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Pension Uncertainty and Demand for Retirement Saving

Tullio Jappelli, Immacolata Marino and Mario Padula

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Pension Uncertainty and Demand for Retirement Saving

Tullio Jappelli[*], Immacolata Marino[**], Mario Padula[***]

Abstract
According to the life-cycle model, if there is an expectation that social security benefits will fall, demand for retirement saving should increase. In precautionary saving models, the risk associated to future benefits matters and, if benefits become more uncertain, individuals will react by increasing their demand for retirement saving. To assess the empirical relevance of this mechanism, we rely on unique Italian data to obtain individual level measures of the subjective distribution of the social security benefit replacement rate. Italy is an interesting example, because of the frequent changes to eligibility rules and benefits implemented in the past thirty years, fueling individual uncertainty about future pension outcomes. We find evidence of wide cross-sectional heterogeneity in both the location and scale of the subjective replacement rate distribution. Our results indicate higher participation in private pension funds among individuals who expect lower and more uncertain replacement rates.

JEL Classifications: D12, D14, E21

Keywords: Pension uncertainty; Retirement saving; Subjective distributions; Social security.

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1. Introduction

In January 2019, the newly elected Italian government passed a law to reduce the retirement age of public and private employees, and to reduce the number of years of contributions required to be eligible for social security benefits. The implication is that cohorts of workers born in the 1950s will retire earlier than originally anticipated, and receive a public pension lower than they had expected. The new regime will apply for a period of three years afterward which time it remains unclear whether the legislation will remain in place. This is one of many examples of the kinds of uncertainty that workers are facing when planning for their retirement. During the working lives of employed people, eligibility rules, accrual rates, indexation rules, and other features of the social security system change - often in dramatic ways. Some other examples of changes and sources of uncertainty include the slow transition from an earnings to a contributions model to compute the benefits for new generations of workers, the frequent changes to the retirement age, and the different eligibility rules applying to men and to women and to particular groups of workers.

Even without any pension reforms, predicting future benefits is difficult - particularly for young workers, because of the lack of certainty about income during the working life, aggregate employment and productivity growth, and population-wide survival rates. In short, future pension levels reflect idiosyncratic risk, aggregate risk, and political risks related to future reforms. This makes it important to try to measure the uncertainty associated to future benefits, and assess the impact on saving and portfolio decisions.

Some previous research (Dominitz and Manski, 2006; Delavande and Rohwedder, 2011) estimates working life subjective uncertainty related to the social security benefits payable on retirement i.e. future social security benefit levels. Other studies focus on uncertainty about future replacement rates, that is the ratio of pension benefits to earnings at

retirement, see Guiso, Jappelli, and Padula (2013) and Van Santen (2016) for applications using respectively Italian and Dutch data. We build on this work and rely on data from a large-scale representative survey of the Italian population (2016 Survey of Household Income and Wealth, SHIW) which provides information on the subjective distribution of the replacement rate, income, wealth, portfolio allocation, and other socioeconomic variables. This paper contributes to the literature on subjective expectations and the increasing reliance on economists and survey responses to elicit probabilistic expectations about significant personal events (Manski, 2004).

In the first step of our analysis we use data on the subjective distribution of the future replacement rate. For each working-age individual we construct the subjective mean of the future replacement rate and the subjective standard deviation which we label pension risk. We find substantial heterogeneity in the subjective mean, ranging from 20% to 100% with a sample average of 65%. We also find considerable heterogeneity in the pension risk: the standard deviation to replacement rate mean ratio (the coefficient of variation) ranges between zero and 10%. The variation in pension risk across individuals is in line with a priori expectations based on workers' observable characteristics (such as age and occupation).

In the second step of the analysis we test the hypothesis that individuals who expect a lower replacement rate and perceive a higher risk have a greater incentive to supplement their public pension by increasing their retirement saving. We employ a probit model which confirms both our hypotheses: a 10 percentage points increase in the subjective mean replacement rate is associated to a 2.5 percentage points reduction in private pension fund participation, other things being equal. Further, a one standard deviation increase in the coefficient of variation of the replacement rate distribution is associated to a 2 percentage points increase in pension fund participation.

The paper is organized as follows. Section 2 provides institutional details of the Italian social security system and the main retirement instruments available to supplement retirement benefit. Section 3 presents the data and the method used to determine the replacement rate distribution. Section 4 reports the descriptive statistics of the replacement rate distribution, and the results of the regressions. Section 5 concludes.

2. The three-pillar Italian pension system

In the post-second world war period, spending on social security in Italy increased steadily as a result of generous eligibility rules, decreasing fertility and increasing life-expectancy. In the early 1990s, social security spending reached 16% of GDP, due to the provisions for early retirement and the generous benefits which were indexed to the wage level in the five years before retirement for private sector employees (10 years for self-employed, and one year for public employees).

These unsustainable trends triggered a series of reforms (the 1992 "Amato reform" and the 1995 "Dini reform") which had a cumulative effect. First, for the younger generations of workers (those who entered the labor market after 1995), the reforms introduced a contributions model which linked contributions to benefits rather than to earnings, and imposed stricter eligibility criteria for the minimum retirement age.[1] The reforms maintained a strong role of the *pay-as-you-go* social security system but at the same time, tried to promote the idea of private pensions to establish a multi-pillar pension system model. The

[1] In the contributions model, yearly contributions are capitalized according to the 5-year moving average of GDP growth, and benefits are obtained by applying a retirement age varying multiplier to the capitalized contributions. In the earnings model, pension benefits are a fixed fraction of the salary received over the 5 years before retirement. See Bottazzi, Jappelli, and Padula (2006) for more details.

first of these pillars is the social security system, the second pillar represents the contractual funds organized by workers and employers, and the third pillar is the open pension funds (with individual or collective enrollment) and individual pension plans offered by banks, and insurance and management saving companies.

The second pillar was established by legislative decree in the form of law 124/1993 which extended the already existing contractual pension funds to a larger pool of workers.[2] Subsequent interventions contributed further to the development of a multi-pillars system. A 2000 law introduced the ETT tax-regime, tax-exempting contributions up to 5,000 euro for collective and individual pension funds and establishing a preferential taxation of returns and benefits.

Then, in 2005 another reform resulted in a homogenous regulatory framework for the various pension funds which blurred the distinction between collective and individual pension funds.

Overall, by the end of 2017, 7.6 million individuals were enrolled in one or more second and third pillar schemes which manage assets valued at €162.3 billion and receive €14 billion of contributions a year. Enrollment in and contribution to these schemes are voluntary. Hired workers are enrolled automatically into a contractual fund but can withdraw within six months of being hired. Those workers who remain enrolled in a fund after this six month period contribute to a severance pay or TFR fund, at a rate of just below 7% of their gross annual salary whose proceeds are channeled to a contractual pension fund. Employers can contribute a matching contribution according to a limit set by the contractual arrangement. Individual pension schemes are market products but private sector workers can divert their

[2] Previously only a few groups of workers in the financial sector, and a few white collar employees in selected large companies were included in these funds.

TFR contributions to an individual pension scheme and employers can (and sometimes do) also contribute.

With the exclusion of a few pension funds that were in existence before 1993, all pension funds operate according to a defined contributions model: benefits depend on the contributions history, market returns, and costs. Private pension schemes typically offer multiple portfolios (investment lines) which are ranked with respect to the degree of exposure to equity market risk. To reduce exposure to equity risk, investment schemes combine different investment lines. Workers can switch among investment lines and investment schemes at no cost after two years of enrollment in a fund.

The sequence of reforms described briefly above provide the grounds to relate future social security benefits to demand for retirement saving in the form of collective and individual pension schemes. Despite some differences, collective and individual pension schemes are quite similar in practice since both operate under the same fiscal treatment and regulatory framework.[3] Therefore, in the baseline estimates of our empirical analysis we do not distinguish between contractual and individual pension funds. However, in additional tests we explore the effect of pension risk separately for the two types of funds. Before providing these estimates, we describe the microeconomic data and the method we use to elicit pension risk.

[3] Among the collective schemes, contractual or closed funds related to a labor contract are typically less expensive than individual plans and are not available to self-employed workers.

3. The subjective distribution of replacement rates

There have been previous attempts to measure the subjective probability distribution of future social security benefits in household surveys. Dominitz and Manski (2006) designed a set of questions included in the Survey of Economic Expectations to elicit the minimum, maximum, and six intermediate points of the subjective probability distribution. Based on this distribution, they calculate measures of uncertainty for each respondent and found that both younger and older respondents reported substantial uncertainty about future social security benefits. They also note that younger individuals appear to be concerned with the survival of the social security system, but not with the reduction of benefits if the system survives.

Delavande and Rohwedder (2011) study the relation between individual uncertainty about future social security benefits and households' portfolio choices, using data from the responses to an Internet administered Health and Retirement Survey. Like Dominitz and Manski (2006), they find that younger respondents report greater uncertainty, and further, that uncertainty is associated to a smaller share of wealth invested in stocks. Van Santen, Alessie, and Kalwij (2012) study the responses to subjective retirement income replacement rate expectations questions in a survey of Dutch employees and find that one-third of respondents violates the basic laws of probabilities.

Guiso, Jappelli, and Padula (2013) rely on the 2006 Unicredit Customer Survey of a representative sample of Unicredit customers. The survey proposes a simple replacement rate distribution method based on the minimum and maximum values of future replacement rates. Assuming that the distribution is uniform or triangular, the mean and the standard deviation of the replacement rate can be derived. They find that individuals a long way from retirement, who face more career uncertainty, are more uncertain about the replacement rate and that individuals with higher income risk, who are more uncertain about their future contributions,

are also more uncertain also about their pension benefits. Thus, in part pension uncertainty reflects uncertainty associated to the wage profile over the life-cycle. Using Dutch data, Van Santen (2016) estimates the relation between saving (or the saving rate) and subjective expectations of pension benefits, distinguishing between the expected replacement rate and the replacement rate variance. Using an instrumental variables (IV) approach based on pension fund performance, Van Santen finds a significant and negative effect of the expected replacement rate on saving, and a significant and positive effect of the variance.

In this paper we use cross-sectional data from a large-scale representative survey of the Italian population (Survey of Household Income and Wealth - SHIW) which in the 2016 wave included questions about the subjective distribution of future replacement rates. The SHIW is a biannual survey on the Italian households' population. In 2016, the survey included close to 17,000 individuals and 7,416 households, and provides detailed information on demographic characteristics, income, consumption, wealth (broken down into real assets and various components of financial assets and debt), and financial decisions including the choice to invest in pension funds.

To elicit the minimum (y_m) and maximum (y_M) values of the replacement rate, the survey asked working individuals:

> *Think about when you will retire, and consider only the public pension (i.e., exclude any contractual pension fund or private pension if you have one).*
>
> *(a) At the time of retirement, what is the minimum fraction of labor income that you expect to receive as public pension? (y_m)*
>
> *(b) And what is the maximum value? (y_M)*

We assigned missing values to observations with missing y_m and y_M, cases of respondents aged 65 years or over, and inconsistent answers (very few report $y_m > y_M$). The

resulting sample includes 3,249 observations - 63% of the original sample. The fraction of respondents to these items is in line with the 66% value in Dominitz and Manski (2006) but lower than the 97% of usable answers in Delavande and Rohwedder (2011).[4]

To estimate the moments of the subjective distributions of the replacement rate we rely on the assumptions and methods in Guiso, Jappelli, and Padula (2013). We assume that the subjective distribution is either uniform or triangular, and based on the y_m and y_M values obtained, for each individual we compute the respondent-specific mean, standard deviation, and coefficient of variation. Clearly, the two distributions have the same mean but the standard deviation is lower for the triangular distribution. [5]

By asking respondents directly what they expect to receive in benefits as a ratio of the last salary, the survey provides an alternative estimate of the replacement rate distribution mean, the point expectation measure of the replacement rate. Table 1 reports sample statistics for all the variables used in the descriptive and regression analysis. The average age of respondents is 46 years, the proportion of females is 43%, and 57% of the sample are married. For education level, 42% attended elementary and/orjunior high school, 38% attended high school, and 20% completed college level education. Private sector employees (85% of the sample) work mainly in the industry sector (39%) and in services (38%). The survey asked about employing firm size: 55% of individuals work in firms with more than 15 workers. Among the outcome variables, 16% of workers contribute to at least one pension fund with considerable heterogeneity across employment groups (private vs. public, sectors, firm size).

[4] Delavande and Rohwedder (2011) compare a visual format and a percentage chance format in an internet survey and find that the response rate is considerably higher in the visual format. Our response rate is high (63%) but is not directly comparable to previous studies given the different sample characteristics, elicitation method, and survey design (internet vs. face-to-face interviews).

[5] Van Santen (2016) uses a more elaborate strategy to elicit the moments of the subjective replacement rate distribution. The respondents indicate 7 points along a subjective cumulative distribution function of the pension income. The complete distribution for each respondent is obtained using linear interpolation between thresholds.

The average expected age of retirement reported by respondents was 66 years, with considerable cross-sectional heterogeneity (a standard deviation of 4 years).

The cross-sectional average of the mean of the distribution of the replacement rate is 66%, quite close to the point expectation estimate (67%). For each individual, the dispersion of the replacement rate distribution depends on the assumptions made about the distribution. If we assume a uniform distribution the average of the coefficient of variation is 8%; if we assume a triangular distribution the average is 5.7%.

Figure 1 plots the cross-sectional distribution of the minimum, maximum, and mean. The upper left-graph shows that for 60% of the sample, the minimum is between 50% and 70%, a realistic interval given the current pension rules. About 8% of respondents expect a minimum replacement rate of less than 30%, while 10% expect it to be over 85%. This optimistic portion of the sample shows up also in the distribution of the maximum replacement rate, plotted in the upper right-graph: 10% of respondents report a subjective maximum replacement rate above 95%. The lower graphs show the cross-sectional distribution of the mean in the formats point expectation estimate (lower-left graph), and mean computed as the mid-point of the expected maximum and minimum (lower-right graph). The two distributions are quite similar which we take as supporting the validity of our elicitation method.

The dispersion of the distribution of the replacement rate is a summary indicator of the pension risk. Figure 2 plots the cross-sectional distribution of the individual standard deviations and coefficient of variations. Both indicators reveal substantial heterogeneity in the responses. For instance, assuming that the distribution is uniform, the coefficient of variation ranges between 1% and 25%. In the next section, this heterogeneity provides the basis for estimating the relation between demand for retirement saving and pension risk.

Figure 3 plots the relation between age (grouped in 10 equal-sized bins), and the mean, standard deviation, and coefficient of variation of the replacement rate distributions. Younger workers (40 years old) expect a replacement of about 63%, much lower than expected by elderly (over 60 year old) workers who expect a replacement rate of 70% or higher. This pattern reflects current pension legislation which grants more generous pension benefits to the older cohort of workers whose benefits are computed based on a favourable earnings-related method whereas the pension benefits of younger cohorts will be proportional to their contributions (see Bottazzi, Jappelli, and Padula, 2006). The age-profile of the standard deviation (upper-right panel) and the coefficient of variation (bottom panel) is negative, suggesting that younger workers perceive more uncertainty than workers close to retirement. Indeed, the coefficient of variation is 8% for 30-year old respondents and about 6% for 60-year old workers.

The upper-left graph in figure 4 shows a positive correlation between log earnings and the means of the replacement rate distributions except at high levels of earnings. The other two graphs in figure 4 show a negative correlation between earnings and pension risk. This might be because higher earnings tend also to show more volatility, and therefore will be associated to more unpredictable contribution to the social security system.

4. The demand for retirement saving

People who expect a lower replacement rate can supplement their public pension by increasing their retirement saving. This is related directly to the offset between social security and private wealth accumulation, and has received much attention since Feldstein's (1974) seminal work on an extended life-cycle model in the presence of a social security system. The data on the subjective distribution of future replacement rates allow us to focus on a related but unexplored question: is uncertainty about future replacement rates i.e. pension risk, associated to retirement saving, over and above any effect that the expected replacement rate might may have?

The standard argument is that participation in a private pension fund (the main vehicle for retirement saving) should be negatively associated to the expected replacement rate, regardless of the risk. Under certainty equivalence, risk should not affect saving. However, if people engage in precautionary saving, an increase in the riskiness of future resources (in our case an increase in pension risk) should prompt higher saving. Of course, wealth is fungible so the increase in saving could take many forms. The specific channel we want to test is whether pension risk is negatively associated to the demand for contractual and individual pension funds which are the main retirement saving vehicles.

Before moving to the regression analysis, figure 5 depicts the correlation of pension fund participation to the mean, standard deviation, and coefficient of variation of the individual replacement rate distributions. It suggests a negative relation between pension fund participation and the subjective mean of the replacement rate. Indeed, individuals who expect relatively low return from their public pension show a higher propensity to invest in a private pension which is consistent with the extended life-cycle model. Figure 5 suggests also that

pension risk is positively associated to participation in a pension fund. The regression analysis confirms the descriptive evidence.

4.1. Baseline estimates

We relate the probability of pension fund enrollment to the mean and standard deviation (or coefficient of variation) of the replacement rate distribution. In all specifications, we include the expected retirement age and the socioeconomic variables (earnings, education, age, gender, and marital status).

Table 2 reports the marginal effects and associated standard errors of the baseline probit specification. In column 1 we assume that the individual distribution of the replacement rate is uniform. The results confirm a positive association between participation in pension a fund and the coefficient of variation of the replacement rate distribution. To gauge the impact of pension risk, consider that a one standard deviation increase in the coefficient of variation is associated to a 2 percentage points increase in pension fund ownership. The results are similar if we compute the coefficient of variation using a triangular distribution (column 2).

To distinguish between the effects of the mean and the standard deviation, in columns 3 and 4 we introduce them into the regression separately. In line with our expectations, the coefficient of the mean is negative, while the coefficient of the subjective standard deviation is positive. Both coefficients are statistically different from zero, regardless of the type of distribution considered (uniform in column 3, triangular in column 4), and are economically important. A 10 percentage points increase in the subjective mean is associated to a 2.5 percentage points reduction in the probability of pension fund participation. And a one standard deviation increase in the standard deviation of the replacement rate distribution is associated to a 1.6 percentage points increase in participation. Thus, heterogeneity of pension

risk is an important driver of the demand for private pensions, and is at least as important as the offset effect which is the focus of the previous literature.

The probit regressions show also that pension fund participation increases with income and education, and that it is related negatively to the expected retirement age. Workers aged 46-55 invest more in private pension funds relative to other cohorts. There is no evidence of different participation by gender or marital status (married vs. single).

4.2. Robustness analysis

Table 3 includes the sector and regional dummies; we find that size, precision, and economic significance are un affected by the inclusion of these additional controls. In particular, we find that private pension fund participation is higher for financial sector and real estate sector employees. Participation is lowest among public employees but the coefficient is not precisely estimated. There are no significant differences in participation associated to the regional dummies.

Table 4 tests for the separate effects of financial and real wealth, modeled using quartile dummies. The household finance literature suggests that more risk averse individuals tend to invest in bonds and saving accounts which usually offer lower returns (Munnell, Sunden, and Taylor, 2001), and that risk aversion decreases with wealth (Guiso and Paiella, 2008). Also, in general financial wealth is associated to a more diversified portfolio, and therefore, a possibly higher propensity to invest in a pension fund.

The regressions results confirm that pension fund participation increases across financial assets and real assets quartiles. They show in particular, that pension fund participation increases by 9 percentage points for the upper quartile of the financial wealth distribution, and by 5.5 percentage points for the upper quartile of the real wealth distribution.

The coefficients of the mean and standard deviation of the replacement rate distribution are still statistically different from zero and of similar magnitude to the baseline specification.

The results in table 5 suggest that pension fund participation is positively associated to the size of the employing firm. Unions and employer associations tend to be more active in large firms, reflected by their role in instituting contractual pension plans. Also, in the case of small firms (less than 50 employees) the TFR contributions for workers not enrolled in a closed pension fund remain within the firm.

Financial literacy can also shape replacement rate expectations; see the argument in Paiella (2016) in the context of asset returns expectations. Therefore, in table 6 among the explanatory variables included in the baseline specification we add an indicator of financial literacy constructed by relying on the responses to three questions in the 2016 SHIW survey:

1. *Suppose you put 100 euros into a "no fee, tax free" savings account with a guaranteed interest rate of 2% per year. You don't make any further payments into this account and you don't withdraw any money. How much would be in the account at the end of 5 years, once the interest payment is made?* [Less than 102 euros | Exactly 102 euros | More than 102 euros| Don't know]
2. *Suppose you put 1,000 euros into a "no fee, tax free" savings account with a guaranteed interest rate of 1% per year. Suppose furthermore inflation stays at 2 per cent. In one year's time will you be able to buy the same amount of goods that you could buy by spending today 1,000 euros?* [Yes | No, less than I could buy today | No, more than I could buy today | Don't know | No answer]
3. *In your opinion, the purchase of shares of one company usually provides a safer return than buying shares of a wide range of companies through a mutual fund?* [True | False | Don't know | No answer]

Several other papers use the responses to these questions to construct proxies for financial literacy, see Lusardi and Mitchell (2007), Guiso and Jappelli (2009), Fornero and Monticone (2011). We proxy financial literacy by a dummy that takes the value 1 for correct responses to all three questions. We find that controlling for financial literacy does not affect our main results. Although the association between financial literacy and retirement saving is

positive, due to the likely endogeneity of financial literacy to the saving and portfolio choices we cannot impute a causal interpretation to the estimated coefficients (Jappelli and Padula 2013, 2015).[6]

4.3. Closed, open, and individual pension funds

Our indicator of private pension participation selects individuals who have invested in at least one private pension fund. Table 7 investigates whether future social security benefits affect the type of pension plan, distinguishing between contractual (or closed) funds, tied to a labor contract and established jointly by a union and an employer organization, and open funds offered by commercial banks, insurance companies, and management saving companies which allow for both collective and individual enrollment, and individual plans.

We distinguish between the probability of enrolling in a closed plan (columns 1 and 4), an open plan (columns 2 and 5), and an individual plan. The results suggest that there are some differences in the relation between type of pension plan and our subjective expectations measures. The coefficient of the mean of the replacement rate distribution is negative but statistically different from zero only for closed and individual pension plans. The coefficient of the standard deviation is negative in all the regressions but is statistically significant only for individual pension plans. Note, however, that probit estimates tend to be noisy if the sample proportion is close to zero which applies to the closed and open pension funds probit.

4.4. Other margins

We have shown that changes to the mean and the standard deviation of the replacement rate distribution affect the decision to contribute to a pension fund. In particular,

[6] Using an alternative proxy for financial literacy based on a count of the number of correct answers to the three questions provides very similar results.

we showed that individuals who are more uncertain about their future pension invest more in pension funds, replacing annuities provided by the social security system with private annuities.

Annuitized wealth is only one component of wealth. Table 8 shows whether changes to the replacement rate distributions also affect demand for bonds, stocks, and mutual funds. We find a negative but small effect of the coefficient of variation on participation in all three assets (columns 1 to 3). In columns 4 to 6 the coefficient of variation is split into its two components. The effect of the standard deviation tends to be negative for all three assets, and particularly for stocks and mutual funds. Overall, the evidence shows that an increase in pension risk is associated to a reallocation of wealth, increasing pension fund participation, and reducing exposure to stock market risk.

5. Conclusions

Over the last two decades various Italian governments have implemented pension reforms. The result has been a less generous first pillar pension system as a result of reforms that increased the retirement age and reduced replacement rates, and introduced a switch from an earnings-related to a contributions model. At the same time, the second and third pillars of the pension system have operated partially to offset the reduced social security system benefits. However, these reforms have increased uncertainty about future social security benefits. On the one hand, if benefits are linked to lifetime contributions they are typically more uncertain and more difficult to predict than if they are linked to the last few years of earnings – which applied to the previous regime. On the other hand, pension legislation has been revised almost yearly, and these sequential reforms sometimes have worked to revert the

previous rules which makes the future more uncertain. There is an additional complication in the form of a gap between the pension reforms and the perception of these reforms.[7]

This paper provides individual measures of pension risk, and relates this risk to the demand for retirement saving. First, we used a representative sample of Italian workers drawn from the 2016 SHIW to elicit the respondent-specific distribution of the replacement rate in a simple and effective way. The survey allowed us to construct individual-specific moments of the distribution of future replacement rates. Next, we showed that the propensity to invest in a pension fund is inversely related to the expected replacement rate. We found also that participation in a private pension fund is positively associated to pension risk, measured by the standard deviation or coefficient of variation of the replacement rate subjective distribution. Both effects are statistically and economically significant. A 10 percentage points decrease in the expected replacement rate increases the propensity to invest in pension funds by 2.5 percentage points. Also, a one standard deviation increase in the coefficient of variation of the replacement rate increases the propensity to invest in a private pension fund by 2 percentage points.

The evidence from out study supports the view that Italians respond to pension reforms consistent with economic reasoning and intuition. However, future research should assess whether this response is sufficient to offset the projected fall in future benefits, and to overcome the adequacy of saving issue raised by these pension reforms.

[7] Bottazzi, Jappelli, and Padula (2006) show that the offset effect of pension wealth on private wealth is stronger for households with a better understanding of the changes to pension legislation. In this context, for many years Italy has made no serious attempts to communicate the effects of its pension reforms. Information about future social security benefits similar to the Swedish ‘orange pension letter’, was sent for the first time in 2018 to selected groups of workers.

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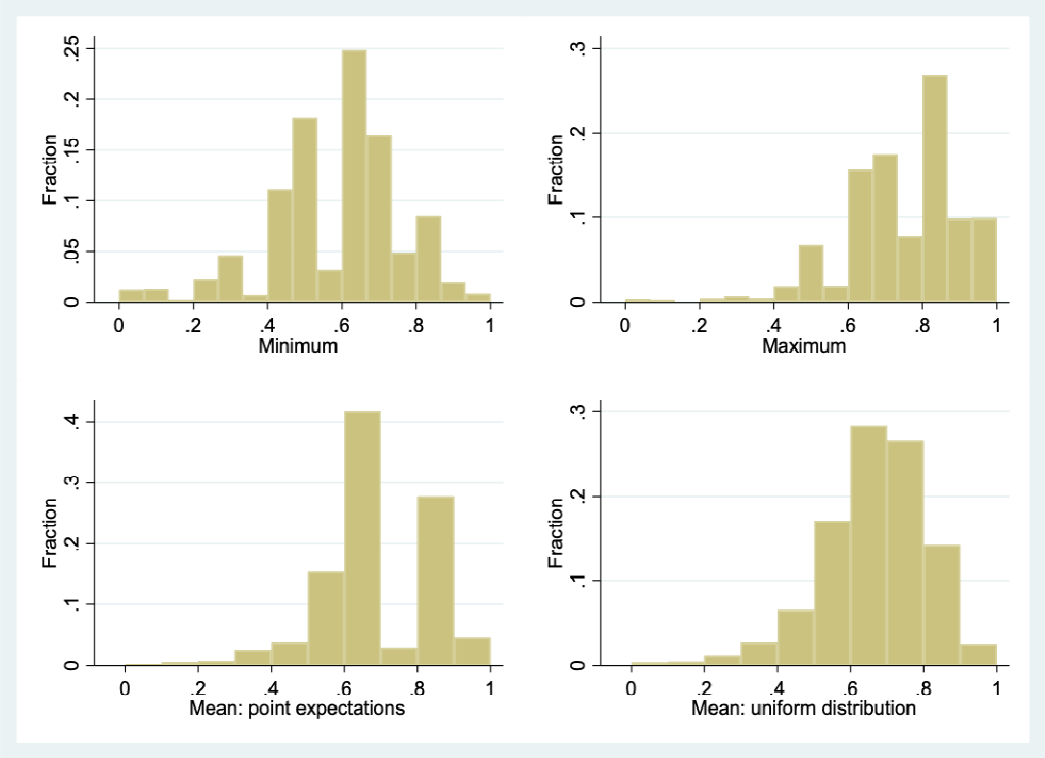
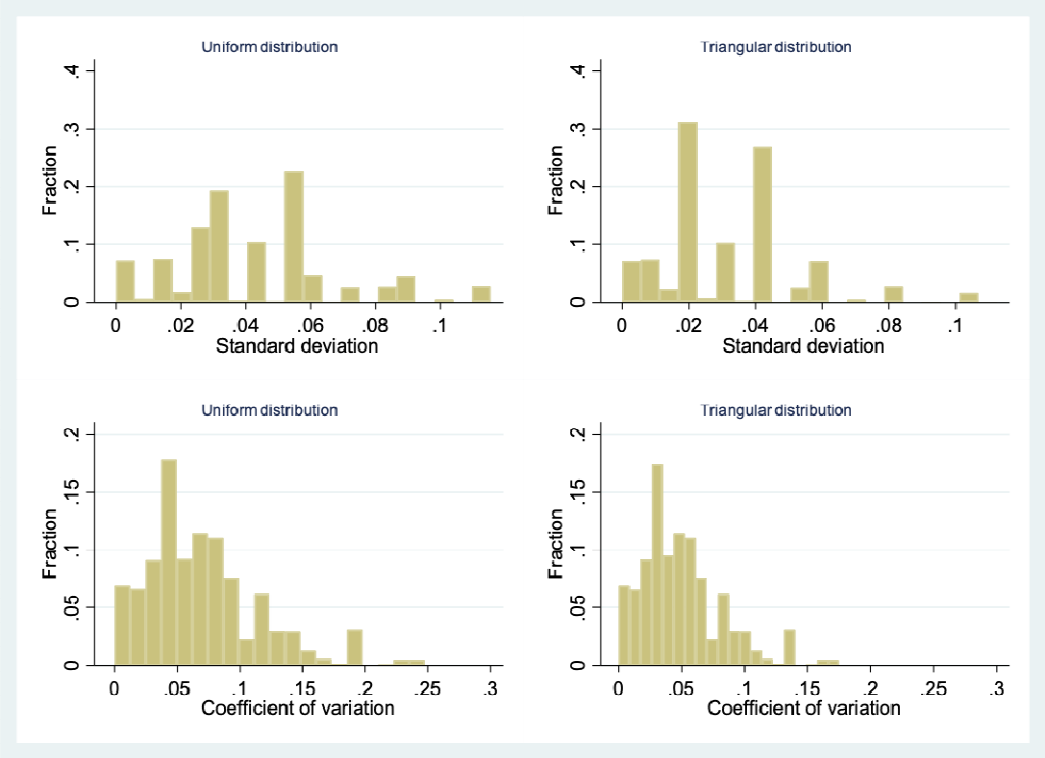
Figure 1: The distribution of the subjective replacement rate



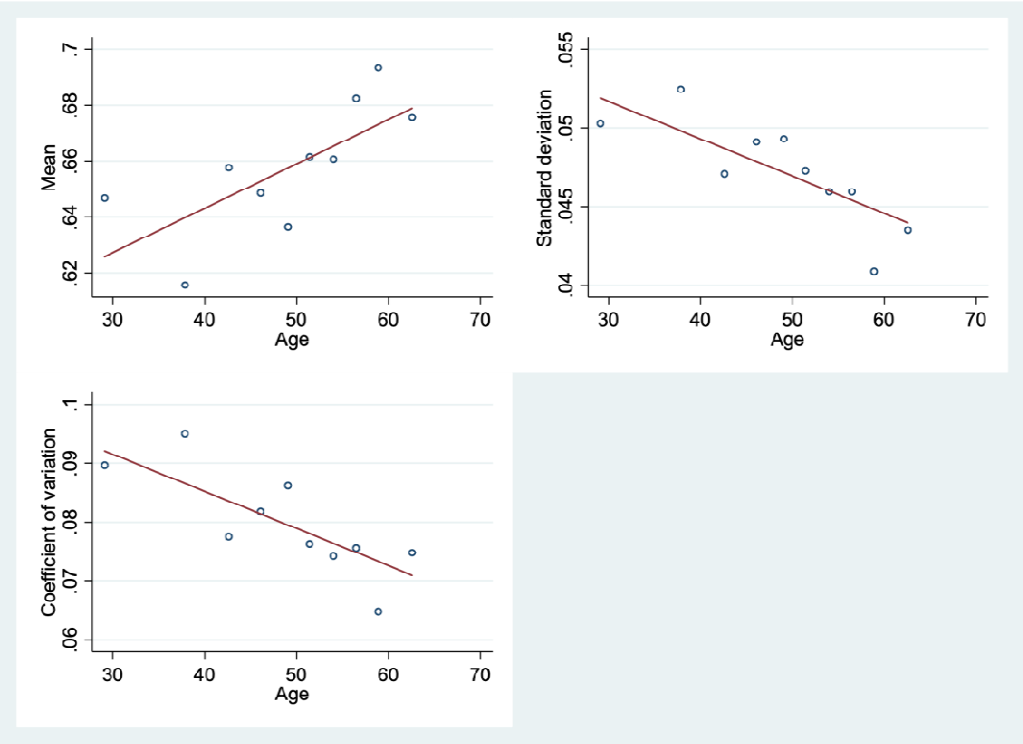
Note. The figure plots the cross-sectional distribution of the replacement rate subjective minimum (upper left panel), maximum (upper right panel), and mean (lower panels). In the lower left panel the mean is the point expectation. In the lower right panel the mean is the midpoint of the minimum and the maximum subjective replacement rate.

Figure 2: Subjective replacement rate standard deviation and coefficient of variation



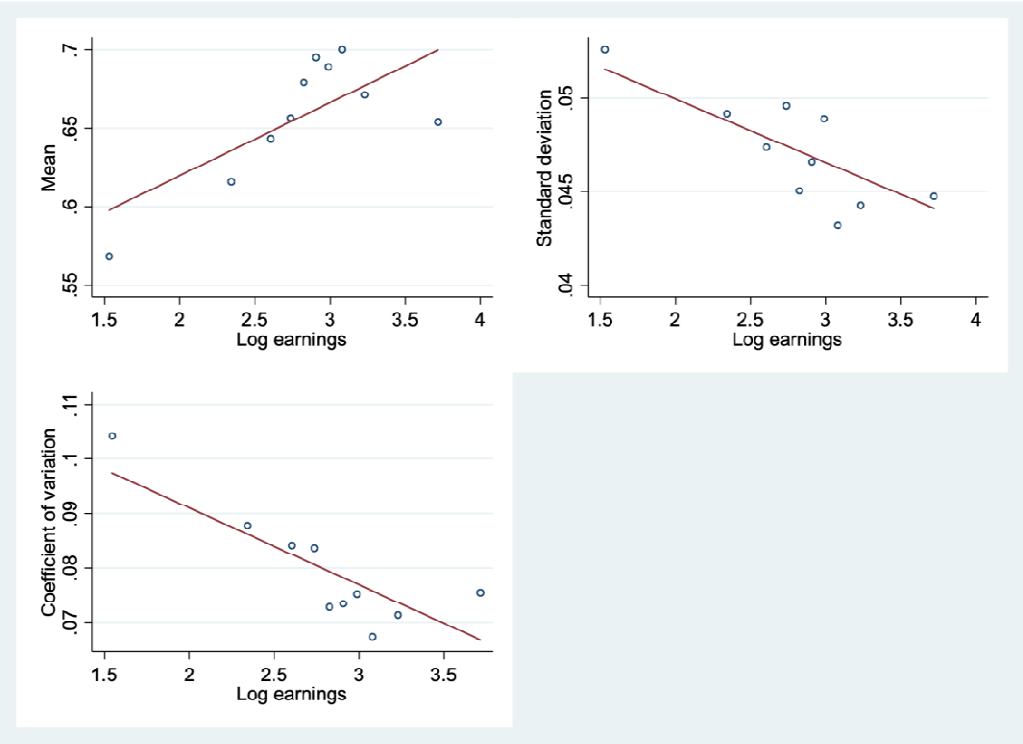
Note. The figure plots the cross-sectional distribution of the replacement rate subjective standard deviation (upper panels) and coefficient of variations (lower panels). Left panels assume that the subjective replacement rate distribution is uniform, the right panel that it is triangular.

Figure 3: The relation between age and the replacement rate distribution



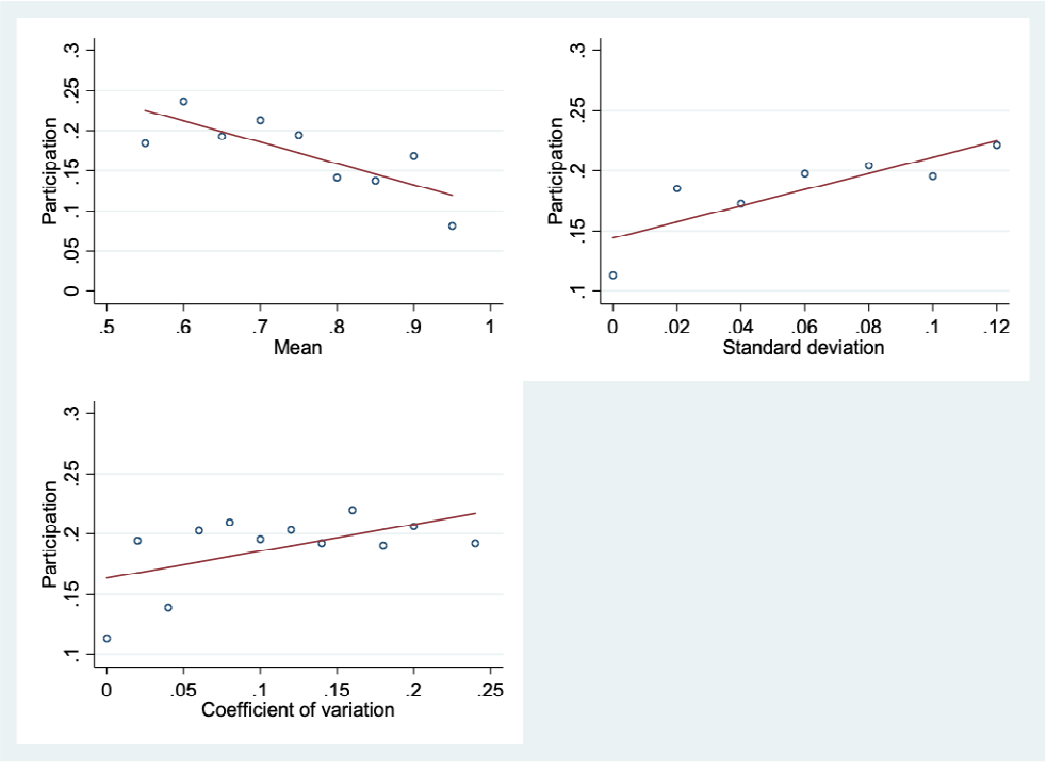
Note. The figure plots the replacement rate subjective mean (upper left panel), standard deviation (upper right panel) and coefficient of variations (lower left panel) against the age of the respondents.

Figure 4: The relation between earnings and the replacement rate distribution



Note. The figure plots the replacement rate subjective mean (upper left panel), standard deviation (upper right panel) and coefficient of variations (lower left panel) against the log earnings of the respondents.

Figure 5. The relation between participation in pension funds and the replacement rate distribution



Note. The figure plots participation in pension funds against the replacement rate subjective mean (upper left panel), standard deviation (upper right panel) and coefficient of variations (lower left panel).

Table 1. Sample statistics

	Mean	***Standard deviation***
Subjective replacement rate distribution:		
Minimum	0.574	0.175
Maximum	0.738	0.159
Mean		
Point estimate	0.671	0.167
Uniform	0.656	0.155
Standard deviation (s.d.):		
Uniform	0.047	0.036
Triangular	0.033	0.026
Coefficient of variation (c.v.):		
Uniform	0.080	0.077
Triangular	0.057	0.054
Subjective mean retirement age	66.484	4.195
Pension funds participation	0.155	0.362
Closed pension plan	0.057	0.233
Open pension plan	0.026	0.159
Personal pension plan	0.072	0.258
Earnings	18.029	13.659
Financial assets	30.810	134.485
Real assets	228.534	333.573
Bonds	0.112	0.315
Shares in listed and unlisted companies	0.040	0.195
Mutual funds	0.091	0.288
Elementary and junior high school	0.416	0.493
High school	0.384	0.486
College	0.200	0.400
Financial literacy (three correct answers)	0.351	0.477
Age	46.081	11.195
Male	0.575	0.494
Married	0.567	0.496
Agriculture	0.048	0.214
Industry	0.385	0.487
Finance and real estate	0.038	0.191
Public sector	0.150	0.357
Services	0.379	0.485
N. workers<5	0.281	0.450
N. workers<5-15	0.181	0.385
N. workers<16-99	0.231	0.422
N. workers>99	0.305	0.460
North	0.468	0.499
Center	0.225	0.418
South	0.307	0.461
Number of observations	3,249	

Table 2. Pension funds participation, baseline specification

	(1)	*(2)*	*(3)*	*(4)*
Coefficient of variation				
Uniform	0.256			
	(0.084)***			
Triangular		0.361		
		(0.119)***		
Mean			-0.157	-0.157
			(0.046)***	(0.046)***
Standard deviation				
Uniform			0.450	
			(0.177)**	
*Triangul*ar				0.636
				(0.250)**
Subjective mean	-0.004	-0.004	-0.004	-0.004
retirement age	(0.002)**	(0.002)**	(0.002)**	(0.002)**
II income quartile	0.037	0.037	0.043	0.043
	(0.024)	(0.024)	(0.024)*	(0.024)*
III income quartile	0.112	0.112	0.124	0.124
	(0.025)***	(0.025)***	(0.026)***	(0.026)***
IV income quartile	0.224	0.224	0.235	0.235
	(0.028)***	(0.028)***	(0.028)***	(0.028)***
High school	0.030	0.030	0.029	0.029
	(0.016)*	(0.016)*	(0.016)*	(0.016)*
College	0.041	0.041	0.038	0.038
	(0.022)*	(0.022)*	(0.021)*	(0.021)*
Age 36-45	0.076	0.076	0.075	0.075
	(0.031)**	(0.031)**	(0.031)**	(0.031)**
Age 46-55	0.106	0.106	0.104	0.104
	(0.028)***	(0.028)***	(0.028)***	(0.028)***
Age> 55	0.055	0.055	0.059	0.059
	(0.030)*	(0.030)*	(0.030)*	(0.030)*
Male	-0.007	-0.007	-0.007	-0.007
	(0.014)	(0.014)	(0.014)	(0.014)
Married	-0.017	-0.017	-0.017	-0.017
	(0.014)	(0.014)	(0.014)	(0.014)
N	3,240	3,240	3,249	3,249

Note: The table reports marginal effects and standard errors in parenthesis for an estimated probit model, where the dependent variable is a dummy equal to one if the individual contributes to at least one pension plan. *** indicate statistical significance at the 1% confidential level, ** statistical significance at the 5% level, * statistical significance at the 10% level.

Table 3. Pension funds participation, controlling for sector and regional effects

	(1)	*(2)*	*(3)*	*(4)*
Coefficient of variation				
Uniform	0.280			
	(0.085)***			
Triangular		0.396		
		(0.120)***		
Mean			-0.145	-0.145
			(0.046)***	(0.046)***
Standard deviation				
Uniform			0.523	
			(0.179)***	
Triangular				0.739
				(0.253)***
Agriculture	-0.031	-0.031	-0.033	-0.033
	(0.032)	(0.032)	(0.032)	(0.032)
Industry	0.043	0.043	0.042	0.042
	(0.017)**	(0.017)**	(0.017)**	(0.017)**
Finance and real estate	0.134	0.134	0.135	0.135
	(0.042)***	(0.042)***	(0.042)***	(0.042)***
Public sector	-0.022	-0.022	-0.017	-0.017
	(0.020)	(0.020)	(0.020)	(0.020)
Center	0.001	0.001	0.000	0.000
	(0.017)	(0.017)	(0.017)	(0.017)
South	-0.009	-0.009	-0.008	-0.008
	(0.016)	(0.016)	(0.016)	(0.016)
N	3,240	3,240	3,249	3,249

Note: The table reports marginal effects and standard errors in parenthesis for an estimated probit model, where the dependent variable is a dummy equal to one if the individual contributes to at least one pension plan. The set of controls also includes sector and regional dummies. *** indicate statistical significance at the 1% confidential level, ** statistical significance at the 5% level, * statistical significance at the 10% level.

Table 4. Pension funds participation, controlling for financial and real assets

	(1)	*(2)*	*(3)*	*(4)*
Coefficient of variation				
Uniform	0.243			
	(0.084)***			
Triangular		0.343		
		(0.119)***		
Mean			-0.144	-0.144
			(0.046)***	(0.046)***
Standard deviation				
Uniform			0.443	
			(0.177)**	
Triangular				0.626
				(0.250)**
II fin. assets quartile	-0.013	-0.013	-0.013	-0.013
	(0.020)	(0.020)	(0.020)	(0.020)
III fin. assets quartile	0.026	0.026	0.025	0.025
	(0.021)	(0.021)	(0.021)	(0.021)
IV fin. assets quartile	0.090	0.090	0.088	0.088
	(0.024)***	(0.024)***	(0.024)***	(0.024)***
II real assets quartile	0.014	0.014	0.014	0.014
	(0.020)	(0.020)	(0.020)	(0.020)
III real assets quartile	0.045	0.045	0.043	0.043
	(0.022)**	(0.022)**	(0.022)**	(0.022)**
IV real assets quartile	0.057	0.057	0.055	0.055
	(0.024)**	(0.024)**	(0.024)**	(0.024)**
N	3,240	3,240	3,249	3,249

Note. The table reports marginal effects and standard errors in parenthesis for an estimated probit model, where the dependent variable is a dummy equal to one if the individual contributes to at least one pension plan. The set of controls also includes financial and real assets quartile dummies. *** indicate statistical significance at the 1% confidential level, ** statistical significance at the 5% level, * statistical significance at the 10% level

Table 5. Pension funds participation, controlling for firm size

	(1)	*(2)*	*(3)*	*(4)*
Coefficient of variation				
Uniform	0.288			
	(0.084)***			
Triangular		0.407		
		(0.118)***		
Mean			-0.211	-0.211
			(0.047)***	(0.047)***
Standard deviation				
Uniform			0.483	
			(0.176)***	
Triangular				0.683
				(0.249)***
N. workers 5-15	0.042	0.042	0.049	0.049
	(0.025)*	(0.025)*	(0.025)*	(0.025)*
N. workers 16-99	0.074	0.074	0.085	0.085
	(0.023)***	(0.023)***	(0.024)***	(0.024)***
N. workers> 99	0.137	0.137	0.149	0.149
	(0.022)***	(0.022)***	(0.022)***	(0.022)***
N	3,175	3,175	3,184	3,184

Note: The table reports marginal effects and standard errors in parenthesis for an estimated probit model, where the dependent variable is a dummy equal to one if the individual contributes to at least one pension plan. The set of controls also includes firm size dummies. *** indicate statistical significance at the 1% confidential level, ** statistical significance at the 5% level, * statistical significance at the 10% level.

Table 6. Pension funds participation, controlling for financial literacy

	(1)	*(2)*	*(3)*	*(4)*
Coefficient of variation				
Uniform	0.277			
	(0.084)***			
Triangular		0.392		
		(0.119)***		
Mean			-0.150	-0.150
			(0.046)***	(0.046)***
Standard deviation				
Uniform			0.505	
			(0.178)***	
*Triangul*ar				0.714
				(0.251)***
Subjective mean	-0.004	-0.004	-0.004	-0.004
retirement age	(0.002)**	(0.002)**	(0.002)**	(0.002)**
II income quartile	0.037	0.037	0.043	0.043
	(0.024)	(0.024)	(0.024)*	(0.024)*
III income quartile	0.110	0.110	0.121	0.121
	(0.025)***	(0.025)***	(0.026)***	(0.026)***
IV income quartile	0.217	0.217	0.228	0.228
	(0.028)***	(0.028)***	(0.028)***	(0.028)***
High school	0.022	0.022	0.022	0.022
	(0.016)	(0.016)	(0.016)	(0.016)
College	0.029	0.029	0.027	0.027
	(0.021)	(0.021)	(0.021)	(0.021)
Age 36-45	0.074	0.074	0.073	0.073
	(0.031)**	(0.031)**	(0.031)**	(0.031)**
Age 46-55	0.102	0.102	0.100	0.100
	(0.028)***	(0.028)***	(0.028)***	(0.028)***
Age> 55	0.055	0.055	0.059	0.059
	(0.030)*	(0.030)*	(0.030)*	(0.030)*
Male	-0.009	-0.009	-0.009	-0.009
	(0.014)	(0.014)	(0.014)	(0.014)
Married	-0.018	-0.018	-0.018	-0.018
	(0.014)	(0.014)	(0.014)	(0.014)
Index of financial literacy	0.049	0.049	0.052	0.052
	(0.015)***	(0.015)***	(0.015)***	(0.015)***
N	3,240	3,240	3,249	3,249

Note: The table reports marginal effects and standard errors in parenthesis of an estimated probit model, where the dependent variable is a dummy equal to one if the individual contributes to at least one pension plan. The set of controls also includes the Index of financial literacy. *** indicate statistical significance at the 1% confidential level, ** statistical significance at the 5% level, * statistical significance at the 10% level.

Table 7. Closed, open and individual pension funds

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
	Closed	Open	Individual	Closed	Open	Individual
Coefficient of Variation	0.107 (0.053)**	0.048 (0.041)	0.150 (0.064)**			
Mean				-0.070 (0.030)**	-0.014 (0.023)	-0.107 (0.034)***
Standard deviation				0.128 (0.114)	0.112 (0.086)	0.288 (0.132)**
Subjective mean retirement retirement age	-0.002 (0.001)*	-0.001 (0.001)	-0.002 (0.001)	-0.002 (0.001)**	-0.001 (0.001)	-0.002 (0.001)
II income quartile	0.012 (0.017)	0.034 (0.016)**	0.003 (0.017)	0.015 (0.018)	0.035 (0.016)**	0.007 (0.018)
III income quartile	0.060 (0.020)***	0.025 (0.015)*	0.057 (0.020)***	0.066 (0.021)***	0.027 (0.016)*	0.066 (0.021)***
IV income quartile	0.146 (0.026)***	0.059 (0.020)***	0.104 (0.023)***	0.153 (0.027)***	0.061 (0.020)***	0.112 (0.024)***
High school	0.010 (0.011)	0.005 (0.008)	0.019 (0.013)	0.009 (0.011)	0.005 (0.008)	0.019 (0.013)
College	0.010 (0.014)	0.002 (0.011)	0.038 (0.018)**	0.009 (0.014)	0.002 (0.010)	0.036 (0.018)**
Age 36-45	0.007 (0.020)	0.018 (0.018)	0.067 (0.027)**	0.006 (0.019)	0.017 (0.018)	0.067 (0.027)**
Age 46-55	0.035 (0.019)*	0.030 (0.017)*	0.065 (0.023)***	0.034 (0.019)*	0.030 (0.017)*	0.064 (0.023)***
Age> 55	0.010 (0.019)	0.025 (0.019)	0.030 (0.025)	0.011 (0.019)	0.025 (0.019)	0.033 (0.025)
Male	-0.005 (0.010)	0.002 (0.007)	-0.003 (0.011)	-0.004 (0.010)	0.001 (0.007)	-0.004 (0.011)
Married	0.009 (0.009)	-0.008 (0.007)	-0.021 (0.011)*	0.009 (0.009)	-0.008 (0.007)	-0.022 (0.011)*
N	2,857	2,744	2,921	2,865	2,752	2,930

Note: The table reports marginal effects and standard errors in parenthesis for an estimated probit model, where the dependent variables are a dummies equal to one if the individual contributes to a closed pension funds (columns 1 and 4), to a open pension (columns 2 and 5), to an individual pension funds (columns 3 and 6). *** indicate statistical significance at the 1% confidential level, ** statistical significance at the 5% level, * statistical significance at the 10% level.

Table 8. Bonds, stocks and mutual funds

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
	Bonds	Stocks	Mutual Funds	Bonds	Stocks	Mutual funds
Coefficient of variation	-0.143 (0.070)**	-0.059 (0.040)	-0.064 (0.066)			
Mean				0.045 (0.032)	-0.039 (0.016)**	-0.098 (0.030)***
Standard deviation				-0.266 (0.141)*	-0.143 (0.076)*	-0.301 (0.137)**
Subjective mean retirement age	0.000 (0.001)	-0.002 (0.001)***	-0.004 (0.001)***	0.000 (0.001)	-0.002 (0.001)***	-0.004 (0.001)***
II income quartile	0.018 (0.018)	-0.003 (0.009)	0.002 (0.016)	0.016 (0.018)	-0.002 (0.009)	0.005 (0.016)
III income quartile	0.049 (0.019)**	0.007 (0.010)	0.024 (0.017)	0.046 (0.019)**	0.009 (0.010)	0.030 (0.018)*
IV income quartile	0.107 (0.022)***	0.046 (0.015)***	0.108 (0.021)***	0.105 (0.022)***	0.047 (0.015)***	0.113 (0.022)***
High school	0.051 (0.012)***	0.028 (0.008)***	0.048 (0.012)***	0.051 (0.012)***	0.028 (0.008)***	0.048 (0.012)***
College	0.065 (0.018)***	0.050 (0.014)***	0.064 (0.018)***	0.065 (0.018)***	0.051 (0.014)***	0.065 (0.018)***
Age 36-45	0.098 (0.036)***	0.005 (0.013)	0.030 (0.024)	0.099 (0.036)***	0.006 (0.013)	0.030 (0.024)
Age 46-55	0.129 (0.031)***	0.022 (0.013)	0.070 (0.023)***	0.129 (0.031)***	0.024 (0.014)*	0.073 (0.023)***
Age> 55	0.178 (0.041)***	0.019 (0.015)	0.054 (0.025)**	0.177 (0.041)***	0.023 (0.016)	0.059 (0.026)**
Male	-0.034 (0.010)***	0.003 (0.005)	-0.025 (0.010)**	-0.035 (0.010)***	0.004 (0.005)	-0.024 (0.010)**
Married	0.002 (0.010)	0.010 (0.005)**	0.006 (0.010)	0.002 (0.010)	0.009 (0.005)*	0.004 (0.010)
N	3,240	3,240	3,240	3,249	3,249	3,249

Note: The table reports marginal effects and standard errors in parenthesis for an estimated probit model, where the dependent variables are a dummies equal to one if the individual holds bonds (columns 1 and 4), shares in listed and unlisted companies (columns 2 and 5), shares of investment funds and managed portfolios (columns 3 and 6). *** indicate statistical significance at the 1% confidential level, ** statistical significance at the 5% level, * statistical significance at the 10% level.