Financial Literacy and the Design of Retirement Plans

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Abstract

We design and administer a financial literacy test tailored to a specific defined contribution plan. We find that participants show fairly good knowledge of the basic mechanics of the plan, but are unable to differentiate among various investment options. Knowledge is particularly low among women, low income and low education employees. We also find some evidence that personal contributions lead to more knowledge. These results support plan designs that have few investment options and encourage personal contributions.

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1. Introduction

A number of recent papers report alarmingly low levels of financial literacy. For example, Lusardi and Mitchell (2007a) find that only 18% of the respondents in the Health and Retirement Survey (HRS) could calculate compound interest. Using a different survey Lusardi and Tufano (2008) show that only 7% recognized the time value of money. As pointed out by Lusardi (2008), this dramatic lack of knowledge has serious implications for retirement planning, the design of retirement plans and financial education programs.

This paper contributes to the financial literacy literature in two ways. First, we design and administer a financial test in the context of a specific defined contribution plan. Existing work relies on national surveys, such as the HRS or the American Life Panel (ALP). Although these surveys have the advantage of large and representative samples, the link between the literacy questions and the decisions that participants actually make is weak. Our financial literacy test is administered to employees at a small liberal arts college and asks specific questions about their retirement plan. All employees in our survey receive a generous 11% employer contribution and thus have a significant stake in making informed investment choices within the plan. This enables us to establish a direct correspondence between the test questions and the decisions that participants have to make. In our case, participants also know the *context* within which these questions are being asked: The title of the survey instrument was "How well do you know your retirement plan?" Levitt and List (2007) summarize how context matters for all kinds of laboratory experiments in economics. It is possible that lack of context in national surveys leads to an underestimation of the level of financial literacy.

The second way in which we contribute to the literature is by examining knowledge of a typical defined contribution plan. Specifically, we test whether participants can *differentiate* among investment options that are normally available in defined contribution plans. By asking about various investment options, such as short-term vs. long-term bonds, growth vs. value, index vs. managed, we are able to test for somewhat higher levels of knowledge than previously examined. As Benartzi (2001), Choi, Laibson and Madrian (2005) and Mottola and Utkus (2007) show, many defined contribution portfolios are poorly structured. To indentify the reason for poorly structured portfolios, it may be important to know what specific aspects of defined contribution plans and investment options within these plans participants don't understand.

Our paper also contributes to the literature on retirement plan design. A number of papers suggest that retirement plans contain too many investment options. Iyengar, Huberman and Jiang (2004) find that participation rates drop as the number of options increases. Agnew and Szykman (2005) document "information overload" that participants suffer when faced with too many options. If plans are to be simplified, we need to know the margins on which the simplification should take place. For example, if we know that employees understand what equity funds are but can't distinguish between growth and value, consolidating growth and value funds into equity funds may be one margin on which the plans can be simplified.

We find that participants have a fairly good knowledge of the basic *mechanics* of the defined contribution plan. They know how their benefits are determined, when and where they can change asset or contribution allocations, the advantages of tax deferred saving, etc. However, participants can't *differentiate* among various investment options.

Some misconceptions are fairly alarming – such as the belief that long-term government bond funds can't lose money. The characteristics of those with low knowledge are the same as those found in the existing literature: low education, low income and gender. We also find that those who actively participate in the plan by making personal contributions have more knowledge that those that are just passive participants. Overall, the results suggest that consolidation of some of the investment options may be desirable, as are designs that encourage active participation, financial education targeted at women, low education, and low income participants.

In the next section we describe the design of our financial literacy test. Section 3 shows the results of the test and Section 4 concludes.

2. Data

The data for this paper comes from a survey administered to employees of a small liberal arts college. The employees participate in a 403(b) defined contribution plan which offers two providers (TIAA-CREF and Fidelity) and over 200 investment options. We surveyed the retirement plans at 29 other small liberal arts colleges and find that 9 of them have identical set of providers. The rest have either TIAA-CREF only or TIAA-CREF and some other provider. Therefore, we find that our plan is fairly typical of other liberal arts colleges. In addition, the type of investment options (mutual funds) and other provisions of the plan (e.g. restrictions on withdrawals, calculation of fees, ability to change investment selection) appear fairly typical of defined contribution plans in general.

Our survey consisted of three parts. The first part asked questions about participation in the plan: whether participants made their own contributions, how often they changed their asset or contribution allocations, whether or not they use a financial advisor, and whether or not they take advantage of the providers' consultants during the consultants' campus visits. The second part of the survey was a financial literacy test which we discuss in the next subsection. The third part gathered basic demographic information on gender, age, income, education and faculty status.

2.1 Financial literacy test

Our financial literacy test is designed to gauge participants' understanding of the defined contribution plan. The test is a multiple choice format with only one correct answer per question. Following Lusardi and Mitchell (2007a, 2007b), one of the answer choices for each question is "I don't know." The exact wording of each question as well as the available answer options are in appendix 1. The test consists of two parts. The first part includes questions about basic *mechanics* of the plan, while the second focuses on participants' ability to *differentiate* between available investment options. The questions about *mechanics* ask if participants understand:

how their benefits are determined;

the advantages of tax-deferred savings;

when their money can be withdrawn penalty-free;

when they can change the allocation of their assets or contributions;

how fees are assessed; and

when allocations may need rebalancing.

The second part of the test focuses on the participants' ability to *differentiate* among the investment options available in the plan. We ask whether they can:

differentiate between managed funds and index funds;

understand "life-cycle" or "target date" funds;

identify an "equity" fund;

differentiate between short-term and long-term bonds;

differentiate between growth and value funds;

differentiate between variable annuities and mutual funds; and

differentiate between traditional and Roth contributions.

The questions are motivated by the fact that all of these options are available in the plan. If participants make informed decisions they should be able to identify correct answers. For example, since both short-term and long-term government bond funds are on the menu of investment options, participants should know the risks and rewards of "ordering" one or the other. Similarly, participants should be able to identify an "equity" fund from a list of funds. This is particularly important since most enrollment packets – after assessing participants' risk tolerance and time horizon - recommend an asset allocation in terms of percentages allocated to "equity," "bonds" etc. Unfortunately, in the list of investment options there is no option named "equity" or "bonds." There are only funds with names such as "Large Cap Blend" or "Mid Cap Value." Thus, the terminology used in the brochures does not match the terminology used in the listings of funds. Our question tests whether participants have the knowledge to actually implement the advice from the enrollment packet and pick a fund that corresponds to a desired asset class.

Our test differs from earlier financial literacy tests by asking more specific and somewhat more difficult questions. For example, Lusardi and Mitchell (2007a) HRS questions explored basic numeracy, diversification, real vs. nominal returns and compound interest. The questions in the Rand American Life Panel used by Lusardi and Mitchell (2007b) test for more advanced knowledge such as the function of the stock market, workings of mutual funds, relationship between bond prices and interest rates, and long-term rates of returns on various asset classes. In contrast, our questions pertain to specific investment choices. For example, Lusardi and Mitchell (2007b) ask about a relationship between interest rates and bond prices. While this is clearly an important concept, it is also somewhat abstract, and participants may not be able to answer such a question without some context. We ask more directly whether participants understand the risks of investing in long-term rather than short-term bonds – a choice they no doubt faced when making investment allocations in the plan.

Our test is also focused on retirement planning within a defined contribution plan. Other papers such as Luchak and Gunderson (2000) explore participants' knowledge of a defined benefit plan. Still other financial literacy tests explore broader personal finance topics such as credit card debt or home mortgages, e.g. Lusardi and Tufano (2008).

2.2 Sample Description

We sent out 963 invitations to complete the survey. 707 invitations were sent via email to employees with email accounts and 256 via campus mail to employees without email accounts. The email invitations were linked to an online version of the survey which participants could complete online. The campus mail invitations were hard

copy and participants had to complete the survey by hand and return via campus mail in an enclosed envelope. We received 247 responses from employees with email account (35% participation), and 33 responses from employees without email (13% participation). The cumulative participation rate was thus 29% with 280 completed surveys out of the 963 invitations sent out. The employees without email typically work in dining services, cleaning and maintenance. Therefore, they tend to have lower income and education levels than workers with work email accounts. The fact that the participation rate in the survey is lower for workers without email probably biases our sample towards employees with higher income and higher education levels.

Panel a in Table 1 shows descriptive statistics of the demographic variables in our sample. Women's 61% share in the sample is somewhat higher than in the population of the college. According to the human resources office, approximately 54% of employees are women. Faculty employees appear somewhat over-represented in the sample with a 36% share among the respondents and only a 25% share in the population. Given that faculty tend to have more education than other groups, their over-representation in the sample may bias our estimate of financial literacy upwards. According to the human resources department of the college, the average age among employees is 49 years which roughly corresponds to the average age of 47 in our sample.

Panel b in Table 1 provides information about participation in the plan. All respondents are participants in the plan since all employees are automatically enrolled and the college contributes a percentage of base salary regardless of whether the employees themselves contribute. Nearly 80% of respondents to our survey make personal contributions to the plan. This is considerably higher the 68% that – according

to the human resources office – actually make personal contributions. Therefore, our sample appears biased toward those employees that make personal contributions.

Surprisingly, nearly 60% of participants claim that they make changes to their investment or contribution allocations at least once every 5 years. This is in sharp contrast to findings of studies that observe participant's actual behavior. For example, Agnew, Balduzzi, and Sundén (2003), Mitchell et al. (2006) and Ameriks and Zeldes (2004) report that changes in asset allocations are very rare. Our question did not distinguish between changing the allocation of assets and changing the allocation of contributions, so it is possible that participants in our sample referred to changes their contributions. It is also possible that there is disconnect between what participants *say* they do and what they actually do.

We also asked about the sources of information that participants use when making their investment decisions. Participants could check more than one source. About 23% claim they use provider websites, 29% outside financial advisor and 40% said they used provider consultants during campus visits. Participants who checked "other" usually wrote that they either sought the advice of relatives or called the providers directly.

Overall, our sample of individuals appears somewhat biased towards those with higher education (faculty, and employees with email accounts), and towards those who have an interest in retirement planning (make personal contributions). These groups are likely to have higher levels of financial literacy and thus bias our estimates of financial literacy upwards. On the other hand the sample is somewhat biased towards women who in previous studies were found to have lower levels of financial literacy.

3. Results

5.1 What Do Participants Know?

As the first half of Table 2 shows, participants have fairly good knowledge of the basic *mechanics* of the plan. Nearly 80% of them understand that their benefits depend on their contributions and the performance of their assets. This is in contrast to Gustman, Steinmeir and Tabatabai (2009) who find that about a third of people with defined *contribution* plans think they have a defined *benefit* plan. Also, 83% of participants understand the advantages of tax-deferred savings. The majority of participants understand that penalty-free withdrawals can be made after severance from employment and after the age of 59 and a half. The majority also know that allocations of contributions and assets can be changed anytime via the provider websites. A surprisingly large percentage, 69%, understand the need for rebalancing. However, only 28% of participants understand what expense ratios mean. Nearly half of them answered that they did not know, 13% thought that expenses are charged against investment gains, and 9% thought that they are subtracted from contributions. The misunderstanding of the impact of fees on performance is also reported in Choi, Liabson and Madrian (2009a).

The second half of Table 3 shows that participant ability to differentiate between various investment options is fairly limited. The only question that more than half of the participants answered correctly was about “lifecycle” or “target date” funds. This perhaps reflects the popularity of these funds, which itself may reflect a lack of participant confidence in managing their savings. More than half of the participants do not know the difference between index and managed funds. Only 24% of participants are able to identify the “S&P500 Index Fund” as an “equity” fund. This indicates that

participant ability to map asset classes to actual funds is somewhat limited. Only 17% of participants understand the difference between short-term and long-term government bond funds. Most worrisome is that a full 41% answered that "neither [short-term nor long-term government bond funds] can lose money, but that long-term bonds have higher returns." Clearly, this large percentage of participants did not realize that holding a government bond *fund* (as opposed to holding a bond to maturity) exposes them to interest rate risk.[1] It is also curious that employees would think that long-term bonds would offer higher returns than short-term bonds and still be risk free. Perhaps this shows a lack of knowledge of the basic risk and return tradeoff that is central to financial markets. Still, it is very serious when participants think that an investment option is risk free when, in fact, it is far from it.[2]

The vast majority of participants can't distinguish between value and growth. More than half of the participants answered that they don't know the difference. A full 33% answered that "growth stocks generally outperform value stocks." (Perhaps the word "growth" associates with returns more easily than the word "value"). According to Fama and French (1992) or more recently Chan and Lakonishok (2004), growth stocks have *lower* returns than value stocks. Only 8% of our participants answered that in recent decades the returns have been similar. These answers suggest that including growth and value style into the menu of options is probably counter-productive. [3]

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[1] Lack of understanding of how bonds are priced is also reported in Lusardi and Mitchell (2007b).

[2] Given the answers on this and other questions, shortly after closing out the survey we released a document entitled "Seven things X College employees don't know but probably should" In the document we explained why investing in long-term government bond funds is not risk free.

[3] In retrospect, we wish we had asked what value and growth mean rather than about returns. For example, the question could have asked : The difference between value and growth stocks is: a. Value

Although the plan offers both variable annuities and mutual funds, participants can't distinguish between the two. A full 56% of participants answered that they do not know the difference between a variable annuity and a mutual fund. An alarming 20% of the participants thought that the value of a variable annuity could never decline below the sum of their contributions. While this is true for some variable annuities, it is false for the variable annuities offered in the plan.[4] Given that participants face the choice between variable annuities and mutual funds, and given that expenses are generally lower for mutual funds, it is important to understand the difference.

Finally, only 15% of participants were able to distinguish between traditional and Roth contributions. Given the potential unambiguous advantages of Roth contributions for low income employees, such lack of knowledge is disturbing.

In summary, while participant have a fairly good understanding of the basic mechanics of the plan, they seem unable to differentiate among the numerous investment options.

3.2. Who's knowledgeable and who's not?

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stocks have high market value relative to their earnings, while growth stocks have low market value relative to their earnings. B. Value stocks have low market value relative to their earnings, while growth stocks have high market value relative to their earnings. C. Value stocks generally have low returns, while growth stocks generally have high returns. Also, we wish we had asked what "Large Cap" means. The question could have been: The difference between Large Cap and Small Cap stocks is that: A. Large Cap stocks have high returns, while Small Cap stocks have low returns. B. Large Cap stocks have lot of capital relative to their debt, Small Cap stocks are the opposite. C. Large Cap stocks are stocks of large firms while Small Cap stocks are stocks of small firms. Another question could have been: "Fixed income" funds invest in: A. Stocks. B. Bonds. C. Any investment with a guaranteed interest.

[4] The exception is the TIAA traditional variable annuity.

In this section we examine how financial knowledge varies across participant characteristics. We estimate three sets of regressions using three different scores on the financial literacy test as the dependent variables. The first score is the score on all questions, the second is the score on questions about mechanics and the third is the score on questions about differentiating among investment options. As independent variables we include demographic information and the information about degree of participation in the plan. Table 3 shows the results.

It appears that men score around 10 percentage points higher than women. The effect is statistically significant at the 1% level and persists even after controlling for other characteristics, like age, income and education. Given that the overall mean score is around 40 percent, a 10 percentage point advantage is economically large. Interestingly, the magnitude of the difference is similar to the differences between men and women reported by Lusardi and Mitchel (2006, Figure 3). We find that age does not appear to be a statistically significant determinant of financial literacy. In contrast, Lusardi and Mitchell (2007b) find age positively related to financial literacy.

Similar to Lusardi and Mitchell (2007b), higher income participants score better on financial literacy tests even when we control for education. For every ten thousand dollar increase in annual income, the financial literacy scores increase by about 1.4 percentage points. Not surprisingly, education is perhaps the most significant determinant of financial literacy: the higher the level of education, the higher the score. Relative to participants with only high school degrees, participants with some college education scored about 12 points higher, those with a college degrees scored 17 points higher, and those with graduate degrees around 20 points – about 50% higher than participants with

only high school. The combined effect of income and education is alarming. As an example, a custodian with a high school degree making 20,000 dollars a year is expected to score nearly 30 points lower than a faculty member or an administrator with a graduate degree and 80,000 dollar income. The consequences of such gap in knowledge are almost certainly to be reflected in retirement savings outcomes. It is disquieting that those who can least afford to make uninformed decisions are most likely to make them.

In the second specification, shown in column (2) of Table 3, we add measures of participation in the plan. The measures are dummy variables for whether a participant makes personal contributions, makes changes to allocations, uses an outside financial advisor, a provider website, or a provider consultants. No doubt many of these variables are endogenous since knowledge is likely to drive whether or not participants contribute, change their allocations or use an outside financial advisor. We report them here as mere associations, not as causal effects. Not surprisingly, making personal contributions and making changes in allocations is associated with higher financial literacy – even after we control for demographic factors. Respondents who said they use the provider websites as a source of information score better than those that use other sources. In contrast, having an outside financial advisor or using provider consultants is not associated with higher financial literacy scores.

We estimated the same set of regressions using scores for the questions about mechanics, and differentiation as dependent variables. Columns (3) through (6) of Table 1 show that the results are almost identical. In other words, the same characteristics affect knowledge about mechanics and differentiation across investment options. The results

also show that the relationship between financial literacy and various demographic or participation characteristics is robust. [5]

3.3. Do personal contributions lead to more knowledge?

In this subsection we examine whether there is a causal relationship between contributions and knowledge. As an instrument for personal contributions we use participant's age. The identifying assumption here is that age is correlated with whether or not a person contributes, but is uncorrelated with the error term in our financial literacy equation. This amounts to assuming that controlling for education, gender and income, age has no effect on financial literacy. In other words, financial knowledge is gained only as a result of formal education. We argue that while some general skills are simply acquired with age, financial literacy requires a set of analytical and mathematical skills that don't increase with age. We estimate the simultaneous equation using a maximum likelihood procedure that takes into account that one endogenous variable, *knowledge*, is continuous and the other endogenous variable, *contribute*, is a dummy. We implement this in Stata using the treatreg command. The results are in Table 4.

The first stage regression, shown in column (1) shows that age indeed predicts whether or not a person contributes – the older the participant the more likely he or she is to make personal contributions. In the second stage regression the coefficient on whether

[5] We also estimated probit regressions with answers to each financial literacy question as the dependent variable and demographic and participation characteristics as independent variables. These results are available upon request.

or not a person contributes is always positive, but statistically significant only when the dependent variable is the score on the questions about mechanics. We interpret this as suggestive evidence that there is a causal link between personal contributions and knowledge. It is possible that the personal contributions give participants an incentive to learn about the plan and the options within it. This is consistent with evidence that participants treat their own contributions differently than they treat the employer contributions, e.g. Card and Ransom (2008) and Choi, Laibson, Madrian (2009b).

4. Conclusion

We find that in the context of a specific defined contribution plan, participants have a fairly good understanding of the mechanics of the plan but don't have the sufficient knowledge to differentiate among numerous investment options. These results lend support to arguments for paring down the menu of investment options, e.g. as in Agnew and Szykman (2005) or Bodie (2003). Our results suggest several specific dimensions on which the menu of options may be simplified. First, given that participants have a limited understanding of style investing, having value and growth funds in the investment menu may be counter-productive. Second, offering variable annuities that are essentially identical to mutual funds is also counter-productive as participants seem to think that variable annuities are safer than mutual funds even when they are not. Third, given that participants can't pick out an "equity" fund from a list of funds, clearly identifying which asset class a fund represents is important. With fewer investment options participants may have an easier time linking particular funds to correct asset classes.

Our results also point to specific areas that should be targeted by financial education as well as the population groups that should be targeted. First, it is essential that participants understand the risks of investing in long-term bonds. The participants in our survey overwhelmingly think that because an investment is in *government* bonds, it is safe. This could have an adverse effect on their wealth. For example, between the first quarter of 2000 and the first quarter of 2010, the return on long-term government bond funds as measured by Barclays Capital Long-Term Government Bond Index was negative in 11 of the 40 quarters. Most recently, the index lost 6% in the first quarter of 2009 - a cruel surprise for participants who fled to "safety" of government bond funds in the midst of the financial crisis. Second, while the impact of fees on investment performance has received a lot of attention from regulators and academics (see e.g. Beshears et al. 2009) most participants still don't understand what expense ratios mean. Once again this misunderstanding could have a significant impact on retirement savings. For example, the Department of Labor warns that over 35 years, one percentage point increase in fees results in nearly one third reduction in retirement savings. Finally, given the potentially unambiguous benefit to households with no current income tax liability, the difference between a traditional and Roth contribution must be explained or promoted particularly among participants with low income and education. It is worth emphasizing that the level of financial literacy in the population could be even lower than in our sample. It is likely that those who responded to the survey have already taken interest in retirement planning. Also, some of the demographic characteristics of our sample suggest that low income and education participants are underrepresented. Therefore, we probably underestimate the level of financial literacy which only *strengthens* our conclusion that

more financial education is needed and that simplification of defined contribution plans may be desirable.[6]

Our finding that personal contributions lead to more knowledge lends support to plan designs that encourage personal contributions. For example, employers should make their contributions conditional on employee contributions (employer match), rather than making contributions independent of the employee's contribution.

[6] Future research may explore the determinants of the design of defined contribution plan. One hypothesis worth investigating is that retirement plan consultants who largely determine the design of the plan benefit from complex plans as these generate higher fees than simple plans.

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Table 1: Description of the survey participants

The table shows descriptive statistics of variables collected from a survey of employees at a small liberal arts college. Income is self-reported annual income in thousands. Some college, college graduate, graduate degree are dummy variables indicating self-reported level of education. The variable "contribute" is one if a respondent makes personal contributions to her retirement plan. The variable "makes changes" is one if a respondent makes changes to asset of contribution allocation at least once every five years.

	Mean	Median	St. Dev.	Min	Max	Nobs
Panel A: Demographics						
Male	0.39	0	0.49	0	1	280
Age	47.59	45	11.7	24	75	279
Income (in '000)	68.3	60	33.51	20	150	271
Some college	0.13	0	0.34	0	1	280
College graduate	0.24	0	0.43	0	1	280
Graduate degree	0.51	1	0.5	0	1	280
Faculty	0.36	0	0.48	0	1	280
Panel B: Participation in the plan						
Contribute	0.77	1	0.42	0	1	280
Make changes to allocations	0.58	1	0.49	0	1	280
Uses providers' website	0.23	0	0.42	0	1	280
Uses outside financial advisor	0.29	0	0.46	0	1	280
Uses providers' consultants	0.40	0	0.49	0	1	280

Table 2: Results of the financial literacy test

The table reports the results of a financial literacy test administered to employees of a small liberal arts college. The complete text of the questions and possible answers is in appendix 1.

Question:	Percent correct answer	Percent wrong answer	Percent I don't know
Questions about *mechanics* of the plan			
1. How benefits are determined	78	6	13
2. Advantages of tax deferred saving	83	5	12
3. When can penalty-free withdrawals be made	66	12	22
4. When can allocations be changed	51	24	25
5. Need for rebalancing	69	10	21
6. Mutual fund fees	28	23	49
Mean score on questions about *mechanics*	62		
Questions about *differentiating* among investment options			
1. Difference between index funds and. managed funds	46	2	52
2. What are "lifecycle" or "target date" funds?	51	6	43
3. Which of these funds is an "equity" fund?	24	11	65
4. Difference between short-term and long-term bonds	17	41	36
5. Difference between growth and value funds	8	40	52
6. Difference between variable annuity and mutual fund	20	24	56
7. Difference between traditional and Roth contributions	15	28	47
Mean score on questions about *differentiating*	26		
Mean score on the entire financial literacy test	43		
Median score on the entire financial literacy test	46		

Table 3: Variation of knowledge across participants' characteristics

The table reports regression results with dependent variable is percentage of correctly answered questions on a financial literacy test described in section 2.1. Number of observations is 271. Robust standard errors are in parentheses. ***,** and * indicate significance at the 1, 5 and 10% level.

	Dependent variable: percentage score on financial literacy questions					
	All questions		mechanics		differentiation	
	(1)	(2)	(3)	(4)	(5)	(6)
Male	9.09***	9.49***	9.57***	10.43***	8.67***	8.69***
	(2.67)	(2.44)	(3.30)	(3.06)	(2.93)	(2.78)
Age	0.10	0.04	0.16	0.09	0.04	0.01
	(0.11)	(0.11)	(0.14)	(0.14)	(0.12)	(0.12)
Income ('000)	0.14***	0.13***	0.16***	0.15***	0.12**	0.11**
	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)
Some college	12.70***	7.85*	22.98***	17.22**	3.89	-0.19
	(4.59)	(4.74)	(6.89)	(6.86)	(4.31)	(4.66)
College grad	17.30***	13.92***	22.76***	18.95***	12.62***	9.61**
	(4.57)	(4.61)	(6.62)	(6.67)	(4.21)	(4.26)
Grad school	21.20***	17.16***	29.06***	24.73***	14.47***	10.66**
	(4.07)	(4.34)	(6.07)	(6.34)	(3.93)	(4.20)
Contribute		6.03**		5.42		6.55**
		(3.05)		(3.80)		(3.24)
Make changes		7.67***		9.28***		6.29**
		(2.51)		(3.18)		(2.84)
Website		8.29***		6.93**		9.46***
		(3.04)		(3.52)		(3.58)
Financial adv.		3.90		5.22		2.78
		(2.45)		(3.23)		(2.77)
Provider consult.		-0.13		3.30		-3.08
		(2.41)		(2.94)		(2.78)
Constant	8.36	2.50	16.49*	9.55	1.39	-3.55
	(6.36)	(6.74)	(8.63)	(8.83)	(6.36)	(6.68)
R-squared	0.24	0.32	0.23	0.30	0.16	0.23

Table 4: Instrumental variable estimates of the impact of contributing on knowledge

The table reports regression results of a system of equations where percentage score on the financial literacy test and a dummy variable indicating personal contributions are the endogenous variables. We use age of the respondent as the instrument for the contribution dummy. The system is estimated using maximum likelihood. The reported first stage results are for a system with the score on all questions as one of the endogenous variables. The first stage results using score on mechanics or differentiation scores as endogenous variables are nearly identical. Number of observations is 271. Standard errors are in parentheses. ***, **, and * indicate significance at the 10, 5 and 1 percent level.

	First Stage:	Second Stage: Dep. var: percent score		
	Dep var: Contribute	All	Mechanics	Differentiation
	(1)	(2)	(3)	(4)
Male	0.02	9.24***	9.85***	8.72***
	(0.19)	(2.57)	(3.39)	(2.74)
Income	0.00	0.12**	0.13**	0.11**
	(0.00)	(0.05)	(0.06)	(0.05)
Some college	1.18***	6.05	11.41	1.45
	(0.40)	(6.68)	(8.79)	(7.15)
College grad	0.44	14.83***	18.54***	11.65**
	(0.31)	(4.76)	(6.29)	(5.09)
Grad school	0.89***	16.36***	20.74***	12.60**
	(0.32)	(5.16)	(6.80)	(5.51)
Contribute		20.35	35.40**	7.45
		(13.04)	(17.03)	(14.00)
Age	0.03***			
	(0.01)			
Constant	-1.37***	2.51	5.89	-0.39
	(0.48)	(7.86)	(10.30)	(8.43)

Appendix 1:

Survey of Financial Literacy among X College Faculty and Staff

(besides the options shown, each question included "I don't know" as one of the options)

Questions about plan *mechanics*:

1. Upon retirement, your Union College retirement benefits will be determined based on:

A. Your salary and years of service
B. How much you and the College contributed and how well your assets performed
C. Your salary and years of service and how well Union's endowment fund performed

2. The major advantage of saving for retirement in a tax-deferred account is that:

A. Withdrawals after the age of 59 and a half are tax free
B. You don't pay taxes on your contributions and investment gains until you withdraw your money
C. Your investment gains are never taxed
D. Your social security benefits will be higher

3. Generally, you can withdraw money from your Union College retirement plan without penalty:

A. When you become unemployed
B. When you switch jobs to another employer
C. When you no longer work at Union and are 59 and a half years old
D. When you are 59 and a half years old

4. The allocation of your retirement assets and of your contributions across different funds can be changed based on the following conditions:

A. Both can be changed once a year during the "open enrollment" period
B. The allocation of existing assets can be made anytime by filling out an "IRA rollover" form, but the allocation of contributions can be changed anytime on the providers' websites
C. Both can be changed anytime on the providers' websites
D. Only the allocation of your new contributions can be changed (on the providers' websites) but not that of your existing assets.

5. If your contributions have always been 50% to fund A and 50% to fund B, your retirement account:

A. Will always be 50% in fund A and 50% in fund B
B. Will be more than 50% in fund A if fund A outperformed fund B.
C. Will be less than 50% in fund A if fund A outperformed fund B

6. Suppose a mutual fund or a variable annuity account has an expense ratio of 1%. This means that:

A. The fund management company takes 1% of all investment gains every year
B. The fund management company takes 1% of the value of your holdings every year
C. The fund management company takes 1% of all your contributions

Questions about *differentiating* among investment options:

1. The difference between a "managed" and an "index" fund is that:

A. Managed funds cost more than index funds but the majority of them outperform the overall market
B. Index funds cost more than managed funds but the majority of them outperform the overall market
C. Index funds allocate assets according a specified index, whereas a manager makes asset allocations in a managed fund

2. Which of the following best describes a "lifecycle" or a "target date" fund?

A. A fixed annuity fund with regular payments that is guaranteed throughout the investor's life
B. A fund that automatically shifts into safer assets as an investor approaches their desired retirement year
C. A fund that shifts from low yielding assets into high yielding assets as an investor approaches desired retirement year

3. You have determined that some portion of your assets should be in domestic equity. Which of these funds best falls into this category:

A. Lifecycle 2020 Fund
B. S&P 500 Index Fund
C. Blue Chip Growth Fund
D. Investment Grade Bond Fund

4. The difference between investing in long-term government bond funds as opposed to short-term government bond funds is that:

A. Long-term funds have a higher average return but also have higher risk
B. There is no difference since both are guaranteed by the U.S. government
C. Neither can lose money, but long-term funds have a higher return

5. The difference between "value stocks" and "growth stocks" is that:

A. Value stocks tend to outperform growth stocks because value stocks tend to be under priced by the market
B. Growth stocks generally outperform value stocks because of their above average prospects for capital growth as a result of their earnings potential
C. The returns have been similar in recent decades.

6. The difference between a TIAA-CREF variable annuity and a mutual fund is that:

   A. Variable annuities cannot lose money; however, investors can lose money with mutual funds
   B. The value of a variable annuity can never fall below the sum of your contributions; however, the value of a mutual fund can fall below the sum of your contributions
   C. Variable annuities can be turned into fixed monthly payments for the rest of the investor's life

7. Which of the following statements about traditional IRA and Roth IRA is FALSE?

   A. Contributions to a traditional IRA are generally tax deductible, whereas contributions to a Roth IRA are not
   B. Withdrawals from a traditional IRA are taxed at lower rates than withdrawals from a Roth IRA
   C. Withdrawals from a traditional IRA are taxed as ordinary income whereas withdrawals from a Roth IRA are tax free