The Effects of Trust on Stock Market Participation

A Cross-Sectional Study Based on 15 Countries

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Abstract

This paper shows the significance of trust in the stock market participation decision. We have examined the roles of two different types of trust; general trust in other individuals and trust in institutions. By using data that contains more than 60.000 individuals across 15 countries we have both managed to explain variation across individuals and countries by using different measures of trust. We find evidence that general trust in other individuals and trust in governmental institutions play a major role in the stock market participation decision.

Key words: Cross country heterogeneity, Individual trust, Institutional trust, Stock market participation puzzle

Acknowledgements

I would like to express my greatest gratitude towards my two supervisors André Gyllenram and Niklas Hanes, you have both been great during the process and my trust for you are unshakably high. Since this is my last work as a student I also want to thank all my study companions, teachers, staff and students that I have met during my five years at Umeå University and Mannheim Business School.

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1. Introduction

How individuals and households allocate their assets in different ways of savings has gained a lot of attention during the 21th century. Just the fact, that households hold approximately twice as much assets and at least as much debt as corporations (in United States) makes it interesting for research (Guiso and Sodini, 2012). An interesting research aspect of individuals' savings decision is to understand why many households choose not to participate in the stock market, despite the high average return it offers. When assessing why individuals, even wealthy, choose not to own stocks we refer to it as stock market participation puzzle, introduced by Haliassos and Bertaut (1995). One could argue that risk aversion is a factor that should influence an individual's participation decision. However, other factors have been proven to play a role in the participation puzzle (Guiso and Sodini, 2012). In fact, there are models such as the Merton model of intertemporal consumption and portfolio choice that suggests that even individuals with high risk aversion should hold some fraction of their portfolio in stocks (Merton, 1969).

In this paper we examine the effect of trust on stock market participation. We define stock market participation as direct holding of at least one type of stock (i.e. not via mutual funds). Trust was defined by Gambetta (2000) as: "the subjective probability with which an agent assesses that another agent or group of agents will perform a particular action". The level of trust among individuals plays an important role in the stock market participation puzzle. For instance, Guiso, Sapienza and Zingales (2008), henceforth GSZ, compared the stock market to a three card game on the street. Most people will choose not to participate since they do not trust the fairness of the game or the persons playing it. With respect to major scandals, such as the Enron and Madoff scandals, history has shown that the stock market is not always a fair game.

By following the definition of trust by Gambetta we argue that openness among agents is one of the most crucial factors when it comes to increasing trust. For instance, La Porta, Florencio and Shleifer (2006) maintain that financial agreement requires a certain level of transparency between the agents, especially when it comes to transparency in financial instructions and government. Further, strong institutions in society imply that people who get involved in litigation can expect a faster and fairer outcome of that process (La Porta, Florencio and Shleifer, 2006). In terms of trust, a social study by Newton (2001) argued that individuals in a

society should be regarded as trust takers and claimed that trust is a collective phenomenon that depends on institutional stability.

In this paper we assess two different types of trust; trust in other individuals and trust in institutions. We argue that there is a point to divide trust into these two components. Firstly, it is likely that trust varies across a population in a certain country; thereby we use micro data of trust in other individuals to capture these effects. Secondly, when it comes to institutional trust, we argue in line with La Porta, Florencio and Shleifer (2006) and Newton (2001) that institutional trust could be regarded as idiosyncratic over a certain population since they are exposed to the same institutions. Hence, we also include a measurement of institutional quality in the country where the individual resides.

Trust has earlier been proven by studies like GSZ, Georgarkos and Pasini (2011) and Asgharian, Liu and Lundtofte (2014) to have a strong impact of stock market participation. Even if the pile of papers on the effects of trust on stock market participation is quite thin it plays an important role in the stock market participation puzzle. Not only does trust itself help to explain stock market participation, trust also capture two additional important effects. Firstly, trust varies between countries; thereby it plays an important role by capturing the effects of cultural and other heterogeneous factors between countries (GSZ). Secondly, trust does not vary much between different income and wealth levels among individuals and thereby provide evidence why even wealthy individuals choose to not participate in the stock market (GSZ; Georgarkos and Pasini, 2011).

One purpose of this paper is, by using new data that also includes countries that has not been examined in this approach yet, to provide support for the existing evidence from previous studies. Further, we also have the purpose to widen and develop the trust measure. The survey we have used as data was released in the year 2015. The survey was performed during the year 2013 and contains 65281 individuals across 14 European countries and also Israel. The individuals in the survey are mostly above 50 years old. Since the group older than 50 years hold a great fraction of the resources in society the results of this group provide important macroeconomic implications (Georgarkos and Pasini, 2011).

In the survey individuals graded on a scale from 1 to 10 their level of trust in other people, where 10 corresponded as high trust and 1 as low trust. In the analysis, we use the individual trust measure in two different ways. Firstly, we estimate a model where we transform the individual trust to a variable that corresponds as either high trust or not. Secondly, we use it in

a more specific way by using dummy variables for each level of trust. Further, we use the Corruption perceptions index (CPI) as a proxy variable of institutional trust. CPI is conducted on a yearly basis by the independent organization Transparency International (TI) and aims to reflect the level of corruption in governmental institutions in a country.

By incorporating dummies for each level of individual trust and also the CPI measure we contribute to the field by testing two new versions of the trust measure. Further, by testing the effects of trust we also intend to provide an explanation to cross country differences in participation rate. Apart from containing many individuals across different countries we also have access to many variables at an individual level. The wide prevalence of variables enables us to control for socioeconomic variables as well as other variables that have earlier been proven to be a part of the stock market participation puzzle.

The remainder of this paper is structured as follows. In Chapter 2 we present a theoretical framework including previous studies of why people should own stocks, but also some theoretical explanations why people choose not to. Chapter 3 presents an overview of all variables used and how these are formulated. Furthermore, Chapter 3 also presents a description of the data material we use. In the analysis part of the paper we take two different approaches. Firstly, in Chapter 4 we perform an exploratory data analysis (EDA) including different illustrations and descriptions of trust and stock market participation. Secondly, in Chapter 5 we perform an econometric analysis, using logit models and also estimating the marginal effects of the variables. Chapter 5 should be regarded as the main analysis. Finally, Chapter 6 sums up the paper in a concluding discussion.

2. Theoretical framework and previous studies

2.1 The Merton model

To introduce the subject stock market participation we begin by asking an important question: Who should own stocks in theory?

To answer this question we explain Merton's model of intertemporal consumption and portfolio choice (Merton, 1969). Assuming no participation costs, the optimal fraction, *w*, of risky assets in the portfolio of an individual, *i*, could be described as:

$$w_i = \frac{r_i^e}{\gamma_i \sigma_i^2},$$

where r_i^e is the expected excess return, γ_i is the Arrow-Pratt measure of relative risk aversion and σ_i^2 is a measure of the short term volatility of the portfolio. The expected excess return is the return of the portfolio when subtracting the risk free rate. The Arrow-Pratt measure of relative risk aversion used by Merton takes two different forms; Constant relative risk aversion (CRRA) and decreasing relative risk aversion (DRRA). Assuming that people have a utility function with risk preferences according to CRRA both rich and poor people should hold the same fraction of their wealth in risky assets. If people have risk preferences according to DRRA rich people should hold a bigger fraction of their wealth in risky assets than poor people. However, an important implication of these results is that regardless of the form of the utility function basically all individuals should, to some extent, hold a fraction of their wealth in risky assets.

2.2 Fixed participation costs

Naturally, the reality is not as simple as the Merton model. By adding participation costs for an individual the rational decision process changes dramatically. For instance, studies like Vissing-Jorgensen (2003) examined the impact of participation costs on stock market participation. Vissing-Jorgensen divided the costs of participating into two parts; monetary costs and information costs. Monetary costs basically correspond to all transactional costs of buying and holding stocks, whilst administrational costs correspond to the effort to learn and understand the financial products, executing trades etc. These costs can be regarded as fixed participation costs. Unfortunately, there are hard to find estimates on information costs and furthermore many transactional and holding costs are not totally fixed. However, the technological development with the internet and increased availability of information has, to some extent, decreased the information costs (Guiso and Sodini, 2012).

One intuition of fixed participation costs is that they will consume a greater fraction of poor investor's wealth than a rich one; thereby it could in some cases be rational for a poor investor to stay outside of the stock market. However, it has been shown that also many wealthy individuals choose not to invest in stocks. For instance, 28% of the top 5% wealthiest do not to participate in the stock market in Netherlands, 39% in Germany and as high as 75% of the wealthiest in Spain did not own stocks (Guiso and Sodini, 2012). This implies that fixed

participation costs cannot solely provide an explanation of the low participation rate. Thereby we now examine the stock market participation puzzle in next section and also a more thorough presentation of trust in section 2.4.

2.3 The stock market participation puzzle

When the puzzle was introduced by Haliassos and Bertaut (1995) risk aversion, heterogeneity of beliefs, habit persistence and time nonseparability were suggested as plausible explanations to the limited participation rate. In this section we shortly present and explain factors that, according to earlier studies and theories, play a role in the participation puzzle.

There are theories such as Modigliani's life cycle theory that support the fact that savings varies during the life cycle (Modigliani, 1966). According to this theory people build up their stock of assets during their working life and use them during retirement. It is reasonable to assume that this behavior is also reflected in differences in stock market participation between different ages. Moreover, whether an individual has kids or not is also likely to have an impact on the participation decision. However, the overall effect of kids might be a bit ambiguous. On the one hand, having kids could imply that you have to supply some of your income or wealth to them, making it less likely to have money left over to invest. On the other, having kids could also improve the bequest motive, causing people to invest in stocks to be able to have more savings to transfer to their next generation.

The stock market participation rate has also been shown to have clear differences between genders. For instance, Jianakoplos and Bernasek (1996) show that men have higher level of risk tolerance than women, which implies they are more likely to own stocks. Further, Dreber (2012) examined the differences between genders and found out that risk tolerance, numeracy and financial literacy were all factors that explained why men participate to a greater extent than women. In general, financial literacy, cognitive ability and education are proven to be factors that lower the fixed participation costs. Well educated people are more likely to understand the mechanisms of the financial system, such as the relationship between risk reward and in addition to that also more likely to be able to perform trades (Cole and Shastry, 2009).

When it comes to how an individual assess the future it has been shown to have an impact on participation. Puri and Robinson (2005) examined the effects of optimism on stock market

participation. They used the estimation of life expectancy as a proxy of optimism and found out that people who overestimated their life expectancy invested more. Further, the impact of social interaction is another factor that plays a role in the participation puzzle. By dividing individuals into socials and non socials, the fixed participation costs gets substantially lower for social individuals, especially when the participation rate is higher in their peers (Guiso and Sodini, 2012). For instance, Hong, Kubik and Stein (2004) found that people who interacted with their neighbors or attended church were more likely to participate on the stock market.

2.4 The role of trust

Models like Merton's in section 2.1 rely on the assumption that an investor is able to achieve the historical returns of the risky assets. Apart from the risk of the historical returns not to repeat themselves, one could also include the aspect of not believing or trusting the overall system (GSZ). Major event such as collapses of companies can both change the distribution of returns and in addition also affect the trust people have in the stock market.

As mentioned in the introduction, two examples of this were the Enron and the Madoff scandal. Enron were one of the largest energy companies in America, but due to poor financial reporting they managed to hide billions of debt for years. After the revalation, the share price decreased from $90.75 to $1 in one year. Eventually, after failing to sell the company to a competitor Enron filed for bankruptcy in the end of 2001 and was, at that time, the largest bankruptcy in American history. The Madoff investment scandal was a version of a Ponzi scheme, but differed a bit in the way that it was a real business. In contrast of other Ponzi schemes Madoff offered a lower but stable return of 5% per annum for the investors, at that way the scheme were able to work for almost 20 years, until it eventually broke down in December 2008.

Studies like Giannetti and Wang (2014) confirms that corporate fraud revelations, such as the mentioned scandals above, decrease the probability of participating in the stock market due to lower trust in the market. Apart from the cases where corporate fraud get revealed it is quite common that such frauds go undetected; according to Dyck, Morse and Zingales (2007) just about 50% of corporate frauds are revealed. Moreover, Calvet, Campbell and Sodini (2009) incorporated the risk of being cheated in the participation decision of an investor. By defining the concept of being cheated as the investment loses it entire value it changes the outcome of the participation decision radically. By assuming a certain level of wealth is needed to

participate, due to fixed participation costs, Calvet, Campbell and Sodini (2009) showed that having a probability of being cheated of 2% increase the threshold level of wealth needed to participate by a factor of five.

Being cheated by companies is not the only risk an investor takes; there is always some risk in the financial and governmental institutions. Studies have shown that many people lack in trust of their governmental institutions; for instance more than 1/3 of the American people believe that the government was involved in attacks of the 11th of September (Hargrove, 2007). In general, institutional stability and corruption has become a more popular subject during the last decades. There are many ways to define corruption. One of the most common definitions, which also used by the World Bank, is: "the abuse of public power for private benefit". Except for the early mentioned CPI there are other measurements of corruptions. For instance, Asgharian, Liu and Lundtofte (2014) used the measurement "Rule of law", which is conducted by the World Bank. Rule of law is a measurement of institutional stability and is similar to the CPI-measure.

Studies that are similar to this one have earlier provided strong evidence for the effect of trust on stock market participation. Based on a study of Dutch households GSZ showed that individuals with high trust were 50% (not percentage points) more likely to hold stocks. Further, Asgharian, Liu and Lundtofte (2014) showed that immigrants' probabilities of participation were strongly affected to the difference by institutional quality of their country of residence and their country of origin. Moreover, Georgarkos and Pasini (2011) tested trust in combination with sociability. They found that trust affected stock market participation; however their results also implied that a reduction of trust could be counterbalanced by an increase in sociability.

3. Variables and data

3.1 Overview of control variables

In this section we shortly present the variables that are used as control for the effects of trust on stock market participation.

- Since the fixed participation costs corresponds to a greater fraction of wealth for less wealthy people we use the variable financial wealth as control. We estimate **financial wealth** as the sum of the amount in bank account, stocks, mutual funds and bonds.

- Apart from financial wealth we add the monetary variable **income** of last month of the household.

- Regarding theories like Modigliani's that implies that savings to vary across the life cycle we control for both **age** and **age squared**.

- To include **gender** differences we use a dummy variable that take value 1 in case the individual is a male and 0 otherwise.

- Despite its ambiguity, we include the number of **kids** of the individual.

- To capture the effects of cognitive ability and financial literacy we include number of years of **education**.

- Furthermore, we control for **optimism**. We use the individual's view on the future as proxy variables for optimism, where the answers are divided into four categories which are based on how often they looked bright on the future. The answer could be "Never", "Rarely", "Sometimes" or "Often", where each answer takes value 1 if fulfilled, and otherwise 0.

- We also incorporate a proxy variable that captures the **social** impact of stock market participation by including whether an individual attended to at least one social activity last year. The social activities available in the data was: "Done voluntary or charity work", "Attended an educational or training course", "Gone to a sport, social or other kind of club" or "Taken part in political or community related organizations". The variable is used as a dummy, where 1 corresponds to an individual who attended at least one of the four mentioned events during last year, and 0 otherwise.

3.2 Measuring trust

GSZ used the question "Generally speaking, would you say that people can be trusted or that you have to be very careful in dealing with people?". The respondents could answer either "Yes", "No" or "Don't know". In the model, GSZ used the answers to formulate the following dummy variable:

$$x_{ij} = \begin{cases} 1, \text{if "Yes"} \\ 0, \text{if "No" or "Don't know"} \end{cases}$$

The variable can be interpreted as high trust or not. As mentioned, in the survey for this study people could rank their trust in other people on a discrete scale from 1 to 10, where 10 is high trust and 1 is low trust. In addition people could also answer "Don't know".

We estimate two models using two different versions of the individual trust variable. For the first model we choose to reformulate the discrete scale from 1 to 10 to a dummy variable similar to the one GSZ uses as a measure of trust. By assuming that answers of 7 or greater correspond as high trust we formulate the variable of individual trust as follows:

$$x_{ij} = \begin{cases} 1, \text{if "Trust in other people"} \geq 7 \\ 0, \text{if "Trust in other people"} < 7 \text{ or "Don't know"} \end{cases}$$

By using this formulation we obtain a dummy variable capturing high trust among individuals, enabling us to compare the results of this study to the corresponding one of GSZ.

For the second model we use a more specific version of the individual trust measure. This is done by treating the answers of individual trust as 11 categorical variables. Hence, we choose to use 10 different dummy variables for each level of trust and one additional if the respondent answered the question by "Don't know".

As mentioned, we use the corruption measure "Corruption perceptions index" (CPI) performed by the independent organization Transparency International (TI) as a proxy variable for trust in institutions. The measure CPI is performed on a yearly basis and takes values on discrete scale from 0 to 100. It is measured on a scale from 0 to 100, where 100 correspond to a very clean country and 0 corresponds to a highly corrupt one. The CPI variable work as an idiosyncratic trust variable for institutions within a country since it takes the same value for all individuals from same country. We choose to incorporate the CPI to capture the effect of idiosyncratic trust in institutions in a country in both of our models.

3.3 Data

All variables, except for the CPI, are obtained from a data survey called Survey of Health Ageing and Retirement in Europe (SHARE). The physical location of the data material is at Tilburg University, Netherlands. The SHARE data is a survey that targets people across Europe in the age of 50 and above. The data is obtained by interviews, which have been done over several waves, including a total of more than 85000 individuals across 20 European countries (+Israel). In February of 2015 the fifth wave got released, which incorporates interviews from 14 different European countries (+Israel), performed during 2013. Older waves of SHARE, including fewer and to some extent other countries, have been used by Georgarkos and Pasini (2011) and Asgharian, Liu and Lundtofte (2014). We solely use the fifth wave of SHARE in this paper. A variable overview of the micro data from the fifth wave are presented in Table 1 and a cross country overview are presented in Table 2.

Table 1: Summary statistics.

	Mean	Median	SD	Min	Max	Observations
Panel A. Socioeconomic variables (N=65281)						
Direct stockholders	0.120	0	0.325	0	1	43325
Financial wealth (‘000 of euros)	129.290	0	10044.599	-30.839	1100000	52385
Household income (‘000 of euros)	8.203	1.900	299.061	0	50000	35164
Age	67.10	66	10.06	50	104	64265
Male	0.441	0	0.496	0	1	65281
Number of kids	2.13	2	1.40	0	17	44541
Years of education	11.5	12	4.29	0	25	23138

(continued)

Table 1: *Continued.*

Panel B. Individual trust, CPI, Optimism and Attended social events (N=65281)						
High trust	0.472	0	0.496	0	1	61800
Level of individual trust						
Trust 10	0.049	0	0.217	0	1	61800
Trust 9	0.054	0	0.227	0	1	61800
Trust 8	0.377	0	0.172	0	1	61800
Trust 7	0.370	0	0.164	0	1	61800
Trust 6	0.108	0	0.310	0	1	61800
Trust 5	0.216	0	0.412	0	1	61800
Trust 4	0.060	0	0.238	0	1	61800
Trust 3	0.057	0	0.231	0	1	61800
Trust 2	0.036	0	0.186	0	1	61800
Trust 1	0.014	0	0.117	0	1	61800
Don't know	0.017	0	0.127	0	1	61800
CPI	69.50	71	14.20	43	91	65281
Optimism						
Future often looks good	0.395	0	0.489	0	1	62760
Future sometimes looks good	0.363	0	0.481	0	1	62760
Future rarely looks good	0.175	0	0.380	0	1	62760
Future never looks good	0.067	0	0.250	0	1	62760
Attended social event	0.442	0	0.497	0	1	64197

In Table 1 we have chosen to manipulate the variables age and the monetary variables household income and financial wealth. Firstly, we have excluded the individuals that were included despite being younger than 50. Excluding those below age of 50 enable us to make stronger inferences about the specific population from the 15 countries of age 50 and above. Secondly, we have chosen to truncate the variable household income for values greater than €100.000 and financial wealth for values greater than €2000.000. Monetary variables, such as household income and financial wealth, generally suffer from right skewed distributions, due to high wealth/income outliers. The truncation excluded the 70 wealthiest individuals and the 98 individuals with the highest household income. By performing this action we achieve more symmetrical distributions (but still right skewed) for the monetary variables. The cost of

losing less than 100 observations in each monetary variable should be negligible in the context of more than 60.000 observations.

Furthermore, it is noteworthy that the median value of financial wealth in Table 1, is 0; there are more than 50% of the 52315 individuals who reported they neither had any money in bank account, stocks, mutual funds or bonds. This highlights a shortcoming in our wealth variable, which possibly occurs due to the lack of assets included. A better measure would possibly be gross wealth, but we do not have access to that information. Moreover, as observed in Table 1, the data lack of observations in many variables, especially: direct stockholders, financial wealth, household income, number of kids and years of education. Therefore, the econometric analysis in chapter 5 both involves estimates of the models with all variables included and also estimates when excluding education and household income, the two variables that suffer most from missing observations. However, when observing the estimates from the reduced models we have to regard the risk of bias, since it might occur due to omitted variables (Greene, 2012).

Table 2: Overview of cross country data.

	Stock market participation	Average level of individual trust	CPI	Average household income (‘000 of euros)	Average financial wealth (‘000 of euros)	Observations
Panel A. Cross country data (N=65281)						
Austria	0.065	5.96	69	5.971	22.490	4252
Belgium	0.150	5.53	75	5.646	15.523	5614
Czech	0.038	5.44	48	1.416	6.216	5698
Denmark	0.347	7.62	91	5.892	16.473	4136
Estonia	0.018	6.13	68	0.967	1.844	5735
France	0.100	5.14	71	5.169	12.756	4445
Germany	0.118	5.32	78	5.892	14.503	5690
Italy	0.039	5.44	43	4.087	9.512	4703
Israel	0.092	4.48	61	2.714	4.970	2332
Luxemburg	0.099	5.45	80	17.275	54.904	1610
Netherlands	0.098	6.54	83	4.169	9.772	4129
Slovenia	0.078	5.54	57	2.019	3.791	2948
Spain	0.039	5.40	59	3.288	9.334	6450
Sweden	0.393	6.93	89	4.992	13.816	4531
Switzerland	0.223	6.40	85	13.280	30.821	3008

Further descriptions and illustrations of the cross country data shown in Table 2 are presented in the next chapter.

4. Exploratory data analysis of trust

Exploratory data analysis (EDA) can sometimes be a useful analytical tool for statisticians (Tukey, 1980). By being able to illustrate what the data can tell beyond formal modeling and hypothesis testing EDA offers an additional dimension to the analysis. Important to clarify, is that even if EDA add additional aspects to the analysis we just regard the results from this chapter as a supplement to the econometric analysis, performed in the next chapter. Hence, no stronger conclusions should solely be based on the EDA. In this chapter we mainly examine trust and stock market participation, both on a cross country and individual level. To get a good overview we begin to observe the data on an average cross country level by illustrating the stock market participation rate across countries in Table 1.

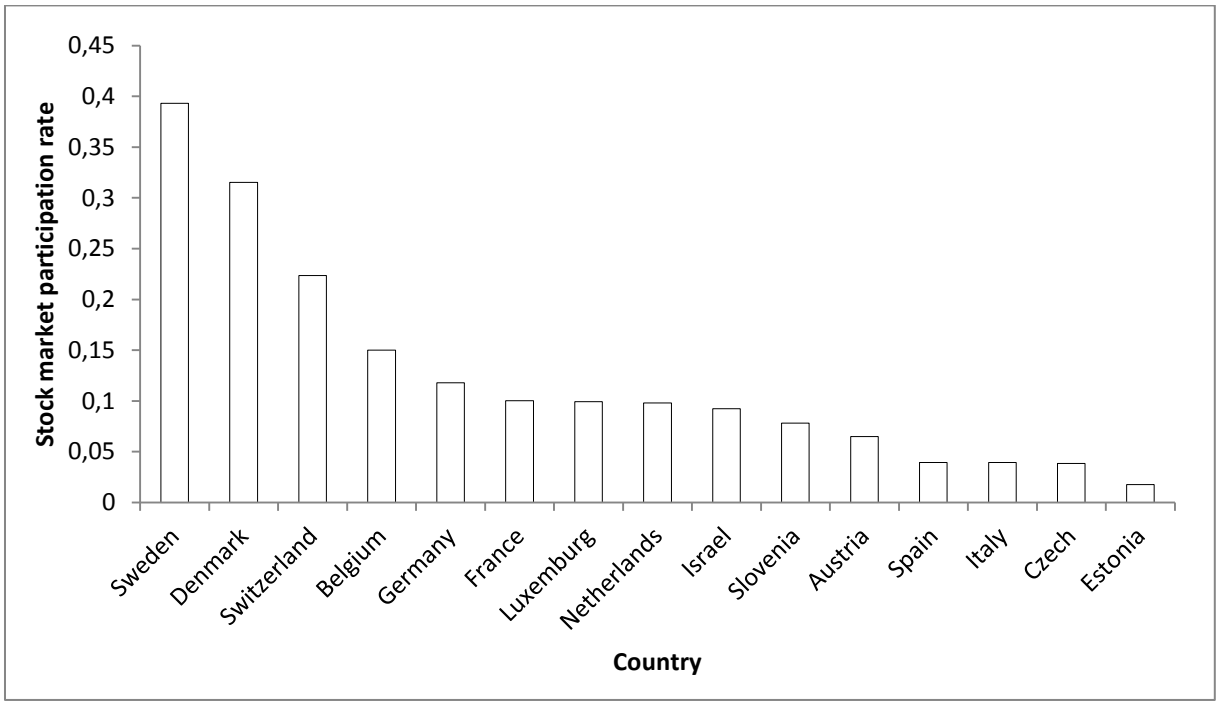
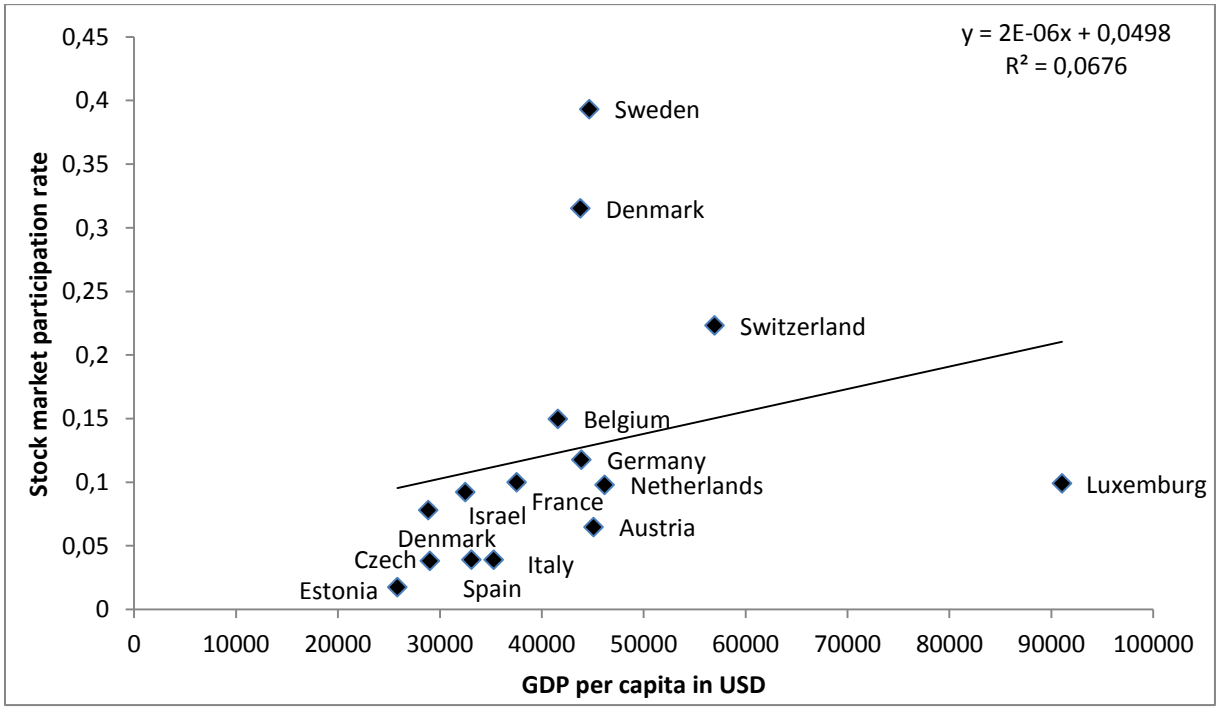


Figure 1: Histogram of cross country stock market participation rate in 2013.

For all individuals in the data the average the participation rate is 12.04%. With respect to the Merton model, we notice the discrepancy between the expected results and the observed ones. This highlights the relevance of the stock market participation puzzle. Apart from the low

average participation rate we also notice the high dispersion in participation across countries in Figure 1. For instance, Sweden at the top has a participation rate of 39.33%, whilst Estonia in the bottom only has a participation rate of 1.76%. We argue that these differences are due to factors that are heterogeneous between countries.

As mentioned, studies like Vissing-Jorgensen (2003) regarded the aspect of participation costs as a factor of the participation decision. One intuition of fixed participation costs is that they consume a greater fraction of poor investor's wealth than a rich one; thereby it could in some cases be rational for a poor investor to stay outside the stock market. By including fixed participation costs one could argue that wealthy countries should have a higher participation rate than poor ones. Hence, we choose to observe the relationship of the wealth of countries and the average participation rate in the data. In Figure 2 we use GDP per capita in USD, obtained from the same year as the survey, as a wealth measure and plot that against the participation rate across countries.



Source of GDP per capita: World Bank

Figure 2: Scatter plot of GDP per capita in 2013 vs. stock market participation.

By observing Figure 2 we notice that the fitted line is upward sloping. However, the low R^2 of 0.0676 indicate that the relationship between GDP per capita and stock market participation is far from clear. This highlights the flaw of using the wealth countries to explain the rate of stock market participation. For instance, Sweden and Austria have GDP per capita

of $44658 and $45079, whilst the participation rates are 39.3% and 6.5%. Thus, even if countries like Sweden and Austria basically have the same wealth, Sweden has a participation rate six times as high as Austria. This implies that there are other factors than fixed participation costs behind the low participation rate. Hence, we now examine trust in the remaining figures in this chapter.

By observing Table 2 in previous chapter, we notice that both individual trust and CPI varies across countries. The distributions of average individual trust and CPI across countries are illustrated in Figure 3 and 4.

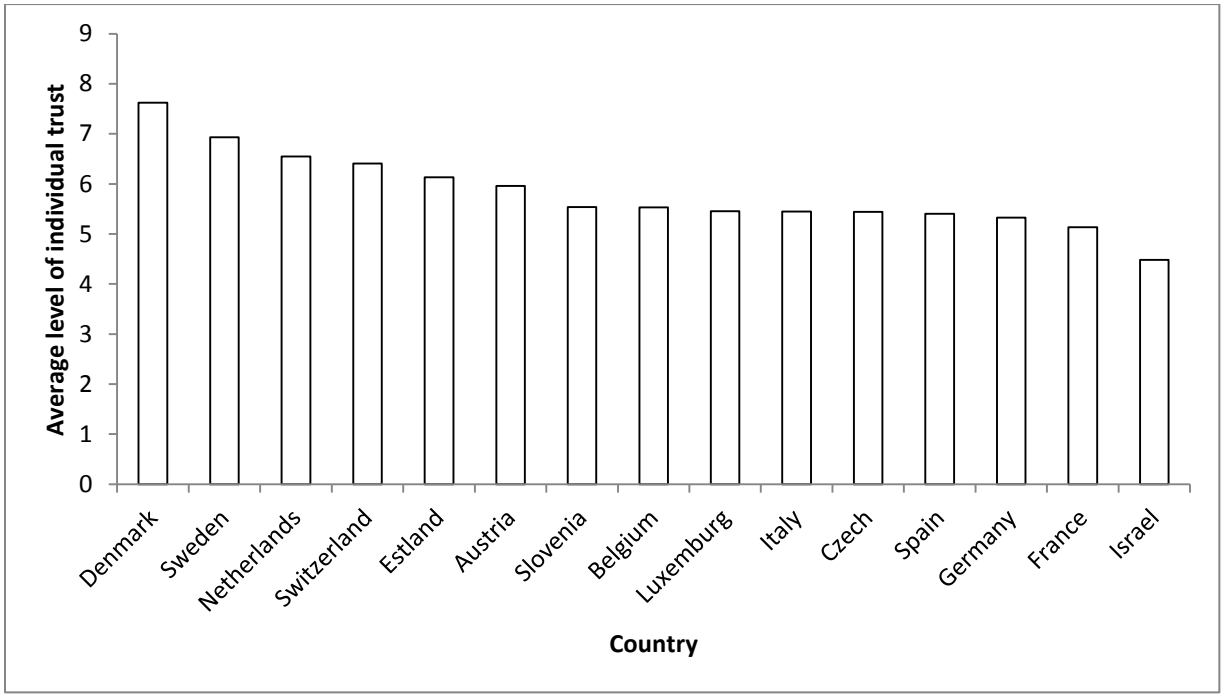
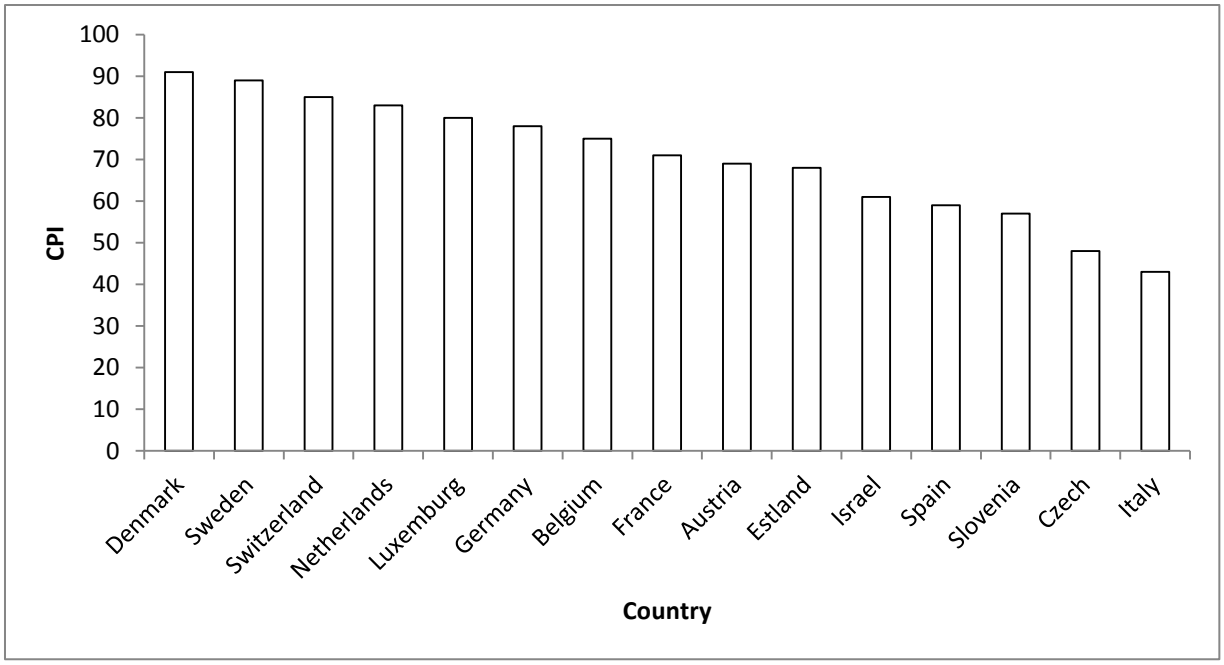


Figure 3: Histogram of average level of individual trust across countries.



Source of CPI: Transparency International

Figure 4: Histogram of CPI across countries.

With respect to the cross country variation of average level of individual trust and CPI we are now interested in relationship between these and the stock market participation rate across countries. For individual trust we use the rate of high trust (level 7-10), described in previous chapter, in Figure 5. Further, the relationship between CPI and stock market participation rate is shown in Figure 6.

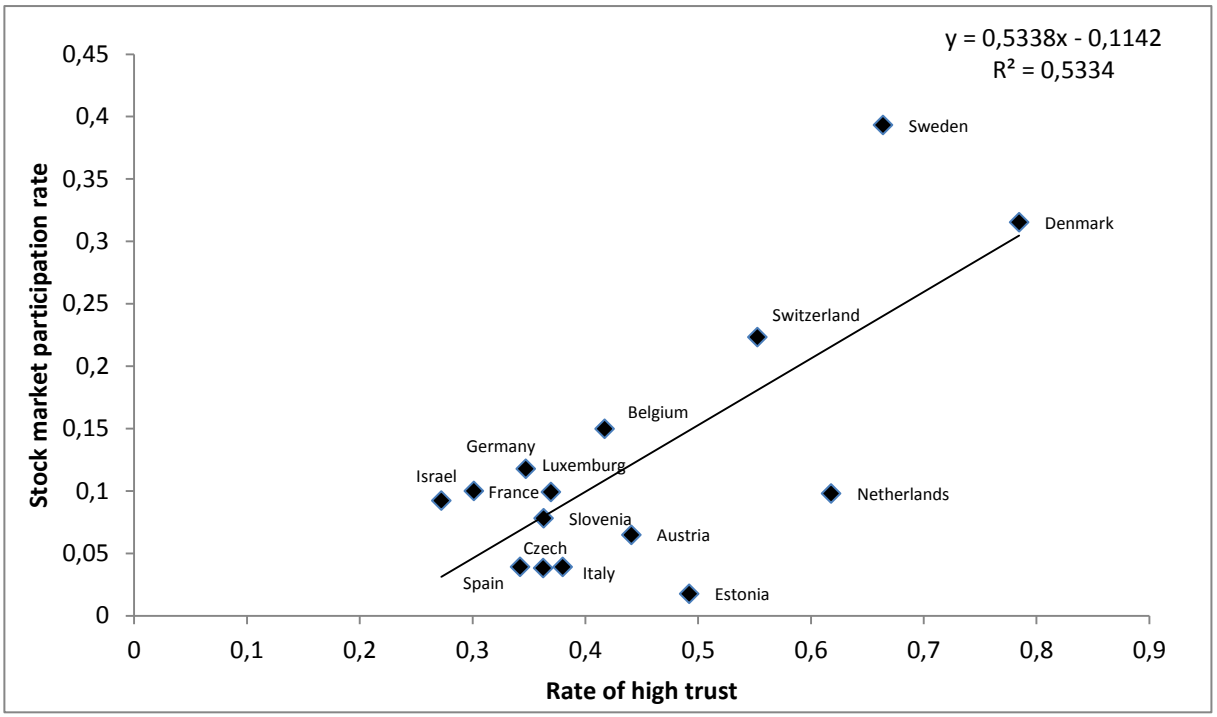
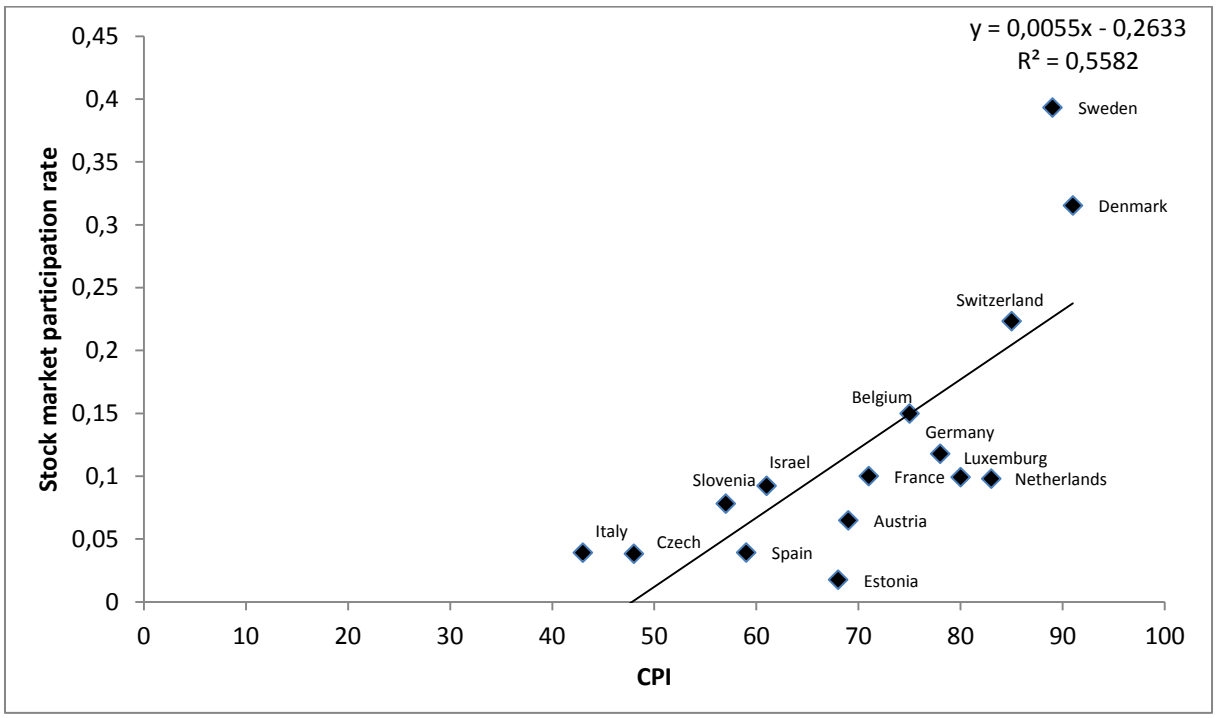


Figure 5: Scatter plot of average cross country trust vs. stock market participation rate.

By observing Figure 5 and the fitted line one can notice a clear tendency between average rate of high trust in a country and the rate of stock market participation. Further, we also notice the dispersion between countries; in top, Denmark has a rate of high trust at 78.4%, while the corresponding value is 27.2% for Israel at the bottom.



Source of CPI: Transparency International

Figure 6: Scatter plot of cross country CPI in 2013 vs. stock market participation rate.

Even if there are some differences we can also notice some similarities between the scatter plot in Figure 6 and the one in from Figure 5. It might be reasonable that corruption in institutions, to some extent, influence individuals trust in other people. However, the correlation of high trust and CPI on an individual level is just observed to 0.184, implying that they are positively correlated, but still captures different effects of trust. Observing the fitted line in Figure 6 one can clearly see the positive trend between countries "cleanness" and rate stock market participation. The high R^2 of 0.5582 does also support that. We also notice the heterogeneity in corruption between countries when observing Denmark at top at the value 91 of CPI, while Italy at the bottom only has the value of 43.

Since the models we estimate in the next chapter contain micro data we also shortly present a more detailed overview of the individual trust variable. The distribution of individual level of trust is presented in Figure 7.

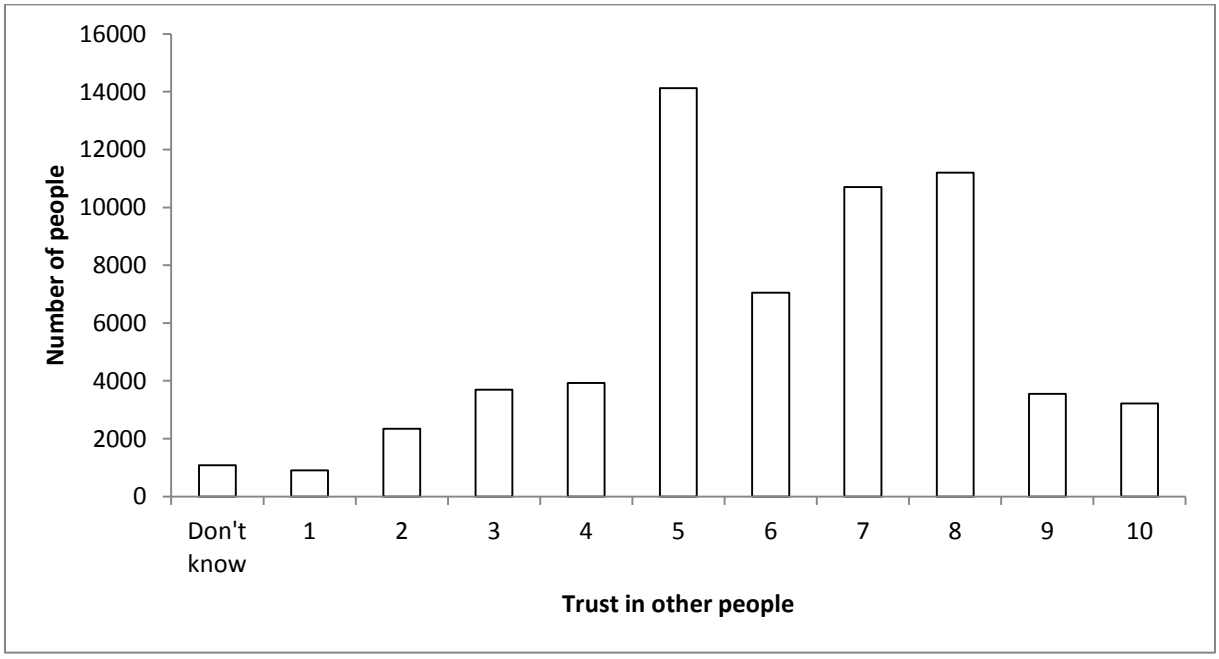


Figure 7: Histogram of frequencies of individual level of trust in other people

Even if we observe some tendencies of trust to be more frequent for the mid/high values there are no clear pattern in Figure 7. We notice that there are relatively few people with very low individual trust in the data. Now we examine one of the major purposes of this study by observing the participation rate at the different levels of individual trust in Figure 8.

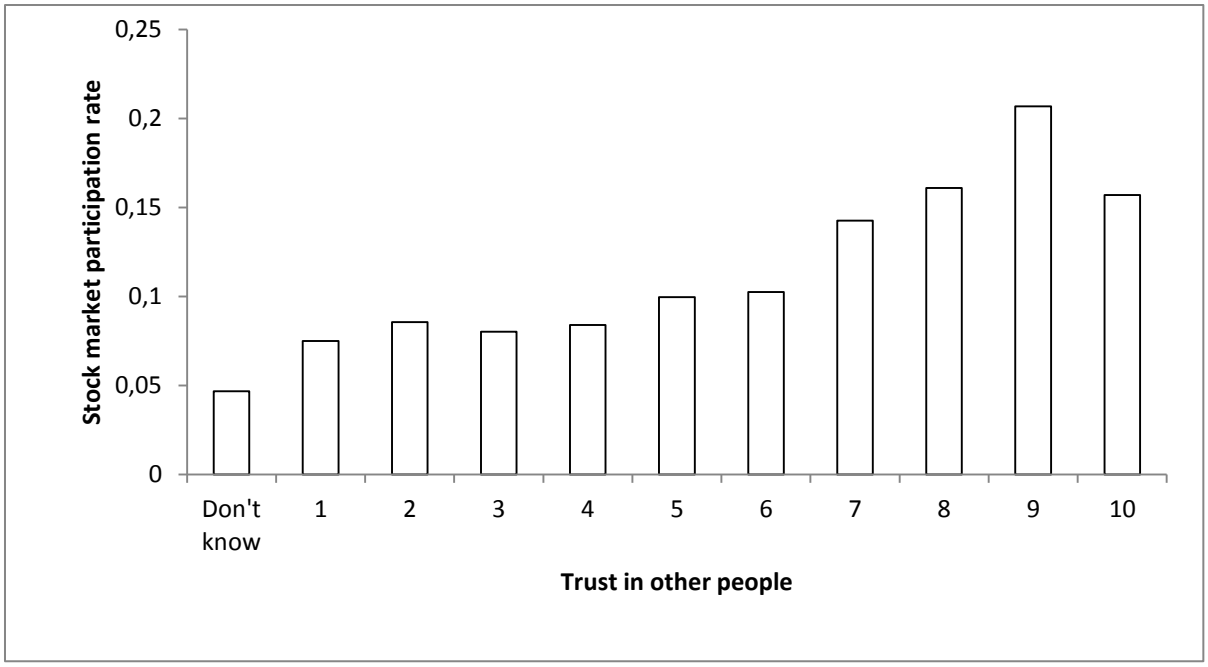


Figure 8: Histogram of stock market participation rate at different levels of individual trust.

The histogram in Figure 8 clearly indicates that higher levels of individual trust correspond to a higher probability of holding stocks. Even if the pattern is not strictly increasing over the levels we observe that trust of 7 to 10 clearly exceeds the other levels. However, we notice that both trust levels 8 and 9 both exceeds the highest level of trust. Hence, it might be hard to say something about the differences between one level of individual trust and another. Further, interestingly individuals who answered "Don't know" have a lower participation rate than people with trust at the lowest level. However, there might be some uncertainty between these two rates since we know from Figure 7 that the frequencies of the trust level 1 and those who answered don't know have fewest observations.

5. Econometric analysis

5.1 The model

In the models we use direct ownership of stocks as response variable. We use it as a binary variable, which means that an individual can either own stocks ($Y = 1$) or not own stocks ($Y = 0$). When estimating a model with binary outcome the two most common models are the probit and the logit models. The probit model incorporates a standard normal distribution while the logit model incorporates a logistic distribution. The two models are equal in many

aspects, but one difference is that the logistic distribution has fatter tales. However, it is hard to justify one of these two models over the other on theoretical grounds. (Greene, 2012)

Without further motivation we choose the logit model for the econometric purpose. By gathering all explanatory variables in vector **x** the logistic distribution can be defined as follows:

$$Prob(Y = 1|\mathbf{x}) = \frac{\exp(\mathbf{x}'\boldsymbol{\beta})}{1 + \exp(\mathbf{x}'\boldsymbol{\beta})}, \qquad (1)$$

where the vector **β** contains the parameters that reflect how a change in the corresponding explanatory in vector **x** affect the response variable. By setting $Prob(Y = 1|\mathbf{x})$ to p we rearrange equation (1) to the logit link function which describes our model as follows:

$$ln\left(\frac{p}{1-p}\right) = \mathbf{x}'\boldsymbol{\beta} \qquad (2)$$

The model described by equation (2) is a type of generalized linear model (GLM). The estimates of **β** is obtained by maximum likelihood estimation (MLE), which finds the values of vector **β** that fit best for the given data. The estimates of vector **β,** presented in next section in Table 4 and 5, show the variables effect on the log odds quota, $ln\left(\frac{p}{1-p}\right)$. Further, we also present in the same tables how **x** affect the odds ratio, $\frac{p}{1-p}$, in the tables of the estimates. When measuring the goodness of fit in a GLM, like the logit model, Pseudo R^2 (also known as the likelihood ratio index) is a possible method. The index is computed as follows:

$$Pseudo\ R^2 = 1 - \frac{\ln(L)}{\ln(L_0)},$$

where $\ln(L)$ is the log-likelihood for the estimated model and $\ln(L_0)$ is the log-likelihood for the same model, but only with a constant term.

For the models estimated in next section the vector **x** consists of some dummy variables. The factors optimism and the level specific version of individual trust have 4 respective 11 categories of answers. In those cases we exclude one dummy variable from each to avoid the dummy variable trap; by including all dummy variables for these we would obtain perfect multicollinearity. For optimism we choose to drop the variable "Never looks bright on future" and for the level specific individual trust we have chosen to drop "Trust=1". Thereby, the

coefficient estimates of the other categorical dummy variables use the dropped one as reference.

5.2 Empirical results

This section presents the results of the logit models. For readers not familiar with the logit model the appendix presents estimates from the ordinary least square method. In this section we present both the result from the logit models with all variables included, but also in reduced forms, where the variables household income and years of education are excluded. The estimates from the first model, which use a high trust dummy, can be observed in Table 3, whilst the results of the second model, with trust level specific dummies, can be observed in Table 4. In Table 3 and 4 the standard errors of the coefficients are reported in parenthesis, while *** indicates the estimate of the coefficient in the model is different from zero at the 1% level, ** at the 5% level, and * at the 10% level. Moreover, the odds ratio reported in Tables 3 and 4 is just a transformation of the coefficients of the logit model, hence its level of significance is identical to the logit coefficients'.

Table 3: Estimates from the first model.

	Model 1 (High trust dummy)			
	The full model		The reduced model	
	Coefficient	Odds ratio	Coefficient	Odds ratio
Financial wealth	0.0057***	1.0057	0.0053***	1.0053
	(0.0004)		(0.0002)	
Household income	-0.0016	0.9984	-	-
	(0.0032)			
Age	0.0586	1.0603	-0.0965***	1.1014
	(0.0510)		(0.0301)	
Age^2	-0.0004	0.9996	-0.0007***	0.9993
	(0.0004)		(0.0002)	
Male	0.5288***	1.6970	0.5736***	1.7746
	(0.0780)		(0.0467)	
Number of kids	0.0000	1.0000	-0.0442**	0.9567
	(0.0302)		(0.0169)	
Years of education	0.0644***	1.0660	-	-
	(0.0102)			
High trust	0.3325***	1.3944	0.2202***	1.2463
	(0.0825)		(0.0468)	

(continued)

Table 3: *Continued.*

CPI	0.0466*** (0.0039)	1.0477	0.0464*** (0.0020)	1.0475
Optimism				
Future often looks good	0.5272* (0.2730)	1.6942	0.8929*** (0.1533)	2.4421
Future sometimes looks good	0.3967 (0.2738)	1.4868	0.7709*** (0.1532)	2.1617
Future rarely looks good	0.1053 (0.2929)	1.1111	0.4464** (0.1624)	1.5626
Attended social event	0.3086*** (0.0864)	1.3616	0.4595*** (0.0486)	1.5833
Model diagnostics	Psuedo R^2 = 0.1951 (N=6947)		Psuedo R^2 = 0.1918 (N=26266)	

In Table 3 we observe that the control variables: financial wealth, male, future often look good and attended social event show a positive relationship with the response variable in both of the models. Further, years of education are also significant at a 1% level. These results are all in line with previous studies mentioned in chapter 2. Further, we also observe that both the individual trust variable, high trust, and the institutional proxy variable, CPI, are positive and different from 0 at a 1% significance level in both of the full and reduced model. Moreover we also notice that dropping the two variables with most missing observation increases the number of observations more than threefold from 6947 to 26266.

Table 4: Estimates from the second model.

	Model 2 (Trust level specific dummies)			
	The full model		The reduced model	
	Coefficient	Odds ratio	Coefficient	Odds ratio
Financial wealth	0.0057*** (0.0004)	1.0057	0.0053*** (0.0002)	1.0053
Household income	-0.0017 (0.0032)	0.9983	-	-
Age	0.0575 (0.0510)	1.0592	0.0961*** (0.0301)	1.1008
Age^2	-0.0004 (0.0004)	0.9996	-0.0007*** (0.0002)	0.9993
Male	0.5343*** (0.0782)	1.7063	0.5787*** (0.0448)	1.7838

(continued)

Table 4: *Continued.*

Number of kids	0.0005 (0.0303)	1.0005	-0.0447** (0.0169)	0.9563**
Years of education	0.0637*** (0.0103)	1.0657	-	-
Level of individual trust				
Trust 10	0.6571 (0.4270)	1.9293	0.6008** (0.2832)	1.8236
Trust 9	0.6193 (0.4241)	1.8577	0.7443** (0.2808)	2.1050
Trust 8	0.5967 (0.4134)	1.8160	0.6123** (0.2751)	1.8446
Trust 7	0.5568 (0.4146)	1.7450	0.5519** (0.2756)	1.7366
Trust 6	0.0685 (0.4285)	1.0709	0.2922 (0.2810)	1.3394
Trust 5	0.3491 (0.4161)	1.4178	0.4577* (0.2756)	1.5805
Trust 4	0.3091 (0.4447)	1.3623	0.2939 (0.2908)	1.3417
Trust 3	0.3312 (0.4465)	1.3927	0.3967 (0.2912)	1.4869
Trust 2	0.2011 (0.4759)	1.2227	0.5350* (0.3012)	1.7074
Don't know	0.5710 (0.8885)	1.7700	-0.1391 (0.6726)	0.8701
CPI	0.0461*** (0.0039)	1.0472	0.0461*** (0.0020)	1.0471
Optimism				
Future often looks good	0.5324 * (0.2739)	1.7030	0.8902*** (0.1536)	2.4355
Future sometimes looks good	0.4059 (0.2746)	1.5007	0.7721*** (0.1535)	2.1642
Future rarely looks good	0.1093 (0.2932)	1.1154	0.5576*** (0.1625)	1.5646
Attended social event	0.3148*** (0.0866)	1.3700	0.4612*** (0.0487)	1.5860
Model diagnostics	Psuedo R^2 = 0.1958 (N=6947)		Psuedo R^2 = 0.1926 (N=26266)	

Level of significance: ***=1%, **=5%, *=10%

By comparing the results of the second model in Table 4 to the corresponding ones in the first model in Table 3 we notice that the same control variables show significance in both of the models. Further, years of education are also significant in the full version of the second model. We also notice that the CPI is significant that the 1% level in both models. However, when using dummies for different levels of individual trust, we notice that it is just significant in the reduced version of the second model in Table 4. This might occur due to fewer observations for each level of trust, compared to when we collect the levels 7 to 10 into a high trust dummy, like in the Table 3. The full model only contains around 11% of the total number of survey participants. Hence, it might be reasonable to observe the reduced model rather than the full one when dividing the individual trust measure into level specific dummy variables. However, omitting variables, such as household income and education, can possibly cause a bias in the estimates of the models, making them less reliable.

5.3 Marginal effects

By observing the Table 3 and 4 we were able to determine to which extent the variables affect the log odds ratio or the odds ratio. However, based on that information, we are not able to make good interpretations how the variables affect the probability of owning stocks. Hence, we include marginal effects. The marginal effects are calculated as partial derivatives. We take the derivative on the probability of owning stocks with respect to a specific explanatory variable, while the other variables are held constant at their mean value. In the case of dummy variables the partial derivative is approximated by a discrete change of the variable from 0 to 1. The predicted value of the response variable in Table 5 is the predicted probability of owning stocks when the variables in the **x**-vector of the model are at their mean values. Table 5 presents estimates of the marginal effects for the both full and reduced versions of the first and the second model, estimated in the previous section.

Table 5: Estimates of marginal effects.

	Marginal effects $\left(\frac{\partial y}{\partial x_i}\right)$			
	The first model		The second model	
	Full model	Household income and education excluded	Full model	Household income and education excluded
Predicted value of response variable	0.0939	0.0673	0.0939	0.0672
Financial wealth	0.0005*** (0.0000)	0.0003*** (0.0000)	0.0005*** (0.0000)	0.0003*** (0.0000)
Household income	-0.0001 (0.0003)	-	-0.0001 (0.0003)	-
Age	0.0050 (0.0043)	0.0061*** (0.0019)	0.0049 (0.0043)	0.0060*** (0.0019)
Age^2	-0.0000 (0.0000)	-0.0000*** (0.0000)	-0.0000 (0.0000)	-0.0000*** (0.0000)
Male	0.0455*** (0.0068)	0.0377*** (0.0031)	0.0459*** (0.0068)	0.0380*** (0.0031)
Number of kids	-0.0000 (0.0026)	-0.0028*** (0.0011)	0.0001 (0.0026)	-0.0028*** (0.0011)
Years of education	0.0054*** (0.0009)	-	0.0054*** (0.0009)	-
High trust	0.0283*** (0.0071)	0.0139*** (0.0030)	-	-
Level of individual trust				
Trust 10	-	-	0.0705 (0.0562)	0.0474* (0.0275)
Trust 9	-	-	0.0653 (0.0542)	0.0621** (0.0301)
Trust 8	-	-	0.05890 (0.0470)	0.0456* (0.0241)
Trust 7	-	-	0.0547 (0.0467)	0.0406* (0.0236)
Trust 6	-	-	0.0060 (0.0381)	0.0202 (0.0214)
Trust 5	-	-	0.0323 (0.0419)	0.0320 (0.0215)
Trust 4	-	-	0.0294 (0.0470)	0.0206 (0.0227)
Trust 3	-	-	0.0317 (0.0477)	0.0290 (0.0245)

(continued)

Table 5: *Continued.*

Trust 2	-	-	0.0184 (0.0469)	0.0416 (0.0285)
Don't know	-	-	0.0610 (0.1161)	-0.0082 (0.0374)
CPI	0.0040*** (0.0003)	0.0029*** (0.0001)	0.0039*** (0.0003)	0.0029*** (0.0001)
Optimism				
Future often looks good	0.0467* (0.0252)	0.0632*** (0.0121)	0.0472* (0.0253)	0.0629*** (0.0121)
Future sometimes looks good	0.0353 (0.0255)	0.0536*** (0.0117)	0.0362 (0.0256)	0.0536*** (0.0117)
Future rarely looks good	0.0092 (0.0264)	0.0316** (0.0129)	0.0096 (0.0265)	0.0317** (0.0129)
Attended social event	0.0263*** (0.0074)	0.0296*** (0.0032)	0.0277*** (0.0074)	0.0299*** (0.0032)

Level of significance: ***=1%, **=5%, *=10%

By observing the full models we notice that the marginal effects are similar between the first and second model. With respect to the similarity we now interpret the effects of the variables in the full version of the first model, which can be seen as representative for both of the full models (except for individual trust). In Table 5 the following variables constituent show significance at the 1% level: financial wealth, male, years of education, high trust, CPI and attended social event. We relate the marginal effect of the variables to the predicted mean of response variable ($\hat{y}$) as follows:

$$Change\ in\ percent\ of\ probability\ of\ holding\ stocks = \frac{\left(\partial y / \partial x_i\right)}{\hat{y}}, \qquad (3)$$

where $\frac{\partial y}{\partial x_i}$ corresponds to the marginal effects which is the change in percentage points in y when x_i changes. By using equation (3) we obtain the effect in percentage instead of percentage points when x_i changes. When making interpretations of the marginal effects we remind ourselves that the effects are estimated when the variables are held at their mean value, thereby consider some caution due to non linearity.

By using equation (3) for the first model (all variables included) we provide the following interpretations for the variables with marginal effects significant at the 1% level:

- Increasing the financial wealth by €1000 increases the probability of holding stocks by 0.52%
- Men are 48.46% more likely to hold stocks than women.
- Increasing the years of education by one year increases the probability of holding stocks by 5.79%
- Individuals with high trust in other people are 30.09% more likely to hold stocks than people with low, medium or do not know their level of trust.
- If the institutional trust proxy (CPI) increases by one unit it increases the probability of holding stocks by 4.22% for an individual in that specific country.
- Individuals who attended at least one social event last year are 27.98% more likely to hold stocks than individuals who did not attend any event last year.

With some caution, due to the lower level of significance, we can also interpret the effect of optimism in the first model (all variables included):

- Individuals who often think that the future looks good are 49.75% more likely to hold stocks than individuals who never think the future looks good.

With respect to one of the purposes of this paper, to develop the individual trust measure, we choose to interpret the significant dummy variables of individual trust in the reduced version of the second model. All of the following percentages are compared to the probability of owning stocks when the individuals have the lowest value of trust, 1, which is also the reference dummy:

- Individuals with trust level of 10 are 71.61% more likely to hold stocks.
- Individuals with trust level of 9 are 92.49% more likely to hold stocks.
- Individuals with trust level of 8 are 67.82% more likely to hold stocks.
- Individuals with trust level of 7 are 60.49% more likely to hold stocks.

Considering the risk of bias that may occur from omitting variables the interpretations from the reduced model should be taking with some caution.

6. Conclusions

The 15 countries we have examined have shown that the stock market participation rate, among individuals aged 50 and above, varies a lot between countries. Besides, stock market participation even varies between countries with the same level of wealth. We have both shown and confirmed that trust, both individual and institutional, varies between countries. Further, we have also shown that both of types of trust are useful vehicles to explain cross country variation in stock market participation. In fact, the average values for trust in countries are a lot better predictors for stock market participation rate than GDP per capita.

When it comes to trust on an individual level the most robust result is that high trust (level 7-10) is strongly positively correlated with stock market participation. Both versions of the first model with the high trust dummy and the reduced version of the second model support that. In addition, the illustration in the EDA of participation rates among different levels of trust was also able to confirm that result. The interpretation of the marginal effect of trust from the first model was that individuals with high trust in other people were approximately 30% more likely to hold stocks. However, even if the result is strong it is not as strong as GSZ's result of 50% in their corresponding measure. The discrepancy of the results might be due to differences in definitions of high trust or due to the different data materials.

When it came to differences between different levels of individual trust we showed that the effects between specific levels are sometimes hard to distinguish. Further, when examining institutional quality we have been able to confirm studies like Asgharian, Liu and Lundtofte (2014) by showing that CPI had a significant impact on stock market participation. The interpretation of the marginal effects was that increasing the CPI by one unit increases the probability of individuals in that country to hold stocks by 4.25%. The results of this study should be studied by policy makers who wish to promote stock holding in their country. Based on the results, we suggest that one way to improve trust is to increase transparency in financial and governmental institutions.

Moreover, we conclude that it is reasonable to divide trust into an idiosyncratic part that all individuals within a country face and an individual specific part. Except the focus variables of trust we have confirmed earlier studies by showing evidence that variables such as male, years of education, optimism and social individuals all have a positive impact on stock market participation. For further research of the impact of trust on stock market participation we

suggest further development by using new versions of the trust measures to validate and develop the findings of this study.

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Appendix

Table 6 presents estimates obtained by the ordinary least squares method. When using the estimation method ordinary least squares with a binary response variable we have to be aware of that the results is not it as correct as the estimates from the logit model.

Table 6: Estimates from the ordinary least squares method

	Ordinary least squares			
	The first model		The second model	
	Full model	Household income and education excluded	Full model	Household income and education excluded
Financial wealth	0.0008***	0.0008***	0.0008***	0.0008***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Household income	-0.0002	-	-0.0002	-
	(0.0003)		(0.0003)	
Age	0.0073	0.0072***	0.0074	0.0071***
	(0.0048)	(0.0022)	(0.0048)	(0.0022)
Age^2	-0.0001	-0.0001***	-0.0001	-0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Male	0.0510***	0.0462***	0.0519***	0.0467***
	(0.0078)	(0.0036)	(0.0078)	(0.0036)
Number of kids	0.0010	-0.0027**	0.0008	-0.0027**
	(0.0030)	(0.0013)	(0.0030)	(0.0013)
Years of education	0.0064***	-	0.0063***	-
	(0.0010)		(0.0010)	
High trust	0.0404***	0.0223***	-	-
	(0.0081)	(0.0036)		
Level of individual trust				
Trust 10	-	-	0.0651*	0.0332**
			(0.0348)	(0.0164)
Trust 9	-	-	0.0702**	0.0566***
			(0.0344)	(0.0165)
Trust 8	-	-	0.0529	0.0343*
			(0.0322)	(0.0154)
Trust 7	-	-	0.0412	0.0248
			(0.0323)	(0.0154)
Trust 6	-	-	-0.0021	0.0041
			(0.0331)	(0.0157)
Trust 5	-	-	0.0164	0.0152
			(0.0320)	(0.0152)
Trust 4	-	-	0.0158	0.0053
			(0.0348)	(0.0163)

(continued)

Table 6: *Continued.*

Trust 3	-	-	0.0182 (0.0345)	0.0124 (0.0164)
Trust 2	-	-	0.0109 (0.0363)	0.0186 (0.0173)
Don't know	-	-	0.0436 (0.0862)	-0.0162 (0.0395)
CPI	0.0030*** (0.0003)	0.0030*** (0.0001)	0.0030*** (0.0003)	0.0030*** (0.0001)
Optimism				
Future often looks good	0.0288 (0.0188)	0.0380*** (0.0075)	0.0288 (0.0189)	0.0376*** (0.0075)
Future sometimes looks good	0.0085 (0.0184)	0.0232*** (0.0072)	0.0101 (0.0185)	0.0236*** (0.0073)
Future rarely looks good	-0.0069 (0.0195)	0.0088 (0.0076)	-0.0064 (0.0195)	0.0090 (0.0076)
Attended social event	0.0317*** (0.0086)	0.0376*** (0.0038)	0.0324*** (0.0086)	0.0376*** (0.0038)
Model diagnostics	R^2=0.1657 (N=6947)	R^2=0.1565 (N=26266)	R^2=0.1664 (N=6947)	R^2=0.1572 (N=26266)

Level of significance: ***=1%, **=5%, *=10%