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Willingness to take financial risks and insurance holdings: A European survey[a]

Martin Eling[*], Omid Ghavibazoo, and Katja Hanewald[b]

ABSTRACT

We investigate the relationship between self-reported willingness to take financial risks and ownership of life insurance and long-term care insurance. For a representative sample of individuals aged 50+ from 14 countries and controlling for demographic and socioeconomic determinants of insurance demand, we find a positive link between willingness to take financial risks and ownership of both long-term care insurance and life insurance. The link is stronger for whole life insurance compared to term life insurance and long-term care insurance. Two robustness tests that (i) use risky asset ownership instead of willingness to take financial risks and (ii) focus on specific demographic and socioeconomic groups confirm the results for life insurance, while the results for long-term care insurance are less clear. Our empirical results cannot be explained by the classical expected utility framework and thus support recent research indicating that alternative models (e.g., prospect theory) are needed to explain insurance demand.

Keywords: Risk attitudes; Long-term care insurance; Life insurance; SHARE data
JEL Classification: D81, D90, G22, J14.

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1. Introduction

In this paper, we investigate the relationship between risk attitudes and insurance ownership. We focus on life insurance and long-term care insurance because these two products provide coverage against the major risks many households face. Life insurance protects families against loss of income due to the early death of an income earner (e.g., Han and Hung, 2017). Long-term care insurance protects individuals against potentially high costs of long-term care needs as they get older (e.g., Mitchell, 2018).

Theoretical studies (e.g., Mossin, 1968) suggest that when faced with the same risky situation, rational agents who are more risk-averse purchase more insurance. However, empirical studies testing this link for long-term care insurance and life insurance report inconclusive and inconsistent results. For instance, Costa-Font and Rovira-Forns (2008) find no significant association between risk attitudes and demand for long-term care insurance, while Stum (2008) reports that those who are more willing to take financial risks participate more in group long-term care insurance. For life insurance, Luciano et al. (2016) and Giesbert et al. (2011) find negative effects of risk aversion on demand for insurance, and Liebenberg et al. (2012) find no significant association between risk aversion and life insurance ownership.

We test the link between risk attitudes and life insurance and long-term care insurance holdings using data for 14 countries from the Survey of Health, Ageing and Retirement in Europe (SHARE). Our sample consists of 33,892 individuals from the 2013 SHARE wave. We use self-reported willingness to take financial risks as a measure of risk attitudes because previous research shows that this measure is a strong predictor of risky behavior in financial matters (Dohmen et al., 2011; Barasinska et al., 2012). In a robustness test, we use self-reported risky asset ownership as an alternative measure for risky behavior. One advantage of the SHARE dataset is that it allows us to include a wide range of individual- and household-level control variables.

We find that the link between willingness to take financial risks and insurance take-up is significant and positive, with a stronger association for whole life insurance compared to term life insurance and long-term care insurance. Specifically, we find that willingness to take both average and above average financial risks (compared with no willingness to take financial risks) is positively associated with whole life insurance ownership, and taking average financial risks is positively associated with both term life insurance and long-term care insurance holdings. A robustness test that uses self-reported risky asset ownership as an alternative measure confirms

the results for whole life and term life insurance, whereas it does not confirm any association for long-term care insurance. We also repeat the analysis for respondents with no risky assets and run the models in specific demographic and socioeconomic groups and again confirm the robustness for whole life insurance in all groups. In contrast, the results for term life insurance and long-term care insurance are less clear.

Our study contributes to both the classical literature on insurance demand based on expected utility (e.g., Schlesinger, 2013; Woodard and Yi, 2020) and the growing literature on behavioral aspects of insurance purchase decisions (Corcos et al., 2020; Bonsang and Costa-Font, 2020; Richter et al., 2019). We provide new results on how individuals' risk aversion impacts ownership of life insurance and long-term care insurance, using both individual financial risk preferences and risky asset ownership as proxies for risk aversion. While other studies typically analyze smaller samples from one country, our study is based on a large dataset across 13 European countries and Israel. We also analyze the possible interaction of the effects of risk aversion and age on insurance ownership. We contribute to the current literature by showing how the magnitude and significance of the link between willingness to take financial risks and insurance ownership differ among demographic and socioeconomic groups.

Overall, our results, that individuals who are more willing to take financial risks purchase more insurance, cannot be explained via the expected utility theory. Instead, our results might signal that many individuals do not fully understand the risk transfer mechanism underlying life insurance and long-term care insurance products. This is concerning because the resulting underinsurance of these products can increase financial burdens on individuals and public insurance programs. Our results might also motivate future studies to test such a link using other theoretical frameworks such as prospect theory because researchers have recently considered narrow framing and loss aversion as potential explanations for finding a negative/insignificant link between risk aversion and insurance demand (Gottlieb and Mitchell, 2020; Hwang, 2017). We thus interpret our results for a large sample across many countries as a benchmark for other future studies that may help to better understand the link between risk attitudes and insurance demand.

The insights of our study suggest that product providers could enhance their marketing strategies and product designs so that consumers better understand insurance products. Such improvements should increase individuals' awareness of their exposure to financial risks. In addition, insurance providers should clearly communicate the crucial role of insurance products in reducing financial risks. This is essential in whole life insurance where we find robustly that

individuals with no willingness to take any financial risks own less whole life insurance (even though we control for the demographic and socioeconomic characteristics of the respondents). However, for term life insurance and long-term care insurance, there exist more heterogeneities across demographic and socioeconomic groups in terms of the link between willingness to take financial risks and insurance ownership, which might call for more diverse marketing strategies for different consumer segments.

The remainder of the paper is organized as follows. Section 2 describes the relevant conceptual background of risk attitudes and demand for insurance. Section 3 describes the SHARE data, presents the descriptive statistics, and describes our methodology. Section 4 reports the main results and presents the robustness tests. Section 5 discusses our findings and Section 6 concludes the paper.

2. Conceptual background

Pratt (1964) and Arrow (1965) independently introduced the measure of absolute and relative risk aversion in economic models describing risky situations. Mossin (1968) proved that, in a one-period expected utility setting, risk-averse individuals purchase full insurance when the premium is actuarially fair and purchase less than full coverage in the case of proportional premium loading.[1] Schlesinger (1981) and Szpiro (1985) further analyzed the link between risk aversion and optimal choice of insurance theoretically by implicitly assuming that individual risk aversion influences the subjective discounting factors of policyholders, who evaluate insurance options based on premium payments and expected rate of returns (Outreville, 2014). Schlesinger (1981) proves that for insurance contracts with a deductible, a higher degree of risk aversion leads to more insurance purchases. Szpiro (1985) presents explicit expressions for the amount of insurance coverage by considering the role of risk aversion in optimal insurance choice.

Several empirical studies analyze the link between risk aversion and insurance demand. For instance, Giesbert et al. (2011) report that risk-averse individuals in Ghana do not purchase micro-life insurance products as they consider this insurance to be a risky investment. Hwang (2017), using data from the Health and Retirement Study (HRS), finds that term life insurance, as a pure protection product, is perceived by individuals to be risky since the premium is

[1] Schlesinger (2006) confirms the results of Mossin (1968) in the case of upper-limit insurance policies. This is a relevant result in our context, because long-term care schemes typically have an upper limit for the amount of their coverage (e.g., $100 per day).

forfeited if no loss occurs. Zietz (2003) provides a comprehensive review of theoretical and empirical studies addressing the relationship between risk aversion and life insurance demand and finds mixed results (i.e., negative, positive, and insignificant associations). To improve our understanding of the association between risk aversion and life insurance demand, we summarize the recent studies that incorporate a measure of risk aversion in their analysis of life insurance demand in Panel A of Table 1.

However, to the best of our knowledge, there is no review of studies addressing the association between risk aversion and demand for long-term care insurance. A recent paper by Eling and Ghavibazoo (2019) documents the most important determinants of demand for long-term care insurance. They report mixed results (i.e., negative, positive, and insignificant results) for the association between risk aversion and long-term care insurance demand. Boyer et al. (2017) find that long-term care insurance products might be seen as a risky investment by individuals due to the risks related to insurance payouts, lapsing and premium increases. We summarize the studies reporting such an association with long-term care insurance demand in Panel B of Table 1.

Table 1 provides a summary of studies that either focus on the impact of risk attitudes on insurance demand or include a measure of risk aversion as a covariate in their analysis of insurance demand. Such measures include questions about preferences via gambling over lifetime income or qualitative questions about taking financial risks and receiving a proportionate reward.[2] Table 1 also reports relevant datasets along with the risk aversion measure and the type of products analyzed in each study. Most studies use country-specific datasets. For both life insurance and long-term care insurance, positive, negative, and insignificant associations between risk aversion and ownership of insurance are found. For both insurance products, the negative association between risk aversion and insurance demand is mainly attributed to either viewing such products via the narrow frame of financial gain or loss (see, e.g., Gottlieb and Mitchell, 2020; Hwang, 2017), or complexities and characteristics of such products from individuals' perspectives (see, e.g., Boyer et al., 2017; Giesbertt et al., 2011).

[2] Outreville (2014) discusses the difficulties in measuring risk attitudes and the alternative use of socio-demographic proxies, such as gender, instead. Since we use a direct question about self-reported risk willingness to take financial risks, we compare our results with those using direct risk aversion questions rather than with proxies.

In previous studies on risk attitudes, self-reported willingness to take financial risks is used as a valid measure of risk attitudes (see, e.g., Kapteyn and Teppa, 2011; Barasinska et al., 2012). Dohmen et al. (2011) compare several different survey measures of risk attitudes in different contexts (such as car driving, financial matters, sport/leisure, career, and health) and find that individuals' self-reported willingness to take risks is a useful all-round measure of risk attitudes. They also find that self-reported willingness to take risks in a specific context provides a stronger measure within this particular domain of risky behavior: For example, Dohmen et al. (2011) report that self-reported willingness to take risks in financial matters is a better predictor of portfolio choices than willingness to take risks in general. In our analysis, we choose individuals' self-reported willingness to take financial risks as our main measure of respondents' financial risk attitudes (see Section 3.1.4 for more details).[3]

[3] Following Dohmen et al. (2011), we use the terms "risk aversion" and "risk attitudes" interchangeably and focus on risk aversion only (that is, we do not address higher-order risk attitudes such as temperance and prudence). We refer readers interested in higher-order risk attitudes to Eeckhoudt and Schlesinger (2013) and Denuit and Eeckhoudt (2013).

Table 1
Literature review: The link between risk aversion and insurance demand.

Study	Link	Data	Analysis	Product(s)	Risk aversion measure
Panel A. Life insurance (LI)					
Barsky et al. (1997)	+	HRS 1992	Emp.	LI in general	GOLI
Chen et al. (2006)	+	-	Theo.	Term LI	-
Zhu (2007)	+	-	Theo.	Term LI	-
Gutter and Hatcher (2008)	+	SCF 2004	Emp.	Term/Whole LI	WTR Financial (4 levels)
Nam and Hanna (2019)	+	SCF 1992–2013	Emp.	Whole LI	WTR Financial (4 levels)
Baek and DeVaney (2005)	-	SCF 2001	Emp.	Term/Whole LI	WTR Financial (4 levels)
Giesbert et al. (2011)	-	Own survey in Ghana 2008	Emp.	Term	WTR General (5 levels)
Luciano et al. (2016)	-	SHIW 2012	Emp.	Term/Traditional LI	WTR Financial (4 levels)
Nam and Hanna (2019)	-	SCF 1992–2013	Emp.	Term LI	WTR Financial (4 levels)
Guiso and Paiella (2004)	0	SHIW 1995	Emp.	LI	Expected investment gain
Huang and Milevsky (2008)	0	-	Theo.	LI	-
Huang et al. (2008)	0	-	Theo.	LI	-
Liebenberg et al. (2012)	0	SCF 1983–1989	Emp.	Term/Whole LI	WTR Financial (4 levels)
Heo et al. (2013)	0	NLSY 2004–2008	Emp.	Whole LI	GOLI
Mulholland et al. (2016)	0	SCF 1992–2010	Emp.	Whole LI	WTR Financial (4 levels)
Hwang (2017)	0	HRS 2012	Emp.	Term/Whole LI	GOLI
Song et al. (2019)	0	NLSY 2006–2012	Emp.	Whole LI	WTR 8 domains
Nagy et al. (2020)	0	Own survey in Romania 2018	Emp.	LI	Risky lottery vs. fixed pay-off
Panel B. Long-term care insurance (LTCI)					
Schaber and Stum (2007)	+	Own survey of U.S. employees 1994	Emp.	Group LTCI	WTCL
Chatterjee and Fan (2017)	+	HRS 2012	Emp.	Private LTCI	GOLI
Akaichi et al. (2020)	+	SLTCAP 2014	Emp.	Private LTC	WTR General (10 levels)
Stum (2008)	-	Own survey of U.S. employees 2000	Emp.	Private LTCI	WTCL
Allaire et al. (2016)	-	SLTCAP 2014	Emp.	Private LTCI	WTR General (10 levels)
Gousia (2016)	-	SHARE 2013	Emp.	Private LTCI	WTR Financial (4 levels)
Boyer et al. (2017)	-	Own survey in Canada 2016	Emp.	Private LTCI	WTR Financial (4 levels)
Sloan and Norton (1997)	0	HRS 1992/1994	Emp.	Private LTCI	GOLI
Costa-Font and Rovira-Forns (2008)	0	Survey of Catalans 1999	Emp.	Private LTCI	Risk attitudes (10 levels)
Davidoff (2010)	0	HRS 2004	Emp./Theo.	Private LTCI	-
Boyer et al. (2019)	0	Own survey in Canada 2016	Emp.	Private LTCI	WTR Financial (4 levels)
Gottlieb and Mitchell (2020)	0	HRS and own survey 2012 in U.S.	Emp./Theo.	Private LTCI	Lotteries with large stakes

Notes: Emp. (Theo.) denotes studies showing an empirical (theoretical) link. + (-, 0) denotes a positive (negative, insignificant) link between risk aversion measure and insurance demand. WTR is willingness to take risks. GOLI is gamble over lifetime income. WTCL is willingness to take chance of not needing long-term care. HRS is Health and Retirement Study in the U.S. SCF is the U.S. Survey of Consumer Finances. SHIW is Survey of Household Income and Wealth in Italy. NLSY is National Longitudinal Survey of Youth in the U.S. SLTCAP is Survey of Long-term care Awareness and Planning in the U.S.

Hence, based on theoretical studies using standard classical utility theory, we can expect a significant negative association between willingness to take financial risks and ownership of both long-term care insurance and life insurance, even though empirical studies have mixed or inconclusive results.

3. Data and methodology

3.1. Data

3.1.1. Sample

We use data from Wave 5 (2013) of SHARE, a multidisciplinary longitudinal and cross-national follow-up survey comprising separate modules for different variables (e.g., health-related, labor market, demographical, income, assets and housing, social network, and risk attitudes). SHARE Wave 5 collects data for non-institutionalized individuals and their spouses who are sampled to be nationally representative of the population aged 50 or above at the time of interview. The survey uses standardized questions across countries and includes more than 66,000 respondents. Its design is based on the U.S. Health and Retirement Study (HRS) and the English Longitudinal Study of Ageing (ELSA)[4].

SHARE data are available from seven waves collected between 2004 and 2018. We use Wave 5 in which the question about ownership of long-term care insurance was first added. To maximize the sample size in the analysis, we extract two subsamples from Wave 5, one containing all individuals who have reported whether they have long-term care insurance and the other containing all individuals who have reported whether they have life insurance. Furthermore, we separate our life insurance analysis into term life and whole life insurance ownership. We only include respondents aged between 50 and 90 because there are few responses to the financial risk preference question in the survey by individuals aged 90 or above. We apply all five imputations provided by SHARE to fill missing entries in the relevant variables. We then drop observations with missing values in any of the remaining variables relevant to our study.

[4] A detailed description of the methodologies of data collection of the SHARE survey can be found in [dataset]Börsch-Supan et al. (2013). The SHARE data can be accessed and downloaded for free after registration at this link: http://www.share-project.org/data-access.html.

3.1.2. Long-term care insurance subsample

We limit our analysis to six countries that have private markets for long-term care insurance: Czech Republic, France, Israel, Italy, Spain, and Switzerland.[5] The long-term care insurance subsample consists of 21,912 observations. Since 2013, SHARE respondents have answered the following question: *Do you have any of the following public or private long-term care insurances?* with the following possible answers: *Public, Private mandatory, Private voluntary/supplementary, None.* Based on this question, we define a binary variable indicating whether an individual holds private voluntary or supplementary long-term care insurance.

We also include several health and disability measures relevant to long-term care insurance demand, such as an individual's ability to perform activities of daily living (ADL) and instrumental activities of daily living (IADL). SHARE asks individuals to rate their ability to perform six ADL items related to basic functional living: bathing, eating, toileting, dressing, transferring, and continence. SHARE participants also rate their ability to perform seven IADL needed for living independently: cooking, shopping, using the telephone, cleaning, accessing transportation, taking medicines, and managing personal finances. These variables have been used in other studies that analyze the demand for long-term care insurance (see, e.g., Courbage and Roudaut, 2008; Courbage et al., 2020). We construct two binary variables indicating whether individuals reported having at least one limitation in each of ADL or IADL.[6]

3.1.3. Life insurance subsample

The life insurance subsample comprises 33,892 observations in 14 countries (Austria, Belgium, Czech Republic, Denmark, France, Germany, Israel, Italy, Luxembourg, Netherlands, Slovenia, Spain, Sweden, and Switzerland).[7] For our main analysis, we use two separate binary variables indicating whether individuals own whole life insurance or term life insurance. We differentiate these two types of life insurance since whole life insurance products include a savings

[5] We follow Bonsang and Schoenmaeckers (2015) and exclude: Austria, Belgium, Slovenia, and Sweden because of spurious or missing data; Denmark because the Danish SHARE survey does not distinguish between private mandatory and private voluntary long-term care insurance; and Luxembourg because at the time of the survey, no private market for long-term care insurance existed. Furthermore, in SHARE there is no available data for long-term care insurance ownership in Germany.

[6] We note that many private insurance providers do not offer long-term care insurance to individuals with ADL/IADL limitations at the inception of the insurance contract, but since there is no information in the dataset regarding when private long-term care insurance is purchased (i.e., either before or after experiencing such limitations), we include all the respondents with/without ADL/IADL limitations in our analysis.

[7] Owing to a lack of responses regarding insurance ownership, we removed Estonia from our analysis of whole life insurance, and Estonia, Italy, and Spain from our analysis of term life insurance.

component while term life insurance ownership only provides pure life insurance coverage.[8] For analysis of term life insurance, it is more likely that employers provide group term life insurance policies for their employees (Hwang, 2017). Since the SHARE questionnaire does not ask whether the respondent purchased term life insurance individually or via a group life policy offered by their employer, we limit our analysis of term life insurance to non-workers at the time of interview (i.e., those who are not employed or not self-employed). For specific life insurance demand controls (in both term and whole life insurance analysis), we additionally include a binary indicator of praying frequently to proxy for being religious, which previous studies identified to be a determinant of life insurance demand (see, e.g., Outreville, 2014).

3.1.4. Willingness to take financial risks

Our main explanatory variable is self-reported willingness to take financial risks, which is elicited in SHARE with the following question: *When people invest their savings they can choose between assets that give low return with little risk to lose money, for instance a bank account or a safe bond, or assets with a high return but also a higher risk of losing, for instance stocks and shares. Which of the statements on the card comes closest to the amount of financial risk that you are willing to take when you save or make investments?*

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
4. Not willing to take any financial risks.

This question has also been included in other surveys, such as the U.S. Survey of Consumer Finances (SCF) and the China Household Finance Survey, and it is widely used in many studies on risk attitudes.[9] In terms of reliability, Grable and Lytton (2001) find that this risk tolerance question has a high degree of face and construct validity in investment choice attitudes. Hanna and Lindamood (2004) find a significant positive correlation between the above risk tolerance question and the more theory-based risk aversion measure based on income gambles. Dohmen et al. (2011) also suggest that self-reported qualitative survey measures of risk-taking are meaningful measures of risk attitudes that can be correctly mapped into actual choices in lotteries with monetary incentives, and hence, they are behaviorally a valid measure of risk

[8] Nam and Hanna (2019) find a positive link between risk aversion and whole (i.e., cash-value) life insurance and a negative link between risk aversion and term life insurance.

[9] See, for example, Banks et al. (2020), Bonsang and Dohmen (2015), Courbage et al. (2018), and Bucciol et al. (2018) who use SHARE. Kim et al. (2020) provide a review of the studies using the same self-reported risk aversion question in the SCF.

preferences. Kapteyn and Teppa (2011), comparing several different measures of risk preferences (i.e., theory-based risk aversion questions based on income gambles suggested by Barsky et al., 1997, with other ad hoc questions such as self-reported risk aversion), show that simple risk preference questions have the highest explanatory power regarding decisions in actual portfolios. To further test the predictability of the above willingness to take financial risks question on actual risky asset ownership (i.e., stock), we follow Bonsang and Dohmen (2015) and Banks et al. (2020) and report these predictions in Table B1 in Appendix B.

Owing to the categorical nature of the willingness to take financial risks question, we define four binary variables for the financial risk preference categories. Relatively few individuals report being willing to take above average and substantial financial risks. Therefore, we follow previous studies (e.g., Bucciol et al., 2018; Courbage et al., 2018) and create a binary variable called "taking no financial risks (TNFR)" which is equal to one if the respondent selects category 4 (*Not willing to take any financial risks)*, and zero otherwise. We use this variable to analyze interactions and demographic and socioeconomic groups.

3.1.5. Control variables

In addition to the product-specific control variables discussed above, we include control variables identified in the literature as relevant determinants of the demand for both life insurance and long-term care insurance. We include the following demographic and socioeconomic indicators for each respondent: age, gender, marital status, years of education, number of children, and household size.[10] The economic factors considered are total annual household income, total household net wealth (in five 20 percentiles of wealth),[11] and homeownership.[12] Other factors we include in both datasets are binary indicators for self-reported health status (Courbage and Roudaut, 2008, Tsendsuren et al., 2018, Sloan and Norton, 1997), higher life expectancy (Zietz, 2003), and being retired. Vigorous physical activity and drinking are incorporated as proxies of risky behaviors.[13] We further include body mass index (BMI) in four binary levels and number of chronic diseases[14] as health indicators, which could

[10] Marital status, number of children, and household size are included as proxies for bequest motives.

[11] We adjust the net worth variable (i.e., "hnetw") in SHARE by subtracting savings for long-term investments (i.e., variable "slti"), which includes the face value of life insurance policies and might cause endogeneity issues in the regression analysis.

[12] For the impact of homeownership on insurance demand, see, for example, Davidoff (2010) for long-term care insurance, and Zietz (2003) for life insurance.

[13] For example, Courbage et al. (2018) use similar variables as determinants of risky behavior. While being a smoker is also considered an important determinant of risky behavior, due to frequent non-responses in the dataset for this question, adding it would have resulted in a huge decrease in the number of observations.

[14] The question regarding chronic diseases includes 16 conditions (such as high blood pressure, cholesterol, blood sugar, etc.).

affect the demand for insurance. We also control for measures of cognitive ability relevant to insurance ownership by combining three cognitive tests collected in SHARE.[15] As we suspect that risks involved in purchasing insurance products such as long-term care insurance and life insurance might not be purely financial (Barsky et al., 1997), we control for other important determinants that might influence insurance purchasing decisions (such as health risks). For the case of long-term care insurance, limitations in ADLs and IADLs represent morbidity related risks, while controlling for self-reported subjective life expectancy could capture the mortality risks that might influence purchase of life insurance products.

3.2. Descriptive statistics

Table 2 reports the definitions and descriptive statistics of the relevant variables for the long-term care insurance and life insurance subsamples. On average, around 10% of the long-term care insurance subsample report having long-term care insurance. In the life insurance subsample, the number of insurance holders is 16% and 11% for whole life and term life insurance, respectively. The average age at interview for the long-term care insurance subsample is around 67 years, and for the life insurance subsample the average age is around 70 for term life insurance and 67 for whole life insurance. In Appendix B we report the number of respondents in each country per product in Table B2 and additional descriptive statistics of the variables in Table B3.

In both subsamples, the majority of the respondents prefer not to take any financial risks (77% for long-term care insurance and around 75% for life insurance). However, those who have insurance are substantially less risk-averse than those without insurance. The average frequency of respondents not willing to take any financial risks in each product is: 1) long-term care insurance: 67% for insurance holders compared to 78% for non-insurance holders; 2) term life insurance: 68% for insurance holders compared to 76% for non-insurance holders; and 3) whole life insurance: 59% for insurance holders compared to 75% for non-insurance holders.

Respondents who have insurance are on average younger and more educated in both subsamples. This might be due to certain age limits imposed on the purchase of life insurance

[15] The three tests measure: numeracy, that is, the respondent's performance in numerical operations based on a series of five questions on basic computations; verbal fluency, that is, the respondents' ability to read and understand text by relating the number of different animals they can name in one minute; and episodic memory, that is, the respondents' ability to distinguish situations and facts at different time distances via the number of recalled words out of 10. We define cognitive skills as the (normalized) first component in a principal component analysis of the scores from the numeracy, fluency, and memory tests given in SHARE. See, for example, Bonsang and Dohmen (2015) and Courbage et al. (2018) for constructing a similar variable.

and long-term care insurance policies, or the much higher insurance premiums for older people. The insurance holders have fewer chronic diseases, better self-reported health, and a higher subjective life expectancy. Specific variables relevant to the subsample of long-term care insurance, such as having any ADL or IADL limitations, substantially vary across insurance holders and non-insurance holders. On average, those with long-term care insurance report having fewer ADL and IADL limitations. This could be due to the fact that many life insurance and long-term care insurance policies are only provided to individuals once they have taken health examinations.

3.3. Methodology

We empirically test whether risk attitudes have an association with holding long-term care insurance or whole life and term life insurance. In so doing, we control for individual demographic and socioeconomic explanatory variables relevant to the demand for long-term care insurance and life insurance along with controls for country of residence. To test the effects of willingness to take financial risks on insurance demand we consider the following probit regression:

$$Y_{i,j,k} = \sum_j \beta_{0,j,k} C_j \; + \; \beta_{1,k} WTR1_{i,j,k} + \beta_{2,k} WTR2_{i,j,k} + \beta_{3,k} WTR3_{i,j,k} + \sum_n \beta_{n,j,k} X_{i,j,k} + \varepsilon_{i,j,k} \,, \tag{1}$$

where the binary variable Y equals one if a respondent has insurance, and zero otherwise; subscript i refers to the individual; and k is an index equal to zero, one, and two for long-term care insurance, term life insurance, and whole life insurance, respectively. C is the vector of country fixed effects with j as country indicator, $WTR1$ to $WTR3$ are binary indicators for different non-zero levels of willingness to take financial risks, from average to substantial risks respectively (we omit the most risk-averse group "not willing to take any financial risks" as the reference group). X refers to a vector of demographic and socioeconomic variables and ε is the error term. All else being equal, we expect that the coefficients $\beta_{1,k}$ to $\beta_{3,k}$ for taking any level of financial risk ($WTR1$ to $WTR3$) will be negative, indicating a negative link between willingness to take financial risks and insurance ownership.

To examine the existence of multicollinearity issues between the explanatory variables, we check the variance inflation factors (VIF) of independent variables in our model, and find that these range from 1.01 to 1.87 for all models. Since all VIFs are below five, we conclude that multicollinearity is not a problem in our models.

Table 2
Variable definitions and descriptive statistics.

	Long-term care insurance subsample				Life insurance subsample							
	Total LTCI	With LTCI	Without LTCI	Sig.	Total Term LI	With Term LI	Without Term LI	Sig.	Total Whole LI	With Whole LI	Without Whole LI	Sig.
Long-term care insurance holding (binary)	0.10	1	0	-	-	-	-	-	-	-	-	-
Term life insurance holding (binary)	-	-	-	-	0.11	1.00	0.00	-	-	-	-	-
Whole life insurance holding (binary)	-	-	-	-	-	-	-		0.16	1	0	-
Taking no financial risks (binary, not taking any level of risk=1)	0.77	0.67	0.78	***	0.75	0.68	0.76	***	0.75	0.59	0.75	***
Household size (discrete)	2.24	2.13	2.26	***	1.85	2.06	1.82	***	2.05	2.21	2.01	***
Female (binary, female=1)	0.55	0.53	0.55	*	0.57	0.54	0.57	*	0.55	0.5	0.55	***
Age at interview in years (continuous)	66.76	66.46	66.79	***	70.14	65.92	70.65	***	66.6	62.72	67.35	***
Age squared divided by 1,000 (continuous)	4.54	4.50	4.55	***	4.99	4.40	5.07	***	4.53	4.01	4.63	***
Number of children (discrete)	2.21	2.28	2.21	***	2.16	2.16	2.16	***	2.12	2.13	2.12	***
Married (binary, married, or registered partnership=1)	0.74	0.74	0.75		0.60	0.71	0.58	***	0.641	0.72	0.63	***
Years of education	10.44	11.87	10.29	***	11.17	11.66	11.11	***	11.23	12.42	11.01	***
Annual income (continuous)	18.93	26.81	18.08	***	21.76	21.35	21.80	***	21.93	24.24	21.50	***
Net wealth (continuous)	129.37	226.79	118.92	***	123.78	129.39	123.10	***	125.44	141.94	122.39	***
Cognitive skills (continuous)	-0.35	0.04	-0.39	***	-0.01	0.43	-0.06	***	0.02	0.47	-0.06	***
Vigorous physical activity (binary, intense physical activity at least once a week=1)	0.52	0.56	0.51	***	0.54	0.62	0.53	***	0.58	0.69	0.56	***
Healthy (binary, excellent, very good, or good health=1)	0.64	0.75	0.625	***	0.62	0.67	0.62	***	0.67	0.75	0.66	***
Number of chronic diseases (discrete)	1.72	1.45	1.75	***	2.00	1.75	2.03	***	1.74	1.48	1.79	***
BMI level 1 (binary, underweight=1)	0.01	0.02	0.01	**	0.01	0.01	0.01		0.01	0.01	0.01	
BMI level 2 (binary, normal weight=1)	0.35	0.37	0.35		0.36	0.34	0.36		0.37	0.39	0.37	**
BMI level 3 (binary, overweight=1)	0.43	0.42	0.43		0.41	0.42	0.41		0.41	0.41	0.41	
BMI level 4 (binary, obese=1)	0.21	0.19	0.21	*	0.22	0.23	0.22		0.21	0.19	0.21	**
Homeowner (binary, homeowner=1)	0.78	0.81	0.78	***	0.65	0.75	0.64	***	0.71	0.75	0.70	***
Drinking (binary, drink at least five times per week=1)	0.23	0.21	0.23	**	0.23	0.23	0.23		0.22	0.211	0.22	*
Retired (binary, retired=1)	0.58	0.56	0.58	*	0.84	0.81	0.84	***	0.58	0.43	0.61	***
Life expectancy (binary, more than 70% chance of living 10 years or more=1)	0.49	0.58	0.48	***	0.46	0.57	0.44	***	0.53	0.62	0.51	***
ADL (binary, at least one ADL difficulty=1)	0.09	0.07	0.10	***	-	-	-	-	-	-	-	-
IADL (binary, at least one IADL difficulty=1)	0.14	0.10	0.14	***	-	-	-	-	-	-	-	-

Table 2 (continued)

Frequent prayer (binary, pray more than once in a week=1)	-	-	-	-	0.33	0.28	0.33	***	0.33	0.26	0.34	***
N	21,912	2,122	19,790		20,203	2,187	18,016		33,892	5,285	28,607	

Note: "LTCI" is long-term care insurance, "Term LI" is term life insurance, and "Whole LI" is whole life insurance. For term life insurance, Spain and Italy are removed, and current workers are excluded. The difference in means (among insurance holders and non-insurance holders) statistically different from zero is reported under the "Sig." columns based on *t*-tests for continuous variables and Chi-Square tests for binary variables, with *, **, and *** denoting statistical significance at the 5%, 1%, and 0.1% levels, respectively. Monetary amounts are PPP-adjusted, divided by household size and in thousand Euros.

4. Results

4.1. Main results

We start by showing that those who are more willing to take financial risks (i.e., less risk-averse) have more insurance compared to respondents with no willingness to take financial risks. Fig. 1 shows the frequency of responses for ownership of long-term care, whole life, and term life insurance. Those who are willing to take average and above average financial risks have on average more insurance compared to those with no willingness to take any financial risks.

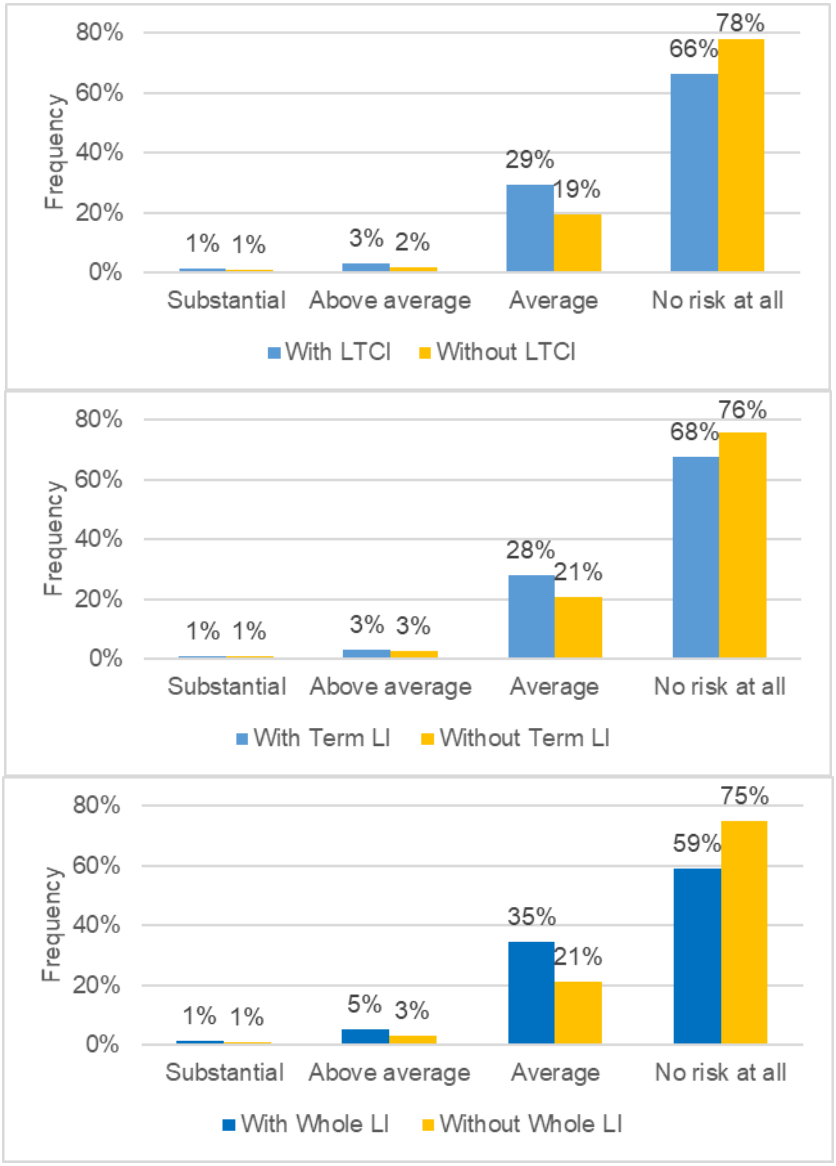

Fig. 1. Insurance ownership and willingness to take financial risks from SHARE.
Note: "LTCI" is long-term care insurance, "Term LI" is term life insurance, and "Whole LI" is whole life insurance. For all three insurance products, the difference in means for the categories willingness to take no financial risks at all and average financial risks are statistically different from 0 (p=0.001).

The main regression results are presented in Table 3.[16] Compared to individuals with no willingness to take any financial risks in the reference category, willingness to take average financial risks is positively and significantly associated with insurance holding of all three products. It can be seen that the average marginal effects of willingness to take average financial risks on long-term care, term life,[17] and whole life insurance ownership are 0.011, 0.025, and 0.044, respectively. The link between taking above average financial risks is only significant for whole life insurance holding (at the 1% significance level). These results show that the significance and impact of willingness to take more financial risks on insurance holding decrease as the level of willingness to take risks increases towards substantial risk.[18]

Table 3
Models for insurance holding.

Dependent variable	LTCI		Term LI		Whole LI	
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Willingness to take financial risks						
Substantial risks (1)	0.007	0.006	0.011	-0.011	0.073**	0.028
	(0.018)	(0.016)	(0.023)	(0.018)	(0.023)	(0.019)
Above average risks (2)	0.046**	0.018	0.042**	0.009	0.110***	0.038**
	(0.016)	(0.012)	(0.016)	(0.012)	(0.014)	(0.011)
Average risks (3)	0.029***	0.011**	0.054***	0.025***	0.092***	0.044***
	(0.005)	(0.004)	(0.006)	(0.005)	(0.005)	(0.005)
Ref=No risk at all (4)						
Household size		0.000		0.010***		0.014***
		(0.003)		(0.003)		(0.003)
Female		-0.001		-0.003		-0.007
		(0.003)		(0.004)		(0.004)
Age		0.004		-0.010*		-0.016***
		(0.003)		(0.004)		(0.003)
Age squared		-0.031		0.033		0.087***
		(0.022)		(0.029)		(0.022)
Number of children		-0.004**		0.001		0.001
		(0.001)		(0.002)		(0.001)
Married		-0.006		0.019***		0.024***
		(0.004)		(0.005)		(0.004)
Log(income)		0.015***		0.017***		0.016***

[16] Table B4 in Appendix B reports the full results. Table B4 also reports the results from models using a binary variable for "taking no financial risks" as the main explanatory variable for insurance ownership.

[17] We further tested the models for term life insurance for respondents who were currently working and found no significant link between willingness to take financial risks and ownership of term life insurance. This result might indicate that many of the currently working respondents are insured via their employers in group term life insurance schemes regardless of their financial risk preferences. The results are available upon request.

[18] The results using survey weights provided in SHARE lead to similar findings in terms of the signs and significance of coefficients for levels of financial risk and are available upon request.

Table 3 (continued)

		(0.002)		(0.003)		(0.003)
Wealth level 2		0.015*		0.020*		0.023**
		(0.007)		(0.008)		(0.007)
Wealth level 3		0.027**		0.025**		0.033***
		(0.008)		(0.009)		(0.008)
Wealth level 4		0.033***		0.026**		0.034***
		(0.008)		(0.010)		(0.008)
Wealth level 5		0.041***		0.012		0.047***
		(0.009)		(0.010)		(0.009)
Ref=Wealth level 1						
Cognitive skills		0.005**		0.011***		0.004*
		(0.002)		(0.002)		(0.002)
Years of education		0.004***		0.002**		0.003***
		(0.000)		(0.001)		(0.001)
BMI level 1		0.020		-0.023		-0.006
		(0.017)		(0.015)		(0.017)
BMI level 3		0.009*		0.005		0.002
		(0.004)		(0.004)		(0.004)
BMI level 4		0.017**		0.003		0.004
		(0.005)		(0.005)		(0.005)
Ref=BMI level 2						
Vig. physical activity		-0.012**		0.003		0.013**
		(0.003)		(0.004)		(0.004)
Healthy		0.008		-0.006		0.002
		(0.004)		(0.005)		(0.005)
Drinking		-0.006		0.004		-0.001
		(0.004)		(0.005)		(0.005)
Number of chronic diseases		-0.005***		-0.001		0.001
		(0.002)		(0.002)		(0.001)
Homeownership		-0.009		0.008		0.008
		(0.006)		(0.006)		(0.006)
Retired		0.008		0.003		-0.022***
		(0.004)		(0.006)		(0.005)
Life expectancy		0.010**		0.009*		0.012**
		(0.003)		(0.004)		(0.004)
ADL		0.007				
		(0.007)				
IADL		-0.010				
		(0.005)				
Frequent prayer				-0.003		-0.007
				(0.004)		(0.004)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	21,912	21,912	20,203	20,203	33,892	33,892
Pseudo R^2	0.15	0.18	0.05	0.12	0.07	0.12

Table 3 (continued)

Notes: "LTCI" is long-term care insurance, "Term LI" is term life insurance, and "Whole LI" is whole life insurance. Average marginal effects are reported with standard errors in parentheses. Columns (i) and (ii) are based on the long-term care insurance subsample, and columns (iii)–(vi) are based on the life insurance subsample. France is the reference country. In columns (iii) and (iv), Spain and Italy are removed, and current workers are excluded. *, **, and *** denote statistical significance at the 5%, 1%, and 0.1% levels, respectively.

Among the demographic and socioeconomic variables in the model for long-term care insurance holding, number of children has a significantly negative effect[19] and years of education[20] has significantly positive average marginal effects. Among the economic variables, both income and wealth (i.e., wealth level 3 and above) have a significantly positive link to ownership of long-term care insurance, but the link for homeownership remains insignificantly negative. Regarding health-related variables, those with higher cognitive skills, fewer chronic diseases, more vigorous physical activity, and a higher subjective life expectancy are more likely to have long-term care insurance. The average marginal effects of BMI levels 3 and 4 are also significantly positive (at the 5% and 1% significance levels, respectively). While the ADL and IADL variables have positive and negative coefficients (similar to the findings reported by Courbage and Roudaut, 2008), these coefficients are insignificant as individuals with initial health issues are often excluded from purchasing long-term care insurance.

The significance of the country fixed effects (reported in Table B4) shows that compared to France as the reference, countries with a higher prevalence of family care in their long-term care scheme (i.e., Czech Republic, Italy, and Spain) have a significantly negative association with long-term care insurance ownership, whereas in other countries (i.e., Switzerland and Israel) there is a significantly positive link to ownership of long-term care insurance. Fuino et al. (2020), using SHARE, analyze the characteristics of individuals reporting ADL limitations and those of respondents who use formal care. They also suggest that, among the countries in our analysis, in Czech Republic, Italy, and Spain there exists a higher prevalence of family care long-term care schemes (compared to Switzerland and France).[21]

For ownership of life insurance (both term life and whole life insurance), we find a negative association for age and a positive association for years of education, in line with Lin and Grace (2007). Also, income has a significant positive link to both products with a larger average marginal effect for term life insurance (0.017 compared to 0.016 for whole life insurance),

[19] Cramer and Jensen (2006) and Zweifel and Strüwe (1998) find similar results and argue that older adults perceive children as a substitute for formal long-term care.

[20] See, for example, Eling and Ghavibazoo (2019) for a list of studies that find a positive link between education and demand for long-term care insurance.

[21] Israel is not discussed by Fuino et al. (2020).

whereas the positive association between wealth and life insurance holding is more pronounced for whole life insurance, both in impact and significance. Among the other controls, household size,[22] being married,[23] cognitive skills, vigorous physical activity (only for whole life insurance holding), and life expectancy have significant positive average marginal effects. Being retired has only a significant negative link to ownership of whole life insurance.

The results from Table 3 do not confirm our expectation about the negative association between willingness to take financial risks and insurance ownership.

4.2. Robustness tests

4.2.1. Risky asset ownership

It is possible that respondents have difficulty answering hypothetical questions regarding risk preferences (Sloan and Norton, 1997).[24] Thus, we consider another variable that measures revealed financial risk preferences. We follow Bonsang and Dohmen (2015) in constructing a binary indicator equal to one for those who own stocks directly, and zero otherwise. We also construct another binary variable indicating indirect stock ownership, which equals one if the respondent claims to have either stocks, mutual funds, or an individual retirement account (IRA).[25] In Table 4, we use stock ownership and indirect stock ownership instead of willingness to take financial risks and find similar results to our main findings in Table 3 for both term life insurance and whole life insurance ownership. However, in contrast to the significantly positive link we find in Table 3 for the association between willingness to take financial risks and ownership of long-term care insurance, in column (i) of Table 4, it can be seen that there is no significant association between stock ownership and long-term care insurance holding. However, the average marginal effects of indirect stock ownership are significantly positive (0.025) as illustrated in column (ii), confirming a partially significant positive link in our base model. Directly or indirectly owning stock has a significantly positive association with term life insurance ownership, as reported in columns (iii) and (iv), and whole life insurance ownership,

[22] See, for example, Millo and Carmeci (2015) for similar results.
[23] See, for example, Eisenhauer and Halek (1999) for similar findings.
[24] Sloan and Norton (1997) suggest that this issue could be the reason why they found an insignificant association between risk aversion and the demand for long-term care insurance in their study.
[25] Bonsang and Dohmen (2015) implicitly assume that mutual funds and IRAs carry some stocks. The same assumption is used in Bucciol et al. (2018) using SHARE to investigate the role of trust in risky investments among Europeans. Although including IRA in indirect stock ownership variable is tricky (due to existing heterogeneity among definition of IRA in various European countries and institutional settings, and the possibility that having IRAs might be mandatory in some of countries) we follow the above studies and assume that having IRA partially resembles indirect risky asset ownership.

as reported in columns (v) and (vi) of Table 4. In line with our previous findings in Table 3, the average marginal effects of risky asset ownership are larger in size for ownership of whole life insurance (i.e., 0.031 and 0.068 for direct and indirect stock ownership, respectively) compared to ownership of term life insurance (i.e., 0.023 and 0.05 for stock and indirect stock ownership, respectively).

Table 4

Models for insurance holding using stock and indirect stock ownership.

Dependent variable	LTCI		Term LI		Whole LI	
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Stock ownership	0.002		0.023**		0.031***	
	(0.006)		(0.007)		(0.006)	
Indirect stock ownership		0.025***		0.050***		0.068***
		(0.005)		(0.005)		(0.005)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
N	14,317	14,317	19,887	19,887	33,402	33,402
Pseudo R^2	0.16	0.16	0.12	0.12	0.12	0.13

Notes: "LTCI" is long-term care insurance, "Term LI" is term life insurance, and "Whole LI" is whole life insurance. Average marginal effects are reported with standard errors in parentheses. Columns (i) and (ii) are based on the long-term care insurance subsample, and columns (iii)–(vi) are based on the life insurance subsample. France is the reference country. For columns (iii) and (iv) Spain and Italy are removed, and current workers are excluded. *, **, and *** denote statistical significance at the 5%, 1%, and 0.1% levels, respectively.

The significant positive relationship between stock ownership and life insurance holding supports the results of Cavapozzi et al. (2013), who find that those who already have a life insurance policy are more likely to invest in stocks or mutual funds in the future.[26] Cavapozzi et al. (2013), using life-history information of respondents in SHARE, argue that this is consistent with behavioral models in which economic agents first avoid poverty by purchasing life insurance, and then invest in riskier assets to gain higher economic returns. Luciano et al. (2016), based on the Survey of Household Income and Wealth (SHIW) in Italy, report similar results: they find that being a stockholder significantly and positively affects ownership of both traditional[27] and term life insurance. They argue that such a relation between stock ownership and life insurance signals that people who are more familiar with financial investments have more diversification needs and are therefore willing to purchase life insurance. Furthermore,

[26] In the context of health insurance, Love and Smith (2010) and Goldman and Maestas (2013) also find a positive association between having health insurance and investment in risky assets. They argue that as risk exposure decreases, individuals tend to invest more in risky assets.

[27] In the SHIW, traditional life insurance guarantees a lump sum benefit or an annuity upon survival of the subscriber.

Luciano et al. (2016) find a negative association between risk aversion and ownership of both traditional and term life insurance (with partial significance in some models).

As emphasized by Bonsang and Dohmen (2015), there might be heterogeneities in the answers to our financial risk preferences question, since it is possible that the willingness to take financial risks question captures the financial investment preferences of the individuals instead of reflecting their pure risk preferences. For instance, it might be possible that those with no direct (or indirect) investment in stocks report more frequently that they do not want to take any risks at all, regardless of their inherent risk preferences. If holding risky assets (such as stocks) directly influences the insurance purchase decision (as argued by Luciano et al., 2016), then the relationship between the willingness to take financial risks question and insurance ownership might be (partially) influenced by the current risky asset structure of the respondents. In an attempt to rule out such an effect from the question about willingness to take financial risks (although we cannot eliminate this effect thoroughly), we exclude respondents who report having stocks directly or indirectly and run the same models. Table B5 in Appendix B presents the average marginal effects of financial risk preferences on insurance take-up for respondents who have no risky assets. While the results are similar to our main findings in Table 3, the levels of significance are lower.

4.2.2. Interactions and homogenous groups

We further run model specifications in which the samples are grouped according to certain demographic and socioeconomic characteristics. In Table 5, the respondents are categorized with respect to gender, marital status (i.e., married or in a registered partnership), size of household (i.e., living alone or with other family members), having children, higher education (i.e., 10 or more years of education), a higher numeracy score (a score of four or five out of five in the numeracy test), and good health (including good, very good, or excellent health) or otherwise. The results in Table 5 confirm our main findings from Table 3 that there is a significant positive association between willingness to take financial risks for whole life insurance, while such an association is less clear for ownership of long-term care insurance and term life insurance.

Panel A in Table 5 reports the results for ownership of long-term care insurance. Among all subgroups, the link between the taking no financial risks variable and long-term care insurance ownership remains negative with a significance level of 1% only in certain groups (i.e., males, and those with children, no higher education, and a lower numeracy score). This analysis helps

us to examine the individuals' risk attitudes toward insurance within certain demographic and socioeconomic groups. It also suggests that certain groups can be better targeted for financial and insurance literacy improvement programs.

Panels B and C of Table 5 suggest that individuals with no willingness to take any financial risks have fewer life insurance products in many demographic groups. For term life insurance, the significant negative association between taking no financial risks and ownership of term life insurance can be seen in almost all groups (except single households, respondents with no children, no higher education, a low numeracy score, and those who are not healthy). However, for whole life insurance, there is a significant negative association between taking no financial risks and insurance ownership in all groups. This confirms that in all groups with homogenous demographic characteristics, individuals who are not willing to take any financial risks have less whole life insurance.

We also test the possible interactions between age and willingness to take financial risks.[28] For the analysis of interactions, we use the taking no financial risks variable and binary variables for each age group from 50–90.[29] The results in Table B6 in Appendix B show that there are no significant interaction effects of age and taking no financial risks on long-term care insurance ownership. For both types of life insurance, as we move from age 50 toward age 90, the coefficients of the interaction between age group and taking no financial risks remain significantly positive and increase in size (for whole life insurance the coefficient of interaction term increases from 0.053 for the 60–69 age group to 0.114 for the 80–90 age group). It can be inferred that individuals in older age groups that take no financial risks have a higher probability of having term life and whole life insurance; but the effect of taking no financial risks (illustrated in the first row in Table B6) remains significantly negative for both term life (-0.056) and whole life insurance holdings (-0.098).

[28] See, for example, Outreville (2014) for references to studies that find a positive link between age and risk aversion.

[29] Ai and Norton (2003) show that the marginal effects of interaction terms between discrete choices in the case of nonlinear models are difficult to interpret as their magnitude and sign might be different across different observations. Therefore, we show the impacts of interactions via linear probability models.

Table 5

Models for insurance holding based on demographic groups.

	Female	Male	Married	Not married	HHsize=1	HHsize>1	Have child	No child	Higher educ.	No higher educ.	Higher numeracy	Lower numeracy	Healthy	Not healthy
Panel A. Dependent variable: Long-term care insurance holding														
Taking no financial risks	-0.005	-0.019**	-0.009*	-0.018*	-0.019	-0.010*	-0.011**	-0.016	-0.012*	-0.015**	-0.014*	-0.014**	-0.011*	-0.013*
	(0.005)	(0.006)	(0.004)	(0.008)	(0.010)	(0.004)	(0.004)	(0.015)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.006)
N	11,961	9,951	16,308	5,604	3,796	18,116	19,959	1,953	12,910	9,002	9,849	12,063	13,939	7,973
Pseudo R^2	0.19	0.17	0.18	0.19	0.19	0.18	0.18	0.13	0.17	0.19	0.17	0.18	0.16	0.20
Panel B. Dependent variable: Term life insurance holding														
Taking no financial risks	-0.023**	-0.022**	-0.024***	-0.020**	-0.013	-0.026***	-0.021***	-0.032*	-0.025***	-0.016	-0.029***	-0.017*	-0.027***	-0.012
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.005)	(0.014)	(0.006)	(0.009)	(0.007)	(0.007)	(0.006)	(0.008)
N	11,455	8,748	12,050	8,153	6,661	13,542	18,091	2,112	13,475	6,728	11,285	8,918	12,586	7,617
Pseudo R^2	0.12	0.12	0.12	0.11	0.11	0.11	0.12	0.15	0.12	0.12	0.13	0.10	0.12	0.12
Panel C. Dependent variable: Whole life insurance holding														
Taking no financial risks	-0.040***	-0.044***	-0.046***	-0.033***	-0.038***	-0.043***	-0.040***	-0.062***	-0.049***	-0.034***	-0.051***	-0.054***	-0.049***	-0.026***
	(0.006)	(0.007)	(0.006)	(0.007)	(0.008)	(0.006)	(0.005)	(0.013)	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)	(0.008)
N	18,461	15,431	21,710	12,182	9,230	24,662	30,132	3,760	22,558	11,334	18,318	15,574	22,772	11,120
Pseudo R^2	0.13	0.11	0.12	0.12	0.11	0.12	0.12	0.14	0.10	0.15	0.10	0.13	0.11	0.13
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Average marginal effects are reported with standard errors in parentheses. Panel A is based on the long-term care insurance subsample, and Panels B and C are based on the life insurance subsample. France is the reference country. For Panel B Spain and Italy are removed, and current workers are excluded. *, **, and *** denote statistical significance at the 5%, 1%, and 0.1% levels, respectively.

The relevant literature on risk preferences also reports that risk aversion is significantly associated with wealth and income. Dohmen et al. (2011) find that willingness to take financial risks increases with both wealth and income. Therefore, in Table B7 in Appendix B, we report the association between taking no financial risks and insurance holdings in homogenous socioeconomic groups based on quartiles of income and wealth. The results in Table B7 also show that the negative association between taking no financial risks and insurance ownership is more significant for whole life insurance than for term life and long-term care insurance. Such an association is largest for those in the fourth level of income and wealth quartiles (in both the whole life insurance and long-term care insurance analysis), which might be due to individuals in higher levels of income and wealth being more willing to take financial risks. Courbage et al. (2018), using SHARE, also report that willingness to take financial risks increases with wealth, and they argue that individuals exhibit decreasing absolute risk aversion. As we do not see a certain pattern in significance of the association between taking no financial risks and ownership of term life insurance, we suspect that this might be due to excluding current workers in the term life insurance analysis. This might distort the quartiles of income and wealth from the original subsample.

4.2.3. Instrumental variables

Survey questions can be subject to measurement error.[30] Considering the discrete and categorical nature of the self-reported willingness to take financial risks question, there can be a measurement error (i.e., misclassification error) which causes an endogeneity problem. This issue cannot be easily addressed via standard instrumental variable methods in the case of discrete variables as we face a nonclassical measurement error.[31] However, to further test our results using instrumental variables, we assume that this question has a continuous nature, and we define a continuous willingness to take financial risks variable that ranges from 1 (= not willing to take any financial risks) representing the highest risk aversion to 4 (= willing to take substantial financial risks) representing the lowest risk aversion with measurement errors that are uncorrelated over time. These strong assumptions allow us to use the responses to the question about willingness to take financial risks from the previous SHARE wave, that is, wave 4, as an instrument to address potential measurement errors in our model. The results in Table B8 in Appendix B confirm our main findings from Table 3 for both term life and whole life

[30] See, for example, Barsky et al. (1997) for the measurement error of preference parameters.

[31] In our study, the existence of a potentially mismeasured discretely distributed regressor (i.e., willingness to take financial risks) will lead to non-zero mean errors, which deviates from classical measurement error assumptions. For more details refer to Hu and Schennach (2008).

insurance but do not confirm the significant association between willingness to take financial risks and long-term care insurance ownership.

5. Discussion

We find a significant positive association between willingness to take average financial risks and ownership of long-term care insurance, which is not supported by our robustness tests. Other studies also find no clear link between willingness to take financial risks and long-term care insurance ownership. Costa-Font and Rovira-Forns (2008) argue that higher risk aversion might lead to a larger probability of insuring long-term care via alternative means of self-insuring, such as protective savings. Furthermore, the role of home equity as a saving mechanism should also be emphasized. Davidoff (2010) shows that asset commitment (in terms of home equity) might weaken the demand for long-term care insurance. Although we find an insignificant negative link between homeownership and having long-term care insurance, it might be useful to further analyze the role of monetary amounts of individuals' asset structure (i.e., both financial and non-financial assets and the amount of risky and non-risky investments) on insurance ownership in future studies.

In our analysis of long-term care insurance, we find that number of children and marital status are negatively associated with insurance ownership (with more significance for number of children). Such an association supports the crowding-out effects of informal care received by elders on private long-term care insurance (see, e.g., Zweifel and Courbage, 2016). However, such results contradict studies that find a positive impact of number of children on long-term care insurance demand, arguing for the role of bequest motives as a determinant of demand for long-term care insurance (see, e.g., Courbage and Roudaut, 2008, who report a positive link between number of children and demand for long-term care insurance). Boyer et al. (2019), using a Canadian survey, test different existing hypotheses explaining the low demand for long-term care insurance from both the supply and demand sides, such as the role of risk aversion and bequests. Their analysis finds that bequest motives are more important than risk aversion in determining long-term care insurance holding. Unfortunately, we cannot test the accurate impact of bequest motives on the association between willingness to take financial risks and insurance ownership as the direct question relating to bequest motives (i.e., the amount of inheritance individuals intend to leave to their descendants) has been removed from recent SHARE waves. Courbage and Roudaut (2008), using early SHARE waves and the direct question relating to bequests, confirm the importance of bequest motives on long-term care

insurance demand in France. Hence, a more accurate question is needed in surveys to test the effects of bequest motives on the relationship between risk aversion and long-term care insurance holding.

Our robustness tests do not fully confirm that long-term care insurance is perceived by individuals to be a risky investment. However, Boyer et al. (2017) argue that long-term care insurance can be perceived as a risky investment due to the risks associated with insurance payout, probability of lapse, and a further increase in premiums. In addition, there might be other factors, such as limited consumer knowledge and low financial literacy, that play a role in long-term care insurance purchase decisions (Brown and Finkelstein, 2009). The heterogeneities regarding the link between taking no financial risks and insurance ownership among groups with higher and lower numeracy as well as higher and lower education partially confirm that financial literacy and consumer knowledge matter. Limited consumer knowledge and low financial literacy might be accompanied by potential supply-side restrictions, such as limited coverage based on age, exclusion of certain medical preconditions, and imposition of high premium loadings (Eling and Ghavibazoo, 2019), which can also lead to low demand for long-term care insurance.

Consumers' low demand for other long-horizon insurance products, for example, life annuities and reverse mortgages, also suggests that individuals might have difficulty deciding on the purchase of coverage for long-term probabilistic outcomes, preferring to stay with their current status quo and remain uninsured (Brown and Finkelstein, 2011). This might imply that the role of reference points (i.e., being uninsured)is more relevant to the demand for insurance compared to the impact of risk aversion. Gottlieb and Mitchell (2020), using narrow framing and loss aversion, find a negative but insignificant relationship between risk aversion and long-term care insurance holding and use prospect theory to argue that the correlation between risk aversion and long-term care insurance can have a negative sign.[32]

A positive association between willingness to take financial risks and ownership of life insurance could be due to the perceived riskiness of such products. Baek and DeVaney (2005), using a similar risk attitude question in SCF, also find a positive association between

[32] Gottlieb and Mitchell (2020) define narrow framers as people whose preferences include both consumption and gain–loss utility from prospect theory. While consumption smoothing should increase the demand for insurance for risk-averse individuals, the concavity of gain–loss utility induces individuals to buy less insurance, which might explain why the risk aversion coefficient is not only statistically insignificant but also has the "wrong" sign.

willingness to take risks and owning cash-value life insurance.[33] Giesbert et al. (2011) also find that risk-averse households are less likely to participate in micro-life insurance in Ghana because they perceive it as a risky investment, as they don't understand the terms and conditions of the contract. Our results contradict the findings of Hwang (2017) regarding the differences between financial riskiness of term and whole life insurance. We find that the association between willingness to take financial risks and whole life insurance holding is stronger than the former's association with term life insurance (i.e., willingness to take both average and above average financial risks is positively and significantly associated with whole life insurance ownership compared to term life insurance). Hwang (2017) argues that whole life insurance comprises a saving component, which makes it financially a less risky product compared to term life insurance. Term life insurance is a pure protection product and the insured will lose the premiums if no loss occurs. Hwang (2017) finds a significant negative link between risk aversion and life insurance demand. However, he reports that such significance disappears when a variable for loss aversion is included in his analysis. Using prospect theory, he argues that an individual might view insurance as a risky investment that is profitable only if the indemnity received from the insurance company exceeds the premium paid. There is a growing literature using prospect theory to address insurance purchasing decisions (see, e.g., Zheng, 2020; McIntosh et al., 2019; Eeckhoudt et al., 2018). Unfortunately, SHARE does not ask specific questions to test the hypotheses derived from prospect theory.

We also find that there exists a significant positive association between risky asset ownership and life insurance holding. This confirms our main results, and it could also be related to the educational role of life insurance policies in financial investments. Cavapozzi et al. (2013) argue that life insurance plays an important role as "a low aspiration level" in protecting individuals against poverty, while the goal of the "high aspiration layer" is "to shot at riches".[34] They state that life insurance purchase could be analogous to the investment in bonds in life-cycle models with bounded rationality. In such life-cycle models, an optimal portfolio strategy is driven by first investing in low-risk assets (to protect against worst-case scenarios) and later on, in more risky assets such as stocks (Binswanger, 2011). Luciano et al. (2016) report that there is a positive association between risky asset ownership and life insurance in Italy and refer to such an association as diversification needs. Although the cross-sectional analysis in this study does

[33] Baek and DeVaney (2005) suggest that such a question mainly addresses saving and investment behavior rather than purely risk aversion.

[34] The terms in quotation marks are introduced by Shefrin and Statman (2000) in a two-layer portfolio with one a low aspiration layer and the other a high aspiration layer.

not seek to find the possible relationships between life insurance and risky assets, it provides new insights by empirically finding a significant positive association between risky asset ownership and having life insurance across many countries. In addition, our analysis of life insurance ownership among individuals with no risky assets confirms that, regardless of the current asset structure of the respondents, the link between willingness to take average financial risks and insurance ownership is significantly positive for both whole life and term life insurance. These results, along with analysis of insurance ownership among demographic and socioeconomic groups, confirm the robustness of our main findings for ownership of whole life insurance. In contrast, the link between willingness to take financial risks and insurance ownership remains less significant for other product types in our analysis.

Our study is subject to several limitations. First, the current questionnaire in the SHARE survey does not allow us to test the impact of other behavioral factors, such as narrow framing, loss aversion, or time preferences. This limitation deprives us of testing alternative models beyond utility theory.

Second, the role of bequest motives, as an important factor in the demand for late-in-life products, might not be accurately tested via proxies (such as marital status, household size, or number of children), and a direct question about bequest motives is needed. Third, a risk attitude question with more levels of risk preferences might have allowed us to capture better the possible nonlinearities in the association between willingness to take financial risks and insurance ownership (as we only find a positive link for average and above average financial risks), and more accurately address potential measurement errors in the risk attitude question. This could have been done if the survey contained well-established incentivized risk attitude questions, such as that designed by Holt and Laury (2002) or used in Barsky et al. (1997). However, asking such questions might not be feasible in a large survey targeting elders in a cross-country setting.

Lastly, owing to data limitations, we do not account for supply-side factors relevant to insurance products. Such factors comprise differences in products in terms of period, amount of coverage, age limitations, and health examination requirements. Knowledge of supply-side factors might help to better disentangle the effects of products' complexities from the effects of individuals' risk attitudes on insurance ownership. Future survey-based research could ask non-insurance holders to list their reasons for not purchasing insurance, possibly with pre-defined answers

about product complexity, supply-side factors such as high premiums and product exclusions, receipt of informal care from family, or coverage via public schemes.

6. Conclusion

While many theoretical studies emphasize the importance of risk attitudes on the demand for insurance, there are inconclusive and ambiguous results on the effects of risk attitudes on long-term care and life insurance demand among empirical studies. This paper uses results from the well-established standard utility theory framework as a benchmark and applies it to a large cross-country dataset obtained from SHARE, to test the effects of individual willingness to take financial risks, as a proxy for risk aversion, on the ownership of private long-term care, term life insurance, and whole life insurance.

We find that willingness to take financial risks is positively associated with insurance ownership, with lower significance for term life and long-term care insurance than for whole life insurance. Our results are robust across many model specifications; we test our models using self-reported risky asset ownership instead of self-reported willingness to take financial risks, and we also limit the analysis to respondents with no risky assets. Moreover, we examine the possible financial risk preference heterogeneities among demographic and socioeconomic groups and test the potential interactions between willingness to take financial risks and age groups. We provide robust evidence of our main findings for whole life insurance, while the results are less robust for long-term care and term life insurance.

Our findings motivate the need for further empirical studies on portfolio choices for retirement. Future research could examine whether insurance products, such as life insurance and long-term care insurance, are perceived as: 1) risk-mitigation tools, that is, they might stimulate more investment in risky assets; and 2) risky investments per se, that is, the complexities associated with insurance coverage, payout, lapses, products' long-term dimensions, or the possible excess of premiums paid over indemnity make them a risky investment.

The results of this study have important implications for researchers and practitioners. Our findings suggest that the classical utility theory might not explain the link between individuals' financial risk preferences and their insurance purchase decisions. Hence, more research is needed to investigate such a relationship in frameworks other than expected utility theory (e.g., prospect theory). Furthermore, practitioners might benefit from our study by redesigning their marketing strategies to enhance individuals' understanding of such products in terms of

financial riskiness. Such strategies should aim to increase customers' knowledge of how insurance products help reduce financial risks. This is especially crucial for whole life insurance as we find that, across different demographic and socioeconomic groups, individuals with no willingness to take any financial risks have less whole life insurance, signaling that whole life insurance is perceived to be financially risky. However, the existing heterogeneities regarding the link between willingness to take financial risks and insurance ownership for long term care and term life insurance might call for more diverse marketing strategies to better address the financial risk perception of certain potential customers.

Appendix A

The relevant SHARE question about ownership of long-term care insurance is: *Do you have any of the following public or private long-term care insurances?*

1. Public
2. Private mandatory
3. Private voluntary/supplementary
4. None

The relevant question for life insurance ownership is: *Do you currently own any life insurance policies?* Depending on the answer to the above question, the following question is asked: *Are your life insurance policies term policies, whole life policies, or both of these?*

1. Term policies
2. Whole life policies
3. Both
4. Other

Appendix B

Table B1

Models for stock ownership.

Dependent variable	Stock ownership			
	(i)	(ii)	(iii)	(iv)
Willingness to take financial risks				
Substantial risks (1)	0.124***		0.181***	
	(0.034)		(0.025)	
Above average risks (2)	0.197***		0.220***	
	(0.027)		(0.015)	
Average risks (3)	0.089***		0.119***	
	(0.007)		(0.005)	
Ref=No risk at all (4)				
Taking no financial risks (TNFR)		-0.092***		-0.122***
		(0.006)		(0.005)
Age	0.010**	0.010**	0.006*	0.006*
	(0.004)	(0.004)	(0.003)	(0.003)
Age squared	-0.072**	-0.071**	-0.045*	-0.044*
	(0.025)	(0.025)	(0.019)	(0.019)
Female	-0.013***	-0.014***	-0.015***	-0.016***
	(0.003)	(0.003)	(0.003)	(0.003)
Years of education	0.004***	0.004***	0.004***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)
Married	0.007	0.007	0.016***	0.016***
	(0.004)	(0.004)	(0.004)	(0.004)
Household size	0.008**	0.008**	0.015***	0.015***
	(0.003)	(0.003)	(0.002)	(0.002)
Number of chronic diseases	0.000	0.000	-0.001	-0.001
	(0.001)	(0.002)	(0.001)	(0.001)
Retired	0.001	0.001	0.008	0.008
	(0.004)	(0.004)	(0.004)	(0.004)
Log(income)	0.012***	0.012***	0.010***	0.010***
	(0.003)	(0.003)	(0.002)	(0.002)
Wealth level 2	0.053***	0.053***	0.080***	0.079***
	(0.012)	(0.012)	(0.009)	(0.009)
Wealth level 3	0.087***	0.086***	0.120***	0.120***
	(0.013)	(0.013)	(0.010)	(0.010)
Wealth level 4	0.102***	0.102***	0.174***	0.174***
	(0.014)	(0.014)	(0.011)	(0.011)
Wealth level 5	0.171***	0.172***	0.263***	0.264***
	(0.017)	(0.017)	(0.012)	(0.012)
Ref=Wealth level 1				
Country fixed effects	Yes	Yes	Yes	Yes
N	14,317	14,317	33,402	33,402
Pseudo R^2	0.24	0.23	0.25	0.25

Table B1 (continued)

Notes: "LTCI" is long-term care insurance, "Term LI" is term life insurance, and "Whole LI" is whole life insurance. Average marginal effects are reported with standard errors in parentheses. Columns (i) and (ii) are based on the long-term care insurance subsample, and columns (iii) and (iv) are based on the life insurance subsample. France is the reference country. *, **, and *** denote statistical significance at the 5%, 1%, and 0.1% levels, respectively.

Table B2

Number of respondents by country.

	Long-term care insurance subsample	Life insurance subsample	
	LTCI	Term LI	Whole LI
Austria	-	2,194	2,652
Belgium	-	2,419	3,402
Czech Republic	4,846	2,645	3,209
Denmark	-	1,416	2,459
France	3,954	1,915	2,437
Germany	-	2,123	3,391
Israel	1,483	517	795
Italy	4,041	-	2,591
Luxembourg	-	743	1,023
Netherlands	-	1,682	2,409
Slovenia	-	1,583	1,888
Spain	5,019	-	3,105
Sweden	-	1,790	2,632
Switzerland	2,569	1,176	1,899
N	21,912	20,203	33,892

Note: "LTCI" is long-term care insurance, "Term LI" is term life insurance, and "Whole LI" is whole life insurance.

Table B3
Additional descriptive statistics.

	Long-term care insurance subsample			Life insurance subsample					
	LTCI			Term LI			Whole LI		
	Min.	Max.	Med.	Min.	Max.	Med.	Min.	Max.	Med.
Long-term care insurance holding	0	1	0	-	-	-	-	-	-
Whole life insurance holding	-	-	-	-	-	-	0	1	0
Term life insurance holding	-	-	-	0	1	0	-	-	-
Financial risk aversion	0	1	1	0	1	1	0	1	1
Household size	1	12	2	1	11	2	1	12	2
Female	0	1	1	0	1	1	0	1	1
Age at interview in years	50	90	66	50	90	70	50	90	66
Age squared divided by 1,000	2.5	8.1	4.36	2.5	8.1	4.9	2.5	8.1	4.36
Number of children	0	17	2	0	17	2	0	17	2
Married	0	1	1	0	1	1	0	1	1
Years of education	0	25	11	0	25	11	0	25	11
Annual income	0.64	389.84	10.10	771.81	397.51	12.25	0.712	399.01	12.41
Net wealth	-235.92	9,756.10	73.65	-85.33	2,917.40	71.66	-86.33	2,927.39	72.94
Cognitive skills	-4.81	6.66	-0.3	-4.81	6.66	0.04	-4.81	6.66	0.10
Vigorous physical activity	0	1	1	0	1	1	0	1	1
Health status	0	1	1	0	1	1	0	1	1
Number of chronic diseases	0	13	1	0	11	2	0	11	1
BMI level 1	0	1	0	0	1	0	0	1	0
BMI level 2	0	1	0	0	1	0	0	1	0
BMI level 3	0	1	0	0	1	0	0	1	0
BMI level 4	0	1	0	0	1	0	0	1	0
Homeowner	0	1	1	0	1	1	0	1	1
Drinking	0	1	0	0	1	0	0	1	0
Retired	0	1	1	0	1	1	0	1	1
Life expectancy	0	1	0	0	1	0	0	1	1
ADL	0	1	0	-	-	-	-	-	0
IADL	0	1	0	-	-	-	-	-	0
Frequent prayer	-	-	-	0	1	0	0	1	0
N	21,912			20,203			33,892		

Notes: "LTCI" is long-term care insurance, "Term LI" is term life insurance, and "Whole LI" is whole life insurance. For term life insurance, Spain and Italy are removed, and current workers are excluded. "Min.", "Max.", and "Med." refer to minimum, maximum, and median values for each variable, respectively. Monetary amounts are PPP-adjusted, divided by household size, and in thousand Euros.

Table B4

Models for insurance holding (full models).

Dependent variable	LTCI			Term LI			Whole LI		
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)
Willingness to take financial risks									
Substantial risks (1)	0.007	0.006		0.011	-0.011		0.073**	0.028	
	(0.018)	(0.016)		(0.023)	(0.018)		(0.023)	(0.019)	
Above average risks (2)	0.046**	0.018		0.042**	0.009		0.110***	0.038**	
	(0.016)	(0.012)		(0.016)	(0.012)		(0.014)	(0.011)	
Average risks (3)	0.029***	0.011**		0.054***	0.025***		0.092***	0.044***	
	(0.005)	(0.004)		(0.006)	(0.005)		(0.005)	(0.005)	
Ref=No risk at all (4)									
Taking no financial risks (TNFR)			-0.011**			-0.022***			-0.042***
			(0.004)			(0.005)			(0.005)
Household size		0.000	0.000		0.010***	0.010***		0.014***	0.014***
		(0.003)	(0.003)		(0.003)	(0.003)		(0.003)	(0.003)
Female		-0.001	-0.001		-0.003	-0.003		-0.007	-0.007
		(0.003)	(0.003)		(0.004)	(0.004)		(0.004)	(0.004)
Age		0.004	0.004		-0.010*	-0.010*		-0.016***	-0.016***
		(0.003)	(0.003)		(0.004)	(0.004)		(0.003)	(0.003)
Age squared		-0.031	-0.031		0.033	0.033		0.087***	0.087***
		(0.022)	(0.022)		(0.029)	(0.029)		(0.022)	(0.022)
Number of children		-0.004**	-0.004**		0.001	0.001		0.001	0.001
		(0.001)	(0.001)		(0.002)	(0.002)		(0.001)	(0.001)
Married		-0.006	-0.006		0.019***	0.019***		0.024***	0.024***
		(0.004)	(0.004)		(0.005)	(0.005)		(0.004)	(0.004)
Log(income)		0.015***	0.015***		0.017***	0.017***		0.016***	0.016***
		(0.002)	(0.002)		(0.003)	(0.003)		(0.003)	(0.003)
Wealth level 2		0.015*	0.015*		0.020*	0.020*		0.023**	0.024**
		(0.007)	(0.007)		(0.008)	(0.008)		(0.007)	(0.007)
Wealth level 3		0.027**	0.027**		0.025**	0.025**		0.033***	0.033***
		(0.008)	(0.008)		(0.009)	(0.009)		(0.008)	(0.008)
Wealth level 4		0.033***	0.033***		0.026**	0.026**		0.034***	0.034***
		(0.008)	(0.008)		(0.010)	(0.010)		(0.008)	(0.008)
Wealth level 5		0.041***	0.041***		0.012	0.012		0.047***	0.047***
		(0.009)	(0.009)		(0.010)	(0.010)		(0.009)	(0.009)
Ref=Wealth level 1									
Cognitive skills		0.005**	0.005**		0.011***	0.011***		0.004*	0.004*
		(0.002)	(0.002)		(0.002)	(0.002)		(0.002)	(0.002)
Years of education		0.004***	0.004***		0.002**	0.002**		0.003***	0.003***
		(0.000)	(0.000)		(0.001)	(0.001)		(0.001)	(0.001)
BMI level 1		0.020	0.020		-0.023	-0.024		-0.006	-0.006
		(0.017)	(0.017)		(0.015)	(0.015)		(0.017)	(0.017)
BMI level 3		0.009*	0.009*		0.005	0.005		0.002	0.002
		(0.004)	(0.004)		(0.004)	(0.004)		(0.004)	(0.004)
BMI level 4		0.017**	0.017**		0.003	0.003		0.004	0.004
		(0.005)	(0.005)		(0.005)	(0.005)		(0.005)	(0.005)
Ref=BMI level 2									

Table B4 (continued)

Vig. physical activity		-0.012**	-0.012**		0.003	0.003		0.013**	0.012**
		(0.003)	(0.003)		(0.004)	(0.004)		(0.004)	(0.004)
Healthy		0.008	0.008		-0.006	-0.006		0.002	0.002
		(0.004)	(0.004)		(0.005)	(0.005)		(0.005)	(0.005)
Drinking		-0.006	-0.006		0.004	0.004		-0.001	-0.002
		(0.004)	(0.004)		(0.005)	(0.005)		(0.005)	(0.005)
Number of chronic diseases		-0.005***	-0.005***		-0.001	-0.001		0.001	0.001
		(0.002)	(0.002)		(0.002)	(0.002)		(0.001)	(0.001)
Homeownership		-0.009	-0.009		0.008	0.008		0.008	0.008
		(0.006)	(0.006)		(0.006)	(0.006)		(0.006)	(0.006)
Retired		0.008	0.008		0.003	0.003		-0.022***	-0.021***
		(0.004)	(0.004)		(0.006)	(0.006)		(0.005)	(0.005)
Life expectancy		0.010**	0.010**		0.009*	0.009*		0.012**	0.012**
		(0.003)	(0.003)		(0.004)	(0.004)		(0.004)	(0.004)
ADL		0.007	0.007						
		(0.007)	(0.007)						
IADL		-0.010	-0.010						
		(0.005)	(0.005)						
freq.prayer					-0.003	-0.003		-0.007	-0.007
					(0.004)	(0.004)		(0.004)	(0.004)
Austria				0.081***	0.066***	0.066***	-0.026***	-0.022**	-0.023**
				(0.012)	(0.012)	(0.012)	(0.008)	(0.008)	(0.008)
Belgium				0.000	-0.017*	-0.017*	-0.083***	-0.097***	-0.097***
				(0.009)	(0.007)	(0.007)	(0.005)	(0.004)	(0.004)
Czech Republic	-0.095***	-0.085***	-0.085***	-0.020*	-0.022**	-0.022**	-0.117***	-0.107***	-0.108***
	(0.003)	(0.003)	(0.003)	(0.008)	(0.007)	(0.007)	(0.004)	(0.004)	(0.004)
Denmark				0.006	-0.003	-0.004	-0.105***	-0.112***	-0.112***
				(0.010)	(0.009)	(0.009)	(0.005)	(0.004)	(0.003)
Germany				-0.065***	-0.065***	-0.065***	-0.005	-0.035***	-0.035***
				(0.006)	(0.005)	(0.005)	(0.008)	(0.007)	(0.007)
Israel	0.115***	0.112***	0.112***	-0.012	-0.009	-0.010	-0.089***	-0.094***	-0.094***
	(0.010)	(0.011)	(0.011)	(0.013)	(0.013)	(0.012)	(0.007)	(0.005)	(0.005)
Italy	-0.082***	-0.071***	-0.071***				-0.140***	-0.132***	-0.132***
	(0.003)	(0.003)	(0.003)				(0.003)	(0.003)	(0.003)
Luxembourg				-0.050***	-0.062***	-0.062***	-0.071***	-0.098***	-0.098***
				(0.009)	(0.005)	(0.005)	(0.008)	(0.005)	(0.005)
Netherlands				-0.061***	-0.062***	-0.062***	-0.075***	-0.087***	-0.087***
				(0.006)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)
Slovenia				0.120***	0.086***	0.086***	-0.113***	-0.109***	-0.109***
				(0.014)	(0.013)	(0.013)	(0.004)	(0.004)	(0.004)
Spain	-0.057***	-0.046***	-0.046***				-0.117***	-0.116***	-0.116***
	(0.003)	(0.004)	(0.004)				(0.004)	(0.004)	(0.004)
Sweden				-0.010	0.000	-0.001	-0.012	-0.011	-0.011
				(0.009)	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)
Switzerland	0.020***	0.013*	0.013*	-0.066***	-0.063***	-0.063***	-0.093***	-0.098***	-0.098***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
N	21,912	21,912	21,912	20,203	20,203	20,203	33,892	33,892	33,892

Table B4 (continued)

pseudo R^2	0.15	0.18	0.18	0.05	0.12	0.12	0.07	0.12	0.12

Notes: "LTCI" is long-term care insurance, "Term LI" is term life insurance, and "Whole LI" is whole life insurance. Average marginal effects are reported with standard errors in parentheses. Columns (i)–(iii) are based on the long-term care insurance subsample, and columns (iv)–(ix) are based on the life insurance subsample. France is the reference country. For columns (iv)–(vi) Spain and Italy are removed, and current workers are excluded. *, **, and *** denote statistical significance at the 5%, 1%, and 0.1% levels, respectively.

Table B5

Models for insurance holding for individuals without stocks.

Dependent variable	LTCI		Term LI		Whole LI	
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Willingness to take financial risks						
Substantial risks (1)	-0.008	-0.004	-0.027	-0.022	0.013	-0.020
	(0.019)	(0.018)	(0.018)	(0.019)	(0.022)	(0.018)
Aboveaverage risks (2)	0.003	-0.022	0.014	-0.011	0.022	0.016
	(0.016)	(0.012)	(0.017)	(0.018)	(0.014)	(0.018)
Average risks (3)	0.012*	0.005	0.020***	0.017*	0.043***	0.035***
	(0.005)	(0.006)	(0.006)	(0.007)	(0.005)	(0.006)
Ref=No risk at all (4)						
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
N	13,187	9,493	17,225	12,747	28,942	20,628
Pseudo R^2	0.16	0.17	0.12	0.13	0.12	0.11

Notes: "LTCI" is long-term care insurance, "Term LI" is term life insurance, and "Whole LI" is whole life insurance. Average marginal effects are reported with standard errors in parentheses. Columns (i), (iii), and (v) are restricted to those who hold no stocks. Columns (ii), (iv), and (vi) are restricted to those who hold no indirect stocks. Columns (i) and (ii) are based on the long-term care insurance subsample, and columns (iii)–(vi) are based on the life insurance subsample. France is the reference country. For columns (iii) and (iv) Spain and Italy are removed, and current workers are excluded. *, **, and *** denote statistical significance at the 5%, 1%, and 0.1% levels, respectively.

Table B6

Estimates of interactions between age and risk aversion for insurance holding.

Dependent variable	LTCI	Term LI	Whole LI
	(i)	(ii)	(iii)
Taking no financial risks (TNFR)	-0.012	-0.056***	-0.098***
	(0.008)	(0.015)	(0.008)
Age60-69	0.021*	-0.061***	-0.088***
	(0.010)	(0.016)	(0.009)
Age70-79	0.028*	-0.134***	-0.139***
	(0.012)	(0.016)	(0.011)
Age80-90	0.012	-0.171***	-0.175***
	(0.017)	(0.019)	(0.016)
TNFR * Age60-69	-0.011	0.019	0.053***
	(0.011)	(0.017)	(0.010)
TNFR * Age70-79	-0.006	0.040*	0.074***

Table B6 (continued)

	(0.012)	(0.018)	(0.012)
TNFR * Age80-90	0.001	0.066**	0.114***
	(0.018)	(0.021)	(0.017)
Ref=Age50-59			
Country fixed effects	Yes	Yes	Yes
Control variables	Yes	Yes	Yes
N	21,912	20,203	33,892
R^2	0.123	0.077	0.100

Notes: "LTCI" is long-term care insurance, "Term LI" is term life insurance, and "Whole LI" is whole life insurance. Coefficients and standard errors in parentheses are reported from linear probability models. Columns (i) and (ii) are based on the long-term care insurance subsample, and columns (iii)–(vi) are based on the life insurance subsample. France is the reference country. For columns (iii) and (iv), Spain and Italy are removed, and current workers are excluded. *, **, and *** denote statistical significance at the 5%, 1%, and 0.1% levels, respectively.

Table B7

Insurance holdings based on quartiles of income and wealth.

	Income.q1	Income.q2	Income.q3	Income.q4	Wealth.q1	Wealth.q2	Wealth.q3	Wealth.q4
Panel A. Dependent variable: Long-term care insurance holding								
Taking no financial risks	0.007	-0.009	-0.013	-0.028*	-0.002	-0.002	-0.016	-0.023*
	(0.004)	(0.006)	(0.009)	(0.011)	(0.006)	(0.006)	(0.009)	(0.011)
N	5,514	5,442	5,479	5,477	5,479	5,479	5,478	5,478
Pseudo R^2	0.19	0.19	0.11	0.13	0.18	0.2	0.15	0.15
Panel B. Dependent variable: Term life insurance holding								
Taking no financial risks	-0.019	-0.027**	-0.013	-0.021*	-0.023*	-0.040***	0.001	-0.024**
	(0.010)	(0.010)	(0.009)	(0.009)	(0.010)	(0.011)	(0.010)	(0.008)
N	5,059	5,043	5,050	5,051	5,051	5,051	5,050	5,051
Pseudo R^2	0.12	0.13	0.14	0.14	0.10	0.13	0.13	0.14
Panel C. Dependent variable: Whole life insurance holding								
Taking no financial risks	-0.014	-0.022***	-0.031**	-0.062***	-0.021***	-0.036***	-0.044***	-0.050***
	(0.007)	(0.008)	(0.010)	(0.010)	(0.010)	(0.009)	(0.008)	(0.009)
N	8,473	8,501	8,445	8,473	8,473	8,473	8,473	8,473
Pseudo R^2	0.11	0.12	0.09	0.12	0.12	0.15	0.12	0.12
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Average marginal effects are reported with standard errors in parentheses. Panel A is based on the long-term care insurance subsample, and Panels B and C are based on the life insurance subsample. France is the reference country. For Panel B, Spain and Italy are removed, and current workers are excluded. Quartiles of income and wealth are denoted by q1-q4. *, **, and *** denote statistical significance at the 5%, 1%, and 0.1% levels, respectively.

Table B8

Models for insurance holding taking into account measurement error.

Dependent variable	LTCI		Term LI		Whole LI	
	OLS	IV	OLS	IV	OLS	IV
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Continuous willingness to take financial risks (1 to 4)	0.005	0.034	0.034***	0.087**	0.033***	0.075**
	(0.006)	(0.027)	(0.008)	(0.033)	(0.007)	(0.023)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
N	8,275	8,275	7,125	7,125	10,898	10,898
R^2	0.074	-	0.089	-	0.080	-

Notes: "LTCI" is long-term care insurance, "Term LI" is term life insurance, and "Whole LI" is whole life insurance. Columns (i) and (ii) are based on the long-term care insurance subsample, and columns (iii)–(vi) are based on the life insurance subsample. France is the reference country. In columns (iii) and (iv) Spain and Italy are removed, and current workers are excluded. Owing to the lack of response to the willingness to take risks question in Wave 4 of SHARE, in columns (i) and (ii) Czech Republic and Israel are removed, and in columns (iii)–(vi) Germany, Israel, and Sweden are removed. *, **, and *** denote statistical significance at the 5%, 1%, and 0.1% levels, respectively.

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