

Stockholding and Financial Literacy New Results from a French Survey

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Abstract. This paper investigates the link between financial literacy and stock market participation. We provide an assessment of the level of financial literacy in the French population using standard and original measures. Based on seven questions asked to individuals about their financial knowledge, we construct two indices in order to account both for numeracy and financial culture. Regression results reveal strong causal impact of financial culture on the probability to hold stocks and weaker impact of numeracy. Thereby, we contribute solving the seminal participation puzzle.

Keywords: Stock Market Participation, Financial Literacy, Household Finance

1. Introduction

Financial literacy has emerged lately in the literature on portfolio choices (Remund, 2010). The standard theory (Arrow, 1965; Merton, 1969; Samuelson, 1969) states that portfolios should be complete and their structure should be independent of wealth and age. Empirically, only a small share of households hold stocks (52% in the United-States and 19% in France¹) and stockholding strongly depends on wealth and age (Guiso *et al.*, 2003). Extensions to the standard model such as transaction or holding costs (King and Leape, 1998), background risks (Kimball, 1993) and labor supply flexibility (Bodie *et al.*, 1992) have been brought to answer these puzzles. Our paper is in line with the literature questioning the participation puzzle (Haliassos and Bertaut, 1995) and investigating the link between financial literacy and financial behaviours. More precisely, we intend to pierce whether financial literacy is a key factor to explain why so few households hold stocks. Several papers provide evidence of a link between financial literacy and financial behaviors. Lusardi and Mitchell (2007) show that financially unsophisticated people are less likely to plan for retirement. Also, households tend to shy away from financial markets because they have little knowledge of stocks and the working of stock markets (Alessie *et al.*, 2011). Using cognitive abilities as a proxy for financial literacy, Christelis *et al.* (2010) find a causal impact of cognitive abilities on the probability to hold stocks.

The originality of this paper lies in the variety of questions about financial literacy we use. We decompose a synthetic measure of financial literacy obtained with a principal component factoring method into two indices reflecting numeracy and financial knowledge. We find that both our measures of financial literacy have large and significant impacts on the probability to hold stocks, in addition to standard explanatory variables (income, wealth, risk aversion, age, education, etc.). Financial culture appears as the main driver and its effect is even stronger when we control for endogeneity. Our findings contribute solving the seminal participation puzzle: heterogeneous levels of financial literacy account for low stockholding rates.

The paper is organized as follows: In section 2, we present the data and provide descriptive statistics. In section 3, we introduce our methodology. In section 4, we report our results. In section 5, we conclude and explore further areas of research.

2. Data and Descriptive Statistics

¹ Sources : Health and Retirement Study, 2004 ; *Enquête Patrimoine (INSEE)*, 2009.

We rely on an original household survey: PATER (2011)². The dataset contains very detailed information on financial literacy, preferences (risk aversion, time preferences, altruism), and expectations (income, stock prices, job insecurity), in addition to wealth, income, socio-economic, and demographic characteristics for a representative sample of French households. The dataset contains both standard measures of financial literacy present in other surveys (assessment of the understanding of simple and compound interests, nominal and real interests (inflation), expected value computation), and original measures such as self-assessment of financial culture and frequency of economic and financial press reading.

In the literature several measures of financial literacy have been proposed; one has nevertheless emerged as a benchmark. In 2004, Lusardi and Mitchell designed a questionnaire for the 2004 US Health and Retirement Study. Their aim was to *identify three economic concepts that individuals should have some understanding of, if they are to use them when making financial decisions*. These concepts were the understanding of interest compounding, inflation, and risk diversification. Simple questions were designed to assess the understanding of these three concepts. Other assessments of financial literacy exist in the literature: Alessie *et al.* (2011) add to the benchmark a more complex set of questions in order to capture knowledge of financial markets and financial products; Christelis *et al.* (2010) rely on measures of cognitive abilities.

Table 1 - Weighted percentage of correct and incorrect answers for standard measures

	Simple interest	Compound interest (1)	Compound interest (2)	Inflation	Expected value
Correct	72.84	47.98	18.97	61.18	33.34
Incorrect	13.15	34.8	57.98	11.45	66.61
Do Not Know	9.04	11.53	23.05	21.32	0.05

Note: Categories may not sum up to 100% because of rounding and refusals. Source: PATER 2011.

Based on our survey, Table 1 reports results from standard measures of financial literacy, the proportion of respondents correctly answering depends on the complexity of the question as well as on the wording³. For example, about three quarters of the sample answer correctly the question on simple interest computation while this share drops to less than a half for interest compounding and less than a fifth when the question on interest compounding is asked with a more complex framing appealing to Monopoly board game. Less than two thirds of the sample understand the impact of inflation on purchasing power and only one third is able to compute expected values. These figures tend to show that financial literacy should not be taken for granted in the population. Results are in line with other countries' data: percentages of correct answers for compound interests range from 35% in Sweden to 85% in Netherlands and from 59% in Japan to 75% in Germany for inflation (Lusardi, 2011).

Table 2 - Weighted percentage of answers by category for original measures

Panel A: Reading of economic and financial press					
Never	Rarely	Sometimes	Often	N/a	
63.13	18.89	10.97	3.73	3.28	
Panel B: Financial culture					
None	Very low	Low	Average	High	N/a
20.75	27.75	26.67	19.4	1.76	3.67

Source: PATER 2011.

Regarding original measures of financial literacy provided in PATER 2011 (Table 2), nearly two thirds of the sample never read the economic and financial press while only less than a third reads it rarely or

² This survey was designed by Luc Arrondel and André Masson, researchers at the Paris School of Economics, and administered by Taylor-Nelson Sofres, a professional agency paid with research funds from the *Agence Nationale pour la Recherche*. A paper-based questionnaire was sent in November 2011 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 the post in exchange of around 25€ in coupon-tickets. 3,616 respondents sent their questionnaires back, representing a 90% response rate. The age of the respondents varies from 18 to 100 (with mean 49.2); 47.6% of our sample are male; 35.7% have a college education and 25.7% are retired.

³ See Appendix for the exact wording of questions.

sometimes (Panel A). More than 50% of respondents declare to have a very low or low level of financial culture and about a fifth states not to have any financial culture (Panel B). Those results suggest that people have indeed a low level of financial literacy and that they are aware of their shortcomings.

So as to analyze the impact of financial literacy on stockholding, we construct a meaningful synthetic variable of financial literacy with a factor analysis. We apply the principal component factoring method on our seven variables⁴ of financial literacy. The analysis brings out two factors dividing our set of variables in two groups: those that involve information processing and computations; those that are linked to culture and knowledge. To account for both dimensions of financial literacy, we construct two distinct indices using rotated factor loadings that we respectively label *numeracy* and *financial culture*⁵.

3. Methodology

In order to evaluate the key determinants of stocks market participation, we consider a simple model in which households compare the utility gain from owning stocks with the costs, thus the net utility gain writes:

$$Y_h^* = X_h' \beta + \varepsilon_h.$$

The term X_h contains variables influencing stockholding such as age, education, wealth, income, occupation, risk aversion, expectations, background risks (on health, income, and unemployment), bequest, and financial education. Coefficients of relative risk aversion (CRRA) are computed using lottery choices following Barsky et al. (1997). A household h holds stock provided the latent variable Y^* is greater or equal to zero. Given that we only observe whether the household holds or not stocks ($Y_h = 1$ or $Y_h = 0$) we can estimate this model using either a linear probability model (LPM) or a probit model.

We strongly suspect the financial culture index to be an endogenous variable and therefore its coefficient to be biased. Indeed, stockholding can foster financial literacy through learning effects. Reverse causality leads the coefficient on financial culture to be upward biased. Also, measurement errors bias the coefficient towards zero. The overall effect then depends on the intensity of each bias. Concerning the numeracy index, it refers to basic numerical ability and it is then unlikely to be affected by stockownership. We can therefore treat this variable as exogenous (Christelis *et al.*, 2010).

The instruments chosen to treat the endogeneity should be valid and relevant. Given these conditions, financial literacy of parents appears as an appropriate instrument provided we control for potential inheritance of financial portfolios as we do with the variable *bequest* in our regressions. There are three variables appearing as relevant proxies for parents' financial literacy in the survey. These variables regard whether parents planned for retirement, owned a life insurance policy or read the economic and financial press. We use these variables so as to instrument the financial culture index.

4. Results

⁴ The variables are standardized to have zero mean and standard deviation equal to one.

⁵ *Numeracy* and *financial culture* respectively vary from -1.63 to 1.77 and from -1.14 to 2.94 with zero mean and standard deviation equal to one.

Table 3 - Probit model

Dep. Var. Stockholding	No financial literacy		Including financial literacy	
Financial culture			0.1***	(0.01)
Numeracy			0.04***	(0.01)
Wealth <75k (ref.)	-	-	-	-
Wealth [75k,225k[	0.11***	(0.03)	0.1***	(0.03)
Wealth [225k,450k[	0.19***	(0.03)	0.16***	(0.03)
Wealth ≥450k	0.42***	(0.04)	0.33***	(0.05)
CRRA ≥3.76 (ref.)	-	-	-	-
CRRA [2;3.76[	0.04	(0.03)	0.02	(0.03)
CRRA [1;2[	0.07**	(0.03)	0.06*	(0.03)
CRRA [0;1[	0.13**	(0.05)	0.09*	(0.05)
CRRA no answer	0.06	(0.06)	-0.04	(0.05)
Expectations	0.001***	(0.000)	0.001***	(0.000)
Pseudo-R ²	0.17		0.23	
Observations	2,047		2,047	

Other controls: age, education, income, background risks and bequest. Marginal effects reported and standard errors in parenthesis.

Table 3 reports results from the probit regression without controlling for endogeneity. In the first column, we display results for the standard determinants of stockholding without financial literacy. We find that wealth has a strong and significant impact on the probability to hold stocks; the marginal effect is increasing with wealth. Risk aversion is negatively associated to stockholding; respondents with high coefficients of relative risk aversion (CRRA) are less likely to participate in the stock market. Finally, respondents expecting an increase in stock market prices over the next five years are more likely to hold stocks. These results are in line with standard theory's predictions.

In the second part of the table, the coefficients of financial literacy indices are positive and highly significant. The introduction of these two variables captures some of the impacts of wealth and risk aversion, stressing the positive correlation between being financially literate and being wealthy or low risk averse. Those first results therefore suggest that financial literacy plays its own part in the process of deciding whether to hold or not stocks as a complement to standard determinants of stockholding.

Table 4 - Simple and IV regressions of stockholding on financial literacy

Dep. Var. Stockholding	Simple regressions		IV regressions	
	LPM	Probit	GMM	Probit
Financial culture	0.11*** (0.01)	0.1*** (0.01)	0.28*** (0.06)	0.26*** (0.04)
Numeracy	0.03*** (0.01)	0.04*** (0.01)	0.02 (0.01)	0.03** (0.01)
R ² / Pseudo R ²	0.24	0.23	0.31	-
Observations	2,047	2,047	2,047	2,047
Controls	Yes	Yes	Yes	Yes

Marginal effects reported for probit models and standard errors in parenthesis.

Table 4 reports simple and instrumental variable regressions. In both cases, we performed linear and probit regressions for robustness; the coefficients obtained are very close for the two methods. We find that instrumenting our endogenous variable leads to a significant increase in the coefficients thereby correcting for the global downward bias. The results suggest that a one-unit increase in the financial culture index leads the predicted probability of stock market participation to increase by 26 to 28 percentage points.

5. Conclusion

Using data from an original survey, we assessed the level of financial literacy for a representative sample of the French population. We distinguished between two dimensions of financial literacy: numeracy and financial culture. We found a strong link between financial literacy and stock market participation. The link

was even stronger when we instrumented to control for the endogeneity of financial culture. These results help filling the gap between standard portfolio theory predictions and empirical facts. Heterogeneity in the levels of financial literacy accounts for portfolios incompleteness apart from education and standard determinants of portfolio choice. Further research should investigate the channel through which financial literacy impacts stockholding so as to identify implications for public policies.

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7. Appendix

Financial literacy questions in PATER 2011

	Wording of questions	Proposed answers
Simple interests	“Suppose you had 1000€ in a savings account and the interest rate was 2% per year. After 1 year, how much do you think you would have in the account?”	1) Less than 1020€ 2) 1020€ 3) More than 1020€ 4) Don't know
Coumpound interests (1)	“And after 5 years, how much do you think you would have if you left the money to grow?”	1) Less than 1100€ 2) 1100€ 3) More than 1100€ 4) Don't know

Compound interests (2)	"You play Monopoly. You have earned 1000€ and the bank offers to pay 20% every time you go through the corner square GO. You need 2000€ to buy a hotel. How often do you need to pass through the first corner square to buy the hotel?"	1) 2 times 2) 3 times 3) 4 times 4) 5 times 5) More than 5 times 6) Don't know
Nominal/Real interests (Inflation)	"Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?"	1) More than today 2) Same as today 3) Less than today 4) Don't know
Expected value	"You toss a coin and earn 1€ each time you get "heads". How much do you think you would earn after 100 flips?"	<i>Free answer</i>
Financial culture	"Would you say your financial culture is...?"	1) High 2) Average 3) Low 4) Very low 5) None
Reading of economic and financial press	"How often do you read the economic and financial press?"	1) Often 2) Sometimes 3) Rarely 4) Never