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ORIGINAL PAPER

Financial Literacy, Human Capital and Stock Market Participation in Europe

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Abstract
Households' stock market participation has significant effects on savings and on an economy's financial development and performance. Yet participation into capital markets is limited and quite heterogonous both among and within several countries. This phenomenon represents an empirical puzzle whose understanding is rather incomplete. In this work, we exploited a combination of datasets for nine European countries and used different econometric specifications that allow to control for endogeneity of financial literacy and human capital, to assess the role of several variables in affecting the probability to participate in the stock market in year 2010. Besides socio-demographic variables, we found that financial literacy has a positive and significant effect on stock market participation, together with the level of human capital and social interaction. Country level differences are explained by such institutional factors as the effectiveness of the education system and by the attractiveness of the stock markets.

Keywords Stock market participation · Financial literacy · Social interaction · Education quality · Europe

Introduction

Individuals across the globe have become increasingly active in financial markets in the last decades. The move from defined-benefit to defined-contribution pension plans and the decline of publicly provided pension benefits have shifted the responsibility of adequate saving-for-retirement from the government and employers to private individuals[1] These trends, together with the availability of new technology and information, have contributed to a rise of stock market participation. However, although increased, participation rates are still relatively low in many countries and show a substantial variability across the globe. In countries like Sweden or the US, over 50% of households participate in stock market while in Southern Europe the same proportion of households does not exceed 20% (Campbell 2006; Christelis et al. 2013; Dimmock and Kouwenberg 2010; Guiso et al. 2008). These studies confirm that only a minority of the population join the stock market and this fact, besides representing an empirical puzzle is a source of major concern to policymakers.

In fact, several authors have pointed out that in the long-run there can be considerable welfare loss in non-participation of individuals, in the form of reduction of returns to household saving and lower asset accumulation (see, for example, Bagliano et al. 2014). From the perspective of the financial system, a higher participation rate could favour a greater breadth and depth of capital markets, which is an important determinant of the equity premium and of the stock market volatility (Brav et al. 2002; Thomas et al. 2014; Thomas and Spataro 2016).

[1] Also the significant increase of employee financial plans, either directly through employee share ownership (ESO) or indirectly through intermediaries like Employee stock ownership plans (ESOP) or profit sharing (PS) have provided a relevant support to individuals' demand for risky assets. These financial plans, also linked to defined contribution schemes, have empirically proven to favor higher productivity, strengthen corporate governance and competitiveness of firms (Kaarsemaker et al. 2010; Soppe and Houweling 2014). Most importantly, these financial plans have also improved the financial outlook of workers, equipping them with more sophisticated financial techniques and thus resulting in better financial decisions in terms of savings, risky asset participation and retirement planning.

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Given that the well-being of households will increasingly depend on the individuals' ability to deal with complex choices over instruments for portfolio differentiation, a growing body of literature has tried to unveil the determinants of stock market participation and to remove the barriers that might prevent such investment opportunity. Empirical evidence of industrialized countries documents that stock market participation depends on a variety of factors, such as household financial wealth (which supports the entry costs thesis; see Alan 2006; Guiso et al. 2003) age and education (Bertaut 1998), risk aversion (Campbell and Cochrane 2000), trust in financial institutions (Georgarakos and Pasini 2011), social interaction (Hong et al. 2004), home ownership (Vestman 2010) and social capital (Guiso et al. 2004). Some recent works have put much emphasis on the role of financial literacy (Arrondel et al. 2012; Guiso and Jappelli 2005; Van Rooij et al. 2011; Yoong 2011) and human capital investment (Bertaut and Starr-McCluer 2002; Cole and Shastry 2008) in affecting individuals' attitude towards financial markets.

The present work adds to such a growing literature on the determinants of stock market participation by making two main contributions. First, by using The Survey of Health, Ageing and Retirement in Europe (SHARE[2] hereafter) database, we aimed to provide new evidence about the determinants of households' stock market participation in nine European countries in year 2010. Second, we developed an empirical model encompassing, under a unified framework, the relationship between stock market participation and human capital and financial literacy, along with other socio-economic and institutional factors.

More precisely, we drew from the existing literature by including most of the socio-demographic and economic variables explored in related studies at both country level (Cole and Shastry 2008; Van Rooij et al. 2011; Yoong 2011) and at cross-country level (Christelis et al. 2010). We also acknowledged the fact that financial literacy is endogenous and we used some of the instruments used by Christelis et al. (2010) and Jappelli and Padula (2013) to deal with such an issue. In fact, the literature (Jappelli 2010; Jappelli and Padula 2013) acknowledged that the correlation between financial literacy and investment behaviour seems at least partly driven by reverse causality. For instance, a positive relation between participation in the stock market and an investor literacy, as in Van Rooij et al. (2011), is consistent with the argument that, on one hand, financial literacy helps alerting individuals about the excess returns on stocks/bonds, which in turn induces them to invest and, on the other hand, investing in advanced financial products, could provide some kind of financial literacy training, enabling respondents to answer more questions correctly. Additionally, this positive correlation may reflect the fact that financial literacy is not distributed randomly in the population and those who possess high levels of literacy are likely to have certain characteristics, often unobservable, such as talent, ability, or patience that may lead also to "better" financial decisions. Finally, we followed the existing literature by including human capital, social interaction and financial incentives as the most important predictors of stock market participation.

However, we departed from previous empirical literature in that we allowed for the possibility that both human capital and financial literacy acquisition are endogenous. To the best of our knowledge, this has never been done so far[3] Hence, we allowed investment in general and financial education to be driven by both individual-related abilities and by economic/financial incentives that were present at the very early stages of life (such as the attractiveness of the financial market). By doing this, we also offered a possible explanatory argument to the findings of Malmendier and Nagel (2011), as to why also past stock market returns may affect the current decision to participate or not in the stock market.

Finally, we also adopted a measure of the effectiveness/quality of the education system (namely cohort/country specific student–teacher ratios at individuals' young age) in order to explain possible country and cohort level differences in the observed attitude towards financial markets. For doing this, we based our analysis on the rich information provided by SHARE, which contains both current and retrospective information that are necessary to test our empirical approach, together with other datasets.

The paper proceeds as follows. In the next section we review the main contributions on the topic of stock market participation and then we present our main source of data, i.e., SHARE, showing the features of the variables used in the regressions. Then we examine the results of the empirical estimates under the assumption of no endogeneity of human

[2] This paper uses data from SHARE wave 4 release 1.1.1, as of March 28th 2013 (https://doi.org/10.6103/SHARE.w4.111), and SHARELIFE release 1, as of November 24th 2010 (https://doi.org/10.6103/SHARE.w3.100). The SHARE data collection has been primarily funded by the European Commission through the 5th Framework Programme (Project QLK6-CT-2001-00360 in the thematic programme Quality of Life), through the 6th Framework Programme (Projects SHARE-I3, RII-CT-2006-062193, COMPARE, CIT5- CT-2005-028857, and SHARELIFE, CIT4-CT-2006-028812) and through the 7th Framework Programme (SHARE-PREP, N° 211,909, SHARE-LEAP, N° 227,822 and SHARE M4, N° 261,982). Additional funding from the US National Institute on Aging (U01 AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG12815, R21 AG025169, Y1-AG-4553-01, IAG BSR06-11 and OGHA 04-064) and the German Ministry of Education and Research as well as from various national sources is gratefully acknowledged (see http://www.share-project.org for a full list of funding institutions)."

[3] Among few theoretical exceptions, see the model developed by Spataro and Corsini (2017).

capital and financial literacy. Next, we discuss the case of determinants of stock market participation under a multiple endogeneity framework. Conclusions will end the study.

Literature Review

In recent years, several studies have been focussing on the determinants of stock market participation. A growing body of works has pointed out that stock market participation is correlated with characteristics such as investor cognitive skills, financial literacy[4] and education. For example, Guiso and Jappelli (2005), using the 1995 and 1998 Bank of Italy Surveys of Household Income and Wealth (SHIW), found that lack of financial awareness among Italian households was a primary reason for the limited participation (for more recent works see Arrondel et al. 2012; Van Rooij et al. 2011; Yoong 2011). As for human capital, Campbell (2006) and Haliassos and Bertaut (1995) showed that the college educated were more likely to own stocks than less educated individuals were. Cole and Shastry (2008) argued that 1 year of schooling increased the probability of financial market participation by 7–8%. Other empirical studies on stock holding have shown that controlling for educational attainment did enhance the significance of the variable financial literacy (Behrman et al. 2012; Lusardi and Scheresberg 2013; Van Rooij et al. 2011) underlying the observation that both general knowledge (education) and specialized knowledge (financial literacy) contributed for financial decision-making in countries such as Denmark, Netherlands, and US.

As for other individual economic variables, the overall conclusion of previous literature was that higher levels of wealth were associated with a greater likelihood of participation, also due to the presence of participation costs (Calvet and Sodini 2014; Fagereng et al. 2017).

A relatively new literature on the role of social-interaction or social networks is worth mentioning. This recent literature has conjectured that social interactions and social capital positively affects the financial decisions of individuals like wealth accumulation, retirement decisions, stock market participation (Brown et al. 2008; Brown and Taylor 2007; Liu et al. 2014).

As for the role of market returns, Dimson et al. (2002) found that, coupled with fixed participation costs and investor home bias, variations in Sharpe-ratios across countries could contribute to explain the differences in the participation. Hurd et al. (2011) observed that the movements of stock market prices were correlated with expectations of Dutch and American investors, and optimistic believes based on the past return data improved the probability to participate in stock markets. Arrondel et al. (2012) uncovered that stock ownership strongly correlated with both expectations and realizations of stock market returns, and was robust to the inclusion of measures of financial literacy, ability or trust. Finally, Malmendier and Nagel (2011) provided evidence those cohorts who experienced high stock market returns throughout their life and recently were more likely to participate in the stock market.

In the light of this literature, in this paper we aim at providing new evidence on the determinants of participation to stock markets in some European countries, by controlling for possible endogeneity of both human capital and financial literacy and for the role of some institutional and socio-economic variables, both at individual and country level.

Data Description

The data were drawn from Wave 3 and Wave 4 of SHARE, a representative sample of the adult population in several European countries. The survey covers various aspects of the well-being of the elderly population ranging from socio-economical, mental, and health conditions. Wave 4 refers to year 2010 and we focused on individual information from nine selected European economies (Austria, Belgium, Denmark, Germany, Italy, France, Switzerland, Sweden, and Netherlands). Wave 3 is known as SHARELIFE, which records the life histories of half of the respondents of Wave 4. More precisely, Wave 4 comprises 32,337 observations, while the life history information provided in Wave 3 for the individuals re-interviewed in Wave 4 amounts to 17,533 individual records (although with several missing data). Given the lack of retrospective information for most of observations in previous waves, we carried out our analysis by focusing on Wave 4 only. Moreover, our analysis also used country-level data from International Historical Statistics and Global Financial database, which concerns the nine countries above. The variables used in the model and their sources are listed in Appendix 1.

The dependent variable in our model was participation in the stock market, a binary variable which takes value 1 if the worker was participating in the stock market in year 2010 or 0 otherwise (or the probability to participate in the stock market in the case of probit regressions). More precisely, we used a standard measure of stock market participation (as done, among others, by Vestman 2010) which consists in stock ownership. The measure excludes stock market participation through mutual funds, pension plans or mandatory retirement accounts. In Wave 4, 16.84% of workers

[4] In the recent years there has been burgeoning research on the measurement of financial literacy and its effects on household behaviour especially on retirement planning (Lusardi and Mitchell 2011; Van Rooij et al. 2012 among others) on savings and portfolio decisions (Jappelli and Padula 2013; Lusardi et al. 2017). For a review see Jappelli (2010).

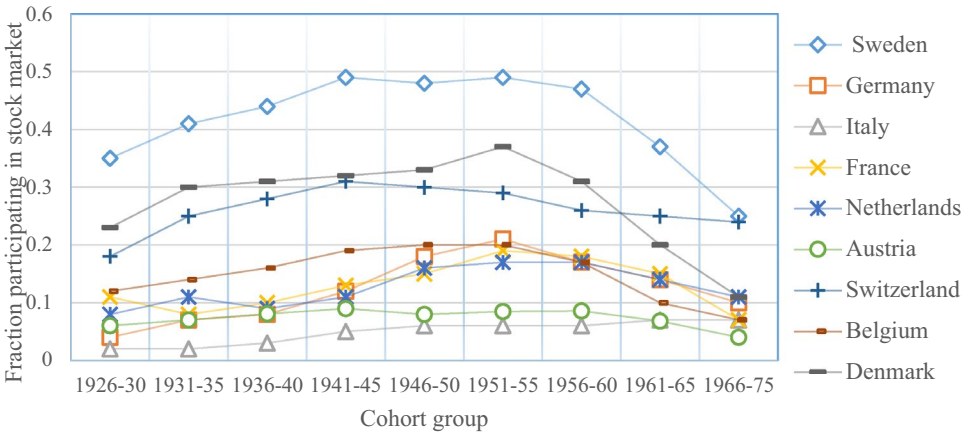

Fig. 1 Fraction participating in stock market by cohort group and country. Source: Authors' calculation using SHARE database. Data are provided for 5-year cohort groups (apart from 1966 to 1975, due to low number of observations)

participated in the stock market and invested in risky assets, in line with the evidence provided by existing studies.

Figure 1 shows the fraction of individuals born in different cohorts and in different countries participating in the stock market. Individuals were grouped into nine 5-year cohort groups. For each cohort group we computed the fraction of people participating in stock market by dividing the number of participants by the total number of individuals belonging to the same cohort group.

We note that not only was there a significant difference in the country-level participations rates, but, especially for some countries, also a visible age effect. More precisely, lower participation rates characterized Southern European countries, while a common trait is that participation rates displayed an inverse U shape, already documented in previous studies, probably due to the combination of different effects,[5] with higher propensity to join the financial markets associated with middle-aged individuals. In fact, in our sample stock market participation was concentrated in the age interval 54–70.

Individual Explanatory Variables

The first independent variable in our model was current level of individual's financial literacy, which has been extensively used in the literature. Several studies both in United States and other countries found out that more financially literate individuals are also more likely to participate in stock markets (Arrondel et al. 2012; Van Rooij et al. 2011; Yoong 2011).

As for the measurement of such a variable, following Jappelli and Padula (2013) we used the index provided by SHARE, whereby each individual of Wave 4 is presented with four financial and numerical questions and the answers are imputed to obtain a value ranging from 1 to 5. Details of the actual questions and the construction of this indicator are given in the Appendix 2 and have been discussed in Christelis et al. (2010).

In Fig. 2, we report the fraction of individuals participating in stock markets across different levels of financial literacy and different countries. The Figure clearly shows that stock ownership increases sharply with financial literacy: In fact, participation in the stock market is concentrated among individuals with high literacy (fourth and fifth scores), while only 3 and 9% of respondents in the first and second scores were in the stock market in 2010, respectively.

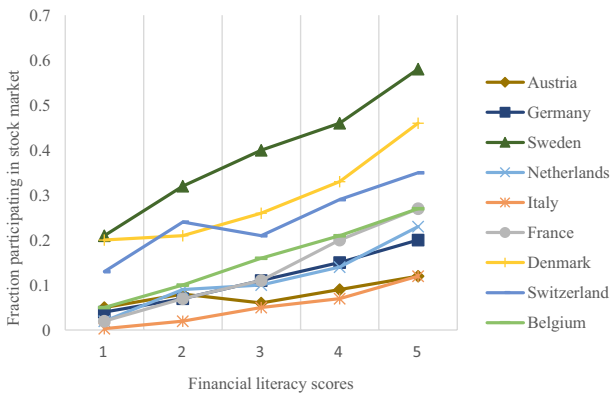

Fig. 2 Fraction participating in stock market by financial literacy scores and country. Source: Authors' calculation using SHARE database. For details on financial literacy groups see Appendix 2

[5] Such differences among countries in stockholding could also arise from differences in cultural norms which are likely to be associated with apparent differences in risk tolerance levels or perception of the risk of the financial options. Additionally, changes in participation rates in risky asset markets could be influenced by the nature of society the worker belongs to. For example, in collectivistic societies, respondents are likely to receive financial assistance from their family and social networks; Pyles et al. (2016) showed that in these societies the perceived risk in financial decisions is lower than in individualistic societies (such as the Denmark, Sweden), where individuals are more likely to be left to fend for themselves. In the empirical analysis we take these issues into account by using control variables at both individual and cohort/country level.

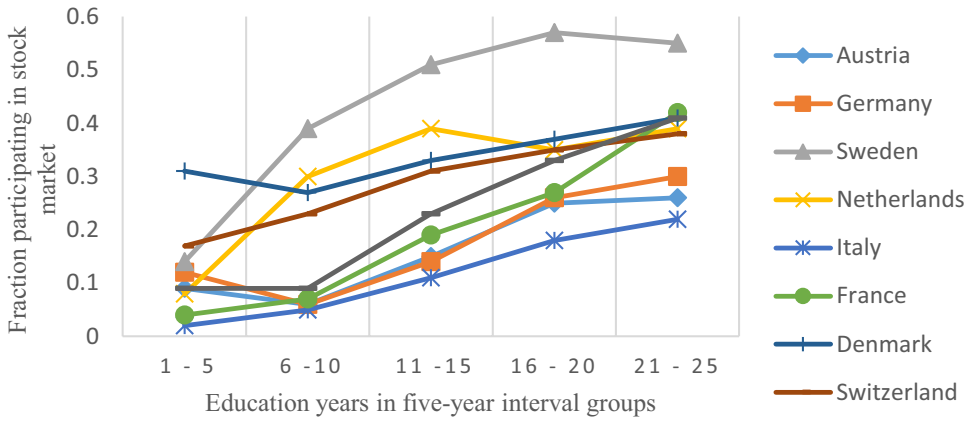

Fig. 3 Fraction participating in stock market by schooling years and country. Source: Authors' calculation using SHARE database

The second explanatory variable used in our analysis was human capital, proxied by years of schooling (stock of education). It is widely noted in the literature that human capital/education affects cognitive ability, which in turn increases participation (Bertaut and Starr-McCluer 2002; Cole and Shastry 2008). Figure 3 shows the fraction of individuals who invested in stock market, by schooling years. Education years were stratified into five groups and the figure clearly shows increasing probability to invest in the stock market as schooling years increase.

The next independent variable was individual income, measured by income-quintiles at country level. Total income was calculated by adding wages for employed workers and income from self-employment for the self-employed workers. As for retired workers, income was calculated from social security entitlements. Next, income was divided into quintiles at country level in order to take care of the country-differences in purchasing power.[6] We created two dummies for medium income group (second and third quintiles) and high income group (fourth and fifth) respectively. We expected a positive relationship between income groups and participation in stock market as suggested, for example, by Bertaut and Starr-McCluer (2002) and Brown et al. (2008), who argued that higher income respondents are more likely to have access to financial advice and information, which in turn facilitate stock ownership. In fact, Fig. 4 shows that income and the participation to stock market are positively correlated.

In line with earlier studies, we also used wealth as a possible relevant predictor of stock market participation. The overall conclusion of previous literature (e.g., Calvet and Sodini 2014; Fagereng et al. 2017) was that changes in wealth are associated with a greater likelihood of

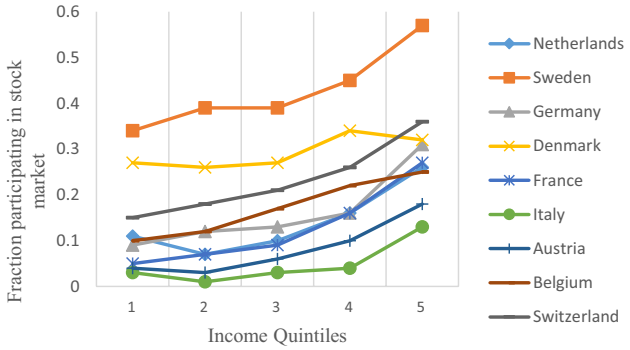

Fig. 4 Fraction participating in stock market and income quintiles, by country. Source: Authors' calculation using SHARE database. Income quintiles are country-specific

participation, also due to the presence of participation costs. The expected positive correlation between wealth quintiles computed for each country and stock market participation emerges from Fig. 5. Further, observing the participation rates across different wealth levels suggested a remarkable difference across Europe. For example, among the high-participation countries (Sweden, Denmark and Switzerland), households belonging to third and fourth quintiles of wealth exhibit twice as high participation rates, relative to low level participating countries.

Furthermore, following previous literature (Brown and Taylor 2007; Brown et al. 2008; Liu et al. 2014) and available data in SHARE, we employed a set of variables to investigate the role of social interaction in influencing the decision to join financial markets. Specifically, we used three dummy variables which take value 1 if a person attended some voluntary/charity activity, if she was a member of any club, if she was involved in political or organisational activity, respectively. The total number of people in the network was also added as a variable to capture the effect of the size of the network.

[6] We also tried to capture the difference in wages across different sectors; however, large number of missing values has forced us to drop the exercise.

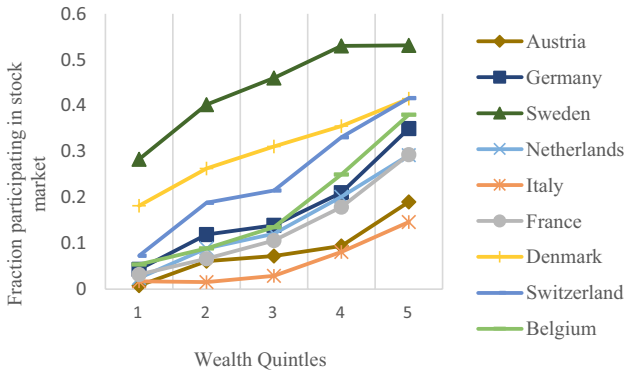

Fig. 5 Fraction participating in stock market and wealth quintiles, by country. Source: Authors' calculation using SHARE database. Wealth quintiles are country-specific

One of the striking features of the empirical data on financial literacy is the large and persistent gender difference and this is also reflected in the economic decision to participate in stock market. Previous studies showed that women as less likely to enter the stock market (Croson and Gneezy 2009; Fonseca et al. 2012). Hence, we expected a negative relationship between female individuals and stock market participation. In fact, the statistics of our sample showed a correlation between sex (1 if female, zero otherwise) and stock holding equal to −0.1041. Demographic variables such as age, age-squared, number of children in the family, and marital-status were also included in the model and used as controls in the regressions. These variables were aimed at capturing some life-cycle features that could influence individuals' attitude towards risky investments. Additionally, we included a dummy for retired respondents to account for households who might have been in the decumulation phase of their life-cycle.

Country Specific and Country-Cohort Specific Variables

As for institutional variables at country-level, we assessed the role of the effectiveness of the education system in influencing stock market participation. Following Ostroff and Schmitt (1993), effectiveness of schooling was proxied by student–teacher ratio. As for empirical support, we hinged on few studies which identified the effects of teacher-student ratio in a range of outcomes, including improvement in test scores (Arum 1996), increased years of educational attainment (Bound and Turner 2007) and higher lifetime earnings (Card and Krueger 1996).

In this work, we argue that the effectiveness of education could be treated as a country-level institutional variable, which may exert a positive externality in the decision to participate in stocks or in the attitude towards risky financial decisions. The construction of the variable was performed by first dividing the age groups into ten different cohort groups. From the International Historical Statistics on Education database, the 10-year average student–teacher-ratio was calculated for each individual belonging to a specific cohort and country. The years taken into account were those in which the members of each cohort group were within the age interval of compulsory schooling years (6–15). For each cohort group and country, we calculated the fraction of individuals participating in the stock market and the associated student–teacher ratio (although data are not available for all cohorts present in the SHARE database). Figure 6 shows that, with few exceptions, irrespective of the different levels of student–teacher ratio featuring different countries, the fraction of individuals holding stocks tends to decline as the student–teacher ratio increases.

In our empirical investigation, we also included a country-level financial incentive measure proxied by the Sharpe-ratio (Appendix 3 for details on these data). In this respect, it is probably true that most people did not observe and/or

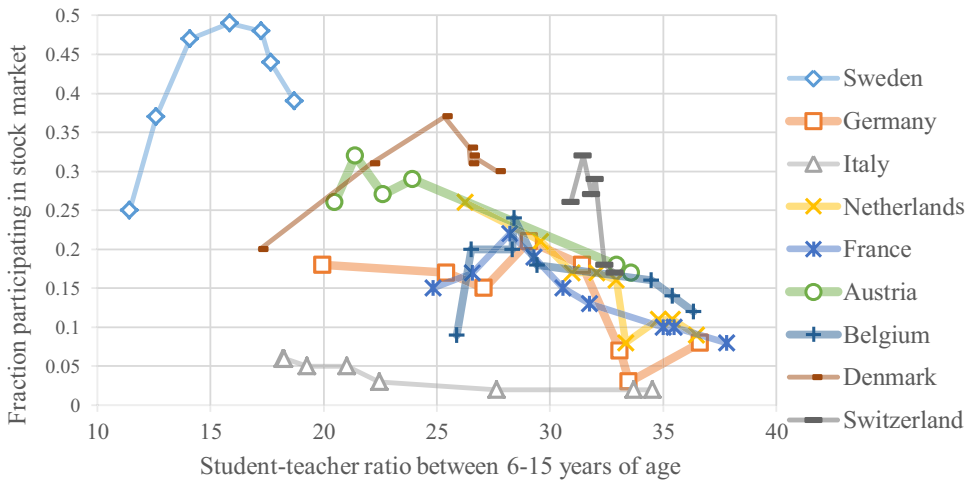

Fig. 6 Fraction participating in stock market in 2010 by country and student–teacher ratio at early ages (6–15 years of age). Source: Authors' calculation using International Historical Statistics. X axis: 5-year average student–teacher ratio for 5-year cohort groups at age 6–15 (some older cohorts were merged with others in case of low number of observations or lack of data). Y axis: fraction of individuals participating in the stock market for each cohort group and country

understand such a complex financial index as the Sharpe-ratio when deciding whether to take part in stock market or not. However, we assumed, as it is reasonable, that they did observe financial cycles through print and visual media and the Sharpe-ratio is a proxy of the market performance experienced and perceived by households in each country. Moreover, it is a well-documented fact that there is a significant home-bias in the stock market participation, so that we assumed that people living in a country had more information on the financial status of their own country of residence and they primarily tended to observe and analyse the financial attractiveness of the country of residence when deciding to make a financial investment. In this respect, we followed the argument made by Kaustia and Knüpfer (2008) and Malmendier and Nagel (2011) on the relevance of observed returns in the decision of making financial decisions including direct stock participation.

More precisely, in this paper we argued that the effect of the attractiveness of the stock market on the decision to join it is twofold. First, *current* (or recent) financial incentives as measured by the Sharpe-ratio may affect the *current* decision to invest in the stock market. Second, *previous* financial incentives are likely to have affected the decision to invest in financial literacy and human capital, a decision that in fact happens early in life.

As for the first channel, for each individual we computed a 5-year average of Sharpe-ratios at country level between 2006 and 2010. Overall, these data showed that the correlation between Sharpe-ratios observed in 2006–2010 and participation rates in stock markets was 0.08 and significant. The second channel (Sharpe-ratios observed at young ages) is discussed in the identification strategy under the endogenous framework.

Finally, we added the country dummies (three country-group dummies), namely high participation countries (Sweden, Denmark and Switzerland), medium-participation countries (Germany, Belgium, France and Netherlands) and low-participation countries (Austria and Italy[7]) to capture the country-level effects (due to, for example, taxation, openness of the economy, economic freedom, generosity of pension arrangements and other cultural elements) which were not captured by other socio-economic and institutional variables otherwise. We kept medium-participation country group as the benchmark. The statistics for the full set of variables and instruments used in the empirical exercise are reported in Table 1.

[7] The classification is based on direct stockholding percentages. Italy and Austria are low participating countries with less than 7% of the respondents holding stocks. The medium participation country group represents countries whose direct participation levels are between 8–20% and the high participating countries ranges from 21 to 40%. Broadly speaking stockholding increases form Southern to Northern Europe, with Switzerland as an exception.

To sum up, in light of the above discussion, in this work we argued that there are different channels through which individual and country/cohort specific variables may affect the decision to invest in stocks.

As for individual variables, apart from usual socio-demographic variables used in previous studies like age, marital status, gender, household size, income and wealth, we focused on financial literacy and human capital (measured by the number of years of schooling). By doing so we assumed that investing in risky assets requires both general level of education and a specific human capital investment (financial literacy). Moreover, we controlled for possible endogeneity of the latter variables: more precisely, sharing insights with Grohmann et al. (2015) and a fresh and yet growing strand of literature, we argued that early endowments might be strong predictors of late life acquisition of financial literacy and general education. We also assumed that such level of acquisition could be affected by specific economic country/cohort variables like financial attractiveness of the stock market when the individual was in his/her adolescence.

As for other individual variables potentially affecting the decision to invest in stocks, we explored the role of social interaction and social capital variables: In fact, individuals with low social interactions are likely to have low familiarity with risky markets, overestimate financial risks and, thus, abstain from stock markets.

Finally, we focused on the role of country/cohort level factors, such as effectiveness/quality of education at young ages and performance of financial markets in previous years.

Empirical Model

The econometric analysis followed a two step strategy. In the first step, variables like financial literacy and human capital were considered as exogenous and we implemented both an OLS and a probit model to have a baseline model. In the second step, we allowed for the endogeneity of financial literacy and human capital. In fact, in the presence of multiple endogeneity, the probit approach yields biased results as suggested by Cameron and Trivedi (2010) and therefore we resorted to control function (CF) approach, which will be discussed in detail in the later part of this section. Finally, as a check, we used an IV two-stage regression when considering the endogenous model.

OLS and Probit Models

The first empirical model was obtained as a simple OLS and probit model. Both estimations had the following specification:

Table 1 Sample statistics of the variables used in the regressions

Variable	Observations	Mean	SD	Min	Max
Individual level variables					
Participation in Stock Market (dependent variable)	32,337	0.168	0.374	0	1
Financial literacy	32,337	3.461	1.145	1	5
Number of years in school	32,337	10.341	4.608	0	25
Age at interview date	32,337	43.33	10.520	31	86
Age squared	32,337	4448.552	1431.787	961	7,396
Dummy for married	32,337	0.845	0.3610	0	1
Number of children	32,337	2.175	1.414	1	17
Dummy for female	32,337	0.558	0.496	0	1
Dummy for medium income group	32,337	0.3999	0..4899	0	1
Dummy for high income group	32,337	0.3999	0.4899	0	1
Dummy for medium wealth group (base level: wealth low)	32,337	0.3867	0. 48701	0	1
Dummy for high wealth group (base level: wealth low)	32,337	0.3861	0.4867	0	1
Dummy for retirement	32,337	0.5299	0.4991	0	1
Dummy for participation in charity/voluntary activities	31,664	0.23021	0.4210	0	1
Dummy for participation in political/organisational activities	31,664	0.07080	0. 2565	0	1
Dummy for membership in a club	31,664	0.33043	0.47037	0	1
Total individuals in network	30,773	2.6196	1.5505	0	7
Cohort/country level variables					
Sharpe-ratio (5-year average for 2006–2010)	32,337	0.0222	0.0504	−0.101	0.068
Dummy for low participation countries	32,337	0.2742	0.4461	0	1
Dummy for high level participation countries	32,337	0.2466	0.4310	0	1
Student–teacher ratio	32,337	27.696	5.751	10.366	37.822

$$\text{Stock Y}\,[1,0] = \alpha_{1+}\beta_1\text{FL} + \beta_2\text{HC} + \beta_3\text{Age} + \beta_4\text{Agesq} + \beta_5\text{MS} + \beta_6\text{CH} + \beta_7\text{FE} + \beta_8\text{IN\_M} + \beta_9\text{IN\_H} + \beta_{10}\text{WEALTH\_M} + \beta_{11}\text{WEALTH\_H} + \beta_{12}\text{RE} + \beta_{13}\text{CHA} + \beta_{14}\text{POL} + \beta_{15}\text{CLUB} + \beta_{16}\text{NET} + \beta_{17}\text{SH} + +\beta_{18}\text{DUM\_HIGH} + \beta_{19}\text{DUM\_LOW} + \beta_{20}\text{EQ} + \varepsilon$$

where Stock is, in the case of OLS regression, the dependent variable which takes value 1 if the worker participated in the stock market in year 2010 or 0, while, in the case of the probit model, is the probability of participating in the stock market in the same year. The individual level variables are the financial literacy score (FL) and the number of years of schooling (HC). The socio-demographic characteristics such as age (Age), age-squared (Agesq), dummy for married (MS), number of children (CH), dummy for female (FE), and dummy for retired (RE) were also included in the model.

The economic variables included income groups (IN_M and IN_H are dummies for individuals belonging to the medium and high-income groups, respectively) and WEALTH_H and WEALTH_M are high wealth and medium wealth groups. The social interaction terms included a dummy for participation in voluntary/charity activities (CHA), a dummy for participation in political and organisational activities (POL), for membership in a club (CLUB), and the number of persons in individual's social network (NET).

The country-level variables comprised SH, that is the current (5-year average) country-level Sharpe-ratio. Additionally, we included country-group dummies for high participation countries (DUM_HIGH) and low participation countries (DUM_LOW). The country/cohort group level variable EQ is the student/teacher-ratio at cohort-country level when individuals were within their 6–15 age interval. ε is error term.

Empirical Results Based on OLS and Probit Models

Table 2 reports the results of regressions carried out under two different specifications: OLS and probit. The empirical results of these baseline regressions show that all the explanatory variables used in this study were significant across all specifications and displayed the expected signs, with the only exception of the interaction term of low participation

Table 2 Multivariate regression using OLS (Model 1) and Probit model (Model 2, associated marginal effects in column 3)

Variables	OLS	Probit	Marginal effects
Individual level variables			
Financial literacy	0.0232** (0.000)	0.0213** (0.022)	0.0261** (0.002)
Schooling years	0.0048** (0.000)	0.1271** (0.010)	0.0044** (0.000)
Age	0.0171** (0.002)	0.0848** (0.014)	0.0174** (0.002)
Age-squared	−0.00009** (0.000)	−0.0005** (0.000)	−0.0001** (0.000)
Number of children	−0.0074** (0.001)	−0.0537** (0.007)	−0.0110** (0.001)
Dummy for married	−0.0431** (0.006)	−0.2071** (0.027)	−0.0462** (0.006)
Dummy for female	−0.0395** (0.004)	−0.1697** (0.020)	−0.0353** (0.004)
Dummy for medium income group	0.0202** (0.005)	0.1169** (0.030)	0.0244** (0.006)
Dummy for high income group	0.0654** (0.005)	0.3180** (0.029)	0.0678** (0.006)
Dummy for medium-wealth group	0.0548** (0.004)	0.4295** (0.032)	0.0935** (0.007)
Dummy for high-wealth group	0.1682** (0.005)	0.8906** (0.032)	0.2034** (0.007)
Dummy for retirement	−0.0227** (0.005)	−0.0679* (0.027)	−0.0141* (0.005)
Dummy for participation in charity/voluntary activities	0.0184** (0.005)	0.0987** (0.022)	0.0200** (0.004)
Dummy for participation in political/organisational activities	0.0369* (0.009)	0.1213** (0.033)	0.0262** (0.007)
Dummy for membership in a club	0.0343** (0.004)	0.1470** (0.020)	0.0311** (0.004)
Total persons in the network	0.0069** (0.001)	0.0390** (0.006)	0.0073** (0.001)
Cohort/country variables			
Sharpe-ratio (years 2006–2010)	0.1511* (0.035)	0.8021* (0.239)	0.1651* (0.049)
Dummy for low-participation countries	−0.1267** (0.010)	−0.6662** (0.035)	−0.1166** (0.005)
Dummy for high-participation countries	0.1028** (0.007)	0.3590** (0.028)	0.0824** (0.007)
Student–teacher ratio	−0.008** (0.000)	−0.0335** (0.028)	−0.0069** (0.000)
Constant	−0.570** (0.089)	−4.554** (0.046)	
Observations	28,847	28,847	28,847
R-squared	0.145		
Pseudo R^2			0.17

Standard errors in brackets. Dependent variable: binary variable in case of OLS – 1 if participating in the stock market in year 2010, 0 otherwise; probability to invest in stock market in the case of probit regression model

**p < 0.01, *p < 0.05, †p < 0.10

country groups. The OLS and the probit regressions (marginal effects) provided similar results. The likelihood ratio (L-R tests) for overall variables' relevance [probit model; LR (χ^2) (20) = 4573.01 with prob > (χ^2) = 0.00] shows that the hypothesis that all parameters are equal to zero could be rejected at 1% level of significance.

In both specifications, financial literacy and human capital (proxied by number of years of schooling) showed a positive effect on stock market participation and coefficients were significant at 1% level. The marginal effects suggested an independent, economically important estimate of these two variables. More financially literate individuals were more likely to invest in stocks by 2.6%, while a unit change in the years of schooling added a marginal 0.4% increase in the probability to enter stock markets. The above effects are net of various demographics, household resources, country/cohort wide differences and are economically important given that the average participation rate in our sample did not exceed 17%.

Based on the probit specification we found that the variable dummies for medium and high-income groups were significant and positive and that one standard deviation of these variables was associated with a 2.4 and 6.7% increase in the probability to own stocks, respectively.

When we distinguished households by median net wealth levels, we found significant effects among those with more than medium and high levels of wealth in both regressions (low wealth group is the baseline). The estimated marginal effects of the medium wealth and high wealth holders displayed a higher probability of stock participation of 9.3 and 20.3% respectively, compared to the low wealth group.

As for demographic characteristics, married individuals turned out to have a lower probability to participate in the stock market, by 4.6% (significant at 1%). Conversely, higher number of children and being female reduced the probability of stock holding. As for gender effect, if the dummy for female changed from 0 to 1, the probability to participate in the stock market would decrease by 3.5%, pointing to

the presence of a gender gap already documented in previous studies. Moreover, the regressions indicated that direct stockholding increased with age, thus showing that the U shape form in Fig. 1 is a combination of both age and cohort effects. The retired individuals were less likely to participate in the stock market.

As for social interaction variables, we observed that they were significant and positive at 1% level, showing that both the size (total number of individuals in the social network) and the quality of the social networks did matter. The social interaction variables, like dummies for charity/voluntary activities, for political/ organisational participation and for club membership showed a positive marginal effects of 2.0, 2.6, and 3.1% respectively. Finally, a standard deviation in the number of persons in networks increased the probability to participate in the stock market by 0.7%. The latter findings confirmed the presence and the relevance of peer-effects through social interaction.

When different groups of countries were considered, the respondents from high participation countries were 8.2% more likely to participate. In contrast, the low participation countries were 11.6% (significance level 1%) less likely compared to the baseline medium participation countries.

Student–teacher ratio at schooling years (that is when individuals were in their 6–15 years of age) demonstrated a negative effect, suggesting that, as education quality gets worse in a country, social capital deteriorates as well, so that both quality of own education is lower and there are lesser possibilities to find individuals in the same cohort group that are engaged in stock markets. According to our findings, respondents belonging to higher student–teacher ratio cohort-groups were 0.6% less likely to participate in asset markets.

Finally, the current financial attractiveness of the market proxied by the 5-year average Sharpe-ratio revealed a positive and significant marginal effect. We observed that a unit change in this variable made respondents 16.5% more likely to enter stock markets.[8]

Empirical Model under Endogenous Framework

Identification Strategy

This section illustrates the identification strategy used to correct for the potential endogeneity of some of the independent variables. Although these variables will be referred as instruments, one should be aware that the estimation method adopted here differs from the standard two-stage instrumental variable method (see next section for details). As already mentioned, we allowed for the possibility that both human capital and financial literacy investments are endogenous. Our identification strategy was based on two assumptions: (1) Early endowments in the form of talent and ability are strong predictors of financial literacy and schooling years (Grohmann et al. 2015); (2) The current stock holding decisions are shaped by history in the sense that they are not only based on current variables but are also transmitted slowly over time and have early-life influences.

Therefore, the endogeneity could arise from the fact that the current level of financial literacy is influenced by the "endowment" (starting or initial conditions) before the worker enters the labour market. SHARE retrospective data (SHARELIFE) provide a plausible measure of this endowment. Survey participants reported their mathematical ability at age 10 in response to the question: "How did you perform in Maths compared to other children in your class? Did you perform much better, better, about the same, worse or much worse than the average?" While mathematical ability does not span exactly the same domain of financial literacy, ongoing research shows that there is a close correlation between the two concepts of literacy. We used this instrument as suggested by Jappelli and Padula (2013) who exploited Wave 1 and Wave 2 of the SHARE database to explore the effect of financial literacy on the saving decisions of workers.

Moreover, we also suspected human capital, which we measured through years of schooling, to be endogenous. As pointed out by Lam and Schoeni (1993), an omitted variable like the individual ability/talent of the worker which is correlated to schooling in the wage equation could overestimate the schooling's true effect on wages, because it has captured some of the wage effect of ability. In other words, differences in the initial endowments of the individual at younger ages can also induce unobserved compensatory behaviour among workers in their economic and financial decisions, and therefore the probability to participate in stock market based on only the observed human capital investment would surely provide biased results.

Additionally, taking a cue from the literature examining cognitive abilities and academic achievement (Männamaa and Kikas 2010; Marton 2008; Van der Sluis et al. 2004) academic performance in the school years computed from proficiency in maths and language was regarded as a strong predictor of academic achievements. Also following Kern and Friedman (2009), who argued that reading ability is generally associated with positive baseline characteristics such as higher IQ and higher schooling years, we included a measure of language skills at young age of the respondents as an instrument capturing the talent/endowment. The participants reported their language skills at age 10 in response to the questions: "How did you perform in language compared to other children in

[8] Interactions of country dummies with Sharpe-ratios were also attempted, although they were not significant. In fact, Sharpe-ratios are country-specific and the latter, together with the country—group dummies and student–teacher ratios (cohort/country level) already capture the between-country variability in participation rates.

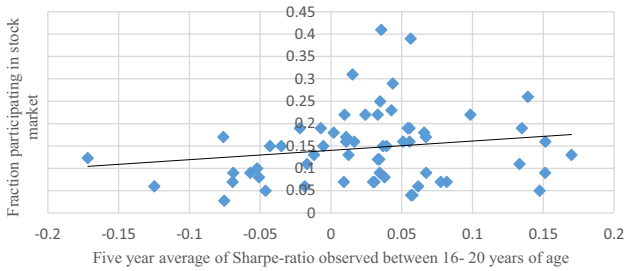

Fig. 7 Fraction participating in stock market and Sharpe-ratio at age 16–20 by cohort groups and countries. Source: Authors' calculation using Global Financial Database. X axis: 5-year averages of Sharpe-ratios for each 5-year cohort-groups and countries. Y axis: fractions of individuals participating in the stock market for each cohort group and country

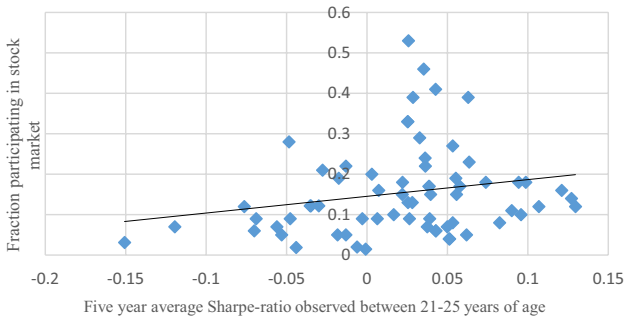

Fig. 8 Fraction participating in stock market and Sharpe-ratio at age 21–25 by cohort groups. X axis: 5-year average Sharpe-ratios for each 5-year cohort-groups and countries. Y axis: fractions of individuals participating in the stock market for each cohort group and country

your class? Did you perform much better, better, about the same, worse or much worse than the average?" The complete statistics of the instruments are provided in Appendix 4.

To validate our assumptions that financial incentives are likely to have affected the decision to invest in financial literacy and human capital, a decision that in fact happens early in life, we computed and included the 5-year-average Sharpe-ratios at cohort-group/country level, observed when each worker in Wave 4 was between 16 and 20 years old and 21–25 years old respectively.[9] The computed values and the associated fractions of participation in stock markets are plotted in Figs. 7 and 8 respectively. From both figures, it emerges that the fraction of individuals participating in the stock market for each cohort tends to increase when the Sharpe-ratio observed at young ages increases. However, correlations were weak and not significant, so that it is likely that the effect of the Sharpe-ratios observed at early stages of life on stock market participation was indirect, possibly via financial literacy and human capital accumulation. More precisely, in our framework the Sharpe-ratios observed by individuals at younger ages influence the decision to acquire more education and financial literacy and thus indirectly facilitate their decision to join stock markets in the later period of time (in terms of lower costs to take track of their investments, to acquire relevant information and so on).

In order to check the robustness of our assumptions we run the control function regressions by using additional instruments concerning family background variables, including occupation of father when respondent was aged 10 (Model 2 in Table 4) and initial conditions like number of rooms in the accommodation at age 10, number of books in the house, besides parents' occupation at the age of 10 (Model 3 in Table 4).

Multiple Endogeneity and Estimations Based on Control Function Approach

One of the approaches to deal with an endogenous regressor is the linear probability model using two-stage least squares (2SLS) with a valid and strong set of instruments. Given the dichotomous nature of the independent variable, we resorted to a control function (IVprobit). The latter procedure can be based on either the maximization of the likelihood function associated with a system of equations or a two-step procedure when MLE is difficult to obtain (for details see Wooldridge 2002, pp. 474–477). Given that the latter approaches produce the same results, we used the IVprobit-MLE approach and include 2SLS regression as a check.

To test whether financial literacy and human capital are endogenous to the participation in stock market, we employed the Wald test of endogeneity. The null hypothesis corresponds to the exogeneity case of the regressor under scrutiny. The Wald test computation (bottom of Table 4) of different specifications led us to reject the null hypothesis of exogeneity of the regressors and therefore justified the use of approaches that correct for endogeneity.

In this background, we instrumented both financial literacy and schooling years on a set of exogenous variables, which were correlated with the endogenous variables, and not correlated with stock participation at later age. The OLS estimates (not shown here for brevity reasons) showed that maths score at 10 and language skills at 10 were strong predictors of financial literacy and schooling years,[10] and that the latter had no significance on stock market participation,

[9] We recall that in SHARE database education years range from age zero to 25 (see Table 1).

[10] The relative mathematical ability at age10 shows almost equal effect on financial literacy and school years, while relative score of language skills at age 10 is a better predictor of school years rather than financial literacy.

Table 3 First stage regressions of control function (Model 1 of Table 4) to correct endogeneity of schooling years and financial literacy. Robust standard errors are reported in parentheses

Endogenous variable	Schooling years	Financial literacy
Age	0.0415 (0.064)	0.0150 (0.015)
Age squared	−0.0006 (0.004)	−0.0002† (0.000)
Number of children	−0.1165** (0.027)	−0.0145* (0.006)
Dummy for married	−0.5806** (0.011)	0.0299 (0.021)
Dummy for female	−0.5840** (0.078)	−0.2737** (0.018)
Dummy for medium income group	−0.1010 (0.099)	0.0035 (0.023)
Dummy for high income group	1.2963** (0.104)	0.1568** (0.024)
Dummy for medium-wealth group	0.2619* (0.100)	0.1390* (0.023)
Dummy for high-wealth group	1.4022** (0.1031)	0.2707** (0.024)
Dummy for retirement	−0.0357 (0.0952)	0.0392† (0.023)
Dummy for participation in charity/voluntary activity	0.2497* (0.08)	0.0895** (0.020)
Dummy for participation in Political/ organisational activity	0.8112** (0.143)	0.0968* (0.034)
Dummy for membership of a club	0.0331 (0.07)	0.0914** (0.018)
Total persons in the network	0.1552** (0.024)	0.0189* (0.005)
Sharpe-ratio (years 2006–2010)	−7.3873** (0.910)	−0.1417 (0.217)
Dummy for low-participation countries	−4.9853** (0.151)	−0.2131** (0.036)
Dummy for high-participation countries	−2.3941** (0.115)	0.2031** (0.027)
Student–teacher ratio	−0.1080** (0.009)	−0.0014 (0.002)
Instruments		
Maths at age 10	0.4086** (0.043)	0.2350** (0.010)
Language at age 10	0.7001** (0.043)	0.0706** (0.010)
Sharpe-ratio at age 16–20	3.9154** (0.810)	0.5989* (0.193)
Sharpe-ratio at age 21–25	5.641** (0.842)	0.5028* (0.200)
Constant	11.47 (0.527)	2.17 (0.533)
Observations	12,291	12,291
R-squared	0.273	0.190

**$p < 0.01$, *$p < 0.05$, †$p < 0.10$

thus convincingly ruling out any direct effect of these two instruments on the dependent variable. Second, we also argued that the Sharpe-ratios observed by individuals at their young ages (16–25) influenced the decision to acquire more education and financial literacy and thus indirectly facilitated their decision to join stock markets in the later period of life; hence, these variables entered the regression framework as instruments. OLS estimates (not reported here) confirmed that Sharpe-ratios at young age were good predictors of financial literacy and schooling years. As a formal measure, we used the tests of overidentifying restrictions and we observed that the null hypothesis could be rejected (Amemiya–Lee–Newey (ALN) test for exogeneity and Hansen J test Table 4), indicating that the exclusion restrictions for these instruments were appropriate.

The first stage results reported in Table 3 showed that self-rated maths and self-rated language skills at age 10, a proxy for talent (ability)/endowment, exerted a positive effect on both financial literacy and human capital accumulation. Moreover, the financial attractiveness of the market observed at young ages showed a positive correlation with the latter variables. Hence, not only variables proxing talent, but also the positive correlation of the Sharpe-ratios observed between 16 and 25 suggested that a good performance of financial markets in the host country at one's young age is likely to induce individuals to invest more in schooling years and in financial literacy, in view of better future opportunities and returns from such investments.

As for the relevance of the instruments (signifying the fact that they influence the suspected endogenous regressors) we observe that the F-statistics are high and above the value recommended to avoid the weak instrument problem (Staiger and Stock 1997) as reported in the first stage regression (Table 3). Finally, in order to test whether the set of instruments are valid, we exploit the Amemiya–Lee–Newey (1978) test. The null hypothesis is that the instruments are jointly valid, that is, they are uncorrelated with the error term in the structural equation and the instruments are correctly excluded from the estimated equation. With the aforementioned instruments for the vector of endogenous

Table 4 Marginal effects from different specifications under control function approach (Models 1–3) and IV two-stage approach (Model 4)

Variables	(1) IVprobit MLE	(2) IVprobit MLE	(3) IVprobit MLE	(4) IV2SLS
Individual level variables				
Financial literacy	0.06209* (0.019)	0.0690* (0.020)	0.0711* (0.018)	0.041* (0.021)
Schooling years	0.0123* (0.005)	0.008† (0.004)	0.0072† (0.004)	0.0194* (0.006)
Age	0.02614** (0.006)	0.0274** (0.006)	0.0279** (0.006)	0.0302** (0.006)
Age-squared	−0.0001** (0.000)	−0.0001** (0.000)	−0.0001** (0.000)	−0.0001** (0.000)
Number of children	−0.0113* (0.002)	−0.0114** (0.002)	−0.0117** (0.002)	−0.0070* (0.002)
Dummy for married	−0.0398** (0.010)	−0.0445** (0.010)	−0.0457** (0.010)	−0.0367** (0.011)
Dummy for female	−0.0416** (0.008)	−0.0441** (0.008)	−0.0569** (0.008)	−0.0486** (0.008)
Dummy for medium income group	0.0231* (0.009)	0.0221* (0.011)	0.0213* (0.010)	0.0252* (0.009)
Dummy for high income group	0.0428** (0.011)	0.0458** (0.011)	0.0482** (0.010)	0.0400** (0.011)
Dummy for medium wealth group	0.0690** (0.011)	0.0669** (0.011)	0.0659** (0.011)	0.0467** (0.010)
Dummy for high wealth group	0.1501** (0.012)	0.1523** (0.012)	0.1529** (0.011)	0.1353** (0.011)
Dummy for retirement	−0.0186* (0.009)	−0.0204* (0.009)	−0.0271* (0.005)	−0.0310* (0.009)
Dummy for participation in charity/voluntary activities	0.0219* (0.007)	0.0231* (0.007)	0.0243** (0.002)	0.0206* (0.008)
Dummy for participation in political/organisational activities	−0.0041 (0.012)	−0.0019 (0.008)	−0.0011 (0.012)	−0.0029 (0.014)
Dummy for membership in a club	0.0352** (0.007)	0.0341** (0.007)	0.0343** (0.007)	0.0414** (0.007)
Total persons in network	0.008** (0.002)	0.0091** (0.002)	0.0099** (0.002)	0.0071* (0.002)
Cohort/country level variables				
Sharpe-ratio (years 2006–2010)	0.2148* (0.106)	0.195† (0.105)	0.1745* (0.104)	0.1907* (0.102)
Dummy for high participation countries	0.0828** (0.020)	0.0736** (0.019)	0.0671** (0.018)	0.1245** (0.022)
Dummy for low participation country	−0.1219* (0.032)	−0.1360** (0.028)	−0.0146** (0.025)	−0.0648* (0.032)
Student–teacher ratio	−0.0087** (0.001)	−0.0093** (0.001)	−0.0097** (0.001)	−0.0095** (0.001)
Observations	12,291	12,068	11,939	12,291
Wald test	24.88	25.28	30.03	
P value	0.00	0.00	0.00	
ALN test	0.29	0.30	0.50	0.14
Hansen J Statisitic				8.18
Chi sq P value				0.16
Durbin Wu–Hausman test				27.59
P value				0.00
F statistics	105.21	105.24	105.30	105.21

Standard errors in parentheses. Dependent variable: probability to invest in the stock market

**p < 0.01, *p < 0.05, †p < 0.10

variables, Table 3 shows that the Amemiya-Lee-Newey minimum χ^2 p-values is 0.29, 0.30, 0.50 respectively in all specifications and therefore we rejected the null hypothesis of endogeneity of the instruments.

We can conclude that throughout all the empirical specifications we used and several robustness checks carried out by adding other instruments (see next subsection), we consistently found confirmation that both performance of financial markets observed at early stages in life and self-reported results in maths and language skills at age of 10, while not significantly correlated with stock holdings, provide more incentive for respondents to invest in general education and in financial literacy.

Empirical Results Based on the Endogenous Model

As for the regression of stock market participation, in Table 4, four specifications are reported. Models (1), (2) and (3) use a control function (CF) approach (IVprobit-MLE) with different specifications, Model (4) is the 2SLS model, added as a check. Model (1) was our benchmark model, where only four instruments displayed in Table 3 were used.

Model (2) adds to Model (1) father's occupation at age of 10 as an instrument and Model (3) adds initial conditions like number of books and number of rooms at the residence when the respondent was 10 years old. After pursuing a variety of robustness checks, as mentioned above, in all the specifications we found consistent results and the value of the endogenous coefficient gained more strength as the number of instruments increased. Given that the results did not vary significantly across specifications, the presentation and the discussion of results are mainly based on Model (1).

The regressions showed that the endogenous variables, namely financial literacy and years of schooling, contributed significantly to direct stock participation, with a more pronounced effect than in the baseline probit model. In line with the existing literature, more financial literate respondents across the whole sample were 6.2% more likely to participate in the stock market, while a one unit change in the years of schooling increases the probability for stock participation by 1.2% (5% level significance). These findings suggested again that the baseline probit coefficients of financial literacy and human capital were downward biased (Table 2, Model 2).

As far as exogenous variables are concerned, we observed that income and wealth quintiles continued to remain as important predictors of stock participation. The estimated coefficient of dummy for medium and high income groups revealed that one standard deviation of these income groups was associated with 2.3 and 4.2% increase in the probability to own stocks, respectively. The estimated marginal effects of wealth revealed that members of the medium and high wealth-groups were more likely to participate in stock markets than individuals belonging to the low-wealth group, by 6.9 and 15%, respectively. This result was in line with previous findings on the relevant role of wealth and pointed to the presence of entry and management costs for investors in financial markets.

Moving to the socio-demographic variables, results were similar to those stemming from the baseline model (Table 4, Model 1) and the changes were concerned with the magnitude of the marginal effects of some variables, not even the sign. Married respondents had a lower probability to participate in stock markets and the estimated coefficient was around 3.9% (significance level 1%). On the other hand, the dummy variable for female was significant at 1% level and showed a negative effect (gender gap) as anticipated from the earlier studies (marginal effect − 4.1%). The number of children also affected negatively the stock market participation and was significant at 5% level, with a marginal effect of − 1.1%. If a respondent moved to the retirement phase, then his/her probability to participate in risky assets would decline by 1.8%. Finally, age and age-square were both significant, showing that stock holding, when purged out from cohort effects, increased with age.

As for social interaction, we found that all variables were significant and with the expected signs, with the only exception of participation in political and organisational activities, which was not significantly different from zero. More precisely, all specifications showed that the size of the social network did matter, in that the latter positively affected the decision of participating in financial markets with a marginal effect of 0.8%. Moreover, also the quality of social interaction was found to play a significant and differentiated role. Interestingly enough, individuals that were involved in charity/voluntary activities, although more prone to join the stock market if compared with those not involved in such activities (marginal effect of 2.1%), displayed a lower propensity to participate in the stock market relative to those who were members of clubs (marginal effect of 3.5%). This finding is possibly due to differences in attitude/values towards self-interest, risky activities or business in general featuring the members of these two different groups of individuals. Overall, we can say that our work confirmed the evidence of a relevant role played by social interaction variables.

The country level effects in the CF approach showed that a person belonging to a high participation country group was 8.2% more likely to enter stock markets relative to the benchmark (medium-participation countries), while we observed a negative effect for low participation country group relative to the benchmark group (-12.1%). These differences were possibly due to different attitude towards risk, culture, functioning of capital markets, level of investor protection and other unobserved institutional factors. However, the analysis of this an unexplained residual was beyond the scope of our study and was left for future research.

Turning to financial attractiveness of the host country, the estimated coefficients revealed that the contribution of current financial attractiveness proxied by 5-year average Sharpe-ratios was positive and significant, with a marginal effect of 21.4%.

Finally, as for the student–teacher ratio, such country-cohort group variable, meant to capture the effect that a better education system exerted on participation in stock markets through externalities, had a negative sign, as expected, and its marginal effect increased up to 0.8% in Model 3.

Conclusions

In this work, we shed new light on the determinants of stock market participation under an endogenous framework for nine European countries in year 2010, which is a

major issue both for researchers and policymakers. Using different database and different econometric specifications, we estimated the effects of such variables as financial literacy, human capital, effectiveness of the education system, social-interaction and financial attractiveness of the markets on the probability to invest in stocks, together with the effects of other socio-demographic individual characteristics and institutional/country level variables.

Our study contributes to the existing literature on several respects.

From a quantitative point of view, we quantified the marginal effects of financial literacy and human capital (schooling years) on the probability to participate in the stock market in Europe (about 6.2 and 1.2% respectively).

From a methodological point of view, we showed that not controlling for endogeneity of both financial literacy and human capital produces results that are negatively biased. Among other relevant determinants of stock market participation, we found that both wealth and income play a significant and positive role in shaping participation rates across countries.

Interestingly enough, as for social interaction, we observed that both its size and quality do matter, in that the former exerted a positive effect on the probability to invest in risky assets, and the latter showed that individuals that were involved in charity/voluntary activities were more likely to invest in the stock market, although to a lesser extent than members of clubs. Finally, our estimates provide evidence of gender gap, which deserves further analysis in future research.

Another interesting result of our work is that both past and present financial incentives at cohort-country level significantly influence the participation of individuals in stocks. However, we have provided new evidence on the different channels of action of such financial incentives, by showing that past market performances affected the decision to join the stock market indirectly, that is, by influencing the decision to invest in financial education and human capital. We also found that participation rates varies across country groups, possibly due to differences in attitude towards risk, culture, functioning of capital markets and fiscal policies, level of investor protection and other unobserved institutional factors. The exploration of such unexplained differences represents an interesting avenue for future research. Finally, we found confirmation that higher effectiveness of education (lower student–teacher ratio) is also positively associated with stock market participation at country level.

Our analysis is not devoid of limitations. The inclusion of risk preferences of individuals, the sector of employment and the field of study in the SHARE database could further improve the quality of the database for future research on the field of financial related decisions at the European level.

However, in the light of our findings, some policy implications follow: The enhancement of financial literacy, human capital and the quality of education at both individual and country level is crucial for ensuring higher participation in capital markets. Moreover, since the latter were found to be strongly affected by starting conditions, policies aimed at restoring equality in opportunities among young individuals should be designed to increase financial market participation. Finally, much effort should be put in filling the gender gap, and improving institutional factors such as the effectiveness of the education system and the efficiency of financial markets (e.g., by favouring the presence of institutional investors such as pension funds, or reducing entry costs).

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval This article does not contain any studies with human participants or animals performed by any of the authors.

Appendix

Appendix 1

See Table 5.

Table 5 Description of variables used in the study and their source

Variable	Description	Source
STOCK	Participation to stock market (Dummy)	SHARE
FL	Financial Literacy Score	SHARE
HC	Schooling years	SHARE
AGE	Age at the time of the interview	SHARE
AGESQ	Age squared	SHARE
FE	Dummy for Female	SHARE
CH	Number of children	SHARE
MS	Dummy for married	SHARE
IN_H	Dummy for medium income group	SHARE
IN_L	Dummy for high income group	SHARE
WEALTH_MED	Medium wealth holding group	SHARE
WEALTH_HIGH	High wealth holding group	SHARE
CHA	Dummy for participating in voluntary or charity	SHARE
POL	Dummy for participating in political and organisational activities	SHARE
CLUB	Dummy for membership in a club	SHARE
TOT_NET	Number of persons in the social network	SHARE
SH (2006–2010)	Five year average of the lag of the Sharpe-ratio from the date of the interview	Global Financial Statistics Country level
DUM_HIGH	Dummy for high participation country group	SHARE/Country group
DUM_LOW	Dummy for low participation country group	SHARE/country group
EQ	Student–teacher ratio	International Historical Statistics Individual/country level
Instruments		
MATHS_10	Relative position of maths when aged 10	SHARE
LANGUAGE_10	Relative position of language skills when aged 10	SHARE
FATHER_OCCU	Occupation of the main bread winner at age 10	SHARE
INITIAL_CON	Rooms at house at age of 10	SHARE
BOOKS_10	Books at shelf when aged 10	SHARE
SHARPE_16	Sharpe-ratio when aged between 16 and 20	Global Financial Statistics Country/cohort group level
SHARPE_20	Sharpe-ratio when aged between 21 and 25	Global Financial Statistics Country/cohort group level

Appendix 2: Financial Literacy in SHARE

The questions used to construct the financial literacy indicator are set out below. Possible answers are shown on cards displayed by the interviewer who is instructed not to read them out to respondents:

1. If the chance of getting a disease is 10%, how many people out of 1000 can be expected to get the disease? The possible answers are 100, 10, 90, 900 and another answer.
2. 2. In a sale, a shop is selling all items at half price. Before the sale a sofa costs 300 euro. How much will it cost in the sale? The possible answers are 150, 600 and another answer.
3. 3. A second hand car dealer is selling a car for 6000 euro. This is two-thirds of what it costs new. How much did the car cost new? The possible answers are 9000, 4000, 8000, 12,000, 18,000 and another answer.
4. 4. Let's say you have 2000 euro in a savings account. The account earns 10 per cent interest each year. How much would you have in the account at the end of the second year? The possible answers are 2420, 2020, 2040, 2100, 2200, 2400.

If a person answers (1) correctly she is then asked (3) and if she answers correctly again she is asked (4). Answering (1) correctly results in a score of 3, answering (3) correctly but not (4) results in a score of 4 while answering (4) correctly results in a score of 5. On the other hand, if she answers (1) incorrectly she is directed to (2). If she answers (2) correctly she gets a score of 2 while if she answers (2) incorrectly she gets a score of 1.

Table 6 Variables and detailed methodology used to compute Sharpe-ratios from Global Financial Database. Source: Global Financial Database

Variable	Description	Years
CDAXD	Germany CDAX Total return index (Stocks)	Monthly from Dec 1869 to Dec 1969 and daily from Jan 1970 to May 2014
TRSBF250D	France CAC All tradable Total return index	Monthly from Jan 1895 to Jan 1991 and daily from Jan 1991 to Mar 2014
BCIPRD	Italy BCI Global return Index	Monthly from Dec 1924 to Dec 1972 and daily from Jan 1973 to May 2014
BCSHD	Brussels All share Return index	Monthly from Dec 1950 to Dec 1984 and daily from Jan 1985 to May 2014
SSHID	Swiss performance index	Monthly from Jan 1966 to Aug 1987 and daily from Sep 1987 to May 2014
TRNLDSTM	Netherlands Total Return Stock Index	Monthly from dec 1950 to Apr 2014
OMXSBGD	OMX Stockholm Benchmark Gross Index	Monthly from Dec 1918 to Jun 1995 and daily from Jul 1995 to May 2014
OMXCGID	OMX Copenhagen All share gross index (Denmark)	Monthly from dec 1969 to Jul 1989 and daily from Aug 1989 to May 2014
ATXTRO	Vienna SE ATX Total return Index (Austria)	Monthly from Dec 1969 to Jan 1996 and daily from Jan 1996 to May 2014
TRDEUGVM	Germany 10 year government bond return index	Monthly from Dec 1923 to Apr 2014
TRFRAGVM	France 10 year government bond return index	Monthly from Dec 1796 to Apr 2014
TRITAGVM	Italy 10 year government bond return index	Monthly from Oct 1807 to Apr 2014
TRBELGVM	Belgium 10 year government bond return index	Monthly from Nov 1831 to Apr 2014
SDGTD	Switzerland TR Government bond index	Monthly from Jan 1915 to Jan 1996 and daily from Jan 1996 to May 2014
TRNLDGVM	Netherlands 10 year government bond return index	Monthly from Dec 1813 to Apr 2014
RXTBD	Sweden Government bond return index	Monthly from Jul 1868 to Dec 1989 and daily from Jan 1990 to May 2014
TRDNKGVM	Denmark 10 year government bond return index	Monthly from Aug 1788 to Mar 2014
TRAUTGVM	Austria 10 year government bond return index	Monthly from Jun 1923 to Apr 2014

The questions were asked in national languages like German, Italian, Swedish, Danish and Dutch. As for the Austria, the language used was German. The respondents from Belgium questions were provided in French or Flemish and for the Switzerland, the questionnaires were provided in Italian, German or French.

The actual range of responses were as follows: For question 1, the range of response is five, question 2 has three alternative answers, question 3 have six responses and finally question 4 has seven responses.

Appendix 3

See Table 6.

The detailed methodology of calculating the Sharpe-ratios is the following. The data on the return index is computed from Global Financial Database. The returns on risky assets and safe asset returns are calculated separately from the return index by applying the formula

$$\frac{Y_1}{Y_0} - 1$$

where Y_1 is the current return index value and Y_0 is the base return index. Then we calculate the average returns by subtracting the return of the risky asset (R_f) from the return from safe asset(R_0) : $\frac{R_f - R_o}{stdev(R_f)}$.

Finally, the average returns are divided by the standard deviation of risky assets that is annualised by multiplying by $\sqrt{2}$of the respective years.

Appendix 4

See Table 7.

Table 7 Ranking based on skills of father's occupation at respondent's age of 10 provided by SHARE Wave 3

Occupation of the father	Rank based on skill
Legislator, senior official or manager	1
Professional	2
Technician or associate professional	3
Clerk	4
Armed forces	5
Service, shop or market sales worker	6
Skilled agricultural or fishery worker	7
Craft or related trades worker	8
Plant/machine operator or assembler	9
Elementary occupation	10

Appendix 5

See Table 8.

Table 8 Sample Statistics of the instruments for financial literacy and schooling years used in Section "Multiple Endogeneity and Estimations Based on Control Function Approach"

Variable	Observations	Mean	SD	Min	Max
Relative score of maths at 10 (ranked 1–4)	17,533	3.326	0.906	1	5
Relative score of language at 10 (ranked 1–4)	17,473	3.359	0.892	1	5
Father's occupation (ranked from 1 to 10)	17,475	4.803	2.393	1	10
Number of rooms at home at 10	175,93	4.130	2.157	1	50
Number of books at home at 10 (ranked 1–4)	17,631	2.212	1.257	1	5

References

Alan, S. (2006). Entry costs and stock market participation over the life cycle. *Review of Economic Dynamics, 9*(4), 588–611. https://doi.org/10.1016/j.red.2006.06.003.

Amemiya, T. (1978). The estimation of a simultaneous equation generalized probit model. *Econometrica 46*(5), 1193–1205. https://doi.org/10.2307/1911443.

Arrondel, L., Calvo-Pardo, H., & Tas, D. (2012). Subjective return expectations, information and stock market participation: Evidence from France. *Discussion Paper on Economics and Econometrics, University of Southampton*. https://doi.org/10.2139/ssrn.2483909.

Arum, R. (1996). Do private schools force public schools to compete? *American Sociological Review, 61*(1), 29–46. https://doi.org/10.2307/2096405.

Bagliano, F., Fugazza, C., & Nicodano, G. (2014). Optimal Life-Cycle Portfolios for Heterogeneous Workers. *Review of Finance, 18*, 2283–2323. https://doi.org/10.1093/rof/rft046.

Behrman, J. R., Mitchell, O. S., Soo, C. K., & Bravo, D. (2012). How financial literacy affects household wealth accumulation. *The American Economic Review, 102*(3), 300–304. https://doi.org/10.1257/aer.102.3.300.

Bertaut, C., & Starr-McCluer, M. (2002). Household Portfolios in the US. In Household Portfolios, L. Guiso, M. Haliassos & T. Jappelli (Eds.), Cambridge: MIT Press.

Bertaut, C. C. (1998). Stockholding behavior of US households: Evidence from the 1983–1989 survey of consumer finances. *Review of Economics and Statistics, 80*(2), 263–275. https://doi.org/10.1162/003465398557500.

Bound, J., & Turner, S. (2007). Cohort Crowding: How Resource Affect College Attainment. *Journal of Public Economics, 91*(5), 877–899. https://doi.org/10.1016/j.jpubeco.2006.07.006.

Brav, A., Constantinides, G. M., & Geczy, C. C. (2002). Asset participation with heterogeneous consumers and limited participation: Empirical evidence. *Journal of Political Economy, 110*(4), 793–824. https://doi.org/10.1086/340776.

Brown, J. R., Ivković, Z., Smith, P. A., & Weisbenner, S. (2008). Neighbours matter: Causal community effects and stock market participation. *The Journal of Finance, 63*(3), 1509–1531. https://doi.org/10.1111/j.1540-6261.2008.01364.x.

Brown, S., & Taylor, K. (2007). Religion and education: Evidence from the National Child Development Study. *Journal of Economic Behavior & Organization, 63*(3), 439–460. https://doi.org/10.1016/j.jebo.2005.08.003.

Calvet, L. E., & Sodini, P. (2014). Twin picks: Disentangling the determinants of risk taking in household portfolios. *Journal of Finance, 69*(2), 867–906. https://doi.org/10.1111/jofi.12125.

Cameron, A. C., & Trivedi, P. K. (2010). *Microeconometrics Using Stata*. Texas: Stata Press, College Station.

Campbell, J. (2006). Household finance. *The Journal of Finance, 61*(4), 1553–1604. https://doi.org/10.1111/j.1540-6261.2006.00883.x.

Campbell, J. Y., & Cochrane, J. H. (2000). Explaining the poor performance of consumption-based asset pricing models. *The Journal of Finance, 55*(6), 2863–2878. https://doi.org/10.1111/0022-1082.00310.

Card, D., & Krueger, A. (1996). School resources and student outcomes: An overview of the literature and new evidence from North and South Carolina. *Journal of Economic Perspectives, 10*(4), 31–50. https://doi.org/10.1257/jep.10.4.31.

Christelis, D., Georgarakos, D., & Haliassos, M. (2013). Differences in portfolios across countries: Economic environment versus household characteristics. *Review of Economics and Statistics, 95*(1), 220–236. https://doi.org/10.1162/REST_a_00260.

Christelis, D., Jappelli, T., & Padula, M. (2010). Cognitive abilities and portfolio choice. *European Economic Review, 54*(1), 18–38. https://doi.org/10.1016/j.euroecorev.2009.04.001.

Cole, S., & Shastry, G. (2008). If you are so smart, why aren't you rich? The effects of education, financial literacy and cognitive ability on financial market participation. *Working Paper# 09–071. Harvard Business School, Wellesley College* (*unpublished*), *Cambridge MA*.

Croson, R., & Gneezy, U. (2009). Gender differences in preferences. *Journal of Economic Literature, 47*(2), 1–27. https://doi.org/10.1257/jel.47.2.448.

Dimmock, S. G., & Kouwenberg, R. (2010). Loss-aversion and household portfolio choice. *Journal of Empirical Finance, 17*(3), 441–459. https://doi.org/10.1016/j.jempfin.2009.11.005.

Dimson, E., Marsh, P., & Staunton, M. (2002). *Triumph of the optimists: 101 Years of global investment returns*. New Jersey: Princeton University Press.

Fagereng, A., Gottlieb, C., & Guiso, L. (2017). Asset market participation and portfolio choice over the life-cycle. *The Journal of Finance, 72*(2), 705–750. https://doi.org/10.1111/jofi.12484.

Fonseca, R., Mullen, K. J., Zamarro, G., & Zissimopoulos, J. (2012). What explains the gender gap in financial literacy? The role of household decision making. *Journal of Consumer Affairs, 46*(1), 90–106. https://doi.org/10.1111/j.1745-6606.2011.01221.x.

Georgarakos, D., & Pasini, G. (2011). Trust, sociability, and stock market participation. *Review of Finance, 15*(4), 693–725. https://doi.org/10.1093/rof/rfr028.

Grohmann, A., Kouwenberg, R., & Menkhoff, L. (2015). Childhood roots of financial literacy. *Journal of Economic Psychology, 51*, 114–133. https://doi.org/10.1016/j.joep.2015.09.002.

Guiso, L., Haliassos, M., & Jappelli, T. (2003). Stockholding in Europe: where do we stand, and where do we go? *Economic Policy 36*, 123–170. https://doi.org/10.1111/1468-0327.00104.

Guiso, L., & Jappelli, T. (2005). Awareness and stock market participation. *Review of Finance, 9*(4), 537–567. https://doi.org/10.1007/s10679-005-5000-8.

Guiso, L., Sapienza, P., & Zingales, L. (2004). The role of social capital in financial development. *The American Economic Review, 94*(3), 526–556. https://doi.org/10.1257/0002828041464498.

Guiso, L., Sapienza, P., & Zingales, L. (2008). Trusting the stock market. *The Journal of Finance, 63*(6), 2557–2600. https://doi.org/10.1111/j.1540-6261.2008.01408.x.

Haliassos, M., & Bertaut, C. (1995). Why do so few hold stocks? *The Economic Journal, 105*(432), 1110–1129. https://doi.org/10.2307/2235407.

Hong, H., Kubik, J., & Stein, J. (2004). Social interaction and stock-market participation. *The Journal of Finance, 59*(1), 137–163. https://doi.org/10.1111/j.1540-6261.2004.00629.x.

Hurd, M., Van Rooij, M., & Winter, J. (2011). Stock market expectations of Dutch households. *Journal of Applied Econometrics, 26*(3), 416–436. https://doi.org/10.1002/jae.1242.

Jappelli, T. (2010). Economic Literacy: An International Comparison. *The Economic Journal, 120*(548), F429-F451. https://doi.org/10.1111/j.1468-0297.2010.02397.x.

Jappelli, T., & Padula, M. (2013). Investment in financial literacy and saving decisions. *Journal of Banking and Finance, 37*(8), 2779–2792. https://doi.org/10.1016/j.jbankfin.2013.03.019.

Kaarsemaker, E., Pendleton, A., & Poutsma, E. (2010). Employee share ownership. In A. Wilkinson, P. Gollan, M. Marchington, & D. Lewin (Eds.), *The oxford handbook of participation in organizations* (pp. 315–337). Oxford: Oxford University Press.

Kaustia, M., & Knüpfer, S. (2008). Do investors overweight personal experience? Evidence from IPO subscriptions. *The Journal of Finance, 63*, 2679–2702. https://doi.org/10.1111/j.1540-6261.2008.01411.x.

Kern, M. L., & Friedman, H. S. (2009). Early educational milestones as predictors of lifelong academic achievement, midlife adjustment, and longevity. *Journal of Applied Developmental Psychology, 30*(4), 419–430. https://doi.org/10.1016/j.appdev.2008.12.025.

Lam, D., & Schoeni, R. F. (1993). Effects of family background on earnings and returns to schooling. *Journal of Political Economy, 101*(4), 710–740. https://doi.org/10.1086/261894.

Liu, Y. J., Meng, J., You, W., & Zhao, L. (2014). Word-of-mouth communication, observational learning, and stock market participation. https://doi.org/10.2139/ssrn.2251570.

Lusardi, A., Michaud, P., & Mitchell, O. S. (2017). Optimal financial knowledge and wealth inequality. *Journal of Political Economy, 125*(2), 431–477. https://doi.org/10.1086/690950.

Lusardi, A., & Mitchell, O. S. (2011). *Financial literacy and planning: Implications for retirement wellbeing* in. In A. Lusardi & O. Mitchel (Eds.), *Financial literacy: Implications for retirement security and the financial marketplace* (pp. 17–39). New York: Oxford University Press.

Lusardi, A., & Scheresberg, C. D. B. (2013). Financial literacy and high-cost borrowing in the United States (No. w18969). *National Bureau of Economic Research*. https://doi.org/10.3386/w18969.

Malmendier, U., & Nagel, S. (2011). Depression babies: Do macroeconomic experiences affect risk-taking? *The Quarterly Journal of Economics, 126*(1), 373–416. https://doi.org/10.1093/qje/qjq004.

Männamaa, M., & Kikas, E. (2010). Cognitive profiles and their stability in different academic performance groups for math and language. In A. Toomela (Ed.), *Systemic person-oriented study of child development in early primary school* (pp. 95–131). Frankfurt: Peter Lang.

Marton, K. (2008). Visuo-spatial processing and executive functions in children with specific language impairment. *International Journal of Language and Communication Disorders, 43*, 181–200. https://doi.org/10.1080/16066350701340719.

Ostroff, C., & Schmitt, C. (1993). Configurations of organizational effectiveness and efficiency. *Academy of Management Journal, 36*(6), 1345–1361. https://doi.org/10.2307/256814.

Pyles, M. K., Li, Y., Wu, S., & Dolvin, S. D. (2016). Cultural influences on risk tolerance and portfolio creation. *Journal of Behavioral and Experimental Finance, 9*, 43–55. https://doi.org/10.1016/j.jbef.2016.01.001.

Soppe, A., & Houweling, R. (2014). *Sharing in Modern companies: Employee financial participation in Netherlands (Delen in modern ondernemen: Financiële werknemersparticipatie in Nederland)*. Rotterdam: Erasmus Universiteit Rotterdam.

Spataro, L., & Corsini, L. (2017). Endogenous Financial Literacy, Saving, and Stock Market Participation. *FinanzArchiv: Public Finance Analysis, 73*(2), 135–162. https://doi.org/10.1628/001522117X14877521353555.

Staiger, D., & Stock, J. H. (1997). Instrumental variables regression with weak instruments. *Econometrica, 65*, 557–586. https://doi.org/10.2307/2171753.

Thomas, A., & Spataro, L. (2016). The effects of pension funds on markets performance: A review. *Journal of Economic Surveys, 30*(1), 1–33. https://doi.org/10.1111/joes.12085.

Thomas, A., Spataro, L., & Mathew, N. (2014). Pension funds and stock market volatility: An empirical analysis of OECD countries. *Journal of Financial Stability, 11*, 92–103. https://doi.org/10.1016/j.jfs.2014.01.001.

Van der Sluis, S., de Jong, P., & Van der Leij, A. (2004). Inhibition and shifting in children with learning deficits in arithmetic and reading. *Journal of Experimental Child Psychology, 87*, 239–266. https://doi.org/10.1016/j.jecp.2003.12.002.

Van Rooij, M., Lusardi, A., & Alessie, R. (2011). Financial literacy and stock market participation. *Journal of Financial Economics, 101*(2), 449–472. https://doi.org/10.1016/j.jfineco.2011.03.006.

Van Rooij, M., Lusardi, A., & Alessie, R. (2012). Financial literacy, retirement planning and household wealth. *The Economic Journal, 122*(560), 449–478. https://doi.org/10.1111/j.1468-0297.2012.02501.x.

Vestman, R. (2010). *Limited stock market participation among renters: Explanations and welfare consequences*. Stockholm: The Institute for Financial Research (SIFR).

Wooldridge, J. M. (2002). *Econometric analysis of cross section and panel data*. Cambridge: The MIT Press.

Yoong, J. (2011). Financial illiteracy and stock market participation: Evidence from the RAND American Life Panel. In O. S. Mitchell & A. Lusardi (Eds.), *Financial literacy: Implications for retirement security and the financial marketplace* (pp. 76–97). New York: Oxford University Press.

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