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FINANCIAL LITERACY, RETIREMENT PREPARATION AND PENSION EXPECTATIONS
IN THE NETHERLANDS

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ABSTRACT

We present new evidence on financial literacy and retirement preparation in the Netherlands based on two surveys conducted before and after the onset of the financial crisis. We document that while financial knowledge did not increase from 2005 to 2010, significantly more individuals planned for their retirement in 2010. At the same time, employees' expectations about the level of their pension income are high compared to what retirement plans may realistically provide. However, financially knowledgeable employees report lower expected replacement rates and acknowledge higher levels of uncertainty. Moreover using instrumental variables estimates for financial knowledge, we find a positive effect of financial literacy on retirement preparation. Employing the panel feature of our dataset, we show that financial knowledge has a causal impact on retirement planning. Our findings suggest that the formation of pension expectations might be an important mechanism contributing to the impact of financial literacy on planning.

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1. Introduction

The typical Dutch employee reports confidence of receipt of a generous pension benefit upon retirement, in sharp contrast with what pension funds can realistically promise to future retirees. This “expectation gap” is the subject of much policy debate in the Netherlands and an important part of the discussions on the need to redesign pension contracts. Current pension arrangements are too ambitious and changes will most likely result in either lower replacement rates or increased dependency upon investment risk, or both. In either case, there is an increasing need for employees to inform themselves and to invest in retirement preparation.

Of great concern is whether Dutch workers have the financial knowledge and skills to collect and process the relevant pension information and save adequately. For example, the government has decided to abolish the so-called AOW partner allowance. Currently, residents aged 65 and older with a partner below age 65 are, under certain conditions, entitled to a supplement on their AOW, i.e., the pay-as-you-go financed state benefit in the Netherlands. The abolishment of the partner allowance will become effective as of 2015. Although announced in 1995, awareness of this policy change seems very limited; yet affected households will forgo up to tens of thousands of euros of pension wealth. Based on a 2005 survey, about two out of three Dutch households have not thought much about their retirement, a measure of retirement planning that is shown to be correlated to saving behavior and wealth accumulation in both the Netherlands and the United States (Van Rooij, Lusardi and Alessie, 2011b; Lusardi and Mitchell 2007). In this paper, we investigate whether levels of financial literacy and retirement preparedness changed in the five years between 2005 and 2010. During that period, discussions of the low solvency of Dutch pension funds, restoring the sustainability of the Dutch pension system, and increasing the pension age may have encouraged retirement preparation in the Netherlands. At the same time, the government and the financial sector developed several initiatives to increase financial awareness. Moreover, in this period we witnessed the biggest financial crisis since the Great Depression.

We commissioned a new survey on financial literacy and retirement preparedness in summer 2010, as part of the Dutch Central Bank Household Survey (DHS). Our main conclusions are as follows: There are vast differences in levels of financial knowledge among the Dutch population: women and those with low levels of education often display a lack of basic financial skills. Moreover, despite the financial crisis and several initiatives to enhance

financial skills, the overall level of financial literacy has not improved compared to the results of the 2005 survey. Nevertheless, based on 2010 results, individuals seem to have increased their preparation for retirement. This might be the result of the policy debate on the future of the Dutch pension system and the deterioration of the solvency position of pension funds. However, when we employ the variation in the financial situation of older siblings and parents, we find that financial literacy is an important determinant of retirement readiness. Moreover, higher levels of financial literacy go hand in hand with lower expected replacement rates given income, age, education, etc. In addition, the perceived level of uncertainty surrounding the estimated replacement rate is higher for employees with more financial knowledge. This suggests that overly high expectations of future retirement benefits are concentrated among individuals with lower levels of financial literacy. An important policy implication is that while the Dutch pension system is about to transfer much more responsibility for retirement financial security to employees, it is important to develop programs to increase financial literacy and pension knowledge and awareness, especially in the more vulnerable groups of the population.

This research is part of an international project on financial literacy around the world. While the financial literacy scores for respondents in the Netherlands are among the highest of participating countries, it should be stressed that it cannot be concluded that the Dutch are better equipped to make financial decisions. The comparison between countries may be hampered by things such as differences in survey methods.

The richness of our data set enables us to come up with a number of novel contributions to the research. First, by employing information on literacy levels and financial situations of parents and siblings of respondents, we are able to go beyond highlighting associations and can make causal inferences on the effect of literacy on retirement planning. Second, in collecting the same type of information in 2005 as in 2010, we are able to exploit the panel component of our survey to circumvent the problem of unobserved individual heterogeneity in studying the effect of financial literacy on retirement planning. Third, by studying pension expectations we are able to shed more light on the mechanism underlying the relationship between literacy and retirement planning. Individuals with low levels of financial knowledge have difficulty forming correct expectations about future replacement rates and do not know at what age to retire. Fourth, an interesting feature of our data set is the fact that it includes information on religion. This enables us to explore the correlation of

financial literacy and retirement planning with religion, a relationship that no other scholars have yet explored.

The outline of the paper is as follows: In Section 2, we briefly explain and describe the Dutch pension system, the current policy debate on pension arrangements, and recent initiatives to increase levels of financial knowledge. In section 3, we provide information on our survey data. In section 4, we introduce the questions used to measure financial literacy and present the distribution of financial knowledge across demographics. In section 5, we discuss to what extent Dutch citizens plan for retirement and the relationship of planning to overall measures of financial literacy. In section 6, we employ the panel component of our survey so as to take into account unobserved individual heterogeneity in assessing the relationship of financial literacy to planning. In section 7, we explore the relationship between financial literacy and the formation of pension expectations. In section 8, we discuss policy implications.

2. The Dutch pension system

Internationally, the Dutch pension system is often set as an example for other countries. There is a pay-as-you-go financed state pension, the AOW, which provides a flat, relatively generous benefit based on the number of years of residence in the Netherlands between the ages of 15 and 65. Beyond that, more than nine out of ten employees save compulsory for an additional pension benefit in their workplace (Van Els, Van Rooij and Schuit 2007). On average, the company pension benefit and the AOW benefit are about equal. The average gross replacement rate provided by these two arrangements combined has been above 80 percent (OECD 2009), a level that makes the additional third pillar savings of minor importance.

Company retirement plans have historically provided little freedom of choice (Van Rooij, Kool, and Prast 2007). Trade unions determine the level of pension contributions and pension funds decide the investment policy. Until the start of the new century, the majority of retirees were entitled to a retirement benefit of 70 percent of their final salary after 35–40 years of work. As the number of retirees was low compared to the number of workers, pension funds were able to exploit intergenerational solidarity among their participants to protect the retirees from shocks to investment returns or longevity. While the ageing of the

population led to a steady increase in the ratio of retirees to workers, a period of strong investment returns in the 1990s enabled pension funds to make payments without endangering solvency ratios. After the dot-com crash, these ratios decreased dramatically and pension funds overwhelmingly exchanged career final wage pension plans for career average wage plans with conditional indexation for active participants and retirees. As these indexation decisions are dependent on solvency ratios, this policy change introduced an important DC element into the Dutch pension system. At the same time, many plan sponsors got rid of the obligation to make additional premium payments to remedy solvency problems. Meanwhile, pension funds communicated that nominal pension rights were guaranteed and that their premium and investment policy was geared to meeting the indexation ambitions with a high level of certainty.

During the financial crisis, pension funds incurred huge investment losses, especially in 2008. And low interest rates plus upward revisions in longevity expectations increased pension costs to unprecedented levels. The government appointed a committee of pension experts that concluded that the current system is not sustainable and that pension ambitions need to be lowered in terms of either the level of benefits or the degree of certainty of receiving this benefit. Either way, it became obvious that it was increasingly important for households to prepare for retirement and to maintain or acquire the necessary financial skills to do so.

The need for increasing financial knowledge and skills was recognized by the Treasury department, which created *CentiQ*, a platform enabling many partners to work together to increase the financial awareness and skills of Dutch consumers. Many initiatives have been developed, often focused on specific target groups (several examples are given by Lusardi and Van Rooij, 2010). If deemed effective, these education programs will be important for household financial behavior and savings outcomes, as previous research using Dutch data has documented a causal link between financial literacy and investment decisions (Van Rooij, Lusardi, and Alessie 2011a).

3. Data set

To study the relationship between financial knowledge and retirement preparation after the financial crisis and the emergence of solvency problems for pension funds, we fielded a new

survey among participants in the CentERpanel between June 25 and July 6, 2010. This panel is run by CentERdata at Tilburg University and contains approximately 2,000 households whose members fill out short questionnaires via the internet on a weekly basis. Annually, panel members provide information on “income, wealth, health, employment, pensions, savings attitudes, and savings behavior” for the DNB Household Survey (DHS), providing researchers with a rich set of background information on the respondents. Households are recruited based upon careful selection procedure to safeguard the representativeness of the Dutch population. The availability of a computer or internet connection is not a prerequisite of the selection procedure, which is done by a combination of recruiting randomly selected households over the phone and by house visits. After having agreed to participate, panel members receive explanation on survey administration, which is conducted via the internet. If necessary, either a computer with internet access or alternative equipment such as a set-top box for communication through the television is provided to respondents. Participants do not receive financial incentives to fill out questionnaires.

To investigate the extent of financial literacy and planning for retirement, we have selected members of the CentERpanel aged 25 years and older, including both the household head and partner, if present. A total of 1,665 respondents have completed the questionnaire, a response rate of 65.4 percent. The average age of respondents is 55 years, 53.0 percent is male, and 4.8 percent did not attain a school diploma after primary education, while 12.7 percent attained a university degree. As high-income respondents are somewhat overrepresented, we use weights to present statistics representative of the Dutch population. Since we fielded a similar survey to the CentERpanel five years earlier, we are able to compare the financial knowledge and intensity of retirement planning well before and after the onset of the financial crisis. Moreover, in our empirical analysis we are able to exploit the panel component for those respondents who participated in both the 2005 and 2010 survey. In particular, we are able to test for attrition bias and for the presence of “learning” among respondents who answered the 2005 questions and to run fixed effect regressions controlling for unobserved individual heterogeneity.

4. Empirical evidence

4.1 How much do individuals know?

We measure financial literacy by using the three questions which were first proposed by Lusardi and Mitchell (2006) for the 2004 U.S. Health and Retirement Study. The first two questions are rather basic and measure respondents' ability to perform simple calculations and understand the effect of inflation. To be able to classify respondents according to different levels of financial sophistication, a third and more complicated question has been added to the module. This question measures understanding of risk diversification. The precise wording of the questions is as follows:

1) *Understanding of Interest Rate (Numeracy)*

Suppose you had €100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow? (i) More than €102; (ii) Exactly €102; (iii) Less than €102; (iv) Do not know; (v) Refusal.

2) *Understanding of Inflation*

Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account? (i) More than today; (ii) Exactly the same; (iii) Less than today; (iv) Do not know; (v) Refusal.

3) *Understanding of Risk and Diversification*

Do you think that the following statement is true or false? Buying a company stock usually provides a safer return than a stock mutual fund. (i) True; (ii) False; (iii) Do not know; (iv) Refusal.

Van Rooij, Lusardi and Alessie (2011a) designed a financial literacy module for the DHS in 2005 that contained the three questions presented above, in addition to other questions. To assess the relevance of the wording financial literacy questions, they inverted the wording of the question on risk diversification and exposed two randomly chosen groups of respondents to the same question but with the different wording. The precise wording is as follows:

3a) Buying a company stock usually provides a safer return than a stock mutual fund. True or false?

3b) Buying a stock mutual fund usually provides a safer return than a company stock. True or false?

Van Rooij et al. (2011a) found that the pattern of answers changed dramatically when the order of the wording was inverted. The number of correct answers was very low when respondents were asked whether “buying a stock mutual fund usually provides a safer return

than a company stock,” but it doubled when respondents were asked the same question but in inverted order. In this study, we do not do any randomization to keep the data for the Netherlands as comparable as possible with the data collected by the other countries participating in the international comparison. However, the results of Van Rooij et al. (2011a) show that our measures of financial literacy (such as the number of correct answers) are rather noisy proxies for the true level of financial knowledge. We will address the problem of measurement error when we assess the effect of financial literacy on retirement planning.

Responses to the three financial literacy questions collected in the 2010 survey are reported in Table 1. Most respondents (84.8 percent) have at least some idea about interest rate calculations, with the percentage of incorrect answers at only 5.2 percent (Table 1a). About 10 percent of individuals refuse or do not know how to respond to this question. About seventy-seven percent of the respondents answer the inflation question correctly and about 11 percent respond incorrectly (Table 1b). To answer the second question correctly, individuals need to have some basic understanding of the concept of inflation and its impact on purchasing power. Obviously, this basic understanding could be higher had the Dutch population gone through a time of high inflation. However, well before the start of the EMU in 1999, the Dutch Central bank closely followed the monetary policy of the German Bundesbank. As Bucher-Koenen and Lusardi (2010) point out, German monetary policy has been quite strict during recent decades. As a result, inflation has been quite low from the mid 1980s onwards.

The proportion of correct answers decreases considerably, to a little more than 50 percent, when we consider the more complex question on risk diversification (Table 1c). Note also that a sizable fraction (35 percent) of respondents either refuse to or are not able to answer the risk diversification question. In order to interpret the low percentage of correct answers, one should realize that the questionnaire is representative of the Dutch population, aged 25 years and older, on an individual level and not on the household level. The sample contains respondents who know much about the household financial situation but also by respondents whose partner is in charge of the household finances. Moreover, one should be aware that the overwhelming majority of the Dutch population neither holds company stocks nor stock mutual funds (see e.g. Alessie, Hochguertel and Van Soest 2002). Furthermore, concepts like “stock mutual funds” are typically not covered in (lower secondary) high schools.

Given the low percentage of correct answers to the risk diversification question, it is not surprising that only 45 percent of respondents answered all questions correctly (Table 1d). A considerable fraction of respondents (73 percent) provided a correct answer to both the interest rate and the inflation question. About 96 percent ($73.36/76.86*100$) of the respondents with a correct answer to the inflation question also answered the interest rate question correctly. Since this percentage is considerably higher than the overall percentage of correct answers to the interest rate question (84.8 percent), one can conclude that there is a strong positive association between the ability of respondents to answer to these two basic literacy questions correctly.

4.2 Who knows the least?

Financial literacy varies widely across demographic variables such as age, gender, education, and socioeconomic status (Table 2).¹ Interestingly, the 65 plus cohort - who actively experienced the high inflation period in the 1970s - scores somewhat better on the inflation question than younger respondents, while the reverse is true for the other two questions and the overall score. Overall, however, differences across age are not statistically significant. These results differ from those found in a number of other studies, which typically show a hump-shaped age profile for financial literacy. See, for example, Agarwal, Driscoll, Gabaix, and Laibson's (2009) work on financial literacy in the United States.

In line with results of other studies, we find large and significant gender differences in financial literacy in the Netherlands: women display much lower knowledge than men, and differences are statistically significant. Notice, however, that women do not give many more incorrect answers than men. Instead they state "do not know" much more often. As expected, financial literacy increases strongly and significantly with level of education. About a third of respondents with primary or lower secondary education answered all literacy questions correctly. Around half of those individuals answered at least one of the three literacy questions with "do not know" or "refuse to answer". Conversely, the majority (70 percent) of respondents with a university degree gave a correct answer to all literacy questions.

¹ Furthermore, financial literacy is significantly and positively correlated with income and home ownership. We do not observe a statistically significant relationship, however, between financial literacy on the one hand and region of residence or urbanization grade on the other hand. These results are not reported in Table 2 but are available from the authors upon request.

Financial literacy is significantly correlated with socioeconomic status. Self-employed respondents not only have higher overall literacy scores but also more often provide a correct answer to each individual literacy question than those who are employed, retired, or unemployed (other than retirees). This is important since the self-employed in the Netherlands have to take care of their own retirement savings, while employees typically participate in their employer's mandatory retirement plan. Employees seem more financially literate than retirees (including those who have retired early), who in turn score much better than unemployed respondents. The latter group includes those who are unemployed but looking for a job, those who are not able to work and receive a disability benefit, and housewives and househusbands.

4.3 Financial literacy across religion

Renneboog and Spaenjers (2010) have used the DHS panel to investigate the differences in economic attitudes and financial decisions between religious and non-religious Dutch households. They find the Netherlands to be an important case study to examine the effect of religion on individual decision making, for two reasons. First, there is considerable variety in religious beliefs in the Netherlands: Catholicism, different types of Protestantism, and several other beliefs (e.g., Islam). Nevertheless, Christian religions dominate in the Netherlands. An essential difference between Catholics and Protestants is that “the former rely on salvation by works with enforcement by the Church and the latter on salvation from divine grace with enforcement from social interaction” (Arruñada 2010). Second, the distinction between religious and non-religious individuals is probably easier to make in the Netherlands than in other countries. Generally, those who claim affiliation with a specific religious denomination also practice their religion.

Renneboog and Spaenjers (2010) find that religious households consider themselves more trusting, have a stronger bequest motive, and—most important for our work—a longer planning horizon. Given this last finding, one would expect that religious individuals put more emphasis on retirement planning than those who are non-religious. We will return to this issue in Section 5 of the paper. Furthermore, Catholics invest less in the stock market. At the same time, in line with the differences between the two Christian religions, Protestants seem to have a weaker internal locus of control than Catholics (i.e. they feel less able to influence the course of their life) but a higher awareness of individual financial responsibility.

Especially in light of the last result, one may expect differences in the level of financial literacy across religious groups. As our survey contains information on religion, we are able to explore this relationship. Our religion variable measures affiliation and does not necessarily capture upbringing and religious attendance. With respect to religion, we make a distinction between no religion (including humanists), Catholic, Protestant (including Evangelicals²), and “other” religions. The last category contains Muslims and other smaller religious groups. Table 3a shows that individuals with religions designated “other” display the least financial literacy. However, we do not find that Protestants are more financially literate than Catholics or non-religious individuals. Individuals of “other” religion report that they “do not know” the answer more often than other groups.

5. Thinking about retirement

5.1 Descriptive evidence

Our main interest is explaining why some households prepare for retirement better than others. To that end, we included the following question in our surveys: How much have you thought about retirement: A lot, some, little, or hardly at all? This question was included in the 2005 DHS questionnaire on financial literacy and in the U.S. HRS (Lusardi and Mitchell 2006), and it is also included in the 2010 DHS questionnaire. As we stated in the introduction, the recent financial crisis has shown that the Dutch pension system is vulnerable to financial market shocks. As a result, Dutch policymakers have proposed additional pension reforms, such as an increase in the statutory retirement age. A key element of the proposals is more individual choice concerning the timing of retirement. Furthermore, the market risk of pension investments will be deferred away from employers, meaning individuals will face more uncertainty with their second pillar pension. In this respect one would expect that in the years since the 2005 survey, individuals will have taken more responsibility in preparing for retirement.

² Evangelicals are conservative Protestants who share a strong belief in a literal interpretation of the Bible and the importance of rebirth. The group of Evangelicals is rather small and we therefore decided to lump them together with the other Protestants.

Table 3b indeed suggests that in 2010 respondents think significantly more about their retirement than they did in 2005 (see the results of the χ^2 -tests).³ This is a comforting result. Nonetheless it should be made clear that about a third of respondents acknowledge that they have thought a little (28.1 percent in 2005; 21.9 percent in 2010) or hardly at all (7 percent in 2005 and 2010) about retirement. Only a small group of respondents (12.9 percent in 2005; 17.1 percent in 2010) has thought a lot about retirement. The majority (about 50 percent) take an intermediate position and report to have thought some about retirement, although not a lot. The picture is even more dramatic if we consider the subsample of non-retirees. Obviously, this is the group of individuals who should be preparing for retirement. Compared with the whole sample, relatively more respondents in this subgroup think hardly at all or not at all about retirement.

Overall, most respondents seem to prepare only to a limited extent for retirement. Moreover, one may debate whether respondents who think a lot or some about retirement are actually thinking about the sufficiency of retirement savings rather than of ways to enjoy life after retirement. Psychological research, however, has shown that having a concrete picture in mind induces action and has a positive effect on the likelihood of taking concrete steps (McCrea et al. 2008). Indeed, the Dutch data show that respondents who think more about retirement not only find it more important to save but also manage to save more (Van Rooij, Lusardi, and Alessie, 2011b). Lusardi and Mitchell (2007) report evidence from the United States showing households who think a little, somewhat, or a lot about retirement accumulate substantially more wealth than those who do not think about retirement at all. For the median household, planners on the verge of retirement hold twice as much wealth as non-planners.

Table 3c summarizes changes in financial literacy between 2005 and 2010. As mentioned in Section 4, we randomized the risk diversification question in 2005 so that half of the sample answered the same question but with an inverted order. Hence, the results presented in left panel of Table 3c should be interpreted with some caution. In the right panel of Table 3c we present a more appropriate comparison, restricting the 2005 sample to respondents who got exactly the same question on risk diversification as the members of the 2010 sample. Table 3c shows that the 2010 respondents have somewhat more trouble in

³ There are some differences in the composition of the 2005 and 2010 samples. In 2005, the financial literacy questionnaire was only filled out by the household member in charge of household finances, whereas in 2010 we selected all household members aged 25 and older, including both the household head and partner, if present. In order to have comparable results, we consider in Table 3b the same group of individuals in 2005 and 2010, i.e. individuals aged 25 or over in charge of household finances.

answering the interest rate and risk diversification questions correctly than the 2005 respondents. This is a worrisome result in light of the fact that given events in the years 2005–2010 and changes at the policy level, individuals should be taking on more responsibility for retirement preparation.⁴

Exploring the correlation between financial literacy and thinking about retirement, we find that respondents who think a lot or some about retirement have, on average, a similar level of financial literacy.⁵ Moreover, these respondents are more financially literate than individuals who think less about retirement. Based on this evidence, in our multivariate analysis we construct a dummy variable for retirement planning that takes on the value 1 if the respondent thinks “a lot” or “some” about retirement and zero otherwise. Table 4 reports the relationship between this dummy variable and financial literacy, showing there is a strong positive correlation between financial literacy and thinking about retirement.

5.2 Multivariate analysis of retirement preparation

In this section, we perform a multivariate analysis of the relationship between retirement planning and financial literacy. We use two different measures for financial literacy: (1) a dummy variable that equals one if a respondent correctly answered all three financial literacy questions, and (2) a variable counting the number of correct answers to these three questions. We include dummy variables that control for age, education, gender, marital status, net monthly household income quartiles, home ownership, and religion to take into account individual heterogeneity that might affect the relationship between retirement planning and financial literacy.

In Table 5 we first report the results of a simple Ordinary Least Squares (OLS) regression of retirement planning on socioeconomic controls and financial literacy. In this analysis we only consider the 2010 sample. Moreover, we select all respondents who are 65 or younger and not yet retired. Notice that our analysis not only refers to individuals in charge of household finances but also to other household members. The results in the first two

⁴ Interestingly, the number of incorrect answers is not so much higher in 2010, rather it is the number of do not know answers that has increased. This suggests that there might be less guessing and overconfidence than was present in 2005.

⁵ Results are available from the authors upon request.

columns of Table 5 show that there is a strong positive relationship between retirement planning and financial literacy. The size of the estimated coefficient for the number of correct questions (0.102, see the second column) suggests that one extra correct answer is associated with an increased probability (by 10 percentage points) of having thought (some or a lot) about retirement. The OLS results also indicate that respondents do not tend to think much about retirement when they are young and retirement is a distant concept. After controlling for literacy, there is no role for education in explaining retirement planning once we control for other individual characteristics. While in raw data men think more often about retirement than women, the effect of gender disappears in the multivariate setting. Interestingly, Catholics think more about retirement than others. This finding is consistent with the results of Renneboog and Spaenjers (2010) who find that, compared with respondents with “other” religions or without religion, Catholics attach more importance to thrift and are more risk averse.

Based on these simple estimates, we cannot yet give a causal interpretation of the relationship between financial literacy and planning. The literacy variable might be endogenous due to reverse causality (by planning more for retirement one becomes more literate) and omitted variables (ability, for example). On the basis of these arguments, one might state that the estimated literacy coefficient is biased upward. On the other hand, Van Rooij et al. (2011a) show that financial literacy is rather difficult to measure. It is likely that financial knowledge is measured with substantial error, which might lead to a downward bias in the estimated financial literacy coefficient.⁶ In either case, we cannot simply rely on the OLS estimates reported in Table 5 to assess the effect of literacy on retirement planning. To remedy this problem, we have collected additional information that can serve as instruments for advanced financial literacy. For this purpose, we asked respondents about the financial experiences of their siblings and parents.⁷ Specifically, we collected information on whether the financial situation of the oldest sibling is “better,” “the same,” or “worse” than the financial situation of the respondent. The experience of siblings is not under the control of the respondent, but respondents can learn from those around them and increase their own financial literacy. One may argue that the experience of siblings can proxy for a common set of preferences or for a family fixed effect. While plausible in theory, the first stage results

⁶ However, it should be realized that since retirement planning and financial literacy are discrete variables, measurement errors are non-classical. In other words, a measurement error in financial literacy might not necessarily lead to attenuation in the estimated financial literacy coefficient but possibly to an upward bias.

⁷ Van Rooij et al. (2011a) also use these instruments.

reported in the second column of Table 6 show that, in fact, if siblings are in worse financial condition than the respondents, respondents are more likely to have higher financial literacy. In addition to the financial situation of siblings, we also consider parents' understanding of financial matters as perceived by the respondent.

The first stage regressions reported in Table 6 show that if one takes the number of correct answers as the measure of financial literacy, the F-statistic is very high and well above the value of 10 recommended to avoid the weak instrument problem (Staiger and Stock 1997; Bound, Jaeger, and Baker 1995). The first-stage results also continue to confirm the relationship between financial literacy and demographic characteristics such as education and gender, reported in Table 2. The estimates in the second stage reported in the third and fourth column of Table 5 show that the relationship between literacy and retirement planning remains positive and statistically significant in the Generalized Method of Moments (GMM) regression. Moreover, the results of the exogeneity test indicate that the OLS estimates differ significantly from the GMM estimates and that therefore the OLS estimates are inconsistent. Moreover, the Hansen's J test does not indicate rejection of the over-identifying restrictions. Overall, our GMM estimates show that financial literacy is an important determinant of retirement planning: Those who have low financial knowledge are less likely to plan for retirement.

6. Financial literacy and retirement planning: Panel estimation results

We next exploit the longitudinal nature of our data set. By merging the 2005 and 2010 survey, we can control for an individual fixed effect and thereby address the problem of omitted variables (such as ability) that could bias our estimates.⁸ Before estimating such models, we checked whether or not respondent attrition from the survey is random. Such a check is important because the attrition rate over the five-year period is rather high (somewhat more than 50 percent in the DHS panel). We split the 2005 sample into two parts: (1) the "stayers," i.e., individuals who are in the data in both 2005 and 2010 and (2) the "movers," i.e., individuals who took part in the survey in 2005 but not in 2010. The attrition is random if, on average, there are no significant differences in retirement planning between the two

⁸ In the fixed effects regressions we only consider respondents who are in charge of household finances as this selection criterion was used in the 2005 survey.

subgroups. The result of an χ^2 test indicates that we cannot reject the null hypothesis that the attrition is random ($\chi^2(1) = 0.513$). Given this result, we can estimate a fixed effects model with some confidence. In the fixed effects models we control for a large number of background characteristics, as we did in the cross-sectional models. Moreover, we include a time dummy and a binary variable, taking into account that in 2005 the risk diversification question was randomized.

Table 7 shows the results of the fixed effects regressions. If we take the number of correct answers as the relevant measure of financial literacy, we find that the “within estimate” of the financial literacy coefficient is positive and statistically significant. In other words, even after controlling for background characteristics and for correlated unobserved heterogeneity, we still find that financial literacy has a significant positive effect on retirement planning. One should however be aware that the fixed effect estimate is possibly still biased due to reverse causality. Moreover, the problem of measurement error is normally exacerbated in a fixed effect regression. In this respect, it is worth noting that we still find a significant estimate of the effect of financial literacy on retirement planning.

The problem of reverse causality can be addressed by relating retirement planning in 2010 with financial literacy in 2005, since time spent thinking about retirement in 2010 should not affect the level of financial knowledge five years earlier. In columns 3 and 4 of Table 7, we show the results of an OLS regression that reports the relationship between thinking about retirement in 2010 and financial literacy level in 2005 (and other explanatory variables measuring personal characteristics and the socioeconomic situation in 2010). Again we find that financial literacy affects retirement planning. The coefficient of the number of correct answers to the three financial literacy questions is significant and is comparable to the coefficient in the fixed effect regressions. It suggests that one additional correct answer on the three financial literacy questions increases the probability of planning for retirement by 6 percentage points.

7. Relationship between financial literacy and pension expectations

The empirical estimates convincingly show that financial literacy is an important determinant of retirement planning. This suggests that implementing policy changes in the Netherlands and shifting investment risk to individuals, as well as introducing uncertainty about

replacement rates should go hand in hand with programs to increase pension knowledge and awareness. For this purpose it is important to better understand the relationship between financial literacy and planning. In this section we explore the relationship between financial literacy and retirement expectations as this might provide information on how financial literacy affects planning for retirement.

7.1 Expected retirement age

We merge our data on financial literacy and retirement planning with information available for employees younger than 65 (from an additional module on pension expectations collected by CentERdata in the autumn of 2010). This survey includes the question: “At which age do you expect to retire?” Respondents can either provide an age or choose the “do not know” option. Table 8 shows the responses. The current statutory retirement age is 65. At the end of 2009, the government proposed a two-step increase in the statutory retirement age: to age 66 in 2020 and to age 67 in 2025. According to this proposal, individuals born in 1959 will receive the public pension (AOW) from age 67 onward and individuals born between 1955 and 1958 will receive the AOW from age 66 onward. The proposal did not imply a change in the statutory retirement age for older generations. Results shown in Table 8 suggest that 22 percent of respondents expect to retire early (i.e., before age 65), a considerable fraction expect to retire after age 65, and, notably, many (more than 25 percent) expect to retire at age 67. A possible explanation for these findings is that the proposed pension reform has led Dutch employees to revise their expectations concerning retirement age.

We investigate the association between financial literacy and the formation of retirement expectations using a multivariate model. In this model we should take into account that a substantial subgroup (10.5 percent) of the respondents answers “don’t know” to the retirement expectation question. It seems likely that the financially illiterate are overrepresented in this subgroup. Therefore we have estimated a two-part model. The first part is a linear probability model that associates the incidence of a do not know answer with a measure of financial literacy, controlling for a large set of background characteristics as done in the analysis of retirement planning behavior. We then select the subsample of respondents who report an expected pension (age) and we regress the expected pension age on a measure

of financial literacy and background characteristics.⁹ The results of the first part of the model are summarized in columns 1 and 2 of Table 9. In the previous sections we have seen that financially illiterate individuals have a lower tendency to think about retirement. Given this result it is not surprising that financial literacy is negatively correlated with the probability of answering don't know on the retirement age expectation question. This result holds true even if we control for education, income, and other individual characteristics (see column 2 of Table 9). Women, younger respondents, those with a low monthly income, and those with "other" religion (e.g., Islam) are more likely to answer the expected retirement age question with don't know.

Columns 3 and 4 of Table 9 show that, conditional upon reporting a retirement age, a financially literate respondent expects to retire later. However, this effect is not significant. The estimation results suggest that to some extent employees take the policy proposal to change the statutory retirement age into account in reporting their expected retirement age. For example, employees born before 1955 expect to retire 1.6 years earlier than workers born after 1975. In line with the policy proposal, those born between 1955 and 1958 expect to retire one year earlier than young employees (year of birth > 1975). Perhaps surprisingly, there is no difference in the retirement age expectation between the group born between 1959 and 1975 and the group born between 1955 and 1958. The estimation results suggest that the expected retirement age is negatively associated with income and that there is no significant relationship with religion.

7.2 Expected replacement rate

Assuming that the typical Dutch employee expects a replacement rate of 70 percent of their final wage income, the Netherlands Authority for the Financial Markets (AFM) asserts that Dutch employees hold overly optimistic expectations. The AFM, in charge of the supervision on pension fund communication and information, has reported a number of calculations showing that for different reasons these replacement rates are not feasible for many Dutch workers. Our survey includes the following question from which the subjective distribution of the replacement rate can be inferred (note that RET_AGE is the retirement age provided by the respondents themselves):

⁹ As we only look at observed correlations, we do not account for selectivity.

Suppose now that you retire at age RET_AGE. Think about your total pension income from public and private pension entitlements. What is the minimum and maximum gross pension income you expect to receive as a percentage of your gross income just before retirement?

- I expect the gross pension income to be at least ... percent of my gross income just before retirement
- I expect the gross pension income to be at most ... percent of my gross income just before retirement

Responses confirm the findings of the AFM. On average, Dutch workers expect to receive a replacement rate upon retirement of between 70 and 80 percent of their final wage, and hence the majority of respondents seem overly optimistic. We have estimated a two-part model to shed light on the relationship between expected replacement rates and individual characteristics. The first part concerns the probability that the respondent is not able to answer this question (i.e., the probability that the respondent chooses the “do not know” option). About 20 percent of respondents answer “do not know.” The second part associates respectively the minimum replacement rate, the range (i.e., the difference between the maximum and minimum replacement rates), and the expected replacement rate on a large number of background characteristics among which are financial literacy and expected retirement age.

Keeping other factors constant, financial literacy is negatively associated with the probability of a do not know answer on the replacement rate question (column 1 of Table 10). This is again a sign that financially literate individuals are more likely to think about retirement and consequently are more likely to report pension expectations than other workers. As in the case of the expected retirement age, women, low-income workers, and employees with “other” religion have a higher tendency to respond “do not know” to replacement rate questions.

Conditional upon giving a valid answer, financial literacy seems to be partially negatively correlated with the (minimum) expected replacement rate (Table 10, columns 2 and 3). Given that most workers are too optimistic about their future pension income, one would expect that financially literate respondents would indeed report a lower expected replacement rate. As the Dutch public pension (AOW) basically provides a minimum flat retirement income for everyone, the replacement rate is likely to be higher for employees with low permanent income. This feature of the Dutch pension system is confirmed in the regression results, provided that one accepts level of education as a proxy for permanent

income: workers with low educational attainment expect higher (minimum) replacement rates than workers with higher levels of education. Financial literacy is negatively associated with the expected replacement rate even if we correct for permanent income proxies such as education. The expected retirement age does not appear to have an effect on the (minimum) expected replacement rate. This result seems to be a bit odd as future pension entitlements would increase if one continued to work longer. However, anticipation of a high replacement could induce workers to retire before the statutory retirement age. Note that Protestants and Catholics expect a lower minimum replacement rate than respondents without a religion.

The recent financial crisis has shown that the Dutch occupational pension system is vulnerable to shocks in financial markets. Pension reforms that are shifting investment risk to retirement plan participants are being discussed. Even without reforms, a number of pension funds have decided to curtail current and future pension benefits due to solvency problems. In order to investigate whether employees realize the uncertainty about current and future pension benefits, we run a regression using the difference between the expected minimum and maximum replacement rates (i.e., a measure of the perceived riskiness of future pensions) on the number of correct answers to the financial literacy questions and other background variables (Table 10, column 4).

Respondents with greater financial sophistication report more uncertainty about future pension benefits than those who are financially illiterate, keeping other factors such as education constant. Compared with workers with low levels of education, those with a university degree are more likely to indicate a higher degree of uncertainty around future benefits. While this is consistent with the uncertainty that is particularly evident among younger well-educated employees regarding the trajectory of their career path, it may in part reflect greater awareness of the increasing imbalance of the pension system and uncertainty about the response by politicians and pension fund boards. The regression results also show that older workers anticipate less variability in future replacement rates than younger workers. This is a plausible result not only because older individuals are closer to retirement, but also because the current Dutch pension system is a defined benefit system, and most pension reform proposals do not affect the pension rights of older individuals in the same way as they affect those of younger workers.

8. Discussion and implications for policy

Our empirical results convincingly show a causal relationship of financial knowledge upon thinking about retirement. We use innovative instrumental variables based upon information about the financial situation and financial knowledge of siblings and parents to correct for reverse causality, and we exploit the panel component of our survey to correct for ability bias and further unobserved individual heterogeneity. These findings are based upon the responses to three financial literacy questions, devised by Lusardi and Mitchell (2006) for the Health and Retirement Survey in the United States, which have proved to provide reliable information on respondents' level of financial knowledge.

Despite several policy initiatives to increase financial awareness and financial knowledge, our research shows that there has been little improvement between 2005 and 2010. Nevertheless, individuals' propensity to plan for retirement *has* increased. This change is not surprising once we realize that worsening pension fund solvency is not only heavily debated in the Netherlands but also directly affects workers and retirees. For a few years now, accumulated pension rights and benefits have often not been indexed to price and wage developments, reducing their value in real terms, and sometimes even nominal pension benefits have been cut. In fact, there is a broad consensus that current pension arrangements are not sustainable and an intense debate is taking place on the design and implementation of new pension contracts.

Our findings show that many Dutch workers hold replacement rate expectations that will likely turn out to be overly optimistic. On top of that, employees are quite confident that they will obtain these overly optimistic replacement rates. It is evident that pension fund companies have, so far, not been successful in effectively communicating what employees can expect from their retirement plan. This will make the transition to new pension contracts entailing reduced replacement rates or reduced levels of certainty even more difficult. The good news is that more literate workers are more likely to be prepared for retirement and are better equipped to form correct pension expectations. More knowledgeable households expect significantly lower replacement rates and recognize that any expectations entail a significant amount of uncertainty. These results are suggestive of more literate household holding more realistic retirement expectations.

The Dutch pension system is about to change from offering retirement plans with little freedom of choice and high levels of benefit certainty to new pension arrangements with

vastly different but as-yet uncertain characteristics. Therefore, it is important to make sure that employees form realistic expectations and that - given limited levels of financial literacy - newly designed pension contracts contain adequate mechanisms to prevent employees from easily making large mistakes in saving for retirement. At the same time, changes in retirement plans could benefit from programs directed at increasing financial literacy and pension knowledge as increased knowledge has been shown to contribute to the formation of realistic retirement expectations and effectively increase planning for retirement among the Dutch population.

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| Table 1a. Interest Question | | |
|------------------------------------|--------------|-----------|
| Weighted percentages | | |
| | Whole sample | Age 25-65 |
| More than 102 euro | 84.83 | 85.54 |
| Exactly 102 euro | 3.44 | 3.01 |
| Less than 102 euro | 1.74 | 2.11 |
| Do not know | 8.90 | 8.26 |
| Refuse to answer | 1.08 | 1.08 |
| Number of observations | 1665 | 1324 |

| Table 1b. Inflation Question | | |
|-------------------------------------|--------------|-----------|
| Weighted percentages | | |
| | Whole sample | Age 25-65 |
| More | 2.74 | 3.09 |
| Exactly the same | 5.65 | 5.77 |
| Less | 76.86 | 75.90 |
| Do not know | 13.54 | 14.01 |
| Refuse to answer | 1.20 | 1.24 |
| Number of observations | 1665 | 1324 |

| Table 1c. Risk Question | | |
|--------------------------------|--------------|-----------|
| Weighted percentages | | |
| | Whole sample | Age 25-65 |
| Correct "false" | 51.91 | 53.29 |
| Incorrect "true" | 13.32 | 11.98 |
| Do not know | 33.20 | 32.86 |
| Refuse to answer | 1.57 | 1.87 |
| Number of observations | 1665 | 1324 |

| Table 1d. Answers across Questions | | |
|---|--------------|-----------|
| Weighted percentages | | |
| | Whole sample | Age 25-65 |
| Interest & Inflation correct | 73.36 | 73.11 |
| All correct | 44.83 | 46.18 |
| No correct | 10.46 | 10.45 |
| At least 1 "Do not know" | 37.60 | 37.25 |
| All "Do not know" | 8.07 | 8.24 |
| Number of observations | 1665 | 1324 |

| Table 2. Distribution of Financial Literacy across Demographics | | | | | | | | |
|--|-------------------|-------|--------------------|-------|---------------|-------|-----------|-------------|
| Weighted percentages | | | | | | | | |
| | Interest question | | Inflation question | | Risk question | | Overall | |
| | Correct | DK | Correct | DK | Correct | DK | 3 correct | ≥ 1 DK |
| Age | | | | | | | | |
| 35 and younger | 84.67 | 8.89 | 76.17 | 16.70 | 52.51 | 32.29 | 45.97 | 34.32 |
| 36 to 50 | 85.13 | 10.68 | 74.24 | 17.32 | 52.71 | 35.89 | 45.83 | 38.34 |
| 51 to 65 | 86.57 | 8.22 | 77.48 | 12.04 | 54.43 | 35.16 | 46.70 | 38.07 |
| Older than 65 | 82.10 | 12.44 | 80.60 | 12.79 | 46.56 | 34.92 | 39.57 | 38.94 |
| Gender | | | | | | | | |
| Male | 86.63 | 9.31 | 81.91 | 11.06 | 62.03 | 27.50 | 55.06 | 29.04 |
| Female | 83.10 | 10.63 | 71.99 | 18.30 | 42.14 | 41.79 | 34.96 | 45.85 |
| Education | | | | | | | | |
| Primary | 70.24 | 18.29 | 65.62 | 19.49 | 41.68 | 48.53 | 28.01 | 54.36 |
| Lower secondary | 79.81 | 15.18 | 66.00 | 20.73 | 45.76 | 40.89 | 35.10 | 44.88 |
| Middle secondary | 85.30 | 8.90 | 75.28 | 16.55 | 47.43 | 34.87 | 41.66 | 38.07 |
| Upper secondary | 91.48 | 4.95 | 88.00 | 7.54 | 59.42 | 25.86 | 54.40 | 26.56 |
| Higher vocational | 89.45 | 6.78 | 85.80 | 9.52 | 59.70 | 29.68 | 55.38 | 30.81 |
| University | 95.66 | 2.63 | 94.79 | 4.81 | 72.40 | 23.19 | 69.76 | 24.11 |
| Self-employed, non-employed, workers, and retired | | | | | | | | |
| Self-employed | 86.54 | 8.99 | 78.30 | 13.13 | 55.34 | 33.28 | 50.15 | 34.39 |
| Non-employed | 87.84 | 6.66 | 84.39 | 13.54 | 65.53 | 23.99 | 57.96 | 28.14 |
| Workers | 78.94 | 12.49 | 68.05 | 21.63 | 40.90 | 43.43 | 28.30 | 50.14 |
| Retired | 85.86 | 10.81 | 80.31 | 11.89 | 50.82 | 32.58 | 44.97 | 35.24 |

| Table 3a. Distribution of Financial Literacy across Religion | | | | | | | | |
|---|-------------------|-------|--------------------|-------|---------------|-------|-----------|-------------|
| Weighted percentages | | | | | | | | |
| | Interest question | | Inflation question | | Risk question | | Overall | |
| | Correct | DK | Correct | DK | Correct | DK | 3 correct | ≥ 1 DK |
| No religion | 86.03 | 9.47 | 78.92 | 13.34 | 53.57 | 34.42 | 46.97 | 36.35 |
| Roman-catholic | 84.79 | 9.84 | 74.32 | 16.58 | 54.20 | 32.29 | 44.82 | 36.26 |
| Protestant | 83.48 | 9.59 | 78.94 | 10.64 | 50.50 | 31.73 | 43.82 | 35.84 |
| Other religion | 81.74 | 14.58 | 69.18 | 26.94 | 37.08 | 54.92 | 35.15 | 54.92 |

| Table 3b. Retirement Planning across Years | | | | | | |
|---|----------------|------|-------|---------------------------------|------|-------|
| Weighted percentages | | | | | | |
| | Whole sample | | | Non-retired, age 65 and younger | | |
| | 2005 | 2010 | Total | 2005 | 2010 | Total |
| Thought about retirement | | | | | | |
| A lot | 12.9 | 17.1 | 14.7 | 9.7 | 13.2 | 11.2 |
| Some | 51.1 | 52.4 | 51.6 | 51.6 | 53.1 | 52.3 |
| Little | 28.1 | 21.9 | 25.4 | 28.7 | 24.7 | 27.0 |
| Hardly at all | 7.2 | 7.0 | 7.1 | 9.0 | 6.7 | 8.0 |
| Do not know/Refusal | 0.8 | 1.7 | 1.1 | 1.0 | 2.2 | 1.5 |
| Number of observations | 1498 | 1138 | 2636 | 1028 | 769 | 1797 |
| χ^2 - statistic (p-value) | 15.73 (0.0034) | | | 9.77 (0.0444) | | |

Note: Respondents are in charge of household finances and at least 25 years old

| Table 3c. Financial Literacy across Years | | | | | | | | | |
|--|-----------|-------------------|------|--------------------|------|----------------|------|-----------|---------|
| Weighted fractions | | | | | | | | | |
| Whole sample | | | | | | | | | |
| | | Interest question | | Inflation question | | Risk question | | Overall | |
| Year | N of obs. | Correct | DK | Correct | DK | Correct | DK | 3 correct | >= 1 DK |
| 2005 | 1498 | 0.91 | 0.04 | 0.83 | 0.09 | 0.48 | 0.27 | 0.43 | 0.30 |
| 2010 | 1138 | 0.86 | 0.09 | 0.81 | 0.12 | 0.56 | 0.33 | 0.50 | 0.35 |
| Total | 2636 | 0.89 | 0.06 | 0.82 | 0.10 | 0.52 | 0.30 | 0.46 | 0.32 |
| χ^2 -statistic (p-value) | | 23.17 (0.0000) | | 4.94 (0.1760) | | 76.90 (0.0000) | | | |
| 2005 sample restricted to respondents who got the same risk question as 2010 sample | | | | | | | | | |
| | | Interest question | | Inflation question | | Risk question | | Overall | |
| Year | N of obs. | Correct | DK | Correct | DK | Correct | DK | 3 correct | >= 1 DK |
| 2005 | 755 | 0.91 | 0.04 | 0.82 | 0.08 | 0.63 | 0.24 | 0.56 | 0.27 |
| 2010 | 1138 | 0.86 | 0.09 | 0.81 | 0.12 | 0.56 | 0.33 | 0.50 | 0.35 |
| Total | 1893 | 0.88 | 0.07 | 0.81 | 0.11 | 0.59 | 0.30 | 0.52 | 0.32 |
| χ^2 -statistic (p-value) | | 14.00 (0.0029) | | 4.49 (0.2127) | | 11.99 (0.0024) | | | |

Note: Respondents are in charge of household finances and at least 25 years old

| Table 4. Financial Literacy by Retirement Planning | | |
|---|----------|--------------|
| Weighted percentages | | |
| | Planners | Non-planners |
| <i>Interest question</i> | | |
| Correct | 90.61 | 77.14 |
| Do not know | 4.24 | 17.32 |
| <i>Inflation question</i> | | |
| Correct | 81.00 | 67.32 |
| Do not know | 9.06 | 25.48 |
| <i>Risk question</i> | | |
| Correct | 62.15 | 39.05 |
| Do not know | 25.74 | 48.93 |
| <i>Overall</i> | | |
| Interest and inflation correct | 77.85 | 64.86 |
| All correct | 52.96 | 34.88 |
| At least one DK | 28.67 | 51.00 |

| Table 5. Multivariate Analysis of Retirement Planning | | | | |
|--|-------------------------|-------------------------|-------------------------|-------------------------|
| | OLS | GMM | OLS | GMM |
| All three correct | 0.126*** (0.0308) | 0.595*** (0.173) | | |
| Number correct | | | 0.101*** (0.0175) | 0.175*** (0.0448) |
| Age | 0.0210 (0.0159) | 0.0147 (0.0178) | 0.0219 (0.0156) | 0.0217 (0.0155) |
| Age squared | -0.000166 (0.000168) | -0.000107 (0.000188) | -0.000178 (0.000165) | -0.000180 (0.000164) |
| Female | -0.0276 (0.0280) | 0.0573 (0.0447) | -0.0235 (0.0275) | -0.000530 (0.0300) |
| <i>Education dummies (base: primary education)</i> | | | | |
| Lower secondary | 0.104 (0.0791) | 0.0562 (0.0862) | 0.0982 (0.0766) | 0.0887 (0.0759) |
| Middle secondary | 0.0900 (0.0823) | 0.00511 (0.0941) | 0.0721 (0.0800) | 0.0452 (0.0813) |
| Upper secondary | 0.0745 (0.0881) | -0.0593 (0.108) | 0.0466 (0.0856) | 0.00244 (0.0889) |
| Higher vocational | 0.159* (0.0812) | 0.0390 (0.0976) | 0.141* (0.0789) | 0.105 (0.0802) |
| University | 0.125 (0.0869) | -0.0420 (0.112) | 0.101 (0.0845) | 0.0584 (0.0876) |
| <i>Quartile dummies monthly net household income (base: lowest quartile)</i> | | | | |
| Second income quartile | 0.0217 (0.0542) | 0.0202 (0.0576) | 0.00883 (0.0530) | 0.00445 (0.0529) |
| Third income quartile | 0.0214 (0.0573) | -0.0570 (0.0700) | 5.78e-05 (0.0565) | -0.0254 (0.0598) |
| Highest income quartile | 0.111* (0.0610) | 0.0326 (0.0733) | 0.0929 (0.0595) | 0.0683 (0.0620) |
| Income not known | -0.0181 (0.146) | -0.0636 (0.114) | 0.00937 (0.130) | 0.0215 (0.112) |
| Home-owner | 0.0789** (0.0397) | 0.0219 (0.0495) | 0.0786** (0.0391) | 0.0696* (0.0400) |
| <i>Marital status (base: single)</i> | | | | |
| Married, no children | 0.0122 (0.0470) | 0.0707 (0.0552) | 0.00473 (0.0460) | 0.0115 (0.0457) |
| Married, children | -0.0812 (0.0721) | 0.00528 (0.0814) | -0.0813 (0.0707) | -0.0593 (0.0703) |
| Single parent, other | -0.0866 (0.0847) | -0.0265 (0.0929) | -0.0729 (0.0825) | -0.0436 (0.0821) |
| Number of children | -0.00161 (0.0279) | -0.00740 (0.0293) | -0.000379 (0.0275) | -0.00270 (0.0272) |
| <i>Socio-economic status (base: employee)</i> | | | | |
| Self-employed | 0.0252 (0.0511) | 0.00374 (0.0598) | 0.0171 (0.0514) | 0.00413 (0.0527) |
| Non-employed | -0.0501 (0.0377) | -0.0341 (0.0421) | -0.0560 (0.0373) | -0.0556 (0.0374) |
| <i>Religion (base: no religion)</i> | | | | |
| Roman-catholic | 0.0781** (0.0342) | 0.0776** (0.0371) | 0.0787** (0.0338) | 0.0833** (0.0335) |
| Protestant | 0.0179 (0.0396) | 0.0139 (0.0426) | 0.0190 (0.0389) | 0.0218 (0.0385) |
| Other religion | -0.0332 (0.0597) | -0.0234 (0.0667) | -0.0257 (0.0608) | -0.0179 (0.0620) |
| Constant | -0.211 (0.374) | -0.194 (0.413) | -0.356 (0.368) | -0.483 (0.370) |
| Number of observations | 1166 | 1166 | 1166 | 1166 |
| R-squared | 0.095 | -0.112 | 0.113 | 0.095 |
| p-value age, age squared | 0.00216 | 0.0314 | 0.00331 | 0.00685 |
| p-value education | 0.280 | 0.328 | 0.269 | 0.258 |
| p-value income | 0.117 | 0.233 | 0.131 | 0.169 |
| p-value marital status | 0.504 | 0.503 | 0.581 | 0.735 |
| p-value socio-economic status | 0.328 | 0.710 | 0.279 | 0.316 |
| p-value religion | 0.0860 | 0.153 | 0.0892 | 0.0698 |
| F-statistic first stage regression | | 9.608 | | 19.37 |
| p-value exogeneity test | | 0.00760 | | 0.0817 |
| p-value Hansen OIR test | | 0.170 | | 0.198 |

Note: Standard errors reported in parentheses are clustered at the household level; *** p<0.01, ** p<0.05, * p<0.1

| Table 6. First Stage Regressions | | |
|--|-------------------------|-------------------------|
| | All three correct | Number correct |
| Financial situation oldest sibling (base: no sibling, do not know) | | |
| Worse | 0.0849* (0.0469) | 0.338*** (0.0970) |
| The same or better | 0.0422 (0.0417) | 0.307*** (0.0899) |
| Parents' understanding of financial matters (base: low) | | |
| Intermediate or high | 0.00360 (0.0394) | 0.0385 (0.0691) |
| DK | -0.238*** (0.0586) | -0.759*** (0.132) |
| Age | 0.0166 (0.0159) | 0.0204 (0.0287) |
| Age squared | -0.000155 (0.000169) | -0.000152 (0.000305) |
| Female | -0.186*** (0.0284) | -0.292*** (0.0477) |
| <i>Education dummies (base: primary education)</i> | | |
| Lower secondary | 0.0820 (0.0656) | 0.148 (0.138) |
| Middle secondary | 0.149** (0.0696) | 0.304** (0.142) |
| Upper secondary | 0.249*** (0.0769) | 0.509*** (0.151) |
| Higher vocational | 0.203*** (0.0692) | 0.355** (0.140) |
| University | 0.310*** (0.0726) | 0.530*** (0.143) |
| <i>Quartile dummies monthly net household income (base: lowest quartile)</i> | | |
| Second income quartile | -0.00152 (0.0487) | 0.0831 (0.0990) |
| Third income quartile | 0.156*** (0.0526) | 0.354*** (0.104) |
| Highest income quartile | 0.162*** (0.0578) | 0.338*** (0.111) |
| Income not known | 0.123 (0.145) | -0.0724 (0.365) |
| Home-owner | 0.127*** (0.0365) | 0.165** (0.0682) |
| <i>Marital status (base: single)</i> | | |
| Married, no children | -0.137*** (0.0455) | -0.0973 (0.0841) |
| Married, children | -0.166** (0.0683) | -0.176 (0.134) |
| Single parent, other | -0.0827 (0.0752) | -0.208 (0.155) |
| Number of children | 0.00406 (0.0262) | -0.0127 (0.0495) |
| <i>Socio-economic status (base: employee)</i> | | |
| Self-employed | 0.0189 (0.0530) | 0.0365 (0.0867) |
| Non-employed | -0.0196 (0.0385) | 0.0264 (0.0699) |
| <i>Religion (base: no religion)</i> | | |
| Roman-catholic | 0.0145 (0.0350) | 0.0166 (0.0630) |
| Protestant | 0.00763 (0.0401) | -0.0218 (0.0722) |
| Other religion | -0.00600 (0.0557) | -0.0445 (0.101) |
| Constant | -0.100 (0.372) | 1.024 (0.684) |
| Number of observations | 1166 | 1166 |
| R-squared | 0.170 | 0.237 |
| p-value age, age squared | 0.282 | 0.110 |
| p-value education | 2.57e-05 | 2.76e-05 |
| p-value income | 0.000683 | 0.00121 |
| p-value marital status | 0.0143 | 0.449 |
| p-value socio-economic status | 0.791 | 0.880 |
| p-value religion | 0.972 | 0.919 |
| F-statistic first stage regression | 9.608 | 19.37 |

Note: Clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

| Table 7. Retirement Planning and Financial Literacy: Fixed Effects and Dynamic Regressions | | | | |
|---|---------------------------|-------------------------|---------------------------|---------------------------|
| | Fixed Effects Regressions | | Dynamic Regressions | |
| All three correct | 0.0133 (0.0424) | | | |
| All three correct in 2005 | | | 0.0700 (0.0447) | |
| Number correct | | 0.0573** (0.0278) | | |
| Number correct in 2005 | | | | 0.0609** (0.0283) |
| Time dummy (equals 1 in 2010) | 0.221* (0.124) | 0.216* (0.123) | | |
| Dummy for alternative risk question in 2005 | 0.0630 (0.0529) | 0.0472 (0.0514) | | |
| Age | | | 0.0703*** (0.0265) | 0.0700*** (0.0266) |
| Age squared | -0.000410 (0.000276) | -0.000402 (0.000274) | -0.000676** (0.000277) | -0.000675** (0.000278) |
| Female | | | 0.0625 (0.0449) | 0.0588 (0.0439) |
| <i>Education dummies (base: primary education)</i> | | | | |
| Lower secondary | -0.0924 (0.124) | -0.0744 (0.128) | 0.0332 (0.107) | 0.0334 (0.106) |
| Middle secondary | 0.0430 (0.133) | 0.0405 (0.136) | 0.0694 (0.108) | 0.0629 (0.106) |
| Upper secondary | 0.292 (0.220) | 0.304 (0.222) | 0.0435 (0.113) | 0.0250 (0.112) |
| Higher vocational | 0.190* (0.111) | 0.219* (0.117) | 0.0678 (0.106) | 0.0565 (0.104) |
| University | 0.553** (0.257) | 0.553** (0.257) | 0.0493 (0.114) | 0.0343 (0.112) |
| <i>Quartile dummies monthly net household income (base: lowest quartile)</i> | | | | |
| Second income quartile | 0.0744 (0.0785) | 0.0539 (0.0773) | 0.0339 (0.0729) | 0.0337 (0.0724) |
| Third income quartile | -0.0422 (0.104) | -0.0633 (0.103) | 0.140* (0.0778) | 0.128 (0.0779) |
| Highest income quartile | 0.118 (0.137) | 0.0857 (0.137) | 0.202** (0.0865) | 0.196** (0.0861) |
| <i>Marital status (base: single)</i> | | | | |
| Married, no children | 0.0744 (0.0785) | 0.0539 (0.0773) | 0.0339 (0.0729) | 0.0337 (0.0724) |
| Married, children | -0.0422 (0.104) | -0.0633 (0.103) | 0.140* (0.0778) | 0.128 (0.0779) |
| Single parent, other | 0.118 (0.137) | 0.0857 (0.137) | 0.202** (0.0865) | 0.196** (0.0861) |
| Number of children | -0.0979* (0.0579) | -0.0971* (0.0579) | 0.0645 (0.0398) | 0.0672* (0.0390) |
| <i>Socio-economic status (base: employee)</i> | | | | |
| Self-employed | -0.0501 (0.134) | -0.0735 (0.131) | 0.0938 (0.0628) | 0.0928 (0.0632) |
| Non-employed | -0.114 (0.0790) | -0.126 (0.0798) | -0.0364 (0.0595) | -0.0375 (0.0593) |
| Constant | 1.366** (0.567) | 1.243** (0.562) | -1.312** (0.618) | -1.391** (0.618) |
| Number of observations | 1784 | 1784 | 472 | 472 |
| R-squared | 0.080 | 0.088 | 0.115 | 0.119 |
| p-value age, age squared | 0.137 | 0.142 | 0.00347 | 0.00444 |
| p-value education | 0.248 | 0.205 | 0.980 | 0.986 |
| p-value income | 0.0265 | 0.0404 | 0.0491 | 0.0675 |
| p-value marital status | 0.105 | 0.107 | 0.00407 | 0.00375 |
| p-value socio-economic status | 0.350 | 0.288 | 0.228 | 0.236 |
| Number of unique respondents | 1338 | 1338 | 472 | 472 |

Note: Standard errors reported in parentheses are clustered at the household level; *** p<0.01, ** p<0.05, * p<0.1

| Table 8. Expected Retirement Age of Employees | | | |
|--|-----------|-------------|------------|
| Weighted percentages | | | |
| Expected Retirement Age | Frequency | Percentages | Cumulative |
| 50 | 4 | 0.64 | 0.64 |
| 55 | 7 | 1.11 | 1.75 |
| 56 | 2 | 0.29 | 2.03 |
| 58 | 5 | 0.73 | 2.76 |
| 59 | 1 | 0.08 | 2.84 |
| 60 | 30 | 4.63 | 7.47 |
| 61 | 4 | 0.60 | 8.08 |
| 62 | 53 | 8.01 | 16.09 |
| 63 | 27 | 4.09 | 20.18 |
| 64 | 9 | 1.42 | 21.60 |
| 65 | 198 | 30.07 | 51.67 |
| 66 | 57 | 8.62 | 60.30 |
| 67 | 169 | 25.73 | 86.02 |
| 68 | 11 | 1.72 | 87.74 |
| 70 | 9 | 1.41 | 89.16 |
| 75 | 2 | 0.37 | 89.52 |
| Do not know | 69 | 10.48 | 100.00 |
| Total | 657 | 100.00 | |

| Table 9. Financial Literacy and Pension Retirement Expectations | | | | |
|--|---------------------------------|------------------------|-------------------------|----------------------|
| | Expected Retirement Age Unknown | | Expected Retirement Age | |
| Number correct | -0.0734*** (0.0161) | -0.0613*** (0.0150) | 0.0843 (0.130) | 0.0859 (0.137) |
| <i>Year of birth (base: birth year > 1975)</i> | | | | |
| 1959 <= year of birth <= 1975 | | -0.0300 (0.0337) | | -0.910** (0.429) |
| 1955 <= year of birth <= 1958 | | -0.0179 (0.0398) | | -1.019** (0.434) |
| Year of birth < 1955 | | -0.0591* (0.0311) | | -1.559*** (0.385) |
| Female | | 0.0414** (0.0202) | | -0.368* (0.217) |
| <i>Education dummies (base: primary education)</i> | | | | |
| Lower secondary | | -0.0737 (0.0811) | | -0.252 (0.498) |
| Middle secondary | | -0.0291 (0.0822) | | -0.520 (0.511) |
| Upper secondary | | -0.0113 (0.0880) | | -0.156 (0.549) |
| Higher vocational | | -0.0729 (0.0801) | | 0.108 (0.506) |
| University | | -0.0646 (0.0821) | | -0.00437 (0.620) |
| <i>Quartile dummies monthly net household income (base: lowest quartile)</i> | | | | |
| Second income quartile | | -0.0395 (0.0354) | | -0.171 (0.360) |
| Third income quartile | | -0.0342 (0.0364) | | -0.370 (0.360) |
| Highest income quartile | | -0.0831** (0.0360) | | -0.893** (0.371) |
| Income not known | | 0.289 (0.241) | | 1.521*** (0.490) |
| <i>Marital status (base: single)</i> | | | | |
| Married, no children | | 0.0189 (0.0325) | | -0.173 (0.380) |
| Married, children | | 0.0212 (0.0468) | | 0.0864 (0.536) |
| Single parent, other | | -0.00919 (0.0511) | | 0.506 (0.525) |
| Number of children | | 0.00293 (0.0173) | | 0.0198 (0.187) |
| <i>Religion (base: no religion)</i> | | | | |
| Roman-catholic | | -0.0205 (0.0195) | | -0.457* (0.250) |
| Protestant | | 0.00292 (0.0249) | | -0.122 (0.337) |
| Other religion | | 0.171** (0.0760) | | -0.235 (0.444) |
| Constant | 0.242*** (0.0440) | 0.288*** (0.107) | 64.54*** (0.332) | 66.35*** (0.825) |
| Number of observations | 657 | 657 | 611 | 611 |
| R-squared | 0.068 | 0.142 | 0.001 | 0.071 |
| p-value year of birth | | 0.163 | | 0.000167 |
| p-value education | | 0.419 | | 0.438 |
| p-value income | | 0.208 | | 2.06e-05 |
| p-value marital status | | 0.870 | | 0.506 |
| p-value religion | | 0.0680 | | 0.335 |

Note: Standard errors reported in parentheses are clustered at the household level; *** p<0.01, ** p<0.05, * p<0.1

| Table 10. Financial Literacy and Replacement Rate Expectations | | | | |
|--|--|------------------------------|--------------------------------------|---------------------------|
| | Do not Know Expected Replacement Rate | Expected Replacement Rate | Expected Minimum Replacement Rate | Range Replacement Rate |
| Number correct | -0.110*** (0.0207) | -1.232* (0.736) | -1.972*** (0.688) | 1.354*** (0.437) |
| Expected Retirement Age | 0.00496 (0.00582) | 0.0804 (0.264) | 0.231 (0.269) | -0.0136 (0.195) |
| <i>Year of birth (base: yob > 1975)</i> | | | | |
| 1959 <= year of birth <= 1975 | -0.0121 (0.0444) | -4.827*** (1.802) | -2.798 (1.822) | -4.689*** (1.234) |
| 1955 <= year of birth <= 1958 | 0.0540 (0.0570) | -1.446 (2.145) | 1.395 (2.220) | -4.938*** (1.433) |
| Year of birth < 1955 | -0.0374 (0.0484) | -1.389 (1.942) | 2.811 (1.958) | -8.547*** (1.305) |
| Female | 0.0655** (0.0322) | -1.078 (1.205) | -1.187 (1.209) | 1.160 (0.777) |
| <i>Education dummies (base: primary education)</i> | | | | |
| Lower secondary | -0.00756 (0.120) | -9.878* (5.839) | -10.44* (5.871) | 2.161 (1.476) |
| Middle secondary | -0.0461 (0.119) | -9.617* (5.788) | -9.253 (5.838) | 1.212 (1.443) |
| Upper secondary | -0.0116 (0.123) | -11.30* (6.169) | -12.31** (6.171) | 3.520** (1.699) |
| Higher vocational | -0.0458 (0.117) | -9.559 (5.989) | -10.65* (6.009) | 3.159** (1.466) |
| University | -0.0499 (0.118) | -14.22** (6.066) | -15.32** (6.100) | 4.208** (1.633) |
| <i>Quartile dummies monthly net household income (base: lowest quartile)</i> | | | | |
| Second income quartile | -0.113 (0.0752) | -3.238 (4.399) | -2.814 (4.242) | -1.496 (1.971) |
| Third income quartile | -0.155** (0.0759) | -2.098 (4.380) | -2.113 (4.238) | -0.687 (2.098) |
| Highest income quartile | -0.217*** (0.0780) | -2.737 (4.625) | -2.350 (4.477) | -1.755 (2.135) |
| Income not known | 0.349 (0.270) | | -15.71*** (4.755) | -1.127 (2.399) |
| <i>Marital status (base: single)</i> | | | | |
| Married, no children | -0.0122 (0.0511) | -1.227 (1.960) | -1.040 (1.896) | -0.981 (1.223) |
| Married, children | 0.0360 (0.0726) | -1.404 (2.854) | -0.617 (2.744) | -1.907 (1.646) |
| Single parent, other | 0.0708 (0.0919) | 1.151 (3.366) | 2.859 (3.686) | -4.312** (2.189) |
| Number of children | -0.0244 (0.0259) | 1.042 (1.067) | 0.896 (1.076) | 0.232 (0.572) |
| <i>Religion (base: no religion)</i> | | | | |
| Roman-catholic | 0.00262 (0.0353) | -1.745 (1.589) | -1.646 (1.537) | -0.567 (0.883) |
| Protestant | 0.0593 (0.0381) | -2.134 (1.295) | -2.481* (1.334) | 0.267 (0.882) |
| Other religion | 0.188** (0.0853) | -0.348 (2.641) | -1.087 (2.772) | 0.960 (1.798) |
| Constant | 0.276 (0.414) | 87.92*** (18.48) | 72.13*** (18.79) | 14.46 (12.79) |
| Number of observations | 649 | 497 | 527 | 526 |
| R-squared | 0.173 | 0.0770 | 0.111 | 0.174 |
| p-value year of birth | 0.367 | 0.0183 | 0.00170 | 1.13e-10 |
| p-value education | 0.916 | 0.0287 | 0.00715 | 0.0663 |
| p-value income | 0.00924 | 0.819 | 2.49e-05 | 0.700 |
| p-value marital status | 0.799 | 0.747 | 0.649 | 0.271 |
| p-value religion | 0.0752 | 0.361 | 0.302 | 0.800 |

Note: Standard errors reported in parentheses are clustered at the household level; *** p<0.01, ** p<0.05, * p<0.1