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Stock Market Literacy, Trust, and Participation*

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Abstract. This article studies the importance of stock market literacy and trust for stock ownership decisions. We find that these two distinct channels simultaneously explain not only the probability of participation, but, conditional on participation, also explain the share of investment in stocks. Once we account for stock market literacy, sociability is no longer significant for participation; what matters is literacy rather than sociability. Further, we observe that economic shocks and future expectations are key behavioral characteristics that explain a household's decision to invest in stocks. However, upon participation, a larger set of behavioral characteristics explains the level of stock investment.

JEL Classification: A13, D03, D12, G11

1. Introduction

In explaining the stock market nonparticipation puzzle, there is a growing literature that studies the behavioral and psychological factors acting as barriers to stock ownership. Recent papers suggest that household participation in the stock market is driven by factors such as optimism (Puri and Robinson, 2007), trust in financial markets (Guiso, Sapienza, and Zingales, 2008), intelligence quotient (Grinblatt, Keloharju, and Linnainmaa, 2011), genetics (Barnea, Cronqvist, and Siegel, 2010), political orientation (Kaustia and Torstila, 2011), the ability to understand investment (Graham, Harvey, and Huang, 2009; Christelis, Jappelli, and Padula, 2010), stock market return experience (Malmendier and Nagel, 2011), educational attainment and financial sophistication (Christelis, Georgarakos, and Haliassos, 2011), financial literacy (Cardak and Wilkins, 2009; Van Rooij, Lusardi, and Alessie, 2011), cognitive ability (Benjamin, Brown, and Shapiro, 2013), and sociability (Hong, Kubik, and Stein, 2004; Bönte and Filipiak, 2012).

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Recently, Georgarakos and Pasini (2011) assess the joint importance of trust and sociability on stock market participation. They show that trust and sociability affect stock ownership through distinct channels, where mistrust lowers the expected return on investment, making stock market participation unattractive, and sociability serves to reduce the fixed cost of participation through cheaper information sharing. However, Bönte and Filipiak (2012) report that households' investment decisions are not strongly affected by their social interaction once the households are aware of shares, bonds, and mutual funds. They observe that although social interaction may not influence investment in financial instruments directly, word-of-mouth communication affects individuals' awareness of the financial instruments, thereby indirectly affecting investment. Meanwhile, Van Rooij, Lusardi, and Alessie (2011) find that financial literacy plays a key role in understanding the nonparticipation puzzle. They show that households with low financial literacy are significantly less likely to invest in stocks. However, the mechanism through which financial literacy influences stock ownership decisions is unclear.

In this article, we propose a theoretical framework for stock market participation whereby stock market literacy reduces the cost barriers, hence encouraging participation. Moreover, we account for households' level of trust in the stock market, as advocated by Guiso, Sapienza, and Zingales (2008), and jointly consider the distinct role of stock market literacy and trust on households' stock ownership decisions. Moreover, we empirically test whether sociability is capturing the effect of stock market literacy and hence whether it is literacy, rather than sociability, that matters for understanding stock market participation. Georgarakos and Pasini (2011) document that more sociable households reduce their participation costs through cheaper information sharing, thereby increasing participation. We argue that sociability actually proxies for households' stock market literacy, and hence introducing stock market literacy, which is the aggregate product of stock market knowledge and awareness, should capture the effect of sociability on stock market participation. Moreover, we argue that the evidence for the distinct roles of trust and sociability on stock ownership observed by Georgarakos and Pasini (2011) can be explained by the unique and distinct effects of trust and stock market literacy on participation. As in Guiso, Sapienza, and Zingales (2008), we define trust as the firm reliance on the characteristics of the financial system such as sound management, quality of investor protection, effective regulation, and supervision, etc. A household's level of trust in the stock market cannot necessarily be associated with their knowledge about the stock market. Knowing about

the market does not make the market trustworthy. Our empirical findings support these conjectures.

To understand the distinct effects of stock market literacy and trust on participation, we adopt the standard two-asset portfolio model of Tobin (1958). In this theoretical framework, we distinguish households according to their level of stock market literacy. We observe that stock market literate households increase their expected return from participating in the stock market by lowering their cost of participation, identified as the income and substitution effect. Our framework is motivated by recent research showing that financial awareness may lead to reduced pecuniary and nonpecuniary portions of participation cost, thereby encouraging stock market participation (see, e.g., Campbell, 2006; Jappelli and Padula, 2013; and Khorunzhina, 2013). When we consider households' levels of trust in the stock market, the probability of being cheated by participating in the stock market reduces their expected returns, further contributing to the substitution effect. However, households that trust the stock market have a lower threshold level for the proportion of stock market investment below which participation is not worthwhile and hence participate more in the stock market. Thus, the theoretical framework shows how the two distinct channels—stock market literacy and trust—explain stock market participation, where stock market literacy has an income as well as a substitution effect, and trust has a substitution effect on portfolio allocation.

To test the framework empirically, we use data from the American Life Panel (ALP) survey, which consists of over 340 diverse surveys and 6,000 representative samples of US consumers of age 18 years and above. ALP surveys capture a rich set of information that is of scientific and policy interest, such as expectations, opinions, financial participation and circumstances, cognition, and demographics. Hence, it is possible for us to measure stock market literacy, sociability, and trust in the stock market, and also construct proxies for a wide range of household behavioral characteristics.

This article contributes to the existing literature in four major aspects. First, we reassess the previously documented relations between sociability and stock market participation, once households' stock market literacy has been taken into account. Second, we propose a theoretical framework to understand the distinct effects of stock market literacy and trust on stock ownership. The testable implications of the model are supported by the data. In particular, we show that stock market literacy and trust have distinct and significant effects on the probability of participation as well as the proportion of households' wealth invested in stocks. Third, unlike previous studies, which use general financial literacy questions to measure financial knowledge, we construct a Stock-market-specific literacy index that is related to the understanding of the

stock market and measures households' knowledge of investing in stocks directly or indirectly through mutual funds or investment accounts. Thus, we are able to reduce the noise in capturing households' knowledge of the stock market and study its role for stock ownership. Fourth, using the rich set of data on household behavioral characteristics, we additionally examine the importance of various behavioral and psychological factors for stock market participation. In particular, we test the role of economic shock, optimism, time preference, future expectations, self-confidence, sense of commitment, and risk aversion for households' decisions to invest in stocks. Hence, we are also able to distinguish the effects of stock market literacy and trust from other behavioral characteristics. For instance, by modeling both trust and self-confidence in the empirical analysis enables us to separate their distinct effects, although the two characteristics might often be understood synonymously. Previous studies allude to the significant role of behavioral characteristics on stock market participation, but fail to test adequately for these effects due to data constraints. Hence, we fill a noticeable gap in the literature by considering a wide range of behavioral characteristics. It is important to emphasize that the analyses performed simply explain the existence of a relationship between the various household characteristics and stock market participation, and do not give rise to causal inferences.

The empirical results show that stock market literacy remains a key characteristic for stock market participation, even after allowing for sociability, trust, and a large set of behavioral characteristics. Before considering households' stock market literacy, we obtain a significant relationship for sociability, but once stock market literacy is accounted for, we observe that sociability can no longer explain stock market participation. Hence, we find that sociability captures the association between stock market literacy and participation. To further analyze this, in the additional analysis, we investigate the relation between stock market literacy, sociability, and participation by separately analyzing highly sociable households that have low stock market literacy, and low sociability households with high stock market literacy. Interesting results emerge—we find no association between sociability and participation even among highly sociable households that have low stock market literacy. In contrast, we observe that stock market literacy remains highly significant for stock ownership among households with low sociability. This means that households with low sociability invest in stocks if they are stock market literate. Hence, we confirm that what matters is stock market literacy, rather than sociability, for stock market participation.

The other important characteristic that explains the probability of participation is households' level of trust in the stock market. We find that trusting households are more likely to invest in the stock market, and for a given level of

trust, lack of stock market literacy additionally acts as a barrier to stock market participation. For US households, we find that changing stock market literacy by one standard deviation varies the probability of participation by around 11%, while the equivalent change for trust in the stock market is around 17%. Further, we find that demographic characteristics, including age, education and income, and behavioral variables, including economic shock and future expectations, significantly explain the heterogeneity in stock market participation.

When we examine the characteristics that relate to households' share of wealth invested in stocks, we find that stock market literate households invest a larger proportion of their wealth in stocks. In addition, households trusting the stock market hold a higher portfolio investment in risky assets, confirming the finding of Guiso, Sapienza, and Zingales (2008). Sociability remains insignificant and does not play a role in households' portfolio allocation decisions. Further, we observe significant positive associations for age, education, economic shock, future expectations, self-confidence, and time preference, while income negatively explains the proportion of investment in stocks. We see that some behavioral characteristics—self-confidence and time preference—that do not explain the probability of participation are now significant. This shows that there are different behavioral factors that explain a household's decision to participate in the stock market and, conditional on participation, their level of investment.

Our findings, while descriptive and not providing any causal explanations, will be of interest to policy makers in their strategic endeavors to promote stock market participation. For example, since stock market literacy and trust concurrently explain participation, this relation should be taken into account while designing various financial literacy programs for encouraging stock market participation. Also, our results show that social interaction and peer-group effects cannot explain stock ownership decisions per se; what matters is literacy rather than peer effects. Additionally, behavioral characteristics (economic shock, future expectations, self-confidence, and time preference) are shown to explain the heterogeneity observed in stock market participation.

The reminder of the article is organized as follows: Section 2 presents the theoretical model; Section 3 describes our data and variables; Section 4 reports the empirical analysis; Section 5 provides results from the robustness analysis; and Section 6 concludes.

2. The Model

In this section, we propose a theoretical framework to understand the role of stock market literacy and trust in households' decisions to invest in the stock

market. For this purpose, we adopt the standard two-asset portfolio model of Tobin (1958). In this setup, households have the choice of investing in two financial assets: a risky asset, which yields the return r_s, considered here to be a stock with $E[r_s] = \overline{r_s}$ and standard deviation $\sigma_s > 0$, and a risk-free asset, which yields the return r_f (and $r_f < \overline{r_s}$). We assume that the probability distribution of the returns of the risky asset is normal. Therefore, only the expected return and standard deviation are relevant for a household i who chooses the proportion w_i of their initial wealth Y_i to be invested in the risky asset in order to maximize the expected utility:

$$\max_{w_i} \mathrm{EU}\big[r_f Y_i + w_i(r_s - r_f) Y_i\big]. \tag{1}$$

The household participates in the stock market if their expected utility from investing their wealth in the stock market and in the risk-free asset is greater than (or equal to) the utility from investing only in the risk-free asset $U[r_f Y_i]$. Thus, the stock market participation condition is:

$$\mathrm{EU}\big[r_f Y_i + w_i(r_s - r_f) Y_i\big] \geq U[r_f Y_i]. \tag{2}$$

Under the assumption of normality, we adopt the risk-return analysis to explore further the effects of stock market literacy and trust on the households' portfolio choice problem. We use the standard deviation σ as a measure of the riskiness of the portfolio. In this setup, the stock market participation condition is:

$$U[\mathrm{ER}, \sigma] \geq U[r_f Y_i, 0], \tag{3}$$

where ER is the expected return of the portfolio.

In Figure 1, ER is measured on the vertical axis and σ on the horizontal axis. In the (ER, σ) space, we plot the investment opportunity locus for combinations of investment in both the risk-free asset and the stock market expected return, ER_s, and the investment opportunity locus of investing only in the risk-free asset, R_f (when $w_i = 0$). Following Tobin (1958), $\mathrm{ER}_s = r_f Y_i + \frac{(\bar{r_s} - r_f)}{\sigma_s}\sigma$, knowing that $\sigma = w_i Y_i \sigma_s$, and $R_f = r_f Y_i$. Household i has preferences between expected return, ER, and risk, σ, represented by a field of indifference curves, and is indifferent between all pairs (ER, σ) on the indifference curve I plotted in Figure 1. A is the point at which the highest indifference curve is tangent to the investment opportunity locus, giving us the optimum proportion of wealth, w_i^A, to be invested in the stock market in order to maximize the expected return of the portfolio.

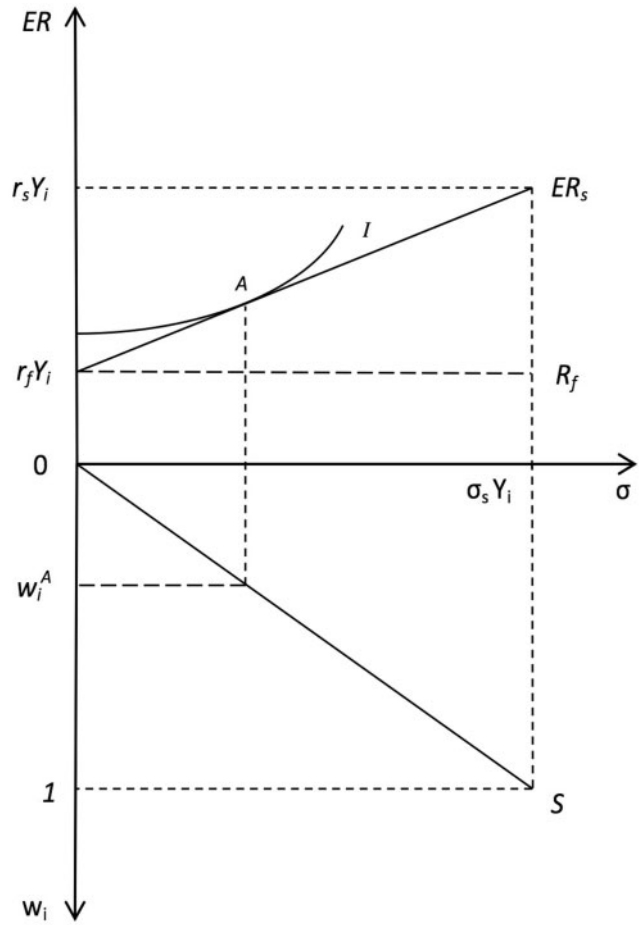

Figure 1. This figure plots a household's investment opportunity loci in the (ER, σ) space for combinations of investment in both the risk-free asset and the stocks, labeled ER_s, and only in the risk-free asset, labeled R_f. The lower part of the figure depicts the optimal proportion of wealth invested in the stock market, w_i^A, on the [0,1] segment.

Further, in this model, we distinguish households according to their level of stock market literacy. Our framework is motivated by several previous studies that document a relation between financial literacy and stock market participation.[1] We propose that stock market literacy increases participation

[1] Campbell (2006) shows that participating households, due to lack of financial literacy, may delegate the decision making to professionals, resulting in higher fees paid and increased participation cost (aware of their limited investment skills, some households

by decreasing the participation cost. We define the cost function q, which reduces the disposable wealth to be invested between the two available assets, as a function of household i's stock market literacy level k_i. Thus, $q : [0, k^{\max}] \rightarrow [0, 1]$, with $q'(k_i) < 0$, and $k^{\max}$ is the maximum level of stock market literacy household i can attain and use for the purpose of stock market participation. $q(k_i)$ is decreasing in stock market literacy. Capturing the effect of stock market literacy, the expected return in the participation condition given by Equation (3) becomes:[2]

$$r_f(Y_i - q(k_i)) + w_i(r_s - r_f)(Y_i - q(k_i)). \tag{4}$$

In Figure 2, in the (ER, σ) space, along with R_f and ER_s, $\mathrm{ER}_s^{q(k_i)}$ plots the new investment opportunity locus for combinations of investment in both the risk-free asset and the stock market when the household i participates in the stock market and faces the cost function, subject to their level of stock market literacy, $q(k_i)$. Here, the expected return in the participation condition can be rewritten as $\mathrm{ER}_s^{q(k_i)} = r_f(Y_i - q(k_i)) + \frac{(\bar{r_s} - r_f)(Y_i - q(k_i))}{\sigma_s}\sigma$, where $\sigma = w_i\sigma_s$. We see that the new investment opportunity locus $\mathrm{ER}_s^{q(k_i)}$ shifts downwards and pivots clockwise relative to that of the baseline model, ER_s, as both its intercept and slope decrease. Further, the marginal expected return to risk-taking is lower in the model with stock market literacy than in the baseline model, as $\frac{\partial \mathrm{ER}_s^{q(k_i)}}{\partial \sigma} < \frac{\partial \mathrm{ER}_s}{\partial \sigma}$. This will cause a reduction in the amount of risk taken by the household through stock market participation, indicating that we have a "substitution effect" between the two available assets. In addition, the household will also encounter an "income effect", as their overall final wealth will be lowered by the cost function.

T^* on the budget constraint depicts the point below which the household is better off investing only in the risk-free asset, while after T^* the household

withhold from investing in risky markets altogether). Further, Khorunzhina (2013), using a dynamic model of stock market participation, argues that participation costs are lower for more educated investors and shows that they further decrease with stock market participation experience. The author finds that financial education and counseling alleviate the burden on consumers' time and effort necessary for making financial decisions and reduce the objective cost of stock market participation. Moreover, Van Rooij, Lusardi, and Alessie (2011) establish a positive link between financial literacy and stock market participation.

[2] This functional form of the expected return is in line with previous studies such as Vissing-Jorgensen (2004), Guiso, Sapienza, and Zingales (2008), and Georgarakos and Pasini (2011).

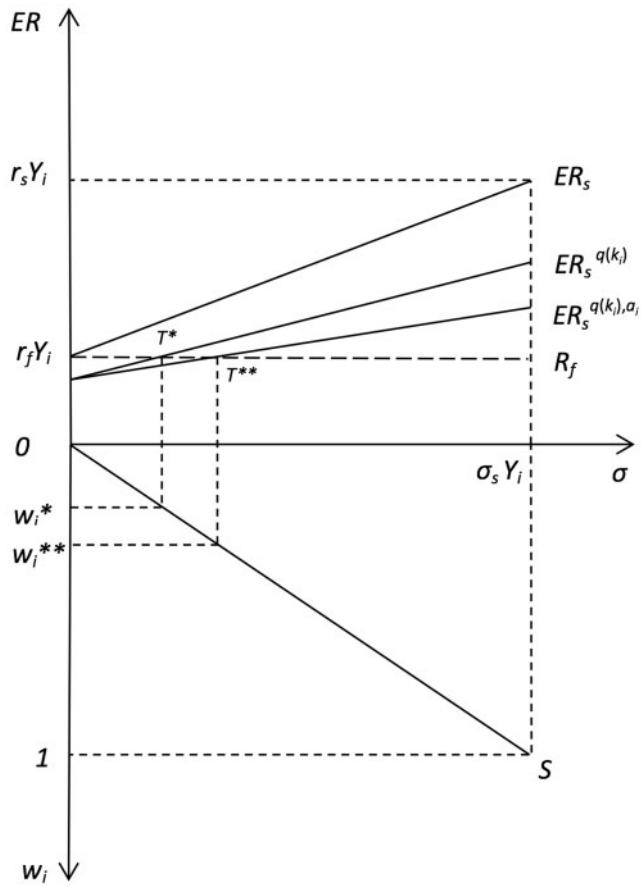

Figure 2. This figure plots a household's investment opportunity loci in the (ER, σ) space for combinations of investment in both the risk-free asset and the stock market in the baseline model (labeled ER_s), in the model with stock market literacy (labeled $ER_s^{q(k_i)}$), and in the model with stock market literacy and lack of trust (labeled $ER_s^{q(k_i),a_i}$). R_f labels the opportunity locus of investing only in the risk-free asset. On the [0,1] segment in the lower part of the figure, w_i^* and w_i^{**} are the minimum threshold proportions of stock investment necessary for stock market participation to occur.

will have a higher expected return from participating in the stock market. The cost function decreases the expected return from participating in the stock market, making investing in the stock market less attractive. The lower part of Figure 2 gives the minimum threshold proportion of investment in the stock market necessary for stock market participation to occur, w_i^* ($w_i^* > 0$) in this model.

Another technology we introduce in this model is the households' level of trust. Recent literature points out that less trusting households are less likely

to participate in the stock market.[3] Therefore, we incorporate the effects of trust in our model along stock market literacy, building a more realistic framework.[4] Here, independent of the probability distribution of the risky asset returns, we allow for the probability that a household's investment (in terms of both initial investment and returns) vanishes due to nonmarket sources of risk. Suppose $a_i \in [0, 1]$ is household i's assessed probability of being cheated by the managers, intermediaries or the firm itself, and hence losing a proportion of their wealth invested in stocks. This probability measures the degree of the household's mistrust and serves as a discount factor applied by the household to their return from investing in the stock market.[5] Hence, household i's expected return on the risky asset is now dependent not only on the risk aversion incorporated in their utility function but also on their trust (or subjective probability of being cheated) in the stock market, a_i, where $r_s : [0, 1] \rightarrow [0, r_s^{\text{full}}]$, $r_s'(a_i) < 0$ and r_s^{full} is the highest return attained for the highest level of trust in the stock market. In the model with stock market literacy and trust, the expected return in the participation condition in Equation (3) is now:

$$r_f(Y_i - q(k_i)) + w_i(r_s(a_i) - r_f)(Y_i - q(k_i)). \tag{5}$$

In this case, we see that the expected return from investing in both the risk-free asset and the stock market decreases even further for any $a_i \in (0, 1]$, as the already smaller disposable wealth (due to the cost function) is distributed between the risk-free asset and the stock market, which now has a discounted return (given by the household's assessed level of trust in the stock market). In Figure 2, $\text{ER}_s^{q(k_i),a_i}$ plots the investment opportunity locus for combinations of investment in both the risk-free asset and the stock market when household i, who participates in the stock market faces the cost function subject to their level of stock market literacy, $q(k_i)$, and has a positive level of mistrust in the stock market, where $\text{ER}_s^{q(k_i),a_i} = r_f(Y_i - q(k_i)) + \frac{(\overline{r_s}(a_i) - r_f)(Y_i - q(k_i))}{\sigma_s}\sigma$, and $\sigma = w_i\sigma_s$. We assume $\overline{r_s}(a_i) > r_f$ for any $a_i \in (0, 1]$. We observe that the new investment opportunity locus $\text{ER}_s^{q(k_i),a_i}$ pivots clockwise relative to $\text{ER}_s^{q(k_i)}$, as the slope of the schedule is now lower than in the case when the household invests in stocks and has total trust in the stock market. In the model with stock

[3] See, for example, Guiso, Sapienza, and Zingales (2008), Georgarakos and Pasini (2011), Pevzner, Xie, and Xin (2013), and Carlin, Dorobantu, and Viswanathan (2009).

[4] We assume that the effect of trust is independent of that of stock market literacy.

[5] We assume a partial equilibrium framework in the sense that the choice of one household does not affect the equilibrium level of a_i.

market literacy and lack of trust, the marginal rate of substitution between the expected return and risk is lower than in the model with stock market literacy and total trust, as $\frac{\mathrm{ER}_s^{q(k_i),a_i}}{\partial\sigma} < \frac{\partial \mathrm{ER}_s^{q(k_i)}}{\partial\sigma}$. We see here an additional "substitution effect", as the lack of trust further reduces the marginal expected return from investing in the stock market.

T^{**} on the budget constraint depicts the point below which the household is better off investing only in the risk-free asset, while after T^{**} the household will have a higher expected return from participating in the stock market. The lower part of Figure 2 shows that the minimum threshold level of investment required to make participation worthwhile has increased further to w_i^{**}, with $w_i^{**} > w_i^* > 0$.

Thus, in the complete model framework comprising the effects of both stock market literacy via participation cost, and trust via discounted return on investment in stocks, a household i chooses w_i in order to maximize their expected utility, conditional on their level of stock market literacy, trust, initial wealth, and the returns of the two assets in which they can invest:

$\max_{w_i} \mathrm{ER}\left[w_i|k_i, a_i, Y_i, r_s, r_f\right]$, where:

$$\mathrm{ER}[w_i] = \begin{cases} r_f(Y_i - q(k_i)) + w_i(r_s(a_i) - r_f)(Y_i - q(k_i)), \text{ if } w_i > 0 \\ r_f Y_i, \text{ if } w_i = 0. \end{cases} \tag{6}$$

This setup allows us to investigate the independent effects of stock market literacy and trust on stock market participation. We observe that the household's level of stock market literacy has a distinct effect on the participation condition, over and above the effect of trust. Unlike the household's level of stock market literacy, which affects both the slope and the intercept of the investment opportunity locus, trust only affects the slope of this locus. Hence, the slope is affected by two distinct factors coming from stock market literacy and trust.

2.1 TESTABLE IMPLICATIONS

From the above participation condition, we observe that stock market literate households have higher disposable wealth to invest in the stock market than their counterparts (as their participation costs are smaller). For a given level of mistrust a_i and initial wealth Y_i, the expected utility from investing in the available assets is monotonically increasing in the disposable wealth $Y_i - q(k_i)$, and monotonically increasing in the level of stock market literacy, k_i.

In Figure 3, in the (ER, σ) space, along with R_f and ER_s, we plot the investment opportunity loci for a household with a high level of stock market literacy, k_2, and a household with low stock market literacy, k_1, labeled as $ER_s^{q(k_2),a_i}$ and $ER_s^{q(k_1),a_i}$, respectively. We see that $ER_s^{q(k_2),a_i}$ has a steeper slope and the locus shifts upwards compared to $ER_s^{q(k_1),a_i}$. In other words, a more literate household will have a higher marginal rate of substitution between the two available assets and a higher return given the lower participation cost, as compared to that of a less literate household. A and B are the points at which the highest indifference curve is tangent to the two investment opportunity loci, giving us the optimum proportion of wealth to be invested in the stock market w_i^A and w_i^b, respectively, in order to maximize the expected return of portfolios. T_1 and T_2 on the budget constraints are the cut-off points below which the households are better off investing only in the risk-free asset. After these points, the households will have a higher expected return from participating in the stock market. This gives us the minimum threshold proportion of stock investment necessary for stock market participation to occur, w_{i1} and w_{i2} ($w_{i1} > 0, w_{i2} > 0$).

For identical degrees of risk aversion, given the positioning of the two loci for households with levels of stock market literacy k_1 and k_2, we have $w_i^B > w_i^A$ and $w_{i1} > w_{i2}$. In Figure 3, we observe that on the segment [0,1], the interval (w_{i2}, w_i^B) is greater than the interval (w_{i1}, w_i^A) showing that a more stock market literate household has a higher participation interval compared to a less stock market literate household. Moreover, given that $w_i^B > w_i^A$, conditional on participation, a high stock market literate household invests more in stocks. Based on this model framework, the testable implications we draw are summarized as follows: for a given level of mistrust a_i and initial wealth Y_i,

(i) a household with higher stock market literacy has a higher probability of stock market participation;
(ii) conditional on participation, stock market literate households invest a higher proportion of investment in stocks.

3. Data and Variables

Our data are sourced from various ALP surveys that gather information from over 6,000 representative samples of US households.[6] ALP consists

[6] Other databases such as the DNB Household Survey (DHS) of Dutch households and the Survey of Health, Ageing and Retirement in Europe (SHARE) database of multidisciplinary and cross-national household data do not contain adequate information on households'

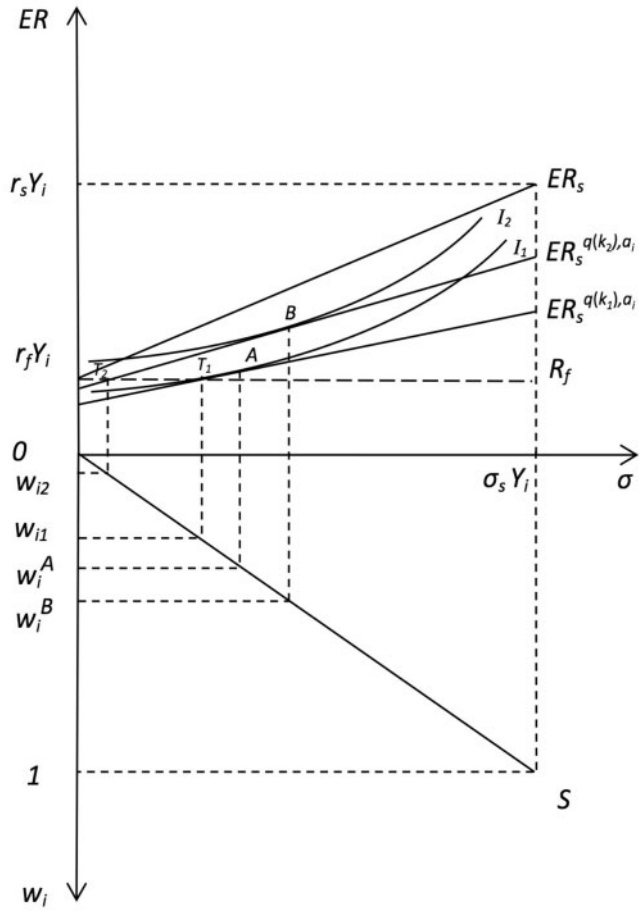

Figure 3. This figure plots investment opportunity loci in the (ER, σ) space for combinations of investment in both the risk-free asset and the stock market in the baseline model, labeled as ER_s, and in the model with stock market literacy and trust, with stock market literacy levels, k_1 and k_2, labeled as $ER_s^{q(k_1),a_i}$ and $ER_s^{q(k_2),a_i}$, respectively. k_2 indicates a higher level of stock market literacy than k_1. R_f labels the opportunity locus of investing only in the risk-free asset. On the [0,1] segment in the lower part of the figure, w_i^A and w_i^B are the optimal proportions of wealth invested in the stock market corresponding to households' stock market literacy levels, k_1 and k_2, respectively. w_{i1} and w_{i2} are the minimum threshold proportions of stock investment necessary for stock market participation to occur.

financial literacy and participation information. For example, although DHS contains information on stock-holding status and financial literacy, the number of households that actually possess stocks is very low. For instance, in the 2012 wave, only 218 households out of the 2,155 responding households possess stocks. In addition, only 170 households shared information on the amount of money invested in stocks. In the SHARE database, there is limited information on financial literacy and households' investment in financial assets.

of a diverse set of surveys (around 368 different surveys) that is of scientific and policy interest, covering multiple aspects such as expectations, opinions, financial participation and circumstances, cognition, and demographics. Hence, it is possible for us to measure stock market literacy, sociability and trust in the stock market, and construct proxies for a wide range of households' behavioral characteristics. The interviews are conducted via an internet-based panel and take advantage of its computerized nature, with visualization and interactive tools supporting implementation. ALP allows for customized feedback to respondents as part of plausibility checks of a given response. Further, the survey questions are also customized for clients who have special requirements, thereby increasing the diversity of surveys. Chang and Krosnick (2010) show that self-administered computer-based surveys facilitate optimal responding, with higher concurrent validity, less survey satisficing, and less social desirability response bias than in the intercom mode, especially among households with limited cognitive skills. Moreover, question orders and response choices have been randomly assigned in order to avoid any response biases due to the order in which they appear.

We obtain information on whether households hold stocks or stock mutual funds from the Effects of the Financial Crisis survey waves fielded between November 2008 and January 2011, with an average response rate of 79%. We do not consider stock holdings that are part of an IRA, 401(k), Keogh or similar retirement accounts. In our sample, we find that 70% of the households participate in the stock market. Using the Cognition and Aging in the US survey (fielded between November 2008 and September 2009), we gather information on households' share of wealth invested in the stock market, which is calculated as a proportion of total financial assets invested in stocks. The total financial assets are made up of the value of checking accounts, savings accounts, money market accounts, bond funds, balanced or life-cycle funds, foreign investments, index funds, sector funds, other mutual funds, retirement accounts, short-term assets, other stocks or funds not listed, educational savings accounts, and life insurance settlements. We observe that, on average, households in our sample invest 6.7% of their share of wealth in stocks.

3.1 MEASURING STOCK MARKET LITERACY, SOCIABILITY, AND TRUST IN THE STOCK MARKET

We develop an index for stock market literacy using questions from the Investing submodule developed by Hung, Parker, and Yoong (2009) and part of the ALP Financial Literacy survey. This survey is fielded between

March 2009 and September 2009, with a response rate of 85.87%. The Investing submodule consists of Lusardi and Mitchell's (2007) sophisticated financial literacy items, as well as five additional items on investment markets and products. They capture households' knowledge of investing directly in the stock market or indirectly using mutual funds accounts. Hung, Parker, and Yoong (2009) conduct a battery of tests to assess the construct validity and find strong reliability and internal consistency, with a highest Cronbach's alpha as compared to other prominent financial literacy scales. Appendix A presents the questions used to develop our stock market literacy index. Since the responses are a mix of nominal and ordinal data, unlike previous studies that use linear principal component analysis (PCA), we use categorical principal component analysis (CATPCA) to construct the stock market literacy index. CATPCA is the nonlinear equivalent of linear PCA and has been developed for efficiently handling categorical variables and nonlinear relationships.

Table I reports the CATPCA results for the stock market literacy index. The optimal scaling level of all items is set to ordinal, and we use Kaiser's criterion to determine the number of significant dimensions. We find that there are three significant dimensions with eigenvalues greater than one, explaining 52% of the variance of our data. We construct the stock market literacy index as the weighted sum of the significant dimensions, where the weight is given by the eigenvalues. We scale the households' stock market literacy index scores to lie between the range of zero and one. The summary statistics in Table II show that our sample of households has an average stock market literacy score of 0.61. In Panel B, we report the sample characteristics of households with different levels of stock market literacy. If we compare the stock ownership characteristics of household groups with literacy scores in the upper and lower quartile, we observe that around 95% of the high stock market literate households participate in stocks, while around 58% of the low stock market literate households hold stocks. On average, high stock market literate households invest 12% of their financial wealth in stocks, which is about double the sample average (6.7%) and low stock market literate households invest 4% of their wealth in the stock market. We see that our high stock market literate group has an average education of roughly 13 years, is made up of largely male respondents (around 68%), with an average income double that of the low stock market literate group, and has large average net wealth. The sample characteristics suggest that, on average, wealthy households participate more in the stock market and such households have the ability as well as the incentive to be more stock market literate, as they participate more in the stocks.

Table I. CATPCA results for stock market literacy index.

This table reports the eigenvalues and the proportion of the variance explained by the dimensions. The total number of dimensions is 12, which is the number of items in our questionnaire. Optimal scaling level of all the variables is set as ordinal.

Dimension	Eigenvalues	Percentage of variance
1	4.138	34.481
2	1.092	9.104
3	1.004	8.365
4	0.883	7.36
5	0.82	6.832
6	0.74	6.165
7	0.67	5.582
8	0.644	5.365
9	0.563	4.696
10	0.522	4.349
11	0.492	4.098
12	0.432	3.602

For creating a measure for households' level of sociability, we utilize the broader definition of sociability employed by Hong, Kubik, and Stein (2004), and Georgarakos and Pasini (2011), among others. In particular, households are considered sociable if they participate in formal training, make donations of money or possessions totaling $500 or more, participate in volunteer work, or spend time helping friends, neighbors, or relatives. According to Unger (1998), sociability refers to the ease and urgency with which individuals pursue common goals, which will otherwise be impossible or expensive to achieve if individuals operate in isolation. Hence, households' involvement through cooperation in the organization of society is used as a measure of sociability. We obtain information on these sociability characteristics from various ALP surveys fielded between 2008 and 2013, with a minimum response rate of around 84%.[7] The sample characteristics

[7] More specifically, participation in formal training data is from the Financial Decision-making survey, with a response rate of 97.74%; the charity donations data is from the Health and Retirement Study (Well Being module 62), with a response rate of 83.94%; and we use the Health and Retirement Study (Well Being module 66), which has a response rate of 97.81%, to obtain information on participation in volunteer work, and time spent helping friends, neighbours, or relatives.

Table II. Summary statistics.

This table reports the summary statistics of our sample. The description and construction of all the variables is detailed in Section 3. The data have been obtained from the ALP surveys. Panel A reports the summary statistics (mean, standard deviation, minimum, and maximum values) of the variables, the selected sample size (N), and the ALP survey labels. N refers to our selected sample of households that have responded to the survey question(s) used for the variable construction as well as responded to the survey question on whether they own stocks or not. Panel B reports sample characteristics for households with different levels of stock market literacy and Panel C reports sample characteristics for households that are sociable (with sociability proxy equal to one) and nonsociable (with sociability proxy equal to zero). In both Panels B and C, we report the averages, with number of samples provided in parentheses.

	Panel A: summary statistics					
Variable	Mean	Stdev	Minimum	Maximum	N	ALP survey labels
Stock market literacy	0.612	0.248	0	1	1,707	Financial Literacy
Sociability	0.929	0.257	0	1	2,649	Financial Decision-making; and HRS surveys (Well Being 62, 66)
Trust in stock market	0.330	0.195	0	1	2,090	DOL Pilot
Age	50.931	15.071	18	93	2,711	Demographics and survey selection
Education	11.561	2.115	1	16	2,711	Demographics and survey selection
Employed	0.621	0.485	0	1	2,711	Demographics and survey selection
Male	0.422	0.494	0	1	2,710	Demographics and survey selection
Income ($000s)	7.066	8.682	0	145.469	2,477	Effects of the Financial Crisis
Net wealth ($000s)	293.727	1248.477	−954	38000	2,545	HRS Q Income and Assets section
Economic shock	0.458	0.261	0	1	2,675	Effects of the Financial Crisis
Future expectations	0.263	0.290	0	1	2,480	HRS P Expectations and N Healthcare sections
Optimism	0.728	0.182	0	1	2,355	Health Expectations
Risk aversion	0.822	0.181	0.25	1	2,098	DOL Pilot
Self-confidence	0.605	0.225	0	1	2,355	Health Expectations
Sense of commitment	0.531	0.135	0.095	1	2,355	Health Expectations
Time preference	0.326	0.318	0	1	2,093	DOL Pilot

(continued)

Table II. (Continued)

	Panel B: sample characteristics according to stock market literacy levels						
Stock market literacy	Age	Education	Male	Income ($000s)	Net wealth ($000s)	Stock ownership	Share of investment in stocks
> 75th percentile	57.789	12.774	0.679	10.164	760.142	0.949	0.120
	(336)	(336)	(336)	(318)	(328)	(336)	(323)
25th to 75th percentile	55.203	11.957	0.438	7.871	358.640	0.820	0.074
	(950)	(950)	(950)	(912)	(928)	(950)	(866)
< 25th percentile	49.295	10.829	0.271	5.284	87.880	0.575	0.040
	(351)	(421)	(421)	(382)	(410)	(421)	(351)

	Panel C: sample characteristics for social and nonsocial households						
Sociability	Age	Education	Male	Income ($000s)	Net wealth ($000s)	Stock ownership	Share of investment in stocks
Social	51.219	11.651	0.418	7.240	309.669	0.727	0.068
	(2460)	(2460)	(2460)	(2315)	(2385)	(2461)	(1873)
Nonsocial	47.319	10.282	0.410	4.232	56.094	0.420	0.048
	(188)	(188)	(188)	(147)	(160)	(188)	(116)

for sociable (with sociability proxy equal to one) and nonsociable (with sociability proxy equal to zero) households are reported in Panel C of Table II. We observe that sociable households participate more in the stock market and hold a greater proportion of their wealth in stocks than nonsociable households. In particular, we see that around 73% (42%) of (non-)sociable households hold stocks and on average, (non-)sociable households invest around 6.8% (4.8%) of their wealth in stocks. The average demographic characteristics (age, education, gender) between the two groups are similar; however, we observe that sociable households have a larger average income and net wealth than nonsociable households.

To measure households' trust in stock markets, we use the Trust in Financial Institutions submodule under the Department of Labor (DOL) Pilot survey. This survey is fielded from June 2011 until August 2011, with a response rate of 85.04%. We incorporate three questions about households' level of trust in the stock market, trust in stockbrokers and trust in

investment advisers. The choices of responses range from 1 (I do not trust at all) to 5 (I trust completely). We take the average of the responses to the aforementioned questions and scale them between zero and one, where zero corresponds to households who have the lowest trust in the stock market and one corresponds to those with the highest level of trust in the stock market. While previous studies such as Guiso, Sapienza, and Zingales (2008) use trust in bank officials and financial advisers as a proxy for personalized trust in the stock market, our measure is more specific to households' trust relating to stock market investment decisions. The summary statistics in Table II show that our sample of households has an average trust score of 33%. From the correlations reported in Table III, we observe that our key variables—stock market literacy, sociability, and trust measures—are not highly correlated with each other, with trust being correlated only 19% with stock market literacy.

3.2 MEASURING DEMOGRAPHIC AND BEHAVIORAL CHARACTERISTICS

We consider the key demographic characteristics related to stock ownership decisions in the literature, including age, education, employed (indicator for being an employee), male dummy, income, and net wealth. For example, Guiso, Sapienza, and Zingales (2008) find that age is negatively related to stock ownership and investment in stocks, while employment is positively related to participation in the risky assets. They further report that males and investors with a college education have a higher proportion of investment in stocks, while employment increases the share of investment in risky assets. Likewise, Guiso, Sapienza, and Zingales (2008), Hong, Kubik, and Stein (2004), Georgarakos and Pasini (2011) and Van Rooij, Lusardi, and Alessie (2011) report the importance of education for stock market participation; Haliassos and Bertaut (1995) and Van Rooij, Lusardi, and Alessie (2011) find a significant role of gender, observing that stock market participation is much lower among women than men; Guiso, Haliassos, and Jappelli (2003), Campbell (2006) and Van Rooij, Lusardi, and Alessie (2011) show that stock market participation increases strongly with income and wealth; and Vissing-Jorgensen (2004) reports that nonfinancial income is positively related to both the stock ownership and share of investment in stocks.

We obtain the demographic characteristic variables—age, education, employed, and gender—from the ALP household information. Our selected sample of respondents is aged between 18 years and 93 years. As can be seen from Table II, the average age of our respondents is around 51 and the average number of years in education is around 12, with about 42%

Table III. Correlations matrix.

This table reports the Spearman's rank correlations for all the variables in our sample. The description and construction of all the variables is detailed in Section 3.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Stock ownership	1																	
2	Share of investment in stocks	0.378	1																
3	Stock market literacy	0.316	0.388	1															
4	Sociability	0.120	0.052	0.114	1														
5	Trust in stock market	0.258	0.208	0.190	0.121	1													
6	Age	0.079	0.197	0.219	0.061	0.022	1												
7	Education	0.276	0.195	0.319	0.130	0.118	−0.025	1											
8	Employed	0.079	−0.043	−0.054	0.044	0.023	−0.483	0.123	1										
9	Male	0.113	0.134	0.314	0.026	0.033	0.099	0.071	0.024	1									
10	Income	0.355	0.169	0.255	0.121	0.168	−0.080	0.318	0.215	0.093	1								
11	Net wealth	0.326	0.386	0.418	0.112	0.226	0.360	0.218	−0.198	0.108	0.311	1							
12	Economic shock	0.196	0.164	0.191	0.038	0.010	0.012	0.114	0.034	0.015	0.086	0.118	1						
12	Future expectations	0.304	0.270	0.356	0.137	0.216	0.081	0.255	−0.036	0.112	0.392	0.533	0.074	1					
14	Optimism	0.097	0.127	0.170	0.141	0.128	0.144	0.097	−0.068	0.029	0.118	0.149	−0.031	0.178	1				
15	Risk aversion	−0.124	−0.087	−0.176	−0.056	−0.189	0.191	−0.127	−0.124	−0.156	−0.177	−0.051	−0.048	−0.108	−0.018	1			
16	Self-confidence	0.119	0.157	0.200	0.140	0.120	0.211	0.124	−0.074	0.023	0.140	0.181	0.027	0.158	0.642	−0.025	1		
17	Sense of commitment	−0.000	0.023	0.032	0.042	0.001	0.191	0.050	−0.190	−0.051	−0.051	0.074	−0.063	0.049	0.108	0.038	0.082	1	
18	Time preference	0.136	0.197	0.337	0.047	0.121	0.065	0.186	0.004	0.202	0.169	0.298	0.064	0.171	0.061	−0.150	0.080	0.026	1

males and 62% of respondents in employment. Utilizing information from the Effects of the Financial Crisis survey, we calculate households' total income as the sum of respondents' and their partners' monthly income from work and other sources. We take the average of their income during 17 months starting from October 2009, to deal with abnormal income in any month. The summary statistics table shows that, on average, households in our sample have a monthly income of around $7,000 (with sample median of $5,150). In order to measure net wealth, we use the HRS Q Income and Assets section survey that is fielded between June 2009 and August 2013 and has a response rate of 97.74%. We calculate net wealth as the total value of all assets (excluding equity wealth) minus total household debt.

We include a large set of behavioral characteristic variables, including economic shock, optimism, time preference, future expectations, self-confidence, sense of commitment, and risk aversion. We utilize information from a wide range of ALP surveys to construct proxies for these behavioral characteristics. Exact wordings of the survey questions utilized, choices of responses, and the construction of the variables are provided in Appendix B. The summary statistics table shows that households in our sample on average are largely optimists but at the same time risk averse, with low expectations of the future. Further, we observe that the households on average are moderately self-confident and committed. From Table III, we find that overall the behavioral characteristics are not strongly correlated with each other, with positive correlations noted between optimism and self-confidence, and negative correlations noted between future expectations and risk aversion.

4. Empirical Analysis

4.1 WHO PARTICIPATES IN STOCK MARKETS?

In this section, we investigate the importance of stock market literacy, sociability, trust, and other household characteristics for stock market participation. We estimate the following binary choice model for the participation condition in Equation (3):

$$PROB\_STOCK_i = \gamma SL_i + \delta SO_i + \theta TR_i + +\beta_j[X_{ji}] + \varepsilon_i \quad \text{and } \varepsilon_i \sim N(0, 1), \tag{7}$$

where the response variable is probability of stock market participation. We include the key explanatory variables—stock market literacy (SL),

sociability (*SO*), and trust (*TR*)—and a large set of household characteristic variables, X_j, outlined in Section 3.2.

The first set of results are reported in Table IV. We report the fully standardized coefficients, allowing us to measure accurately the association of variables among the various probit models.[8] We find that stock market literacy, sociability, and trust are strongly significant when considered independently. Moreover, the effect of sociability remains significant contemporaneously with trust. This is in line with Hong, Kubik, and Stein (2004), Guiso, Sapienza, and Zingales (2008) and Georgarakos and Pasini (2011), who find that trust and sociability play distinct roles for stock market participation. However, when we introduce stock market literacy, the relationship between sociability and participation vanishes; and what matters is stock market literacy, along with trust, which is also strongly significant. This finding is also consistent with those documented by Hilgert, Hogarth, and Beverly (2003), Cardak and Wilkins (2009), Christelis, Jappelli, and Padula (2010) and Van Rooij, Lusardi, and Alessie (2011), showing that more financially literate people are more likely to invest in the stock market. Our results indicate that sociability actually proxies for financial awareness and stock market literacy, which affects stock market participation.[9] In terms of demographic characteristics, we find that age, education, employment, income, and net wealth are important indicators of stock ownership, with income having the highest explanatory power (around 53%) for households' probability of participation.

Next, we examine the importance of household behavioral characteristics for explaining the probability of participation. We add a rich set of behavioral and psychological measures to the model specification used in Table IV, including economic shock, future expectations, optimism, risk aversion, self-confidence, sense of commitment, and time preference.

[8] When including different predictor variables in the various probit model specifications, the scaling of the response variable changes and therefore the changes in estimated coefficients might not entirely be due to the suppressor effect (see Winship and Mare, 1984; Williams, 2009; Mood, 2010; among others). Standardizing only the response variable does not adequately fix the scaling issue and hence we perform a full standardization (i.e., standardization of both response and explanatory variables). In this way, the changes to reported coefficient estimates in the various nested model specifications can be accurately associated with the suppression effect rather than the scaling effect (see Long and Freese, 2006 for details).

[9] Since a large proportion (93%) of our selected sample is considered sociable, we carry out robustness checks to ensure that the low variability of the sociability measure is not influencing the results. In particular, we rerun the analysis on various household groups based on the number of sociable activities participated in and our findings are fully upheld.

Table IV. Analysis of stock market participation.

This table reports the fully standardized probit regression estimates of Long and Freeze (2006). The robust standard errors are reported in parentheses. The dependent variable is a dummy variable equal to one for households owning stocks and zero otherwise. The explanatory variables are stock market literacy, sociability, trust in stock market, and demographic variables. ***, **, and * denote significance at 1, 5, and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Stock market literacy	0.472*** (0.031)	0.150*** (0.025)				0.150*** (0.025)	0.138*** (0.029)	0.138*** (0.029)
Sociability			0.066*** (0.022)		0.052** (0.025)	0.01 (0.019)		−0.002 (0.022)
Trust in stock market				0.221*** (0.027)	0.219*** (0.027)		0.156*** (0.027)	0.156*** (0.028)
Age		0.092*** (0.024)	0.245*** (0.025)	0.236*** (0.028)	0.231*** (0.028)	0.091*** (0.024)	0.082*** (0.028)	0.082*** (0.028)
Education		0.135*** (0.025)	0.274*** (0.028)	0.265*** (0.03)	0.259*** (0.03)	0.133*** (0.026)	0.146*** (0.029)	0.146*** (0.029)
Employed		0.056** (0.026)	0.087*** (0.026)	0.096*** (0.029)	0.093*** (0.029)	0.056** (0.026)	0.066** (0.03)	0.066** (0.03)
Male		0.005 (0.024)	0.051** (0.024)	0.038 (0.026)	0.037 (0.026)	0.006 (0.024)	0.012 (0.029)	0.012 (0.029)
Income		0.543*** (0.108)	0.423*** (0.119)	0.376*** (0.138)	0.373*** (0.137)	0.542*** (0.108)	0.528*** (0.114)	0.529*** (0.114)
Net wealth		0.43** (0.186)	0.093 (0.071)	0.073 (0.059)	0.071 (0.059)	0.429** (0.186)	0.361* (0.186)	0.361* (0.185)
Pseudo R^2	0.133	0.269	0.193	0.228	0.230	0.270	0.293	0.293
Observations	1,707	1,595	2,410	2,019	2,019	1,595	1,351	1,351

In doing so, we are also able to distinguish the distinct roles of stock market literacy and trust from other household behavioral characteristics that can explain the probability of participation. Table V reports the test results. We find that the introduction of behavioral and psychological characteristics in the model specifications does not alter the previous results. In particular, we find that stock market literacy and trust remain the significant indicators, along with age, education, employed, and income, even after the introduction of behavioral and psychological characteristics. Changing stock market literacy by one standard deviation varies the probability of participation by around 11%, while the equivalent change for trust in the stock market is around 17%. As before, sociability does not significantly explain stock ownership, once we account for stock market literacy. With regard to the behavioral characteristics, we observe that past economic shock is positive and strongly significant for stock market participation. This result may be driven by the fact that during periods of economic downturn and large drops in the

Table V. Behavioral characteristics explaining stock market participation.

This table reports the fully standardized probit regression estimates of Long and Freeze (2006). The robust standard errors are reported in the parentheses. The dependent variable is a dummy variable equaling one for households owning stocks and zero otherwise. The explanatory variables are stock market literacy, sociability, trust in stock market, demographic, and behavioral variables. ***, **, and * denote significance at 1, 5, and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Stock market literacy	0.138***		0.138***		0.113***	0.113***
	(0.03)		(0.03)		(0.031)	(0.031)
Sociability		0.046*	−0.001			−0.007
		(0.024)	(0.025)			(0.024)
Trust in stock market				0.203***	0.165***	0.166***
				(0.026)	(0.029)	(0.029)
Age	0.109***	0.232***	0.109***	0.226***	0.107***	0.108***
	(0.031)	(0.028)	(0.031)	(0.028)	(0.031)	(0.031)
Education	0.156***	0.243***	0.156***	0.216***	0.143***	0.144***
	(0.031)	(0.029)	(0.031)	(0.029)	(0.031)	(0.031)
Employed	0.081**	0.113***	0.081**	0.102***	0.068**	0.068**
	(0.032)	(0.029)	(0.032)	(0.029)	(0.032)	(0.032)
Male	0.008	0.021	0.008	0.02	0.017	0.017
	(0.03)	(0.026)	(0.03)	(0.026)	(0.03)	(0.03)
Income	0.476***	0.321***	0.476***	0.3***	0.486***	0.487***
	(0.12)	(0.115)	(0.12)	(0.115)	(0.112)	(0.112)
Net wealth	0.287	0.043	0.287	0.039	0.259	0.26
	(0.215)	(0.047)	(0.215)	(0.045)	(0.194)	(0.194)
Economic shock	0.126***	0.149***	0.126***	0.156***	0.137***	0.137***
	(0.032)	(0.027)	(0.032)	(0.027)	(0.031)	(0.031)
Future expectations	0.105**	0.178***	0.105**	0.163***	0.091**	0.092**
	(0.05)	(0.04)	(0.05)	(0.039)	(0.047)	(0.047)
Optimism	0.037	−0.007	0.038	−0.01	0.03	0.031
	(0.036)	(0.031)	(0.036)	(0.031)	(0.036)	(0.035)
Risk aversion	−0.062**	−0.059**	−0.062**	−0.034	−0.038	−0.038
	(0.028)	(0.027)	(0.028)	(0.027)	(0.028)	(0.028)
Self-confidence	−0.004	0.039	−0.004	0.028	−0.008	−0.007
	(0.035)	(0.031)	(0.036)	(0.031)	(0.035)	(0.035)
Sense of commitment	−0.015	0.003	−0.015	0.019	−0.011	−0.011
	(0.028)	(0.025)	(0.028)	(0.025)	(0.028)	(0.028)
Time preference	0.012	0.065**	0.012	0.047*	−0.002	−0.002
	(0.03)	(0.026)	(0.03)	(0.026)	(0.029)	(0.03)
Pseudo R^2	0.301	0.243	0.301	0.266	0.326	0.326
Observations	1,332	1,993	1,332	1,989	1,331	1,331

stock market, households holding stocks experience a higher exposure to these shocks. We further find that future expectations is positive and strongly significant, showing that people who want to leave more inheritance have a higher probability of stock market participation. Risk aversion

remains negative and significant at the 5% level, before considering the effect of households' trust in the stock market. In addition, we find some marginal significance for time preference, but its relation with participation vanishes as we include stock market literacy. We note here that since these analyses are descriptive, the results reveal associations between behavioral characteristics and households' probability of participation, and no causal effects can be established from these results.

4.2 ANALYSIS OF HOUSEHOLDS' SHARE OF INVESTMENT IN STOCKS

Conditional on participation, in our model framework stock market literacy reduces the cost barriers and increases the disposable wealth that can be invested between the risky and the risk-free assets. Further, trusting households invest a larger share of their wealth in stocks (Guiso, Sapienza, and Zingales, 2008). In this section, we empirically investigate the characteristics that explain the households' share of investment in stocks. We estimate the following ordinary least squares regression:

$$INV\_PROP_i = \alpha + \gamma SL_i + \delta SO_i + \theta TR_i + \beta_j[X_{ji}] + \varepsilon_i, \tag{8}$$

where the response variable is investment proportion in stocks, which is measured as total investment in stocks as a percentage of total financial assets (see data section for details).[10] All explanatory variables are as in Equation (7).

The test results are reported in Table VI. We find that stock market literacy is consistently positive and highly significant in all model specifications considered. This shows that stock market literate households are not only more likely to participate in stocks, but conditional on participation, they also invest a larger share of their wealth in stocks. In addition, we find that trust in the stock market, which is also highly significant, positively affects the share of investment in stocks. Our results corroborate those of Guiso, Sapienza, and Zingales (2008), who find that trusting households have a higher portfolio share invested in stocks, conditional on participation.

[10] We also consider wealth invested in stocks as a percentage of total assets. In this case, we calculate the total assets of households as the sum of total financial assets and total value of farm equity livestock and equipment, nonfarm partnerships, and all other assets (such as trusts, limited partnerships, hedge funds, commodities, timber or mineral rights, valuable art, jewelry, metals, coins, and collectables). We do not report the results for investment in stocks as a percentage of total assets, as they are qualitatively identical to those reported in Table VI (available upon request).

Table VI. Analysis of households' share of investment in stocks.

This table reports the standardized beta estimates obtained from ordinary least square regressions. The dependent variable is investment in stocks as a percentage of total financial assets. The explanatory variables are stock market literacy, sociability, trust in stock market, demographic, and behavioral variables. ***, **, and * denote significance at 1, 5, and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Stock market literacy	0.210***	0.095***		0.097***		0.085***	0.087***
	(0.014)	(0.019)		(0.019)		(0.019)	(0.019)
Sociability			−0.026	−0.044			−0.050
			(0.019)	(0.027)			(0.027)
Trust in stock market					0.082***	0.083***	0.086***
					(0.018)	(0.023)	(0.023)
Age		0.159***	0.190***	0.162***	0.183***	0.156***	0.160***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education		0.058*	0.096***	0.062**	0.085***	0.055*	0.059**
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Employed		−0.013	−0.021	−0.010	−0.027	−0.017	−0.013
		(0.009)	(0.007)	(0.009)	(0.007)	(0.009)	(0.009)
Male		0.021	0.035	0.020	0.034	0.025	0.025
		(0.008)	(0.007)	(0.008)	(0.007)	(0.008)	(0.008)
Income		−0.091***	−0.077***	−0.091***	−0.079***	−0.091***	−0.091***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Net wealth		0.062	0.053	0.062	0.050	0.058	0.058
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Economic shock		0.103***	0.131***	0.104***	0.131***	0.106***	0.107***
		(0.017)	(0.014)	0.017)	(0.014)	(0.017)	(0.017)
Future expectations		0.085**	0.098***	0.087**	0.084***	0.076**	0.078**
		(0.017)	(0.014)	0.017)	(0.014)	(0.017)	(0.017)
Optimism		−0.047	−0.028	−0.043	−0.036	−0.053	−0.049
		(0.03)	(0.024)	0.029)	(0.024)	(0.029)	(0.029)
Risk aversion		−0.011	−0.012	−0.012	−0.000	−0.000	−0.001
		(0.023)	(0.017)	0.023)	(0.017)	(0.022)	(0.022)
Self-confidence		0.075**	0.073**	0.077**	0.067**	0.073**	0.076**
		(0.023)	(0.018)	0.023)	(0.018)	(0.023)	(0.023)
Sense of commitment		0.015	0.001	0.017	0.004	0.017	0.019
		(0.032)	(0.026)	0.032)	(0.026)	(0.031)	(0.031)
Time preference		0.080***	0.110***	0.079***	0.106***	0.076**	0.075**
		(0.014)	(0.011)	0.014)	(0.011)	(0.014)	(0.014)
Adjusted R^2	0.044	0.114	0.122	0.115	0.127	0.119	0.121
Observations	1,542	1,239	1,577	1,239	1,575	1,239	1,239

Further, accounting for households' trust in the stock market does not change the relationship or the significance of stock market literacy. Changing stock market literacy or trust in the stock market by one standard deviation increases the share of stocks in a household's portfolio

by 0.087 standard deviation. Sociability remains insignificant in all model specifications and does not explain households' portfolio allocation decisions.

In terms of household demographics, we observe that age, education, and income have a significant association with the proportion of wealth invested in stocks. In addition, we see that a large set of behavioral characteristics exhibit significance. In particular, behavioral characteristics including economic shock, future expectations, self-confidence, and time preference significantly explain the heterogeneity in the share of wealth invested in the stock market, with past economic shock having the highest explanatory power of around 11% (and highly significant). Notice that several of the behavioral characteristics such as self-confidence and time preference, which did not explain the probability of households' participation in stocks, now significantly explain the share of wealth invested in the stock market. Although a causal relationship cannot be established from the analysis, our results show that there are distinct behavioral characteristics that are associated with a household's decision to participate in the stock market and, conditional on participation, a household's decision on how much to invest in stocks.

5. Additional Analysis

5.1 THE EFFECT OF SOCIABILITY ON STOCK MARKET PARTICIPATION

The results thus far provide a consistent picture that stock market literate households and households that trust the stock market are more likely to participate in the stock market. These two characteristics concurrently explain participation. Moreover, the results indicate that sociability does not explain participation per se, but rather mirrors stock market literacy. To further analyze this, we separately investigate what explains stock market participation among high sociability and low sociability households. We use our proxy for sociability that defines households to be sociable if they participate in formal training, make donations of money or possessions totaling $500 or more, participate in volunteer work, or spend time helping friends, neighbors, or relatives. Using this proxy, we define high sociability households as those that participate in two or more sociable activities and low sociability households as those that participate in at most one sociable activity.

The test results for the two groups are reported in Table VII. Interestingly, we find that stock market literacy is strongly significant for both high sociability and low sociability households. Moreover, although sociability is

Table VII. Stock market participation for high and low sociability households.

This table reports the fully standardized probit regression estimates of Long and Freeze (2006). Panel A reports regression estimates for the high sociability households, while Panel B reports regression estimates for the low sociability households. We define high sociable households as those that participate in two or more social activities and low sociable households as those that participate in at most one social activity. The robust standard errors are reported in parentheses. The dependent variable is a dummy variable equal to one for households owning stocks and zero otherwise. The explanatory variables are stock market literacy, sociability, trust in stock market, and demographic variables. ***, **, and * denote significance at 1, 5, and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: high sociability households					
Stock market literacy	0.422***		0.405***	0.117***		0.092**
	(0.036)		(0.037)	(0.036)		(0.036)
Sociability		0.154***	0.083*	0.010	0.002	0.01
		(0.032)	(0.044)	(0.038)	(0.033)	(0.038)
Trust in stock market					0.202***	0.185***
					(0.031)	(0.033)
Demographics and behavioral characteristics	No	No	No	Yes	Yes	Yes
Pseudo R^2	0.108	0.011	0.111	0.277	0.238	0.309
Observations	1,345	1,984	1,347	1,088	1,565	1,087
	Panel B: low sociability households					
Stock market literacy	0.515***		0.508***	0.101***		0.099***
	(0.065)		(0.065)	(0.033)		(0.035)
Sociability		0.140***	0.056	−0.027	0.035	−0.028
		(0.048)	(0.062)	(0.032)	(0.048)	(0.033)
Trust in stock market					0.165***	0.036
					(0.05)	(0.034)
Demographics and behavioral characteristics	No	No	No	Yes	Yes	Yes
Pseudo R^2	0.146	0.009	0.147	0.432	0.298	0.436
Observations	358	691	358	244	424	244

significant for both groups initially, it becomes insignificant once stock market literacy is considered. Also, we observe that trust in the stock market is highly significant only for high sociable household groups. The results of this table confirm that no matter how sociable a household is, stock market literacy significantly explains their probability of owning stocks. Further, for high sociable household groups, trust has significant explanatory power for participation.

In order to further understand the role of sociability, we segregate high and low sociability groups further into high and low stock market literacy groups. Households with the stock market literacy index score above (below) the median are considered high (low) stock market literate. Here we are interested in investigating whether high sociability increases the probability of participation for those households who have low stock market literacy and whether high stock market literacy increases the probability of participation for households with low sociability. Table VIII reports the results for these two household groups. We find that sociability is insignificant for high sociable but low stock market literate households. As expected, stock market literacy is insignificant for this household group and as in the previous table, trust remains strongly significant. For the low sociable but high stock market literate household groups, stock market literacy remains a significant determinant of participation. These results confirm that sociability does not play an important role for participation, while stock market literacy remains a significant determinant of stock ownership even among households with low sociability. Hence, we do not find supportive evidence of participation explained by social interactions with cheaper information sharing, and peer-group effects; however, participation can be explained by households' level of stock market literacy.

5.2 AN ALTERNATIVE MEASURE OF SOCIABILITY

In this section, we test the association between sociability and stock ownership using households' participation in national elections as an alternative definition for sociability. Previous studies such as Rogers, Gerber, and Fox (2012) argue that participation in elections is a volunteering act for society and fundamentally a social behavior. Hence, sociable households will take active part in setting up the organization of their community and exercise their voting rights. Their research finds that, for voting behavior, personal means of contact such as face-to-face canvassing are more motivating than less personal ones such as telephone calls. In this scenario, less sociable households will be difficult to reach and therefore less likely to participate in the electoral process.

Our alternative measure of sociability takes the value of one if the households voted in the recent national elections, and zero otherwise. We obtain the information from the ALP Post Election survey, fielded between November 2008 and September 2009, with a response rate of 91.21%. The results with this new measure are reported in Table IX. In Panel A, we examine the households' probability of participation. We observe that our alternative sociability proxy is positive and remains significant in the presence of trust.

Table VIII. Stock market participation for households with various sociability and stock market literacy levels.

This table reports the fully standardized probit regression estimates of Long and Freeze (2006). Panel A reports regression estimates for households with high sociability and low stock market literacy and Panel B reports regression estimates for households with low sociability and high stock market literacy. We define high sociable households as those that participate in two or more social activities and low sociable households as those that participate in at most one social activity. Households with the stock market literacy index score above (below) the median are considered high (low) stock market literate. The robust standard errors are reported in parentheses. The dependent variable is a dummy variable equal to one for households owning stocks and zero otherwise. The explanatory variables are stock market literacy, sociability, trust in the stock market, and demographic variables. ***, **, and * denote significance at 1, 5, and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: households with high sociability and low stock market literacy					
Stock market literacy	0.212***		0.202***	0.056		0.037
	(0.051)		(0.051)	(0.046)		(0.045)
Sociability		0.103*	0.076	0.033	0.045	0.042
		(0.054)	(0.055)	(0.049)	(0.048)	(0.049)
Trust in stock market					0.235***	0.232***
					(0.047)	(0.047)
Demographics and behavioral characteristics	No	No	No	Yes	Yes	Yes
Pseudo R-squared	0.022	0.005	0.025	0.229	0.269	0.270
Observations	659	659	659	526	525	525
	Panel B: households with low sociability and high stock market literacy					
Stock market literacy	0.415***		0.411***	0.107**		0.107**
	(0.125)		(0.123)	(0.043)		(0.043)
Sociability		0.076	0.05	0.022	0.017	0.022
		(0.104)	(0.094)	(0.030)	(0.032)	(0.030)
Trust in stock market					0.014	0.001
					(0.033)	(0.035)
Demographics and behavioral characteristics	No	No	No	Yes	Yes	Yes
Pseudo R^2	0.085	0.003	0.086	0.483	0.425	0.483
Observations	178	178	178	128	128	128

Table IX. Analysis of stock market participation with the alternative sociability measure.

This table reports in Panel A the fully standardized probit regression estimates of Long and Freeze (2006), while Panel B reports the standardized beta estimates from ordinary least squares regressions. The robust standard errors are reported in parentheses. The dependent variable in Panel A is a dummy variable equal to one for households owning stocks and zero otherwise. In Panel B, the dependent variable is investment in stocks as a percentage of total financial assets. The explanatory variable sociability takes the value of one if the households have casted their votes in national elections, and zero otherwise. The other explanatory variables are stock market literacy, trust in stock market, and all demographic and behavioral variables previously considered. For readability, we only report estimates for key explanatory variables. ***, **, and * denote significance at 1, 5, and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: results for stock market participation						
Stock market literacy	0.138***		0.134***		0.113***		0.11***
	(0.03)		(0.031)		(0.031)		(0.031)
Sociability		0.069***	0.023			0.056**	0.008
		(0.023)	(0.024)			(0.023)	(0.023)
Trust in stock market				0.203***	0.165***	0.180***	0.166***
				(0.026)	(0.029)	(0.028)	(0.029)
Pseudo R^2	0.301	0.286	0.323	0.266	0.326	0.310	0.323
Observations	1332	1688	1316	1989	1331	1684	1315
	Panel B: results for share of investment in stocks						
Stock market literacy	0.095***		0.096***		0.085***		0.086***
	(0.019)		(0.019)		(0.019)		(0.019)
Sociability		−0.008	−0.013			−0.017	−0.021
		(0.008)	(0.010)			(0.008)	(0.0109
Trust in stock market				0.082***	0.083***	0.086***	0.084***
				(0.0183)	(0.023)	(0.019)	(0.023)
Adjusted R^2	0.124	0.130	0.123	0.135	0.130	0.136	0.129
Observations	1,239	1,552	1,234	1,575	1,239	1,550	1,234

However, corroborating our previous findings, when we introduce stock market literacy in the model specifications, the significant association of sociability on stock market participation vanishes, while stock market literacy remains significant, along with trust. Hence, it is stock market literacy rather than sociability that matters for households' probability of participation. In Panel B, we investigate the households' share of investment in stocks. Using the alternative measure of sociability, we obtain similar results to those reported in Section 4.2, with sociability negative and insignificant in all specifications. Hence, we conclude that stock market literacy and trust are the key indicators of households' stock ownership decisions.

6. Conclusion

In this article, we set up a theoretical framework and empirically assess the distinct channels of stock market literacy and trust that simultaneously explain households' stock ownership decisions. Additionally, we investigate whether the previously documented evidence for sociability is in fact capturing the role of stock market literacy and hence whether it is literacy, rather than sociability, that matters for understanding stock market participation. We construct a stock market-specific literacy measure and investigate the factors that explain households' decisions to participate in the stock market and their wealth allocation in the stock market. Moreover, using a rich set of behavioral characteristic variables, including past economic shocks, future expectations, optimism, risk aversion, self-confidence, sense of commitment, and time preference, we explain the heterogeneity observed in stock market participation.

The results indicate that stock market literate and trusting households are more likely to participate in stocks and invest a higher proportion of their wealth in the stock market. These two independent household characteristics concurrently remain significant even after accounting for several other important behavioral variables. Although one cannot place any causal interpretation on the results, we observe that changing stock market literacy by one standard deviation varies the probability of participation by 11%, while the equivalent change for trust in the stock market is around 17%.

Further, we find no association between sociability and participation, once we account for stock market literacy. In the additional analysis, we find that sociability is insignificant even among highly sociable households, if they have low stock market literacy, while conversely, we see a significant relation between stock market literacy and participation even among low sociable households. These results indicate that households with low sociability invest in stocks if they are stock market literate; and hence participation is explained by households' level of stock market literacy rather than their level of sociability.

Further, we observe that a large set of household behavioral characteristics play an important role for households' investment decision making. We find that past economic shocks and future expectations explain households' probability of participation and, conditional on participation, several other behavioral characteristics such as self-confidence and time preference, along with past economic shocks and future expectations, explain households' portfolio choice decision of how much to invest in stocks. Our findings aid the strategic endeavors of policy makers in promoting stock market participation.

Appendix A: Stock Market Literacy Questionnaire

S. No.	Question	Options
1	Which of the following statements describe the main function of the stock market?	a. The stock market helps to predict stock earnings b. The stock market results in an increase in the price of stocks c. The stock market brings people who want to buy stocks together with those who want to sell stocks d. I don't know
2	[Stocks/Bonds/Cap] are normally riskier than [Stocks/Bonds/Cap]	a. True b. False c. I don't know
3	Considering a long time period (for example 10 or 20 years), which asset normally gives the highest return?	a. Savings accounts b. Bonds c. Stocks d. I don't know
4	Normally, which asset displays the highest fluctuations over time?	a. Savings accounts b. Bonds c. Stocks d. I don't know
5	When an investor spreads his money among different assets, does the risk of losing money:	a. Increase b. Decrease c. Stay the same d. I don't know
6	What happens if you buy a company's stock?	a. You own a part of the company b. You have lent money to the company c. You are liable for the company's debts d. The company will return your original investment to you with interest e. I don't know f. You have lent money to the company g. You are liable for the company's debts h. You can vote on shareholder resolutions i. I don't know
7	A stock mutual fund combines the money of many investors to buy a variety of stocks.	a. True b. False c. I don't know
8	If you were to invest 1,000 in a stock mutual fund, it would be possible to have less than 1,000 when you withdraw your money.	a. True b. False c. I don't know

(continued)

(Continued)

S. No.	Question	Options
9	Which of the following statements is correct?	a. Once one invests in a mutual fund, one cannot withdraw the money in the first year b. Mutual funds can invest in several assets, for example invest in both stocks and bonds c. Mutual funds pay a guaranteed rate of return which depends on their past performance d. None of the above e. I don't know
10	Buying a [Single/Mutual] usually provides a safer return than a company stock?	a. True b. False c. I don't know
11	It is hard to find mutual funds that have annual fees of less than 1% of assets.	a. True b. False c. I don't know
12	Mutual funds pay a guaranteed rate of return.	a. True b. False c. I don't know d. False e. It depends on the type of 401(k) plan f. I don't know

Appendix B: Exact Wordings of Survey Questions

B.1. ECONOMIC SHOCK

Over the past months, there have been reports about the nation's financial problems including large drops in the stock market and in the housing market and increased rates of foreclosures and joblessness. As this financial crisis unfolds, more and more people have been affected in different ways. Have you (or your husband/wife/partner) been affected by these problems?

[ ] No [ ] Yes, a little [ ] Yes, a lot

The above question is taken from Effects of the Financial Crisis survey, measuring households' exposure to economic shock. We take the average of the responses over the 22 months between 2009 and 2012 as a proxy for economic shock (and scale them between zero and one). By using the average over multiple periods, we not only capture the intensity of the economic shock but also incorporate the frequency of the households' exposure to economic shock. A household facing the greatest number of

economic shocks with the highest impact will have the highest economic shock score.

B.2. FUTURE EXPECTATIONS

What are the chances that you (and your husband/wife/partner) will leave an inheritance totaling $10,000 or more? Include properties and other valuable items as well in your total estimate. Remember, 0% means absolutely no chance, and 100% means you are absolutely certain.

For this question, the respondents provide a percentage number between 0 and 100. The question is further repeated twice with an increased inheritance amount of $100,000 and $500,000 respectively. The questions are obtained from the HRS P Expectations and N Healthcare sections survey. This survey is fielded from September 2009 until August 2013 and has a response rate of 98.52%. Our proxy for future expectations is based on the inheritance-weighted average of the responses on the three questions (and scaled between zero and one).

B.3. OPTIMISM

i. If something can go wrong for me it will.
ii. I'm always optimistic about my future.
iii. In uncertain times, I usually expect the best.
iv. Overall, I expect more good things to happen to me than bad.

[ ] I strongly disagree, [ ] I somewhat disagree, [ ] I slightly disagree, [ ] I slightly agree, [ ] I somewhat agree, [ ] I strongly agree

Questions i to iv are taken from the Optimism submodule of the Health Expectations survey, which is fielded from July 2010 to May 2011, with a response rate of 89.49%. The households' score on optimism is the average of the responses to these four questions and numerated such that a score of zero corresponds to the households who are least optimistic and one corresponds to the households who are most optimistic.

B.4. RISK AVERSION

Suppose that you unexpectedly inherited 1 million dollars. You have the chance to take a risky but possibly rewarding investment option that has a 50–50 chance of doubling the money to 2 million dollars in a month,

and a 50–50 chance of reducing the money by one third, to 667,000 dollars in a month. Would you choose to invest in the risky asset?

[ ] Yes [ ] No

Following Barsky *et al.* (1997) and Hung, Parker, and Yoong (2009), we use the above question from the Risk and Time Preference submodule of the Department of Labor (DOL) Pilot survey, fielded between June 2011 and August 2011 with a response rate of 85.04%, to create the households' risk aversion proxy. If the respondent chooses the fixed income over the lottery option, the above question is repeated with a reduced level of potential loss in income by one-fifth and one-tenth, until the respondent switches from the fixed option to the lottery option. However, if the respondent chooses the lottery option in the first question, the questions are repeated with an increased level of potential loss in income by half and three-quarters, until the respondent switches from the lottery to the fixed amount option. If the proportion of potential loss that a household is willing to forgo is defined as $1-\lambda$ then λ is the risk aversion measure of the household and it is calculated at the point where the household decides to switch from the fixed income to lottery options (or vice versa). Hence, our risk aversion variable takes the value of zero for households that are total risk-takers, while takes the value of one for fully risk-averse households.

B.5. SELF-CONFIDENCE

I hardly ever expect things to go my way.

[ ] I strongly disagree [ ] I somewhat disagree [ ] I slightly disagree
[ ] I slightly agree

[ ] I somewhat agree [ ] I strongly agree

The Optimism submodule of the Health Expectations survey contains the aforementioned question that we use to create a proxy for households' self-confidence. We scale the responses between zero and one where zero corresponds to the households who strongly agree and one corresponds to the households who strongly disagree with the above statement.

B.6. SENSE OF COMMITMENT

i. How closely do you follow the suggestions of your doctor? Please indicate which of the below.

[ ] I closely follow the suggestions [ ] I loosely follow the suggestions
[ ] I rarely follow the suggestions [ ] I would like to follow the suggestions but I don't manage to do so

ii. Are you currently smoking cigarettes?
[ ] Yes [ ] No

iii. Do you go to a doctor to have a routine examination at least twice a year?
[ ] Yes [ ] No

iv. How many servings of alcohol do you have on a typical day? (One serving is a can of beer, a glass of wine or a shot of liquor.)
[ ] None [ ] 1 [ ] 2 [ ] 3 or more

v. How many times per week do you do some sort of moderate activity (like walking or raking the leaves) for at least 30 minutes?
[ ] None [ ] 1 [ ] 2 [ ] 3 or more

vi. All in all, how many hours per week do you do some sort of moderate activity?
[ ] 0 [ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ] 6 or more

vii. On average, how many servings of fruits and vegetables do you eat in a day?
[ ] 0 [ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ] 6 or more

viii. And how many servings of cereal fiber or whole grain (wheat bread, whole grain pasta, brown rice, oatmeal, whole grain breakfast cereal, bran or popcorn) do you eat in a typical day? A serving is one slice of bread, 1 ounce of breakfast cereal or $\frac{1}{2}$ cup of cooked cereal, pasta or rice. How many servings of refined grains (white bread, white rice, white pasta, white potatoes or low fiber cereals like crispy rice and corn flakes) do you eat in a typical day? A serving is one slice of bread, 1 ounce of breakfast cereal or $\frac{1}{2}$ cup of cooked cereal, pasta or rice.
[ ] 0 [ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ] 6 or more

The eight questions above are part of the Health Behaviors/Risk Factors submodule of the Health Expectations survey that we use to create a proxy for households' sense of commitment. All above questions reflect how responsibly households treat themselves. Households with a sense of commitment will also treat their own lives with responsibility/commitment. We take the average of the responses on these questions and scale them between zero and one to establish a proxy for sense of commitment.

B.7. TIME PREFERENCE

Imagine you just won a lottery prize and have to choose now between one of two options for receiving your payment. Which would you choose?
[ ] $1,000 today [ ] $1,250 a year from today

The question is further repeated two times with different amounts offered in one year's time: \$1,650 and \$1,100. These questions measuring time preference of the households is taken from the Risk and Time Preference submodule of Department of Labor (DOL) survey. If the households choose to receive money today then they prefer present as compared to the future. Our proxy for time preference is the average of the responses on the three questions (and scaled between zero and one).

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