LUND UNIVERSITY
School of Economics and Management

Behavioral Determinants of Stock Market Participation

Master of Finance Thesis II

May 2012

Authors:

Behnaz Alimohammadisagvand & Adriana Matos

Supervisors:

Hossein Asgharian & Frederik Lundtofte

Abstract:

In this paper we present the effect of two behavioral factors, optimism and sociability, on stock market participation. We use novel measures of optimism and sociability based on the questions from the Survey of Health, Ageing and Retirement in Europe (SHARE). Our results show that both of these variables are significant and have a positive effect on stock market participation, controlling for risk aversion, wealth, age, education, and gender. Furthermore, risk aversion is found to have the largest effect on the probability of direct stock market participation. The analysis is conducted with a Probit model, and utilizes a sample composed of individuals fifty years of age and above.

Keywords: SHARE data, stock market participation, optimism, sociability, risk aversion

Acknowledgements:

We would like to express our deep appreciation to Professors Hossein Asgharian and Frederik Lundtofte for always being there to guide us in the process of writing our thesis. Their valuable input and insightful suggestions gave us the main roots and inspiration. We also would like to thank Lu Liu and Mingfa Ding for their plentiful contributions.

Contents

1. Introduction

1.1 Purpose

Recently, both household finance and the behavioral aspects affecting individual economic decision-making have received increased attention. The prevailing economic situation following the recent financial crisis may be affecting many households, both financially and psychologically, and there could be an inclination towards abstaining from the stock market. Unease about investing in risky assets among those nearing retirement ages is also possible due to the low performance of equity over the last decade. As noted by Georgarakos and Pasini (2011) in a recent study on behavioral economics, "Older households control a large fraction of society's resources and therefore their investment decisions can have broader macroeconomic implications." Consequently, gaining a deeper insight into the behavioral factors affecting investors' choices is not only interesting, but also warranted to better understand and meet the needs of investors.

Among the factors related to individual personality, risk-aversion seems to be the only one that has been profusely researched, with resulting conclusions that individuals with higher levels or risk-aversion tend to refrain from investing large portions of their portfolios in risky assets such as high-risk stock portfolios, keeping all other things constant. (Pratt, 1964; Arrow, 1971; Cohn et al., 1975). Nonetheless, recent literature in behavioral economics has taken a direction in trying to identify additional factors, such as optimism, sociability, and trust, that could influence investor choice because high levels of risk aversion and other known control variables alone are not enough to explain the observed low market participation rates. This market participation puzzle is highlighted even more when viewed in conjunction with the relatively high risk-premiums on equity over the risk-free rates, which were observed in better economic times. It is puzzling why many investors did not participate in the stock market when the equity premiums were high; and on a related note, why many investors required high equity premiums to induce market participation. Mehra and Prescott (1985) point out that in order to justify the high risk-premiums, individual risk-aversion would have to be extremely high, which is something that has not been documented. A

famous example by Mankiw and Zeldes (1991) illustrates the degree of this high risk aversion. If a person were presented with a gamble that pays $100,000 50-percent of the time, and $50,000 otherwise ($75,000 expected value), a person with a high relative risk aversion of 30 would be indifferent to the bet with a surety of just $51,209. Since $50,000 and $51,209 are relatively close, and the possibility of losing out on the extra $1,210 outweighs the equal probability of obtaining an extra $48,790, this example is demonstrative of loss aversion and extreme risk aversion. It is interesting to investigate if and to what extent other psychological and behavioral factors affect market participation.

1.2 Research question

Is it possible that there are other behavioral and psychological factors besides inherent risk-aversion that affect investors' choice of participating in the stock market? This paper seeks to answer this question by investigating the impact of optimism and sociability on stock market participation, while using established influential demographic factors (household wealth, years of education, age, and gender) as control variables. We are seeking to uncover the positive relationship between optimism, sociability, and stock ownership.

1.3 Background

It has been documented that optimism affects decision-making in many different settings. Research on this topic has been conducted in many different domains, such as diseases (Harris & Guten, 1979**)** and crime (Weinstein, 1977). These studies show that many people believe their chances of confronting these problems in life are below average; very few people think their risks are higher than average. In the domain of financial behavior, optimism affects decision-making under uncertainty by influencing an individual's perception of the future, so that the probability of positive outcomes is overestimated, even for professional stock market participants **(**Camerer & Lovallo, 1999; Rosen, 2003). Optimistic managers overestimate the future earnings' growth rates, and issue more than adequate amounts of debt in terms of capital financing, thus putting the company at a risk and decreasing firm value (Hackbarth, 2007). Optimism also affects asset pricing; it causes under-reaction and over-reaction to events, leading to more volatility in stock prices (Lee, Shleifer, & Thaler, 1991; Barberis, Shleifer, & Vishny, 1998). There is loss-aversion

behavior among traders in the stock market, showing the impact of behavioral bias on asset prices (Coval & Shumway, 2005). Does the same type of behavioral bias in relation to optimism also impact the decisions of households when it comes to the problem of portfolio allocation?

In regards to sociability, numerous research in this field has been conducted on the effect it has on learning, health, and general well being (Reyes-Garcia et al., 2009; Schmidt & Fox, 1995; Charlton et al., 2008). Some studies also note a positive effect of sociability on market participation. (Hong, Kubik, & Stein, 2004; Georgarakos & Pasini, 2011; Brown et al., 2008). According to these studies, one reason for this positive effect could be attributed to peer learning. By interacting with multiple and diverse acquaintances people increase their chances of coming into contact with others that have ample knowledge about the stock market. Through these "loose-ties" individuals can learn by "word of mouth" about investment opportunities (Hong et al., 2004; Brown et. al. 2008) and gain a deeper interest and understanding of the investment process so that some of the burdens and psychological fixed costs (Vissing-Jorgensen, 1999) of doing the research and investing are reduced. This also affects fixed monetary costs of participation because, as Georgarakos and Pasini (2012) note, "cheaper information sharing […] effectively augments disposable wealth."

Optimism and sociability are two personality traits that can affect an agent's propensity to invest in the stock market. As previously mentioned, excessive optimism has been documented to affect the way people perceive the probability of positive outcomes (Camerer & Lovallo, 1999; Rosen R. J., 2003). Thus, above average levels of optimism can influence market participation through the upward biasing of expected returns. Sociability, on the other hand, has been theorized to influence market participation through a reduction of non-pecuniary fixed market participation costs (Hong et. al., 2004; Georgarakos & Pasini, 2011; Brown et al., 2008; Vissing-Jorgensen, 1999). We summarize our results briefly in the following paragraph.

1.4 Summary of results

This study shows that optimism and sociability play a notable role in predicting stock market participation, and confirms that risk aversion is still the main psychological deterrent of stock ownership. Optimism is measured on a scale from one to four, based on how often (never,

rarely, sometimes, often) a person feels full of opportunities and the future looks good. Sociability is based on the number of distinct social activities per month a person was involved in, ranging from zero up to four. Marginal, one unit increases in optimism and sociability levels are demonstrated to increase the probability of stock market participation by 1.29% and 1.15%, respectively. An increase in the level of risk aversion from low to average, or from average to high is found to decrease the probability of stock ownership by 6.57%. To further analyze risk aversion, the main variable affecting stock market participation, we explore how optimism, sociability and the established demographic control variables affect the self-assigned measure of risk aversion. We find that marginal increases in either optimism or sociability reduce the probability of having above average level of risk aversion.

1.5 Contribution

Our research supplements existing literature on behavioral aspects that affect market participation by identifying additional, less extensively researched, key behavioral/ psychological/personality determinants that increase an individual's propensity to invest in the stock market. Additionally, this research employs data from the Survey of Health, Ageing and Retirement in Europe (SHARE), administered to people aged 50 and above. Wave 2 of this dataset is relatively new to the finance field, and this study will complement existing literature with additional results from this new survey. The sample draws data from many European countries, ensuring that the statistics are more diverse and not pertain to any country in particular, as in some of the previous studies. Country dummies are used to isolate the pure effects of the variables. The survey contains an extensive list of questions and answers on behavioral factors that provide an opportunity to select the most relevant proxies for optimism and sociability.

1.6 Limitations

Since the analysis is based on survey responses, we must rely on the answers provided by the participants and have confidence in their credibility. Given the behavioral/psychological nature of our independent variables, we have some concern that the responses could be sensitive to a particular "mood" a respondent was at the time of the interview. Nevertheless, we anticipate that the patterns that emerge from the analysis are not influenced by this

element very much. As with many similar studies, it is also important to be critical about the possible bi-directional influence of our variables.

1.7 Outline

The structure of the remainder of this study is as follows. The subsequent section reviews existing literature and provides a discussion on the theoretical background of the behavioral determinants of stock market participation before formulating a formal hypothesis. Section 3 provides an overview of the data sample, introduces the variables, and describes the methodology employed. Finally, section 4 and 5 present the results and conclusion, respectively.

2. Literature review and theory

Both optimism and sociability could be perceived as psychological factors that affect the way individuals behave. What follows is a review of a number of studies that investigated the effects of these behavioral variables on decision-making and other spheres.

2.1 Optimism in literature

In general, optimistic people believe that good things will happen instead of bad things. This way of looking at life is part of their personality and it is not restricted to a special domain (Scheier & Carver, 1985). For example, in the health domain, optimism has been observed as an important factor influencing patient recovery. Schuls et al. (1996) showed that cancer patients who are optimistic recover better than pessimistic ones, as pessimists' negative expectations about the future may lead to mortality. The same result was found for patients recovering from coronary bypass surgery (Scheier et al., 1989). In addition, optimistic people adapt better to different steps and transitions in their lives (Aspinwall & Taylor, 1992; Rissette, Scheier, & Carver, 2002; Chang & Sanna, 2001; Cozzarelli, 1993; Litt, Tennen, Affleck, & Klock, 1992), and the probability of getting depressed is lower for them (Bromberger & Matthews, 1996). Scheier and Carvar (1985) showed in their studies that optimism could affect people's expectations in such a way that they achieve favorable outcomes in the future, either by working harder and being more persistent or by successfully dealing with problems in the early stages.

A number of previous studies about optimism in the areas of finance and psychology have produced the same results. McKenna (1993) showed that individuals believe that negative phenomena happen, but that it is unlikely that these events will happen to them. Weinstein (1980) demonstrates that optimism affects the expectation regarding the future life. He tried to find out under which conditions and to what extent optimistic biases occurred. He chose a variety of positive and negative events to answer his hypothesis. Optimistic young students overestimate their probability of success and underestimate their chance of failure. They are confident about their own success in all states. Weinstein (1985) examined the attitude of

students in terms of health and safety risks. Again, the results showed a significant association with optimistic biases. Some studies showed that optimistic people seek positive information and pessimists search for negative information. When confronted with difficulties, optimistic people search for positive news (Segerstrom, 2001). But, this behavior in the financial domain may work a bit differently. It causes individuals to be led by selective hypothesis testing strategies, so that they search more for information on risky investment options. (Hilton, 2001; Sanbonmatsu, Posavac, Kardes, & Mantel, 1998). This behavior makes them prone to making riskier choices.

According to (Kahneman & Lovallo, 1993; Palme, Sunden, & Soderlind, 2005), in relation to financial economics and financial decision-making, optimism predisposes individuals to taking riskier alternatives since optimistic people overestimate the probability of having good results and underestimate the probability of having bad results. Felton (2003) used portfolio simulation named *stock track*, where students were the main participants, to observe the link between optimism and portfolio performance. His results illustrated that although optimism might lead people to seek information regarding their health and cope actively, it might have another effect when they are faced with risky portfolio choices. It might not be as beneficial as it was in the health domain. In fact, higher optimism resulted in the choice of riskier investment options.

There are a few studies about optimism and its impact on household economics. In their study, Puri and Robinson (2007) showed that optimism and stock market participation have a strong positive relationship, and that optimism can affect people's decisions regarding their portfolio allocation. Optimists are more "stock picker" (have more investment in stocks in comparison with other financial vehicles). The authors chose a domain-based measurement and approximated the level of optimism based on the deviation of an individual's personal expectation of future life span from the actuarially expected longevity. They found that moderate optimism with a long-term horizon would lead to good financial behavior: these individuals work harder and do not invest much in daily trading. On the other hand, the extreme optimists with a short-term horizon work fewer hours in comparison with moderate ones and their investment strategy consists mainly of day-trades, showing irrational (bad) behavior in relation to financial and economic decisions.

2.2 Recent developments in research on sociability

Among the pioneering literature on the effects of sociability and social capital on stock market participation rates, one may find the studies by Guiso, Sapienza, & Zingales (2004), Hong et al (2004), Brown et al. (2008), Georgarakos & Pasini (2011), and Dierkes et al. (2011).

In the study by Guiso et al. (2004), the authors investigate the part that social capital plays in financial development by utilizing data from the Italian Survey of Household Income and Wealth (SHIW), and the measures of voter turnout and number of blood donation participants as proxies for the level of sociability in a given region. The findings suggest that in the Italian regions with higher social capital there is a higher level of financial sophistication, including higher levels of stock ownership. The authors speculate that since social capital is important in establishing a level of trust in the community, and trust is an integral part of a well functioning financial system due to its effect on facilitation of transactions, then higher social capital regions increase financial sophistication by instilling trust.

In a more resent research paper by Georgarakos & Pasini (2011), the authors disambiguate the effect that social capital plays on market participation from the level of trust. They show that each variable has its own way of influencing stock ownership. Utilizing the SHARE data from Wave 1 (2004), the authors find that European households that score higher on a sociability scale (participate in a greater number of community activities, clubs, and the like) are more likely to participate in the stock market regardless of the level of trust in the community. The sociability effect was only slightly higher (0.5% points increase in the probability of stock ownership) in areas of higher trust. This result indicates that sociability is a separate entity from trust that influences an individual's propensity to invest in the market, but that it can, to some extent, "balance the discouragement effect on stockholding induced by low regional prevailing trust." Georgarakos & Pasini (2011).

The abovementioned study builds on the argument put forth by Hong et al. (2004), in which the authors state that sociability affects market participation through people's interactions with acquaintances; the resulting "word of mouth" learning serves to reduce psychological barriers and the fixed entry costs. Hong et al. (2004) studied the effect of sociability on market participation across the different states in the U.S. using data from the American

Health and Retirement Study. The proxy for sociability was church attendance and visits with neighbors, similar to the one used by Georgarakos & Pasini (2011). Both studies find that sociability has a stronger effect in areas where the overall market participation rate is higher, because the chances that people come into contact with someone that can provide guidance about the stock market are increased. According to this argument, sociability affects participation through learning and is not just an inherent personality trait (or an instrument for other unobserved variables) that can influence participation rates. Both studies also control for some of the possible personality aspects of sociability by including measures of optimism/depression and risk aversion in the model. The findings of both studies suggest that sociability has an effect on market participation. This effect is evidenced both in the U.S. and in Europe. Brown et al. (2008) examined more closely the link between community stock market participation rates and those of the individual using U.S. data from tax returns. The authors test the hypothesis of peer-effects more rigorously by using instrumental variables, and conclude that sociability indeed may be responsible for the alignment of an individual participation rate to that of the community.

Dierkes et al. (2011) tested the sociability hypothesis further by expanding the age group to include younger participants since the datasets used by Hong et al. (2004) and Georgarakos & Pasini (2011) are representative only of the population in retirement ages. Using data from The German Socio-Economic Panel Study and visits to neighbors as a measure of sociability, the authors find significant differences between the generations when it comes to exacting the effects of sociability on stock ownership: the sociability effect is stronger for younger participants. As such, if sociability is found to be significant for the participants represented by the Second Wave of SHARE data, it is reasonable to assume that it may be as effective or more for the population at large.

2.3 Established control factors

Studies demonstrate that market participation is affected by wealth and there is a positive relationship between wealth and stock market participation. (Bertaut, 1998; Guiso, Haliassos & Jappelli, 2003; Vissing-Jorgensen, 2004). However, wealth is not the only factor which plays a role in financial decision making of households. Risk aversion and some demographic characteristics such as age, education, and gender will affect household economics.

Education was shown to have a positive effect on market participation, either directly or indirectly. Households with a higher level of education learn easier and quicker about markets and how to enter them, as well as how to trade stocks and reap the benefits from them, considering the inherent costs. (Guiso, Haliassos, & Jappelli, 2003). Well-educated people invest their portfolios more efficiently. Consequently, they make fewer mistakes and are less risk averse compared to less educated individuals, which helps, and causes them to participate more (Campbell, 2006). On the other hand, Barsky et al. (1997) showed that risk aversion is a factor that plays the main role in the choice or risky assets. Campbell and Viceira (2002) demonstrated that the level of market participation varies by differences in risk aversion. Some other previous studies (Jianakoplos & Bernasek, 1998) have shown that gender can affect risk aversion and stock market participation. Women are found to be more risk averse; accordingly, the stock market participation of women is more conservative in comparison with men (Bernasek & Shwiff, 2001; Felton et al., 2006; Barber & Odean, 2001). Even professional female investors are more risk averse than professional men. They weight more in the downside measure of risk and are more uncertain about the future outcomes (Olsen & Cox; 2001). In addition, it has been shown that age and the level of financial risk tolerance have a negative relationship. Older individuals tolerate less financial risk (Yao et al., 2004; Wang & Hanna, 1998; Xiao et al., 2001). In their study, Campbell and Viceira (2002) depicted an inverse relationship between age and stock allocation, while controlling for risk aversion. Risk aversion was also demonstrated to have a negative relationship with wealth and age (Morin & Suarez, 1983; Bernasek & Jianakoplos, 2006).

2.4 Hypothesis

As presented above, optimism can present a biased view of the future in many different spheres, and there is no reason to believe household finance is an exception. Optimism can also make people work harder to produce the desired outcomes. We believe high values of optimism could serve to induce market participation through a perceived change in expected returns by biasing the probability of higher returns upwards, as Weinstein (1980,1985) indicated optimistic people tend to bias the probability of positive outcomes in their favor. Moreover, a change in low optimism levels to moderate or average levels of optimism could induce market participation through an individual's willingness to put more effort and exertion into doing the necessary preparations and research, as Scheier and Carvar (1985)

noted optimistic people are more likely to try and work harder. These efforts would result in more positive outcomes and subsequently lead to higher investment rates. Either way, the effect of optimism on market participation should be positive.

Given the body of evidence from sociology that people learn from their peers via informal word-of mouth communication (Ellison et al., 1995; Banerjee, 1992; Bikhchandani et al., 1992) we speculate that if an individual is social in a sense that he participates in multiple social activities that would allow him to come into contact with multiple diverse people, he would have a higher probability of striking a conversation with someone knowledgeable in finance and learn from this individual. This acquired financial knowledge would reduce the psychological fixed costs of investing, and also reduce the monetary fixed costs due to cheaper acquisition of information, both leading to higher market participation rates. (Vising-Jorgensen, 1999; Hong et al., 2004; Brown et. al., 2008; Georgarakos & Pasini, 2011). By having a more sociable personality, individuals are able to take advantage of the social capital networks available in their regions. Since the effect of sociability depends on the availability of social capital i.e. degree of sociability of the region in general (Guiso et al., 2004), we expect that a more pure effect of sociability is evidenced if we control for differences in resident country characteristics.

To summarize, we expect increases in the measures of optimism and sociability to produce a positive effect on the probability of stock market participation.

3. Data and Methodology

The following section starts with definitions of variables and data description, continues with a detailed depiction and analysis of the data with related statistics, and ends with the presentation of the methodology used in this paper.

3.1 Data and Variables

This research employs cross-sectional data from the Survey of Health, Ageing and Retirement in Europe (SHARE), administered to people aged 50 and above. It is a multidisciplinary and cross-national panel database composed of micro data on more than 55,000 individuals. Wave 1 of the survey was released in 2004 and consisted of data from eleven European countries: Austria, Belgium, Denmark, France, Germany, Greece, Italy, The Netherlands, Spain, Sweden and Switzerland. The questionnaire comprises 20 modules on topics related to health, socio-economics and social networks, and was administered via a direct interview. The survey contains many detailed questions on subjects ranging from health (health conditions, physical and cognitive functioning), psychological variables (well-being, life satisfaction), economic variables (current work activity, sources and composition of current income, wealth and consumption, housing, education), and social support variables (transfers of income and assets, social networks, volunteer activities). In 2006 Wave 2 of the survey was released that complements the existing database by including a longitudinal dimension. It allows for more complex analysis through observation of changes of the same people over time. This version adds two additional modules, and an 'End of Life' interview that was conducted for deceased respondents. Furthermore, Czech Republic, Poland, and Ireland entered the survey. (SHARE, 2012).

3.1.1 Variable definitions

The table (Figure 3.1) on the following page presents the names and definitions of the variables used in this study.

Figure 3.1 – Variable definitions

This table summarizes the variables used in this study

Variable	Definition
participation	Dummy variable denoting 1 if the household has any money invested in stocks, and 0 otherwise
optimism	Categorical value denoting a person's optimism on a scale from 1-4, with 4 being the most optimistic
sociability	Value from 0-4 denoting the number of distinct social activities an individual participated in over the last month. 4 stands for four or more different activities, but not more than 7
risk aversion	A measure of risk-aversion ranging from 1-3, with three being the most risk-averse value
age	The respondent's age divided by 10
male	Dummy variable with code 1 for men and code 0 for women
education	Number of full-time education years; maximum value is 25
wealth	Total household net wealth, consisting of net financial and net real assets

All the amounts are in Millions of Euros. The observations for which the respondents answered in local currency amounts were converted into Euro values at the exchange rate valid at the time the non-Eurozone country joined the Eurozone. For the formal interview questions related to behavioral variables, please refer to the Appendix section A.2.

3.1.2 Data transformations

The dummy variable for stock market participation is generated based on a person's reply to the survey question on stock ownership. Any amount above zero in the stock portfolio is assigned a value of 1.

To proxy for optimism, the average responses of two survey questions are used. One question asked if the person feels "full of opportunities," while another asked if the "future looks good." There were four possible answers. A value of 4 is assigned to "always," 3 to "often," 2 to "sometimes," and 1 to "never."

The measure for sociability is based on the survey question that asked the respondents to check as many (up to 7) different activities that they have participated in over the last month. The activities ranged from providing aid to others to participation in social clubs, sports, charities, educational courses, social religious activities and political/community-related events. Not many people chose to participate in more than four distinct activities; therefore, we group the responses of four or more activities into one category. A sociability "level 4" in

this study means a person participated in four or more distinct activities, while the remaining sociability levels 0-3 represent the actual number of distinct activities the respondents took part in.

The level of risk aversion ranges from 1-3. The first level is below average risk aversion, 2 is average, and 3 is above average level of risk aversion. The measures are based on the choices in the survey question related to risk taking and investing:

> Which of the statements on the card comes closest to the amount of financial risk that you are willing to take when you save or make investments?
>
> 1. Take substantial financial risks expecting to earn substantial returns
> 2. Take above average financial risks expecting to earn above average returns
> 3. Take average financial risks expecting to earn average returns
> 4. Not willing to take any financial risks

Relatively few (50 out of about 4600) individuals picked choice 1, therefore we decided to group the first two responses as "above average" risk taking, level 1 on the risk-aversion scale.

The respondent's age is calculated to be as it was in 2006, when the second Wave of SHARE data became available. Age is divided by 10 to be in the approximate range of the other variables.

The measure for education stands for the number of years of full-time education attained by the individual. The maximum value for education years is 25.

Wealth is at the household level and is composed of net financial and real assets. Net financial assets include the values of stocks, bonds, mutual funds, bank accounts, individual retirement accounts (for both partners), contractual savings for houses, life insurance policies, net of any non-mortgage liabilities. Net real assets include the values of primary residence and any secondary residence, cars, household share in any companies owned, net of any mortgages. The total wealth is divided by 1 million, so that the average observations are within the range of other variables.

3.1.3 Observation exclusions

Numerous observations are excluded from the final data sample due to missing or inconclusive answers. This includes observations with blank answers, those answers for which the respondent said, "I don't know" or refused to answer the question, as well as observations that the interviewer marked as "not codeable", "not applicable", or "implausible value/suspected wrong." This affected many variables used in the determination of total net wealth due to a lot of non-responses.

In the data sample, some individuals were under 50 years of age, possibly family members residing in the same household. We removed about 50 observations related these younger individuals to be consistent with the sampling.

As a further precaution to possible errors in the data, we removed those observations that did not pass at least one of the data reliability proxies:

- The respondent was not able to give the correct answer for the current month and year
- The interviewer marked that the respondent did not understand all the questions
- The interviewer answered affirmatively to the question: "Were there any factors that may have impaired the respondent's performance on the tests?"

The majority of observations removed due to this exercise consisted of individuals born in the 1920s. About 3,000 from an initial sample of about 34,000 were eliminated.

Additionally, a few extreme value observations were eliminated due to the possibility that they may not be valid answers or because they would skew the remaining sample too much (outliers). Specifically, ten observations with wealth values in excess of € 5 million were excluded, as well as a couple of observations with debts greater than € 1 million.

Finally, since wealth variables and stock market data is at the household level, only one person per household was kept in the final data sample. To decide which person's behavioral characteristics should be associated with the financial data, we decided to use the member with the higher income or pension to be the designated "household decision maker." Fortunately, there were only 5 eliminations based on this criterion, as most of the household doubles were eliminated during the previous exercises.

The final data sample after clearing inconclusive answers and missing values amounts to 4494.

3.2 Data Analysis and Statistics

In the data sample, there are a total of 602 households that have direct investments in the stock market, which is equivalent to a 13.4% participation rate. Figure 3.2 below presents the average values of the behavioral and demographic variables for both market participants and non-participants. It can be seen that participants have, on average, higher values of optimism and are more social than average non-participants and the sample population as a whole. They also have lower than average values of risk aversion, are more educated, and are a lot wealthier. In this data sample, the average age of participants and non-participants is about the same. In the sample, there is an equal distribution by gender, but most of the stock market participants are male. There are no gender differences in the average non-participant.

Figure 3.2 – Average Characteristics of Market Participants

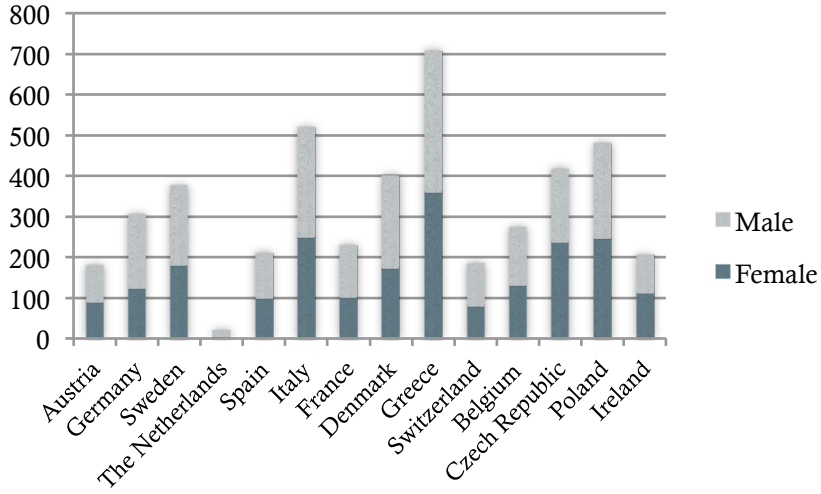
The table below presents the average values of the variables used in this study. The sample is segregated by market participation. Where applicable, the range of values a variable could have is denoted in parentheses.

Average Variable	Non-Participants	Participants	All
Sociability (0-4)	0.66	1.35	0.76
Optimism (1-4)	2.99	3.41	3.05
Risk-Aversion (1-3)	2.78	2.20	2.70
Years of Education (Max 25)	9.91	12.67	10.28
Wealth (Euro Millions)	0.23	0.55	0.27
Age/10	6.51	6.53	6.51
Male (dummy variable)	0.50	0.62	0.51

The following graph (Figure 3.3) offers a look at the observation counts by country and gender. It can be seen that they vary substantially by country, so some country effects may overpower the model if country dummies are not included. In all the countries the ratio of men to women is about the same.

Figure 3.3 – Count of Observations by Country and Gender

This graph demonstrates the sample characteristics by segregating data by countries and gender



Participation rates and other variables, as can be seen in the three graphs in the Appendix (Figures A.1.1 – A.1.3) show a lot of variability by country, therefore it would be important to test the model with country specific dummy variables to allow for this variation. There are some gender differences as well, but there is not as much variability by gender as there is by country.

Examining the correlations among variables, it can be seen in Figure 3.4 that most of the variables are not correlated, and some are slightly correlated. Stock market participation is correlated with sociability, optimism, education, risk aversion and wealth, to a certain degree. Risk aversion and market participation have the highest correlation among all the variables, as expected. Most of the variables show slight correlation with each other, except for age and gender. Gender does not appear to be strongly correlated with any variable, while age is somewhat negatively correlated with optimism and the level of education, which is reasonable for this data sample.

Figure 3.4 – Pearson Correlation Matrix

This table presents the correlations among variables, including the correlation between stock market participation and the explanatory variables, as well as correlations among all the explanatory variables. Correlations of 15% and above are represented with a star (*)

Figure 3.4 – Pearson Correlation Matrix (Continued)

	Part.	Socia.	Optim.	Educ.	Age	Male	Risk-Av	Wealth
Participation	1.000	0.234*	0.190*	0.222*	0.007	0.087	-0.345*	0.269*
Sociability		1.000	0.221*	0.234*	-0.062	0.013	-0.181*	0.163*
Optimism			1.000	0.259*	-0.182*	0.091	-0.164*	0.216*
Education				1.000	-0.217*	0.122	-0.181*	0.227*
Age					1.000	0.028	0.094	-0.016
Male						1.000	-0.112	0.078
Risk Aversion							1.000	-0.189*
Wealth								1.000

The next table (Figure 3.5) analyzes the distribution of risk aversion by age category. It is roughly the same for all age categories. About 5-7% of people are willing to take above average risks, and about 70-85% of people are risk-averse. Almost all of the observations are contained within the age range of 50-79 years. Only 21 people are above 90 years of age, making it impractical to place a large significance on the 10% of this sample that prefers above average risks. If we concentrate just on the three age-decades with the largest number of observations, we observe a slight gradual trend towards more risk-aversion with increasing age. This can be seen by the gradual increase in the percent of risk-averse people, and a decrease in a percent of people preferring to take average risks. However, the percent of people drawn to risk stays about the same, implying that extreme and above average risk attitudes may be more persistent and do not disappear as noticeably with age, or they may have stabilized by this age.

Figure 3.5 – Level of Risk Aversion by Age Category

The five columns, starting form 50-59 and ending with 90-99, group the sample by five different age categories. The rows contain a count of the number of people (in percent below) with the corresponding level of risk aversion in each age category. The darker shaded regions contain most of the observations in the sample.

Risk-Aversion	**50-59**	**60-69**	**70-79**	**80-89**	**90-99**	**All**
1	95	95	50	24	2	266
2	338	279	164	31	1	813
3	1053	1153	891	300	18	3415
Total	1486	1527	1105	355	21	4494
			In Percent			
1	6%	6%	5%	7%	10%	6%
2	23%	18%	15%	9%	5%	18%
3	71%	76%	81%	85%	86%	76%

In the next table (Figure 3.6) below, it can be observed that stock market participation is also evenly distributed among the different age groups (excluding the 90-99 age sample due to low observation count), suggesting age will not come out to be a large predictor of stock market participation. People aged 50 and above tend to have similar investing patterns in this sample.

Figure 3.6 – Stock Market Participation by Age Group

The five columns, starting form 50-59 and ending with 90-99, group the sample by five different age categories. The rows contain a count of the number of people (in percent below) that participate in the stock market in each age category. The darker shaded regions contain most of the observations in the sample.

Part	50-59	60-69	70-79	80-89	90-99	All
no	1310	1289	964	309	20	3892
yes	176	238	141	46	1	602
Total	1486	1527	1105	355	21	4494
			In Percent			
no	88%	84%	87%	87%	95%	87%
yes	12%	16%	13%	13%	5%	13%

In the next three graphs we look at the behavioral factors in a little more detail. As the graph in Figure 3.7 demonstrates, stock market participation is linearly decreasing with higher levels of risk-aversion for the people in our sample. The slope of descent is quite steep. Nearly all the people in this sample are risk-averse, with only 24% having low and average levels of risk-aversion. Of the risk-averse sample, only 7.3% chose to participate in the stock market directly, while about 50% of the people with below average level of risk aversion participate in the market.

Figure 3.7 – Stock Market Participation Rate by Risk-Aversion Level

This graph presents direct market participation (percent) with respect to risk aversion. Risk Aversion is also graphed to show the percentile of each level in our sample. The table below provides the data supporting the graphs.

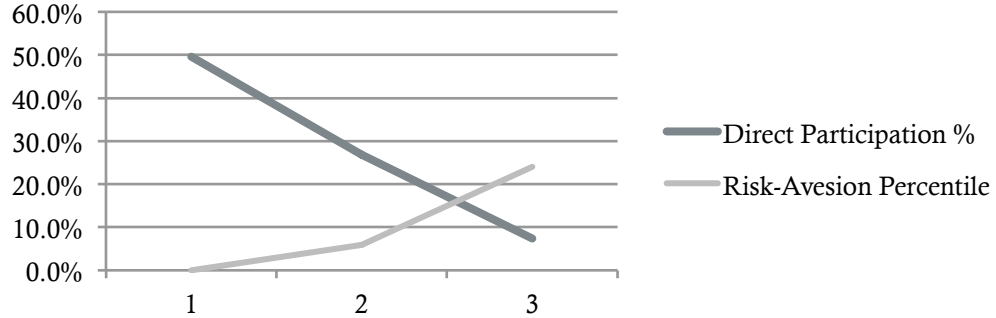


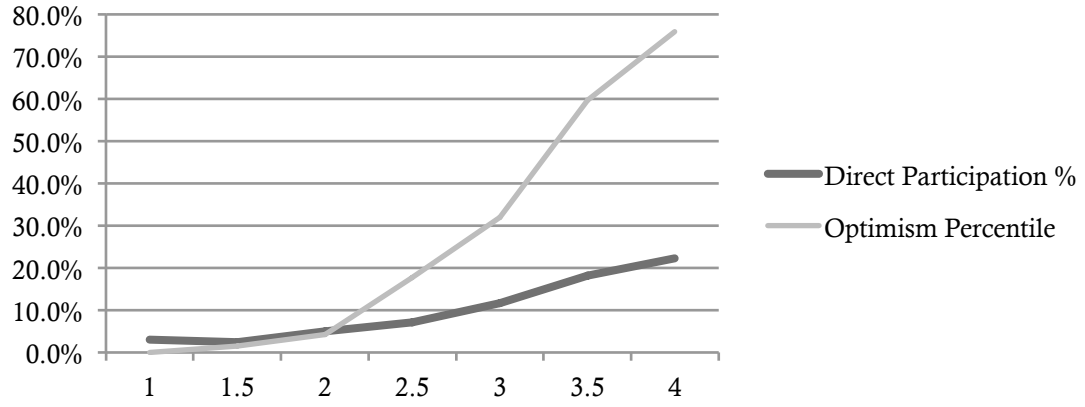
Figure 3.7 – Stock Market Participation Rate by Risk-Aversion Level (Continued)

Part./ Risk-Aversion	1	2	3	Total
no	134	594	3164	3892
yes	132	219	251	602
All	266	813	3415	4494
Direct Participation %	49.6%	26.9%	7.3%	13.4%
Risk-Avesion Percentile	0.00%	5.92%	24.01%	

The next graph (Figure 3.8) depicts the trend in market participation with increases in the level of optimism. As the level of optimism rises, market participation steadily increases. About 22% of the very optimistic people participate in the market, compared to 3% of the pessimists. The majority of the people in our data sample show characteristics of optimism, and most of the time they believe "life is full of opportunities" and "the future looks good". Only about 18% of the sample believes that "rarely," and even fewer people think that "never."

Figure 3.8 – Stock Market Participation Rate by Optimism Level

This graph presents direct market participation (percent) with respect to optimism. Optimism is also graphed to show the percentile of each level in our sample. The table below provides the data supporting the graphs.



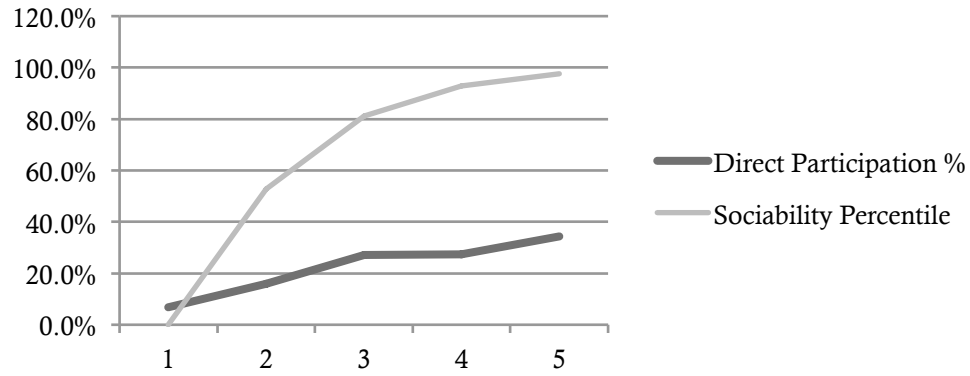
Part/Optimism	1	1,5	2	2,5	3	3,5	4	Total
no	63	120	576	594	1106	591	842	3892
yes	2	3	30	46	147	132	242	602
All	65	123	606	640	1253	723	1084	4494
Direct Participation %	3.1%	2.4%	5.0%	7.2%	11.7%	18.3%	22.3%	13.4%
Optimism Percentile	0.00%	1.45%	4.18%	17.67%	31.91%	59.79%	75.88%	

In the table below (Figure 3.9) it can be observed that market participation is also trending upwards with increases in sociability. 34% of the most social people participate in the market, while only 7% of people that have not participated in any mentioned social activities

own shares. It must also be noted that most of the people in our sample do not participate in multiple distinct social activities. Doing three distinct social activities per month is ranked at the 93rd percentile, and doing just one type of activity is already ranked at the 53rd percentile.

Figure 3.9 – Stock Market Participation Rate by Sociability Level

The graph below presents direct market participation (percent) with respect to sociability. Sociability is also graphed to show the percentile of each level in our sample. The table below provides the data supporting the graphs.



Part/ Sociability	0	1	2	3	4	Total
no	2209	1073	388	153	69	3892
yes	161	202	145	58	36	602
All	2370	1275	533	211	105	4494
Direct Participation %	6.8%	15.8%	27.2%	27.5%	34.3%	13.4%
Sociability Percentile	0.00%	52.74%	81.11%	92.97%	97.66%	

In the following two charts (Figure 3.10) we analyze participation by wealth and gender. Based on the average wealth values, those individuals that participate in the stock market have noticeably higher wealth. Men have higher wealth than women, on average, as well. Additionally, the difference in wealth between those people that own shares and those that don't is distinct for each gender. Women participating in the stock market have on average 2.66 times more wealth than the rest of women, while men participating in the stock market have 2.17 times more wealth than the other men. Due to some skeweness in the wealth data, a closer look at the medians is necessary.

The median values of wealth express almost the same pattern. Wealth still tends to be higher for those people that participate in the stock market. Women that participate have 2.87 times more wealth than women that do not participate, while men that own shares have 2.21 times

as much wealth as the rest of men. This shows that there might be some differences in the wealth effect on participation between men and women.

Figure 3.10 – Wealth by Gender and Participation

The chart below shows the average and median wealth amounts in millions of Euros for men and women that participate and don't participate in the stock market. A wealth participation multiple is the ratio of wealth of the participants to non-participants for each gender.

Average Wealth by Gender and Participation

Gender/Participation	Yes	No	Wealth Participation Multiple
Women	€ 548 312	€ 205 942	2.66
Men	€ 556 782	€ 256 687	2.17

Median Wealth by Gender and Participation

Gender/Participation	Yes	No	Wealth Participation Multiple
Women	€ 352 869	€ 123 000	1.87
Men	€ 340 000	€ 154 000	1.21

3.3 Methodology

This paper seeks to answer two questions:

1) How the explanatory variables affect direct stock market participation
2) How the explanatory variables affect a self-ascribed measure of risk aversion

To answer the first question, a dummy dependent variable is used that takes on a value of one if an individual has any investments in the stock market and a value of zero otherwise. For the second part, the dependent variable uses the level of risk-aversion, which ranges from 1 to 3. In addition to the predictor variables sociability and optimism, a standard set of control variables is applied in both models.

3.3.1 Probit Model

In a regression, variables don't always represent quantitative figures; sometimes they capture qualitative information such as emotional states or gender. At times, it is the dependent variable that contains the qualitative information. Accordingly, the dependent variable can have specific numbers (1,2,3), or be a binary number (0 or 1) that represents the qualitative factors. In a binary choice model the explained variable (y_i) takes on the values of 0 and 1 for i number of observations. These are represented by a 0-1 dummy variable. In our case, 1 stands for market participation and 0 for no participation. The outcome or fitted value for

each observation *i* is interpreted as the probability of having y_i equal to one. This probability cannot have a negative value, and cannot be bigger than one. Considering this limitation, the linear probability model is not very good. A better model, *probit*, converts the linear regression model in a way that restricts all the fitted values in an interval of (0, 1) with an s-shaped line. The formula for this transformation is the cumulative density function of the standard normal distribution:

$$\Phi(z_i) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{zi} e^{-zi^2/2}\, dz_i \tag{1}$$

$$z_i = \beta_1 + \beta_2 x_{2i} + \beta_3 x_{3i} + \cdots + u_i \tag{2}$$

Where z_i is the linear regression model that is transformed by $\Phi(z_i)$, and $\Phi(z_i)$ is the probability that $y_i = 1$. (Brooks, 2008). In our case the linear model for z_i is:

$$z_i = Participation_i = \beta_1 + \beta_2 Sociability_i + \beta_3 Optimism_i + \beta_4 Education_i + \beta_5 Age_i + \beta_6 Male_i + \beta_7 Risk\ Aversion_i + \beta_8 Wealth_i + u_i \tag{3}$$

An extension of the binary probit model is the ordered probit model. The difference is that the dependent variable can take on more than two values to represent the qualitative factors, and has a natural ordering. It does not have zero as the threshold:

$$R_i^* = x_i'\beta + \varepsilon \tag{4}$$

$$R_i = \begin{cases} 1 \ if \ R_i^* \leq \mu_1 \\ 2 \ if \ \mu_1 < R_i^* \leq \mu_2 \\ 3 \ if \ R_i^* > \mu_2 \end{cases}$$

R_i represents the observed outcomes for risk aversion, where 1 = below average level of risk aversion, 2 = average level of risk aversion, and 3= above average level of risk aversion. R_i^* is the true outcome, which is not observed. μ_1 and μ_2 are the threshold parameters estimated in the regression with the coefficients. (Brooks, 2008). The following is the linear model of z_i that is transformed in the regression for risk aversion:

$$z_i = Risk\ Aversion_i = \beta_1 + \beta_2 Sociability_i + \beta_3 Optimism_i + \beta_4 Education_i + \beta_5 Age_i + \beta_6 Male_i + \beta_8 Wealth_i + u_i \tag{5}$$

3.3.2 Marginal effects

To interpret the resulting coefficients properly, the marginal effect of a coefficient is calculated. The marginal effect of a variable in a *probit* model explains by how much the probability of obtaining an outcome of $y_i = 1$ will alter (increase or decrease) as a result of a unit change in a specific variable, while keeping all the other variables constant at their average values.

By differentiating $\Phi(z_i)$ in equation (1) above with respect to any independent variable x_j, one can obtain the impact – the change in probability of market participation – of a unit change in the explanatory variable, which is equal to the coefficient of that variable multiplied by $\Phi'(z_i)$:

$$\frac{d}{d\,x_j} = (\beta_j)\Phi'(z_i) \tag{6}$$

The marginal effects in an *ordered probit* model explain by how much the probability of one of the outcomes changes with respect to a change in one independent variable (keeping the other explanatory variables constant at their means). The marginal effects for all the possible outcomes must sum up to zero, as the increase in the probability of one of the outcomes necessarily reduces the probability of one or more of the other outcomes. (Brooks, 2008). In our case, we have three possible outcomes, corresponding to the level of risk aversion.

3.3.3 Maximum likelihood

Since the transformed model of the linear equation (2) is no longer linear, OLS cannot be performed to obtain the coefficients (β_j) of the independent variables. Instead, *maximum likelihood* is utilized to estimate the coefficients.

To obtain the best estimates for models which are not linear, the maximum likelihood method can be performed by applying the likelihood function, taking the log of this likelihood function (LLF) and maximizing the result of the LLF. This method differs depending on the model at hand. As described in the above definition of a probit model, $\Phi(z_i)$ is equal to the probability of $y_i = 1$. The conditional distribution of y_i based on x_i is described as follows:

The probability that y_i equals zero will be equal to one minus $\Phi(z_i)$, and Φ is the standard normal cumulative distribution function (cdf):

$$P(Y_i = 0|X_i) = 1 - \Phi(X_i\beta) \tag{7}$$

Considering the fact that y_i can only have zeros and ones, each y_i will have a likelihood function as follows:

$$f(Y_i|X_i) = [\Phi(X_i\beta)]^{Y_i}[1 - \Phi(X_i\beta)]^{1-Y_i} \tag{8}$$

Hence, the log likelihood function for this specification is specified by the formula below:

$$Log(L) = \sum_{i=1}^{n}\{Y_i \log[\Phi(X_i\beta)] + (1 - Y_i)\log[1 - \Phi(X_i\beta)]\} \tag{9}$$

By taking the first order condition of this log likelihood function with respect to β, the proper estimates for β will be derived:

$$\frac{\partial Log(L)}{\partial \beta} = \sum_{i=1}^{n}\frac{Y_i - \Phi(X_i\beta)}{\Phi(X_i\beta)[1 - \Phi(X_i\beta)]}\phi(X_i\beta)X_i' = 0 \tag{10}$$

φ is defined as the probability density function for the standard normal distribution. (Gourieroux, 2000).

3.4 Applied methodology

Initially, the regression presented in equation (3) is performed. This includes both sociability and optimism, together with the control variables. Subsequently, it will be modified as follows:

1. Country dummies are added to see if they significantly improve the results. These country dummies would be able to capture differences in institutional development, regional trust levels, and the economic environment that affect investment decisions, and are responsible for the heterogeneity in participation rates across countries. Controlling for country fixed effects also controls for some of the cultural differences among the countries that might affect our behavioral/personality variables, so that the effect of each

variable could be reduced. We pick Germany to be the reference country when applying dummy variables because it contains one of the central economies of Europe.

2. Models with just one of the behavioral/personality variables are run to check for consistency in the coefficients.
3. Control variables are eliminated one at a time to see the effect on the remaining coefficients, and to check model stability.

Equation (5), where risk-aversion is the dependent variable, will be performed last.

In this research, Stata is used to perform all the regressions and the econometric tests. We specify the use of Huber/White robust standard errors, which compute the quasi-maximum likelihood standard errors, and are robust to some possible misspecification of the distribution.

One of the issues we have to consider when performing the mentioned regressions is multicollinearity, which could affect the standard errors and R^2. Coefficients are said to be orthogonal to each other if the explanatory variables do not have any relationship with each other. In this case, adding or removing one of the variables in the regression will not produce a change in the coefficients of the other variables. One can expect to see some correlation between explanatory variables, but when this correlation is significantly high it might cause a multicollinearity problem. High levels of multicollinearity are not tolerated by the model (perfect multicollinearity), but some other level, which is neither high nor non-negligible, is more common. By looking at the correlation matrix between variables, one can figure out whether there is any chance for multicollinearity based on the magnitude of the coefficient of correlation. Based on the correlation matrix corresponding to our data (Figure 3.7) it is unlikely that there is any perfect multicollinearity that can affect the result in the regression. Additionally, Stata drops one of the explanatory variables if it could be determined by a linear combination of any other explanatory variables.

4. Results and Discussion

In this section we present the results of the regressions and discuss their implications. The discussion begins with the effect of optimism and sociability on market participation. Diagnostics and robustness checks follow. Lastly, optimism and sociability as the determinants of risk aversion are analyzed.

4.1 Effect of Optimism and Sociability on Market Participation

The regression results are depicted in Figure 4.2 at the end of this section. In model (1), which excludes country dummies, all the variables are significant at 5%, except for male, which is significant at the 10% level. Age is significant at the 5% level; however, the effect is counterintuitive and not consistent with some other empirical findings. (Yao et al., 2004; Wang & Hanna, 1998; Xiao et al., 2001; Morin & Suarez, 1983). The regression suggests that the probability of market participation increases with age, with a calculated marginal increase in probability of 2.5% for each additional life year. This result is probably attributed to variability in omitted variables, such as economic state, employment rate, retirement age, longevity and culture, among different countries. The next model addresses this issue by including country dummies.

In model (2), with country dummies, it is observed that the variables sociability, optimism, education, male, risk aversion, and wealth are all significant at 5% and the coefficients have the expected signs, while age is now insignificant. The biggest factor in predicting market participation is the level or risk-aversion, implying that this control variable is performing well. Both sociability and optimism have a similar impact, in terms of magnitude, on market participation. Figure 4.1 presents the marginal change in probabilities in response to a unit change in one explanatory variable, while keeping the others constant at their means. By doing one more distinct type of social activity per month (if the current number is currently less than four), an individual's probability of participating in the stock market is increased by 1.15%. Similarly, the results show that if a person scores higher on an optimism scale that ranges from 1 to 4, then the probability of participating in the stock market increases by

1.29%. That is, if an individual feels that "life is full of opportunities" and "the future looks good" quite "often" as opposed to "sometimes," or "sometimes" as opposed to "rarely," and "rarely" as opposed to "never," then the effect of optimism will be noted. Education years have a 0.04% impact on the probability of participating in the stock market. Risk aversion has the biggest role in affecting market participation. If a person becomes more risk averse by one unit (i.e. moves from low risk aversion to average, or from average to high risk aversion), then the probability of owning shares decreases by 6.57%. Wealth impacts the probability positively by 0.512%, that is, if wealth increases by € 100,000. Additionally, men are 1.8% more likely to participate in the stock market than women.

Figure 4.2 – Marginal effects on market participation

Marginal effects on the change in probability of participating in the stock market with respect to a unit change in the explanatory variable. All the marginal effects are statistically significant at 5% with the exception of Age.

	dy/dx	Std .Err.	Z	P>|z|
Sociability	0.0115	0.003	3.530	0.000
Optimism	0.0129	0.005	2.440	0.015
Education	0.0036	0.001	3.820	0.000
Age	0.0008	0.004	0.220	0.822
Male*	0.0184	0.007	2.600	0.009
Risk	-0.0657	0.006	-10.990	0.000
Wealth	0.0511	0.008	6.120	0.000

(*) dy / dx is for discrete change of dummy variable from 0 to 1

The fact that age is insignificant, after controlling for the country specific effects suggests that in our data sample age does not play a role in predicting market participation. This could be because our sample is already restricted to a certain age group, within which the variation in stock market participation is not very pronounced. This group may have similar attitudes about investing in comparison to much younger people. Also, as previously mentioned, about 70-85% of this sample is risk-averse, and this is consistent among the different age-decade categories. The effect of age may be overpowered by the risk-aversion factor. Additionally, we did not make a distinction between age and birth-cohorts. Some studies have pointed out that there are generational differences and life experiences such as growing up during the Great Depression or high inflation periods that can shape a person's aversion to risk (Malmendier & Nagel, 2011), and that age-risk profiles can vary by birth-cohort (Bernasek &

Jianakoplos, 2006). As such, it is possible that in the same individuals age could affect market participation, but the effect is clouded by these generational differences.

In relation to other studies on sociability our results are consistent: higher sociability tends to translate into increased stock holding. (Hong et. al., 2004; Brown et al., 2008; Georgarakos & Pasini, 2011; Dierkes et al., 2011). The closest study to ours is by Georgarakos and Pasini (2011), in which the same data was used to measure sociability, but the variable was converted into a binary one. With this transformation, the authors found that households that are more social have a 3.1% higher chance of owning shares.

Our study is one of the first to empirically test the effect of optimism on market participation with as many observations. Another study that is close to ours is written by Puri & Robinson (2007), in which the measure of optimism was approximated based on the difference in a person's own estimation of longevity and life expectancy statistics. In our study the measure of optimism is more direct, as questions about the future and opportunities were included in the SHARE survey. Nevertheless, our findings are consistent with this study, more optimistic people tend to own more stocks.

Table 4.1 – Effect of optimism and sociability on direct stock market participation

The specified columns one through four present the results of four probit models, in which the dependent variable is a dummy variable denoting 1 if the household has any money invested in stocks, and 0 otherwise. Sociability is valued from 0-4 denoting the number of distinct social activities an individual participated in over the last month (4 stands for four or more different activities, but not more than 7). Optimism is the average number achieved from the following questions: Do you feel the future looks good? And, do you feel full of opportunities?) The possible answers are never, rarely, sometimes, and often, which denote a person's optimism on a scale from 1-4, with 4 being the most optimistic. Male is a dummy variable, if the person is male it will be one, otherwise zero. Age is the respondent's age divided by 10. Risk aversion ranges from 1-3, with two being the average level of risk aversion, and three above average. Education is the number of full-time education years. Wealth is total household net wealth, consisting of net financial and net real assets, in millions of Euros. Country dummies are used as specified.

	Simple model	Main Model: With country dummies	With country dummies, excluding sociability	With country dummies, excluding optimism
	(1)	**(2)**	**(3)**	**(4)**
sociability	0.197**	0.097**		0.107**
	(0.025)	(0.027)		(0.027)
optimism	0.241**	0.109**	0.131**	
	(0.041)	(0.045)	(0.045)	

(Continued from above)	Simple model	Main Model: With country dummies	With country dummies, excluding sociability	With country dummies, excluding optimism
	(1)	**(2)**	**(3)**	**(4)**
education	0.049**	0.031**	0.034**	0.032**
	(0.007)	(0.008)	(0.008)	(0.008)
age	0.156**	0.007	0.000	-0.005
	(0.029)	(0.032)	(0.031)	(0.031)
male	0.103*	0.156**	0.151**	0.161**
	(0.055)	(0.06)	(0.06)	(0.06)
risk-aversion	-0.617**	-0.555**	-0.567**	-0.559**
	(0.040)	(0.045)	(0.045)	(0.045)
wealth	0.466**	0.432**	0.429**	0.448**
	(0.063)	(0.066)	(0.066)	(0.066)
constant	-2.262**	-0.633**	-0.561*	-0.229
	(0,274)	(0.323)	(0.321)	(0.284)
Diagnostics				
Pseudo-R^2	0.23	0.34	0.34	0.34
Wald Chi^2	698.31	852.00	842.76	854.08
Log Pseudolikelihood	-1367.17	-1165.94	-1172.04	-1168.86
Lstat classification	87.47%	88.43%	88.32%	88.36%
Country dummies	No	Yes**	Yes**	Yes**
Observations	4494	4494	4494	4494

*** Denotes significance at the 5% level, * denotes significance at the 10% level. Country dummies are not shown, but, according to the Wald test they are jointly significant at 5% .*

4.2 Diagnostics and robustness check

Based on the diagnostics in Figure 4.2 above, model (2) is a much better fit than the first one. The pseudo-R^2 implies this model can now explain 34% of the variability in market participation, as opposed to 23%. In the third and fourth models the effects of sociability and optimism are examined one at a time to see if there is consistency in the model specification. By comparing the results across models 2 - 4, it can be seen that sociability, optimism and all the control variables (except age) are significant at 5%. The fact that the coefficients remain similar in value after adding or removing either sociability or optimism variables signifies that the effect of all these variables on market participation is consistent. The effect of the demographic control variables is also relatively consistent across all four models, with the exception of gender and age in the simple model. This implies that country dummies control for the effect of some systematic differences in age and gender across countries. Additionally, inclusion of country dummies noticeably alters the magnitude of sociability and optimism coefficients, indicating that countries might have cultural differences that affect optimism and sociability levels. Controlling for these effects is necessary so that the pure, though smaller,

effect of sociability and optimism across countries could be determined. The joint significance of the country dummy coefficients was tested with a Wald test, implying that they are all jointly significant.

4.2.1 Regressions with control variable omissions

To see if the main model, model (2) in Figure 4.2 is robust we check it by removing one of the control variables at a time. Figure A.1.4 in the Appendix presents the results. In most of the cases, the coefficients for sociability and optimism are still very close to those in the main model. There is a slight increase in the coefficients when the variable risk-aversion is excluded, implying that a small part of sociability and optimism is related to the level of risk aversion. Wealth is also related to the level of optimism, as the coefficient for optimism is higher when wealth is excluded. We also take a closer look at age, to see if there is a change in the regression in which risk-aversion is omitted: the coefficient for age is now negative and the statistical significance has improved by 56%, though it still not highly significant. Nevertheless, this shows that risk-aversion may indeed be overpowering the effect of age to some extent.

4.3 Additional results: determinants of risk aversion

Figure A.1.5 in the Appendix presents the results of the ordered probit regression on the possible determinants of risk aversion. The probability of obtaining outcome 3 – the highest level of risk aversion – is 79%. The probabilities of obtaining average and below average levels of risk aversion are 17% and 4%, respectively. These results are intuitive since most of the people in our sample are risk averse. To interpret the results of the equation it is best to analyze the marginal effects. As can be seen in Figure A.1.5, by increasing the level of optimism or sociability, the marginal change on the probability of obtaining above average level of risk aversion (outcome 3) is negative. But, the marginal changes in the probability of obtaining an average level of risk aversion (outcome 2) and below average level (outcome 1) are positive. By increasing one of these explanatory variables, the probability of obtaining outcome 3 decreases, while the probability of obtaining outcome 1 or outcome 2 increases. These results suggests that higher levels of optimism and sociability are most likely to be observed in individuals with an average level of risk aversion, and to some extent with those that have below average levels of risk aversion. Wealth, education, and gender also appear to

have a similar pattern as sociability and optimism: increases in these variables will largely decrease the probability of above average level of risk aversion, increase the probability of average risk aversion, and also slightly increase the probability of below average level of risk aversion. The marginal effects for all the explanatory variables have the highest impact in absolute value terms for outcome 3. Also notable is the effect of age: in this regression it is significant. Increases in age have a positive marginal effect on the probability of having above average levels of risk aversion, while the impact on the probabilities for below average and average levels of risk aversion is negative.

Overall, the results on risk aversion suggest that there is some notable relationship between risk aversion and optimism, sociability, and the control variables. However, the pseudo-R^2 of the regression is only 10%, so there must be other more important predictors of risk-aversion. One may wonder why we include risk aversion in the regression for market participation if it is a function of the other explanatory variables that are already there, implying that it is not exogenous. The reason is that we do not know all the determinants of risk aversion to model it completely, and the determinants used here explain only 10% of the variation in risk-aversion; it seems to be only partially endogenous.

5. Conclusion

Our results suggest that optimism and sociability both affect the probability that a person will be a stock-owner. By participating in an additional social activity an individual's probability of being a stock-owner increases by 1.15%, keeping all other things constant. An upward shift in optimism (from very low to low, low to moderate, and moderate to high) produces a 1.29% change in the probability of picking stocks.

Based on general questions related to outlook on the future and a feeling of opportunities, we measured optimism in a way that we believe is close to dispositional optimism and does not contain a possible bias that is related to a particular sphere, as the life-expectancy domain in Puri and Robinson's (2007) study. Our measure of sociability, which is based on the count of different social activities performed over the last month, is also different from some other studies such as Hong et al. (2004) and Brown et al. (2008), which measure only if a person has met with neighbors and/or attended church. Georgarakos and Pasini (2012) use a similar measure to ours, but instead of categorizing a level of sociability, they use a dummy variable.

Our results also confirm that risk aversion is still one of the most prominent psychological/personality factors in predicting stock market participation. A person's innate feeling about taking risk, and the resulting action or inaction due to that personal rationalization of the risk and reward frontier will be one of the main determinants of market participation. Across all the models tested in this research, the measure for risk aversion consistently had a high level of significance. The marginal change in the probability on owning shares by a shift in the level of risk aversion from low to average and from average to high produced the largest change among all other explanatory variables. Upon regressing optimism and sociability (with the same set of control variables) with an ordered probit model where the dependent variable is risk aversion, we note that all the explanatory variables are significant. Sociability and optimism markedly decrease the probability that an individual will have above average levels of risk aversion, and increases the probability that the level of risk aversion will be average, and to some extent below average.

This empirical research into the behavioral aspects affecting market participation was conducted with data from 2004 - 2006. It would be interesting to see if and how the optimism and sociability measures have changed following the financial crisis of 2008, and if their effect on market participation is just as strong. Similarly, it is a topic of interest to examine more closely how optimism and sociability could affect risk aversion, or if risk-aversion determines optimism and sociability on some level.

References

Books:

Brooks, C. (2008). *Introductory Econometrics for Finance,* 2nd ed., Cambridge University Press, 511-545.

Campbell, J. Y., & Viceira, L. M. (2002). *Strategic asset allocation*, Oxford University Press.

Gourieroux, C. (2000). *Econometrics of Qualitative Dependent Variables*, Cambridge University Press.

Articles and Essays:

Arrow, K. J., (1971). "The Theory of Risk Aversion," in K. J. Arrow, *Essays in the Theory of Risk Bearing* (Amsterdam: North-Holland)

Aspinwall, L. G., & Taylor, S. E. (1992). Modeling Cognitive Adaptation: A longitudinal investigation of the impact of individual differences and coping on college adjustment and performance. *Journal of Personality and Social Psychology*, *63*, 989-1003.

Banerjee, A. (1992). A Simple Model of Herd Behavior. *Quarterly Journal of Economics, 107(3)*, 797-817.

Barberis, N., Shleifer, A., & Vishny, R. (1998). A model of Investor Sentiment, *Journal of Financial Economics, 49*, 307-343.

Barber, B. M., & Odean, T. (2001). Boys Will be Boys: Gender, Overconfidence, and Common Stock Investment. *The Quarterly Journal of Economics, 116* (1), 261-292.

Barsky, R., Juster, T., Kimball, M., & Shapiro, M. (1997). Preference parameters and behavioral heterogeneity: An experimental approach in the health and retirement study, *Quarterly Journal of Economics, 112* (2), 537-579

Bernasek, A., & Jianakoplos, N. (1998). Are Women More Risk Averse? *Economic Inquiry , 36* (4), 620-30.

Bernasek, A., & Jianakoplos, N. (2006). Financial Risk Taking by Age and Birth Cohort. *Southern Economic Journal , 72* (4), 981-1001.

Bernasek, A., & Shwiff, S. (2001). Gender, Risk, and Retirement. *Journal of Economic Issues (Association for Evolutionary Economics), 35*(2), 345-763.

Bikhchandani, S., Hirshleifer, D., & Welch, I. (1992). A Theory of Fads, Fashion, Custom, and Cultural Change as Informational Cascades. *Journal of Political Economy*, *100* (5), 992-1026.

Brissette, I., Carver, C., & Scheier, M. (2002). The role of Optimism in Social Network Development, Coping, and Psychological Adjustment During a Life Transition. *Journal of Personality and Social Psychology, 82*, 102-11

Bromberger, J. T., & Matthews, K. A. (1996). A longitudinal study of the effects of pessimism, trait anxiety, and life stress on depressive symptoms in middle-aged women, *Psychology and Aging, 11*, 207-213.

Brown, J. R., Ivkovic, Z., Smith P. A., & Weisbenner, (2008). Neighbors Matter: Causal Community Effects and Stock Market Participation. *The Journal of Finance*, *63*(3),1509-1531.

Brunnermeier, M., & Parker, J. (2005). Optimal Expectations, *American Economic Review*, 95(4), 1092-1118

Camerer, C., & Lovallo, D. (1999). Overconfidence and Excess Entry: An Experimental Approach. *The American Economic Review ,89 (*1), 306-318.

Campbell, J., 2006. Household finance. *The Journal of Finance, 111*, 1553-1604.

Chang, E. C., & Sanna, L. J. (2001). Optimism, pessimism, and positive and negative affectivity in middle-aged adults: A test of a cognitive-affective model of psychological adjustment. *Psychology & Aging*, *16*, 524-531

Charlton, T., Marshall, L., & Devlin, M. (2008). Evaluating the extent to which sociability and social presence affects learning performance. *SIGCSE Bull*, *40*(3), 342-342.

Cohn, R. A., Lewellen, W. G., Lease, R. C., & Schlarbaum, G. G. (1975). Individual Investor Risk Aversion and Investment Portfolio Composition. *The Journal of Finance, 30*(2), 605-620.

Coval, J. D., & Shumway, T. (2005). Do Behavioural Biases Affect Prices? *The Journal of Finance, 60* (1), 2005.

Cozzarelli, C. (1993). Personality and self-efficacy as predictors of coping with abortion. *Journal of Personality and Social Psychology, 65, 1224-1236.*

Ellison, G., & Fudenberg D. (1995). Word of mouth communication and social learning. *Quarterly Journal of Economics, 110*, 93-125.

Felton, J., Gibson, B., & Sanbonmatsu, D. (2003). Preference for risk in investing as a function of trait optimism and gender. *The Journal of Behavioral Finance, 4*(1), 33-40.

Georgarakos, D. & Pasini, G., (2011). Trust, Sociability, and Stock Market Participation. *Review of Finance*, *15*, 693–725.

Guiso, L., Sapienza, P., & Zingales, L. (2004). Association The Role of Social Capital in Financial Development. *The American Economic Review*, 94(3), 526-556.

Guiso, L., Haliassos, M., & Jappelli, T. (2003). Household stockholding in Europe: Where do we stand and where do we go? *Economic Policy, 18* (36), 123-170.

Hackbarth, D. (2007). Managerial Traits and Capital Structure Decisions**.** *Journal of Financial and Quantitative Analysis, 43, 843-882*

Harris, D. M., & Guten, S. (1979). Health Protective Behavior: An Exploratory Study. *Journal of Health and Social Behavior, 20*, 17-29

Hilton, D. J. (2001). The psychology of financial decision-making: Applications to trading, dealing, and investment analysis. *The Journal of Psychology and Financial Markets*, 2, 37-53.

Hong, H., Kubik, J. D., & Stein, J. C. (2004). Social Interaction and Stock-Market Participation. *The Journal of Finance, 59* (1), 137-163.

Jianakoplos, N., & Bernasek, A., (1998). Are women more risk averse? *Economic Inquiry,* 36, 620-630.

Kahneman, D., & D. Lovallo., (1993). Timid Choices and Bold Forecasts: A Cognitive Perspective on Risk Taking. *Management Science*, 39 (1), 17–31

Lee, C. C., Shleifer, A., & Thaler, R. H. (1991). Investor Sentiment and the Closed-End Fund Puzzle. *The Journal of Finance , 46* (1).

Litt, M. D., Tennen, H., Affleck, G., & Klock, S. (1992). Coping and cognitive factors in adaptation to in vitro fertilization failure. *Journal of Behavioral Medicine*, 15, 171-187.

Dierkes, M., Klos, B., & Langer, T. (2011). A note on representativeness and household finance. *Economics Letters*, 62-64.

Malmendier, U., & Nagel, S. (2011). Depression Babies: Do Macroeconomic Experiences Affect Risk-Taking? *Quarterly Journal of Economics, 126* (1), 373-416.

Mehra, R. & Prescott, E. (1985). The equity premium: A puzzle. *Journal of Monetary Economics*, *15*(2), 145–161.

McKenna, F. P. (1993). It Won't Happen to Me: Unrealistic Optimism or Illusion of Control? *British Journal of Psychology, 84*, 39-50.

Morin, R. A., & Suarez, A. F. (1983). Risk Aversion Revisited. *Journal of Finance, 38* (4), 1201-1216.

Nofsinger, J. R. (2005). Social Mood and Financial Economics. *Journal of Behavioral Finance , 6* (3), 144-160.

Mankiw S. & Zeldes G. (1991). The consumption of stockholders and nonstockholders, *Journal of Financial Economics*, 97–112.

Olsen, R. A., & Cox, C. M. (2001). The influence of gender on the perception and response to investment risk: The case of professional investors. *The Journal of Psychology and Financial Markets*, 2, 29-36.

Palme, M., Sunden, A., & Soderlind, P. (2007). Investment Choice in the Swedish Premium Pension Plan. *Journal of the European Economic Association Papers and Proceedings*, 5, 636-646.

Puri, M., & Robinson, D., (2007). Optimism and economic choice. *Journal of Financial Economics,* 86 (1), 71-99.

Sanbonmatsu, D. M., Posavac, S. S., Kardes, F. R., & Mantel, S. P. (1998). Selective Hypothesis Testing. *Psychonomic Bulletin & Review*, 5, 197-220.

Segerstrom, S. C. (2001). Optimism and attentional bias for negative and positive stimuli. *Personality and Social Psychology Bulletin*, 27, 1334-1343.

Scheier, M., & Carver, C., (1985). Optimism, coping and health: Assessment and implications of generalized outcome expectancies. *Health Psychology,* 4, 219-247.

Scheier, M., & Carver, C., (1992). Effects of optimism on psychological and physical well-being: Theoretical overview and empirical update. *Cognitive Therapy and Research,* 16, 201-228.

Schmidt, L. A., & Fox, N. A. (1995). Individual differences in young adults' shyness and sociability: Personality and health correlates. *Personality and Individual Differences, 19*(4), 455-462.

Schulz, R., Bookwala, J., Knapp, J.E., Scheier, M., & Williamson, G.M. (1996). Pessimism, age and cancer mortality, *Psychology and Ageing* ,11, 304–309.

Reyes-García, V., Godoy, R., Vadez, V., Ruíz-Mallén, I., Huanca, T., Leonard, W., et al. (2009). The Pay-Offs to Sociability. *Human Nature*, 20(4), 431-446.

Rosen, R. J. (2003). Merger Momentum and Investor Sentiment: The Stock Market Reaction to Merger Announcements. *The Journal of Business, 79, 987-1017*

Vissing-Jorgensen, A., (2003). Perspectives on behavioral finance: Does irrationality disappear with wealth? Evidence from expectations and actions. *NBER Macroeconomics Annual 2003 ,*18, MIT Press, Cambridge

Vissing-Jorgensen, A., (1999). Limited stock market participation and the equity premium puzzle, Working Paper, University of Chicago.

Wang, H., & Hanna, S. (1997). Does risk tolerance decrease with age? *Financial Counseling and Planning*, 8 (2), 27-31.

Weinstein, N. D. (1977). Coping with Environmental Hazards: Reactions to the Threat of Crime. Paper presented at the meeting of the American Psychological Association, San Francisco

Weinstein, N. D. (1980). Unrealistic Optimism About Future Life Events. *Journal of Personality and Social Psychology , 39* (5), 806-820.

Weinstein, N., (1984). Why it won't happen to me: Perceptions of risk factors and susceptibility. *Health Psychology,* 3 (5), 431-457.

Xiao, J. J., Alhabeeb, M. J., Hong, G. S., & Haynes, G. W. (2001). Attitude toward risk and risk taking behavior of business owning families. *The Journal of Consumer Affairs*, 35 (2), 307-325.

Yao, R., Hanna, S. D., & Lindamood, S. (2004). Changes in financial risk tolerance, 1983-2001. *Financial Services Review*, 13 (4), 249-266.

Web sources

SHARE. (2012, May 17). *SHARE Home, Wave1, Wave 2 webpages*. Retrieved May 17, 2012, from The Survey of Health, Ageing and Retirement in Europe (SHARE): http://www.share-project.org/home0.html

Appendix

A.1 Supplementary regressions and outputs

Figure A.1.1 – Stock Market Participation Rates by Country

This graph shows the variability in market participation rates among the countries represented in the sample

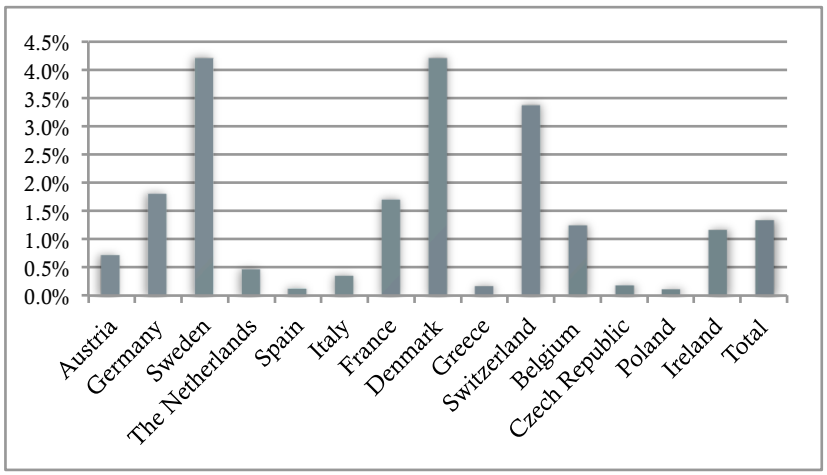


Figure A.1.2 – Average Behavioral Characteristics by Country and Gender

The graph below shows the average values of sociability, optimism, and risk aversion in each country by gender. Sociability is a measure of the number of distinct activities a person participated in over the last month. Optimism and risk aversion measures are based on a set of interview questions on personality.

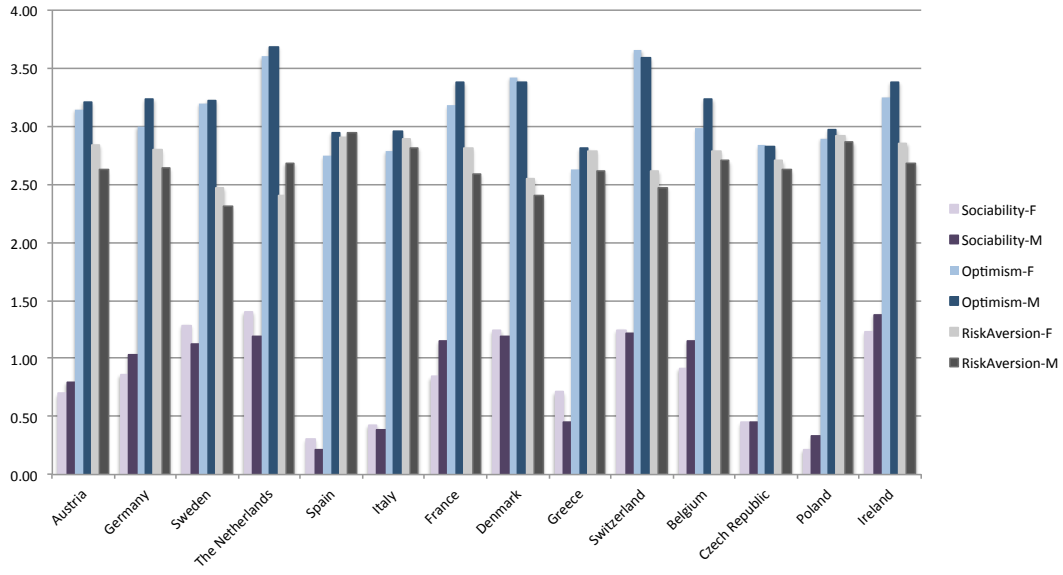


Figure A.1.3 – Average Demographics by Country and Gender

The graph below shows the average demographics in each country by gender.
Wealth is in 100,000s; Age is real age/10; Education is number of full-time education years

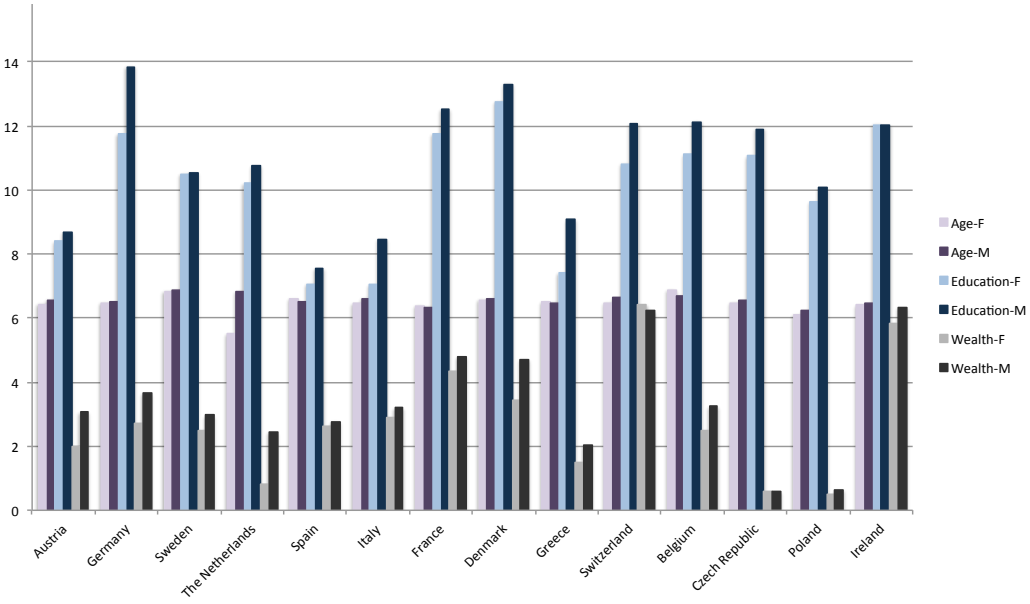


Figure A.1.4 – Regressions with control variable omissions

The specified columns one through six present the results of six probit models, in which the dependent variable is a dummy variable denoting 1 if the household has any money invested in stocks, and 0 otherwise. Sociability is valued from 0-4 denoting the number of distinct social activities an individual participated in over the last month (4 stands for four or more different activities, but not more than 7). Optimism is the average number achieved from the following questions: Do you feel the future looks good? And, do you feel full of opportunities?) The possible answers are never, rarely, sometimes, and often, which denote a person's optimism on a scale from 1-4, with 4 being the most optimistic. Male is a dummy variable, if the person is male it will be one otherwise zero. Age is the respondent's age divided by 10. Risk aversion ranges from 1-3, with two being the average level of risk aversion, and three above average. Education is the number of full-time education years. Wealth is total household net wealth, consisting of net financial and net real assets, in millions of Euros.

	Main Model	Excluding Education	Excluding Age	Excluding Male	Excluding Risk Aversion	Excluding Wealth
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
sociability	0.097**	0.111**	0.097**	0.096**	0.124**	0.095**
	(0.027)	(0.027)	(0.027)	(0.027)	(0.026)	(0.027)
optimism	0.109**	0.117**	0.108**	0.114**	0.125**	0.142**
	(0.045)	(0.044)	(0.045)	(0.045)	(0.043)	(0.044)
education	0.031**		0.031**	0.033**	0.038**	0.040**
	(0.008)		(0.008)	(0.008)	(0.008)	(0.008)
age	0.007	-0.016		0.013	-0.035	0.015
	(0.032)	(0.031)		(0.032)	(0.031)	(0.031)
male	0.156**	0.175**	0.157**		0.230**	0.162**
	(0.060)	(0.059)	(0.060)		(0.058)	(0.059)
risk-aversion	-0.555**	-0.567**	-0.554**	-0.567**		-0.588**
	(0.045)	(0.045)	(0.045)	(0.045)		(0.044)
wealth	0.432**	0.472**	0.433**	0.436**	0.510**	
	(0.066)	(0.065)	(0.066)	(0.066)	(0.066)	
constant	-0.633**	-0.104	-0.582**	-0.576*	-2.067**	-0.667**
	-0.323	-0.300	-0.228	-0.322	-0.296	-0.321
Diagnostics						
Pseudo-R^2	0.341	0.337	0.341	0.339	0.275	0.328
Wald Chi^2	852	834.83	848.70	846.77	751.20	819.22
Log Pseudolikelihood	-1165.942	-1173.496	-1165.964	-1169.325	-1282.644	-1190.047
Country dummies	Yes**	Yes**	Yes**	Yes**	Yes**	Yes**
Observations	4494	4494	4494	4494	4494	4494

*** Denotes significance at the 5% level, * denotes significance at the 10% level. Country dummies are not shown, but, according to the Wald test they are jointly significant at 5% .*

Figure A.1.5 – Ordered probit for risk-aversion determinants

The specified column one presents the coefficients from the ordered probit regression, where the dependent variable is risk-aversion with three possible outcomes: outcome 1 stands for below average risk aversion, outcome 2 is average risk aversion, and outcome 3 stands for above average level of risk aversion. Columns 2-4 represent the marginal effects in the change in probabilities of the specified outcomes in response to unit changes in the dependent variables. Sociability is valued from 0-4 denoting the number of distinct social activities an individual participated in over the last month (4 stands for four or more different activities, but not more than 7). Optimism is the average number achieved from the following questions: Do you feel the future looks good? And, do you feel full of opportunities?) The possible answers are never, rarely, sometimes, and often, which denote a person's optimism on a scale from 1-4, with 4 being the most optimistic. Male is a dummy variable, if the person is male it will be one otherwise zero. Age is the respondent's age divided by 10.. Education is the number of full-time education years. Wealth is total household net wealth, consisting of net financial and net real assets, in millions.

	regression coefficients	marginal effect: first outcome	marginal effect: second outcome	marginal effect: third outcome
	(1)	**(2)**	**(3)**	**(4)**
socia	-0.112**	0.009	0.023	-0.033
	(0.020)	(0.00)	(0.004)	(0.006)
optim	-0.146**	0.012	0.030	-0.042
	(0.032)	(0.003)	(0.007)	(0.009)
educ	-0.020**	0.002	0.004	-0.006
	(0.006)	(0.001)	(0.001)	(0.002)
age	0.162**	-0.013	-0.034	0.047
	(0.025)	(0.002)	(0.005)	(0.007)
male	-0.275**	0.023	0.057	-0.079
	(0.042)	(0.004)	(0.009)	(0.012)
wealth	-0.404**	0.007	0.084	-0.117
	(0.052)	(0.011)	(0.011)	(0.015)
cut 1	-1.171			
	(0.233)			
cut 2	-0.776			
	(0.233)			
Diagnostics				
Pseudo-R^2	0.104			
Wald Chi^2	547.08			
Log Pseudolikelihood	-2759.36			
Country dummies	yes**			
N	4494			
Probability of outcome		0.038	0.174	0.788

*** Denotes significance at the 5% level, * denotes significance at the 10% level. Country dummies are not shown, but, according to the Wald test they are jointly significant at 5% .*

A.2 Survey questions relating to behavioral variables

AS068_ RISK AVERSION
When people invest their savings they can choose between assets that give low return with little risk to lose money, for instance a bank account or a safe bond, or assets with a high return but also a higher risk of losing, for instance stocks and shares. Which of the statements on the card comes closest to the amount of financial risk that you are willing to take when you save or make investments?

5. Take substantial financial risks expecting to earn substantial returns
6. Take above average financial risks expecting to earn above average returns
7. Take average financial risks expecting to earn average returns
8. Not willing to take any financial risks

AC024_ [Do you feel] FULL OF OPPORTUNITIES
How often do you feel that life is full of opportunities?

1. Often
2. Sometimes
3. Rarely
4. Never

AC025_ [Do you feel the] FUTURE LOOKS GOOD
How often do you feel that the future looks good for you?

1. Often
2. Sometimes
3. Rarely
4. Never

AC002_ ACTIVITIES IN LAST MONTH
Have you done any of these activities in the last month?

1. Done voluntary or charity work
2. Cared for a sick or disabled adult
3. Provided help to friends or neighbors
4. Attended an educational or training course
5. Gone to a sport, social or other kind of club
6. Taken part in activities of a religious organization (church, synagogue, mosque etc.)
7. Taken part in a political or community-related organization
1. 96. None of these