Participation in Equity Markets and the Strength of Weak Ties

Koen Seebus and Roberto E. Wessels[1]

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ABSTRACT

The participation rate by individual investors in equity markets is low in many rich countries, a phenomenon that has significant welfare implications. In this paper we provide an explanation for this finding based on an individual's social capital, in particular, her social ties. To test this explanation we use data from the 2013 Survey of Health and Ageing and Retirement in Europe (SHARE).

We find that weak social ties, established for instance by performing volunteer work, are significantly associated with a higher propensity to invest in equities. Strong social ties on the other hand, for example established by providing care to family members do not appear to influence the investment decision. We find that other measures of social capital, which are not directly related to social interactions, for instance like trusting other people, political preferences or religious affiliation do not have a significant impact on the participation decision.

Finally, we find that none of our measures of social capital are significant determinants of investing in bonds. On the other hand,investing in equities, requires incremental information which apparently can be obtained from social capital accumulated through weak social ties.

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[1] Corresponding author, r.e.wessels@rug.nl, +31 503633691. The authors are with the Faculty of Economics and Business, University of Groningen, the Netherlands.

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1. Introduction

This paper provides an explanation why in many of the wealthiest countries in the world a large part of the population does not invest in the stock market. This so-called limited participation puzzle, is an important issue given that the welfare loss of not investing in the stock market can make a difference of 1.5 to 2% in total annual consumption [see Cocco, Gomes and Maenhout (2005)]. Related findings suggest that participants in the stock market accumulate significantly more wealth than non-participants though they also increase the risk of their portfolios [see Fama and French (2002)]. Differences in the degree of participation in the stock market can therefore be seen as a cause of differences in wealth across countries [see Guvenen (2006)].

On an aggregate level, an increase in participating in the stock market would also have important effects on the real economy [see Abel (2001) and Diamond and Geanakoplos (2003)], and since risk can then be spread across a wider population as the degree of paprticipation increases this can also help to solve the so-called equity premium puzzle [see Heaton and Lucas (1999), Attanasio, Banks and Tanner (2002) and Brav, Constantinides, and Gezcy (2002)].

Davis, Kubler and Willen (2006), argue that non-participants may feel that their wealth is insufficient to risk investments in equities, so that life-cycle considerations can perhaps explain the differences in equity ownership, but this explanation overlooks the fact that a large proportion – often relatively wealthy - of the population aged 50 years and older do not hold sequities.

We provide several tests of the hypothesis that “social capital” is a significant determinant of the decision to participate in the stock market using data obtained from the 2013 Survey of Health and Ageing and Retirement in Europe (SHARE), which is representative for individuals 50 years and older, across several European countries. This data is described in Section 3 and detailed information about the SHARE dataset is provided in Table A1 of the Appendix .

According to standard investment theory, economic agents take rational investment decisions in order to maximize their utility from wealth. However, according to Guiso and Japelli (2005) and Van Rooij, Alessie and Lusardi (2011), the average economic agent has only limited information about investment opportunities and is generally unaware of the equity market. However, economic agents can acquire information about the equity market from others, for example by word-of-mouth, while being part of a social network.

According to Durlauf and Fafchamps (2004) externalities from social networks, such as acquiring information, are often the result of shared trust between participants in social network. There is considerable support in the literature for this argument which suggests that many factors associated with social capital, like belonging to social networks and sharing trust and norms with others are important factors when taking investment decision, [see Guiso, Sapienza and Zingales (2004), Hong et al (2004), Christellis et al (2010), Georgakos and Pasini (2011) and Changwony et al (2015)].

In our paper we explore how social capital influences the decision to invest in the stock market by considering information that has been acquired from social ties. In particular, *weak* social ties could be an important determinant of the decision to participate in the stock market, since the cost of obtaining information through weak social ties is very low [see Granovetter (1973)].

In the literature on how social capital influences stock market participation by the diffusion of information through social networks, generally no distinction is made between strong or weak social ties [an exception is Changwony et al (2015)], perhaps because strong and weak ties can be formed contemporaneously making it difficult to disentangle to identify the origin of the information that lead to a decision to invest in the stock market.

However, making a distinction between how economic agents acquire social capital, i.e. through strong or weak social ties can help to shed light on why some policy measures to increase participation have significant results, while others do not.

In our statistical analyses we rely on seemingly unrelated probit regressions to measure the effect of social capital measures such as weak or strong ties on financial

market participation while controlling for income, cognitive abilities, risk tolerance, health and area of living. This approach allows us to use the potential correlations in the error terms across regressions as a result of omitted variables, as an aid in the estimation process.

Our empirical reults show that *weak* social ties such as being active in social groups in general, as well as the number of different social groups in w*h*ich an agent is active, are positively and significantly related to equity market participation. *Strong* social ties on the other hand, do not seem to increase the propensity to own equities significantly. Moreover, other measures of social capital (such as indicators for trust or norms) that are arguably not directly related to acquiring and disseminating information, have a small or statistically insignificant effect on the equity participation decision.

Not surprisingly, the effects of weak and strong social ties on the decision to invest in the bond market, which does not require much complex information, are much smaller or statistically insignificant. Our results indicate that the most significant mechanism through which social interaction has an effect on stock market participation is the sharing of information acquired through weak social ties.

While the data from the SHARE survey allows us to address the question of how the participation in the stock market decision depends on weak social ties, the process by which weak social ties are formed is not exogenous to the participation decision, since both are very likely being driven by common (unobserved) determinants as the indicators we use to measure social ties may also capture information about underlying personality traits associated with a propensity for risk-taking and thus investing in equity. 'Social' individuals -those who are likely to form many social ties- may therefore also possess characteristics that bear on the decision to participate in the stock market.

In Georgarakos and Pasini (2011), the authors argue that socially active individuals are more time-efficient, a personality trait that can be regarded as an indicator of (unobservable) ability. Including a measure of social activity in a regression as an explanatory variable for the decision to participate in the equity market will result in the ommitted measure of time efficiency being correlated with the residual of the regression, which will then lead to inconsistently estimated regression coefficients.

We conduct tests of the potential endogeneity of our social network measure 'Active in social groups' which indicate that we cannot reject the hypothesis that this measure is exogenous to the propensity to invest in equities. As a further check we also perform a sample split according to average stock holding across different countries. Social network measures should then show a progressively increasing effect as we move from low to high-participation countries. In a country where nobody participates, we should not expect to find an effect for sociability since there is no one who can provide information about investing in stocks. We find progressively increasing effects for social network measures in high-participation-countries with regards to investing in equities, but not for investing in bonds.

Finally, we also present evidence using exploratory factor analysis that the indicators of social network measures show high factor loadings, specific to a single factor with a Cronbach's alpha in excess of 0.70 indicating that our measures of weak (and strong) social ties are unique factors.

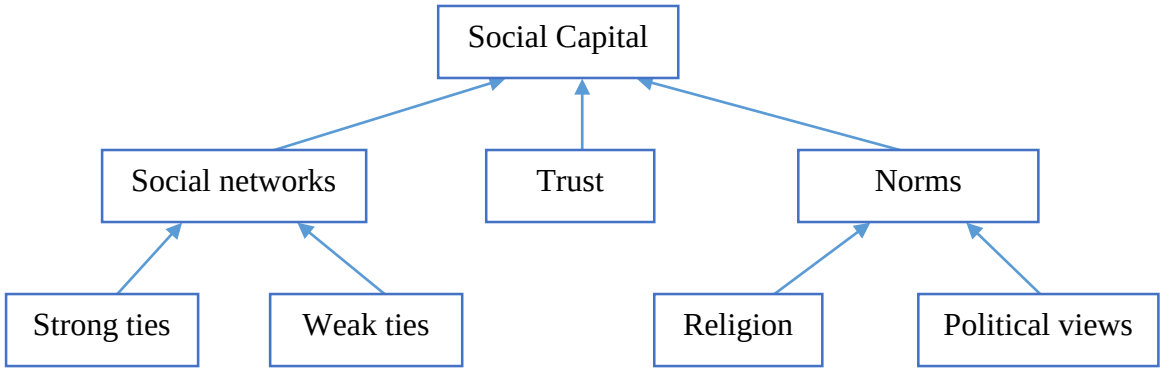
Our paper makes several contributions to the literature. First, we move beyond the single country setting, [see Changwony et al (2015)] who analyse the impact of social ties internationally thus allowing for a larger variety of cultural mores. Next, our evidence shows that strong and weak social ties are separate factors in the participation decision supporting the hypothesis that the participation decision is being driven by information constraints and supporting for the conjecture that information diffusion passes through two distinct channels, [see Granovetter (1973)].

The rest of paper is organized as follows. The next section provides a short review of the literature as well as introducing a simple framework showing how social capital influences stock market participation. Section 3 describes the data. Section 4 discusses the econometric specifications of our model and addresses the issues of identification. Section 5 presents the empirical results. Section 6 concludes and section 7 offers a discussion.

2. **Review of the literature**

The concept of social capital plays an important role in our explanation of participation in the equity market. Putnam (2001) defines social capital as a combination of social networks, i.e. connections among individuals and the norms of reciprocity and trustworthiness that arise from them. Following Putnam (2001) and Durlauf and Fafchamps (2004), we define social capital as the stock of (social) capital built over time as a result of social interactions. Figure 1 depicts a simplified version of how social capital is treated in this thesis.

***Figure 1**:* How social capital is built



Note: Following Putnam (2001) social capital is derived from social networks, trust and norms. Granovetter (1973) distinguishes between strong and weak ties as determinants of social networks. While norms can encompass many variables, we follow Changwony et al (2015) in focussing only on religion and political views.

Putnam (2001) argues that individual social capital is an important determinant of a range of economic decisions that individuals take. Guiso, Sapienza and Zingales (2004) find that in regions where social capital is high, people use more financial products, such as stock market investments and checking accounts, which they attribute to social capital helping to increase the trust in financial institutions. Changwony et al (2015) also find that social capital indicators, as defined by Putnam (2001) explain the variance of participation in equity markets.

We disaggregate social capital into three components: social networks, trust and norms, because they are likely to have different effects on stock market participation. Trust and norms are expected to operate through people's emotions, rather than through calculation. Social networks capture the extent of social interaction that people have through different channels such as family, friends, neighbors, sports or leisure groups, their community or religious organizations. Thus

they provide a channel through which information gets diffused amongst the participants of the network, which we expect increases their propensity to invest in equity.

2.1 Social networks and the role of information

Standard portfolio models often assume that investors maximize utility by taking rational and take fully-informed decisions. Ellison and Fudenberg (1995) argue that in reality, economic agents must often make decisions without knowing the costs or benefits from available options. The average individual lacks basic investment knowledge [see John Hancock Financial Services (2004); Van Rooij, Alessie and Lusardi (2011); Lusardi and Mitchell (2011)] or is not even aware of the opportunities offered by stock market, Guiso and Japelli (2005). When considering investments, however, agents could rely on information they have acquired from their social network, for example through word-of-mouth communication. Jackson (2006) also stresses the role of social interaction in the process of information acquisition and subsequent decisions and economic outcomes. Social interaction can therefore enable the sharing of information by reducing information costs and thus effectively lowering the threshold for participation in the stock market, Hong, Kubik and Stein (2004).

Since social networks affect the flow and quality of information, Granovetter (2005) and are also important for information gathering[1], Rogers (2010), information could be an important determinant of the decision to participate. The manner in which information is diffused also has implications for bondholding, since bond markets have higher levels of transparency. As investments in bonds are less information intensive, the effects of social networks on the propensity to own bonds should be accordingly smaller than the effects on equity investing[2] .

Empirical research supports this assertion. When individuals interact and are socially active, there is evidence they are more likely to participate in the equity market, Hong et al (2004); Georgarakos et al (2011) and Changwony et al (2015) as are those who have strong connections with neighbours, [see Ivkovic and Weisbenner (2007)]. Brown et al (2008) argue that a high degree of stock market participation

[1] We assume that persons do not engage in social activities in order to learn about the stock market.

[2] The focus of this thesis is on stock market participation, but we include bonds in the analysis to provide evidence that the limited participation puzzle is a problem of the equity market, and not a problem of investments in general.

with a community has strong influence on the decision of individuals in the same community to also participate.

Hong et al (2004) posit two possible channels through which social interaction influences stock market participation: observational learning and word-of-mouth information diffusion. First, social learning can provide individuals with information, lowering the information costs. Individuals may for example learn about practicalities such as how to execute trades, but may also share investment ideas. In Brown et al (2008) and in Hong et al (2004), the effect of social interaction is stronger in areas that start with a higher participation rate, implying a mechanism of social learning through word-of-mouth. Second, investors can also convince each other to invest, pointing to past returns and success stories through word of mouth. The fact that others have made a lot of money appears to many people to be a very persuasive argument, [see Shiller (2005)]. Kaustia and Knüpfer (2012) also show that the stock market performance of peer also affects stock market participation.

The strength of social ties is an important concept in social network analysis. In his influential theory of social networks, Granovetter (1973) defines tie strength of social ties as "a combination of the amount of time, the emotional intensity, the intimacy and reciprocal services which characterize the tie" and describes two forms: strong ties and weak ties. Weak ties include acquaintances in formal and informal organizations where strong ties include family, friends, and close associates. New information or ideas especially flow through weak ties, because they have fewer overlap with our existing social ties and subsequent existing ideas, Granovetter (1983) and Changwony et al (2015) also find that weak ties are important in the decision to participate in the equity market.

Recent empirical evidence confirms this. For example, Bakshy, Rosenn, Marlow, and Adamic (2012) show that in social media such as Facebook, weak ties expose "friends" to information they would not have otherwise shared. The authors conclude that although stronger ties may have a larger impact, the much more abundant weak ties are mainly responsible for the diffusion of new information.

The data from the SHARE survey allows us to also examine the effect of the other two determinants of social capital: Trust and Norms (see Figure 1), with norms subdivided into those derived from religion and those derived from political beliefs. Trust as a personality trait makes it more likely for a person to invest in stocks (Guiso,

Sapienza and Zingales (2004) and (2008). In geographical regions where a high levels of general trust is prevalent, people more often conclude informal agreements rather than writing contracts; they have fewer legal disputes and perceive institutions as more credible, all of which are important in the participation decision. Trusting individuals are indeed more inclined to trust the stock market, [see Guiso et al (2004) and (2008)].

Georgakas and Pasini (2011) combine measures of social interaction and trust to confirm earlier findings of the positive relation between social interaction, trust and participation rates. The authors also report results on the interplay of sociability and trust that show that social interaction can partly cancel low levels of trust and thus partly overcome the barriers to stockholding induced by low trust.

Changwony et al (2015) consider trust to also be a measure of social capital since trust and sociability are difficult to distinguish empirically. Trust is especially important in determining an individual's strong and weak ties (Levin, Cross and Abrams (2004). Trusting individuals may be more inclined to start new social connections or be more active socially. Additionally, 'level of trust' is positively associated with religiosity, making it hard to determine causality of sociability or trust, [see Guiso et al (2004) and Christellis et al (2010)]. We therefore include trust in our analysis when examining social interaction and stock market participation. In contrast to Georgarakos and Pasini (2011), who use average levels of trust from the World Values Survey, we have data on trust levels for each individual respondent, which allows us to test whether individuals are more likely to participate in the stock market.

According to Bonaparte and Kumar (2013) forming part of a political organization increases a person's propensity to participate in the equity market, because as an investor she faces lower costs of gathering information. These individuals are more exposed to financial news and are found to be 9-25% more likely to participate in the capital market, which underscores the importance of social interaction. However, previous literature suggests that political preference itself influences the investment decisions of investors: right-wing oriented individuals are more likely to participate in the equity market than left-wing oriented individuals. Kaustia and Torstila, (2011) note that this may have to do with the negative perceptions people have about the stock market, even though equities outperforms all

other asset classes in the long run. The authors use the term “stock market aversion”, to denote additional cognitive participation costs due to the negative perception that left-wing oriented individuals have of how markets work, especially capital markets.

After controlling for reverse causality issues, the results of Kaustia and Torstila, (2011) indicate that holding left-wing views are associated with a lower probability of holding risky assets. At the same time, their results show that when individuals feel strongly that market forces benefit society, a view generally taken by individuals with right-wing political orientations, they are more likely to own stocks or bonds.

Religion can directly affect stock market participation by individuals that share the same religious beliefs and attitudes. Religion can also affect the decision to invest in the equity market indirectly through underlying characteristics such as trust, risk aversion, planning horizons or social interaction in churches. For example, Hong et al (2004) find that church attendance and participation in the stock market are positively associated, but it’s not clear whether it is religion that is driving participation rates or that other mechanisms are at play. Renneboog and Spaenjers (2012) find that religious households have longer planning horizons and are more trusting. Religious households also put greater emphasis on thrift i.e. being frugal or careful with money, [see Guiso, Sapienza and Zingales (2003); Guiso et al (2003) and Renneboog and Spaenjers (2012)]. Guiso et al (2003) also find that religiosity is a term used to denote the numerous aspects of religious activities, which is associated with trust, mainly induced by the social interaction of attending regular religious services. Religiosity is also positively associated with risk aversion, which might be driven by the social aspects of church membership, [see Noussair, Trautmann, Van de Kuilen and Vellekoop (2013)]. However, more recent research by Changwony et al (2015) finds insignificant results for the impact of religiosity on stock market participation, which leads to the following hypothesis. With our data we can test whether religious individuals have a below average propensity towards participating in the stock market.

3. Description of the data

Our data is taken from the 2013 Survey of Health and Ageing and Retirement in Europe (SHARE). SHARE is a multidisciplinary, cross-national survey. It mostly surveys a representative sample of the population aged 50 years and older about social and economic issues. The survey took place in several European countries, namely Austria (AT), Belgium (BE), Switzerland (CH), Germany (DE), Denmark (DK), Spain (ES), France (FR), Italy (IT), Luxembourg (LU), the Netherlands (NL), Sweden (SE), Israel, (IL), Czech (CZ), Estonia (EE), and Slovenia (SI). The survey contains data on measures of social capital and also has responses to questions about investments in equities, bonds, mutual funds, life insurance, contractual savings or individual retirement accounts.

With this data we can perform analyses that were not possible with earlier versions of the survey. First, we can examine the effect of trust levels obtained directly from the respondents themselves instead of using indirect measures based on regional averages. Second, we have data on the frequency of particular social activities undertaken by respondents over the previous year. Prior literature was forced to consider only a binary choice at social activities i.e. whether the respondent had engaged in social activities or not. The (self-reported) frequency that respondents undertake social activities provides an enrichment of the data. In addition, the results of the SHARE survey allow us to analyse the impact of social ties in a heterogeneous, international setting and to contrast those results with those of Changwony et al (2015) whose results are based on respondents from the UK, a more homogeneous group than the multi-country SHARE survey. Unfortunately, SHARE surveys only the population of 50 years[3] and older and relatively unique in the sense that there is no historical sequence.

The results of the analyses are conditional on the particular circumstances that were prevalent when the survey was held. This is a drawback especially given that peer performance affects stock market participation. Thus how much participation results from social contacts depends in part on the way the equity markets performed in the period before the survey was held, [see Kaustia and Knüpfer, (2012)]. Summary statistics are provided in the Table 1. In Table A1 of the Appendix we provide more detail on how each variable has been constructed.

[3] In rare occasions, a family member is interviewed in the presence of their parents. More than 99% of the respondents are 50 years and older.

Table 1: Summary statistics for individuals 50 years and older

Variable	Obs	Mean	Std. Dev.	Min	Max
Direct stock market participation	43,325	.120	.325	0	1
Total stock market participation	42,868	.349	.476	0	1
Bond market participation	43,264	.053	.224	0	1
Active in social groups (ASG)	63,887	.572	.4947	0	1
Number of different social groups (DSG)	63,887	.977	1.087	0	5
Frequency of going to social groups (FSG)	45,805	3.440	2.788	0	21
Providing help to family or friends (HELP)	44,529	.289	.453	0	1
Trust in people, in general (TMP)	63,169	5.920	2.353	0	10
Right or left wing in politics (RLW)	55,844	5.019	2.264	0	10
Frequency of praying (PRAY)	63,639	2.5541	1.829	1	6
Risk tolerance	62,756	1.30	.575	1	4
Meet ends financially	43,190	2.946	.990	1	4
Self-perceived health	65,099	2.861	1.089	1	5
Income (log)	35,150	7.584	1.186	-3.259	13.688
Verbal ability	63,070	2.057	7.724	0	100
Memory indicator	64,103	3.031	.949	1	5
Numerical ability	22,848	3.403	1.113	1	5
Years of education	23,240	1.149	4.360	0	25
Area of living	42,176	2.528	1.403	1	5
Perceived future outlook	62,760	3.085	.911	1	4
Sadness	64,068	.3944	.488	0	1
Loneliness	63,906	1.289	.568	1	3
Gender	67,410	1.557	.496	1	2
Marital status	25,493	.724	.447	0	1
Has children	65,281	.921	.269	0	1
Unemployment	65,281	.029	.167	0	1
Retired	65,281	.553	.497	0	1
Age	65,265	66.677	1.033	22	104
Health limits activities, answered by spouse	41,127	1.394	2.220	0	10

4. The model

This section discusses how we model the probability of direct stock market participation, total stock market participation and bond market participation as a function social capital indicators (in capitals: ASG, DSG, FSG, HELP, TMP, RLW, PRAY) of a broad set of individual characteristics. The social capital indicators are divided into social networks (i.e. weak and strong ties) and other 'social capital' respectively, because we believe these indicators to have distinct effects on stock market participation. In line with previous literature that use the same data set [see Christellis et al (2010) and Georgarakos (2011)], we use probit regressions[4] and estimate general static binary response models for equations (1) – (3) as seemingly unrelated regressions. Country dummies are used to capture unobserved country specific effects.

Social networks

Weak ties Stronger ties Other social capital

$$(1)\ SMP1_i = \beta_1 ASG_i + \beta_2 DSG_i + \beta_3 FSG_i + \beta_4 HELP_i + \beta_5 TMP_i + \beta_6 RLW_i + \beta_7 PRAY_i + \theta CONTROLS_i + \mu_i + \varepsilon_i$$

$$(2)\ SMP2_i = \phi_1 ASG_i + \phi_2 DSG_i + \phi_3 FSG_i + \phi_4 HELP_i + \phi_5 TMP_i + \phi_6 RLW_i + \phi_7 PRAY_i + \varphi CONTROLS_i + \upsilon_i + \partial_i$$

$$(3)\ BMP_i = \lambda_1 ASG_i + \lambda_2 DSG_i + \lambda_3 FSG_i + \lambda_4 HELP_i + \lambda_5 TMP_i + \lambda_6 RLW_i + \lambda_7 PRAY_i + \psi CONTROLS_i + \omega_i + \kappa_i$$

where $SMP1_i$ is a dichotomous variable for direct stock market participation for individual i.; $SMP2_i$ is a dichotomous variable for total stock market participation for individual i.; and BMP_i is a dichotomous variable for bond market participation for individual i.; $\mu_i, \upsilon_i, \omega_i$ are unobserved country specific effects; $\varepsilon_i, \partial_i, \kappa_i$ represent the error terms.

[4] To test the goodness of fit a Hosmer-Lemeshow test is performed with groups approximately equal to 10% of N (in the case of specification 1, number of groups = 2000). Specification 1 shows a proper fit (p-value = 0.3303). Tests for the other specifications (12 in total) do not provide evidence that probit models should not be used. For completeness we also estimate our models with logit regressions, leading to qualitatively similar results. Marginal effects vary only slightly, but the variables show similar significance levels.

We adopt two definitions for the dependent variable. Direct stock market participation (SMP1) is defined as a dichotomous variable for stocks held directly, taking a value of 1 if the individual holds stocks. Total stock market participation (SMP2) takes on a broader definition. SMP2 is also a dichotomous variable, now taking the value of 1 if stocks are either held directly, stocks are held through mutual funds or through investment accounts (individual retirement accounts). SMP2 is formed under the assumption that mutual funds and investment accounts hold some stocks in them. SMP2 is used to check on robustness. We also use direct bond market participation (BMP), which is similar to SMP1, but takes a value of 1 when the person owns bonds directly. We use bond market participation to provide further evidence that information drives the relation between social networks and stock market participation.

According to Durlauf and Fafchamps (2004) there is no consensus on what the best metrics for social capital are. However, in his Social Capital Index, Putnam (2001) divides social capital into (i) community organizational life; (ii) engagement in public affairs; (iii) community voluntarism; (iv) informal sociability and (v) social trust. SHARE does not allow us to replicate this scheme, but we can examine all of these dimensions in data, namely by looking at active in social groups (community organizational life and engagement in public affairs); political views (engagement in public affairs); done voluntary of charity work (community voluntarism); helping family, friends and neighbors (community voluntarism and informal sociability); and trust in other people (social trust).

This model[5] also allows us to test the effect of weak and strong ties and also allows me to differentiate between social network variables and social capital variables that do not directly reflect interaction (other social capital). The variables of interest in these equations are (1) active in social groups (ASG), (2) the number of different social groups the respondent participates in (DSG), (3) the frequency of going to these specific social groups (FSG), (4) providing help to family outside the

[5] We analyse on an individual level, since questions on social activities are also asked on this level. We choose not to standardize the variables, because the shapes of the variables' distributions do not necessarily resemble one another across all questions. Missing values are treated with available case analysis, which can lead to inconsistency among different subsets in the data. We do not try methods of data imputation, because the majority of these methods can introduce large amounts of bias. Note too that the estimated coefficients from binary choice models are not directly interpretable, hence, we calculate and report marginal effects at the mean of the sample.

household, friends, neighbors (HELP), (5) trusting most people (TMP), (6) right or left-wing political views (RLW) and (7) the extent of religiosity (PRAY). Both ASG and DSG are proxies for weak ties. FSG is unclassified as strong or weak tie. However, higher values indicate stronger ties than lower values. HELP is a proxy for a strong tie. The control variables are risk tolerance, financial situation, self-perceived health, household income, verbal ability, self-rated memory, area of living, perception of the future, feelings of sadness, loneliness, dummies for gender, children, unemployment, retirement and age. See also Table A1 in the appendix for details of the questions asked.

4.1 Social networks

Our main focus is on social network interaction and the distinction between strong and weak ties. We make an important distinction between strong and weak social ties, because we assume them to diffuse different types of information. Tie strength characterizes the closeness of a relationship between two parties, in this case a knowledge seeker and knowledge source, and is usually operationalized as a combination of closeness[6] and interaction frequency, [see Granovetter (1973); Hansen (1999); Marsden and Campbell (1984) and (2012)]. Strong ties are connections between people such as friends. On the other hand, a weak tie is a connection between people who feel a looser connection such as for example, acquaintances. *Weaker* ties will often transmit more new information relative to *stronger* ties (Granovetter, 1983).

According to our information diffusion narrative *weaker* ties should then have a bigger impact on stock market participation than *stronger* ones. Problems arise when defining the exact point at which to label a tie strong or weak. There is an on-going discussion how to label ties as strong or weak. We differentiate merely between *stronger* and *weaker* ties. At what point to properly label a tie as strong or weak is beyond the scope and purpose of this research. The purpose of this research is not to address the issue of defining strong or weak ties, but rather to examine in which way social capital affects stock market participation. Social ties can be viewed as measures of interactions with reliable and potentially informative acquaintances.

The simplest way to distinguish strong and weak ties, is to assume that close friends have strong ties and acquaintances or distant friends have weak ties, [see

[6] Although measured also in terms of closeness, tie strength is not to be confused with social distance. Social distance captures the distance between different groups in society, not individuals and their relationships.

Granovetter (1974); Murray et al (1981) and Wilson (1998)], and to then assume that family, friends and neighbours represent *stronger* ties than people met at a sports club or at an vocational training. We therefore assume that the indicator for strong ties covers close relatives such as friends, family or neighbours, whereas the indicators for weak ties cover general social activities and the people met there.

We measure weak ties in two different ways. First, we measure the presence of weak ties by the answers provided by respondents to the question whether they have engaged in any social activities (excluding family, friends or neighbors) in the last 12 months (ASG). The answer takes the value of 1 if the respondent undertook at least one of these activities over the last 12 months. We consider this a *weaker* social tie than helping family or friends. Second, we take the number of different social activities undertaken by the respondent (variable DSG) as a proxy for the number of weak ties. A higher number of different social activities should reflect a higher probability of acquiring novel information and thus participating in the stock market.

To measure strong ties involving family, friends and neighbours we create a binary variable indicating whether the respondent provides help to family, friends or neighbors (variable HELP), which is an indicator proxy for a strong tie. It takes the value of 1 if a respondent provided help to at least one member of the groups over the last 12 months. Providing help or asking for help may actually be a very good indicator for the strength of the tie, according to Friedkin (1990). He finds that a strong friendship implies the seeking of help and having frequent discussion.

Finally, the social network literature suggests that frequency of contact is an indicator of the strength of ties, [see Marsden and Campbell (1984) and (2012)]. The 2013 wave of the SHARE survey also reports on the frequency with which respondents take part in these social activities. We therefore also use the answer to the question: "How often has the respondent done: voluntary or charity work; educational or training course; a sport, social, or other kind of club; activities organized by a political or community?". As lower frequencies represent *weaker* ties and higher values represent *stronger* ties, we expect that a busy social life does not necessarily increase the probability of obtaining new information.

4.2 Other measures of social capital

In addition to social networks, we examine the dimensions of trust, political views and religion of social capital. Individuals who have higher levels of general trust will be more likely to 'trust' the stock market or take information they receive about investing at face value and thus more likely to participate. The most famous example of a trust constructed in terms of social capital is based on the World Values Survey. Respondents are asked: ''generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?'' 1. Most people can be trusted 0. Can't be too careful.

The SHARE survey poses a similar question with the answer recorded on a Likert scale which can take a value from 1 to 10, (10 being the most trusting), indicating whether the respondent feels that other people can be trusted in general or that one can never be too careful. There is an important problem with this question. As Glaeser et al (1999) show, the answer to this type of question is correlated with the degree of the trustworthiness of the respondent and not necessarily with his or her level of trust.

Forming part of a political group also affects decision whether to invest in the equity market, [see Bonaparte and Kumar (2013); Kaustia and Torstila (2011)]. Thus individuals who identify with political parties may be more likely to receive information through related social activities. This is captured in previous questions on activities (ASG, DSG and FSG). Apart from these activities, when political beliefs align with views that market forces benefit society, individuals may have higher propensity towards owning financial assets. Therefore, right wing minded people might on average be more invested in capital markets. Political preferences are measured with the question: "In politics people sometimes talk of left and right. On a scale from 0 to 10, where 0 means the left and 10 means the right, where would you place yourself?" Higher values should thus indicate a higher tendency to own stocks, since literature suggests that right wing individuals are more inclined to participate in the equity market.

Finally, religion seems to be positively related to stock market participation, partly through social aspects such as church activities (Changwony et al (2015), but such activities are already captured by previous questions on activities (ASG, DSG

and FSG). To capture norms in the form of religion, a proxy "frequency of praying" is used. Respondents answer: 6. more than once a day, 5. once daily, 4. a couple of times a week, 3. once a week, 2. less than once a week or 1. never, to the question: "Thinking about the present, how often do you pray?".

4.3 Control variables

We control for risk tolerance, financial situation, self-perceived health, household income, verbal ability, self-rated memory, area of living, perception of the future, feelings of sadness, loneliness, gender, children, unemployment, retirement and age.

Participation in the stock market is determined by a few basic indicators, which are well known. First, participation is strongly increasing in wealth, [see Vissing-Jorgensen (2002) and Campbell (2006)], and personal characteristics such as risk tolerance, [see Dimmock and Kouwenberg (2010)], hence, research in stock market participation should control for factors such as wealth or income, and for personal characteristics such as risk tolerance. Financial risk tolerance is answered directly in the SHARE questionnaire. We include 'meet ends financially' to capture financial distress and total household income during the last month.[7]

Moreover, participation in stock markets depends on intellectual and cognitive capability, [see Christelis, Jappelli, and Padula (2010) and Grinblatt, Keloharju and Linnainmaa (2011)]; education, [see Bayer, Bernheim and Scholz (2009)] and financial literacy, [see Van Rooij, Alessie and Lusardi (2011)]. One interpretation for these findings is that higher education or abilities make it easier for prospective investors to understand the market's risk-rewards trade-offs. In other words, these would-be investors experience lower information costs. Therefore, we also include measures to try and capture the effects of such latent variables. Persons with high ability are able to understand the market faster and process information easier. Cognitive abilities are measured using methods similar to those of Christellis et al

[7] Unfortunately we do not have unequivocal data on individual or household's total wealth, since different types of assets are considered in separate questions, on aggregate resulting in many missing observations. We use only data of respondents who do not show missing values. Previous studies "solved" this problem using multiple imputations methods. We choose not to do this, because the solutions are sensitive to the method of imputation and the results often biased. However, a high degree of correlation exists between wealth and income at microeconomic level for both rich and poor households in OECD countries (Durand and Murtin, 2015).

(2010) in two domains: fluency and memory (to check on robustness of our results numerical ability is included only in the appendix).[8] Fluency is the ability to speak smoothly, but also to think fast simultaneously. Fluency can be an important determinant in financial decisions since it affects the ability to read and understand written texts such as newspapers. Memory is the mental capacity of recalling facts, events, impressions or previous experiences. Memory is a self-rated indicator. Memory is a very important ability for comparing facts and situations through time. Memory can thus play an important role in forming individual financial decisions, [see Christellis et al (2010)].

In addition, social networks may partly reflect the influence of other personal traits. For example, optimistic people may have higher expectations for returns in these markets and are therefore more likely to participate. We try to control for optimism using two questions: "How often do you feel that the future looks good for you? and "In the last month, have you been sad or depressed?". (Often, sometimes, rarely or never?)". The last question is an arbitrary one, but is used in prior literature to proxy optimism and overconfidence (or excess optimism).

To control for health, we use data on respondent's own health perception where the respondents are asked to rate their own health. A large literature documents the validity of self-reported health measures, [see Idler and Benyamini (1997)]. Perceptions can be more relevant than actual health data, because people probably base financial decisions on a perception of risk, not the actual presence of this risk, which is very difficult for individuals to objectively assess. Rosen and Wu (2004) also use this measure and find that low self-reported health status is associated with a smaller share in risky assets and larger share in safe assets. According to the authors, health problems discourage people from investing in equities, after controlling for risk preferences, bequest motives, planning horizons, and health insurance, but they fail to

[8] As a check on the robustness of the results , we include numeracy as a control variable in regressions shown in the appendix Table A5 , however this greatly reduces the sample size. As expected, it shows highly significant results, but the overall results are qualitatively unchanged. None of the explanatory variables are significantly affected by the inclusion of numeracy. Numeracy is the ability to perform basic numerical operations and is measured by four questions in SHARE: (1) find 10 percent of a number; (2) find one half of a number; (3) find the number of which another known number represents two-thirds; (4) find the number which increases 10 percent for 2 consecutive years. Christellis et al (2010) measure numeracy on a five-point Likert scale.

mention a channel through which this effect could operates. Given their significant results we nevertheless include controls for it in our specification.

The area of living might have an effect on activities undertaken. In some areas it may simply be easier to be socially active than in other ones. In order to control for these effects, we include an ordinal variable *"area of living"*, which takes the value of 1 if the respondent lives in a big city, whereas it takes the value of 5 for a rural area or village. Living in a big city may be easier for social contacts. Lastly, we control for gender, children (aiming to capture possible bequest motives), unemployment (in order to account for possible effects of public pensions on stock market participation, also partly captured by country dummies), retirement, age, marital status and education[9]. To address possible omitted variables that vary across countries we include country dummies.

4.4 Validity and endogeneity: sample split, exploratory factor analysis and instrumental variable approach.

The social network measures that we apply are exogenous to stock market participation as long as we assume that a stockholder does not engage socially with the goal to acquire information about the stock market. Given the type of measures we apply (giving help to close ones, participating in sport, social or political clubs, engaging in training courses or voluntary work, and going to church), this seems a reasonable assumption. To address endogeneity and validity we perform several operations.

First, we explore if the impact of social interaction is higher in countries with higher stock market participation with a sample split. In regions where participation rates are high there is a higher probability of socializing with someone who can provide information on stock markets. If social networks are to directly affect a household's decision to invest in stocks, the effect should be higher in regions where participation rates are already high. Contrarily, in a region where absolutely nobody invests in stocks, there should be no effect for social networks. In other words, if networks mostly reflect the influence of other personal traits, there is no reason to

9 Again, inclusion of marital status and education results in major data loss. In regressions shown in the appendix these variables are included and do not alter the overall qualitative outcomes.

expect a different effect of the social capital measures across countries with different participation rates.

Second, we examine the validity of our social capital measures and perform exploratory factor analysis (EFA). Regardless of a sample split, social capital measures may partly capture unobservable personality traits or some form of unmeasured ability that is beneficial socially as well as financially. For example, people with high financial literacy levels may also show high ability in general, such as the ability to socialize effectively and create bigger networks. Financial literacy is found to correlate strongly with education, income and age (Lusardi and Mitchell, 2011). EFA can be used to show the strength of the relationship between factors and each observed measure and subsequently make statements about underlying factors that are responsible for a set of observed responses. Results for EFA are shown the Appendix, A4a. To check for robustness we also include numerical abilities, education and marital status in Appendix A4b, but note that due to missing variables the is a loss of observations when we include these variables.

Important results emerge from this analysis. The results of the exploratory factor analysis shown in Tables A4a and A4b indicate that our social network measures Active in Social Groups (ASG), number of Different Social Groups (DSG), and the Frequency of meeting these specific Social Groups (FSG) have clear and distinct factor loadings on factor 2 with loadings of 0.5497, 0.9303 and 0.9333, respectively.[10] These indicators therefore seem distinct from our other measures of social capital that are not directly related to social interaction: trust, political views and religiosity. This is important to note since social interaction and trust are difficult to distinguish empirically. Moreover, it reinforces the idea that our measures of social networks and generalized trust are measuring different concepts. Since no other variable loads significantly onto factor 2, these items are likely to adequately capture social interaction in networks and not something else. HELP does not load onto factor 2, which provides evidence that our distinction between strong and weak ties is a reasonable one. Cronbach's alpha is above the threshold of 0.70, indicating that the items are reliable and consistent.

[10] These three items loaded onto factor 2 have an average inter-item covariance of 1.143493. Cronbach's alpha equals 0.7053 (>0.70), suggesting high reliability and internal consistency among the items.

The results also indicate that measures of cognitive ability, trust and income load on factor 1. However, compared to factor 2, the loadings on factor 1 are smaller and have a lower Cronbach's alpha ($\alpha = 0.5942$).[11] In addition, the variables loading on factor 1 are heterogenous and it is thus less clear what the underlying factor is that is causing them. These results are confirmed in Table A4b Therefore, if sociability is partly reflecting an unobservable personality trait, it is not probable to be some kind of ability, because factor 1 incorporates many variables that previous research finds to be correlated with abilities, [see Mitchell and Lusardi (2011) and Vernon (2014)]. Heckman, Stixrud and Urzua (2006) also show that correlations of test scores within several cognitive tests and non-cognitive tests are much stronger than across cognitive and non-cognitive tests. The effect of cognitive tests is different from non-cognitive tests for a range of economic outcomes. Our results from factor analyses support this and show that there is a difference between social items and cognitive items.

We also use the instrumental variable approach of Rivers and Vuong (1988) to test for endogeneity. As an instrument we choose a variable that indicates health problems in the respondent's partner, hereby limiting the sample to married couples only. As already noted, the SHARE survey interviews people of 50 years and older, many of whom are married, and it contains a multitude of health questions broadly defined. One of the questions, *Health Spouse*s indicates whether the respondent's spouse is impaired as to walking, climbing flights of stairs or picking up objects. This variable represents health problems exogenous to the respondent but which is likely to negatively affect his or her social activities given the time that the respondent must devote to helping their spouse. Indeed, we find a negative correlation between the number of limitations in daily activity of one's spouse and the social network measures. We assume a partner's health problems are not related to the other person's stock market participation decision or to the residual of the regression. However, health problems can entail costs that affect the entire household and its ability to invest in equity markets. We therefore control for financial distress (meet ends financially) and household income.

As previously mentioned, it is likely that participation in social networks reflects, at least in part, unobserved characteristics such as abilities. However, the

[11] These items loaded onto factor 1 have an average interitem covariance of .1803192. Cronbach's alpha equals 0.5942 (<0.70), suggesting moderate forms reliability and internal consistency among the items.

probability that the omitted abilities are causing the partner's health problems seems far-fetched, especially given the negative correlation between the instrument and social networks.

We follow Georgarakos and Pasini (2011)[12] in their method for the instrumental variable approach who use the two-step standard for binary choice models developed by Rivers and Vuong (1988). We use only the variable "Active in social groups" (ASG) in our analysis, because this is our most important social network measure.

Our procedure is as follows. In the first stage, we estimate an OLS regression of the potentially endogenous covariate Active in Social Groups (ASG) on the relevant instrument (i.e. Health Spouse) and the same independent variables as used in our baseline model. The F-test provides a test for instrument validity. We then estimate a baseline probit model and add the residuals obtained in the first stage as explanatory variable. Since this probit model encompasses a regression generated variable, standard errors are estimated from a parametric bootstrap with 300 replications as in Georgarakos and Pasini (2011).

5. Model estimates

We model the probability of direct stock market participation, total stock market participation and bond market participation as a function of a broad set of individual characteristics and social capital indicators. Table 2a shows average marginal effects and their standard errors from probit regressions. Specifications 1. through 4. present the marginal effects on direct stock market participation, meaning the probability of owning stocks directly. As a check on robustness, we include mutual funds and retirement accounts in our definition of total stock market participation in specification 5.

Specification 6 shows the effect of these variables on bond market participation. The prior literature does not distinguish between strong and weak ties.

[12] Georgarakos and Pasini (2011) use the frequency of contact with grandchildren as instrument for a binary sociability variable with similar reasoning as in this thesis, i.e. grandparents that take care of grandchildren have less time for social activities. Strange enough, we do not find a negative, but a positive correlation for taking care of grandchildren and social activities. The positive correlation disqualifies it as an instrument, because it could mean that such persons are more time efficient or posses another ability not currently captured in our model.

Our results indicate that weaker ties are more important in participation decisions than stronger ties. Our main results in Table 2a show positive and significant marginal effects for proxies for weak ties (ASG and DSG) in the process of stock market participation. The results suggest that it is more important *if* a person interacts socially and whether this occurs in different groups than *how often* a person interacts socially.

Table 2a: Baseline model

The table reports marginal effects (at means) from probit regressions for individuals. The sample covers the Survey of Health and Ageing and Retirement in Europe (SHARE) conducted in 2013. Unreported country dummies are used to capture unobserved country specific effects. The dependent variables are indicators whether the individual owns stocks (SMP1), stocks and funds such as retirement accounts (SMP2) or bonds (BMP) respectively. The independent variables are: social interaction indicators - either 'active in social groups' (ASG), the amount of different social groups (DSG), 'the frequency participating in these social groups' (FSG) or 'helping close ones' (HELP) - trust in people (TMP), right or left wing in politics (RLW), the frequency of praying (PRAY), risk tolerance, financial situation, self-perceived health, household income, verbal ability, self-rated memory, area of living, perception of the future, feelings of sadness, loneliness, dummies for gender, children, unemployment, retirement and age. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

	SMP1				SMP2	BMP
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
ASG	0.0502***	0.0515***	0.0494***	0.0502***	0.0990***	0.0137***
	(0.0104)	(0.0115)	(0.0107)	(0.0104)	(0.0163)	(0.00526)
DSG	0.0218***	0.0219***	0.0217***	-	0.0575***	0.00570**
	(0.00429)	(0.00429)	(0.00430)	(omitted)	(0.00876)	(0.00251)
FSG	-0.00268*	-0.00269*	-0.00843	-0.00268*	-0.00703**	0.000459
	(0.00158)	(0.00158)	(0.0154)	(0.00158)	(0.00314)	(0.000913)
HELP	0.0103**	0.0162	0.0103**	0.0103**	0.0526***	0.000171
	(0.00445)	(0.0229)	(0.00445)	(0.00445)	(0.00863)	(0.00259)
ASG*HELP		-0.00611				
		(0.0233)				
ASG*FSG			0.00581			
			(0.0155)			
ASG*DSG				0.0218***		
				(0.00429)		
TMP	0.000617	0.000620	0.000611	0.000617	0.00758***	0.000433
	(0.00104)	(0.00104)	(0.00104)	(0.00104)	(0.00191)	(0.000581)
RLW	0.00497***	0.00497***	0.00497***	0.00497***	0.0108***	0.00120**
	(0.000970)	(0.000970)	(0.000970)	(0.000970)	(0.00184)	(0.000555)
PRAY	-0.00371***	-0.00371***	-0.00368***	-0.00371***	-0.0116***	-0.000372
	(0.00132)	(0.00132)	(0.00133)	(0.00132)	(0.00247)	(0.000739)
Risk tolerance	0.0841***	0.0841***	0.0841***	0.0841***	0.186***	0.0173***
	(0.00338)	(0.00338)	(0.00338)	(0.00338)	(0.00707)	(0.00194)
Meet ends financially	0.0426***	0.0426***	0.0426***	0.0426***	0.111***	0.0194***
	(0.00284)	(0.00284)	(0.00284)	(0.00284)	(0.00504)	(0.00170)
Self-perceived health	0.00875***	0.00875***	0.00876***	0.00875***	0.0228***	0.00244*
	(0.00233)	(0.00233)	(0.00233)	(0.00233)	(0.00446)	(0.00134)
Income (log)	0.0111***	0.0111***	0.0111***	0.0111***	0.0296***	0.00508***
	(0.00222)	(0.00222)	(0.00222)	(0.00222)	(0.00413)	(0.00123)
Verbal ability	0.00163***	0.00163***	0.00163***	0.00163***	0.00424***	0.000278
	(0.000330)	(0.000330)	(0.000330)	(0.000330)	(0.000628)	(0.000189)
Memory indicator	-0.00446*	-0.00445*	-0.00445*	-0.00446*	-0.00666	-0.000315
	(0.00256)	(0.00256)	(0.00256)	(0.00256)	(0.00490)	(0.00145)
Area of living	0.00245	0.00245	0.00244	0.00245	0.00975***	0.00178**
	(0.00154)	(0.00154)	(0.00154)	(0.00154)	(0.00295)	(0.000880)
Perceived future outlook	-0.00322	-0.00321	-0.00322	-0.00322	0.00533	0.00135
	(0.00316)	(0.00316)	(0.00316)	(0.00316)	(0.00570)	(0.00178)
Sadness	0.00112	0.00111	0.00112	0.00112	0.000381	0.00454*
	(0.00477)	(0.00477)	(0.00477)	(0.00477)	(0.00900)	(0.00271)
Loneliness	-0.00558	-0.00556	-0.00559	-0.00558	-0.0106	-0.00158
	(0.00449)	(0.00449)	(0.00449)	(0.00449)	(0.00794)	(0.00250)
Gender (dummy)	-0.0208***	-0.0208***	-0.0208***	-0.0208***	-0.0267***	0.00401
	(0.00446)	(0.00446)	(0.00446)	(0.00446)	(0.00847)	(0.00252)
Has children (dummy)	-0.00655	-0.00655	-0.00655	-0.00655	-0.0183	-0.0132***
	(0.00691)	(0.00691)	(0.00691)	(0.00691)	(0.0127)	(0.00440)
Unemployment (dum)	-0.0485***	-0.0486***	-0.0485***	-0.0485***	-0.103***	-0.00200
	(0.0104)	(0.0104)	(0.0104)	(0.0104)	(0.0222)	(0.00906)
Retired (dummy)	0.00399	0.00399	0.00397	0.00399	-0.0482***	0.0146***
	(0.00637)	(0.00637)	(0.00637)	(0.00637)	(0.0122)	(0.00355)
Age	0.0103***	0.0103***	0.0103***	0.0103***	-0.00105	0.00245
	(0.00309)	(0.00309)	(0.00309)	(0.00309)	(0.00576)	(0.00176)
Age squared	-6.58e-05***	-6.56e-05***	-6.57e-05***	-6.58e-05***	-3.00e-05	-1.31e-05
	(2.21e-05)	(2.21e-05)	(2.21e-05)	(2.21e-05)	(4.12e-05)	(1.24e-05)
Observations	19,252	19,252	19,252	19,252	19,252	19,252

Table 2b: Correlation of residuals

	(1) SMP1	(2) SMP2	(3) BMP
SMP1	1		
SMP2	0.1901***	1	
	(0.0000)		
BMP	0.1636***	0.0228***	1
	(0.0000)	(0.0015)	

Variables are indicators whether the individual owns stocks (SMP1), stocks and funds such as retirement accounts (SMP2) or bonds (BMP). The residuals are taken from Table 2a specifications (1), (5) and (6). Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

In our model, individuals are around 5.0 percentage points more likely to invest in stocks directly when they are active in social groups (ASG). Ceteris paribus, a different social group (DSG) is associated with an increase in probability of around 2.2 percentage points. However, the frequency of going to these social groups (FSG) shows no convincing results.[13] Providing help to friends or family (HELP), which is a proxy for a strong tie, shows only a small effect of around 1 percentage points.

However, in specification 2, HELP is insignificant when interacted with ASG. The weak ties (ASG and DSG) seem to partly absorb the effect. The interaction between ASG and FSG provides similar results. As a check on the robustness of our results we interact these variables to find distinct effects and to rule out possible moderating effects. These findings support the theory that weak ties are more important than strong ties in explaining stock market participation.

The other social capital measures (TMP, RLW, PRAY) do not show convincing results. The coefficient of Trust Most People (TMP) is not significant in specification 1. However, trust in people could be distinct from trusting institutions. Unfortunately the SHARE survey does notinclude a question related to trust in institutions.

Our results do not support Guiso et al (2008). Although they use the same measure of trust as in our study they do not control for social activities. In their model, RLW and PRAY show significant, but very small marginal effects on stock market participation. On the other hand, the results are consistent with the idea that

[13] A higher frequency, on average, is an indicator of a stronger tie (Marsden and Campbell (1984) and (2012).

externalities of social capital mainly operate through social interaction as argued by Durlauf and Fafchamps (2004). [14]

Specification 5 confirms the general picture with respect to total stock market participation while the estimated effects are larger. In this specification persons actively engaged in social groups are more than 10 pp more likely to own stocks, mutual funds or retirement accounts. Especially providing help to close ones (HELP) has a large effect of 5.26 percentage points. This finding does not reject the conjecture that strong ties have no effect on total stock market participation, but it does support the idea that weak ties have a stronger effect on participation in the equity market than strong ties.

The results obtained with specification 6 indicate that social networks are not significantly associated with participation in the bond market, which is a relatively information-light asset class. In Europe especially, bond markets are very transparent as most of the bonds traded are issued by the government. Thus although these individuals do not gather information from social ties and cannot therefore use it in their investment decision they nevertheless invest in the bond maket. These results could partly be explained if individuals with social ties possess an unobservable characteristic that allows them to make better to make better-informed decisions, which is implied by the significant, though small marginal effects of the interaction between for social ties and bond market participation.

Most control variables are statistically significant with the expected signs, indicating they measure what they are supposed to measure. As expected, risk tolerance is more important for direct stock market participation than for bond market participation. Individuals' financial situation, measured by income and 'meet ends financially' show positive significant associations. In addition, being unemployed has a negative impact on the propensity to invest. The state of a person's health is positively associated with stock market participation. The effects of social networks and social capital are robust to the inclusion of these controls.

[14] Durlauf and Fafchamps (2004) raise an important issue in empirical research with social capital. They state that: "evidence must also be provided that trust and shared norms are achieved via social interaction based on interpersonal networks and associations." we are unable to establish causality and therefore do not differentiate between general social trust and trust caused by social interaction or community. However, our results are in line with the idea that among social capital measures, especially interaction leads to positive externalities.

In Table 2b we show the correlations between the residuals of the regressions of direct stockholding (SMP1), direct bondholding (BMP) and total stockholding (SMP2). These represent conditional correlations which are measuring the influence of common explanatory variables not included in the regression specifications. The correlations between the residuals of SMP1 and SMP2, and the correlation between between the residuals of SMP1 and BMP are sizeable and statistically significant, indicating the presence (in the background) of common omitted variables. For instance, some form of unobserved trait that is important for investing in both stocks and bonds, like an ability to make well-informed decisions or to formulate long-term goals.

This correlation of course does not imply in any way that SMP1 and SMP2 (or BMP for that matter) are causually connencted, but rather that if we knew what the omitted variable was and had included it in the regression, the conditional correlation would have gone to zero.

The correlation between the residuals of total stockholding (SMP2), which includes holdings in mutual funds and retirement accounts, and bond holding (BMP) is small ($\rho = 0.0228$) indicating that the effect of common omitted variables in the SMP2 and BMP regressions although minor is being estimated with considerable precision.

5.1 Examining endogeneity by way of sample split: social interaction across countries with different participation rates in stock and bond markets.

As discussed earlier, a sociable individual should be more likely – all else being equal - to acquire information about equities in countries where stock market participation is high. Consequently, a sociable individual has a higher probability to find someone with equities in their portfolio in his or her social circle. This effect should be less pronounced for bond holding, because the information requirements for potential investors are much less demanding. We examine this conjecture by splitting the sample into three groups of countries based on their average stock market participation rates.

Thus, in Table 3a we sort the data into countries with low, medium and high participation rates in either directly held equity, total holdings of equity or bond holdings. Directly held equity is shown in specifications 1 to 3. Similar to previous results, proxies for weak ties (ASG and DSG) are highly significant and show

progressively increasing effects on stock market participation in the country group with highest fraction of stock market participants. However, proxies for stronger ties (FSG and HELP) do not show any significant effects on direct stock holding across different participation groups. Being active in social groups increases the probability of investing in equity by 1.7 percentage points (pp) in low-participation countries and increases to 9.6 pp in high-participation countries. The number of different social groups also shows increasing marginal effects in high-stock participation countries. Contrary to Hong et al (2004), we also find increasing effects for risk tolerance, financial situation and income. As Hong et al (2004) note, the participation rate for social individuals are more sensitive to changes in such ‘exogenous’ parameters than for less sociable individuals. A possible social multiplier effect expands the impact, causing other to participate as well.

Table 3a: Sample split for low and high participation countries

The table reports marginal effects (at means) from probit regressions for individuals. The sample covers the Survey of Health and Ageing and Retirement in Europe (SHARE) conducted in 2013. Unreported country dummies are used to capture unobserved country specific effects. The dependent variables are indicators whether the individual owns stocks (SMP1), stocks and funds such as retirement accounts (SMP2) or bonds (BMP) respectively. The sample is split for regions with: (1) low, (2) medium and (3) high average stock and bond market participation rates respectively. The independent variables are: social interaction indicators - either 'active in social groups' (ASG), the amount of different social groups (DSG), 'the frequency participating in these social groups' (FSG) or 'helping close ones' (HELP) - , trust in people (TMP), right or left wing in politics (RLW), the frequency of praying (PRAY), risk tolerance, financial situation, self-perceived health, household income, verbal ability, self-rated memory, area of living, perception of the future, feelings of sadness, loneliness, dummies for gender, children, unemployment, retirement and age. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

VARIABLES	SMP1			SMP2			BMP		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	LOW	MID	HIGH	LOW	MID	HIGH	LOW	MID	HIGH
ASG	0.0170***	0.0376**	0.0960***	0.0789***	0.0306	0.102***	4.17e-05	0.0252*	0.0248*
	(0.00640)	(0.0171)	(0.0360)	(0.0149)	(0.0281)	(0.0264)	(0.00274)	(0.0148)	(0.0136)
DSG	0.0149***	0.0160**	0.0323***	0.0360***	0.0529***	0.0525***	0.000836	0.00814*	0.0120*
	(0.00349)	(0.00725)	(0.0115)	(0.00940)	(0.0147)	(0.0127)	(0.00135)	(0.00487)	(0.00696)
FSG	-0.00369***	-0.00181	-0.000544	-0.00868***	-0.00691	-0.00121	0.000540	-0.00202	0.00223
	(0.00127)	(0.00265)	(0.00427)	(0.00335)	(0.00530)	(0.00458)	(0.000468)	(0.00179)	(0.00255)
HELP	0.00889**	0.00915	0.0118	0.0362***	0.0364**	0.0529***	-0.000708	0.00307	-0.000828
	(0.00360)	(0.00744)	(0.0120)	(0.00937)	(0.0146)	(0.0123)	(0.00152)	(0.00495)	(0.00715)
TMP	3.34e-05	0.00253	-0.000496	0.00273	0.00553*	0.00999***	0.000606*	0.00120	-0.000344
	(0.000788)	(0.00174)	(0.00290)	(0.00198)	(0.00325)	(0.00278)	(0.000343)	(0.00125)	(0.00154)
RLW	0.00125*	0.00280*	0.0128***	0.00502**	0.00518	0.0147***	-0.000176	0.000946	0.00342**
	(0.000732)	(0.00168)	(0.00264)	(0.00197)	(0.00323)	(0.00260)	(0.000289)	(0.00115)	(0.00151)
PRAY	-0.00117	-0.00323	-0.00755**	-0.00459*	-0.0113***	-0.0120***	-0.000231	-0.000587	-0.000346
	(0.00102)	(0.00212)	(0.00379)	(0.00260)	(0.00402)	(0.00372)	(0.000446)	(0.00141)	(0.00205)
Risk tolerance	0.0308***	0.0871***	0.146***	0.0997***	0.204***	0.156***	0.00461***	0.0176***	0.0345***
	(0.00301)	(0.00585)	(0.00868)	(0.00759)	(0.0124)	(0.00988)	(0.00118)	(0.00346)	(0.00544)
Meet ends financially	0.0173***	0.0458***	0.0709***	0.0566***	0.120***	0.0990***	0.00341***	0.0154***	0.0468***
	(0.00222)	(0.00472)	(0.00804)	(0.00519)	(0.00883)	(0.00728)	(0.000938)	(0.00351)	(0.00450)
Self-perceived health	0.00306	0.00721*	0.0165***	0.00906*	0.0186**	0.0258***	-0.000206	0.00475*	0.00386
	(0.00188)	(0.00388)	(0.00630)	(0.00483)	(0.00752)	(0.00641)	(0.000768)	(0.00250)	(0.00378)
Income (log)	0.000512	0.0121***	0.0282***	0.0176***	0.0247***	0.0293***	0.00126*	0.00524**	0.00994***
	(0.00164)	(0.00357)	(0.00642)	(0.00415)	(0.00672)	(0.00642)	(0.000720)	(0.00243)	(0.00334)
Verbal ability	0.000345	0.00178***	0.00323***	0.00206***	0.00363***	0.00406***	-2.98e-05	0.000444	0.000480
	(0.000239)	(0.000565)	(0.000926)	(0.000596)	(0.00111)	(0.000944)	(0.000112)	(0.000364)	(0.000521)
Observations	6,605	6,335	6,312	6,021	5,746	7,485	5,833	5,595	7,824

(Continued)

Continued - Table 3a*:* Sample split for low and high participation countries

VARIABLES	SMP1			SMP2			BMP		
	(1) LOW	(2) MID	(3) HIGH	(4) LOW	(5) MID	(6) HIGH	(7) LOW	(8) MID	(9) HIGH
Memory indicator	-0.00364*	0.000169	-0.00792	-0.000308	0.00160	-0.0162**	-0.000746	0.000262	-0.000138
	(0.00199)	(0.00443)	(0.00689)	(0.00515)	(0.00860)	(0.00694)	(0.000847)	(0.00283)	(0.00396)
Area of living	0.00430***	0.00257	-0.00414	0.0153***	0.0119**	-0.00815*	0.000955*	0.00491***	5.44e-05
	(0.00115)	(0.00251)	(0.00443)	(0.00289)	(0.00503)	(0.00448)	(0.000514)	(0.00165)	(0.00248)
Perceived future outlook	-0.00132	-0.00746	0.000562	0.00181	0.00646	0.00692	-0.000510	0.00219	0.00383
	(0.00227)	(0.00510)	(0.00922)	(0.00568)	(0.00959)	(0.00860)	(0.000920)	(0.00385)	(0.00481)
Sadness	0.000139	0.00440	-0.00445	0.0147	-0.0145	-0.00114	0.00315**	0.000737	0.00926
	(0.00378)	(0.00763)	(0.0134)	(0.00952)	(0.0148)	(0.0133)	(0.00153)	(0.00551)	(0.00742)
Loneliness	-0.000125	-0.00646	-0.00977	-0.00986	-0.00841	-0.00563	-0.00212	-0.00703	0.00353
	(0.00338)	(0.00728)	(0.0128)	(0.00870)	(0.0130)	(0.0116)	(0.00133)	(0.00581)	(0.00664)
Gender (dummy)	-0.0118***	-0.0254***	-0.0241**	-0.0217**	-0.0113	-0.0318***	0.00255*	-0.00353	0.0124*
	(0.00385)	(0.00742)	(0.0120)	(0.00925)	(0.0143)	(0.0123)	(0.00144)	(0.00495)	(0.00700)
Has children (dummy)	-0.00335	0.00897	-0.0256	-0.0142	-0.0174	-0.00998	-0.00787*	-0.0107	-0.0236**
	(0.00558)	(0.0102)	(0.0194)	(0.0135)	(0.0208)	(0.0191)	(0.00433)	(0.00866)	(0.0109)
Unemployment (dummy)	-0.0136*	-0.0614***	-0.0696*	-0.0572***	-0.0930***	-0.0967**	0.0107	-0.0267***	-0.00652
	(0.00784)	(0.0124)	(0.0377)	(0.0169)	(0.0359)	(0.0397)	(0.00966)	(0.0101)	(0.0246)
Retired (dummy)	-0.000578	0.00455	-0.000465	-0.0271**	-0.0746***	-0.0264	0.00151	0.00276	0.0462***
	(0.00489)	(0.0106)	(0.0178)	(0.0122)	(0.0207)	(0.0184)	(0.00198)	(0.00682)	(0.0100)
Age	0.00690**	0.000887	0.0324***	-0.00375	-0.0105	0.00879	-0.000106	0.00534	0.00488
	(0.00271)	(0.00511)	(0.00838)	(0.00613)	(0.00963)	(0.00847)	(0.00102)	(0.00331)	(0.00489)
Age squared	-5.03e-05***	-1.03e-05	-0.000195***	1.16e-06	5.80e-05	-0.000106*	5.53e-07	-2.52e-05	-3.25e-05
	(1.95e-05)	(3.69e-05)	(5.94e-05)	(4.44e-05)	(6.92e-05)	(6.00e-05)	(7.23e-06)	(2.33e-05)	(3.48e-05)
Observations	6,605	6,335	6,312	6,021	5,746	7,485	5,833	5,595	7,824

Table 3b: Correlation of residuals

	SMP1			SMP2			BMP		
	(1) (LOW)	(2) (MID)	(3) (HIGH)	(1) (LOW)	(2) (MID)	(3) (HIGH)	(1) (LOW)	(2) (MID)	(3) (HIGH)
SMP1 (LOW)	1								
SMP1 (MID)	0.9784*** (0.0000)	1							
SMP1 (HIGH)	0.8360 *** (0.0000)	0.8800*** (0.0000)	1						
SMP2 (LOW)	0.3462*** (0.0000)	0.3760*** (0.0000)	0.3540*** (0.0000)	1					
SMP2 (MID)	0.1862*** (0.0000)	0.2372*** (0.0000)	0.2723*** (0.0000)	0.8520*** (0.0000)	1				
SMP2 (HIGH)	-0.2273 *** (0.0000)	-0.1919*** (0.0000)	-0.0390 *** (0.0000)	0.0001*** (0.0000)	0.3635 *** (0.0000)	1			
BMP (LOW)	0.1733*** (0.0000)	0.1662*** (0.0000)	0.1431*** (0.0000)	0.0943*** (0.0000)	0.0442*** (0.0000)	-0.0728*** (0.0000)	1		
BMP (MID)	0.1720*** (0.0000)	0.1653*** (0.0000)	0.1440*** (0.0000)	0.0935*** (0.0000)	0.0443 *** (0.0000)	-0.0727*** (0.0000)	0.9955*** (0.0000)	1	
BMP (HIGH)	0.1846*** (0.0000)	0.1806*** (0.0000)	0.1692*** (0.0000)	0.1034 *** (0.0000)	0.0544*** (0.0000)	-0.0643*** (0.0000)	0.9812*** (0.0000)	0.9815*** (0.0000)	1

Variables are indicators whether the individual owns stocks (SMP1), stocks and funds such as retirement accounts (SMP2) or bonds (BMP). The residuals are taken from Table 3a, all specifications. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

An increasing pattern is less clear for total equity market participation in specifications 4, 5 and 6. For example, the effect of ASG is relatively strong in low-participation countries but is insignificant in medium-participation countries. The other social capital measures (TMP, RLW, PRAY) do not show significant associations with participation rates across the three samples. This suggests that the partial effects of trust, religion and political views are not very important in explaining differences in stock holding.

In specifications 7, 8 and 9 we find no significant effects of social interaction on bond market participation. In line with the information diffusion narrative, the coefficients of variables that control for how easy it is for prospective investors to understand the market's risk-rewards trade-offs, such as verbal ability and memory, are no longer significant. As expected, risk tolerance, financial situation and income are significant determinants of bond market participation.

Table 3b displays correlations between residuals for all specifications in Table 3a. The results are generally similar to the residual correlations from the baseline model. Direct and total stock market participation are likely to be jointly affected by omitted variables, because their residuals are highly correlated. SMP1 shows lower correlations with BMP. Previously, Tables 2a and 3a showed that bond holding cannot be explained by our social interaction measures. The residuals from the regressions of the various country groups are almost perfectly correlated with the BMP regresssion residuals, indicating that in all groups there is an omitted variable that is (almost) orthogonal to social interaction that is explaining bond market participation.

5.2 Testing for exogeneity: instrumental variable approach

To test for exogeneity of the social network variable "Active in social groups" (ASG), we follow Georgarakos and Pasini (2011) and use an instrumental variable approach as proposed by Rivers and Vuong (1988). Results from the instrumental variable approach are very similar to the ones found in the baseline model. More importantly, we cannot reject the null hypothesis that the variable representing "Active in social groups" (ASG) is exogenous to direct and total stock holding or bond holding.

The first stage regression is shown in Table 4a. The second stages are shown in Table 4b. As an instrument for ASG in the first stage regression we use the variable Health Spouse. The estimate is highly significant with an F-statistic equal to 21.74, and which can therefore be considered as a valid instrument. We report the Rivers-Vuong test for exogeneity in Table 4b. All specifications, i.e. SMP1, SMP2 and BMP, show insignificant results for this test with p-values of 0.3525, 0.7881 and 0.7429 respectively. Thus, we cannot reject the hypothesis that ASG, our social network measure, is exogenous to the propensity to invest in equities**.**

Table 4a: Instrumental variable approach: First stage OLS regressions

The table reports results from first stage instrumental variable estimations for individuals. The sample covers the Survey of Health and Ageing and Retirement in Europe (SHARE) conducted in 2013. Unreported country dummies are used to capture unobserved country specific effects. The dependent variable is the social capital indicator 'active in social groups' (ASG). ASG is instrumented by the number of health limitations that limit ones' spouse in their daily activities (Health Spouse). The independent variables are: 'helping close ones' (HELP), trust in people (TMP), right or left wing in politics (RLW) and the frequency of praying (PRAY). The control variables are risk tolerance, financial situation, self-perceived health, household income, verbal and numerical ability, self-rated memory, education, area of living, perception of the future, feelings of sadness, loneliness, dummies for gender, marital status, children, unemployment, retirement and age. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

VARIABLES	(1) ASG
HELP	0.0506***
	(0.00720)
TMP	-0.000105
	(0.00156)
RLW	-0.000691
	(0.00147)
PRAY	-0.00379*
	(0.00200)
Risk tolerance	0.00763
	(0.00567)
Meet ends financially	0.0477***
	(0.00426)
Self-perceived health	0.0115***
	(0.00366)
Income (log)	0.00524
	(0.00355)
Verbal ability	0.00740***
	(0.000504)
Memory indicator	-0.00307
	(0.00395)
Area of living	0.00507**
	(0.00243)
Perceived future outlook	0.0257***
	(0.00468)
Sadness	0.00419
	(0.00739)
Loneliness	-0.0373***
	(0.00807)
Gender (dummy)	0.00217
	(0.00694)
Has children (dummy)	-0.0125
	(0.0137)
Unemployment (dummy)	0.00794
	(0.0200)
Retired (dummy)	0.0680***
	(0.00948)
Age	0.0106**
	(0.00479)
Age squared	-9.35e-05***
	(3.50e-05)
Health Spouse	-0.00760***
	(0.00163)
Constant	0.137
	(0.167)
F-test instrument (=Health Spouse)	21.74***
P-value	(0.0000)
Observations	9,001
R-squared	0.288

Table 4b: Instrumental variable approach: Second stage probit regressions

The table reports marginal effects (at means) from second stage instrumental variable (probit) estimations for individuals. The sample covers the Survey of Health and Ageing and Retirement in Europe (SHARE) conducted in 2013. Unreported country dummies are used to capture unobserved country specific effects. The dependent variables are indicators whether the individual owns stocks (SMP1), stocks and funds such as retirement accounts (SMP2) or bonds (BMP) respectively. The independent variables are: the social capital indicators 'active in social groups' (ASG), 'helping close ones' (HELP), trust in people (TMP), right or left wing in politics (RLW) and the frequency of praying (PRAY). ASG is instrumented by the number of health limitations that limit ones' spouse in their daily activities (Health Spouse). The control variables are risk tolerance, financial situation, self-perceived health, household income, verbal and numerical ability, self-rated memory, education, area of living, perception of the future, feelings of sadness, loneliness, dummies for gender, marital status, children, unemployment, retirement and age. Standard errors are in parentheses and result from 300 parametric bootstrap replications. *** p<0.01, ** p<0.05, * p<0.1

	SMP1	SMP2	BMP
VARIABLES	(1)	(2)	(3)
ASG	0.0649***	0.190***	0.0251**
	(0.0231)	(0.0352)	(0.0107)
HELP	0.0197***	0.0831***	0.00131
	(0.00758)	(0.0127)	(0.00439)
TMP	0.000847	0.00874***	-0.000116
	(0.00176)	(0.00316)	(0.000918)
RLW	0.00510***	0.00883***	0.000941
	(0.00163)	(0.00281)	(0.000863)
PRAY	-0.00441**	-0.0105***	0.000254
	(0.00223)	(0.00386)	(0.00107)
Risk tolerance	0.102***	0.204***	0.0220***
	(0.00526)	(0.0126)	(0.00289)
Meet ends financially	0.0481***	0.122***	0.0228***
	(0.00512)	(0.00873)	(0.00319)
Self-perceived health	0.00766**	0.0220***	0.00146
	(0.00369)	(0.00720)	(0.00216)
Income (log)	0.0123***	0.0281***	0.00381
	(0.00374)	(0.00647)	(0.00243)
Verbal ability	0.00180***	0.00367***	0.000493*
	(0.000549)	(0.000984)	(0.000291)
Memory indicator	0.00325	0.0189**	-0.00129
	(0.00429)	(0.00809)	(0.00232)
Area of living	0.00692**	0.0169***	0.00132
	(0.00279)	(0.00436)	(0.00140)
Perceived future outlook	0.00164	0.00716	0.00446
	(0.00521)	(0.00907)	(0.00299)
Sadness	0.00672	0.00652	0.00812*
	(0.00842)	(0.0128)	(0.00471)
Loneliness	0.00727	0.00118	-0.000543
	(0.00938)	(0.0163)	(0.00521)
Gender (dummy)	-0.00791	-0.0192	0.0122***
	(0.00698)	(0.0131)	(0.00423)
Has children (dummy)	-0.00560	0.0139	-0.00369
	(0.0147)	(0.0248)	(0.00848)
Unemployment (dummy)	-0.0629***	-0.0907***	0.000169
	(0.0174)	(0.0350)	(0.0180)
Retired (dummy)	0.00453	-0.0377**	0.0149***
	(0.0106)	(0.0171)	(0.00558)
Age	0.00997*	-0.0108	-0.00245
	(0.00594)	(0.00846)	(0.00293)
Age squaraed	-6.35e-05	2.92e-05	2.29e-05
	(4.27e-05)	(6.19e-05)	(2.11e-05)
Residuals 1st stage	-0.0387	-0.0171	-0.00702
	(0.0409)	(0.0635)	(0.0214)
Rivers-Vuong test for exogeneity, chi square (p-value)	0.86	0.07	0.11
	(0.3525)	(0.7881)	(0.7429)
Observations	9,001	9,001	9,001

6. CONCLUSIONS

Among the indicators of social capital we find that indicators that measure actual interaction (i.e. social networks) are associated with stock market participation. *If* a person interacts socially and whether this occurs across different groups seems to matter more than *how often* a person interacts socially. More specifically, weak social ties, such as membership in different social groups, seem to be of more importance to stock market participation than having strong social ties to family or to close friends.

We find that indicators of social capital that do not directly reflect social interaction, such as trust, and norms, have no effect on stock market participation. This is in line with social capital literature which claims that positive externalities from social capital mainly arise from social interactions rather than from trust and norms. Significantly, we also find that all our measures of social capital are only weakly associated with participation in the bond market where information constraints are less likely to play a role. This finding underlines the importance of weak social ties have in transmitting information relevant to investing in the stock market.

Since most questions in SHARE produce noisy answers due to the presence of measurement errors, a cause of endogeneity, the results should be interpreted with caution. Moreover, we cannot discard the effects that reverse causality, another cause of endogeneity, can have on our estimates. Prior research has sometimes chosen to ignore this. For example Guiso et al (2008) do not include sociability as a variable to explain stock holding, but instead uses 'trusting most people'. The problem with this approach is that developing trust could operate through social activities or vice versa. In this paper we show that a very similar measure of trust produces insignificant results when a measure of particpating social activities is included as a control variable.

To judge the robustness of our measures we conduct an exploratory factor analysis to determine whether our measure of social networks is clearly distinct from a measure of possessing cognitive abilities. We also show that a large part of the 'sociability' factor is being captured by our indicators, especially the Active in Social Groups (ASG) measure which the Rivers-Vuong test indicates is exogenous to the decision to participate in the stock market.

As is to be expected, belonging to social networks has small marginal effects in low-participation countries and large effects in high-participation countries. We also find no relation between social networks and bond holding, whereas we do find a relation between

bond holding and risk tolerance and the respondents' financial situation. These findings all fit the information diffusion narrative.

However, the correlations of residuals between the seemingly unrelated regressions in Table 2b indicate the presence of variables omitted from the regressions. By construction these variables must be orthogonal to the set of variables already included in the regression, which implies that in order to further our understanding of the participation puzzle we need to extend our search for additional explanatory factors beyond those that have been considered here.

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8. APPENDIX

Table A1: Descriptions of variables

Variable	Question	Value
Dependent variables		
Direct stock market participation (SMP1)	Does your household currently have any money in stocks or shares?	Yes =1; No =0
Total stock market participation (SMP2)	Does your household currently have any money in stocks or shares, mutual funds or retirement accounts?	Has stocks or mutual funds or retirement accounts =1; No =0
Direct bond market participation (BMP)	Does your household currently have any money in government or corporate bonds?	Yes =1; No =0
Social network measures		
Weaker ties Active in social groups (ASG)	Have you done any of these activities in the last year? 1. Done voluntary or charity work 2. Attended an educational or training course 3. Gone to a sport, social or other kind of club 4. Taken part in a political or community-related organization 5. Played cards or games such as chess 6. None of these	=1 if at least one household member has taken part in one of these activities over the last 12 months. =0 otherwise;
Weaker ties Number of different social groups (DSG)	Derived variable for how many different activities undertaken by respondent.	Number of above (ASG) held. None of ASG activities undertaken =0; five activities undertaken =5
How often done activities? (FSG)	How often has the respondent done: voluntary or charity work; educational or training course; a sport, social, or other kind of club; activities organized by a political or community	4. Almost daily 3. Almost every week 2. Almost every month 1. Less often; Sum of all values for different activities.
Stronger ties Providing help to neighbors, family and friends (HELP)	In the last twelve months, have you given personal care or practical household help to a family member living outside your household, a friend or neighbor? Please exclude looking after grandchildren.	=1 if the respondent provided help to at least one of these persons over the last 12 months =0 otherwise

(Continued)

Variable	Question	Value
Other social capital measures		
Trusts most people (TMP)	Generally speaking, would you say that most people trusted or that you can't be too careful in dealing with people?	You can't be too careful =0; People can be trusted =10
Right or left wing in politics (RLW)	Are you right or left wing in politics?	Left-wing =0; Right-wing =10
Religion (PRAY)	Thinking about the present, how often do you pray?	6. More than once a day 5. week 3. Once a week 2. Less t
Control variables		
Risk tolerance	Respondent's answer to question on (financial) risk tolerance.	=4 if willing to take substantial financial risks expecting to earn substantial returns; =3 if willing to take above average financial risks expecting to earn above average returns; =2 if willing to take average financial risks expecting to earn average returns; =1 if not willing to take any financial risks
Meet ends financially	Thinking of your household's total monthly income, would you say that your household is able to make ends meet?	1. With great difficulty. 2. With some difficulty. 3. Fairly easy. 4. Easily.
Self-perceived health status	Would you say your health is: excellent, very good, good, fair or poor?	Excellent =5; Poor =1
Income (log)	Total overall income, after taxes and contributions, that the entire household had in the previous month	
Numerical ability (note: only in appendix regressions)	Score for answering up to four numeracy questions.	[See Christellis et al (2010)] for full specification. Highest score =5; Lowest score =1

(Continued)

Variable	Question	Value
Memory indicator (self-rated)	How would you rate your memory at the present time? Would you say it is excellent, very good, good, fair or poor?	5. Excellent 4. Very goo
Verbal ability	Number of animals the respondent can name in one minute exactly	Number of animals the respondent can name in one minute exactly
Area of living	What area does the respondent live in?	5. A big city 4. town 2. A sma 1. A rural area o
Sadness	In the last month, have you been sad or depressed?	Yes =1; No =0
Loneliness	How often do you feel lonely?	1. Never 2. Rarely 3. Sometir
Perceived future outlook	How often do you feel that the future look s good for you? (Often, sometimes, rarely or never?)	1. Never 2. Rarely 3. Sometir
Gender		Male =1; Female =2
Has children	Do you have any children?	Yes = 1; No = 0
Unemployment	What is your employment status?	Unemployed = 1; Other = 0
Retired	What is your employment status?	Retired = 1; Other = 0
Age	Derived variable from date of birth variable in survey.	Age at date of interview
Years of education (note: only in appendix regressions)	How many years have you been in full time education?	Number of years in full time education at date of the interview
Marital status (note: only in appendix regressions)	Are you married?	Married and living together with spouse =1; Separated, divorced, widowed or never married =0
Instrument Health Spouse (note: only in instrumental variable regression)	Please tell me whether you have difficulty doing each of the everyday activities: 1. Walking 100 meters about two hours long periods resting ng. one flight of stairs without resting 5. Climbi Stooping, kneeling, or crouching your arms above shoulder level 8. Pulling or pushing large objects like a living room chair weights over 5 kilos, like a heavy bag of groceries 10. Picking up a small coin from a table. Exclude any	Number of everyday activities that respondent has difficulty with. None =0; All=10

Variable	Question	Value
	difficulties that you expect to last less than three months.	

Table A2: Correlation matrix

	Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1)	SMP1	1.00															
(2)	SMP2	0.5013	1.00														
		(0.0000)															
(3)	BMP	0.2186	0.1775	1.00													
		(0.0000)	(0.0000)														
(4)	ASG	0.1654	0.2774	0.0738	1.00												
		(0.0000)	(0.0000)	(0.0000)													
(5)	DSG	0.2012	0.2989	0.0910	0.6413	1.00											
		(0.0000)	(0.0000)	(0.0000)	(0.0000)												
(6)	FSG	0.1724	0.2411	0.0837	0.5851	0.8889	1.00										
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)											
(7)	HELP	0.0864	0.1790	0.0255	0.2085	0.2421	0.2033	1.00									
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)										
(8)	TMP	0.1141	0.1555	0.0412	0.1622	0.2028	0.1823	0.0917	1.00								
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)									
(9)	RLW	0.0714	0.0619	0.0272	0.0264	0.0080	0.0177	-0.0230	0.0110	1.00							
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.1937)	(0.0040)	(0.0003)	(0.0757)								
(10)	PRAY	-0.0842	-0.1646	0.0044	-0.1422	-0.0770	-0.0196	-0.0544	-0.0171	0.1075	1.00						
		(0.0000)	(0.0000)	(0.4532)	(0.0000)	(0.0000)	(0.0007)	(0.0000)	(0.0033)	(0.0000)							
(11)	Risk tolerance	0.3125	0.3412	0.1169	0.1673	0.2122	0.1688	0.1183	0.1365	0.0667	-0.1029	1.00					
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)						
(12)	Meet ends	0.2362	0.3241	0.1243	0.3115	0.3010	0.2699	0.0868	0.1984	0.0750	-0.1087	0.1817	1.00				
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)					
(13)	Income (log)	0.1775	0.2401	0.0985	0.1902	0.2142	0.1785	0.0597	0.0927	0.0199	-0.0624	0.1688	0.3599	1.00			
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0043)	(0.0000)	(0.0000)	(0.0000)				
(14)	Verbal ability	0.1485	0.2639	0.0389	0.3870	0.3649	0.3111	0.1936	0.1683	-0.0152	-0.1690	0.1785	0.2254	0.1595	1.00		
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0139)	(0.0000)	(0.0000)	(0.0000)	(0.0000)			
(15)	Memory	-0.1008	-0.1682	-0.0504	-0.2361	-0.2345	-0.2053	-0.1019	-0.1265	-0.0211	0.0915	-0.1354	-0.2034	-0.2075	-0.2973	1.00	
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0006)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)		
(16)	Age	-0.0306	-0.2009	0.0166	-0.1895	-0.2067	-0.1352	-0.1993	-0.0426	0.0699	0.1963	-0.1487	-0.0083	-0.1945	-0.3430	0.2787	1.00
		(0.0000)	(0.0000)	(0.0040)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	0.1678	(0.0000)	(0.0000)	(0.0000)	

Note: not all variables are shown due to space reasons.

Table A3: Country groups

	SMP1			SMP2			BMP		
	LOW	MID	HIGH	LOW	MID	HIGH	LOW	MID	HIGH
	Austria	France	Sweden	Austria	France	Sweden	Czech	Denmark	Italy
	Spain	Netherlands	Denmark	Spain	Netherlands	Denmark	Slovenia	Netherlands	Germany
	Czech	Israel	Switzerland	Italy	Israel	Switzerland	France	Israel	Belgium
	Italy	Luxembourg	Belgium	Estonia	Luxembourg	Belgium	Spain	Luxembourg	Sweden
	Estonia	Slovenia	Germany	Slovenia	Germany	Czech	Estonia	Austria	Switzerland
Obs	6,605	6,335	6,312	6,021	5,746	7,485	5,833	5,595	7,824

This table shows factor loadings on different factors resulting from a factor analysis, based on the correlation matrix, using a promax rotation. Blanks are shown if the loading is <0.25. Minimal eigenvalue = 1. The variables are variables are: social interaction indicators - either 'active in social groups' (ASG), the amount of different social groups (DSG), 'the frequency participating in these social groups' (FSG) or 'helping close ones' (HELP) - trust in people (TMP), right or left wing in politics (RLW), the frequency of praying (PRAY), risk tolerance, financial situation, self-perceived health, household income, verbal ability, self-rated memory, area of living, perception of the future, feelings of sadness, loneliness, gender, children, unemployment, retirement and age.

Factors	(1)	(2)	(3)	Uniqueness
Variables				
ASG		0.5497		0.5789
DSG		0.9303		0.1429
FSG		0.9333		0.1930
HELP				0.9100
TMP	0.3001			0.8857
RLW				0.9781
PRAY				0.9355
Risk tolerance				0.8978
Meet ends financially	0.5623			0.6679
Self-perceived health	0.5487			0.6329
Income (log)	0.3803			0.8229
Verbal ability				0.7325
Memory indicator	-0.3796			0.7717
Area of living				0.9981
Perceived future outlook	0.5965			0.6220
Sadness	-0.5039			0.8098
Loneliness	-0.4738			0.8064
Gender	-0.2539			0.9522
Has children				0.9966
Unemployment			-0.2851	0.9142
Retired			0.7347	0.5030
Age			0.7829	0.3783
Observations	19,252	19,252	19,252	

Table A4a: Exploratory factor analysis

This table shows factor loadings on different factors resulting from a factor analysis, based on the correlation matrix, using a promax rotation. Blanks are shown if the loading is <0.25. Minimal eigenvalue = 1. The variables are variables are: social interaction indicators - either 'active in social groups' (ASG), the amount of different social groups (DSG), 'the frequency participating in these social groups' (FSG) or 'helping close ones' (HELP) - trust in people (TMP), right or left wing in politics (RLW), the frequency of praying (PRAY), risk tolerance, financial situation, self-perceived health, household income, verbal ability, self-rated memory, area of living, perception of the future, feelings of sadness, loneliness, gender, children, unemployment, retirement and age.

Factors	(1)	(2)	(3)	Uniqueness
Variables				
ASG		0.5894		0.5616
DSG		0.9356		0.1639
FSG		0.9463		0.2054
HELP				0.8987
TMP	0.2896			0.8809
RLW				0.9623
PRAY				0.9242
Risk tolerance	0.2607			0.8897
Meet ends financially	0.5668			0.6480
Self-perceived health	0.5076			0.6741
Income (log)	0.3868			0.8260
Verbal ability	0.2526		-0.2663	0.6843
Memory indicator	-0.3503			0.7529
Numerical ability	0.3535			0.7063
Years of education	0.2659			0.6939
Area of living				0.9977
Perceived future outlook	0.5463			0.6609
Sadness	-0.4817			0.8276
Loneliness	-0.5356			0.7694
Gender	-0.2629			0.9485
Marital status	0.4463			0.8489
Has children				0.9726
Unemployment			-0.2818	0.9066
Retired			0.7944	0.4495
Age			0.8440	0.3256
Observations	6,510	6,510	6,510	

Table A4b: Exploratory factor analysis including numerical ability, education and marital status

Table A5

Robustness of the baseline model. Here including numerical ability, education and martial status, leading to a smaller sample

The table reports marginal effects (at means) from probit regressions for individuals. The sample covers the Survey of Health and Ageing and Retirement in Europe (SHARE) conducted in 2013. Unreported country dummies are used to capture unobserved country specific effects. The dependent variables are indicators whether the individual owns stocks (SMP1), stocks and funds such as retirement accounts (SMP2) or bonds (BMP) respectively. The independent variables are: social interaction indicators - either 'active in social groups' (ASG), the amount of different social groups (DSG), 'the frequency participating in these social groups' (FSG) or 'helping close ones' (HELP) - trust in people (TMP), right or left wing in politics (RLW), the frequency of praying (PRAY), risk tolerance, financial situation, self-perceived health, household income, verbal and numerical ability, self-rated memory, education, area of living, perception of the future, feelings of sadness, loneliness, dummies for gender, marital status, children, unemployment, retirement and age. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

	SMP1	SMP2	BMP
VARIABLES	(1)	(2)	(3)
ASG	0.0710***	0.134***	0.0259**
	(0.0191)	(0.0297)	(0.0106)
DSG	0.0149*	0.0490***	0.00159
	(0.00763)	(0.0156)	(0.00515)
FSG	-0.00186	-0.00890	0.00221
	(0.00290)	(0.00580)	(0.00193)
HELP	0.0154*	0.0719***	-0.000756
	(0.00812)	(0.0153)	(0.00516)
TMP	0.000956	0.00435	-0.000372
	(0.00187)	(0.00339)	(0.00111)
RLW	0.00907***	0.0138***	0.00186*
	(0.00185)	(0.00346)	(0.00105)
PRAY	-0.00640***	-0.0182***	0.000166
	(0.00248)	(0.00448)	(0.00147)
Risk tolerance	0.0863***	0.174***	0.0188***
	(0.00601)	(0.0132)	(0.00359)
Meet ends financially	0.0478***	0.111***	0.0204***
	(0.00554)	(0.00913)	(0.00343)
Self-perceived health	0.00773*	0.0274***	0.000632
	(0.00410)	(0.00775)	(0.00260)
Income (log)	0.00453	0.0154**	0.00634**
	(0.00382)	(0.00720)	(0.00262)
Verbal ability	0.000278	0.00268**	6.85e-05
	(0.000624)	(0.00122)	(0.000392)
Memory indicator	-0.00548	0.00577	0.000660
	(0.00462)	(0.00874)	(0.00280)
Numerical ability	0.0137***	0.0213**	0.00390
	(0.00448)	(0.00836)	(0.00281)
Years of education	0.00381***	0.0116***	0.00123*
	(0.00112)	(0.00206)	(0.000655)
Area of living	0.00178	0.00103	0.000981
	(0.00286)	(0.00539)	(0.00178)
Perceived future outlook	-0.00268	0.0112	0.0101***
	(0.00595)	(0.0104)	(0.00367)
Sadness	0.0114	-0.0129	0.0109**
	(0.00868)	(0.0162)	(0.00538)
Loneliness	0.000267	0.0136	0.00733
	(0.00879)	(0.0150)	(0.00503)
Gender (dummy)	-0.0116	0.0154	0.00362
	(0.00815)	(0.0153)	(0.00506)
Marital status (dummy)	0.0307***	0.0922***	0.0178***
	(0.00871)	(0.0166)	(0.00538)
Has children (dummy)	0.00606	-0.0303	-0.00623
	(0.0122)	(0.0233)	(0.00836)
Unemployment (dum)	-0.0725***	-0.124***	-0.0143
	(0.0141)	(0.0338)	(0.0145)
Retired (dummy)	0.000330	-0.0561**	0.0137*
	(0.0122)	(0.0221)	(0.00771)
Age	0.00499	0.0125	0.000397
	(0.00533)	(0.00973)	(0.00330)
Observations	6,510	6,510	6,510

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