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Household portfolio choices, health status and health care systems: A cross-country analysis based on SHARE

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ABSTRACT

Health risk is increasingly viewed as an important form of background risk that affects household portfolio decisions. However, its role might be mediated by the presence of a protective full-coverage national health service that could reduce households' probability of incurring current and future out-of-pocket medical expenditures. We use SHARE data to study the influence of current health status and future health risk on the decision to hold risky assets, across ten European countries with different health systems, each offering a different degree of protection against out-of-pocket medical expenditures. We find robust empirical evidence that perceived health status matters more than objective health status and, consistent with the theory of background risk, health risk affects portfolio choices only in countries with less protective health care systems. Furthermore, portfolio decisions consistent with background risk models are observed only with respect to middle-aged and highly-educated investors.

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1. Introduction

Health spending continues to outpace economic growth in OECD countries (OECD, 2009, p. 160). This long-running trend has produced much concern among policy makers, especially in European countries where the 1992 Maastricht Treaty imposed a fixed cap on deficit spending. Policy makers have responded to the increased fiscal pressure by reducing the generosity of the social security system, especially the health care system. As a result, many Europeans have experienced cost-containment measures including greater rationing of publicly-provided health care services, increased cost sharing, and greater private-sector insurance provision, all of which have increased exposure to out-of-pocket medical expenditure risk. Consequently, health-related costs represent an increasingly important contributor to household financial risk in many European countries.

Health problems can impose both direct costs (health care) and indirect costs (loss of income due to reduced labor productivity or supply) on households. To the extent these costs can be large, unpredictable, and are uninsured, they form a source of background financial risk. This phenomenon has been widely documented in several countries. For instance, in the U.S., Himmelstein et al. (2009) find that medical expenses were cited in 62% of all personal bankruptcy filings in 2007; surprisingly, three-quarters of medical debtors had health insurance. Goldman and Maestas (forthcoming) find that medical expenditure risk is significant even for older Americans, who have basic Medicare coverage. In Europe, Atella et al. (2006) find that the variance of health expenditures by Italian households has increased sharply since the policy changes imposed by the Maastricht Treaty went into effect between 1993 and 1995.

In response to an increase in out-of-pocket medical expenditure risk, a household might alter its financial behavior in two ways. The first is to increase precautionary saving (see, e.g., Kotlikoff, 1986; Skinner, 1988; Palumbo, 1999; Atella et al., 2006). The second is to reduce its exposure to *other* financial risks (see for example, Pratt and Zeckhauser, 1987; Kimball, 1993; Gollier and Pratt, 1996; Goldman and Maestas, forthcoming). This paper explores the second channel by testing how health risk, as mediated by medical expenditure risk, affects a household's decision to invest in risky financial assets.

Although health risk and medical expenditure risk are closely related, they are distinct sources of background risk. The former is solely a function of current and expected health status, while the latter depends not only on health risk but also on health insurance coverage. For this reason, in examining how health risk affects household portfolio choices we highlight the role of national health

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systems, which offer different degrees of risk protection, in reducing the background health risk faced by households.

Compared to the existing literature, this paper innovates on three grounds. First, we try to disentangle the role of current health status from that of future health risk, which allows us to distinguish between "myopic" and "forward-looking" behavior. Second, within current health status we distinguish between perceived and objective health status in order to highlight their potentially different roles. Third, we analyze this issue from a comparative perspective, exploiting heterogeneity across the health care systems of ten European countries. This enables us to investigate whether households are more willing to invest in risky financial assets when the financial consequences of health risk are mitigated by a highly protective national health care system.

The paper is organized as follows. We review the relevant literature in Section 2, and the main features of the health care systems in the European countries under analysis in Section 3. Section 4 describes our methodological approach while Section 5 provides a description of the dataset. Section 6 presents the results of the econometric analyses, and robustness checks are discussed in Section 7. Section 8 concludes.

2. The literature

A rich theoretical and empirical literature has investigated household portfolio decisions along both the extensive participation margin (the decision to hold financial assets) and the intensive allocation margin (the share of the financial portfolio held in a given asset). In both cases, portfolio variation is explained by a set of economic (income, wealth) and demographic observables ranging from age (see for example, Guiso et al., 2002; Brunetti and Torricelli, 2010) to gender and marital status (see for example, Bertocchi et al., 2011; Christiansen et al., 2010a,b).

Health status has also been advanced as a possible determinant of portfolio decisions, the rationale being that households may adjust their demand for financial risk in response to their exposure to background risks such as health risk.[1] Using data from the Health and Retirement Study (HRS), Rosen and Wu (2004) are first to note that being in fair or poor health reduces the probability of holding risky assets as well as the portfolio shares held in those assets. Using the same data, Berkowitz and Qiu (2006) find that once omitted variables biases are addressed, health events affect portfolio choices only *indirectly*, by reducing financial wealth. In this vein, Edwards (2008) shows that individuals who assigned a higher probability to the possibility that medical expenses would exhaust their household savings in the next five years held lower risky portfolio shares. Subsequent empirical studies that have used panel methods to control for unobserved heterogeneity find either no direct effect or a small direct effect of health status on portfolio choices (see for example, Gupta, 2007; Coile and Milligan, 2009; Love and Smith, 2010). Cardak and Wilkins (2009) find that the relationship between poor health status and risky asset holding becomes insignificant once risk and time preference variables are controlled for, using the Household Income and Labor Dynamics in Australia (HILDA) Survey. The authors argue that Australia's protective universal health care system might well play a role in explaining the absence of a direct effect, but do not take this element explicitly into account in their empirical analyses.

Goldman and Maestas (forthcoming) examine the medical expenditure risk channel in an empirical analysis of Medicare beneficiaries whose exposure to medical expenditure risk varies with different supplementary forms of health insurance.[2] Controlling for health status, they find that individuals who face less medical expenditure risk are indeed more likely to hold risky financial assets.

In a recent contribution, Christelis et al. (2010) examine the relationship between cognitive abilities and stockholding. To this end, they use data for several European countries from the Survey of Health, Aging and Retirement in Europe (SHARE). They find that good cognitive abilities increase the propensity to invest in stocks but not the share invested in them.

As the literature has advanced our understanding of the direct and indirect effects of health risk on portfolio choices, at least two important gaps remain. First, most research to date has focused on the US, with European countries rarely considered. Second, cross-country comparisons are rarely performed, and thus the role of different national health care systems in protecting households against the negative financial impacts of health risk cannot be taken into account. With our analyses we endeavor to fill these gaps.

3. The organization of health care systems in SHARE countries

Our analysis centers on households in ten European countries included in the 2004 Survey of Health, Aging, and Retirement in Europe (SHARE): Austria, Denmark, France, Germany, Greece, Italy, Netherlands, Spain, Sweden, and Switzerland. We classify countries into two groups according to whether or not the country has a publicly financed national health service (NHS) that grants full coverage for a comprehensive package of medical expenditures. The NHS countries are Denmark, Italy, Spain and Sweden. As described in Allin et al. (2005), the health care systems in NHS countries share several key features. They are all primarily financed through general taxation, and grant universal access to a uniform level of care throughout the country. Private health insurance is not particularly widespread, and if any exists it is used to purchase additional specific services or to avoid waiting lists. In Table 1 we compile data from several sources to compare the study countries across a variety of indicators. As Table 1 shows, in the NHS countries there is full population coverage, medical expenditures are largely publicly financed, the average share of out-of-pocket (OOP) expenditures is slightly lower than in non-NHS countries,[3] private health insurance is quite rare and co-payments and deductibles are uncommon.

In contrast, Table 1 shows that in non-NHS countries the degree of population coverage is still high but incomplete (except in

[1] From a theoretical point of view health risk is not uninsurable, as it is possible to buy health insurance to cover any medical expense. Nevertheless, despite the fact that markets for health insurance exist, they are far from complete. Furthermore, as argued by Edwards (2005), "The depreciation of health over time weakens the ability of individuals to dynamically insure against future health shocks." The same is found by Goldman and Maestas (forthcoming), who consider medical expenditure risk to be part of background risk as it is "*not fully insurable and largely beyond one's control.*" Based on these arguments, health risk might well be considered an uninsurable risk.

[2] The decision to hold supplementary health insurance might be endogenous with respect to the decision to hold risky assets. This issue is taken into account by jointly modelling these two decisions, whereby identification comes from factors that explain the decision to hold supplemental insurance but not the decision to hold risky assets (specifically the market penetration of non-Medicare HMOs and state supplemental insurance regulation).

[3] Mean OOP expenditures are not a reliable measure of the medical expenditure risk faced by households. In fact, OOP expenditures are endogenous, reflecting both generosity of coverage and behavioural responses to coverage rules like cost-sharing provisions. All else being equal, people in higher cost-sharing systems will spend less compared to those in lower cost-sharing systems, which will bias down mean differences between higher and lower-cost health care systems. Furthermore, mean differences in OOP expenditures are not informative about the variance in expenditures, which is the relevant statistic for assessing risk. Finally, measurement of OOP expenditures is plagued by severe measurement problems, particularly at the extremes of the distribution (Goldman and Smith, 2001). These measurement issues are compounded in cross-country analyses, where in addition to the usual measurement difficulties, the definition of what is counted as an OOP expenditure varies from country to country, and in some countries includes discretionary products such as food supplements, vitamins, and over-the-counter drugs.

Table 1
Characteristics of health care systems in Europe.

Variables		NHS					Non-NHS						
		Italy	Spain	Sweden	Denmark	Average	Switz.	Nether.	Austria	France	Germany	Greece	Average
Population coverage[a] (%) (2001)		100.0	100.0	100.0	100.0	100.0	100.0	75.7	99.0	99.0	90.9	100.0	94.1
Health insurance participation[c] (2004)	NHS Only (%)	94.1	91.4	96.5	70.9	88.2	69.1	23.6	75.7	19.3	78.0	94.4	60.0
	Voluntary (%)	5.9	8.5	3.5	29.1	11.7	30.9	41.9	23.7	79.2	10.9	5.5	32.0
	Supplementary (%)	0.0	0.1	0.0	0.0	0.0	0.0	16.1	0.4	0.9	10.2	0.1	4.6
Public share of total health expenditures[b] (%) (2006)		76.6	71.3	81.1	84.6	78.4	59.1	63.4[e]	76.0	78.7	76.4	62.0	69.3
Private share of total health expenditures[b] (%) (2006)		23.4	28.7	18.9	15.4	21.6	40.9	36.6[e]	24.0	21.3	23.6	38.0[f]	30.7
- of which:													
	- OOP[b]	19.9	21.3	16.6	14.3	18.0	30.8	5.6	15.8	6.6	13.7	37.0	18.3
	- Other Private[b]	3.5	7.4	2.3	1.1	3.6	10.1	31.0	8.2	14.7	9.9	1.0	12.5
Copayments[d]	Acute inpatient care	NO	NO	YES	NO	No. with copay = 1	YES	NO	YES	YES	YES	YES	No. with copay = 5
	Outpatient primary care & specialist contacts	NO	NO	YES	NO	No. with copay = 1	YES	NO	NO	YES	YES	YES	No. with copay = 4
	Pharmaceuticals	NO	YES	YES	YES	No. with copay = 3	YES	NO	YES	YES	YES	YES	No. with copay = 5

Data sources:
[a] http://www.lenus.i.e./hse/bitstream/10147/44403/1/449.pdf and Allin et al. (2005).
[b] http://www.dotstat.oecd.org/Index.aspx?DataSetCode=HEALTH_SHA.
[c] SHARE data, authors' computation.
[d] OECD (2009), Health at a Glance 2009: OECD indicators.
[e] Docteur and Oxley (2003).
[f] Siskou et al. (2009).

Switzerland and Greece), private health insurance is more widespread, co-payments and deductibles are typically required and a much higher share of Total Health Expenditures is privately financed. For example, although the Swiss health care system provides universal coverage, it does so through a multitude of private insurers operating in a regulated competitive market (see Leu et al. (2009) for a discussion of similarities between the Swiss and Dutch systems). In the Netherlands, the national health care system covers only "exceptional medical expenses" such as long-term care or high-cost treatments. For all other forms of expenditures, people must turn to compulsory sickness funds (around 65% of the population), private health insurance (30%), or servants' health insurance (5%). Similarly, in Austria about 97% of the population is covered by mandatory or voluntary health insurance, while the remaining 3% has no coverage. France has three national social insurance schemes: a general scheme (covering about 84% of the population), an agricultural scheme (7%), and a self-employed scheme (5%). These are complemented by voluntary private health insurance, which now covers over 95% of the population and is free for low-income individuals. In Germany as well three schemes coexist: about 87% of the population has statutory health insurance, about 10% has private health insurance, while only the remaining 3% is covered by governmental schemes. Finally, in Greece a national system coexists with compulsory social insurance (held by 97% of the population) and voluntary private health insurance (8%).

In sum, there is a higher degree of centralized, publicly guaranteed protection against health risk in NHS countries than in non-NHS countries, where private health insurance is a necessary component of coverage. Moreover, because private health insurance depends on the employment contract and for-profit insurers demand greater risk-sharing, it is less secure. Overall, households in private-based systems face greater health risk through several channels (for example, risk sharing, incomplete coverage, and risk of discontinuity of coverage when changing employers or insurers) than households in public-based systems.

4. Framework and approach

Our analysis focuses on the extensive margin decision by households to hold risky financial assets. We assume that households are influenced by their socioeconomic and health characteristics, as well as by characteristics of the health care system in their country of residence. With respect to health status, the literature has thus far only considered the effects of *current* health status on portfolio decisions, without investigating the role of *future* health risk. In principle, both aspects of health could affect portfolio decisions. For example, individuals in good current health who believe they have high future health risk should anticipate higher out-of-pocket health expenditures than otherwise similar individuals with low future health risk. Then, the degree to which the group with high future health risk chooses a less risky financial portfolio will depend on the degree to which these individuals have internalized their future health risk. If our results highlight an explanatory role for both current and future health risk, then forward-looking behavior could be inferred; otherwise, if only current health matters then we might infer relatively myopic behavior. In addition, within current health status we distinguish between perceived and objective health status, to allow for the possibility that how household members currently *feel* might affect their financial portfolio choices differently than knowledge of the health conditions they have been told they *have*.

Importantly, we posit that current and future health risk may affect portfolio decisions differently depending on the health care system existing in each country. The presence of a universal NHS offering full or nearly full coverage for unexpected future health expenditures might act as a shelter against high current and/or future health risk, thereby reducing background risk. In such a case, individual health-related characteristics should play a minor role, if any, in shaping portfolio choices. By contrast, whenever full public coverage is not guaranteed, individual health-related characteristics should play a more important role.

Empirically, we assume the following direct relationship between our dependent variable Y, a binary variable equal to 1 if risky assets are present in the financial portfolio of the household and 0 otherwise, and the explanatory variables of interest:

$$Y_{i,j,k} = \sum_j \beta_{0,j,k} C_j + \beta_{1,k} CHS_{i,j,k} + \beta_{2,k} \mathrm{FHR}_{i,j,k} + \beta_{3,k} \mathrm{FHR}_{i,j,k} EDU_{i,j,k} + \sum_n \beta_{n,j,k} \mathbf{X}_{i,j,k} + \varepsilon_{i,j,k} \quad k = 1, 0 \tag{1}$$

where the subscript i refers to the household, j to the country and k to the category to which the country belongs in terms of protection against health risk offered by the health care system. As an indicator of this degree of protection, we use a binary variable assuming value 1 whenever the household lives in a country with a fully protective NHS (namely Denmark, Italy, Spain, and Sweden), and 0 otherwise. Hence, k = 0, 1. To maximize flexibility in the specification, we estimate Eq. (1) separately for these two groups. This is equivalent to estimating a variant of Eq. (1) in which we pool households in all countries and fully interact all variables with the NHS indicator.[4]

With respect to the explanatory variables, C is a vector of country dummies, $\boldsymbol{X}$ a vector of socio-economic and demographic variables, CHS refers to Current Health Status (in some analyses, further divided into Perceived and Objective Health Status), FHR refers to Future Health Risk, and EDU is a binary variable for having completed higher education. Finally, assuming $\varepsilon \sim N(0, \sigma^2)$ is a normally distributed idiosyncratic error term, Eq. (1) can be estimated using a probit model.

All else being equal, we expect that poor Current Health Status is associated with a lower probability of investing in risky assets. Similarly, higher Future Health Risk, and hence a higher risk of incurring future medical expenses, will lower the likelihood of investing in risky assets. Furthermore, since a more protective NHS might shield individuals against unexpected out-of-pocket expenditures, the effects of Current Health Status and Future Health Risk on the decision to hold risky assets should differ between NHS and non-NHS countries. More specifically, households in NHS countries should be less responsive to both Current Health Status and Future Health Risk.

Furthermore, it is well known that education enhances financial literacy, and financial literacy has a positive effect on the probability of holding risky assets.[5] However, education may also affect *health* literacy. If highly educated patients are more knowledgeable about their health risk factors, they may place greater weight on their Future Health Risk when making portfolio decisions. In other words, how health information is perceived and internalized by agents might play a crucial role in shaping portfolio decisions. In our empirical model we take this into account by interacting FHR with the higher-education dummy variable. A negative coefficient on the interaction term would be consistent with the notion that in response to greater Future Health Risk more educated households reduce holdings of risky assets more than less educated households.

Finally, we expect the informative content of FHR to be higher for middle-aged households than for older ones. At the age of 50

[4] We also tested a less flexible specification in which we pooled all countries and interacted the NHS indicator with only the health-related variables. Results (available upon request) were similar.

[5] On the important influence of financial literacy on portfolio choices (see e.g. Lusardi and Mitchell (2007, 2008) and the references therein).

many health problems might still be latent and not realized, and thus households might still be forming their expectations of their future health conditions. On the other hand, by age 70 many health problems are likely to have already manifested and hence are incorporated into Current Health Status rather than Future Health Risk. In addition, middle-aged households have a longer investment horizon than older households. As a result, every factor needed for future planning, such as FHR, should be more relevant for middle-aged households than older households. This implies a certain degree of heterogeneity in the role played by FHR depending on the age of the household's financial respondent: the older the household, the lower the relevance of FHR.

In summary, the specification in Eq. (1) allows us to test the following implications:

I. Otherwise similar households living in different countries make different portfolio decisions due to different degrees of national protection against health-related expenditures. In particular, consistent with background-risk portfolio choice models, in countries without a protective National Health System, both Current Health Status and Future Health Risk have a relevant effect on the decision to hold risky assets; in contrast, in countries with a protective NHS, health-related variables have a minor effect, if any.
II. Current Health Status and Future Health Risk play independent roles in shaping household participation decisions. Households might take into account both CHS and FHR or CHS only. We label the former behavior "forward-looking," the latter "myopic."
III. Within Current Health Status, Perceived Health Status (PHS) and Objective Health Status (OHS) play distinct roles in shaping households' participation decisions. In other words, the decision to hold risky assets might be affected by PHS only, OHS only, or by both.
IV. Education plays a key role, especially with respect to Future Health Risk. If Future Health Risk is not fully internalized by agents with lower financial and/or health literacy, portfolio decisions may differ across households who share the same Future Health Risk but who have different levels of education.
V. The relevance of Future Health Risk differs across households at different stages in the life cycle. More specifically, middle-aged households are more responsive to FHR than older households.

In the following sections we present the empirical results that will allow us to test these implications.

5. The data

5.1. The Survey of Health, Aging and Retirement in Europe (SHARE)

We use the 2004 Survey of Health, Aging and Retirement in Europe (SHARE), which surveys households with at least one member aged 50 or older in the following countries: Austria, Denmark, France, Germany, Greece, Italy, Netherlands, Spain, Sweden, Switzerland, Belgium and Israel. We focus on households whose financial respondent is between ages 50 and 90, and we drop observations with missing values on any of the variables relevant for our analyses. This latter restriction eliminates all households in Belgium and Israel. Our resulting sample is composed of 11,793 individuals and 5902 households.[6]

In addition to standard demographic variables, SHARE provides detailed information on health, cognition, and a variety of economic and financial variables, including PPP-adjusted net wealth, gross income and household total consumption.

SHARE also reports detailed information on households' financial wealth allocation in a comprehensive set of financial instruments, namely: (i) bank, transaction or saving accounts; (ii) government or corporate bonds; (iii) stocks or shares (listed or unlisted on stock market); (iv) mutual funds or managed investment accounts; (v) Individual Retirement Accounts (IRAs); (vi) contractual saving for housing; and (vii) term or whole life insurance policies. The indication of the main investment profile for mutual funds and IRAs ("mostly in stocks", "mostly in bonds", or "half stocks and half bonds") allows an even more precise classification of these assets. Following the literature on portfolio allocation (see for example, Guiso et al., 2002; Rosen and Wu, 2004; Brunetti and Torricelli, 2010), these assets can be organized into three groups with relatively homogeneous risk profiles, namely "safe," "fairly safe" and "risky" assets, as shown in Table 2.[7] In the analyses that follow, the binary indicator takes the value of 1 only when the households hold risky assets.

5.2. Construction of health status variables

As described above, we use two different measures of Current Health Status: Perceived Health Status and Objective Health Status. Perceived Health Status is based on the standard self-reported global health variable in which individuals are asked, "Would you say your health is: 1. Very Good, 2. Good, 3. Fair, 4. Bad, 5. Very Bad".[8] We create both a discrete variable ("PHS discrete") and a dummy variable ("PHS dummy"). The discrete variable is the mean evaluation of self-reported health averaged over all respondents within the household. The dummy variable measures poor perceived health and takes the value of 1 whenever average household Perceived Health Status is between fair (3.0) and very bad (5.0), and takes the value 0 otherwise.

While the PHS variables measure how households subjectively judge their current overall health, the Objective Health Status variable is a summary measure of a household's chronic disease burden.[9] We construct the OHS variable as the weighted number of chronic diseases, where the weights are derived according to the disease's degree of severity and the implied disability following Sprangers et al. (2000).

Regarding Future Health Risk, we assume households base their assessment on the relevant health information available at time t, such as engagement in risky behaviors, whether they have been diagnosed with an as-of-yet asymptomatic disease, and grip strength. More specifically, we define FHR as:

$$\mathrm{FHR}_{i,j} = ((1 + RB_{i,j}) * (1 + \mathrm{AOHS}_{i,j}))/GS_{i,j} \tag{2}$$

[6] Despite the fact that the sample unit in SHARE is the individual, some variables relevant for our analyses (e.g. consumption and gross income) are collected only at the household level; thus we collapse the dataset by household.

[7] According to Lea and Bertrand (1995), "A Contractual Saving for Housing [...] entails no inflation risk, but it actually carries an interest rate risk and definitely a liquidity risk." Accordingly, we classify these assets as fairly safe.

[8] Although we use the European scale in this analysis, respondents are asked to provide an answer based on both the European scale (1 = Very good, 2 = Good, 3 = Fair, 4 = Bad, 5 = Very bad) and the US scale (1 = Excellent, 2 = Very good, 3 = Good, 4 = Fair, 5 = Poor.) We describe PHS as "discrete" and not "categorical" as it has been obtained as an average of integer (categorical) values across individuals in households. This implies that we obtain several cases with non-integer intermediate values between the integer values from 1 to 5. We take the simple rather than weighted average of respondents' answers, implicitly assuming that the financial decisions of the household do not depend on the health status of one specific individual more than another.

[9] More specifically, individuals are asked whether they have ever been diagnosed by a physician as having had a heart attack, high blood pressure, high blood cholesterol, diabetes, asthma, arthritis, osteoporosis, stroke, lung disease, stomach disease, cataracts, femoral or hip fracture, Parkinson's or cancer.

Table 2
Risk classification of financial asset categories in SHARE.

Safe	Fairly safe	Risky
Bank, transaction or saving accounts	Government or corporate bonds Mutual funds mostly in bonds Mutual funds half bonds and half stocks IRA mostly in bonds IRA half in bonds and half in stocks Contractual savings for housing term and whole life insurance	Stocks or shares Mutual funds mostly in stocks IRA mostly in stocks

In Eq. (2), FHR is an increasing function of the average number of risky behaviors (RB) undertaken by the household's members at time t (i.e., smoking, drinking, and a sedentary lifestyle) and the household's Asymptomatic Objective Health Status (AOHS), measured as the average number of diseases diagnosed by a doctor that are currently asymptomatic but might entail worsening health in the future (i.e., high blood pressure, high blood cholesterol and osteoporosis).[10] FHR is a decreasing function of average household grip strength (GS), which has been shown to be a powerful predictor of functional decline, disability and mortality (see for example, Laukkanen et al., 1995; Rantanen et al., 1999, 2000; Syddall et al., 2003).

5.3. Other controls

Following the literature, we include a rich set of control variables, all of which have been shown to affect household portfolio choices. We include linear and quadratic terms in household total income and net wealth, the latter being the sum of the financial and real assets of the household (including the value of owned property) net of financial liabilities. We also include a series of socio-demographic indicators for the financial respondent of the household, namely age, both in linear and quadratic terms to capture life-cycle effects, gender and marital status, to capture possible gaps between male and female and married and non-married agents' preferences, household size, and an indicator capturing the level of education.

Education systems in SHARE countries are highly heterogeneous, therefore a direct comparison between achieved educational qualifications is difficult. Hence, we rely on the completed years of education rather than the educational degrees achieved. Furthermore, given the composition of the SHARE sample, in which the average age is slightly under 65 years, most respondents had not completed compulsory education. We thus define highly educated households as those whose financial respondent attended at least one year beyond the current compulsory full education process, which on average takes 9 years. In other words, the indicator for highly educated households is a binary variable that takes the value 1 if the number of completed years of education is higher than or equal to 9.

Following results recently reported in Christelis et al. (2010), we also include indicators of social interactions and cognitive ability. The social interactions variables include a binary measure of Social Activities, taking the value 1 in the case of participation in sport, social, political or other community-related associations during the last month, and a measure of Religion, taking the value 1 in the case of participation in a religious organization during the same time period. Cognitive abilities are measured by three different constructs, each measuring different aptitudes which might be relevant to financial investing: (i) numeracy (i.e., the ability to perform numerical operations), measured based on the number of correct answers given to five questions on simple computations; (ii) fluency (i.e., the ability to read and understand texts), measured based on the number of animals named in 1 min; and (iii) recall (i.e., the ability to compare facts and situations at distant points in time), measured by the number of words recalled out of ten.[11]

Finally, the bequest motive, which might extend a household's investment horizon and hence affect the probability of holding risky assets, enters via the self-reported probability of leaving an inheritance worth 50,000 Euros or more.

5.4. Descriptive statistics

Table 3 reports descriptive statistics for the variables used in the empirical analysis. Around 31% of the households in the sample live in a country with a protective NHS. The average household has slightly more than two members, who earn a yearly income of around 43,800 € and can count on a net wealth of about 377,000 €. The financial respondent is around 64 years old and has almost 11 years of education. Around 59% of households are married, one fifth is widowed, 9% are divorced, and 9% never married. As for cognitive abilities, the average household is quite skilled at performing numerical operations (numeracy equal to 3.4 on a scale of 1–5), but has some difficulty with memory (recall measuring about 5 on a scale of 0–10) and language fluency (19 animal names in one minute.) The share of households participating in a religious activity is around 14% of the total sample, while those active in some type of social activity is around 29%. Bequest motives are evident in that the average probability of leaving an inheritance is around 60%, and the probability of leaving more than 150,000 € is as high as 40%. As for health condition, the average Perceived Health Status is between 2 (good) and 3 (fair), and almost one third of the households in the sample judge their overall subjective health status as poor.

Around 19.3% of households in the sample hold risky assets in their financial portfolios, and there is a substantial variation in this participation rate across households with different levels of Perceived Health Status (see Table 4). Consistent with the literature, households with a better health status have a much higher probability of holding risky assets than those in poorer health.

Table 4 also shows that the average rate of participation in risky assets is quite disparate across European countries. In countries such as Greece, Spain and Italy the share of households holding risky assets is around 10%, while in countries such as Sweden, Denmark and Switzerland a much larger share of households hold risky assets in their financial portfolios. This heterogeneity stems from several factors, ranging from the development of each country's financial market to the average level of financial education of households. Nonetheless, households in countries such as Denmark and Sweden, which enjoy a full-coverage NHS, show a higher propensity to hold risky assets, while in less protective non-NHS countries such as Austria or Greece, households choose to hold risky assets less frequently.

This descriptive evidence seems to be not only consistent with health being a source of background risk for households but also

[10] We have added 1 to both variables in the numerator of Eq. (2) to avoid situations in which individuals with no asymptomatic diseases and no risky behaviors could end up having the same value as those with one of the two variables in the numerator equal to 0.

[11] For further details on how these indicators are defined and constructed, see Appendix A.2 of Christelis et al. (2010).

Table 3
Descriptive statistics.[a]

Variable	Mean	SD	Min	Max	Obs.
Dependent variable					
Binary for holding risky assets	0.193	0.395	0	1	5902
Independent variables—individual level					
Household size	2.031	1.006	1	9	5902
Income	0.438	0.477	0	4.082	5902
Net wealth	3.774	12.532	-33.469	438.192	5902
Age	64.306	10.149	41	90	5902
Male	0.512	0.500	0	1	5902
Female	0.488	0.500	0	1	5902
Married	0.592	0.491	0	1	5902
Divorced	0.092	0.289	0	1	5902
Widow	0.206	0.404	0	1	5902
Single	0.092	0.288	0	1	5902
Years of education	10.944	4.685	0	22	5902
Religious participation	0.139	0.346	0	1	5902
Social activity	0.287	0.452	0	1	5902
Prob. of leaving any inheritance	15.317	33.368	0	100	5877
Prob. of leaving inheritance >50,000€	59.376	43.592	0	100	5902
Prob. of leaving inheritance >150,000€	40.650	44.752	0	100	5855
Numeracy	3.431	1.015	1	5	5902
Fluency	19.142	6.821	0	67	5902
Recall	4.983	1.667	0	10	5902
PHS (dummy: 1 if poor health)	0.326	0.469	0	1	5902
PHS (categorical: from 1 "very good" to 5 "very bad")	2.328	0.808	1	5	5902
Objective health Status	0.117	0.116	0	0.785	5902
Future health risk	0.182	0.515	0.014	12	5902
Independent variables—system level					
Dummy for NHS country	0.314	0.464	0	1	5902
Austria	0.030	0.170	0	1	5902
Germany	0.347	0.476	0	1	5902
Sweden	0.060	0.237	0	1	5902
Netherlands	0.070	0.255	0	1	5902
Spain	0.089	0.284	0	1	5902
Italy	0.137	0.343	0	1	5902
France	0.187	0.390	0	1	5902
Denmark	0.030	0.169	0	1	5902
Greece	0.025	0.157	0	1	5902
Switzerland	0.026	0.159	0	1	5902

[a] All statistics computed using SHARE sample weights (wgtach). Monetary amounts are PPP-adjusted and in thousand Euros.

Table 4
Participation in risky assets by presence of NHS and PHS.

		%
Presence of NHS	Yes	20.5
	No	18.6
Country	Austria	5.9
	Germany	15.5
	Sweden	55.8
	Netherlands	21.6
	Spain	10.4
	Italy	8.2
	France	24.5
	Denmark	37.1
	Greece	10.2
	Switzerland	31.7
Perceived health status	Very good	33.0
	Good	20.2
	Fair	11.5
	Bad	3.9
	Very bad	2.7

suggests that different health care systems might contribute to the heterogeneity in financial decisions and that the presence of a protective NHS in particular could play a role in shaping portfolio decisions.

In the next section we estimate the sensitivity of portfolio participation decisions to Current Health Status and Future Health Risk, in an effort to isolate the effect of a protective National Health System.

6. Econometric analysis

Most of the existing literature analyzes the effect of health status on household portfolio choices by including in the empirical model a measure for Perceived Health Status on either a 1–5 scale or, more often, as a dummy variable for poor health status. On the other hand, Objective Health Status is rarely taken into account, and to the best of our knowledge none of the existing contributions has introduced a measure such as Future Health Risk.[12] Thus, in order to make our results comparable with the existing literature we first run a restricted probit specification of Eq. (1), in which the FHR parameters ($\beta_{2,k}$, and $\beta_{3,k}$) are set equal to zero. Next, we run a full probit specification in which all parameters in Eq. (1) are estimated. In both specifications, the reference household is a household living in Switzerland, whose financially responsible party is non-married and female.[13]

[12] Delavande and Rohwedder (2010) is the only contribution we are aware of that makes an effort in the same direction, although portfolio choices are analyzed as a function of the uncertainty about the future Social Security system rather than individual health status.

[13] Since the SHARE survey presents problems with non-response units, all estimates have been weighted using the variable "wgtach" (Calibrated household weight for the two samples – vignette and main sample – jointly) provided by SHARE. According to SHARE documentation, these are calibrated weights that compensate, although only to some extent, for unit non-response (see page 19 of Short information on generated variables: Weights in SHARE documentation, see http://www.share-project.org/t3/share/fileadmin/pdf_FAQ/SHARE1rel2-0-1_GV_weights.pdf.)

Table 5
Restricted model.[a]

Dep. var.: binary for holding risky assets	Countries with NHS			Countries without NHS		
	Dummy PHS (1)	Discrete PHS (2)	OHS (3)	Dummy PHS (1)	Discrete PHS (2)	OHS (3)
Income	0.1423**	0.1389**	0.1397**	0.1004**	0.0989**	0.1042**
	(0.064)	*(0.064)*	*(0.065)*	*(0.041)*	*(0.041)*	*(0.041)*
Income squared	−0.0218	−0.0205	−0.0207	−0.0269*	−0.0267*	−0.0281*
	(0.023)	*(0.024)*	*(0.024)*	*(0.015)*	*(0.015)*	*(0.015)*
Net wealth	0.0014	0.0014	0.0014	0.0092***	0.0088***	0.0097***
	(0.002)	*(0.002)*	*(0.002)*	*(0.002)*	*(0.002)*	*(0.002)*
Net wealth squared	−0.00001	−0.00001	−0.00001	−0.0001***	−0.0001***	−0.0001***
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Age	−0.0069	−0.0062	−0.0065	−0.0042	−0.0016	−0.0044
	(0.015)	*(0.015)*	*(0.015)*	*(0.012)*	*(0.012)*	*(0.012)*
Age squared	0.0414	0.0371	0.0387	0.0226	0.0051	0.0203
	(0.110)	*(0.110)*	*(0.110)*	*(0.090)*	*(0.089)*	*(0.091)*
Male	0.0377*	0.0370*	0.0372*	0.0286	0.0279	0.0316*
	(0.020)	*(0.020)*	*(0.021)*	*(0.017)*	*(0.017)*	*(0.018)*
Married	0.0444	0.0442	0.0435	0.0377*	0.0428**	0.0406*
	(0.028)	*(0.027)*	*(0.028)*	*(0.022)*	*(0.022)*	*(0.022)*
Household size	−0.0128	−0.0127	−0.0128	0.0037	0.0051	0.0031
	(0.013)	*(0.013)*	*(0.013)*	*(0.011)*	*(0.011)*	*(0.011)*
Higher education	0.0319	0.0324	0.0325	0.0064	0.0044	0.0099
	(0.027)	*(0.027)*	*(0.027)*	*(0.027)*	*(0.027)*	*(0.026)*
Social activities	0.0824***	0.0798***	0.0799***	0.021	0.0205	0.0222
	(0.028)	*(0.028)*	*(0.028)*	*(0.018)*	*(0.018)*	*(0.018)*
Religion	−0.0242	−0.0264	−0.026	−0.0198	−0.0207	−0.0187
	(0.029)	*(0.029)*	*(0.029)*	*(0.024)*	*(0.023)*	*(0.024)*
Prob. of inheritance	0.0011***	0.0011***	0.0011***	0.0010***	0.0010***	0.0011***
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Numeracy	0.0141	0.0135	0.0137	0.0354***	0.0364***	0.0387***
	(0.013)	*(0.013)*	*(0.013)*	*(0.010)*	*(0.010)*	*(0.011)*
Fluency	0.0025	0.0024	0.0024	0.0026*	0.0024*	0.0027*
	(0.002)	*(0.002)*	*(0.002)*	*(0.002)*	*(0.002)*	*(0.002)*
Recall	0.0059	0.0057	0.0058	0.0067	0.006	0.008
	(0.008)	*(0.008)*	*(0.008)*	*(0.006)*	*(0.006)*	*(0.006)*
PHS dummy	0.017			−0.0627***		
	(0.025)			*(0.019)*		
PHS discrete		−0.0013			−0.0418***	
		(0.011)			*(0.012)*	
OHS			0.0125			0.014
			(0.096)			*(0.082)*
Observations	2632	2632	2632	3270	3270	3270
pseudo R^2	0.2788	0.2785	0.2785	0.1643	0.1652	0.1587

Robust standard errors in parentheses.
Country dummies included but not reported, with Switzerland as reference country. PHS dummy is a binary variable assuming value 1 for poor Perceived Health Status, while PHS discrete is the average Perceived Health Status of the households' members on a scale from 1 (very good) to 5 (very bad). OHS is a weighted index for the household's Objective Health Status. Monetary amounts are PPP-adjusted and in 1000 Euros.
[a] Table entries are weighted marginal effects from probit specification.
[*] Significant at 10%.
[**] Significant at 5%.
[***] Significant at 1%.

6.1. Restricted specification

In our restricted models, we estimate three specifications using our different constructions of Current Health Status: (1) PHS dummy (the binary indicator for poor Perceived Health Status); (2) PHS discrete (the discrete measure of the household's Perceived Health Status); and (3) OHS (our measure of Objective Health Status as defined above). The three specifications are estimated separately for households in countries with and without a NHS, and marginal effects and standard errors are reported in Table 5.[14]

Across both samples and different specifications, the standard control variables exhibit the expected signs and significance. The probability of participating in the stock market rises with income and wealth but at a decreasing rate, confirming the well-known humped-shaped pattern (although full statistical significance is reached only in non-NHS countries).[15] The age coefficients are not statistically significant. Though that may seem somewhat surprising, it is reasonable given that the SHARE sample includes individuals older than age 50, and thus the focus is on the last phase of the life cycle. Gender and marital status gaps in investment decisions are evident, as households headed by males and married individuals are on average more inclined to hold risky assets compared to those headed by females and singles, respectively. More education, which is likely associated with higher financial literacy, is positively associated with holding risky assets, although its effect is not precisely estimated. Engagement in social activities, such as participation in a sport or political association, is associated with a higher likelihood of investing in risky assets, though the effect is statistically significant only in NHS countries. In both subsamples the religion coefficient is negative but insignificant. The bequest coefficient is

[14] We also estimated a specification in which we pooled all countries and interacted the NHS indicator with the set of health-related variables. Results (available upon request) are similar to those presented here.

[15] As a robustness check, we also tried a more flexible specification for income and wealth by including quintile dummies for households' total income and net wealth, finding qualitatively similar results.

Table 6
Full model.[a]

	Countries with NHS			Countries without NHS		
Dep. var.: binary for holding risky assets	Dummy PHS (1)	Discrete PHS (2)	OHS (3)	Dummy PHS (1)	Discrete PHS (2)	OHS (3)
Income	0.1422**	0.1392**	0.1396**	0.0994**	0.0979**	0.1034**
	(0.064)	*(0.064)*	*(0.065)*	*(0.041)*	*(0.041)*	*(0.041)*
Income squared	−0.0219	−0.0207	−0.0207	−0.0268*	−0.0266*	−0.0280*
	(0.023)	*(0.024)*	*(0.024)*	*(0.015)*	*(0.015)*	*(0.015)*
Net wealth	0.0014	0.0014	0.0014	0.0092***	0.0088***	0.0097***
	(0.002)	*(0.002)*	*(0.002)*	*(0.002)*	*(0.002)*	*(0.002)*
Net wealth squared	−0.00001	−0.00001	−0.00001	−0.0001***	−0.0001***	−0.0001***
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Age	−0.0072	−0.0066	−0.007	−0.0018	0.0009	−0.0018
	(0.015)	*(0.015)*	*(0.015)*	*(0.011)*	*(0.011)*	*(0.011)*
Age squared	0.0447	0.0406	0.0429	0.003	−0.015	−0.0002
	(0.110)	*(0.110)*	*(0.111)*	*(0.086)*	*(0.085)*	*(0.087)*
Male	0.0369*	0.0363*	0.0366*	0.0299*	0.0292*	0.0328*
	(0.020)	*(0.020)*	*(0.021)*	*(0.017)*	*(0.017)*	*(0.018)*
Married	0.0448	0.0443	0.043	0.0371*	0.0425**	0.0408*
	(0.028)	*(0.027)*	*(0.028)*	*(0.022)*	*(0.022)*	*(0.022)*
Household size	−0.0133	−0.0132	−0.0135	0.0045	0.0059	0.0037
	(0.013)	*(0.013)*	*(0.013)*	*(0.011)*	*(0.011)*	*(0.011)*
Higher education	0.0326	0.033	0.0328	0.0182	0.0154	0.0221
	(0.028)	*(0.028)*	*(0.028)*	*(0.026)*	*(0.026)*	*(0.026)*
Social activities	0.0829***	0.0803***	0.0796***	0.0199	0.0195	0.0211
	(0.028)	*(0.028)*	*(0.028)*	*(0.018)*	*(0.018)*	*(0.018)*
Religion	−0.0248	−0.0268	−0.0268	−0.0181	−0.0191	−0.0171
	(0.029)	*(0.029)*	*(0.029)*	*(0.024)*	*(0.023)*	*(0.024)*
Prob. of inheritance	0.0011***	0.0010***	0.0010***	0.0011***	0.0011***	0.0011***
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
Numeracy	0.014	0.0135	0.0137	0.0354***	0.0365***	0.0387***
	(0.013)	*(0.013)*	*(0.013)*	*(0.010)*	*(0.010)*	*(0.011)*
Fluency	0.0024	0.0023	0.0023	0.0027*	0.0025*	0.0028*
	(0.002)	*(0.002)*	*(0.002)*	*(0.001)*	*(0.001)*	*(0.002)*
Recall	0.0057	0.0056	0.0056	0.0072	0.0065	0.0083
	(0.008)	*(0.008)*	*(0.008)*	*(0.006)*	*(0.006)*	*(0.006)*
PHS dummy	0.0204			−0.0657***		
	(0.025)			*(0.019)*		
PHS discrete		0.0012			−0.0433***	
		(0.012)			*(0.012)*	
OHS			0.0293			0.0017
			(0.097)			*(0.083)*
FHR	−0.026	−0.0239	−0.0256	0.0693**	0.0673**	0.0645**
	(0.020)	*(0.020)*	*(0.020)*	*(0.030)*	*(0.030)*	*(0.031)*
FHR * high education	0.0006	0.0015	0.0029	−0.0563*	−0.0521	−0.0576*
	(0.033)	*(0.032)*	*(0.033)*	*(0.034)*	*(0.033)*	*(0.035)*
Observations	2632	2632	2632	3270	3270	3270
pseudo R^2	0.2795	0.279	0.2791	0.1676	0.1683	0.1613

Country dummies not reported (Switzerland reference country). PHS dummy is a binary variable assuming value 1 for poor Perceived Health Status, while PHS discrete is the average Perceived Health Status of the households' members on a scale from 1 (very good) to 5 (very bad). OHS is a weighted index for the household's Objective Health Status. FHR captures the household's Future Health Risk. Monetary amounts are PPP-adjusted and in 1000 Euros.
Robust standard errors in parentheses;

[a] Table entries are weighted marginal effects from probit specification.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

strongly statistically significant and positively associated with the decision to hold risky assets, consistent with the idea that a bequest motive lengthens the investment horizon of the household. As for cognitive ability, like Christelis et al. (2010) we find that numeracy, fluency and recall are positively associated with the decision to hold risky assets. However, despite finding very similar results in terms of magnitude, the effects are statistically significant only for numeracy and fluency and only in non-NHS countries.

More importantly, the two subsamples differ substantially in terms of the effects of the health-related variables. Both Perceived Health Status specifications (dummy and discrete, see columns (1) and (2)), whenever significant, are negatively signed, suggesting an inverse relationship between current poor Perceived Health Status and the probability of holding risky assets. However, these variables are strongly significant only in the non-NHS subsample. In other words, in NHS countries Current Health Status is not associated with portfolio decisions, while the opposite is true for non-NHS countries. Our interpretation is that the absence of a full-coverage NHS, which shelters against the risk of unexpected health expenses, might amplify background risk, thereby discouraging the decision to hold risky assets. Finally, the effect of Objective Health Status is never statistically significant, even in non-NHS countries (see column (3)), suggesting that in making financial portfolio decisions households rely more on Perceived Health Status than Objective Health Status.[16]

[16] As a robustness check, we run a model specification in which we combine a measure of Perceived Health Status (either binary or discrete) with the index of Objective Health Status, obtaining very similar results (available upon request). Nevertheless, the current specifications, in which Perceived and Objective Health Status indicators are not combined in the same model, are preferred in order to retain comparability with the existing literature, in which Perceived and Objective Health Status have never been considered jointly.

Table 7
Estimates of health-related variables, by age class.[a]

Age Class	Dep. Var.: Binary for Risky Assets	Countries with NHS: Dummy PHS (1)	Countries with NHS: Discrete PHS (2)	Countries without NHS: Dummy PHS (1)	Countries without NHS: Discrete PHS (2)
50–54	PHS dummy	0.0444		−0.1536***	
		(0.073)		*(0.049)*	
	PHS discrete		0.018		−0.0749**
			(0.029)		*(0.034)*
	FHR	−0.1278	−0.1482	0.9672***	0.9023***
		(0.585)	*(0.641)*	*(0.369)*	*(0.349)*
	FHR*high education	0.1403	0.1576	−1.0132***	−0.9700**
		(0.584)	*(0.639)*	*(0.392)*	*(0.377)*
	Observations	525	525	692	692
	Pseudo R^2	0.2702	0.2698	0.1316	0.1271
55–59	PHS dummy	0.0053		−0.0778	
		(0.012)		*(0.053)*	
	PHS discrete		−0.0027		−0.1063***
			(0.006)		*(0.036)*
	FHR	0.0164	0.0209	−1.6211	−1.333
		(0.065)	*(0.076)*	*(1.047)*	*(1.048)*
	FHR*high education	−0.0215	−0.0221	1.2504	1.114
		(0.071)	*(0.077)*	*(1.088)*	*(1.067)*
	Observations	533	533	537	537
	Pseudo R^2	0.2683	0.268	0.1873	0.2078
60–69	PHS dummy	0.004		−0.0791**	
		(0.038)		*(0.033)*	
	PHS discrete		−0.0111		−0.0359
			(0.019)		*(0.023)*
	FHR	−0.1384	−0.1183	−0.0387	−0.0588
		(0.188)	*(0.187)*	*(0.204)*	*(0.275)*
	FHR*high education	0.0949	0.081	0.036	0.0558
		(0.189)	*(0.187)*	*(0.207)*	*(0.277)*
	Observations	722	722	1007	1007
	Pseudo R^2	0.3754	0.3759	0.1975	0.1924
70–79	PHS dummy	0.0059		−0.016	
		(0.015)		*(0.028)*	
	PHS discrete		0.0108		−0.0109
			(0.009)		*(0.017)*
	FHR	−0.0103	−0.015	0.0476	0.0468
		(0.012)	*(0.015)*	*(0.031)*	*(0.031)*
	FHR*high education	−0.0083	−0.0116	−0.0197	−0.0172
		(0.018)	*(0.019)*	*(0.031)*	*(0.031)*
	Observations	473	473	572	572
	Pseudo R^2	0.3814	0.3841	0.2783	0.2785
80–90	PHS dummy	−0.0001		−0.0194	
		(0.001)		*(0.027)*	
	PHS discrete		−0.0004		−0.0094
			(0.001)		*(0.013)*
	FHR	−0.0149	−0.0126	0.0154	0.01
		(0.014)	*(0.013)*	*(0.020)*	*(0.013)*
	FHR*high education	0.0153	0.0129	−0.0178	−0.0119
		(0.014)	*(0.013)*	*(0.023)*	*(0.016)*
	Observations	175	175	152	152
	Pseudo R^2	0.5865	0.5889	0.3263	0.3388

PHS dummy is a binary variable assuming value 1 for poor Perceived Health Status, while PHS discrete is the average Perceived Health Status of the households' members on a scale from 1 (very good) to 5 (very bad). FHR measures the household's Future Health Risk.
Robust standard errors in parentheses.
[a] Table entries are weighted marginal effects from probit specification.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

6.2. Full specification

The full specification introduces our measure of Future Health Risk, and is reported in Table 6. As in the restricted model, Perceived Health Status does not matter in countries with a protective NHS, while it does in non-NHS countries. Furthermore, the difference between NHS and non-NHS countries holds even when considering the coefficients of FHR and its interaction with the education variable. Neither coefficient is statistically significant in the NHS sample, while both are statistically significant in the non-NHS subsample. In other words, the asset participation decision of households living in countries that lack a protective NHS seems to be associated not only with Current Health Status but also with Future Health Risk, pointing towards forward-looking behavior. Strikingly, the coefficients on the main effect of FHR and its interaction with education indicate that as Future Health Risk increases, less educated households are *more likely* to hold risky assets, suggesting behavior that is inconsistent with background risk portfolio choice theory. In con-

Table 8
Full model under alternative specification of FHR.[a]

Binary for holding financial risky assets	Countries with NHS Dummy PHS (1)	Countries with NHS Discrete PHS (2)	Countries without NHS Dummy PHS (1)	Countries without NHS Discrete PHS (2)
Income	0.1468**	0.1440**	0.0943**	0.0930**
	(0.063)	*(0.063)*	*(0.040)*	*(0.040)*
Income squared	−0.0234	−0.0222	−0.0245*	−0.0245*
	(0.023)	*(0.023)*	*(0.015)*	*(0.015)*
Net wealth	0.001	0.001	0.0091***	0.0086***
	(0.002)	*(0.002)*	*(0.002)*	*(0.002)*
Net wealth squared	−0.00001	−0.00001	−0.0001***	−0.0001***
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*
Age	−0.0082	−0.0076	−0.0021	0.0007
	(0.015)	*(0.015)*	*(0.012)*	*(0.011)*
Age squared	0.0578	0.0535	−0.0007	−0.0198
	(0.109)	*(0.109)*	*(0.088)*	*(0.086)*
Male	0.0201	0.021	0.0468**	0.0456**
	(0.023)	*(0.023)*	*(0.019)*	*(0.019)*
Married	0.0471*	0.0460*	0.0358*	0.0416*
	(0.027)	*(0.026)*	*(0.022)*	*(0.022)*
Household size	−0.0133	−0.0132	0.0056	0.007
	(0.013)	*(0.013)*	*(0.011)*	*(0.011)*
Higher education	0.0998	0.0994	−0.1248	−0.1233
	(0.062)	*(0.062)*	*(0.101)*	*(0.099)*
Social activities	0.0838***	0.0811***	0.0203	0.0197
	(0.028)	*(0.028)*	*(0.018)*	*(0.018)*
Religion	−0.0268	−0.0287	−0.0179	−0.0189
	(0.029)	*(0.028)*	*(0.024)*	*(0.023)*
Prob. of inheritance	0.0011***	0.0010***	0.0011***	0.0011***
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*
Numeracy	0.0121	0.0118	0.0383***	0.0394***
	(0.013)	*(0.013)*	*(0.010)*	*(0.010)*
Fluency	0.0025	0.0024	0.0029**	0.0027*
	(0.002)	*(0.002)*	*(0.001)*	*(0.001)*
Recall	0.0051	0.005	0.0071	0.0064
	(0.008)	*(0.008)*	*(0.006)*	*(0.006)*
PHS dummy	0.0251		−0.0701***	
	(0.026)		*(0.019)*	
PHS discrete		0.0042		−0.0453***
		(0.012)		*(0.012)*
LFHR	−0.0028	−0.0027	0.0057**	0.0055**
	(0.002)	*(0.002)*	*(0.003)*	*(0.002)*
LFHR * high education	0.002	0.002	−0.004	−0.0038
	(0.002)	*(0.002)*	*(0.003)*	*(0.002)*
Observations	2632	2632	3270	3270
pseudo R^2	0.2813	0.2806	0.1692	0.1698

Country dummies included but not reported, with Switzerland as reference country. PHS dummy is a binary variable assuming value 1 for poor Perceived Health Status, while PHS discrete is the average Perceived Health Status of the households' members on a scale from 1 (very good) to 5 (very bad). FHR measures the household's Future Health Risk. Monetary amounts are PPP-adjusted and in thousand Euros.
Robust standard errors in parentheses.
[a] Table entries are weighted marginal effects from probit specification.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table 9
Estimates of health-related variables with alternative FHR interaction term.[a]

Dep. var.: binary for risky assets	Countries with NHS Dummy PHS (1)	Countries with NHS Discrete PHS (2)	Countries without NHS Dummy PHS (1)	Countries without NHS Discrete PHS (2)
PHS dummy	0.0203		−0.0653***	
	(0.025)		*(0.019)*	
PHS discrete		0.0011		−0.0438***
		(0.012)		*(0.012)*
FHR	−0.036	−0.0334	0.0472**	0.0486**
	(0.029)	*(0.029)*	*(0.024)*	*(0.023)*
FHR*income	0.0348	0.0351	−0.0568	−0.0553
	(0.075)	*(0.074)*	*(0.051)*	*(0.047)*
Observations	2632	2632	3270	3270
pseudo R^2	0.2796	0.2791	0.1668	0.1678

PHS dummy is a binary variable assuming value 1 for poor Perceived Health Status, while PHS discrete is the average Perceived Health Status of the households' members on a scale from 1 (very good) to 5 (very bad). FHR captures the household's Future Health Risk.
[a] Weighted marginal effects, Robust standard errors in parentheses;
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table 10
Estimates of health-related variables and life expectancy, by age class.[a]

		Countries with NHS		Countries without NHS	
Age class of financial respondent	Dep. var.: binary for holding risky assets	Dummy PHS (1)	Discrete PHS (2)	Dummy PHS (1)	Discrete PHS (2)
All	Life expectancy	−0.0105*	−0.0104*	−0.001	−0.0011
		(0.006)	*(0.006)*	*(0.004)*	*(0.004)*
	PHS dummy	0.0209		−0.0657***	
		(0.025)		*(0.019)*	
	PHS discrete		0.0018		−0.0433***
			(0.012)		*(0.012)*
	FHR	−0.0264	−0.0244	0.0692**	0.0673**
		(0.020)	*(0.019)*	*(0.030)*	*(0.030)*
	FHR * High edu	0.0007	0.0017	−0.0562*	−0.052
		(0.033)	*(0.033)*	*(0.034)*	*(0.033)*
	Observations	2632	2632	3270	3270
	pseudo R^2	0.282	0.2815	0.1676	0.1683
50–54	Life expectancy	0.0530**	0.0529**	−0.014	−0.0138
		(0.027)	*(0.027)*	*(0.024)*	*(0.025)*
	PHS dummy	0.034		−0.1534***	
		(0.070)		*(0.048)*	
	PHS discrete		0.0102		−0.0747**
			(0.028)		*(0.034)*
	FHR	−0.7456	−0.763	0.9522***	0.8890**
		(1.132)	*(1.155)*	*(0.368)*	*(0.348)*
	FHR * high edu	0.7597	0.7768	−0.9912**	−0.9489**
		(1.125)	*(1.149)*	*(0.390)*	*(0.375)*
	Observations	525	525	692	692
	pseudo R^2	0.2814	0.281	0.1325	0.1279
55–59	Life expectancy	−0.0022	−0.0026	0.004	0.0061
		(0.004)	*(0.005)*	*(0.017)*	*(0.016)*
	PHS dummy	0.0053		−0.0771	
		(0.012)		*(0.053)*	
	PHS discrete		−0.0027		−0.1062***
			(0.006)		*(0.036)*
	FHR	0.0253	0.0308	−1.6334	−1.3553
		(0.077)	*(0.089)*	*(1.047)*	*(1.046)*
	FHR * high edu	−0.0304	−0.032	1.2461	1.1171
		(0.084)	*(0.091)*	*(1.087)*	*(1.067)*
	Observations	533	533	537	537
	pseudo R^2	0.2697	0.2694	0.1874	0.208
60–69	life expectancy	−0.0131	−0.0132	−0.0078	−0.0071
		(0.008)	*(0.008)*	*(0.010)*	*(0.010)*
	PHS dummy	0.0039		−0.0810**	
		(0.038)		*(0.032)*	
	PHS discrete		−0.0112		−0.0368
			(0.018)		*(0.023)*
	FHR	−0.1364	−0.1152	−0.0506	−0.0745
		(0.192)	*(0.190)*	*(0.243)*	*(0.313)*
	FHR * high edu	0.091	0.0762	0.0482	0.0716
		(0.192)	*(0.189)*	*(0.246)*	*(0.314)*
	Observations	722	722	1007	1007
	pseudo R^2	0.379	0.3796	0.1988	0.1934
70–79	Life Expectancy	−0.0007	−0.0006	0.0001	0.0002
		(0.005)	*(0.004)*	*(0.005)*	*(0.005)*
	PHS dummy	0.0057		−0.016	
		(0.015)		*(0.028)*	
	PHS discrete		0.0108		−0.0109
			(0.009)		*(0.017)*
	FHR	−0.0103	−0.0149	0.0477	0.0469
		(0.012)	*(0.015)*	*(0.031)*	*(0.031)*
	FHR * high edu	−0.009	−0.0123	−0.0197	−0.0172
		(0.019)	*(0.020)*	*(0.031)*	*(0.031)*
	Observations	473	473	572	572
	Pseudo R^2	0.3815	0.3842	0.2783	0.2785
	Life expectancy	−0.0002	−0.0002	−0.0018	−0.0014
		(0.000)	*(0.000)*	*(0.002)*	*(0.002)*
	PHS dummy	−0.0001		−0.0131	
		(0.001)		*(0.019)*	
	PHS discrete		−0.0004		−0.0063

(*continued on next page*)

Table 10 (*continued*)

Age class of financial respondent	Dep. var.: binary for holding risky assets	Countries with NHS		Countries without NHS	
		Dummy PHS (1)	Discrete PHS (2)	Dummy PHS (1)	Discrete PHS (2)
80–90	FHR	−0.0151	−0.0126	0.0103	0.0061
		(0.013)	*(0.012)*	*(0.014)*	*(0.009)*
	FHR * high edu	0.0155	0.013	−0.0121	−0.0073
		(0.014)	*(0.013)*	*(0.016)*	*(0.010)*
	Observations	175	175	152	152
	Pseudo R^2	0.5903	0.5928	0.3377	0.3535

Only relevant parameters reported. Life Expectancy is the age to which the respondent reports he/she expects to live, PHS dummy is a binary variable assuming value 1 for poor Perceived Health Status, while PHS discrete is the average Perceived Health Status of the households' members on a scale from 1 (very good) to 5 (very bad). FHR measures the household's Future Health Risk.
Robust standard errors in parentheses.
[a] Table entries are weighted marginal effects from probit specification.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

trast, as Future Health Risk increases, more educated households are *less likely* to hold risky assets, in line with the theory.[17] The effects of Future Health Risk for more and less educated households nearly offset one another, resulting in an average effect over all households that is small and negative. This result is quite interesting as it seems to support the rationality hypothesis: an agent is rational if and only if he/she jointly has access to the right amount of information and he/she knows how to use it.

The remaining economic and socio-demographic variables have signs and statistical significances unaltered with respect to the restricted model and are quite robust across all specifications.

The results presented thus far provide evidence that both current and future health status play independent roles in affecting portfolio decisions and that these effects are apparent only in countries that lack a protective NHS, therefore suggesting that an NHS might indeed play a role in shaping households' participation decisions.

6.3. A further look at the role of Future Health Risk

Our measure of FHR is intended to predict future health problems based on current Objective Health Status, asymptomatic health conditions, as well as current risky behaviors. But it is quite possible that the effect of Future Health Risk on portfolio decisions varies across the life cycle, and in particular declines with age. One reason for this possibility is that among the most elderly, many health problems have already materialized, while at age 50 many such problems might still be latent, and middle-aged households might still be actively updating expectations with new information about their future health status. If this is the case, then the FHR coefficient presented in Table 6 is an average effect across households at different points in their life cycle, for which the information content of FHR might be more or less.

We test for a declining effect of FHR with age by splitting the sample into subsamples based on the financial respondent's age class and re-estimating our models for middle-aged and older households separately. Table 7 reports the coefficients for the variables of interest, estimated on subsamples defined by the following age classes: 50–54, 55–59, 60–69, 70–79 and 80–90 (with the last classes spanning 10 years rather than 5 to allow for reasonable sample sizes). The effect of FHR in non-NHS countries is now clearer compared to what is observed in Table 6; the FHR coefficients for the youngest age class are now strongly statistically significant and much greater in magnitude. At the same time, for the highly educated households, the effect of FHR is still negative and now more than offsets the value of FHR for less educated households (although the negative net effect is still small). In contrast, these effects disappear when moving across age classes toward older individuals.

This evidence suggests that the information content of FHR varies over the life cycle, and declines with age. Furthermore, this evidence is again supportive of a forward-looking attitude consistent with background risk theory only for middle-aged and highly educated households. In conclusion, our empirical findings fully support the theoretical implications discussed in Section 4.

7. Robustness checks

In this section we test the robustness of our main results to: (i) an alternative specification of the FHR variable; (ii) alternative FHR interaction terms; (iii) inclusion of the households' investment horizon; and (iv) an alternative definition of NHS countries.[18]

7.1. Alternative specification of FHR

In the analyses performed thus far, we assumed a multiplicative definition of FHR (see Eq. (2)). In this subsection we adopt a linear specification for FHR (LFHR) as follows:

$$\mathrm{LFHR}_{i,j} = RB_{i,j} + \mathrm{AOHS}_{i,j} - GS_{i,j} \tag{3}$$

The new variable ranges between −72 and 6 (as before, the higher the value, the higher the risk for future health worsening), with a sample weighted mean (standard deviation) of −30.09 (0.1562). Since this specification allows a lower degree of variation, we end up with less precise estimates. In fact, as reported in Table 8, the coefficient for LFHR retains the sign and the statistical significance of the FHR coefficients in Table 6, but its interaction with higher education is not statistically significant. However, the key results are confirmed: the participation decision is associated with perceived but not with objective health status. FHR also plays an independent role, but in both cases these effects are apparent only in those countries lacking a fully protective NHS.[19]

7.2. Alternative interpretation of FHR interaction term

[17] As the interaction term in non-linear models might be biased and imprecisely estimated (see Ai and Norton, 2003), we checked the validity of all our estimates using a linear probability model. Similar results, available upon request, are obtained.

[18] Besides the robustness checks discussed in this section, we ran additional robustness analyses, e.g., adopting alternative definitions of CHS or different measures of bequest motive. The interested reader can refer to the working paper version, available at http://www.rand.org/pubs/working_papers/WR839.html.

[19] The LFHR specification has also been tested across the different age classes, obtaining the same evidence reported in Section 6.3. Detailed results available upon request.

Table 11
Estimates of health-related coefficients, under alternative grouping of countries.

Country classification		Coverage: CH and GR as NHS				Private health insurance: GR and DK Switched			
		Countries with NHS		Countries without NHS		Countries with NHS		Countries without NHS	
Age Class of Financial Respondent	Dep. Var.: Binary for Holding Risky Assets	Dummy PHS (1)	Discrete PHS (2)	Dummy PHS (1)	Discrete PHS (2)	Dummy PHS (1)	Discrete PHS (2)	Dummy PHS (1)	Discrete PHS (2)
Whole sample	PHS dummy	0.0164		−0.0678***		0.027		−0.0707***	
	PHS discrete		−0.0032		−0.0442***		0.006		−0.0463***
	FHR	−0.0283	−0.0251	0.0722**	0.0701**	−0.023	−0.0215	0.0633**	0.0607**
	FHR * high edu	0.0154	0.0159	−0.0599*	−0.0557	0.0171	0.0172	−0.0535	−0.0489
	Observations	3310	3310	2592	2592	2311	2311	3591	3591
	Pseudo R^2	0.2646	0.2644	0.1645	0.165	0.2971	0.2961	0.1629	0.1637
50–54	PHS dummy	0.0476		−0.1623***		0.0708		−0.1645***	
	PHS discrete		0.0186		−0.0816**		0.0312		−0.0806**
	FHR	−0.1149	−0.1327	1.0752***	1.0174***	−0.1088	−0.1418	1.0412***	0.9743***
	FHR * high edu	0.134	0.1487	−1.1359***	−1.1043***	0.1462	0.1677	−1.0853***	−1.0387***
	Observations	685	685	532	532	452	452	765	765
	Pseudo R^2	0.2269	0.2264	0.1426	0.1376	0.2709	0.27	0.1298	0.125
55–59	PHS dummy	0.0194		−0.0628		0.0012		−0.0674	
	PHS discrete		−0.0314		−0.0931***		−0.0009		−0.0973***
	FHR	0.1551	0.185	−2.6144***	−2.2864**	0.0059	0.0086	−1.5613	−1.3051
	FHR * high edu	−0.1861	−0.19	2.1949**	2.0201*	−0.0069	−0.0089	1.1996	1.0859
	Observations	632	632	438	438	428	428	642	642
	Pseudo R^2	0.2521	0.2547	0.2009	0.2204	0.298	0.2983	0.1754	0.192
60–69	PHS dummy	0.0057		−0.0810**		0.0036		−0.0802**	
	PHS discrete		−0.0142		−0.0341		−0.0102		−0.0353
	FHR	−0.1797	−0.1519	0.076	0.0254	−0.2308*	−0.2141	0.1779	0.1496
	FHR * high edu	0.1185	0.0983	−0.0674	−0.0169	0.179	0.1678	−0.177	−0.149
	Observations	906	906	823	823	666	666	1063	1063
	Pseudo R^2	0.3535	0.3543	0.1927	0.1863	0.409	0.4097	0.1924	0.1875
70–79	PHS dummy	0.0013		−0.0177		0.0088		−0.0247	
	PHS discrete		0.014		−0.0136		0.0173		−0.0167
	FHR	−0.0166	−0.023	0.0489	0.0469	−0.0107	−0.0198	0.0011	−0.0001
	FHR * High Edu	0.0469	0.0417	−0.0243	−0.0204	0.0369	0.0334	0.0281	0.0315
	Observations	602	602	443	443	418	418	627	627
	Pseudo R^2	0.3437	0.3452	0.2792	0.28	0.373	0.376	0.2682	0.2685
80–90	PHS dummy	0.0048		−0.0087		[a]		−0.013	
	PHS discrete		0.0016		−0.0014		[a]		−0.0073
	FHR	−0.0938**	−0.0955*	0.0038	0.0011	−0.0013	−0.0009	0.0124	0.0084
	FHR * High Edu	0.0942**	0.0962**	−0.0046	−0.0014	0.0013	0.0009	−0.0148	−0.0101
	Observations	199	199	128	128	133	133	194	194
	Pseudo R^2	0.5332	0.5325	0.3729	0.3907	0.6493	0.6518	0.3097	0.3256

Note: Table entries are weighted marginal effects from probit specification.
Only relevant parameters reported. PHS dummy is a binary variable assuming value 1 for poor Perceived Health Status, while PHS discrete is the average Perceived Health Status of the households' members on a scale from 1 (very good) to 5 (very bad). FHR measures the household's Future Health Risk.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

[a] Predict failure perfectly.

According to the results of our fully specified model, the coefficient on the interaction between Future Health Risk and the higher education dummy is negative, meaning that highly educated households on average reduce their exposure to risky assets in the presence of higher FHR. We interpret this as a sign that better educated households are able to fully internalize FHR, while less educated households are not. Nonetheless, since education is typically highly correlated with income, an alternative explanation could be that less educated households do not behave as expected simply because they have lower levels of income, and thus are financially constrained.

We estimate an alternative model in which we interact FHR with the household's income (FHR * INCOME) rather than with the education dummy. If the new interaction term has the same sign and magnitude of the one used thus far, then we will not be able to isolate which of these two explanations is actually at play. However, the results show that the coefficient on the interaction of FHR with income is never significant (see Table 9), suggesting that our original interpretation is more appropriate.[20]

7.3. FHR and the investment horizon

Our model specification with FHR intends to capture the weight that households attach to potential future health problems in shaping their participation decisions. A possible alternative interpretation lies with the investment horizon. In addition to Future Health Risk, our FHR measure (and all the other health-related variables) might also measure health-related variation in the investment horizon. We thus include in the specification the financial respondent's subjective life expectancy (i.e., the age to which they expect to live) as a proxy for the investment horizon. Table 10 shows that the coefficient on life expectancy is not significant across the full sample. Nevertheless, the relevance of the investor's horizon becomes apparent once we focus on younger investors for whom, as expected, a longer life span is associated with a higher probability of holding risky assets. Remarkably, households in NHS and non-NHS countries differ in this respect: in the former, life expectancy is relevant while health status is not, and in the latter the opposite is true. At the same time, the results for the FHR variables remain substantially unchanged for both the whole sample and by age class. This not only confirms the robustness of our results but also corroborates our main intuition: in countries where the NHS provides full coverage for health problems, it is life expectancy and not health status during the lifetime that has an impact on financial choices, while in countries lacking NHS protection, current and future health risk have an impact on financial choices, and life expectancy does not have an independent effect.

7.4. Alternative grouping of countries

One concern regarding the results presented thus far is that they might be an artifact of the allocation of countries to the NHS and non-NHS groups. To test the robustness of the evidence reported, we re-estimated our models under an alternative grouping of countries, in which some countries were switched across groups whenever their classification as NHS or non-NHS was "borderline" according to one or more of the indicators reported in Table 1. For example, Switzerland and Greece are classified here as non-NHS countries, yet both have 100% coverage. We then moved these two countries into the NHS group and re-estimated the model. Similarly, Denmark and Greece are substantially differentiated from the other countries in their groups in terms of private health insurance diffusion. Table 11 reports the results of the following sensitivity analyses ("switched" countries shown in *italics*).

1. Sensitivity on "COVERAGE": NHS (Italy, Spain, Sweden, Denmark, *Switzerland, Greece*), NON-NHS (all others);
2. Sensitivity on "PRIVATE HEALTH INSURANCE DIFFUSION": NHS (Italy, Spain, Sweden, *Greece*), NON-NHS (all others and *Denmark*).

In all cases, our results hold, suggesting that they are not sensitive to the classification of borderline countries.

8. Conclusions

Household participation in financial markets is limited, and the reasons that impede, limit or discourage this participation are the subject of current debate. In this paper we analyze both individual and systemic characteristics that might affect this participation decision and focus on the roles played by households' health status and by the level of protection embodied in national health care systems. To this end, we test the association between (current and expected future) health status and financial portfolio choices at the household level across ten European countries, heterogeneous not only in terms of financial education and financial market development, but also in terms of their health care systems. More specifically, we estimate a model for the likelihood of holding risky financial assets on two different subsamples, countries with and without a protective NHS. In all cases we include country dummies and control for a set of standard socio-economic and demographic variables. Compared to the existing literature we innovate by introducing a composite indicator of Future Health Risk, assumed to be assessed based on currently available health information.

We provide robust evidence in support of the implications of our conceptual framework based on background risk, which can be summarized as follows. First, a household's decision to hold risky assets is driven primarily by Perceived rather than Objective Health Status. Consistent with the theoretical underpinnings of background risk, worse current Perceived Health Status, entailing a higher risk of out-of-pocket medical expenditures, forces households to reduce their exposure to other sources of risk, including financial risks. Second, Future Health Risk retains an important role independent of Current Health Status: households shape their portfolios by taking into account not only their current but also their future health conditions, suggesting that households are forward-looking in this respect. However, and quite interestingly, for less educated individuals, higher Future Health Risk is associated with a *higher* probability of holding risky assets, a prediction which is at odds with the portfolio choice models framed in background risk theory. Third, consistent with the way in which the indicator of Future Health Risk is constructed, its role is highly sensitive to the education and age of the investor. In fact, evidence of forward-looking behavior is found only for highly-educated households, leading to an interpretation that leans toward the rationality hypothesis. Furthermore, since FHR aims to capture the risk of future health deterioration its role is particularly relevant for middle-aged households, while it vanishes for older households. This result should call for further investigation of younger households (not included in the SHARE dataset), whose investment horizon is longer and for whom the role of FHR could be even stronger.

Turning to the systemic characteristics, households living in countries without a protective NHS lack a shelter against the risk

[20] As a further check, we interacted FHR with both education and income. Results, available upon request, show that across the whole sample none of the interactions reach statistical significance. However, by splitting the sample by age class, the interaction with the education dummy still retains signs and significance for the 50–54 age class, while the interaction with income is never significant.

of unexpected health expenses. This increases their overall degree of background risk and hence discourages their investment in risky financial assets. This suggests an important role for a NHS in shaping households' portfolio decisions.

Besides the evidence provided, there are several issues that deserve further investigation. For instance, whether or not the same evidence holds true for other portfolio choices, including the degree of diversification (number of different types of financial assets held) and level of risk (share of total financial wealth held in risky assets) in a financial portfolio. Furthermore, health-related issues and in particular the role of Future Health Risk are likely to be particularly relevant for the financial choices of very young households who face a longer (and hence more uncertain) horizon. These and other related questions which require additional data beyond those we use in the present paper are left to further research.

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