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Individual choice of pension fund investment options: Evidence from Italy

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Abstract

This paper examines the factors influencing individuals' choices of investment options offered by pension funds in Italy. Using survey data from the Italian Financial Education Committee (EDUFIN Committee), we analyze how financial and pension literacy, along with other behavioral traits, affect the decision to make more conservative or riskier investment decisions for retirement savings. We find that higher knowledge – particularly pension literacy – and seeking professional guidance significantly increase the likelihood of selecting more equity-oriented investment sub-funds. Conversely, interest in riskier sub-funds declines with risk aversion, economic satisfaction, and financial anxiety.

Keywords: Financial decision-making, Portfolio preferences, Financial Literacy

JEL codes: D14, G11, G23, G51, G53

1. Introduction

Over the past decades, the Italian public pension system has undergone significant reforms in response to growing financial and demographic pressures. These changes introduced a Notional Defined Contribution (NDC) scheme within the existing Pay-As-You-Go (PAYG) framework, shifting the system towards greater individual responsibility. As a result, future public pension benefits now depend on both personal contribution histories and broader economic and demographic factors. Specifically, the total amount accrued is based on contributions paid during an individual's working life, revalued by the nominal growth rate of national GDP, and adjusted to life-expectancy changes. In contrast, since the reform in the mid-nineties, the private pension system has become fully funded and mostly based on Defined Contribution (DC) schemes. This means that the investment risks are fully borne by

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the members of the pension funds and the future retirement income depends essentially on both the amount contributed and the financial returns earned over time.

These reforms have transferred greater responsibility for retirement outcomes to individuals, both in public and private pension systems. Therefore, ensuring an adequate income in retirement now requires active and informed decision-making. Successful retirement planning depends not only on access to information, but also on individuals' ability to understand and apply it – drawing on pension-specific knowledge, general financial literacy, and financial awareness. This stands in contrast to traditional Defined Benefit (DB) systems, where employers managed contributions and guaranteed benefits, requiring little engagement or financial expertise from plan members.

Within DC private pension systems, individuals must make a series of complex financial decisions – such as whether to enroll in a supplementary pension plan, how much to contribute, how to allocate investments, and when to withdraw savings. However, many lack adequate financial knowledge and are susceptible to behavioral biases, including choice overload, time inconsistency, heuristic decision-making, framing effects, overconfidence, extrapolation bias, and loss aversion (OECD, 2018). These factors can lead to suboptimal investment decisions. To design policies that help members maximize their retirement savings, it is therefore essential to understand how their decisions are shaped by personal characteristics and behaviors.

Given the significant impact that investment choices in DC schemes have on future retirement income, both retirement planning and informed individual decision-making are essential. This paper investigates how financial and pension knowledge, and behavioral factors influence investment choices within private pension schemes in Italy, moving beyond the traditional focus on socio-demographic characteristics alone. The analysis draws on the fourth wave of the survey conducted by the Italian EDUFIN Committee, which provides detailed information on a representative sample of Italian individuals. Our findings show that higher levels of knowledge, particularly pension-specific literacy, and seeking professional financial guidance increase the likelihood of choosing equity-oriented sub-funds among those enrolled in supplementary pension schemes. Conversely, individuals with higher risk aversion, greater financial anxiety, or (less intuitively) higher satisfaction with their family economic situation are more likely to prefer conservative investment options.

The rest of the paper is organized as follows. Section 2 summarizes the existing literature. Section 3 describes the institutional background. Section 4 details the dataset used for the empirical analysis. Section 5 presents the methodology used. Section 6 shows the results. Section 7 discusses robustness checks. Section 8 gives the concluding remarks.

2. Literature Review

The member's choice of the appropriate investment option among those offered by the pension fund is crucial, as the value of the private pension depends not only on the contributions paid but also on the financial returns generated by the invested funds. Moreover, given the presence of an equity premium, insufficient exposure to equity investments, especially in

long-term investments, can lead to consistently lower financial returns, which in turn can leave individuals with reduced pension wealth and greater financial vulnerability in the future. While the literature on portfolio allocation extensively examines both demographic and behavioral determinants of stock market participation, research focusing on the factors influencing investment choices within private pension funds is less developed and looks primarily at the role played by demographic characteristics.

Bernasek and Shwiff (2001) examine gender differences in asset allocation within retirement plans, using survey data from faculty members at five Colorado universities. Their findings indicate that women tend to adopt more conservative investment strategies in private pension funds. Similarly, Sunden and Surette (1998), analyzing data from the Surveys of Consumer Finances on U.S. families, identify a positive correlation between being female and allocating a lower percentage of defined contribution pension assets to equities. They further highlight that gender alone is not the sole determinant, but rather its interaction with marital status. Expanding on this, Yilmazer and Lyons (2010) investigate whether asset allocation differs between married men and women. Their results reveal an asymmetry in investment behavior, showing that a wife's characteristics have little influence on her husband's financial decisions. Additionally, they find that women married to older men and those with greater financial control are less likely to invest their pension savings in riskier assets.

With reference to age results are mixed. Ameriks and Zeldes (2011), relying on data from the Survey of Consumer Finances and TIIA-CREF (US private pension plan open to university professors and teachers in the public sector), show that there are no evidences of a reduction in the share of equity held by private pension plan holders as they get older. On the contrary, Agnew et al. (2003) show that age and the share held in equities are negatively correlated.

Another stream of literature examines the impact of automatic enrollment on asset allocation decisions. Madrian and Shea (2001) analyze the 401(k) savings behavior of employees in a large U.S. corporation before and after the introduction of automatic enrollment in the company's 401(k) plan. Their findings show that both the default contribution rate and the investment allocation set by the company significantly influence employees' savings behavior. A large proportion of participants remained with the default option, despite very few employees hired before automatic enrollment selecting this particular allocation. The authors attribute this behavior to participant inertia and the tendency of many employees to interpret the default choice as implicit investment guidance from the company. Building on this work, Choi et al. (2004) expand their analysis to three other companies and extend the period of observation after the introduction of the automatic enrollment. They find that, while automatic enrollment dramatically increases participation in private pension funds, it also locks participants into the default option, which is characterized by low saving rates and conservative investments.

Looking at the Italian context, Cappelletti et al. (2014) investigate the effect of age on portfolio choice for participants in a private pension plan sponsored by a medium-sized Italian bank operating in the northern regions of Italy. They find that exposure to risky assets

decreases with age, but not in a linear way, with more pronounced effects at the very end of the career. They also document the fairly widespread presence of inertial behavior, showing that a non-negligible proportion of workers never change their asset allocation.

Other strands of research which focus on the potential relationships between the financial market participation, on one hand, and financial knowledge, behavioral factors and other personal traits on the other hand are summarized in Section 4.

3. Institutional Background

In Italy, private pension funds are structured as multi sub-funds, each offering a range of investment options with differentiated risk-return profiles. Each sub-fund follows a predefined strategic asset allocation, which portfolio managers maintain over time through re-balancing when necessary. This structure allows members to select the investment option that best aligns with their retirement goals and risk preferences. For individuals who do not actively choose an investment strategy, a default option is typically provided, acknowledging that not all members may be able or willing to make a fully informed choice.

The available sub-funds are classified according to standardized categories defined by COVIP, designed to facilitate comparisons across pension plans:

- guaranteed sub-fund: designed to deliver a minimum return, primarily investing in debt securities with zero (or minimal) equity exposure;
- bond sub-fund: focused mainly on fixed-income securities with an equity component capped at 30%;
- balanced sub-fund: maintains a mix of debt and equity investments, with equity holdings ranging from 30% to 50%;
- equity sub-fund: allocates at least 50% of its portfolio to equities.

Within this framework, Italian law has established the guaranteed sub-fund as the default option for new private-sector employees (a similar mechanism has been introduced for public-sector employees) who do not actively select an investment sub-fund upon enrolling in the private pension system.[1]

In order to strengthen the reliability of revealed personal preferences under this choice architecture, COVIP regulations have required Italian pension funds to provide potential members with a pre-contractual information document since 2017. This includes a self-assessment questionnaire with two distinct components designed to guide individuals towards an investment option that matches their characteristics. The first component assesses the

[1] A more extensive description of the Italian supplementary pension system can be found in Castagno et al. (2025).

member's understanding of the private pension system and serves primarily an "educational" function. The second component evaluates the suitability of pension choices through three key dimensions: personal savings capacity, investment time horizon (measured in years remaining until retirement) and individual risk tolerance. This component generates a composite score that guides members toward investment options following a life-cycle approach. Importantly, this scoring system acts as a recommendation rather than a binding constraint, preserving members' freedom to select alternative investment options according to their preferences.[2]

Members' choices among investment sub-funds are also affected by the range of investment options offered by pension funds. According to the 2023 COVIP Annual Report (COVIP, 2023), the above four categories of investment sub-funds are offered by almost all pension funds, but the distribution varies according to the type of pension fund. In contractual pension funds, there is a prevalence of guaranteed and balanced sub-funds; equity sub-funds have a lower incidence (also compared with other types of pension funds), but an increase in these options has been observed in the last 5 years. On the other hand, in open pension funds and "new" PIPs there is a slightly stronger concentration of balanced and equity options, which represent more than 50% of the distribution in both cases.

This study takes the investment options as given and concentrates on the determinants of choice arising from the demand side.

4. Data

4.1. Dataset and Sample selection

This study uses data from a CAWI survey commissioned by the EDUFIN Committee. The Committee plans and promotes financial education initiatives with the aim of improving the Italian population's basic knowledge of finance, insurance and pensions.[3]

From 2020 to 2023, BVA Doxa managed the survey, collecting responses from a representative sample of individuals aged 18 and over who either manage their household's finances or are its most financially knowledgeable member.[4] Each year, the survey included approximately 5,000 respondents, with a longitudinal component to track participants over time.

The survey captured detailed information on respondents' socio-economic backgrounds, as well as their financial, insurance, and pension knowledge, behaviors, and attitudes. This

[2]Ceccarelli et al. (2023) found that self-evaluation questionnaires have proved effective in advising people on the most appropriate investment option.

[3]The EDUFIN Committee is currently chaired by Donato Masciandaro (previously chaired by Annamaria Lusardi, whose term ended in August 2023). Its members are appointed by government departments, financial authorities (Bank of Italy, Consob, Ivass, and COVIP), the supervisory authority for financial advisors and their register (OCF) and the National Council of Consumers and Users (CNCU).

[4]Sample representativeness was ensured by weighting the data according to gender, age, geographical area, and municipality size (EDUFIN, 2022).

paper relies on data from the fourth wave – the first to provide in-depth insights into private pension plan holders, including their chosen investment option, accumulated capital, and total annual contributions. In this wave, 5,002 individuals were interviewed, of whom 4,247 had participated in previous waves as part of the longitudinal panel, while the remaining respondents were surveyed for the first time in 2023.

For the empirical analysis, we restrict our sample to individuals aged 65 or younger, not retired, and who did not respond "Don't Know" (about 20% of private pension plan holders) to the question about their chosen investment option among those offered by their private pension fund.[5] This results in a final sample of 891 individuals.

4.2. Variable description and Hypothesis development

Investment Sub-funds The variable measuring what is the pension fund's investment option chosen by the respondent is a categorical variable which has been defined according to the answer to the following question:

Which investment sub-fund did you choose?

- *Guaranteed*
- *Bond*
- *Balanced*
- *Equity*
- *Don't Know/Do not answer*

Literacy The literature has consistently shown that financial literacy is positively correlated with financial behaviors. Specifically, individuals with higher financial literacy are more likely to participate in stock markets, earn higher investment returns, and engage in retirement planning (see, e.g., Van Rooij et al., 2011; Bucher-Koenen and Lusardi, 2011; van Rooij et al., 2012). Similarly, pension literacy is key to retirement-related decisions. Evidence suggests that individuals with greater pension literacy are more likely to have accurate estimates of their future pension benefits (Mastrobuoni, 2011) and to participate in supplementary pension schemes (Landerretche and Martínez, 2013; Castagno et al., 2025).

Financial and pension literacy can influence how individuals allocate their pension contributions between the different investment options offered by pension plans. Those with higher levels of financial literacy better understand risk-return trade-offs and the impact of

[5] More information about private pension plan holders, who did not remember their chosen investment option among those offered by their private pension fund, are reported in Appendix Table A1.

asset allocation on long-term returns. As a result, they may opt for higher-risk, higher-return asset classes, such as equity-based funds, especially if they have a long investment horizon. Conversely, individuals with lower financial literacy may make conservative choices or rely on default options, potentially limiting their long-term retirement wealth (Clark et al., 2017). Similarly, individuals with higher levels of pension literacy, being more aware of how the pension system works and of their expected benefits, could make more informed supplementary pension investment choices. For example, those who recognize a potential gap between state pension benefits and their retirement needs may proactively select higher-return investment options to bridge the shortfall. Conversely, individuals with lower pension literacy may either underestimate the need for additional savings or misjudge their optimal risk level, leading to sub-optimal investment choices.

To assess financial and pension literacy levels, we construct two indexes ranging from zero to five, representing the number of correct answers given. Financial literacy is evaluated using the Big Five questions defined by Lusardi and Mitchell (2011, 2014), while pension literacy is measured through a set of questions designed to test knowledge of the Italian pension system.[6] Additionally, to assess whether individuals are aware of the trade-off between risk and return, we include a dummy variable equal to one if respondents declare that they know what this concept is and how it works, and zero if they have never heard of it or if they have heard of it but do not understand its meaning.[7]

Based on the literature and the mechanisms described above, we hypothesize that:

H1: There is a positive association between financial/pension literacy and the choice of a riskier investment option.

Risk aversion There is extensive literature showing that individuals' risk aversion significantly influences their investment decisions, including retirement investments, with risk-averse investors preferring safer financial choices – often opting for investments with lower potential returns but also lower risk, such as bonds – while less risk-averse individuals are more inclined to invest in assets with higher potential returns, such as stocks, despite the increased risk (Neelakantan, 2010).

We measure risk aversion as a categorical variable based on a self-reported scale that assesses an individual's willingness to take financial risks. Participants are asked to reflect on their financial decisions, including investments, and rate their level of risk aversion on a scale from one to ten. A score of one indicates that individuals are "Very risk-averse", meaning they strongly prefer safer financial choices with lower potential for loss. Conversely, a score of ten signifies that individuals are "Not at all risk-averse", indicating a high tolerance for financial risk and a preference for potentially higher returns despite uncertainty. The constructed

[6]For a detailed discussion about financial and pension literacy levels in Italy, see Castagno et al. (2025).
[7]The exact wording of the questions is provided in Appendix B.

variable takes the value of one if individuals are risk tolerant and ten if they are risk averse.[8]

Based on the literature and the mechanisms described above, we hypothesize that:

H2: There is a negative association between risk aversion and the choice of a riskier investment option.

Financial guidance Although there is no specific literature assessing the role of professional guidance in selecting a retirement plan, previous research has shown a positive relationship between professional financial guidance and overall financial well-being finding that individuals who receive financial guidance tend to experience greater satisfaction at retirement, as they are less likely to make significant downward adjustments to their standard of living upon retirement (Elder and Rudolph, 1999; Kim and Hanna, 2015). Furthermore, Byrne (2007) shows that those who receive pension guidance are more likely to calculate their retirement savings needs, possess higher investment-related knowledge, and actively review their investment decisions. More generally, advised individuals have been found to make more tax-optimal investment choices (Horn et al., 2009).

To measure whether individuals seek professional financial guidance, we rely on a question asking respondents whether they have consulted a financial advisor before enrolling in a private pension fund in the last three years. Based on the answer given, we define a dummy variable equal to one if the respondent has relied on professional financial guidance for private pension fund decisions and zero otherwise.[9]

Based on the literature and the mechanisms described above, we hypothesize that:

H3: There is a positive association between the use of professional guidance and the choice of a riskier investment option.

Emotions The behavioral finance literature has relied on two alternative psychological theories to understand the role of emotions in shaping financial decisions. On the one hand, the Affect Infusion Model (AIM) developed by Forgas (1995) predicts that positive emotions foster risk tolerance, as positive moods increase the perceived benefits of risk-taking. Conversely, negative emotions increase risk aversion by amplifying the perceived negative consequences of risk. On the other hand, the Mood Maintenance Hypothesis (MMH), developed by Isen and Patrick (1983), suggests that positive emotions make individuals more cautious and risk-averse, as they seek to avoid actions that could threaten their current well-being.

Regarding negative emotions, previous research consistently shows that they lead individuals to make less risky financial decisions. For example, Kuhnen and Knutson (2011) find that people experiencing anxiety are more likely to adopt a conservative investment approach, favoring bonds over stocks. Similarly, Gambetti and Giusberti (2012) report that anxiety is

[8]The exact wording of the question is reported in Appendix B.
[9]The exact wording of the questions is reported in Appendix B.

positively correlated with risk aversion, highlighting how anxious individuals prefer stable and predictable returns. In contrast, the relationship between positive emotions and financial decision-making remains less clear. Some studies suggest that financial well-being is positively related to risk aversion because those facing low financial well-being are more inclined to take risks in an attempt to improve their situation (Pownall et al., 2012). However, other research presents a different perspective. For instance, Apergis et al. (2019) find a positive relationship between happiness and the proportion of risky assets held in financial portfolios, suggesting that happier individuals may be more willing to take financial risks.

To measure emotions, we rely on two different variables. First, we assess financial satisfaction by asking respondents to rate their satisfaction with their family's financial situation on a scale from one (not at all satisfied) to ten (very satisfied). Second, we evaluate financial anxiety by asking respondents to indicate whether or not they feel stressed about some specific financial situations. We therefore define a dummy variable that takes the value zero if respondents report not being financially stressed or not being worried about the general economy, and one if they report being financially stressed.[10]

Based on the literature and the mechanisms described above, we hypothesize that:

H4: There is an uncertain association between financial satisfaction and the choice of a riskier investment option.

H5: There is a negative association between financial anxiety and the choice of a riskier investment option.

4.3. Descriptive evidence

Although the EDUFIN survey is designed to be representative, it records a lower private pension participation rate (approximately 17%), compared to the figure of around 37% reported by COVIP. Despite this limitation, EDUFIN remains the only up-to-date Italian source that combines information on investment choices, financial and pension literacy, and behavioral traits.[11] Moreover, the sub-sample of private pension participants in the EDUFIN survey shows socio-demographic characteristics that are broadly consistent with those observed in COVIP administrative data.

Table 1 presents the descriptive statistics of the variables used in this study. The sample is predominantly male (70%), with an average age of 47 years. Regarding employment status, the majority work in the private sector (66%), while public sector employees and the self-employed each account for 16%. More than half of the respondents reside in northern regions. About 30% of the sample hold a university degree. Around 60% report having

[10]The exact wording of the questions is reported in Appendix B.

[11]For a detailed comparison between EDUFIN, SHIW, and COVIP data, see Castagno et al. (2025).

children in the household and 70% are married. Over 80% own their home, while about 50% report holding financial investments.

Looking at the distribution of investment choices among participants, we find that the EDUFIN data are broadly in line with the COVIP ones. In our sample, 38.9% of respondents chose the guaranteed investment option, 9.2% the bond option, 39.5% the balanced option and 12.4% the equity option. These figures are similar to those reported by COVIP of 37.1%, 12.8%, 39.9% and 10.3% respectively (COVIP, 2023). Contribution levels also show a similar pattern. In our sample, 44% of respondents report making annual contributions of between 1,001 and 3,000 euro, which is in line with COVIP's estimated average contribution of 2,810 euro. In terms of accumulated pension capital, 67% of respondents report having accumulated less than 50,000 euro, while COVIP reports an average accumulated capital of 23,350 euro (COVIP, 2023).[12]

5. Empirical Strategy

To investigate the factors driving individuals' choices in allocating their contributions among the different investment options offered by pension funds, we employ a multivariate analysis. Specifically, given the ordered nature of our dependent variable – which reflects the percentage of equity in each sub-fund, ranging from the most conservative (the guaranteed sub-fund) to the least conservative (the equity sub-fund) – we estimate the following Ordered Logit model:

$$\begin{gathered} y_i^* = \alpha + literacy_i\beta_1 + behavior_i\beta_2 + membership\_choice_i\beta_3 + X_i\beta_4 + \epsilon_i \\ y_i = j \quad \text{if} \quad m_{j-1} \leq y_i^* < m_j \quad j = 1, ..., 4 \end{gathered} \tag{1}$$

where y_i^* is a latent variable and y_i is the observed categorical outcome representing the pension fund's investment option chosen by the respondent. The vector $literacy_i$ contains information related to the level of financial and pension literacy. In particular, it includes two indexes counting the number of financial/pension literacy questions answered correctly, and a dummy variable to account for whether the individual knows what the risk-return relationship is. The vector $behavior_i$ includes a variable measuring risk aversion, a variable assessing whether respondents consulted a financial advisor before enrolling in a private pension fund, an index measuring the level of economic satisfaction, and a dummy variable indicating whether respondents are currently experiencing financial stress. The vector $membership\_choice_i$ includes a set of variables reflecting the individual's choice of membership to control for the type of enrollment in the pension fund (with personal contribution only, with TFR only, with employer contribution only, with all the above), the contributions paid (<1,000 euro, between 1,001 and 3,000 euro, or >3,000 euro), and the accumulated capital in the individual

[12]Both contribution levels and accumulated capital in the EDUFIN survey are reported in intervals, meaning precise individual values are not available.

Table 1: Descriptive statistics

	Obs.	Mean	Std. Dev.	Min	Max
Investment sub-fund: guaranteed	891	0.389	0.488	0	1
Investment sub-fund: bond	891	0.092	0.289	0	1
Investment sub-fund: balanced	891	0.395	0.489	0	1
Investment sub-fund: equity	891	0.124	0.330	0	1
Financial Literacy	891	3.989	1.191	0	5
Pension Literacy	891	2.944	1.367	0	5
Knowledge of risk-return trade-off	891	0.705	0.456	0	1
Risk aversion	891	5.947	2.291	1	10
Advisor for private pension	891	0.137	0.344	0	1
Economic Satisfaction	891	6.202	1.859	1	10
Financial Anxiety	891	0.897	0.304	0	1
Female	891	0.302	0.459	0	1
Self-employed	891	0.157	0.364	0	1
Public employee	891	0.160	0.367	0	1
Private employee	891	0.664	0.473	0	1
Not employed	891	0.019	0.137	0	1
North	891	0.510	0.500	0	1
Center	891	0.218	0.413	0	1
South	891	0.272	0.445	0	1
Age	891	47.306	8.843	19	65
Primary education	891	0.160	0.367	0	1
Secondary education	891	0.517	0.500	0	1
Tertiary education	891	0.323	0.468	0	1
Single	891	0.193	0.395	0	1
Married	891	0.716	0.451	0	1
Divorced/Widower	891	0.091	0.288	0	1
Kids in the household	891	0.562	0.496	0	1
Homeowner with mortgage	891	0.333	0.471	0	1
Homeowner without mortgage	891	0.553	0.497	0	1
Renter	891	0.114	0.318	0	1
Income: <540	891	0.006	0.076	0	1
Income: 540-1,549	891	0.251	0.434	0	1
Income: 1,550-2,454	891	0.317	0.465	0	1
Income: >2,454	891	0.427	0.495	0	1
Financial investment	891	0.491	0.500	0	1
Real estate investment	891	0.136	0.343	0	1
Enrollment with: personal contribution only	891	0.352	0.478	0	1
Enrollment with: TFR only	891	0.121	0.326	0	1

Enrollment with: employer contribution only	891	0.073	0.261	0	1
Enrollment with: all the above	891	0.454	0.498	0	1
Pension plan private contribution: <1,000	891	0.285	0.452	0	1
Pension plan private contribution: 1,000-3,000	891	0.439	0.497	0	1
Pension plan private contribution: >3,000	891	0.177	0.382	0	1
Pension plan private contribution: DK	891	0.098	0.298	0	1
Acc. capital in pension plan: <50,000	891	0.669	0.471	0	1
Acc. capital in pension plan: 50,000-150,000	891	0.179	0.383	0	1
Acc. capital in pension plan: >150,000	891	0.043	0.203	0	1
Acc. capital in pension plan: DK	891	0.109	0.312	0	1

Note: EDUFIN 2023 survey – people in the labor market aged 18-65 who did not respond "Don't Know" regarding their chosen investment sub-fund for their DC plan, weighted data. TFR (Trattamento di Fine Rapporto) refers to the severance pay provision in Italy.

account (<50,000 euro, between 50,001 and 150,000 euro, or >150,000 euro). The vector X_i includes standard demographic and socio-economic controls (gender, employment status, macro-area of residence, age categories, education level, marital status, kids in the household, home ownership, household income, a dummy for holding financial investments, and a dummy for holding real estate investments). The cutoffs, m_1 and m_2, are estimated by the model together with the coefficients on each independent variable. The error term ϵ_i is assumed to follow a standard normal distribution.

6. Results

Table 2 gives our estimation results. In particular, it reports the marginal effects of a change in the independent variables on the probability to choose each sub-fund.

From the first group of variables – those assessing the role of sophistication on investment option choices – we observe clear patterns linking higher knowledge levels to more growth-oriented portfolio allocations. Specifically, all three indicators (financial literacy, pension literacy, and understanding of the risk-return trade-off) are significantly and positively associated with the likelihood of selecting balanced or equity sub-funds, and negatively associated with the choice of guaranteed sub-funds. A similar, albeit weaker, negative relationship is also observed for bond sub-funds.

Coefficient estimates underscore the relevance of these relationships. A one-point increase in the financial literacy index corresponds to a 1.4 and 1.2 percentage point rise in the probability of choosing balanced and equity sub-funds, respectively, while lowering the probability of selecting guaranteed options by 2.4 points. Pension literacy exerts an even stronger effect, with one additional correct answer increasing the probability of choosing balanced and equity sub-funds by 1.8 and 1.5 percentage points, respectively, and reducing the likelihood of selecting guaranteed sub-funds by 3.1 percentage points – all statistically significant at the 1% level. The understanding of the risk-return trade-off has the largest influence among the three

Table 2: Investment sub-fund choice

	(1) Guaranteed sub-funds	(2) Bond sub-funds	(3) Balanced sub-funds	(4) Equity sub-funds
Financial Literacy index	-0.024**	-0.002*	0.014**	0.012**
	(0.012)	(0.001)	(0.007)	(0.006)
Pension Literacy index	-0.031***	-0.002***	0.018***	0.015***
	(0.011)	(0.001)	(0.006)	(0.005)
Knowledge of risk-return trade-off	-0.057*	-0.004*	0.033*	0.027*
	(0.030)	(0.002)	(0.018)	(0.015)
Risk Aversion	0.048***	0.003***	-0.028***	-0.023***
	(0.006)	(0.001)	(0.004)	(0.003)
Advisor for private pension	-0.075**	-0.005**	0.044**	0.036**
	(0.033)	(0.002)	(0.020)	(0.016)
Economic Satisfaction	0.024***	0.002***	-0.014***	-0.011***
	(0.008)	(0.001)	(0.005)	(0.004)
Financial Anxiety	0.071*	0.005*	-0.042*	-0.034*
	(0.037)	(0.003)	(0.022)	(0.018)
Female	0.052*	0.003*	-0.030*	-0.025*
	(0.029)	(0.002)	(0.017)	(0.014)
Self-employed	0.069	0.004*	-0.042	-0.032*
	(0.045)	(0.002)	(0.028)	(0.019)
Public employee	0.100***	0.005***	-0.062***	-0.044***
	(0.035)	(0.002)	(0.023)	(0.014)
Not working	0.010	0.001	-0.006	-0.005
	(0.071)	(0.006)	(0.040)	(0.037)
Center	0.002	0.000	-0.001	-0.001
	(0.033)	(0.002)	(0.019)	(0.016)
South	0.008	0.001	-0.005	-0.004
	(0.032)	(0.002)	(0.019)	(0.015)
Age: 40-49	-0.036	-0.002	0.022	0.017
	(0.036)	(0.002)	(0.022)	(0.017)
Age: 50-59	-0.027	-0.002	0.016	0.013
	(0.038)	(0.002)	(0.023)	(0.017)
Age: 60-65	0.013	0.001	-0.008	-0.005
	(0.054)	(0.002)	(0.034)	(0.023)
High School	0.050	0.004	-0.029	-0.025
	(0.072)	(0.006)	(0.039)	(0.040)
Degree	0.022	0.002	-0.012	-0.012
	(0.073)	(0.007)	(0.039)	(0.040)
Married	0.009	0.001	-0.005	-0.004
	(0.039)	(0.003)	(0.023)	(0.019)

Divorced/Widower	0.059	0.003	-0.036	-0.026
	(0.060)	(0.003)	(0.037)	(0.025)
Kids in the household	0.080***	0.005**	-0.047**	-0.038**
	(0.031)	(0.002)	(0.018)	(0.015)
Homeowner with mortgage	-0.019	-0.001	0.011	0.009
	(0.028)	(0.002)	(0.016)	(0.014)
Renter	-0.026	-0.002	0.015	0.012
	(0.042)	(0.003)	(0.024)	(0.021)
Income: 540-1,549	-0.209	-0.001	0.139	0.071
	(0.191)	(0.012)	(0.138)	(0.044)
Income: 1,550-2,454	-0.171	0.002	0.117	0.053
	(0.193)	(0.012)	(0.139)	(0.043)
Income: >2,454	-0.205	-0.000	0.137	0.069
	(0.194)	(0.012)	(0.139)	(0.043)
Financial investment	-0.081***	-0.005***	0.047***	0.039***
	(0.028)	(0.002)	(0.016)	(0.014)
Real estate investment	0.073**	0.005**	-0.043**	-0.035**
	(0.033)	(0.002)	(0.019)	(0.016)
Enrollment: TFR only	-0.026	-0.001	0.017	0.009
	(0.048)	(0.002)	(0.032)	(0.018)
Enrollment: employer contribution only	-0.062	-0.003	0.040	0.024
	(0.054)	(0.003)	(0.034)	(0.023)
Enrollment: all the above	-0.120***	-0.008***	0.074***	0.054***
	(0.033)	(0.003)	(0.022)	(0.014)
Private contribution: 1,000-3,000	-0.079**	-0.004**	0.051**	0.032**
	(0.035)	(0.002)	(0.024)	(0.013)
Private contribution: >3,000	-0.126***	-0.008**	0.078***	0.057***
	(0.042)	(0.003)	(0.027)	(0.019)
Private contribution: DK	-0.087	-0.004	0.056	0.036
	(0.057)	(0.004)	(0.035)	(0.026)
Acc. capital: 50,000-150,000	-0.104***	-0.009**	0.058***	0.055***
	(0.031)	(0.004)	(0.017)	(0.018)
Acc. capital: >150,000	0.017	0.001	-0.011	-0.007
	(0.063)	(0.002)	(0.041)	(0.025)
Acc. capital: DK	-0.033	-0.002	0.020	0.015
	(0.043)	(0.003)	(0.026)	(0.020)
Observations	891	891	891	891

Ordered Logit estimation models. Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

indicators: it is associated with a 3.3 and 2.7 percentage points increase in the probability of selecting balanced and equity sub-funds, respectively, and a 5.7 percentage points decrease for guaranteed sub-funds.

Individuals who understand the relationship between risk and return recognise that, despite short-term market fluctuations, equities tend to generate higher long-term returns. This makes them more likely to invest in equity sub-funds. Furthermore, individuals with financial and pension literacy are better able to estimate their retirement income and grasp the workings of financial markets. This enables them to make more informed investment decisions and reduces the likelihood of them making overly conservative choices that could limit their long-term returns.

As expected, risk aversion is positively correlated with choosing safer investments and negatively correlated with selecting riskier ones. A one-unit increase in the risk aversion measure raises the probability of choosing a guaranteed sub-fund by 4.8 percentage points while reducing the likelihood of selecting a balanced or an equity sub-fund by 2.8 and 2.3 percentage points, respectively. These results are significant at the 1% level.

Seeking professional financial guidance is negatively correlated with choosing a guaranteed sub-fund (-7.5 percentage points) and positively associated with selecting balanced and equity sub-funds (4.4 and 3.6 percentage points, respectively). This may be because financial advisors encourage clients to take on more investment risk by providing better information on long-term returns.

Regarding the role of emotions, we find that economic satisfaction has significant negative effect on the probability of choosing riskier investments. This finding supports the MMH, which posits that individuals experiencing positive emotions tend to become more cautious and risk-averse, seeking to preserve their current sense of well-being. Specifically, our results align with the MMH, as individuals with higher economic satisfaction appear less likely to opt for equity or balanced sub-funds and more likely to select the guaranteed ones, reflecting a desire to maintain their positive emotional state. Similarly, financial anxiety also lowers the probability of selecting a riskier sub-fund. Individuals experiencing financial stress are more likely to choose safer investments (7.1 percentage points for the guaranteed sub-fund) and less likely to invest in equities (-3.4 percentage points for the equity sub-fund). This suggests that financial anxiety amplifies risk aversion, leading to more conservative investment behavior.

Overall, we find strong support for hypotheses H1 and H3: both knowledge and seeking professional guidance are significantly and positively associated with interest in equity sub-funds. Similarly, hypotheses H2 and H5 are supported, as risk aversion and financial anxiety show a significant negative correlation with selecting a less conservative sub-fund. Finally, the significant negative relationship with financial satisfaction confirms that the Mood Maintenance Hypothesis prevails over the Affect Infusion Mode (H4).

Turning to demographic and economic characteristics, our results align with previous literature. Consistent with Sunden and Surette (1998) and Cappelletti et al. (2014), we find a statistically significant gender difference: women are less likely than men to select equity or balanced sub-funds and more likely to opt for guaranteed sub-funds, ceteris paribus. Employment type also plays a role, with self-employed individuals favoring conservative guaranteed sub-funds over equity sub-funds compared to private-sector employees, while public-sector employees show an even stronger preference for guaranteed funds. Age does not

appear to be statistically significant. Regarding family composition, we find no significant relationship between marital status and the choice of the investment option. However, having children in the household is significantly associated with a preference for more conservative sub-funds. In terms of economic factors, higher income levels are linked to a slight preference for riskier sub-funds, though the effect is not statistically significant. Owning financial investments significantly reduces the likelihood of conservative choices while significantly increasing the probability of selecting balanced or equity sub-funds. Conversely, real estate investment is associated with a significant preference for guaranteed sub-funds. These patterns suggest a consistent investment logic: individuals who avoid financial markets in favor of real estate investments tend to choose guaranteed pension sub-funds, while those who actively participate in financial markets are more inclined toward balanced or equity options.

Finally, examining membership choices, our results show that individuals who contribute both their own contributions and their TFR to complementary pension schemes, while also benefiting from employer contributions, tend to choose higher-risk sub-funds. Additionally, we find a positive correlation between both pension fund contributions and accumulated capital with the choice of riskier sub-funds, suggesting that individuals with greater financial resources – and thus higher contributions – are more inclined toward higher-yielding investment options.

7. Robustness Checks

To test the robustness of our baseline findings, we conduct some additional analyses.

First, we assess the suitability of our chosen model by testing the parallel lines (or proportional odds) assumption underlying the Ordered Logit specification. This assumption requires the effect of each independent variable on the latent outcome to be constant across all thresholds of the dependent variable. A likelihood-ratio test rejects the null hypothesis that all coefficients – except the intercept – are equal across outcome categories (LR test $= 234.24$, $p < 0.000$), indicating that the parallel lines assumption does not hold in our data. To address this, we re-estimate Equation 1 using a Generalized Ordered Logit model, which relaxes the constant-threshold constraint. The results, reported in Table C1, show that our main findings remain robust when coefficients are allowed to vary across thresholds. As a further check, we collapse the dependent variable into a binary indicator equal to one for more equity-exposed options (balanced or equity sub-funds) and zero for safer options (guaranteed or bond sub-funds) and estimate a standard Logit model. This approach avoids the proportional-odds assumption and evaluates whether our results hold when focusing on a general low- vs. high-risk choice. The results, reported in Table C2, again support the baseline findings.

Second, we examine whether multicollinearity among the explanatory variables may affect our results. High multicollinearity can inflate the variance of coefficient estimates and may generate unusually large (in absolute value) coefficients that appear spuriously significant. Following the rule of thumb proposed by Chatterjee and Hadi (2015), concern arises when the largest variance inflation factor (VIF) exceeds 10 or when the mean VIF is substantially

greater than 1. To assess potential multicollinearity among the explanatory variables, we compute the VIFs using the STATA command "collin" (Ender, 2010). In our case, VIF values for each variable range from 1.05 to 1.36, with a mean value of 1.21. Therefore, we conclude that multicollinearity does not represent an issue in our model.

Third, results related to financial and pension literacy could be biased due to measurement errors. Therefore, we start by re-estimating Equation 1 replacing the financial and pension literacy indexes with two dummy variables equal to one when the respondent scores above the sample mean and zero otherwise.[13] Results reported in Panel A of Table C3 confirm the robustness of our main findings. Next, to distinguish the effect of knowledge from confidence, we follow the approach proposed by Bucher-Koenen et al. (2024) and include two indexes (ranging from zero to five) counting the number of "Don't Know" responses to the financial and pension literacy questions as additional control variables. As shown in Panel B of Table C3, including these measures slightly reduces the coefficient associated with financial literacy, which also becomes non-significant, while strengthens the coefficient associated with pension literacy. This indicates that knowledge of the pension system is the key factor that matters.

8. Conclusions

Pension reforms in Italy have placed greater responsibility on individuals, requiring them to actively plan for retirement to maintain their standard of living. In this context, private pension benefits – intended to supplement the public pension benefits – depend on individuals' investment choices, making asset allocation a key determinant of future financial well-being.

Given the existence of an equity premium, financial theory suggests that having zero or very limited exposure to equities is not an optimal investment strategy, as it significantly limits long-term returns (Campbell and Viceira, 2002). In fact, while it is generally advisable to reduce equity exposure with age to manage risk, completely excluding equities throughout one's working life can result in inadequate retirement savings. However, choosing an appropriate investment option is a complicated process that is influenced by a number of factors. Many individuals struggle with the complexity of pension investment decisions and often underestimate the long-term consequences of their choices.

In this paper, we use data from the EDUFIN Committee to examine how financial and pension literacy, along with behavioral characteristics, influence individuals' choices of investment options in private pension funds. We hypothesize that higher levels of financial and pension literacy, as well as seeking professional financial guidance, are associated with a greater likelihood of selecting riskier investment options. In contrast, we expect risk aversion and financial anxiety to correlate negatively with the selection of riskier assets, while the effect of satisfaction with one's financial situation remains ambiguous *ex ante*.

[13] The pension literacy dummy equals one when at least four out of five questions are answered correctly, while the financial literacy dummy equals one when all five questions are answered correctly.

Using an Ordered Logit model – which accounts for the ordered nature of our dependent variable, representing the percentage of equities in each sub-fund – we find that both knowledge and behavior significantly influence investment choices. Specifically, individuals with higher financial and pension literacy, and those who seek professional guidance, are more likely to select riskier sub-funds, such as balanced or equity sub-funds. Conversely, risk aversion, financial anxiety, and greater economic satisfaction are associated with a preference for more conservative options. Our findings also indicate that individuals traditionally seen as more financially vulnerable – particularly women – are significantly more likely to choose conservative investment options, even when controlling for other factors.

Although certain findings – like financial anxiety or economic satisfaction – are harder to translate into direct policy measures, others offer policymakers clear opportunities to improve retirement outcomes. In this regard, the framework provided by the OECD (2018) is particularly useful as it emphasizes the need to account for behavioral biases and low levels of financial literacy when designing the architecture of choice of DC pension plans. Key recommendations include offering a manageable range of investment options, designing an effective default fund, and supporting individuals through clear information, financial education, and access to professional guidance.

Building on our findings, expanding access to professional financial guidance – including workplace-based services – and promoting initiatives to enhance financial and pension literacy could support individuals in making more informed investment decisions. Such efforts may improve retirement planning and reduce the risk of financial hardship later in life.

Finally, the structure of available investment options – particularly the design of the default sub-fund – plays a crucial role, as it often serves as implicit investment guidance. Currently, the guaranteed sub-fund, despite its lower expected returns, is set as the default option. This can lead to suboptimal investment decisions, especially among women and younger individuals, due to factors such as risk aversion, inertia, and limited financial knowledge. Reassessing the default fund structure could therefore lead to better outcomes. For instance, life-cycle investment strategies may encourage greater risk-taking early in one's career and gradually shift toward more conservative allocations as retirement nears, thereby balancing long-term growth with risk management (OECD, 2023).

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Appendix A

Table A1: Pension plan holder not knowing their chosen investment option by socio-demographic characteristics

	Observations	Percentage
	Gender	
Female	115	59.61
Male	78	40.39
	Age categories	
<40	25	13.20
40-49	83	42.77
50-59	59	30.74
>59	26	13.29
	Macro area of residence	
North	83	42.72
Center	28	14.64
South	82	42.64
	Level of education	
Primary education	68	35.17
Secondary education	81	42.02
Tertiary education	44	22.82
	Employment status	
Self-employed	50	25.96
Public employee	25	12.90
Private employee	114	59.13
Not employed	4	2.01
	Income categories	
<540	2	0.85
540-1,549	87	45.02
1,550-2,454	56	28.98
>2,454	48	25.15
	Housing tenure	
Ownership with mortgage	32	16.69
Ownership	129	66.99
Renter	32	16.33
Total	193	100.00

Note: EDUFIN 2023 survey – people in the labor market aged 18-65 who responded "Don't Know" regarding their chosen investment sub-fund for their DC plan, weighted data.

Appendix B

Financial Literacy

1. Suppose you had 100 euro in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?

   - **More than 102 euro**
   - Exactly 102 euro
   - Less than 102 euro
   - Don't Know

2. Imagine leaving 1,000 euro in a current account that pays 1% interest per year and has no charges. Imagine that inflation is running at 2%. After 1 year, how much would you be able to buy with the money in this account?

   - More than today
   - Exactly the same
   - **Less than today**
   - Don't Know

3. Do you think that the following statement "Investing 1,000 euro by buying a single company's stock is usually less risky than investing 1,000 euro by buying stocks from 10 different companies" is true or false?

   - True
   - **False**
   - Don't Know

4. A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less.

   - **True**
   - False
   - Don't Know

5. Suppose to deposit money in your bank account for 2 years. Suppose that the interest rate is 5% per year and that your account has no charges. The bank will then:

- **Give you a higher amount of money the second year than the first one**
- Give you the same amount of money in both years
- Don't Know

6. Have you heard of the risk-return relationship before?
   - Yes, but I do not know what it means
   - Yes, and I understand what it means
   - No, I have never heard of it before

Pension Literacy

1. Which of the following statement is true:
   - **As life expectancy increases the monthly amount of pension decreases**
   - As life expectancy increases the monthly amount of pension increases
   - The monthly amount of pension and life expectancy are not related
   - Don't Know
2. Do you know how, in accordance with current legislation, is the public pension of a newly hired young employee calculated?
   - **Yes, it is determined according to the defined contribution method, meaning that it depends on how much has been contributed during one's entire working career**
   - Yes, it is determined according to the defined benefit method, meaning that it depends on one's average late-career earnings
   - Yes, it is determined according to a mixed method, meaning that it partly depends on the defined contribution scheme and partly depends on the defined benefit scheme
   - Don't Know
3. In accordance with current legislation, the revaluation of the pension contributions paid to INPS follows:
   - **The Italian economic growth**
   - The performance of the financial market
   - Don't Know
4. In your opinion what is the best thing to do to have a high capital to supplement the public pension?

- **Start to save even small amounts as soon as possible**
- Start to save only after having worked for at least 10 years
- Start to save after you are 50, meaning during the period in which you are assumed to have the highest earnings
- Don't Know

5. According to current legislation, the contributions that workers pay to the INPS today:
    - **Are used to pay pensions to those who are already retired**
    - Are set aside on workers' social security accounts and invested in the financial markets
    - Are partly used to pay pensions to those who are already retired and partly set aside on workers' social security accounts and invested in the financial markets
    - Don't Know

Risk aversion

When you think about your financial decisions, including financial investments, how risk-averse are you? (Please answer on a scale of 1-10, where 1 means "Very risk-averse" and 10 means "Not at all risk-averse").

Financial guidance

1. Have you and/or your partner consulted a financial advisor in the last 3 years?
    - Yes, to have access to mortgages
    - Yes, to evaluate investments
    - Yes, to seek guidance before purchasing insurance policies
    - Yes, to seek guidance before enrolling in a private pension fund
    - Yes, for other reasons
    - No, we have not consulted a financial advisor

Emotions

1. How satisfied are you with the financial situation of your family? (Please answer on a scale of 1-10, where 1 means "Not at all" and 10 means "Very much").
2. What do you see as the main financial stressors today?
    - Not having a secure job/lack of stable income/uncertainty about economic prospects

- Not having savings for emergencies
- Not being able to pay expenses (e.g., bills, rent)
- Not being able to pay debts (e.g., mortgage, installments)
- Not being able to put money aside for retirement
- Major fluctuations in the financial market
- Rising interest rates
- Rising food and/or energy prices (e.g., gas, electricity)
- I am not under financial stress
- I am not worried about the general economic situation

Appendix C

Table C1: Investment sub-fund choice

	(1) Guaranteed sub-funds	(2) Bond sub-funds	(3) Balanced sub-funds	(4) Equity sub-funds
Financial Literacy index	-0.023*	-0.003*	0.015*	0.011*
	(0.012)	(0.001)	(0.008)	(0.006)
Pension Literacy index	-0.030***	-0.003***	0.020***	0.014***
	(0.011)	(0.001)	(0.007)	(0.005)
Knowledge of risk-return trade-off	-0.057*	-0.007*	0.038*	0.026*
	(0.030)	(0.004)	(0.020)	(0.014)
Risk Aversion	0.051***	-0.016***	0.001	-0.036***
	(0.006)	(0.003)	(0.008)	(0.005)
Advisor for private pension	-0.076**	-0.009**	0.050**	0.035**
	(0.033)	(0.004)	(0.022)	(0.015)
Economic Satisfaction	0.024***	0.003***	-0.016***	-0.011***
	(0.008)	(0.001)	(0.005)	(0.004)
Financial Anxiety	0.069*	0.008*	-0.045*	-0.032*
	(0.037)	(0.004)	(0.024)	(0.017)
Observations	891	891	891	891

Note: Generalized Ordered Logit estimation models. Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Controls include gender, employment status, macro-area of residence, age categories, education level, marital status, kids in the household, home ownership, household income, a dummy for holding financial investments, a dummy for holding real estate investments, type of enrollment in the pension fund, level of contributions paid, and accumulated capital in the individual account.

Table C2: Investment sub-fund choice

	(1) Balanced/Equity sub-funds
Financial Literacy index	0.033**
	(0.015)
Pension Literacy index	0.025*
	(0.013)
Knowledge of risk-return trade-off	0.080*
	(0.036)
Risk Aversion	-0.037***
	(0.007)
Advisor for private pension	0.118***
	(0.042)
Economic Satisfaction	-0.024**
	(0.010)
Financial Anxiety	-0.079*
	(0.047)
Observations	891

Note: Logit estimation model. Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Controls include gender, employment status, macro-area of residence, age categories, education level, marital status, kids in the household, home ownership, household income, a dummy for holding financial investments, a dummy for holding real estate investments, type of enrollment in the pension fund, level of contributions paid, and accumulated capital in the individual account.

Table C3: Investment sub-fund choice

Panel A - Dummy indicator				
	(1) Guaranteed sub-funds	(2) Bond sub-funds	(3) Balanced sub-funds	(4) Equity sub-funds
Financial Literacy index	-0.051*	-0.003*	0.030*	0.024*
	(0.026)	(0.002)	(0.015)	(0.013)
Pension Literacy index	-0.074***	-0.005**	0.044***	0.035***
	(0.027)	(0.002)	(0.016)	(0.013)
Panel B - DK index				
	(1) Guaranteed sub-funds	(2) Bond sub-funds	(3) Balanced sub-funds	(4) Equity sub-funds
Financial Literacy index	-0.020	-0.001	0.012	0.009
	(0.015)	(0.001)	(0.009)	(0.007)
Financial Literacy DK	0.013	0.001	-0.007	-0.006
	(0.025)	(0.002)	(0.015)	(0.012)
Pension Literacy index	-0.040***	-0.003***	0.023***	0.019***
	(0.013)	(0.001)	(0.007)	(0.006)
Pension Literacy DK	-0.024	-0.002	0.014	0.011
	(0.017)	(0.001)	(0.010)	(0.008)
Observations	891	891	891	891

Note: Ordered Logit estimation models. Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Controls include knowledge of risk-return trade-off, risk aversion, use of advisor for private pension, economic satisfaction, financial anxiety, gender, employment status, macro-area of residence, age categories, education level, marital status, kids in the household, home ownership, household income, a dummy for holding financial investments, a dummy for holding real estate investments, type of enrollment in the pension fund, level of contributions paid, and accumulated capital in the individual account.