

**Title:**

Dispositional optimism and stock investments

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## Abstract

This paper analyzes the relationship between dispositional optimism and stock investments, controlling for cognitive skills and personality traits such as trust, social interactions and risk aversion. We use data from the Survey of Health, Ageing and Retirement in Europe (SHARE) on investors aged 50+ in twelve European countries. Our results show that dispositional optimism and personality matter for financial decisions. Optimism is positively and significantly related to both the ownership of stocks and the share of gross financial wealth invested in these assets and its role is especially relevant for risk tolerant investors and investors with little trust in others.

JEL classification: D14; G02; G11.

Keywords: Dispositional Optimism; Household finance; Saving behavior.

# 1 Introduction

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3 Population ageing and increasing longevity imply that individuals must make careful  
4 and skillful use of financial resources, which should support their consumption over a  
5 much longer retirement period than a few decades ago. Therefore, understanding how  
6 older individuals make their financial and investment decision is a question of central  
7 importance for economists and policy makers. Although there is a growing literature  
8 showing that individual investment decisions are affected by behavioral and personality  
9 traits, only few empirical studies analyze the role that these factors play in the portfolio  
10 decisions of older individuals.

11  
12 In this paper we use data from the second wave of the Survey of Health, Ageing and Re-  
13 tirement in Europe (SHARE) to investigate how portfolio decisions of older Europeans  
14 are affected by dispositional optimism, defined as having generalized positive expecta-  
15 tions regarding future events (Scheier and Carver, 1985). From an empirical point of  
16 view, one of the key issues is how to measure dispositional optimism in the popula-  
17 tion. Puri and Robinson (2007) draw data from the US Survey of Consumer Finances to  
18 develop a novel indicator of dispositional optimism based on the difference between self-  
19 reported life-expectancy and that implied by actuarial life-tables. They use this index  
20 of life-expectancy miscalibration to investigate the relationship between optimism and a  
21 wide range of economic outcomes, including investment behavior. They find that opti-  
22 mism is significantly and positively related to the participation in the equity market and  
23 the amount of wealth invested in stocks, even controlling for health and socio-economic  
24 status.

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26 We study the relationship between optimism and financial behavior for a sample of older  
27 individuals (aged 50+) living in twelve European countries by focusing both on the own-  
28 ership and the share of financial wealth invested in stocks. We use the same approach  
29 as in Puri and Robinson (2007) to measure optimism but we extend their contribution  
30 along three important dimensions. First, we explicitly control for cognitive skills. In-  
31 dividuals endowed with higher cognitive skills might be better able to estimate their

1 survival probability. Hence, some of the sample variability in the life-expectancy mis-  
2 calibration index might be due to heterogeneity in cognitive functioning rather than to  
3 expectations regarding the future. At the same time, cognitive skills are also related to  
4 financial market participation. Christelis et al. (2010) find that cognitive abilities have  
5 a positive and significant effect on the probability of investing in information-intensive  
6 assets, such as stocks, which have a higher degree of sophistication and whose proper use  
7 requires higher abilities to process contextual information related to financial markets.  
8 Therefore, not controlling for cognitive functioning might bias the results. Second, we  
9 take advantage of the richness of the SHARE data to control for three additional person-  
10 ality traits that have been proven to be relevant predictors of financial behavior: trust,  
11 social interactions, and risk aversion (see Campbell 2006, Guiso et al. 2008 and Hong  
12 et al. 2004). As these factors are also related to the optimism of investors, our approach  
13 allows us to disentangle the role played in shaping financial decisions by having positive  
14 expectations about the future (dispositional optimism) from those played by the trust of  
15 investors about the reliability and the fairness of financial markets, their propensity to  
16 establish social interactions with other people and their willingness to take financial risks.  
17 Our findings show that taking into account these additional personality traits substan-  
18 tially decreases but does not nullify the effect of optimism on stock market participation.  
19 While on average optimism seems to encourage risk taking behavior, risk aversion, low  
20 levels of trust and not having social interaction discourage it. Third, we also analyze the  
21 interplay between dispositional optimism and the other personality traits in explaining  
22 financial behavior. We find that optimism matters especially for risk tolerant investors,  
23 while risk averse individuals are in general unlikely to invest in stocks independently  
24 of whether they are very pessimistic or very optimistic. In addition, having positive  
25 expectations about the future encourages stock investments of individuals with no or  
26 little trust in other people. The effect of optimism does not vary instead with the level  
27 of social interaction. Overall, our results suggest that the behavioural characteristics of  
28 individuals, such as personality and preferences, play an important role in explaining  
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1 financial decisions. The rest of the paper is organized as follows. Section 2 presents  
2 the data and the definition of the main variables of interest in our analysis. Section 3  
3 explains the empirical strategy adopted and our findings. Finally, Section 4 concludes.  
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## 7 8 **2 Data** 9

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11 In this paper we use data from the second wave of the Survey of Health, Ageing and  
12 Retirement in Europe (SHARE)<sup>1</sup>. SHARE collects extensive information on current de-  
13 mographics, health, employment, income, assets, social activities and expectations of  
14 individuals aged 50 and over living in several European countries, ranging from Scandi-  
15 navia to the Mediterranean. Our sample includes 17,450 households. For each house-  
16 hold we selected the financial respondent, who is the person in charge of answering the  
17 financial and asset questions on behalf of the household. Descriptive statistics of all  
18 the variables included in our empirical analysis are presented in Table 1 for the pooled  
19 sample and in Table 2 separately by country.  
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31 Our empirical analysis crucially depends on the availability of complete information  
32 on the economic resources available to households. As common in household surveys,  
33 information on wealth is often missing (in SHARE information on wealth is incomplete  
34 for about 47% of the sample). Excluding observations with missing values from the  
35 analysis would reduce the sample size and, most importantly, might introduce sample  
36 selectivity issues, leading to biased results. To deal with this issue, SHARE uses the  
37 method of multiple imputation. For each missing observation, SHARE provides 5 im-  
38 puted values in order to reflect the stochastic nature of the imputation process. This  
39 approach is then aimed at providing (some points of) the distribution of the missing  
40 value instead of deriving a single prediction for it (see Christelis, 2008, 2011, for details  
41 about the imputation procedure). In our empirical analysis we take into account the  
42 variability associated with the imputation process by following Little and Rubin (1987),  
43 who explicitly control for the variance of the estimates both within and between each  
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58 <sup>1</sup>See Börsch-Supan et al. (2013, 2008, 2005).  
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set of imputation.

[TABLE 1 and 2 ABOUT HERE]

## 2.1 Financial market participation

We analyze financial market participation by looking at the total ownership of stocks, which includes not only direct ownership but also ownership through mutual funds and individual retirement accounts.<sup>2</sup> In our sample, 31% of households hold stocks either directly or indirectly through retirement accounts and mutual funds. Table 2 shows that stock ownership is relatively high in Sweden, Denmark, Belgium and Switzerland, where financial markets and institutions are more developed. In Austria, the Southern countries (Italy, Spain and Portugal) and Eastern Europe, financial market participation is less widespread, although in Czech Republic stock ownership is relatively common, probably due to individual retirement accounts. Poland is the country with the lowest stock market participation (2.9%) but also the one with the lowest average level of income and financial wealth.

We also compute the share of (gross) financial wealth invested in stocks. Gross financial wealth is defined as the amount of wealth invested in bank accounts, government and corporate bonds, stocks, mutual funds, individual retirement accounts, contractual savings for housing and life insurance policies. Our measure for the share is then equal to the amount of wealth invested in stocks divided by gross financial wealth.<sup>3</sup>

If we restrict our attention to the households who own stocks (directly or indirectly via mutual funds or individual retirement accounts), the average share of their gross financial wealth invested in these assets is 30%. If we consider all the households in the sample, the average share falls to 11%.

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<sup>2</sup>In SHARE respondents who declare to have money in mutual funds or managed investment accounts are asked whether these are mostly stocks, mostly bonds or half stocks and half bonds.

<sup>3</sup>The share of gross financial wealth invested in stocks and bonds cannot be defined for households whose gross financial wealth is 0. This leads to the exclusion from the sample of about 2,100 households.

## 2.2 Cognitive skills

The SHARE questionnaire includes an entire section devoted to the measurement of cognitive abilities. In line with Christelis et al. (2010), we use three indicators that are likely to influence financial investments: numeracy, planning and executive function (fluency) and memory (recall). The definition of the cognitive ability indicators used in our analysis is carefully explained by Christelis et al. (2010).

The indicator of numeracy is based on the answers to four questions in which respondents have to perform simple calculations, such as finding the 10 percent of a number. The numeracy indicator ranges from 1 to 5. The sample average is 3.48: it is the lowest in Spain and the highest in Switzerland. For fluency, the respondent has one minute to name as many different animals as she can think of. The fluency score is equal to the total number of animals mentioned. Any member of the animal kingdom, real or mythical is scored correct, except repetitions and proper nouns. On average, our respondents named 20 animals. Finally, memory is measured through a recall test. The interviewer reads a list of 10 words and the respondent has up to one minute to tell as many words as she can recall.<sup>4</sup> On average, respondents were able to recall 4 words.

## 2.3 Trust

To make sure that our measure of optimism is not just a proxy for trust, we also include a control for trust in our regressions. More optimistic individuals might be more likely to trust other people since they have more positive expectations about other people's behavior and respect of social norms. At the same time, Guiso et al. (2008) have provided evidence of a strong association between trust and financial market participation. To measure trust we use a question asked in the second wave of SHARE:

*Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?*

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<sup>4</sup>The list includes the following words: butter, arm, letter, queen, tickets, grass, corner, stone, book, stick.

1 The wording of the question is the same as in the World Values Survey questionnaire and  
2 as used by Guiso et al. (2008). The only difference is that in SHARE respondents have  
3 to answer on a scale that goes from 0 to 10, where 0 means you can't be too careful and  
4 10 means that most people can be trusted, while in the World Values Survey the answer  
5 can only be yes or no. The average level of trust of SHARE respondents is 5.71: it is  
6 particularly high in Sweden and Denmark, while it is low in France and Italy . About  
7 6% of respondents declare a level of trust equal to 0 and a further 6% selects the highest  
8 level on the trust scale.  
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## 10 **2.4 Social interaction**

11 The SHARE questionnaire asks respondents whether they have been involved in social  
12 activities in the last months. The question text is reported below.  
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14 *Have you done any of these activities in the last month?*

15 The available answering categories are: 1. Done voluntary or charity work; 2. Cared  
16 for a sick or disabled adult; 3. Provided help to friends or neighbors; 4. Attended an  
17 educational or training course; 5. Gone to a sport, social or other kind of club; 6. Taken  
18 part in activities of a religious organization (church, synagogue, mosque etc.); 7. Taken  
19 part in a political or community-related organization. Respondents can select more than  
20 one activity. We define a social interaction indicator which is equal to 1 if the respondent  
21 was involved in at least one of these activities in the last month, and 0 otherwise. Overall,  
22 almost 51% of respondents in our sample have done at least one of these activities in  
23 the last month. The most selected activities are voluntary or charity work (15%), the  
24 provision of help to friends or neighbors (20%) and the attendance of a club (23%).  
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## 26 **2.5 Risk aversion**

27 As an indicator for risk aversion, we use the self-reported answer to a question on portfolio  
28 allocation between riskless and risky assets. The question reads as follows:  
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*Which of the following statements comes closest to the amount of financial risk that you are willing to take when you save or make investments?*

The available options are: 1. Take substantial financial risks expecting to earn substantial returns; 2. Take above average financial risks expecting to earn above average returns; 3. Take average financial risks expecting to earn average returns; 4. Not willing to take any financial risks. As about 75% percent of the answers are concentrated in option 4, the variable that we include in the specification is a dummy equal to 1 if the individual declares not to be willing to take any financial risk.

## 2.6 Dispositional optimism

Following Puri and Robinson (2007), we measure dispositional optimism as the difference between self-assessed and actuarial survival probabilities. We elicit respondents' self-assessed survival probabilities from the question:

*What are the chances that you will live to be age  $T$  or more?*

The target age  $T$  depends on the age of the respondent at the time of the interview. It is equal to 75 for respondents aged 50-65, 80 for those aged 66-70, 85 for those aged 71-75, 90 for those aged 76-80, 95 for those aged 81-85, 100 for those aged 86-95, 105 for those aged 96-100, and 110 for those aged 101-105. We then follow Peracchi and Perotti (2010) and use the information available in the Human Mortality Database (see <http://www.mortality.org>) by gender, country and year of birth to compute actuarial probabilities of survival to the same target age  $T$ . Our measure of dispositional optimism is equal to the difference between the self-assessed probability of survival and that obtained from the actuarial life tables,

$$\text{Optimism}_i = \text{Subjective\_survival}_i - \text{Actuarial\_survival}_i$$

Figure 1 reports the cumulative distribution function of the dispositional optimism indicator in our sample. The indicator has been standardized to lie between 0 and 1. This

1 standardization is needed to define clear benchmarks to indicate the most pessimistic and  
2 most optimistic individuals. Higher levels of optimism correspond to higher levels of this  
3 indicator.  
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6 The figure shows that in our sample the first quartile of the dispositional optimism  
7 indicator is 0.37, the median is 0.48 and the third quartile is 0.58.  
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10 [FIGURE 1 ABOUT HERE]  
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13 Figure 2 provides *prima facie* evidence of a positive correlation between disposi-  
14 tional optimism and stock market participation, even if at a descriptive and aggregate  
15 levels. On average, in countries where individuals tend to be more optimistic, stock mar-  
16 ket participation is higher. Optimism and stock ownership are the highest in Denmark  
17 and the lowest in Eastern Europe.  
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24 [FIGURE 2 ABOUT HERE]  
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28 The left panel of Figure 3 shows that the correlation between our indicators of  
29 dispositional optimism and risk aversion is negative. At a pure descriptive level, indi-  
30 viduals who are not willing to take any financial risks are also more pessimistic about  
31 their probability of survival. This suggests that the unwillingness to take financial risks  
32 is correlated with a more general pessimistic disposition towards evaluating uncertain  
33 events. Vice versa, the relationships between trust and optimism and social interaction  
34 and optimism are positive and the R-squared values of the regressions interpolating the  
35 points in the graph reveal a much stronger link than in the risk aversion case. Cognitive  
36 skills are positively correlated with optimism, especially when we consider the recall test.  
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49 [FIGURE 3 ABOUT HERE]  
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52 Differences between subjective and actuarial survival probabilities might be un-  
53 related with optimism but just be due to the fact that individuals have more accurate  
54 information about their longevity than demographers (Perozek, 2008). For instance, indi-  
55 viduals might be better informed about their health status, life-style, economic resources  
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1 devoted to health care and the presence of genetic diseases among family members. For  
2 this reason, Puri and Robinson (2007) conduct an extensive series of tests to validate  
3 life expectancy miscalibration as a measure of optimism, showing that it correlates both  
4 with positive expectations about future economic conditions and with psychometric tests  
5 of optimism. In what follows, we also carry out several tests to validate our measure of  
6 dispositional optimism within our sample by comparing it with other outcomes arguably  
7 related to a positive attitude towards life. In the SHARE data, we have information on  
8 respondents' expectations about their future standards of living. As long as overestimat-  
9 ing their own probability of survival reflects higher levels of dispositional optimism, we  
10 expect a positive correlation between the two, *ceteris paribus*.

21 [TABLE 3 ABOUT HERE]

25 SHARE respondents are asked to assess the chances (on a scale from 0 to 100) that  
26 in the next five years their standard of living will improve. The sample average is around  
27 27. We estimate an OLS regression of this outcome on our measure of dispositional op-  
28 timism and the whole set of covariates that will be used in our main analysis. They  
29 include country of residence, gender, a second order polynomial of age, household size,  
30 number of children, education, employment status, household income, wealth, health,  
31 parental longevity, cognitive abilities indicators, risk preferences and trust. The results  
32 are shown in column 1 of Table 3. The coefficient on the dispositional optimism indica-  
33 tor is positive and statistically significant (p-value=0.000). This result suggests a strong  
34 correlation between these two indicators in the expected direction. Everything else con-  
35 stant, the higher the dispositional optimism, the higher the probability that individuals  
36 think that their standard of living will improve in the future. Moving from extreme  
37 pessimism to extreme optimism improves the chances of living better by 38 percentage  
38 points. A similar question asks respondents to rate the chances that in the next five  
39 years their standard of living will get worse. On average our respondents believe that  
40 the chances that things will get worse in the future amount to 38%. Consistently with  
41 our previous results, the OLS regression of this outcome on the dispositional optimism

1 indicator shows that the coefficient is negative and statistically significant (see column  
2 of Table 3). Individuals are less prone to think that their standard of living will get  
3 worse if they are more optimistic. On average, the self-assessed probability of experienc-  
4 ing a deterioration of the standard of living for extremely pessimistic individuals is 16  
5 percentage points higher than the one of their extremely optimistic counterparts.  
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10 We also look at the correlation between dispositional optimism and self-assessed  
11 health. In our sample 65% of respondents declare that their health is good, very good  
12 or excellent, as opposed to fair or poor. Crucially, our specification controls for more  
13 objective health indicators based on limitations with (instrumental) activities of daily  
14 living, number of chronic diseases and number of symptoms of poor health. In particular,  
15 we define a dummy variable, *adl*, which is equal to 1 if the respondent has at least one  
16 limitation with activities of daily living, which include dressing (including putting on  
17 shoes and socks), walking across a room, bathing or showering, eating (such as cutting  
18 up your food), getting in and out of bed, using the toilet (including getting up or down).  
19 The dummy *iadl* is equal to 1 if the individual reports at least one limitation with  
20 instrumental activities of daily living, namely using a map to figure out how to get around  
21 in a strange place, preparing a hot meal, shopping for groceries, making telephone calls,  
22 taking medications, doing work around the house or garden, managing money (such as  
23 paying bills and keeping track of expenses). We also control for the number of chronic  
24 diseases which have been diagnosed by a doctor<sup>5</sup> and for the number of symptoms of  
25 poor health.<sup>6</sup> Our hypothesis is that, conditional on objective health indicators and  
26 socioeconomic status, higher dispositional optimism makes individuals more likely to rate  
27 their health status as good or even better. Our results show that the correlation between  
28 our indicator of optimism and self-reported health is actually positive and significant  
29 (see column 3). The magnitude of the coefficient shows that everything else constant,  
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52 <sup>5</sup>The list includes high blood pressure, high cholesterol, heart attack, stroke, diabetes or high blood  
53 sugar, asthma, arthritis, osteoporosis, cancer, ulcer, Parkinson, cataracts, fractures and dementia.

54 <sup>6</sup>Symptoms of poor health are pain in back or joints, heart trouble, breathlessness, persistent cough,  
55 swollen legs, sleeping problems, falling down or fear of following down, dizziness or faints, stomach or  
56 intestine problems, incontinence and fatigue.  
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1 extremely optimistic individuals are 34 percentage points more likely than extremely  
2 pessimistic individuals to define their health as at least good. Obviously given our  
3 definition of optimism, there is strong reverse causality between self-assessed health and  
4 life expectancy miscalibration and these results should be interpreted with caution.  
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8 Finally, we analyze the correlation between our indicator of optimism based on  
9 survival probability miscalibration and the Life Orientation Test (LOT) implemented  
10 in the second wave of SHARE. LOT has been introduced and validated by Scheier and  
11 Carver (1985) and Scheier et al. (1994) as an indicator of dispositional optimism. In  
12 LOT respondents are asked to rate their agreement with a set of sentences designed to  
13 measure their positive attitude towards life according to a numerical scale. The value of  
14 the LOT score for each respondent comes from the summation of her so-coded answers  
15 and ranges from 0 to 28.<sup>7</sup> The fourth column of Table 3 shows that on average the LOT  
16 score of respondents with the highest level of optimism based on survival probability  
17 miscalibration is 5 points higher than the one of respondents with the lowest level of  
18 optimism as measured by miscalibration. This variation is statistically significant and  
19 sizable since it amounts to about one third of the sample average of the LOT score  
20 (17.48). Unfortunately the LOT questions in SHARE are included in a paper-and-pencil  
21 section of the questionnaire that has been filled in by less than one fourth of respondents  
22 (25 % overall and less than 10% in Belgium and Austria).<sup>8</sup>  
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40 <sup>7</sup>The sentences proposed in LOT are “I pursue my goals with lots of energy”, “In uncertain times,  
41 I usually expect the best”, “I’m always optimistic about my future”, “I hardly ever expect things to  
42 go my way”, “I still find ways to solve a problem if others have given up”, “I rarely count on good  
43 things happening to me”, “Given my previous experiences I feel well prepared for my future”. For each  
44 sentence, positive attitudes of respondents are coded on a scale ranging from 0 (lowest optimism) to 4  
45 (highest optimism).  
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47 <sup>8</sup>A sample comparison suggests a strong sample selection problem. Households for which we have  
48 information on LOT are significantly less optimistic, in poorer health status, less likely to own stocks  
49 and of lower socio-economic status than those for which the LOT score is not available.  
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# 3 Results

## 3.1 Stock market participation

Our estimating equation is

$$y_i = \beta_0 + \beta_1 \text{Optimism}_i + \text{Cognitive\_Skills}'_i \beta_2 + \text{Personality}'_i \beta_3 + X'_i \beta_4 + u_i$$

Stock market participation  $y_i$  takes on value 1 if individual  $i$  lives in a household owning stocks and 0 otherwise. Stock market participation depends on a constant term, our indicator of dispositional optimism, a vector  $X_i$  including individual and household characteristics and an error term  $u_i$ . The variables included in the vector  $X_i$  are country of residence, gender, a second order polynomial of age, household size, number of children, education, employment status, household income, wealth, health and parental longevity. Personality includes trust, social interaction and risk preferences. The model is estimated with a linear probability model.<sup>9</sup> Standard errors are adjusted to take into account arbitrary heteroskedasticity and all the results of the regression analyses in this paper come from the combination of multiply-imputed datasets according to Little and Rubin (1987).

Table 4 reports our main results. The first column considers a parsimonious specification that only controls for the country of residence and basic demographics, namely gender, age, household size and the number of children. As expected, the probability of holding stocks is highest in Scandinavian countries and lowest in Mediterranean and Eastern countries. It is lower for females and its relationship with age is hump-shaped. Finally, it increases with the number of household members and decreases with the number of children. This latter effect might suggest that individuals prefer not to invest their resources in risky assets if they plan to leave an inheritance. The optimism coefficient is positive and significant, even when we add socio-economic controls (column 2).

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<sup>9</sup>The results are very similar if we use a probit model instead than a linear probability model. Available upon request from the authors.

1 As discussed earlier, one potential criticism against our optimism measure is that  
2 the miscalibration in the probability of survival might just reflect the fact that individ-  
3 uals have more information about their health and genetics than the demographers do  
4 when computing the life tables. To address this issue, in column 3 we augment our model  
5 with four objective measures of health, namely limitations with activities of daily living,  
6 limitations with instrumental activities of daily living, number of chronic diseases, num-  
7 ber of symptoms of poor health and information on parental longevity, that is whether  
8 the mother and the father of the respondent are still alive or not at the time of the in-  
9 terview. The results show that, even controlling for health and genetic factors, optimism  
10 still plays a significant role in explaining stock market participation.  
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21 Further, the effect of survival probability miscalibration might be explained by the  
22 fact that the accuracy of respondents' assessments concerning their survival probability  
23 might depend on the level of their cognitive abilities, which have also been shown to  
24 be relevant determinants of stock market participation (Christelis et al. (2010)). In  
25 the fourth column of Table 4 we report the results obtained when a set of cognitive  
26 ability indicators is included in the specification. All the three indicators are statistically  
27 significant and suggest that individuals with higher cognitive abilities are more likely to  
28 hold stocks. However, the coefficient on the dispositional optimism indicator remains  
29 positive and significant.  
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40 Next, we include in our specification three further explanatory variables describing  
41 personality traits: trust, social interaction and risk aversion. The first indicator measures  
42 the level of trust in other people: respondents who have less trust in institutions might  
43 be less likely to establish contact or ask services from them and therefore to participate  
44 in the financial markets. The social interaction indicator measures the involvement of  
45 respondents in social activities during the last month. As pointed out by Hong et al.  
46 (2004), individuals involved in social interactions might be more likely to be informed  
47 about the state of financial markets by talking about it with their peers. The third  
48 indicator is needed to assess whether the correlation captured by the parameter on the  
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miscalibration term is due to a generic positive attitude of individuals towards risk in uncertain contexts. Column 5 of Table 4 shows that the effect of optimism remains statistically significant, although the coefficient decreases from 0.069 to 0.048. Moving from the lowest to the highest level of optimism is now associated with an increase in total stock-holding by 4.8 percentage points. This effect is economically significant if compared to those induced by changes in other key determinants of stock-ownership. It is more than half of the one associated with moving from low education to high education (7.6 percentage points) and higher than the one induced by moving from the lowest to the highest level of our numeracy skills indicator (3.19 percentage points). An immediate implication of these comparisons is that the detrimental effect on stock ownership exerted by moving from the highest to the lowest level of dispositional optimism can be offset by investments in education and numeracy skills, which are outcomes easier to target for policy makers. Moreover, both trust and social interactions have a positive and significant effect on the total holding of stocks, while risk aversion discourages stock market participation. The effect we find for trust is in line with the hypothesis that individuals with a higher level of trust in financial institutions are more likely to use the services offered by financial intermediaries and include stocks in their portfolios.

Finally, we are interested in studying the degree of complementarity (or substitution) between optimism and the other personality traits in explaining financial behavior. While optimism encourages risk taking behavior, risk aversion, low levels of trust and not having social interactions discourage it. Therefore, we test whether the relationship between dispositional optimism and stock-holding is affected by the degree of trust, social interaction and risk aversion. To do this, we add to our specification interaction terms between dispositional optimism and the other personality traits (column 6). While the role of optimism in explaining stock ownership does not seem to vary with the level of trust and social activities, the interaction term between optimism and risk aversion turns out to be statistically significant and negative. The results show that the large, positive effect of optimism is mainly driven by risk tolerant investors, while it is small



1 and not significant for risk averse individuals<sup>10</sup>. For risk tolerant individuals with no  
2 trust in other people and no social interactions, the difference in the probability of hold-  
3 ing stocks between extremely optimistic and extremely pessimistic individuals is equal  
4 to 16.1 percentage points.  
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9 [TABLE 4 ABOUT HERE]  
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### 11 **3.2 Share of financial wealth invested in stocks**

12 We now focus on the relationship between dispositional optimism and how much house-  
13 holds invest in stocks overall by estimating standard Tobit models via maximum likeli-  
14 hood. Our estimating equation is:  
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$$24 \quad y_i = \max(0, \beta_0 + \beta_1 \text{Optimism}_i + \text{Cognitive\_Skills}'_i \beta_2 + \text{Personality}'_i \beta_3 + X_i' \beta_4 + u_i)$$

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28 where  $y_i$  is the observed share of financial wealth invested in stocks by the household  
29 of individual  $i$ , the control factors  $X_i$  included in the right-hand-side of the equation are  
30 the same as those used in the previous subsection and  $u_i$  is a stochastic component fol-  
31 lowing a normal distribution with zero mean and unknown variance  $\sigma^2$ . The parameters  
32 in the Tobit specification make it possible to assess the effect of the explanatory variables  
33 on the average share of financial wealth invested in stocks by stock owners,  $E[y|x, y > 0]$ ,  
34 and by all individuals in the sample,  $E[y|x]$ . The results in Table 5 confirm the pattern  
35 previously found for the total ownership of stocks. If we look at the most parsimonious  
36 specification, the response of stock owners to a discrete change in our optimism indica-  
37 tor is to increase the share of financial wealth held in stocks by 5.07 percentage points  
38 (6 percentage points if we consider all investors). In the specification with the full set  
39 of control variables, the coefficient on dispositional optimism is still significant. The  
40 share of financial wealth invested in stocks by extremely pessimistic stock-owners is on  
41 average 1.53 percentage points lower than the one held by their extremely optimistic  
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57 <sup>10</sup>Our results are confirmed even if we remove the interactions of our optimism indicator with trust  
58 and social interactions. The results are reported as supplementary material in an online appendix.  
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1 counterparts. If we look at the variation induced in the share of wealth held in stocks  
2 by all agents, this is equal to 1.76 points. As in the ownership case, these effects are  
3 not only statistically but also economically significant if compared to those associated  
4 with moving from the lowest to the highest levels of education and numeracy. If we  
5 focus on stock-owners, the variation in the share of wealth invested in stocks induced  
6 by moving from extreme pessimism to extreme optimism is more than two thirds than  
7 the differential between low and high educated individuals (2.44 percentage points) and  
8 equivalent to the differential between individuals with the lowest and the highest levels  
9 of our numeracy indicator (1.72 percentage points)<sup>11</sup>. Risk aversion, trust and social  
10 interactions remain important determinants of stock market investment.  
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21 If we include interaction terms in our model, we can predict the response of the  
22 share of financial wealth invested in stocks to variations in optimism for different profiles  
23 of stock-owners defined according to the personality traits considered in our models. We  
24 consider eight profiles of stock owners defined by combining the lowest and the highest  
25 achievable levels of our indicators for trust, social interaction and risk aversion. We find  
26 that, regardless of the degree of social interaction, risk tolerant stock owners, who do not  
27 trust others and move from extreme pessimism to extreme optimism, increase by about  
28 9 percentage points the share of financial wealth invested in stocks. Instead for risk  
29 averse stock-owners, the same change in optimism is not associated with any significant  
30 variation, regardless of the levels of social interactions and trust. These patterns parallel  
31 our findings for stock market participation and reinforce the importance of analyzing  
32 the interplay between dispositional optimism and other personality traits in explaining  
33 financial behavior. The role of dispositional optimism varies with personality traits and  
34 it is found to be stronger for risk tolerant agents who do not trust other people. For this  
35 group of agents, the negative beliefs with respect to stock investments induced by lack  
36 of trust can be offset by an increase in dispositional optimism.<sup>12</sup>  
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54 <sup>11</sup>Looking at the share of wealth invested in stock by all agents provides similar results. The differential  
55 between low and high education individuals amount to 2.81 percentage points, the one between agents  
56 with low and high numeracy levels is 1.96 percentage points.

57 <sup>12</sup>We obtain similar results when looking at the share of wealth invested in stocks by all investors.  
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[TABLE 5 ABOUT HERE]

### 3.3 Robustness analysis

We perform several checks for the robustness of our results.<sup>13</sup> First, one potential objection is that past success in the stock market might drive today's optimism and financial market participation, causing endogeneity issues. In this respect, it should be noted that we use a broad definition of optimism which has to do with general positive expectations about the future, not only about the financial market, and as such should be less subject to this criticism. In addition, if the relationship between optimism and financial behavior we observe is driven by past success in the stock market, we should not find any correlation between optimism and our dependent variables for individuals who have never invested in the stock market before. To test for this, we use information from the retrospective life-history data collected in the third wave of SHARE (SHARELIFE)<sup>14</sup> on the year in which the respondent invested in the stock market for the first time. The second wave of SHARE we use in our analysis has been run between 2006 and 2007. We then re-estimate our models on a sample including only the respondents who take part in SHARELIFE and did not invest in the stock market before 2006. The sample size reduces to 8,866 and 7,555 individuals for the linear probability model and tobit specifications respectively. Our optimism indicator is still found to be positively and significantly correlated with stock ownership and the share of financial wealth invested in this asset.

Second, we test whether dispositional optimism has an effect also on other financial choices which are particularly relevant for older European workers, such as retirement planning. Unfortunately in SHARE we do not have direct information on whether individuals are planning for retirement. Therefore, we use as indicator for retirement

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In particular, it increases by about 11 percentage points for risk tolerant agents who do not trust other people, regardless of their social interactions. Instead, this variation is statistically not significant for risk averse individuals.

<sup>13</sup>All the results discussed in this section are included in an appendix as supplementary material.

<sup>14</sup>See Börsch-Supan et al. (2005), Schröder (2011).

1 planning a dummy which is equal to one if the respondent holds individual retirement  
2 accounts (independently of whether they are invested mostly in stocks, mostly in bonds or  
3 half in stocks and half in bonds) and we restrict our sample only to workers ( $N = 5,075$ ).  
4 The results confirm the importance of dispositional optimism for financial behavior: ex-  
5 tremely optimistic individuals are 8.95 percentage points more likely to be planning for  
6 retirement than extremely pessimistic individuals.  
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12 Third, we test whether the effect of dispositional optimism on financial market  
13 participation varies by country by estimating a more flexible specification in which we  
14 interact our optimism indicator with the country dummies. For stock ownership, the F-  
15 test for the stability of the optimism coefficient across countries rejects the null hypothesis  
16 at the 5% level but not at the 1% level (p-value=0.024). However, the significance of  
17 the joint test is driven by two countries only, namely France and Spain, for which the  
18 effect of optimism is higher. For the share of wealth invested in stocks, we do not detect  
19 cross-country differences in the optimism coefficient at any conventional significance level  
20 (p-value=0.115). These results are consistent with the findings by Christelis et al. (2010),  
21 who also do not reject the null hypothesis of the stability of coefficients across countries.  
22 As a further sensitivity, we check the robustness of our results to the contribution of a  
23 specific country. The estimates and the statistical significance we obtain re-estimating  
24 the model excluding one country at the time does not alter the main findings.  
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40 Finally, it might be argued that the role of optimism we find is driven by unobserved  
41 health heterogeneity which is not captured by the battery of health indicators included in  
42 our specification. As a sensitivity analysis, we include respondents' self-assessed health  
43 among the set of covariates in our specifications as this is a more general health measure.  
44 Our results are overall confirmed. However, we prefer to exclude self-assessed health  
45 from our main specification as it is a subjective measure. Conditional on the presence of  
46 limitations with (instrumental) activities of daily living, chronic diseases and symptoms,  
47 heterogeneity in health self-assessments might capture differences in optimism levels of  
48 respondents in rating the severity of their health problems (see Bago d'Uva et al. (2008)).  
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## 4 Conclusions

We draw data from the second wave of SHARE to analyze the relationship between dispositional optimism and stock market participation in twelve European countries. Following Puri and Robinson (2007), we develop an indicator of dispositional optimism based on the miscalibration between subjective and objective survival probabilities. We analyze total stock market participation, which also include stocks held in mutual funds and individual retirement accounts, at both the extensive and the intensive margin. Our paper extends the previous literature by estimating the relationship between dispositional optimism and financial investments in stocks controlling not only for a rich set of demographic and socio-economic characteristics but also for cognitive skills and personality traits, namely risk aversion, trust and social interactions. We find that optimism is significantly and positively related to both the probability of stock ownership and the share of wealth invested in stocks. If we focus on the ownership of stocks, we find that dispositional optimism mainly matters for risk tolerant agents, for whom being extremely optimistic rather than extremely pessimistic is associated with a statistically and economically significant increase in the probability of holding stocks of about 16 percentage points. However, for risk averse agents dispositional optimism plays a negligible role on financial behavior. If we look at the share of wealth invested in stocks, for risk tolerant investors with no trust in other people, being extremely optimistic rather than extremely pessimistic is associated with an increase of about 9 percentage points in the total share of wealth that they invest in stocks. These empirical findings provide support for the development and the calibration of theoretical models of financial behavior that incorporate standard economic determinants with the behavioral characteristic of agents. Pessimistic individuals might develop unattractive beliefs of the actual costs of trading and managing stocks and decide not to participate in the market, even if they are not risk averse. However, our results suggest that investing in their education and numeracy might offset the impact of their negative attitude towards life and lower barriers to financial market participation.

## Acknowledgements

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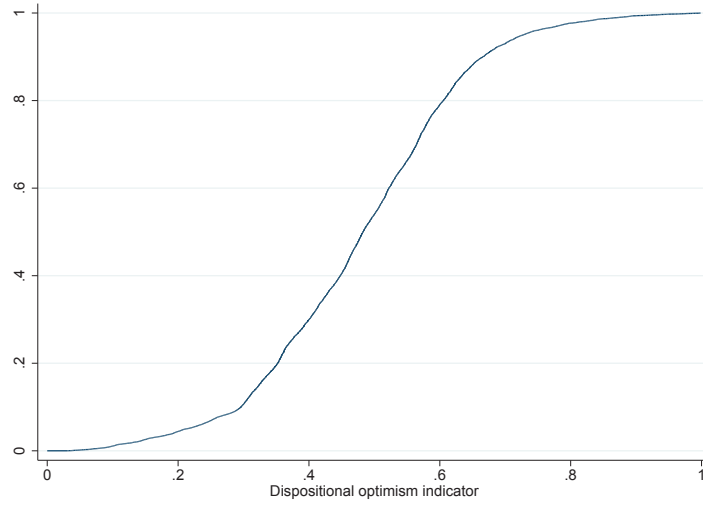
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# A Figures

Figure 1: Cumulative distribution function of the dispositional optimism indicator



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Figure 2: Stock market participation and dispositional optimism

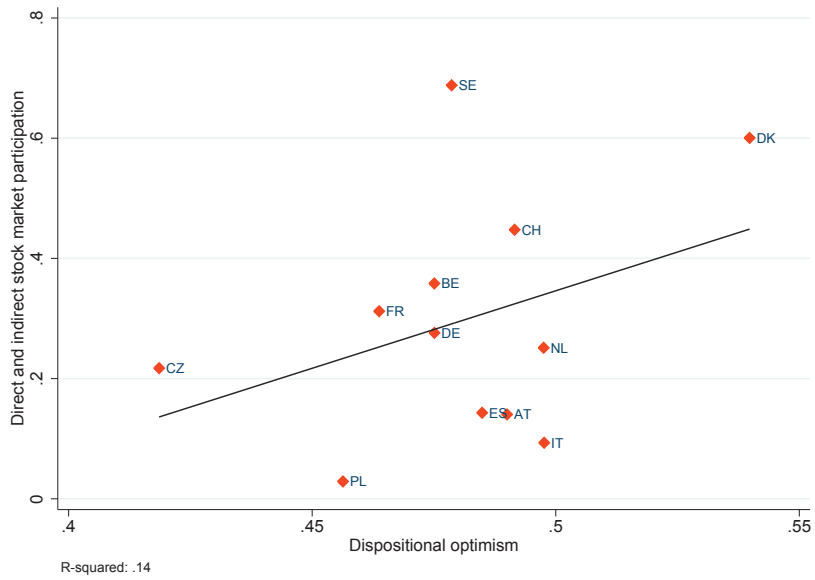
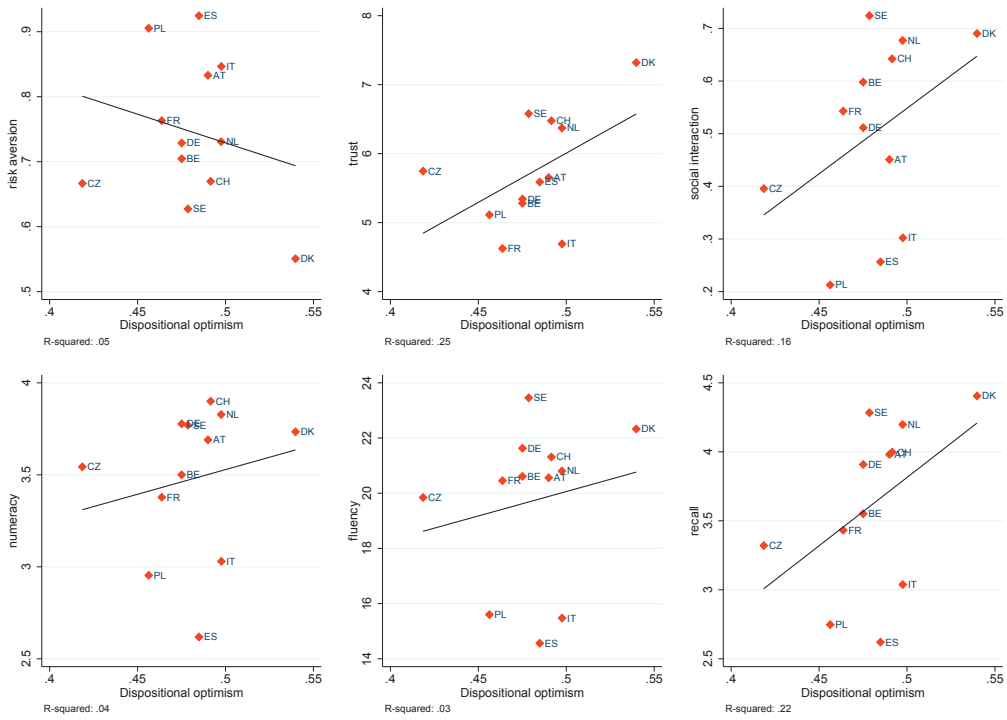


Figure 3: Risk aversion, trust, social interaction, cognitive skills and dispositional optimism



## B Tables

Table 1: Summary statistics of the variables used in the regressions

Variable	Definition	Mean	Std. Dev.	Min	Max
total stock own.	Ownership of stocks	0.307	0.465	0	1
share of total stock own.	Share of financial wealth invested in stocks	0.106	0.207	0	0.999
living better	Chances of living better 5 years from now	26.779	28.669	0	100
living worse	Chances of living worse 5 years from now	38.286	32.14	0	100
good health	Excellent, very good or good health	0.651	0.477	0	1
optimism	Survival probability miscalibration	0.48	0.156	0	0.998
lot	Life Orientation Test	17.48	4.282	0	28
SE	Living in Sweden	0.1	0.3	0	1
DK	Living in Denmark	0.089	0.285	0	1
NL	Living in The Netherlands	0.093	0.291	0	1
BE	Living in Belgium	0.11	0.313	0	1
FR	Living in France	0.088	0.284	0	1
CH	Living in Switzerland	0.056	0.23	0	1
AT	Living in Austria	0.048	0.215	0	1
ES	Living in Spain	0.06	0.237	0	1
IT	Living in Italy	0.096	0.295	0	1
PL	Living in Poland	0.086	0.281	0	1
CZ	Living in Czech Republic	0.085	0.278	0	1
female	The respondent is female	0.534	0.499	0	1
age	Age	64.467	10.059	24	100
age2	Age squared	4257.149	1347.67	576	10000
hhszise	Number of household members	2.122	1.086	1	14
number of children	Number of children	2.166	1.405	0	16
medium education	Medium education (ISCED=3)	0.312	0.468	0	1
high education	High education (ISCED=4,5,6)	0.237	0.429	0	1
employed	The respondent is employed	0.291	0.454	0	1
retired	The respondent is retired	0.529	0.499	0	1
hh income	IHS transf. of household income	10.541	1.347	0	14.536
hh net financial wealth	IHS transf. of household net wealth	7.791	7.564	-15.361	17.154
adl	Limited with activities of daily living	0.097	0.296	0	1
iadl	Limited with instrumental adl	0.07	0.254	0	1
chronic	Number of chronic diseases	1.626	1.512	0	10
symptoms	Number of symptoms of poor health	1.795	1.881	0	11
mother dead	Mother is dead	0.763	0.425	0	1
father dead	Father is dead	0.905	0.293	0	1
numeracy	Results of the numeracy test	3.482	1.104	1	5
fluency	Results of the verbal fluency test	19.827	7.532	0	100
recall	Results of the recall test	3.634	1.994	0	10
trust	Level of trust in other people	5.713	2.529	0	10
social interaction	Taken part in social activities last month	0.51	0.5	0	1
risk aversion	No willingness to take any financial risk	0.738	0.441	0	1

Table 2: Sample averages by country

Variables	SE	DK	DE	NL	BE	FR
total stock own.	0.688	0.601	0.276	0.251	0.358	0.312
share of total stock own.	0.25	0.198	0.076	0.08	0.115	0.093
living better	31.083	31.596	17.952	30.396	22.126	17.518
living worse	32.489	21.748	45.743	37.094	35.234	51.458
good health	0.722	0.772	0.632	0.714	0.722	0.663
optimism	0.479	0.54	0.475	0.498	0.475	0.464
lot	18.836	19.553	18.229	17.919	18.043	16.88
female	0.506	0.493	0.511	0.534	0.501	0.539
age	65.374	63.976	64.688	63.31	64.62	63.844
age2	4371.291	4203.27	4273.604	4103.518	4282.606	4184.411
hhsz	1.895	1.838	1.997	2.023	1.992	1.988
number of children	2.292	2.193	1.955	2.305	2.107	2.157
medium education	0.188	0.412	0.534	0.243	0.269	0.33
high education	0.329	0.385	0.312	0.253	0.284	0.234
employed	0.406	0.413	0.287	0.332	0.257	0.309
retired	0.548	0.477	0.552	0.371	0.522	0.544
hh income	10.847	10.802	10.755	10.99	10.634	10.803
hh net financial wealth	7.718	9.273	8.72	9.518	9.614	7.941
adl	0.078	0.068	0.085	0.054	0.118	0.092
iadl	0.048	0.062	0.05	0.047	0.079	0.069
chronic	1.569	1.682	1.52	1.269	1.593	1.485
symptoms	1.602	1.603	1.649	1.371	1.852	1.864
mother dead	0.765	0.756	0.766	0.765	0.75	0.693
father dead	0.901	0.903	0.908	0.905	0.907	0.866
numeracy	3.77	3.734	3.777	3.828	3.5	3.378
fluency	23.456	22.327	21.63	20.806	20.613	20.452
recall	4.284	4.405	3.908	4.198	3.551	3.431
trust	6.58	7.32	5.342	6.371	5.28	4.625
social interaction	0.724	0.69	0.511	0.677	0.598	0.543
risk aversion	0.627	0.551	0.729	0.731	0.705	0.763
Number of observations	1744	1553	1537	1626	1923	1538
Variables	CH	AT	ES	IT	PL	CZ
total stock own.	0.448	0.14	0.143	0.093	0.029	0.217
share of total stock own.	0.132	0.042	0.049	0.038	0.015	0.055
living better	26.15	22.28	36.024	33.411	27.169	26.072
living worse	30.916	40.028	39.27	37.953	42.452	45.674
good health	0.835	0.688	0.56	0.578	0.384	0.559
optimism	0.492	0.49	0.485	0.498	0.456	0.419
lot	19.882	19.571	18.32	17.794	15.887	16.681
female	0.522	0.56	0.561	0.516	0.577	0.621
age	64.331	67.263	65.541	65.215	63.271	63.505
age2	4245.695	4616.034	4409.085	4342.478	4103.275	4128.421
hhsz	1.94	1.754	2.576	2.452	2.951	2.03
number of children	2.032	2.006	2.4	2.045	2.52	1.93
medium education	0.354	0.444	0.094	0.198	0.411	0.314
high education	0.305	0.243	0.108	0.09	0.125	0.147
employed	0.429	0.141	0.225	0.185	0.171	0.292
retired	0.436	0.71	0.379	0.57	0.601	0.654
hh income	11.005	10.561	10.06	10.203	9.656	10.1
hh net financial wealth	9.647	7.769	6.904	6.71	3.113	6.322
adl	0.051	0.11	0.111	0.093	0.217	0.079
iadl	0.029	0.085	0.078	0.072	0.155	0.06
chronic	1.116	1.574	1.744	1.874	2.123	1.827
symptoms	1.255	1.817	1.81	1.851	2.682	2.069
mother dead	0.736	0.854	0.771	0.788	0.771	0.778
father dead	0.858	0.944	0.904	0.914	0.93	0.923
numeracy	3.9	3.69	2.619	3.03	2.954	3.543
fluency	21.312	20.56	14.563	15.475	15.601	19.844
recall	3.997	3.981	2.621	3.038	2.748	3.32
trust	6.477	5.653	5.589	4.692	5.113	5.747
social interaction	0.642	0.451	0.256	0.302	0.213	0.396
risk aversion	0.67	0.833	0.925	0.847	0.905	0.667
Number of observations	981	845	1041	1681	1505	1476

Note: For each variable we tested the null hypothesis of absence of cross-country differences in the average. The null hypothesis is rejected at any conventional significance level.

Table 3: Validation of the dispositional optimism indicator

	living better	living worse	good health	lot
optimism	38.214*** (1.493)	-16.119*** (1.814)	0.340*** (0.023)	5.146*** (0.447)
SE	12.591*** (0.958)	-12.517*** (1.225)	0.055*** (0.014)	0.273 (0.309)
DK	9.210*** (1.052)	-21.701*** (1.206)	0.089*** (0.014)	-0.069 (0.361)
NL	9.442*** (0.977)	-7.160*** (1.239)	0.027* (0.014)	-0.569** (0.279)
BE	3.948*** (0.878)	-9.900*** (1.200)	0.127*** (0.013)	-0.538 (0.521)
FR	-0.610 (0.890)	5.792*** (1.294)	0.063*** (0.014)	-1.104*** (0.282)
CH	6.143*** (1.099)	-13.483*** (1.344)	0.116*** (0.014)	1.219*** (0.260)
AT	6.449*** (1.071)	-5.308*** (1.432)	0.093*** (0.017)	1.141* (0.661)
ES	17.566*** (1.101)	-5.724*** (1.387)	0.043** (0.017)	0.596 (0.450)
IT	15.048*** (0.968)	-7.620*** (1.226)	0.051*** (0.015)	0.175 (0.296)
PL	8.775*** (0.989)	-4.411*** (1.261)	-0.036** (0.016)	-0.862*** (0.272)
CZ	9.163*** (0.940)	-0.792 (1.274)	0.011 (0.015)	-0.745*** (0.252)
female	0.185 (0.442)	-1.334** (0.522)	0.060*** (0.006)	0.298** (0.132)
age	-2.116*** (0.296)	2.445*** (0.317)	0.008** (0.004)	0.054 (0.077)
age2	0.010*** (0.002)	-0.018*** (0.002)	-0.000** (0.000)	-0.001 (0.001)
hhsz	0.951*** (0.218)	-0.416* (0.242)	0.001 (0.003)	0.111** (0.054)
number of children	-0.052 (0.143)	-0.304* (0.178)	0.001 (0.002)	0.114** (0.047)
medium education	-0.781 (0.516)	0.619 (0.611)	0.011 (0.008)	-0.106 (0.148)
high education	0.335 (0.602)	0.255 (0.707)	0.034*** (0.008)	0.556*** (0.176)
employed	-0.196 (0.734)	2.850*** (0.815)	0.092*** (0.010)	0.134 (0.202)
retired	-1.508** (0.630)	-2.110*** (0.754)	0.032*** (0.010)	0.305 (0.201)
hh income	0.106 (0.172)	-0.334 (0.209)	0.005* (0.003)	0.174** (0.078)
hh net financial wealth	-0.060 (0.041)	-0.152*** (0.043)	0.001 (0.001)	0.030*** (0.010)
adl	0.196 (0.730)	1.092 (0.971)	-0.105*** (0.013)	-0.154 (0.246)
iadl	-0.781 (0.807)	1.525 (1.144)	-0.065*** (0.014)	-1.094*** (0.321)
chronic	-0.134 (0.163)	0.208 (0.203)	-0.066*** (0.003)	-0.051 (0.049)
symptoms	-0.575*** (0.135)	0.831*** (0.171)	-0.064*** (0.002)	-0.279*** (0.040)
mother dead	-0.913 (0.594)	0.634 (0.639)	-0.026*** (0.008)	-0.048 (0.151)
father dead	0.196 (0.818)	-0.742 (0.855)	-0.011 (0.010)	0.285 (0.195)
numeracy	-0.207 (0.225)	0.613** (0.262)	0.015*** (0.003)	0.159** (0.066)
fluency	0.009 (0.034)	-0.042 (0.040)	0.003*** (0.000)	0.025*** (0.009)
recall	0.226* (0.125)	0.168 (0.145)	0.007*** (0.002)	0.131*** (0.036)
trust	0.334*** (0.086)	-0.466*** (0.105)	0.004*** (0.001)	0.101*** (0.025)
social interaction	-0.646 (0.447)	-0.477 (0.523)	0.052*** (0.007)	0.454*** (0.127)
risk aversion	-2.647*** (0.517)	0.891 (0.587)	-0.028*** (0.007)	-0.202 (0.136)
Constant	94.565*** (10.234)	-23.177** (11.028)	0.142 (0.141)	10.511*** (2.656)
Number of observations	17450	17450	17450	4394

Note: Linear regression models estimated by OLS and based on 5 sets of multiply-imputed data combined according to Little and Rubin (1987). \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 4: Total stock market participation

	(1)	(2)	(3)	(4)	(5)	(6)
optimism	0.163*** (0.022)	0.087*** (0.021)	0.078*** (0.021)	0.069*** (0.021)	0.048** (0.020)	0.161** (0.064)
SE	0.423*** (0.015)	0.440*** (0.015)	0.440*** (0.015)	0.427*** (0.015)	0.386*** (0.015)	0.387*** (0.015)
DK	0.317*** (0.017)	0.300*** (0.016)	0.301*** (0.016)	0.299*** (0.016)	0.247*** (0.016)	0.247*** (0.016)
NL	-0.030** (0.015)	-0.028* (0.015)	-0.029* (0.015)	-0.032** (0.015)	-0.041*** (0.014)	-0.041*** (0.014)
BE	0.086*** (0.016)	0.094*** (0.015)	0.095*** (0.015)	0.099*** (0.015)	0.083*** (0.014)	0.083*** (0.014)
FR	0.040** (0.016)	0.071*** (0.016)	0.071*** (0.016)	0.079*** (0.016)	0.077*** (0.015)	0.078*** (0.015)
CH	0.172*** (0.019)	0.153*** (0.019)	0.152*** (0.019)	0.150*** (0.018)	0.131*** (0.018)	0.131*** (0.018)
AT	-0.112*** (0.016)	-0.078*** (0.016)	-0.078*** (0.016)	-0.081*** (0.016)	-0.067*** (0.015)	-0.068*** (0.015)
ES	-0.126*** (0.016)	-0.027* (0.016)	-0.027* (0.016)	0.006 (0.016)	0.024 (0.015)	0.024 (0.015)
IT	-0.189*** (0.013)	-0.084*** (0.014)	-0.084*** (0.014)	-0.060*** (0.014)	-0.056*** (0.013)	-0.055*** (0.013)
PL	-0.256*** (0.012)	-0.093*** (0.013)	-0.090*** (0.013)	-0.064*** (0.013)	-0.050*** (0.013)	-0.050*** (0.013)
CZ	-0.050*** (0.015)	0.040*** (0.015)	0.040*** (0.015)	0.043*** (0.015)	0.005 (0.015)	0.006 (0.015)
female	-0.064*** (0.007)	-0.040*** (0.006)	-0.039*** (0.006)	-0.039*** (0.007)	-0.020*** (0.006)	-0.019*** (0.006)
age	0.013*** (0.004)	0.019*** (0.004)	0.017*** (0.004)	0.015*** (0.004)	0.012*** (0.004)	0.011*** (0.004)
age2	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
hhsz	0.017*** (0.003)	0.009*** (0.003)	0.009*** (0.003)	0.009*** (0.003)	0.010*** (0.003)	0.010*** (0.003)
number of children	-0.014*** (0.002)	-0.005** (0.002)	-0.005** (0.002)	-0.005** (0.002)	-0.004* (0.002)	-0.004* (0.002)
medium education=1		0.054*** (0.008)	0.053*** (0.008)	0.038*** (0.008)	0.025*** (0.008)	0.025*** (0.008)
high education=1		0.142*** (0.009)	0.141*** (0.009)	0.114*** (0.009)	0.076*** (0.009)	0.076*** (0.009)
employed		0.053*** (0.011)	0.051*** (0.011)	0.045*** (0.011)	0.034*** (0.010)	0.034*** (0.010)
retired		-0.014* (0.009)	-0.016* (0.009)	-0.019** (0.009)	-0.014* (0.008)	-0.014* (0.008)
hh income		0.029*** (0.002)	0.029*** (0.002)	0.027*** (0.002)	0.021*** (0.002)	0.021*** (0.002)
hh net financial wealth		0.015*** (0.001)	0.015*** (0.001)	0.015*** (0.001)	0.013*** (0.001)	0.013*** (0.001)
adl			-0.012 (0.011)	-0.006 (0.011)	-0.005 (0.010)	-0.005 (0.010)
iadl			-0.011 (0.012)	0.003 (0.012)	-0.001 (0.011)	-0.002 (0.011)
chronic			-0.002 (0.002)	-0.002 (0.002)	-0.000 (0.002)	-0.000 (0.002)
symptoms			-0.001 (0.002)	-0.001 (0.002)	-0.001 (0.002)	-0.001 (0.002)
mother dead			0.002 (0.009)	0.004 (0.009)	0.007 (0.009)	0.007 (0.009)
father dead			0.002 (0.012)	0.004 (0.012)	0.007 (0.012)	0.007 (0.012)
numeracy				0.017*** (0.003)	0.008** (0.003)	0.008** (0.003)
fluency				0.003*** (0.001)	0.002*** (0.000)	0.002*** (0.000)
recall				0.005*** (0.002)	0.005*** (0.002)	0.005*** (0.002)
trust					0.003** (0.001)	0.006 (0.003)
social interaction=1					0.038*** (0.006)	0.035* (0.019)
risk aversion=1					-0.257*** (0.008)	-0.205*** (0.026)
optimism × trust						-0.006 (0.007)
social interaction=1 × optimism						0.006 (0.038)
risk aversion=1 × optimism						-0.107** (0.051)
Constant	0.023 (0.127)	-0.756*** (0.140)	-0.710*** (0.144)	-0.788*** (0.143)	-0.403*** (0.139)	-0.448*** (0.141)
Number of observations	17450	17450	17450	17450	17450	17450

Note: Linear regression models estimated by OLS and based on 5 sets of multiply-imputed data combined according to Little and Rubin (1987). \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 5: Share of gross financial wealth invested in total stock ownership

	(1)	(2)	(3)	(4)	(5)	(6)
optimism	0.175*** (0.031)	0.111*** (0.030)	0.094*** (0.031)	0.085*** (0.031)	0.052* (0.030)	0.231*** (0.083)
SE	0.417*** (0.017)	0.448*** (0.018)	0.447*** (0.018)	0.433*** (0.018)	0.389*** (0.017)	0.389*** (0.017)
DK	0.309*** (0.018)	0.295*** (0.018)	0.296*** (0.018)	0.295*** (0.018)	0.246*** (0.018)	0.247*** (0.018)
NL	-0.009 (0.019)	0.001 (0.019)	-0.002 (0.019)	-0.003 (0.019)	-0.014 (0.019)	-0.013 (0.019)
BE	0.114*** (0.019)	0.135*** (0.019)	0.136*** (0.019)	0.146*** (0.019)	0.122*** (0.018)	0.123*** (0.018)
FR	0.057*** (0.019)	0.095*** (0.019)	0.096*** (0.019)	0.109*** (0.019)	0.109*** (0.018)	0.109*** (0.018)
CH	0.179*** (0.020)	0.160*** (0.019)	0.156*** (0.019)	0.156*** (0.019)	0.138*** (0.019)	0.139*** (0.019)
AT	-0.154*** (0.025)	-0.124*** (0.025)	-0.124*** (0.025)	-0.127*** (0.025)	-0.110*** (0.024)	-0.110*** (0.024)
ES	-0.134*** (0.025)	-0.010 (0.024)	-0.011 (0.024)	0.034 (0.025)	0.064*** (0.024)	0.065*** (0.024)
IT	-0.240*** (0.022)	-0.142*** (0.023)	-0.143*** (0.023)	-0.112*** (0.023)	-0.104*** (0.022)	-0.104*** (0.022)
PL	-0.419*** (0.033)	-0.289*** (0.033)	-0.281*** (0.033)	-0.248*** (0.033)	-0.219*** (0.032)	-0.219*** (0.032)
CZ	-0.022 (0.021)	0.068*** (0.021)	0.067*** (0.021)	0.068*** (0.021)	0.021 (0.020)	0.022 (0.020)
female	-0.078*** (0.009)	-0.049*** (0.009)	-0.048*** (0.009)	-0.044*** (0.009)	-0.019** (0.008)	-0.019** (0.008)
age	0.030*** (0.005)	0.027*** (0.005)	0.022*** (0.006)	0.019*** (0.006)	0.014*** (0.005)	0.014*** (0.005)
age2	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
hhsz	0.020*** (0.005)	0.002 (0.005)	0.002 (0.005)	0.003 (0.005)	0.006 (0.005)	0.006 (0.005)
number of children	-0.020*** (0.003)	-0.012*** (0.003)	-0.012*** (0.003)	-0.013*** (0.003)	-0.012*** (0.003)	-0.012*** (0.003)
medium education=1		0.087*** (0.010)	0.085*** (0.010)	0.068*** (0.011)	0.051*** (0.010)	0.051*** (0.010)
high education=1		0.159*** (0.011)	0.157*** (0.011)	0.123*** (0.011)	0.083*** (0.011)	0.083*** (0.011)
employed		0.023 (0.014)	0.017 (0.014)	0.011 (0.014)	0.006 (0.014)	0.006 (0.014)
retired		0.004 (0.014)	0.000 (0.014)	-0.004 (0.014)	0.001 (0.013)	0.001 (0.013)
hh income		0.070*** (0.006)	0.069*** (0.006)	0.065*** (0.006)	0.049*** (0.005)	0.049*** (0.005)
hh net financial wealth		0.017*** (0.001)	0.017*** (0.001)	0.016*** (0.001)	0.013*** (0.001)	0.013*** (0.001)
adl			-0.037** (0.018)	-0.028 (0.018)	-0.027 (0.018)	-0.026 (0.018)
iadl			-0.057** (0.024)	-0.038 (0.024)	-0.040* (0.023)	-0.041* (0.023)
chronic			-0.002 (0.003)	-0.001 (0.003)	0.001 (0.003)	0.001 (0.003)
symptoms			-0.004 (0.003)	-0.004 (0.003)	-0.004 (0.003)	-0.004 (0.003)
mother dead			0.002 (0.011)	0.004 (0.011)	0.008 (0.010)	0.008 (0.010)
father dead			0.013 (0.014)	0.016 (0.014)	0.018 (0.013)	0.018 (0.013)
numeracy				0.027*** (0.005)	0.015*** (0.004)	0.015*** (0.004)
fluency				0.004*** (0.001)	0.003*** (0.001)	0.003*** (0.001)
recall				0.006*** (0.002)	0.006*** (0.002)	0.006*** (0.002)
trust					0.003* (0.002)	0.012** (0.005)
social interaction=1					0.034*** (0.008)	0.031 (0.028)
risk aversion=1					-0.253*** (0.008)	-0.197*** (0.028)
optimism × trust						-0.019* (0.010)
social interaction=1 × optimism						0.005 (0.055)
risk aversion=1 × optimism						-0.115** (0.056)
Constant	-1.021*** (0.175)	-1.995*** (0.192)	-1.817*** (0.200)	-1.927*** (0.200)	-1.392*** (0.193)	-1.470*** (0.195)
sigma Constant	0.402*** (0.005)	0.383*** (0.004)	0.382*** (0.004)	0.380*** (0.005)	0.361*** (0.004)	0.361*** (0.004)
Number of observations	15357	15357	15357	15357	15357	15357

Note: Tobit regression models estimated by maximum likelihood and based on 5 sets of multiply-imputed data combined according to Little and Rubin (1987). \*\*\* p<0.01, \*\* p<0.05, \* p<0.1