PEF, **11** (1): 1–20, January, 2012. © Cambridge University Press 2011
doi:10.1017/S1474747211000230 First published online 18 May 2011

*Trust, plan knowledge and 401(k) savings behavior**

JULIE R. AGNEW

The College of William and Mary, Mason School of Business, P.O. Box 8795, Williamsburg, VA 23187
(*e-mail:* Julie.agnew@mason.wm.edu)

LISA R. SZYKMAN

The College of William and Mary, Mason School of Business, P.O. Box 8795, Williamsburg, VA 23187

STEPHEN P. UTKUS

Vanguard Center for Retirement Research, 100 Vanguard Boulevard, M38, Malvern, PA 19355

JEAN A. YOUNG

Vanguard Center for Retirement Research, 100 Vanguard Boulevard, M38, Malvern, PA 19355

Abstract

Plan knowledge and trust in financial institutions – two variables missing from standard neoclassical or behavioral models of decision-making – are strongly correlated to 401(k) savings behavior based on results from this paper. In voluntary enrollment settings, plan knowledge and demographic characteristics are related to participation in a 401(k) plan. In automatic enrollment settings, trust in financial institutions and knowledge of an available plan match are related to participation. Although this study cannot prove causality of the relationships, it does extend our understanding of the complex factors underlying savings choices. Policy implications are discussed.

Keywords: Behavioral finance, 401(k), trust, financial literacy, savings.

1 Introduction

Over the past 15 years, a substantial body of 401(k) savings research has posited a number of reasons why employees participate (or fail to participate) in voluntary 401(k) arrangements. These include neoclassical explanations, such as employee

*We would like to thank Olivia Mitchell and Michael Orszag (Coordinating Editor of the Journal of Pension Economics and Finance) for their comments. In addition, this paper benefited greatly from the guidance from two anonymous referees from the Journal of Pension Economics and Finance. Finally, we would also like to thank Matthew Woodall for his excellent research assistance. The research reported herein was performed pursuant to a grant from the U.S. Social Security Administration funded as part of the Retirement Research Consortium. The opinions and conclusions expressed are solely those of the author(s) and do not represent the opinions or policy of the Social Security Administration or any agency of the Federal Government, the Center for Retirement Research at Boston College or Vanguard.

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

budget constraints, the incentive effect of employer matching contributions, and the desire by employees for tax-deferred savings, as well as behavioral explanations, including procrastination, peer effects and choice overload. Meanwhile, recent efforts to understand household financial decision-making more broadly have focused on the critical role played by financial knowledge and the awareness of retirement plan features. Finally, in the context of banking and other financial decisions, the role of trust has emerged as an important determinant of financial behavior, particularly among low-income households. Overall, it appears that financial decision-making is influenced by a complex set of factors, yielding to both neoclassical and behavioral explanations. The goal of this paper is to provide a deeper understanding of how important these different factors are to the 401(k) participation decision.

Our current effort uses a very unique dataset that combines both survey and administrative data and is the first attempt to extend issues of both knowledge of plan features and trust to the domain of 401(k) savings behavior. Moreover, our research takes place in the context of a significant change occurring in the nature of 401(k) plan design, motivated by behavioral findings regarding employee inertia and the importance of default and framing effects on employee savings. Increasingly, employers offering 401(k) plans are availing themselves of a plan design strategy known as automatic enrollment, under which eligible workers have 401(k) contributions automatically deducted from their paychecks, with the legal right to opt-out if they choose.[1] This reframing of the savings decision, from a positive to a negative election, improves plan participation rates dramatically. At the same time, it is still the case that among certain demographic groups within the population of eligible workers, as many as 20% choose to exercise their opt-out rights and quit an automatic enrollment plan (Madrian and Shea, 2001; Nessmith *et al.*, 2007).

As a result, two types of non-savers have emerged today in the U.S. 401(k) system: 'non-joiners', those who fail to join voluntary 401(k) arrangements; and 'quitters', those who exercise their opt-out rights under an automatic enrollment regime. This development raises an intriguing set of questions about the dynamics of 401(k) savings behavior. For example, within each type of plan, do the same types of factors influence participation levels? In addition, do neoclassical models help explain the variations between participants and non-participants (either quitters or non-joiners) within both types of plans – or are broader factors such as trust important as well? The goal of this paper is to paint a more complete picture of the 401(k) savings decision in the context of both voluntary and automatic enrollment plans. We rely on administrative and survey data drawn from three large firms sponsoring 401(k) plans, two offering automatic enrollment plans and one offering a voluntary enrollment plan. The survey data permit us to delve into the psychological motivations behind employee savings decisions, which would not be possible with administrative data alone. This unique combination is an important distinguishing feature of this study.

Before summarizing our findings, the reader should be aware of several important assumptions that frame our interpretation of the results. First, we assume that 401(k)

[1] Automatic enrollment was first authorized by the US Internal Revenue Service in 1997. The Pension Protection Act of 2006 also included several provisions to encourage its wider adoption.

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

participation is desirable. Second, while it is not necessarily irrational to not trust financial institutions, we assume that if a lack of trust leads to 401(k) non-participation and if improving trust levels increases participation then individuals will benefit. That said, we acknowledge that there exist several strong counterarguments to our assumptions.[2] Therefore, the reader should bear this in mind when considering our conclusions and may choose to interpret the results differently. Moreover, this article does not examine any of the potential negative effects on household well-being of increased trust in financial institutions or investing in an employer's 401(k).

In our results, we find a strong correlation between knowledge of plan features and participation in both types of plans. While the direction of causality between plan knowledge and participation cannot be determined in this study, our findings raise interesting research questions for the future. For example, do individuals participate because they are aware of their plan's features, such as the specifics about their plan match or do they learn about these features through their participation in the plan? It is feasible that people who take time to study the plan features understand their benefits better and become more likely to enroll in their plans. It is also feasible that, over time, exposure to plan statements and other correspondence contributes to learning and awareness. If the former is true, then our results provide motivation for educational programs and communication strategies that emphasize the plan features available and their benefits to participants. If the latter is true and in light of research suggesting the importance of learning in financial decision-making, then our results provide further support for automatic enrollment and even more persistent approaches to automatic enrollment, such as the periodic re-enrollment of quitters.[3]

Our study also finds that trust plays a critical role in shaping employee savings behavior in automatic enrollment plans. Specifically, we find that participants who do not trust financial institutions are more likely to quit automatic enrollment plans. Our findings underscore the fact that even the highly successful reframing strategies, such as automatic enrollment, can have limitations in the face of lack of trust – an aspect of decision-making that has not been included in prior 401(k) research. As a result, our findings highlight the importance of trust-building efforts, principally through communications and education programs, as a potential remedy. Finally, our findings present a promising avenue for future research. Given recent economic events, the number of individuals reporting mistrust in financial institutions may have increased since our survey. Therefore, more research into the influence of recent events on trust and financial decisions could be interesting.

This paper is organized as follows. After a literature review in the next section, the third section of the paper turns to our administrative data, and the fourth to our survey instrument and measures of literacy and trust. The fifth section presents our econometric analysis, and a final section concludes.

[2] We thank a referee for suggesting several counterarguments. He/she points out that in 2006 the stock market was overvalued, so participating in a 401(k) emphasizing stocks at that time is unsupported. In addition, the reviewer mentions that mistrust would be useful at the same time given the excessive fees of some funds, as well as the many funds investing based on inflated credit ratings.

[3] See Agarwal *et al.* (2009) for an illustration of learning and financial decision-making.

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

2 Literature review

Most prior research on the 401(k) savings decision has been centered on straightforward neoclassical lifecycle models, using either administrative or survey data, and considering employee choices in a voluntary enrollment setting.[4] Overall, the research using administrative data suggests that three key demographic variables are positively related to 401(k) participation – income, age and job tenure. Several theories have been suggested to explain the positive income and plan participation relationship. For instance, low-income households may participate less than higher income households because they are more likely to be financially constrained (i.e. a simple positive elasticity of saving with respect to income); they face lower (or negative) tax rates and derive little (or no) tax benefit from 401(k) savings; or they need to save less because of the progressive benefits structure of Social Security. In terms of age, a general lifecycle model suggests age-related variation in savings. As employees age, the importance of savings may become more salient, making participation in a retirement plan more likely. Job tenure is also strongly linked to 401(k) plan participation. One reason may be that longer-tenured employees find plan participation more attractive due to the vesting of benefits over time; another may be a growing familiarity, over time, with the employer's retirement plan.

Workplace financial education programs have been linked to improved 401(k) savings outcomes (Bernheim and Garrett, 2003; Nyce, 2005), although financial literacy levels *per se* have not been incorporated in 401(k) savings models. Outside the domain of 401(k) plans, Moore (2003) finds that less financially literate individuals are less likely to engage in positive financial behaviors (e.g. paying bills on time, budgeting and tracking expenses and saving/investing money out of every paycheck). Moore (2003) also suggests that individuals with low financial literacy are naïve when it comes to evaluating financial options. Using special modules from the Dutch National Bank Household Survey, van Rooij *et al.* (2007) find that individuals with low literacy are significantly less likely to invest in stocks. Alternatively, Lusardi and Mitchell (2006) demonstrate that those with higher financial literacy are more likely to save and invest in more complex assets, using data from older households in the Health and Retirement Study. In addition, Behrman *et al.* (2010) find using an instrumental variable approach and data from the Chilean Social Protection Survey that financial literacy has even stronger effects on wealth outcomes than found in linear regression models. Finally, in the 401(k) domain, using an experimental approach, Agnew and Szykman (2005) suggest that individuals with lower levels of financial literacy are more likely to take a default plan investment option when making asset allocations than individuals with higher levels of financial literacy.

Knowledge of a retirement plan's specific features, as opposed to measures of general financial literacy, may also be related to increased savings behavior. Choi *et al.* (2005) found that only 21% of 401(k) participants contributing below their plan's match threshold knew their plan's match rate, compared to 41% of those above the match threshold. Furthermore, Chan and Stevens (2008) find that individuals who are better informed about the retirement benefits of their pensions are more responsive to

[4] See Munnell *et al.* (2001/2002) and Mitchell *et al.* (2007) for a review of past literature.

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

those benefits. Those who are ill informed show no significant response to actual pension incentives. Interestingly, the authors find evidence that the ill-informed group do react to incentives that do not exist. They are responding to their perceived, but incorrect, beliefs about the benefits.

Finally, a well-known stream of research supports the influence of behavioral biases on 401(k) decisions and suggests that employees may not be behaving as standard neoclassical decision agents.[5] The automatic enrollment findings noted above indicate that a simple reframing of the 401(k) savings decision from a positive to a negative election can elicit substantially higher plan participation rates. Prior researchers have noted other behavioral biases (including procrastination) in a variety of other retirement plan decisions (Choi *et al*., 2006). For example, 'choice overload' (as measured by the number of plan investment options) may discourage plan participation (Sethi-Iyengar *et al*., 2004) or encourage more conservative investing (Iyengar and Kamenica, 2010). In addition, an individual's own savings behavior can be influenced by the effects of peer groups (Duflo and Saez, 2003).

In this paper, we expand our understanding of 401(k) savings behavior by examining the role of trust. While one can argue that trust can be irrational or rational, it has been shown to have an influence on other financial behaviors.[6] A distrust of financial institutions has been shown to influence general financial behavior, particularly among households in the lower socio-economic strata. Poorer individuals have a culture of distrust of financial institutions and consciously avoid doing business with them (Bertrand *et al*., 2006; Szykman *et al*., 2005). In a focus group conducted by Szykman *et al*. (2005), respondents expressed feelings of alienation as well as an underlying belief that banks cannot be trusted to do the right thing. The respondents also stated that they avoided doing business with banks because of these perceptions. Finally, Guiso *et al*. (2008) found that lack of trust can explain why some people do not invest in the stock market.[7] Additionally, they find that countries with low stock participation rates have low trust levels.

Broadly speaking the prior literature on 401(k) savings behavior advances three distinct models of individual decision-making.

2.1 Model 1: Neoclassical agents

According to this model, non-savers, regardless of the type of retirement plan offered, are viewed as forward-looking, rational agents. Their decision not to save in a 401(k)

[5] See Benartzi and Thaler (2007) for a comprehensive overview.

[6] Not all distrust of financial institutions among the poor is irrational. *Business Week* (Grow *et al*., 2007) devoted a cover story to how U.S. companies are actively seeking profits from the poor and not always using fair business practices. The recent subprime lending crisis in the U.S. demonstrates that in many instances, poorer individuals may have been misled by financial institutions. Furthermore, Guiso *et al*. (2008) present a theoretical model of trust that relies on prior beliefs which they argue cannot be irrational. They assert that only beliefs after exposure to information can be irrational, and if the information presented is not trusted, then it cannot be used to form beliefs. For some additional background on trust and a survey of the psychology literature as it related to finance, please refer to Olsen (2008).

[7] Researchers have also shown that trust can have a positive effect on a company's financial performance and on the macroeconomy. La Porta *et al*. (1997), in particular, found that large organizations perform better and have a larger share of the economy when trust levels are higher. Similarly, Knack and Keefer (1997) found that the economy of countries where trust levels are higher grows faster than countries that have lower overall levels of trust.

plan is rationally explained by income-related budget constraints, their own preferences for tax-deferred savings, and by recognition that savings is unnecessary given the presence of Social Security benefits. If this model explains participant behavior, then trust and all plan knowledge variables should be unrelated to plan participation. In addition, automatic enrollment should not influence savings behavior.

2.2 Model 2: Information costs

In this model, non-savers may be impeded by a lack of information on basic financial concepts and plan features, as well as by the transaction costs needed to accumulate that information. They are rational agents hindered by information or financial literacy constraints. If this model explains behavior, then knowledge of plan features should be significantly related to participation. A complete test of this model requires evidence of direct causality from plan knowledge to participation and not vice versa. In this model, trust should not be significant and automatic enrollment may have an influence.

2.3 Model 3: Behavioral biases

Under behavioral theories of 401(k) decision-making, non-savers are impeded by psychological biases (such as procrastination) that may interfere with a purely rational assessment of retirement savings choices. Automatic enrollment would be expected to have an influence. Trust, whether rationally or irrationally based, is another psychological factor that may influence behavior. A significant relationship between trust and participation would support this model. These models are not necessarily mutually exclusive. For example, List (2004) finds that prospect theory adequately explains the behavior of inexperienced consumers, whereas those with extensive market experience react more in line with neoclassical predictions. It is thus possible that elements of 401(k) savings behavior are explained by all three models. Indeed, both the prior empirical evidence, as well as our new findings, suggest that a complex set of factors – rational, information-constrained and behavioral – are all linked to 401(k) savings.

3 Administrative and survey data

Our current study is based on administrative and survey data from three 401(k) savings plans. Administrative data, including employee demographics and plan behavior, were extracted from Vanguard recordkeeping systems under restricted access conditions in mid-2006.[8] The three plans were chosen based on similar plan features, including the availability of employer matching contributions and the presence of similar-sized investment menus, in order to minimize the impact of plan-specific design variation.[9] What distinguishes the plans from one another is their use of

[8] Administrative data for Plans A and B were collected in June 2006; for Plan C, in May 2006. Data included: age, income, sex and race/ethnicity; contributions for the year; investment holdings and balances; and related plan features. Vanguard (2007) provides descriptive statistics of the overall Vanguard database from which the three plans were drawn.

[9] All three plans offer the same employer matching contributions; the ability of employees to make 'catch-up' contributions (after age 50); and the standard immediate vesting of employee contributions. The matching formula and vesting schedule for employer contributions vary somewhat by plan. In terms of

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

Table 1. *Plan and employee characteristics*

This table reports general statistics for all the plan participants, including survey respondents and non-respondents. In addition, it includes the type of enrollment each plan uses and the cutoff date for the data collection.

Plan	Plan A	Plan B	Plan C	All
Type of enrollment	Automatic	Automatic	Voluntary	
Cutoff date	7/1/2003	1/1/2001	1/1/2001	
Eligible participants hired after date	1,270	2,328	5,925	9,523
Participation rate	84 %	78 %	64 %	70 %
Mean salary	$37,994	$34,383	$69,803	$56,934

automatic versus voluntary enrollment. Plans A and B have an automatic enrollment feature: eligible employees receive communication materials notifying them that they are automatically enrolled after a given period of employment – 90 days in the case of Plan A, 2 months in the case of Plan B. Plan C is a voluntary enrollment plan; eligible employees receive communication materials inviting them to join the plan on employment.

Table 1 summarizes important plan characteristics. Plan A and Plan B instituted automatic enrollment in 2003 and 2001, respectively, for new hires only. As a result, our analysis is restricted to individuals hired after the 'cut-off date' when automatic enrollment was introduced in each plan. (For the voluntary plan, we set the cut-off date to equal Plan B.) Our sample size for the administrative data set, from which our survey respondents are drawn, is 9,523.

As expected based on prior studies, the automatic enrollment plans have higher participation rates than the voluntary enrollment plan – 84 % (Plan A) and 78 % (Plan B) versus 64 % (Plan C).[10] This difference is even more striking given the substantially lower incomes of the participants in the automatic enrollment plans (mean salary of $37,994 for Plan A and $34,383 for Plan B versus $69,803 for Plan C). We believe that these descriptive statistics underscore the strong effect of automatic enrollment on savings choices.

To obtain our literacy and trust measures, we administered a telephone survey during the month of August in 2006 to a random subset of the individuals drawn from the administrative dataset.[11] Panel A of Table 2 presents summary statistics for the 817 survey respondents. As in the overall administrative dataset, survey respondents from Plans A and B, the automatic enrollment plans, have a lower mean

investment options, all three plans offer individual fund options ranging from 11 funds to 14 funds. In addition to individual fund choices, Plans B and C also offer pre-mixed lifecycle portfolios.

[10] An employee is considered an active participant if he/she is making positive *employee* contributions to the plan at the time the administrative data is extracted.

[11] Our sample includes the overwhelming majority of the employees eligible to participate in each plan who were hired after their respective cut-off dates. It excludes employees who had participated in the past year in market research for Vanguard or who previously asked not to be contacted. Although not reported here, the demographic statistics for the entire population of employees are very similar to our sample data. These results are available upon request. The marketing research firm Greenwald Associates conducted the survey.

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

Table 2. *Survey respondents characteristics*

Panel A reports important demographic statistics for each plan and all the plans combined ('Total' column on the far right) for respondents only. Panel B breaksdown the number of respondents for each participant status/plan type category.

Panel A: Demographic characteristics

Plan	Plan A	Plan B	Plan C	Total
Type of enrollment	Automatic	Automatic	Voluntary	All
Survey sample size (*N*)	116	199	502	817
% of eligible hires	9%	9%	8%	9%
Mean age	41	40	40	40
Mean salary	$35,784	$44,019	$66,463	$56,656
Mean tenure (years as of 30 June 2006)	1.52	3.00	2.12	2.25
Sex				
Male	22%	26%	31%	29%
Female	78%	74%	69%	71%
Missing	0%	0%	0%	0%
Ethnic group				
White	85%	80%	78%	79%
Black/African–American	6%	9%	4%	6%
Hispanic	6%	5%	4%	4%
Other/missing	3%	7%	14%	10%
Married				
No	25%	34%	38%	35%
Yes	75%	66%	62%	65%
Dependents				
Zero	35%	41%	45%	42%
One	22%	19%	19%	19%
Two	19%	23%	25%	23%
Three	16%	12%	9%	10%
More than three	6%	6%	3%	5%
Missing	1%	0%	0%	0%
Education				
High school	20%	37%	9%	18%
Some college	38%	28%	23%	26%
College	31%	25%	40%	35%
Post graduate work or degree	11%	10%	27%	21%
Refused	0%	1%	0%	0%

Panel B. Number of employees by participation status and plan type

	Participant	Non-participant	Total
Automatic	253	62	315
Voluntary	275	227	502
Total	528	289	817

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

salary than the voluntary enrollment plan, Plan C. Plan C participants, besides having higher wages, also have higher levels of educational attainment: the proportion of post-graduate education is more than double in Plan C than in Plan A and Plan B, and only 9% of Plan C respondents have just completed high school (or less), versus 20% and 37% in the two automatic enrollment plans. Due to the differences in demographic characteristics between the automatically enrolled and voluntary enrollment groups, we will limit our discussions to comparisons within each group.

In implementing the survey, our aim was to reach at least 250 respondents in four categories: in a voluntary or automatic enrollment plan, and participating or not participating. Given the small total number of automatic enrollment non-participants, however, we were able to reach only 62 of such employees. Panel B of Table 2 presents the number of respondents in each category.

4 Plan knowledge and trust measures

To assess individuals' knowledge of their 401(k) plan features we asked three basic questions regarding the availability of an employer match, the actual value of the match and the presence or absence of a loan feature. All three plans offered a match but each plan offered a different match schedule. Both automatic plans featured more difficult to recall tiered match rates compared to the single-tiered match schedule offered in the voluntary plan.[12] Given the complexity of some of the match schedules, we constructed two measures of match awareness. The first measure (match correct) equals one if the individual correctly identified each match rate and the associated percent of salary. The second measure (match close) equals one if the individual either mentioned one of the match rates or the percent of salary that is matched. Thus, match close is much easier for an employee to recall. A correct response indicates that a respondent is more familiar with the match policy, but may not remember all the specific details of the policy. Finally, two of the plans offered loans and one did not. We asked each participant whether they were aware if loans were available and coded their responses accordingly.

Our trust measure was based on the extent of respondents' agreement or disagreement with the following statement: 'For the most part, financial institutions are trustworthy'. Often trust measures in other studies are based on broad statements, such as whether the respondents are trusting of other people. But, such instruments have been criticized as being too vague and perhaps unrelated to specific behaviors (Glaeser *et al.*, 2000). Our approach (following Alesina and La Ferrara, 2002) is to focus on trust in financial institutions.[13] As with our financial literacy indicator, we created a binary measure of trust. 'Low trust' respondents are those who disagree or

[12] We define a tiered match rate as a schedule that matches contributions at a specified rate up to a specific percent of salary. The rate then changes to a new match rate up to an additional percent of salary.

[13] Alesina and La Ferrara (2002) show that while an average of 40% of survey respondents report that they trust other people, the percentage drops dramatically when they are asked about their confidence in certain institutions. Specifically, an average of only 27% of people report having confidence in financial institutions. See also Guiso *et al.* (2008).

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

strongly disagree with the idea of trusting financial institutions; 'high trust' are all others.[14]

Table 3 presents the responses to a question regarding participation status. Interestingly, several individuals incorrectly report whether they are participating or not. Non-participants appear more likely to misreport their status. For example, 18% of the automatically enrolled non-participants thought they were participating and 8% were not sure. In addition, 31% of the voluntary non-participants thought they were actively enrolled. These individuals could easily skew our results. For example, lack of trust cannot be a contributing factor to non-participation if the individual does not know they are not participating.[15] Therefore, we have eliminated those who incorrectly reported their participation status from the remainder of the analysis and reduced the sample size from 817 to 713. Table 3, Panel B reports the new sample sizes for each type of plan and participation status.

Table 4 provides summary statistics for our plan knowledge and trust measures using the smaller sample. As shown in Panel A, voluntary enrollment participants answer questions related to plan features more accurately than do non-participants (non-joiners) in the same plan. A similar pattern is found between participants and non-participants (quitters) in the automatic enrollment plan group. However, caution is needed when interpreting these figures as the sample size is very small for the quitters in automatic enrollment category. Furthermore, we cannot determine causality between knowledge of specific plan features and participation with our data. Conceivably, individuals who participate may learn about the plan over time resulting in higher number of correct answers, suggesting causality from participation to plan knowledge. Alternatively, individuals could choose to join or not quit the plan because they are aware of the benefits, suggesting causality in the reverse direction.

Regarding trust, the percentage of individuals in the low-trust category is higher for non-participants in both the voluntary and automatically enrolled participants. However, once again small samples size could be an issue and more advanced techniques are needed to test significance.

Panel B of Table 4 analyzes plan knowledge questions and trust measures by level of educational attainment and salary for the *voluntary plan only*. As might be expected, a high school education (or less) or a salary in the lower-income quartiles appears generally associated with lower levels of accuracy related to the match-specific questions and trust. On the other hand, those with higher salary or education levels appear more likely to answer the loan question correctly. Despite improvements in accuracy for the match questions and higher levels of trust with education and salary, more than a few individuals in both the high education and top salary quartile exhibit ignorance regarding the features of the plans and express feelings of mistrust. For example, only 19% of individuals with graduate level training knew their match rate exactly and only 61% came close. In addition, less than half knew

[14] All non-respondents to this question were conservatively classified as high-trust individuals. As a robustness check, we also excluded this group from the later regression analysis and did not find a qualitatively different result.

[15] We thank an anonymous referee for pointing this out.

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

Table 3. *Accuracy of self-reported participation status*

Panel A reports the percentage of employees that accurately report their participation status by plan type and actual participation status. Panel B reports the new sample sizes for the analysis after removing employees that incorrectly report their participation status.

Panel A. Accuracy of participant status question by plan type and participation status

Question (correct answer in italics and underlined)	Answer	All respondents	Automatic enrollment		Voluntary enrollment	
			Participants	Non-participants	Participants	Non-participants
Do you currently contribute part of your paycheck to your company's retirement savings plan? Yes or No. (Non-Participants: *No*, Participants: *Yes*)	Correct	87%	96%	74%	99%	67%
	Incorrect	12%	3%	18%	1%	31%
	Not sure	1%	0%	8%	0%	2%

Panel B. Number of employees by participation status and plan type who correctly knew their participation status

	Participant	Non-participant	Total
Automatic	244	46	290
Voluntary	271	152	423
Total	515	198	713

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

Table 4. *Plan knowledge and trust measures by participation status, plan type, education and salary*

These tables breakdown the percentage of the sample answering plan feature related questions correctly and trust categories by plan type, participation status, education and salary. Individuals with low trust either strongly disagreed or disagreed to the statement 'For the most part, financial institutions are trustworthy.' Sample sizes of each category are reported in the far right column.

Panel A: Plan knowledge and trust by participation status and plan type

	Plan knowledge (% that correctly answers question)					
Savings behavior and type of enrollment	Match available?	Know match	Match close	Loans available?	Trust low	*N*
All	93%	9%	53%	42%	13%	713
Voluntary enrollment						
Participant	97%	17%	69%	56%	11%	271
Non-participant	84%	5%	33%	36%	13%	152
Automatic enrollment						
Participant	96%	5%	52%	32%	11%	244
Non-participant	76%	0%	35%	26%	35%	46

Panel B: Voluntary plan: plan knowledge and trust by education and salary

	Plan knowledge (% that correctly answer question)					
Demographic characteristics	Match available?	Know match	Match close	Loans available?	Trust low	*N*
Education						
High school	81%	8%	43%	43%	19%	37
Some college	90%	11%	46%	49%	15%	94
College	96%	10%	61%	51%	9%	171
Graduate work	93%	19%	61%	48%	11%	119
Salary						
1st quartile ($0–47,147)	88%	7%	47%	43%	14%	106
2nd quartile ($47,147–64,050)	93%	8%	51%	44%	10%	106
3rd quartile ($64,050–82,675)	95%	19%	63%	54%	11%	106
4th quartile (>$82,675)	93%	16%	62%	54%	11%	105

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

Table 4. (*cont.*)

Panel C: Automatic Plan: plan knowledge and trust by education and salary

	Plan knowledge (% that correctly answer question)					
Demographic characteristics	Match available?	Know match	Match close	Loans available?	Trust low	*N*
Education						
High school	93%	3%	45%	34%	17%	88
Some college	92%	2%	42%	36%	15%	89
College	94%	7%	57%	23%	16%	81
Graduate work	90%	3%	61%	29%	10%	31
Salary						
1st quartile ($0–23,129)	95%	0%	45%	30%	23%	73
2nd quartile ($23,129–32,864)	93%	4%	47%	38%	11%	73
3rd quartile ($32,864–43,551)	89%	7%	49%	33%	18%	72
4th quartile (>$43,551)	94%	6%	56%	22%	8%	72

Percentages may not sum to 100% due to rounding.

they had a loan feature or not. Finally, just over 1 in 10 of respondents in the top quartile of salary have low levels of trust in financial institutions.[16] Thus, education and salary are not perfectly related to trust.

Panel C of Table 4 reports the same statistics for automatically enrolled plans. For the most part, the same type of relative patterns emerges as in the voluntary plan except for awareness of the loan feature. The percentage aware of the loan feature generally decreases with education and salary for the automatically enrolled plan in contrast to the voluntary plan.

5 Econometric analysis

The descriptive statistics in the previous section suggests that both plan literacy and trust may play a role in 401(k) savings decisions. In this section, we assess the relationship between the employee plan participation decision using several probit regressions relating an employee's plan participation decision to a variety of demographic measures and our trust and plan knowledge indicators. Specifically our

[16] Guiso *et al.* (2008) note that one of the advantages of using trust to predict general stock market participation in their study is that it can explain lack of participation by wealthy individuals. They show a strong positive correlation between the level trust in a country and the level of participation among the top 5% of the wealth distribution in the same 12 countries.

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

models are of the following form:

$$\begin{aligned}\text{PARTICIPANT}_i = {} & \beta_0 + \beta_1 EE_i \\ & + \beta_2 \text{MATCHAVAILABLE}_i \\ & + \beta_3 \text{MATCHCLOSE}_i \\ & + \beta_4 \text{LOANSAVAILABLE}_i \\ & + \beta_5 \text{LOWTRUST}_i \\ & + \beta_6 \text{CONTROLS}_i + \varepsilon_i.\end{aligned} \tag{1}$$

In equation (1), the dependent variable PARTICIPANT equals 1 if the *i*th eligible employee is participating in the plan, otherwise 0; EE_i is a vector of demographic variables for the *i*th eligible employee in our survey, which includes age, salary, marital status, number of dependents, job tenure, education and race/ethnicity. Our education variables do not include information regarding past economics classes. Future research could benefit from more details related to past courses taken by individuals that specifically address financial literacy topics. MATCHAVAILABLE_i, MATCHCLOSE_i and LOANSAVAILABLE_i are dummy variables that equal one if individual *i* correctly answered the associated plan feature question and zero if not. LOWTRUST_i is a dummy variable indicating whether participant *i* fell into the low-trust category or not. CONTROLS_i is a vector of controls that include dummy variables related to the accuracy of the participant *i*'s response to two general literacy questions and a stock market belief question.[17] A plan dummy is also included in the automatically enrolled group regressions to control for possible plan-specific effects. We pool respondents from Plans A and B into a single regression for automatic enrollment; the respondents from Plan C are in a separate regression for voluntary enrollment. We do not pool all the plans together because the binary choice to participate is fundamentally different (either opt in or opt out) depending on the enrollment method and the samples are different in terms of education and salary.

In Table 5, the first set of results is for a standard specification of 401(k) plan participation based on prior studies. The coefficients and their standard errors are shown. Not surprisingly, in the standard specification for voluntary enrollment, we find that the probability of participation increases when salary increases, job tenure increases or the participant is married versus not married. On the other hand, lower levels of education and additional dependent children reduce the probability of participation. Meanwhile, in the standard specification model under automatic enrollment, none of these demographic variables has a positive relationship to plan participation except for salary. This result is consistent with the finding from prior research that automatic enrollment tends to equalize savings behavior across various demographic groups.

[17] We asked two questions to test general knowledge about savings and investment. The first asked if it was better to start saving early or not and the second asked if it was possible to lose money in a stock mutual fund. The third question asked which financial product should have the highest expected long-term growth. The third question measures belief in the future returns in the stock market relative to other assets. Each of these questions is included separately in the regression as controls. Our expectation is that individuals answering the first two questions correctly would be more likely to save. In addition, those selecting a stock market mutual fund would be more likely to participate.

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

Table 5. *Probit regressions for survey sample*

This table reports the coefficients from a probit regression. The dependent variable is a binary variable that equals one if the employee participated in his 401(k) plan or equals zero if he did not. Ln(Salary) is the natural log of salary measured in dollars. High school, some college, college are dummy variables for education (omitted category is graduate work). Age is measured in years. Male is a dummy variable that equals one if the employee is male. Married is a dummy variable that equals one if the respondent is married. Dependents is equal to the number of children or elderly living in the household not including the spouse and Job tenure is the years employed. Match available, Match close and Loans available are dummy variables that equal one if the employee correctly answers these questions about plan features. Low trust is equal to 1 if the employee strongly disagrees or disagrees to the statement 'For the most part, financial institutions are trustworthy'. Race is controlled for with dummy variables. The results are not significant and not reported for space reasons. Robust standard errors are reported in parentheses. **, * indicate a significance of 1 % and 5 %, respectively.

	Standard specification		Standard specification plus plan knowledge		Standard specification plus plan knowledge and mistrust	
	Voluntary enrollment	Automatic enrollment	Voluntary enrollment	Automatic enrollment	Voluntary enrollment	Automatic enrollment
Dependent variables	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Constant	−5.713*	−3.346	−6.788**	−4.407	−6.789**	−3.371
	(2.276)	(2.103)	(2.402)	(2.334)	(2.404)	(2.311)
Ln(Salary)	0.534*	0.473*	0.521*	0.413	0.522*	0.367
	(0.209)	(0.194)	(0.212)	(0.214)	(0.213)	(0.208)
High school[1]	−0.749*	−0.698	−0.663	−0.915	−0.661	−1.071
	(0.322)	(0.517)	(0.368)	(0.607)	(0.368)	(0.593)
Some college[1]	−0.220	−0.681	−0.171	−0.904	−0.170	−1.022
	(0.208)	(0.500)	(0.220)	(0.579)	(0.221)	(0.566)
College[1]	0.134	−0.325	0.094	−0.473	0.095	−0.522
	(0.179)	(0.511)	(0.187)	(0.593)	(0.187)	(0.592)
Age	−0.001	0.003	−0.005	0.005	−0.006	0.010
	(0.008)	(0.009)	(0.008)	(0.009)	(0.008)	(0.010)
Married[1]	0.409**	−0.179	0.365*	−0.148	0.365*	−0.042
	(0.157)	(0.235)	(0.167)	(0.255)	(0.167)	(0.259)
Male	−0.087	0.394	−0.088	0.315	−0.088	0.382
	(0.152)	(0.206)	(0.172)	(0.220)	(0.172)	(0.227)
Dependents	−0.162*	−0.078	−0.161*	−0.031	−0.161*	−0.034
	(0.064)	(0.074)	(0.064)	(0.076)	(0.064)	(0.076)
Job tenure	0.216**	−0.053	0.214**	−0.093	0.214**	−0.088
	(0.047)	(0.086)	(0.047)	(0.090)	(0.047)	(0.094)
Match available			0.878*	1.128**	0.877*	1.097**
			(0.354)	(0.312)	(0.354)	(0.316)
Match close			0.664**	0.047	0.664**	−0.056
			(0.147)	(0.218)	(0.147)	(0.232)
Loans available			0.265	0.218	0.265	0.204
			(0.145)	(0.215)	(0.145)	(0.223)
Low trust[1,2]					−0.012	−0.782**
					(0.231)	(0.250)

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

Table 5. (*cont.*)

Dependent variables	Standard specification		Standard specification plus plan knowledge		Standard specification plus plan knowledge and mistrust	
	Voluntary enrollment	Automatic enrollment	Voluntary enrollment	Automatic enrollment	Voluntary enrollment	Automatic enrollment
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Other literacy controls	No	No	Yes	Yes	Yes	Yes
Race controls	Yes	Yes	Yes	Yes	Yes	Yes
Plan control	NA	Yes	NA	Yes	NA	Yes
Pseudo R^2	0.146	0.090	0.245	0.180	0.245	0.213
N	416	283	416	283	416	283

[1] These variables are dummy variables.
[2] Eighteen individuals who did not answer the trust question were coded as low trust equals zero. Excluding these 18 from the analysis did not qualitatively change the results.

The second specification adds plan knowledge dummies as separate explanatory variables. In the standard specification with our plan knowledge measures under voluntary enrollment, several demographic variables – salary, job tenure, marriage and number of dependents – remain significant. Two of the plan knowledge variables, match available and match close, are significant demonstrating a relationship between participation and knowledge of these features. Meanwhile, under the same specification with automatic enrollment, the demographic effects remain insignificant and only the match available variable is significant. Under both voluntary and automatic enrollment models, the addition of the new plan knowledge and control variables improves the regressions pseudo-R^2s over the standard specification without those variables.

The final specification adds the trust variable to the specification. In both the voluntary enrollment and automatic enrollment specifications, the same variables included in the second specification remain significant. However, in the new regressions, low trust is only significant in the regression associated with the automatically enrolled plans. It is not clear as to why trust is not a factor in the voluntary plan. One explanation is that the samples are fundamentally different. From the summary statistics, the voluntary sample includes higher-educated and higher-salaried employees. In fact, the first three salary quartiles of the automatically enrolled group (those earning less than $43,551) would fall into the first quartile of the voluntary plan (under $47,147). In addition, the voluntary group has only 37 participants with a high school or less education and 119 with graduate-level experience. This contrasts with 88 and 31 participants for the automatically enrolled group, respectively. Perhaps trust is a larger issue in lower-educated, lower-salaried employees, and so its

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

effects are not evident in the voluntary plan where there is less representation of this population. It is also possible that the voluntary employees are in an industry that tends to attract employees that hold more favorable outlooks on financial institutions than the industries associated with the automatically enrolled employees. These explanations need to be tested with more data from additional plans. However, the significance of trust in the automatic enrollment regressions is a noteworthy result because it does show that trust can be an important factor in savings and investment decisions related to retirement.

Taken together, our findings suggest a multi-faceted model of employee savings in 401(k) plans, consistent with models of neo-classical decision agents, information costs and behavioral biases. Our final specification confirms both a neoclassical model for voluntary enrollment, linking savings behavior to various demographic variables such as salary, as well as a behavioral model, in which automatic enrollment eliminates much of these demographic variations. Beyond these explanations, however, our results underscore the importance of behavioral measures such as trust in explaining retirement savings behavior. Furthermore, the results reveal a relationship between plan knowledge and participation that should be explored more to determine causality. If later research demonstrates that plan knowledge leads to participation, then our results are consistent with a model of decision agents constrained by access to appropriate financial information. If causality runs in the other direction, then our results support research suggesting learning through experience. Both have important policy implications. Finally, the significance of trust confirms a new dimension of decision-making in 401(k) savings choices that may or may not be rational, namely, a lack of trust in financial institutions, particularly, but not exclusively, among employees with lower wages and lower levels of educational attainment.

6 Conclusions

Prior research on 401(k) savings behavior has focused on the importance of neoclassical models in explaining variation in savings behavior, or on behavioral biases such as procrastination as impediments to rational decision-making. Automatic enrollment, in particular, has emerged as a response by employers and policymakers to findings of employee procrastination in retirement savings. The strategy is being adopted by employers in the U.S., with active encouragement in the Pension Protection Act of 2006, in an effort to improve savings behavior through default or reframing effects. This paper highlights the importance of two other factors – plan knowledge and trust – in 401(k) savings decisions, and assesses their impact depending on whether the decision is framed as a positive (voluntary) or negative (automatic enrollment) one.

In particular, in voluntary savings arrangements, both demographic characteristics and plan knowledge relate to participation in a 401(k) plan. Specifically, awareness of a 401(k) match and some idea of the specifics of the match correlate with participation. Whether this is because individuals have learned about their plan features through experience or this knowledge drove their participation is not known and should be evaluated in future research. In automatic enrollment arrangements, which

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

tend to minimize demographic variations in savings behavior, what stands out is the role of trust in financial institutions, along with knowledge of an available plan match. As in the voluntary plan, the causality between plan knowledge and participation is unknown. Therefore, taken together, our results cannot reject either a rational information costs model of decision-making (some employees are impeded in their decision-making simply by a lack of adequate financial information) or a behavioral bias theory (some employees are influenced substantially by trust and the framing of the enrollment decision). Furthermore, our trust finding demonstrates that some employees may be influenced by the psychological level of trust they have in financial institutions. This finding is new to 401(k) research, and may also more broadly influence retirement and other savings behavior.

Overall, our findings extend the richness of our understanding of the complex factors underlying savings choices and present further avenues for research. The earliest empirical models of 401(k) savings focused exclusively on voluntary savings choices. Furthermore, they relied on a neoclassical lifecycle framework and incorporated demographic factors, such as age and income, as important related variables. In subsequent studies of automatic enrollment, this approach was extended to include behavioral biases such as procrastination. Our findings contribute to the literature by suggesting an even more nuanced model. First, models of voluntary savings choice ought to incorporate plan knowledge variables as separate, and powerful, explanatory variables. They must also investigate the direction of causality of these variables. Second, even with the introduction of automatic enrollment, which eliminates most of the demographic variation in savings choices, low trust in financial institutions stands out as critical explanation of non-saving behavior. In addition, the significance of the match available variable suggests that once again there may be a link between participation and awareness of plan details that should be explored.

On a practical and policy level, the significance of plan knowledge variables raises important implications that hinge on causality. If plan knowledge leads to participation, then our findings underscore the importance of plan education programs and plan design strategies that focus on raising plan awareness among targeted groups of employees. If causality runs in the opposite direction, then our findings support remedial strategies such as considering changing plan design. In particular, periodically re-enrolling those who quit automatic enrollment arrangements – under the assumptions that plan knowledge and understanding savings and investing may change over time with learning, and that such employees, if re-enrolled, may choose not to quit the second or third time around.

Furthermore, as automatic enrollment becomes more widespread, plan sponsors and policymakers may come to view enrollment communications and 401(k) plan literacy programs generally as superfluous, and quitters as purely rational agents making calculated choices about their future. An alternative view arising from our study is that plan enrollment communications by employers – and retirement education generally by community groups and the government – becomes even more essential in raising plan awareness, and reducing quit rates under automatic enrollment.

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

Our findings also highlight the need for strategies to bolster trust in financial institutions. These include employers and community groups adopting social marketing approaches, such as electing a plan or retirement savings advocate, introducing a trusted peer program or offering seminars designed to increase understanding and trust of financial institutions.

In summary, what emerges from our findings, and the now extensive body of prior research, is a complex and nuanced model of 401(k) retirement savings. It is no longer sufficient to explain savings behavior in terms of purely neoclassical lifecycle models. Literacy effects appear to be pervasive. Even a behaviorally motivated reframing of savings choices under automatic enrollment, while extremely effective, still leaves some room for improvement among a vulnerable subset of employees, those exhibiting mistrust of financial institutions. Our findings suggest several possible avenues for future research, including the ways in which employers, community groups and governments can effectively improve understanding of basic retirement savings concepts and determining the causality between plan knowledge and participation. Furthermore, our sample size of non-participants in automatic enrollment plans was limited in this analysis. While our econometric results were significant, more research on larger samples would be useful to confirm our findings. Additionally, if trust levels in financial institutions drop due to the recent economic events, the long-term repercussions may be far-reaching and long lasting. Therefore, research focusing on how overall trust affects all financial decisions, including retirement decision-making, is now even more important and necessary.

References

Agarwal, S., Driscoll, J. C., Gabaix, X. and Laibson D. I. (2009) The age of reason: financial decisions over the lifecycle with implications for regulation. Working Paper, SSRN. Available at: http://ssrn.com/abstract=973790

Agnew, J. R. and Szykman, L. R. (2005) Asset allocation and information overload: the influence of information displays. *Journal of Behavioral Finance*, **6**(2): 57–70.

Alesina, A. and La Ferrara, E. (2002) Who trusts others? *Journal of Public Economics*, **85**: 207–234.

Behrman, J. R., Mitchell, O. S., Soo, C. and Bravo, D. (2010) Financial literacy, schooling, and wealth accumulation. Working Paper No. 16452, NBER.

Benartzi, S. and Thaler, R. H. (2007) Heuristics and biases in retirement savings behavior. *Journal of Economic Perspectives*, **21**(3): 81–104.

Bernheim, B. D. and Garrett, D. M. (2003) The effects of financial education in the workplace: evidence from a survey of households. *Journal of Public Economics*, **87**: 1487–1519.

Bertrand, M., Mullainathan, S. and Shafir, E. (2006) Behavioral economics and marketing in aid of decision making among the poor. *Journal of Public Policy and Marketing*, **25**(1): 8–23.

Chan, S. and Stevens, A. H. (2008) What you don't know can't help you: pension knowledge and retirement decision making. *Review of Economics and Statistics*, **90**(2): 253–266.

Choi, J. J., Laibson, D. and Madrian, B. C. (2005) $100 bills on the sidewalk: suboptimal saving in 401(k) plans. Working Paper, Harvard University.

Choi, J. J., Laibson, D., Madrian, B. C. and Metrick, A. (2006) Saving for retirement on the path of least resistance. In McCaffrey, Ed and Slemrod, J. (eds), *Behavioral Public Finance: Toward a New Agenda*. New York: Russell Sage Foundation, pp. 304–351.

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press

Duflo, E. and Saez, E. (2003) The role of information and social interactions in retirement plan decisions: evidence from a randomized experiment. *Quarterly Journal of Economics*, **118**(3): 815–842.

Glaeser, E. L., Laibson, D. I., Scheinkman, J. A. and Soutter, C. L. (2000) Measuring trust. *Quarterly Journal of Economics*, **115**(3): 811–846.

Grow, B., Epstein, K., Elgin, B. and Der Hovanesian, M. (2007) The poverty business; inside U.S. companies' audacious drive to extract more profits from the Nation's working poor. *Business Week*, 21 May 2007.

Guiso, L., Sapienza, P. and Zingales, L. (2008) Trusting the stock market. *Journal of Finance*, **63**(6): 2557–2600.

Iyengar, S. S. and Kamenica, E. (2010) Choice proliferation, simplicity seeking and asset allocation. *Journal of Public Economics*, **94**: 530–539.

Knack, S. and Keefer, P. (1997) Does social capital have an economic payoff? A cross-country investigation. *Quarterly Journal of Economics*, **112**(4): 1251–1288.

LaPorta, R., Lopez-de-Silanes, F., Shliefer, A. and Vishny, R. W. (1997) Trust in large organizations. *American Economic Review*, **87**(2): 333–338.

List, J. A. (2004) Neoclassical theory versus prospect theory: evidence from the marketplace. *Econometrica*, **72**(2): 615–625.

Lusardi, A. and Mitchell, O. S. (2006) Financial literacy and planning: implications for retirement wellbeing. Wharton Pension Research Council Working Paper No. 2006-1, Wharton School, University of Pennsylvania. Available at http://www.pensionresearchcouncil.org

Madrian, B. C. and Shea, D. F. (2001) The power of suggestion: inertia in 401(k) participation and savings behavior. *Quarterly Journal of Economics*, **116**: 1149–1525.

Mitchell, O. S., Utkus, S. P. and Yang, T. (2007) Turning workers into savers? Incentives, liquidity and choice in 401(k) plan design. *National Tax Journal*, **LX**(3): 469–489.

Moore, D. (2003) Survey of financial literacy in Washington state: knowledge, behavior, attitudes, and experiences. *Social and Economic Sciences Research Center Technical Report, 03-39*.

Munnell, A. H., Sunden, A. and Taylor, C. (2001/2002) What determines 401(k) participation and contributions? *Social Security Bulletin*, **64**(3): 64–76.

Nessmith, W. E., Utkus, S. P. and Young, J. A. (2007) Measuring the effectiveness of automatic enrollment. Vanguard Center for Retirement Research, available at http://www.vanguard.com/retirementresearch

Nyce, S. A. (2005) The importance of financial communications for participation rates and contribution levels in 401(k) plans. Wharton Pension Research Council Working Paper No. 2005-03, Wharton School, University of Pennsylvania. Available at http://www.pensionresearchcouncil.org

Olsen, R. A. (2008) Trust as risk and the foundation of investment value. *Journal of Socio-Economics*, **37**: 2189–2200.

Sethi-Iyengar, S., Huberman, G. and Jiang, W. (2004) How much choice is too much? Contributions to 401(k) retirement plans. In Mitchell, O. S. and Utkus, S. P. (eds), *Pension Design and Structure: New Lessons From Behavioral Finance*. Oxford, UK: Oxford University Press, pp. 83–95.

Szykman, L., Rahtz, D. R., Plater, M. and Goodwin, G. (2005) Living on the edge: financial services for the lower socio-economic strata. Working Paper, The College of William and Mary.

van Rooij, M., Lusardi, A. and Alessi, R. (2007) Financial literacy and stock market participation. Working Paper No. 2007-162, University of Michigan Retirement Research Center. Available at http://www.mrrc.isr.umich.edu/publications/papers/

Vanguard (2007) How America Saves 2006: A Report on Vanguard 2005 Defined Contribution Plan Data. Available at http://www.vanguard.com/retirementresearch

https://doi.org/10.1017/S1474747211000230 Published online by Cambridge University Press