THE EFFECTS OF PERCEIVED AND ACTUAL FINANCIAL LITERACY ON FINANCIAL BEHAVIORS

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*A combined measure of financial literacy that includes both a test score of actual financial literacy and a self-rating of overall financial literacy is used in this study. We find that the combined measure appears to provide greater understanding about how financial literacy affects financial behaviors. A large national survey of U.S. adults and households (*n = 28,146*) was used to investigate how this overall financial literacy is likely to change financial behaviors across five financial topics: credit cards, investments, loans, insurance, and financial advice. For each topic, we include 4–5 financial behaviors (22 in total) to demonstrate the consistency of the findings within and across topics. Although we are unable to identify a causal relationship, the results from the probit analysis show that both actual and perceived financial literacy appear to influence financial behaviors and that perceived financial literacy may be as important as actual financial literacy.* (*JEL* D14, G00)

I. INTRODUCTION

What adults know about household finance is important because of the many personal financial responsibilities people assume over a lifetime. Adults must manage household budgets subject to income constraints, buy goods and services, monitor financial accounts, handle credit cards, save and invest for a future event such as a child's college education or retirement, purchase insurance to reduce risk, pay taxes, and seek sound financial advice. The difficulty of knowing all that a person should know about personal finance in an ever-changing and more complex financial world is an enormous challenge for even the most educated adults, although the importance of some of this knowledge will vary based on phases of the life-cycle or personal circumstances. Yet, the consequences of not knowing even the basics about household financial matters can prove to be costly for adults as they make financial decisions for the short term or the long term. It is this

ever-changing and costly financial environment that has stimulated major interest in financial literacy in recent decades. This growing interest has led to increased research among economists and other academics on how financial literacy affects the financial behavior of both adults and youth and their financial capabilities.

A two-part measure of financial literacy is used in this study to investigate the likely effects of financial literacy on a broad range of financial behaviors. The first part of the measure is an objective test and is based on correct and incorrect answers to test questions, which has been the traditional way that financial literacy has been measured and studied in past research. The second part of the measure is a subjective evaluation and focuses on what people think they know about personal finance based on self-assessments of their financial literacy. We are unable to identify a causal relationship between literacy and behavior, but we do find that this combination of actual financial literacy (test score) and perceived financial literacy (self-rating) in the probit analysis provides nuanced insights about how the two different dimensions of financial literacy are related to financial outcomes.

To offer evidence on the value of this combined measure, we use a large national survey of U.S. adults and households (*n* = 28,146) and

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ABBREVIATIONS

FINRA: Financial Industry Regulatory Authority

NFCS: National Financial Capability Study

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investigate how financial literacy may affect financial behaviors within and across five topics: credit cards; financial investments; mortgages and loans; insurance; and financial counseling. Within each topic, we include 4–5 behaviors to provide depth to our analysis of each topic, and across topics we look for consistency in the outcomes to demonstrate the breadth of our findings. We specify a probit regression model and use it to estimate the marginal effects of perceived and actual financial literacy on 22 financial behaviors while controlling for the demographic characteristics of the adults. The results suggest that financial literacy as measured by both an objective test and a subjective assessment appear to be more valuable and insightful for explaining financial behaviors than is the use of test information alone as the measure of financial literacy. For example, a change in perceived financial literacy from low to high has a significant and positive marginal effect on financial behaviors regardless of whether actual financial literacy is at a high or low level.

II. PREVIOUS RESEARCH

A major challenge for conducting research on financial literacy is the difficulty of determining how best to measure financial literacy because there is no standard definition of it in the research literature (Hung, Parker, and Yoong 2009; Huston 2010; Lusardi and Mitchell 2014; Remund 2010). Most research on financial literacy focuses on the cognitive dimensions of the construct and relies on a test measure of what people know or understand about financial concepts. This objective approach to the measurement of financial literacy is most often conducted by economists and other researchers using a set of multiple-choice test questions or true–false test questions that are embedded in a questionnaire that also includes questions about demographic characteristics and asks about financial behaviors and activities (e.g., Hastings, Madrian, and Skimmyhorn 2013; Hilgert, Hogarth, and Beverly 2003; Lusardi and Mitchell 2014). These test measures of financial literacy have been put to productive use by economists in research studies to explain many different financial behaviors, such as retirement planning (Lusardi and Mitchell 2007, 2008, 2011; Parker et al. 2012; van Rooij, Lusardi, and Alessie 2011a), wealth accumulation (Behrman et al. 2012; Gustman, Steinmeier, and Tabatabai 2012), stock investing (Abreu and Mendes 2010; van Rooij, Lusardi, and Alessie 2011b); banking

(Grimes, Rogers, and Smith 2010); and inflation expectations (Bruine de Bruin et al. 2010).

Just as there is no standard definition of financial literacy, there is no standardization in the measures that are used in research studies. In fact, in the list of studies just cited the number of test questions used for assessing financial literacy varies from as few as three to as many as 70. The test content within a measure often covers a wide range even when there are as few as three questions (e.g., interest compounding, risk diversification, and inflation effects). Content differences also are found across measures with some studies giving more emphasis to numeracy, personal finance, economics, or some mixture of such contents. In spite of the differences within and across these measures, the operational definition of financial literacy that is common to these studies is to test what people actually know about financial concepts. For the purposes of this research, we label it as "actual" financial literacy, a distinction used in the research literature (e.g., Hung et al. 2009; Lusardi and Mitchell 2014).

An alternative way to assess financial literacy is to use some type of subjective measure such as a self-assessment of financial literacy or knowledge. Although economists have preferred to use objective measures in their research, there is growing interest in the use of subjective measures for studying different types of economic or financial behaviors such as perceptions of life satisfaction, happiness, and well-being (Kahneman and Krueger 2006); risk attitudes (Hallahan, Faff, and McKenzie 2004; Leonard 2011); and credit scores (Courchane, Gailey, and Zorn 2008). Political scientists too have relied on public opinion polls and similar subjective evaluations in studies of political or voting behavior (Jacoby 2010; McDonald and Tolbert 2012). Even in the medical field, doctors use self-assessments, most commonly for getting feedback from patients on a subjective concept such as pain (Turk and Melzack 2011),[1] and also for assessing patient numeracy (Fagerlin et al. 2007). Finally, studies of subjective and objective knowledge have long been the focus

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1. The following quote explains the medical practice: "There is no simple thermometer that can objectively record how much pain an individual experiences. As we have noted, all that can be determined about the intensity of a person's pain is based on what the patient verbally or nonverbally communicates about his or her subjective experience. Often patients are asked to quantify their pain by providing a single general rating of pain: 'Rate your usual level of pain on a scale from 0 to 10 where 0 equals "no pain" and 10 is the "worst pain you can imagine"'" (Turk and Melzack 2011, 7).

of consumer or marketing research (Alba and Hutchinson 2000; Carlson et al. 2009; Moorman et al. 2004; Park, Mothersbaugh, and Feick 1994). In these studies, the two types of knowledge have been shown to be distinct and useful constructs because self-assessed or subjective knowledge reveals what people think they know whereas objective knowledge reveals what they do know about a particular consumer product.

For this study, and following practices in the research literature on financial literacy (e.g., Hung et al. 2009; Lusardi and Mitchell 2014), we label the subjective assessment of financial literacy as "perceived" financial literacy. The research on financial literacy also suggests that perceived financial literacy is not simply a proxy for actual financial literacy. One study found that correlations between perceived and actual financial knowledge of investments varied considerably depending on the characteristics of the individual (Agnew and Szykman 2005). Another study reported only a modest correlation (0.366) between actual financial knowledge and perceived knowledge of economics and found that perceived knowledge had positive effects on prudent planning for retirement separate from actual knowledge (Parker et al. 2012). Other studies found that on average there is a positive association between subjective and objective measures of financial literacy, but the cross-tabulations of scores shows sizable percentages of individuals in each possible combination (Lusardi and Mitchell 2009; van Rooij et al. 2011b). The relationship between the two types of scores also may be less positive when the objective test covers more specific concepts, as indicated by findings from Gallery et al. (2011) that only 41% of those respondents with a good or very good self-rating of financial literacy also had scores on the specific investment questions in the highest two quintiles.

If perceived financial literacy is not simply another measure of actual financial literacy, it may affect financial behavior through some other mechanism. Perceived financial literacy may measure financial confidence, so that a person with high perceived financial literacy and low actual financial literacy may be thought of as over-confident. In the literature on stock market behavior and over-confidence, individuals are overconfident because they believe they have a better *ability* to forecast future stock prices, and this leads them to take riskier stock positions (Barber and Odean 2001; Odean 1998). Many entrepreneurs are overconfident about their ability to successfully start a business, which leads them to enter markets where there is a low probability of success (Camerer and Lovallo 1999). In our study, individuals are reporting a perception of their financial *knowledge* which is different from reporting perceived financial ability (such as forecasting). Also, in contrast to the research literature on over-confidence related to stock traders or entrepreneurs, there is no reason, a priori, to assume that this confidence in financial knowledge among the general population of adults will lead to poor financial decisions. In fact, confidence in financial knowledge may improve financial decisions or outcomes because financial confidence may be needed to take an action (Hung et al. 2009). A financially confident adult, for example, may be willing to shop for the best loans whereas a less financially confident adult may simply take the first loan offered. Probing the reasons, however, for why people perceived themselves the way they do, whether it be from the influence of confidence or some other underlying factor is a different question that is beyond the scope of this study or the available data.[2] As is the practice with the use of subjective measures for research studies in economics and in other fields that were previously cited, we take the subjective assessment as a given and seek to determine if it is useful for explaining behavior.

III. DATASET AND QUESTIONNAIRE

The National Financial Capability Study (NFCS) was commissioned by the Financial Industry Regulatory Authority (FINRA) Investor Education Foundation and was conducted in consultation with the U.S. Treasury Department and the President's Advisory Council on Financial Literacy. The primary purpose of this study was to assess the financial capability of U.S. adults and provide baseline results that could be tracked over time. The NFCS dataset we used for our research was the state-by-state survey that was conducted from June through October 2009. The data were collected through an online survey of 28,146 adults, age 18 or older, with approximately 500–550 interviewed in each state and the District of Columbia. The NFCS also included state and national data weights for researchers to use to create a national sample of adults that was approximately representative of the U.S. adult population. We followed all NFCS

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2. See Parker and Stone (2014) and Parker et al. (2012) for further discussion of confidence and overconfidence issues.

procedures to prepare this national sample from the NFCS state-by-state data for our analysis.[3]

Conducting our study required selecting and transforming items from the NCFS survey. Table 1 describes the demographic factors, financial literacy items, and financial behavior questions that we used and how we coded them. Our initial interest was with financial literacy, so we begin with our explanation of those variables, then turn to the measures of financial behaviors, and end with coverage of demographic factors. The questionnaire included five items to test for understanding of five financial concepts—interest compounding, inflation effects on the value of money, the relationship between bond prices and interest rates, interest payments differences on shorter and longer mortgages, and stock diversification and risk. Although the questions appear to be relatively simple, they have been found to be challenging for many adults and have served as reliable and valid indicators of financial literacy in several national surveys (Hastings et al. 2013; Lusardi and Mitchell 2014). Questions 1, 2, and 5 were used in a 2004 Health and Retirement Survey and in Wave 11 of a 2007–2008 National Longitudinal Survey of Youth (Lusardi and Mitchell 2008; Lusardi, Mitchell, and Curto 2010). Questions 1, 2, 3, and 5 were used in an American Life Panel survey (Fonseca et al. 2012; Lusardi and Mitchell 2009). A version of question 4 has been used in a University of Michigan survey of consumers (Hilgert et al. 2003). The five items provide an overall measure that we labeled as "actual" financial literacy.

The questionnaire also contained an alternative measure of overall financial literacy. Survey respondents were asked to self-assess their overall financial knowledge based on a seven-point scale with a rating of one being very low and a rating of seven being very high. This subjective item provides insights into how respondents perceive their level of financial literacy without having to answer test questions.[4]

The availability of the two overall measures of financial literacy and scales for both that range from low to high allowed us to sort the national sample into four distinct groups. We first split the sample into "actual-hi" and "actual-lo" groups using the composite test score and then split the sample into "perceived-hi" and "perceived-lo" based on self-ratings. From the two splits, we sorted the sample into one of four distinct groups: high actual and high perceived financial literacy; high perceived and low actual financial literacy; low perceived and high actual financial literacy; and, low perceived and low actual financial literacy. It is worth remembering that individuals are asked to assess their *financial literacy* and not how they manage their finances.

As previously stated, the survey contained many items asking respondents about their financial behaviors on many financial topics. We selected 22 items from the survey for our analysis. We chose credit cards as the first financial topic to study because there is widespread use of credit cards by consumers and their use of credit cards has the potential to offer key insights related to consumer behavior. Credit cards are frequently used to facilitate consumer purchases and consumers are expected to review and pay or account for credit card use monthly. As shown in Table 1, we used five questions about credit card use to investigate credit card behaviors. There is some redundancy across the items. Not paying your credit card bill each month implies you are carrying a balance. We view including both items as a consistency check on our results.

In contrast to frequent activity represented by credit card use, the other topics on the survey largely covered financial decisions or behaviors that were more occasional and infrequent. Examples would be purchasing a large discrete item with loan financing (buying a house or an auto), buying coverage for financial liabilities (insurance), holding a financial asset with risks and returns (investments), or seeking financial counseling. As shown in Table 1, we used an additional 17 items to assemble a set of behaviors that would be associated with the four other categories: investment (4), mortgages and loans (4), insurance (4), and financial counseling (5). In the way that the variables are constructed, most of these behaviors would be considered

3. Further information on the NFCS, survey methodology, and sample data are found in Appendix 1, or see www .usfinancialcapability.org. Appendix 1 also contains a comparison of the NFCS data and U.S. census data across major variables. It shows that the weighted characteristics of the NFCS sample are similar to the characteristics reported in the U.S. census data for most variables. The FINRA sample, however, is not a random sample of the U.S. population.

4. The item asking adults to give themselves a self-rating of their financial literacy came after the respondents answered questions in the nine sections of the survey that

asked about their financial behaviors or outcome. The self-rating, however, was not influenced by the five test items because those items came after they gave their self-rating.

TABLE 1
Variable Definitions for Financial Literacy Study

(A) Demographic Variables (0,1 Except As Noted)

1. Male = male respondent. [A3]
2. Age: (a) age by groups: 18–24, 25–34, 35–44, 45–54, 55–64, 65+ [A3aw]
3. White = white or Caucasian. [A4]
4. Education: (a) < Highschool = did not complete high school; (b) = Highschool = high school graduate;
   (c) Somecollege = some college work; (d) College = college graduate; (e) Postgrad = graduate education. [A5]
5. Marital status: (a) Married = married; (b) Single = single; (c) Divorced/sep = divorced or separated; (d) Widowed/er = widow
   or widower. [A6]
6. Children: number of children who are financial dependents. Continuous. [A11]
7. Employment or work status: (a) Selfemploy = self-employed; (b) Full-time = work full-time for an employer; (c)
   Part-time = work part-time for an employer; (d) Homemaker = homemaker; (e) Student = full-time student; (f)
   Disabled = permanently sick, disabled, or unable to work; (g) Unemployed = unemployed or temporarily laid off; (h)
   Retired = retired. [A10]
8. Living arrangements: (a) LiveAlone = only adult in household; (b) LivePartner = live with my spouse/partner/significant
   other; (c) LiveParents = live in my parents' home; (d) LiveOther = live with other family, friends, or roommates. [A7]
9. Income: (a) Income by group: $15K, $15–25K, $25–35K, $35–50K, $50–75K, $75–100K, $100–150K, $150K+ [A8]
10. Income-drop = Yes to: *Has your household experienced a large drop in income you did not expect?* [J10]

(B) Financial Literacy Variables

11. Q1correct = correct answer * to: *Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5
    years how much do you think you would have in the account if you left the money to grow? (a) more than $102*; (b) exactly
    $102; (c) less than $102.* [M6]
12. Q2correct = correct answer * to: *Imagine that the interest rate on your savings account was 1% per year and inflation was
    2% per year. After 1 year, how much would you be able to buy with the money in the account? (a) more than today; (b)
    exactly the same; (c) less than today*.* [M7]
13. Q3correct = correct answer * to: *If interest rates rise, what will typically happen to bond prices? (a) they will rise; (b) they
    will fall*; (c) they will remain the same; (d) there is no relationship between bond prices and the interest rate.* [M8]
14. Q4correct = correct answer * to: *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. (a) true*; (b) false.* [M9]
15. Q5correct = correct answer * to: *Buying a single company's stock usually provides a safer return than a stock mutual fund.
    (a) true; (b) false*.* [M10]
16. Actual Literacy = sum of correct responses to five financial literacy test questions. Continuous. [M6–M10]
17. Perceived Literacy = self-rating response to: *On a scale from 1 to 7, where 1 means very low and 7 means very high, how
    would you assess your overall financial knowledge?* Continuous. [M4]
18. Perceived literacy split: (a) Perceived-Hi = self-rating > mean; (b) Perceived-Lo = self-rating ≤ mean.
19. Actual literacy split: (a) Actual-Hi = test score > mean; (b) Actual-Lo = test score ≤ mean.
20. Financial literacy groups: (a) Perc-Hi/Actual-Hi = self-rating > mean and test score > mean; (b)
    Perc-Hi/Actual-Lo = self-rating > mean and test score ≤ mean; (c) Perc-Lo/Actual-Hi = self-rating ≤ mean and test
    score > mean; (d) Perc-Li/Actual-Lo = self-rating ≤ mean and test score ≤ mean.

(C) Credit Card (CC) Behaviors

21. Notpaidfull = *I do not always pay my credit cards in full.* Yes. [F2_1; changed to "do not"]
22. Carrybalance = *In some months, I carried over a balance and was charged interest.* Yes. [F2_2]
23. Minpayment = *In some months, I paid the minimum payment only. Yes.* [F2_3]
24. Latefee = *In some months, I was charged a late fee for a late payment.* Yes. [F2_4]
25. Exceedcredit = *In some months, I was charged an over the limit fee for exceeding my credit limit.* Yes. [F2_5]

(D) Investment (IV) Behaviors

26. Stocks = *Not including your retirement accounts, does your household have any investments in stocks, bonds, mutual funds,
    or other securities?* Yes. [B14]
27. IRA = *Do you have any other retirement accounts NOT through an employer, like an IRA, Keogh, SEP, or any other type of
    retirement account that you have set up yourself?* Yes. [C4]
28. >.5stocks = *How much of your retirement portfolio is invested in stocks or mutual funds that contain stocks?* More than
    half. [C7]
29. Rebalance = *How often do you change or rebalance the investments in your retirement account(s)? At least once a year or
    once every few years.* [C9]

(E) Loan (LN) Behaviors

30. Ownhome = *Do you or your spouse/partner currently own your own home?* Yes. [Ea_1]
31. Everlate = *How many times have you been late with your mortgage payments in the last 2 years?* Once or more. [E15]
32. Compmort = *When you were getting your mortgage, did you compare offers from different lenders or mortgage brokers?*
    Yes. [E10]
33. Compauto = *Thinking about your most recent auto loan, did you compare offers from different lenders?* [G2]

TABLE 1
Continued

(F) Insurance (IS) Behaviors

34. Health = *Are you covered by health insurance?* Yes. [H1]
35. Life = *Do you have a life insurance policy?* Yes. [H3]
36. Auto = *Do you have auto insurance?* Yes. [H4]
37. Review = *How often do you review your insurance coverage?* At least once a year. [H7]

(G) Financial Advice (FA) Behaviors (in last 5 years)

38. Investing = *Have you asked for any advice from a financial professional about savings or investing?* Yes. [K_2]
39. Loan = *Have you asked for any advice from a financial professional about taking out a mortgage or a loan?* Yes. [K_3]
40. Insure = *Have you asked for any advice from a financial professional about insurance of any type?* Yes. [K_4]
41. Taxplan = *Have you asked for any advice from a financial professional about tax planning?* Yes. [K_5]
42. Debt = *Have you asked for any advice from a financial professional about debt planning?* Yes. [K_1]

Notes: All but five are (0,1) dummy variables. Bracket item by a variable or set of variables is the NFCS questionnaire item code.

as positive or expected ones for a person with more financial literacy. A few items, however, are more likely to have an inverse relationship with financial literacy, such as ever being late on a mortgage payment or asking a financial counselor for advice on debt.

Before we can explore the relationship between financial literacy and financial behaviors, we need to control for the effects of demographic factors. We constructed control variables from the survey for ten demographics as shown in Table 1. Seven factors were coded either as dummy variables (gender, race, education, marital status, employment or work status, living arrangements, and income-drop). The number of dependent children was a continuous variable. The six categorical variables for ages (18–24, 25–34, 35–44, 45–54, 55–64, and 65+) and the eight categorical variables for incomes (<$15K; $15–25K; $25–35K; $35–50K; $50–75K; $75–100K; $100–150K; and >$150K) were included in the regression but the marginal effects are not reported for the sake of parsimony.

Table 2 lists the number of observations and mean for each variable. The full sample has 28,146 observations and respondents were required to answer all items on the survey. Some variables have fewer observations because of routing in the survey. For example, you cannot answer the credit card questions unless you have a credit card. For each item, respondents could choose "Don't know" or "Prefer not to say," and this response was treated as a missing value for all variables except the five items used to measure actual literacy. For the five literacy dummy variables, a one means a correct response

and a zero reflects an incorrect response, "Don't know," or "Prefer not to say."[5]

As for demographics, a person in the sample is more likely to be female, white, have some college education, be married, parent one child, live with a spouse or partner, and be employed full-time. Over 40% of the respondents reported that during the last 12 months they experienced a large drop in income. This large percentage was not unexpected because the nation was in a recession during surveying and in the proceeding 12-month period.

A number of financial literacy variables are included in Table 2. Scores on the five test items ranged from a high of 78% correct for question 1 to a low of 28% correct for question 3. The average correct score across all five items (actual literacy) was 3, which is barely above chance. The average self-rating of financial literacy (perceived literacy) rounds to a mean of five on the seven-point scale. The split of the sample into "actual-hi" and "actual-lo" groups was done using the test mean score to determine the sorting (high > mean; low ≤ mean). The split of the sample into "perceived-hi" and "perceived-lo" groups was based on the mean self-ratings (high = 6 or 7; low = 5 or less). From the two splits, we sorted the sample into four groups: high actual and high perceived financial literacy (18%); high perceived and low actual financial literacy (16%); low perceived and high actual

5. For example, 21,011 have credit cards and answered the item used to create the variable Notpaidfull (see Table 1, for definition). Of those responding, 161 responded "Don't know" and 218 responded "Prefer not to say" which yields 20,632 observations as reported in Table 2. This breakdown is typical for most variables used in the analysis.

TABLE 2
Variable Characteristics

Variable	Obs.	Mean
Male	28,146	0.4867
Age18–24	28,146	0.1352
Age25–34	28,146	0.1708
Age35–44	28,146	0.1828
Age45–54	28,146	0.1960
Age55–64	28,146	0.1631
Age65+	28,146	0.1520
White	28,146	0.6851
Nonwhite	28,146	0.3149
<Highschool	28,146	0.0348
=Highschool	28,146	0.2932
Somecollege	28,146	0.4193
College	28,146	0.1586
Postgrad	28,146	0.0940
Married	28,146	0.5337
Single	28,146	0.2824
Divorced/sep	28,146	0.1398
Widowed/er	28,146	0.0441
Children	28,146	0.7351 (1.103)
Selfemployed	28,146	0.0807
Full-time	28,146	0.3609
Part-time	28,146	0.0978
Homemaker	28,146	0.0895
Student	28,146	0.0583
Disabled	28,146	0.0423
Unemployed	28,146	0.0980
Retired	28,146	0.1725
LiveAlone	28,146	0.2189
LivePartner	28,146	0.6005
LiveParents	28,146	0.0885
LiveOther	28,146	0.0921
< $15K	28,146	0.1459
$15–25K	28,146	0.1318
$25–35K	28,146	0.1295
$35–50K	28,146	0.1614
$50–75K	28,146	0.1872
$75–100K	28,146	0.1074
$100–150K	28,146	0.0881
$150K+	28,146	0.0486
Income-drop	27,585	0.4062
Q1correct	28,146	0.7771
Q2correct	28,146	0.6451
Q3correct	28,146	0.2764
Q4correct	28,146	0.7560
Q5correct	28,146	0.5339
Actual Literacy	28,146	2.9885 (1.443)
Perceived Literacy	27,548	4.9474 (1.308)
Perceived-Hi	27,548	0.3413
Perceived-Lo	27,548	0.6587
Actual-Hi	28,146	0.4219
Actual-Lo	28,146	0.5781
Perc-Hi/Actual-Hi	27,548	0.1815
Perc-Hi/Actual-Lo	27,548	0.1598
Perc-Lo/Actual-Hi	27,548	0.2487
Perc-Lo/Actual-Lo	27,548	0.4100
CC: Notpaidfull	20,632	0.5818
CC: Carrybalance	20,644	0.5753
CC: Minpayment	20,709	0.4022
CC: Latefee	20,672	0.2635
CC: Exceedcredit	20,662	0.1572
IV: Stocks	25,912	0.3700
IV: IRA	22,081	0.2541
IV: >.5stocks	8,054	0.5190
IV: Rebalance	9,223	0.4073
LN: Ownhome	27,808	0.5911

TABLE 2
Continued

LN: Everlate	11,494	0.2138
LN: Compmort	4,672	0.6391
LN: Compauto	9,733	0.4523
IS: Health	27,806	0.7963
IS: Life	27,340	0.6010
IS: Auto	27,920	0.8636
IS: Review1year	25,707	0.4580
FA: Invest	27,640	0.3024
FA: Loan	27,697	0.2486
FA: Insure	27,675	0.3231
FA: Taxplan	27,600	0.1743
FA: Debt	27,666	0.1038

Notes: All but three variables are (1,0) dummy variables. For the continuous variables, the standard deviation is given in parenthesis beside the mean.

financial literacy (25%); and low perceived and low actual financial literacy (41%).[6]

IV. PROBIT MODEL AND GROUP COMPARISONS

We specified a probit model to investigate the relationship between overall financial literacy and each type of financial literacy (actual and perceived) on different financial behaviors. The dummy dependent variable for each equation was one of the 22 financial behaviors we listed in Table 1. The set of control variables in each equation included the four financial literacy variables we constructed with the low perceived and low actual financial literacy category serving as the omitted group. The other variables in each equation were the ten demographic factors and their associated variable or sets of variables as described in Table 1. The omitted categories for the dummy variables were: female; nonwhite; college graduate; married; full-time employed; living with spouse or partner; and not a large drop in income.

Probit models are nonlinear regressions where coefficients are fitted with the maximum likelihood to the following function:

$$P(Y = 1) = \Phi\left(\beta'x\right)$$

6. We considered the possibility that our measures of actual and perceived financial knowledge when treated as continuous variables were simply measuring the same characteristic, but the pair-wise correlation is only 0.26. This low correlation is consistent with other findings in the research literature (Parker et al. 2012). In our data, while those respondents with high test scores often have higher perceived knowledge, there is substantial variation. For example, 3.5% of the respondents rated themselves as a 6 or 7 for perceived knowledge although they had a score of only 0 or 1 for actual knowledge.

where Φ is the standard normal distribution, x is a vector of explanatory variables, and β is vector coefficients to be estimated. The primary sampling unit for the sample is the 50 states and the District of Columbia. The dataset also provides weights to match Census distributions for age by gender, ethnicity, education, and Census division. To compute clustered, robust standard errors for our probit regressions, we use the survey commands available in Stata. The model is nonlinear in β, meaning that the probit coefficients are difficult to interpret so the marginal effects are typically reported instead. Tables 3–7 report the marginal effects of variables on the dependent variables for the 22 financial behaviors. The marginal effect for each dummy regressor is the change in the likelihood of the dependent variable equaling one computed for a discrete change in the dummy variable from zero to one when evaluating all other variables at their means. For continuous variables, the marginal effect is obtained by taking the partial derivative of the likelihood function with respect to a given variable and evaluating it at the mean. The robust z-values are reported in parentheses below the marginal effects. Given that our sample sizes ranged from 4,607 to 27,110, but with most equations having over 20,000 observations, it is not surprising that many variables equations are statistically different from zero.[7] Therefore, we limit the discussion of results to the magnitude of the marginal effects.

In the results that follow, we focus on the interpretation of the marginal effects from comparing the four financial literacy groups: high perceived and high actual (I); high perceived and low actual (II); low perceived and high actual (III); and low perceived and low actual (IV). The comparison between the high-high (I) and the low-low (IV) groups is especially valuable because it allows both perceived and actual financial literacy to vary from high to low. This comparison provides an estimate of the *overall* or *combined* effects of actual and perceived financial literacy on financial behaviors as they change in one direction. It also has the largest marginal effect among the group estimates across the equation results.

The assessment of the *relative* contributions of perceived or actual financial literacy in explaining financial behavior is more complex because each type of financial literacy has two

possible comparisons. For perceived financial literacy, actual financial literacy can be low and then perceived financial literacy changes (II–IV), or actual financial literacy can high while perceived financial literacy varies (I and III). Another way to evaluate the effects of actual financial literacy would be to hold perceived financial literacy fixed at low and let actual financial literacy vary (III–IV), or hold perceived financial literacy fixed at high and let actual financial literacy change (I–II). Whether the two comparisons within each type of financial literacy produce similar results can be checked using the marginal effects.

A final group contrast is between groups II and III in which both perceived financial literacy and actual financial literacy change in *opposite* directions. Such a comparison provides a test of whether having a high level of perceived financial literacy is more important than having a high level of actual financial literacy when the corresponding type of financial literacy is low for each group. It differs from the other group comparisons because both types of financial literacy change instead fixing one type at high or low and letting the other type change. For these reasons, this group contrast will be given less attention as the other comparisons.

Several other points should be kept in mind in reviewing the results that follow. First, for each financial behavior we used multiple items to assess its relationship to financial literacy and provide depth for our findings. We selected four to five items that we thought best represented each financial behavior and that could be easily understood, given that there would be 22 in total. We also expected that some of the behaviors asked about on the survey were not likely to be affected by financial literacy (see Section IV.F). The equations we estimated represent 22 tests of our hypothesis about the effect of financial literacy on financial behaviors. Second, each equation includes demographic variables. For brevity, we exclude reference to them in the following discussion of the results.[8] Third, even with this

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7. We also ran our regression repeatedly using a randomly selected 20% of the sample and the sign and significance of the marginal effects were largely unaffected.

8. The demographic results are broadly consistent with what would be expected to be found. For example, with the costly credit card behaviors we studied, people who have experienced a large drop in income and also households with children are more likely to engage in such behavior because they are more liquidity-constrained. As another example, in the case of investments we found that males were significantly more likely than females to hold more than half of their retirement funds in stocks or stock mutual funds, consistent with the research indicating that males are more risk-taking in investing (Dwyer, Gilkeson, and List 2002).

TABLE 3
Credit Card (CC) Behaviors

Variables	(1) Notpaidfull	(2) Carrybalance	(3) Minpayment	(4) Latefee	(5) Exceedcredit
Perc-Hi/Actual-Hi (I)	−0.1583	−0.1274	−0.1486	−0.1134	−0.0612
	(13.52)*	(10.19)*	(13.13)*	(11.04)*	(9.05)*
Perc-Hi/Actual-Lo (II)	−0.1389	−0.0949	−0.0829	−0.0776	−0.0313
	(8.44)*	(5.64)*	(4.75)*	(7.00)*	(4.95)*
Perc-Lo/Actual-Hi (III)	−0.0458	−0.0129	−0.0795	−0.0327	−0.0275
	(4.23)*	(1.00)	(7.17)*	(4.08)*	(4.51)*
Male	−0.0482	−0.0381	−0.0097	−0.0503	−0.0001
	(5.86)*	(4.67)*	(1.00)	(8.97)*	(0.01)
Age	0.0215	0.0167	0.0114	0.0049	0.0018
	(10.86)*	(6.79)*	(4.52)*	(2.69)*	(1.11)
Agesquared	−0.0002	−0.0002	−0.0002	−0.0001	−0.0000
	(10.83)*	(6.56)*	(6.07)*	(3.39)*	(2.15)**
White	−0.0174	0.0047	−0.0531	−0.0767	−0.0486
	(1.52)	(0.43)	(3.30)*	(6.80)*	(5.11)*
<Highschool	0.0793	0.0284	0.1001	0.0616	0.0908
	(2.48)**	(0.82)	(2.24)**	(1.54)	(2.58)**
=Highschool	0.0667	0.0423	0.0681	0.0074	0.0313
	(5.36)*	(3.20)*	(4.85)*	(0.55)	(3.02)*
Somecollege	0.0920	0.0788	0.0601	0.0249	0.0363
	(8.50)*	(7.66)*	(5.39)*	(2.66)**	(3.82)*
Postgrad	−0.0539	−0.0499	−0.0384	−0.0035	−0.0052
	(4.92)*	(3.69)*	(2.97)*	(0.34)	(0.53)
Single	0.0539	0.0373	0.0289	0.0340	0.0246
	(3.00)*	(2.02)**	(1.64)	(2.28)**	(2.04)**
Divorced/sep	0.1163	0.0917	0.0690	0.0383	0.0281
	(5.72)*	(4.87)*	(3.83)*	(1.93)	(1.71)
Widowed/er	0.0585	0.0512	0.0570	0.0009	0.0301
	(2.31)**	(1.92)	(2.30)**	(0.04)	(1.59)
Children	0.0368	0.0267	0.0428	0.0398	0.0229
	(6.08)*	(5.22)*	(7.30)*	(9.28)*	(8.14)*
Selfemployed	−0.0660	−0.0247	0.0057	0.0177	0.0003
	(4.05)*	(1.64)	(0.35)	(1.56)	(0.03)
Part-time	−0.0655	−0.0447	−0.0642	−0.0358	−0.0359
	(3.17)*	(2.19)**	(4.52)*	(3.00)*	(3.89)*
Homemaker	−0.1187	−0.1204	−0.0686	−0.0774	−0.0351
	(6.44)*	(6.61)*	(5.44)*	(7.65)*	(4.43)*
Student	−0.1469	−0.1432	−0.0859	−0.0445	−0.0494
	(6.20)*	(5.01)*	(3.03)*	(1.98)	(3.49)*
Disabled	0.0402	−0.0191	−0.0249	−0.0187	0.0067
	(1.85)	(0.98)	(0.96)	(0.99)	(0.38)
Unemployed	−0.0575	−0.0586	−0.0321	−0.0011	−0.0316
	(3.37)*	(3.59)*	(1.69)	(0.08)	(3.32)*
Retired	−0.1395	−0.1381	−0.1021	−0.0790	−0.0471
	(8.09)*	(7.66)*	(7.15)*	(5.66)*	(3.91)*
LiveAlone	−0.1187	−0.0680	−0.0979	−0.0476	−0.0160
	(4.48)*	(2.78)*	(5.55)*	(3.03)*	(1.37)
LiveParents	−0.1248	−0.1387	−0.0716	−0.0222	−0.0077
	(4.54)*	(4.10)*	(2.91)*	(1.38)	(0.49)
LiveOther	−0.0329	0.0039	−0.0331	−0.0062	0.0099
	(1.37)	(0.14)	(1.49)	(0.29)	(0.59)
Income	0.0000	0.0008	−0.0020	−0.0011	−0.0008
	(0.10)	(1.68)	(3.22)*	(2.72)*	(2.19)**
Incomesquared	−0.0000	−0.0000	−0.0000	0.0000	0.0000
	(5.23)*	(5.21)*	(0.15)	(0.44)	(0.10)
Income-drop	0.0780	0.0816	0.1576	0.1376	0.0958
	(8.53)*	(11.02)*	(22.45)*	(17.81)*	(14.85)*
Observations	20,204	20,221	20,279	20,245	20,242
F-stat	62.81	67.11	151.4	91.99	113.8
Pseudo R^2	0.0869	0.0638	0.119	0.0952	0.0946
Wald tests					
(I)−(III)	84.83	89.90	35.73	67.53	19.31
P1	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
(I)−(II)	1.685	4.751	20.93	9.015	10.29
P2	(0.19)	(0.03)	(0.00)	(0.00)	(0.00)
(II)−(III)	40.49	32.39	0.0953	16.31	0.248
P3	(0.00)	(0.00)	(0.76)	(0.00)	(0.62)

Notes: Marginal effects of probit regressions with absolute value of robust *z*-statistic in parenthesis. The last six rows report the Chi-squared statistic of a Wald test that the marginal effects are different from each other with *p* values in parenthesis.

Significance: *$p \leq .01$; **$p \leq .05$.

TABLE 4
Investment (IV) Behaviors

Variables	(6) Stocks	(7) IRA	(8) >.5stocks	(9) Rebalance
Perc-Hi/Actual-Hi (I)	0.2053	0.1689	0.2921	0.2718
	(14.50)[*]	(15.30)[*]	(14.56)[*]	(15.97)[*]
Perc-Hi/Actual-Lo (II)	0.1078	0.1184	0.0706	0.1325
	(7.47)[*]	(7.91)[*]	(2.54)[**]	(6.25)[*]
Perc-Lo/Actual-Hi (III)	0.0738	0.0731	0.2109	0.0865
	(6.31)[*]	(5.67)[*]	(11.87)[*]	(4.42)[*]
Male	0.0326	−0.0038	0.1430	0.0297
	(3.16)[*]	(0.50)	(14.34)[*]	(2.20)[**]
Age	−0.0012	0.0054	0.0055	−0.0046
	(0.58)	(2.52)[*]	(2.15)	(1.09)
Agesquared	0.0001	−0.0000	−0.0001	0.0001
	(2.49)[**]	(0.18)	(2.64)	(1.41)
White	0.0164	0.0291	0.0493	0.0289
	(1.17)	(2.53)[**]	(2.64)[**]	(1.50)
<Highschool	−0.1566	−0.1554	−0.1350	−0.1183
	(7.54)[*]	(12.07)[*]	(1.69)	(1.68)
=Highschool	−0.1196	−0.1129	−0.0746	−0.0502
	(9.54)[*]	(13.39)[*]	(4.47)[*]	(1.92)
Somecollege	−0.0728	−0.0552	−0.0486	−0.0053
	(8.60)[*]	(6.92)[*]	(3.87)[*]	(0.36)
Postgrad	0.0234	0.0419	0.0295	0.0257
	(1.53)	(3.82)[*]	(1.92)	(1.25)
Single	0.0506	0.0023	−0.0015	0.0112
	(3.58)[*]	(0.16)	(0.07)	(0.37)
Divorced/sep	−0.0419	−0.0342	−0.0154	−0.0066
	(2.55)[**]	(3.32)[*]	(0.52)	(0.18)
Widowed/er	0.0457	−0.0404	−0.0233	−0.0206
	(2.05)[**]	(2.46)[**]	(0.52)	(0.26)
Children	−0.0135	−0.0154	0.0064	−0.0008
	(2.85)[*]	(4.02)[*]	(1.03)	(0.10)
Selfemployed	0.0179	0.0323	−0.0467	−0.0195
	(1.20)	(3.02)[*]	(2.48)[**]	(0.73)
Part-time	0.0232	0.0260	−0.0396	−0.0125
	(1.37)	(2.10)[**]	(1.82)	(0.45)
Homemaker	0.0225	−0.0053	−0.0574	−0.0065
	(1.44)	(0.41)	(2.26)[**]	(0.29)
Student	0.0161	−0.0557	0.0169	0.0302
	(0.73)	(2.34)[**]	(0.44)	(0.37)
Disabled	−0.1361	−0.1019	−0.0909	−0.0093
	(6.24)[*]	(6.48)[*]	(2.95)	(0.19)
Unemployed	−0.0471	−0.0235	−0.0471	−0.0195
	(3.14)[*]	(2.02)[**]	(2.32)[**]	(0.65)
Retired	0.0263			
	(1.81)			
LiveAlone	0.0024	0.0441	0.1139	−0.0019
	(0.14)	(2.65)[**]	(4.02)[*]	(0.05)
LiveParents	−0.0383	−0.0266	0.0436	−0.0825
	(1.98)	(1.20)	(1.18)	(1.05)
LiveOther	−0.0464	−0.0275	0.0443	−0.0158
	(2.89)[*]	(2.63)[**]	(1.51)	(0.38)
Income	0.0067	0.0044	0.0009	0.0028
	(14.35)[*]	(8.01)[*]	(1.42)	(2.52)[**]
Incomesquared	−0.0000	−0.0000	0.0000	−0.0000
	(6.22)[*]	(3.57)[*]	(0.69)	(0.48)
Income-drop	−0.0234	−0.0220	0.0335	−0.0214
	(2.66)[**]	(3.41)[*]	(2.51)[**]	(1.98)
Observations	25,232	21,465	10,860	8333
F-stat	158.2	251.0	59.18	50.20
Pseudo R^2	0.178	0.218	0.106	0.083
Wald tests				
(I)−(III)	128.8	69.74	29.03	119.5
P1	(0.00)	(0.00)	(0.00)	(0.00)
(I)−(II)	48.26	11.85	109.8	31.85
P2	(0.00)	(0.00)	(0.00)	(0.00)
(II)−(III)	6.444	10.87	47.42	3.511
P3	(0.01)	(0.00)	(0.00)	(0.06)

Notes: Marginal effects of probit regressions with absolute value of robust *z*-statistic in parenthesis. The last six rows report the Chi-squared statistic of a Wald test that the marginal effects are different from each other with *p* values in parenthesis.
  Significance: [*]$p \leq .01$; [**]$p \leq .05$.

TABLE 5
Loan (LN) Behaviors

Variables	(10) Ownhome	(11) Everlate	(12) Commort	(13) Compauto
Perc-Hi/Actual-Hi (I)	0.1210	−0.0706	0.0895	0.1201
	(10.41)*	(5.91)*	(4.00)*	(6.34)*
Perc-Hi/Actual-Lo (II)	0.0780	−0.0241	0.0787	0.1268
	(5.79)*	(1.68)	(3.23)*	(6.23)*
Perc-Lo/Actual-Hi (III)	0.0554	−0.0403	0.0418	0.0571
	(5.81)*	(3.07)*	(2.24)**	(3.52)*
Male	−0.0445	−0.0125	0.0553	0.0148
	(5.13)*	(1.09)	(2.65)**	(1.30)
Age	0.0154	0.0063	−0.0070	−0.0024
	(5.91)*	(1.75)	(1.44)	(0.69)
Agesquared	−0.0001	−0.0001	0.0000	0.0000
	(2.44)**	(1.85)	(0.80)	(0.53)
White	0.1097	−0.0887	−0.0394	−0.0165
	(5.71)*	(6.36)*	(1.76)	(1.07)
<highschool	−0.0360	0.0827	−0.1811	−0.0234
	(1.22)	(1.53)	(2.19)**	(0.50)
=highschool	−0.0017	0.0497	−0.0614	−0.0410
	(0.14)	(3.48)*	(3.27)*	(1.98)
Somecollege	−0.0241	0.0412	−0.0123	−0.0029
	(1.90)	(3.05)*	(0.63)	(0.21)
Postgrad	0.0035	−0.0103	0.0063	−0.0096
	(0.22)	(0.56)	(0.27)	(0.50)
Single	−0.1700	0.0534	−0.0394	−0.0247
	(8.36)*	(2.43)**	(1.34)	(1.29)
Divorced/sep	−0.1914	0.0404	−0.0826	−0.0415
	(11.07)*	(1.61)	(2.04)**	(1.33)
Widow/er	−0.0734	−0.0043	0.0018	−0.0475
	(3.37)*	(0.11)	(0.03)	(0.93)
Children	0.0055	0.0340	−0.0172	0.0078
	(1.03)	(10.48)*	(2.23)**	(1.34)
Selfemployed	0.0416	0.0455	0.0839	0.0205
	(3.09)*	(2.51)**	(3.27)*	(0.73)
Part-time	−0.0055	−0.0193	0.0596	−0.0030
	(0.35)	(1.03)	(1.52)	(0.14)
Homemaker	−0.0134	−0.0283	0.0259	0.0235
	(0.83)	(2.27)**	(0.90)	(1.20)
Student	0.0061	0.0343	−0.0042	0.1107
	(0.28)	(0.70)	(0.04)	(3.06)*
Disabled	−0.0553	0.0583	−0.0391	−0.0267
	(2.75)*	(1.90)	(0.55)	(0.65)
Unemployed	−0.0322	−0.0233	−0.0010	−0.0255
	(1.65)	(1.28)	(0.02)	(0.85)
Retired	0.0652	−0.0699	0.0127	0.0203
	(4.20)*	(3.29)*	(0.30)	(0.87)
LiveAlone	−0.0180	−0.0381	0.0595	−0.0074
	(1.16)	(2.03)**	(1.52)	(0.28)
LiveParents	−0.1019	−0.0041	0.1132	−0.0829
	(3.87)*	(0.07)	(2.14)**	(2.60)**
LiveOther	−0.1152	−0.0116	0.0277	−0.0440
	(6.35)*	(0.52)	(0.59)	(1.26)
Income	0.0091	−0.0025	0.0026	0.0012
	(19.86)*	(4.31)*	(2.20)**	(1.79)
Incomesquared	−0.0000	0.0000	−0.0000	−0.0000
	(11.84)*	(1.98)	(0.95)	(1.12)
Income-drop	−0.0097	0.1532	0.0321	0.0236
	(0.90)	(13.90)*	(1.42)	(1.95)
Observations	26,918	11,307	4607	9560
F-stat	337.1	46.18	6.134	16.66
Pseudo R²	0.285	0.125	0.042	0.0182
Wald tests				
(I)−(III)	29.51	6.670	4.489	11.97
P1	(0.00)	(0.01)	(0.03)	(0.00)
(I)−(II)	9.126	9.687	0.121	0.0932
P2	(0.00)	(0.00)	(0.73)	(0.76)
(II)−(III)	3.012	1.247	1.733	11.43
P3	(0.01)	(0.26)	(0.19)	(0.00)

Notes: Marginal effects of probit regressions with absolute value of robust z-statistic in parenthesis. The last six rows report the Chi-squared statistic of a Wald test that the marginal effects are different from each other with p values in parenthesis.
Significance: $^*p \leq .01$; $^{**}p \leq .05$.

TABLE 6

Insurance (IS) Behaviors

Variables	(14) Health	(15) Life	(16) Auto	(17) Review1year
Perc-Hi/Actual-Hi (I)	0.0386	0.0369	0.0369	0.1096
	(5.59)*	(4.17)*	(4.55)*	(11.23)*
Perc-Hi/Actual-Lo (II)	0.0123	0.0775	0.0075	0.1088
	(1.59)	(6.78)*	(1.61)	(12.07)*
Perc-Lo/Actual-Hi (III)	0.0256	0.0330	0.0295	−0.0050
	(3.48)*	(3.91)*	(5.06)*	(0.59)
Male	−0.0609	−0.0189	−0.0185	−0.0128
	(12.23)*	(2.19)**	(5.57)*	(1.69)
Age	−0.0106	0.0094	−0.0022	0.0004
	(8.70)*	(3.56)*	(1.94)	(0.18)
Agesquared	0.0002	−0.0000	0.0000	−0.0000
	(10.79)*	(1.10)	(2.60)**	(1.04)
White	0.0131	−0.0078	0.0533	−0.0233
	(1.59)	(0.62)	(4.04)*	(2.06)**
<highschool	−0.0817	−0.1035	−0.0752	−0.0666
	(3.50)*	(4.64)*	(4.52)*	(2.69)*
=highschool	−0.0570	−0.0141	−0.0168	−0.0202
	(5.24)*	(1.31)	(2.25)**	(1.36)
Somecollege	−0.0380	−0.0121	−0.0093	0.0065
	(4.18)*	(1.38)	(1.46)	(0.47)
Postgrad	0.0155	−0.0257	−0.0331	−0.0096
	(1.31)	(1.83)	(2.23)**	(0.70)
Single	−0.0560	−0.1493	−0.0808	−0.0251
	(5.35)*	(8.58)*	(4.97)*	(1.93)
Divorced/sep	−0.0736	−0.1161	−0.0578	−0.0081
	(4.78)*	(5.89)*	(5.35)*	(0.41)
Widowed/er	−0.0242	−0.0524	−0.0539	0.0365
	(1.05)	(1.77)	(3.27)*	(1.61)
Children	0.0006	0.0046	−0.0058	0.0031
	(0.16)	(1.12)	(2.77)*	(1.00)
Selfemployed	−0.2076	−0.2382	−0.0362	0.0121
	(13.42)*	(14.70)*	(3.12)*	(0.80)
Part-time	−0.1145	−0.1859	−0.0088	0.0057
	(10.89)*	(12.87)*	(1.33)	(0.40)
Homemaker	−0.1060	−0.2536	−0.0627	−0.0090
	(7.64)*	(15.79)*	(5.02)*	(0.69)
Student	−0.0156	−0.1620	−0.0109	−0.0765
	(1.00)	(6.92)*	(1.37)	(2.67)**
Disabled	0.0385	−0.2520	−0.1072	0.0269
	(3.65)*	(10.68)*	(5.03)*	(1.05)
Unemployed	−0.2008	−0.2557	−0.0819	−0.0563
	(12.21)*	(16.84)*	(6.93)*	(3.45)*
Retired	0.0178	−0.1698	−0.0323	0.0395
	(2.06)**	(11.06)*	(2.53)**	(2.79)*
LiveAlone	0.0371	0.0144	−0.0516	−0.0182
	(3.39)*	(0.82)	(4.84)*	(1.07)
LiveParents	0.0349	0.0564	−0.0589	−0.0918
	(2.91)*	(2.57)**	(5.73)*	(4.77)*
LiveOther	−0.0044	0.0022	−0.0705	−0.0312
	(0.30)	(0.11)	(4.89)*	(1.39)
Income	0.0048	0.0080	0.0033	0.0014
	(9.75)*	(13.59)*	(11.55)*	(2.91)*
Incomesquared	−0.0000	−0.0000	−0.0000	−0.0000
	(5.47)*	(9.45)*	(8.95)*	(3.36)*
Income-drop	−0.0799	−0.0629	0.0050	0.0310
	(13.16)*	(9.31)*	(1.03)	(4.18)*
Observations	26,881	26,468	26,977	25,054
F-stat	137.1	152.6	121.7	31.26
Pseudo R^2	0.230	0.177	0.241	0.0162
Wald tests				
(I)−(III)	2.637	0.112	2.129	105.1
P1	(0.10)	(0.74)	(0.15)	(0.00)
(I)−(II)	7.696	8.742	20.81	0.00444
P2	(0.01)	(0.00)	(0.00)	(0.95)
(II)−(III)	2.339	12.54	13.69	80.48
P3	(0.13)	(0.00)	(0.00)	(0.00)

Notes: Marginal effects of probit regressions with absolute value of robust z-statistic in parenthesis. The last six rows report the Chi-squared statistic of a Wald test that the marginal effects are different from each other with p values in parenthesis.

Significance: *$p \leq .01$; **$p \leq .05$.

TABLE 7
Financial Advice (FA) Behaviors

Variables	(18) Invest	(19) Loan	(20) Insure	(21) Taxplan	(22) Debt
Perc-Hi/Actual-Hi (I)	0.1294	0.0766	0.0785	0.0640	−0.0210
	(11.19)[*]	(6.49)[*]	(6.66)[*]	(7.51)[*]	(4.13)[*]
Perc-Hi/Actual-Lo (II)	0.0883	0.0314	0.0582	0.0666	0.0151
	(10.38)[*]	(3.29)[*]	(4.99)[*]	(8.82)[*]	(2.04)[**]
Perc-Lo/Actual-Hi (III)	0.0871	0.0664	0.0521	0.0326	−0.0031
	(8.20)[*]	(8.99)[*]	(7.07)[*]	(4.00)[*]	(0.54)
Male	−0.0218	−0.0301	−0.0253	−0.0053	−0.0014
	(2.99)[*]	(4.85)[*]	(3.24)[*]	(1.00)	(0.30)
Age	−0.0137	−0.0040	0.0012	−0.0093	0.0045
	(7.03)[*]	(2.05)[**]	(0.52)	(5.80)[*]	(3.92)[*]
Agesquared	0.0002	0.0000	−0.0000	0.0001	−0.0001
	(7.62)[*]	(0.17)	(1.06)	(5.27)[*]	(4.51)[*]
White	0.0050	0.0196	0.0155	0.0036	−0.0297
	(0.52)	(2.63)[**]	(1.40)	(0.45)	(4.44)[*]
<highschool	−0.1302	−0.0978	−0.1226	−0.0607	−0.0393
	(7.56)[*]	(5.77)[*]	(6.91)[*]	(3.81)[*]	(3.95)[*]
=highschool	−0.0966	−0.0515	−0.0707	−0.0572	−0.0142
	(13.37)[*]	(5.18)[*]	(6.56)[*]	(6.89)[*]	(2.24)[**]
Somecollege	−0.0412	−0.0105	−0.0226	−0.0273	0.0016
	(4.81)[*]	(1.23)	(2.78)[*]	(3.91)[*]	(0.28)
Postgrad	0.0532	0.0147	0.0325	0.0471	0.0098
	(3.76)[*]	(1.27)	(3.30)[*]	(5.91)[*]	(1.04)
Single	0.0103	−0.0849	−0.0383	−0.0295	−0.0138
	(0.65)	(6.71)[*]	(2.98)[*]	(2.76)[*]	(1.94)
Divorced/sep	−0.0218	−0.0409	−0.0178	−0.0323	0.0006
	(1.78)	(3.31)[*]	(1.32)	(2.97)[*]	(0.09)
Widowed/er	0.0466	0.0054	0.0245	0.0100	−0.0034
	(2.17)[**]	(0.24)	(1.14)	(0.60)	(0.24)
Children	−0.0026	0.0118	0.0135	0.0055	0.0107
	(0.66)	(3.02)[*]	(3.46)[*]	(1.77)	(4.87)[*]
Selfemployed	0.0355	0.0195	0.0571	0.0895	0.0026
	(2.68)[*]	(1.45)	(5.16)[*]	(6.62)[*]	(0.22)
Part-time	0.0015	−0.0415	−0.0002	0.0375	−0.0181
	(0.13)	(3.75)[*]	(0.01)	(3.79)[*]	(2.29)[**]
Homemaker	−0.0348	−0.0375	−0.0392	0.0098	−0.0324
	(2.50)[**]	(3.74)[*]	(2.71)[*]	(0.95)	(6.06)[*]
Student	−0.0094	−0.0709	−0.0641	−0.0060	−0.0357
	(0.52)	(4.84)[*]	(3.34)[*]	(0.47)	(4.44)[*]
Disabled	−0.0675	−0.0138	0.0130	−0.0515	−0.0010
	(3.38)[*]	(0.87)	(0.61)	(3.88)[*]	(0.0)
Unemployed	−0.0482	−0.0460	−0.0500	0.0013	−0.0270
	(3.24)[*]	(4.46)[*]	(4.37)[*]	(0.11)	(3.78)[*]
Retired	−0.0045	−0.0286	0.0022	0.0336	−0.0124
	(0.40)	(2.54)[**]	(0.15)	(3.33)[*]	(1.26)
LiveAlone	0.0092	−0.0049	−0.0250	0.0135	0.0024
	(0.64)	(0.29)	(2.10)[**]	(1.08)	(0.34)
LiveParents	−0.0396	−0.0750	−0.0882	−0.0469	−0.0167
	(2.03)[**]	(3.92)[*]	(4.86)[*]	(3.23)[*]	(1.95)
LiveOther	−0.0250	−0.0009	−0.0060	−0.0071	0.0120
	(1.45)	(0.05)	(0.39)	(0.60)	(1.17)
Income	0.0038	0.0039	0.0017	0.0022	0.0007
	(9.71)[*]	(12.00)[*]	(3.21)[*]	(7.75)[*]	(3.41)[*]
Incomesquared	−0.0000	−0.0000	−0.0000	−0.0000	−0.0000
	(4.78)[*]	(8.03)[*]	(1.70)	(2.51)[**]	(4.69)[*]
Income-drop	0.0563	0.0498	0.0706	0.0511	0.0633
	(8.38)[*]	(8.71)[*]	(7.37)[*]	(6.57)[*]	(10.89)[*]
Observations	27,110	27,110	27,110	27,110	27,110
F-stat	70.76	72.08	67.92	69.78	17.43
Pseudo R^2	0.0765	0.0718	0.0414	0.0811	0.0534
Wald tests					
(I)−(III)	15.72	0.951	6.300	14.30	8.480
P1	(0.00)	(0.33)	(0.01)	(0.00)	(0.00)
(I)−(II)	10.48	14.61	2.621	0.0477	22.98
P2	(0.00)	(0.00)	(0.11)	(0.83)	(0.00)
(II)−(III)	0.00	10.30	0.245	12.06	6.803
P3	(0.98)	(0.00)	(0.62)	(0.00)	(0.00)

Notes: Marginal effects of probit regressions with absolute value of robust *z*-statistic in parenthesis. The last six rows report the Chi-squared statistic of a Wald test that the marginal effects are different from each other with *p* values in parenthesis.
Significance: [*]$p \leq .01$; [**]$p \leq .05$.

extensive data set our estimates do not iden-
tify a causal relationship between financial liter-
acy and behavior although we do find a statis-
tically significant relationship that is consistent
with our hypothesis.

A. Credit Cards

In the case of credit card use, we had five
relevant survey items in a set of questions asking
about credit card use: (1) I do not always pay
my credit cards in full;[9] (2) In some months, I
carried over a balance and was charged interest;
(3) In some months, I paid the minimum pay-
ment only; (4) In some months, I was charged
a late fee for late payment; and (5) In some
months, I was charged an over-the-limit fee for
exceeding my credit line.[10] Financial experts
would not recommend that credit card users
adopt these financial behaviors because they are
costly and put a credit card user on the path to
financial problems if repeated over time (Stango
and Zinman 2009). From this recommended
perspective, it would be expected that greater
financial literacy would be associated with less
participation in these potentially costly credit
card behaviors.

Table 3 reports the marginal effects using our
four categories of financial literacy. The marginal
effects for credit card behaviors show that over-
all financial literacy has a sizeable marginal effect
on the probability that a person engages in each
behavior. Respondents with high perceived and
actual financial literacy (I) are 16 percentage
points more likely to always pay their credit card
balance in full each month than were respon-
dents in the omitted group with low perceived
and actual financial literacy (IV).[11] Also relative
to this low-low group, the high–high group was
13 percentage points less likely to carry a credit
balance, 15 percentage points less likely to make
only a minimum payment, 11 percentage points

less likely to be charged a late fee for a late pay-
ment, and 6 percentage points less likely to be
charged an over-the-limit fee for exceeding their
credit limit. Although the marginal effect for the
high-high group in the Exceedcredit regression is
the smallest, the averages for each of the depen-
dent variables should be remembered: 58% of
respondents reported that they did not pay their
credit card balance in full each month, but only
16% of the respondents stated that they exceeded
their credit card limit (see Table 2). The percent-
age of those individuals exceeding their credit
card limit is relatively small, so the marginal
effects would be expected to be less.

Perceived financial literacy appears to influ-
ence credit card behaviors. Actual financial
literacy can be fixed at low as perceived financial
literacy varies from high to low (II vs. IV). The
results show that adults with high perceived
and low actual financial literacy are less likely
to exhibit any of the five credit card behaviors
compared with adults with low perceived and low
actual financial literacy. The marginal effects are
all statistically significant as shown by the robust
z-statistics below each marginal effect in Table 3.
Actual financial literacy also can be fixed at high
as perceived financial literacy varies from high to
low (I vs. III). For this comparison, adults with
high perceived and high actual financial literacy
are less likely to participate in the five credit
card behaviors than adults with low perceived
and high actual financial literacy. At the bottom
of Table 3 is a Wald test of the differences
between pairs of marginal effects showing that
each difference is statistically different from zero
($p < .01$). Considering both comparisons (II and
IV; I and III), the results are consistent because
the change in perceived financial literacy has
about the same size of an effect, whether actual
financial literacy is low or high.

Actual literacy also has a statistically signifi-
cant relationship with credit card behavior. The
differences in marginal effects between groups
III and IV provide one of the two contrasts.
When perceived financial literacy is low, adults
with high actual financial literacy compared with
adults with low actual financial literacy are 2–8
percentage points less likely not to use the five
credit card behaviors with one of the effects
(carrying a credit card balance) being insignif-
icant. These outcomes appear to indicate that
change in actual financial literacy influences on
credit card behaviors, but not as much as the
change in perceived financial literacy. The other
way to assess the effects of changes in actual

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9. On the survey, this first item was originally stated
in a positive direction as "I always pay … ," but for the
purposes of this analysis it was changed to make it consistent
with negative behaviors associated with the other four credit
card behaviors.

10. The set of survey questions on credit card use had
a sixth item the use of cash advances. This item is dis-
cussed later as one of the counterfactuals we tested (see
Section IV.F).

11. Another perspective on this change would be to com-
pare it relative to the average. As shown in Table 2, 58% of
the sample pays their balance in full each month. A 16 percent-
age point reduction lowers the percentage to 42. Thus, this
behavior is now 27% less likely to occur.

financial literacy is to hold perceived financial literacy fixed to be high (I vs. II) and evaluate the change in actual financial literacy: In this comparison, the differences ranges from 2 to 7 percentage points less likely and an insignificant difference was found for Notpaidfull. Although both group comparisons show that a change in actual financial literacy influences credit card behaviors in the expected direction, the marginal effects are mixed in significance and smaller in size when compared with those for perceived financial literacy.

The final comparison is between the perceived high and actual low group (II) with the actual high and perceived low group (III). The marginal effect of perceived high and actual low group is larger than the marginal effect of the perceived low and actual high and statistically significant in three of the five regressions (Notpaidfull, Carrybalance, and Latefee). In the other two regressions the marginal effects are not statistically significant.

While the regression results appear to confirm our expectations about the relationship between financial literacy and different credit card behavior, we note that the explanatory power of the probit model is modest, as measured by the pseudo R^2. The values indicate that financial literacy and our control variables do not fully explain the financial behaviors we are investigating. This general point also applies to the probit results we report for other financial behaviors.

B. Investments

We selected four items on investments for our analysis. We first wanted to know if households had financial investments in the form of stocks, bonds, mutual funds, or other securities. Because retirement often requires initiative and investing, we selected a second item that asked whether a person had set up a retirement account independent of any retirement accounts with an employer. Our third item measured whether or not adults had more than half of their retirement accounts invested in stocks or mutual funds containing stocks because this financial practice is often necessary for accumulating enough wealth for retirement. Finally, investments have to be managed, so our fourth item asked whether a person rebalanced his or her portfolio in retirement account(s) at least once a year or once every few years. For each item, we expected that greater financial literacy would increase the likelihood of participation in these types of investment activities based on

previous research (Abreu and Mendes 2010; van Rooij et al. 2011b).[12]

As shown in Table 4, the marginal effect of financial literacy are significant, suggesting that it affects the probability for each investment behavior, even more so than was the case with credit card behaviors. Adults with high perceived and actual financial literacy (I) are 21 percentage points more likely to have financial investments in stocks, bonds, mutual funds, or other securities than those adults with low perceived and actual financial literacy (IV), indicating that they are more capable of building wealth through investing. They are 17 percentage points more likely to have set up a retirement account (e.g., IRA) that is independent of an employer, suggesting that they have a greater ability to take personal initiative for retirement. These high financially literate adults are 29 percentage points more likely to be willing to invest more than half of their retirement accounts in stocks or mutual funds that contain stocks, demonstrating that the financially literate are more likely to follow a recommended investment strategy of building wealth through investing in stocks or mutual funds containing stocks.[13] They also are more careful about managing their financial investments because they are 27 percentage points more likely to change or rebalance the investments in their retirement account(s) at least once a year or once every few years than are less financially literate adults.

When actual financial literacy is low (II and IV), adults with high perceived financial literacy compared with those with low perceived financial literacy are more likely to engage in each of the four investment behaviors. Similar outcomes are found when actual financial literacy is high (I and III). The results suggest that the change in perceived financial literacy is significant and important in affecting investment behaviors no matter what the level of actual financial literacy. Some of these marginal effects are large. Those with high perceived and high actual literacy (I) are about 13 percentage points more likely to own stocks than those with low perceived and high

12. We view the rebalancing of a portfolio on occasion (once a year or even every few years) as an infrequent activity that is part of prudent management of portfolio (Tokat and Wicas 2007). It is different from frequent trading of investment assets, which can be costly for individuals.

13. The results for having more than half of a retirement portfolio in stocks or mutual funds that contain stocks are not just a function of age. We re-ran the probit regression, but broke the sample for those less than 55 years old and those greater than or equal to 55 years old. The results for perceived and actual financial literacy were essentially the same.

actual literacy (III). As was the case with the credit card results, the change in actual financial literacy has somewhat less of an effect on the four investment behaviors regardless of whether perceived financial literacy is low (III vs. IV) or perceived financial literacy is high (I vs. II).

C. Mortgages or Loans

The list of loan behaviors that we studied is an eclectic assortment, but that is fitting because loan behavior is tied to a specific purchase and infrequently occurs. The first three items are related to homeownership and mortgages because a mortgage is the largest loan most people ever receive. Our first item asked adults whether they owned a home because most homes are purchased with a mortgage. The second item probed the adults about their mortgage payments and whether any were ever late in making a mortgage payment. The third item asked whether the adults with a mortgage had ever compared mortgage offers from different lenders. To provide a consumer loan contrast for comparing mortgage offers, we included a fourth item on auto loans that asked whether the adults compared different offers for auto loans.[14]

We expected that adults with more financial literacy would be more likely to own a home because it is one means of building household wealth (Behrman et al. 2012; Lusardi and Mitchell 2007), although the recent recession may have weakened that relationship. Financially literate homeowners also would be less likely to be late on a mortgage payment to preserve that wealth. To make the best use of limited resources, adults with more financial literacy would be more likely to compare offers for either mortgages or auto loans. The results in Table 5 confirm the expectations.

When actual financial literacy is low, adults with high as opposed to low perceived financial literacy are 8 percentage points more likely to own a home, 2 percentage points less likely to ever be late on a mortgage payment, 8 percentage points more likely to compare mortgage offers, and an impressive 13 percentage points more likely to shop for auto loans. When comparing groups I and III, which holds actual financial literacy fixed at high, we find essentially the same pattern of results, although the marginal effects are smaller than when actual literacy was low.

When actual financial literacy is low, perceived financial literacy appears to affect whether consumers shop for auto loans.

The role of actual literacy is conditional on the level of perceived literacy. Actual literacy has a positive, statistically significant relationship with each behavior when perceived financial literacy is low (III vs. IV). However, when perceived financial literacy is high (I vs. II), actual literacy is statistically unrelated to shopping for either type of loan.

D. Insurance

We used four insurance questions, three of which asked whether a person was covered by one of the three major types of insurance (health, life, or auto) and one of which asked about how often a person reviewed their insurance coverage (Table 1).[15] To the extent that purchases of health or life insurance are voluntary, and not simply provided with employment, more financially literate adults are expected to be more likely to have health or life insurance coverage because they are probably more aware of the value of the protection and more concerned with managing risk.[16] The same reasoning may apply to the purchase of auto insurance. Auto insurance is mandatory for licensed owners of vehicles in each state, although not all owners who are required to purchase it do so. Thus, it is not obvious how much volition is involved in the choices to purchase these three types of insurance. As for the fourth item on review, we expect adults with more financial literacy would be more likely to review their insurance coverage in their responsibilities for household management.

The results shown in Table 6 generally support our expectations. Adults with high perceived and high actual financial literacy are 4 percentage points more likely to have health insurance, life insurance, or auto insurance compared to adults with low perceived and actual financial literacy. The differences are relatively small,

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14. A fifth item on adjustable-rate mortgages is discussed later as one of the counterfactuals we tested (Section IV.F).

15. The survey had seven questions on insurance, but we excluded three of them. We excluded one on "*homeowner's/renter's insurance*" because it combines two different insurance decisions unlike the three separate items we used for health, life, and auto insurance. Two insurance purchasing questions also were excluded because they asked about purchasing *any* type of insurance and they were considered too general to be of use for the analysis.

16. This statement is somewhat speculative because financial literacy effects have not been studied in past research on insurance or risk tolerance (e.g., Hallahan et al. 2004; Zietz 2003). A related study, however, found that financial literacy affected the annuity decision (Agnew et al. 2008).

probably because there is less volition with the three types of insurance coverage, as we suspected with auto insurance, and might also be the case with health and life insurance, if they were included in employment packages. The other behavior we studied—review of insurance coverage—appears to be more clearly affected by volition and personal choice, and thus we see a greater marginal effect from financial literacy.

Given the small differences in the overall effects of financial literacy on health, life, and auto insurance, it is not worthwhile parsing the separate effects of perceived or actual financial literacy as done previously with the other financial behaviors. The only noteworthy one is life insurance. Those adults with high perceived financial literacy and low actual financial literacy are more likely to have life insurance than those adults with low perceived and actual financial literacy, indicating again that perception of financial literacy is significant. In addition, perceived literacy may change insurance reviews by households. When actual financial literacy is low, those adults with high perceived financial literacy are more likely to review their insurance policies once a year than those adults with low perceived financial literacy. By contrast, when perceived financial literacy is high or low, and actual financial literacy is allowed to vary, there is essentially no change in the likelihood of reviewing insurance.

E. Financial Advice

The survey had a set of five questions asking about advice from a financial professional in the last five years on different financial matters such as savings or investments, taking out a mortgage or a loan, insurance of any type, tax planning, and debt counseling. Presumably people with a higher level of financial literacy would be more willing to seek financial advice or counseling than people with less financial literacy. A likely reason why would be that they may be more interested in financial planning because they are more aware of what they might lose or gain financially if they do not make a careful decision and thus are more willing to seek financial advice. The only advice item that would be an exception to this expected positive relationship between financial literacy and seeking financial advice is the one on debt counseling. Here we anticipated that there would be a negative relationship because debt has to become a problem before people seek debt counseling whereas seeking advice on other

financial matters is part of normal information gathering and planning.[17]

The financial advice results conform to our initial expectations. Before reviewing the results in Table 7, it is worth remembering that the fewer people seek advice than most of the other behaviors we consider. The most common advice sought were for investments and insurance (both about 30%) and the lowest was tax planning (10%). Thus, smaller marginal effects than those previously estimated might be more economically relevant. Adults with high perceived and actual financial literacy compared with adults with low perceived and actual financial literacy are significantly more likely to seek financial advice about savings and investments, mortgages or loans, or tax planning.[18] The 13 percentage point marginal effect for seeking financial advice about investments is large but not surprising because savings and investment decisions can be complicated and have a broad reach that covers personal investing, college saving, and retirement accounts. There is a positive, statistically significant marginal effect of literacy for seeking advice on loans, insurance, and tax planning is about half the size of the marginal effect for seeking advice on investments.

Although perceived financial literacy appears to affect the seeking of financial advice, the relationship is stronger when actual financial literacy is low (II and IV) than high (I and III). Actual financial literacy also has significant effects on seeking financial advice, especially when perceived financial literacy is low (III vs. IV). When

17. There is ambiguity about the effects of financial literacy on seeking financial advice in the limited research literature (e.g., see Hung and Yoong 2010). Seeking financial advice also may be similar to participation in a financial education program, and thus may be affected by time preferences and discounting (Meier and Sprenger 2013). Our working hypothesis is that the type of advice and reasons for seeking the advice matter. More financially literate adults are more likely to seek financial advice that simply provides information or assistance, but the advice is not crisis-driven. Less financially literate adults are more likely to seek financial advice on matters because of a financial crisis or problem such as paying debts.

18. It is possible that the positive relationship between financial literacy and asking for financial advice reflects reverse causality, but it is unlikely for several reasons. The fact that the effect of financial literacy can be ambiguous based on the type or reasons for the advice suggests that there is no consistent reverse causality across the outcomes (see footnote 17). Also, none of the actual financial literacy questions deal specifically with the topics on which the advice is sought, such as tax planning. All that was asked in the survey question was whether a person asked for any advice from a financial professional in the past five years, but nothing is known about the quality or the content of the advice given.

perceived financial literacy is high (I vs. II), the contribution from actual financial literacy is relatively minor.

Finally, we turn to the overall results for debt counseling, which are different from the other financial advice results. The estimated marginal effects show that most financially literate adults (I) were 2 percentage points less likely to use financial counseling. As previously explained, this negative result was anticipated because getting debt counseling means that there is already a debt problem. Adults who are more financially literate are better able to manage their personal finances and thus would be less likely to seek or use debt counseling.

F. Alternative Explanations for the Results

We now consider several alternative explanations for the likely positive influence of financial literacy on financial behavior as a check of the robustness in our results. None of these other explanations appear to be grounds to reject our findings, but it is important to identify and discuss each one in turn to make that case. Among the ones we consider are: (1) reverse causality; (2) more refined sorting of groups; (3) counterfactual testing of financial behaviors; and (4) further evidence on the difference between actual and perceived financial literacy.

The first and most critical issue we addressed is reverse causality, which implies that actual financial literacy is the result of experience with financial decision-making. That is, more experience with financial decision-making will increase financial literacy. A number of studies of actual financial literacy and financial outcomes using different research methods find no support for reverse causality (e.g., Courchane et al. 2008; Lusardi and Mitchell 2007; van Rooij et al. 2011a). Although reverse causality has not been investigated directly for perceived financial literacy, it too could be the result of experience (success or failure) with financial decision-making. For example, individuals with "good" financial outcomes would self-assess their overall financial literacy as high while those individuals with "poor" financial outcomes would self-assess their financial literacy as low.

In some of the previous research, financial literacy questions were designed so that they directly related to the financial behavior under consideration. Clark, Morrill, and Allen (2012), for example, investigate the link between knowledge about Social Security, Medicare, and pensions and decisions and attitudes regarding retirement planning. Thus, the financial knowledge questions were designed to relate specifically to the financial behavior under consideration. For our study, the five questions used reflect important financial knowledge, but they are not directly related to many of the financial behaviors we investigate. Paying a credit card each month, for example, will not provide financial knowledge about how bonds are priced (Q3). Similarly, our perception measure asks individuals to rate their "overall" financial knowledge, it does not ask them to rate their "handling of personal finances" or their "ability to make good investment decisions." Individuals are thus rating a general type of financial knowledge that will be used to assess behavior related to specific financial decisions. Reverse causality is less of a concern given that we use general measures of actual and perceived literacy with the 22 specific financial outcomes we evaluated.

As noted, reverse causality can occur if experience generates actual or perceived financial literacy. Although we do not have a direct measure of experience, age provides a good proxy for it. If our results simply reflect reverse causality caused by experiences, we would expect that the relationship between financial literacy and financial behavior to be stronger for those with more experience (those who are older). To investigate this issue, we estimated a probit model with the credit card outcome NotPaidFull as the dependent variable and the standardized measure of perception an explanatory variable (replacing our hi-lo dummy variables). The regressions include all other control variables. We estimated the results for each of the six age groups. Aside from the youngest group, the marginal effect is between −7 and −10 percentage points. We find a similar relationship when we estimate the same probit model but with Stocks as the dependent variable. Neither set of results suggests that the relationship between perception and the outcome is driven by experience.[19]

With a perceived measure of financial literacy, the concern is that those individuals with "good" financial outcomes would self-assess their overall financial literacy as high while those individuals with "poor" financial outcomes would self-assess their overall financial literacy as low.

19. We wanted to demonstrate the result for two types of outcomes. We chose NotPaidFull and Stocks because they are the first outcome given for the first two sets of outcomes we analyzed. The estimates are available from the authors.

We do not find that adults have financial outcomes that can be consistently labeled as "good" or "bad" across the many financial behaviors we studied. For example, 25% in our sample have been late in paying a credit card bill and 20% have been late in making a mortgage payment, but only 4% have been late with a credit card payment *and* a mortgage payment. This means that most individuals that are late paying a credit card bill have never been late in making a mortgage payment.[20] Given the heterogeneous behavior of households, it appears less likely that perception can be driven by the types of financial outcomes experienced for most households.

Lastly, we note that what we call good outcomes or behaviors are actually what financial advisors would call best practices, as discussed, for example, in the study by Braunstein and Welch (2002). The NFCS data reveals *what* financial behavior individuals report engaging in, but it does not allow us to assess *why* a person engages in a particular financial behavior. A person may have decided not to shop for a mortgage loan because of a long-standing banking relationship with a particular bank. In this case, the person is not following best financial practices, but they probably do not personally view this as a "bad" financial behavior and it is unlikely to impact their perceived literacy.

A second issue was whether our financial literacy groups were sufficiently refined so that we were not comparing people who are not all that different in their financial literacy. For example, some adults in the high-high group may have answered one more test question correctly and ranked themselves one point higher on the perception scale than some adults in the low-low group. To investigate this issue, we added a middle category to our financial literacy definition, thus splitting the sample into nine groups instead of four. This change produced more separate definitions of high and low financial literacy. It also would be reasonable to expect that this refinement would strengthen our results because,

for example, a change in perceived financial literacy from very low to very high would have a greater effect when actual financial literacy is held constant at a very high or very low level.

To test this hypothesis, we re-estimated our probit equation for credit card use with the more refined grouping for perceived and actual financial literacy and using all of our other explanatory variables. We found that our results for perceived financial literacy do strengthen with this new definition, as we expected. For example, in our original estimation (Table 3) adults are 14 percentage points less likely not to pay their credit card bill in full when actual financial literacy is held constant at a low level and perceived financial literacy changes from low to high. With the more refined definition for high and low, the difference increases to 26 percentage points more likely. Similarly, in our original estimation adults are 11 percentage points less likely not to pay their credit card bill in full when actual financial literacy is held constant at a high level and perceived financial literacy changes from low to high. With the extreme definition, the difference doubles to 22 percentage points less likely. We also find that the effects we reported for perceived financial literacy strengthened considerably for the four other credit card outcomes we studied with the more extreme definition of financial literacy. We do not, however, prefer to use this nine-group scheme over our four-group scheme because it would only add more complexity without changing the basic findings.

A third issue we studied was the testing of counterfactuals to the general positive relationship we found between financial literacy and recommended financial behaviors. The purpose of this exercise was to see if we could find results where financial literacy *did not* influence the outcome and there was no strong reason or expectation for why it should. To provide evidence for this counterfactual perspective we selected two financial behaviors: one related to credit card use and the other to mortgage loan. A credit item from the survey asked for a yes or no response to the statement: *In some months, I used the cards for a cash advance.* It is certainly possible that the regular use of a credit card for a cash advance could get a consumer in financial trouble by accumulating substantial debt at high interest rate. But we suspect that use of a cash advance is more irregular and only a small percentage access credit this way (only 13% in our sample). The use of a credit card for a cash advance probably depends more on personal circumstances, for

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20. To further illustrate, we restricted our samples to only individuals that responded to the five credit card items, the four investment items, owning a home, never being late on a mortgage payment, comparing mortgage rates, and comparing auto loans. We picked these financial behaviors or outcomes because they are most clearly seen as good financial practices. The result was a sample of 1,003 individuals. We find that only 1.6% of the sample engaged in all 12 good behaviors and a quarter of the sample had five or fewer of these good financial behaviors. These results reinforce the idea that individuals are not consistent in having good and bad behaviors.

example, being short of cash while traveling. If getting a cash advance is not a reliable indicator of poor credit card practices, then financial literacy should not affect this financial behavior or, if there is an effect, it would be quite minor.[21] In fact, we found those results when we estimated the probit equation with cash advance as a dummy dependent variable. There was significant difference between the high-high group and the low-low group.

To provide another counterfactual example we used our model to estimate the effect of financial literacy on whether a homeowner with a mortgage had an adjustable-rate mortgage. The conventional thinking is that there is substantial risk to the borrower with an adjustable-rate mortgage if the interest rate rises in the future, thus making the selection of an adjustable-rate mortgage a poor decision. As Campbell (2006, 1560–61) explains, adjustable-rate mortgages are not necessarily riskier. The mortgage selection decision depends on individual circumstances, such as the planning, risk aversion, and borrowing constraints, and economic conditions, such as real interest rates and expected inflation. The point is that the financial advice on selecting an adjustable-rate over a fixed-rate mortgage is not certain because personal circumstances and economic conditions matter, so financial literacy is not likely to explain why someone has an adjustable-rate mortgage rather than a fixed-rate mortgage. When we estimated our regression there was no significant effect of financial literacy on this mortgage decision.

Finally, we offer further evidence that perceived and actual financial literacy have separate effects on financial behaviors using another method to measure the effect of each variable. To conduct it, we first estimated our set of regressions with actual financial literacy normalized to have a mean of zero and a standard deviation of one, but without a measure of perceived financial literacy. We then estimated our set of regressions with both actual financial literacy and perceived financial literacy included in normalized form.

In Table 8, we provide an example of the results using this alternative method for the five

credit card outcomes. In each case perceived financial literacy is a statistically significantly predictors of the credit card behaviors, indicating that its inclusion in each regression adds explanatory power. The inclusion of the perceived financial literacy also has only a minimal effect on the statistical significance of actual financial literacy. Even in the one case where actual financial literacy is not statistically significant, that result holds regardless of whether perceived financial literacy is included in the regression. In addition, the magnitudes of the marginal effects for both actual and perceived financial literacy are economically relevant in most cases. The results for minimum payments, for example, show that a change from one standard deviation below the mean to one standard deviation above the mean decreases the probability of making a minimum payment about 7 percentage points. A comparable effect (6 percentage points) is found with actual literacy for this same change.[22]

For completeness, we can summarize the results for all the financial outcomes we studied. The inclusion of perceived literacy in 19 of 22 regressions did not change the sign, magnitude, or significance of the marginal effect of actual literacy. In the three cases where the significance of actual literacy was altered, the results for the effect of actual literacy without perceived literacy were already relatively weak (significant at only the 5% level). Also, in all 22 regressions, perceived literacy had a marginal effect of equal or larger value than actual literacy and it was statistically significant. This alternative analysis supports the results from our primary analysis based on group comparisons that perceived financial literacy likely measures something *different* than actual financial literacy and that both objective and subjective constructs may be important in explaining financial outcomes.

V. CONCLUSION

We find evidence that supports the hypothesis that financial literacy affects financial behavior

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21. We calculated the correlation among the credit card behaviors to see if receiving a cash advance was different. The correlation between receiving a cash advance and the five other credit card behaviors averages .23. By contrast, the average correlations for the other credit card behaviors with each other are substantially larger and ranges from a .37 (exceedcredit) to .43 (carrybalance).

22. An alternative approach would be to estimate the model in Table 8 and interact the two financial literacy variables. This method would address the concern raised by MacCallum et al. (2002), who show that mean-splitting variables may bias the estimates. Greene (2010), however, explains that such interaction terms can be difficult to interpret in a probit model. To check that our method does not bias the results, we also estimated the model in Table 8 with the interaction terms and found that our estimates were not qualitatively or quantitatively altered.

TABLE 8
Credit Cards and Normalized Financial Literacy Scores

Variables	Notpaidfull		Carrybalance		Minpayment		Latefee		Exceedcredit	
Actual	−0.0217	−0.0143	−0.0011	0.0029	−0.0340	−0.0302	−0.0150	−0.0106	−0.0116	−0.0093
	(3.61)*	(2.30)**	(0.29)	(0.77)	(10.01)*	(8.47)*	(4.58)*	(3.17)*	(4.77)*	(3.82)*
Perceived		−0.0793		−0.0482		−0.0367		−0.0432		−0.0209
		(13.10)*		(10.17)*		(8.00)*		(12.19)*		(9.26)*
Observations	20,378	20,204	20,394	20,221	20,456	20,279	20,422	20,245	20,414	20,242

Notes: Actual is the normalized score for the variable Actual Literacy and Perceived is the normalized score for the variable Perceived Literacy. Marginal effects of probit regressions with absolute value of robust *z*-statistic in parenthesis.
Significance: *$p \leq .01$; **$p \leq .05$.

within a financial topic and across a set of financial topics. To support this conclusion, we conducted analyses across five financial topics—credit cards, investments, loans, insurance, and financial counseling—and within each topic we studied four or five relevant behaviors to provide some depth to our topical analysis. We are unable to identify a causal relationship, but in the 22 equations we estimated we found that financial literacy appears to change these financial behaviors when comparing between adults with high and low levels of financial literacy. The marginal effects of financial literacy were stronger with some topics than others (e.g., investment vs. insurance), and while we cannot statistically rule out the influence of reverse causality (for example, estimating instrumental variables), we are able to provide reasonable arguments for why reverse causality does not fully explain our results. Overall the beneficial effects of financial literacy are likely to be substantial on financial practices or behaviors that are often recommended by financial professionals or experts.

What is more revealing in the findings is that the self-assessment of financial literacy that we labeled as perceived financial literacy appears to be as valuable in explaining financial behavior as is tested knowledge that we labeled as actual financial literacy. It is this combination of actual financial knowledge and perceive financial knowledge that may have the greatest influence on the financial behaviors generally recommended by financial experts for improving financial well-being. Although there is evidence across the five major financial topics we studied to support this broad conclusion, we also should note that the results may well be affected by the shortness of our test measure.

One implication from this research applies to future research in financial literacy. Measuring financial literacy with just a test score and then using it to assess the effects of financial literacy on financial behavior may understate the contribution that financial literacy makes to that financial behavior. Future research should take into account both what people know about financial matters and also what they think they know when controlling for financial literacy. Both financial knowledge and perception appear to affect financial literacy and in turn appear to affect financial decisions and behavior.

APPENDIX

NATIONAL FINANCIAL CAPABILITY STUDY

The National Financial Capability Study (NFCS) administrated questionnaires to three different samples: (1) a national sample of 1,488 U.S. adults, ages 18 or older; (2) a state-by-state analysis of more than 28,000 adult respondents; and, (3) a survey of 800 military personnel and spouses. The set of items on each questionnaire was essentially the same, so it is the questionnaire that links the three survey studies. The NFCS website provides a copy of each questionnaire, a brief reporting of the survey methods and basic findings, and an SPSS data file for each sample that can be used by researchers (www.usfinancialcapability.org).

We used the 2009 NFCS state-by-state dataset for this study. The survey was conducted with a sample of 28,146 adults age 18 and older (approximately 500–550 per state plus the District of Columbia) from June to October 2009. The data were collected by Research Now and SSI via proprietary, online panels of individuals who have agreed to participate in the panel and who were compensated for completing surveys. Nonprobability quota sampling was used to obtain the sample. The average time to complete the survey was 15 minutes. We used the dataset weights supplied with the dataset to create the national sample. This work was accomplished by weighting the state-by-state data to match U.S. Census distributions using the 2008 American Community Survey data and several demographic variables at different levels of aggregation—state, regional, national. Within each state (and Washington DC), data were weighted to match U.S. Census distributions by age and gender categories, race and ethnicity categories, and education level. For each U.S. Census region, data were weighted based on census distributions to match variables on age by gender, race and ethnicity, level

TABLE A1
Comparison with U.S. Census Data (%)

Variable	Census	FINRA
Male	49.1	46.8
Age 18–24 years	12.9	11.7
Age 25–44 years	40.7	36.7
Age 45–64 years	29.6	27.9
Age 65+ years	16.7	14.5
White	77.9	75.5
<Highschool	13.2	2.7
=Highschool	30.0	23.9
Somecollege	28.6	35.1
College	18.4	28.6
Postgrad	9.8	13.9
Married	61.9	56.3
Single/never married	22.2	25.6
Divorced/sep	8.31	13.8
Widowed/er	7.51	4.2

Note: Age for census data is the percent of the population 18 and over so the total sums to 100%.

of education, and state. At the national level, the data were weighted to match national census distributions based on age by gender, race and ethnicity, level of education, and census region.

The NFCS questionnaire administered to each adult was extensive and contained about 135 questions that were divided into 11 sections. The first section began with a number of demographic questions to obtain information about the respondents such as age, gender, race and ethnicity, highest education achieved, marital status, living arrangements, income, employment or work status, and number of dependent children. The remaining ten sections focused on a wide assortment of financial topics that are only briefly described in the following list: (1) personal financial condition covering such items as spending relative to income, savings accounts, and credit scores; (2) financial counseling on saving and investing, loans and mortgages, insurance purchases, tax planning, and debt management, as well as opinions about financial professionals; (3) banking practices related to checking and assets held as investments; (4) retirement accounts and planning for those respondents who are currently employed; (5) retirement accounts, living expenses, and money management by those respondents who are retired; (6) home ownership, mortgages, and home equity loans; (7) the use of credit cards and paying credit card bills; (8) auto loans, bankruptcy, and the use of alternative loans (e.g., auto title loans); (9) insurance coverage for health, home, life, and auto; and, (10) financial literacy and awareness.

For context, we compared our sample with characteristics of the U.S. population based on U.S. census data. Age and gender data are obtained from www.census.gov/prod/cen2010/briefs/c2010br-03.pdf, marital status is from table 56 of www.census.gov/compendia/statab/cats/population/marital_status_and_living_arrangements.html, race is from http://quickfacts.census.gov/qfd/states/00000.html, and education data are obtained from table 2 of http://www.census.gov/hhes/socdemo/education/data/cps/2012/tables.html. Table A1 compares the unweighted mean from our sample with the census data. We see that our sample is very similar to the U.S. population based on U.S. Census data.

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