# Who's listening? Heterogeneous Impact of Social Interaction on Individuals' Stock Market Participation

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**ABSTRACT**

Novel evidence is provided indicating that the influence from family (parents and partners) and peer social interaction on individuals' stock market participation vary over different types of individuals. Focusing on distinct features of concern for the social interaction process, results imply that individuals' exposure to, and valuation of, stock market related social signals are of importance and thus, contribute to the understanding of the heterogeneous influence of social interaction. Overall, the results are interesting and enhance the understanding of the underlying mechanisms of social interaction on individuals' financial decision making.

**JEL Classification**: G02, G11, D03, D14, D83

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"*Listen to your elder's advice, not because they are always right, but because they have more experience of being wrong*" -Unknown

## 1. Introduction

Economists have for long noticed that individuals do not make decisions in isolation from others.[1] In contrast to assumptions in standard portfolio choice models, individual investors are seldom fully informed, but often rely on various types of information.[2] A central mechanism in individuals' collection of information is through interaction with the social environment. Individuals share information and observe the behavior of others and are influenced by others' behavior in their own decision making. Evidence of social influence is, for example, given in a growing literature concerning individuals' stock market participation. While this literature document evidence on both community and family influence (e.g. Duflo and Saez, 2002; Hong et al., 2004; Brown et al., 2008; Kaustia and Knüpfer, 2012; Li, 2014; Hellström et al., 2013), less is known about how the impact differs over different types of individuals.

In this paper we provide novel evidence on the effect of social interaction and in particular, the heterogeneity in the impact of social interaction on individuals' decisions to own stocks.[3] In the study, we include both family (parents and partner), as well as peers in the social environment, and their influence on individuals' stock market participation. We argue that social interaction effects are broadly characterized along two potentially important dimensions. First, whether individuals are influenced by social interaction or not depends on to what degree individuals are exposed to stock market related signals, i.e. if individuals in their social environment talk about investments and in particular the stock market. Differences in the structure of individuals' social environment (family and peers), i.e. the types of individuals that they socialize with, may then potentially lead to heterogeneity in the impact of social interaction on stock market behavior. Second, conditional on being exposed to stock

[1]Research has found evidence on social influence and learning in a number of areas, e.g. labor market participation of married women (Woittiez and Kapteyn, 1998), use of welfare benefits (Bertrand, Luttmer and Mullainathan, 2000), pension plan participation (Duflo and Saez, 2002), and stock market trading (Shive, 2010).

[2] From a bounded rationality perspective (Simon, 1957) individuals gather some (but not all) information, analyze using heuristics, and "satisfice" rather than optimize, when making decisions. In terms of information, Ellison and Fudenberg (1995, p. 93) note that individuals' must often "rely on whatever information they have obtained via casual word-of-mouth communication".

[3] An individual's decision to own stocks has received ample attention, both empirical and theoretical, over the last decade (e.g. Mankiw and Zeldes, 1991; Haliassos and Bertaut, 1995; Cocco et al., 2005; Guiso and Jappelli, 2005; Brown et al., 2008; Kaustia and Knüpfer, 2011; Grinblatt et al., 2011). The so called non-participation puzzle, i.e. the observation that large parts of the population do not own stocks, has been shown to have important implications for individuals' welfare (e.g. Cocco et al., 2005) and for the explanation of the equity premium puzzle (e.g. Mankiw and Zeldes, 1991). Hence, we focus on direct ownership in this study. Indirect ownership, i.e. holdings in equity mutual funds, is left for future research.

market related signals, individuals' valuation of these are crucial for whether they will have an impact on their subsequent behaviors. For example, whether an individual will act on socially obtained information is likely to depend on whether the individual understands and trusts the obtained signal. Differences in individuals' level of financial literacy and interpersonal trust may therefore lead to further heterogeneity in the impact of social interaction on individuals' participation.[4]

The main results of the paper do, indeed, confirm that the influence of social interaction on participation is different for different types of individuals. Notably, our results, using individual characteristics as indicators (c.f. Lazarsfeld and Merton, 1954; McPherson et al., 2001), suggest that both exposure, as well as individuals' valuation of signals, matter in the understanding of heterogeneous influence of social interaction on participation.[5] Among results, we highlight that mainly individuals with a relatively higher wealth, compared to low-wealth individuals, are affected by both parental and peer (community members) social influence. This likely reflects that relatively more wealthy individuals are more likely to socialize with other wealthy individuals (i.e. parents and peers), thereby to a larger extent exposing themselves towards stock market related signals. Similarly, we find that males (on average more exposed towards stock market related signals than females, given their higher propensity to socialize with other men, in turn more likely to be engage in financial activity) are affected by peer influence, but females are not. Moreover, we find that both male and females are influenced by parental social interaction.

In regard to the valuation of stock market related signals, the results indicate that an individual's likelihood to participate is affected by parental and partner social interactions, mainly for individuals with relatively higher (compared to lower) interpersonal trust in family and friends. Results for peer social influence on the matter is somewhat mixed. Furthermore, an individual's level of financial literacy is found to be of significant importance. While individuals with relatively higher (compared with lower) financial literacy are affected by parental (and tentatively partner) social interaction, individuals with relatively lower (compared to higher) levels of financial literacy are affected by community interaction. A potential explanation to these results is that an individual's level of financial literacy mirror

[4] Although our study is explorative in nature and we lack detailed data to explicitly test the link between individual characteristics and the underlying social interaction mechanisms (i.e. the exposure towards social signals and the valuation of these), we prefer thinking of the considered individual characteristics as broadly reflecting these channels as a way of systemizing, rather than considering a random chosen set of individual characteristics.

[5] Note here, that given our data we do not claim or attempt to empirically identify these mechanisms in detail. Rather, our objective is, based on individual characteristics, to find evidence broadly consistent with these explanations.

both the potential to value socially obtained signals (mainly explaining community effects), as well as capturing with whom they socialize (parental effect). Overall, the results suggest that both interpersonal trust and an individual's level of financial literacy are of importance in the understanding of social influence on individuals' financial behavior.

The evidence provided within the paper has been obtained by analysis of an extensive and detailed data set including two full cohorts of Swedish individuals, and information about their parents, partners, as well as a large number of controls, e.g. detailed information about financial holdings, personal income, wealth, marital status, and education. In the study, identification of heterogeneous social interaction effects utilizes the detailed data on stock holdings for individuals, their parents, and partners. In the outcome based approach, e.g. Kaustia and Knüpfer (2012) and Hellström et al. (2013), one-year-lagged portfolio outcomes among family and community members are assumed to form time-varying family and a community sentiments towards stock investments, shared or observed by individuals through social interaction after including various controls for background characteristics.[6] Recent positive experiences (portfolio outcomes) among parents, partners, or community members are then assumed to encourage, while negative experiences (portfolio outcomes) discourage, individuals' subsequent participation.[7] Hence, we follow earlier studies and focus solely on direct ownership through stocks, and not holdings in equity mutual funds (e.g. Kaustia and Knüpfer, 2012; Li, 2014).

To study the potential heterogeneous effects from social interaction, the outcome based stock portfolio measures are interacted with the considered background characteristics. Given that the identification is conditioned on a large number of individual and community control variables, both in terms of observables and time-fixed community effects capturing unobserved heterogeneity, we consider results to pertain to social interaction effects rather than to alternative competing mechanisms. The results have been challenged by various robustness tests and been found to hold.

Our results are interesting for a number of reasons: First, they contribute with empirical evidence to a nascent literature focusing on the role of the microstructure, i.e. the underlying determining mechanisms, of social transactions for individuals' financial behavior (Hirshleifer, 2014). This is important since empirical economic research on the underlying

[6] Outcome-based social learning has theoretically been modeled by e.g. Ellison and Fudenberg (1993, 1995), McFadden and Train (1996), Persons and Warther (1997), Banerjee and Fudenberg (2004), and Cao et al. (2011). Empirical research on the issue is still, however, limited. Munshi (2004) and Kaustia and Knüpfer (2012) are two exceptions.

[7] A more detailed discussion about our identification of social interaction effects are given in Section 3.2 and 3.3.

mechanisms of social transmissions is largely missing.[8]; Second, they contribute to research on diffusion of financial information (see e.g. Shiller and Pound, 1989; Ivkovic and Weisbenner, 2007) and herding behavior (see e.g. Devenow and Welch, 1996; Choe et al., 1999; Kumar and Lee, 2006; Barber et al., 2009) among individual investors. Knowing who among individuals that are relatively more affected by social interaction effects potentially indicate through whom financial information is most likely to be spread, and also among whom a mimicking behavior is most likely to be adopted.[9]; Third, given that social interaction may amplify effects of underlying structural changes, i.e. work as a social multiplier (see e.g. Hong et al., 2004), understanding who among investors are affected by social interaction will help in predicting changes through this mechanism. Systematical differences in, for example, interpersonal trust and financial literacy between individuals in different regions may then explain a diverse development of social multiplier effects and stock market participation rates between countries or regions.[10]; Fourth, they provide a deeper understanding of what influences individuals' beliefs about asset returns and risks. Given that individuals in surveys, e.g. van Rooij et al. (2011), indicate that parents, friends, and acquaintances are one of the most important sources for advice concerning important financial decisions, our results about heterogeneity in the impact of social influence indicate potentially important differences in the use of socially obtained information in individuals' belief formation.; Finally, they provide evidence on an indirect channel through which characteristics matter for individuals' participation. For example, while trust (e.g. Guiso et al., 2008; Georgarakos and Pasini, 2011), financial literacy (e.g. Van Rooij et al., 2011), and gender (e.g. Van Rooij et al., 2011; Halko et al., 2012) previously have been found to be of direct importance, our results indicate that these characteristics also have important secondary roles in explaining differences in the impact of social interaction, for participation.[11]

The rest of the paper is organized as follows. In Section 2, we discuss motivations for heterogeneous influence of social interactions. In Section 3, the data for our main analysis is

[8] An exception is Han and Hirshleifer (2014), who model social transmission biases, empirically documented in e.g. Kaustia and Knüpfer (2012) and Hellström et al. (2014).

[9] Understanding the mechanisms behind herding is important. Demarzo et al. (2004) show theoretically that even small groups of individuals influenced by behavioral biases may through community herding (amplifying the effects of the bias) have a large impact on equilibrium outcomes and drive prices of assets up in a way that is unrelated to aggregate consumption risk.

[10] For example, a structural change lowering fixed participation costs may, apart from the direct effect, lead to stronger social multiplier effects and through that to a relatively stronger increase in participation rates in high trusting regions compared to that in low trusting regions.

[11] For example, our results for gender differences in impact of social interaction on participation are interesting and contribute to the recent literature (e.g. Corson and Gneezy, 2009) studying the underlying mechanisms for differences in gender financial risk taking.

presented along with the empirical model and details about the measurement of variables. Section 4 contains our empirical analysis, while Section 5 outlines our conclusions.

## 2. Motivations for heterogeneous impact of social interaction

Social interaction is, in general, defined as a mechanism for information sharing, either by means of word-of-mouth communication or through observational learning (Banerjee, 1992; Bikhchandani et al., 1992; Ellison and Fudenberg, 1993, 1995). A link between individuals' stock market participation decision and its social environment may then be motivated by either (i) a lowering of fixed non-monetary participation costs (see e.g. Vissing-Jorgensen, 1999) through social learning, (ii) a desire to be included in a social context and follow social norms (e.g. Hong et al. 2004), and/or (iii) a "keeping/catching up with the Joneses" effect for individuals striving to maintain a similar level of consumption as their social group (Abel, 1990; Bakshi and Chen, 1996; DeMarzo et al., 2004).

The effects of social interaction, both within-family and within the peer group, on an individual's financial decisions are, however, likely to differ between different individuals. For example, informational constraints or bounded rationality imply that individuals may use different sources of information in their formation of subjective stock market expectations.[12] Taking this view, it is thus plausible to assume that individuals in their formation about stock market expectations are affected by influence obtained through social interaction at differing degrees. Two central features determining whether individuals are affected by social interaction are the individuals exposure to stock market related signals and the individuals' valuation of these. Given our main interest, to characterize who among individuals are affected by social interaction, we focus our main analysis on separating effects based on heterogeneity in individual characteristics, i.e. income, wealth, gender, level of interpersonal trust, and financial literacy. Below we argue that these individual characteristics broadly reflect with whom individuals socialize, as well as capture aspects of the valuation of stock market related signals.

### 2.1 Exposure to stock market related signals

To what extent individuals are exposed to stock market related signals will depend on how frequent and with whom the individuals' socialize. In regard to the first Hong et al. (2004), for example, separate investors between "socials" and "non-socials" and find evidence indicating

[12] Manski (2004, p. 1354) do, for example, state: "*The empirical existence of such strong heterogeneity in investments expectations runs counter to the usual rational expectations assumption that all persons access and process public information in the same way".* This proposition is supported by earlier work by, for example, Harris and Raviv (1993), Kandel and Pearson (1995) and Morris (1995), but also by more recent in behavioral finance, see e.g. Daniel et al. (2002).

that more social individuals to a larger extent participate in the stock market. In regard to the second (focused in the current study), individuals socializing with family and peers that own and/or are interested in stocks are more likely to also be exposed to relevant signals which may affect their decision to participate.

Given our focus on characterizing social interaction effects based on individuals' characteristics, we argue here that an individual's gender, income, and wealth, broadly reflect with whom individuals socialize. Of course other characteristics could be of importance in this context, but the chosen characteristics are likely to be highly correlated with characteristics such as interests and profession etc. This focus is motivated in terms of parents, since individuals inherit common genetic features and throughout early life are socialized by parents, rendering similarities in parental-child characteristics. For example, a large empirical literature in economics documents persistence in wealth, consumption, and schooling across generations. Mazumder (2005), for example, reports that in the United States the intergenerational elasticity of parents' lifetime earnings with respect to children's is 0.6. Although the respective contribution from inheritance of abilities (nature), family background (nurture), and economic policy in generating persistence, is subject to discussion and debate, studies have documented a high correlation between parents (both fathers and mothers) and children's cognitive and non-cognitive (psychological) abilities (e.g. Black et al., 2009; Björklund et al., 2009; Grönqvist et al., 2010; Anger, 2012). Results in Hanes and Norlin (2011) and Lindqvist and Vestman (2011), further provide evidence that cognitive and non-cognitive ability predict individuals' labor market outcomes, e.g. wage. Thus, characterizing an individual based on income and wealth is likely, at least broadly, to mirror the characteristics of its parental social environment.

In terms of partner, one may motivate that individual characteristics reflect the characteristics of one's partner by resorting to a positive assortative matching mechanism (e.g. Lam, 1981) sorting individuals into homogeneous couples. Pencavel (1998) and Schwartz and Mare (2005) do, for example, point out that the proportion of couples with the same level of schooling has been growing over the past few decades. Eika et al. (2014) provide evidence that this trend is partly driven by an assortative matching mechanism. Studies in genetics and psychology, further, document a positive assortative matching of both anthropometric and psychometrical traits (e.g. Vandenberg, 1972), and in regards to IQ (e.g. Mascie-Taylor and Vandenberg, 1988), as well as personality (weaker evidence). Thus, a relatively higher individual income and wealth is broadly, all else equal, interpreted as having

a partner with a higher income and wealth, indicating a larger exposure towards partner related stock market signals.

Individual characteristics are also likely to indicate with whom individuals socialize outside the family. Social groups are formed with similar others (e.g. Baccara and Yariv, 2013), i.e. individuals exhibit homophily (Lazarsfeld and Merton, 1954), indicating that individuals with similar wealth and income are more likely to belong to the same peer group. Individuals with relatively higher income and wealth are, thus, all else equal, more likely to socialize with peers with relatively higher income and wealth, which in turn are more likely to own stocks. Those individuals are then more likely to be exposed to socially shared stock market information.

One may also hypothesize that an individual's social identity and interests are of key importance for whether stock market related information is discussed and shared in one's social environment. An important part of an individual's personality and social identity is its gender. Since individuals often socialize with others based on similarities in interests, values or attitudes, it is reasonable to assume that males (females), on average, are relatively more likely to socialize with other males (females). Given that males usually are found to be more active in financial markets (e.g. Barber and Odean, 2001), it is likely that males socializing with other men, all else equal, to a larger extent is exposed to stock market related signals. That males are more active in financial markets is motivated by the large number of papers finding systematical differences in observed choices of risky assets between genders, e.g. Haliassos and Bertaut, (1995), Sundén and Surette (1998), Barber and Odean (2001), Dwyer et al. (2002), Van Rooij et al. (2011), Halko et al. (2012).

### 2.2 Valuation of stock market related signals

Conditional on the exposure towards stock market related signals, the individual's valuation of these will matter for whether they will affect the subsequent behavior. If the individual, for example, trusts the information, i.e. finds it highly reliable, it is more likely that it affects the individual's subsequent decisions. To what extent financial signals are found reliable is likely to depend on, among other factors, the nature of the information, the individual's availability of other information, the ability to process and value such information, as well as to what extent the individual trusts the sender transmitting the information. In the paper we therefore suggest that interpersonal trust and financial literacy may be of key importance in the understanding of the heterogeneous impact of social influence on individuals' participation decision.

In terms of interpersonal trust, a high trusting individual is, all else equal, more likely to believe and act on signals received through social interaction than an individual with a low level of trust. That trust is of importance may further be motivated by means of observational learning since an individual may feel more confident in making financial decisions if peers, whom they trust, make similar decisions. Hence, an individual with a relatively higher level of interpersonal trust will then, all else equal, place a greater value on observed peer or family stock market related signals. An individual's level of interpersonal trust may, thus, strengthen or weaken the impact of social interaction on an individual's participation either through affecting the valuation of shared information or affecting an individual's self-confidence. Guiso et al. (2008) and Georgarakos and Pasini (2011) have previously demonstrated a direct effect from trust, or rather mistrust in financial markets, on individuals' decision to participate. Based on the above, the current paper suggests a potentially secondary channel through which trust (amplifying or weakening socially obtained signals) may matter for individuals' participation. While Guiso et al. (2008) and Georgarakos and Pasini (2011) focus on trust in financial systems, our focus is on trust at an individual interpersonal level. This perspective is related to that presented in Gennaioli et al. (2014), who consider investor trust in portfolio managers as a central factor in investors' decision to delegate portfolio management to professional managers.

Furthermore, highly financially literate individuals may be more exposed to stock market related signals since they discuss financial topics to a larger extent with their peers. However, they may also have a larger number of additional sources of financial information, as well as a higher ability to process signals (e.g. value the relevance of the information) obtained through social interaction in comparison with individuals with low financial literacy. It is, thus, likely that the relative importance of socially shared information differs depending on an individual's level of financial literacy. That financial literacy matters for the impact of social interaction is indicated by the data from the DNB Household Survey[13], reported by Van Rooij et al. (2011). On the question "What is your most important source of advice when you have to make important financial decisions for the household?" about 40 percent of individuals in the lowest quartile of financial literacy answered parents, friends, and acquaintances. The corresponding figure for individuals in the highest quartile of financial literacy was about 20 percent. These survey results, thus, imply that the effect of social interaction, both within family and peer, seem to be relatively stronger for individuals with relatively lower levels of

[13] The DNB Household Survey covers a representative sample of Dutch households.

financial literacy. An argument supporting this observation is that individuals with high levels of financial literacy may have better access to additional financial information making socially obtained information relatively less important.

In sum, in this section we argue that an individual's exposure towards, as well as, valuation of, stock market related signals are of key importance in the motivation and understanding of heterogeneous impact of social interaction on individuals' stock market participation. Characterizing potential heterogeneous social interaction effects over individuals' income, wealth, and gender are then likely to broadly capture important aspects connected to exposure toward both family and community or peer stock market related signals, while over individuals' level of interpersonal trust and financial literacy, broadly towards the valuation of these signals.

## 3. Sample, identification, and variable measurement

### 3.1 Sample and participation rates

The analysis is based on a sample derived from two full cohorts of Swedish residents, born in 1963 and 1973, observed over the period 1999-2007. Information on individual stock holdings are collected from both tax records, by Statistics Sweden, as well as from the Nordic Central Securities Depository Group (NCSD).[14] The latter plays an important role in the Nordic financial system and uphold an electronic database on the ownership of all Swedish stocks. The data include, for individuals, the ownership records of all stocks owned at the end of December and at the end of June each year, i.e. the data is recorded at 6-month intervals. Data on individuals other assets (mutual funds, bank holdings, real estate, and investments in debt securities), and taxable income are retrieved from the Swedish tax authorities, and are reported on an annual basis. Individual characteristics have been gathered over our sample period from Statistics Sweden.[15] Data belonging to individuals' parents, both during the observational period 1999 to 2007, as well as pertaining to the individuals' adolescence (at age 17-19), along with data for partners, if any, during 1999 to 2007 has also been collected.

All selected individuals have a partner in the main analysis, and their parents, not necessarily their birth-parents, are observed in the data set.[16] This condition is required since

[14] The official securities depository and clearing organization, NCSD (www.ncsd.eu), currently includes VPC and APK, the Swedish and Finnish Central Securities Depositories, to which all actors on the Nordic capital markets are directly or indirectly affiliated. NCSD is responsible for providing services to issuers, intermediaries and investors, as regards the issue and administration of financial instruments as well as clearing and settlement of trades on these markets.

[15] Individual characteristics are collected from the LISA database, Statistics Sweden.

[16] The sample with single individuals, i.e. those who lack a partner during the considered period, is analyzed in the robustness testing section at the end of the paper.

within-family social interaction effects are being examined. Parents are identified as observed adults registered on the same address as the individual (when the individual was 17-19 years old).[17] The proportion of individuals with a registered partner, spouse, or cohabite, increases from 22.9 to 60.6 percent during the observed time period. The most likely explanation for this large increase is the cohorts' relatively young age. A partner is a registered partner with whom the individual lives, i.e. including cohabiters with common children. Hence, if an individual changes marital status, and become single, they are excluded from the sample. However, they can reenter in a later time period if they get a partner later on. The selected sample consists of 366,897 observations, divided on 88,730 individuals, where the older cohort represents 53.89 percent of the observations.

In Table 1, stock market participation rates for the sample divided over years (Panel A) and group of individuals (Panel B) are displayed.

**Table 1: Stock market participation**

The table shows the stock market participation rates divided over years and for different groups of individuals. N= 366,897, n= 88,730. 53.89 percent of the observations belong to cohort 1 (born 1963), and 46.11 percent belong to cohort 2 (born 1973).

| Panel A | | | Panel B | | |
|---|---|---|---|---|---|
| Year | Stock market participation | s.d. | Group | Stock market participation | s.d. |
| *2001* | 25.6% | 0.436 | *Women* | 18.4% | 0.388 |
| *2002* | 24.7% | 0.432 | *Men* | 32.6% | 0.469 |
| *2003* | 23.1% | 0.421 | *Low Financial literacy* | 17.1% | 0.377 |
| *2004* | 25.4% | 0.435 | *Medium Financial literacy* | 25.1% | 0.434 |
| *2005* | 24.5% | 0.430 | *High Financial literacy* | 50.5% | 0.500 |
| *2006* | 26.1% | 0.439 | *Income group 1* | 16.2% | 0.369 |
| *2007* | 25.7% | 0.437 | *Income group 2* | 16.0% | 0.367 |
| Stock market participation, over all time periods | | | *Income group 3* | 20.7% | 0.405 |
| Main sample | Born 1963 | Born 1973 | *Income group 4* | 28.4% | 0.451 |
| 25.2% | 28.9 % | 21.2 % | *Income group 5* | 44.4% | 0.497 |
| | | | *Low wealth* | 13.6% | 0.343 |
| | | | *Medium wealth* | 19.4% | 0.394 |
| | | | *High wealth* | 38.4% | 0.486 |
| | | | *Non-European origin* | 23.3% | 0.423 |
| | | | *European origin* | 25.2% | 0.434 |

[17] Observed between the years 1980-1982 (1990-1992) for individuals born in 1963 (1973).

The average participation rate over the sample period is 25.2%, with an annual low in 2003 (23.1%) following the bust of the dot-com bubble during 2001. As a reference, the overall household participation rate in Sweden for the full population was 22.5% (Statistics Sweden) compared to the slightly higher 24.7% in our sample in 2002. As indicated, individuals born in 1963 are, on average, participating to a higher extent in the stock market compared to individuals born in 1973 (28.9% versus 21.2%). In Panel B, participation rates for selected groups are displayed. Notable, participation rates are higher for men than women, increases in individuals' level of financial literacy, and in disposable income, while slightly lower for individuals with non-European origin than European.

### 3.2 Identification of family and peer effects

The identification strategy must eliminate concerns about possible correlations driven by inherited or within family socially learnt behavior. To study family and peer social interaction effects on individuals' stock market participation an outcome based approach is therefore chosen (c.f. Kaustia and Knüpfer, 2012; Hellström et al., 2013). One year-lagged changes in parental, partner, and peer stock portfolio values are in this approach assumed to reflect either positive or negative stock market experiences, forming a time-varying family and peer sentiment towards stock investments.[18] Recent positive experiences (portfolio outcomes) shared through social interaction are then assumed to encourage, while negative experiences (portfolio outcomes) to discourage, individuals' subsequent behavior. Given that research indicate that individuals, in general, lack superior skills in achieving stock returns[19], i.e. that portfolio outcomes to a large extent are a product of exogenous stock performance, we regard the portfolio outcome based measures to be good exogenous instruments in identification of social interaction effects.[20]

To study to what extent there is a systematic difference in social interaction effects on individuals' participation over different groupings, family and community portfolio outcome variables are interacted with group specific controls. Given that econometric research (e.g. Ai and Norton, 2003 and Greene, 2010) indicates potential problems with estimating proper

[18] In line with e.g. Brown et al. (2008) and Kaustia and Knüpfer (2012), the one-year lagged family and peer portfolio outcomes are utilized to avoid capturing correlations between portfolio outcomes and individuals participation driven by reactions to similar general market information.

[19] A number of studies provide evidence indicating that individual investors' average performance is poor relative the market and institutional investors. Among other, individuals have been found to trade too much, hold poorly diversified portfolios, and to suffer from a disposition effect, see e.g., Blume and Friend (1975), Ferris et al. (1988), Odean (1998), Odean (1999), Barber and Odean (2000), Grinblatt and Keloharju (2001).

[20] We have also performed the empirical analysis on lagged excess returns than merely lagged portfolio outcomes and this yields similar results and the conclusions in the paper holds.

marginal effects for interaction terms in nonlinear models, we employ linear probability models instead of the more traditional logit or probit models. Although the linear probability model does not take account of that the dependent variable is limited between zero and one, it ensures a proper calculation of marginal effects pertaining to interaction effects.[21]

In estimation of heterogeneous social interaction effects random effects linear probability models are utilized. The dependent variable ($Part_{it}$) takes the value one if an individual, *i*, participate in the stock market at time *t*, zero otherwise. The random effects specification is motivated since the within-variance in the dependent variable[22] is not sufficient for a fixed-effects approach and since several of the control variables are time-invariant. The general specification is given by

$$\Pr\left(Part_{it}|X\right) = \alpha + \sum \beta_j \, SPO^{i,j}_{t-2,t-1} + \sum \emptyset_j \, SPO^{i,j}_{t-2,t-1} \times GI_{it} + \theta GI_{it} + \gamma X^i_t + \omega \Lambda^{i,c}_t + \mu \Upsilon_t + c_i + \varepsilon_{it}$$

where $SPO^{ij}_{t-2,t-1}$ is the one-year lagged stock portfolio outcome variables for *j=mother, father, partner, and community members*, $GI_{it}$ is a group-indicator vector, $X^i_t$ a matrix with individual demographic and economic characteristics, as well as, average background characteristics of the mother and father (variable definitions are given in Table A1 in Appendix A), $\Lambda^{i,c}_t$ includes time-variant and time-invariant community characteristics, $\Upsilon_t$ contain time fixed effects, while random effects are captured by $c_i$, and $\varepsilon_{it}$ is the error term. The group-indicator variables contained in $GI_{it}$ correspond to our measures of characteristics capturing individuals' exposure to stock market related signals (income, wealth, gender, and community (peer) participation rates) and the valuation of these (interpersonal trust and financial literacy).

If parents, partners, or community members are not participating in the stock market the value of the one-year-lagged stock portfolio outcome value is set to zero, since no changes occur.[23] However, since experiencing a return of zero is very different from experiencing no returns due to non-participation and to avoid capturing an effect driven by parental and partner participation through the portfolio outcome variables[24], an indicator variable indicating parental and partner participation is further included in the regressions to capture

[21] As a reference, however, estimations for random effects logit models have also been performed and they show similar results (results available on request).
[22] In the sample we observe that once an individual has entered the stock market they are not very likely to exit during the observed time period.
[23] The inclusion of zero return for non-participating family and community members portfolio outcomes is done to avoid having missing observations for this variable, rendering an exclusion of these cases in the regressions.
[24] That is, to avoid capturing effects driven by the variation between imputed zero returns for non-participating parents and partners and that of non-zero returns for participating parents and partners.

these effects. To measure the size of the stock market sentiment exposure towards investing in the stock market within communities, we create two variables.[25] The first captures the proportion (out of all stock owners) with positive returns, while the second the proportion of community portfolios with negative portfolio returns. An increase in the proportion of peers with positive (negative) portfolio returns is then intended to capture a relatively more positive (negative) community sentiment towards stock investments. To ensure that the portfolio outcome based community variables capture social interaction effects the proportion of individuals in the community participating in the stock market is further included to capture common peer preferences.

Measuring family and peer sentiment towards stock market investments through past portfolio outcomes warrants some discussion. Given that family and peer relations are likely to be extremely heterogeneous (e.g. some individuals socialize frequently with parents and peers, others seldom, some discuss stock market related issues often, others hardly at all) and given that individuals' reaction times towards obtained signals (time from obtaining the signals until action) are likely to be quite heterogeneous (some individuals may receive relevant signals and act immediately, but others react at a much later point in time), capturing all possible cases would demand extremely detailed data on individuals and its social relations. Thus, given the nature of our data, we are unable to capture all possible situations.

In our data, participation is observed at a specific point in time, *t* (in December each year). We do not, however, observe when in time, between *t-1* and *t*, individuals enter the stock market. Using data at the annual frequency then means that some individuals observed participating at *t* will have entered in the beginning of the year (close to *t-1*), say January, while others at the end of the year (close to *t*), say December. To avoid capturing correlations between participation and portfolio outcome variables pertaining to the time after entry, e.g. when actual entry occurred in January and returns pertain to the subsequent part of the period, we therefore use the lagged parental, partner, and community portfolio values corresponding to the period *t-2* until *t-1*. This approach then guarantees that correlations between participation observed at *t* and portfolio outcomes, do not capture a simultaneity problem. An additional motive for using this lag structure is further to avoid capturing spurious correlations due to reactions to similar general market information or shocks during the period *t-1* to *t* (in

[25] Swedish municipality area codes have been extracted from individuals' home addresses, used in the definition of communities. Community members are those from the same cohort as the individual, as well as all registered partners. The communities are smaller in size, but comparable, to MSAs (Metropolitan Statistical Areas). MSAs are often applied in similar studies based on US data (e.g. Brown et al, 2008). Municipality areas provide well-defined and non-overlapping communities. The municipality level is moreover chosen to get a sufficient amount of observations in each community.

line with the approaches and motivations in e.g. Brown et al., 2008; Kaustia and Knüpfer, 2012 and Hellström et al., 2013).

A potential drawback with our lag-approach and with using data at the annual frequency is that for individuals actually entering in the later part of the period *t-1* to *t* (unobserved to us), the portfolio outcome variables (measured between *t-2* to *t-1*) may not represent the most recent and relevant portfolio developments. Thus, the lagged portfolio outcome variables may for these individuals potentially be weak instruments in representing parental, partner, and community stock market sentiments. For those entering earlier in the period *t-1* to *t*, the lagged portfolio outcome variables do, however, lie closer in time, and should better represent recent parental, partner, and peer stock market experiences. Although we do not fully capture all thinkable situations that could occur, we still argue that the approach is suitable in capturing social interaction effects. Assume, for example, that only recent portfolio outcomes among family and peers affect individuals' participation.[26] A finding of a significant correlation between the family and peer lagged portfolio outcomes (realized between *t-2* and *t-1*) and an individual's participation (observed at *t*), is then driven by the relationship between the lagged portfolio outcome variables and those who enter early in the period *t-1* to *t*. For those entering relatively later in the period *t-1* to *t*, there should be no relationship since only recent portfolio outcomes affect participation. The consequence of not being able to capture the most recent portfolio developments for those entering relatively later in the period is then that our estimates become less precise. It does not, however, invalidate that we capture relevant correlations between lagged family and peer portfolio outcomes and participation among individuals entering early in the period.

To strengthen the argument that portfolio outcome variables capture social interaction effects, rather than alternative mechanisms potentially generating a correlation between individuals' participation and family and community portfolio outcomes, we condition the analysis on a large number of control variables, such individual disposable income and educational attainment (explained further in Section 3.3) but we also include parental variables. The parental variables are included to ensure that the parental portfolio outcome based measures capture effects from recent social interaction rather than inherited behavior. The included parental controls are average background characteristics (parents' educational levels, incomes, as well as financial market participation indicators based on whether parents

[26] Note here, though, that in reality we do not know at what frequency individuals are affected. While some individuals are affected by hearing about or observing family and peer short term portfolio outcomes, others may be affected by hearing about long-term performances.

acquired capital income during individuals' pre-adult years) for mothers and fathers, measured during the individual's adolescence (pertaining to when individuals were in the age 17-19). This is important to consider since evidence on intergenerational relationships between parents and adult children have repeatedly peen presented in earlier studies, e.g. Solon (1992) and Charles and Hurst (2003). We therefore have to take into account that children can "inherit" their parents' risk preferences both through social and biological influence (e.g. Kimball et al., 2009; Cesarini et al., 2010). Our inclusion of variables pertaining to the individuals' adolescents is in line with Chiteji and Stafford (1999) who study the cross-generational influence on young adults' portfolio choice and find that the likelihood of young families to hold transaction accounts and stocks is affected by whether parents held these assets or not during the adult child's adolescence. Apart from these, we also include measures to capture potential influence on individuals' participation from being exposed towards the general media flow. Here, time-specific fixed effects capture contemporaneous influence[27], while the average aggregated one-year portfolio outcomes (over all investors) is used as a proxy for the past year stock market performance (assumed to be correlated with positive and negative influences from media). Finally, time-invariant community fixed effects and a large set of time-variant community controls are added to minimize potential problems with unobservables and spurious correlation (e.g. community information about composition of industry and occupation, community-level mean income, and share of highly educated).

### 3.3 Details about variable measurements and summary statistics

Information about yearly stock portfolio values, collected from tax records by Statistics Sweden, are used to construct the main variables of interest, i.e. the measures of parents, partners, and community members stock portfolio outcomes. The variables are calculated by taking the difference in percent from one year to another. The time in between portfolio outcome value observations is a result of the data availability.

Social interaction may not be the only mechanisms affecting the stock market participation decision and therefore, numerous control variables are included in all specifications. Summary statistics for portfolio outcome, group indicator, as well as for a selection of our control variables are shown in Table 2 (variable definitions in Appendix A, Table A1).[28]

[27] This is in line with e.g. Brown et al. (2008) and Kaustia and Knüpfer (2012).
[28] Summary statistics of additional control variables included in the regressions are shown in Appendix A, Table A3.

**Table 2: Summary statistics**

The table reports summary statistics for our main stock portfolio outcome variables, i.e. annual portfolio outcomes for mothers, fathers and partners, community proportions of positive and negative portfolio outcomes (all as averages over the full sample period, 2000-2007), group indicator variables (income, wealth, gender, interpersonal trust and financial literacy), as well as selected control variables. Additional control variables included in the regressions are shown in Appendix A, Table A3. Disposable income and net wealth are measured in hundreds of SEK.

| Variable | Mean | SD | Min | Max |
|---|---|---|---|---|
| Portfolio outcome variables: | | | | |
| *Mother, portfolio outcome* | 0.016 | 0.153 | -1 | 1.484 |
| *Father, portfolio outcome* | 0.031 | 0.230 | -1 | 2.837 |
| *Partner, portfolio outcome* | 0.060 | 0.381 | -1 | 5.398 |
| *Community proportion of positive portfolio change* | 0.114 | 0.062 | 0 | 0.214 |
| *Community proportion of negative portfolio change* | 0.065 | 0.043 | 0 | 0.173 |
| Group indicator variables: | | | | |
| *Disposable income* | 1800 | 1887 | 0 | 1086052 |
| *Net Wealth* | 3644 | 15986 | -306221 | 2801000 |
| *Negative net weatlh* | 0.309 | 0.462 | 0 | 1 |
| *Gender* | 0.526 | 0.500 | 0 | 1 |
| *Trust in family and friends* | 2.422 | 0.191 | 1.715 | 2.438 |
| *Trust in neighbors* | 2.265 | 0.167 | 1.530 | 2.768 |
| *Low financial literacy* | 0.073 | 0.260 | 0 | 1 |
| *Medium financial literacy* | 0.898 | 0.303 | 0 | 1 |
| *High financial literacy* | 0.029 | 0.168 | 0 | 1 |
| Selected control variables: | | | | |
| *Born 1973* | 0.473 | 0.499 | 0 | 1 |
| *Educational attainment* | 4.154 | 1.311 | 1 | 7 |
| *Education within economics and/or business* | 0.124 | 0.330 | 0 | 1 |
| *Married* | 0.665 | 0.472 | 0 | 1 |
| *Children, age 0-3* | 0.515 | 0.664 | 0 | 4 |
| *Children, age 4-6* | 0.351 | 0.541 | 0 | 4 |
| *Children, age 7-10* | 0.410 | 0.615 | 0 | 4 |
| *Children, age 11 or older* | 0.603 | 0.869 | 0 | 6 |
| *Mutual funds* | 0.512 | 0.500 | 0 | 1 |

As seen, the average partner portfolio outcome is the highest over the considered period (6%), followed by that of fathers (3%), then mothers (1.6%).[29] Interestingly, the standard deviations of the portfolio outcomes follow a similar pattern, i.e. highest for the partners, then the fathers' and mothers', portfolio outcomes. For community portfolio outcome, the average community proportion of positive outcomes is larger (0.114) than the average proportion of negative outcomes (0.065).

In regard to our first group indicators (i.e. individual characteristics along which we examine potential heterogeneous social interaction effects), we note that the average annual disposable income over the sample period is 180,000 Swedish kronor (SEK), the net average wealth 364,400 SEK, while 52.6% of the individuals in the sample are females.[30] As a reference, the corresponding average disposable income and net wealth in the population over

[29] The portfolio outcome variables have been trimmed to ensure that results are not driven by extreme outliers.
[30] The average SEK/US dollar exchange rate during the years 1999 to 2007 is 0.1232 SEK per USD.

the same period are 231,000 SEK and 874,157 SEK. Thus, the individuals in our sample have a slightly lower disposable income and a considerable lower net wealth, most likely explained by the relatively younger age of our sample.

Since measures of trust are not readily available at the level of the individual, we utilize in this study an aggregated approach to capture interpersonal trust. In this approach we utilize that we have access to data also for individuals with non-Swedish origin within the sample. Given data on interpersonal trust at the country level, obtained from the World Value Survey 1999-2008, we then assign the country level of interpersonal trust to individuals based on their origin.[31] A justification for this approach is given by Guiso et al. (2004), who suggest that the social capital of an individual's region of birth can have long lasting effects on its future financial decisions. Thus, by using the World Value Survey data we calculate the country average trust levels using the survey participants' stated trust in family and friends as well as neighbors. The country specific trust variables (trust in family/friends and trust in neighbors) are then merged with our data, and individuals are later on categorized depending European origin and Non-European origin. Here an individual is categorized to have a Non-European origin if the person or anyone of his/her parents is born outside of Europe. A drawback with this approach is that only 3.1 percent of the sample is categorized as Non-Europeans, while the advantage is that there is a marked variation in levels of trust between the groups. The level of trust in family and friends is 1.9 for Non-Europeans and 2.4 for Europeans, while the level of trust in one's neighbors is, on average, 1.8 for Non-Europeans and 2.8 for Europeans. Thus, people of Non-European origin have, on average, a significantly lower inter-personal level of trust in both family and friends and in their neighbors.

An individual's level of financial literacy is also unobserved and, hence, proxy indicators have been created. These variables are based on the individual's level of education and subject major. As seen in Table 2, about 7% of the sample are classified as low financial literates (individuals with 9 years of schooling or less), about 3% as high financial literates (individuals with at least 3 years of university education within economics and/or business administration), while about 90% as medium financial literates (individuals that do not have 3 years or more of university studies within economics and/or business administration, but at least 9 years of schooling).

In addition to including the above group indicator variables as direct control variables, a host of other variables are also included in the regressions. From Table 2, we note that the

[31] For a more detailed description see: www.worldvaluessurvey.org.

control variable for age (dummy for individuals belonging to the cohort born 1973) indicate that 47.3% of the individuals belong to the younger cohort, individuals mean educational attainment is 4.15 (approximate "Senior high school"), about 12% have an education within economics and/or business administration, 66% are married, the highest mean number of children are in the category "age 11 or older", while about 51% of the individuals hold mutual funds. Furthermore, a number of parental, partner, and community related variables are also included (see Appendix A, Table A3). The time-invariant community fixed effects and the time-variant community controls are included to minimize potential problems with unobservables and spurious correlation (e.g. community information about composition of industry and occupation, community-level mean income, and share of highly educated). The included parental controls are average background characteristics (parents' educational levels, incomes, as well as financial market participation indicators based on whether parents acquired capital income during individuals' pre-adult years) for mothers and fathers, measured during the individual's adolescence (pertaining to when individuals were in the age 17-19). The average aggregated one-year portfolio outcomes (over all investors) variable is seen as a proxy for the past year stock market performance. The time-specific fixed effects are included to capture contemporaneous influence from e.g. the general media flow.

## 4. Empirical analysis

To study the potential heterogeneous impact of social interaction on individuals' likelihood to own stocks, we run regressions with our binary dependent variable on family and community portfolio outcome, as well as, control variables. The results are throughout reported in terms of marginal effects with cluster robust standard errors at the household level reported in parenthesis. Before presenting results pertaining to heterogeneous social interaction effects, we report estimates for a baseline model indicating average family and community social interaction effects.

### 4.1 Social interaction effects - baseline model

The effect of social interaction, both within-family and community, have been shown to influence an individual's decision to participate in the stock market (e.g. Brown et al., 2008; Kaustia and Knüpfer, 2012; Li, 2014; Hellström et al., 2013). In Table 3, we confirm these findings for a baseline model specification, excluding interaction effects.[32]

[32] A full presentation, including results for control variables, is presented in Appendix A, Table A2.

**Table 3: Stock market participation – baseline model**

The table displays estimation results for a linear probability, as well as for a logit, random effects panel data model, all excluding interaction effects. Reporting of results is restricted to variables of interest, while results pertaining to the full model specification are given in Appendix A, Table A2. The dependent variable is an indicator variable with the value one if the individual is observed to own stocks at time t, zero otherwise. Cluster robust standard errors at household level in parentheses. Equality test of the effect of social interaction for mother and father: Test statistic (Prob>chi2): 1.29(0.2569). Significance levels: *******p<0.01 ******p<0.05 *****p<0.10.

| Variable | Linear probability model | Random effects logit model |
|---|---|---|
| *Mother, lagged portfolio outcome* | 0.011*** | 0.008*** |
| | (0.002) | (0.002) |
| *Father, lagged portfolio outcome* | 0.007*** | 0.005*** |
| | (0.001) | (0.001) |
| *Partner, lagged portfolio outcome* | 0.017*** | 0.009*** |
| | (0.001) | (0.001) |
| *Community proportion of positive portfolio outcomes* | 0.053* | 0.069*** |
| | (0.027) | (0.020) |
| *Community proportion of negative portfolio outcomes* | 0.022 | -0.019 |
| | (0.036) | (0.027) |
| *Individual controls* | Y | Y |
| *Partner and parental controls* | Y | Y |
| *Community fixed effects* | Y | Y |
| *Community controls* | Y | Y |
| *Time fixed effects* | Y | Y |
| *Random effects* | Y | Y |
| *Memo* | N= 366,897; n= 88,730; Pseudo $R^2$= 0.1737 | N= 366,897; n= 88,730; Pseudo $R^2$= 0.522 |

In Model 1, we present estimates from a linear probability model with random effects, with the corresponding random effects logit specification in Model 2, as a reference. As indicated in both models, individuals' subsequent likelihood to participate is positively affected by increasing portfolio outcomes among mothers, fathers, as well as partners (all significant at the one percent level).[33] The correlation is the strongest for partners, then mothers, and finally fathers, although not significantly different. These results confirm the findings in Li (2014) and Hellström et al. (2013) regarding the influence of family on individuals' participation. For community effects, increasing proportions of positive portfolio outcomes among peers increases significantly (at the 1% level in the logit specification and 10% level for the linear probability model) individuals' subsequent likelihood to participate, while there are no significant effects for increasing proportions of negative portfolio outcomes. These results confirm earlier findings (e.g. Kaustia and Knüpfer, 2012; Hellström

[33] The correlation in regard to the partner is challenging to interpret from a social interaction or information sharing point of view, since other within-household mechanisms may generate this correlation. The issue is considered in some detail in Hellström et al. (2014) indicating that, at least partly, correlations seem driven by information sharing effects.

et al., 2013) indicating that community sharing is selective and constrained to sharing of mainly positive experiences, in support of related psychological theories (e.g. Festinger, 1957; Akerlof and Dickens, 1982; Han and Hirshleifer, 2014).

### 4.2 Evidence on the importance of exposure towards stock market related signals

To characterize who among individuals are affected by social interaction and to broadly capture individuals' exposure (and to some extent how they interpret the information) to stock market related signals, we interact our parental, partner, and community portfolio outcome variables with indicators of individuals' income, wealth, and gender.

#### 4.2.1 Social interaction effects over income and wealth

As indicated in Section 3, we view an individual's income and wealth as a broad indicators of both family and peer social group belonging. Given that stock market participation is, in general, higher among individuals with relatively higher incomes (wealth), one may expect, all else equal, that individuals with relatively higher incomes (wealth), more prone to socialize with other high income (wealth) individuals, to a larger extent is exposed to stock market related signals. Thus, social interaction effects are, all else equal, expected to be increase with relatively higher incomes (wealth). To test this proposition, income (divided into five categorical dummies) and wealth (divided into three categorical dummies) are interacted with the parental, partner, and community portfolio outcome variables, respectively. The results from running these regressions are displayed in Table 4.

**Table 4: Heterogeneous social interaction effect over individuals' disposable income and wealth.**

The table report estimates for a random effects linear probability model interacting parental, partner, and community portfolio outcome variables with indicators of individuals' disposable income (Group 1 to Group 5) and wealth (low, medium, and high). The dependent variable is an indicator variable for whether the individual participates in the stock market at time t. Cluster robust standard errors at household level in parentheses. Significance levels: *******p<0.01 ******p<0.05 *****p<0.10.

| | Income | | | | | Wealth | | |
|---|---|---|---|---|---|---|---|---|
| Variable | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 | Low | Medium | High |
| *Mother, lagged portfolio outcome* | 0.011** (0.004) | 0.010** (0.005) | 0.018*** (0.005) | 0.014** (0.006) | 0.000 (0.007) | 0.007* (0.004) | 0.013*** (0.004) | 0.014*** (0.005) |
| *Father, lagged portfolio outcome* | 0.005** (0.002) | 0.002 (0.003) | 0.001 (0.003) | 0.011*** (0.004) | 0.019*** (0.005) | 0.003 (0.002) | 0.006** (0.002) | 0.014*** (0.003) |
| *Partner, lagged portfolio outcome* | 0.012*** (0.002) | 0.008*** (0.002) | 0.016*** (0.003) | 0.021*** (0.004) | 0.032*** (0.004) | 0.022*** (0.003) | 0.013*** (0.002) | 0.019*** (0.002) |
| *Community proportion of positive portfolio outcomes* | 0.037 (0.028) | 0.049* (0.028) | 0.048* (0.028) | 0.061** (0.029) | 0.110*** (0.030) | 0.042 (0.028) | 0.055** (0.028) | 0.066** (0.028) |
| *Community proportion of negative portfolio outcomes* | -0.068 (0.038) | -0.065 (0.038) | 0.001 (0.039) | 0.060 (0.040) | 0.061 (0.045) | -0.027 (0.038) | 0.009 (0.037) | 0.004 (0.039) |
| *Individual controls* | Y | | | | | Y | | |
| *Partner and parental controls* | Y | | | | | Y | | |
| *Community fixed effects* | Y | | | | | Y | | |
| *Community controls* | Y | | | | | Y | | |
| *Time fixed effects* | Y | | | | | Y | | |
| *Memo* | N= 366,897; n= 88,730; $R^2$=0.179 | | | | | N= 366,897; n= 88,730; $R^2$=0.174 | | |

Starting with individuals' income and family effects (left panel), we find no clear systematic pattern. Lagged portfolio outcomes among mothers are positively correlated (statistically significant at, at least, the 5% level) with individuals' subsequent likelihood to participate for all income categories, apart from the highest. For father social influence, the estimation results indicate that increasing portfolio outcomes among fathers increases the individuals' subsequent likelihood to hold stocks for individuals with the lowest (income category 1) and highest (income categories 4 and 5) income categories. Increasing portfolio outcomes among partners increases individuals' subsequent propensity to participate for individuals in all income categories. A notable tendency is that social interaction effects pertaining to the fathers and partners are somewhat stronger for individuals in the top two income categories. For wealth and family effects (right panel), the lagged portfolio outcomes among mothers are positively correlated (statistically significant at the 10% level) with

individuals' subsequent likelihood to participate for all wealth categories. For father social influence, the estimation results indicate that increasing portfolio outcomes among fathers increases the individuals' subsequent likelihood to hold stocks for individuals with medium and high wealth (significant at, at least, the 5% level). Increasing portfolio outcomes among partners increases individuals' subsequent propensity to participate for individuals in all wealth categories (all significant at the 1% level).

In contrast to family social interaction effects, the results for community social influence over income (left panel) indicate a clearer pattern. The impact on individuals' likelihood to participate from increasing proportions of peers with positive portfolio outcomes within one's community is positive and significant (at, at least, the 10% level), highest for individuals in the top income category, followed by the second and third highest categories. There are no significant effects on individuals in the lowest income category. For wealth and community effects, we find a similar pattern as for income. Increasing proportions of peers with positive portfolio outcomes increases individuals' likelihood to participate (significant at the 5% level) for individuals with both medium (0.055) and high wealth (0.066), with no effect for those with low wealth.

Reflecting over the above income and wealth related results yield some interesting indications. While participation among individuals with relatively higher income are affected by both family and community social interaction effects, participation among low income individuals is only affected by family influence. This is in line with an interpretation that income predicts social group belonging among peers and that stock market related information is more prevalent in social groups with higher income. Based on wealth, social interaction effects are larger and more significant among medium and high wealth individuals for both parental and community effects. This gives tentative evidence that individuals in these wealth groups are more exposed and affected by social interaction. That social interaction effects follow a clearer pattern among peers than within-family, potentially indicate that income and wealth may be better predictors of social group belonging among peers than in characterizing family social relations. Notably, partner correlations, between individuals' likelihood to participate and partner portfolio outcomes, are positive and significant for all levels of income and wealth, indicating a potential different within-household behavior than with parents and peers. This is expected given that the partner correlations capture a mix of within-household mechanisms.

### 4.2.2 Social interaction effects over gender

To study whether an individual's gender matter for the influence of social interaction the parental, partner, and community portfolio outcomes are interacted with the gender dummy. In Table 5, we report estimation results from this model specification.

**Table 5: Heterogeneous social interaction effects over individuals' gender.**
The table report estimates for a random effects linear probability model interacting parental, partner, and community portfolio outcome variables with an indicator of individuals' gender. The dependent variable is an indicator variable for whether the individual participates in the stock market at time t. Cluster robust standard errors at household level in parentheses. Test of equal effects: Test statistic (Prob > chi2). Significance levels: ***p<0.01 **p<0.05 *p<0.10.

| Variable | Women | Men | Test of equal effects |
|---|---|---|---|
| *Mother, lagged portfolio outcome* | 0.011*** | 0.012*** | 0.03 |
| | (0.003) | (0.004) | (0.8697) |
| *Father, lagged portfolio outcome* | 0.004** | 0.012*** | 6.53** |
| | (0.002) | (0.003) | (0.0106) |
| *Partner, lagged portfolio outcome* | 0.010*** | 0.035*** | 52.05*** |
| | (0.001) | (0.003) | (0.0000) |
| *Community proportion of positive portfolio outcomes* | 0.025 | 0.082*** | . |
| | (0.027) | (0.028) | |
| *Community proportion of negative portfolio outcomes* | -0.054 | 0.013 | . |
| | (0.037) | (0.038) | |
| *Individual controls* | Y | | |
| *Partner and parental controls* | Y | | |
| *Community fixed effects* | Y | | |
| *Community controls* | Y | | |
| *Time fixed effects* | Y | | |
| *Memo* | N= 366,897, n= 88,730, $R^2$= 0.1743 | | |

The results indicate that both male and female individuals' likelihood to participate is positively affected by the lagged portfolio outcome of mothers, fathers, and partners (all significant at the 1% level, apart for the father effect on females that is significant at the 5% level). While there is no significant difference in the impact from mothers, the influence from fathers and partners are significantly larger for male individuals. A comparison of the relative size of the effects within each gender reveals that females to a larger extent are influenced by mothers, while men are equally influenced by mothers and fathers. Interestingly, female partner portfolio outcomes have a significantly larger impact on male individuals' subsequent participation than the reverse.

Increasing community proportions with positive portfolio outcomes increases significantly (at the 1% level) male individuals' subsequent likelihood to participate, but not female. This indicates that while both female and male individuals are influenced by family social interaction, only males are influenced by peers. This is consistent with that males, more prone

to socialize with other males, in general, more active on financial markets (e.g. Barber and Odean, 2001), to a larger extent are exposed and affected by stock market related signals. Interestingly, differences in impact from peer social interaction (or that male individuals seem to rely more on socially obtained information from peers in their financial decision making) may contribute to explain the often found systematical difference in observed choice of risky assets between genders.

### 4.3 Evidence on the valuation of stock market related signals

To capture potential heterogeneity in individuals' valuation of stock market related signals, we interact our parental, partner, and community portfolio outcome variables with indicators of individuals' level of interpersonal trust and financial literacy.

#### 4.3.1 Social interaction effects over interpersonal trust

As previously discussed, the impact of social interaction on participation may depend on an individual's level of interpersonal trust. Conditional on exposure towards stock market related signals, variations in trust may lead to a heterogeneous valuation of socially shared or observed information. For example, a high trusting individual, all else equal, is more likely to believe and act on information obtained through social interaction than one with low interpersonal trust. Trust may further matter since individuals may feel more confident in taking financial decisions if peers, whom they trust, have already taken the decision. To get an indication of the impact of an individual's interpersonal trust on the effect of social interaction, parental, partner, and community portfolio outcome variables are interacted with the geographical (European versus Non-European origin) based measure of interpersonal trust. In Table 6, we report results for models including the average level of trust in family and friends and in neighbors, respectively, as interacting variables and direct effects.

**Table 6: Heterogeneous social interaction effects over interpersonal trust**

The table report estimates for models interacting parental, partner, and community portfolio outcome variables with an indicator of individuals' geographic origin. The geographical indicator separates individuals between non-European (2% of the sample) and European origin. Information on levels of "trust in family and friends" and "trust in neighbors" (1-7) at the country level is collected from the World Surveys (WVS) for 1999-2008. The dependent variable is an indicator variable for whether the individual participates in the stock market at time t. Cluster robust standard errors at household level in parentheses. Significance levels: *******p<0.01 ******p<0.05 *****p<0.10.

| | Trust in family and friends | | Trust in neighbors | |
|---|---|---|---|---|
| Variable | *Non-European* | *European* | *Non-European* | *European* |
| *Mother, lagged portfolio outcome* | -0.011 | 0.012 *** | 0.001 | 0.005*** |
| | (0.015) | (0.002) | (0.007) | (0.001) |
| *Father, lagged portfolio outcome* | -0.008 | 0.008*** | 0.004 | 0.003*** |
| | (0.010) | (0.001) | (0.006) | (0.001) |
| *Partner, lagged portfolio outcome* | -0.006 | 0.018*** | 0.006* | 0.007*** |
| | (0.008) | (0.001) | (0.004) | (0.001) |
| *Community proportion of positive portfolio outcomes* | 0.049* | 0.054** | 0.038* | 0.021* |
| | (0.025) | (0.027) | (0.019) | (0.011) |
| *Community proportion of negative portfolio outcomes* | 0.023 | 0.022 | 0.025 | 0.009 |
| | (0.052) | (0.036) | (0.031) | (0.015) |
| *Individual controls* | Y | | Y | |
| *Partner and parental controls* | Y | | Y | |
| *Community fixed effects* | Y | | Y | |
| *Community controls* | Y | | Y | |
| *Time fixed effects* | Y | | Y | |
| *Memo* | N= 366,897, n= 88,730, $R^2$= 0.1698 | | N= 366,897, n= 88,730, $R^2$= 0.1739 | |

The results from both models indicate that, while parental and partner effects are not significant for individuals with lower levels of interpersonal trust (individuals with Non-European origin), they are significant at the one percent level for individuals with an on average higher level of trust (individuals with a European origin).[34] Thus, this is a tentative indication about that relatively high trusting individuals (i.e. with a relatively higher stated trust in family and friends or in neighbors) are more prone to be affected by parental social interaction effects than relatively low trusting individuals. Community effects, constrained to proportions of positive portfolio outcomes among peers, are positive and significant at the 10% level for individuals with a non-European, and at the 5% level for individuals with a European, origin, in the model using trust in family and friends, and at the 10% level for the model using trust in neighbors. In terms of sizes, the effect is slightly larger (although not

[34] For the model using "trust in neighbors ", the partner effect is weakly significant (at the 10% level) also for those with a non-European origin. As noted before, however, partner effects are likely to also capture a mix of other intra-household mechanisms than social interaction.

statistically different from each other) for individuals with a European origin using the trust in family and friends measure (0.054 versus 0.049), while the reverse pattern is found in the model using the trust in neighbors based measure (European origin: 0.021; non-European origin: 0.038). Overall, the results indicate that while a higher level of interpersonal trust (European origin) strengthens the social interaction effects in regard to family, there are no significant differences for community effects. A notable effect, however, in the model using the trust in neighbor measure, is that community effects are tentatively stronger for low trusting individuals compared to those with higher trust. This may be interesting since ideas have been put forth that in societies where people are raised to trust their close family networks, they are also taught to distrust people outside the family (Fukuyama, 1995). Thus, for individuals with a relatively higher within family trust level (those with European origin), trust in people outside the family seems tentatively lower.

Albeit our measure of interpersonal trust is broad, the results provide tentative evidence consistent with that difference in individuals' interpersonal trust matter for the impact of social interaction on individuals' stock market participation. This is interesting since it extends the general role of trust in explaining participation. While earlier literature, e.g. Guiso et al. (2008) and Georgarakos and Pasini (2011), emphasize the direct effect of trust (or mistrust in financial systems) on non-participation and Gennaioli et al. (2014), the impact of trust in professional managers for delegation of portfolio management, the results in this paper indicate that trust may also have an important indirect role in determining the strength of effects from social interaction.

### 4.3.2 Social interaction effects over financial literacy

An individual's financial knowledge is likely to affect how socially obtained information is valued. To examine the impact of an individual's financial literacy on the effect of social interaction, parental, partner, and community portfolio outcome variables are interacted with indicators of financial literacy (low, medium, and high). The results from this regression are presented in Table 7.

**Table 7: Heterogeneous social interaction effects over individuals' level of financial literacy.**
The table report estimates for a random effects linear probability model interacting parental, partner, and community portfolio outcome variables with an indicator of individuals' financial literacy. High financial literates are individuals with at least 3 years of university education within economics and/or business administration (2.9 percent of the sample). Low financial literates are those with 9 years of schooling or less (7.3 percent of the sample). Medium financial literates are individuals with more than 9 years of schooling and those that do not have at least 3 years of university education within economics and/or business administration. The dependent variable is an indicator variable for whether the individual participates in the stock market at time t. Cluster robust standard errors at household level in parentheses. Significance levels: *******p<0.01 ******p<0.05 *****p<0.10.

| Variable | Low Financial Literacy | Medium Financial Literacy | High Financial Literacy |
|---|---|---|---|
| *Mother, lagged portfolio outcome* | 0.010 | 0.011*** | 0.012 |
| | (0.012) | (0.003) | (0.015) |
| *Father, lagged portfolio outcome* | 0.013 | 0.007*** | 0.029** |
| | (0.008) | (0.0016) | (0.012) |
| *Partner, lagged portfolio outcome* | 0.024*** | 0.017*** | 0.030*** |
| | (0.007) | (0.001) | (0.009) |
| *Community proportion of positive portfolio outcomes* | 0.063** | 0.056** | 0.056 |
| | (0.031) | (0.027) | (0.051) |
| *Community proportion of negative portfolio outcomes* | -0.002 | 0.012 | 0.097 |
| | (0.044) | (0.036) | (0.092) |
| *Individual controls* | Y | | |
| *Partner and parental controls* | Y | | |
| *Community fixed effects* | Y | | |
| *Community controls* | Y | | |
| *Time fixed effects* | Y | | |
| *Memo* | N= 366,897, n= 88,730, $R^2$= 0.1744 | | |

Starting with family effects, the results imply that individuals' subsequent likelihood to participate for individuals with medium, but not high and low, financial literacy are significantly positively affected (at the 1% level) by the portfolio outcomes of mothers, while individuals with medium and high financial literacy positively by the portfolio outcomes of fathers. In contrast, individuals pertaining to all levels of financial literacy are significantly positively affected by recent portfolio outcomes among partners (all significant at the 1% level). In contrast, for community interaction effects, the results imply that increasing proportions of peers with positive portfolio outcomes, all else equal, significantly (at the 5% level) increases the individuals' subsequent likelihood to participate for individuals with medium and low financial literacy, but not high.

Overall, these results are interesting and indicate a marked difference in social interaction effects between that of parents and peers. For peer social interaction we could interpret the results as reflecting individual differences in the valuation of stock market related signals, where the social impact on highly financially literate non-participating individuals is assumed lower (due to an access of a larger number of additional sources of financial information and a

higher ability to process information). The explanation does however not hold for the results for parental effects. In regard to community social interaction, the results are in line with the survey results in Van Rooij et al. (2011), where individuals with lower levels of financial literacy indicate a relatively higher importance to advice from parents, friends, or acquaintances when making important financial decisions. A potential explanation to the reverse finding for parental social interaction effects may be connected to differences in sharing of stock market related experiences between peers and parents. Hellström et al. (2013) find evidence indicating that community sharing is selective and confined to positive stock market experiences (in line with e.g. Kaustia and Knüpfer, 2012 and Han and Hirshleifer, 2013), while parental sharing involve both positive, as well as negative experiences. Given that sharing of stock market related information among peers to a larger extent may be driven by reputational concern (see e.g. Han and Hirshleifer, 2013, on selective communication related to reputational concerns), a possible explanation to the result that highly financially literate individuals are not affected by peers, but by parental sharing of experiences, that they realize that peer sharing is selective and driven by reputational concern, whilst parental are not.

### 4.4 Heterogeneous social interaction based on family and community characteristics

Our analysis, so far, has characterized who among individuals are affected by social interaction based on individuals' characteristics. Given that one of our interpretations of these characteristics relate to an individual's exposure towards stock market related signals (i.e. for income, wealth, and gender), we further consider, in this section, differences in social interaction effects based on parental financial wealth (family characteristic), as well as, on differences in community participation rates (community characteristic). In regard to parental financial wealth, we assume that this broadly capture parental interest in stock market investments, while community participation rates the peer financial engagement within individuals' communities. Thus, we assume that the availability of relevant financial signals and, thus, the likelihood that individuals are exposed and affected, are increasing along both these measures.

#### 4.4.1 Social interaction effects over parental financial wealth

In Table 8, we report the results from interacting the parental, partner, and community portfolio outcomes with indicators of individuals' parent's financial wealth.

**Table 8: Heterogeneous social interaction effects over financial wealth of parents.**

The table report estimates for a random effects linear probability model interacting parental, partner, and community portfolio outcome variables with indicators based on the level of financial wealth among individuals' parents. The dependent variable is an indicator variable for whether the individual participates in the stock market at time t. Cluster robust standard errors at household level in parentheses. Significance levels: ***p<0.01 **p<0.05 *p<0.10.

| Variable | Low Financial Wealth | Medium Financial Wealth | High Financial Wealth |
|---|---|---|---|
| *Mother, lagged portfolio outcome* | 0.003 | 0.007** | 0.005 |
| | (0.022) | (0.003) | (0.004) |
| *Father, lagged portfolio outcome* | 0.007 | 0.004* | 0.005** |
| | (0.013) | (0.002) | (0.002) |
| *Partner, lagged portfolio outcome* | 0.003 | 0.014*** | 0.007** |
| | (0.003) | (0.002) | (0.003) |
| *Community proportion of positive portfolio outcomes* | 0.092*** | 0.057** | 0.095*** |
| | (0.017) | (0.029) | (0.025) |
| *Community proportion of negative portfolio outcomes* | 0.005 | -0.052 | -0.024 |
| | (0.004) | (0.038) | (0.015) |
| *Individual controls* | Y | | |
| *Partner and parental controls* | Y | | |
| *Community fixed effects* | Y | | |
| *Community controls* | Y | | |
| *Time fixed effects* | Y | | |
| *Memo* | N= 366,897, n= 88,730, $R^2$= 0.1693 | | |

As seen, the results support our earlier evidence, indicating that whether an individual is affected by parental social interaction seems to be related to individuals' exposure towards stock market related signals. Individuals' likelihood to participate among those with parents with low financial wealth (i.e. relatively lower availability of financial signals) are not affected by social interaction with neither mothers nor fathers. In contrast, individuals with parents with medium and high financial wealth are in turn affected by parental social interaction. This strengthens our belief that our earlier findings, based on individuals' characteristics, at least broadly, reflect relevant characteristics of individuals' parental social environment. The results further indicate that individuals with low financial-wealth-parents are affected by peers to the same extent as those with high financial-wealth-parents. This is interesting since it indicates that peers are of similar importance, regardless of the existence of relevant parental social influence.

### 4.4.2 Social interaction effects over community participation rates

In Table 9, we report the results from interacting the parental, partner, and community portfolio outcomes with indicators representing the level of community stock market participation rates in individuals' communities.

**Table 9: Heterogeneous social interaction effects over community participation rates.**

The table report estimates for a random effects linear probability model interacting parental, partner, and community portfolio outcome variables with indicators of community stock market participation rates (in the community where the individual resides). *High Participation Proportion* is the top 10%, while *Low Participation Proportion* is the bottom 10%. Those communities in between are categorized to *Medium Participation Proportion*. The dependent variable is an indicator variable for whether the individual participates in the stock market at time t. Cluster robust standard errors at household level in parentheses. Significance levels: *******p<0.01 ******p<0.05 *****p<0.10.

| Variable | Low Participation Proportion | Medium Participation Proportion | High Participation Proportion |
|---|---|---|---|
| *Mother, lagged portfolio outcome* | 0.015** | 0.011*** | 0.018** |
| | (0.007) | (0.003) | (0.009) |
| *Father, lagged portfolio outcome* | 0.013*** | 0.006*** | 0.019*** |
| | (0.005) | (0.002) | (0.006) |
| *Partner, lagged portfolio outcome* | 0.011** | 0.017*** | 0.028*** |
| | (0.005) | (0.001) | (0.005) |
| *Community proportion of positive portfolio outcomes* | 0.074** | 0.094*** | 0.135*** |
| | (0.030) | (0.031) | (0.042) |
| *Community proportion of negative portfolio outcomes* | -0.073 | -0.012 | 0.093 |
| | (0.051) | (0.038) | (0.084) |
| *Individual controls* | Y | | |
| *Partner and parental controls* | Y | | |
| *Community fixed effects* | Y | | |
| *Community controls* | Y | | |
| *Time fixed effects* | Y | | |
| *Memo* | N= 366,897, n= 88,730, $R^2$= 0.1737 | | |

The results show that an increase in the number of peers with positive portfolio outcomes within one's community has a significantly larger effect (0.135 versus 0.074) on individuals' likelihood to participate for individuals residing in high participation rate communities (communities with a participation rate among the top 10%), than in low participation rate communities (communities with a participation rate among the bottom 10%). This is interesting, since it likely reflects that individuals in high participation rate communities are more likely to be exposed towards stock market related signals, i.e. to socialize with peers active on the stock market.

From an identification point of view, it is also reassuring to see that the community effect from increasing proportions of peers within a community with positive portfolio outcomes also is significant for individuals residing in low participation communities. This strengthens our belief that our community proportion measure captures community social interaction effects, rather than, for example, similarities in values and attitudes among community members due to the endogenous formation of communities.

### 4.5 Summarizing results and economic significance

To get a better overview of the results, we present in this section a short summary as well as a discussion of the economic significance of the established effects. In regard to parental social interaction effects, results indicate that mainly individuals with relatively high compared to low wealth, both male and females, individuals with relatively high compared to low interpersonal trust in family and friends, and individuals with relatively higher financial literacy, are affected by parental social interaction in their decision to participate. To exemplify, for individuals exhibiting a high financial literacy, a one percent increase in their father's lagged portfolio outcome increase the likelihood of stock market participation with 2.9 percentage points. The participation rate is 50.5 percent for this group, and consequently, the social interaction influence of the father has, on average, a 5.7 percent relative effect on participation for individuals with a high financial literacy. Moreover, for individuals with a relatively high trust in family and friends, a 1 percent increase in lagged portfolio outcome of the mother generates a 1.2 percentage point increase in the likelihood of individual stock market participation (i.e. a 4.8 percent average effect on participation since the average participation rate is 25.2 percent). Hence, the level of interpersonal trust and financial literacy affect the magnitude of family social interaction influence on stock market participation considerably, and are therefore according to our study of economic significance.

Compared to parental effects, results for partner effects indicate fewer patterns over the considered individual characteristics. Individuals from all income and wealth levels are positively affected by lagged positive portfolio outcomes among partners, although the effect is significantly stronger for the highest income group compared to the relatively lower (for wealth there is no significant pattern). Interestingly, the effect on male (female) individuals from female (male) partners is significantly larger (smaller) than the reverse. The result on interpersonal trust (based the "trust in family and friends" measure) indicates that the partner effect is significantly positive for individuals with a European origin, but insignificant for those with a non-European origin. The partner effect is positive significant for all levels of financial literacy, although significantly stronger for high literate individuals.

For community social interaction effects, the results indicate that individuals with a relatively high compared to low income and wealth are affected by community social interaction in their decision to participate. For individuals with a relatively high wealth, a 1 percent increase in the community proportion of positive portfolio outcomes increases the likelihood of individual stock market participation with 6.6 percentage points. The average

participation rate for individuals in the "high wealth" category is 38.6 percent and the community effect on participation is thus of substantial economic significance.

We also find that males are affected by community social interaction, but not females. A 1 percent increase in the community proportion of positive portfolio outcomes increases individual stock market participation likelihood with 8.2 percentage points for males. The average stock market participation rate is 32.6 percent for men and we can therefore conclude that the magnitude of the community social interaction effect is of economic importance. The same holds for individuals with lower levels of financial literacy. The group has a relatively low stock market participation rate (17.1 percent), but the effect of community social interaction is in relative terms large (6.3 percentage points). This economic significant effect is interestingly not present for individuals with a high financial literacy.

### 4.6 Other explanatory variables

For all reported model specifications, a rich set of control variables are included to condition the analysis on alternative mechanisms affecting individuals' stock market participation. In Appendix A, Table A2, we report results in regard to these other variables.[35] For the variables intended to capture inheritance/similarities of values and attitudes towards stock investments (e.g. in regard to risk taking) between individuals and their parents, as well as between individuals and their partners (mother, father, and partner non-participation dummies; mother and father average salaries and capital incomes during individuals' adolescents), the results show, as expected, a significant negative impact from non-participation among all family members on individuals' participation. However, a positive significant effect is established for individuals growing up with a father that has a relatively higher salary and for individuals that have a mother and father with capital incomes.

In line with theory and previous empirical findings, individuals' likelihood to participate increases (statistically significant at the 1% level) in disposable income, net wealth, and for increasing levels of financial literacy (negative effect for low literate and positive effect for high literate individuals). The same holds for increasing financial literacy (proxied by dummies for whether individuals have a university education within business administration/economics and participate in the mutual funds market). Individuals' level of education (regardless of subject) has an expected positive (significant at the 1% level) impact on participation, as do the partner educational level. Furthermore, men have a higher

[35] These results correspond to the linear probability model in Table 3. Similar results for other explanatory variables were obtained also in the other considered model specifications.

likelihood to hold stocks (significant at the 1% level) and the probability to participate increases with age (significant at 1%). Results also indicate that individuals without, compared to those with, children, are more likely to hold stocks (significant at the 1% level).

In terms of effects driven by individuals' exposure to general media, our proxy (the aggregated average portfolio outcome over all individuals) indicate an expected higher likelihood to participate following increasing past year aggregated portfolio outcomes (significant at the 1% level), while the one-year lagged community participation rate (to control for common community values and preferences towards stock market investments) affect participation positively (significant at the 5% level). For our broad measure of interpersonal trust, dummy for individuals with a low trust country origin, effects are insignificant. Overall, given that most of the above results for the other explanatory variables conform to the expectations from previous literature, we find this reassuring for the economic validity of the model.

## 5. Conclusions

In this paper we study the heterogeneous impact of social interaction (from family and peers) on individuals' stock market participation. A main conclusion from the study is that social interaction effects are, indeed, heterogeneously distributed over individuals. While community and parental social interaction effects, in general, display systematic patterns in regard to our considered individual characteristics, patterns are somewhat less clear for effects from partner social influence. This is, however, expected since partner correlations are likely to capture a mix of within-household mechanisms. Broadly interpreting social interaction effects over individual characteristics as capturing differences in individuals' exposure to (income, wealth, and gender), as well as individuals' valuation of (interpersonal trust and financial literacy), stock market related signals, indicate that both these features matter for the understanding of heterogeneous influence of social interaction on individuals' stock market participation.

Contrasting the results for parental, with those for community social influence, indicates some interesting differences. First, while parental influence pertains to both male and females, only males are found to be affected by peers. A likely explanation to this result is that individuals (men) socializing in male dominated peer groups are more likely to be exposed towards stock market related signals. Moreover, peer groups often are formed with similar others (men socialize with other men), i.e. that individuals exhibit homophily (Lazarsfeld and Merton, 1954). Second, while interpersonal trust explains parental effects (significant positive

impact from parental social interaction for relatively more trusting individuals, but no effect on relatively low trusting individuals), both high and low trusting individuals are affected by community social interaction effects, but with a larger community social impact for low trusting individuals (based on the "trust in neighbor" measure). This is interesting since ideas have been put forth that in societies where people are raised to trust their close family networks, they are also taught to distrust people outside the family (Fukuyama, 1995). Thus, for individuals with a relatively higher within-family trust level (those with European origin), the impact from people outside the family seems lower. Note here, however, that our results on interpersonal trust should be interpreted with caution since our trust measures are broad and potentially also capture other cultural differences between non-European and European individuals. Third, comparing parental and community social interaction effects over individuals' level of financial literacy indicate that low literate individuals are affected by community interaction, but not by parental. Individuals with a high level of financial literacy are affected by parental interaction, but not by community.

This is possibly explained by that an individual's level of financial literacy (which we mainly interpret as capturing an individual's ability to value stock market related signals) may mirror both its potential to value socially obtained signals (mainly explaining community effects), as well as capturing with whom they socialize (parental effect). In this paper, we are interested in the effect of social interaction and its heterogeneous impact on direct ownership, i.e. stock market participation; however, indirect ownership of stocks through holdings in equity mutual funds may most likely also be of importance since the participation rates in Sweden are quite high.

The result, that differences in individuals' exposure to, as well as individuals' valuation of, stock market related signals are important in the understanding of who are affected by its social environment, are interesting and contribute to the nascent literature focusing on the role of the microstructure of social transactions for individuals' financial behavior (Hirshleifer, 2014). Although, our proxies are somewhat broad and further research is needed in order to draw more definite conclusions, results still point towards important aspects of concern for the understanding of the underlying mechanisms for the impact of social transmissions on individuals' financial behavior.

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# APPENDIX A

**Table A1: Variable definitions**

The table gives the definitions for the main variables used within the analysis.

| Variable | Variable definition |
|---|---|
| Dependent | |
| *Stock market participation* | 1=participate in stock market, 0=otherwise |
| Controls | |
| *Low financial literacy* | 1= Low financial literates are those with 9 years of schooling or less. 0=otherwise |
| *Medium financial literacy* | 1=Medium financial literates are individuals with more than 9 years of schooling and those that do not have at least 3 years of university education within economics and/or business administration. 0=otherwise |
| *High financial literacy* | 1=high financial literates are those individuals with at least 3 years of university education within economics and/or business administration. 0=otherwise |
| *Low trust* | Share of community residents that perceive themselves to not trust others in their surrounding community *(*data from Swedish National Institute of Public Health*)* |
| *Trust in family and friends* | Average trust level in one's neighbors, aggregated average on European/Non-European origin |
| *Trust level in neighbors* | Average trust level in one's family and friends, aggregated average on European/Non-European origin |
| *Disposable income* | Yearly disposable income, hundreds of SEK |
| *Gender* | Gender, 1= female, 0= male |
| *Born 1973* | 1= born 1973, 0= born 1963 |
| *Educational attainment* | Educational attainment (level 1-7) |
| *Education within business administration/economics* | 1= Education within economics or business administration (upper secondary and/or higher education) |
| *Children, age 0-3* | Nr of children, age 0-3 |
| *Children, age 4-6* | Nr of children, age 4-6 |
| *Children, age 7-10* | Nr of children, age 7-10 |
| *Children, age 11 or older* | Nr of children, age 11 or older |
| *Mutual funds* | 1= participate in mutual fund market, 0= otherwise |
| *Net wealth* | Net wealth, hundreds of SEK |
| *Negative net wealth* | 1= negative net wealth, 0=otherwise |
| *Married* | 1= if married, 0= otherwise |
| *Equal relationship* | Indicator variable for equal partners, i.e. relative income is between 0.9-1.1. 1= if equal partners, 0= otherwise. |
| *Partner, income* | Partners' yearly disposable income, hundreds of SEK |
| *Partner, educational attainment* | Partners' educational attainment (level 1-7) |
| *Mother, salary* | Mother, average yearly salary during individuals' adolescence, hundreds of SEK |
| *Father, salary* | Father, average yearly salary during individuals' adolescence, hundreds of SEK |
| *Mother, capital income* | Mother, 1= received capital income during individuals' adolescence, 0= otherwise |
| *Father, captial income* | Father, 1= received capital income during individuals' adolescence, 0= otherwise |
| *Mother, lagged portfolio outcome* | Stock portfolio outcome of mother between time period t-2 and t-1, raw ratio |
| *Father, lagged portfolio outcome* | Stock portfolio outcome of father between time period t-2 and t-1, raw ratio |
| *Partner, lagged portfolio outcome* | Stock portfolio outcome of partner between time period t-2 and t-1, raw ratio |
| *Mother, not participating in stock market* | 1= not participating in the stock market, 0=participating in the stock market |
| *Father, not participating in stock market* | 1= not participating in the stock market, 0=participating in the stock market |
| *Partner, not participating in stock market* | 1= not participating in the stock market, 0=participating in the stock market |
| *Community proportion of positive portfolio outcome* | Municipality log share of community inhabitants with a positive stock portfolio change between t-2 and t-1 |
| *Community proportion of negative portfolio outcome* | Municipality log share of community inhabitants with a negative stock portfolio change between t-2 and t-1 |
| *Community average disposable income* | Municipality average disposable income, hundreds of SEK |
| *Community proportion with high educational level* | Municipality share of highly educated individuals, raw ratio |
| *Lagged community proportion participating in the stock market* | Municipality share of community inhabitants that participate in the stock market |
| *Community proportion working in sector 1* | Municipality proportion working within sector 1 (farming, hunting) |
| *Community proportion working in sector 2* | Municipality proportion working within sector 2 (forestry and service to forestry) |
| *Community proportion working in sector 3* | Municipality proportion working within sector 3 (manufacturing of electric, and optics products) |
| *Community proportion working in sector 4* | Municipality proportion working within sector 4 (electricity, gas, heating, and water supply) |
| *Community proportion working in sector 5* | Municipality proportion working within sector 5 (wholesale trade and retail, reparation of vehicles, and other personal equipment) |
| *Community proportion working in sector 6* | Municipality proportion working within sector 6 (transportation, storage, and communication) |
| *Community proportion working in sector 7* | Municipality proportion working within sector 7 (real estate and renting, business service) |
| *Community proportion working in sector 8* | Municipality proportion working within sector 8 (education) |
| *Community proportion working in sector 9* | Municipality proportion working within sector 9 (societal and personal service) |
| *Community proportion with low trust* | Municipality proportion of individuals which are experiencing low trust in their surrounding network. |
| *Lagged mean portfolio outcome* | Aggregated average portfolio outcome, based on the whole sample |

**Table A2: Stock market participation**

The results pertain to the linear probability model reported in Table 3 within the paper. The dependent variable in all regressions is a binary indicator variable of stock market participation (participation=1; non-participation=0). Cluster robust standard errors at household level are reported in parentheses. Significance levels: *******p<0.01 ******p<0.05 *****p<0.10.

| Variable | Coefficient | Standard error |
|---|---|---|
| *Mother, lagged portfolio outcome* | 0.011*** | 0.002 |
| *Father, lagged portfolio outcome* | 0.007*** | 0.001 |
| *Partner, lagged portfolio outcome* | 0.017*** | 0.001 |
| *Community proportion of positive portfolio outcomes* | 0.053* | 0.027 |
| *Community proportion of negative portfolio outcomes* | 0.022 | 0.036 |
| *Mother, not participating in the stock market* | -0.060*** | 0.003 |
| *Father, not participating in the stock market* | -0.034*** | 0.003 |
| *Partner, not participating in the stock market* | -0.059*** | 0.002 |
| *Mother, average salary* | -0.00001 | 0.00005 |
| *Father, average salary* | 0.0001*** | 0.00001 |
| *Mother, capital income* | 0.048*** | 0.003 |
| *Father, capital income* | 0.053*** | 0.003 |
| *Partner, income* | -0.001 | 0.001 |
| *Log disposable income* | 0.007*** | 0.001 |
| *Log net wealth* | 0.035*** | 0.001 |
| *Negative net wealth* | 0.004*** | 0.001 |
| *Low financial literacy* | -0.005*** | 0.001 |
| *High financial literacy* | 0.057*** | 0.011 |
| *Education within business administration/economics* | 0.035*** | 0.004 |
| *Mutual funds* | 0.050*** | 0.002 |
| *Educational attainment* | 0.029*** | 0.001 |
| *Partner, educational attainment* | 0.013*** | 0.0013 |
| *Low trust country origin* | -0.001 | 0.007 |
| *Female* | -0.150*** | 0.003 |
| *Born 1973* | -0.089*** | 0.007 |
| *Children, age 0-3* | -0.002** | 0.001 |
| *Children, age 4-6* | -0.003*** | 0.001 |
| *Children, age 7-10* | -0.004*** | 0.001 |
| *Children, age 11 or older* | -0.006*** | 0.001 |
| *Married* | -0.001 | 0.002 |
| *Lagged mean portfolio outcome* | 0.010*** | 0.002 |
| *Lagged log community proportion of stock market* | 0.058** | 0.011 |
| *Log community average disposable income* | -0.032* | 0.012 |
| *Community proportion with high educational level* | -0.069 | 0.066 |
| *Community proportion working in sector 1* | -0.037 | 0.119 |
| *Community proportion working in sector 2* | -0.170** | 0.078 |
| *Community proportion working in sector 3* | -0.222*** | 0.067 |
| *Community proportion working in sector 4* | -0.121 | 0.099 |
| *Community proportion working in sector 5* | -0.139* | 0.078 |
| *Community proportion working in sector 6* | -0.001 | 0.096 |
| *Community proportion working in sector 7* | -0.200*** | 0.073 |
| *Community proportion working in sector 8* | -0.163** | 0.075 |
| *Community proportion working in sector 9* | -0.256** | 0.107 |
| *Community and time fixed effects* | Y | |
| *Memo* | N= 366,897; n= 88,730; Pseudo $R^2$=0.522 | |

**Table A3: Additional summary statistics**

The table reports summary statistics for additional parental, partner, and community control variables (included in the regressions). Mother and father salaries, partner disposable income, and community average disposable income, are all measured in hundreds of SEK.

| Variable | Mean | SD | Min | Max |
|---|---|---|---|---|
| *Mother, salary*[*] | 2310 | 3030 | 0 | 35963 |
| *Father, salary*[*] | 4534 | 4535 | 0 | 11940 |
| *Mother, indicator for capital income* | 0.431 | 0.495 | 0 | 1 |
| *Father, indicator for captial income* | 0.286 | 0.452 | 0 | 1 |
| *Partner, disposable income** | 1820 | 0.883 | 0 | 1076762 |
| *Partner, educational attainment* | 4.339 | 1.332 | 1 | 7 |
| *Mother, not participating in the stock market* | 0.866 | 0.340 | 0 | 1 |
| *Father, not participating in the stock market* | 0.797 | 0.402 | 0 | 1 |
| *Partner, not participating in the stock market* | 0.742 | 0.438 | 0 | 1 |
| *Lagged mean portfolio outcome* | 0.041 | 0.032 | -0.020 | 0.096 |
| *Community proportion trading* | 0.113 | 0.044 | 0.012 | 0.436 |
| *Community proportion participating in the stock market* | 0.223 | 0.194 | 0.091 | 0.478 |
| *Community average disposable income*[*] | 1927 | 1.171 | 1282 | 5966 |
| *Community average high educational level* | 0.293 | 0.081 | 0.089 | 0.554 |
| *Community proportion working in sector 1* | 0.020 | 0.021 | 0 | 0.210 |
| *Community proportion working in sector 2* | 0.098 | 0.059 | 0 | 0.404 |
| *Community proportion working in sector 3* | 0.056 | 0.041 | 0 | 0.320 |
| *Community proportion working in sector 4* | 0.061 | 0.019 | 0.013 | 0.166 |
| *Community proportion working in sector 5* | 0.125 | 0.026 | 0.031 | 0.243 |
| *Community proportion working in sector 6* | 0.067 | 0.023 | 0.007 | 0.198 |
| *Community proportion working in sector 7* | 0.138 | 0.050 | 0.023 | 0.295 |
| *Community proportion working in sector 8* | 0.220 | 0.032 | 0.125 | 0.362 |
| *Community proportion working in sector 9* | 0.038 | 0.011 | 0.006 | 0.155 |