THE IMPORTANCE OF BEHAVIOURAL FACTORS FOR PENSION SAVINGS DECISIONS – CROSS-COUNTRY EVIDENCE[a, b, c]

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In this study, we challenge the problem of inadequate voluntary pension savings by exploring the micro-dataset of the Luxembourg Wealth Study (LWS) for three countries: Italy, the United Kingdom and the United States. The existing empirical literature usually focuses on the role of socio-demographic factors to understand this phenomenon, and theoretical studies additionally highlight the role of behavioural factors. However, empirical studies in this field are extremely scarce. The use of the LWS data enables us to fill this research gap. Separately for each country, we verify the role of individuals' risk attitudes and intertemporal choices in the demand for voluntary pension savings. To make the results more robust, we add a set of socio-demographic control variables to our regressions. Our findings clearly reveal that being more risk averse and being less forward looking negatively affect people's propensity to save for retirement. Furthermore, we confirm that age, gender and education are significant predictors of pension demand in each of the analysed countries. We argue that these conclusions have practical meaning to improve regulatory frameworks.

Keywords: supplementary pension savings, risk aversion, intertemporal choices, socio-demographic factors, Tobit models

JEL classification indices: C25, G41, J32

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1. INTRODUCTION

Due to society's ageing process, the replacement rate in the public pension system is expected to steadily decrease in the coming decades. However, a reduction in consumption opportunities faced by future pensioners may not be politically acceptable. Therefore, to avoid the additional redistribution from the working-age generation to the pensioners, one of the available solutions for government is to make an effort to motivate individuals to accrue supplementary savings for their retirement. The current international experiences are not optimistic, as participation rates are often far from the satisfactory (Rutecka et al. 2014).

The existing literatures usually try to explain the observed heterogeneity in the demand for voluntary pensions with socio-demographic determinants (Peeters et al. 2003; Stinglhamber et al. 2007). However, although the importance of the previously investigated factors is undeniable, this type of evidence does not provide useful conclusions for economic policy. Relating pension decisions only to the socio-demographic characteristics would make it hard for government to successfully affect individuals' decisions. Therefore, in this paper, we extend the list of potential determinants of this phenomenon with two behavioural variables – *financial risk attitudes*[1] and *intertemporal choices* – whose importance for savings decisions has been presented mainly on a theoretical basis (Samuelson 1937; Yaari 1965; Bommier 2006). The empirical verification for the significance of the aforementioned behavioural factors addresses the question of whether and how policymakers can nudge people to save.

Our study contributes to the existing literature by delivering empirical evidence based on the updated data set from the Luxembourg Wealth Study 2016 (LWS) for three countries, i.e., Italy, the UK and the USA[2]. LWS uses national surveys from the upper- and middle-income countries and homogenises them, providing a unique opportunity to run cross-country comparative studies. It enables the formulation of not only country-level but also global-level conclusions and further policy recommendations.

The remainder of the paper is organised as follows: *Section 2* presents the theoretical rationale for exploring the risk attitudes and intertemporal choices in analysing individuals' retirement savings decisions. *Section 3* surveys the empirical literature and *Section 4* presents the model and hypotheses tested. *Section 5* contains a detailed description of the dataset used in this research. In *Section 6*, we report the empirical outcomes, and *Section 7* concludes.

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[1]   From now on referred to, for simplicity, as 'risk attitudes', 'risk aversion' or 'risk tolerance' interchangeably.

[2]   The sample has been narrowed down to three countries due to data availability on risk aversion and/or intertemporal choices in the LWS database.

2. THEORETICAL BACKGROUND

The individual decisions concerning pension savings for retirement are complex, involving a wide variety of determinants. Such problems can be analysed within two major dimensions: First, an individual decides how much money to save at each single point in time, and also controlling for the way of savings (type of financial product, time horizon, etc.). This perspective implies an analysis based on the portfolio selection criteria. That is, given a person's current income, her *attitude towards risk* and specific characteristics of the financial products available in the market, she makes an optimal decision regarding how to allocate the total money at her disposal. The aforementioned determinants come from the assumptions underlying the commonly recognised model of modern portfolio theory (Markowitz 1952). Interestingly, an alternative model adds psychological traits as another powerful influential factor. The behavioural portfolio theory (Shefrin – Statman 2000) allows for such decisions to be adjusted for the cognitive errors individuals experience when assessing the probability distribution of future outcomes (returns) on particular financial opportunities. This assessment is affected, for example, by the common bias of overweighting the small probabilities of high returns while underweighting the high probabilities of low returns (or losses).

Second, it is essential to introduce time variation into retirement savings analysis. Any issue concerned with the pension topic is reviewed in the long run. The central point is a trade-off between current and future consumption, as individuals decide on what fraction of their income to spend today while saving the rest and delaying consumption until later (i.e. reaching the retirement age). When analysing the *intertemporal choice problem* the two core concepts are utility theory and time discounting (Camerer et al. 2003). Rational agents are assumed to discount the utilities obtained from possible future outcomes in the form of their expected values and then maximise over the set of such alternatives (Samuelson 1937). Moreover, the agents are assumed to be risk averse on average. The problem with the expected utility theory, however, is that while many different shapes of utility functions have been proposed, none can be undoubtedly verified by observable decision making (Friedman – Savage 1948).

Time discounting, on the other hand, originates from the assumption that people do not equally value cash flows that are the same in absolute terms but occur at different points in time. People, who are more impatient, for example, exhibit a higher rate of discount, meaning that the future value of money diminishes for them very fast. Classically, an exponential form is used when assessing the discounting function. However, this form implies an individually fixed rate of time discounting, whereas experimental data suggest that people tend to behave inconsistently in terms of discounting, by changing the rates as time passes (Thaler

1981). This is why it is increasingly important to introduce hyperbolic or quasi-hyperbolic discounting functions (Strotz 1955).

One of the most prominent theoretical frameworks in the context of intertemporal choice is a life-cycle model. Its central assumption holds that individual consumption-savings decisions today are determined by the expectations of changes in future income. Specifically, it is believed that a person adjusts his current consumption level with respect to both current and anticipated future incomes. For instance, according to the model, one would increase his spending today when faced with a reliable belief of receiving higher earnings tomorrow (Diamond – Hausman 1984). However, the assumptions of life-cycle theory in practice might not always work. People often tend to behave with a backward- instead of a forward-looking perspective (making their current decisions based on past actions), but they may also face particular constraints preventing them from increasing their current consumption.

3. SURVEY OF EMPIRICAL LITERATURE

The empirical research analysing the role of the investigated behavioural factors for pension decisions is scarce, but it confirms the need for further empirical verification in this particular area.

O'Donnell (2011) focused on the UK and Irish households employing the results of the surveys run by local regulators. In the first step, the obtained risk aversion measures were regressed by the following socio-demographic characteristics: ethnic background variables, age, region of residence, marital status, gender, illness, the number of children under 18 years of age and the highest educational attainment of the individuals. In both countries, people with an ethnic background, singles and women were found to be more risk averse. Further, O'Donnell (2011) ran two types of models to explain the observed pension assets holdings, first with only the socio-demographic exogenous variables and then with the addition of proxies of risk attitude. But, the results were not conclusive. Risk-tolerant households were more likely to collect pension assets, but the estimated parameter was not significant, because the risk measure was highly correlated with other socio-demographic factors. Clark et al. (2012) challenged a specific research question about the reliance on home ownership for retirement planning. Using the results of a unique survey from 2007, where 2,400 participants of a defined contribution pension plan that was offered by an investment bank located in London were asked about their attitude to the role of home ownership, they compared the collected responses with the set of socio-demographic characteristics and a few risk attitude measures. The first finding was that in-

dependent of the employed risk attitude proxy, the models estimated after the addition of one of these variables were better than the models that relied only on socio-demographic factors. Second, those individuals, who declared that they relied upon the family home for a 'majority of their retirement needs', were found to be highly risk averse.

We can also find researches investigating the significance of time preference (again: a trade-off between current and future consumption) for the decisions regarding pension savings. Munnell et al. (2001/2002), using the results of 1998 Survey of Consumer Finances, confirmed that people with a short planning horizon were less likely to participate in a popular 401(k) plan in the US. Finke – Huston (2013) analysed the responses of nearly 7,000 students about the importance of savings for retirement. The intertemporal choices of the students were measured in two ways: The first was by measuring the time preference for money using a log-transformed numerical dollar comparison. The second was by asking a set of questions regarding eight behaviours that involve a trade-off between present and future utility. In conclusion, they confirmed the importance of both measures, but a scale of eight behaviours was found to be a better predictor of the importance of retirement savings than the traditional numerical scale of time preference. However, it should be noted that they analysed the self-reported statements of the students, which may not reflect their true savings decisions.

We contribute to the related research in two ways: First, we investigate simultaneously the importance of two behavioural factors that should support the robustness of the obtained results. Second, by using the internationally comparable LWS dataset, we try to indicate the country-specific and global determinants of demand for voluntary pensions.

4. OUR ECONOMETRIC APPROACH

To verify the link between behavioural variables and the demand for pension accounts, we estimate the following models for each country[3] separately:

$$PA_i = \gamma RA_i + \theta IT_i + \sum_{k=1}^{r} \varnothing_k SD_{i,k} + \mu\left(RA_i * IT_i\right) + \sum_{j=1}^{z} \delta_j\left(SD_{i,j} * IT_i\right)$$

$$+ \sum_{j=1}^{s} \partial_j\left(SD_{i,j} * RA_i\right) + \sum_{k=1}^{n} \beta_k INT_k + \varepsilon_i \ (1) \tag{1}$$

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[3]   Estimating the model on a full dataset would be undesirable as the number of observations for each country varies significantly.

where

$$INT_k = SD_{i,j} * SD_{i,j'} \tag{2}$$

and *RA* is a risk aversion variable, *IT* is an intertemporal choices variable, *SD* is a vector of *j* socio-demographic control characteristics, and *PA* is a pension account variable describing the demand for the voluntary pension savings of a particular individual, *i*.

The demand for pension (*PA*) is measured by the amount of funds accumulated in the individual voluntary pension account. The value of the accumulated assets can be equal to 0 for people who do not save at all or positive and continuous for the rest. Hence, we deal with a censored variable (censored from below). In our case, we use a Tobit model to explain two decisions simultaneously. The first decision is whether to save voluntarily, and in the case of a positive answer, the second decision is about how much to save. Hence, it is a combination of two models: probit and truncated regression.

In order to deliver more precise results, we decide to estimate the set of inter-action effects in our models. These interaction effects would measure the impact of two (or more) independent variables on the dependent variable. It is based on interpreting the μ, δ_j, ∂_j and β_k. For example, the parameter (β_1) measures the impact of $SD_{i,j'}$ on *PA* given the value of $SD_{i,j}$. For example, $SD_{i,j}$ is a gender variable (0 for male, 1 for female) of an individual *i*, and $SD_{i,j'}$ is a marital status dummy variable (1 if the individual married) for the same individual *i*. The interaction effect measured by β_1 reflects the impact of being married on pension savings for females or for males. In our study, we have estimated the interaction between two investigated behavioural variables ($RA_i * IT_i$), two interactions between socio-demographic and behavioural variables, i.e. gender and risk aversion ($SD_{i,j} * RA_i$) (s = 1) and gender and intertemporal choices ($SD_{i,j} * IT_i$) (z = 1), and also five (n = 5) interactions between socio-demographic variables ($SD_{i,j} * SD_{i,j'}$), namely interactions between gender and education, immigrant status and income, age and education, education and income, and finally gender and marital status. These pairs have been chosen to test some literature findings. Hinz et al. (1997) and Bajtelsmit – VanDerhei (1997) found that after controlling for income and age, women are more risk averse than men. Sundén – Surette (1998) identified that among all married individuals, women are more risk averse than men. Other studies have investigated interactions between a set of socio-demographic variables and have found heterogeneous results (Lee – Hanna 1995; Adhikari – O'Leary 2013).

5. DATA

The countries data applied in this study come from the "Survey on Italian House-holds' Income and Wealth 2010" and "Household Assets Survey 2011" for the UK and "Survey of Consumer Finance 2013" for the USA. These three datasets have been further acquired and harmonised by Luxembourg Wealth Study 2016 (LWS) to enable comparability across these countries.

Each country has its specific dataset that contains two kinds of files: individu-al-level and household-level files. The individual files present information about household members, while the household files display information about particu-lar households. The total of the continuous variables for the household members is equal to the overall variable for this particular household; for example, the sum of the individual members' income is reported as aggregate income in the house-hold file. Every file also contains a weight variable. The weight variable makes the sample representative for the overall population and hence allows for a more accurate estimation. The investigated variables have been standardised in terms of their content and coding structure. The continuous variables are expressed in the same units across different datasets. The categorical variables have been standardised and coded using the same value code and label for all countries.

We focus on three phenomena: risk aversion, intertemporal choices and de-mand for pensions. In the local surveys, *risk aversion (RA)* is measured asking the following question: "Which of the following statement comes closest to de-scribing the amount of financial risk that you (and your husband/wife/partner) are willing to take when you save or make investments?" The respondent can pick one of the following answers: (1) take substantial financial risks, expecting to earn substantial returns; (2) take above-average financial risks, expecting to earn above-average returns; (3) take average financial risks, expecting to earn average returns; and (4) not willing to take any financial risk. In the UK, the answers were ranked in 5 categories (see below) rather than four.

There are slight differences between the analysed countries in the assessment of *intertemporal choices (IT)*. However, a comparison is still possible, as the results allow for classifying the individuals from the most patient ones (who do not discount the future) to the most impatient ones (who discount the future at the highest rate).

The set of questions to estimate time discounting rate measuring the intertem-poral choices was as follows:

Italy: *You have won the lottery and will receive a sum equal to your house-hold's net yearly revenue. You will receive the money in a year's time. However, if you give up part of the sum, you can collect the rest of your win immediately.*[4]

Respondents were classified in 5 categories, from 1, the most patient (forward looking), to 5, the most impatient, as presented in *Table 1*.

Table 1. Intertemporal choice classifications for Italy (%)

Category	Agree to give up	Refuse to give up
1		2
2	2	5
3	5	10
4	10	20
5	20	

UK: If you had a choice of receiving a thousand pounds today or one thousand one hundred pounds next year, which would you choose?
1. £1,000 today; 2. £1,100 next year; 3. Don't know/no opinion (Spontaneous only).

USA: In planning or budgeting your (family's) saving and spending, which of the following time periods is most important to you (and your family living here):
1. The next few months; 2. The next year; 3. Next few years; 4. Next 5–10 years; 5. Longer than 10 years.

A detailed description of each *socio-demographic regressors (SD)* is found in *Appendix A*.

6. EMPIRICAL RESULTS

We start our verification procedure by analysing the diversity of the investigated samples with respect to the two behavioural variables.

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[4]   This question can be considered as a measure of risk aversion: the amount that respondent is ready to give up to avoid future uncertainty is considered as a risk premium. However, in the question, the uncertainty about the future benefit is not mentioned. This is why we argue that the question measures patience (intertemporal choices): a respondent who is ready to give up more (20%) to get the amount immediately is considered as impatient.

We notice, unsurprisingly, that in every society, the majority of its members are moderately and highly risk averse (*Table 2*), which is in line with the empirical outcomes reported by Barsky et al. (1997).

Table 2. Risk attitude by countries (%)

	Italy	USA	UK	
[1] takes substantial financial risks, expecting to earn substantial returns	1.09	4.22	(1) Risk tolerant	1
[2] takes above-average financial risks, expecting to earn above average returns	19.71	18.95	2	8
[3] takes average financial risks, expecting to earn average returns	33.11	39.96	3	16
[4] not willing to take any financial risk	46.09	36.87	4	45
			(5) Risk averse	30

Similarly, the summary statistics show the significant heterogeneity in people's attitudes towards the future in the investigated countries. According to the taxonomy presented in *Table 1*, 28% of the Italians are classified in the 1st category, 16% in the 2nd, 18% in 3rd, 17% in the 4th and 21% in the 5th. In the UK, 76% of the respondents picked the immediate payment (1000 pounds today), 23% picked the deferred payment (1100 pounds next year), and 1% had no opinion. In the USA, 23% of the population was concerned about the next few months, 13% about the next year, 25% about the next few years, 23% about the next 5–10 years and 16% about beyond the next 10 years.

The visual inspection of the statistics presented in *Tables A.1, A.4* and *A.6* does not provide a clear guidance about whether the behavioural factors are correlated with particular socio-demographic characteristics. The exception is the relationship between gender and risk attitude revealing that in every analysed country, women are more risk averse than men. However, the role of *SD* is assessed by estimating equation 1[5].

In every country, men are found to collect more in pension accounts than women[6]. The first guess regarding the reason for this result could be gender wage

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[5]   In *Appendix B,* we provide the models with those socio-demographic variables that were found to be significant.

[6]   We cannot directly interpret the estimates of the elasticity coefficients because in Tobit models, they may be referred directly to the uncensored latent variable, not to the observed outcome. In other words, the estimated coefficients can be interpreted as the combination of change in the endogenous variable above the limit (in our case, the value of a pension account is greater than zero) weighted by the probability of being above the limit. Hence, we interpret only the coefficients' signs and their significance.

gap, but we always include income as a variable in our models to account for it. Another strong conclusion can be formulated about the role of education and financial literacy[7], which positively affect pension demand. In the case of Italy, an unexpected result is obtained regarding age, as this variable has a negative load. This is probably due to the fact that in the past, the public pension system in Italy had provided relatively generous benefits, and government started to promote individual accounts only in 2007. We should also report the unique results regarding the ethnicity factor, which is verified only for the US due to data availability. All other ethnic groups, relative to "Whites (include Middle Eastern/Arabian with White); Caucasian", were found to save less for retirement in individual accounts. To sum up, the identified significant relationships between the socio-demographic characteristics and pension demand justify the use of the *SD* vector as a set of control variables and should support the robustness of the conclusions on the role of risk attitudes and intertemporal choices.

The summarised results on the importance of the behavioural factors for pension demand are presented in *Table 3*.

Table 3. Demand for pensions – summary results for behavioural predictors

Behavioural variable	Italy	UK	USA
Risk aversion	–	–	–
Intertemporal choice (being forward looking)	0	+	+

Note: '+'/'–' mean positive impact of a particular variable on pension demand, while '0' indicates an insignificant variable. As the time preference factor for Italy is found to be insignificant, we estimate model 1 after excluding this variable.

We have identified that risk aversion negatively affects pension savings accumulation in each of the analysed countries (*Tables A.3, A.5* and *A.7*). The observed negative relationship has also been confirmed by other studies (e.g. Bommier – Le Grand 2014). The potential explanation is that risk-averse individuals may be afraid of not receiving their savings back; hence, they tend to avoid uncertainty surrounding the future benefit and prefer current consumption.

To deliver more detailed results, we have tested the interactions between the model variables, and the summary outcomes are displayed in *Table 4*.

When examining the interaction effects, we find that in Italy and the UK being a woman intensifies the negative effect of risk aversion on pension demand. Surprisingly, the opposite relationship is found for the USA, where risk-averse women save more than risk-tolerant ones.

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[7]   The proxy for financial literacy was available only for Italy.

Table 4. Interaction effects when demand for pensions is the dependent variable

Interaction effects	Italy	UK	USA
Gender##education	Compared with low-educated females, medium-educated females demand less voluntary pension, and highly educated females demand more voluntary pension	Highly educated females save more in voluntary pension accounts than low educated females	Highly educated females save more in voluntary pension accounts than low educated females
Gender##Income	Females with high income save more in their voluntary pension accounts	Females with high income save more than females with low income	Females with high income save more than females with low income
Age##Income	For all age groups, high-income people save more in voluntary pensions	For all age groups, high-income people save more in voluntary pensions	Insignificant
Gender##Marital status	Females who were formerly married or in a union save less in voluntary pension accounts. Widows save more.	Married females save more in voluntary pension accounts	Insignificant
Gender##inter temporal choices	Insignificant	Patient females save more than impatient females	Forward-looking females save less in voluntary pension accounts
Gender##risk aversion	Females with high risk aversion save less than females with low risk aversion	Female with high risk aversion save less than females with low risk aversion	Among females, risk-averse ones save more in their voluntary pension accounts
Risk aversion##inter temporal choices	Among all categories of risk aversion, intertemporal choice has a mixed impact on the demand for voluntary pension	Among high risk averse categories, being patient does not mean saving more for retirement	n.a.
Ethnicity##gender	n.a.	n.a.	Across ethnicities, females save more in voluntary pension accounts

Note: n.a. = data are not available.

According to the existing literature (e.g. Arrondel et al. 2004; Lusardi – Mitchell 2007), people who highly discount the future should be less eager to save for retirement. Our study also supports this view for the UK (*Table A.5*) and the US (*Table A.7*), while in Italy, it is insignificant (*Table A.2*). Similar to the risk-aversion factor, in the case of intertemporal choices, we have also estimated its interaction with gender. However, the obtained results are inconclusive. Additionally, we have also tested the interaction between risk aversion and intertemporal choices. The results show that in Italy, among all categories of risk aversion, being patient has a significant impact on voluntary pension savings; however, this result is somewhat noisy and difficult to read. The same mixed results have been obtained for the UK. In the USA, this interaction is not applied because the two variables are codified in four categories, which results in too many interactions.

Finally, in order to ensure the robustness of the obtained results we analysed Variance Inflation Factor (VIF) to test collinearity in all our models (Mansfield – Helms 1981). This phenomenon does not lead to biased estimates of the parameters but may dramatically increase the probability of type II error – we may wrongly conclude that variable is insignificant. A commonly given rule of thumb is that VIFs of 10 or higher may be a reason of concern. In our study, the VIFs for all independent variables are substantially lower than the threshold which means that no collinearity problem exists in our models.

7. CONCLUSIONS

In this study we have demonstrated that the two investigated behavioural characteristics affect the demand for voluntary pensions in a similar way in the three analysed countries: Italy, the UK and the USA. We believe the obtained results enable us to formulate some policy recommendations to enhance people's propensity to save for retirement.

We have shown that, on average, greater risk aversion reduces people's willingness to save. An exception to the latter is the case of the USA, where the risk-averse women were inclined to save more on average than those of higher risk tolerance. Nevertheless, the majority of society members are at least moderately risk averse, which should motivate the regulatory bodies to run a strict supervision of the pension saving sector. At the same time, financial institutions should pay more attention to the development and sales of low-risk products, even if the theory (Poterba – Summers 1988; Spierdijk et al. 2012) supports investing more in risky instruments due to the mean reversion of their returns, which improves the risk-return trade-off in the long run. High risk aversion may also have tremendous consequences for the decumulation phase. Regulators should deeply

reconsider this argument whenever they wish to impose mandatory annuitisation of voluntary retirement savings. People may be afraid to die shortly after retiring[8]; hence, they might have a feeling of overpaying the annuity. Therefore, the lump-sum option should always be available, and the longevity risk should be managed by the public (mandatory) pension pillar.

Our next general conclusion states that people who highly discount the future are less likely to save for retirement. Therefore, the government and/or private institutions should offer savings products combined with some other products/services offering immediate benefits. Following Jhabvala (1998), examples from the public sector include access to the healthcare system for children of an insured person or discounted tickets for transportation. Clark et al. (2016) argue that something simple as a small incentive to attend a retirement workshop during individuals' normal work hours may successfully change their behaviour.

Regarding the role of socio-demographic variables, we have found that age, gender and education are significant predictors of pension demand. Somewhat surprisingly, the analysis of "family variables", i.e., marital status and number of children, does not drive us to any robust conclusions. This means that individuals in these analysed countries do not expect family support during old age. Therefore, this finding grounds the need for an institutional pension system.

According to the interaction effects, the impact of some variables on saving behaviours is different across gender, income, immigrant and age groups. These detailed results may also help project more effective policy solutions supporting saving for retirement in the diversified society.

Last but not the least, we should note the points that deserve further research attention. So far, we have investigated only two behavioural factors affecting the decision of pension savings, but the list of potential behavioural determinants is longer. One candidate may be an individual's confidence in a public pension system. In the past few decades, especially in Continental Europe, governments were granting generous pension benefits (in terms of the replacement rate), as the demographic situation was favourable. Therefore, many people may recognise the current conditions as a "state of nature" and treat the warning consequences of demographic projections as incredible. Understanding the importance of these beliefs may have tremendous meaning for the future shape of pension systems.

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[8]   Even if people systematically underestimate how long they will live (Drinkwater – Sondergeld 2004).

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APPENDIX A

Variables' definitions[9]

Variable	Definition	Comments
Socio-demographic variables		
Age	Age in years	
Disposable household income	Total monetary and non-monetary current income net of income taxes and social security contributions.	
Education	Recode of highest completed level of education into three categories: – low: less than secondary education completed (never attended, no completed education or education completed at the ISCED levels 0, 1 or 2); – medium: secondary education completed (completed ISCED levels 3 or 4); – high: tertiary education completed (completed ISCED levels 5 or 6).	
Ethnicity/race	Information about cultural, racial, religious, or linguistic characteristics, origin, or classification.	
Gender	Classification of persons according to their sex.	
Immigrant (dummy)	All persons who have that country as country of usual residence and (in order of priority): – whom the data provider defined as immigrants; – who self-define themselves as immigrants; – who are the citizen/national of another country; – who were born in another country.	
Individual voluntary pension accounts	Value of voluntary non-occupational individual accounts for old-age purposes.	Refers to non-occupational plans for which the state does not require mandatory participation. Please note that non-occupational plans are not established by the employer, but employers could also participate in such plans. The contributions can be paid by the individual alone or by the individual and his/her employer.

[9]   The definitions and comments have been provided by Luxembourg Income Study (LIS).

Table continued

Variable	Definition	Comments
Industry	Industry classification of main job.	
Marital status	Classification of persons according to their marital status, as provided in relation to the marriage laws or customs of the country.	Marital status will in general correspond to the *de jure* situation (i.e., the situation with respect to legal unions – whether marriage or registered unions), but can also refer to some customary consensual unions in case they are based on generally accepted and agreed upon norms and regulations as established by common practice. As a result, whereas for most datasets the "married/in union" overall category only refers to the *de jure* unions (code 110), for some others it can also refer to consensual unions (code 120). Users interested in partnership status including both the *de jure* and the *de facto* situations (i.e., any consensual union) should use the variable PARTNER instead. Note that in case the 100s codes refer to both the *de jure* and *de facto* situations, then code 210 ("never married/never in union") will in practice capture those who were never in a *de jure* union (never married or in a registered union) and who are not CURRENTLY in a consensual union (as information on cohabitation history is rarely provided).
Number of own children	Number of (biological, adoptive or step) children of the individual who exist in a household.	This variable is always provided for head and spouse (assuming the children of the head are also children of his/her spouse). It is provided for other members only when the dataset includes pointers to parents or a full matrix of relationships.

Table continued

Variable	Definition	Comments
Status in employment	Status in employment in main job. At a minimum, employees should be distinguished from the self–employed, but other details available can be provided (e.g., regular versus non regular for employees and type of self-employed – employer, own-account worker, member of producers co-operative and contributing family worker).	
Total income	This includes: – total monetary payments from labour, property, and social or private transfers. – total value of non-monetary goods and services received from labour and social or private transfers, excluding social transfers in kind, such as universal health insurance, universal education benefits, and near cash benefits from public housing.	
Behavioural variables		
Financial literacy	Financial literacy of each household member. The topics covered can include the basic financial literacy (numeracy, money illusion, time value of money, information about the understanding of interest rates, compounding, discounting, etc.) as well as topics related to more advanced financial knowledge (the difference between stocks and bonds, the function of the stock market, the working of risk diversification, the relationship between bond prices and interest rates, etc.).	
Forward looking	How far the household members look into the future for their financial planning (e.g., the time period that is important for household savings and spending) or how in details the household members organise their financial planning.	

Table continued

Variable	Definition	Comments
Risk aversion	Investment strategies that a household member is willing to take with respect to the exposure to risk of losing capital; it can also contain the information about the preferences in terms of risk and return on financial investments.	
Savings behaviour	Indication of whether or not a household member saves during the income reference year based on all sources of their income (i.e., employment income, rent, income from capital, social security income, private transfers, etc.).	

APPENDIX B

Model estimates

Italy

Table A.1. Summary statistics

	[1] Prefers financial investments with very high returns, but with a high risk of losing part of the capital	[2] Prefers financial investments with a good return, but also a fair degree of protection for the invested capital	[3] Prefers financial investments with a fair return, with a good degree of protection for the invested capital	[4] Prefers financial investments with low returns, with no risk of losing the invested capital
Less than 24 (%)	1	22	35	42
25–34 (%)	1	22	36	42
35–44 (%)	1	21	35	43
45–54 (%)	1	22	35	42
55–64 (%)	1	20	35	44
65 and over (%)	1	15	27	58
Gamma	0.11			
[1] Male (%)	1	20	34	45
[2] Female (%)	1	19	33	47
Gamma	0.03			
[0] None (%)	1	19	30	49
[10] Primary school (%)	1	16	25	58
[20] Lower secondary school (%)	1	20	33	47
[31] Vocational second school (%)	1	20	34	45
[32] Upper secondary school (%)	1	22	38	39
[51] 3-year university (%)	1	22	39	38
[52] 5-year university (%)	1	23	41	34
[60] Postgraduate qualification (%)	1	22	43	34
Gamma	−0.13			

Table A.1. continued

	[1] Prefers financial investments with very high returns, but with a high risk of losing part of the capital	[2] Prefers financial investments with a good return, but also a fair degree of protection for the invested capital	[3] Prefers financial investments with a fair return, with a good degree of protection for the invested capital	[4] Prefers financial investments with low returns, with no risk of losing the invested capital
[110] Regular employee (%)	1	21	36	42
[120] Non regular employee (%)	4	15	23	58
[200] Self-employed (%)	0	0	100	0
[210] Employer (%)	1	25	37	37
[220] Own-account workers (%)	1	22	38	39
[240] Contributing family workers (%)	0	26	35	39
Gamma	−0.044			
[1] Agriculture (%)	0	17	32	51
[2] Industry (%)	1	19	31	48
[3] Services (%)	1	22	39	38
Gamma	−0.14			
Average income, EUR	16952.25	14722.3	14896.33	12655.08
[0] Not living with own children (%)	1	17	30	52
[1] Living with 1 own child (%)	1	19	34	46
[2] Living with 2 own children (%)	1	22	36	41
[3] Living with 3 own children (%)	0	24	34	42
[4] Living with 4 own children (%)	2	20	42	37
[5] Living with 5 own children (%)	0	45	18	36
[6] Living with 6 own children (%)	0	0	100	0
Gamma	−0.12			

Table A.1. continued

	[1] Prefers financial invest-ments with very high returns, but with a high risk of losing part of the capital	[2] Prefers financial invest-ments with a good return, but also a fair degree of pro-tection for the invested capital	[3] Prefers financial invest-ments with a fair return, with a good degree of protection for the invested capital	[4] Prefers financial invest-ments with low returns, with no risk of losing the invested capital
[11] Does not save: expenses higher than income (%)	1	15	30	54
[12] Does not save: ex-penses equal to income (%)	1	18	29	52
[20] Saves (%)	1	20	36	44
Gamma	−0.11			
Average accumulated stock of assets in vol-untary pension account, EUR	468.3417	168.9029	239.0009	101.2987
Quantile of income (%)				
1st	1	17	30	52
2nd	1	19	34	46
3rd	1	22	36	41
4th	0	24	34	42
5th	2	20	42	37
If I had to change a job my priority would be :				
Working in a healthy safe place (%)	1	18	39	42
A secure job, without the risk of company shutdown or of dis-missal (%)	2	20	37	42
Working in healthy safe place is my priority (1st & 2nd priority if I had to change a job) (%)	1	18	39	42
A secure job, without the risk of company shutdown or of dis-missal (1st & 2nd priority if I had to change a job) (%)	2	20	37	42

Table A.1. continued

	[1] Prefers financial investments with very high returns, but with a high risk of losing part of the capital	[2] Prefers financial investments with a good return, but also a fair degree of protection for the invested capital	[3] Prefers financial investments with a fair return, with a good degree of protection for the invested capital	[4] Prefers financial investments with low returns, with no risk of losing the invested capital
Refuse to give up 2% (patient) (in per cent)	1	24	29	46
Accept to give up 2% and refuse 5% (in per cent)	1	18	39	41
Accept to give up 5% and refuse 10% (in per cent)	2	17	43	39
Accept to give 10% and refuse 20% (in per cent)	0	19	32	49
Accept to give up 20% (impatient) (in per cent)	2	16	24	57
Gamma	0.09			
Having voluntary health insurance (%)	2	16	44	38
Not having voluntary health insurance (%)	1	20	32	47
Gamma	0.08			
Poor (%)	1	18	26	56
Gamma	0.11			

Source: Own study based on LWS data.

Table A.2. Weighted Tobit model with time preference as one of the independent variable. The dependent variable is the amount accumulated in the voluntary pension account

Variable	Coefficient
Age	−2.512
	(39.20)
Female	−4,890*
	(2,847)
2. Medium level of education	17,510***
	(3,665)
3. Higher level of education	23,565***
	(5,302)
2. Time preference 2 (preference for the present)	−3,500
	(5,231)
3. Time preference 3	4,647
	(4,827)
4. Time preference 4	1,049
	(4,239)
5. Time preference 5 (patient)	−984.6
	(4,146)
Correct answer to the inflation question	−4,210**
	(2,073)
Personal Income	0.147***
	(0.0410)
Constant	−58,124***
	(11,986)
Observations	9,852

Note: The model was estimated for the entire sample. *** significant at 1% level, ** significant at 5% level, * significant at 10% level. Standard errors in parentheses.

Source: The model was estimated using Stata software and LWS data.

Table A.3. Weighted Tobit model with risk attitude as one of the independent variable. The dependent variable is the amount accumulated in the voluntary pension account

Variable	Coefficient
Age	−1,733***
	(167.2)
Female	−9,830***
	(2,896)
2. Medium level of education	23,375***
	(3,916)
3. Higher level of education	29,271***
	(4,706)
2. Prefers financial investments with a good return, but also a fair degree of protection for the invested capital	−23,803***
	(8,306)
3. Prefers financial investments with a fair return, with a good degree of protection for the invested capital	−15,600*
	(7,959)
4. Prefers financial investments with low returns, with no risk of losing the invested capital	−23,911***
	(8,119)
Financial literacy	−3,275
	(3,481)
Financial literacy 2	15,762***
	(3,424)
Household income	0.358***
	(0.0582)
Constant	6,574
	(10,798)
Observations	7,721

Note: The model was estimated for the whole sample. *** significant at 1% level, ** significant at 5% level, * significant at 10% level, Standard errors in parentheses.

Source: The model was estimated using Stata software and LWS data.

UK

Table A.4. Summary statistics

	Risk tolerant (1)	2	3	4	Risk averse (5)
Less than 24 (%)	1	9	23	48	19
25–34 (%)	2	8	20	47	23
35–44 (%)	1	9	18	48	24
45–54 (%)	1	9	16	47	27
55–64 (%)	1	8	13	45	33
65 and over (%)	2	6	14	39	38
Gamma	0.13				
[1] Male (%)	2	9	16	44	30
[2] Female (%)	1	7	16	46	30
Gamma	0.034				
[110] Married (%)	1	7	14	46	31
[120] In consensual union (%)	2	9	17	46	25
[210] Never married/ no (%)	2	8	20	45	24
[221] Separated (%)	3	9	19	40	30
[222] Divorced (%)	2	8	17	42	30
[223] Widowed (%)	2	7	16	38	37
[0] Not living with own children (%)	1	7	15	44	32
[1] Living with 1 own child (%)	2	8	16	44	30
[2] Living with 2 own children (%)	1	9	18	48	24
[3] Living with 3 own children (%)	1	9	18	47	25
[4] Living with more than 4 own children (%)	3	8	21	46	22
Gamma	−0.09				
[1] Low education (%)	2	8	20	38	31
[2] Medium (%)	1	7	15	46	30
[3] High education (%)	1	8	15	47	29
Gamma	0.013				

Table A.4. continued

	Risk tolerant (1)	2	3	4	Risk averse (5)
[100] Dependent employed (%)	1	8	16	49	26
[122] Apprentice / training (%)	0	17	17	28	39
[200] Self-employed (%)	0	0	0	100	0
[210] Employer (%)	3	8	15	43	32
[220] Own-account work (%)	1	10	15	45	28
[240] Contributing family workers (%)	2	4	19	40	36
Gamma	0.01				
[1] Agriculture (%)	2	11	17	48	22
[2] Industry (%)	1	9	17	49	24
[3] Services (%)	1	8	15	48	27
Gamma	0.065				
[1] Very good health (%)	1	8	15	45	30
[2] Good health (%)	1	8	15	48	28
[3] Fair (%)	2	8	16	41	33
[4] Bad health (%)	3	8	19	39	31
[5] Very bad health (%)	5	7	23	33	33
Gamma	−0.0049				
Average personal income (GBP)	20,208.42	26,593.36	22,658.01	23,487.67	22,445.58
Average household income (GBP)	30,716	38,232	34,829	37,531	35,453.35
Average accumulated stock of assets in voluntary pension account (GBP)	4293.068	11289.25	5635.431	4444.046	3786.164

Table A.4. continued

	Risk tolerant (1)	2	3	4	Risk averse (5)
[3] Don't know / no opinion (%)	6	5	38	33	19
[2] One in five chance to win 10000 (%)	2	12	17	47	23
[1] Guaranteed payment of 1000 (%)	1	7	15	45	32
Gamma	0.19				

[1] £1,000 today (%)	2	7	16	45	30
[2] £1,100 next year (%)	1	8	14	46	31
[3] Don't know / no opinion (%)	7	4	45	22	23
Gamma	0.02				

Take a risk to get a good return					
[0] Don't know (%)	8	12	9	38	34
[1] Agree Strongly (%)	3	9	9	16	62
[2] Agree (%)	1	8	11	56	24
[3] Neither agree nor disagree (%)	1	3	38	36	22
[4] Disagree (%)	1	12	5	46	36
[5] Disagree strongly (%)	21	5	3	10	62
Gamma	−0.06				

Source: Own study based on LWS data.

Table A.5. Weighted Tobit model. The dependent variable is the amount accumulated in voluntary pension account

Variable	Coefficient
2. Fair toward risk	−28,933***
	(7,002)
3. Risk averse	−23,064***
	(5,673)
Avoid the risky gamble	−16,346***
	(4,154)
Wait for differed payment	19,150***
	(3,948)
Female	−47,770***
	(3,792)
Age	1,427***
	(157,3)
2. Medium level of education	50,167***
	(8,835)
3. High level of education	71,860***
	(9,098)
1. Dependent employed, apprentice / trainee |(ref)	0
	(0)
2. Self-employed	−870,832
	(0)
3. Employer	94,851***
	(10,424)
4. Own-account worker	40,785***
	(5,107)
5. Contributing family worker	−74,255**
	(33,831)
2. Industry	9,730
	(16,296)
3. Services	−13,852
	(16,038)
Constant	−156,569***
	(20,950)
Observations	14,968

Note: The model is estimated for the whole sample, i.e. for the individuals who save and do not save.

Source: The model was estimated using Stata software and LWS data. *** significant at 1% level, ** significant at 5% level, * significant at 10% level. Standard errors in parentheses.

USA

Table A.6. Summary statistics

	[1] Takes substantial financial risks expecting to earn substantial return	[2] Takes above average financial risks expecting to earn above average return	[3] Takes average financial risks expecting average return	[4] Not willing to take any financial risk
Less than 24 (%)	5	20	37	38
25–34 (%)	4	18	38	40
35–44 (%)	6	21	38	35
45–54 (%)	5	20	42	32
55–64 (%)	3	19	46	32
65 and over (%)	3	13	41	43
Gamma	0.02			
[1] Male (%)	4	20	43	33
[2] Female (%)	4	18	40	39
Gamma	0.09			
[100] Married/in union (%)	3	12	30	55
[110] Married (%)	4	21	46	29
[120] In consensual un (%)	4	15	30	51
[210] Never married/no (%)	4	17	38	40
[220] Formerly married (%)	3	13	28	56
[221] Separated (%)	4	8	32	56
[222] Divorced (%)	4	12	35	50
[223] Widowed (%)	2	7	27	64
Chi^2	2.80E+03	Pr	0	
[1] Low level of education (%)	2	6	17	75
[2] Medium level of education (%)	3	13	36	48
[3] High level of education (%)	5	26	50	19
Gamma	–0.51			
[1] White (include Middle Eastern/Arabian with White); Caucasian (ref) (%)	4	20	44	33
[2] Black/African-American (%)	4	12	31	53

Table A.6. continued

	[1] Takes substantial financial risks expecting to earn substantial return	[2] Takes above average financial risks expecting to earn above average return	[3] Takes average financial risks expecting average return	[4] Not willing to take any financial risk
[3] Hispanic/Latino (%)	4	8	22	66
[4] Other: Asian, American Indian/Alaska Native, Native Hawaiian/Pacific Islander (%)	7	16	41	36
Gamma	0.28			
[1] Excellent health (%)	5	25	46	23
[2] Good health (%)	3	18	42	36
[3] Fair health (%)	4	10	33	53
[4] Poor health (%)	2	7	26	64
Gamma	0.31			
[110] Employed, at work (%)	4	21	43	31
[210] Unemployed (%)	4	12	35	49
[220] Not in labour force (%)	6	20	43	31
[221] Retired, pension (%)	2	10	41	47
[222] In education (%)	7	17	38	38
[223] Homemaker (%)	5	22	41	32
[224] Disabled (%)	2	8	22	68
Gamma	0.19			
[100] Dependent employee (%)	4	19	41	36
[200] Self-employed (%)	7	27	49	17
Gamma	−0.33			
[1] Agriculture (%)	7	18	38	37
[2] Industry (%)	4	18	42	36
[3] Services (%)	5	22	43	30
Gamma	−0.1			
Average log income	11.1736	11.09101	10.77835	10.08863
Average accumulated stock of assets in voluntary pension account (USD)	170,199.5	211,779.2	122,157.5	110,86.41

Table A.6. continued

	[1] Takes substantial financial risks expecting to earn substantial return	[2] Takes above average financial risks expecting to earn above average return	[3] Takes average financial risks expecting average return	[4] Not willing to take any financial risk
[0] Not living with own children (%)	3	17	43	37
[1] Living with 1 own child (%)	5	17	39	38
[2] Living with 2 own children (%)	4	24	42	30
[3] Living with 3 own children (%)	6	26	34	34
[4] Living with 4 own children (%)	3	16	43	38
[5] Living with 5 own children (%)	3	17	39	41
[6] Living with 6 own children (%)	26	11	21	42
[7] Living with 7 own children (%)	0	0	67	33
Gamma	−0.0875			

[1] Next few months are the most important for my budget plan (%)	3	10	25	62
[2] Next year is the most important for my budget plan (%)	4	14	39	43
[3] Next few years are the most important for my budget plan (%)	4	19	41	36
[4] Next 5–10 years are the most important for my budget plan (%)	4	23	50	23
[5] Longer than 10 years are the most important for my budget plan (%)	7	30	47	17
Gamma	−0.36			

Does not save: usually spend more than income (%)	9	8	22	61
Gamma	0.33			

Table A.6. continued

	[1] Takes substantial financial risks expecting to earn substantial return	[2] Takes above average financial risks expecting to earn above average return	[3] Takes average financial risks expecting average return	[4] Not willing to take any financial risk
Does not save: I spend as much as my income (%)	4	10	24	63
Gamma	0.46			
Saves whatever is left (%)	4	15	40	41
Gamma	0.13			
Saves income of one family member and spends the other (%)	4	26	48	23
Gamma	−0.21			
Spends regular income and saves the rest (%)	5	29	48	17
Gamma	−0.33			
Saves regularly by putting money aside each month (%)	4	25	46	25
Gamma	−0.32			

Source: Own study based on LWS data.

Table A.7. Weighted Tobit model. The dependent variable is the amount accumulated
in voluntary pension account

Variable	Coefficient
Age	6,561*** (251.4)
Female	−38,726*** (7,234)
2. Medium education	255,307*** (21,462)
3. High education	406,468*** (21,953)
2. Takes above average financial risks expecting to earn above average return	37,828* (20,859)
3. Takes average financial risks expecting average return	6,8117 (19,912)
4. Not willing to take any financial risk	−169,256*** (20,385)
2. Next year is the most important for my budget plan	6,467 (12,340)
3. Next few years is the most important for my budget plan	24,737** (10,385)
4. Next 5–10 years is the most important for my budget plan	43,408*** (10,897)
5. Longer than 10 years is the most impor- tant for my budget plan	141,847*** (12,426)
Household income	178,096*** (4,953)
2. Black/African-American	−78,835*** (11,697)
3. Hispanic/Latino	−100,007*** (15,094)
4. Other: Asian, American Indian/Alaska Native, Native Hawaiian/Pacific Islander	−33,818** (16,364)

Table A.7. continued

Variable	Coefficient
Number of children	−38,008***
	(3,688)
2. I don't save I spend as much as my income	36,351
	(22,752)
3. I save whatever is left	61,718***
	(21,635)
4. Saves income of one family member and spends the other	52,758
	(32,101)
5. Spends regular income and saves the rest	89,598***
	(25,811)
6. Saves regularly by putting money aside each month	93,167***
	(21,458)
Constant	−2.731e+06***
	(63,402)
Observations	29,679

Note: The model is estimated for the whole sample, i.e. for the individuals who save and do not save.

Source: The model was estimated using Stata software and LWS data. *** significant at 1% level, ** significant at 5% level, * significant at 10% level. Standard errors in parentheses.