

Peer performance and stock market entry ^{*}

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This version: February 26, 2010

Abstract

Peer performance can influence the adoption of financial innovations and investment styles. We present empirical evidence of this type of social influence: recent stock market returns that local peers experience strongly influence an individual's stock market entry decision. This effect is limited to positive returns that encourage entry, whereas negative returns do not make entry less likely. Market returns, media coverage, returns on locally held stocks, omitted local variables, and stock purchases within households do not drive our results. This type of social influence may partly explain, among other things, why participation rates tend to sharply increase in times of high market returns.

Keywords: Investor behavior, peer effect, social interaction, social influence, stock market participation

JEL classification: G11, D83

* We thank Malcolm Baker, James Choi, Joao Cocco, Lauren Cohen, David Faro, Simon Gervais, Harrison Hong, Michela Verardo, Annette Vissing-Jørgensen, Stefan Nagel, Jeffrey Wurgler, Motohiro Yogo, and the seminar and conference participants at the American Finance Association 2010 Atlanta meeting, European Finance Association 2009 Bergen meeting, Helsinki School of Economics, and London Business School for comments. Antti Lehtinen provided excellent research assistance. Financial support from the Finnish Foundation for Advancement of Securities Markets is gratefully acknowledged.

1. Introduction

“That others have made a lot of money appears to many people as the most persuasive ... evidence that outweighs even the most carefully reasoned argument...”

Robert Shiller, *Irrational Exuberance*, 2005

Investor sentiment—the collection of beliefs not justifiable by economic fundamentals— influences asset prices.¹ Although a variety of studies document the price impact of sentiment, the microfoundations are not well understood. In this paper, we analyze the role of social influences. Our aim is to explain individuals' stock market entry decisions using recent stock market experiences of local peers.

Market entry is an interesting decision to analyze, as asset price bubbles tend to be associated with sharp increases in participation rates.² Figure 1 uses data from Finland during the internet and technology boom of the late 1990s to illustrate this point: at the peak of the market, entry rates were about five times the average. Shiller (1984, 1990), among others, suspects that investment success stories spreading in networks of peers partly explain the pattern of new investors flocking into the market in times of high sentiment.

Stock market outcomes of peers may influence entry decisions through two plausible channels. First, individuals may use peer outcomes to update beliefs about long-term

¹ Investor sentiment is related to blatant violations of the law of one price (Mitchell, Pulvino, and Stafford 2002; Lamont and Thaler 2003), closed-end fund discounts (Lee, Shleifer and Thaler 1991), retail investor trading (Kumar and Lee 2006; Barber et al. 2009), IPO pricing patterns (Cornelli, Goldreich, and Ljungqvist 2006; Derrien 2005), investment (Baker, Stein, and Wurgler 2003, Polk and Sapienza 2009), and stock return predictability (Baker and Wurgler 2006).

² The low rates of stock market participation have attracted attention from both academics and policy makers (see, e.g., Mankiw and Zeldes 1991, Haliassos and Bertaut 1995, Guiso, Haliassos, and Jappelli 2003). Most of the evidence on stock market participation comes from cross-sectional snapshot data. An exception is Brunnermeier and Nagel (2008) who study the dynamics of wealth and participation.

fundamentals, such as the equity premium. However, compared with more deterministic environments, the stock market is exceptional in that learning about fundamentals from peer outcomes is difficult to rationalize. Peer outcomes represent small data samples that come with various biases: the random components in returns are large and unobservable factors are involved, such as investment skill and exposure to risk.³ For these reasons, information on peer outcomes should be discounted heavily. A large literature on probabilistic judgment shows, however, that people typically fail to fully adjust for small sample biases (e.g., Tversky and Kahneman 1971, Nisbett et al. 1976, Einhorn 1980).

Second, and even more importantly, people cannot directly observe peer outcomes and have to rely on indirect cues, such as verbal accounts, instead. Communication may be biased toward positive outcomes if appearing to be a successful investor carries private benefits.⁴ If such selectivity is present and people do not know whether their peers participate in the market, communication reveals not only the outcomes but also the participation status of peers. This mechanism may, in turn, make people enter the market if they care about their wealth relative to their peers' (Abel 1990; Gali 1994; Bakshi and Chen 1996; DeMarzo, Kaniel, and Kremer 2004).

We analyze the influence of peer outcomes by using reliable and accurate microdata that cover the stock holdings and trades of the entire population of individual investors in Finland from 1995 to 2002.⁵ These individual-level stock market transactions are an exceptional source of outcome data, as we can identify the true outcomes of neighboring investors for each

³ See models of social learning, for example, Ellison and Fudenberg (1993, 1995), McFadden and Train (1996), Persons and Warther (1997), Banerjee and Fudenberg (2004), and Cao, Han, and Hirshleifer (2009).

⁴ Such behavior is modeled by Hirshleifer (2009), and is also in line with the communication model by Bénabou and Tirole (2002).

⁵ The data source, the Finnish Central Securities Depository, is an official ownership registry that covers the whole Finnish stock market. More description of a subset of the data is provided in Grinblatt and Keloharju (2000).

individual explicitly (as opposed to self-reported information in survey data), measure them at a high frequency without error, and relate them to individual decisions.

We identify peer outcomes by taking advantage of the large geographical variation in stock holdings and returns. We aggregate direct stock holdings at the zip-code level and measure the monthly returns of these zip-code portfolios. We find that high stock returns during a month in a neighborhood stock portfolio are associated with an increase in the number of new investors entering the stock market in the same neighborhood the following month. The effects are economically large: an increase from the median neighborhood return to the 75th percentile return causes an annual increase of several percentage points in the participation rate. We also directly contrast the neighborhood return effect with the impact of the general market return, which in itself is a significant predictor of entry. We find that the neighborhood effect is more powerful.

Alternative mechanisms that do not involve social influence could generate some of our results. Panel data techniques, that is, fixed effects and the use of lagged returns, eliminate concerns about common unobservables and reverse causality. For example, the time fixed effects remove the influence of market returns and market-wide media coverage, and the zip-code fixed effects control for systematic regional differences. A possibility nevertheless remains that the residents of a zip code would experience a shock in a month that is positively correlated with neighborhood returns. We assess this possibility by analyzing subsamples in which such influences are unlikely.

Any shocks that involve stocks of local companies cannot explain our results, as the estimates are similar in areas with no local stocks. An analysis in which we look at the peer influences in individuals' decisions to participate in IPOs, which, by definition, are not held by any investors before listing, rules out any other special roles for stocks local investors hold. Wealth effects from local stock market returns to non-participants' wealth are an unlikely

explanation, as our results are practically the same in areas where wealth and income of residents are more locally concentrated. Local media coverage is also an unlikely explanation, as business news coverage usually operates at the province level, for which we control in a robustness check. We rule out household heads purchasing shares for other household members by looking at the interactions in the behavior of individuals of the same sex and age.

We also perform additional tests to understand the nature of social influence. We decompose the outcome variable into negative and positive regions to analyze whether negative peer returns influence entry similarly to positive returns. We find that the negative outcomes do not affect entry, and that the relation between peer returns and entry comes solely from the positive region of returns. This pattern is consistent with selective communication: people are more likely to talk about favorable experiences.⁶

We can summarize our contribution as follows. First, we find strong evidence of outcome-based social influence in the stock market, a setting in which peer outcomes should not be very informative. Second, we uncover a peculiar pattern in social influence consistent with the idea that people communicate selectively, that is, refrain from discussing bad outcomes. Third, we find evidence consistent with individuals extrapolating from peer outcomes, with implications for understanding how sentiment develops and propagates in the economy.

Our paper is most closely related to studies that analyze the influence of peer actions in the stock market.⁷ Hong, Kubik, and Stein (2004) and Brown et al. (2008) provide evidence consistent with the notion that individuals are more likely to participate in the stock market when

⁶ This asymmetry does not appear to be driven by short-sales restrictions that make it difficult for prospective new investors to act on negative information. In our regressions, the constant term is positive, that is, the unconditional entry rate is positive. Hence, if communication were equally likely for negative and positive returns, the negative peer returns would bring down the entry rate from the positive unconditional average. Our results are not consistent with this hypothesis, however. Furthermore, the results hold also in areas where the unconditional entry rate is particularly high.

⁷ In section 2, we review other papers on the influence of peer actions in settings outside the stock market.

their geographically proximate peers are participating. Hong, Kubik, and Stein (2005) also show that investors tend to buy stocks their local peers have been buying in the recent past. Unlike these studies, we show that peer outcomes have strong incremental explanatory power over peer actions, making it easier to attribute our findings to sentiment rather than valuable information exchange.

Our paper also connects to a recent literature that examines how individuals form their beliefs about asset returns. Kaustia and Knüpfer (2008), Choi et al. (2009), and Malmendier and Nagel (2009) argue that personally experienced outcomes are an important influence in investment decisions, over and above general statistical information. Such behavior is consistent with reinforcement learning, that is, repeating behavior that has produced good outcomes in the past. Lacking any personal experiences, the new investors we analyze may turn to the next most cognitively accessible source of information: the experiences of their peers.

Only a handful of other studies analyzes the influence of peer outcomes in other settings, within the fields of agricultural and development economics (Munshi 2004, Kremer and Miguel, 2007, and Conley and Udry 2009). We provide evidence on the influence of peer outcomes in the stock market, where the environment is much less deterministic and consequently the impediments to social learning are much stronger than in the settings involved in previous studies (planting of wheat variants, de-worming drugs, and fertilizer use).

We outline the remainder of the paper as follows. Section 2 reviews the literature on different forms of social interaction and develops the hypotheses. Section 3 discusses relevant institutional background and the data sources, and section 4 presents the empirical strategy. Section 5 presents the results, and section 6 assesses alternative explanations. Section 7 concludes.

2. Literature and hypotheses

2.1. Earlier literature on social interaction

Empirical studies on social interaction come from various fields and settings. One manifestation of the magnitude of the studies is the vocabulary they use: the social mechanism can be referred to as social influence, peer effects, community effects, neighborhood effects, network effects, herding, mimicking, conformity, or observational learning. A common problem in empirical studies is identification: a finding that individuals' choices are related to peers' choices is not necessarily due to social interaction (Manski 1993, 2000). Many empirical studies nevertheless argue, and use varying identification strategies to show, that social interaction is indeed driving the observed relation between average behavior of a peer group and an individual's behavior.

Research has found evidence for action-based social learning in farmers' crop choices (Foster and Rosenzweig 1995), criminal activity (Glaeser, Sacerdote, and Scheinkman 1996), labor market participation of married women (Woittiez and Kapteyn 1998), use of welfare benefits (Bertrand, Luttmer, and Mullainathan 2000), membership of social groups (Sacerdote 2001), pension plan participation (Duflo and Saez 2002), stock market participation (Hong, Kubik, and Stein 2004), stock market trading (Shive 2009), choice of a health plan (Sorensen 2006), automobile purchases (Grinblatt, Keloharju, and Ikäheimo 2008), choice of workplace (Topa, Bayer, and Ross 2009), and choice of dishes from a restaurant menu (Cai, Chen, and Fang 2009).

Sacerdote (2001) and Zimmerman (2003) show that the performance of a randomly assigned roommate positively affects academic performance in college. One interpretation of this result is that being assigned to a high-achieving roommate helps one emulate good study practices. This

interpretation is consistent with outcome-based social learning. It may, however, be due to other externalities, such as motivation or competitive pressure.

2.2. Outcome-based social influence

Early work by social psychologists has shown the importance of observing outcomes as children copy new behaviors (Bandura and Walters 1963). In the field of animal studies, Call and Tomasello (1994) find that orangutans do not merely copy what other orangutans are doing when they are trying to obtain out-of-reach food. Rather, they adopt techniques that yield best results, paying attention to both orangutan and human demonstrators' success. Theorizing based on these findings informs the development of hierarchical models of learning in the behavioral brain sciences (for a review, see Byrne and Russon 1998). Economic theorists have extensively modeled outcome-based social learning (Ellison and Fudenberg 1993, 1995; McFadden and Train 1996; Persons and Warther 1997; Banerjee and Fudenberg 2004; Cao, Han, and Hirshleifer 2009).

Despite the theoretical interest, empirical research on the outcome-based dimension of social influence has been limited. The studies of which we are aware are in the areas of agricultural and development economics. Munshi (2004) finds that Indian farmers planted more of a new high-yielding variant of wheat in the early 1970s if farmers in the neighboring districts had received good yields from that variant. The farm-level results are based on a single snapshot of data in 53 villages. Kremer and Miguel (2007) test for peer effects in the decision to undergo drug treatment against intestinal worms in Kenya. There can be large benefits to society via fewer infections if enough people take the treatment. Despite this positive externality, Kremer and Miguel find that people are less likely to take the de-worming drugs if their peers have taken them. This finding suggests people are learning something about the outcomes of their peers, although Kremer and

Miguel are not able to measure those outcomes. Conley and Udry (2009) investigate fertilizer use in 47 pineapple farms in the Akwapim South district of Ghana at a time when pineapple was a new produce in the area. Figuring out the right amount of fertilizer requires some experimentation, as the optimum amount depends on local conditions. Conley and Udry's results show that the amounts of fertilizer used, as well as the profits their peers achieved, affected farmers' use of fertilization.

2.3. Naïve extrapolation and selective communication

In addition to our main hypothesis about outcome-based social influence, we investigate two broad channels through which peer outcomes might influence actions in the stock market. First, if people extrapolate from peer outcomes when forming their return expectations (as in Shiller 1984, 1990), outcomes will exert an incremental influence on entry decisions beyond other sources of information. Given the small and biased samples drawn from peer outcomes, such behavior appears anomalous. Second, if more communication follows good peer outcomes, and the participation status of peers is not fully known prior to communication, people may enter the market due to relative wealth concerns. People may want to imitate their peers due to a "Keeping up with the Joneses" effect (Abel 1990, Gali 1994, Bakshi and Chen 1996). Such an effect may arise from conformity to social norms (Akerlof 1976) or competition for local resources (DeMarzo, Kaniel, and Kremer 2004).

People might be more willing for several reasons to discuss their stock market experiences after they have experienced good returns. First, they may simply enjoy discussing their positive stock market experiences more than the bad ones. Second, appearing to be a competent investor can carry private benefits. Third, various theories in psychology (under the conceptual umbrellas of motivated cognition, self-deception, or attribution) predict, and experiments confirm, that

people have a self-serving bias in recalling and interpreting the factors involved in their successes and failures.

People tend to take credit for good performance while blaming external factors for poor performance. Cognitive dissonance theory (Festinger 1957; see Akerlof and Dickens [1982] for an economic model) argues that a discrepancy between one's actions and self-image causes discomfort, and that people try to act and think in ways that reduce the discomfort. Bénabou and Tirole (2002) present a general economic model in which agents protect their self-esteem by engaging in self-deception through selective memory and awareness. Hirshleifer (2009) provides a model of investor communication in which investors are more likely to discuss their profitable investments than their losing ones, and people fail to adjust for this bias when deciding which investment style to adopt. Strategies with higher variance thus tend to be reported more often, making people overestimate the value of active investment strategies.

The naïve extrapolation and selective communication stories can alone account for a positive relation between past neighborhood returns and the tendency of new investors to enter the market. Selective communication makes a further testable prediction the extrapolation story does not share: peer outcomes should have a stronger influence on actions when the outcomes have been better. The stories are not mutually exclusive, however. In particular, communication might be selective, but once communication takes place, extrapolation still occurs.

3. Institutional background and data

3.1. Stock market participation in Finland

Direct stock ownership was the primary means for stock market participation in Finland during our sample period. From 1995 to 2002, the stock market participation rate increased from

9.3 percent to 13.9 percent, which implies an annual increase of 50 basis points.⁸ The largest increases occurred from 1998 to 2000, and they coincided with high market returns and many equity offerings that attracted new investors to participate in the stock market. Privatizations of government-owned companies played an important role in increasing stock market participation—individuals made about 240,000 subscriptions in these offerings (Keloharju, Knüpfer, and Torstila 2008).

Other means of participating in the stock market comprise the government-sponsored obligatory pension plan, voluntary pension products, and mutual funds. All employees in Finland are automatically included in a government-sponsored defined benefits pension plan. Finland has no personal pension accounts such as 401k, and an individual employee has no influence on the amount of her own contribution or the selection of investments in these government-sponsored plans. Pensions are mostly financed by the contributions of the current workforce.

Making additional voluntary pension investments with some tax benefits is also possible. Numbers from the beginning of 2003 suggest that 15 percent of the assets in these voluntary plans were allocated to financial products in which the return depends on the performance of the capital markets.⁹ For the remaining 85 percent of the assets, the return is linked to money market rates.

Mutual funds are a relatively recent phenomenon in Finland. The first mutual funds were introduced in 1987, but their use by households remained limited for several years. In the beginning of our sample period in 1995, households' assets held in all types of mutual funds were 11 percent of the households' direct stock market investments. This figure increased to 32 percent

⁸ In our analysis, as in Figure 1, we leave out stock market entries through equity offerings and other transactions where the investor cannot fully determine the timing of entry.

⁹ The estimates in this section are based on data provided by the Finnish Bankers' Association and the Finnish Association for Mutual Funds.

by 2002, the end of our sample period. Discussions with bankers reveal that people without any direct stock holdings did not commonly purchase equity mutual funds during the 1990s. Since 2002, the popularity of mutual funds has grown.

We lack accurate statistics on the amount invested in equity mutual funds, but their share has been about 30 percent to 50 percent of all mutual fund assets during 1998–2002. We assume the same numbers apply to voluntary pension plans. Based on these assumptions, one can approximate the relative importance of various channels for stock market investments. Of all the forms of households' equity exposure (directly held stock, mutual funds, pension plans), directly held stock has been the dominant form: its average share during the sample period has been 89 percent to 93 percent.

3.2. Data

The data come from an established source for investor level data. The dataset is derived from the Finnish Central Securities Depository (FSCD), an official registry that includes every stock market transaction of every stock market participant in the whole Finnish stock market. The data span a time period from January 1995 to November 2002. The data also include a number of investor characteristics. For our purposes, the most important is the place of residence, which is available at three points in time: January 10, 1997, June 30, 2000, and November 27, 2002.

From this dataset, we extract two types of data:

- a. Entry dates. For every investor in the sample, we determine the stock market entry date as the first day on which an investor buys stocks of publicly listed companies. We require that no other transactions with positive volume occur on that day to exclude entries through equity offerings, gifts, inheritances, divorce settlements, and

others that do not represent an active stock market entry decision. This definition of stock market entry also leaves out investors that have a stock market position in the beginning of the sample period. Some of the investors that enter the stock market during our sample period might already have participated in the stock market earlier but perhaps exited before the beginning of our sample period. If anything, this possibility is likely to bias our results in favor of the null, because investors with previous personal experiences of stocks probably pay less attention to peer outcomes than individuals with no such experiences.

- b. Neighborhood returns. In the absence of a direct mapping from an individual to his or her neighbors, we use zip codes as the neighborhoods. In total, there were about 2,700 zip codes in Finland at the end of 2002. For each zip code in the sample, we define neighborhood return as the value-weighted average return on the portfolio the investors residing in a zip code held in the beginning of a month. We also use the equally weighted portfolio return in some of the analysis.

We merge this dataset with socioeconomic census data from Statistics Finland. Table 1, Panel A, summarizes descriptive statistics of the zip codes in the sample. The average stock market entry rate implies that on average 1.6 percent of the inhabitants of a zip code entered the stock market during the sample period. This number is different from the aggregate entry rate, 1.8 percent, which effectively weights the zip-code entry rates with the number of inhabitants in each zip code. For illustrative purposes, Panel B reports results of regressions of the determinants of stock market entry rates aggregated at the zip-code level. Entry rates are higher in areas with higher wealth and income, and higher levels of education. Members of the Swedish-speaking

minority, which hold a disproportionately high amount of wealth, are also more likely to enter the stock market. Figure 2 plots the stock market entry rates across the whole country. Stock market entry rates are much higher in Southern and Western Finland, reflecting the concentration of urban areas in the South and the Swedish-speaking communities in the West.

4. Methods and identification

In an effort to test our main hypothesis, we run analyses of changes in zip-code entry rates at monthly level. This approach introduces significant cross-sectional and temporal variation in our key variables of interest: neighborhood returns and entry rates. Our identification of the effect of experienced outcomes on neighborhood entry relies on the panel features of the data. Another important feature is our ability to unambiguously identify the shareholders and non-shareholders in an area at any point in time. Since we lack register data on individuals who never became shareholders during the sample period, we aggregate the number of shareholders to zip codes, for which we have the total number of inhabitants available. This aggregation enables us to trace the changes in the exact number of participating and non-participating individuals between any two points in time.

We construct a panel of observations consisting of 2,668 cross sections (zip-code areas) and 93 periods (calendar months). This panel dataset is not typical in that it has an unusually large number of both cross sections and time periods. In estimating the models, we rely on methods developed in political science for analysis of political connections between countries over time. Beck and Katz (1995, 2004) show that such models can be estimated with simple OLS techniques, and more complex techniques provide minor or non-existing improvements.

The main regression model is the following:

$$y_{it} = a + b(\mathbf{w}_{i,t-1}\mathbf{r}_{i,t-1}) + y_{i,t-1} + p_{i,t-1} + u_{it}, \quad (1)$$

where the subscripts i and t refer to zip-code areas and months, respectively. The dependent variable, y , is the (log) number of new investors entering the stock market in the zip code during a month. \mathbf{w} is a row vector of local portfolio weights in each stock in the beginning of a month, \mathbf{r} is a column vector of returns for those stocks during a month, so that $\mathbf{w}\mathbf{r}$ is the return of the local (zip-code) portfolio. p is the stock market participation rate, and u is the error term that absorbs the fixed effects for months and zip codes used in the analysis. We calculate standard errors, allowing clustering at the zip-code level.

The outcome variable $\mathbf{w}\mathbf{r}$ is our main variable of interest. We include lagged number of new investors and lagged stock market participation to control for trends in stock market entry. According to our main hypothesis, neighborhood return measured as $\mathbf{w}\mathbf{r}$ should be positively related to the number of entries.

The empirical model attempts to capture social influence in which communication takes place between two groups of people living in the same area (shareholders and non-participants). This structure, combined with the significant amount of temporal and cross-sectional variation, rules out alternative mechanisms based on reverse causality and common unobservables. First, consider reverse causality—the possibility that stock market entry in a particular area causes higher neighborhood returns, not vice versa. The introduction of new stock market participants could result in price pressure on stocks owned by existing investors in an area. Although this mechanism might affect the contemporaneous relation between entry and return, it does not explain the relation between *lagged* returns and entry. We therefore rule out this alternative mechanism by using the lagged neighborhood return as a regressor.

Common time-invariant unobservables might also generate a positive relation between neighborhood returns and entry. As an example, consider an area where residents are financially sophisticated. Existing investors might enjoy high returns in such an area, and high-quality advice from their peers—rather than the returns—might encourage new investors to participate in the stock market.¹⁰ This scenario involves social interaction but not necessarily the outcome-based mechanism we posit. We nevertheless eliminate this type of influence from our analysis, as the zip-code fixed effects control for common time-invariant unobservables.

Common time-varying shocks might also produce a positive relation between local returns and entry. For example, high market returns are likely to be associated with increased visibility of stocks in the media, which could make some investors enter the market. We control for this possibility and any other market-wide time-varying influences by including month fixed effects in the analysis.

A remaining issue involves time-varying shocks that are unique to a particular zip code. The majority of these influences, such as changing prospects of the local economy, work mainly through the stock returns of local companies. Another potential story is one in which investors only follow local companies and decide to participate after observing good returns. Yet another, though perhaps less plausible possibility, is that local stock market wealth shocks generate spillovers to non-participants' wealth. Finally, household heads might purchase shares for other household members after experiencing high returns, or regional media coverage of the stock market might increase after high neighborhood returns. Our empirical strategy for assessing these alternative explanations relies on the rich cross section of data we have on different types of areas

¹⁰ Individual investors underperform the market portfolio, and would thus be better off investing in a passive market portfolio (Odean 1999, Barber and Odean 2000).

and investors: we identify subsamples in which the alternative explanations imply a weaker or a nonexistent neighborhood-return effect. We discuss this evidence in section 6.

In this section, we have argued our empirical framework is immune to many of the econometric challenges that plague empirical studies of social interaction. In influential papers, Manski (1993, 2000) argues that identifying social interaction in most of the available datasets is difficult due to reverse causality, common unobservables, or common responses to shocks. We believe our data and method are exceptionally well-suited to overcome these issues.

5. Results

5.1. Past neighborhood returns and stock market entry

In each month and each zip code, we explain the number of new investors entering the stock market with the returns existing investors experience. We discussed this regression in detail in section 3.1. Table 2, Panel A reports descriptive statistics of the key variables in the regression. On average, 0.19 investors entered the stock market in a zip code in a month. The average return on the portfolio of existing investors equals 1.2 percent and the mean stock market participation rate is 9.6 percent. We find considerable variation in these numbers both across time and across zip codes. For example, half of the monthly zip code returns fall between -3.9 percent and 5.7 percent. In the majority of the cases, no new investors entered the market, whereas the maximum number of new investors equals 42.

Table 2, Panel B, reports the results of the regression (1). Column 1 leaves out the lagged number of new investors and lagged participation rate while column 2 adds the lagged number of investors. The full model appears in column 3.

All specifications provide strong support for our main hypothesis, that is, that past peer outcomes influence strongly individual actions. In the full model, past neighborhood return enters the regression with a significantly positive coefficient of 8.5×10^{-2} . Lagged variables suggest a strong autocorrelation in stock market entry and that stock market entries are positively related to the level of stock market participation in a zip code. Leaving out the lagged control variables changes somewhat, but not dramatically, the coefficient on the neighborhood return variable.

We experiment with several different specifications in addition to those we report here. We estimate the models with a subsample that leaves out observations for which the number of entering investors equals zero. We also replace the dependent variable with a dummy variable that takes the value of one if at least one new investor in a zip code in a month enters the market. The results in these alternative specifications are similar to those obtained in the baseline analysis.

We also divide the sample into quartiles according to participation rates prevailing in the zip code in the previous month. The results in areas with higher participation rates are much stronger than in the baseline analysis—the coefficient of the neighborhood return variable equals 18.6×10^{-2} (t -value 6.22) in the top quartile of areas where on average every fifth individual participates in the market. We also replace the value-weighted return with a variable that equally weights each investor's portfolio return, and find that the coefficient on the equally weighted return equals 13.7×10^{-2} (t -value 8.37), which is considerably larger than that of the value-weighted return. These results are intuitively appealing: areas with high participation rates have more opportunities for social learning, and peer outcomes there are more likely to influence entry. When many investors in the neighborhood (as opposed to investors owning a large fraction of the neighborhood portfolio) have experienced high returns, the influence of peer outcomes should also be stronger.

We assess economic significance by providing marginal effects of the coefficients and comparing the effect of neighborhood return with the effect of market returns. Marginal effects are calculated as a change in the number of investors resulting from a one-standard-deviation change in the neighborhood return. Our benchmark in this analysis is the average zip code, which has 225 investors and a 1.2 percent monthly return. Based on our estimates, the typical increase in the logged number of investors in a month equals $0.085 \times 0.012 = 0.001$. This number translates into 0.2 new investors. With a one-standard-deviation increase in the return from its mean, the increase in the log number of investors equals $0.085 \times 0.097 = 0.008$, which corresponds to 1.9 new investors. This finding suggests the effect of increasing the return by one standard deviation has an eightfold effect on stock market entry.

Column 4 in Table 2, Panel C, drops the month fixed effects and replaces them with a variable measuring market return in the previous month. Although we lose the ability to control for time effects, this analysis allows us to compare the strength of the neighborhood return effect with that of market returns.

The results show that neighborhood return effects are more important than market returns: the coefficient on neighborhood return is about 30 percent higher than that of market returns. The results also show that market returns are imperfect controls of time effects. For example, the coefficients of the lagged dependent variable and participation rate increase significantly, both in magnitude and statistical significance, suggesting that part of the imperfectly controlled time effects spill over to these variables.

Market returns are visible in the media as well as in the publications of stockbrokers and mutual fund companies. The neighborhood returns, on the other hand, are not published anywhere. Instead, they are transmitted by word of mouth. This observation is consistent with the

idea that vivid stories of the actual experiences of one's peers have a greater effect on behavior than general statistical information.

5.2. Naïve extrapolation and selective communication

Section 2 outlines two broad channels through which peer outcomes may influence stock market entry. Under naïve extrapolation, return expectations of potential new investors adapt to the outcomes their peers experience. Under selective communication, communication that is more likely after good outcomes reveals the participation status of peers, which triggers relative wealth concerns. The stories are not mutually exclusive (naïve extrapolation may occur after selective communication), but analyzing how the neighborhood return effect varies in the region of good and bad outcomes can test for the presence of selective communication. In defining good and bad outcomes, we look at returns above and below zero, a reference point investors commonly use when defining gains and losses.

In Table 3, we estimate a piecewise linear model in which we break down the neighborhood return into two variables that capture separately the slope estimates associated with positive and negative returns. The results show that the effect on entry rates comes exclusively from positive returns. The coefficient on negative returns is somewhat surprisingly negative, but statistically insignificant in columns 1 and 2. Column 3 presents results on the full specification by adding the past participation rate variable, which produces a coefficient for negative returns that is essentially zero.

Table 3, Panel B, shows a graphical illustration of the different impacts of negative and positive peer returns. We divide the neighborhood return into categories representing five percentage point intervals between -10 percent and 15 percent, as well as categories for a return less than -10 percent and in excess of 15 percent. We choose the cutoff values for the top and

bottom categories so that approximately 5 percent of the distribution falls within them both in the right and left tail of the distribution. We assign the categories dummy variables that replace the neighborhood return variable in a regression similar to the full model in Table 2, with the 0 to 5 percent as the omitted category.

The graph, which plots the coefficient estimates, confirms the results from the piecewise linear specification that employed a single change in the slope estimate at zero. The graph further shows that the influence of peer returns is particularly strong for returns in excess of 15 percent.

These results are consistent with selective communication. That is, people are more likely to discuss their stock market experiences with others when the experiences have been favorable, maybe because appearing to be a successful investor carries private benefits. Self-serving bias in recall and attention can also cause people to talk about their investments more when performance is good.

We have attributed our finding of an asymmetric relation between the neighborhood return and entry rates to selective communication. Alternatively, this result could be due to short-selling constraints. Under this alternative explanation, people would be equally likely to discuss their stock market performance with their peers regardless of the sign of the return. Given short-sale restrictions, the prospective new investors could not easily act on the negative information and would continue to stay out of the market. This mechanism would produce behavior consistent with our findings.

Short selling was relatively difficult for individual investors, and thus rare during our sample period. This hypothesis nevertheless faces difficulty in accounting for the asymmetric relation we find. Recall that a strong upward trend in stock market participation exists in our sample, similar to many other countries. The unconditional entry rate per month is thus positive, exemplified by the positive constant term, 0.21 (t -value 10.5), in the regression. Therefore, the monthly entry rate

can come down to the extent that the prospective new investors are affected also by their peers' negative experiences. The positive unconditional entry rate should thus allow a positive coefficient also in the region of negative returns, a result we do not find.

One may still wonder whether the magnitude of the unconditional entry rate is large enough to allow for the entry rate to drop when peer returns have been negative. We investigate this possibility by dividing the sample into quartiles based on the overall entry rate during the sample. We would expect to see a significant positive coefficient on the negative return variable in the top entry-rate quartile in a regression similar to that in Table 3, column 3, if short sales constraints contribute to the asymmetric relation, but entry rates in the full sample are too low to drop after negative peer returns. The coefficient estimate equals -3.3×10^{-2} and is statistically insignificant with a t -value of -0.51. This result is not consistent with the story that short sales constraints explain the asymmetric relation we find.

6. Alternative explanations

6.1. Purchases within households

Household heads purchasing shares for other members of the household after experiencing positive returns could drive our results. Such a mechanism does not necessarily involve any social influence. We address this possibility by relating individuals' entry decisions to outcomes of individuals who are not likely to be members of the same household but live in the same zip code. People of the same sex and same age rarely live in the same household, so we analyze how investors of the same sex and age influence individuals' entry decisions. Since most investors are male, we choose the men in our sample. We experiment with different ranges for the ages. For males born between 1948 and 1968, the coefficient estimate equals 6.6×10^{-2} (t -value 4.35), and

for males born between 1938 and 1958, the estimate equals 4.6×10^{-2} (t -value 3.99). These numbers are similar to the baseline results, providing reassurance that purchases within households do not generate the neighborhood effect.

6.2. *Local wealth shocks*

If neighborhood returns are positively correlated with changes in the wealth of individuals who do not participate in the stock market, some of these individuals may enter the stock market after high neighborhood returns, either due to changes in risk aversion or to lower per-period costs of participation (Abel 2001, Vissing-Jørgensen 2003, Brunnermeier and Nagel 2008). Here the positive relation between neighborhood returns and market entry arises from the local wealth shock to non-participants' wealth and is not due to social influence.

Either local stocks or stock market wealth effects may create a channel through which local stock market wealth shocks could influence entry. Changes in the prospects of the local economy may influence both the returns on local stocks (which are predominantly held by local investors; see Coval and Moskowitz [1999], Huberman [2001], and Grinblatt and Keloharju [2001]) and the wealth of the non-participants through higher demand for local products and services, or higher salaries and bonuses paid to employees of local companies.

We put together several pieces of evidence that collectively speak against local wealth shocks. We first repeat the baseline results in Table 2 by including only the municipalities that have no local companies with listed stocks. The analysis includes 197,511 observations and yields a coefficient estimate of 6.27×10^{-2} (t -value 5.42). The estimates are similar to the baseline specification, which is strong evidence against local stocks driving our results.

Even in the absence of local stocks, changes in stock market wealth may influence the real economy through wealth effects from changes in stock market wealth to stockholders'

consumption (Poterba 2000). If stockholders increase their consumption after observing positive returns on their portfolios, the effect may generate a spillover to the local economy, and ultimately, to the wealth of non-participants.

How much individuals should alter their consumption in response to month-to-month fluctuations in stock prices is unclear, as consumption should be related to anticipated, not observed, changes in wealth. Even with longer estimation periods than ours, microdata-based empirical evidence on stock market wealth effects is mixed and many of the estimates are insignificant. The estimates are especially small for households that do not participate in the stock market (Starr-McCluer 2002, Dynan and Maki 2001).

Even less evidence is available to guide our expectations about the speed at which a wealth shock might propagate from the stock market to non-participants' wealth. In unreported analysis, we find that lagged returns beyond one month are not statistically significantly related to stock market entry, which is consistent with social influence but perhaps difficult to reconcile with wealth effects.¹¹ We also noted earlier that negative neighborhood returns do not discourage entry. Wealth effects have a hard time explaining this result, whereas it is naturally related to social influence and communication.

We also provide additional results on wealth effects by investigating how the neighborhood return effect relates to the composition of wealth and income in an area. Wealth effects from the stock market to non-participants' wealth can operate either through housing wealth or income and should thus be higher in areas where housing wealth represents a larger proportion of wealth and

¹¹ This result comes from an analysis at the daily level where lags of more than one month can be included in the analysis. The investor-level analysis randomly assigns one day from $t = -370$ to $t = -120$ before the actual entry date as a shadow-entry date. The actual entry date and the shadow-entry date are coded as the dependent variables taking the value of one and zero, respectively. The independent variables are the neighborhood returns measured over intervals of -1 to -30 , -31 to -60 , -61 to -90 , and -91 to -120 days. Out of these variables, only the first one is statistically significant.

in areas where income is more closely tied to the local economy. We implement these ideas by looking at how the neighborhood return effect varies in areas with a high proportion of homeowners and a high proportion of self-employed people (defined here as the sum of the proportions of farmers and entrepreneurs).

We run regressions similar to that in Table 2, column 3, and include an additional explanatory variable that is an interaction between the neighborhood return and a dummy variable for higher-than-median homeownership and self-employment. The interaction terms in both regressions, one for homeownership and the other for self-employment, are small in magnitude and statistically insignificant (coefficients of 1.7×10^{-2} and -0.2×10^{-2} with t -values of 1.25 and -0.12, respectively). These results suggest the neighborhood return effects we find are not confined to areas with high homeownership and self-employment rates, going against the predictions of the wealth effect story. Taken together, we believe local wealth shocks are not driving the relation between neighborhood returns and stock market entry.

6.3. Locally held stocks

If prospective investors more closely follow stocks existing investors tend to hold, they may buy these stocks after seeing them produce high returns. Given that differences in local ownership generate the observed cross-sectional variation in neighborhood returns, cases in which stocks individuals follow have been performing well are likely to coincide with a high return on the corresponding neighborhood portfolio. New investors would thus enter the stock market after observing good performance of the locally held stocks, irrespective of observing any outcomes of their neighbor's portfolio.

We investigate the ability of local following to explain our results by analyzing market entry in stocks with no prior history, namely, Initial Public Offerings (IPO). These stocks are not part

of any local portfolio and following their performance prior to the listing is impossible. If prospective investors only follow stocks the existing investors hold, past returns on them should not influence market entry via IPO stocks.

In Table 4, we perform an analysis of the demand for IPOs. The sample is a time–zip-code panel with the full set of zip codes we used in the main analysis of stock market entry. We now define time as the starting date of the subscription period of an IPO. Details of the sample IPOs and their characteristics appear in Kaustia and Knüpfer (2008).

The dependent variable in the regression is the log number of new investors participating in a particular IPO in a zip code. Independent variables are similar to those in Table 2, and we measure them at the beginning of the subscription period of each IPO. We measure the neighborhood return from a period of 30 days before the beginning of the subscription period. We estimate the regressions by including zip-code fixed effects. We control for time effects with IPO fixed effects, which pick up the influence of market returns and other contemporaneous effects.

The results show recent neighborhood returns strongly influence the likelihood of entering the stock market via an IPO. The similarity of the results on IPOs to the baseline results goes against the idea that a tendency to follow locally held stocks would drive the results.

Besides providing a possibility to address an important alternative explanation, the results on IPOs make an independent contribution to the IPO literature. Derrien (2005) and Ljungqvist, Nanda, and Singh (2006) model the impact of investor sentiment on IPO demand and pricing patterns. Empirical studies find that these demand and pricing patterns are correlated with measures of investor sentiment (Lee, Shleifer, and Thaler 1991; Rajan and Servaes 1997; Lowry 2003; and Cornelli, Goldreich, and Ljungqvist 2006). Kaustia and Knüpfer (2008) argue that

investors' past personal experiences with IPOs provide a microfoundation for the role of sentiment in IPO demand.

Our results show how the positive stock market experiences of peers influence the inexperienced investors' IPO demand. Existing investors' good performance thus introduces a positive externality in the form of new investors, something the issuers and their investment banks are likely to value (Cook, Kieschnick, and Van Ness 2006).

6.4. Local media coverage

Neighborhood returns might correlate positively with the extent of media coverage on stocks. A local journalist might, for example, decide to write a story promoting stock market investment after experiencing good returns.

The institutional characteristics of the Finnish media industry suggest such a mechanism is not likely to drive our results. Finland has practically no local TV stations. Instead, all parts of the country follow the four national TV channels. The month fixed effects in our regressions absorb the shocks in TV coverage. One national newspaper dominates the newspaper market, but several smaller newspapers do exist. The market areas of the newspapers that regularly cover business news follow provincial borders; that is, each of the 20 provinces typically has its own newspaper. As for radio stations, the national broadcasting company has one station in each of the provinces.

The geographical segmentation of the media market suggests shocks to media coverage should operate at the level of provinces. We implement this idea by adding province-month fixed effects to the neighborhood return regression, which then identifies the neighborhood return effect solely from the variation between zip codes in a particular province in a particular month. This regression yields a coefficient estimate of 7.15×10^{-2} (t -value 5.54), which is similar to the baseline results, making news coverage an unlikely driver of our results.

7. Conclusion

The returns the existing investors in a neighborhood experience in a given month encourage new investors to enter the market the following month. This neighborhood return effect is asymmetric: only positive returns are related to entry. These results are consistent with a type of social influence in which the stories of positive outcomes from stock market investing make people more likely to enter the market.

We have outlined two channels through which peer outcomes may have an impact on individual actions—extrapolative expectations and selective communication with relative wealth concerns—but have so far remained agnostic about their explanatory power. As a side product of one of our robustness checks, we find that the neighborhood return effects are practically invariant to the regional levels of homeownership and self-employment. Although these tests are by no means decisive, they suggest the results may be difficult to reconcile solely with relative wealth concerns, as we should expect them to be strongest in areas where income and wealth are tied more to the local economy.

Extrapolative beliefs influenced by success stories of peers can explain how financial innovations and investment styles spread, but they may also contribute to asset price bubbles, especially in markets with limits to arbitrage (see Scheinkman and Xiong 2002, Hong and Stein 2007). A prime example of such a market is the housing market where an analysis along the lines of our paper would be interesting. Extrapolation from others' outcomes can also play a part in explaining the success of Ponzi-type securities scams and other frauds, as the information about favorable peer outcomes often encourages individuals to participate in the investment scheme.

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Table 1
Descriptive statistics

This table reports descriptive statistics of zip-code-level socioeconomic characteristics and stock market entry rates. Panel A summarizes the socioeconomic characteristics of the 2,649 zip codes at the end of the sample period (in 2002). "Stock market entry rate" is the proportion of inhabitants entering the stock market during the sample period of 1995 to 2002. "Population density" is the number of inhabitants divided by the area of a zip code (in km²). Age measures the average age of all the inhabitants of a zip code. "College degrees" is the proportion of people with higher academic education. "Swedish-speaking" measures the proportion of people whose mother tongue is Swedish (Finland has two official languages, Finnish and Swedish). Income and wealth are based on official tax filings of all the individuals living in a zip code. Panel B explains stock market entry rates with socioeconomic characteristics. The regressions include decile dummies (except one) for population density, not reported for brevity. Heteroskedasticity robust *t*-values are reported in parentheses below coefficients. The table multiplies the original regression coefficients by 100.

Panel A: Socioeconomic characteristics of zip codes							
Variable	Mean	Sd	Minimum	25%	Median	75%	Maximum
Stock market entry rate (%)	1.6	1.2	0.0	1.0	1.5	2.0	35.0
Number of inhabitants	1,911	2,801	101	272	609	2,423	24,734
Area (km ²)	110	226	0.1	21	55	114	3,511
Population density (per km ²)	299	1,010	0.1	4	10	59	23,464
College degrees (%)	55.4	10.0	25.0	48.0	55.0	62.0	92.0
Swedish-speaking (%)	7.0	21.3	0.0	0.0	0.0	1.0	98.0
Income (1000€)	15.6	4.1	9.1	13.0	15.0	17.3	66.4
Wealth (1000€)	52.6	25.2	10.0	39.0	48.0	60.0	397.0

Panel B: Regressions of stock market entry rate			
Dependent variable	Stock market entry rate		
Specification	1	2	3
Ln (Income)	0.41 (1.85)	1.11 (4.72)	
Ln (Wealth)	0.50 (6.14)		0.58 (6.78)
College degrees	0.01 (2.80)	0.01 (1.67)	0.02 (4.38)
Swedish-speaking	0.01 (7.66)	0.01 (7.59)	0.01 (8.14)
Number of observations	2,649	2,649	2,649
Adjusted <i>R</i> ²	0.15	0.14	0.15

Table 2

Past neighborhood returns and stock market entry

This table shows the results of regressions of the number of investors entering the stock market in a month in a zip code. The dependent variable is $\ln(1 + \text{Number of new investors})$. "Neighborhood return" is defined as the return on the portfolio of all investors in a zip code, calculated as the sum of the return on stocks held in a zip code weighted by the value of holdings in each stock at the beginning of a month. "Participation rate" is the number of stock market participants divided by the number of inhabitants in a zip code. "Market return" is the return on the Helsinki Exchanges Portfolio Index that represents the whole Finnish stock market. The regressions 1 to 3 include fixed effects for months and zip codes; column 4 drops the month fixed effects and adds market return as an explanatory variable. The regressions are estimated with OLS, and t -values (in parentheses below coefficients) are robust at the zip-code level. The table reports the original regression coefficients multiplied by 100.

Panel A: Descriptive statistics							
	Mean	Sd	Minimum	25%	Median	75%	Maximum
Ln (1 + Number of new investors)	0.18	0.42	0.00	0.00	0.00	0.00	3.76
Neighborhood return (%)	1.17	8.56	-47.67	-3.88	0.96	5.72	99.92
Participation rate (%)	9.55	6.85	0.00	5.42	7.94	11.30	100.00

Panel B: Regressions				
Dependent variable	Ln (1 + Number of new investors)			
	1 (OLS)	2 (LDV)	3 (LDV)	4 (LDV)
Neighborhood return	9.00 (7.15)	8.10 (6.77)	8.51 (7.01)	6.09 (8.42)
Lagged dependent variable		22.05 (39.11)	21.91 (38.63)	31.57 (52.55)
Participation rate			24.63 (4.01)	103.21 (22.44)
Market return				4.72 (7.23)
Month fixed effects	Yes	Yes	Yes	No
Zip-code fixed effects	Yes	Yes	Yes	Yes
Number of zip codes	2,649	2,649	2,649	2,649
Number of observations	251,823	251,823	251,823	251,823
Overall R^2	0.11	0.29	0.30	0.31

Table 3

The relation between past neighborhood returns and stock market entry for positive and negative returns

This table presents the results of a regression similar to Table 2, except the neighborhood return accounts for an asymmetric relation between returns and entry. The dependent variable is $\ln(1 + \text{Number of new investors})$. In Panel A, the neighborhood return is replaced by a piecewise linear functional form employing a single change in the slope at the return equaling zero. In Panel B, the return is divided into 8 categories, with the omitted category in the regression being the return between 0% and 5%. All the coefficients are multiplied by 100.

Panel A: Regressions			
Dependent variable	Ln (1 + Number of new investors)		
Specification	1 (OLS)	2 (LDV)	3 (LDV)
Max (Neighborhood return, 0)	15.32 (7.15)	13.52 (6.90)	13.14 (6.71)
Min (Neighborhood return, 0)	-2.37 (-0.85)	-1.63 (-0.65)	0.18 (0.07)
Lagged dependent variable		22.05 (39.11)	21.91 (38.63)
Participation rate			24.04 (3.92)
Month fixed effects	Yes	Yes	Yes
Zip-code fixed effects	Yes	Yes	Yes
Number of zip codes	2,649	2,649	2,649
Number of observations	251,823	251,823	251,823
Overall R^2	0.11	0.29	0.30

Panel B: Return broken down into categories

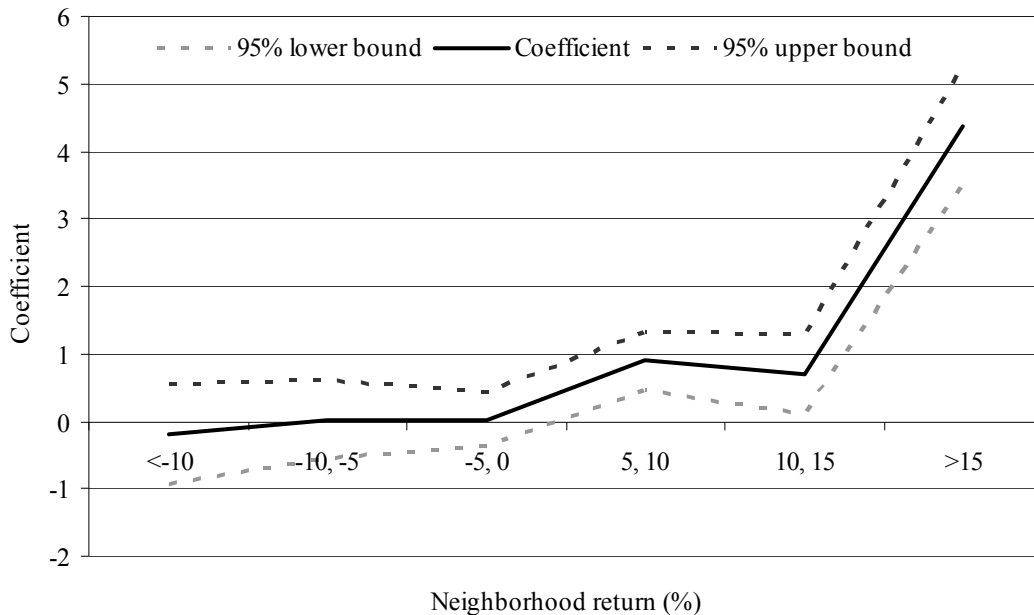


Table 4**Past neighborhood returns and stock market entry through IPOs**

This table reports the results of the regressions on the number of investors entering the stock market through an IPO. The dependent variable is $\ln(1 + \text{Number of new investors})$. The sample contains 57 IPOs. Independent variables are from the beginning of the subscription period of an IPO. "Neighborhood return" is the return on the portfolio of all investors in a zip code, calculated as the sum of the return on stocks held in a zip code, weighted by the value of holdings in each stock in the beginning of a month. "Participation rate" is the number of stock market participants divided by the number of inhabitants in a zip code. The regressions are estimated with OLS, with columns 2 and 3 including the lagged dependent variable as an explanatory variable. The regressions include fixed effects for IPOs and zip codes, and t -values (in parentheses below coefficients) are robust at the zip-code level. The table reports the original regression coefficients multiplied by 100.

Panel A: Descriptive statistics							
	Mean	Sd	Minimum	25%	Median	75%	Maximum
Ln (1 + Number of new investors)	0.11	0.43	0.00	0.00	0.00	0.00	5.24
Neighborhood return (%)	2.18	10.58	-58.46	-3.98	1.97	8.85	164.48
Participation rate (%)	9.60	6.69	0.25	5.43	7.98	11.41	51.20

Panel B: Regressions				
Dependent variable	Ln (1 + Number of new investors)			
	Specification	1 (OLS)	2 (LDV)	3 (LDV)
Neighborhood return		9.14 (7.80)	8.16 (7.06)	8.28 (7.13)
Lagged dependent variable			3.86 (10.28)	3.78 (9.97)
Participation rate				20.97 (6.86)
Number of zip codes		2,649	2,649	2,649
Number of observations		150,993	150,993	150,993
Overall R^2		0.28	0.29	0.30

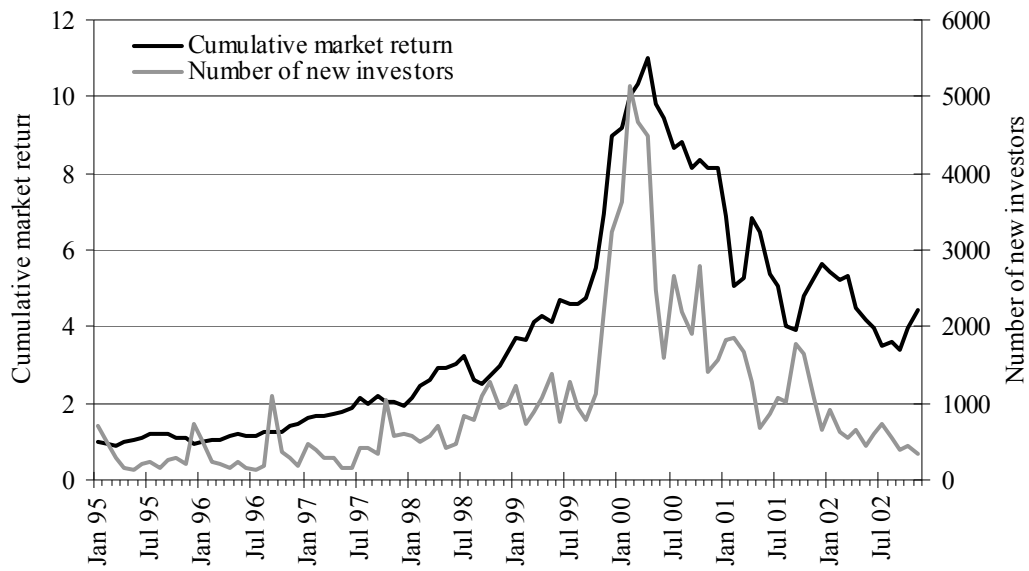


Figure 1. Stock market entry and returns. This figure plots the monthly number of investors who enter the stock market and the cumulative market return in the Finnish stock market from 1995 to 2002. The stock market entry date is the first day on which an investor buys stocks of publicly listed companies. We exclude entries through equity offerings, gifts, inheritances, divorce settlements, and other transactions that do not represent an active stock market entry decision. The market return is based on the HEX Portfolio Index.

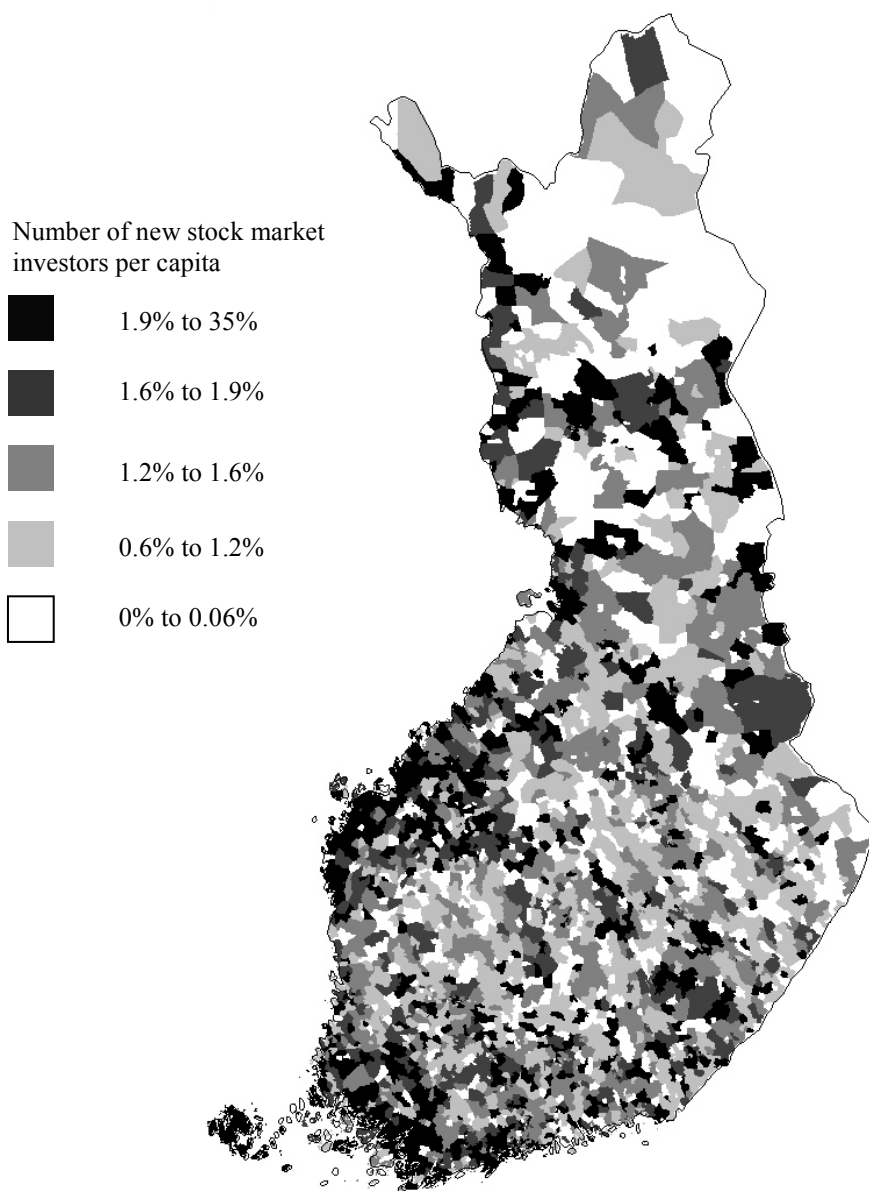


Figure 2. Distribution of stock market entry rates across zip codes in Finland. This figure plots the stock market entry rates, that is, the number of new investors entering the stock market during the sample period of 1995 to 2002 divided by the total number of inhabitants at the end of 2000, across Finnish zip codes.