn from economics point to three broad classes of interventions to help consumers make better decisions: offering more choices; providing better information to consumers about options they might consider; and providing incentives for consumers or sellers to change their behavior (Lynch and Wood 2006). Financial education is a form of information remedy. An inherent weakness of information remedies is that, for the most part, they aim to influence consumers' evaluations of options; consumer research shows that far more variance in chosen behavior is controlled by affecting the "consideration set" of actively considered options. Put another way, it does not matter changing consumers' evaluation of options if consumers are not considering those options in the first place.

Others have advocated defaults, "nudges", and "choice architecture" such as opt-out retirement savings plans, and "plain vanilla" financial products as less costly and more effective alternatives to financial education (Choi et al. 2003; Thaler and Sunstein 2008; Barr, Mullainathan, and Shafir 2009; Boshara et al. 2010). These approaches bring assistance close to the time of related decisions. They blend incentives with information, making it easy to consider and choose more desirable behaviors and slightly more costly to consider and choose alternatives deemed less desirable by a social planner. But defaults work best when almost all consumers have similar needs. When needs are heterogeneous, one needs to know something to decide for oneself. Here, "just-in-time" financial education may have promise, alone and embedded in decision support systems that help identify a tailored consideration set of safe options.

Some might argue that the heterogeneity problem can be solved without financial education by "smart defaults" that tailor the default based on personal characteristics (Goldstein et al. 2008). Smart defaults are like recommender systems or "smart agents" in that their success depends entirely on the correlation between the order of recommendations and the ordering of options by the consumer's individual utility function if fully informed (Diehl, Kornish, and Lynch 2003). Some smart defaults like

target date retirement funds customize only on one or two demographics. In marketing, it is well known that demographics may predict group behavior but are weakly correlated with individual preferences (Bass, Tigert, and Lonsdale 1968). In many markets, adequate customization requires a deeper interactive conversation; consumers need some level of just-in-time financial education to inform such conversations.

Just-in-time financial education might be embedded in more deeply customized recommender systems and decision support systems for financial decisions (Lynch and Woodward 2009) or in the form of coaching (Collins and O'Rourke 2010). Coaching has the advantage of high relevance, low propensity for forgetting between information receipt and behavior, and opportunities to learn from feedback. Recommender systems are encouraged by "Smart Disclosures" that require sellers of financial products to disclose their features in a machine-readable form that can then be packaged by trustworthy "infomediaries" to develop recommender systems (Thaler 2012, White House Executive Office of the President National Science and Technology Council 2013). Future research should focus on these kinds of tools and on the problem of how to reach consumers at a point in time close to their decision when they are impatient for closure.

It is also important in future work to consider how the specific behavior affects which tools in the policy mix that are likely to be more effective. Four key dimensions are: whether the mistakes reflect behaviors under intentional control versus the control of habit or emotion; the frequency of the behavior that leads to the mistake; whether the mistakes pertain to situations that can or cannot be readily foreseen by the consumer and any policy maker trying to help improve the decision; and whether the consumer mistakes to be corrected are errors of omission or commission.

Lynch and Wood (2006) argued that information remedies such as financial education or disclosures can be effective when behavior is under cognitive and intentional control, but not for behaviors with weak intention-behavior links. We found that financial literacy has less effect in low-income samples; the financial behavior of the poor is arguably more controlled by circumstances independent of intention (Bertrand, Mullainathan, and Shafir 2006). The poor have little financial slack

and low fungiblility of money across periods to deal with financial shocks (cf. Zauberman and Lynch 2005). Lynch and Wood further note that information will have little effect on behaviors controlled by emotion or habit. Here, people are unlikely to retrieve the knowledge and apply it to the situation at hand. With emotionally controlled decisions such as compulsive spending, the primary role for education is in calling attention to the problematic behavior and pointing to pre-commitment tools for self-control coming out of behavioral economics. Behaviors under the control of habit are improved by changing habits, which research has shown can occur much more readily when a consumer is in a transition from one environment to another (Verplanken and Wood 2006). For example, education aimed at changing college students' budgeting habits may be more effective at times of transition than in mid-semester. Arguably, both just-in-time financial education and nudges have more potential in redressing financial errors that are associated with very infrequent decisions whose timing can be predicted by consumers and those trying to help them. If a mistake comes from an infrequent but legal behavior and the consumer cannot anticipate the occasion, cooling off laws are an appropriate remedy (Lynch and Zauberman 2006). If the mistake is falling prey to financial scams or frauds, unfortunately, cooling off laws provide little protection, nudges cannot help, and it is difficult for preventative educational interventions to be timely enough to be salient (cf. FINRA Foundation 2013).

On the other hand, certain decisions are more predictable, such signing up for a 401(k) plan, buying a more expensive house than one can afford, or choosing a risky mortgage. For such decisions, the consumer perceives there is a large and important decision and the policy maker has signals to predict its timing. If the decision is one where consumers are heterogeneous, just in time financial education may find a receptive audience. If consumers are homogeneous or if heterogeneity is of the sort that can be adequately addressed by "smart defaults," the policy maker can nudge at an appropriate time.

Appendix A. Details of Studies Using Instrumental Variables in Meta-Analysis

Table A1: Effect-Sizes of Econometric Studies with Non-weak and Exogenous Instruments

Study	OLS Regression Effect-size	Instrumental variables Effect-size	Instrument Used	Weak Instrument Test Used	Passed Test?	Exogenous Instrument Test Used	Passed Test?
Alessie, van Rooij and Lusardi (2011)	0.17	0.12	financial experiences of siblings and parents	First-stage F-value	Yes	Hansen J	Yes
Behrman, Mitchell, Soo and Bravo (2010)	0.12	0.09	macroeconomic conditions and family background	First-stage F-value	Yes	Hansen J	Yes
Calcagno and Monticone (2011)	0.11	0.06	average financial literacy at regional level	First-stage F-value	Yes	Hansen J	Yes
Duca and Kumar (2012)	0.05	0.01	whether respondent worked in a managerial or professional occupation	First-stage F-value	Yes	Hansen J	Yes
Fornero and Monticone (2011) sample 1	0.06	0.05	cost of learning financial knowledge	First-stage F-value	Yes	Hansen J	Yes
Fornero and Monticone (2011) sample 2	0.05	0.08	cost of learning financial knowledge	First-stage F-value	Yes	Hansen J	Yes
Jappelli and Padula (2011) sample 1	0.06	0.04	math performance in school	First-stage F-value	Yes	Sargan test	Yes
Jappelli and Padula (2011) sample 2	0.08	0.06	math performance in school	First-stage F-value	Yes	Sargan test	Yes
Kimball and Shumway (2007)	0.31	0.11	financial education and demographics	First-stage F-value	Yes	Correlation with residuals	Yes
Klapper, Lusardi, and Panos (2011)	0.17	0.07	number of newspapers in circulation and of universities per region	Kleibergen -Paap	Yes	Hansen J	Yes
Lusardi and Mitchell (2007a)	0.12	0.09	background training in economics	First-stage F-value	Yes	Hansen J	Yes
Sekita (2011)	0.07	0.04	individual and average regional Japanese skills	First-stage F-value	Yes	Hansen J	Yes
van Rooij, Lusardi and Alessie (2008)	0.12	0.06	economic education, financial condition of siblings and knowledge of parents	First-stage F-value	Yes	Hansen J	Yes
van Rooij, Lusardi and Alessie (2011)	0.18	0.06	background training in economics	First-stage F-value	Yes	Hansen J	Yes
Yoong (2010)	0.19	0.08	bond pricing knowledge	First-stage F-value	Yes	Hansen J	Yes
Zanghieri (2013)	0.06	0.04	having a mortgage, risk aversion, and living in a region with a high bank density	First-stage F-value	Yes	Hansen J	Yes
Sample Weighted Average Effect-size	*0.091*	*0.059*					

Table A2: Effect-Sizes of Studies with Weak, Endogenous, or Untested Instruments

Study	OLS Regression Effect-size	Instrumental variables Effect-size	Instrument Used	Weak Instrument Test Used	Passed Test?	Exogenous Instrument Test Used	Passed Test?
Bucher-Koenen and Lusardi (2011)	0.08	0.08	voting share for the libertarian party	First-stage F-value	No	Hansen J	Yes
Disney and Gathergood (2011)	0.05	0.08	self-reported mathematical ability in school	None	-	None	-
Giofré (2012)	0.06	0.11	lagged values of financial literacy	None	-	None	-
Kotlikoff and Bernheim (2001)	0.09	0.08	macroeconomic knowledge	None	-	None	-
Lusardi and Mitchell (2009)	0.08	0.05	lived in a state with mandated financial education at age 17	First-stage F-value	No	Hansen J	No
Lusardi and Mitchell (2011)	0.07	0.06	exposure to mandate and length of time to mandate	None	-	None	-
Monticone (2010a)	0.08	0.04	trust in advisors and trust in banks	First-stage F-value	No	Hansen J	Yes
Mullock and Turcotte (2012)	0.15	0.15	whether first language is English or French and is the one in charge of financial management at home	None	-	None	-
Sample Weighted Average Effect-size	*0.106*	*0.109*					

Appendix B. Measures Used in Studies 1, 2, and 3

13-Item Financial Literacy Measure (correct response in italics):

1) 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 today with the money in this account
- exactly the same as today with the money in this account
- *less than today with the money in this account*
- Don't know
- Refuse to answer

2) Do you think that the following statement is true or false? "Bonds are normally riskier than stocks."

- True
- *False*
- Don't know
- Refuse to answer

3) Considering a long time period (for example 10 or 20 years), which asset described below normally gives the highest return?

- savings accounts
- *stocks*
- bonds
- Don't know
- Refuse to answer

4) Normally, which asset described below displays the highest fluctuations over time?

- savings accounts
- *stocks*
- bonds
- Don't know
- Refuse to answer

5) When an investor spreads his money among different assets, does the risk of losing a lot of money:

- increase
- *decrease*
- stay the same
- Don't know
- Refuse to answer

6) Do you think that the following statement is true or false? "If you were to invest $1000 in a stock mutual fund, it would be possible to have less than $1000 when you withdraw your money."

- *True*
- False
- Don't know
- Refuse to answer

7) Do you think that the following statement is true or false? "A stock mutual fund combines the money of many investors to buy a variety of stocks."

- *True*
- False
- Don't know
- Refuse to answer

8) Do you think that the following statement is true or false? "After age 70 1/2, you have to withdraw at least some money from your 401(k) plan or IRA."

- *True*
- False
- It depends on the type of IRA and/or 401(k) plan
- Don't know
- Refuse to answer

9) Do you think that the following statement is true or false? "A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less."

- *True*
- False
- Don't know
- Refuse to answer

10) Suppose you had $100 in a savings account and the interest rate is 20% per year and you never withdraw money or interest payments. After 5 years, how much would you have on this account in total?

- *More than $200*
- Exactly $200
- Less than $200
- Don't know
- Refuse to answer

11) Which of the following statements is correct?

- Once one invests in a mutual fund, one cannot withdraw the money in the first year
- *Mutual funds can invest in several assets, for example invest in both stocks and bonds*
- Mutual funds pay a guaranteed rate of return which depends on their past performance
- None of the above
- Don't know

- Refuse to answer

12) Which of the following statements is correct? If somebody buys a bond of firm B:

- He owns a part of firm B
- *He has lent money to firm B*
- He is liable for firm B's debts
- None of the above
- Don't know
- Refuse to answer

13) Suppose you owe $3,000 on your credit card. You pay a minimum payment of $30 each month. At an Annual Percentage Rate of 12% (or 1% per month), how many years would it take to eliminate your credit card debt if you made no additional new charges?

- less than 5 years
- between 5 and 10 years
- between 10 and 15 years
- n*ever*
- Don't know
- Refuse to answer

NOTE*:* Items 1 and 2: Lusardi and Mitchell (2006); Items 3, 4, 5, 10, 11, 12: van Rooij, Lusardi and Alessie (2011); Item 6: Agnew and Utkus (2005); Items 7 and 8: Hung, Meijer, Mihaly, Yoong (2009); Item 9: Lusardi (2010); Item 13: Lusardi and Tufano (2009).

Related Traits of Studies 1 and 2:

Preference for Numerical Information (coefficient alpha = .90 in Study 1). Each item scored 1 = strongly disagree, 6 = strongly agree.

1) I enjoy work that requires the use of numbers.
2) I find it satisfying to solve day-to-day problems involving numbers.
3) Numerical information is very useful in everyday life.
4) I prefer not to pay attention to information involving numbers (reverse coded).
5) I don't like to think about issues involving numbers (reverse coded).
6) I like to make calculations using numerical information.
7) I don't find numerical information to be relevant for most situations (reverse coded).
8) I think it is important to learn and use numerical information to make well informed decisions.

Attitude toward Money (coefficient alpha = .89 in Study 1). Each item scored 1 = strongly disagree, 6 = strongly agree.

1) I do financial planning for the future.
2) I put money aside on a regular basis for the future.
3) I save now to prepare for my old age.
4) I keep track of my money.

5) I follow a careful financial budget.
6) I am very prudent with money.

Tightwad-Spendthrift Scale **(coefficient alpha = .67 in Study 1)**

1) Which of the following description fits you better?

Tightwad (difficulty spending money)				About the same or neither					Spendthrift (difficulty controlling spending)	
1	2	3	4	5	6	7	8	9	10	11

2) Some people have trouble limiting their spending: they often spend money – for example on clothes, meals, vacations, phone calls – when they would do better not to. Other people have trouble spending money. Perhaps because spending money makes them anxious, they often don't spend money on things they should spend it on

a) How well does the first description fit you? That is, do you have trouble limiting your spending? Never (1); Rarely (2); Sometimes (3); Often (4); Always (5)

b) How well does the second description fit you? That is, do you have trouble spending money? Never (1); Rarely (2); Sometimes (3); Often (4); Always (5)

3) Following is a scenario describing the behavior of two shoppers. After reading about each shopper, please answer the question that follows. Mr. A is accompanying a good friend who is on a shopping spree at a local mall. When they enter a large department store, Mr. A sees that the store has a "one-day-only-sale" where everything is priced 10-60% off. He realizes he doesn't need anything and ends up spending almost $100.00 on stuff. Mr. B is accompanying a good friend who is on a shopping spree at a local mall. When they enter a large department store, Mr. B sees that the store has a "one-day-only-sale" where everything is priced 10-60% off. He figures he can get great deals on many items that he needs, yet the thought of spending the money keeps him from buying the stuff. In terms of your own behavior, who are you more similar to, Mr. A or Mr. B?

Mr. A		about the same or neither		Mr. B
1	2	3	4	5

Need for Cognition (coefficient alpha = .76 in Study 1; .73 in Study 2; .77 in Study 3). Each item scored 1 = strongly disagree, 6 = strongly agree.

1) I don't like to have to do a lot of thinking (reverse coded).
2) I try to avoid situations that require thinking in depth about something (reverse coded).
3) I prefer to do something that challenges my thinking rather than something that requires little thought.
4) I prefer complex to simple problems.
5) Thinking hard and for a long time about something gives me little satisfaction (reverse coded).

Numeracy (coefficient alpha = .79 in Study 1; .79 in Study 2)

1) Imagine that we roll a fair, six-sided die 1,000 times. Out of 1,000 rolls, how many times do you think the die would come up even (2, 4, or 6)?
2) In the BIG BUCKS LOTTERY, the chances of winning a $10.00 prize are 1%. What is your best guess about how many people would win a $10.00 prize if 1,000 people each buy a single ticket from BIG BUCKS?

3) In the ACME PUBLISHING SWEEPSTAKES, the chance of winning a car is 1 in 1,000. What percent of tickets of ACME PUBLISHING SWEEPSTAKES win a car? (Enter a number below without a % sign.)
4) Which of the following numbers represents the biggest risk of getting a disease? a) 1 in 100; b) 1 in 1000; c) 1 in 10
5) Which of the following represents the biggest risk of getting a disease? a) 1%; b) 10%; c) 5%
6) If Person A's risk of getting a disease is 1% in ten years, and Person B's risk is double that of A's, what is B's risk? (Enter a number below without a % sign.)
7) If Person A's chance of getting a disease is 1 in 100 in ten years, and Person B's risk is double that of A, what is B's risk (out of 100)?
8) If the chance of getting a disease is 10%, how many people would be expected to get the disease out of 100?
9) If the chance of getting a disease is 10%, how many people would be expected to get the disease out of 1000?
10) If the chance of getting a disease is 20 out of 100, this would be the same as having a ____% chance of getting the disease. (Enter a number below without a % sign.)
11) The chance of getting a viral infection is .0005. Out of 10,000 people, about how many of them are expected to get infected?

Numeracy (coefficient alpha = .75 in Study 3)

1) Imagine that we roll a fair, six-sided die 1,000 times. Out of 1,000 rolls, how many times do you think the die would come up as an even number? Of the values below, which is the most likely outcome?
- ❍ 157
- ❍ 298
- ❍ 512
- ❍ 754
- ❍ 919
- ❍ The above answers are all equally likely.
- ❍ I do not know.

2) In the BIG BUCKS LOTTERY, the chances of winning a $10.00 prize are 1%. What is your best guess about how many people would win a $10.00 prize if 1,000 people each buy a single ticket from BIG BUCKS?
- ❍ 1
- ❍ 2
- ❍ 10
- ❍ 100
- ❍ 110
- ❍ The answers above are equally likely.
- ❍ I do not know.

3) If the chance of getting a disease is 20 out of 100, this would be the same as having a _____% chance of getting the disease.
- ❍ 0.02
- ❍ 0.2
- ❍ 2
- ❍ 2.0
- ❍ 20
- ❍ 25

- 200
- I do not know.

4) In the ACME PUBLISHING SWEEPSTAKES, the chance of winning a car is 1 in 1,000. What percent of tickets of ACME PUBLISHING SWEEPSTAKES win a car?
- 0.001%
- 0.01%
- 0.1%
- 1.0%
- 1.1%
- None of the above
- I do not know.

5) If the chance of getting a disease is 10%, how many people would be expected to get the disease out of 1,000?
- 1
- 10
- 11
- 50
- 100
- 110
- 1,000
- I do not know.

6) If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?
- 1 minute
- 5 minutes
- 10 minutes
- 100 minutes
- 1,000 minutes
- 1 day
- None of the above
- I do not know.

7) A bat and ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost?
- 1 cent
- 5 cents
- 10 cents
- 11 cents
- 20 cents
- 100 cents
- 1 dollar
- I do not know.

8) In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?
- 16 days
- 24 days
- 25 days
- 32 days

- ❍ 26 days
- ❍ 22 days
- ❍ 47 days
- ❍ I do not know.

Consumer Confidence in Financial Information Search (coefficient alpha = .94 in Study 1; .93 in Study 2; .92 in Study 3). Each item scored 1 = strongly disagree, 6 = strongly agree.

1) I am confident in my ability to recognize a good financial investment.
2) I know what investments to look for to get the most return on my money.
3) I know the right questions to ask when making financial investment decisions.
4) I have the skills required to make sound financial investments.
5) I know the right sources to consult to make wise financial decisions.

Planning for Money–Long Run (coefficient alpha = .95 in Study 1; .93 in Study 2; .95 in Study 3). Each item scored 1=strongly disagree, 6 = strongly agree.

1) I set financial goals for the next 1-2 years for what I want to achieve with my money.
2) I decide beforehand how my money will be used in the next 1-2 years.
3) I actively consider the steps I need to take to stick to my budget in the next 1-2 years.
4) I consult my budget to see how much money I have left for the next 1-2 years.
5) I like to look to my budget for the next 1-2 years in order to get a better view of my spending in the future.
6) It makes me feel better to have my finances planned out in the next 1-2 years.

NOTE: The items above reflect long-run planning; the phrase "1-2 years" was replaced by "1-2 months" for short-run planning used in Study 1.

Willingness to Take Investment Risk (coefficient alpha = .81 in Study 3). Items 1-4 scored 1=very unlikely, 5 = very likely. Item 5 scored 1=not at all willing, 5 = very willing.

1) Investing 10% of your annual income in a moderate growth mutual fund.
2) Investing 5% of your annual income in a very speculative stock.
3) Investing 5% of your annual income in a conservative stock.
4) Investing 10% of your annual income in government bonds (treasury bills).
5) When thinking of your financial investments, how willing are you to take risks?

Generalized Self-efficacy (coefficient alpha = .93 in Study 3). Each item scored 1=strongly disagree, 6 = strongly agree.

1) I will be able to achieve most of the goals that I have set for myself.
2) When facing difficult tasks, I am certain that I will accomplish them.
3) In general, I think that I can obtain outcomes that are important to me.
4) I believe I can succeed at most any endeavor to which I set my mind.
5) I will be able to successfully overcome many challenges.

Delayed Gratification Inventory (coefficient alpha = .74 in Study 3). Each item scored 1=strongly disagree, 6 = strongly agree.

1) I would have a hard time sticking with a special, healthy diet.

2) I have always tried to eat healthy because it pays off in the long run.
3) I have given up physical pleasure or comfort to reach my goals.
4) When faced with a physically demanding chore, I always tried to put off doing it.
5) I try to consider how my actions will affect other people in the long-term.
6) I do not consider how my behavior affects other people.
7) I try to spend my money wisely.
8) I cannot be trusted with money.
9) I cannot motivate myself to accomplish long-term goals.
10) I have always felt like my hard work would pay off in the end.

Restraint (coefficient alpha = .89 in Study 3). Each item scored 1=strongly disagree, 6 = strongly agree.

1) I am good at resisting temptation.
2) I have a hard time breaking bad habits.
3) I wish I had more self-discipline.
4) People would say that I have iron self- discipline.

Impulsivity (coefficient alpha = .89 in Study 3). Each item scored 1=strongly disagree, 6 = strongly agree.

1) I do certain things that are bad for me, if they are fun.
2) Pleasure and fun sometimes keep me from getting work done.
3) Sometimes I can't stop myself from doing something, even if I know it is wrong.
4) I often act without thinking through all the alternatives.

Financial Behavior Dependent Variables of Study 2 and of Study 3

1) ***Savings for an emergency fund*** (yes – no).

Have you set aside emergency or rainy day funds that would cover your expenses for 3 months, in case of sickness, job loss, economic downturn, or other emergencies?

- ❍ Yes
- ❍ No

2) ***Figuring out how much savings is needed for retirement*** (yes – no).

Have you ever tried to figure out how much you need to save for retirement?

- ❍ Yes
- ❍ No

3) ***Positive savings / investment behaviors*** **(coefficient alpha = .68 in Study 2; .68 in Study 3)**.

Have you ever opened a savings account or bought a CD.

- ❍ Yes
- ❍ No

Have you ever bought a savings bond or other bonds.

- ❍ Yes
- ❍ No

Have you ever invested in mutual funds.

- ❍ Yes
- ❍ No

Have you ever invested in individual stocks.

- ❍ Yes
- ❍ No

4) The respondent's perception of ***how banks or credit card companies would rate the respondent's credit score***.

How do you think banks or credit card companies would rate your credit?

Very Poor 1 2 3 4 5 6 7 8 9 10 Excellent

5) ***Credit and checking fees*** relating to check bouncing and late credit card payments **(in coefficient alpha = .65 in Study 2; .66 in Study 3)**.

Over the past two years, how frequently have you been late paying credit card bills?

- ❍ Never
- ❍ Once or twice since had credit cards
- ❍ Once or twice per year
- ❍ More than twice per year

How often have you bounced a check?

- ❍ Never
- ❍ Once or twice in lifetime
- ❍ Once or twice per year
- ❍ More than twice per year

Please indicate below the option that best describes your payments on credit cards.

- ❍ Always pays off monthly
- ❍ Generally pays off monthly
- ❍ Occasionally pays off monthly
- ❍ Seldom pays off, but tries to pay down
- ❍ Generally pays minimum each month

Appendix C, Table C1: Study 1 Summary Statistics, Cronbach Alpha Reliabilities, and Correlations

	Mean	SD	Cronbach Alpha	1	2	3	4	5	6	7	8	9	10	11	12
1. Financial Literacy	7.27	3.51	.84	1											
2. Numeracy	7.43	2.57	.79	**.59**	1										
3. Consumer Confidence	3.61	1.15	.94	**.31**	.10	1									
4. Plan For Money – Short Term	4.16	1.01	.95	.11	.04	.36	1								
5. Pref. for Numerical Info.	4.07	.93	.90	**.39**	**.39**	**.43**	**.31**	1							
6. Attitude/Concern for Money	4.21	.99	.89	**.27**	.05	**.64**	**.70**	**.44**	1						
7. NFC	3.82	.87	.76	**.29**	**.40**	**.24**	.11	**.51**	**.22**	1.00					
8. Spendthrift/Tightwad	13.97	3.77	.67	-.17	-.08	-.12	**-.20**	-.04	**-.35**	.01	1				
9. Gender	.26	.44	-	**.23**	**.19**	**.25**	-.01	**.20**	.08	.16	-.15	1			
10. Age	46.30	12.95	-	**.28**	.15	-.14	.02	.01	-.01	-.07	.02	-.11	1		
11. Number of Children	2.57	1.45	-	-.15	-.19	-.01	.03	-.01	.06	.00	-.05	-.05	.16	1	
12. Years to Retire	3.49	1.95	-	**-.23**	-.19	-.05	-.06	-.01	-.10	.07	.06	.15	**-.79**	-.14	1

Note: Significant correlations ($p < .05$) are in **bold**. Coding is as follows: Gender: 1 = Male, 0 = Female; Years to retire: 1 = 5 or less, 2 = 6-10, 3 = 11-15, 4 = 16-20, 5 = 20-30, 6 = 31 or more.

Appendix C, Table C2: Study 2 Summary Statistics, KR-20 or Cronbach Alpha Reliabilities, and Correlations

	Mean	SD	Alpha	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Financial literacy	7.43	3.18	.82	1																		
2. Numeracy	7.81	2.53	.79	**.50**	1																	
3. Confidence	3.63	1.02	.93	**.23**	.01	1																
4. Plan For Money – LT	3.64	1.09	.93	**.10**	.04	**.43**	1															
5. Willing to Take Risks	3.43	1.52	-	**.19**	**.39**	**.46**	**.23**	1														
6. Savings for Emergency Fund	0.45	0.50	-	**.21**	.05	**.39**	**.32**	**.22**	1													
7. Figure Needed for Retire	0.42	0.49	-	**.26**	**.40**	**.38**	**.25**	**.28**	**.43**	1												
8. Positive Savings / Investment Behaviors	2.06	1.33	.68	**.47**	.05	**.33**	**.16**	**.32**	**.35**	**.36**	1											
9. Banks / CC Credit Score	6.48	2.96	-	**.29**	**.19**	**.37**	**.27**	**.19**	**.49**	**.30**	**.28**	1										
10. Credit and Checking Fees	5.58	2.34	.65	**-.18**	**.15**	**-.30**	**-.20**	**-.15**	**-.41**	**-.13**	**-.14**	**-.59**	1									
11. Gender	.39	.49	-	.16	**.14**	**.16**	-.03	**.27**	.06	.06	**.35**	**.13**	-.02	1								

Appendix C, Table C2 (cont.): Study 2 Summary Statistics, KR-20 or Cronbach Alpha Reliabilities, and Correlations

	Mean	SD	Alpha	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
12. Age	46.55	14.72	-	**.35**	.05	-.01	-.06	**-.10**	**.09**	**.14**	.05	.02	.01	.01	1							
13. Race / Ethnicity	0.81	0.39	-	**.20**	**.18**	-.07	-.07	**-.13**	-.03	.00	**.37**	**.36**	-.02	.01	**.20**	1						
14. Income	4.00	1.95	-	**.26**	**.12**	**.28**	**.14**	**.28**	**.30**	**.29**	**.37**	**.29**	-.17	.05	.06	-.02	1					
15. Education	3.34	1.04	-	**.29**	**.23**	**.28**	**.19**	**.26**	**.24**	**.18**	.03	-.05	-.18	.06	-.03	-.08	**.34**	1				
16. Number of Children	2.49	1.45	-	-.01	-.06	-.04	-.01	-.05	-.05	.10	.13	**.23**	**.18**	-.03	**.35**	-.01	.06	**-.12**	1			
16. Marital Status	0.55	0.50	-	**.13**	.04	**.13**	.05	.08	.15	.23	.13	**.23**	-.08	-.01	**.14**	-.02	**.42**	**.11**	**.32**	1		
17. Years to Retire	3.65	1.99	-	**-.30**	-.01	-.03	.04	.04	-.07	-.16	-.33	**-.12**	.04	.02	**-.81**	-.13	**-.09**	.01	**-.27**	**-.13**	1	
19. Need for Cognition	3.99	0.82	.73	**.35**	**.31**	**.25**	.14	.18	.04	**.12**	.07	.03	.03	.11	**.**04	.13	**.**08	.20	-.03	.05	.03	1

Note: Significant correlations ($p < .05$) are in **bold**; Race/Ethnicity: 1 = Caucasian, 0 = Other; Income: 1 = less than $15K, 2 = $15K to < $25K, 3 = $25K to <$35K, 4 = $35K to < $50K, 5 = $50K to < 75K, 6 = $75K to < $100K, 7 = $100 K to < $150K, 8 = more than $150K; Education: 1 = Some High School, 2 = High School Graduate, 3 = Some College, 4 = College Degree, 5 = Masters, 6 = Doctor, Ph.D., or Law degree; Marital status: 1 = Married, 0 = Other.

Appendix C, Table C3: Study 3 Summary Statistics, KR-20 or Cronbach's Alpha Reliabilities, and Correlations

	Mean	SD	Alpha	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. Financial literacy	7.81	3.52	.85	1																					
2. Numeracy	3.35	2.14	.75	**.63**	1																				
3. Confidence	4.05	0.97	.92	**.27**	**.16**	1																			
4. Plan For Money – LT	3.64	1.12	.95	**.21**	.06	**.53**	1																		
5. Willing to Take Risks	2.78	0.85	.81	**.34**	**.15**	**.30**	**.30**	1																	
6. Savings for Emergency Fund	0.53	0.50	-	**.33**	**.21**	**.32**	**.40**	**.36**	1																
7. Figure Needed for Retire	0.47	0.50	-	**.44**	**.30**	**.21**	**.31**	**.35**	**.44**	1															
8. Positive Savings / Investment Behaviors	2.20	1.32	.68	**.59**	**.38**	**.25**	**.27**	**.40**	**.40**	**.49**	1														
9. Banks / CC Credit Score	7.44	2.80	-	**.40**	**.26**	**.30**	**.32**	**.34**	**.49**	**.36**	**.39**	1													
10. Credit and Checking Fees	5.30	2.25	.66	**-.24**	**-.16**	**-.35**	**-.36**	**-.24**	**-.44**	**-.24**	**-.13**	**-.66**	1												
11. Gender	.50	.50	-	**.21**	**.19**	.08	.04	**.13**	**.11**	**.09**	**.12**	.02	**-.18**	1											

Appendix C, Table C3 (cont.): Study 3 Summary Statistics KR-20 or Cronbach's Alpha Reliabilities, and Correlations

	Mean	SD	Alpha	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
12. Age	2.58	0.93	-	**.20**	.02	.01	.02	-.03	**.18**	**.18**	**.31**	**.15**	.01	.03	1										
13. Race / Ethnicity	0.77	0.42	-	**.24**	**.23**	.05	-.04	.04	.06	**.10**	**.20**	**.13**	-.05	-.02	.08	1									
14. Income	5.11	2.00	-	**.44**	**.27**	**.16**	**.15**	**.33**	**.30**	**.36**	**.44**	**.39**	**-.14**	**.08**	.08	**.16**	1								
15. Education	2.97	0.94	-	**.51**	**.41**	**.22**	**.19**	**.31**	**.21**	**.28**	**.40**	**.29**	**-.16**	.02	**-.11**	**.12**	**.47**	1							
16. Marital Status	0.60	0.49	-	**.20**	**.15**	.07	.05	**.10**	**.17**	**.18**	**.25**	**.23**	-.01	.02	**.16**	**.22**	**.38**	**.14**	1						
17. Years to Retire	3.75	1.88	-	**-.23**	-.02	-.05	-.05	-.01	**-.20**	**-.18**	**-.33**	**-.19**	.07	-.03	**-.79**	-.07	-.07	**.10**	**-.13**	1					
18. Restraint	3.54	0.89	.76	.04	-.06	**.35**	**.35**	**.11**	**.21**	**.12**	.02	**.23**	**-.31**	.04	.03	-.08	.06	.07	.04	-.04	1				
19. Need for Cognition	4.16	0.84	.77	**.31**	**.26**	**.25**	**.25**	**.16**	**.15**	**.23**	**.24**	**.13**	**-.11**	**.09**	.06	**.11**	.06	**.28**	.07	-.01	**.20**	1			
20. Self-efficacy	4.66	0.79	.93	**.21**	**.16**	**.41**	**.31**	**.13**	**.14**	.07	**.14**	**.16**	-.06	-.05	-.03	**.12**	**.22**	**.20**	**.12**	.01	**.26**	**.38**	1		
21. Delayed Gratification	4.41	0.59	.74	**.24**	**.14**	**.43**	**.41**	**.17**	**.28**	**.22**	**.19**	**.30**	**-.29**	-.07	**.12**	.05	**.18**	**.18**	**.13**	**-.10**	**.47**	**.43**	**.55**	1	
22. Impulsivity	2.93	0.92	.78	-.06	.07	**-.21**	**-.20**	-.05	**-.13**	**-.12**	-.06	**-.18**	**.18**	**.14**	**-.14**	.06	-.02	.02	-.04	**.12**	**-.55**	**-.22**	**-.19**	**-.44**	1

Note: Significant correlations ($p < .05$) are in **bold**; Age: 1 = 18-29, 2 = 30-44, 3 = 45-59, 4 = 60+. ; Race/Ethnicity: 1 = Caucasian, 0 = Other; Income: 1 = less than $15K, 2 = $15K to < $25K, 3 = $25K to <$35K, 4 = $35K to < $50K, 5 = $50K to < 75K, 6 = $75K to < $100K, 7 = $100 K to < $150K, 8 = more than $150K; Education: 1 = Some High School, 2 = High School Graduate, 3 = Some College, 4 = College Degree; Marital status: 1 = Married, 0 = Other.

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Web Appendix for Fernandes, Lynch, and Netemeyer

Web Appendix A. Reference List of Papers Included in the Meta-Analysis and Tables of Effect Sizes for All Coded Papers

Abreu, Margarida, and Victor Mendes (2010), "Financial Literacy and Portfolio Diversification," *Quantitative Finance*, 10 (5), 515-528.

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Table WA1: Studies of Manipulated Financial Literacy with Randomized Experiments

	Study	Effect-size partial r (financial literacy, behavior)	Dependent Variable						
			Save	Plan	Debt	Cash flow	Invest	Plan active	Inertia
1	Becchetti, Caiazza and Coviello (2013)	0.04	X						
2	Berry, Karlan and Pradhan (2013)	0.01	X	X					
3	Bruhn, Ibarra and McKenzie (2013)	0.01	X		X				
4	Carpena, Cole, Shapiro, and Zia (2013)	0.02				X			
5	Clark, Maki and Morril (2012)	0.02					X		
6	Cole et al. (2012)	-0.03	X						
7	Cole, Sampson, and Zia (2011) sample 1	-0.03				X			
8	Cole, Sampson, and Zia (2011) sample 2	-0.07				X			
9	Collins (2011)	0.02	X		X		X		
10	Drexler, Fischer, and Schoar (2011) sample 1	0.02	X			X	X		
11	Drexler, Fischer, and Schoar (2011) sample 2	0.06	X			X	X		
12	Duflo and Saez (2003)	-0.01						X	
13	Gaurav, Cole, and Tobacman (2011)	0.08		X					
14	Giné, Karlan and Ngatia (2013)	0.04		X					
15	Seshan and Yang (2012)	-0.04	X						
Total	*Sample Weighted Average Effect-size*	*0.009*	8	3	2	5	4	1	0

Table WA2: Studies of Manipulated Financial Literacy with Pre-Post or Quasi-Experiments

	Study	Effect-size partial r (financial literacy, behavior)	Dependent Variable						
			Save	Plan	Debt	Cash flow	Invest	Plan active	Inertia
16	Agarwal et al. (2010) sample 1	0.03				X			
17	Agarwal et al. (2010) sample 2	0.03				X			
18	Bauer et al (2011)	0.12	X		X				
19	Bayer, Bernheim, and Scholz (2009)	0.07						X	
20	Bell, Gorin and Hogarth (2009)	0.02	X	X		X		X	
21	Bernheim and Garrett (2003)	0.07						X	
22	Bernheim, Garrett and Maki (2001)	0.01	X				X		
23	Choi, Laibson and Madrian (2005)	0.01					X		
24	Choi, Laibson and Madrian (2007)	0.03						X	
25	Choi, Laibson and Madrian (2008)	0.02					X		X
26	Clancy, Ginstein-Weiss and Schreiner (2001)	0.06	X						
27	Clark and Schieber (1996)	0.04						X	
28	Clark, Ambrosio, McDermed and Sawant (2006)	0.01		X			X		
29	Clark, Morrill and Allen (2010)	0.01							X
30	Cole and Shastry (2010)	-0.004					X		

	Study	Effect-size partial r (financial literacy, behavior)	Dependent Variable						
			Save	Plan	Debt	Cash flow	Invest	Plan active	Inertia
31	Courchane and Zorn (2005)	0.01	X		X				
32	Danes (2004)	0.14			X	X			X
33	Danes, Huddleston-Casas and Boyce (1999)	0.13	X	X	X		X		
34	Ding, Quercia, and Ratcliffe (2008)	0.04			X				
35	Elliehausen, Lindquist, and Staten (2007)	0.04			X				
36	Garman et al. (1999)	0.12	X	X	X	X	X		
37	Goda, Manchester, and Sojourner (2012)	0.01						X	
38	Grinstein-Weiss et al. (2011)	0.02	X	X	X		X		
39	Guo, Sherraden and Johnson (2009)	0.04						X	
40	Han, Grinstein-Weiss,and Schreiner (2007) study 1	0.06	X						
41	Han, Grinstein-Weiss,and Schreiner (2007) study 2	0.06	X						
42	Hartarska and Gonzalez-Vega (2005)	0.04							X
43	Hartarska and Gonzalez-Vega (2006)	0.06							X
44	Hartarska, Gonzalez-Vega, and Dobos (2002) sample 1	0.10							X
45	Hartarska, Gonzalez-Vega, and Dobos (2002) sample 2	0.03							X
46	Haynes-Bordas, Kiss and Yilmazer (2012)	0.04	X				X		
47	Hershey et al. (1998)	0.14		X					
48	Hershey, Mowen and Jacobs-Lawson (2003)	0.12	X	X					
49	Hira and Loibl (2005a)	0.01			X				
50	Hira and Loibl (2005b)	0.11						X	
51	Hirad and Zorn (2001)	0.05			X				
52	Kim, Garman, and Sorhaindo (2003)	0.09							X
53	Kim, Kratzer, and Leech (2001)	0.08							X
54	Kim, Sorhaindo, and Garman (2003)	0.21							X
55	Kimball and Shumway (2007)	0.06					X		
56	Loibl and Hira (1999)	0.21							X
57	Loibl, Hira and Rupured (2006) study 1	-0.03			X				
58	Loibl, Hira and Rupured (2006) study 2	-0.01			X				
59	Lusardi (2002)	0.03	X						
60	Lusardi (2005)	0.03	X						
61	Lyons, Chang and Scherpf (2006)	0.06			X	X			
62	Lyons, White and Howard (2008) study 1	-0.001							X
63	Lyons, White and Howard (2008) study 2	0.002							X
64	Maki (2004)	0.08					X		
65	Mandell (2005)	0.02	X		X				
66	Mandell (2006a)	0.02							X
67	Mandell (2006b)	0.02							X
68	Mandell (2009a)	0.05	X						

	Study	Effect-size partial r (financial literacy, behavior)	Dependent Variable						
			Save	Plan	Debt	Cash flow	Invest	Plan active	Inertia
69	Mandell (2009b)	0.04	X		X				
70	Mandell and Klein (2009)	0.03	X		X				
71	Mastrobuoni (2007) study 1 sample 1	0.01						X	
72	Mastrobuoni (2007) study 1 sample 1	0.01						X	
73	Mastrobuoni (2007) study 2 sample 2	0.01						X	
74	Mastrobuoni (2007) study 2 sample 2	-0.03						X	
75	Mills, Patterson, Orr and DeMarco (2004) sample 1	-0.02	X	X			X		
76	Mills, Patterson, Orr and DeMarco (2004) sample 2	0.03	X	X			X		
77	Muller (2003a)	0.01					X		
78	Muller (2003b)	-0.03		X					
79	Peng, Bartholomae, Fox and Cravener (2007)	0.03	X						
80	Schreiner and Sherraden (2007)	0.05	X						
81	Schreiner et al. (2001)	0.08	X						
82	Shim, Xiao, Barber, and Lyons (2009)	0.02	X		X				
83	Spader and Quercia (2008) sample 1	0.001		X					X
84	Spader and Quercia (2008) sample 2	0.02		X					X
85	Tennyson and Nguyen (2001)	0.05	X		X		X		
86	Varcoe, Martin, Devitto and Go (2005)	0.12				X			X
87	Way and Holden (2009) sample 1	0.03	X	X		X	X		
88	Way and Holden (2009) sample 2	0.03	X	X		X	X		
89	Wiener, Donovan, Gross and Block-Lieb (2005)	0.20	X						
90	Xiao, Serido and Shim (2010)	0.01			X		X		
Total	*Sample Weighted Average Effect-size*	*0.032*	28	14	19	9	15	12	18

Table WA3: Studies of Measured Financial Literacy with Instrumental Variables (effect-sizes from OLS regressions are in parentheses)

	Study	Effect-size partial r (financial literacy, behavior)	Dependent Variable						
			Save	Plan	Debt	Cash flow	Invest	Plan active	Inertia
91	Alessie, van Rooij and Lusardi (2011)	0.12 (0.17)		X					
92	Behrman, Mitchell, Soo and Bravo (2010)	0.09 (0.12)					X		
93	Bucher-Koenen and Lusardi (2011)	0.08 (0.08)		X					
94	Calcagno and Monticone (2011)	0.06 (0.11)					X		
95	Disney and Gathergood (2011)	0.08 (0.05)				X	X		
96	Duca and Kumar (2012)	0.01 (0.05)		X					
97	Fornero and Monticone (2011) sample 1	0.05 (0.06)						X	
98	Fornero and Monticone (2011) sample 2	0.08 (0.05)						X	

	Study	Effect-size partial r (financial literacy, behavior)	Dependent Variable						
			Save	Plan	Debt	Cash flow	Invest	Plan active	Inertia
99	Giofré (2012)	0.11 (0.06)					X		
100	Jappelli and Padula (2011) sample 1	0.04 (0.06)					X		
101	Jappelli and Padula (2011) sample 2	0.06 (0.08)					X		
102	Kimball and Shumway (2007)	0.11 (0.31)					X		
103	Klapper, Lusardi, and Panos (2011)	0.07 (0.17)				X			X
104	Kotlikoff and Bernheim (2001)	0.08 (0.09)	X						
105	Lusardi and Mitchell (2007a)	0.09 (0.12)		X					
106	Lusardi and Mitchell (2009)	0.05 (0.08)	X						
107	Lusardi and Mitchel (2011)	0.06 (0.07)		X					
108	Monticone (2010a)	0.04 (0.08)							X
109	Mullock and Turcotte (2012)	0.15 (0.15)	X	X					
110	Sekita (2011)	0.04 (0.07)		X					
111	van Rooij, Lusardi and Alessie (2008)	0.06 (0.12)		X					
112	van Rooij, Lusardi and Alessie (2011)	0.06 (0.18)					X		
113	Yoong (2010)	0.08 (0.19)					X		
114	Zanghieri (2013)	0.04 (0.06)						X	
Total	*Sample Weighted Average Effect-size*	*0.07 (0.094)*	3	8	0	2	9	3	2

Table WA4: Studies of Measured Financial Literacy with OLS Regression

	Study	Effect-size partial r (financial literacy, behavior)	Dependent Variable						
			Save	Plan	Debt	Cash flow	Invest	Plan active	Inertia
115	Abreu and Mendes (2010)	0.11					X		
116	Agnew and Szykman (2005) study 1	0.26							X
117	Agnew and Szykman (2005) study 2	0.32							X
118	Agnew, Bateman, and Thorp (2012)	0.11		X					
119	Agnew, Szykman, Utkus, and Young (2007) sample 1	0.33						X	
120	Agnew, Szykman, Utkus, and Young (2007) sample 2	0.19						X	
121	Alexander, Jones, and Nigro (1997)	0.15					X		
122	Almenberg and Säve-Söderberg (2011)	0.11		X					
123	ANZ (2008)	0.30	X						
124	Arrondel, Debbich and Savignac (2013)	0.15					X		
125	Bateman et al. (2011)	0.09					X		
126	Beckmann (2013)	0.08	X						
127	Brounen, Koedijk and Pownall (2013)	0.08	X						
128	Burke and Mihaly (2012)	0.08							X
129	Cao and Hill (2005)	0.08					X		
130	Caratelli and Ricci (2011)	0.16					X		

	Study	Effect-size partial r (financial literacy, behavior)	Dependent Variable						
			Save	Plan	Debt	Cash flow	Invest	Plan active	Inertia
131	Ceccarelli and Rinaldi (2011)	0.04						X	
132	Chan and Stevens (2008)	0.04	X						
133	Chang, Tang and Zhang (2010)	0.20			X		X		
134	Chen and Volpe (1998)	0.26				X	X		
135	Clark, Morrill and Allen (2011)	0.13		X					
136	Cole, Sampson, and Zia (2011) sample 3	0.11	X						
137	Cole et al. (2012)	0.03	X						
138	Courchane and Zorn (2005)	0.24	X		X				
139	Crossan, Feslier, and Hurnard (2011)	0.13		X			X		
140	Croy, Gerrans and Speelman (2010)	0.33					X		
141	Danes and Hira (1987)	0.32				X			
142	Delafrooz and Paim (2011)	0.25	X						
143	Dick and Jaroszek (2013)	0.13				X			
144	Dimmock, Kouwenberg, and Wakker (2010)	0.19					X		
145	Dwyer, Gilkeson and List (2002)	0.18					X		
146	Eisenstein and Hoch (2012) study 1	0.36					X		
147	Eisenstein and Hoch (2012) study 2	0.30					X		
148	Forbes and Kara (2010)	0.29					X		
149	Fornero, Monticoney and Trucchiz (2011)	0.17					X		
150	Gerardi, Goette, and Meier (2010)	0.15			X				
151	Glaser and Klos (2012)	0.16					X		
152	Guiso and Jappelli (2009) sample 1	0.07					X		
153	Guiso and Jappelli (2009) sample 2	0.10					X		
154	Guiso, Sapienza and Zingales (2011)	0.11			X				
155	Gustman, Steinmeier, and Tabatabai (2012)	0.06	X						
156	Hansen (2012)	0.29				X			
157	Hastings and Mitchell (2012)	0.06		X			X		
158	Hastings and Tejeda-Ashton (2008) sample 1	0.11				X			
159	Hershey et al. (1998)	0.37		X					
160	Hilgert, Hogarth and Beverly (2003)	0.51	X			X	X		
161	Hira and Loibl (2005b)	0.20						X	
162	Hogarth, Hilgert, and Schuchardt (2002)	0.17	X		X	X	X		
163	Honekamp (2012)	0.16	X						
164	Hung, Meijer, Mihaly and Yoong (2009)	0.14	X	X					
165	Insler, Compton, and Schmitt (2013)	0.10			X				
166	Jacobs-Lawson and Hershey (2005)	0.52	X						
167	James, Boyle, Bennett, and Bennett (2012)	0.49				X			
168	Kaufmann, Weber, and Haisley (2013)	0.08					X		
169	Kaustia, Lehtoranta and Puttonen (2013)	0.31					X		

	Study	Effect-size partial r (financial literacy, behavior)	Dependent Variable						
			Save	Plan	Debt	Cash flow	Invest	Plan active	Inertia
170	Kharchenko (2011)	0.10	X						
171	Loibl, Hira and Rupured (2006) study 1	0.06			X				
172	Loibl, Hira and Rupured (2006) study 2	0.17			X				
173	Lusardi (1999)	0.19		X					
174	Lusardi (2010)	0.08	X	X	X				
175	Lusardi and Mitchell (2006)	0.21		X			X		
176	Lusardi and Mitchell (2007b)	0.10		X					
177	Lusardi and Tufano (2009)	0.14	X						
178	Lyons and Scherpf (2003)	0.26	X						
179	Lyons and Scherpf (2004)	0.49							X
180	Lyons, Rachlis and Scherpf (2007)	0.40				X			
181	Mandell (2009a)	0.06	X						
182	Mandell (2009b)	0.54	X		X				
183	Mayer, Zick and Marsden (2011) sample 1	0.24		X					
184	Mayer, Zick and Marsden (2011) sample 2	0.22		X					
185	Mckay (2011)	0.39		X		X	X		
186	Meijer and Smeets (2011)	0.26					X		
187	Monticone (2010b)	0.36					X		
188	Moore (2003)	0.10			X				
189	Müller and Weber (2010)	0.23					X		
190	Navarro-Martinez et al. (2011)	0.19				X			
191	Nye and Hillyard (2013)	0.39	X		X				
192	Okura and Kasuga (2007)	0.21					X		
193	Pahnke and Honekamp (2010)	0.06	X	X					
194	Peng, Bartholomae, Fox and Cravener (2007)	0.09	X						
195	Perry and Morris (2005)	0.15	X						
196	Robb and Sharpe (2009)	0.11			X	X			
197	Serido, Shim, and Tang (2013)	0.07		X					
198	Shim, Xiao, Barber, and Lyons (2009)	0.19	X		X				
199	von Gaudecker (2011)	0.05					X		
200	Xiao, Serido and Shim (2010)	0.13			X		X		
201	Yoong, See, and Baronovich (2012)	0.15				X			
Total	*Sample Weighted Average Effect-size*	*0.153*	25	16	15	13	31	4	4

The dependent variables noted in the above tables are: 1) “Save” indicating the amount saved for retirement, 2) “Plan” reflecting the level of planning for retirement, 3) “Debt” about the level of debt for each respondent, 4) “Cash Flow” management” about the ability to perform healthy financial behaviors in a day-to-day basis, 5) “Invest” reflecting ownership of stocks or return on investment, , 6) “Plan Active” indicating the participation and contribution to retirement plans and 7) “Inertia” about the likelihood to choose default options rather than choosing actively.

Web Appendix B: Deriving a Unidimensional Scale of Financial Literacy

As noted in the text of the paper, one goal of empirical Studies 1 and 2 was to derive a short, reliable, and valid measure of financial literacy from 26 items used to measure the construct in prior studies (e.g., Agnew and Szykman 2005; Hung et al. 2009; Mandell and Klein 2009; van Rooij et al. 2011). Below we detail the procedures for deriving our 13-item measure of financial literacy.

A primary criticism of financial literacy research is that it has been conducted with widely varying conceptualizations, dimensions, and measures of the concept (e.g., Huston 2010). Thus, one goal of Studies 1 and 2 was to derive a uni-dimensional, reliable, and valid measure of financial literacy. We aimed for a measure that: 1) reflects widely adopted definitions of the concept; 2) taps its key agreed-upon content domain areas; and 3) is brief enough to encourage study participation in survey or experimental research. Consistent with prevailing views, we define financial literacy as "… *the knowledge of basic concepts of personal finance with respect to borrowing / debt, and saving/investments that leads to better lifetime financial decision-making."* This definition construes financial literacy as a single dimension reflecting objective knowledge with the content domains of personal finance knowledge spanning borrowing/debt and savings/investments.

Prior research in financial literacy had not used standard methods for deriving reliable, valid, and uni-dimensional measures (but see Knoll and Houts 2012). We developed and refined a financial literacy measure using recommended scaling procedures (DeVellis 2012; Linacre 2009; Netemeyer, Bearden, and Sharma 2003; Nunnally and Bernstein 1994). A good scale should be unidimensional and reliable and should show construct validity of two types: discriminant validity or distinguishability from related constructs and nomological validity in terms of correlating with constructs that should be related and not with constructs that should be unrelated.

We originally chose the 26 financial literacy items based on our judgment of their content/face validity given the definition adopted (Haynes, Richard, and Kubany 1995). We then assessed the simple structure of these items via a series of iterative exploratory factor analyses (principal components) with

both Study 1 and Study 2 data. We trimmed the pool to 13 items that best reflected the content domain of financial literacy while having significant factor loadings of .30 and above on a general factor (Netemeyer et al. 2003; Nunnally and Bernstein 1994). General factor loadings for these 13 items ranged from .45 to .78 in Study 1 (mean loading = .57), and .33 to 64 in Study 2 (mean loading = .55). We then further assessed the psychometric properties of these 13 items via dimensionality analysis, Item Response Theory (IRT) Rasch modeling, and reliability and construct validity testing.

Using our Study 2 data, we assessed the dimensionality of our 13 items by estimating a one-factor confirmatory model. Given that the items were coded dichotomously (1= correct answer; 0 = wrong answers), we used a polychoric correlation matrix with diagonally weighted least squares in model estimation (Jöreskog and Sörbom 2006). This model fit the data well, $\chi^2 = 612.33$, df = 65, CFI = 97, NNFI = .97; all factor loadings were significant ($p < .01$); and standardized loadings ranged from .45 to .74 with an average of .64. These results suggest that one dimension underlies the 13 items.

Via Study 2 data, we also assessed discriminant validity by estimating a two-factor model of the financial literacy and numeracy items. (We again used a polychoric correlation matrix and diagonally-weighted least squares.) This model fit well ($\chi^2 = 2{,}938.08$, df = 251, CFI = 96, NNFI = .96) and a 95% confidence interval around the correlation between financial literacy and numeracy did not contain a value of "1," supporting discriminant validity (DeVellis 2012; Netemeyer et al. 2003*).* When all 11 numeracy and all 13 financial literacy items were constrained to a single factor ($\chi^2 = 4{,}809.84$, df = 252), the two-factor model fit better than this one-factor model ($\chi^2_{diff} = 1{,}871.76$, $df_{diff} = 1$, $p < .01$), also supporting discriminant validity.

We next used a one-parameter logistic Rasch Item Response Theory (IRT) model via the WINSTEPS package for Study 2 data to further asses item fit and overall scale goodness. We looked at three measures of fit (Cole et al. 2004; Linacre 2009): 1) infit and outfit mean-square statistics; 2) point-measure correlations; and 3) separation values. Across our 13 items infit mean-square levels ranged from .89 to 1.25 (mean = 1.01); and outfit mean-square values ranged from .70 to 1.32 (mean = .93). These

values indicate good-fitting items (Cole et al. 2004). Point-measure correlation values of .50 and above have been advocated as good fitting items and our items showed point-measure correlations ranging from .47 to .62. Separation reflects the ratio of the overall scale standard deviation corrected for estimation error, with high values being desirable relative to the number of items in a measure. For our 13 items, separation was 10.34; thus, 10 statistically different levels of financial literacy can be distinguished in a normal distribution with the same corrected test standard deviation as the current sample.

The results from Studies 1 and 2 suggest that our 13 items form a uni-dimensional measure of financial literacy. Given these results we assessed internal consistency via KR-20 coefficient alpha. This value was .84 and .82 for Studies 1 and 2, respectively, suggesting adequate consistency reliability (Nunnally and Bernstein 1994).

As further evidence of scale structure, we again examined the 13-item scale using Study 3 data. A one-factor financial literacy model fit the data well, $\chi^2 = 564.37$, df = 65, CFI = 99, NNFI = .98; all factor loadings were significant ($p < .01$); and standardized loadings ranged from .51 to .82 with an average of .71. We assessed discriminant validity by estimating a two-factor model of the financial literacy and numeracy items. Due to a problematic numeracy item that resulted in a Heywood case (Bollen 1989), we could not obtain a fitting function when all eight numeracy items were used. We thus dropped the problematic item and estimated the two-factor model with 7 numeracy items. This model fit well ($\chi^2 =$ 1,616.71, df = 169, CFI = 99, NNFI = .98) and a 95% confidence interval around the correlation between financial literacy and numeracy did not contain a value of "1," supporting discriminant validity. When all 7 numeracy and all 13 financial literacy items were constrained to a single factor ($\chi^2 = 2{,}036.06$, df = 170), the two-factor model fit better than this one-factor model ($\chi^2_{diff} = 419.35$, $df_{diff} = 1$, $p < .01$), also supporting discriminant validity. KR-20 alpha for the financial literacy scale was .85.

We expected that a valid measure of financial literacy would be positively correlated with preference for numerical information (PNI), attitude toward / concern for money, need for cognition (NFC), numeracy, propensity to plan for money, confidence in search for financial information, and

willingness to take investment risks. We also predicted that a valid measure of financial literacy would be negatively correlated with being a spendthrift. Below we offer brief rationale as to "why" we expect these traits to be positively (negatively) correlated with financial literacy.

PNI is defined as "*a proclivity toward using numerical information and engaging in thinking involving numerical information"* (Viswanathan 1993, p. 741). PNI has been shown to be related to numeracy, NFC, and a general desire to favor numerical information when making decisions and evaluative judgments. Given that all prior measures of financial literacy contain several questions assessing numerical-based knowledge, we expected a positive PNI-financial literacy correlation.

Attitude toward/concern for money reflects the degree to which money plays central psychological and behavioral roles in one's life (Yamauchi and Templer 1982). It concerns elements of money as means to generate financial security and comfort, and power/prestige via the acquisition, saving, and planning with money. These elements suggest that it should be positively correlated with financial literacy.

NFC represents a general tendency to engage in and enjoy thinking. Individuals scoring high in NFC tend to show more rational/analytical thinking and are more likely to engage in problem solving. Those high in NFC are also more logical, prefer to encode information numerically, are effortful in decision-making, and have been shown to score higher on objective tests involving numerical reasoning (Epstein et al. 1996). Numerous studies in consumer behavior have shown that NFC is related to a need for deeper information processing to arrive at wiser consumer decisions. As such, we expect NFC to show a positive correlation with financial literacy.

Numeracy has been studied as a prerequisite to good decision-making. Those who are less numerate are less able to retrieve and use appropriate numerical principles to reason numerically (Lipkus et al. 2001). Soll, Keeney, and Larrick (2013) show that those who are less numerate miss elementary properties of how debt repayment affects remaining debt. Numeracy also has a predictive effect on total wealth and difficulty with money management, controlling for demographics and a variety of other

abilities (Agarwal and Mazumder 2011). Thus, we expect numeracy to be positively related to (yet distinct from) a valid measure of financial literacy.

Propensity to plan is trait that has been linked to good financial outcomes (Ameriks, Caplin, and Leahy 2003) and that might be linked to financial literacy (Lusardi and Mitchell 2009). Lynch et al. (2010) defined propensity to plan for the use of money as the chronic tendency to set spending goals, thinking about subgoals and means to achieve goals, thinking about constraints and using props and budgets to see interdependencies, and liking to plan. They developed a six-item scale and showed its relationships to a variety of published scales, further demonstrating that the scale predicted FICO credit scores controlling for a variety of demographics.

Confidence is another trait that might be linked to financial literacy and to good financial behaviors. Though overconfidence in one's skills can be dangerous (Alba and Hutchinson 2000), consumer confidence – the degree to which an individual feels capable and assured with respect to his or her marketplace decisions and behavior – is a positive trait that is associated with proactive information acquisition and processing, as well as proactive decision formation (Bearden et al. 2001). Confidence in financial information search may be an antecedent of proactive learning that leads to increases in financial knowledge. Confidence is closely associated with self-efficacy, a core belief that one has the power to produce desired effects (Chen, Gully, and Eden 2001). Thus, we expect confidence in search for financial information to be positively correlated with numeracy.

Willingness to take investment risks can be detrimental in excess, but it is arguably functional to help consumers choose financial options that will permit sufficient wealth accumulation for retirement (Weber, Blais, and Betz 2002). Without willingness to take risk, one has little chance of accumulating wealth by investing, for example, in saving for retirement. Iyengar and Kamenica (2010) report evidence how proliferation of 401-K options leads to avoidant choices of low-risk investment at the expense of equities. Several items commonly used to measure financial literacy are linked to understanding the properties of financial instruments that differ in risk. Thus, we expect willingness to take investment risks should be positively related to financial literacy.

Spendthrifts (as opposed to tightwads) tend to lack control in their spending habits, experience little pain in paying, and "*…typically spend more than they would ideally like to spend"* (Rick, Cryder, and Loewenstein 2008, p. 767). Spendthrifts also may lack the cognitive constraints necessary for handling money prudently, leading them to consume immediately without assessing the potential for longer-term negative outcomes. In sum, they do not think deeply about the consequences of spending and their finances in general. Spendthrifts have been shown to carry more debt than tightwads, are not price conscious when it comes to handling finances, and show lower levels of frugality and self-control (Rick et al. 2008). We expect financial literacy to be negatively related to being a spendthrift.

As predicted, Table WD5 in Web Appendix D shows that in Study 1 financial literacy was positively correlated with numeracy (r = .59), confidence in financial information search (r = .31), planning for money-short term (r = .11), preference for numerical information (r = .39), attitude/concern for money (r = .27), and NFC (r =.29). Financial literacy was negatively correlated with being a spendthrift (r = -.17). Table WD6 in Web Appendix D shows that in Study 2 financial literacy was positively correlated with numeracy (r = .50), confidence in financial information search (r = .23), planning for money-long term (r = .10), willingness to take investment risk (r = .19), and NFC (r = .35). Finally, Table WD7 in Web Appendix D shows that in Study 3 financial literacy was positively correlated with numeracy (r = .63), confidence in financial information search (r = .27), planning for money-long term (r = .21), willingness to take investment risk (r = .34), and NFC (r =.31). Financial literacy was also related to a measure of self-efficacy (Chen et al. 2001, r = .21) and a measure of delayed gratification (Hoerger et al. 2011; r = .24). In totality across Studies 1, 2, and 3, the large majority of these correlations are significant and in the directions expected/predicted, lending confidence to the construct validity of the financial literacy measure.

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Web Appendix C: Table WC1: Study 2 Logistic Regression / OLS Results for Model 3

	Saving for Emergency Fund	How Much is Needed for Retirement	Banks and Credit Card Firms Rate Credit Score	Credit and Checking Fees	Positive Savings / Investment Behaviors
	N = 475	N = 477	N = 483	N = 373	N = 483
Intercept	.006	.004	2.173*	7.281**	.831*
Gender (1 = M, 0 = F)	1.057	.874	-.243	.293	.263*
Age (30 – 44 years)	1.697	.850	-1.48*	.524	.195
Age (45- 59 years)	2.006	1.172	-.255	.801	.687*
Age (60 and older)	3.181*	1.335	1.544	-.278	1.446**
Race/Ethnicity (1 = Caucasian, 0 = Not)	.884	.979	-.091	-.184	-.043
Income ($15K, but < $25K)	.883	2.610*	-.789	2.044**	.378
Income ($25K, but < $35K)	.975	1.010	-.928	1.722**	.132
Income ($35K, but < $50K)	.954	1.206	.078	1.425*	.651**
Income ($50K, but < $75k)	1.489	1.774	.116	1.452	.491*
Income ($75K, but < $100K)	2.390*	2.467	1.544*	-.068	.612*
Income ($100K, but < $150K)	2.516	1.761	1.54*	.602	1.247**
Income ($150K, or more)	3.635	2.599	2.630*	-.369	.478
High School Graduate	1.152	.647	-.771	-1.398	-1.506**
Some College	1.460	1.040	-.415	-1.177	-1.332**
College Graduate	1.695	.895	.460	-1.220	-.545
Master's Degree	1.690	1.188	.415	-1.877*	-.394
Dr., Ph.D., Law Degree	1.603	1.189	.521	-1.268	-.705
Number of Children	.830*	1.114	-.251**	.344**	-.048
Marital Status (1 = Married, 0 = Not)	1.301	2.007**	.985**	-.368	-.055
Years to Retire	1.039	.937	.080	.056	-.015
Financial Literacy	**1.062**	**1.092**	**.061**	**-.053**	**.128****
Numeracy	.952	.980	.080	.019	-.068**
Consumer Confidence-Investing	1.776**	1.839**	.609**	-.505**	.092
Planning for Money–Long Term	1.620**	1.277*	.317**	-.138	.045

Willing to Take Investment Risks	1.006	1.248*	-.068	.002	.112**
R^2 Model 1 (only demographics)	.136	.157	.255	.163	.340
R^2 Model 2 (model 1 + fin. literacy)	.143	.175	.269	.166	.400
R^2 Model 3 (model 2 + psychol. traits)	.248	.267	.330	.227	.443

Notes: * $p < .05$; ** $p < .01$. For "Saving for an Emergency Fund" and planning "How Much is Needed for Retirement," logistic regression is used and $\mathbf{R^2}$ is Cox and Snell $\mathbf{R^2}$. Further, the coefficients for these two dependent variables are the odds ratio coefficients of logistic regression (Exp(β)). OLS regression is used for "Banks and Credit Card Firms Rate Credit Score," "Credit and Checking Fees," and "Positive Savings / Investment Behaviors." Model 1 used just the demographic variables as predictors; Model 2 used the demographic variables and financial literacy as predictors; and Model 3 used the demographic variables, financial literacy, numeracy, consumer confidence-investing, planning for money-long term, and willing to take investment risks as predictors. All coefficients above reflect Model 3 estimates. The reference category for the age based dummy variable is "18 – 29 years"; the reference category for the income-based dummy variable is "< $15,000"; and the reference category for the education-based variable is "some high school."

Web Appendix C, Table WC2: Study 3 Logistic Regression / OLS Results for Model 3

	Saving for Emergency Fund	How Much is Needed for Retirement	Banks and Credit Card Firms Rate Credit Score	Credit and Checking Fees	Positive Savings / Investment Behaviors
	N = 440	N = 440	N = 455	N = 370	N = 455
Intercept	.001	.004	2.387*	7.085**	-.382
Gender (1 = M, 0 = F)	1.067	.884	-.350	-.692**	-.033
Age (30 – 44 years)	.751	1.844	-.750*	1.461**	.343*
Age (45- 59 years)	1.413	2.580	-.540	1.416**	.457*
Age (60 and older)	2.290	2.589	.274	1.078	.464
Race/Ethnicity (1 = Caucasian, 0 = Not)	.697	.782	.030	-.148	.145
Income ($15K, but < $25K)	2.403	.586	-.289	.238	-.117
Income ($25K, but < $35K)	7.660**	2.060	.458	-.155	-.012
Income ($35K, but < $50K)	2.297	1.345	.666	.111	-.059
Income ($50K, but < $75k)	3.364	1.596	1.241*	.683	.298
Income ($75K, but < $100K)	4.848*	3.229	1.738**	.488	.381
Income ($100K, but < $150K)	4.292*	1.963	1.760**	-.075	.396
Income ($150K, or more)	8.523**	4.124*	1.191	.259	.548*
High School Graduate	3.214	3.149	-.211	1.082*	.076
Some College	2.329	3.115	-.086	.838	.255
Bachelor's Degree or Higher	2.901	2.790	-.088	.898	.376
HH Size: (Number of Children)	.862	.944	-.146	.129	.128
Marital Status (1 = Married, 0 = Not)	1.598	1.414	.647*	-.118	.149
Years to Retire	.889	.948	-.065	.076	-.108*
Financial Literacy	**1.012**	**1.180****	**.089**	**-.070**	**.098****
Numeracy	1.117	1.174*	.134*	-.045	.047
Consumer Confidence-Investing	1.214	.783	.237	-.341**	-.011
Planning for Money–Long Term	2.235**	1.915**	.419**	-.472**	.124*
Willing to Take Investment Risks	1.956**	1.851**	.450**	-.139	.283**

R^2 Model 1 (only demographics)	.192	.232	.240	.161	.396
R^2 Model 2 (model 1 + fin. literacy)	.206	.286	.272	.186	.465
R^2 Model 3 (model 2 + psychol. traits)	.346	.349	.344	.295	.507

Notes: * $p < .05$; ** $p < .01$. For "Saving for an Emergency Fund" and planning "How Much is Needed for Retirement," logistic regression is used and $\mathbf{R^2}$ is Cox and Snell $\mathbf{R^2}$. Further, the coefficients for these two dependent variables are the odds ratio coefficients of logistic regression (Exp(β)). OLS regression is used for "Banks and Credit Card Firms Rate Credit Score," "Credit and Checking Fees," and "Positive Savings / Investment Behaviors." Model 1 used just the demographic variables as predictors; Model 2 used the demographic variables and financial literacy as predictors; and Model 3 used the demographic variables, financial literacy, numeracy, consumer confidence-investing, planning for money-long term, and willing to take investment risks as predictors. All coefficients above reflect Model 3 estimates. The reference category for the age based dummy variable is "18 – 29 years"; the reference category for the income-based dummy variable is "< $15,000"; and the reference category for the education-based variable is "some high school."

Web Appendix C, Table WC3: Study 2 2SLS Results - NFC as an Instrumental Variable

	Saving for Emergency Fund	How Much is Needed for Retirement	Banks and Credit Card Firms Rate Credit Score	Credit and Checking Fees	Positive Savings / Investment Behaviors
	N = 476	N = 478	N = 477	N = 362	N = 468
Intercept	.192	.079**	5.619	3.043*	.430
Gender (1 = M, 0 = F)	1.192	1.043	.088	-.069	.538**
Age (30 – 44 years)	1.424	.778	-1.140**	.837*	.309
Age (45- 59 years)	1.391	.774	-.324	.765	.723**
Age (60 and older)	2.081	.808	.382	.496	1.170**
Race/Ethnicity (1 = Caucasian, 0 = Not)	.822	.691	.237	-.541	.088
Income ($15K, but < $25K)	.981	2.697*	-.356	1.838**	.464*
Income ($25K, but < $35K)	1.135	1.128	-.491	1.344*	.484*
Income ($35K, but < $50K)	1.184	1.419	.408	1.083*	.960**
Income ($50K, but < $75k)	2.195	2.377	1.398**	.670	.937**
Income ($75K, but < $100K)	3.141*	2.689	1.895**	-.350	.991**
Income ($100K, but < $150K)	3.005*	2.421	1.565*	.152	1.398**
Income ($150K, or more)	4.953*	4.084*	2.413**	-.220	.981**
High School Graduate	1.566	.648	.965	-1.072	.576
Some College	2.097	.982	1.851*	-1.218	.948*
College Graduate	3.232	1.097	2.779**	-1.586	1.597**
Master's Degree	3.314	1.377	2.837*	-2.165*	1.739**
Dr., Ph.D., Law Degree	3.131	.325	2.199	-1.330	1.729**
Number of Children	.867	1.139	-.295**	.421**	-.064
Marital Status (1 = Married, 0 = Not)	1.308	1.868*	1.056**	-.619	-.088
Years to Retire	.977	.943	-.118	.235*	-.094*
Financial Literacy	**1.023**	**1.237**	**-.150**	**.201**	**-.073**
R^2 Model	.13	.16	.20	.11	.30

Notes: * $p < .05$; ** $p < .01$. For "Saving for an Emergency Fund" and planning "How Much is Needed for Retirement," logistic regression is used and $\mathbf{R^2}$ is Cox and Snell $\mathbf{R^2}$. Further, the coefficients for these two dependent variables are the odds ratio coefficients of logistic regression (Exp(β)). All coefficients above reflect Model 3 estimates consistent with OLS results in Web Appendix C, Table WC1. The reference category for the age based dummy variable is "18 – 29 years"; the reference category for the income-based dummy variable is "< $15,000"; and the reference category for the education-based variable is "some high school."

Web Appendix C, Table WC4: Study 3 2SLS Results - NFC as an Instrumental Variable

	Saving for Emergency Fund	How Much is Needed for Retirement	Banks and Credit Card Firms Rate Credit Score	Credit and Checking Fees	Positive Savings / Investment Behaviors
	N = 479	N = 479	N = 491	N = 391	N = 485
Intercept	.080*	.005**	5.659**	5.314**	.099
Gender (1 = M, 0 = F)	.787	.437*	-.158	-.595	-.241
Age (30 – 44 years)	.695	1.478	-.806*	1.509**	.304
Age (45- 59 years)	.685	.943	-.716	1.498**	.162
Age (60 and older)	.904	1.173	.065	.828	.280
Race/Ethnicity (1 = Caucasian, 0 = Not)	.410*	.343**	-.129	.210	-.201
Income ($15K, but < $25K)	2.403	.750	-.239	-.505	-.026
Income ($25K, but < $35K)	3.996*	.915	.475	-.490	-.173
Income ($35K, but < $50K)	1.269	.565	.815	-.315	-.213
Income ($50K, but < $75k)	1.353	.434	1.056	.444	-.015
Income ($75K, but < $100K)	2.424	1.082	1.707**	-.014	.111
Income ($100K, but < $150K)	2.228	.647	1.899**	-.624	.166
Income ($150K, or more)	4.381	1.178	1.409	-.356	.292
High School Graduate	.949	.726	-.111	1.058	-.338
Some College	.491	.264	.146	.740	-.406
Bachelor's Degree or Higher	.289	.089	.414	.814	-.615
HH Size: (Number of Children)	.876	1.002	-.170	.141	-.022
Marital Status (1 = Married, 0 = Not)	1.645*	1.318	.710**	-.236	.156
Years to Retire	1.008	1.167	-.084	.016	-.045
Financial Literacy	**1.624***	**2.494****	**.196**	**-.236**	**.349****
R^2 Model	.18	.23	.21	.12	.34

Notes: * $p < .05$; ** $p < .01$. For "Saving for an Emergency Fund" and planning "How Much is Needed for Retirement," logistic regression is used and $\mathbf{R^2}$ is Cox and Snell $\mathbf{R^2}$. Further, the coefficients for these two dependent variables are the odds ratio coefficients of logistic regression (Exp(β)). OLS regression is used for "Banks and Credit Card Firms Rate Credit Score," "Credit and Checking Fees," and "Positive Savings / Investment Behaviors." All coefficients above reflect Model 3 estimates consistent with OLS estimates in Web Appendix C, Table WC2. The reference category for the age based dummy variable is "18 – 29 years"; the reference category for the income-based dummy variable is "< $15,000"; and the reference category for the education-based variable is "some high school."

Web Appendix C, Table WC5: Study 1 Summary Statistics, Cronbach Alpha Reliabilities, and Correlations

	Mean	SD	Cronbach Alpha	1	2	3	4	5	6	7	8	9	10	11	12
1. Financial Literacy	7.27	3.51	.84	1											
2. Numeracy	7.43	2.57	.79	**.59**	1										
3. Consumer Confidence	3.61	1.15	.94	**.31**	.10	1									
4. Plan For Money – Short Term	4.16	1.01	.95	.11	.04	.36	1								
5. Pref. for Numerical Info.	4.07	.93	.90	**.39**	**.39**	**.43**	**.31**	1							
6. Attitude/Concern for Money	4.21	.99	.89	**.27**	.05	**.64**	**.70**	**.44**	1						
7. NFC	3.82	.87	.76	**.29**	**.40**	**.24**	.11	**.51**	**.22**	1.00					
8. Spendthrift/Tightwad	13.97	3.77	.67	-.17	-.08	-.12	**-.20**	-.04	**-.35**	.01	1				
9. Gender	.26	.44	-	**.23**	**.19**	**.25**	-.01	**.20**	.08	.16	-.15	1			
10. Age	46.30	12.95	-	**.28**	.15	-.14	.02	.01	-.01	-.07	.02	-.11	1		
11. Number of Children	2.57	1.45	-	-.15	-.19	-.01	.03	-.01	.06	.00	-.05	-.05	.16	1	
12. Years to Retire	3.49	1.95	-	**-.23**	-.19	-.05	-.06	-.01	-.10	.07	.06	.15	**-.79**	-.14	1

Note: Significant correlations ($p < .05$) are in **bold**. Coding is as follows: Gender: 1 = Male, 0 = Female; Years to retire: 1 = 5 or less, 2 = 6-10, 3 = 11-15, 4 = 16-20, 5 = 20-30, 6 = 31 or more.

Web Appendix C, Table WC6: Study 2 Summary Statistics, KR-20 or Cronbach Alpha Reliabilities, and Correlations

	Mean	SD	Alpha	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Financial literacy	7.43	3.18	.82	1																		
2. Numeracy	7.81	2.53	.79	**.50**	1																	
3. Confidence	3.63	1.02	.93	**.23**	.01	1																
4. Plan For Money – LT	3.64	1.09	.93	**.10**	.04	**.43**	1															
5. Willing to Take Risks	3.43	1.52	-	**.19**	**.39**	**.46**	**.23**	1														
6. Savings for Emergency Fund	0.45	0.50	-	**.21**	.05	**.39**	**.32**	**.22**	1													
7. Figure Needed for Retire	0.42	0.49	-	**.26**	**.40**	**.38**	**.25**	**.28**	**.43**	1												
8. Positive Savings / Investment Behaviors	2.06	1.33	.68	**.47**	.05	**.33**	**.16**	**.32**	**.35**	**.36**	1											
9. Banks / CC Credit Score	6.48	2.96	-	**.29**	**.19**	**.37**	**.27**	**.19**	**.49**	**.30**	**.28**	1										
10. Credit and Checking Fees	5.58	2.34	.65	**-.18**	**.15**	**-.30**	**-.20**	**-.15**	**-.41**	**-.13**	**-.14**	**-.59**	1									
11. Gender	.39	.49	-	.16	**.14**	**.16**	-.03	**.27**	.06	.06	**.35**	**.13**	-.02	1								

Web Appendix C, Table WC6 (cont.): Study 2 Summary Statistics, KR-20 or Cronbach Alpha Reliabilities, and Correlations

	Mean	SD	Alpha	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
12. Age	46.55	14.72	-	**.35**	.05	-.01	-.06	**-.10**	**.09**	**.14**	.05	.02	.01	.01	1							
13. Race / Ethnicity	0.81	0.39	-	**.20**	**.18**	-.07	-.07	**-.13**	-.03	.00	**.37**	**.36**	-.02	.01	**.20**	1						
14. Income	4.00	1.95	-	**.26**	**.12**	**.28**	**.14**	**.28**	**.30**	**.29**	**.37**	**.29**	-.17	.05	.06	-.02	1					
15. Education	3.34	1.04	-	**.29**	**.23**	**.28**	**.19**	**.26**	**.24**	**.18**	.03	-.05	-.18	.06	-.03	-.08	**.34**	1				
16. Number of Children	2.49	1.45	-	-.01	-.06	-.04	-.01	-.05	-.05	.10	.13	**.23**	**.18**	-.03	**.35**	-.01	.06	**-.12**	1			
16. Marital Status	0.55	0.50	-	**.13**	.04	**.13**	.05	.08	.15	.23	.13	**.23**	-.08	-.01	**.14**	-.02	**.42**	**.11**	**.32**	1		
17. Years to Retire	3.65	1.99	-	**-.30**	-.01	-.03	.04	.04	-.07	-.16	-.33	**-.12**	.04	.02	**-.81**	-.13	**-.09**	.01	**-.27**	**-.13**	1	
19. Need for Cognition	3.99	0.82	.73	**.35**	**.31**	**.25**	.14	.18	.04	**.12**	.07	.03	.03	.11	**.**04	.13	**.**08	.20	-.03	.05	.03	1

Note: Significant correlations ($p < .05$) are in **bold**; Race/Ethnicity: 1 = Caucasian, 0 = Other; Income: 1 = less than $15K, 2 = $15K to < $25K, 3 = $25K to <$35K, 4 = $35K to < $50K, 5 = $50K to < 75K, 6 = $75K to < $100K, 7 = $100 K to < $150K, 8 = more than $150K; Education: 1 = Some High School, 2 = High School Graduate, 3 = Some College, 4 = College Degree, 5 = Masters, 6 = Doctor, Ph.D., or Law degree; Marital status: 1 = Married, 0 = Other.

Web Appendix C, Table WC7: Study 3 Summary Statistics, KR-20 or Cronbach's Alpha Reliabilities, and Correlations

	Mean	SD	Alpha	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. Financial literacy	7.81	3.52	.85	1																					
2. Numeracy	3.35	2.14	.75	**.63**	1																				
3. Confidence	4.05	0.97	.92	**.27**	**.16**	1																			
4. Plan For Money – LT	3.64	1.12	.95	**.21**	.06	**.53**	1																		
5. Willing to Take Risks	2.78	0.85	.81	**.34**	**.15**	**.30**	**.30**	1																	
6. Savings for Emergency Fund	0.53	0.50	-	**.33**	**.21**	**.32**	**.40**	**.36**	1																
7. Figure Needed for Retire	0.47	0.50	-	**.44**	**.30**	**.21**	**.31**	**.35**	**.44**	1															
8. Positive Savings / Investment Behaviors	2.20	1.32	.68	**.59**	**.38**	**.25**	**.27**	**.40**	**.40**	**.49**	1														
9. Banks / CC Credit Score	7.44	2.80	-	**.40**	**.26**	**.30**	**.32**	**.34**	**.49**	**.36**	**.39**	1													
10. Credit and Checking Fees	5.30	2.25	.66	**-.24**	**-.16**	**-.35**	**-.36**	**-.24**	**-.44**	**-.24**	**-.13**	**-.66**	1												
11. Gender	.50	.50	-	**.21**	**.19**	.08	.04	**.13**	**.11**	**.09**	**.12**	.02	**-.18**	1											

Web Appendix C, Table WC7 (cont.): Study 3 Summary Statistics KR-20 or Cronbach's Alpha Reliabilities, and Correlations

	Mean	SD	Alpha	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
12. Age	2.58	0.93	-	**.20**	.02	.01	.02	-.03	**.18**	**.18**	**.31**	**.15**	.01	.03	1										
13. Race / Ethnicity	0.77	0.42	-	**.24**	**.23**	.05	-.04	.04	.06	**.10**	**.20**	**.13**	-.05	-.02	.08	1									
14. Income	5.11	2.00	-	**.44**	**.27**	**.16**	**.15**	**.33**	**.30**	**.36**	**.44**	**.39**	**-.14**	**.08**	.08	**.16**	1								
15. Education	2.97	0.94	-	**.51**	**.41**	**.22**	**.19**	**.31**	**.21**	**.28**	**.40**	**.29**	**-.16**	.02	**-.11**	**.12**	**.47**	1							
16. Marital Status	0.60	0.49	-	**.20**	**.15**	.07	.05	**.10**	**.17**	**.18**	**.25**	**.23**	-.01	.02	**.16**	**.22**	**.38**	**.14**	1						
17. Years to Retire	3.75	1.88	-	**-.23**	-.02	-.05	-.05	-.01	**-.20**	**-.18**	**-.33**	**-.19**	.07	-.03	**-.79**	-.07	-.07	**.10**	**-.13**	1					
18. Restraint	3.54	0.89	.76	.04	-.06	**.35**	**.35**	**.11**	**.21**	**.12**	.02	**.23**	**-.31**	.04	.03	-.08	.06	.07	.04	-.04	1				
19. Need for Cognition	4.16	0.84	.77	**.31**	**.26**	**.25**	**.25**	**.16**	**.15**	**.23**	**.24**	**.13**	**-.11**	**.09**	.06	**.11**	.06	**.28**	.07	-.01	**.20**	1			
20. Self-efficacy	4.66	0.79	.93	**.21**	**.16**	**.41**	**.31**	**.13**	**.14**	.07	**.14**	**.16**	-.06	-.05	-.03	**.12**	**.22**	**.20**	**.12**	.01	**.26**	**.38**	1		
21. Delayed Gratification	4.41	0.59	.74	**.24**	**.14**	**.43**	**.41**	**.17**	**.28**	**.22**	**.19**	**.30**	**-.29**	-.07	**.12**	.05	**.18**	**.18**	**.13**	**-.10**	**.47**	**.43**	**.55**	1	
22. Impulsivity	2.93	0.92	.78	-.06	.07	**-.21**	**-.20**	-.05	**-.13**	**-.12**	-.06	**-.18**	**.18**	**.14**	**-.14**	.06	-.02	.02	-.04	**.12**	**-.55**	**-.22**	**-.19**	**-.44**	1

Note: Significant correlations ($p < .05$) are in **bold**; Age: 1 = 18-29, 2 = 30-44, 3 = 45-59, 4 = 60+. ; Race/Ethnicity: 1 = Caucasian, 0 = Other; Income: 1 = less than $15K, 2 = $15K to < $25K, 3 = $25K to <$35K, 4 = $35K to < $50K, 5 = $50K to < 75K, 6 = $75K to < $100K, 7 = $100 K to < $150K, 8 = more than $150K; Education: 1 = Some High School, 2 = High School Graduate, 3 = Some College, 4 = College Degree; Marital status: 1 = Married, 0 = Other.