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Health and Households' Portfolio Choices in Europe

Insook Cho[1]

[1] Economics Department, Yonsei University, Wonju, Republic of Korea

Correspondence: Insook Cho, Economics Department, Yonsei University, Wonju, Gangwon, Republic of Korea. Tel: 82-33-760-2326. E-mail: icho@yonsei.ac.kr

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Abstract

Using the Survey of Health, Ageing, and Retirement in Europe (SHARE), this study investigated how health is associated with households' portfolio choices in 10 European countries. This study reports three important findings on the relationship between health and portfolio choices. First, households in poor health condition are less likely than households in good health to own various types of financial and non-financial assets. Second, households in poor health condition tend to allocate a lower share of their wealth to risky financial assets, savings for long-term investment, their principal residence, and other non-financial assets while they allocate a larger share to liquid assets such as bank deposits. Third, there exists a regional variation in the magnitude of the correlation between health and portfolio choices. This regional variation can be explained by differences in health care systems. Overall, these findings suggest that negative health shocks are significantly associated with a household's portfolio choices.

Keywords: health, portfolio choices, background risk, SHARE

1. Introduction

An aging population creates various social and economic challenges, such as a prevalence of physical health problems among the elderly and an increase in medical expenditures. According to a recent report (Mackenbach et al., 2005), around 40 percent of the population aged 50 or above in Europe experienced limitations in daily activities, almost 50 percent of them reported having some long-term health problems, and more than 60 percent were diagnosed with at least one chronic medical condition (Note 1).

The incidence of negative health shocks could influence a household's portfolio choices by increasing its background risk (Note 2). First, elderly individuals with health problems are more likely to lose their ability to work (Kalwij & Vermeulen, 2005), which can significantly lower household income levels. Second, health problems often incur medical expenditures (Goldman & Maestas, 2013), and the probability of an unexpected increase in medical expenditures is higher among elderly households. Households often respond to medical expenditure risk in two ways: saving more for precautionary reasons (Kotlikoff, 1986; Palumbo, 1999; Atella et al., 2012) and changing the composition of their financial portfolios to reduce their overall exposure to financial risk (Gollier & Pratt, 1996; Goldman & Maestas, 2013; Cho, 2014). This paper aims to examine how health of elderly household is associated with their household portfolio choices.

Considerable attention has been given to the relationship between health and household portfolio choices. In his theoretical model, Edward (2008) defined health as a non-tradable risky asset and explained that an adverse health shock makes an individual more risk averse. According to his model, health influences an individual's attitude toward risky financial assets, and a negative health event leads the individual to lower his/her share invested in a risky portfolio. Feinstein (2006) explicitly included health status in a model for savings and financial portfolio allocation by the elderly. He showed that agents in poor health, who are consequently exposed to greater medical expenditure risk, place a slightly lower proportion of their wealth in risky financial assets than do individuals in good health. The following studies provided empirical evidence to support those theoretical predictions. Rosen and Wu (2004) studied the effect of health on portfolio allocation using the Health and Retirement Study (HRS) and found a negative relationship between poor health and risky asset holdings. They found that households in poor health tend to allocate a lower share of their financial wealth in risky assets and a larger share in safe assets. Using the same data, Berkowitz and Qui (2006) investigated the effect of health on U.S. household portfolios and showed that the effect of health shocks on financial and non-financial wealth is

asymmetric: a diagnosis of a new disease tends to have a larger effect on financial wealth than on non-financial wealth. Colie and Milligan (2009) also used the HRS and found that health shocks play an important role in explaining changes in household portfolios over time. In particular, they investigated households' ownership decisions on various types of assets and their decisions on the share invested in each asset category. They found that households in poor health condition have a lower probability of owning a principal residence, vehicles, financial assets, businesses, and other real estate and those households in poor health allocate a larger share of wealth to liquid assets and time deposits. They also showed that the effect of health shocks strengthens with the passage of time after a shock. However, the literature provides little empirical evidence from outside the U.S.

This study aims to fill this gap in the literature by providing new empirical evidence on the relationship between health and household portfolio choice outside the U.S. Similar to Atella et al. (2012), which is the first empirical research on the effect of health shocks on household portfolio choices outside the U.S., this study uses the Survey of Health, Ageing, and Retirement in Europe (SHARE) data set to examine the relationship between health and household portfolio choices in European countries. The empirical analyses of this study consist of two parts. First, it studies the relationship between health and a household's portfolio decision to own (or not) each type of asset (extensive margin). Second, it explores the relationship between health and a household's allocation decision for each asset category (intensive margin). This study differs from Atella et al. (2012) on two distinct grounds. First, it investigates household portfolio decisions on both financial and non-financial assets. This approach allows exploring the possibility that households' responses toward negative health shocks are asymmetric in their choices about financial and non-financial assets, as Berkowitz and Qui (2006) reported in their study on U.S. households. Second, this study adopts panel data analysis models to control for unobserved household-specific fixed effects. These new approaches allow providing more comprehensive pictures of the relationship between health and household portfolio choices in multiple European countries.

The empirical evidence of this study suggests that health status is importantly associated with household portfolio decisions in ten European countries. The empirical results indicate that households in poor health condition have a lower probability of holding risky financial assets (i.e., bonds, stocks, and mutual funds), savings for long-term investment (i.e., individual retirement accounts, contractual savings, and whole life insurance), a principal residence, and other non-financial assets (i.e., businesses and other real estate). The results also show that households in poor health condition allocate a larger share of their wealth in liquid assets (i.e., bank deposits) with a correspondingly smaller share in risky financial assets, savings for long-term investment, primary residence, and other non-financial assets. The overall findings suggest that health risk is closely associated with households' portfolio choices. In terms of the relationship between health and a household's portfolio choices, the findings of this study are mostly consistent with the empirical evidence reported in prior studies using the U.S. data sets. In addition, the empirical evidence of this study indicates that a negative relationship between poor health condition and household portfolio choices can be observed in all European countries in the sample. This contradicts the findings of Atella et al. (2012), who found that health status has a meaningful relationship with household portfolio choices only in countries with less protective health care systems. The empirical results of this study suggest that health is closely related to household portfolio choices in all European countries in a similar manner regardless of health care system.

The remainder of the paper is organized as follows. Section 2 describes the data set used in this study and provides a descriptive analysis of the health and wealth data in ten European countries. Section 3 discusses the empirical strategy of this study, and Section 4 reports the empirical results on the relationship between health and household portfolio choices. Section 5 concludes with a summary and suggestions for future research.

2. Data

2.1 The Survey of Health, Ageing, and Retirement in Europe (SHARE)

To empirically examine the relationship between health status and households' portfolio choices, this study uses three waves of SHARE data. Of the four survey waves conducted so far, the third wave of SHARE data is restricted for public use because the survey took place in 2009, in the middle of the global financial crisis. SHARE is a cross-national panel survey on a representative sample of individuals aged 50 or above in Europe. The baseline study was conducted in 2004 in 11 European countries: two Northern European countries (Denmark and Sweden), six Central European countries (Austria, Belgium, France, Germany, the Netherlands, and Switzerland), and three Southern European countries (Greece, Italy, and Spain). All of those countries except for Greece participated in the follow-up surveys in 2006 and 2011.

One major advantage of using SHARE is that the data were collected in a completely standardized way across all countries. Therefore, the data collected in multiple countries are compatible, making this data set a good source

for a cross-country analysis. Another advantage is that it provides comprehensive information on the demographics and health status of household members as well as detailed information on household wealth and income. As such, this data set allows researchers to examine how health status is associated with households' portfolio choices.

To facilitate a comparison with the relevant literature on portfolio allocation (Guiso et al., 2002; Rosen & Wu, 2004; Brunetti & Torricelli, 2010), this study categorized seven different types of financial assets into three groups (Note 3): liquid assets (i.e., deposits in bank accounts), risky financial assets (i.e., bonds, stocks, and mutual funds), and savings for long-term investment (i.e., contractual savings, individual retirement accounts, and whole life insurance). Following Colie and Milligan (2009), this study examined not only financial assets but also non-financial assets. This paper focuses on two main non-financial assets: principal residence and other non-financial assets (i.e., business and other real estate).

It must be noted that several exclusion criteria were applied in this study. First, to facilitate the household fixed-effect model, the sample data set includes households that participated in all three waves of surveys, conducted in 2004, 2006, and 2011. Second, to observe a more meaningful relationship between health and households' portfolio choices, this study excluded households with (1) net financial assets less than 500 euros, (2) non-positive total net wealth, and (3) non-positive income. The 2004 SHARE originally surveyed 23,709 households in 10 European countries. The number of households that participated in all three waves was 11,854. After applying the exclusion criteria, the final sample included in the analysis contained 9,119 households. The rest of this section provides a descriptive analysis of households' health and wealth data.

2.2 Demographic Variables

The top panel of Table 1 presents a summary of the sample's demographic characteristics. The average age of the household head is 64-66 years in all countries during the first survey period of 2004. The percentage of married couples is relatively similar across countries, ranging from 56.5 percent in Austria to 69.9 percent in Italy. The average family size is around two in all the sample countries. Educational attainment levels are similar, although there is some cross-country variation. For example, more than 50 percent of elderly households did not complete secondary education in Italy and the Netherlands. Also in Austria, Belgium, Denmark, and Germany, more than 25 percent of elderly households completed a college education.

Table 1. Summary statistics

Country	Austria	Belgium	Denmark	France	Germany	Italy	Netherlands	Spain	Sweden	Switzerland
Age	66.8	66.3	64.5	65.8	65.8	66.0	64.9	65.7	66.0	65.3
% of married	56.5	66.4	59.7	62.7	63.9	69.9	67.9	64.4	61.2	65.1
Female head	50.5	46.8	56.5	46.1	56.4	55.0	56.0	59.2	56.9	45.3
Size of family	1.9	2.0	1.8	2.0	2.0	2.4	2.0	2.5	1.9	2.0
Educational attainment										
Less than high school	24.0	44.7	20.6	45.2	14.9	65.9	50.9	0.8	47.0	32.6
High school	50.9	27.2	41.0	32.1	56.7	26.3	24.5	9.2	29.8	57.7
College	25.1	28.1	38.3	22.6	28.3	7.8	24.5	12.2	23.2	9.6
Health status										
Poor health	28.4	27.6	23.2	35.1	37.4	40.7	28.3	42.6	27.0	15.7
Have a medical condition	72.0	75.0	74.4	76.2	74.1	76.7	66.9	80.1	72.1	63.1
Have an acute condition	13.9	17.9	20.3	18.7	18.3	12.8	15.0	11.8	21.1	11.0
Have a chronic illness	42.5	40.3	45.8	49.0	57.3	40.9	44.4	53.9	52.4	37.6
Limited activities	50.5	38.0	34.0	34.8	49.1	40.0	48.9	39.0	38.7	29.7

Note. All the statistics are weighted. Summary statistics are from the first wave of the SHARE data.

2.3 Health Status Indicators

SHARE provides detailed information on the health status of each household member. Using that information, three different measures for subjective and objective health conditions were constructed. The first measure (*POOR*) is a dummy variable indicating that a respondent's self-reported overall health status is poor. In SHARE, each household member evaluates his/her own health condition and answers by choosing one of five choices: excellent, very good, good, fair, or poor. This dummy variable for self-reported health condition takes the value of one if a respondent answers that his/her health condition is either poor or fair and zero otherwise. The second measure (*ACUTE*) is a dummy variable that takes the value of one if a doctor has diagnosed an acute medical condition such as heart attack, stroke, cancer, or bone fracture and zero otherwise. The third measure (*CHRONIC*) is a dummy variable indicating whether a respondent suffers from a chronic illness such as high blood pressure, high blood cholesterol, diabetes, chronic lung disease, asthma, arthritis, osteoporosis, stomach or duodenal ulcer, Parkinson's disease, cataracts, coronary disease, joint pain, stomach burns, or chronic bronchitis. These three health status indicators provide slightly different information on each individual's health condition. While two of the variables provide somewhat objective information about a respondent's health condition, the self-reported health status (*POOR*) provides better information about a respondent's overall health condition. Therefore, this self-reported health status variable is used as the main health variable in this study.

The bottom panel of Table 1 presents a summary of statistics on the health status indicators in the 10 sample countries. The proportion of household heads who reported poor health condition ranges from 15.7 percent in Switzerland to 42.6 percent in Spain. Having a medical condition does not necessarily lead a household head to perceive his/her health condition to be poor. Almost three quarters of elderly households answered that they have been diagnosed with a medical condition. The proportion of households with one or more medical conditions ranges from 63.1 percent in Switzerland to 80.1 percent in Spain. Elderly households are more likely to have a chronic illness than an acute medical condition. The proportion of households with acute conditions varies across countries, ranging from 11.0 percent in Switzerland to 21.1 percent in Sweden. On the other hand, the proportion of households with chronic illnesses ranges from 37.6 percent in Switzerland to 57.3 percent in Germany. The proportion of households with limited daily activities due to health conditions varies more widely than the other indicators: this proportion is highest in Austria, Germany, and the Netherlands (50.5 percent, 49.1 percent, and 48.9 percent, respectively) and lowest in Switzerland at 29.7 percent.

2.4 Household Income and Wealth

SHARE provides extensive information about the income and wealth of each household. A household's financial wealth is allocated into three major groups of financial instruments: bank accounts, risky financial assets (e.g., bonds, stocks, and mutual funds), and savings for long-term investment (e.g., contractual savings for housing, individual retirement accounts, and whole life insurance). SHARE also surveyed the value of a set of non-financial asset categories, including the principal residence, own business wealth, other real estate, and vehicles.

Table 2. Household portfolio choices in Europe

Country	Austria	Belgium	Denmark	France	Germany	Italy	Netherlands	Spain	Sweden	Switzerland
% with positive asset holdings										
Bank accounts	99.8	100.0	99.7	99.4	98.8	100.0	98.0	99.6	99.6	99.6
Savings for long-term investment	56.6	32.5	39.2	62.8	41.9	4.1	91.3	13.8	54.5	28.9
Bond, stocks, and mutual funds	15.9	36.1	55.5	25.7	32.4	29.0	22.4	9.0	71.1	50.3
Principal residence	56.0	79.2	74.9	77.6	60.8	85.5	64.0	93.6	75.3	55.6
Car	67.3	76.5	75.9	75.7	72.5	72.8	75.1	54.2	76.1	70.0
Other real estate	12.0	18.9	21.2	23.2	14.8	25.4	6.2	26.9	32.0	21.4
Own business	2.7	3.7	9.0	2.3	4.7	1.1	4.6	6.1	13.0	8.6
Median value of assets (in 2006 Euro), conditional on positive asset holding										
Financial assets										
Bank account	4,893	8,924	8,070	4,500	7,100	7,555	9,479	3,000	8,000	26,482

Savings for long-term investment	7,200	23,519	38,927	16,066	25,000	15,000	30,000	15,000	23,485	53,682
Bond, stocks, and mutual funds	14,000	35,157	22,879	12,219	17,441	24,495	20,727	12,000	18,079	55,947
Non-financial assets										
Principal residence	150,000	173,525	161,500	182,938	200,000	150,000	270,000	120,000	98,616	427,831
Car	6,000	5,000	6,729	5,000	6,000	4,167	7,500	3,027	6,779	6,582
Other real estate	100,000	103,976	107,667	100,000	120,000	80,000	150,000	100,000	54,786	185,087
Own business	104,000	150,000	67,291	65,804	50,000	55,966	70,000	45,275	48,301	82,275
Mean share in total asset, conditional on positive asset holding										
Financial assets										
Bank account	22.2	23.1	22.3	15.7	30.3	13.4	30.7	8.7	19.9	34.6
Savings for long-term investment	20.9	11.9	27.2	18.9	20.4	11.1	7.1	13.6	18.2	25.4
Bond, stocks, and mutual funds	21.6	28.2	16.6	8.2	18.2	17.6	16.7	12.0	18.4	25.7
Non-financial assets										
Principal residence	80.6	69.7	52.0	73.1	69.5	80.3	70.2	79.3	56.6	58.6
Car	19.9	5.4	7.0	6.6	11.4	6.2	13.0	4.9	6.1	8.1
Other real estate	38.6	37.7	36.0	39.3	35.0	34.2	39.2	43.2	33.1	34.6
Own business	21.4	25.7	25.6	25.5	13.5	15.2	29.1	23.1	16.6	22.2
No. of households	715	1623	684	1065	874	813	1102	658	1143	442

Note. All statistics are weighted. The values of various assets are in 2006 Euros. Mean share in total assets are the share of household net wealth invested in each asset category.

Table 2 provides a descriptive analysis of the household asset holdings and asset allocation in the sample countries. The top panel reports the proportion of households that own each category of assets. The middle and bottom panels show the median values of asset holding and the share of household net wealth allocated in each asset category, conditioning on ownership. These descriptive statistics reveal some well-known patterns of household portfolio choices in Europe. Almost all the sample households own bank accounts. On average, around 20 percent of household wealth is allocated in bank account deposits, and the median value of deposits is 8,909 euros. However, there is a clear variation in the share of wealth allocated in bank account deposits across countries. For example, households in Germany, the Netherlands, and Switzerland tend to allocate more than 30 percent of their net wealth to deposits in a bank account, whereas Spanish households allocate only 8.7 percent of their wealth in deposits in a bank account.

The proportion of households who own savings instruments for long-term investment is 42.6 percent, on average. Conditioning on the ownership of savings for long-term investment, elderly households allocate 15.9 percent of their wealth in savings for long-term investment, and the median value of assets in this category is 23,444 euros. However, household portfolio choice patterns regarding savings for long-term investment vary significantly across countries. For example, in the Netherlands, where most of the adult population has individual retirement accounts, the proportion of elderly households owning savings for long-term investment reaches 91.3 percent. On the other hand, only 4.1 percent of Italian households own savings for long-term investment. In terms of the share of wealth invested in savings for long-term investment, Dutch households allocate only 7.1 percent of their wealth in this asset category. On the other hand, households in Denmark and Switzerland invest more than 25 percent of their wealth in savings for long-term investment.

Across the 10 sampled European countries, 34.7 percent of European elderly households own risky financial assets such as bonds, stocks, and mutual funds. The households that own risky financial assets allocate 16.7 percent of their wealth in them, on average, and the median value of the risky financial assets held is 22,510 euros. Portfolio choice patterns regarding risky financial assets also vary across countries. Whereas only 9 percent of Italian elderly households own risky financial assets, more than half of elderly households own risky financial assets in Denmark and Switzerland. In Belgium and Switzerland, more than one quarter of household wealth is invested in risky financial assets. On the other hand, French households allocate only 8.2 percent of household wealth in risky financial assets.

Table 2 also shows the ownership status and asset allocation for non-financial assets. The homeownership rate in the sample countries is relatively high. Considering that this study examined the portfolio choices of elderly households, the fact that more than half of the sample households own their primary residences is not very surprising. However, homeownership is generally higher in the southern part of Europe (85.5 percent in Italy and 93.6 percent in Spain) than in the north (56.0 percent in Austria and 55.6 percent in Switzerland). Homeowners allocate 62.7 percent of their wealth to their home, on average. However, the share of wealth invested in one's home varies quite significantly. In Denmark and Sweden, households allocate 52.0 percent and 56.6 percent of their wealth in their principal residences, respectively. On the other hand, more than 80 percent of household wealth is locked in homes in Austria and Italy.

The ownership rate of other real estate is 20.2 percent, on average, which is lower than that for homes. Those households that own other real estate allocate 37.1 percent of their wealth to this asset category. The median value of other real estate is 110,152 euros. The ownership of automobiles is generally high in all sample countries, ranging from 54.2 percent in Spain to 76.5 percent in Belgium. Cars account for 8.9 percent of household wealth, on average. The proportion of elderly households that own their own business is generally low, 6.8 percent on average. The fact that most of the sample households are near or beyond their retirement age could be one explanation for the low rate of owning one's own business. The households that own their own business allocate an average of 19.8 percent of their wealth to that business.

3. Model

This paper explores the relationship between health and portfolio choices in two ways. The first regression analysis examines whether health condition is associated with households' ownership decision for each asset category. The basic regression model takes the following form:

$$assetholdings_{itc} = \beta_0 + \beta_1 Health_{itc} + \beta_2 X_{itc} + \beta_3 D_t + \mu_{ic} + \varepsilon_{itc} \quad (1)$$

where *asset holdings*$_{itc}$ is a binary variable indicating ownership of an asset by household i in country c in year t; $Health_{itc}$ is a measure for the health status; X_{itc} is a set of control variables that influence a household's portfolio choices; D_t is a set of year dummies; μ_{ic} is a time-invariant household-specific fixed effect; and ε_{itc} is an idiosyncratic error.

If the estimate for β_1 is significantly different from zero, health status ($Health_{itc}$) is significantly associated with that household's portfolio choices to hold (or not) a certain type of asset. Equation (1) can be empirically estimated using a fixed effect logit model. This analysis uses four different dependent variables that indicate ownership of the four asset categories: risky financial assets, savings for long-term investment, principal residence, and other non-financial assets. The key independent variable (Note 4) is a measure for the health status of the household head and spouse.

The second part of the analysis explores how health condition is associated with a household's asset allocation decisions. The regression model uses the share of wealth invested in each type of asset category as the dependent variable as follows:

$$assetshare_{itc} = \beta_0 + \beta_1 Health_{itc} + \beta_2 X_{itc} + \beta_3 D_t + \mu_{ic} + \varepsilon_{itc} \quad (2)$$

where *asset share*$_{itc}$ is a continuous variable for the share of net wealth invested in each type of asset category. This analysis uses five separate dependent variables that measure the share of net wealth invested in five asset categories: liquid assets (i.e., deposits in bank accounts), risky financial assets, savings for long-term investment, principal residence, and other non-financial assets. One of the main statistical issues in this analysis is that many households do not hold any of a certain type of asset, so the asset share variable is zero for many households. Because of the non-participation for certain types of asset categories, this study used a panel Tobit regression model (Note 5) to address the sample selection problem.

All the specifications of this study include an extensive set of household characteristics as the determinants of households' portfolio choices. For the choice of control variables, this study relied on the widely accepted results reported in the literature on household finance: the age of household heads, age-squared, a dummy variable for high school graduates and college graduates, family size, and household income and wealth.

4. Results

4.1 Health Condition and the Probability of Asset Ownership

This section explores whether health is associated with a household's decision to own a certain type of asset (extensive margin). Table 3 (Note 6) reports the fixed effect logit analysis results documenting the relationship between health and a household's decision to own each of the four asset categories: risky financial assets,

savings for long-term investment, principal residence, and other non-financial assets. A negative estimate of the health condition variable indicates that a household with poor health condition has a lower probability of holding the asset type of interest. All the estimates reported in Table 3 are marginal effects.

Table 3. Health status and households' decision to hold an asset: panel logit analysis

		Health status		
Asset category		Poor	Acute	Chronic
		(1)	(2)	(3)
Risky financial asset	Health status : HH head	-0.686 **	-0.391 *	-0.369 **
		(0.338)	(0.220)	(0.154)
	Health status : Spouse	0.016	0.610	-0.063
		(0.095)	(0.149)	(0.100)
Savings for long-term investment	Health status : HH head	-0.627 ***	-0.941 ***	-0.190
		(0.167)	(0.191)	(0.151)
	Health status : Spouse	-0.079	-0.510 ***	-0.382 ***
		(0.062)	(0.131)	(0.092)
Principal residence	Health status : HH head	-0.337	1.182	-1.143 *
		(0.556)	(1.504)	(0.600)
	Health status : Spouse	-0.271 *	-3.078 ***	0.064
		(0.147)	(0.636)	(0.545)
Non-financial asset	Health status : HH head	-3.001 **	-0.026	-0.743
		(1.369)	(0.450)	(0.214)
	Health status : Spouse	-0.087	-0.549 ***	0.095
		(0.085)	(0.093)	(0.139)

Note 1. Dependent variables are a dummy variable indicating ownership of risky financial asset in the top panel, a dummy for ownership of savings for long-term investment in the second panel, a dummy for ownership of principal residence in the third panel and a dummy variable for ownership of non-financial asset in the bottom panel. Columns 1-3 use three different health measures, POOR, ACUTE, and CHRONIC, respectively. This table reports a total of 12 pairs of estimates on health condition of household head/spouse from 12 separate specifications. Robust standard errors are in parenthesis. All the estimates reported in the table are marginal effect. The estimates for control variables are reported in Appendix Table 2.

Note 2. "***" indicates that the estimate is statistically significant at the 1 percent significance level, "**" at the 5 percent significance level, and "*" at the 10 percent significance level.

The top panel of Table 3 shows the correlation between health and the probability of owning risky financial assets, such as bonds, stocks, and mutual funds. In columns 1-3, all three estimates for the health status of the household head are negative and statistically significant. This suggests that European elderly households facing increased background risk from negative health shocks have a lowered probability of owning risky financial assets. This result is consistent with the findings of previous studies using U.S. data sets (Rosen & Wu, 2004; Colie & Milligan, 2009). The second panel from the top shows the panel logit analysis results on the probability of owning savings for long-term investment. In all three columns, the coefficients for the health condition of the household head/spouse are negative and statistically significant. This indicates that a household whose head/spouse is in poor health is less likely than households with a healthy head/spouse to invest in savings for long-term investment. The third and the fourth panels show the relationship between health and the probability of owning non-financial assets. In the third panel, the coefficients for the health status of the household head/spouse are negative and statistically significant, which indicates that a household in poor health has a lower probability of owning a house. This result suggests a negative correlation between poor health and homeownership in European countries and is consistent with the findings of Colie and Milligan (2009), who used a U.S. data set. Similarly, in the bottom panel, the coefficients for the health status of household

head/spouse are negative and statistically significant, indicating that the probability of owning other non-financial assets is lower among households in poor health than among households in good health. Overall, the results in Table 3 suggest that a household head/spouse's poor health condition is negatively associated with a household's portfolio decision to own financial and non-financial assets. Similar to the findings in the previous literature (Rosen & Wu, 2004; Colie & Milligan, 2009), these results provide new empirical evidence supporting the theoretical prediction of a negative correlation between health and household portfolio choices in European countries.

Using the 2004 SHARE data, Atella et al. (2012) examined household portfolio choices in European countries and showed that health status influences a household's portfolio choices only in countries with less protective health care systems. They did not observe a negative relationship between health and portfolio choices in countries with a protective, full coverage national health system such as Denmark, Italy, Spain, and Sweden. They argued that the presence of a protective national health system could mediate the effect of health risk on a household's portfolio decision by reducing the probability of incurring out-of-pocket medical expenditures. Similar to Atella et al. (2012), this study also examines whether the relationship between health and household portfolio decisions on asset ownership vary depending on a country's health care system. The model specification of this includes an interaction term (Note 7) between the health status variable and a dummy variable for countries with a national health system (NHS). The reference group is countries where medical expenditures are primarily covered by private health insurance, such as the Netherlands and Switzerland, and countries where public health systems coexist with several forms of private health insurance, such as Austria, Belgium, France, and Germany.

Table 4 reports the fixed effect logit estimates from the specification with an interaction term between the health variable and an NHS dummy. All the reported estimates are marginal effects. If the coefficient for this interaction term were statistically significantly different from zero, it would indicate that the magnitude of correlation between health and the probability of owning a certain type of asset differs across countries depending on the health care system. The first three columns report the estimation results on risky financial assets. In columns 1-3, the coefficients for the health status of the household head/spouse are negative and statistically significant, which suggests a negative relationship between health and the probability of owning risky financial assets. In addition, the coefficient for the interaction term with the NHS dummy is positive and statistically significant, which indicates that the magnitude of the negative correlation between health and the probability of owning risky financial assets is smaller in countries with NHS. In other words, this result shows that a household in poor health condition is less likely to own risky financial assets in all European countries regardless of health care system; however, the magnitude of the negative correlation is significantly smaller in countries with NHS. Columns 4-6 show the fixed effect logit analysis on the probability of owning savings for long-term investment. The coefficients for the health status of the household head/spouse are negative and statistically significant, which indicates that a household in poor health is less likely to own savings for long-term investment. In addition, the coefficient for the interaction with the NHS dummy is positive and statistically significant. This result implies that the magnitude of the negative correlation between health and the probability of owning savings for long-term investment is smaller in countries with a more protective NHS. The results in columns 1-6 show that the magnitude of the negative relationship between health and the probability of owning financial assets is significantly greater in countries with less protective health insurance systems. This result implies that, as Atella et al. (2012) explained, a more protective NHS can provide some mediation to a household with poor health condition against medical expenditure risk and reduce the magnitude of the negative correlation between health shocks and a household's portfolio choices.

Columns 7-9 and columns 10-12 show the fixed effect logit analyses on the probability of owning a home and other non-financial assets, respectively. In columns 7-9, the coefficients for the health status of the household head/spouse are negative and statistically significant. This indicates that the probability of a owning home is significantly lower for a household with poor health. Moreover, in column 9, the coefficient for the interaction with the NHS dummy is negative and statistically significant. This suggests that, among households with chronic medical conditions, the magnitude of the negative correlation between health and the probability of owning home is significantly greater (or smaller) in countries with NHS (or in non-NHS countries). Columns 10-12 also show an asymmetric relationship between health and the probability of owning other non-financial assets, such as a business or other real estate. The coefficients for the health status of the household head/spouse are negative and statistically significant.

Table 4. Households' decision to own asset and health care system: panel logit analysis

	Asset category											
	Risky financial asset			Savings for long-term investment			Principal residence			Non-financial asset		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Poor	Acute	Chronic	Poor	Acute	Chronic	Poor	Acute	Chronic	Poor	Acute	Chronic
Health status : HH head	-0.22**	-0.46**	-0.04	-0.64***	-0.99***	-0.19***	-0.93***	-1.05*	-0.94*	-0.21	0.28	-0.38*
	(0.140)	(0.233)	(0.137)	(0.164)	(0.186)	(0.144)	(0.324)	(0.575)	(0.531)	(0.350)	(0.186)	(0.194)
Health status : Spouse	0.14	0.16	-0.58***	-0.07	-0.32***	0.02	-0.27*	-0.26	0.05	-0.22**	-0.56***	-0.08
	(0.123)	(0.209)	(0.163)	(0.062)	(0.090)	(0.060)	(0.144)	(0.286)	(0.507)	(0.101)	(0.092)	(0.202)
Age	2.54***	3.51***	3.32***	-0.79***	-1.16***	-1.25***	1.21***	6.53**	4.16**	-1.75**	0.31***	-4.45***
	(0.694)	(0.801)	(0.790)	(0.194)	(0.249)	(0.249)	(0.132)	(3.134)	(1.822)	(0.887)	(0.068)	(1.219)
Age squared	-0.00***	-0.002***	-0.002***	0.003***	0.003***	0.004***	-0.009***	-0.01***	-0.01***	0.00	-0.002***	-0.001*
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.002)	(0.002)	(0.001)	(0.000)	(0.001)
High school graduate	-0.31***	-0.25**	-0.30***	0.45***	0.47***	0.42***	-0.54***	-1.14***	-1.35***	-0.72***	-0.37***	-0.47***
	(0.116)	(0.111)	(0.110)	(0.082)	(0.086)	(0.086)	(0.182)	(0.334)	(0.327)	(0.160)	(0.092)	(0.124)
College graduate	0.14	0.43***	0.34**	0.28**	0.21*	0.22*	-0.78***	-1.35***	-1.19***	-0.21	-0.30**	-0.43**
	(0.160)	(0.152)	(0.151)	(0.112)	(0.119)	(0.119)	(0.226)	(0.417)	(0.394)	(0.234)	(0.123)	(0.180)
Family size	0.30***	0.14*	0.17	0.16	0.12	0.11	0.07	0.47	0.13	0.03	-0.02	-0.07
	(0.075)	(0.075)	(0.074)	(0.062)	(0.069)	(0.069)	(0.173)	(0.320)	(0.294)	(0.084)	(0.063)	(0.087)
2nd income quartile	-0.01***	-0.10*	-0.24*	-0.04	0.01	-0.02	-0.56**	-1.07***	-0.44	0.41**	0.56***	0.43***
	(0.119)	(0.124)	(0.122)	(0.090)	(0.101)	(0.100)	(0.219)	(0.357)	(0.330)	(0.163)	(0.115)	(0.147)
3rd income quartile	0.275**	0.247**	0.134	0.178**	0.315***	0.272***	-0.622***	-1.355***	-0.597*	0.397**	0.251**	0.138
	(0.111)	(0.116)	(0.114)	(0.085)	(0.096)	(0.096)	(0.210)	(0.339)	(0.336)	(0.154)	(0.113)	(0.142)
4th income quartile	0.389***	0.412***	0.265**	-0.014	0.050	0.019	-0.809***	-1.094***	-0.663**	0.650***	0.202*	0.228
	(0.113)	(0.119)	(0.117)	(0.085)	(0.096)	(0.096)	(0.210)	(0.341)	(0.328)	(0.154)	(0.111)	(0.139)
5th income quartile (highest)	0.613***	0.674***	0.525***	0.002	0.095	0.074	-0.815***	-1.488***	-0.944**	0.635***	0.313***	0.266*
	(0.119)	(0.126)	(0.124)	(0.090)	(0.102)	(0.102)	(0.230)	(0.396)	(0.384)	(0.160)	(0.118)	(0.151)
2nd wealth quartile	1.036***	1.272***	1.213***	1.107***	1.029***	1.063***	2.816***	2.921***	2.705***	2.716***	2.024***	2.387***
	(0.142)	(0.153)	(0.149)	(0.104)	(0.120)	(0.119)	(0.195)	(0.294)	(0.266)	(0.333)	(0.181)	(0.280)
3rd wealth quartile	1.290***	1.560***	1.467***	1.713***	1.754***	1.791***	5.383***	4.540***	4.451***	3.501***	3.218***	3.502***
	(0.148)	(0.159)	(0.156)	(0.115)	(0.131)	(0.131)	(0.227)	(0.326)	(0.296)	(0.338)	(0.187)	(0.287)
4th wealth quartile	1.794***	2.068***	1.982***	2.263***	2.236***	2.286***	6.237***	5.318***	5.222***	4.707***	4.385***	4.527***
	(0.153)	(0.165)	(0.161)	(0.120)	(0.138)	(0.137)	(0.245)	(0.348)	(0.313)	(0.342)	(0.190)	(0.292)

5th wealth quartile (highest)	2.391***	2.600***	2.528***	2.795***	2.749***	2.800***	7.942***	7.090***	7.588***	6.076***	5.739***	6.009***
	(0.160)	(0.173)	(0.169)	(0.127)	(0.147)	(0.146)	(0.284)	(0.412)	(0.402)	(0.351)	(0.198)	(0.302)
Year 2006	-4.812***	-6.675***	-6.311***	0.629*	1.405***	1.459***	0.462***	-8.323	-4.253	3.008*	-0.821***	8.451***
	(1.392)	(1.604)	(1.582)	(0.372)	(0.483)	(0.485)	(0.129)	(6.230)	(3.580)	(1.767)	(0.067)	(2.429)
Year 2011	-16.336***	-23.247***	-21.894***	2.782**	5.431***	5.495***	0.810***	-28.236	-14.794	12.492**	-0.762***	32.055***
	(4.867)	(5.611)	(5.534)	(1.297)	(1.688)	(1.691)	(0.246)	(21.792)	(12.531)	(6.193)	(0.130)	(8.505)
Health status*Dummy for NHS	0.094***	0.161***	0.171	0.321*	0.577***	0.057***	0.279	0.382	-0.396***	-0.169***	-0.128***	-0.001
	(0.020)	(0.027)	(0.176)	(0.169)	(0.203)	(0.015)	(0.424)	(0.676)	(0.064)	(0.032)	(0.024)	(0.234)
No. of obs	11742	10584	10618	16834	13216	13228	5322	2046	2270	6698	11468	7127
LR chi-squared	667.51	748.67	671.39	836.43	702.74	686.42	2763.09	1036.54	1157.24	1289.86	2413.06	1375.95
Probability > Chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note 1. Dependent variables are a dummy variable indicating ownership of risky financial asset in columns 1-3, a dummy for ownership of savings for long term investment in columns 4-6, a dummy for ownership of principal residence in columns 7-9, and a dummy variable for ownership of non-financial asset in columns 10-12. Robust standard errors are in parenthesis. All the estimates reported in the table are marginal effect.

Note 2. "***" indicates that the estimate is statistically significant at the 1 percent significance level, "**" at the 5 percent significance level, and "*" at the 10 percent significance level.

Table 5. Households' decision to own asset: regional differences

	Asset category											
	Risky financial asset			Savings for long-term investment			Principal residence			Non-financial asset		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Poor	Acute	Chronic	Poor	Acute	Chronic	Poor	Acute	Chronic	Poor	Acute	Chronic
Health status : HH head	-0.042**	-0.035**	-0.274*	-0.478***	-1.019***	-0.355**	-0.782***	0.416	0.196	0.165	0.025	0.121
	(0.155)	(0.119)	(0.151)	(0.136)	(0.182)	(0.154)	(0.181)	(0.439)	(0.201)	(0.161)	(0.133)	(0.092)
Health status : Spouse	-0.003	0.098	-0.036	-0.109	-0.315***	-0.298**	-0.304**	-2.902***	-0.393*	-0.276***	-0.554***	-0.257***
	(0.095)	(0.209)	(0.099)	(0.072)	(0.090)	(0.150)	(0.144)	(0.617)	(0.209)	(0.105)	(0.092)	(0.087)
Age	2.332***	3.564***	3.057***	-0.818***	-1.199***	0.361	1.228***	4.274**	1.694***	-3.694***	0.307***	0.331***
	(0.667)	(0.803)	(0.797)	(0.194)	(0.253)	(0.597)	(0.132)	(2.150)	(0.165)	(1.097)	(0.068)	(0.069)
Age squared	-0.003***	-0.002***	-0.003***	0.003***	0.003***	0.003***	-0.009***	-0.015***	-0.013***	0.000	-0.002***	-0.002***
	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)
High school graduate	-0.001	-0.246**	-0.038	0.476***	0.476***	0.644***	-0.577***	-1.488***	-0.830***	-0.804***	-0.375***	-0.399***
	(0.092)	(0.111)	(0.097)	(0.082)	(0.086)	(0.101)	(0.183)	(0.338)	(0.216)	(0.171)	(0.092)	(0.092)
College graduate	0.055	0.427***	0.064	0.310***	0.241**	0.545***	-0.809***	-1.059***	-1.070***	-0.456*	-0.307**	-0.342***
	(0.124)	(0.152)	(0.132)	(0.112)	(0.119)	(0.146)	(0.227)	(0.388)	(0.272)	(0.250)	(0.123)	(0.123)
Family size	0.269***	0.142*	0.238***	0.179***	0.114*	0.027	0.076	0.355	0.224	-0.023	-0.022	-0.021
	(0.060)	(0.075)	(0.067)	(0.062)	(0.069)	(0.077)	(0.172)	(0.309)	(0.187)	(0.090)	(0.063)	(0.064)

2nd income quartile	0.069	-0.102	-0.006	-0.032	0.032	-0.008	-0.565**	-0.153	-0.117	0.454***	0.559***	0.495***
	(0.101)	(0.124)	(0.112)	(0.090)	(0.101)	(0.111)	(0.219)	(0.337)	(0.261)	(0.169)	(0.115)	(0.115)
3rd income quartile	0.410***	0.268**	0.288***	0.194**	0.344***	0.253**	-0.617***	-0.219	-0.104	0.444***	0.253**	0.185*
	(0.095)	(0.116)	(0.104)	(0.085)	(0.096)	(0.106)	(0.210)	(0.332)	(0.260)	(0.161)	(0.113)	(0.113)
4th income quartile	0.432***	0.434***	0.292***	0.011	0.074	0.048	-0.797***	-0.463	-0.469*	0.684***	0.207*	0.175
	(0.097)	(0.119)	(0.108)	(0.085)	(0.096)	(0.106)	(0.211)	(0.329)	(0.256)	(0.160)	(0.111)	(0.111)
5th income quartile (highest)	0.661***	0.694***	0.528***	0.025	0.105	0.053	-0.786***	-0.563	-0.059	0.676***	0.311***	0.289**
	(0.102)	(0.126)	(0.115)	(0.090)	(0.102)	(0.113)	(0.231)	(0.375)	(0.288)	(0.168)	(0.118)	(0.118)
2nd wealth quartile	0.823***	1.273***	0.708***	1.101***	1.045***	1.220***	2.834***	2.664***	2.712***	2.835***	2.025***	1.921***
	(0.122)	(0.153)	(0.135)	(0.104)	(0.120)	(0.137)	(0.196)	(0.268)	(0.216)	(0.346)	(0.182)	(0.180)
3rd wealth quartile	1.142***	1.548***	1.079***	1.707***	1.787***	1.791***	5.403***	4.434***	5.005***	3.703***	3.221***	3.093***
	(0.128)	(0.160)	(0.142)	(0.115)	(0.132)	(0.149)	(0.228)	(0.299)	(0.250)	(0.351)	(0.187)	(0.185)
4th wealth quartile	1.592***	2.065***	1.490***	2.257***	2.267***	2.292***	6.267***	5.410***	5.647***	4.897***	4.388***	4.296***
	(0.132)	(0.166)	(0.147)	(0.119)	(0.138)	(0.155)	(0.247)	(0.331)	(0.266)	(0.356)	(0.191)	(0.189)
5th wealth quartile (highest)	2.176***	2.594***	1.933***	2.787***	2.780***	2.830***	7.984***	7.458***	7.738***	6.201***	5.751***	5.649***
	(0.139)	(0.174)	(0.157)	(0.127)	(0.147)	(0.166)	(0.287)	(0.403)	(0.329)	(0.365)	(0.198)	(0.197)
Year 2006	-4.148***	-6.785***	-5.521***	0.661*	1.446***	-1.726	0.474***	-4.172	0.338**	6.622***	-0.825***	-0.820***
	(1.335)	(1.610)	(1.597)	(0.371)	(0.492)	(1.192)	(0.129)	(4.279)	(0.160)	(2.182)	(0.067)	(0.067)
Year 2011	-13.693***	-23.654***	-18.966***	2.862**	5.611***	-5.805	0.820***	-15.091	0.944***	25.369***	-0.757***	-0.742***
	(4.669)	(5.629)	(5.588)	(1.297)	(1.720)	(4.172)	(0.244)	(14.963)	(0.294)	(7.642)	(0.130)	(0.131)
Health status*North dummy	0.007***	0.021***	0.006***	0.103	0.877***	-0.151	0.594	1.006	-2.456***	-0.033***	-0.126***	-0.140***
	(0.002)	(0.003)	(0.002)	(0.173)	(0.197)	(0.166)	(0.447)	(0.991)	(0.479)	(0.034)	(0.030)	(0.021)
Health status*South dummy	0.007***	0.017***	0.001	0.120	1.054	0.029	-0.247	1.059	-0.514	-0.137***	-0.090***	-0.032***
	(0.002)	(0.003)	(0.002)	(0.224)	(0.362)	(0.250)	(0.410)	(0.678)	(0.375)	(0.026)	(0.023)	(0.016)
No. of obs	15303	10584	11892	16839	13216	10844	5322	2255	3762	6251	11468	11483
LR chi-squared	844.3	747.92	557.36	818.71	727.42	536.98	2765.03	1129.53	2028.32	1185.82	2410.41	2444.49
Probability > Chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note 1. Dependent variables are a dummy variable indicating ownership of risky financial asset in columns 1-3, a dummy for ownership of savings for long-term investment in columns 4-6, a dummy for ownership of principal residence in columns 7-9, and a dummy variable for ownership of non-financial asset in columns 10-12. Robust standard errors are in parenthesis. All the estimates reported in the table are marginal effect.

Note 2. "***" indicates that the estimate is statistically significant at the 1 percent significance level, "**" at the 5 percent significance level, and "*" at the 10 percent significance level.

The coefficient for the interaction with the NHS dummy is negative and statistically significant. This indicates that a household in poor health condition has a lower probability of owning non-financial assets in all European countries in the sample, but the magnitude of the negative correlation between health and the probability of owning other non-financial assets is significantly smaller in non-NHS countries. This result is consistent with the findings of Berkowitz and Qui (2006) who found that health shocks have an asymmetric influence on household portfolio choices regarding financial and non-financial assets. They explained that health shocks have a more negative effect on financial asset choices because health shocks can have a more immediate effect on financial wealth than on non-financial wealth.

Table 5 presents one more analysis of the correlation between health and a household's decision to own a certain type of asset. This analysis explores regional variation in the relationship between health and portfolio choices. For this analysis, this study uses a model specification that includes interaction terms for the health variable and two regional indicators: a North dummy for northern European countries (Denmark and Sweden) and a South dummy for southern European countries (Italy and Spain). The reference group is the countries in central Europe: Austria, Belgium, France, Germany, the Netherlands, and Switzerland. All the estimates reported in this table are marginal effects. In all columns, the coefficients for the health status of household head/spouse are negative and statistically significant. This indicates that a household in poor health condition has a lower probability of owning risky financial assets (columns 1-3), savings for long-term investment (columns 4-6), a principal residence (columns 7-9), and other non-financial assets (columns 10-12). In the first three columns, the coefficients for the interaction terms with the North and South dummies are positive and statistically significant. Also in column 5, the coefficient for the interaction term with the North dummy is positive and statistically significant. That suggests that the magnitude of the negative correlation between health and the household decision to own risky financial assets is significantly smaller in northern and southern European countries than in central European countries. On the other hand, column 9 shows that the coefficient for the interaction term with the North dummy is negative and statistically significant. Columns 10-12 also show that the coefficients for the interaction terms with the North and South dummies are negative and statistically significant. That shows that the magnitude of the negative correlation between health and the probability of owning other non-financial assets is significantly smaller in the countries of central Europe than in northern and southern European countries. The regional variation in the magnitude of the negative correlation between health and household portfolio choices on asset ownership could stem from variations in countries' health care systems across regions. In fact, the countries in northern and southern Europe have NHS in which medical expenditures are mostly financed publicly and that provide easy access to health care services for almost all of the resident population.

Tables 3-5 display the negative correlation between health and a household's decision to own various types of financial and non-financial assets in all the European countries in the sample. This evidence contradicts the findings of Atella et al. (2012), who found that the negative correlation is observed only in non-NHS countries.

4.2 Health and Asset Allocation Decisions

The second part of this analysis investigates the relationship between health and a household's decision on how much household wealth to invest in each asset category (intensive margin). Table 6 (Note 8) reports the panel Tobit estimates on the relationship between health and the share of net wealth invested in five different types of assets: risky financial assets, savings for long-term investment, principal residence, other non-financial assets, and deposits in bank accounts. A negative estimate for the health variable indicates that households in poor health are more likely to invest a lower share of their net wealth in an asset category than households in good health.

Table 6. Health status and household's decision on asset share: panel tobit analysis

		Health status		
		Poor	Acute	Chronic
Asset category		(1)	(2)	(3)
Risky financial asset	Health status : HH head	-0.006 ***	-0.007***	-0.002***
		(0.004)	(0.005)	(0.003)
	Health status : Spouse	-0.006***	-0.002*	-0.001
		(0.001)	(0.001)	(0.001)
Savings for long-term	Health status : HH head	-0.009*	-0.013**	-0.018***

investment		(0.005)	(0.006)	(0.004)
	Health status : Spouse	0.000	-0.003*	-0.007***
		(0.001)	(0.002)	(0.001)
Principal residence	Health status : HH head	-0.032***	-0.001***	-0.077***
		(0.008)	(0.011)	(0.007)
	Health status : Spouse	-0.001	0.005	-0.006***
		(0.002)	(0.002)	(0.002)
Non-financial asset	Health status : HH head	-0.017***	-0.027***	-0.009*
		(0.005)	(0.007)	(0.005)
	Health status : Spouse	-0.005***	-0.011***	0.000
		(0.001)	(0.002)	(0.001)
Bank deposits	Health status : HH head	0.008***	0.010***	0.050***
		(0.006)	(0.008)	(0.006)
	Health status : Spouse	0.006***	0.000	0.011***
		(0.002)	(0.002)	(0.002)

Note 1. Dependent variables are the share of net wealth invested in risky financial asset in the top panel, the share invested in savings for long-term investment in the second panel, the share invested in principal residence in the middle panel, the share invested in non-financial asset in the fourth panel, and the share allocated in bank deposits in the bottom panel. Columns 1-3 use three different health measures, POOR, ACUTE, and CHRONIC, respectively. This table reports a total of 15 pairs of estimates on health condition of household head/spouse from 15 separate specifications. Robust standard errors are in parenthesis.

Note 2. "***" indicates that the estimate is statistically significant at the 1 percent significance level, "**" at the 5 percent significance level, and "*" at the 10 percent significance level.

The top panel of Table 6 reports the correlation between health and the share invested in risky financial assets. In all three columns, the coefficients for the health of the household head/spouse are negative and statistically significant, which indicates that households in poor health tend to invest a lower share of their wealth in risky financial assets. The second panel shows the correlation between health and the share invested in savings for long-term investment. The coefficients for the health of the household head/spouse are negative and statistically significant, which suggests a negative relationship between poor health and the share of wealth invested in savings for long-term investment. In the third panel from the top, the coefficients for the health of the household head/spouse are negative and statistically significant, indicating that households in poor health tend to allocate a lower share of their wealth in their homes than households in good health. The fourth panel also shows a negative correlation between health and the share of wealth invested in other non-financial assets; that is, the share of household wealth invested in other non-financial assets is significantly lower among households in poor health.

An intriguing result is reported in the bottom panel. On a risk-return basis, bank deposits are generally dominated by other liquid assets. However, the previous literature has reported that when the health condition of household members deteriorates and incurs a potential increase in medical expenditures, households tend to increase the share of their wealth devoted to this asset category (Poterba & Samwick, 2001). Extending these results to this multi-nation comparison confirms that the findings remain the same in other countries. In the bottom panel, the coefficients for the health of the household head/spouse are positive and statistically significant, which indicates that households in poor health tend to allocate a larger share of their wealth to deposits (Note 9). This result is consistent with the findings of Colie and Milligan (2009), who reported an increase in precautionary savings among households in poor health.

Table 7. Household's decision on asset share and health care system: panel tobit analysis

	Asset category														
	Risky financial asset			Savings for long-term investment			Principal residence			Non-financial asset			Bank deposits		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	Poor	Acute	Chronic	Poor	Acute	Chronic	Poor	Acute	Chronic	Poor	Acute	Chronic	Poor	Acute	Chronic

Health status : HH head	-0.004***	-0.011***	-0.005	-0.006***	0.001	-0.006***	-0.017***	-0.025***	-0.002	0.000	-0.004	-0.005**	0.024***	0.022***	0.011***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.003)	(0.002)	(0.004)	(0.004)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)
Health status : Spouse	-0.004***	-0.009***	-0.001	-0.004**	0.000	0.001	-0.016***	0.010	-0.006*	-0.012***	-0.023***	-0.012***	0.021***	0.000	0.017***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.003)	(0.002)	(0.003)	(0.004)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.004)	(0.002)
Age	0.005***	0.006***	0.006***	-0.019***	-0.019***	-0.019***	0.003*	0.004**	0.003*	-0.002	-0.001	0.000	0.025***	-0.026***	-0.027***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age squared	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000	0.000	0.000	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
High school graduate	0.006***	0.005***	0.005***	0.005***	0.005***	0.005***	-0.009***	-0.007***	-0.007***	-0.008***	-0.009***	-0.009***	0.013***	0.013***	0.013***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
College graduate	0.012***	0.009***	0.010***	0.007***	0.007***	0.007***	-0.004	-0.003	-0.003	-0.008***	-0.009***	-0.008***	0.012***	0.012***	0.011***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Family size	-0.005***	-0.004***	-0.005***	-0.004***	-0.002**	-0.002**	0.011***	0.011***	0.011***	0.004***	0.002	0.001	-0.010***	-0.011***	-0.011***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
2nd income quartile	0.004***	0.004***	0.004***	0.000	0.001	0.001	-0.018***	-0.015***	-0.014***	-0.003	-0.005***	-0.005***	0.021***	0.023***	0.021***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
3rd income quartile	0.011***	0.011***	0.011***	0.005***	0.008***	0.008***	-0.022***	-0.017***	-0.016***	-0.010***	-0.014***	-0.014***	0.026***	0.029***	0.028***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
4th income quartile	0.018***	0.018***	0.019***	0.005***	0.007***	0.007***	-0.019***	-0.012***	-0.011***	-0.014***	-0.020***	-0.020***	0.025***	0.030***	0.029***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
5th income quartile (highest)	0.024***	0.024***	0.025***	0.003***	0.007***	0.007***	-0.033***	-0.025***	-0.024***	-0.007***	-0.014***	-0.014***	0.032***	0.036***	0.035***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
2nd wealth quartile	-0.001	0.003	0.002	0.015***	0.013***	0.013***	0.161***	0.156***	0.157***	0.031***	0.032***	0.033***	-0.092***	-0.093***	-0.094***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
3rd wealth quartile	-0.009***	-0.002	-0.004***	0.014***	0.013***	0.014***	0.217***	0.197***	0.198***	0.047***	0.052***	0.053***	-0.143***	-0.140***	-0.141***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
4th wealth quartile	-0.003*	0.002	0.000**	0.016***	0.016***	0.017***	0.167***	0.144***	0.145***	0.075***	0.080***	0.081***	-0.147***	-0.141***	-0.143***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
5th wealth quartile (highest)	0.016***	0.021***	0.018***	0.030***	0.033***	0.034***	0.062***	0.040***	0.041***	0.129***	0.129***	0.130***	-0.140***	-0.131***	-0.132***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Year 2006	-0.005***	-0.004***	-0.004***	0.005***	0.002**	0.003**	0.011***	0.012***	0.012***	-0.005***	-0.006***	-0.005***	0.002	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Year 2011	-0.009***	-0.007***	-0.008***	-0.002*	-0.004***	-0.004***	0.044***	0.037***	0.038***	0.021***	0.020***	0.021***	-0.014***	-0.013***	-0.015***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)

Health status*NHS dummy	-0.003	-0.007	-0.001	0.001	-0.003	0.001	0.030	0.039	0.002	0.000	0.010	0.011	-0.004***	-0.003***	-0.002***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.004)	(0.003)	(0.005)	(0.006)	(0.004)	(0.003)	(0.004)	(0.003)	(0.000)	(0.000)	(0.000)
No. of obs	125062	108656	108685	125062	108656	108685	122756	106511	106540	125062	108656	108685	125062	108656	108685
LR chi-squared	1646.23	1411.96	1367.4	2654.61	2497.8	2585.22	10334.34	8723.71	8837.27	5465.36	4630.19	4674.6	4456	3662.19	3968.24
Probability > Chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note 1. Dependent variables are the share of net wealth invested in risky financial asset in columns 1-3, the share invested in savings for long-term investment in columns 4-6, the share invested in principal residence in columns 7-9, the share invested in non-financial asset in columns 10-12, and the share invested in bank deposits in columns 13-15. Robust standard errors are in parenthesis.

Note 2. "***" indicates that the estimate is statistically significant at the 1 percent significance level, "**" at the 5 percent significance level, and "*" at the 10 percent significance level.

Table 8. Households' decision to own asset: regional differences

	Asset category														
	Risky financial asset			Savings for long-term investment			Principal residence			Non-financial asset			Bank deposits		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	Poor	Acute	Chronic	Poor	Acute	Chronic	Poor	Acute	Chronic	Poor	Acute	Chronic	Poor	Acute	Chronic
Health status : HH head	-0.004***	-0.002	-0.001	-0.003*	-0.007***	0.002	-0.018***	-0.018***	-0.018***	0.001	-0.007***	0.000	0.021***	0.020***	0.017***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.003)	(0.002)
Health status : Spouse	-0.008***	-0.003**	-0.001	-0.003**	0.003	-0.007***	-0.012***	0.006	-0.011***	-0.007***	-0.016***	-0.008***	0.017***	0.003	0.013***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.003)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.003)	(0.002)
Age	0.006***	0.006***	0.006***	-0.018***	-0.019***	-0.019***	0.002	0.003**	0.003**	-0.002	-0.001	0.000	-0.025***	-0.026***	-0.026***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age squared	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000	0.000	0.000	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
High school graduate	0.005***	0.004***	0.004***	0.005***	0.005***	0.004***	-0.008***	-0.006***	-0.006***	-0.008***	-0.009***	-0.009***	0.012***	0.012***	0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
College graduate	0.010***	0.009***	0.009***	0.006***	0.007***	0.006***	-0.003	-0.003	-0.003	-0.009***	-0.009***	-0.008***	0.011***	0.011***	0.011***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Family size	-0.005***	-0.004***	-0.005***	-0.003***	-0.002**	-0.002*	0.010***	0.011***	0.011***	0.005***	0.002*	0.001	-0.010***	-0.011***	-0.011***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
2nd income quartile	0.005***	0.004***	0.004***	0.001	0.002	0.002	-0.019***	-0.015***	-0.014***	-0.002	-0.005***	-0.005***	0.023***	0.023***	0.022***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
3rd income quartile	0.012***	0.011***	0.012***	0.006***	0.008***	0.009***	-0.023***	-0.017***	-0.015***	-0.010***	-0.014***	-0.014***	0.027***	0.029***	0.029***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
4th income quartile	0.019***	0.018***	0.020***	0.006***	0.007***	0.008***	-0.021***	-0.012***	-0.011***	-0.014***	-0.021***	-0.021***	0.027***	0.030***	0.030***

	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
5th income quartile (highest)	0.025***	0.025***	0.026***	0.004***	0.007***	0.008***	-0.034***	-0.025***	-0.024***	-0.007***	-0.014***	-0.014***	0.033***	0.036***	0.037***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
2nd wealth quartile	-0.001	0.003**	0.002	0.015***	0.013***	0.014***	0.161***	0.156***	0.157***	0.031***	0.032***	0.033***	-0.092***	-0.093***	-0.087***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
3rd wealth quartile	-0.008***	-0.001	-0.004**	0.014***	0.013***	0.014***	0.216***	0.196***	0.198***	0.048***	0.052***	0.052***	-0.143***	-0.140***	-0.131***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
4th wealth quartile	-0.002	0.002	0.000	0.017***	0.017***	0.017***	0.166***	0.144***	0.145***	0.075***	0.080***	0.080***	-0.146***	-0.141***	-0.132***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
5th wealth quartile (highest)	0.017***	0.021***	0.018***	0.030***	0.033***	0.034***	0.061***	0.040***	0.041***	0.129***	0.129***	0.130***	-0.139***	-0.131***	-0.120***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Year 2006	-0.005***	-0.004***	-0.004***	0.005***	0.003***	0.003***	0.012***	0.012***	0.011***	-0.005***	-0.006***	-0.005***	0.001	0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Year 2011	-0.009***	-0.007***	-0.007***	-0.003***	-0.003***	-0.004***	0.044***	0.037***	0.038***	0.020***	0.020***	0.021***	-0.014***	-0.013***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Health status*North dummy	0.021***	0.013***	0.017***	0.009**	0.001	0.007***	-0.002	0.012	0.007	0.010	0.000	0.000	-0.004	-0.009	-0.003
	(0.003)	(0.003)	(0.002)	(0.003)	(0.004)	(0.003)	(0.006)	(0.007)	(0.005)	(0.004)	(0.004)	(0.003)	(0.005)	(0.005)	(0.004)
Health status*South dummy	-0.004*	-0.009***	-0.012***	-0.009***	-0.019***	-0.019***	-0.005***	-0.005***	-0.003***	-0.010***	-0.012***	-0.012***	-0.006***	-0.005***	-0.004***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.004)	(0.003)	(0.000)	(0.001)	(0.000)	(0.003)	(0.004)	(0.003)	(0.000)	(0.001)	(0.000)
No. of obs	125062	108656	108685	125062	108656	108685	122756	106511	106540	125062	108656	108685	125062	108656	108685
LR chi-squared	1854.63	1404.34	1527.59	2771.83	2507.78	2740.58	10442.32	8739.79	8822.67	5478.49	4615.55	4964.11	4638.04	3739.84	3082.86
Probability > Chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note 1. Dependent variables are the share of net wealth invested in risky financial asset in columns 1-3, the share invested in savings for long-term investment in columns 4-6, the share invested in principal residence in columns 7-9, the share invested in non-financial asset in columns 10-12, and the share invested in bank deposits in columns 13-15. Robust standard errors are in parenthesis.

Note 2. "***" indicates that the estimate is statistically significant at the 1 percent significance level, "**" at the 5 percent significance level, and "*" at the 10 percent significance level.

Similar to the analysis in the previous section, this section also examines the differences in the relationship between health and household asset allocation choices depending on health care systems across countries to be comparable with Atella et al. (2012)'s findings. Table 7 shows the results from the panel Tobit analyses including an interaction term between the health variable and an NHS dummy. The coefficient for the interaction term captures the difference in the magnitude of the correlation between health and asset allocation decisions in countries with NHS.

The first three columns show the panel Tobit analysis results on a household's asset allocation choices in risky financial assets. The coefficients for the health status of the household head/spouse are negative and statistically significant, which indicates that households in poor health tend to invest a lower share of their wealth in risky financial assets. However, the coefficient for the interaction with the NHS dummy is not different from zero at

any conventional significance level. Thus, a country's health care system has no influence on the correlation between health and the share of wealth invested in risky financial assets. The next three columns show the panel analysis result on household asset allocation decisions for savings for long-term investment. Again, the coefficients for the health of the household head/spouse are negative and statistically significant, but the coefficient for the interaction term with the NHS dummy is not statistically significant. This result implies that a country's health care system does not significantly affect the magnitude of the correlation between health and the share invested in financial assets. Columns 7-9 and columns 10-12 report the panel Tobit results when the dependent variables are the share of wealth invested in the primary residence and the share of wealth invested in other non-financial assets, respectively. In all six columns, the coefficients for the health status of the household head/spouse are negative and statistically significant. But the coefficient for the interaction term with the NHS dummy is not statistically significant, which indicates that there is no difference between countries with and without NHS in the magnitude of the correlation between health and asset allocation decisions for non-financial assets.

The last three columns of Table 7 report the panel Tobit results on household asset allocation decisions on liquid assets. The coefficients for the health of the household head/spouse are positive and statistically significant, which suggests that households in poor health tend to allocate a larger share of their wealth to liquid assets. The coefficient for the interaction with the NHS dummy is negative and statistically significant, which implies that the magnitude of the positive relationship between poor health and precautionary savings is smaller in countries with a more protective NHS. This implies that a more protective health care system via NHS provides some mediation in allocating wealth to liquid assets when facing an increased risk from a negative health shock.

Table 8 illustrates the regional differences in the correlation between health and the share invested in each type of asset. To explore regional differences in the correlation between health and the share invested in each type of asset, this table reports the panel Tobit results including interaction terms with the regional dummies for North (Denmark and Sweden) and South (Italy and Spain).

Overall, Table 8 also shows a negative correlation between health and the share invested in financial and non-financial assets. In columns 1-12, the coefficients for the health status of the household head/spouse are negative and statistically significant. Table 8 also shows a positive correlation between health and the share allocated to liquid assets. In columns 13-15, the coefficients for the health status of the household head/spouse are positive and statistically significant, which indicates that households in poor health tend to allocate a larger share of wealth to liquid assets. Table 8 also shows a significant regional variation in the magnitudes of the correlation between health and the share invested in each asset category. In all columns, the coefficient for the interaction with the South dummy is negative and statistically significant, which indicates that the magnitude of the negative correlation between health and the share invested in each type of asset is much greater in southern Europe. On the other hand, in columns 1-6, the coefficient for the interaction with the North dummy is positive and statistically significant, which suggests that the magnitude of the negative correlation between health and the share invested in each type of asset is much smaller in northern Europe.

Overall, the estimation results show that household portfolio decisions are negatively correlated with household health conditions. When people are in poor health, they are less likely to invest in each type of asset. Also, households in poor health tend to invest a smaller share of their net wealth in each type of asset. Instead, they tend to maintain a larger share of their assets in bank deposits, a very safe and liquid form of asset. This result implies that households in poor health condition have incentive to reallocate not only their financial assets but also their non-financial assets. They also have a higher incentive to maintain a larger share of their assets safely, but inter-country differences exist. There is no significant difference in the sign of the correlation between health condition and household portfolio choices across countries; however, the magnitude of the correlation varies. In NHS countries and northern European countries, the magnitude of the negative correlation is smaller.

Combined with the results on asset ownership choices, these results imply that the magnitude of the correlation between health and the probability of asset ownership decisions might vary between countries with more or less protective health care systems. However, the magnitude of the correlation between health and asset allocation decisions does not vary significantly regardless of a country's health care system.

5. Conclusion

This paper explored the relationship between health and household portfolio choices in European countries. Although previous studies have examined some aspects of this relationship, this study contributes to the literature in three ways. First, this study tested theoretical predictions for the relationship between health and household portfolio choices using a multi-national data set. Most existing literature has investigated the

relationship using only U.S. data sets. This study contributes to the literature by providing new empirical evidence for how health is associated with household portfolio choices outside the U.S. Second, this study carried out a comprehensive analysis on the correlation between health and households' portfolio choices in many asset classes. In particular, this study investigates how health is associated with both financial and non-financial assets, such as a principal residence or business. By examining portfolio choices in multiple asset categories, this study draws more precise conclusions on the relationship between health and portfolio choices. Finally, this study adopts panel data analysis models to control for unobserved household-specific fixed effects. Using panel data analysis models also allowed me to explore how households respond to changes in health status by changing their portfolio allocations.

The empirical evidence reported in this study suggests a negative correlation between health and household portfolio choices in many European countries. The panel logit analysis results indicate that households in poor health condition have a lower probability of holding risky financial assets, savings for long-term investment, a principal residence, and other non-financial assets. Moreover, the panel Tobit analysis results suggest that households in poor health condition tend to allocate a larger share of their wealth to bank deposits and a lower share in risky financial assets, savings for long-term investment, their principal residence, and other non-financial assets.

Typically, older households are considered to have considerable financial resources. These assets are important for the financial security of elderly households because they are used not only to finance everyday consumption during retirement but also provide households with a safety net against risky events in old age, such as negative health events. However, elderly households are increasingly likely to face more responsibility for managing their portfolios because many governments are shifting their public and private pension schemes from defined benefit to defined contribution plans. In addition, how health affects household wealth could have important implications for capital markets in many countries. The financial assets owned by elderly households present a sizeable share of total household net wealth, and household portfolio choices might have important implications for capital markets. The empirical findings of this study are expected to provide interesting insights to policy makers interested in the well-being of elderly households who are wrestling with the fiscal consequences of aging.

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Notes

Note 1. According to the report, the most commonly reported diseases are arthritis, diabetes, hypertension, and high cholesterol. The same report also shows that the prevalence of health problems increases steeply with age. The probability of having a stroke or cataract is 5 times higher among people older than 80 than among those in their 50s. The probability of high cholesterol or asthma and stomach problems is almost 2 times higher among the oldest people than among individuals in their 50s.

Note 2. Goldman and Maestas (2013) argue that health risk can be considered as background risk because it is not fully insurable as well as being beyond one's control. Negative health shocks expose individuals or households to risk by deteriorating one's health condition as well as by incurring unexpected increases in medical expenditures. While the risk from unexpected medical expenditure can be covered by purchasing health insurance, a health condition itself is not tradable across agents and is beyond one's control. From this point of view, health risk can be considered as an uninsurable background risk.

Note 3. Since the fourth wave of the survey, SHARE categorized various types of financial assets into three groups; bank accounts, risky financial asset including bonds, stocks, and mutual funds, and savings for long-term investment including contractual savings for housing, individual retirement accounts, and whole life insurance. This study follows the same asset categorization.

Note 4. A natural question in this context is whether the cumulative effect when both spouses are ill is different from the sum of the individual effects. To investigate this issue, I augmented each equation with an interaction between the husband's and wife's health variables. It turns out that these interactions are not significant for any of the assets, so that the joint effect when both spouses are in poor health is approximately equal to the sum of the individual spouse's effects.

Note 5. Given that a large fraction of households do not hold a certain type of asset, Ordinary Least Squares (OLS) regression is unsuitable to study the share invested in each asset category. Several theoretical papers have treated non-participation (i.e., zero asset holdings) as part of a household's portfolio choice. In this framework, agents maximize their lifetime utility subject to a budget constraint that includes participation cost. Researchers have used a variety of econometric methods to address this issue. For example, Heaton and Lucas (2000) used OLS estimation after eliminating those sample individuals whose asset holdings fell below a certain level. On the other hand, Bertaut and Starr-McCluer (2000) used Heckman's selectivity bias correction to account for the fact that many of the portfolio shares are zeros. This study followed Poterba and Samwick (1997) and used a Tobit estimator. The empirical results using a Tobit estimator are effectively identical to those using the Heckman correction method. This study reports only the Tobit results.

Note 6. Table 3 reports the fixed effect logit estimates for the health condition of the household head and spouse from the analysis of the relationship between health and the probability of owning four different types of assets using three different health measures. The top panel reports the fixed effect logit analysis on the relationship

between health and the probability of owning risky financial assets. The second and the third panels show the analysis results on the probability of owning savings for long-term investment and a home, respectively. The bottom panel shows the estimates on the probability of owning other non-financial assets. Columns 1-3 show the fixed effect logit estimates using three different health measures—POOR, ACUTE, and CHRONIC—respectively. In other words, Table 3 shows a summary of 12 separate empirical analyses. Appendix Table 2 reports the full estimation results of the 12 separate analyses.

Note 7. In a model with household-specific fixed effects, a simple dummy for NHS countries cannot be included because of the perfect collinearity problem. To examine the potential difference in the relationship between health and the probability of owning an asset between NHS countries and non-NHS countries, this study includes an interaction term between the health variable and a dummy for NHS countries.

Note 8. Table 6 is a summary of 15 pairs of estimates for the health status of household head and spouse from 15 separate panel Tobit analyses on the relationship between health and portfolio decisions on the share invested in five different types of assets using three different health measures.

Note 9. Considering that a person experiences a loss of income and a potential increase in medical expenses when he/she becomes sick, a rising share invested in liquid assets might seem unreasonable. Several explanations have been presented in the previous literature. The first is that an increase in liquid assets is a temporary result of a recipient receiving insurance money or proceeds from home sales. The second explanation is the liquidity effect. Initially, poor health might reduce households' liquid financial assets more than their non-financial assets. However, households in poor health condition might want to reserve more assets in liquid form for a potential increase in medical expenditures. Using data from the U.S., Collie and Milligan (2009) found little evidence to support this liquidity effect with poor health. They found that the share of assets invested in liquid assets increased only in households whose members lost their spouses. The empirical results reported in this paper provide stronger support for their hypothesis.

Appendix Table 9. Health system in Europe

		Austria	Belgium	Denmark	France	Germany	Italy	Netherlands	Spain	Sweden	Switzerland
Health system											
Organizational structure		SHI	SHI	NHS	SHI	SHI	NHS	SHI	NHS	NHS	SHI
Funding of health care system		Dominantly SHI-based	Dominantly SHI-based	General taxation	Dominantly SHI-based	Dominantly SHI-based	General taxation	Dominantly SHI-based	General taxation	General taxation	Dominantly SHI-based
Competition among health insurance funds		No	No	No	No	No	No	Yes	No	No	Yes
Membership base		Occupation / region	Occupation / region	Universal coverage	Occupation / region	Occupation / region	Universal coverage	Occupation / region	Universal coverage	Universal coverage	Occupation / region
Expenditure on health											
Public and private expenditure on health (as % of GDP, 2004)	Public	5.3	6.4	7.1	7.2	8	6.3	5.7	5.4	7.4	n.a.
	Private	2.7	2.5	1.3	2.4	2.8	2.1	3.2	2.1	1.3	n.a.
Total expenditure on health per person (Euro, 2002)		2,220	2,515	2,580	2,736	2,817	2,166	2,643	1,646	2,517	n.a.
Health care resources											
No. of health care providers (per 100,000 people, 2004)	Nurses	587	1,075	967	688	973	296	1,328	367	975	n.a.
	Physicians	332	447	364	333	335	606	314	324	304	n.a.
	Hospital beds	609	582	340	396	627	394	307	296	228	n.a.

*(1) SHI: Social Health Insurance, (2) PHI: predominantly private health insurance, (3) NHS: National Health Service.

Source: Grosse-Tebbe and Figueras (2004).

Appendix Table 10. Health status and households' decision to own an asset: panel logit analysis

	Asset category											
	Risky financial asset			Savings for long-term investment			Principal residence			Non-financial asset		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Poor	Acute	Chronic	Poor	Acute	Chronic	Poor	Acute	Chronic	Poor	Acute	Chronic
Health status : HH head	-0.686**	-0.391*	-0.369*	-0.627***	-0.941***	-0.190	-0.337	1.182	-1.143*	-3.001**	-0.026	-0.743***
	(0.338)	(0.220)	(0.154)	(0.167)	(0.191)	(0.151)	(0.556)	(1.504)	(0.600)	(1.369)	(0.450)	(0.214)
Health status : Spouse	0.016	0.610	-0.063	-0.079	-0.510***	-0.382***	-0.271*	-3.078***	0.064	-0.087	-0.549***	0.095
	(0.095)	(0.149)	(0.100)	(0.062)	(0.131)	(0.092)	(0.147)	(0.636)	(0.545)	(0.085)	(0.093)	(0.139)
Age	2.192***	3.544***	2.811***	-0.799***	-0.192	-0.119	1.221***	7.621**	3.955**	0.727***	0.317***	-4.228***
	(0.676)	(0.804)	(0.813)	(0.194)	(0.634)	(0.623)	(0.133)	(3.261)	(1.868)	(0.211)	(0.069)	(1.233)
Age squared	-0.003***	-0.002***	-0.003***	0.003***	0.003***	0.004***	-0.009***	-0.018***	-0.014***	-0.001**	-0.002***	-0.001*
	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.000)	(0.001)
High school graduate	0.013	-0.335***	-0.021	0.455***	0.360***	0.352***	-0.588***	-1.688***	-1.862***	-0.475***	-0.376***	-0.475***
	(0.092)	(0.112)	(0.098)	(0.082)	(0.090)	(0.090)	(0.185)	(0.374)	(0.343)	(0.116)	(0.093)	(0.125)
College graduate	0.082	0.370**	0.141	0.283**	0.198	0.211*	-0.802***	-1.339***	-1.638***	-0.322*	-0.308**	-0.379**
	(0.124)	(0.152)	(0.134)	(0.112)	(0.122)	(0.122)	(0.228)	(0.422)	(0.418)	(0.167)	(0.124)	(0.183)
Family size	0.271***	0.161**	0.228***	0.170***	0.133*	0.086	0.048	0.209	0.237	0.124*	-0.035	-0.085
	(0.060)	(0.075)	(0.067)	(0.062)	(0.070)	(0.070)	(0.174)	(0.318)	(0.312)	(0.072)	(0.064)	(0.088)
2nd income quartile	0.079	-0.100	-0.065	-0.045	0.061	-0.019	-0.602***	-0.264	-0.050	0.339**	0.570***	0.456***
	(0.102)	(0.124)	(0.113)	(0.090)	(0.104)	(0.103)	(0.223)	(0.348)	(0.344)	(0.132)	(0.116)	(0.149)
3rd income quartile	0.391***	0.264**	0.261**	0.180***	0.317***	0.218**	-0.651***	-0.487	-0.335	0.208*	0.250**	0.133
	(0.095)	(0.117)	(0.105)	(0.085)	(0.098)	(0.099)	(0.213)	(0.349)	(0.346)	(0.125)	(0.113)	(0.143)
4th income quartile	0.412***	0.431***	0.254**	-0.014	0.069	-0.006	-0.848***	-0.620*	-0.411	0.461***	0.217*	0.226
	(0.098)	(0.119)	(0.109)	(0.086)	(0.099)	(0.099)	(0.213)	(0.346)	(0.335)	(0.123)	(0.111)	(0.140)
5th income quartile (highest)	0.637***	0.654***	0.494***	-0.001	0.060	-0.016	-0.858***	-0.720*	-0.806**	0.332**	0.320***	0.264*
	(0.103)	(0.126)	(0.116)	(0.090)	(0.105)	(0.105)	(0.233)	(0.389)	(0.397)	(0.131)	(0.118)	(0.153)
2nd wealth quartile	0.832***	1.465***	0.690***	1.108***	1.074***	1.033***	2.788***	2.594***	2.905***	1.794***	2.035***	2.350***
	(0.122)	(0.159)	(0.136)	(0.104)	(0.123)	(0.122)	(0.199)	(0.273)	(0.289)	(0.204)	(0.183)	(0.280)
3rd wealth quartile	1.160***	1.715***	1.066***	1.715***	1.847***	1.807***	5.425***	4.438***	4.886***	2.668***	3.218***	3.491***
	(0.128)	(0.165)	(0.143)	(0.115)	(0.135)	(0.135)	(0.231)	(0.303)	(0.331)	(0.209)	(0.188)	(0.287)
4th wealth quartile	1.616***	2.234***	1.480***	2.267***	2.338***	2.346***	6.248***	5.439***	5.450***	3.649***	4.404***	4.495***
	(0.132)	(0.171)	(0.148)	(0.120)	(0.142)	(0.142)	(0.249)	(0.334)	(0.340)	(0.212)	(0.191)	(0.291)
5th wealth quartile (highest)	2.199***	2.751***	1.932***	2.794***	2.839***	2.849***	7.970***	7.448***	7.934***	5.209***	5.751***	5.974***
	(0.139)	(0.178)	(0.158)	(0.127)	(0.151)	(0.151)	(0.288)	(0.407)	(0.432)	(0.221)	(0.199)	(0.302)
Year 2006	-3.872***	-6.644***	-5.031***	0.630*	-0.537	-0.708	0.516***	-10.101	-4.175	-1.738***	-0.811***	8.045***
	(1.352)	(1.611)	(1.627)	(0.372)	(1.265)	(1.245)	(0.131)	(6.442)	(3.668)	(0.395)	(0.068)	(2.459)
Year 2011	-12.707***	-23.218***	-17.248***	2.791**	-1.514	-2.400	0.858***	-36.034	-14.295	-3.837***	-0.754***	30.449***
	(4.727)	(5.634)	(5.695)	(1.298)	(4.429)	(4.354)	(0.250)	(22.570)	(12.851)	(1.370)	(0.132)	(8.612)

No. of obs	15303	10584	11892	16839	13216	10844	5322	2255	3762	6251	11468	11483
LR chi-squared	844.3	747.92	557.36	818.71	727.42	536.98	2765.03	1129.53	2028.32	1185.82	2410.41	2444.49
Probability > Chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note. Dependent variables are a dummy variable indicating ownership of risky financial asset in columns 1-3, a dummy for ownership of savings for long-term investment in columns 4-6, a dummy for ownership of principal residence in columns 7-9, and a dummy variable for ownership of non-financial asset in columns 10-12. Robust standard errors are in parenthesis. All the estimates reported in the table are marginal effect.

Note 2. "***" indicates that the estimate is statistically significant at the 1 percent significance level, "**" at the 5 percent significance level, and "*" at the 10 percent significance level.

Appendix Table 11. Health status and household's decision on asset share: panel tobit analysis

	Asset category														
	Risky financial asset			Savings for long-term investment			Principal residence			Non-financial asset			Bank deposits		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	Poor	Acute	Chronic	Poor	Acute	Chronic	Poor	Acute	Chronic	Poor	Acute	Chronic	Poor	Acute	Chronic
Health status: HH head	-0.006***	-0.007***	-0.002***	-0.009*	-0.013**	-0.018***	-0.032***	-0.001***	-0.077***	-0.017***	-0.027***	-0.009*	0.008***	0.010***	0.050***
	(0.004)	(0.005)	(0.003)	(0.005)	(0.006)	(0.004)	(0.008)	(0.011)	(0.007)	(0.005)	(0.007)	(0.005)	(0.006)	(0.008)	(0.006)
Health status: Spouse	-0.006***	-0.002*	-0.001	0.000	0.003*	-0.007***	-0.001	0.005	-0.006***	-0.005***	-0.011***	0.000	0.006***	0.000	0.011***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
Age	0.005***	0.006***	0.006***	-0.019***	-0.019***	-0.019***	0.002	0.003**	0.003**	-0.001	0.000	0.000	-0.025***	-0.026***	-0.027***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age squared	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000	0.000	0.000	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
High school graduate	0.005***	0.004***	0.004***	0.005***	0.005***	0.005***	-0.008***	-0.006***	-0.007***	-0.008***	-0.010***	-0.009***	0.013***	0.012***	0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
College graduate	0.011***	0.009***	0.010***	0.007***	0.007***	0.007***	-0.004	-0.002	-0.003	-0.009***	-0.009***	-0.008***	0.012***	0.011***	0.011***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Family size	-0.005***	-0.004***	-0.005***	-0.004***	-0.002**	-0.002**	0.011***	0.011***	0.011***	0.005***	0.002	0.001	-0.011***	-0.011***	-0.011***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
2nd income quartile	0.005***	0.004***	0.004***	0.000	0.001	0.001	-0.020***	-0.015***	-0.015***	-0.002	-0.005***	-0.005***	0.022***	0.023***	0.022***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
3rd income quartile	0.011***	0.011***	0.011***	0.006***	0.008***	0.008***	-0.024***	-0.017***	-0.016***	-0.010***	-0.014***	-0.014***	0.027***	0.029***	0.029***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
4th income quartile	0.019***	0.018***	0.020***	0.005***	0.007***	0.008***	-0.021***	-0.013***	-0.012***	-0.013***	-0.020***	-0.021***	0.026***	0.030***	0.029***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
5th income	0.024***	0.025***	0.026***	0.003*	0.007***	0.007***	-0.034***	-0.026***	-0.025***	-0.007***	-0.014***	-0.014***	0.033***	0.036***	0.035***

quartile (highest)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
2nd wealth quartile	-0.001	0.003**	0.002	0.015***	0.013***	0.013***	0.161***	0.156***	0.156***	0.031***	0.032***	0.033***	-0.092***	-0.093***	-0.094***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
3rd wealth quartile	-0.008***	-0.001	-0.004**	0.014***	0.013***	0.013***	0.216***	0.196***	0.197***	0.048***	0.052***	0.052***	-0.143***	-0.140***	-0.141***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
4th wealth quartile	-0.002	0.002	0.000	0.016***	0.016***	0.017***	0.165***	0.143***	0.144***	0.075***	0.080***	0.080***	-0.146***	-0.141***	-0.143***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
5th wealth quartile (highest)	0.017***	0.021***	0.018***	0.030***	0.033***	0.034***	0.060***	0.039***	0.039***	0.130***	0.129***	0.130***	-0.139***	-0.131***	-0.132***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Year 2006	-0.005***	-0.004***	-0.004***	0.006**	0.002***	0.003**	0.012***	0.012***	0.011***	-0.005***	-0.006***	-0.005***	0.002	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Year 2011	-0.009***	-0.007***	-0.007***	-0.002	-0.004***	-0.004***	0.044***	0.037***	0.038***	0.020***	0.020***	0.020***	-0.014***	-0.013***	-0.015***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
No. of obs	125062	108656	108685	125062	108656	108685	122756	106511	106540	125062	108656	108685	125062	108656	108685
LR chi-squared	1775.82	1572.62	1803.04	2713.99	1572.62	2698.02	10393.46	8883.32	9007.7	5510.18	4647.8	4662.35	4587.02	3778.06	4113.41
Probability > Chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note. Dependent variables are the share of net wealth invested in risky financial asset in columns 1-3, the share invested in savings for long-term investment in columns 4-6, the share invested in principal residence in columns 7-9, the share invested in non-financial asset in columns 10-12, and the share invested in bank deposits in columns 13-15. Robust standard errors are in parenthesis.

Note 2. "***" indicates that the estimate is statistically significant at the 1 percent significance level, "**" at the 5 percent significance level, and "*" at the 10 percent significance level.

Appendix Table 12. Health status and household's decision to own an asset: panel logit analysis

		Austria	Belgium	Denmark	France	Germany	Italy	Netherlands	Spain	Sweden	Switzerland
Risky financial asset											
Poor	HH head	0.000	-0.033***	-0.048***	-0.034***	-0.103***	-0.024***	-0.048**	0.007	-0.042***	-0.114***
		(0.006)	(0.009)	(0.013)	(0.009)	(0.010)	(0.009)	(0.022)	(0.005)	(0.010)	(0.017)
	Spouse	-0.045***	-0.010	-0.052***	-0.009	0.004	-0.008	-0.133***	-0.010**	-0.031***	-0.027
		(0.007)	(0.009)	(0.013)	(0.009)	(0.010)	(0.009)	(0.036)	(0.005)	(0.009)	(0.016)
Acute	HH head	-0.117***	-0.114***	-0.101**	-0.070**	-0.127***	-0.017	-0.178***	-0.067	-0.068**	-0.042
		(0.038)	(0.038)	(0.047)	(0.032)	(0.040)	(0.016)	(0.037)	(0.036)	(0.033)	(0.046)
	Spouse	0.059	0.022	0.019	0.063	0.039	-0.140***	0.052	0.036	-0.018	-0.412***
		(0.073)	(0.029)	(0.036)	(0.043)	(0.034)	(0.027)	(0.053)	(0.035)	(0.031)	(0.126)
Chronic	HH head	-0.003	0.017	-0.004	0.049	-0.007	0.036	-0.033***	0.001	-0.004	0.004
		(0.005)	(0.033)	(0.011)	(0.042)	(0.011)	(0.028)	(0.009)	(0.005)	(0.008)	(0.058)

	Spouse	-0.001	-0.094***	-0.017	-0.141***	-0.010	0.012	0.006	0.000	0.013	0.075
		(0.005)	(0.032)	(0.011)	(0.047)	(0.011)	(0.015)	(0.009)	(0.005)	(0.008)	(0.053)
Savings for long-term investment											
Poor	HH head	-0.051***	-0.029	-0.066***	-0.042***	-0.072**	-0.012**	0.095***	-0.015**	-0.031***	0.024
		(0.011)	(0.043)	(0.015)	(0.009)	(0.032)	(0.005)	(0.011)	(0.007)	(0.012)	(0.019)
	Spouse	0.012	-0.110***	-0.008	-0.014*	0.002	-0.016***	0.007	-0.024***	0.012	0.011
		(0.011)	(0.033)	(0.015)	(0.008)	(0.028)	(0.005)	(0.010)	(0.006)	(0.011)	(0.017)
Acute	HH head	-0.195***	-0.005	-0.077***	-0.078*	-0.003	0.030	0.041	-0.023**	-0.026**	-0.130**
		(0.076)	(0.012)	(0.017)	(0.040)	(0.015)	(0.025)	(0.025)	(0.009)	(0.013)	(0.059)
	Spouse	-0.062	-0.020*	-0.084***	-0.016	-0.047***	-0.051**	-0.016	-0.034***	-0.051***	-0.260***
		(0.087)	(0.012)	(0.018)	(0.043)	(0.014)	(0.021)	(0.032)	(0.008)	(0.013)	(0.046)
Chronic	HH head	0.073	-0.024	-0.093***	-0.015*	-0.110***	-0.017***	0.095***	0.026	0.002	0.024
		(0.061)	(0.023)	(0.029)	(0.008)	(0.029)	(0.005)	(0.010)	(0.020)	(0.010)	(0.052)
	Spouse	0.048	-0.004	-0.054**	-0.009	-0.041	0.007	0.070***	-0.018	-0.033***	0.026
		(0.049)	(0.022)	(0.028)	(0.008)	(0.029)	(0.005)	(0.010)	(0.020)	(0.011)	(0.034)
Principal residence											
Poor	HH head	-0.001	-0.003	-0.001	0.000	0.048	-0.002	-0.030***	-0.029***	0.009	-0.080
		(0.014)	(0.004)	(0.007)	(0.006)	(0.059)	(0.004)	(0.011)	(0.009)	(0.008)	(0.086)
	Spouse	-0.008	-0.009**	-0.018**	0.004	0.056	-0.009**	-0.032***	-0.001	-0.005	-0.438***
		(0.014)	(0.004)	(0.008)	(0.006)	(0.055)	(0.004)	(0.010)	(0.008)	(0.008)	(0.126)
Acute	HH head	-0.020	-0.008	-0.001	-0.006	-0.040***	0.008	0.018	-0.017	0.000	0.024
		(0.018)	(0.013)	(0.008)	(0.021)	(0.016)	(0.005)	(0.012)	(0.015)	(0.032)	(0.016)
	Spouse	-0.035**	-0.029**	-0.013	-0.025	-0.025*	-0.016***	-0.023*	0.004	-0.068*	-0.003
		(0.017)	(0.016)	(0.009)	(0.023)	(0.015)	(0.006)	(0.013)	(0.003)	(0.043)	(0.018)
Chronic	HH head	-0.037***	-0.008**	0.009	-0.016***	-0.056***	-0.003	0.033	0.003	-0.008	-0.007
		(0.013)	(0.004)	(0.006)	(0.005)	(0.012)	(0.004)	(0.039)	(0.002)	(0.015)	(0.013)
	Spouse	-0.036***	-0.003	-0.030***	-0.006	0.016	0.011**	-0.059	-0.002	0.013	0.004
		(0.013)	(0.004)	(0.006)	(0.006)	(0.012)	(0.004)	(0.042)	(0.002)	(0.008)	(0.012)
Non-financial asset											
Poor	HH head	-0.006	-0.018**	-0.023	-0.002	-0.006	-0.006	0.006	-0.016*	-0.013	-0.175***
		(0.008)	(0.008)	(0.014)	(0.009)	(0.007)	(0.010)	(0.006)	(0.009)	(0.014)	(0.048)
	Spouse	-0.024***	-0.017**	-0.016	-0.023***	-0.026***	-0.003	-0.021***	0.009	-0.056***	0.094
		(0.008)	(0.007)	(0.014)	(0.009)	(0.007)	(0.009)	(0.005)	(0.009)	(0.014)	(0.097)
Acute	HH head	0.016	-0.026***	0.059	-0.125**	-0.024***	0.007	-0.006	0.126	0.009	-0.035
		(0.010)	(0.008)	(0.066)	(0.052)	(0.008)	(0.014)	(0.006)	(0.095)	(0.015)	(0.044)
	Spouse	-0.016	0.015	-0.005	-0.088	-0.024***	0.006	-0.029***	0.046	-0.005	-0.073

		(0.010)	(0.009)	(0.054)	(0.068)	(0.008)	(0.013)	(0.005)	(0.083)	(0.015)	(0.056)
Chronic	HH head	-0.006	-0.022***	-0.050***	-0.002	-0.028	-0.005	-0.003	-0.017	-0.025**	-0.007
		(0.008)	(0.007)	(0.011)	(0.008)	(0.017)	(0.043)	(0.005)	(0.037)	(0.012)	(0.012)
	Spouse	-0.012	-0.003	-0.001	-0.010	0.016	-0.103**	-0.012***	0.055	-0.005	-0.059***
		(0.007)	(0.007)	(0.011)	(0.008)	(0.015)	(0.043)	(0.004)	(0.039)	(0.012)	(0.012)

Note 1. Dependent variables are a dummy variable indicating household's ownership of risky financial asset in the top panel, a dummy for ownership of savings for long-term investment in the second panel, a dummy for ownership of principal residence in the third panel, and a dummy for ownership of non-financial asset in the bottom panel. For each asset category, three different health measures-POOR, ACUTE, and CHRONIC-are used. This table reports a total of 120 pairs of coefficients for health condition of household head/spouse from 12 separate specifications for each of 10 participating countries. All the models include control variables listed in the data section. All the reported estimates are marginal effect. Robust standard errors are in parenthesis.

Note 2. "***" indicates that the estimate is statistically significant at the 1 percent significance level, "**" at the 5 percent significance level, and "*" at the 10 percent significance level.

Appendix Table 13. Health status and household decision on asset share: panel tobit analysis

		Austria	Belgium	Denmark	France	Germany	Italy	Netherlands	Spain	Sweden	Switzerland
						Risky financial asset					
Poor	HH head	0.007	-0.001	-0.019***	-0.015 ***	-0.061 ***	-0.009	-0.014 *	0.014	-0.023 ***	-0.064 ***
		(0.012)	(0.006)	(0.007)	(0.004)	(0.006)	(0.007)	(0.008)	(0.009)	(0.005)	(0.013)
	Spouse	-0.094***	-0.024***	0.003	-0.009**	-0.009	-0.017**	0.004	-0.044***	-0.003	-0.010
		(0.011)	(0.005)	(0.007)	(0.004)	(0.006)	(0.007)	(0.008)	(0.009)	(0.006)	(0.011)
Acute	HH head	-0.246***	0.026	-0.054***	-0.011***	-0.071**	0.020	-0.047***	-0.105***	0.007	0.070
		(0.072)	(0.017)	(0.016)	(0.004)	(0.033)	(0.020)	(0.010)	(0.015)	(0.006)	(0.067)
	Spouse	-0.002	-0.025***	-0.015*	0.007	0.004	-0.032 ***	0.003	-0.014 ***	-0.006	-0.133 ***
		(0.084)	(0.009)	(0.009)	(0.004)	(0.011)	(0.012)	(0.010)	(0.005)	(0.006)	(0.039)
Chronic	HH head	-0.058 *	0.013	-0.001	-0.046 ***	-0.004	-0.023 ***	-0.021 ***	-0.010	-0.035 ***	0.029
		(0.031)	(0.014)	(0.005)	(0.009)	(0.006)	(0.007)	(0.007)	(0.010)	(0.011)	(0.038)
	Spouse	-0.023	-0.026 *	0.005	0.010	0.001	-0.001	0.010	0.003	-0.032 ***	0.041
		(0.020)	(0.013)	(0.005)	(0.010)	(0.006)	(0.007)	(0.007)	(0.010)	(0.011)	(0.030)
						Savings for long-term investment					
Poor	HH head	-0.020	0.003	-0.044 ***	-0.028 ***	-0.059 ***	-0.001	0.017	-0.037 ***	-0.024 ***	0.073
		(0.026)	(0.016)	(0.010)	(0.007)	(0.016)	(0.012)	(0.024)	(0.008)	(0.007)	(0.053)
	Spouse	0.003	-0.030 **	0.006	0.001	0.008	-0.033 ***	0.006	-0.029 ***	-0.011	-0.043***
		(0.027)	(0.013)	(0.010)	(0.014)	(0.009)	(0.011)	(0.017)	(0.008)	(0.007)	(0.016)
Acute	HH head	-0.010 **	-0.006	-0.028 **	-0.086 ***	-0.055 *	0.041	0.028	-0.023	-0.069 ***	0.082
		(0.004)	(0.005)	(0.011)	(0.023)	(0.029)	(0.025)	(0.017)	(0.015)	(0.015)	(0.053)
	Spouse	-0.109 ***	0.006	-0.042 ***	-0.073 **	-0.097 ***	0.065	0.056	-0.040 ***	-0.044 *	-0.135 **
		(0.005)	(0.006)	(0.012)	(0.033)	(0.028)	(0.066)	(0.042)	(0.013)	(0.023)	(0.056)
Chronic	HH head	-0.019	0.008	-0.063 ***	*0.007 ***	-0.057 ***	-0.127	0.005	0.014	0.016	0.054
		(0.035)	(0.010)	(0.017)	(0.004)	(0.020)	(0.036)	(0.020)	(0.009)	(0.014)	(0.036)
	Spouse	0.037	0.004	0.005	0.007	0.030	-0.112 ***	0.025	-0.030 ***	-0.023 *	-0.015
		(0.030)	(0.009)	(0.018)	(0.004)	(0.021)	(0.035)	(0.022)	(0.009)	(0.014)	(0.018)

					Principal residence						
Poor	HH head	0.012	-0.018	0.035	0.023	-0.048*	0.007	-0.169***	0.007	0.034	0.043
		(0.013)	(0.026)	(0.032)	(0.032)	(0.027)	(0.021)	(0.044)	(0.006)	(0.031)	(0.133)
	Spouse	-0.016	0.011	-0.067*	0.024	-0.011	0.011	-0.097*	-0.027***	-0.065**	-0.068***
		(0.013)	(0.021)	(0.037)	(0.024)	(0.034)	(0.018)	(0.055)	(0.006)	(0.033)	(0.148)
Acute	HH head	-0.021	-0.048***	-0.017	-0.014	0.012	0.014	0.022	0.004	0.005	0.002
		(0.016)	(0.019)	(0.015)	(0.009)	(0.013)	(0.009)	(0.018)	(0.009)	(0.035)	(0.018)
	Spouse	-0.013	-0.081***	0.007	0.007	-0.015	0.000	-0.008	-0.061***	0.054	-0.042***
		(0.016)	(0.018)	(0.016)	(0.009)	(0.012)	(0.009)	(0.017)	(0.008)	(0.037)	(0.023)
Chronic	HH head	-0.039***	-0.003	0.037	-0.013*	-0.041*	0.008	0.001	0.030	-0.025	0.048
		(0.012)	(0.006)	(0.040)	(0.007)	(0.024)	(0.007)	(0.010)	(0.023)	(0.022)	(0.031)
	Spouse	-0.052***	0.001***	-0.093	0.004	0.015	-0.005	-0.048***	-0.043**	0.013	0.050
		(0.012)	(0.006)	(0.033)	(0.007)	(0.011)	(0.007)	(0.009)	(0.022)	(0.011)	(0.074)
					Non-financial asset						
Poor	HH head	0.006	-0.011	0.011	0.017	0.015	-0.014	0.028	-0.027**	-0.010	0.157
		(0.025)	(0.012)	(0.016)	(0.012)	(0.015)	(0.012)	(0.021)	(0.012)	(0.012)	(0.099)
	Spouse	-0.040*	-0.020*	-0.003	-0.047***	-0.036**	-0.009	-0.079***	0.002	-0.052***	-0.161**
		(0.024)	(0.011)	(0.016)	(0.012)	(0.015)	(0.011)	(0.021)	(0.012)	(0.012)	(0.071)
Acute	HH head	0.013	-0.137***	-0.036	-0.103*	-0.042*	-0.001	-0.002	-0.028***	0.007	-0.160***
		(0.028)	(0.035)	(0.078)	(0.060)	(0.022)	(0.018)	(0.026)	(0.008)	(0.012)	(0.061)
	Spouse	-0.043	0.001	0.059	-0.125*	-0.034	0.012	-0.127***	-0.025***	-0.019	0.021
		(0.029)	(0.018)	(0.063)	(0.073)	(0.022)	(0.016)	(0.028)	(0.008)	(0.012)	(0.042)
Chronic	HH head	0.001	-0.029***	-0.022*	-0.010	-0.049	-0.005	-0.007	-0.003	-0.020	-0.016
		(0.022)	(0.010)	(0.012)	(0.041)	(0.040)	(0.033)	(0.018)	(0.013)	(0.022)	(0.016)
	Spouse	-0.037*	0.010	0.007	-0.104**	-0.032*	0.022	-0.053***	0.001	-0.026**	-0.080***
		(0.021)	(0.010)	(0.012)	(0.043)	(0.019)	(0.029)	(0.018)	(0.014)	(0.011)	(0.016)
					Bank deposits						
Poor	HH head	-0.004	-0.013	0.021	-0.012	0.009*	0.000	0.027***	-0.003	0.028**	-0.030
		(0.006)	(0.008)	(0.018)	(0.015)	(0.005)	(0.003)	(0.006)	(0.014)	(0.013)	(0.034)
	Spouse	0.022***	0.008	0.018**	0.026***	0.013**	0.002	0.002	-0.005	0.006	0.006
		(0.006)	(0.006)	(0.008)	(0.006)	(0.005)	(0.003)	(0.005)	(0.014)	(0.007)	(0.013)
Acute	HH head	-0.036	-0.001	-0.023***	-0.062***	-0.012*	0.000	-0.028*	-0.026***	-0.028***	-0.007
		(0.038)	(0.004)	(0.007)	(0.010)	(0.007)	(0.004)	(0.017)	(0.004)	(0.006)	(0.029)
	Spouse	-0.185***	-0.006	-0.021***	0.014	0.002	0.006	0.016	-0.010**	-0.017***	-0.041**
		(0.035)	(0.005)	(0.008)	(0.026)	(0.007)	(0.004)	(0.020)	(0.004)	(0.006)	(0.018)
Chronic	HH head	0.021***	0.004	0.017	0.010***	0.023***	-0.002	0.002	-0.003	0.006	0.005
		(0.006)	(0.003)	(0.019)	(0.004)	(0.005)	(0.003)	(0.005)	(0.010)	(0.013)	(0.007)
	Spouse	0.024***	-0.003	0.019	0.003	0.021***	0.001	0.005	0.028***	-0.004	0.014**
		(0.006)	(0.003)	(0.015)	(0.004)	(0.005)	(0.003)	(0.005)	(0.010)	(0.007)	(0.007)

Note 1. Dependent variables are the share of net wealth invested in risky financial asset in the top panel, the share invested in savings for long-term investment in the second panel, the share invested in principal residence in the third panel, the share invested in non-financial asset in the forth panel, and the share invested in bank deposits in the bottom panel. For each asset category, three different health measures are used. This table reports a total of 150 pairs of coefficients for health condition of household head and spouse from 15 separate specifications

for each of 10 participating countries. All the models include control variables listed in the data section. Robust standard errors are in parenthesis.

Note 2. "***" indicates that the estimate is statistically significant at the 1 percent significance level, "**" at the 5 percent significance level, and "*" at the 10 percent significance level.