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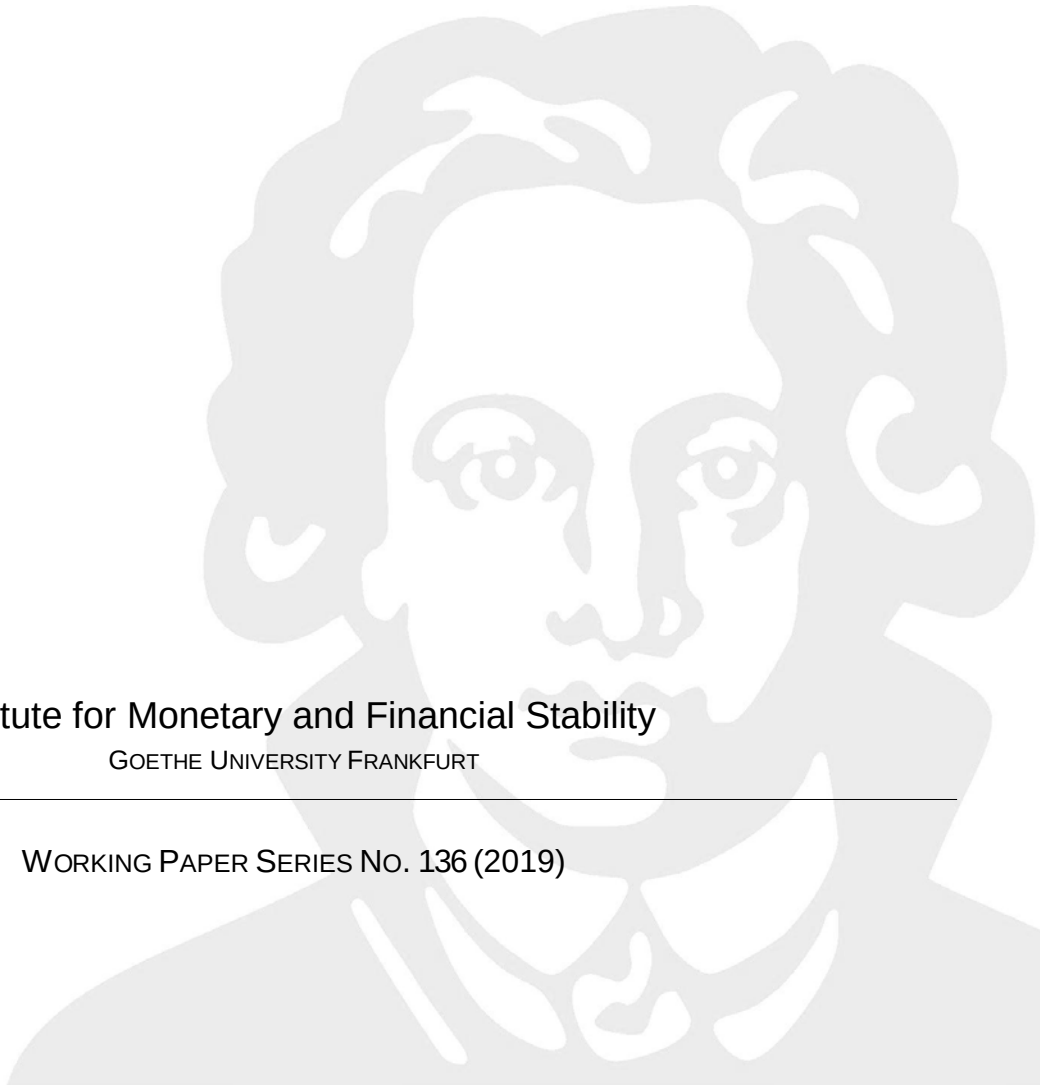

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INFORMATIVE SOCIAL INTERACTIONS*

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Abstract. We design, field and exploit survey data from a representative sample of the French population to examine whether informative social interactions enter households' stockholding decisions. Respondents report perceptions about their circle of peers with whom they interact about financial matters, their social circle and the population. We provide evidence for the presence of an information channel through which social interactions influence perceptions and expectations about stock returns, and financial behavior. We also find evidence of mindless imitation of peers in the outer social circle, but this does not permeate as many layers of financial behavior as informative social interactions do.

Keywords: Information networks; Social interactions; Subjective expectations; Peer effects; Portfolio choice.

JEL Codes: D12, D83, D84, G11, C42.

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1. Introduction

Financially developed economies repeatedly experience episodes in which patterns of behavior spread rapidly through the population and then culminate in dramatic adverse events. Examples of such episodes include the fast spread of stock market participation in the 1990s leading up to the burst of the dot-com bubble, and the spread of excessive borrowing against home equity leading to the more recent global financial crisis. In the face of such large scale and systemically important events, it is natural to ask: what is the role of social interactions and peer effects for the spread of financial behavior in the general population?

It is well understood that there are two broad channels through which social interactions may affect individuals' decisions. The first channel is one of direct information flow, i.e. of direct communication and dissemination of information and knowledge between individuals. The second is a channel of imitation of the behavior of peers, either mindful or mindless. Imitation of peers is mindful when they are perceived to be knowledgeable or well-informed and thus their actions convey useful information. In contrast, imitation is mindless when the actions of peers convey no intrinsic information. While both types of imitation may be widespread in practice, they are difficult to disentangle. But being able to disentangle informative social interactions, namely the exchange of information and mindful imitation on the one hand, from mindless imitation on the other, is of fundamental importance for both the understanding of financial and aggregate macroeconomic outcomes, and the design and conduct of public policy.

In this paper, we focus on individuals' decisions on stock market participation and exposure and on their underlying subjective expectations of future stock market returns, as well as subjective perceptions of recent past returns. We examine whether there is a significant role for informative social interactions in each of these aspects of stockholding behavior, possibly alongside a role for mindless imitation. Our findings support that, in a financially developed economy with a mature stock market, informative social interactions are present and pervasive across perceptions, expectations, and behavior, both at the extensive and at the intensive margin. Our work makes two important contributions. First, we provide evidence of a sizeable and statistically significant information channel in social interactions, operating on different levels: perceptions of realised returns, expectations of future returns, and stockholding behavior conditional on expectations. Our results do not rule out the presence of mindless imitation of stockholding, based on subjective perceptions of stock market participation among an outer circle of peers with whom respondents do not engage in purposeful financial discussions, but highlight the significance of informative interactions even in this case.[1] We also explore the information channel through which social interactions within a competitive market affect individuals' perceptions, expectations, and behavior. Arguably, in an efficient stock market where individuals condition their expectations on equilibrium asset prices, it is unclear that there is 'added value' from information gathered through social interactions (Ozsoylev and Walden, 2011). Specifically, we show that under some reasonable assumptions social interactions that are informative survive in equilibrium, and find empirical evidence in support of it: social interactions improve the accuracy of individuals' stock market expectations by improving the accuracy of their perceptions of realised stock market returns. Subjective stock market expectations do influence participation and conditional portfolio shares, but there is an additional role for informative social interactions at both margins, conditional on expectations, stemming from the reduction in the posterior variance of returns that information dissemination via social interactions facilitates. Overall, our findings provide support for the view that social interactions allow the transfer of relevant knowledge, even in the presence of some mindless imitation.

Broadly, our strategy for establishing the presence of an information channel can be summarized as follows. First, we set out a theoretical framework for analyzing stock market investment decisions that allows for information dissemination via social interactions, within a competitive market setting. Based on this framework, we derive a set of well-defined testable predictions. With these predictions in hand, we design and field a unique

[1] Evidence in support of informative social interactions in the context of small markets in financially developing economies, and in particular in Indian villages, has been established by Banerjee, Chandrasekhar, Duflo and Jackson (2013).

and novel survey in order to test these predictions empirically.

The starting point of our analysis is to model direct communication and information dissemination between individuals, within a large efficient financial market.[2] Within that framework, individuals receive private signals about asset returns, as well as publicly available information from equilibrium asset prices, and locally available information from their peers, friends and acquaintances, to whom they are connected through a well-defined information network. Such a framework extends Ozsoylev and Walden (2011) to individual heterogeneity in both risk preferences and signal precisions, in line with available empirical evidence. Heterogeneity in risk preferences allows us to distinguish between risk and information driven financial decisions.[3] Heterogeneity in signal precision provides a platform for distinguishing individuals that are better informed about the stock market from those that are less informed. A key prediction of the model is therefore that individuals with higher risk-adjusted 'connectedness', i.e. those with more and/or more informative social interactions, invest more in risky assets, in response to good signals and for given risk tolerance. This is because well-connected individuals pool both more and more precise privately received signals from individuals they are acquainted with, increasing the precision of their conditional stock market return expectations.

With this prediction in hand, we design, field and exploit novel survey data from a representative sample by age, asset classes and wealth of the population of France, collected in two stages, in December 2014 and May 2015. The survey questionnaire provides measures of stock market participation and risky portfolio share, risk attitudes, connectedness within the network of peers, perceived characteristics of respondents' peers stock market participation and information, and importantly, probabilistically elicited subjective expectations and perceptions of stock market returns. It also contains specific questions designed to obtain quantitative measures of relevant network characteristics that enable identification of information network effects on financial decisions from individual answers. Finally, the questionnaire contains a rich set of covariates for socioeconomic and demographic controls, preferences, constraints, and access and frequency of consultation of information sources, often absent from empirical studies of social networks.

The survey was designed with four features in mind. First, the mechanism through which social interactions matter for financial decisions can be studied using respondents' answers to questions on beliefs and perceptions of stock market returns, when combined with data on measures of access and frequency of consultation of both publicly and privately available information sources (see Blume, Brock, Durlauf and Jayaraman, 2015). Second, in order to circumvent Manski's (1993) reflection problem that arises when social interactions are identified empirically from linear-in-means econometric specifications (see Blume, Brock, Durlauf and Ioannides, 2011), we do not control for average actual peer behavior but for respondents' perceived peer behavior. Third, the survey is conducted over a representative sample of a population of a financially developed country (France), with a mature stock market and abundant publicly available information. Fourth, we collect reported perceptions of respondents regarding the stock market behavior and information of three circles: the financial circle, i.e. peers with whom they discuss financial matters; their overall social circle of friends and acquaintances; and the overall population, about whom they have general views without systematic social interaction.[4]

Our theoretical framework incorporates heterogeneity in signal precision, which allows for the possibility that social interactions with one's peers may be more or less informative, depending on how well informed or knowledgeable one's peers are. Using the responses about the financial and social circles, we can construct respondents' perceptions about behavior and information of peers in the outer circle, i.e., those peers with whom respondents interact socially, but do not discuss own financial matters. Exploiting then differences between these responses and responses about population wide stock market behaviour or information, enables

[2] Recent work by Blume, Brock, Durlauf and Jayaraman (2015) provides a rigorous derivation of the equilibrium underpinnings of social utility driven (or endorsement, or imitation based) peer effects for the standard linear-in-means econometric specification of social interactions models. However, no such micro-foundation exists for information driven peer effects.

[3] Cabrales, Gossner and Serrano (2013 and 2017) show that in equilibrium, more risk tolerant individuals are willing to pay *more* for information; therefore, less risk averse agents may have more and/or better informed social connections.

[4] In our data, we find that the financial circle is typically small relative to the social circle. On average it contains three to five people, relative to an average size of 53 people for the social circle in France.

our novel triple circle approach to separate pure information exchange and mindful imitation from mindless imitation, while controlling for unobserved factors influencing how the respondent perceives others and the economy in general.[5]

We find that respondents' perceptions about the shares of their financial circles that are informed about the stock market or actively participating in it are systematically and positively related to the accuracy of respondents' perceptions of past stock market returns and of expectations of future returns; to the probability of stock market participation; and to the risky portfolio share conditional on participation. Respondents who perceive their financial circles to be more informed or more widely participating in the stock market have perceptions of returns that are closer to the truth, controlling for their perceptions of the other circles, a wide array of respondent characteristics, as well as perceptions of the respondent's social standing in terms of professional accomplishment, education, or wealth. Interestingly, the extent to which respondents perceive their financial circle to be informed about or participating in the stock market affects the accuracy of their subjective expectations of returns only through its effect on perceptions of (recently realised) returns. These findings argue against the view that individuals simply mimic the optimism of those they interact with, without in fact becoming better informed about the stock market. These results are robust to allowing for possibly correlated unobserved factors influencing the decision to form a financial circle and the accuracy of expectations or perceptions; and for unobserved factors influencing both perceptions about peers and accuracy of expectations and perceptions about stock market returns.

While the relevance of information in the financial circle points to informative interactions, the relevance of participation allows for both information exchange and mindful imitation of peers perceived to be knowledgeable about financial matters. Our analysis does not rule out the additional presence of mindless imitation in stockholding behavior. In particular, some of our estimates indicate that respondents are influenced by their perceived stock market participation of those in their outer social circle, that they may have picked up from incidental remarks even though they do not consider them knowledgeable in financial matters and do not directly discuss such matters with them. Interestingly, this effect does not run either through perceptions or expectations, but controlling for expectations, as one would expect in the case of mindless imitation that does not permeate as many layers of the stockholding decision as informative interactions and mindful imitation of informed peers do.

We employ a number of robustness checks that corroborate our main findings. First, to assess the relevance of unobserved heterogeneity in creating a spurious correlation between the accuracy of perceptions/expectations or the participation probability or the conditional risky portfolio share on the one hand and perceptions about the three circles on the other, we employ placebo tests. We randomly reshuffle responses about all three circles (financial, outer, population) among respondents with the same age, education, and location, and we find that there is no statistically significant relationship between our dependent variables and respondent perceptions about information or participation in any of the three circles. Second, we allow for the possibility that unobserved factors influence both someone's choice to form a financial circle and to invest in stocks, or to be well informed about past returns or the prospects for future returns. Explicitly allowing for such correlation does not affect the statistical significance or sign of our estimates and hardly affects the size. Moreover, we cannot reject the hypothesis of zero correlation between unobserved factors. Third, although our emphasis is on establishing the relevance of perceptions regarding information or behavior of the financial circle, we consider the possibility that lack of statistical significance of outer circle variables can be caused by measurement error creating attenuation bias: respondents are less knowledgeable about their outer circle as they do not discuss financial matters with them. We instrument responses on the outer circle with respondent perceptions of

[5] We note that given the anonymous nature of stockholding and trading, our analysis is not limited by the fact that we do not trace the actual network structure (De Paula, 2016) as this is an inherent feature of the stock market in view of which stockholding behavior is determined. We elicit perceptions that respondents have and on the basis of which they make stockholding choices, even though we cannot observe the extent to which individual perceptions about peer information or behavior correspond to their objective counterparts, except for those relating to population-wide behaviour.

information and participation in the overall population, which we find to have predictive value, using a wide range of additional controls. We fail to reject the null of no measurement error or to find a statistically significant relationship between our endogenous variables and perceptions of information or participation in the outer circle, even focusing on respondents who give very consistent answers regarding their financial and overall social circles. One last concern is reverse causality, or that own stockholding behaviour influences peer behaviour or information about the stock market. To rule out that possibility, we were able to find valid and predictive instruments for perceptions of peer beahviour and information with whom the respondent discusses financial matters, although in no case we were able to find statistical evidence against the null of exogeneity.

Our work relates to different strands of literature, from social interactions and networks to financial literacy. Within the growing literature examining peer and network effects on asset and debt behavior of households, such as Duflo and Saez (2002, 2003), Hong, Kubik and Stein (2004), Kaustia and Knüpfer (2012), Georgarakos, Haliassos and Pasini (2014), Beshears, Choi, Laibson, Madrian and Milkman (2015), Bailey, Cao, Kuchler and Stroebel (2016), Girshina, Mathae and Ziegelmeyer (2017), Haliassos, Jansson and Karabulut (2019) or Ouimet and Tate (2017), we connect to the financial literacy literature through the key role perceptions about returns play as a measure of financial knowledge (e.g. Lusardi, Michaud and Mitchell, 2016; Campbell, 2016; Lusardi and Mitchell, 2014). Our work also relates to a fast growing literature that examines the effect of subjective expectations on individual economic and financial behavior, summarized by Hurd (2009) or more recently, by Greenwood and Schleifer (2014), and its important consequences in the aggregate, as in e.g. Carroll (2003). More generally, Manski (2017) summarizes the progress and discusses the promise of measurement of macroeconomic expectations. Other recent advances in the literature include Bordalo, Gennaioli, Ma and Shleifer (2018), Coibion, Gorodnichenko and Ropele (2019), Fuster, Perez-Truglia, Wiederholt and Zafar (2018) and Giustinelli and Shapiro (2018). Last, it is also closely related to the literature on the effects of social imitation and influence on financial behavior in competitive markets within the larger literature on social and information networks, see e.g. Jackson (2008).

Most related to our work is that of Bursztyn, Ederer, Ferman and Yuchtman (2014), who conduct a field experiment in collaboration with a Brazilian brokerage firm in order to disentangle endorsement from information peer effects on the willingness to invest in a brand new financial product. For such a product, they conclude that both motives are important in individual financial decision making and that the social learning channel is relatively more important than the social utility channel amongst more sophisticated investors. Also related is the experimental work by Banerjee, Chandrasekhar, Duflo and Jackson (2013) who study a newly introduced micro-finance program in rural India and conclude that most peer effects on the take-up rates of the program are due to an information channel. Although the tight control of information flows in both these field experiments helps separate information from social effects, it may artificially magnify the importance of each signal, possibly biasing upwards the estimate of information effects relative to what would have been observed for well-established financial products (stocks) in a mature financial market, where investors may be informed through a multitude of channels.[6] Finally, recent empirical work by Ozsoylev, Walden, Yavuz and Bildik (2014) attempts to identify an empirical (professional) investor network by assuming that time proximity of transactions implies network connectivity between investors. The similarities and differences with these papers are further evaluated, in light of our findings, in Section 4.

The paper is structured as follows. The next section presents the theoretical framework and derives key predictions. Section 3 describes the survey design in detail. Section 4 presents our empirical results. Section 5 concludes.

[6] The same observation is also made by Manski (2017): he argues that the exogenous provision of a new financial product or information about it assumes understanding of the underlying reasons why individuals did not gather the information on their own.

2. The Model

Ozsoylev and Walden (2011) provide a microfoundation for an information network effect within a rational model of equilibrium asset pricing where prices and private signals about asset returns transmit information. We extend their model to guide our survey design and empirical strategy. In what follows, we present a brief overview of the model, the generalization of their theorem and explain how the derived individual asset demand function will be used as a guide for identifying information peer effects.

There are two assets, one risky (stock) and one risk free (bond). The payoff of the risk free asset is 1. The payoff of the risky asset follows a normal distribution $X \sim N(\bar{X}, \sigma^2)$ and its price is p. The supply of stocks is random and is given by $Z_n = nZ$, where $Z \sim N(\bar{Z}, \Delta^2)$ and $\bar{Z} > 0$.[7] The final wealth of the agent is

$$\omega_i = \omega_{0i} + D_i (X - p), \tag{1}$$

where ω_{0i} is the initial wealth of agent i. Agent i chooses D_i units of the risky asset to maximize expected utility from final wealth, conditional on his information set $\mathcal{I}_i$. We assume constant absolute risk aversion (CARA) preferences $u(\omega_i) = -e^{-\rho_i \omega_i}$, where ρ_i is the absolute risk aversion of agent i. Agent i thus solves the problem

$$\max_{D_i} \mathbb{E}[u(\omega_i) \mid \mathcal{I}_i] = \max_{D_i} \mathbb{E}\{-\exp[-\rho_i(\omega_{0i} + D_i(X - p))] \mid \mathcal{I}_i\}. \tag{2}$$

Therefore,

$$D_i^* = \frac{\mathbb{E}[(X - p)|\mathcal{I}_i]}{\rho_i \mathbb{V}[X|\mathcal{I}_i]}. \tag{3}$$

Every agent i receives a primary (agent specific) piece of information in the form of a signal on the risky asset payoff $y_i = X + \epsilon_i$, $\epsilon_i \sim N(0, s_i^2)$. We allow heterogeneity across the variance of the signals of the agents, $\mathbb{V}[X|\mathcal{I}_i]$, to reflect the fact that agents may have more or less precise information about the risky asset for exogenous reasons.

Agents may know each other socially and these links are captured by an adjacency matrix A, where the typical element a_{ij} can take value 1 or 0, if agents i and j know each other or not, respectively. We allow for loops, i.e. we let $a_{ii} = 1$, for all agents. Since $a_{ij} = a_{ji}$, the matrix A is symmetric. For an investor i, his/her social circle is then defined by his network neighborhood, i.e. all investors j, such that $a_{ij} = 1$.

To describe the financial circle of an investor, we define an additional adjacency matrix G which describes the financial network. Investors determine their demand for the risky asset by pooling their own private information about its return, with private signals of investors with whom they interact socially. An investor combines his/her own signal with those of his/her neighbors to generate a payoff signal x_i, by averaging the signals of his/her social circle, *weighted* by their corresponding precisions. In particular, the weight on the signal of investor j used by investor i, is assumed to be the precision of the signal of agent j.[8] From the perspective of agent i, when pooling all the signals from his/her neighbors, he/she then puts more weight on agents with more precise signals and less weight on those with less precision.[9] The typical element of matrix G is then

$$g_{ij} = \{\text{information is passed on from agent } j \text{ to agent } i\} = \frac{a_{ij}}{s_j^2},$$

in other words, $G = A\Sigma^{-1}$, where $\Sigma = diag\{s_1^2, ..., s_n^2\}$. We note that G represents a weighted and directed network. The pooled payoff signal x_i for agent i is:

$$x_i = \frac{\sum_{k \in R_i} y_k}{d_i} \equiv \frac{\sum_{k=1}^n g_{ik} y_k}{\sum_{k=1}^n g_{ik}} = X + \frac{\sum_{k=1}^n g_{ik} \epsilon_k}{\sum_{k=1}^n g_{ik}}. \tag{4}$$

[7] See Easley, O'Hara and Yang (2013) for discussion on positive supply of risky assets and liquidity traders.

[8] We can also assume it to be the *relative* precision of the signal of agent j, i.e. the precision of j's signal over the precision of i's signal. This is a more attractive assumption, but complicates unnecessarily the mathematical expressions of the assumptions needed in deriving the optimal demand function, without affecting the formal expression of our econometric specification.

[9] Proportional weighting as a function of signal precisions typically obtains in models of Bayesian learning from others, but also in recent models of contagion, e.g. Burnside, Eichenbaum and Rebelo (2016).

The assumption that the network is weighted by signal precision captures the fact that investors put more importance on good quality information they receive from the social circle. Given the information network, investors' information sets are defined by

$$\mathcal{I}_i = \{x_i, p\}, \forall i = 1, ..., n \tag{5}$$

because also asset prices are allowed to transmit information in equilibrium, and investors rationally anticipate it. We also assume that the random variables X, Z and ϵ_i are all *jointly independent*.

Next, let

$$k_i = \sum_{k=1}^{n} \frac{a_{ik}}{s_k^2} \tag{6}$$

be the *connectedness* of investor i. This is a generalization of the well known concept of degree, or strength, which counts the number of links of a network node. Under a set of assumptions on the asymptotic nature of the network structure as the number of investors n grows, we extend and generalize Theorem 1 of Ozsoylev and Walden (2011). The set of assumptions and the precise statement of the Theorem can be found in Appendix A. Broadly speaking, the assumptions require that the information network is sparse, i.e. that the strength of connections between agents is of the same order as the number of nodes, and that no agent is informationally superior in the large financial market (as $n \to \infty$). The average connectedness β of the economy-wide information network as the economy grows, is defined via the assumption that

$$\lim_{n\to\infty} \frac{1}{n} \sum_{i=1}^{n} \frac{k_i}{\rho_i} = \beta + o(1), \ \beta < \infty$$

which imposes that the average risk-adjusted node strength is finite. Then, we show that there exists a linear noisy rational expectations equilibrium as $n \to \infty$, such that with probability one the risky asset price converges to

$$p = \pi_0^* + \pi^* \bar{X} - \gamma^* \bar{Z}, \tag{7}$$

where

$$\pi_0^* = \gamma^* \left(\frac{\bar{X}\Delta^2 + \bar{Z}\beta\sigma^2}{\sigma^2\hat{\rho}\Delta^2 + \sigma^2\beta} \right), \quad \gamma^* = \frac{\sigma^2\hat{\rho}\Delta^2 + \beta\sigma^2}{\beta\sigma^2\hat{\rho}\Delta^2 + \Delta^2 + \beta^2\sigma^2}, \quad \pi^* = \gamma^*\beta.$$

and $\hat{\rho}$ denotes the finite harmonic mean of risk aversions of all agents in the population (see Assumption 3, in Appendix A).

In determining their optimal demand for the risky assets, agents form a subjective expectation of the return on the asset, based on the average signal of their social circle. In equilibrium, and as $n \to \infty$, the expected return for an investor i is given by

$$\mathbb{E}(X|\mathcal{I}_i) = \frac{k_i^*\sigma^2\Delta^2}{k_i^*\sigma^2\Delta^2 + \Delta^2 + \sigma^2\beta^2} x_i + \left(\frac{\sigma^2\beta^2 + \Delta^2}{k_i^*\sigma^2\Delta^2 + \Delta^2 + \sigma^2\beta^2} \right) \bar{X}, \tag{8}$$

where $k_i^* = \lim_{n\to\infty} k_i$. This suggests that larger connectedness k_i^* implies that investors expectations react more strongly to their pooled signal x_i. Similarly, the equilibrium posterior variance of returns of investor i is given by

$$\mathbb{V}(X|\mathcal{I}_i) = \left(\frac{1}{\sigma^2} + k_i^* + \frac{\beta^2}{\Delta^2} \right)^{-1}, \tag{9}$$

implying that investors' risk exposure, as measured by the conditional variance of returns, *decreases* the more/better connected they are, as measured by agents' connectedness k_i^*. That this is consistent with Bayesian learning from peers, can be seen from rearranging (8) as

$$\mathbb{E}(X|\mathcal{I}_i) - \bar{X} = \psi(k_i^*)(x_i - \bar{X}) \tag{10}$$

where $\psi(k_i^*) \equiv \frac{k_i^*\sigma^2\Delta^2}{k_i^*\sigma^2\Delta^2+\Delta^2+\sigma^2\beta^2} = k_i^*\left(\frac{1}{\sigma^2}+k_i^*+\frac{\beta^2}{\Delta^2}\right)^{-1}$ denotes the weight signal x_i is given in equilibrium by agent i relative to the prior belief $\bar{X}$, which increases with agent i's connectedness k_i^*, i.e. $\psi'(k_i^*) > 0$. Therefore, agents' posterior expectations of the asset payoff, $\mathbb{E}\left(X|\mathcal{I}_i\right)$, are revised more strongly in the direction of the signal, x_i, (i) the further away their prior asset payoff expectations are from the signal, $(x_i - \bar{X})$, and (ii) the better/more connected agent i is, $\psi(k_i^*)$. Moreover, in equilibrium, the demand for the risky asset by an agent i, (3), can be expressed as:[10]

$$D_i^* \equiv \frac{1}{\rho_i}\left(\frac{1}{\sigma^2}+k_i^*+\frac{\beta^2}{\Delta^2}\right)\left(\mathbb{E}\left(X|\mathcal{I}_i\right)-p\right) \tag{11}$$

Expressions (8) and (11) will guide our empirical investigation of informative social interactions. Expression (11) suggests that there are two ways in which individual connectedness k_i^* is important for investor's i demand for the risky asset: first there is an indirect effect via the expected return, since k_i^* affects $\mathbb{E}\left(X|\mathcal{I}_i\right)$ in (8), and second, a direct positive effect of risk-adjusted connectedness k_i^*/ρ_i appearing in the first parenthesis of (11). The former captures the higher relative weight attributed to more/better informed peers when forming the expectation of a stock market return, common in work on Bayesian learning from peers. The latter captures the reduction in agents' posterior variance of expected returns, (9), obtained in equilibrium by agents that are more and/or better connected, adjusted by the agent's risk aversion.

Equilibrium asset prices and optimal demand for risky assets by individuals are parametrized by a range of model characteristics. Here, our main focus is on two of those, namely connectedness of individuals and risk attitudes, which we discuss in turn. First, the model predicts that higher individual connectedness makes agents more willing to invest in risky assets in response to good pooled signals. In addition, higher individual connectedness k_i^* may be the result of two effects: (i) a larger number of acquaintances (i.e. larger number of agents for which of $a_{ij} \neq 0$) and/or (ii) higher signal precision of the signals that individual i pools from her/his social interactions. Both effects imply that the more informative one's social interactions are (i.e. as the precision of an individual's pooled signals improves), the lower is the posterior variance of returns and hence, the higher the fraction of wealth that the agent is willing to place in the risky asset, in response to good signals. This is the *information effect* from informative social interactions that we seek to empirically identify exploiting our survey data. Second, risk preferences matter for equilibrium demand for information: a given connectedness (which measures how informed an agent is) has more value when the agent's risk aversion is lower, because less risk averse agents can expect to benefit more from investing in the risky asset, as recently uncovered by Cabrales, Gossner and Serrano (2013, 2017).[11]

We also highlight here that both the expressions for expected returns (8) and equilibrium individual demands (11) only require knowledge about the economy-wide average connectedness β and the individual connectedness of investors, k_i^*, and not the exact general structure of the network. This is a very important feature of the theoretical framework for the design of our empirical strategy, because it allows us to sidestep known issues that arise from not knowing the exact network structure within a population. For our purposes, when designing the survey, a representative sample from a large population for which we can identify measures for k_i^* is sufficient to empirically identify an information peer effect and the two expressions (8) and (11) will be the basis of our empirical design and specifications.

[10] In Appendix A, Theorem 1, we show that further replacing expression (8) in expression (11) yields the equilibrium asymptotic demand for the risky asset by agent i,

$$D_i^* = \frac{\hat{\rho}}{\rho_i}\left(\frac{\bar{X}\Delta^2+\bar{Z}\beta\sigma^2}{\hat{\rho}\sigma^2\Delta^2+\sigma^2\beta}\right) - \frac{\hat{\rho}}{\rho_i}\left(\frac{\Delta^2}{\sigma^2\left(\hat{\rho}\Delta^2+\beta\right)}\right)p + \frac{k_i^*}{\rho_i}\left(x_i - p\right).$$

[11] Heterogeneity in risk preferences is what would drive trade in assets in this model were information homogeneous across investors. Less risk averse investors would also be willing to pay more for informative private signals, as recently shown by Cabrales et al. (2013). As a result, less risk averse agents would be expected to have more/better informed connections, which creates the need to extend Ozsoylev and Walden's (2011) theorem to heterogeneity in risk aversion before seeking empirical validation of the model's predictions.

3. Survey Design

In this section, we provide a brief description of the survey design and the specifically designed questions we exploit. More detailed information about both is provided in Appendix B. The survey is part of an ongoing survey of the French population administered by Taylor-Nelson Sofres (TNS). We design and exploit data from two linked questionnaires that were fielded in December 2014 and May 2015 respectively. The first questionnaire (2014 wave) contains questions that provide very detailed information on risk attitudes, preferences, expectations and perceptions of stock market returns, in addition to wealth, income and socioeconomic and demographic characteristics for a representative sample of French households by age, wealth and asset classes. The follow-up questionnaire (2015 wave) contains a variety of questions that specifically aim at gathering information about respondents' social and financial circles. These include questions on of respondents' perceptions of how informed their circles are with respect to the stock market and how heavily they participate in it, as well as similar questions regarding their perceptions of overall population behavior, in terms of information about and participation in the stock market. In addition, respondents are asked to report their perceived relative standing vis-à-vis their peers along a number of dimensions.

The 2014 questionnaire was sent to a representative sample of 4,000 individuals, corresponding to an equivalent number of households. Respondents had to fill the questionnaire, and return it by post in exchange for €25 in shopping vouchers (*bons-d'achat*). Of those, 3,670 individuals returned completed questionnaires, corresponding to a 92% response rate. The follow-up questionnaire in May 2015 was sent to the 2014 wave of 3,670 respondents, out of which we recovered a total of 2,587 completed questionnaires, corresponding to a response rate of 70.5%. The relevant questions that inform our empirical analysis can be grouped in four sets, which we describe below.

First, we have questions that directly ask respondents to state what is their total financial wealth (excluding housing), and of this wealth, what share they invest in the stock market (directly or indirectly). The latter defines variable $\%FW$ which captures the demand for risky assets conditional on participating in the stock market. From the same question, we generate the variable $\Pr(Stocks > 0)$ which takes value 1 if respondents have a positive share of their financial wealth invested in the stock market and value 0 otherwise.

The second set of questions asks respondents to state their expectations and perceptions about a public non-manipulable event (e.g. the expected return on a buy-and-hold portfolio that tracks the evolution of the stock market index, CAC-40, over a five-year time window).[12] The recent literature on measuring expectations privileges the use of probability questions rather than eliciting point expectations or the traditional qualitative approach of attitudinal research (Manski, 2004). Answers to such questions are then used for understanding whether expectations and outcomes are related, and for evaluating whether individual behavior changes in response to changes in expectations. Crucially, we also include questions that inquire respondents about their perceptions regarding the most recent realization of an analogous measure (e.g. the most recent realized cumulative return on a buy-and-hold portfolio that tracks the evolution of the stock market index over a three-year horizon). The questions in this second set are designed with the following four goals in mind. First, the use of five years as a forecasting horizon helps untie expectational answers from business cycle conditions prevailing at the time of fielding the surveys, to better capture the historic average upward trend of the stock market index, and inertia in portfolio management (e.g. see Bilias, Georgarakos and Haliassos, 2010). The latter is important, since it remains an open question with what horizon in mind households invest in the stock market. Second, probability densities are elicited on seven points of the outcome space, instead of just two points of the cumulative distribution functions, to obtain more precise individual estimates of the relevant moments and of the uncertainty surrounding expectations.[13] Third, we exploit data from a representative sample by age (while

[12] Dominitz and Manski (2007) elicit probabilistically individuals' expectations of stock market returns inquiring about how 'well' the respondent thinks the economy will do in the year ahead. They exploit data for a representative sample of the elderly from the 2004 wave of the U.S. Health and Retirement Study (HRS).

[13] This follows the methodology of the Survey on Household Income and Wealth (SHIW) conducted by the Bank of Italy, e.g. Guiso, Jappelli and Terlizzese (1996).

for example, Dominitz and Manski, 2007, report results only for the elderly). Fourth, probabilistic elicitation of the most recent cumulative stock market return over a three-year horizon provides a quantitative measure of households' degree of awareness of stock market developments, to capture differences in information across households as well as the relationship between information and expectations, as in Coibion, Gorodnichenko and Kumar (2018).[14] We use responses to questions C39 and C42 (from TNS2014) to generate variables *Expec. R* and *Perc. R* respectively, which in turn are used as proxies for expected conditional returns $\mathbb{E}(X|\mathcal{I}_i)$ and for perceptions of realized returns (based on signals) x_i.

The questionnaire contains a third set of questions that are designed to identify the social circle of respondents and will be used for the empirical analysis. The aim is generate meaningful proxies for the individual connectedness k_i^* of each respondent. A main novelty of the survey is to distinguish between a broad circle of social acquaintances of respondents (*social circle*) and a smaller circle within it, defined as the respondents' acquaintances with whom the respondents convene about financial matters (*financial circle*). We separately identify both from responses to the following survey questions respectively:

C1: *Approximately how many people are there in your social circle of acquaintances?*

D1: *With how many people from your social circle (as identified in C1), do you interact with regarding your own financial/investment matters?*

Of the 2,587 respondents that returned the TNS2015 questionnaires, about 90% and 87% answered questions C1 and D1 respectively. The average number of people in the respondents social circles and financial circles is 52.5 and 3.1 people respectively. About half of the valid responses for question D1 were zero, so we also report that the average of the remaining half (i.e. not taking into account the zeros) is approximately 5 people. This constitutes evidence in support of our theoretical framework and predictions, which are only relevant under the assumption of sufficient network sparsity, i.e. the network is not too dense in terms of number of links.

Question C1 is formulated with the network of social acquaintances in mind, as described by adjacency matrix A in Section 2. For respondent i, the answer to C1 provides an approximation of the respondent's degree, defined by $\sum_{j=1}^{n} a_{ij}$. Question D1 defines a subset of the people from the respondent's social circle, and is formulated in order to generate broadly a proxy for the elements of matrix G, i.e. a statistic of whether information about the stock market is passed on from acquaintance j to respondent i. Question D1 thus invites respondents to describe a possibly smaller 'inner' circle of peers with whom they discuss financial matters (the financial circle), and to distinguish them from the outer circle of peers with whom they interact socially without necessarily discussing finances. It leaves open the possibility that the respondent does not have such an inner circle, and this choice is modelled explicitly in the later part of our empirical analysis.

With reference to the theoretical model, respondents may be able to extract information (signals) about the stock market from the members of their financial circle, i.e. we assume that (with normalized precision), if an acquaintance belongs in the respondent's financial circle, then $g_{ij} = a_{ij}$. On the other hand, other acquaintances are excluded from the financial circle, if their signal precision is 0, i.e. when respondents state that they do not interact with them regarding financial matters, and in that case $g_{ij} = 0$. Characteristics of the social circle excluding the financial circle, namely the *outer circle*, can then be inferred (up to an allowable margin of error) from responses regarding the overall social circle and the inner financial circle.

Having defined the various peer circles, we elicit respondents' point perceptions about how many of their friends and acquaintances in the overall social circle and in the financial circle, are informed about the stock market, as well as their corresponding perceptions about peers investing in the stock market.[15] The exact wording of the questions is:

[14] Armantier, Nelson, Topa, Van der Klaauw and Zafar (2016) document substantial differences across households regarding the most recent US inflation rate, while Afrouzi, Coibion, Gorodnichenko and Kumar, (2015) examine the relationship between inflation expectations and perceptions of inflation in a sample of CE/FOs of New Zealand firms.

[15] A similar question format has been successfully exploited by researchers at the Dutch National Bank and at the University of Tilburg (CentER Panel) when identifying social interactions on individual outcomes, since it helps in overcoming the reflection

C7i/D16i: *In your opinion, what is the proportion of people in your social/financial circle that invests in the stock market? (as a %)*

C7ii/D16ii: *In your opinion, what is the proportion of people in your social/financial circle that follows the stock market? (as a %)*

Of the 2,587 respondents that send back the TNS2015 questionnaires, about 96% and 88% of respondents provided valid answers for questions C7 and D16 respectively.[16] The cross-sectional average point estimates for the perceived percentage of the social and financial circle that invests in the stock market is 10.7% and 18.9% respectively. Also, the cross-sectional average point estimates for the perceived percentages of the social and the financial circles that follows the stock market are 12.6% and 20.5% respectively. These questions define directly variables $\%SC\ Particip.$, $\%FC\ Particip$, $\%SC\ Inform.$ and $\%FC\ Inform.$ The perceived percentage of the outer circle of a respondent that invests in or is informed about the stock market is obtained from

$$\%OC\ Particip. \equiv \frac{C1 \times C7i - D1 \times D16i}{C1 - D1}, \tag{12}$$

$$\%OC\ Inform. \equiv \frac{C1 \times C7ii - D1 \times D16ii}{C1 - D1}. \tag{13}$$

Additionally and similarly, questions C6i and C6ii ask respondents about the proportion of the French population that invest and are informed about the stock market, respectively.[17] Surprisingly, the cross-sectional average point estimate for the proportion of the French population investing in the stock market is remarkably close to the cross-sectional mean participation rate in our representative sample: 19.4 percent versus 21.7 percent, respectively.

The final set of questions ask respondents to place themselves relative to others in their circles, both social and financial. With these, respondents state how the see themselves in terms of wealth, education and professional standing relative to their peers (for details see Appendix B4).

For notational convenience we use the abbreviations *SC*, *FC*, *OC* for the social circle (defined by C1), financial circle (defined by D1) and outer circle (defined as answer to C1 - answer to D1) respectively. Other abbreviations used throughout the paper are summarized in Table 1. Definitions, exact question statements and detailed explanations on the variables and the survey questions can be found later in the paper and in Appendix B. Table 7 provides summary statistics for the variables we use in the analysis.

4. Empirical analysis

Consistent with our theoretical analysis, in which equilibrium depends on the connectedness, k_i^*, rather than on the precise identity of interacting agents, we employ measures of such connectedness in our empirical analysis. Specifically, we focus on whether and how expectations about future returns, perceptions of past returns, and stockholding behavior are influenced by the share of the relevant peer circle that the respondent considers informed about, or participating in the stock market, controlling for factors, such as risk aversion, that correlate with potential benefits from acquired information.

problem identified by Manski (1993). The reflection problem refers to the impossibility of separately identifying the effect of peers' *choices* (endogenous or peer effects) from the effect of peers' characteristics (contextual effects) on individual outcomes, when individual and peers' choices are made simultaneously and as a function of common contextual factors. Here, instead of considering peers' actual choices, we exploit the variation in individual perceptions about peers' choices (e.g. stockholding status), which when combined with individual perceptions about peers' characteristics (e.g. peers' information or respondents' relative standing in terms of education, wealth or professional status), enables identification. See Blume et al. (2011, 2015) for additional details.

[16] In answering each of the questions, the respondent was also given the option to tick the box '*I do not know*'. About 64% and 61% chose this option for questions C7i and D16i respectively. About 61% and 58% reported this option for questions C7ii and D16ii, respectively.

[17] In answering each of the questions, the respondent was also given the option to tick the box '*I do not know,*' (DK). About 54% and 52% chose this option for questions C6i and C6ii respectively. About 3.1% chose not to answer these questions, and are accordingly coded as 'non-responses,' (NR).

4.1. The social and financial circles. Our assumption in the theoretical model is that respondents meet their peers and weight the information they obtain from them according to how reliable they perceive their peers to be. In real life, it is natural to think of respondents as deciding on whether to form a subset of their social circle, that we call "financial circle", with which to discuss financial matters in the course of making financial choices. A number of factors, both observable and unobservable, may enter this decision. We expect a respondent interested in benefitting from the information of others to be influenced in this decision by his or her overall assessment of information available in the overall social circle. A number of factors may be relevant for this choice, partly because they correlate with the need for financial information from peers or with the willingness to acquire such information. Demographic characteristics, the size of financial resources, attitudes (such as risk aversion or trust), as well as perceived position among peers, in terms of education, wealth, or professional standing, can be relevant for the decision to form a financial circle. Factors relevant for this decision may be among the wide array of respondent characteristics observable to us, or may be unobserved. Furthermore, there may be correlation between unobserved factors influencing the decision to form a financial circle and those relevant for stockholding. Indeed, unobserved factors encouraging households to participate in the stock market may also encourage them to form a financial circle, precisely so as to facilitate choices related to stockholding.

In what follows, we will want to understand the levels at which informative social interactions with the financial circle operate. In principle, interaction with informed or participating peers can improve the accuracy of perceptions regarding past returns, expected future returns, and stockholding behavior. At each level, information or participation of peers can influence the outcome directly, in addition to any effect it may have had on the previous level. For example, interaction with informed or participating peers can sharpen the accuracy of respondent perceptions of past returns, which enter the determination of expected future returns, but may also have a direct further effect on expectations, controlling for perceptions of the past. Similarly, interaction with informed or participating peers may be related to greater stockholding participation or exposure because of its link to expectations, but may also have a further, direct influence beyond the expectational one. Our approach aims to uncover the presence of any such influences.

We have designed the questionnaire to elicit information from respondents regarding their perceptions of the share of informed and of participating peers in their circle. It is important to stress that our data do not record actual shares of informed or participating peers, which may or may not be known to respondents, but shares *as these are perceived* by respondents who form expectations and decide on own stock market participation and exposure. We ask this information on two circles: the "financial circle", i.e., those peers with whom the respondent discusses financial matters; and the "social circle", i.e., the overall set of peers with whom the respondent interacts socially.

Two issues arise. First, the respondent chooses whether to have a financial circle or not, and this choice may be related to observed respondent characteristics, but also to unobserved factors potentially correlated with the respondent's stockholding behavior, expectations, or perceptions of past returns. Our econometric analysis allows for possible correlation of factors that we do not observe, and finds no evidence of sensitivity of estimates to allowing for correlation, nor of the presence of such correlation.

Second, while interactions with informed or participating peers in the financial circle are "informative", either because they entail information transfer or because they represent mindful imitation of trusted peers, respondents may also engage in "mindless imitation", based on their perceptions regarding information or stockholding behavior of social circle members with whom they do not discuss financial matters (the "outer" circle). Although the emphasis of our project is on establishing the presence of informative social interactions, it is interesting to see if we can also find evidence for mindless imitation of perceived participation in the outer circle. Now, respondent perceptions about stock market information or participation in the outer circle are likely to be less precise, because respondents do not care to discuss financial matters with their outer circle or because they are prevented to do so by shame, embarrassment, or lack of trust. Absence of a systematic

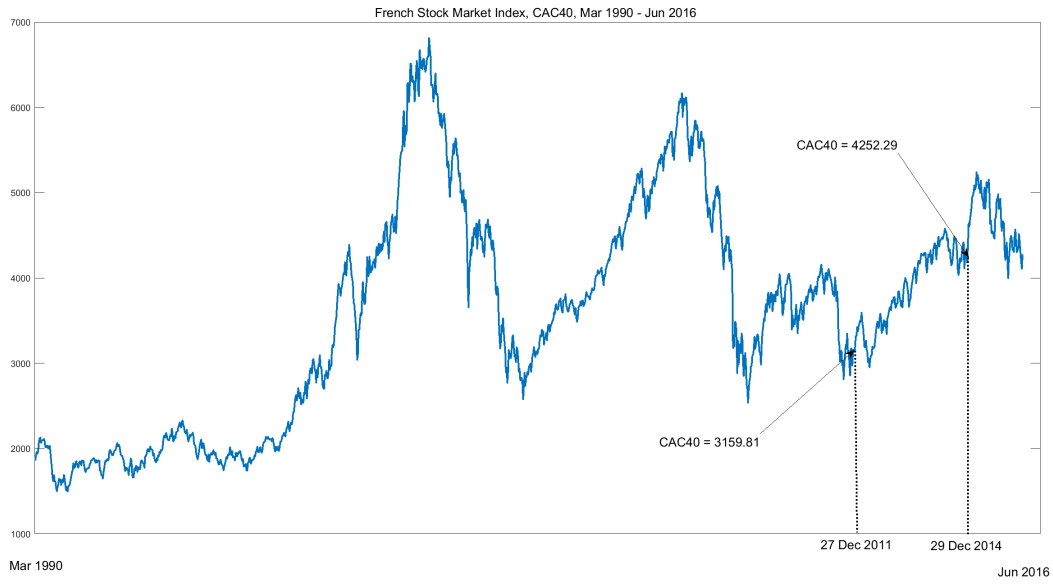

Figure 1: French stock market index, CAC 40, weekly data, 3 March 1990 - 27 June 2016. Source: Yahoo Finance.

relationship to perceptions of the outside circle may be due to this imprecision, but a relationship may exist for respondents who have a clearer view of their outer circle. To shed some light on this issue, we designed the questionnaire to elicit respondent perceptions about the financial circle and the *overall* social circle. We then use expressions (12) and (13) to compute their implied perceptions regarding members of their outer circle. This indirect approach identifies respondents who effectively report outer-circle shares of informed or participating peers below zero or over 100%. For such respondents, we set both the direct response on the financial circle and the implied one for the outer circle to 'missing observation', and we introduce an inconsistency dummy variable (IC) to flag them.[18] We also control for respondent perceptions on population-wide shares of informed and participating households in case they have an independent role beyond responses on the financial and outer circles. We find evidence that the stockholding behavior of at least those who are able and willing to form a more coherent view about information and participation across their social circle tends to exhibit a systematic positive relationship with their perceived share of participating peers in their outer circle. This is consistent with the presence of some mindless imitation of peer participation in the outer social circle, that could give rise to herding or fads both in participation and in the portfolio share of stocks, alongside informative social interactions with the financial circle.

4.2. Errors in Subjective Return Expectations and Perceptions. We begin our analysis by investigating the role that the presence of informed or participating peers plays in the formation of subjective expectations about future stock market returns, as well as of perceptions regarding past stock market performance. Specifically, we focus on whether respondents who report higher shares of informed or participating peers tend to exhibit smaller absolute errors in their stock return forecast (over the next five years); and/or smaller absolute errors in their perception of the past (three-year) return. We also ask whether the perceived presence of informed or participating peers continues to be systematically related to the size of forecast errors once we control for the error in perceived past returns.

Considerable recent interest in subjective expectations has its origins in early papers that documented both their role in stockholding behavior and their suprisingly large heterogeneity, despite their reference to a single stock market (see Dominitz and Manski, 2007; Kezdi and Willis, 2009; Hurd et al., 2011). Even more surprising is the heterogeneity in perceptions regarding recent stock market returns, that we also find in our

[18] Exception is made of those inconsistencies that are attributed to rounding, because of low numbers reported to question D1. With this criterion in place, a total of 19 observations are excluded from the IC category.

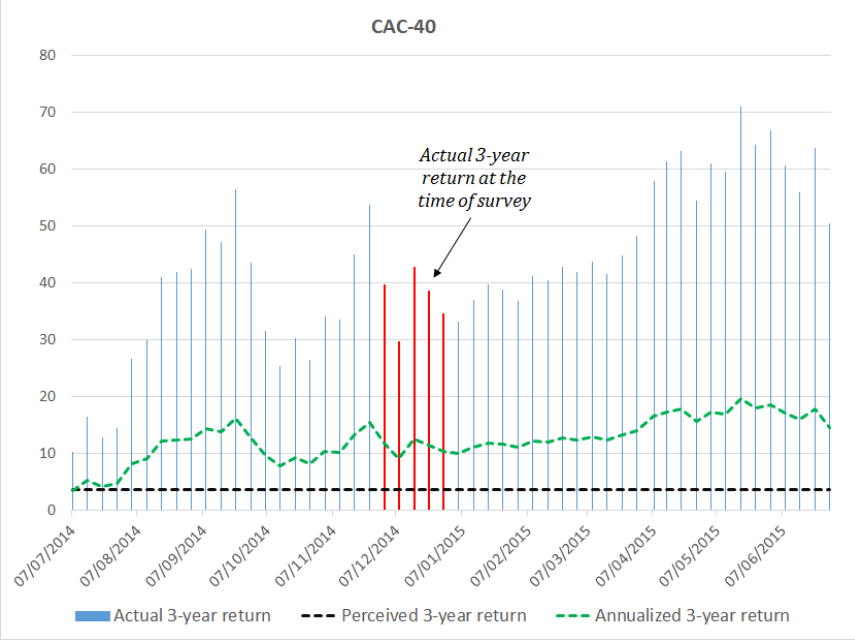

Figure 2: French stock market CAC 40, three-year stock market returns, weekly data, July 2014 to June 2015. The blue bars show cumulative 3-year returns and in particular, the red segment shows the actual cumulative 3-year return at the time that the survey was fielded, Dec 2014. The green dashed line shows the actual annualized 3-year returns and the black dashed line indicates the perceived 3-year return at the time that the survey was fielded.

sample (Arrondel et al., 2014).

Figure 1 shows historical monthly data of the French stock market index CAC-40, from March 1990 to June 2016. The index dropped by nearly 25% at the time of the sovereign-debt crisis during the second half of 2011. After that and as we get closer to the time that the two parts of the survey were fielded, the stock market index was steadily recovering. Both in late December 2014 and May 2015, the index was still below its dot-com and the Lehman brothers peaks, but had already recovered relative to the sovereign-debt crisis. Given the substantial turmoil experienced by the stock market index over the period prior to data collection, respondents are likely to have been exposed to considerable news coverage of the stock market evolution, and this makes the observed variation in perceptions and expectations all the more striking.

The actual stock market return over the three-year period in question (Dec 2011 - Dec 2014) was +34.57%, but the cross-sectional average perception of respondents regarding returns over the same period is equal to +3.6%. Figure 2 shows the actual 3-year returns from July 2014 to the June 2015. The average actual 3-year return in the second half of 2014 was +34.49%. Figure 2 also shows the annualized 3-year returns for the same period, which are still well above the average perceived returns, at an average value of 12.43%. Although this average perception gap in stock market returns seems too wide, it is consistent with rational inattention (Sims, 2003) and is in line with reported empirical findings on the inflation perception gap of households (Jonung, 1981; Armentier et al. 2016) and CE/FOs of firms (Coibion, et. al., 2018). The average cross-sectional subjective expectation of respondents regarding future five-year returns is equal to +1.6%. This deviates both from the immediate history prior to the interviews, as shown in Figure 2, and from the longer-run historical record.[19]

We have shown that even within an efficient competitive asset market, under certain conditions, information sourced from peers influences agents' expectations of returns. The recent empirical literature on subjective

[19] Dimson, Marsh and Staunton (2008) report a historical (arithmetic) mean excess return (risk premium) in France for 1900-2005 of around 6% (per annum, p.a), but that figure was revised downwards by Le Bris and Hautcoeur (2010) to 2% p.a. when examining a longer time window (1870-2007), correctly weighting for stock market capitalization and adjusting for survivorship bias. Since we are asking respondents about the expected return over a five-year horizon, to be consistent with the estimate by Le Bris and Hautcoeur (2010) the cross-sectional mean should be 2% p.a. over a 5-year period, or around 10%, which is almost an order of magnitude larger than the cross-sectional mean expected return of 1.6%.

expectations of aggregate market outcomes (reviewed in Manski, 2017) has focused on the study of systematic patterns that explain the absolute value of deviations of subjective expectations from ex-post return realisations, $|R_{t+1} - F^i R_{t+1}|$ where $F^i R_{t+1} = E\left(X|\mathcal{I}_i\right) \equiv Expec.\ R_i$. In this spirit, guided by a first order approximation of (8) we propose the following two empirical specifications:[20]

$$|R_{t+1} - Expec.\ R_i| \ = \kappa_0 + \kappa_1 k_i^* + \boldsymbol{\tau}_i \boldsymbol{\kappa} + e_i \tag{14}$$

and

$$|R_{t+1} - Expec.\ R_i| \ = \kappa_0 + \kappa_1 D_i^e + \boldsymbol{\tau}_i \boldsymbol{\kappa} + e_i, \tag{15}$$

where k_i^* is an indicator of connectedness to the peer circle, or how informed about the stock market peers are perceived to be, D_i^e is an indicator of expected or perceived peer behavior (participation in the stock market), $\boldsymbol{\tau}_i$ is a vector of individual characteristics which includes respondents' perceptions about peer *and population* characteristics, e_i is an individual zero-mean error term distributed normally conditional on covariates. The same coefficient symbols are used for notational economy but not to imply equality of coefficients.

We are able to control for a wide range of characteristics and attitudes of the household head. These include individual perceptions about the respondent's relative standing in terms of peer characteristics (professional status, education and total wealth), demographic characteristics (age, gender, marital status, number of children), elicited risk preferences (coefficient of absolute risk aversion), proxies for resources and constraints (educational attainment, employment status, assets, income, perceived borrowing constraints, and achieved liquid saving over the past year), and region of residence.[21] In all specifications, we also include dummies for item non-response and inconsistent responses, especially to the questions about perceived peer and population behavior.[22]

Finally, we split respondents' social circle conectedness, k_i^*, (and behaviour) into a financial circle, $k_{i,FC}^*$, and an outer circle, $k_{i,OC}^*$, controlling also for respondents' perceptions about overall population-level counterparts$k_{i,Pop}^*$:

$$|R_{t+1} - Expec.\ R_i| \ = \kappa_0 + \kappa_{1,FC} k_{i,FC}^* + \kappa_{1,OC} k_{i,OC}^* + \kappa_{1,P} k_{i,Pop}^* + \boldsymbol{\tau}_i \boldsymbol{\kappa} + e_i \ , \tag{16}$$

and

$$|R_{t+1} - Expec.\ R_i| \ = \kappa_0 + \kappa_{1,FC} D_{i,FC}^e + \kappa_{1,OC} D_{i,OC}^e + \kappa_{1,P} D_{i,Pop}^e + \boldsymbol{\tau}_i \boldsymbol{\kappa} + e_i \ . \tag{17}$$

Table 2a reports Huber-robust regression estimates for these two specifications under cols. (1) and (2), respectively. For both specifications we find that, relative to the corresponding perceived share of peers in the outer circle or in the population informed about (participating in) the stock market, a one standard deviation increase in the perceived informed (participating) share of peers in the respondent's financial circle (at a mean of 17.2 (16.6) percent) reduces the mean absolute forecast error by approximately -0.45 (-0.41) percentage points (or about a 1.5% (4.7%) reduction relative to the unconditional mean forecast error).

Recent literature on inflation expectations of households (e.g. Jonung, 1981; Armantier et al., 2016) or firms (Coibion et al., 2018) has found that beliefs about the past shape beliefs about the future.[23] We want to investigate whether our results in this first pass at estimating the relevance of the financial circle for expectational errors on stock returns reflects, partly or fully, its possible role in sharpening perceptions about recent past returns. To this end, we introduce as an additional control in econometric specifications (16) and

[20] The derivation of the approximation of (8) is included in Appendix B.

[21] Detailed variable definitions are to be found in Appendix C.

[22] Controlling for item non response to those questions hardly affects the sign, size, and significance of the main coefficients of interest, namely on perceptions regarding peers. A similar robustness exercise in the presence of missing data can be found in Dimmock, et. al. (2016).

[23] Note that this is conceptually different from 'extrapolative expectations', as recently documented in Bordalo et al. (2019). While there 'senior professional analysts' can be assumed to be all equally informed about realised returns, what the 'perceptions' literature initated by Jonung (1981) documents is, precisely, that households (or firms) cannot be assumed to be equally informed about realised returns. Furthermore, ignorance about facts (as measured by respondents' perception gaps) explains beliefs about the future.

(17) the absolute deviation of respondents' subjective perceptions about the most recent stock price growth over the last three years (nowcast or backcast, $B^i R_t$) from the actual realization, R_t, i.e. $\left|R_t - B^i R_t\right|$. Answers to question C42 in our survey enable probabilistic elicitation of respondents' perceptions about the most recent realized cumulative stock market return over a three-year period.[24] We focus on the mean of each respondent's subjective probability distribution over the size of the realized three-year stock market return, which we denote $B^i R_t \equiv Perc.\ R_i$. Results reported in Table 2a under columns (3)-(5) show that the respondents' perception gap about facts, as measured by their mean perception error, is a strongly significant predictor of their forecast error, regardless of whether peer variables are included in the regression (columns 4 and 5) or not (column 3). This extends the results of the inflation literature to the stock returns literature. Strikingly, neither the share of informed peers nor the share of stockholders in respondents' financial circles retain their statistical significance in the presence of the respondent's mean perception error. This suggests that, if informative social interactions do influence subjective expectations of returns, the channel through which they operate is the extent to which they affect perceptions of realised returns.

To address this issue, we inquire into the potential relevance of the social interaction variables, k_i^*or D_i^e, for the absolute size of perception errors regarding recent past returns:

$$|R_t - Perc.\ R_i| \ = \eta_0 + \eta_{1,FC} k^*_{i,FC} + \eta_{1,OC} k^*_{i,OC} + \eta_{1,P} k^*_{i,Pop} + \boldsymbol{\tau}_i \boldsymbol{\eta} + \varrho_i, \tag{18}$$

or

$$|R_t - Perc.\ R_i| \ = \eta_0 + \eta_{1,FC} D^e_{i,FC} + \eta_{1,OC} D^e_{i,OC} + \eta_{1,P} D^e_{i,Pop} + \boldsymbol{\tau}_i \boldsymbol{\eta} + \varrho_i, \tag{19}$$

where ϱ_i is an individual zero-mean error term distributed normally conditional on covariates, τ_i is a vector of individual characteristics.

The last two columns of Table 2a report significant (negative) estimates of the relationship between the absolute size of the perception error and either the perceived share of the financial circle informed about stocks (column (6)) or participating in stocks (column (7)). For both specifications we find that, relative to the share of peers in the outer circle or to the average person in the population informed about (participating in) the stock market, a one standard deviation increase in the mean informed (participating) share of peers in the respondent's financial circle of 17.8 (16.7) percent is associated with a reduction in the mean absolute perception error by approximately -0.91 (-0.76) percentage points (or about 2.9% (2.4%) relative to the unconditional mean backcast error).[25] Taken together, estimates in Table 2a suggest that, controlling for a wide range of household characteristics, informative interactions or mindful imitation of the financial circle tend to sharpen the accuracy of perceptions regarding the recent past return and, through that, increase the accuracy of return expectations.[26]

The estimates in Table 2a do not allow for endogeneity of financial circle formation. Unobserved factors might induce a respondent both to form a financial circle and to collect information so as to sharpen her forecast (backcast) of stock returns, without a causal effect from the informed or participating financial circle

[24] Armentier et al. (2016) have introduced past inflation in regressions of inflation expectations of households, and Coibion et al. (2018) have done so for inflation expectation of firms. Measuring individual information sets is difficult, even in experimental settings, but some progress has been made by extending Manski's (2004) probabilistic elicitation techniques to facts (as opposed to events). See, for example, Arrondel, Calvo-Pardo and Tas (2014), Afrouzi, Coibion, Gorodnichenko and Kumar (2016) and Coibion, Gorodnichenko and Kumar (2018). The exact wording of question C42, details about the construction of the variable as well as summary statistics can be found in Appendix B.

[25] The results reported are robust to adopting Coibion et al.'s (2018) econometric specification not in 'error form'. Table A3 in the online appendix reports the results of Huber-robust regressions of expectations about future returns on perceptions of realised returns and the same individual controls.

[26] The strongly significant positive coefficient on elicited risk aversion in the backcast error regressions is also consistent with an information interpretation. Those who are less willing to take risks are likely to have smaller exposure to stockholding, and therefore smaller benefits from sharpening their views regarding past or expected future stock returns. Other coefficients, omitted for brevity but available in the long version of Table 2a in the online appendix, are also consistent with an interpretation linked to information or financial knowledge. Controlling for retirement status, males, older and wealthier respondents tend to exhibit smaller backcast errors, while retirement status or being self employed per se are associated with larger backcast errors.

to the accuracy of the forecast (backcast). To address this potential concern, Table 2b reports estimates of Heckman regressions of absolute forecast or backcast errors, conditional on the respondent having chosen to form a financial circle. The first-stage regression estimates are reported in the (a) columns, while the second-stage (forecast or backcast) regressions appear in columns (b). A comparison of the findings in columns (b) among Tables 2a and 2b shows that the key finding on absolute forecast errors, namely that social interaction variables play no role once backcast errors are controlled for, is robust to allowing for endogenous formation of the financial circle. Moreover, the null hypothesis of no correlation of unobserved factors in the decision to form a financial circle and in the absolute size of the forecast error cannot be rejected (see the reported statistics at the last two rows of Table 2b). Estimates in columns 5(b) and 5(c) confirm the finding in Table 2a that the share of the financial circle perceived by the respondent to be informed about, or participating in stockholding is related to more accurate perceptions of the recent stock market realization, in the form of smaller absolute backcast errors. Thus our conclusion about information exchange or mindful imitation improving perceptions of the recent past return is robust to allowing for endogenous formation of the financial circle.

Unobserved heterogeneity is another potential concern. Unobserved factors affecting the respondent and her financial circle could be creating a tendency for peers in the financial circle to be (perceived as) informed about the stock market or as participating in the stock market, and simultaneously for the respondent to be having expectations of future returns or perceptions of past returns closer to the ex post realizations. This could induce a relationship between the shares of the financial circle being informed (or participating) and the respondent forecast or backcast error without any causal implication running from perceived peer information (participation) to respondent expectations or perceptions. Table 2c conducts placebo tests to examine whether the significance of perceptions regarding the circle of peers is due to unobserved heterogeneity. In each column, we have reshuffled the responses regarding the financial and the outer circle, as well as responses regarding the overall population, among respondents in the same age, education, and location group. When we do this, we no longer find that the shares of the financial (or the outer) circle perceived to be informed about, or participating in the stock market are significantly related to either absolute forecast or backcast errors. These findings suggest that our conclusions are robust to concerns about unobserved heterogeneity.

4.3. Stockholding. Our preceding analysis of subjective stock market expectations and perceptions has confirmed that connectedness to people more knowledgeable about the stock market tends to reduce absolute deviations of subjective expectations and perceptions from realized returns. In this section, we examine our second prediction, i.e. that social interactions and connectedness increase the prevalence of stockholding and the degree of exposure to stockholding risk, beyond their indirect effect through stock market expectations.

Our starting point is the demand for investing in the stock market in expression (11). Reorganizing this indicates that the risk-adjusted individual demands depend on a term that is common to all agents and a term that is individual-specific. Since we are exploiting empirically the variation across agents, a linear approximation of (11) suggests the following econometric specification for agent i's share of financial wealth invested in the stock market:

$$D_i = \%FW_i = \max\{0,\ \lambda_0 + \underset{(+)}{\lambda_1 k_i^*} + \underset{(+)}{\lambda_2 Expec\ R_i} + \underset{(-)}{\lambda_3 \rho_i} + \boldsymbol{\tau}_i \boldsymbol{\lambda} + u_i\}, \tag{20}$$

where u_i is an individual-specific error term. The vector $\boldsymbol{\tau}_i$ contains individual characteristics for respondent i, like age, gender, marital status, number of children, geographical region of residence, employment status, assets, income, borrowing or liquid savings. As in our analysis of expectations and perceptions above, it also includes individual perceptions about the respondent's relative standing in terms of peer characteristics for both the respondent's social circle (professional status) and financial circle (professional status, education and total wealth),[27] as well as individual perceptions about population behavior/information. The signs under the

[27] The detailed definitions of these can be found in Appendix B.

constant coefficients indicate the theoretically predicted signs: more/better informed connections reduce the equilibrium posterior variance of expected returns and boost the desired risky portfolio share (coefficient λ_1); a higher expected net excess return (coefficient λ_2) and lower risk aversion (coefficient λ_3) similarly increase the desired fraction of financial wealth to be invested in the stock market, controlling for individual characteristics.

The zero term within the specification allows for the observed prevalence of non-stockholders in the population. The empirical literature on stockholding has dealt with stock market non-participation in two ways. One way is discrete choice estimation (typically probit and less frequently logit regressions) of the decision whether to hold stocks or not. Non-participation arises when the expected benefit from participation, which is a function of desired stockholding and the expected equity premium, does not exceed the participation cost. A second type of empirical approach invokes tobit estimation of the risky portfolio share. This is typically linked to the portfolio model by considering that an agent can have a desired portfolio share that is positive or negative, but the latter is restricted to zero through a constraint preventing short sales of stock. This offers a possibility to examine the household's degree of exposure to stockholding risk, as opposed to focusing only on its presence.[28] Note that, in both cases, portfolio demand, stock market expectations, and stock market perceptions play a potentially important role. By analogy to our analysis of expectations and perceptions above, we also consider another specification involving stockholding behavior among peers. This takes the form:

$$D_i = \%FW = \max\{0,\ \zeta_0 + \underset{(+)}{\zeta_1} D_i^e + \underset{(+)}{\zeta_2} Expec\ R_i + \underset{(-)}{\zeta_3}\rho_i + \boldsymbol{\tau}_i\boldsymbol{\zeta} + w_i\}, \tag{21}$$

where D_i^e represents the extent of peer participation in the stock market, as perceived by the respondent. In specification (20) we focus on respondents' perceptions about how informed their financial and outer circles are about the stock market; and in (21) we use their perceptions regarding the incidence of stock market participation in the two circles.

Stock Market Participation. Column (1) of Table 3 presents results for a standard stock marekt participation probit, which additionally employs responses on how informed the financial, the outer circle, and the population are perceived to be. We confirm that subjective expected returns are positively and significantly related to the probability of participation, consistent with existing portfolio models, even after controlling for a range of household characteristics and for the respondent's elicited absolute risk aversion. We find that a one standard deviation increase in the mean share of a respondent's financial circle that is informed about the stock market increases the probability of investing in stocks by 7.4 percentage points, representing about a 34% increase in the unconditional probability.

Column (2) repeats the exercise but now controls instead for respondent perceptions as to the prevalence of stock market participation in the two circles, as well as in the overall population. We find a statistically significant positive relationship with the perceived share of participating peers in the financial circle. This is consistent with either meaningful exchange of information with peers having first-hand familiarity with stockholding, or simply with mindful imitation of peers with whom the respondent has chosen to discuss financial matters.

However, we also find that stock market participation among the outer circle has a positive and statistically significant relationship to the respondent's own decision to hold stocks, controlling for the perceived overall population participation rate that turns out to be insignificant. This finding points to mindless imitation of peers that the respondent does not consider knowledgeable or trustworthy enough to include in the financial circle. In the absence of direct discussion of financial matters with the outer circle, respondent perceptions of who participates in that circle are likely to be based on indirect indications or inferences from other discussions, and therefore to be much less precise. While this imprecision could lead to insignificant estimates, we find

[28] This standard approach should be interpreted with some caution, as it reduces stock market non-participants to frustrated short-sellers of stock. Nevertheless, it is consistent with the use of an estimator for censored data such as Tobit and opens up possibilities for studying the extensive margin.

that those who do not hold inconsistent perceptions regarding their financial and overall social circle do tend to relate their own participation to perceived participation among their outer circle.[29] This finding indicates that a tendency for conformism and mindless imitation as regards stock market participation cannot be ruled out, even in the presence of informative social interactions with the financial circle.

The standard probit does not control for endogenous formation of a financial circle. By analogy to the case of subjective expectation and perception errors discussed above, respondents may have some unobserved reasons to hold stocks that also encourage them to form a financial circle. This joint decision could induce a correlation between stockholding and financial sector attributes without any implication of causality from perceptions of the financial circle to the respondent's stockholding behavior. To deal with this issue, we follow Blume et al. (2011) and we treat group choice and behavior (within a group) as a set of joint outcomes.[30] Specifically, we consider a bivariate probit model for the choice to participate in the stock market and the choice to form a financial circle, allowing for correlated unobserved factors influencing the two choices.[31] We estimate the following bivariate probit econometric specification:

$$\begin{cases} \Pr(Stocks_i > 0) = \Phi(\lambda_0 + \lambda_1 k^*_{iFC} + \lambda_2 k^*_{iOC} + \lambda_3 k^*_{iPop} + \lambda_4 Expec\ R_i + \lambda_5 \rho_i + \boldsymbol{\tau}_i \boldsymbol{\lambda}) \\ \Pr(FC_i > 0) = \Phi(\nu'_1 k^*_{iSC} + \nu'_2 k^*_{iPop} + \nu'_3 Expec\ R_i + \nu'_4 \rho_i + \boldsymbol{\tau}_i \boldsymbol{\nu'}) \end{cases} \tag{22}$$

and the corresponding one for the perceived share of peers participating in stockholding, where we replace k^* with D^e. We are able to control for a number of observables that might influence the choice of a respondent to form a financial circle.

Table 4 presents four bivariate probits. Even-numbered columns are the branches depicting the choice of whether to form a financial circle or not, while odd-numbered columns correspond to the stock market participation branches of the corresponding bivariate probits. In addition to various demographic and economic characteristics of the respondent, we include regressors to capture the respondent's perception of how much is to be gained by forming a financial circle. Specifically, we include the respondent's perception as to the shares of the social circle that are informed about, or participating in, stocks, controlling for perceptions of the corresponding shares in the overall population; and perceptions of the share of the social circle that has higher or lower professional standing than the respondent. As can be seen in all (a) columns, perceiving a higher share of one's social circle as being informed about the stock market is significantly and positively correlated with the respondent's tendency to form a financial circle. The perceived share of stock market participants, in contrast, does not have any additional explanatory power, consistent with the view that information exchange is an important motivation for having a financial circle. Elicited risk aversion, relevant for the likely extent of interactions with the financial circle, is negatively correlated to the likelihood of forming one.

Columns (b) refer to the second leg, of stock market participation. In all specifications, we find the tendency to participate in the stock market to be positively related to the subjective expected stock market return over the next five years. This provides a first channel through which social interactions enter stock market participation. The perceived share of the financial circle that is informed about, or participating in the stock market is also significantly and positively related to participation, consistent with the presence of information exchange and mindful imitation of peers considered knowledgeable and trustworthy enough to be included in the respondent's financial circle. Findings on the importance of the outer circle are mixed. In

[29] Specifically, we find that a one-standard-deviation increase in the mean share of the respondent's financial circle investing in the stock market increases the probability to invest in stocks by around 6.3 percentage points, representing about a 30% increase relative to the sample mean proportion of stockholders of 21.7%; for the outer circle, the respective numbers are an increase in the probability to invest in stocks by 4 percentage points, representing a 19.5% increase relative to the sample mean proportion of stockholders.

[30] An alternative approach in the literature has been to instrument peer financial behavior; e.g. Brown, Ivkovic, Smith and Weisbenner (2008) use the one-year-lagged average equity ownership of nonnative community members' birth states for equity ownership within the community, when exploiting the variation across communities.

[31] Note that a two-step process, with financial circle formation as the first step, would run into the difficulty that having a financial circle is not a prerequisite for holding stocks. Indeed, our data include stockholders who do not declare having a financial circle.

column 1(b), we do not find a significant relationship with the share of the outer circle perceived as informed. However, in column 2(b), we find evidence of a statistically significant and positive relationship of stock market participation to the respondent's perception regarding the share of the outer circle that participates in the stock market. This mirrors our finding in Table 3, where we did not explicitly control for endogenous financial circle choice, and shows robustness of the finding.

These bivariate probit results, which allow for correlation among unobserved factors leading somebody to participate in stocks and to form a financial circle, are entirely consistent with those of the participation probits in Table 3. The source of this robustness is highlighted in the last three rows of Table 4. The correlation under discussion is between the error terms u_i and ν_{iFC}, in the form $u_i = \phi\nu_{iFC} + \upsilon_i$. The three rows report estimates of correlation ϕ, the Wald test statistics and associated p-values for different specifications of (22) considered. In no case can we reject the null of independence, $H_0 : \phi = 0$, between unobserved factors influencing the two choices.

As noted also in the case of standard probits, our estimation sample here excludes respondents who give inconsistent answers regarding their financial and their overall social circle. Our results with this sample suggest that respondents with a more precise view of their outer circle tend to behave in a way also related to perceived participation in, but not to the perceived level of information among that circle. This asymmetry between participation and information in the outer circle is consistent with mindless imitation, since respondents do not discuss financial matters with their outer circle. Yet, we subject the results to further scrutiny. Given that respondents do not directly discuss financial matters with people outside their financial circle, any respondent perceptions of shares of the outer circle are likely to be less precise than perceptions regarding the financial circle.[32] We instrument responses on stock market information or participation in the outer circle with responses of the same individuals regarding the respective share in the overall population (see Table 5, columns 1-4). These responses on the population are quite accurate on average and perform well in first-stage regressions.[33] We are also controlling for a number of household characteristics, limiting the possibilities that population perceptions could be influencing stock market participation through omitted channels other than perceptions of the outer circle; and direct inclusion of the population perceptions above has never yielded a significant estimate.

Odd-numbered columns in Table 5 report IV results for stock market participation (columns 1 and 3) and for the share of financial wealth conditional on participation (columns 5 and 7, discussed below). Each of the nonlinear models, i.e. probits for stockholding and tobits for the conditional shares, is estimated jointly by maximum likelihood, under the null hypothesis of no measurement error. The Wald $\chi^2(1)$ reported at the bottom of Table 5 has associated p-values above 20% for all specifications, and thus we cannot reject the null of no measurement error. It is encouraging that the significance pattern of the estimates regarding the financial circle shares is robust even to this modification. Neither coefficient on outer circle variables (information or participation) is significant, however, casting some doubt on the presence of mindless imitation in stock market participation. Nevertheless, perceptions regarding information and participation among the general population may not be exogenous to stockholding behavior of the respondent. So, we regard the evidence on mindless imitation as mixed, at best, and we cannot rule out that it is also present along informative interactions with the financial circle.

We also consider the possibility that unobserved heterogeneity generates our findings. In principle, unobserved factors that tend to make peers more likely to be informed about, and participating in the stock market may also be increasing the tendency of respondents to participate in stocks, without causality running from

[32] Indeed, attenuation bias per se would push coefficient estimates of outer circle shares towards zero, which makes the presence of significant estimates on outer circle information even more interesting.

[33] For the average stock market participation rate in our sample of 21.7%, respondents have on average a perception of 19.39% (see Table 7 of summary statistics). The results reported at the bottom of Table 5 under even-numbered columns show quantitatively big estimated effects and F-statistics above 40 for the first stage regressions of outer circle participation or information, as a function of population participation or information respectively.

the financial circle to stock market participation of the respondent. In columns (3) and (4) of Table 3, we undertake a placebo test of the hypothesis that the statistical significance of the peer variables arises from a tendency for respondents and their peers to behave in the same way due to unobserved group factors. To this end, we reshuffle the responses regarding how informed the two circles are and how heavily they participate in the stock market, as well as the respondent perceptions about the overall population. Consistent with the overall sample size, we cut the data by three factors in order to reshuffle responses: age, education, and region. We find that, when each respondent is matched not with his or her own responses regarding the financial and outer circles, but with those of a random person in the same age and education group and living in the same area, the coefficients on both circles are no longer statistically significant (and the coefficients on the population perceptions remain insignificant). This supports the view that the observed correlations in columns (1) and (2) do not arise from unobserved group factors that affect all members of the same age and education group who reside in the same area as the respondent.[34]

Conditional portfolio shares. Columns (5) and (6) of Table 3 adopt a tobit specification and report on the size of portfolio exposure to stockholding risk, conditional on holding stocks. Symmetrically to columns (1) and (2), columns (5) and (6) examine the role of perceptions regarding how informed the financial and outer circles are and to what extent they participate in the stock market, controlling also for perceptionsabout the population. Higher shares of informed or participating members of the financial circle are related to greater exposure to stockholding risk, conditional on participation, providing support for the main theoretical prediction. Columns (7) and (8) support the argument that the effects identified on the intensive stockholding margin are not due to unobserved group heterogeneity, by repeating the analogue placebo counterfactual exercises as reported under columns (3) and (4) for the participation decision. We also note that the effects on the conditional share are net of the peer effects on subjective expectations, for which we are controlling.

It is noteworthy that the share of the outer circle investing in the stock market is also statistically significant for the conditional portfolio share, as it was for stock market participation, and it now accounts for about one half of the overall estimated peer effect on the share of wealth invested in the stock market.[35] As was the case for the participation regressions, Table 5 weakens the case for the presence of mindless imitation, by showing insignificant coefficients on outer circle variables when these are instrumented by perceptions regarding the overall population. All in all, our estimates provide consistent support for the view that informative interactions with the financial circle influence conditional portfolio shares, as well as stock market participation, even beyond their effect through expected returns, while results on the additional relevance of mindless imitation are mixed.

4.4. Further possible concerns.

Reverse causality. In addition to endogenous choice to form a financial circle, unobserved heterogeneity and other robustness tests reported above, a possible concern is that our results on stock market participation reflect reverse causality: respondents who participate in stocks and are more exposed to stockholding risk in their portfolios are more likely to convince themselves that their peers are also participating, as this is likely to justify their own decisions. The possibility that reverse causality lies behind the findings in this paper needs to be considered in the overall context of our results. Econometric testing of this possibility requires a valid instrument for perceptions regarding the financial circle. While such instruments are not easily forthcoming, we present two estimations with instruments that pass the validity and relevance tests. For the extensive margin decision, we used as instrument the respondent perception about the proportion of peers in the financial circle who are informed about house prices. This yields estimated coefficients on the social interactions variables

[34] The cut based on age, education, and location is fairly standard in defining relevant peer groups. Adding more characteristics tends to restrict social circles further and implies degrees of homophily not supported by our data.

[35] A one-standard-deviation increase in the mean share of the respondent's financial circle investing in the stock market is related to a higher conditional share of financial wealth invested in the stock market by around 1 percentage point, representing about a 4.3% increase relative to the sample mean share of 21.41% amongst stockholders. For the outer circle, the corresponding figure is a higher conditional share invested by 1.4 percentage points, representing a 6.4% increase relative to the sample mean.

that remain statistically significant and are seven-fold bigger than those reported under columns (1) and (2) in Table 3.[36] Moreover, no statistical evidence against the null of exogeneity is found, suggesting that the non-instrumented results reported in Table 3 are preferred. For the intensive margin decision, the expectational error terms of Huber-robust regressions of expectations conditional on perceptions are found to be valid and predictive instruments, but no statistical evidence against the null of exogeneity is found and coefficients are bigger but imprecisely estimated.[37] More fundamentally, however, we doubt that going down the route of further experimentation with possible instruments is fruitful, since a number of considerations make it unlikely that reverse causality lies behind our results, when these are seen in context. First, one could make the same reverse causality argument about perceptions regarding the entire population: those who hold stocks want to feel that they are not alone, not only in their financial circle but also more broadly. Yet, we find that respondent perceptions about the population tend to be quite accurate and not significantly related to precision of return expectations or perceptions, to stockholding behavior, or to perceptions about the financial circle. Second, reverse causality would imply that respondents who are more accurate in their perceptions of recent stock returns or in their forecasts of future returns would be more likely to inflate their perception of information and participation among their financial circle. It is unlikely that greater accuracy in one dimension of perceptions causes greater bias in another, namely forming perceptions about peers in the financial circle. Third, reverse causality should also apply to perceived stock market *information* in the financial circle: respondents who are more precise in their return expectations or perceptions, and those who hold stocks or are more exposed to stocks should also be more likely to perceive their financial circle peers as more informed. Yet, respondents with greater precision or experience with the stock market are themselves more informed about the stock market and are likely to set higher standards in assessing the degree of information among their peers. Taking all our findings together, it is hard to see why we should expect respondents who have more accurate perceptions and more information about the market to be more likely to have artificially inflated perceptions of the degrees of information and participation among peers with whom they continually discuss financial matters.

Common shocks or preferences. A further possible concern in empirical research on peer effects is that OLS estimates may be inflated due to the presence of common shocks and common preferences among the set of peers, including the respondent. These could be shifting both the proxy for peer effects and the outcome variable, thus inflating the estimated size of the peer effect. In some datasets, it is possible to find a shock that shifts the peer variable, but which itself has no direct effect on the outcome variable, except through its effect on the peer variable. When this is possible, IV estimation is run, using this shock as the instrument, in order to see if IV estimation renders the peer variable insignificant.[38] In our analysis, finding such an instrument is quite challenging, as we need a shock that alters respondent perceptions about information or participation in their financial circle but not directly the accuracy of respondent forecasts or backcasts nor stockholding behavior of the respondent. We have experimented with the respondent perception of information or participation in the overall population. Although this turned out to be a good instrument for the outer circle in one of our exercises above, it turned out to be a poor instrument for the financial circle. This is indeed consistent with our interpretation of the financial circle variables: as respondents have direct contact with their financial circle on matters relating to finances, shocks to how they perceive the overall population do not have much explanatory power for their perceptions of the financial circle. We also experimented with the respondent perception about the proportion of peers in the respondent's financial circle who are homeowners. This turns out to be a valid and predictive instrument, and the estimated coefficients are four-fold bigger than those reported under columns

[36] See Table A1 in the not-for-publication appendix, under columns (3) and (4), respectively. Corresponding first-stage regression results are reported under columns (3) and (4), respectively, in the online appendix Table A2.

[37] See Table A1 in the online appendix, under columns (5) and (6), respectively. Corresponding first-stage regression results are reported under columns (5) and (6), respectively, in the online appendix Table A2.

[38] A good recent example of this approach is Bailey et al. (2019), which uses Facebook data to assess peer effects in product adoption.

(6) and (7), respectively, in Table 2a.[39] Since we find no statistical evidence against the null of exogeneity, the non-instrumented results reported in Table 2a are preferred. Finally, we control for a wide range of observable characteristics of the respondent, for respondent perceptions of the outer circle and the overall population, as well as for respondent perceptions of relative professional, education, and wealth status compared to their peers. For common shocks or preferences to invalidate our conclusions, it should be the case that correlated unobservable shocks or preferences, net of all these controls, induce sufficient bias to our financial circle peer effects estimates to render them significant when they are not.

4.5. Comparison to experimental evidence. Banerjee et al. (2013) and Bursztyn et al. (2014) adopt experimental methods to disentangle information from imitation effects of the social circle. Banerjee et al. (2013) consider a novel microfinance program and replace the unconditional individual probability of participation by the individual probability of participation conditional on individual information sourced from friends. Once informed, they find that an agent's decision to participate in the program is not significantly influenced by the fraction of her friends participating, concluding that the influence of peer participation is mainly an information effect.[40] It is possible to construct an extreme interpretation of their findings that would be in conflict with ours. Under such an interpretation, if people are generally aware of the existence of stocks, they should no longer be influenced by the share of their peers participating in them.

We opt for a different interpretation, which stresses the nature of the underlying financial product. The particular microfinance product may have a much higher probability of participation conditional on awareness than stocks do. To take an extreme, if practically all people who know about the microfinance product choose to use it, the value of social links is in transmitting otherwise inaccessible information and providing more information has no further effects. Yet we know that stock market participation is quite limited even among the many people aware of stocks in developed economies. Thus, there is room for further information beyond the mere existence of stocks to deliver effects on stock market participation and on the degree of exposure to stockholding risk.

Bursztyn et al. (2014) adopt a different experimental strategy and find empirical support for both information and imitation channels. They design a field experiment amongst socially paired investors of a Brazilian brokerage firm, and through sequential randomization, they separate the effect of a social peer actually purchasing a new financial product from being informed about it. This is accomplished by randomly informing peers about products, but also controlling whether they are able to invest in them or not. They are thus able to decompose the total effect of observing a peer hold a product into one that comes from the information that the peer is interested in having the product and one that comes from the information that the peer has been successful in acquiring the product. In this setup with fully controlled information flows, knowledge that a peer is interested in owning the new product is the only participation information that the respondent receives, and it can have a sizeable effect on the respondent's decision. It is entirely possible that observing peers participating in a mature and well-known product, such as stocks, will only have an incremental effect on the respondent's own decision. The objective to control the information flow restricts attention to unknown products with unknown appeal to others.

In our analysis, we deal with a well-known, yet information-intensive product in a developed economy, namely stocks in France. The more limited role for mindless imitation in the context of a widely known and mature product such as stocks is quite intuitive: not much information is added by learning that an extra person holds it, compared to learning this about a completely novel product. Mature financial products for which there is limited participation and uncontrolled access to information by potential investors abound in developed economies. Population-wide surveys of behavior relating to such products can provide useful

[39] See Table A1 in the online appendix, under columns (1) and (2), respectively. Corresponding first-stage regression results are reported under columns (1) and (2), respectively, in the online appendix Table A2.

[40] Their work relies heavily both on the identification of the actual network structure and on control over the information spreading through it.

additional insights to the interesting findings of tightly managed experiments with new or artificial financial products.

5. Conclusions

We provide a model where purely informative social interactions influence subjective expectations of future stock market returns as well as the demand for investing in stocks, within a large efficient asset market. The model shows that, conditional on investing, individuals collect more information from better informed peers, and due to the improved precision that this generates, demand more stock in response to positive pooled signals. By designing, collecting, and exploiting novel survey data for a representative sample of the French population by age, wealth and asset classes, collected in December 2014 and May 2015, we find strong support for the presence of informative social interactions, as well as some evidence for the presence of mindless imitation of perceived participation behavior in the outer social circle with whom respondents do not discuss finances.

Based on our findings, the extent to which respondents perceive the financial circle to be informed about, or participating in the stock market, tends to influence the accuracy of perceptions of recent returns and only through them, the accuracy of expectations of future returns. Stock market participation and the degree of exposure to stocks, conditional on participation, are positively influenced by stock market expectations. However, this is not the only channel through which peers influence stockholding behavior. Even controlling for subjective mean expectations, stock market participation and the conditional portfolio share are additionally positively influenced by the extent to which the financial circle is informed or participating, both of which reduce the posterior variance of expected returns. These findings are consistent with the notion that social interactions tend to be, at least in part, informative in relation to stockholding.

We have found our results to be robust to endogenous formation of the financial circle, and to unobserved heterogeneity, while we have not found evidence that reverse causality or common shocks and preferences are responsible for erroneous results. Moreover, we use four questions from the TNS2015 questionnaire (questions C5, D6, D7 and D8) that ask respondents to report how they perceive themselves relative to those in their social and financial circles, in terms of professional standing, value of their financial assets and qualifications.[41] The reported empirical results are conditional on these social utility covariates, which are never statistically significant, providing further evidence against homophily driving our model-backed interpretation of the estimated information peer effects.

Informative social interactions imply a potentially powerful channel through which financial information and financial literacy can permeate through the economy, even if the original information or financial education content reaches a relatively small segment of the population. They point to a social multiplier in financial education or financial information even in countries with advanced financial development and in products that are mature and widely known, as is the case of stockholding in France. They provide a (partial or superior) substitute for financial advice, if ill-conceived, poorly incentivized, or hardly trusted. Finally, they are likely to grow in importance, as use of social media and the potential to reach more people with new information spread rapidly. Yet the data also indicate the presence of some mindless imitation in stockholding. This, along with the inequities involved in having access to less informed peers, suggest caution in relying exclusively on informative social interactions for the spread of useful information and best financial practices.

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TABLE 1: Abbreviations and notation

Abbreviation	Stands for	Questions	From
SC	Social circle	C1	TNS2015
FC	Financial circle	D1	TNS2015
OC	Outer circle	C1, D1	TNS2015
%SC Inform.	Perceived share of SC members informed about stock market	C7ii	TNS2015
%SC Particip.	Perceived share of SC members investing the stock market	C7i	TNS2015
%FC Inform.	Perceived share of FC members informed about stock market	D16ii	TNS2015
%FC Particip.	Perceived share of SC members investing in stock market	D16i	TNS2015
%OC Inform.	Perceived share of OC members informed about stock market	C1, D1, C7ii/D16ii	TNS2015
%OC Particip.	Perceived share of OC members investing in stock market	C1, D1, C7i/D16i	TNS2015
% Pop. Inform.	Perceived proportion of the French population informed about stock market	C6ii	TNS2015
%Pop. Particip.	Perceived proportion of the French population investing in stock market	C6i	TNS2015
SC Rel.Stand. Prof.+	Perceived share of SC members performing better professionally	C5a	TNS2015
SC Rel.Stand. Prof.-	Perceived share of SC members performing worse professionally	C5c	TNS2015
FC Rel.Stand. Prof.+	Perceived share of FC members performing better professionally	D6a	TNS2015
FC Rel.Stand. Prof.-	Perceived share of FC members performing worse professionally	D6c	TNS2015
FC Rel.Stand. Wealth+	Perceived share of FC members with higher wealth	D7	TNS2015
SC Rel.Stand. Edu.+	Perceived share of SC members with higher educational attainment	D8	TNS2015
%FW	Share of financial wealth invested in the stock market	C19	TNS2014
Pr(stocks >0)	Probability of holding stocks (directly and/or indirectly)	C19, C3	TNS2014
Perc. R	Perceived mean realized stock market returns	C42	TNS2014
Expec. R	Subjective mean expected stock market returns	C39	TNS2014

TABLE 2a: Forecast and Back/Nowcast errors (short)

VARIABLES	(1) $\|FE\ R\|$	(2) $\|FE\ R\|$	(3) $\|FE\ R\|$	(4) $\|FE\ R\|$	(5) $\|FE\ R\|$	(6) $\|BE\ R\|$	(7) $\|BE\ R\|$
%FC. Inf.	-0.0263**			-0.0129		-0.0513***	
	(0.0131)			(0.0129)		(0.0193)	
%OC. Inf.	-0.0005			0.00218		-0.0148	
	(0.0259)			(0.0239)		(0.0370)	
%Pop. Inf.	0.0118		0.0123	0.0104		-0.00140	
	(0.0166)		(0.0184)	(0.0159)		(0.0224)	
%FC. Part.		-0.0247**			-0.0126		-0.0452**
		(0.0124)			(0.0120)		(0.0200)
%OC. Part.		0.0003			0.0089		-0.0455
		(0.0335)			(0.0323)		(0.0439)
%Pop. Part.		0.0068	-0.0049		0.0037		0.0026
		(0.0209)	(0.0237)		(0.0195)		(0.0255)
SC Rel.Stand. Prof.+	-0.0089	-0.0085	-0.0016	-0.0027	-0.0030	-0.0231	-0.0208
	(0.0132)	(0.0132)	(0.0119)	(0.0118)	(0.0118)	(0.0198)	(0.0196)
SC Rel.Stand. Prof -	-0.0230	-0.0233	-0.0204	-0.0188	-0.0194	-0.0222	-0.0198
	(0.0146)	(0.0148)	(0.0139)	(0.0135)	(0.0136)	(0.0229)	(0.0228)
FC Rel.Stand. Prof.+	0.0103	0.0098	0.0135	0.0142	0.0129	-0.0207	-0.0185
	(0.0114)	(0.0115)	(0.0109)	(0.0107)	(0.0107)	(0.0183)	(0.0185)
FC Rel.Stand. Prof.-	-0.0020	-0.0023	0.0084	0.0056	0.0054	-0.0330	-0.0336
	(0.0139)	(0.0139)	(0.0136)	(0.0132)	(0.0132)	(0.0209)	(0.0206)
FC Rel.Stand. Weal.+	-0.3550	-0.3850	-0.3370	-0.3680	-0.3940	0.0196	-0.0111
	(0.3360)	(0.3380)	(0.3070)	(0.3070)	(0.3100)	(0.4750)	(0.4750)
FC Rel.Stand. Educ.+	-4.14e-05	-0.00172	-0.0152	-0.0172	-0.0246	0.1230	0.1480
	(0.3210)	(0.3200)	(0.3060)	(0.3060)	(0.3050)	(0.4690)	(0.4650)
$\|BE\ R\|$			0.271***	0.271***	0.272***		
			(0.0230)	(0.0230)	(0.0230)		
Risk aversion	0.0686*	0.0699*	0.0405	0.0386	0.0387	0.145***	0.150***
	(0.0380)	(0.0380)	(0.0342)	(0.0341)	(0.0341)	(0.0525)	(0.0525)
Socio-demo characteristics:[a]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Socio-econ characteristics:[b]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NR, DK, IC indicators:[c]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,535	2,535	2,535	2,535	2,535	2,328	2,328
F	2.544	2.599	4.971	4.846	4.841	4.331	4.345
R^2	0.054	0.054	0.162	0.164	0.165	0.097	0.096

Notes: The table reports Huber-robust regressions of households' absolute forecast errors $|FE\ R| \equiv \left|R_{t+1} - F^i R_{t+1}\right|$ (columns 1-5) and back/nowcast errors $|BE\ R| \equiv \left|R_t - B^i R_t\right|$ (columns 6-7), for stock market returns on the CAC-40 index over the next five or and last three years respectively, on our measures of informative social interactions. Columns 3-5 report results for households' absolute forecast errors conditional on back/nowcast errors. (^{a}) Age, gender, marital status and children at home. (^{b}) Education (college or more), region of residence, employment status, total wealth, income and savings distribution quartiles and borrowing/liquidity constrained status. (^{c}) The full set of Non-response (NR), Does-not-Know (DK) and Inconsistent (IC) categories is as specified in Table 7. Reference categories are: 18-34 year old, Female, less than college education, single, widow or divorced, out of the labour force, region 1 (living in Paris), borrowing and liquidity unconstrained, and the first quartiles of the total wealth, income and savings distribution, respectively. Robust standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged TNS2014 and TNS2015 waves in France.

TABLE 2a: Forecast and Back/Nowcast errors (long)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	$\|FE\ R\|$	$\|FE\ R\|$	$\|FE\ R\|$	$\|FE\ R\|$	$\|FE\ R\|$	$\|BE\ R\|$	$\|BE\ R\|$
%FC. Inf.	-0.0263**			-0.01290		-0.0513***	
	(0.0131)			(0.0129)		(0.0193)	
%OC. Inf.	-0.0005			0.00218		-0.0148	
	(0.0259)			(0.0239)		(0.0370)	
%Pop. Inf.	0.0118		0.0123	0.0104		-0.0014	
	(0.0166)		(0.0184)	(0.0159)		(0.0224)	
%FC. Part.		-0.0247**			-0.0126		-0.0452**
		(0.0124)			(0.0120)		(0.0200)
%OC. Part.		0.0003			0.0089		-0.0455
		(0.0335)			(0.0323)		(0.0439)
%Pop. Part.		0.0068	-0.0049		0.0037		0.0026
		(0.0209)	(0.0237)		(0.0195)		(0.0255)
SC Rel.Stand. Prof.+	-0.0089	-0.0085	-0.0016	-0.0027	-0.0030	-0.0231	-0.0208
	(0.0132)	(0.0132)	(0.0119)	(0.0118)	(0.0118)	(0.0198)	(0.0196)
SC Rel.Stand. Prof -	-0.0230	-0.0233	-0.0204	-0.0188	-0.0194	-0.0222	-0.0198
	(0.0146)	(0.0148)	(0.0139)	(0.0135)	(0.0136)	(0.0229)	(0.0228)
FC Rel.Stand. Prof.+	0.0103	0.0098	0.0135	0.0142	0.0129	-0.0207	-0.0185
	(0.0114)	(0.0115)	(0.0109)	(0.0107)	(0.0107)	(0.0183)	(0.0185)
FC Rel.Stand. Prof.-	-0.0020	-0.0023	0.0084	0.0056	0.0054	-0.0330	-0.0336
	(0.0139)	(0.0139)	(0.0136)	(0.0132)	(0.0132)	(0.0209)	(0.0206)
FC Rel.Stand. Weal.+	-0.3550	-0.3850	-0.3370	-0.3680	-0.3940	0.0196	-0.0111
	(0.3360)	(0.3380)	(0.3070)	(0.3070)	(0.3100)	(0.4750)	(0.4750)
FC Rel.Stand. Educ.+	-4.14e-05	-0.00172	-0.0152	-0.0172	-0.0246	0.1230	0.1480
	(0.3210)	(0.3200)	(0.3060)	(0.3060)	(0.3050)	(0.4690)	(0.4650)
$\|BE\ R\|$			0.271***	0.271***	0.272***		
			(0.0230)	(0.0230)	(0.0230)		
Risk aversion	0.0686*	0.0699*	0.0405	0.0386	0.0387	0.145***	0.150***
	(0.0380)	(0.0380)	(0.0342)	(0.0341)	(0.0341)	(0.0525)	(0.0525)
35 <Age <50	-0.0416	-0.0575	-0.0731	-0.0226	-0.0501	-0.0105	0.0082
	(0.5130)	(0.5110)	(0.4820)	(0.4820)	(0.4810)	(0.7180)	(0.7150)
50 <Age <65	-0.1800	-0.1730	-0.0315	-0.0599	-0.0463	-0.6570	-0.7260
	(0.5740)	(0.5730)	(0.5440)	(0.5450)	(0.5440)	(0.7780)	(0.7810)
Age >65	-0.7420	-0.8140	-0.1890	-0.1800	-0.2450	-3.243***	-3.334***
	(0.8520)	(0.8490)	(0.7770)	(0.7790)	(0.7760)	(1.1930)	(1.1940)
Male	-1.050***	-1.061***	-0.3530	-0.3490	-0.3620	-3.128***	-3.129***
	(0.3620)	(0.3640)	(0.3420)	(0.3410)	(0.3420)	(0.5070)	(0.5090)
Married	0.9220**	0.9210**	0.7360**	0.7280*	0.7460**	0.9530*	0.8690
	(0.4040)	(0.4060)	(0.3730)	(0.3720)	(0.3730)	(0.5470)	(0.5500)
Children at Home >0	-0.4670	-0.4600	-0.7160	-0.7600*	-0.7500*	1.2540*	1.2500*
	(0.4800)	(0.4770)	(0.4490)	(0.4510)	(0.4470)	(0.6840)	(0.6820)
College or more	0.0459	0.0462	0.1310	0.1790	0.1900	-0.6930	-0.7270
	(0.4080)	(0.4060)	(0.3780)	(0.3870)	(0.3840)	(0.5470)	(0.5470)
Employed	1.0720*	1.0470*	0.9520	0.9480	0.8980	0.1580	0.2510
	(0.6240)	(0.6230)	(0.5950)	(0.5970)	(0.5940)	(0.8980)	(0.8990)
Self-employed	1.552**	1.520**	0.6410	0.6420	0.5940	3.4660**	3.5610**
	(0.7610)	(0.7580)	(0.7150)	(0.7110)	(0.7090)	(1.3970)	(1.395)
Retired	1.3230	1.3460	0.8250	0.8210	0.8110	2.5130**	2.6870**
	(0.8320)	(0.8320)	(0.7470)	(0.7500)	(0.7500)	(1.1510)	(1.1500)

TABLE 2a (Continued)

region 2	0.5690	0.5200	0.4700	0.4710	0.4420	0.2890	0.2050
	(0.9000)	(0.8970)	(0.8720)	(0.8710)	(0.8650)	(1.0710)	(1.0730)
region 3	0.2210	0.1970	0.2730	0.2660	0.2590	0.6050	0.5720
	(0.7100)	(0.7130)	(0.6920)	(0.6920)	(0.6940)	(1.0600)	(1.0560)
region 4	-0.7720	-0.8090	-0.5780	-0.5680	-0.6220	-0.3830	-0.2620
	(0.7280)	(0.7270)	(0.6820)	(0.6810)	(0.6800)	(1.1040)	(1.1020)
region 5	0.0555	-0.0012	-0.1520	-0.1600	-0.2110	1.1650	1.1010
	(0.6880)	(0.6880)	(0.6250)	(0.6230)	(0.6230)	(0.9970)	(0.9920)
region 6	0.5290	0.4700	0.7080	0.7020	0.6520	-0.7200	-0.7260
	(0.5600)	(0.5610)	(0.5420)	(0.5340)	(0.5340)	(0.8500)	(0.8490)
region 7	-1.0060	-1.0560*	-0.6250	-0.5700	-0.6100	-1.5850*	-1.6130*
	(0.6160)	(0.6150)	(0.5640)	(0.5670)	(0.5670)	(0.9260)	(0.9230)
region 8	0.0190	0.0097	0.1250	0.1120	0.1060	-0.1260	-0.1080
	(0.6630)	(0.6620)	(0.6090)	(0.6090)	(0.6090)	(0.8770)	(0.8790)
region 9	-0.2420	-0.2760	0.2500	0.2590	0.2680	-1.7320**	-1.8910**
	(0.6470)	(0.6440)	(0.6220)	(0.6190)	(0.6170)	(0.8760)	(0.8780)
€75K <Assets <€225K	-0.1710	-0.2040	-0.1100	-0.0441	-0.0773	-0.9710	-0.9810
	(0.5410)	(0.5410)	(0.5020)	(0.5040)	(0.5040)	(0.6460)	(0.6470)
€225 <Assets <€450K	-0.0054	-0.01320	0.1020	0.1400	0.1280	-0.8320	-0.8300
	(0.5800)	(0.5810)	(0.5440)	(0.5430)	(0.5440)	(0.7220)	(0.7210)
€450K <Assets	-0.2500	-0.2250	0.3840	0.5230	0.5280	-3.495***	-3.376***
	(0.7340)	(0.7380)	(0.6910)	(0.6860)	(0.6880)	(1.0120)	(1.0120)
€12K <Income <€20	0.3680	0.3930	-0.0325	-0.0644	-0.0414	1.8100**	1.7890**
	(0.5160)	(0.5150)	(0.4820)	(0.4830)	(0.4820)	(0.7040)	(0.7040)
€20K <Income <€30K	-0.1370	-0.1490	-0.2600	-0.2630	-0.2680	0.9350	0.9090
	(0.5480)	(0.5470)	(0.5020)	(0.5030)	(0.5030)	(0.7370)	(0.7370)
Income >€30K	-1.3020**	-1.2880**	-0.9470	-0.9450	-0.9270	-0.7580	-0.8060
	(0.6510)	(0.6530)	(0.6040)	(0.6030)	(0.6050)	(0.9320)	(0.9340)
Borr & Liq. Constr.	0.7600	0.7140	0.6530	0.7060	0.6250	-0.3000	-0.1840
	(1.2030)	(1.2040)	(1.1250)	(1.1220)	(1.1240)	(1.4570)	(1.4550)
0 <Savings <€1K	0.4220	0.4410	0.4430	0.4410	0.4640	-0.1060	-0.1470
	(0.4460)	(0.4450)	(0.4210)	(0.4210)	(0.4200)	(0.6250)	(0.6270)
€1K <Savings <€5K	0.2640	0.2690	0.0664	0.0849	0.0718	0.7080	0.7770
	(0.4630)	(0.4620)	(0.4320)	(0.4340)	(0.4320)	(0.6580)	(0.6570)
Savings >€5K	-0.7820	-0.7850	-0.3970	-0.4100	-0.4050	-1.3570	-1.3980
	(0.5970)	(0.5950)	(0.5820)	(0.5840)	(0.5830)	(0.9060)	(0.9080)
Constant	27.220***	27.360***	18.450***	18.910***	19.170***	30.160***	29.780***
	(2.0030)	(1.998)	(1.936)	(1.930)	(1.928)	(2.899)	(2.914)
Observations	2,535	2,535	2,535	2,535	2,535	2,328	2,328
R-squared	0.054	0.054	0.162	0.164	0.165	0.097	0.096
F	2.544	2.599	4.971	4.846	4.841	4.331	4.345

Notes: The table reports Huber-robust regressions of households' absolute forecast errors $|FE\ R| \equiv \left|R_{t+1} - F^i R_{t+1}\right|$ (columns 1-5) and back/nowcast errors $|BE\ R| \equiv \left|R_t - B^i R_t\right|$ (columns 6-7), for stock market returns on the CAC-40 index over the next five or and last three years respectively, on our measures of informative social interactions. Columns 3-5 report results for households' absolute forecast errors conditional on back/nowcast errors. Reference categories are: 18-34 year old, Female, less than college education, single, widow or divorced, out of the labour force, region 1 (living in Paris), borrowing and liquidity unconstrained, and the first quartiles of the total wealth, income and savings distribution, respectively. Controls also include 'non response' and 'do not know' categorical variables, but are not reported here. Robust standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Author computations from merged TNS2014 and TNS2015 waves in France.

TABLE 2b: Forecast and Back/Nowcast errors, conditional on having a Financial Circle (FC) (short)

VARIABLES	(1a) Pr(FC >0)	(1b) $\|FE\ R\|$	(2a) Pr(FC >0)	(2b) $\|FE\ R\|$	(3a) Pr(FC >0)	(3b) $\|FE\ R\|$	(4a) Pr(FC >0)	(4b) $\|FE\ R\|$	(5a) Pr(FC >0)	(5b) $\|BE\ R\|$	(6a) Pr(FC >0)	(6b) $\|BE\ R\|$
% SC Inf.	0.0104**		0.0087		0.0103*		0.0093*		0.0096*		0.0091	
	(0.0052)		(0.0056)		(0.0053)		(0.0055)		(0.0052)		(0.0817)	
%FC Inf.		-0.0227*		-0.0065						-0.0572***		
		(0.0127)		(0.0131)						(0.0175)		
%OC. Inf.		-0.0167		-0.0035						-0.0758**		
		(0.0251)		(0.0260)						(0.0386)		
% SC Part.	-0.0001		0.0005		-0.0002		-0.0002		-0.0006		-0.0003	
	(0.0052)		(0.0061)		(0.0053)		(0.0057)		(0.0052)		(0.0394)	
%FC. Part.						-0.0180		-0.0063				-0.0507**
						(0.0118)		(0.0128)				(0.0254)
%OC. Part.						-0.0183		0.0024				-0.0858
						(0.0323)		(0.0365)				(0.4040)
%Pop. Inf.	-0.0054	-0.0234	-0.0059	-0.0186	-0.0057		-0.0065*		-0.0049	0.0102	-0.0046	
	(0.0038)	(0.0215)	(0.0039)	(0.0224)	(0.0037)		(0.0038)		(0.0038)	(0.0311)	(0.0420)	
%Pop. Part.	-0.0004		-0.0006		-3.64e-06	-0.0288	0.0002	-0.0262	-0.0009		-0.0011	0.0017
	(0.0044)		(0.0045)		(0.0043)	(0.0275)	(0.0044)	(0.0273)	(0.0042)		(0.0408)	(0.334)
SC Rel.Stand.Prof.+	0.0026	-0.0099	0.0026	-0.0157	0.0026	-0.0086	0.0026	-0.0175	0.0021	0.0089	0.0021	0.0129
	(0.0022)	(0.0171)	(0.0022)	(0.0178)	(0.0022)	(0.0165)	(0.0022)	(0.0172)	(0.0021)	(0.0247)	(0.0022)	(0.2560)
SC Rel.Stand.Prof -	0.0024	-0.0471***	0.0022	-0.0544***	0.00241	-0.0462**	0.0022	-0.0582***	0.0025	0.00740	0.0025	0.0180
	(0.0025)	(0.0181)	(0.0025)	(0.0184)	(0.0025)	(0.0180)	(0.0025)	(0.0179)	(0.0025)	(0.0266)	(0.0026)	(0.2030)
FC Rel.Stand.vars:[a]	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
$\|BE\ R\|$				0.2870***				0.2890***				
				(0.0362)				(0.0368)				
Risk aversion	-0.0175**	0.0380	-0.0154*	0.0501	-0.0176**	0.0428	-0.0155*	0.0464	-0.0167**	0.0965	-0.0168	0.103
	(0.0081)	(0.0553)	(0.0084)	(0.0607)	(0.0082)	(0.0553)	(0.0084)	(0.0580)	(0.0079)	(0.0844)	(0.0114)	(1.230)
Socio-demo inc.:[b]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Socio-econ inc.:[c]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NR/DK/IC cat. inc.:[d]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ϕ	-0.181		-0.322		-0.115		-0.219		-0.172		-0.118	
χ^2, H_0:ϕ=0 (p-value)	0.22 (0.6390)		0.81 (0.3693)		0.16 (0.6868)		0.61 (0.4349)		0.40 (0.686)		0.00 (0.9944)	
Observations	2021		1920		2021		1920		1966		1966	

Notes: The table reports Huber-robust Heckman regressions of absolute forecast (cols. 1-4), $|FE\ R| \equiv \left|R_{t+1} - F^i R_{t+1}\right|$, and back/nowcast errors (cols. 5-6), $|BE\ R| \equiv \left|R_t - B^i R_t\right|$, for returns on the CAC-40 over the next five and last three years respectively: columns labeled (a) report results of the probit selection equation for having a financial circle and columns labeled (b) report results of Huber-robust regressions of forecast and back/nowcast errors, conditional on having a financial circle. Equations are jointly estimated by ML. A constant is included, but not reported. Controls include 'non response' (NR), 'do not know' (DK) and 'inconsistent' (IC) categorical variables (not reported here but in Table 7). The penultimate line reports a Wald test of independent equations (and associated p-values) under the null of no correlation $\phi = 0$ between having a financial circle and the absolute forecast back/nowcast error for stock market returns. The third line from the end reports the estimated correlation between the errors of both equations. ([a]) FC Rel. Stand. +Profes., +Wealth and +Edu. ([b]) Age, gender, marital status and children at home. ([c]) Education (college or more), region of residence, employment status, total wealth, income and savings distribution quartiles and borrowing/liquidity constrained status. ([d]). Reference categories are as in Table 2a. Robust standard errors reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged TNS2014 and TNS2015 waves.

TABLE 2b: Forecast and Back/nowcast errors, conditional on having a Financial Circle (FC)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	$\|FE\ R\|$	Pr(FC >0)	$\|FE\ R\|$	Pr(FC >0)	$\|FE\ R\|$	Pr(FC >0)	$\|FE\ R\|$	Pr(FC >0)	$\|BE\ R\|$	Pr(FC >0)	$\|BE\ R\|$	Pr(FC >0)
% SC Inf.		0.0104**		0.0087		0.0103*		0.0093*		0.0096*		0.0091
		(0.0052)		(0.0056)		(0.0053)		(0.0055)		(0.0052)		(0.0817)
%FC Inf.	-0.0227*		-0.0065						-0.0572***			
	(0.0127)		(0.0131)						(0.0175)			
%OC. Inf.	-0.0167		-0.0035						-0.0758**			
	(0.0251)		(0.0260)						(0.0386)			
%Pop. Inf.	-0.0234	-0.0054	-0.0186	-0.0059		-0.0057		-0.0065*	0.0102	-0.0049		-0.0046
	(0.0215)	(0.0038)	(0.0224)	(0.0039)		(0.0037)		(0.0038)	(0.0311)	(0.0038)		(0.0420)
% SC Part.		-0.0001		0.0005		-0.0002		-0.0002		-0.0006		-0.0003
		(0.0052)		(0.0061)		(0.0053)		(0.0057)		(0.0052)		(0.0394)
%FC. Part.					-0.0180		-0.0063				-0.0507**	
					(0.0118)		(0.0128)				(0.0254)	
%OC. Part.					-0.0183		0.00244				-0.0858	
					(0.0323)		(0.0365)				(0.4040)	
%Pop. Part.		-0.0004		-0.0006	-0.0288	-3.64e-06	-0.0262	0.0002		-0.0009	0.0017	-0.0011
		(0.0044)		(0.0045)	(0.0275)	(0.0043)	(0.0273)	(0.0044)		(0.0042)	(0.334)	(0.0408)
SC Rel.Stand.Prof.+	-0.0099	0.0026	-0.0157	0.0026	-0.0086	0.0026	-0.0175	0.0026	0.0089	0.0021	0.0129	0.0021
	(0.0171)	(0.0022)	(0.0178)	(0.0022)	(0.0165)	(0.0022)	(0.0172)	(0.0022)	(0.0247)	(0.0021)	(0.2560)	(0.0022)
SC Rel.Stand.Prof -	-0.0471***	0.0024	-0.0544***	0.0022	-0.0462**	0.0024	-0.0582***	0.0022	0.0074	0.0025	0.0180	0.0025
	(0.0181)	(0.0025)	(0.0184)	(0.0025)	(0.0180)	(0.0025)	(0.0179)	(0.0025)	(0.0266)	(0.0025)	(0.2030)	(0.0026)
FC Rel.Stand.Prof.+	0.0089		0.0141		0.0101		0.0120		-0.0310*		-0.0283	
	(0.0109)		(0.0112)		(0.0114)		(0.0115)		(0.0184)		(0.0314)	
FC Rel.Stand.Prof.-	0.0082		0.0192		0.0096		0.0189		-0.0409*		-0.0437**	
	(0.0143)		(0.0140)		(0.0144)		(0.0141)		(0.0227)		(0.0210)	
FC Rel.Stand.Weal.+	-0.8640*		-0.9950**		-0.9050**		-1.0590**		0.2990		0.1120	
	(0.4530)		(0.4360)		(0.4550)		(0.4440)		(0.6200)		(1.1330)	
FC Rel.Stand.Educ.+	0.4050		0.6820		0.3580		0.6450		-0.3030		-0.2840	
	(0.4410)		(0.4300)		(0.436)		(0.4280)		(0.6120)		(0.5750)	
$\|BE\ R\|$			0.2870***				0.2890***					
			(0.0362)				(0.0368)					

TABLE 2b: (Continued)

Risk aversion	0.0380	-0.0175**	0.0501	-0.0154*	0.0428	-0.0176**	0.0464	-0.0155*	0.0965	-0.0167**	0.1030	-0.0168
	(0.0553)	(0.0081)	(0.0607)	(0.0084)	(0.0553)	(0.0082)	(0.0580)	(0.0084)	(0.0844)	(0.0079)	(1.2300)	(0.0114)
35 <Age <50	0.7800	-0.4100***	1.3820*	-0.3880***	0.711	-0.4080***	1.1820	-0.384***	-1.8300	-0.373***	-1.6660	-0.3700
	(0.9390)	(0.1140)	(0.8360)	(0.1190)	(0.839)	(0.1140)	(0.8080)	(0.1190)	(1.3650)	(0.1150)	(34.07)	(0.4350)
50 <Age <65	1.7800	-0.8540***	2.4580*	-0.8940***	1.537	-0.853***	2.1470*	-0.893***	0.0475	-0.851***	-0.1690	-0.8510***
	(1.4120)	(0.1150)	(1.3190)	(0.1200)	(1.168)	(0.1150)	(1.1770)	(0.1190)	(2.3550)	(0.1180)	(77.11)	(0.1750)
Age >65	0.8740	-1.0050***	2.3760	-1.0670***	0.582	-1.0030***	1.9520	-1.064***	-2.5260	-1.010***	-2.6400	-1.0100***
	(1.9660)	(0.1660)	(1.8520)	(0.1750)	(1.731)	(0.1660)	(1.7360)	(0.1750)	(3.1400)	(0.1710)	(98.04)	(0.1840)
Male	-1.7720***	-0.0760	-0.8940*	-0.0497	-1.727***	-0.0764	-0.9340*	-0.0482	-3.219***	-0.0462	-3.3510	-0.0466
	(0.5740)	(0.0658)	(0.5350)	(0.0685)	(0.569)	(0.0658)	(0.5260)	(0.0685)	(0.7730)	(0.0678)	(2.7960)	(0.0838)
Married	1.3280**	-0.0294	1.0620*	0.0171	1.287**	-0.0288	0.9980	0.0174	0.3610	0.0374	0.1740	0.0357
	(0.5990)	(0.0710)	(0.6130)	(0.0739)	(0.605)	(0.0710)	(0.6090)	(0.0739)	(0.8600)	(0.0748)	(4.7270)	(0.2480)
Children at Home >0	-0.4080	0.0125	-0.9130	-0.0181	-0.4160	0.0127	-0.8670	-0.0169	3.149***	-0.0220	2.9630	-0.0234
	(0.7460)	(0.0953)	(0.7420)	(0.0992)	(0.7310)	(0.0953)	(0.7270)	(0.0989)	(1.0180)	(0.0988)	(5.9750)	(0.2850)
College or more	-0.7230	0.0439	-0.7980	0.0609	-0.6820	0.0449	-0.7340	0.0625	-0.4100	0.0441	-0.4750	0.0442
	(0.6960)	(0.0724)	(0.6780)	(0.0749)	(0.6760)	(0.0723)	(0.6540)	(0.0747)	(0.8720)	(0.0738)	(6.0750)	(0.0871)
region 2	1.1730	-0.1410	0.9470	-0.2380	1.1050	-0.1430	0.8960	-0.2380	1.4050	-0.2260	1.2140	-0.2240
	(1.5470)	(0.1460)	(1.7120)	(0.1530)	(1.5300)	(0.1460)	(1.6510)	(0.1530)	(1.9390)	(0.1540)	(23.30)	(0.1920)
region 3	2.4310**	-0.0756	2.5710**	-0.0763	2.2940**	-0.0759	2.5070**	-0.0787	1.8510	-0.0398	1.7240	-0.0398
	(1.1610)	(0.1330)	(1.1940)	(0.1390)	(1.1550)	(0.1330)	(1.1930)	(0.1390)	(1.5380)	(0.1380)	(5.6820)	(0.1550)
region 4	-0.4480	-0.0400	-1.1320	-0.0981	-0.5070	-0.0400	-1.2890	-0.0976	2.4980	-0.0840	2.8950	-0.0840
	(0.9510)	(0.1320)	(0.9360)	(0.1370)	(0.9430)	(0.1320)	(0.9300)	(0.1370)	(1.5480)	(0.1370)	(6.9080)	(0.1660)
region 5	-0.1580	0.0256	-0.2110	-0.0022	-0.2050	0.0244	-0.2560	-0.0031	1.5410	0.0107	1.5720	0.0153
	(1.1290)	(0.1300)	(1.0340)	(0.1360)	(1.1170)	(0.1300)	(1.0220)	(0.1360)	(1.4690)	(0.1330)	(1.5810)	(0.6130)
region 6	0.6750	0.0294	0.8970	-0.0169	0.6100	0.03020	0.8370	-0.0141	-0.5990	0.00123	-0.4080	0.0027
	(0.7620)	(0.1130)	(0.7810)	(0.1200)	(0.7670)	(0.1120)	(0.7820)	(0.1190)	(1.2740)	(0.1170)	(1.4870)	(0.1590)
region 7	-0.6460	0.0114	0.0600	-0.0397	-0.6930	0.01140	0.0048	-0.0407	-1.6930	-0.0254	-1.5890	-0.0267
	(0.8980)	(0.1210)	(0.8760)	(0.1260)	(0.8900)	(0.1210)	(0.8700)	(0.1260)	(1.3520)	(0.1230)	(3.3710)	(0.2730)
region 8	-0.5990	0.0160	-0.8490	0.0078	-0.6630	0.0154	-0.7410	0.0068	-0.1980	0.0638	-0.0106	0.0637
	(1.0950)	(0.1210)	(1.0360)	(0.1250)	(1.0800)	(0.1210)	(1.0330)	(0.1250)	(1.3240)	(0.1210)	(8.136)	(0.1520)
region 9	-0.6620	-0.0376	-0.2640	-0.0634	-0.6470	-0.0365	0.0155	-0.0623	-1.2730	-0.0629	-1.526	-0.0624
	(0.8940)	(0.1140)	(0.9130)	(0.1200)	(0.9080)	(0.1140)	(0.910)	(0.1200)	(1.3100)	(0.1180)	(3.277)	(0.1170)

TABLE 2b: (Continued)

Employed	0.9420	0.1040	0.3390	0.0308	0.9480	0.1030	0.2580	0.0297	3.1310**	0.0358	3.2960	0.0369
	(0.9390)	(0.1140)	(0.9790)	(0.1200)	(0.9380)	(0.1140)	(0.9800)	(0.1200)	(1.3860)	(0.1220)	(4.284)	(0.1560)
Self-employed	0.6530	0.2610	-0.3480	0.2160	0.5970	0.2620	-0.4480	0.2210	3.8140*	0.1740	3.9650	0.1700
	(1.2450)	(0.1910)	(1.1690)	(0.2010)	(1.2070)	(0.1910)	(1.1440)	(0.2010)	(2.0970)	(0.1930)	(14.03)	(0.7550)
Retired	0.9570	0.0787	-0.2850	0.0308	0.8370	0.0788	-0.5240	0.0313	4.8770**	-0.0088	4.7800	-0.0073
	(1.3000)	(0.1540)	(1.3220)	(0.1620)	(1.2720)	(0.1540)	(1.2940)	(0.1620)	(1.9500)	(0.1600)	(12.18)	(0.2640)
€75K <Assets <€225K	-1.3670	0.429***	-0.9310	0.406***	-1.3110	0.430***	-0.8020	0.408***	-2.3220	0.385***	-1.9660	0.3840**
	(1.0970)	(0.0923)	(1.0700)	(0.0961)	(0.9560)	(0.0919)	(0.9680)	(0.0952)	(1.4430)	(0.0949)	(35.500)	(0.1660)
€225 <Assets <€450K	-0.1520	0.359***	0.0665	0.366***	-0.0287	0.360***	0.2840	0.369***	-1.1330	0.329***	-0.9240	0.3300*
	(1.0500)	(0.0999)	(1.0420)	(0.1040)	(0.9820)	(0.0996)	(0.9960)	(0.1030)	(1.4710)	(0.1030)	(31.05)	(0.1990)
€450K <Assets	-0.6410	0.570***	0.4750	0.556***	-0.2690	0.570***	1.0040	0.556***	-4.6200**	0.520***	-4.0710	0.520***
	(1.4990)	(0.1230)	(1.4890)	(0.1290)	(1.2900)	(0.1230)	(1.3330)	(0.1290)	(2.0470)	(0.1290)	(50.98)	(0.1260)
€12K <Income <€20	0.4740	0.0641	-0.0609	0.0931	0.4580	0.0637	0.0327	0.0919	0.6110	0.0685	0.3520	0.0676
	(0.7990)	(0.0915)	(0.7640)	(0.0962)	(0.7880)	(0.0915)	(0.7720)	(0.0962)	(1.1970)	(0.0964)	(10.41)	(0.1540)
€20K <Income <€30K	0.02940	0.1450	-0.1340	0.2040**	0.0096	0.1450	-0.0495	0.2010**	-0.8760	0.1690*	-0.9530	0.1690
	(0.9200)	(0.0958)	(0.9030)	(0.1010)	(0.8600)	(0.0957)	(0.8710)	(0.1010)	(1.2780)	(0.0996)	(19.99)	(0.1430)
Income >€30K	-1.0710	0.0221	-0.4630	0.0878	-1.1090	0.0231	-0.3010	0.0877	-3.0960**	0.0561	-3.1040	0.0597
	(0.9060)	(0.1210)	(0.9320)	(0.1260)	(0.9290)	(0.1210)	(0.9630)	(0.1260)	(1.4140)	(0.1240)	(9.1140)	(0.6220)
Borr. & Liq.Constr.	-0.3940	-0.2130	0.3020	-0.2260	-0.4300	-0.2150	-0.0257	-0.2270	1.2230	-0.1580	1.9580	-0.1580
	(1.9230)	(0.1880)	(1.6950)	(0.1990)	(1.9800)	(0.1880)	(1.7300)	(0.1990)	(2.7170)	(0.1980)	(29.13)	(0.2490)
0 <Savings <€1K	1.2470*	0.1310	1.8190**	0.1630*	1.3240*	0.1320	1.977***	0.1650*	-1.7200	0.1680**	-1.8280	0.1650
	(0.7500)	(0.0816)	(0.7540)	(0.0864)	(0.7290)	(0.0812)	(0.7320)	(0.0858)	(1.1360)	(0.0851)	(19.06)	(0.4610)
€1K <Savings <€5K	0.8810	0.335***	0.5630	0.346***	1.0210	0.333***	0.6650	0.345***	0.8130	0.338***	1.0750	0.338***
	(0.9990)	(0.0866)	(0.9920)	(0.0886)	(0.8610)	(0.0862)	(0.8890)	(0.0888)	(1.3430)	(0.0877)	(33.49)	(0.1230)
Savings >€5K	0.3370	0.1740	0.6010	0.2230*	0.3400	0.1740	0.7520	0.2240*	-1.1490	0.2320*	-1.3740	0.2340
	(0.9630)	(0.1150)	(1.0770)	(0.1190)	(0.9280)	(0.1150)	(1.0370)	(0.1190)	(1.4000)	(0.1190)	(24.81)	(0.3070)
ϕ	-0.181		-0.322		-0.115		-0.219		-0.172		-0.118	
Wald χ^2, H_0:ϕ=0 (p-value)	0.22 (0.6390)		0.81 (0.3693)		0.16 (0.6868)		0.61 (0.4349)		0.40 (0.6860)		0.00 (0.9944)	
Observations	2021		1920		2021		1920		1966		1966	

Notes: The table reports Huber-robust Heckman regressions of households' absolute forecast (columns 1-8), $|FE\ R| \equiv \left|R_{t+1} - F^i R_{t+1}\right|$, and back/nowcast errors (columns 9-12), $|BE\ R| \equiv \left|R_t - B^i R_t\right|$, for stock market returns on the CAC-40 index over the next five and last three years respectively: even-numbered columns report the results of the probit selection equation for having a financial circle while odd-numbered columns report the results of Huber-robust regressions of forecast and back/nowcast errors, conditional on having a financial circle. Both equations are jointly estimated by ML. A constant is included, but not reported. Controls also include 'non response' and 'do not know' categorical variables, but are not reported here. The penultimate line reports a Wald test of independent equations (and associated p-values) under the null of no correlation $\phi = 0$ between having a financial circle and the absolute forecast back/nowcast error for stock market returns. The third line from the end reports the estimated correlation between the errors of both equations. ([a]) The full list of covariates is identical to those reported in Table 2a, for the corresponding specifications under odd-numbered columns. Robust standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged TNS2014 and TNS2015 waves.

TABLE 2c: Forecast and Back/Nowcast errors, placebo regressions

	(1)	(2)	(3)	(4)	(5)	(6)
	$\|FE\ R\|$	$\|FE\ R\|$	$\|FE\ R\|$	$\|FE\ R\|$	$\|BE\ R\|$	$\|BE\ R\|$
VARIABLES	Placebo	Placebo	Placebo	Placebo	Placebo	Placebo
%FC. Inf.	0.0096		0.0123		-0.0042	
	(0.0142)		(0.0131)		(0.0207)	
%OC. Inf.	0.0046		-0.0039		0.0515	
	(0.0247)		(0.0251)		(0.0368)	
%Pop. Inf.	-0.0072		0.0190		0.0230	
	(0.0149)		(0.0162)		(0.0256)	
%FC. Part.		0.0167		0.0126		-0.0011
		(0.0155)		(0.0144)		(0.0206)
%OC. Part.		-0.0086		-0.0270		0.0236
		(0.0347)		(0.0343)		(0.0440)
%Pop. Part.		-0.0216		-0.0284		0.0068
		(0.0171)		(0.0185)		(0.0290)
SC Rel.Stand. Prof.+	-0.0068	-0.0077	-0.00273	-0.0032	-0.0226	-0.0250
	(0.0134)	(0.0134)	(0.0128)	(0.0127)	(0.0197)	(0.0196)
SC Rel.Stand. Prof -	-0.0244	-0.0256*	-0.0237	-0.0243	-0.0226	-0.0232
	(0.0149)	(0.0150)	(0.0148)	(0.0149)	(0.0231)	(0.0232)
FC Rel.Stand. Prof.+	0.0046	0.0052	0.0088	0.0093	-0.0287	-0.0273
	(0.0117)	(0.0117)	(0.0112)	(0.0113)	(0.0186)	(0.0187)
FC Rel.Stand. Prof.-	0.0002	0.0018	0.0068	0.0078	-0.0262	-0.0258
	(0.0142)	(0.0142)	(0.0141)	(0.0142)	(0.0211)	(0.0211)
FC Rel.Stand. Weal.+	-0.3150	-0.2950	-0.3070	-0.3180	-0.0221	-0.0359
	(0.3390)	(0.3380)	(0.3160)	(0.3170)	(0.478)	(0.4800)
FC Rel.Stand. Educ.+	-0.0193	-0.0048	-0.0109	0.0432	0.112	0.1260
	(0.3250)	(0.3240)	(0.3280)	(0.3270)	(0.4740)	(0.4740)
$\|BE\ R\|$			0.274***	0.275***		
			(0.0228)	(0.0228)		
Risk aversion	0.0632	0.0639*	0.0551	0.0538	0.151***	0.155***
	(0.0387)	(0.0385)	(0.0392)	(0.0390)	(0.0531)	(0.0530)
Socio-demographic characteristics:[a]	Yes	Yes	Yes	Yes	Yes	Yes
Socio-economic characteristics:[b]	Yes	Yes	Yes	Yes	Yes	Yes
NR, DK, IC indicators:[c]	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,516	2,516	2,158	2,158	2,312	2,312
F	2.521	2.544	5.325	5.122	4.158	4.101
R^2	0.054	0.055	0.188	0.190	0.092	0.092

Notes: The table reports Huber-robust placebo regressions of households' absolute forecast errors $|FE\ R| \equiv \left|R_{t+1} - F^i R_{t+1}\right|$ (columns 1-4) and back/nowcast errors $|BE\ R| \equiv \left|R_t - B^i R_t\right|$ (columns 5-6), for stock market returns on the CAC-40 index over the next five or and last three years respectively, on our measures of informative social interactions. Columns 3-5 report results for households' absolute forecast errors conditional on back/nowcast errors. (^{a}) Age, gender, marital status and children at home. (^{b}) Education (college or more), region of residence, employment status, total wealth, income and savings distribution quartiles and borrowing/liquidity constrained status. (^{c}) The full set of Non-response (NR), Does-not-Know (DK) and Inconsistent (IC) categories is as specified in Table 7. Reference categories are: 18-34 year old, Female, less than college education, single, widow or divorced, out of the labour force, region 1 (living in Paris), borrowing and liquidity unconstrained, and the first quartiles of the total wealth, income and savings distribution, respectively. Robust standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged TNS2014 and TNS2015 waves in France.

TABLE 3: Stockholdings

VARIABLES	(1) Pr(Stocks >0)	(2) Pr(Stocks >0)	(3) Pr(Stocks >0) Placebo	(4) Pr(Stocks >0) Placebo	(5) E(%FW >0)	(6) E(%FW >0)	(7) E(%FW >0) Placebo	(8) E(%FW >0) Placebo
%FC Inform.	0.0027***		-0.0003		0.0290		0.0259	
	(0.0005)		(0.0006)		(0.0198)		(0.0208)	
%OC Inform.	0.0001		0.0024		0.0415		-0.0643	
	(0.0013)		(0.0013)		(0.0416)		(0.0419)	
%Pop. Inform.	-0.0006		8.71e-0.5		-0.0392		0.0360	
	(0.0008)		(0.0008)		(0.0308)		(0.0261)	
%FC Particip.		0.0021***		-0.0002		0.0326*		0.0155
		(0.0006)		(0.0007)		(0.0190)		(0.0208)
%OC Particip.		0.0024*		0.0011		0.0799**		-0.0329
		(0.0012)		(0.0014)		(0.0397)		(0.0437)
%Pop. Particip.		-0.0002		0.0005		-0.0229		0.0170
		(0.0009)		(0.0009)		(0.0362)		(0.0293)
SC Rel.Stand. Prof.+	7.88e-05	-5.59e-05	-0.0002	0.0001	-0.0157	-0.0173	-0.0155	-0.0156
	(0.0007)	(0.0006)	(0.0007)	(0.0007)	(0.0265)	(0.0274)	(0.0230)	(0.0225)
SC Rel.Stand. Prof.-	-0.0001	0.0001	0.0003	0.0004	0.0026	0.0095	0.02840	0.0262
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0244)	(0.0258)	(0.0239)	(0.023)
FC Rel.Stand. Prof.+	0.0002	0.0002	0.0009	0.0006	0.0081	0.00290	0.0166	0.0171
	(0.0065)	(0.0006)	(0.0006)	(0.0006)	(0.0232)	(0.0238)	(0.0195)	(0.0191)
FC Rel.Stand. Prof.-	0.0001	0.0002	-0.0004	-0.0003	-0.0191	-0.0208	-0.0373	-0.0359
	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0254)	(0.0269)	(0.0244)	(0.0240)
FC Rel.Stand. Wealth+	-0.0014	0.0002	-0.0015	-0.0017	0.3440	0.4020	0.1260	0.1150
	(0.0190)	(0.0184)	(0.0181)	(0.0178)	(0.617)	(0.6450)	(0.5600)	(0.5470)
FC Rel.Stand. Edu.+	0.0054	0.0062	0.0095	0.0096	0.7610	0.7790	0.9310*	0.9100*
	(0.0187)	(0.0183)	(0.0179)	(0.0177)	(0.6450)	(0.6740)	(0.5620)	(0.5480)
Expec. R	0.0021**	0.0021**	0.0020**	0.0020**	0.1070***	0.1100***	0.0820**	0.0800***
	(0.0009)	(0.0009)	(0.0010)	(0.0009)	(0.0351)	(0.0366)	(0.0325)	(0.0318)
Risk aversion	-0.0042**	-0.0040**	-0.0038**	-0.0038**	-0.1120*	-0.1120*	-0.0957*	-0.0973*
	(0.0018)	(0.0018)	(0.0017)	(0.0017)	(0.0607)	(0.0630)	(0.0536)	(0.0523)
Socio-demographic characteristics:[a]	yes	yes	yes	yes	yes	yes	yes	yes
Socio-economic characteristics:[b]	yes	yes	yes	yes	yes	yes	yes	yes
NR, DK, IC indicators:[c]	yes	yes	yes	yes	yes	yes	yes	yes
Observations	2,525	2,525	2,506	2,506	2,294	2,294	2,277	2,277
Log-likelihood	-1190	-1192	-1145	-1146	-3618	-3615	-3395	-3396
LR χ^2	445.1	446.0	430.5	426.9	408.9	413.3	349.1	445.7
Pseudo R^2	0.1770	0.1750	0.1580	0.1570	0.0535	0.0541	0.0489	0.0484

Notes: Marginal effects from probits of stock market participation (cols. 1-4) and tobits of share of financial wealth invested in the stock market (direct or indirect), conditional on investing (cols. 5-8), on share of FC and OC circles informed about or participating in the stock market. ([a]) Age, gender, marital status and children at home. ([b]) Education (college or more), region of residence, employment status, total wealth, income and savings distribution quartiles and borrowing/liquidity constrained status. ([c]) The set of Non-response (NR), Does-not-Know (DK) and Inconsistent (IC) categories is as specified in Table 7. Reference categories are as in Table 2a. Robust standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged TNS2014 and TNS2015 waves.

TABLE 4: Bivariate probits

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
VARIABLES	Pr(FC >0)	Pr(Stocks >0)	Pr(FC >0)	Pr(Stocks >0)	Pr(FC >0)	Pr(Stocks >0)	Pr(FC >0)	Pr(Stocks >0)
%FC Inform.		0.0026***				0.0025***		
		(0.0006)				(0.0005)		
%OC Inform.		0.0003						
		(0.0013)						
%SC Inform.	0.0034**		0.0033**		0.0034**		0.0033**	
	(0.0015)		(0.0014)		(0.0015)		(0.0014)	
%Pop. Inform.	-0.0014	-0.0004	-0.0014		-0.0014	-0.0004	-0.0014	
	(0.0011)	(0.0008)	(0.0011)		(0.0011)	(0.0008)	(0.0011)	
%FC Particip.				0.0022***				0.0027***
				(0.0006)				(0.0006)
%OC Particip.				0.0026**				
				(0.0012)				
%SC Particip.	-0.0007		-0.0006		-0.0007		-0.0007	
	(0.0015)		(0.0014)		(0.0015)		(0.0015)	
%Pop. Particip.	-0.0001		-0.0001	-0.0002	-0.0001		-0.0001	0.0001
	(0.0013)		(0.0012)	(0.0009)	(0.0013)		(0.0012)	(0.0009)
SC Rel.Stand. Prof.+	0.0001	-0.0003	0.0001	-0.0004	0.0001	-0.0004	0.0001	-0.0004
	(0.0006)	(0.0007)	(0.0006)	(0.0007)	(0.0006)	(0.0007)	(0.0006)	(0.0007)
SC Rel.Stand. Prof.-	0.0006	-0.0002	0.0006	9.29e-05	0.0006	-0.0002	0.0006	-6.11e-05
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
FC Rel.Stand.vars. inc.:[a]	no	yes	no	yes	no	yes	no	yes
Expec.R	0.0003	0.0024**	0.0003	0.0023**	0.0003	0.0025**	0.0003	0.0024**
	(0.0011)	(0.0012)	(0.0010)	(0.0011)	(0.0011)	(0.0012)	(0.0011)	(0.0012)
Risk Aversion	-0.0042*	-0.0041*	-0.0042*	-0.0039*	-0.0042*	-0.0043*	-0.0042*	-0.0040*
	(0.0024)	(0.0023)	(0.0023)	(0.0022)	(0.0024)	(0.0023)	(0.0024)	(0.0023)
Socio-demogr. inc.:[b]	yes	yes	yes	yes	yes	yes	yes	yes
Socio-econ. inc.:[c]	yes	yes	yes	yes	yes	yes	yes	yes
NR/DK/IC cat. inc.:[d]	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1,684		1,684		1,684		1,684	
Log-likelihood	-1789		-1790		-1791		-1793	
LR χ^2 (p-value)	637.6 (0)		640.6 (0)		629.2 (0)		622.8 (0)	
ϕ	0.0346		0.0415		0.0422		0.0440	
Wald χ^2, H_0:ϕ=0 (p-value)	0.420 (0.517)		0.612 (0.434)		0.633 (0.426)		0.694 (0.405)	

Notes: Marginal effects from bivariate probits of (i) formation of financial circle (columns labeled a). and (ii) stock market participation (columns labeled b). ([a]) FC Rel. Stand. +Profes., +Wealth and +Edu. ([b]) Age, gender, marital status and children at home. ([c]) Education (college or more), region of residence, employment status, total wealth, income and savings distribution quartiles and borrowing/liquidity constrained status. ([d]). Reference categories are as in Table 2a. Robust standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged TNS2014 and TNS2015 waves.

TABLE 5: Measurement Error

VARIABLES	(1) Pr(Stocks >0)	(2) %OC Inform. first stage	(3) Pr(Stocks >0)	(4) %OC Particip. first stage	(5) E(%FW >0)	(6) %OC Inform. first stage	(7) E(%FW >0)	(8) %OC Particip. first stage
%FC Inform.	0.0112***	0.188***			0.0701*	0.192***		
	(0.0036)	(0.0099)			(0.0406)	(0.0099)		
%OC Inform.	-0.0103	-			-0.1720	-		
	(0.0150)				(0.1620)			
%FC Particip.			0.0084*	0.216***			0.0621	0.219***
			(0.0050)	(0.0093)			(0.0506)	(0.0097)
%OC Particip.			0.0038	-			-0.0564	-
			(0.0199)				(0.2070)	
SC Rel.Stand. Prof.+	n/s	0.055***	n/s	0.030***	n/s	0.051***	n/s	0.028**
SC Rel.Stand. Prof.-	n/s	-0.046***	n/s	-0.039***	n/s	-0.057***	n/s	-0.047***
FC Rel.Stand.vars. inc.:[a]	yes	yes	yes	yes	yes	yes	yes	yes
Expec.R	0.0072**	-0.0026	0.0073**	0.0019	0.106***	-0.0031	0.109***	0.0033
	(0.0031)	(0.0144)	(0.0031)	(0.0134)	(0.0357)	(0.0154)	(0.0364)	(0.0150)
Risk Aversion	-0.0142**	0.0076	-0.0138**	0.0146	-0.1140*	-0.0059	-0.1100*	0.0072
	(0.0063)	(0.0287)	(0.0062)	(0.0277)	(0.0607)	(0.0297)	(0.0626)	(0.0290)
%Pop. Inform.	-	0.187***		-	-	0.184***		-
		(0.01270)				(0.0133)		
%Pop. Particip.		-	-	0.164***		-	-	0.167***
				(0.0142)				(0.0150)
Socio-demogr. inc.:[b]	yes	yes	yes	yes	yes	yes	yes	yes
Socio-econ. inc.:[c]	yes	yes	yes	yes	yes	yes	yes	yes
NR/DK/IC cat. inc.:[d]	yes	yes	yes	yes	yes	yes	yes	yes
Observations	2,525		2,525		2,294		2,294	
Log-likelihood	-9402		-9317		-11097		-11036	
LR χ^2 (p-value)	459.3 (0)		440.3 (0)		572.6 (0)		587.6 (0)	
First stage F-stat (p-value); R^2	54.31 (0); 0.55		45.65 (0); 0.51		49.65 (0); 0.55		41.99 (0); 0.51	
Wald test $\chi^2(1)$ (p-value)	0.468 (0.494)		0.0512 (0.821)		1.599 (0.206)		0.388 (0.533)	

Notes: The table reports marginal and conditional marginal effects for the probability of stock market participation and the share of financial wealth invested in the stock market conditional on participating instrumented for potentially endogenous outer circle information or behaviour stemming from measurement error (odd numbered columns), as well as the corresponding results of first stage regressions (even numbered columns) of the outer circle information and behaviour instrumented by population information and behaviour respectively. The last line reports Wald exogeneity tests (and associated p-values) under the null of no-endogeneity, when the models are estimated jointly by ML. The second last line reports the first stage Fisher statistics (and associated p-values) under the null of no relevance, as well as the goodness of fit of the first stage regressions. ([a]) FC Rel. Stand. +Profes., +Wealth and +Edu. ([b]) Age, gender, marital status and children at home. ([c]) Education (college or more), region of residence, employment status, total wealth, income and savings distribution quartiles and borrowing/liquidity constrained status. ([d]). Reference categories are as in Table 2a. Robust standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged TNS2014 and TNS2015 waves.

TABLE 6: Interaction Effects on Stockholding

VARIABLES	(1) Pr(Stocks >0)	(2) Pr(Stocks >0)	(3) Pr(Stocks >0) interacted	(4) Pr(Stocks >0) interacted	(5) E(%FW >0)	(6) E(%FW >0)	(7) E(%FW >0) interacted	(8) E(%FW >0) interacted
%FC Inform.	0.0026***		0.0026***		0.0289		0.0304	
	(0.0005)		(0.0005)		(0.0197)		(0,0194)	
%OC Inform.	0.0002		0.0001		0.0409		0.0304	
	(0.00132)		(0.00132)		(0.0419)		(0.0403)	
%Pop. Inform.	-0.0005		-0.0005		-0.0370		-0.0403	
	(0.0008)		(0.0008)		(0.0309)		(0.0309)	
%FC Particip.		0.0021***		0.0021***		0.0325*		0.0334*
		(0.0006)		(0.0006)		(0.0192)		(0.0187)
%OC Particip.		0.0024*		0.0025*		0.0791**		0.0692*
		(0.0012)		(0.0012)		(0.0402)		(0.0398)
%Pop. Particip.		-0.0001		-0.0001		-0.0220		-0.0248
		(0.0009)		(0.0009)		(0.0364)		(0.0365)
SC/FC Rel.Stand.vars. inc.:[a]	yes	yes	yes	yes	yes	yes	yes	yes
Expec. R	0.0020**	0.0019**	0.0034**	0.0028**	0.104***	0.106***	0.184***	0.0931***
	(0.0009)	(0.0009)	(0.0016)	(0.0013)	(0.0352)	(0.0368)	(0.0509)	(0.0320)
Risk aversion	-0.0041**	-0.0039**	-0.0041**	-0.0039**	-0.1080*	-0.1070*	-0.1060*	-0.0840
	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0600)	(0.0634)	(0.0598)	(0.0529)
Socio-demogr. inc.:[b]	yes	yes	yes	yes	yes	yes	yes	yes
Socio-econ. inc.:[c]	yes	yes	yes	yes	yes	yes	yes	yes
NR/DK/IC cat. inc.:[d]	yes	yes	yes	yes	yes	yes	yes	yes
Observations	2,525	2,525	2,525	2,525	2,294	2,294	2,294	2,294
Log-likelihood	-1192	-1194	-1191	-1193	-3623	-3620	-3620	-3619
LR χ^2	445.0	434.6	445.6	437.2	398.7	403.3	403.4	406.1
Pseudo R^2	0.1750	0.1740	0.1760	0.1750	0.0521	0.0528	0.0528	0.0531

Notes: The table reports marginal and conditional marginal effects for the probability of stock market participation (columns 1-4) and the share of financial wealth invested in the stock market conditional on participating (columns 5-8) when inner and outer circle peer information are interacted with subjective expectations of returns (columns 3-4 and 7-8 respectively). Results under columns 1-2 and 5-6 report for ease of comparison the results under the same columns in Table 2, when no interactions are allowed. ([a]) SC/FC Rel. Stand. +Profes., +Wealth and +Edu. ([b]) Age, gender, marital status and children at home. ([c]) Education (college or more), region of residence, employment status, total wealth, income and savings distribution quartiles and borrowing/liquidity constrained status. ([d]). Reference categories are as in Table 2a. Robust standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively. Source: merged TNS2014 and TNS2015 waves.

TABLE 7: Summary statistics

	Patrimoine INSEE 2014-15	TNS 2014 & 2015 merged				
VARIABLES	Mean	Mean	St.Dev.	Min.	Max.	Observations
Pr(Stocks >0)	0.129	0.217	0.412	0	1	3,606
%FW	15	21.4 (5.324)	22.46 (14.53)	1 (0)	100	719 (2,891)
N in Social Circle	n/a	52.56	77.01	0	999	2,334
N in Financial Circle	n/a	3.160	6.746	0	100	2,243
% SC Particip.	n/a	10.74	15.72	0	90	809
% SC Informed	n/a	12.57	15.82	0	80	871
% FC Particip.	n/a	18.93	28.25	0	100	674
% FC Informed	n/a	20.50	27.59	0	100	740
% OC Particip.	n/a	13.43	17.21	0	100	526
% OC Informed	n/a	11.56	17.65	0	90.05	472
% Population Particip.	n/a	19.39	14.53	0	90	1,112
% Population Informed	n/a	22.88	16.69	0	100	1,171
SC Rel. Stand. Prof. +	n/a	29.34	27.02	0	100	734
SC Rel. Stand. Prof. -	n/a	23.76	23.24	0	100	734
FC Rel. Stand. Prof. +	n/a	36.88	35.03	0	100	518
FC Rel. Stand. Prof. -	n/a	18.73	25.61	0	100	518
FC Rel. Stand. Wealth +	n/a	1.775	0.653	1	3	2,261
FC Rel. Stand. Edu. +	n/a	1.916	0.663	1	3	2,275
Expec. R	n/a	1.62	8.944	-62.5	62.5	2,535
St. dev. Expec. R	n/a	6.699	7.082	0	38.7	2,535
D(StDev.ER=0)	n/a	0.343	0.475	0	1	2,743
Perc. R	n/a	3.607	12.04	-37.5	37.5	2,328
St. dev. Perc. R.	n/a	6.649	7.171	0	31.15	2,328
Risk aversion	n/a	34.90	11.76	0	40	3,670
Borrowing & Liq.Constr.	n/a	0.0292	0.168	0	1	3,670
Age <35	0.177	0.170	0.376	0	1	3,670
35 <Age <50	0.264	0.244	0.429	0	1	3,670
50 <Age <65	0.276	0.275	0.446	0	1	3,670
Age >65	0.283	0.311	0.463	0	1	3,670
Male	0.604	0.464	0.499	0	1	3,670
Married	0.732	0.602	0.490	0	1	3,670
Children at Home >0	0.372	0.241	0.428	0	1	3,670
College or more	0.363	0.376	0.484	0	1	3,670

TABLE 7: Summary statistics (*continued*)

	Patrimoine INSEE 2014-15	TNS 2014 & 2015 merged				
VARIABLES	Mean	Mean	St.Dev.	Min.	Max.	Observations
(continues from previous page)						
reg1	0.175	0.168	0.374	0	1	3,670
reg2	0.060	0.0635	0.244	0	1	3,670
reg3	0.083	0.0817	0.274	0	1	3,670
reg4	+	0.0826	0.275	0	1	3,670
reg5	0.166	0.0959	0.295	0	1	3,670
reg6	0.135	0.142	0.349	0	1	3,670
reg7	0.111	0.115	0.319	0	1	3,670
reg8	0.122	0.123	0.328	0	1	3,670
reg9	0.122	0.128	0.334	0	1	3,670
Employed	0.545	0.518	0.500	0	1	3,670
Self-employed	0.053	0.0349	0.183	0	1	3,670
Retired	0.359	0.311	0.463	0	1	3,670
Assets <74999	0.376	0.275	0.447	0	1	3,087
75000 <Assets <224999	0.242	0.319	0.466	0	1	3,087
224500 <Assets <449999	0.231	0.279	0.448	0	1	3,087
450000 <Assets	0.150	0.127	0.333	0	1	3,087
Income <11999	0.395	0.305	0.460	0	1	3,590
12000 <Income <19999	0.195	0.279	0.449	0	1	3,590
20000 <Income <29999	0.201	0.274	0.446	0	1	3,590
Income >30000	0.209	0.142	0.349	0	1	3,590
Saving=0	n/a	0.324	0.468	0	1	3,519
0 <Saving <999	n/a	0.293	0.455	0	1	3,519
1000 <Saving <4999	n/a	0.280	0.449	0	1	3,519
Saving >5000	n/a	0.103	0.305	0	1	3,519
NR(Assets)	n/a	0.159	0.366	0	1	3,670
NR(Income)	n/a	0.022	0.146	0	1	3,670
NR(Saving)	n/a	0.041	0.199	0	1	3,670
NR(SC Rel. Stand. Prof.)	n/a	0.332	0.471	0	1	3,670
DK(SC Rel. Stand. Prof.)	n/a	0.469	0.499	0	1	3,670
NR(FC Rel. Stand. Prof.)	n/a	0.352	0.478	0	1	3,670
DK(FC Rel. Stand. Prof.)	n/a	0.507	0.500	0	1	3,670
NR(FC Rel. Stand. Wealth)	n/a	0.384	0.486	0	1	3,670
NR(FC Rel. Stand. Edu.)	n/a	0.380	0.485	0	1	3,670

Source: 2014 INSEE 'Patrimoine' survey and authors' calculations on merged TNS 2014 & 2015 data set.

APPENDICES, FOR ONLINE PUBLICATION

A. Noisy Rational Expectations Equilibrium

We conjecture that the risky asset price has the form

$$p = \pi_0 + \sum_{j=1}^{n} \pi_j x_j - \gamma Z_n, \tag{23}$$

and imposing market clearing we have that $\sum_i D_i^* = Z_n$. Let $r_{ij} = g_{ij} / \sum_{k=1}^{n} g_{ik}$ be the intensity of the link between nodes i and j, which defines the intensity matrix $R = [r_{ij}]$. Then, we can define $\mathbf{S} \equiv Cov(R\boldsymbol{\epsilon}) = R\Sigma R^T$,so that $R = K^{-1}G = K^{-1}A\Sigma^{-1}$,where K is a diagonal matrix with diagonal elements the sums of the rows of G, i.e. the strengths of the nodes, $K = diag[k_1, \ldots, k_n]$, and therefore $\mathbf{S} \equiv K^{-1}WK^{-1}$, where the matrix W is defined by $W = G\Sigma G^T = A\Sigma^{-1}A$. We note that because A is symmetric and $a_{ij} \in \{0, 1\}$, it is trivially true that

$$W_{ii} = k_i = \sum_{j=1}^{n} a_{ij}/s_j^2.$$

Finally we make the following assumptions:

A1. $\|W\|_\infty = o(n)$, i.e.

$$\lim_{n\to\infty} \frac{\|W\|_\infty}{n} = 0 \tag{24}$$

A2. $\lim_{n\to\infty} \frac{1}{n} \sum_{i=1}^{n} \frac{k_i}{\rho_i} = \beta + o(1)$. This is slightly modified version of the assumption made by Ozsoylev and Walden (2011). It is written in terms of k_i, i.e. the strength of links, *weighted by the risk aversions*, but has the same interpretation as in Ozsoylev and Walden (2011), i.e. that the average strength of nodes weighted by risk aversion (average risk-adjusted connectedness) is β, and is finite.

A3. The risk aversion coefficients come from a distribution such that the harmonic mean is finite as $n \to \infty$, i.e.

$$\lim_{n\to\infty} \frac{n}{\sum_{i=1}^{n} \frac{1}{\rho_i}} = \hat{\rho} < \infty.$$

A4. The limit

$$\lim_{n\to\infty} k_i = k_i^* < \infty$$

exists and is finite. The interpretation of this assumption is that no investor can be a node with very large strength as the network becomes larger. In other words, no agent can have too many connections that have very precise signals. This excludes scenarios of an informationally superior elite in the network.

Under these assumptions can extend Ozsoylev and Walden's results to the following:

Theorem 1. *Under Assumptions A1-A4, with probability 1, the equilibrium asset price converges to*

$$p = \pi_0^* + \pi^* \bar{X} - \gamma^* \bar{Z}$$

where

$$\begin{aligned} A = & \quad \frac{\beta}{\hat{\rho}\Delta^2} \\ \pi_0^* = & \quad \gamma^* \begin{pmatrix} \bar{X}\Delta^2 + \bar{Z}\beta\sigma^2 \\ \sigma^2\hat{\rho}\Delta^2 + \sigma^2\beta \end{pmatrix} \\ \gamma^* = & \quad \frac{\sigma^2\hat{\rho}\Delta^2 + \beta\sigma^2}{\beta\sigma^2\hat{\rho}\Delta^2 + \Delta^2 + \beta^2\sigma^2} \\ \pi^* = & \quad \gamma^*\beta \end{aligned}$$

and the optimal demand for the risky asset for an investor i is

$$D_i^* \equiv D_i^*(x_i, p) = \frac{\hat{\rho}}{\rho_i}\left(\frac{\bar{X}\Delta^2 + \bar{Z}\beta\sigma^2}{\hat{\rho}\sigma^2\Delta^2 + \sigma^2\beta}\right) - \frac{\hat{\rho}}{\rho_i}\left(\frac{\Delta^2}{\sigma^2(\hat{\rho}\Delta^2 + \beta)}\right)p + \frac{k_i^*}{\rho_i}(x_i - p)$$

The proof follows the same steps as in Ozsoylev and Walden with some suitable modifications. The strategy of the proof is to follow the 'guess-and-verify' approach, and the main steps are:

1. Conjecture a functional (linear) form for the price, with unknown coefficients.
2. Derive beliefs for the agents as a function of the price coefficients (using Bayesian updating).
3. Derive the optimal demands for the agents given their endogenous beliefs.
4. Impose market clearing and solve for the stock price.
5. Impose rational expectations (i.e. equalize coefficients) and confirm that the corresponding system of equation generates a solution, which will then provide solutions for the price coefficients.
6. Check, with asymptotic arguments that conditions required to ensure that the coefficients exist (i.e. the system has solution) as $n \to \infty$, are satisfied given the assumptions A1-A4.

The detailed steps of the proof are available in the Online Appendix.

B. Econometric Specification

We derive a first order approximation of expression (8) around $k_i^* = 0$. Rewriting expression (8) as (10), and rearranging, we obtain:

$$E(X|\mathcal{I}_i) = [1 - \psi(k_i^*)]\overline{X} + \psi(k_i^*)x_i \equiv f(k_i^*)$$

Then its approximation to the first order around $k_i^* = 0$ is $f(k_i^*) \approx f(0) + f'(0)(k_i^* - 0)$, or:

$$\begin{aligned} E(X|\mathcal{I}_i) &\approx [1 - \psi(0)]\overline{X} + \psi(0)x_i + [\psi'(0)x_i - \psi'(0)\overline{X}]k_i^* \\ &= \overline{X} - \sigma^2\left(x_i + \overline{X}\right)k_i^* \\ &= \iota_0 + \iota_{1i}k_i^* \end{aligned}$$

where $\psi(k_i^*) \equiv k_i^*\left(\frac{1}{\sigma^2} + k_i^* + \frac{\beta^2}{\Delta^2}\right)^{-1}$ and hence, $\psi(0) = 0$,$\psi'(k_i^*) \equiv \left(\frac{1}{\sigma^2} + \frac{\beta^2}{\Delta^2}\right)\left(\frac{1}{\sigma^2} + k_i^* + \frac{\beta^2}{\Delta^2}\right)^{-2}$, and $\psi'(0) = \sigma^2$ since $\beta(k_i^* = 0) = 0$. Therefore, $\iota_0 \equiv \overline{X}$ and $\iota_{1i} \equiv -\sigma^2\left(x_i + \overline{X}\right)$ are constants. Recalling that $E(X|\mathcal{I}_i) \equiv$ *Expec.* R_i, we obtain:

$$\textit{Expec. } R_i \approx \iota_0 + \iota_{1i}k_i^*$$

and therefore

$$R_{t+1} - \textit{Expec. } R_i = \kappa_0 + \kappa_1 k_i^*$$

where $\kappa_0 \equiv R_{t+1} - \iota_0$ and $\kappa_1 \equiv -\iota_{1i}$, the latter capturing the reduction in the forecast error that more/better connected individuals achieve, *relative to* unconnected individuals, for whom $k_i^* = 0$. Adding the additional covariates, $\boldsymbol{\tau}_i$, and appending an error e_i term to the above expression, yields expression (14).

C. Definitions of Variables

Table 7 reports summary sample statistics for all the variables we have used for the analysis, and compares them to similar measures (when available) in the 2014-2015 *Patrimoine* INSEE Survey, collected by the French National Institute of Statistics (INSEE). This is a French Household Wealth Survey, which targets around 20,000 households randomly selected through a process that ensures representativeness of social categories at the national level. Respondents are interviewed face-to-face, and are asked to report households' real-estate, financial and professional assets and liabilities in France. It oversamples the rich (just as most national wealth surveys do, like the US PSID or the Italian SHIW), and has been fielded in 1986, 1991-1992 (*Actifs financiers*), 1997-1998, 2003-2004, 2009-2010 and 2014-2015 (*Patrimoine*) without a longitudinal dimension. Since 2017, and in partnership with the Banque de France, it inputs the French part of the Household Finance and Consumption Survey (HFCS), a harmonized system of wealth surveys supervised by the European Central Bank (ECB). From 2014, the French Household Wealth Survey takes place every three years, and contains a subsample with a longitudinal dimension. The new panel establishes, complementary to the face-to-face surveys, a short self-administered follow-up survey (internet/paper) between waves to reduce attrition. In addition to describing the distribution of assets and liabilities and their evolution, the surveys also contain comprehensive information on factors accounting for wealth accumulation: family and professional biography, inheritances and gifts, income and financial situation.

C.1. Expec. R. and Perc. R.: Subjective Mean Expectations and Mean Perceptions of Stock Market Returns. To measure expectations, we elicited probabilistically respondents' beliefs about the cumulative stock market (CAC-40 index) return over a five-year horizon, P_{t+5}, relative to December 2014, P_t, from the following question (translated wording):

C39: 'In five years from now, do you think that the stock market... ' (For each category write down how likely the occurrence is by assigning a value between 0 and 100. The sum of all your answers must be equal to 100):

... will have increased by more than 25%

... will have increased by 10 to 25%

... will have increased by less than 10%

... will be the same

... will have decreased by less than 10%

... will have decreased by 10 to 25%

... will have decreased by more than 25%

Question C39 inquires respondent i about the subjective relative likelihood of occurrence, $p^i_{t+1,k}$, of each of the seven alternative scenarios, $k = 1, \ldots, 7$. Each scenario represents a possible outcome range for the index percentage change between t and $t+5$, $R_{t+1}(5) \equiv \frac{P_{t+5}}{P_t} - 1$.[42] Questions C40 and C41 provide subjective upper

[42] We follow the standard convention in finance for long-horizon returns, and let $1 + R_{t+1}(s)$ denote the stock market index gross return over s *periods ahead* (hence the subindex $t+1$), which is equal to the product of the s single-period (or yearly) returns:

$$1 + R_{t+1}(s) = \prod_{f=0}^{s-1} (1 + R_{t+1+f}) = \prod_{f=0}^{s-1} \left(\frac{I_{t+1+f}}{I_{t+f}} \right)$$

Similarly, we let $1 + R_t(s)$ denote the stock market index gross return *over the most recent* s periods from date $t - s$ to date t (hence the subindex t):

$$1 + R_t(s) = \prod_{b=0}^{s-1} (1 + R_{t-b}) = \prod_{b=0}^{s-1} \left(\frac{I_{t-b}}{I_{t-1-b}} \right)$$

See Campbell et al. (1997) for details.

and lower bounds for the percentage change, $R^i_{\max}$ and $R^i_{\min}$ respectively. The corresponding outcome ranges are:

$$R_{t+1}\in\left\{\underbrace{[-R^i_{\min},-25)}_{k=1},\underbrace{[-25,-10]}_{k=2},\underbrace{(-10,0)}_{k=3},\underbrace{\{0\}}_{k=4},\underbrace{(0,10)}_{k=5},\underbrace{[10,25]}_{k=6},\underbrace{(25,R^i_{\max}]}_{k=7}\right\}$$

and respondents' subjective likelihoods are accordingly:

$$p^i_{t+1,k}\equiv\Pr{}^i\left(R_{t+1}\in k\right)=\Pr{}^i\left(\frac{P_{t+5}}{P_t}-1\in k\right),\forall i$$

and zero elsewhere, i.e. $R_{t+1}\in(-\infty,-R^i_{\min})\cup(R^i_{\max},+\infty)$. Table 5 reports summary sample statistics for respondents' answers regarding expectations about stock market returns, imposing a uniform distribution within the different outcome ranges. On average, households appear more pessimistic and uncertain than the historical record would predict.

To quantitatively assess how factually informed respondents are, we elicit probabilistically respondents' perceptions about the most recent cumulative stock market return (CAC-40 index) over the three years, P_{t-3}, immediately prior to fielding the survey (December 2014), P_t, as follows (translated wording):

C42: 'Over the last three years, do you think that the stock market... (For each category write down how likely the occurrence is by assigning a value between 0 and 100. The sum of all your answers must be equal to 100):

... has increased by more than 25%

... has increased by 10 to 25%

... has increased by less than 10%

... has remained the same

... has decreased by less than 10%

... has decreased by 10 to 25%

... has decreased by more than 25%

Similarly to Question C39, Question C42 asks household i about the subjective relative likelihood of occurrence, $p^i_{t,k}$, of each of the seven alternative scenarios, $k=1,\ldots,7$. Each scenario represents a possible outcome range for the percentage change in the index between $t-3$ and t, $R_t(3)\equiv\frac{P_t}{P_{t-3}}-1$. Probabilistic elicitation of realized outcomes thus enables us to measure how uncertain they are when conveying their answers. Since ranges $k=1$ and $k=7$ are unbounded, we set $(R_{\max},R_{\min})$ to match observed values. The outcome ranges for R_t are identical to those of question C39. Accordingly, households' subjective likelihoods are given by:

$$p^i_{t,k}\equiv\Pr{}^i\left(R_t\in k\right)=\Pr{}^i\left(\frac{P_t}{P_{t-3}}-1\in k\right),\forall i$$

Three years prior to the time when the survey was conducted (December 2011), the stock market index was only slightly above the floors reached after the dot-com and Lehman Brothers busts. But, between late December 2011 (CAC 40 = 3159.81) and late December 2014 (CAC 40 = 4252.29), the index had increased an overall 34.57%. Figure 1 in the main text shows the time window chosen within the wanderings of the CAC-40 index between 1990 and 2016. Table 5 reports summary sample statistics for respondents' answers regarding perceptions and beliefs about stock market returns, imposing a uniform distribution within the different outcome ranges. A striking finding is that households are on average also pessimistic regarding the most recently realized three-year cumulative stock market return (Dec. 2011-Dec. 2014). Although this might

be due to imperfect memory given the unusually long horizon, it might also be related to the 2007 Lehman Brothers' bust being overweighted on respondents' memory (Hurd et al., 2011), even if outside the question's time window. The big spread around the realized three-year cumulative stock market perceived return came as no surprise, and it captures factual ambiguity. In addition, it is remarkable that it remains smaller than the spread around the expected five-year ahead cumulative stock market return.

Figures B1a and B1b below report the histograms of respondents' answers to the subjective expectations and perceptions questions, C39 and C42 respectively, for both the mean (left panel) and the standard deviation of mean responses (right panel). Figure B1a (right panel) conveys that around 34% of respondents reported a zero standard deviation of subjective mean expected returns for the five-year ahead stock market cumulative return, in clear dissonance with available historical evidence. This misperception of stock market risk motivates the definition of a categorical variable 'Certain Expec. R.', which takes value 1 if the respondent reports a zero standard deviation of mean expected returns, and takes value 0 otherwise.

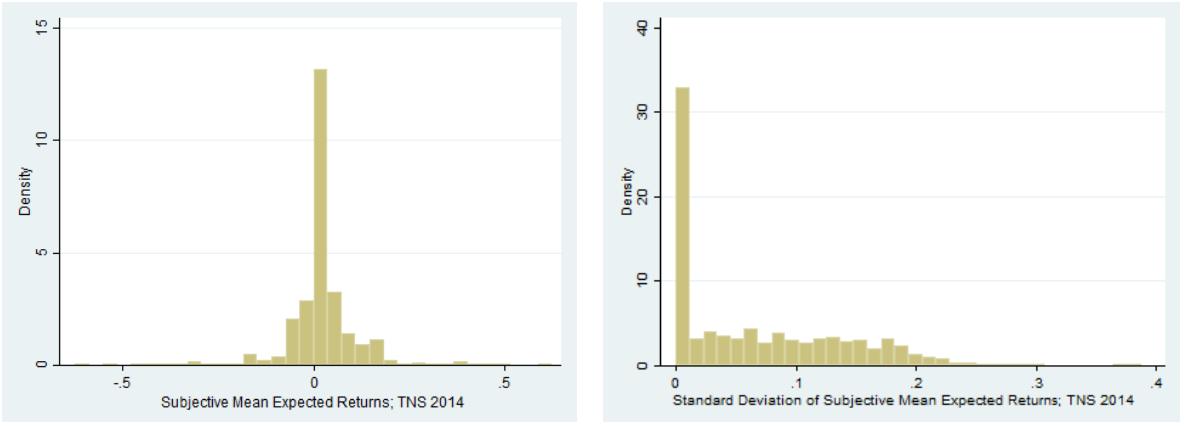

Figure B1a: Histograms of the subjective mean (left panel) expected five-year ahead cumulative return, and its standard deviation (right panel); TNS2014.

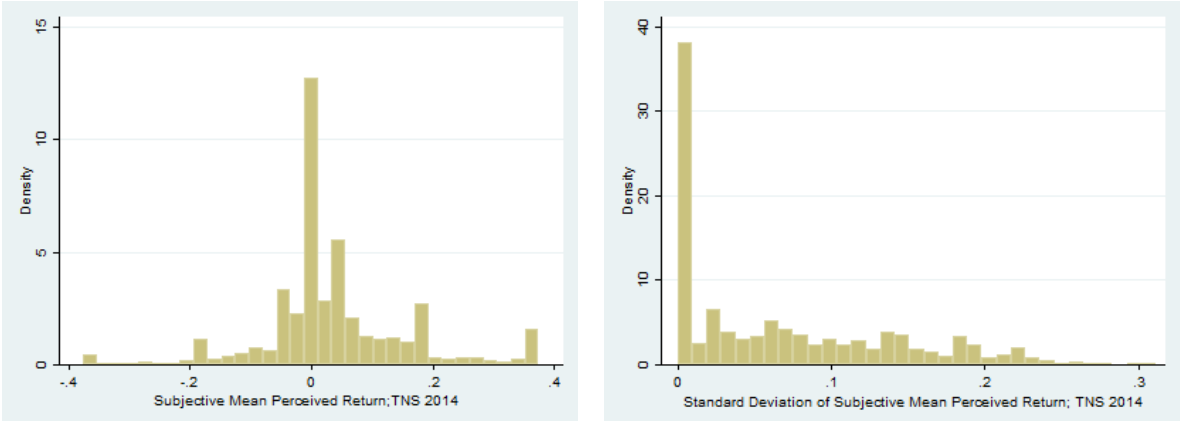

Figure B1b: Histograms of the subjective mean (left panel) perceived three-year cumulative realized return, and its standard deviation (right panel); TNS2014.

Arrondel et al. (2014) report that categorical answers to frequency, variety and access specialized media, advice from professionals, as well as the number of stock market transactions carried over the last year, increase the likelihood of being factually informed. Interestingly, parents' stock ownership status ('cultural transmission'), parents' educational attainment or family background do not increase the odds of being factually informed, and actually significantly decreases them for those who follow family advice. Since those who follow friends' advice are more likely to be informed, they interpret the evidence as being consistent with

social interactions being instrumental in gathering information (as in Hong et al., 2004). On the other hand, a measure of optimism ('being lucky in life') has a negative impact on being informed, indicating that an 'overconfidence bias' is not present once gender is conditioned upon: although males appear better informed, supporting more optimistic forward looking expectations, optimists appear consistently worse informed. On the basis of that finding, they argue that the findings of Bilias, Georgarakos and Haliassos (2010), consistent with inertia in households' portfolios, can be reconciled with Guiso and Jappelli's (2005) findings, consistent with excess trading even amongst the general population. Importantly, they do not find evidence of temporal or risk preferences determining information sets, in line with Van Nieuwerburgh and Veldkamp (2010). In addition, and although total wealth does not increase the odds of being informed, income does, in line with a costly information acquisition interpretation (Peress, 2004). Finally, they report that optimists and low income/income constrained respondents are less likely to be informed, consistent with rational inattention theory (Sims, 2003). Overall, those findings support probabilistically elicited perceptions as a sensible measure of factual information.

C.2. %FW: *Share of financial wealth invested in the stock market.* Respondents report their total financial wealth and the share of their total financial wealth invested in the stock market, in questions C16 and C19 respectively (TNS2014). Question C16 asks respondents to report their total financial wealth (excluding housing and own businesses) within given brackets (see below for further details). The translated wording for question C19 is:

C19: Approximately what percentage of your total financial wealth have you invested in listed or unlisted shares, directly or in unit trusts, in a personal equity plan or a mutual fund (yourself or a member of your household)? If you don't have any, please answer 0%.

We have a total of 2,891 observations for these questions. Out of 3,780 survey respondents, about 76% responded meaningfully. The mean percentage of financial wealth invested in the stock market is 5.32%, and the standard deviation is 14.52%.

C.3. Population, social and financial interactions. These variables are described in detail in section 3. Summary statistics for questions C1, D1, C6, C7 and D16 are presented in Table 5.

C.4. Measures of social relative standing. The survey contains four measures of the respondent's relative standing in terms of social circle and financial circle outcomes:

SC Rel. Stand. Profes.: In the survey (question C5), the respondent is asked about the percentage shares of people in the respondent's social circle that have a professional status above, similar, or below the respondent's, labelled '*SC Rel. Stand. Profes. +*', '*SC Rel. Stand. Profes. =*', or '*SC Rel. Stand. Profes. -*' respectively. Since answers are asked to add up to 100, the reference category is '*SC Rel. Stand. Profes. =*'. About 47% of respondents chose the option to tick the box conveying '*I do not know*', which informs the corresponding '*DK(SC Rel. Stand. Profes.)*' dummy variable in Table 5. Non-respondents account for 33%, and are coded as '*NR(SC Rel. Stand. Profes.)*'.

FC Rel. Stand. Profes.: In the survey (question D6), the respondent is asked about the percentage share of people in the respondent's financial circle that have a professional status above/similar/below the respondent's, labelled '*FC Rel. Stand. Profes. +*', '*FC Rel. Stand. Profes. =*', or '*FC Rel. Stand. Profes. -*' respectively. Since answers are asked to add up to 100, the reference category is '*FC Rel. Stand. Profes. =*'. About 51% of respondents chose the option to tick the box conveying '*I do not know*', which informs the corresponding '*DK(FC Rel. Stand. Profes.)*' dummy variable in Table 5. Non-respondents account for 35%, and are coded as '*NR(FC Rel. Stand. Profes.)*'

FC Rel.Stand. +Wealth: In the survey (question D7), the respondent is asked about her/his relative standing in terms of wealth relative to the average wealth of the respondent's financial circle, and is given three options: 'below the average', 'approximately at the average', or 'above the average'. Responses were coded as ordered categories in increasing order from 1 to 3. About 38% chose not to respond, and are coded as '*NR(FC Rel.Stand. +Wealth)*' in Table 5.

FC Rel.Stand. +Edu.: In the survey (question D8), the respondent is asked about her/his relative standing in terms of educational attainment relative to the average educational attainment of the respondent's financial circle, and is given three options: 'below the average', 'approximately at the average' or 'above the average'. Responses were coded as ordered categories in increasing order from 1 (below) to 3 (above). Around 38% are non-responses, which are coded as 'NR(*FC Rel.Stand. +Edu.)*' in Table 5.

C.5. Demographics and other control Variables.

Endowments.

Total wealth: In the survey (question C29), the respondent is asked which of the ten predefined available brackets corresponds to the household's non-human wealth, including housing, estates and professional assets (without excluding debt):[43] 'Less than 8,000', 'between 8,000 and 14,999', 'between 15,000 and 39,999', 'between 40,000 and 74,999', 'between 75,000 and 149,999', 'between 150,000 and 224,999', 'between 225,000 and 299,999', 'between 300,000 and 449,999', 'between 450,000 and 749,999' and '750,000 or more'. Total wealth is given in Euros. From the empirical distribution we obtain total wealth quartiles, the bounds of which are given by '74,999', '224,999' and '449,999'. The reference category is the first quartile, 'less than 74,999'.

Total financial wealth: In the survey (question C16), the respondent is asked which of the ten predefined available brackets corresponds to the household's financial wealth (excluding housing, estates and professional assets), including cash and positive balances on checking accounts: 'Less than 500', 'between 1,500 and 2,999', 'between 3,000 and 7,999', 'between 8,000 and 14,999', 'between 15,000 and 29,999', 'between 30,000 and 44,999', 'between 45,000 and 74,999', 'between 75,000 and 149,999', 'between 150,000 and 249,999' and '250,000 or more'. Total financial wealth is given in Euros.

Income: For the income of the household, the survey (question A12) asks the respondent which of the nine predefined available brackets better corresponds to her situation: 'Less than 8,000', 'between 8,000 and 11,999', 'between 12,000 and 15,999', 'between 16,000 and 19,999', 'between 20,000 and 29,999', 'between 30,000 and 39,999', 'between 40,000 and 59,999', '60,000 or more' and 'No income'. Income refers to the respondent's annual income (earnings, pensions, bonuses, etc.) in Euros, net of social contributions but before personal income taxes.[44] In addition, TNS reports also the net gross monthly income of the household, in Euros. From the empirical distribution, we obtain the income quartiles the bounds of which are given by '11,999', '19,999' and '29,999'. The reference category is the first quartile, 'less than 11,999'.

Occupational status: (of the household head) the TNS 2014 survey asks respondents about their occupation, grouped into five categories: 'inactive', 'unemployed', 'employed' which includes 'white-collar' (liberal and managerial employees) and 'blue-collar' workers (employees, clerical and manual workers); 'self-employed' which includes farmers, artisans and shop and business owners, and 'retired'. Finally, we group the first two categories into one, the reference category.

[43] If we were interested in a continuous measure, we would implement the method of simulated residuals (Gourieroux et al. 1987). We would then regress an ordered probit of the respondents' total wealth (bracket) on demographic and socio-economic household characteristics. Once we would have the estimated total wealth, a normally distributed error would be added. We would then check if the value falls inside the bracket originally chosen by the individual. If not, another normal error would be added and so on until we the true interval is correctly predicted. Doing so would allow us to overcome the non-response problem for some households. Would there be a missing value, the predicted value plus a normal error would be directly used.

[44] When the survey took place, income in France was not taxed at the source.

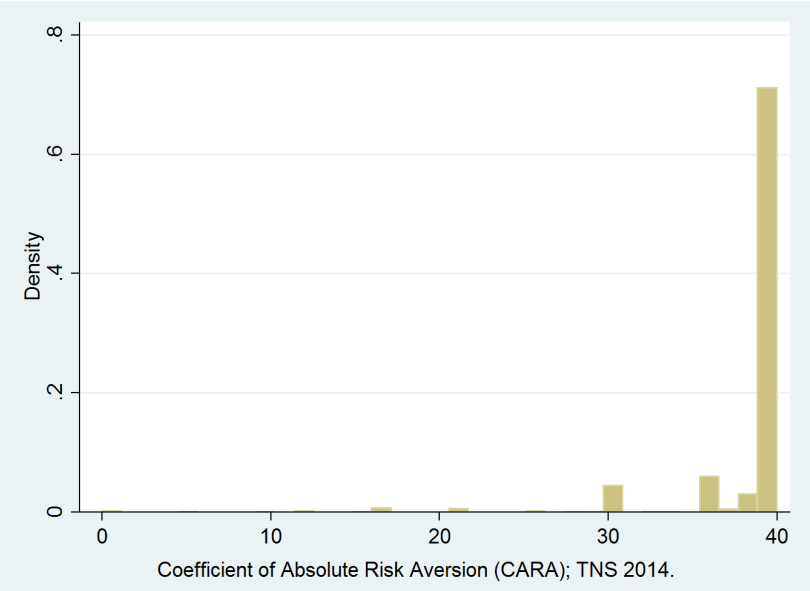

Figure 3: Histogram of responses to the hypothetical lottery that enables elicitation of the respondent's coefficient of absolute risk aversion (CARA) -TNS 2014 survey question C44.

Preferences.

Absolute risk aversion: The following question is asked to the respondent: 'If someone suggests that you make an investment, $\widetilde{S}_i$, whereby you have one chance out of two win 5000 euros and one chance out of two of losing the capital invested, how much (as a maximum) will you invest?' The question aims at eliciting the taste for risk from each respondent i, with preferences $u^i(.)$, from the following equality:

$$u^i(w_i) = \frac{1}{2}u^i(w_i + 5,000) + \frac{1}{2}u^i(w_i - Z_i) \equiv Eu^i(w_i + \widetilde{S}_i)$$

The coefficient of absolute risk aversion can be then obtained from a second order Taylor expansion, as $A_i(w_i) = 2(5000 - Z_i)/(5000^2 + Z_i^2)$, where Z_i is the amount that the respondent declares to be willing to invest. Those who declare $Z_i < 5000$ are risk-averse $Z_i = 5000$, are risk-neutral and $Z_i > 5000$ are risk-lovers. The outcome range for the coefficient of absolute risk aversion $A_i(w_i)$ is $[0, 40]$. A total of 3,335 respondents answered the question, with a mean response of 38.40 and a median value of 39.92. Fig. **??** displays the histogram of responses, which is very skewed to the left but remains within the range responses found in the literature. Further details regarding the measure of absolute risk aversion can be found in Guiso and Paiella's (2008) work.

Demographics.

Age: it is a continuous variable equal to the age of the household head. Respondents' age range is in between 19 and 94. We group respondents into four categories: 'younger than 35', 'between 35 and 49 years old', 'between 50 and 64 years old' or 'older than 65'. Depending on the age bracket within which respondents' age falls, it takes value 1 within it and zero otherwise.

Gender: it is a dummy variable equal to 1 if the household head is a male, and is equal to 0, if a female.

Marital status: Marital status is based on current legal marital status. Respondents who are married or/and living with a partner are coded as 1, and 0 otherwise.

Children at home: it is a dummy variable coded as 1 if the respondent replies that there is (a positive number of) children living at home with their parent(s), and is coded as 0 otherwise.

Constraints.

Liquidity and borrowing constrained: Respondents are asked if they held an outstanding (negative) debt balance, and if not, why. We then constructed a dummy variable that takes value 1 if the respondent answers the question in the categories 'because my debt application was turned down' or 'because I did not submit an application for fear of being turned down', and value 0 otherwise.

Saving: Question C73 in the TNS 2014 survey asks the respondent about total net household saving over the last 12 months. Six brackets are provided, in Euros, of which the first is zero ('we have not saved'). Around 31% of respondents report no savings over the last 12 months. From the empirical distribution, we obtain the saving quartiles the bounds of which are given by '0', '999' and '4,999'. The reference category is the first quartile.

Region of residence is a categorical variable, with nine possible categories representing the respondent's region of residence: 'reg 1' is Paris, 'reg 2' is 'Nord', 'reg 3' is 'Est', 'reg 4' is 'BP Est', 'reg 5' is 'BP Ouest', 'reg 6' is 'Ouest', 'reg 7' is 'Sud Ouest', 'reg 8' is 'Sud Est' and 'reg 9' is 'Mediterranée'.

Information.

Education is a captured by a single categorical variable which takes value 1 if the respondent completed college or a diploma above (BAs, BScs, MScs, MBAs, professional certifications, PhDs and postdoctoral students), and takes value zero otherwise, i.e. High school or less (primary and secondary) and if the respondent failed to complete college education (technical degrees beyond high school but below college, including professional and vocational degrees).

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