FINANCIAL LITERACY AND VULNERABILITY: LESSONS FROM ACTUAL INVESTMENT DECISIONS

Research Challenge
Technical Report

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**THINK FORWARD
INITIATIVE**

FINANCIAL LITERACY AND VULNERABILITY: LESSONS FROM ACTUAL INVESTMENT DECISIONS [*]

TECHNICAL REPORT

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Abstract

This report summarizes the main results of a study in which I match administrative panel data on portfolio choices with survey measures of financial literacy. I show that, even controlling for various demographic and portfolio characteristics, less sophisticated households – those with lower levels of advanced financial literacy – experience lower risk adjusted returns in their investments. Importantly, this relationship can only be explained by looking at specific portfolio rebalancing behaviors. Less sophisticated investors hold a lower exposure to risk precisely at times when risky funds are expected to other higher returns. Less literate households are more likely to move their wealth from funds that have experienced relatively lower returns to funds that have experienced relatively higher returns in the recent past, hence chasing trends. They are more likely to display portfolio inertia, implying that their actual risk exposure is further away from their desired risk exposure. Their returns tend to fall short of those that they would have earned without rebalancing their portfolios. I conclude by discussing the implications of these results for financial institutions.

1. Introduction

Understanding financial vulnerability is a topic of increasing interest for academics and policy makers. Households are required to take more and more (possibly complex) decisions in various financial domains, which result in an increasing need for sophisticated tools to make efficient investment choices.

Not all households are well equipped. It is now established that household portfolios display large heterogeneity; and some portfolios appear suboptimal when confronted to standard benchmarks (Campbell 2006; Calvet, Campbell and Sodini 2007). It is also well known that households vary substantially in their financial literacy; some households seem unfamiliar with basic financial principles (Lusardi and Mitchell 2011).

Understanding whether and how less sophisticated households – those with lower levels of advanced financial literacy – tend to hold suboptimal portfolios would allow to better assess whether households are truly making mistakes. Moreover, if mistakes seem to occur, it is important to get a sense of how costly they are and of how much financial literacy can help. This would inform the large debate on whether it is worth investing in financial education.[3] This debate would also benefit from having a clearer view of how financial sophistication affects financial choices (Ambuehl, Bernheim and Lusardi (2014).

An important recent contribution appears in Von Gaudecker (2015). Combining detailed survey data on household portfolios with measures of financial literacy, he shows that less literate households experience lower risk-adjusted returns. This suggests that portfolio under-diversification is likely to result from investment mistakes.

These mistakes can have important aggregate consequences in terms of investors' welfare, market efficiency and stability, and at a broader level on economic growth. A recent theoretical literature shows that differences financial literacy amplify differences in wealth accumulation patterns and are a key determinant of wealth inequality (Lusardi and Mitchell 2014; Lusardi, Michaud and Mitchell, 2017).

The mechanisms behind the relationship between lack of financial sophistication and investment performance are much less understood. This is key not only to assess the determinants and the consequences of financial vulnerability but also for any policy aimed at improving households' ability to make the best use of financial services.

Part of the challenge is empirical. It is difficult to find data that combine detailed information on household portfolios with measures of household sophistication. Administrative data typically lack direct measures of financial sophistication.

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[3] See e.g. Greenspan (2002); Bernanke (2006); Schuchardt, Hanna, Hira, Lyons, Palmer and Xiao (2009); see Willis (2011) for a critical view.

Survey data typically lack the details and the panel structure necessary to explore portfolio dynamics. An important dimension of heterogeneity may arise from how households rebalance their portfolios over time in response to market conditions or to their own returns.

In Bianchi (2017), I exploit administrative panel data on portfolio choices matched with survey measures of financial literacy. These data are particularly interesting for these purposes. First, they provide a very rare opportunity to combine detailed panel data on actual investment choices with survey measures on investors' preferences, beliefs and sophistication. This allows assessing the effects of financial sophistication controlling for other possibly confounding behavioral factors. Second, they are representative of the (French) population and they focus on a widespread investment product, called *assurance vie*, which typically represent a substantial fraction of investors' financial wealth. Households' main choice is how to allocate their wealth between relatively safe and relatively risky funds, and how to change their allocations over time.

I document several novel patterns that contributes to a better understanding of the relationship between financial literacy and suboptimal investment choices. The data allow to classify households on an index of financial literacy, based on their ability to correctly answers basic questions on household finance. Financial literacy can be related to household demographics such as wealth, income and education. Even controlling for demographic and portfolio characteristics, I show that less

sophisticated households experience lower risk adjusted returns in their investments.

I also show that the relationship between low literacy and low returns can only be explained by looking at specific portfolio rebalancing behaviors, as opposed to standard cross-sectional variations in stock market participation or risk taking. In particular, I show that less sophisticated investors hold a lower exposure to risk (a lower fraction of risky assets in their portfolio) precisely at times when risky funds are expected to other higher returns. Less sophisticated investors are also more likely to display portfolio inertia, and this implies that their actual risk exposure is further away from their desired risk exposure. They are more likely to act as trend-chasers, meaning that they move their wealth from funds that have experienced relatively lower returns to funds which have experienced relatively higher returns in the recent past. These behaviors are key to understand their lower performance and they suggest that less sophisticated investors naively try to time the market.

In what follows, I elaborate on these results as well on some of their implications for our understanding of the effects of financial literacy and financial vulnerability. I refer to Bianchi (2017) for a more systematic analysis and for additional results.

2. Methodology

Our portfolio data describe the value and the detailed composition of clients' holdings of an investment product called *assurance vie*. A typical *assurance vie* contract establishes the types of funds in which the household wishes to invest and the amount of wealth allocated to each fund. A key distinction is between relatively safe vs. relatively risky funds.

The first assets, which are called *Euro funds*, are basically bundles of bonds. Their returns are rather stable and the capital invested is guaranteed by the company. The second funds are bundles of risky assets (typically stocks), called *UC funds*. It is made clear to investors that allocating wealth to *UC fund* provides larger expected returns and larger risk. To give a sense of the trade-off, in Figure 1, we plot the average return of *Euro funds* and *UC fund* in each month of our sample. It appears quite clearly that *Euro funds* provide more stable returns.

Over time, clients are free to change the composition of their portfolios, make new investment and withdraw money as they wish. *Assurance vie* contracts are widespread in France, they are the most common way through which households invest in the stock market.

According to the French National Institute for Statistics, 41% of French households held at least one of these contracts in 2010. Accordingly, our sample can be considered broadly representative. Our data record clients' portfolio of contracts at a monthly frequency from September 2002 to April 2011. The sample includes 511 clients. These contracts can represent a sizeable fraction of households' financial wealth. In our sample, the average value of a portfolio is 32,700 euros, the maximum is 590,000 euros.

Figure 1. Returns of *UC funds* and *Euro Funds*
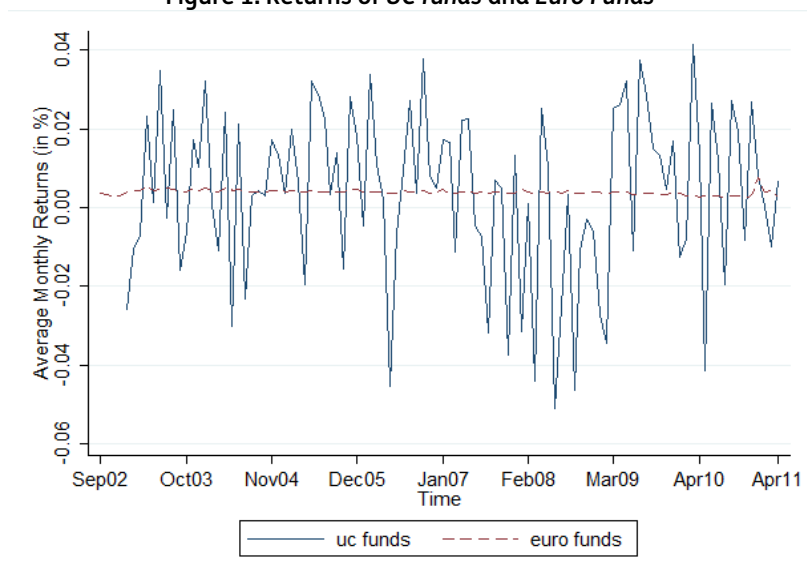
Note: This figure plots the average monthly returns of *Euro funds* and *UC funds* in our sample period, from September 2002 to April 2011.

While not covering the whole household portfolio, investments in *assurance vie* often represent a substantial fraction of investors' financial wealth.[4] Moreover, when investing in these contracts, households face the same menu of assets (the funds offered by the company), and they select among predefined funds with a given risk profile. This choice may be less subject to behavioral biases than direct stock picking. As we have detailed information about the composition of each contract, we can define the returns experienced in a given month by each fund using *Datastream*.

2.1 Financial Literacy

Portfolio data are matched to data from a survey we have designed, which was administered by a professional surveying company at the end of 2010. With this survey, we have two main purposes.

First, we wish to gather information about demographic characteristics, wealth and portfolio holdings outside the company. This helps having a broader picture of the clients' financial activities.

Second, we wish to have an idea of clients' financial literacy. Our main measure of financial literacy is based on the answers to a series of questions related to (basic) principles of household finance. The measure follows the spirit of the methodology proposed by Lusardi and Mitchell (2008) and it covers various aspects of financial sophistication: ability to compute compound interests, knowledge of financial products, information about market trends, math ability. Specifically, we ask the following questions:

1. Suppose that you have 1000€ in a savings account that offers a return of 2% per year. After five years, assuming that you have not touched your initial deposit, how much would you own?
   a) Less than 1100€;
   b) b)Exactly 1100€;
   c) More than 1100€;
   d) I don't know.
2. *Livret A* are used to finance social housing.
3. In 2008, the value of the CAC 40 Index of the largest listed companies decreased by more than 50%.
4. The value of the CAC 40 Index increased during 2009.
5. A share gives the right to fixed revenue.
6. Assurance vie contracts bene.t from special fiscal treatment.
7. 40 divided by one-half, plus 10 equals 30.

For questions 2-7, the choice was among:
   a) True
   b) False
   c) I don't know

The correct answers for question 2-7 were (c), (a), (b), (a), (b), (a), and (b), respectively. The percentages of correct answers were 53%, 57%, 62%, 63%, 89%, 84%, and 38%, respectively.

We define the variable *Financial Literacy* as the number of correct answers to these questions. The variable takes values between 1 and 7; with an average around 4.5 and a standard deviation of around 1.5.

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[4] For the median household in our sample, the value of the contracts that we observe amounts to approximately 50% of its financial wealth.

In our sample, *Financial Literacy* is positively correlated to *Education*, *Income* and *Wealth*. It is negatively correlated with *Married* and *Female*. Comparing the magnitude of the effects (scaling for the standard deviation of the corresponding variables), we observe that somewhat intuitively *Education* and *Wealth* display the largest effects. We also observe that investors with higher financial literacy display larger stock market participation in the sense that they are more likely to hold stocks (either directly or indirectly) in his global portfolio and to hold a larger variety of financial products. These correlations are consistent with other findings in the literature.[5]

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[5] Guiso and Jappelli (2008) show that financial literacy is positively correlated with education, income and wealth and negatively correlated with being female. Almenberg and Dreber (2015); and Fonseca, Mullen, Zamarro and Zissimopoulos (2012) discuss the gender gap in financial literacy. On stock market participation, see Christelis, Jappelli and Padula (2010); Van Rooij, Lusardi and Alessie (2011); Grinblatt, Keloharju and Linnainmaa (2011); and Arrondel, Debbich and Savignac (2015).

3. Results

3.1 Low Literacy and Low Returns

We look at whether financial literacy relates to the returns (net of fees) that households experience in their portfolios. In Figure 2, we plot annual returns as a function of financial literacy, both non parametrically (through local polynomial regressions) and imposing a linear fit. The relation is clearly positive. In Bianchi (2017), this is shown more systematically. We regress the returns on the portfolio held by individual i at time t, on a set of standard demographic variables (age, gender, education, marital status, income, wealth), some portfolio characteristics (such as measures of its riskiness) and month-year fixed-effects. We show that one extra unit of financial literacy is associated with 0.08% higher returns, relative to an average return of 4.3%. This means, those with the highest level of financial literacy experience about 0.5% higher returns than those with the lowest level of literacy.

These results are not driven by a different exposure to risk. We add to our regressions various measures of risk: the risky share, defined as the value of risky assets over the total value of the portfolio at time t; the standard deviation of the returns in the previous 12 months, the beta of the returns in the previous 12 months on the French stock market index CAC40, the skewness of the returns and the co-skewness relative to the French stock market index CAC40. We find that the estimated impact of financial literacy is only slightly reduced. Once controlling for risk, one extra unit of financial literacy is associated with about 0.07% higher returns, which corresponds to a 0.4% difference between the most and the least literate households. These magnitudes are comparable to Von Gaudecker (2015), who shows that least sophisticated households lose about 50 bps per year.

Figure 2. Financial Literacy and Portfolio Returns
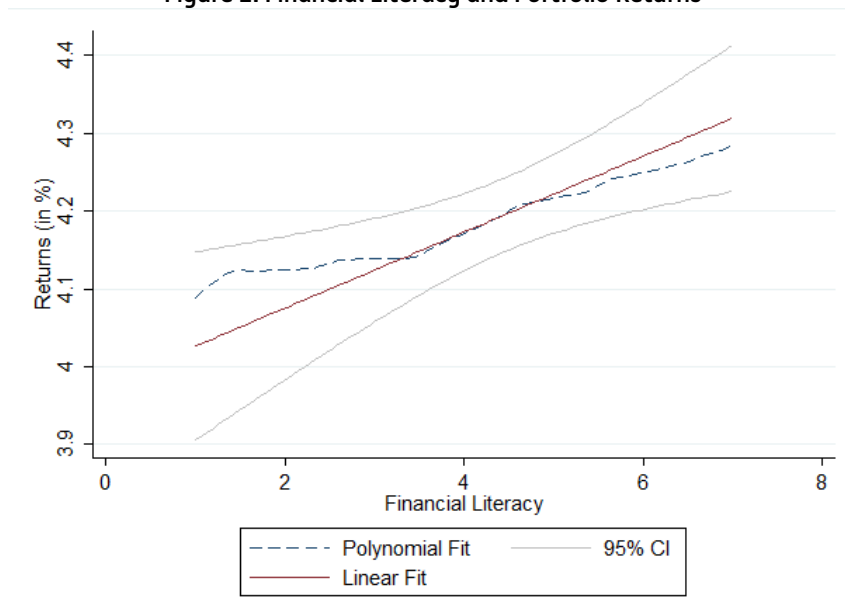
Note: This figure plots annual returns (in %) over our 1-7 index of financial literacy. The middle solid line corresponds to linear estimates, the upper and lower solid lines draw the 95% confidence interval. The dotted line corresponds to non-parametric estimates through local polynomial regressions (local-mean smoothing estimated with the Epanechnikov kernel and the rule-of-thumb bandwidth.)

3.2 Low Literacy and Market Timing

In order to better understand the previous correlations, we first look at whether more sophisticated households always take more risk. This is not the case; instead, their risk exposure varies systematically with market conditions. More sophisticated households hold a larger risky share that is, a larger fraction of risky funds in their portfolio – when risky funds are expected to offer higher returns.

For each month, we compute the average risky share for households with financial literacy above the median in our sample (equal to 4) and the average risky share for those with financial literacy below the median. The difference between the two defines the variable *Difference in Risky Share*, which measures the difference in risk exposure between more literate and less literate households at the end of $t 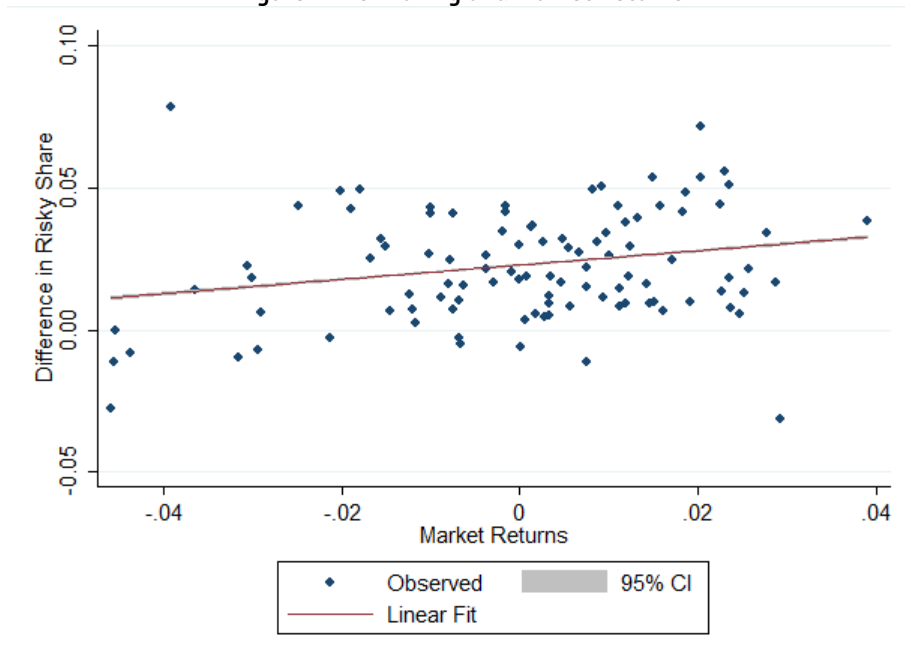− 1$. We also construct the variable *Market Returns* as the difference between the average monthly return of risky assets and that of riskless assets at t. In Figure 3, we plot *Difference in Risky Share* and *Market Returns* over time. We observe that the two curves tend to move together, suggesting that more literate households hold a relatively larger risky share when expected returns are higher. Similarly, Figure 4 plots *Difference in Risky Share* as a function of *Market Returns* and also suggests a positive relationship between the two.

This pattern is uncovered more precisely in Bianchi (2017), where it is shown that an increase in *Market Returns* by 1% is associated to an increase of the risky share by 2% for each extra unit of financial literacy. These results suggest that one way in which more sophisticated households experience larger returns is by holding a larger exposure to risk when market returns are higher.

Figure 3. Risk Taking and Market Returns over time
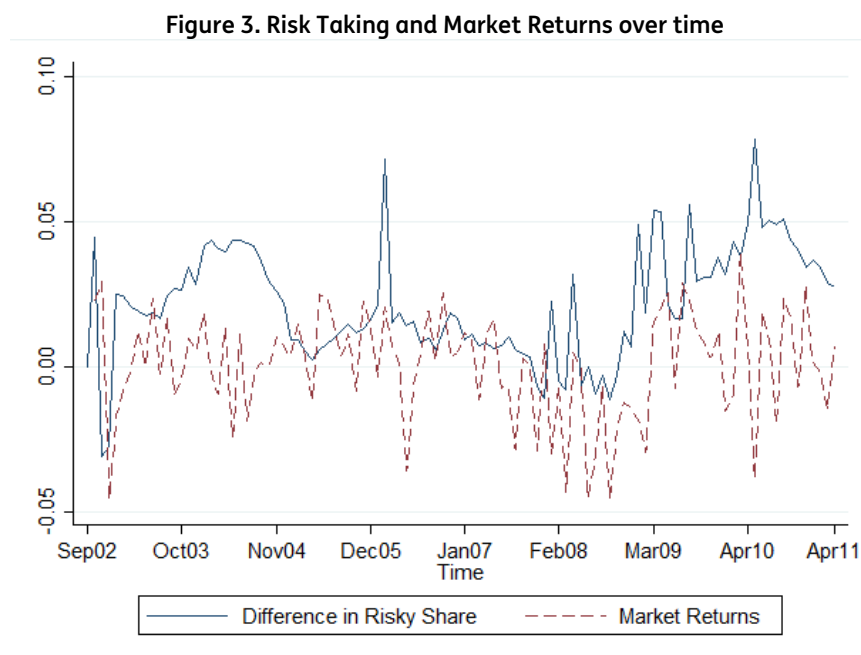
Note: This figure plots Difference in Risky Share and Market Returns in our sample period, from September 2002 to April 2011. Difference in Risky Share is the difference between the average risky share at the end of month *t-1* for households with financial literacy above the median in our sample (equal to 4) and the average risky share for those with financial literacy below the median. Market Returns is the difference between the average return of risky assets and that of riskless assets at month *t*.

Figure 4. Risk Taking and Market Returns

Note: On the vertical axis, *Difference in Risky* Share is the difference between the average risky share at the end of month *t-1* for households with financial literacy above the median in our sample (equal to 4) and the average risky share for those with financial literacy below the median. On the horizontal axis, *Market Returns* is the difference between the average return of risky assets and that of riskless assets at month *t*. The dots correspond to the observed relation in our sample period, the middle solid line corresponds to the linear fit, the upper and lower solid lines draw the 95% confidence interval.

3.3 Low Literacy and Trend Chasing

We then investigate how the direction of rebalancing varies with financial literacy. Trend-chasing behaviors have been often associated with a lack of sophistication, as proxied, for example, by limited market experience.[6] We can directly test this relationship by examining how households move their wealth between safe and risky funds, depending on which funds have gained value relative to others. We show that more literate households are more likely to act as contrarians: they tend to move their wealth toward funds that have experienced relatively lower returns in the past. This allows them to hold their risky share relatively constant over time.

The rebalancing behavior affects how the risky share evolves over time. In Figure 5, we plot the change in risky share over time. We divide the sample in two: The solid line refers to households with financial literacy below the median in the sample; the dotted line refers to households with financial literacy below the median. We observe that more literate households tend to display lower fluctuations in their risky share, suggesting that they may be more likely to act as rebalancers.

In fact, we find a positive relationship between financial literacy and the probability of being a rebalancer. In magnitude, an additional unit of financial literacy increases this probability by 1% relative to an average of 30%.

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[6] See Goetzmann and Kumar (2008); Greenwood and Nagel (2009); and Bilias, Georgarakos and Haliassos (2010).

Finally, we investigate whether, by rebalancing, more sophisticated households earn higher returns. We compare the return experienced in month t with the passive returns in month t; defined as the return that the household would have experienced had it not rebalanced its portfolio. We find that one additional unit of financial literacy increases the probability that experienced returns exceed passive returns by 1.2%, relative to an average of 61%. These results suggest that rebalancing behaviors are an important determinant of portfolio returns: The returns experienced by more sophisticated households tend to exceed those that they would have earned without rebalancing their portfolios. More sophisticated households are more likely to buy funds that provide higher returns than the funds that they sell.

Figure 5. Change over Time in Risk Exposure
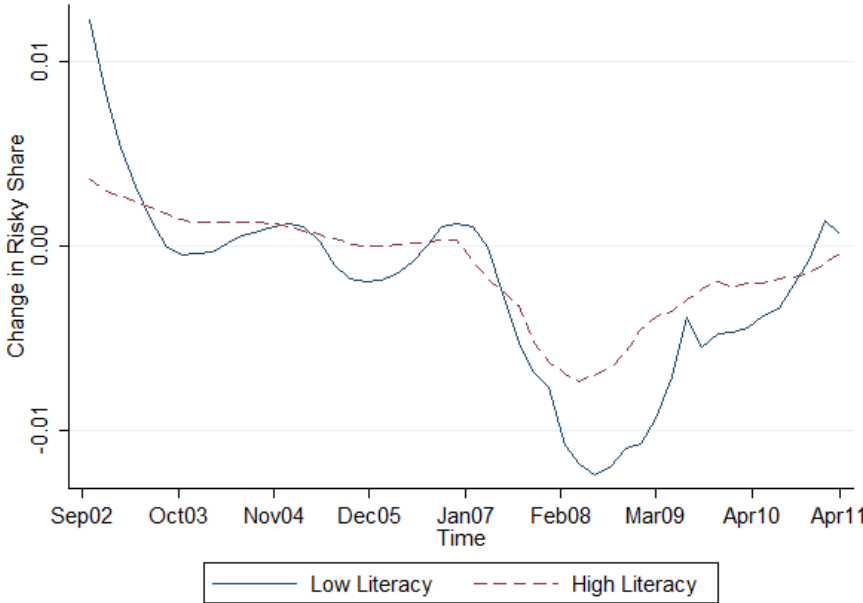
Note: This figure plots the change in the risky share ΔX_{it} over time through local polynomial regressions (local-mean smoothing estimated with the Epanechnikov kernel and the rule-of-thumb bandwidth). The sample is split in two. High literacy refers to households with financial literacy above the median in our sample (equal to 4). Low literacy refers to households with financial literacy below the median.

4. Concluding remarks

The aim of this study has been to uncover novel mechanisms relating financial literacy to financial outcomes. In this way, we believe that our results can inform the substantial policy debate on the effects of financial education (Greenspan 2002; Bernanke 2006; Schuchardt et al. 2009; Willis 2011).

Our results have clear implications for financial institutions. European regulation for example requires financial institutions to gather information about their clients' objectives and preferences before selling them financial products. These results show that clients' financial literacy should be carefully taken into account when advising individual investors.

Financial literacy can be measured in a meaningful way. Together with a series of other papers (reviewed e.g. in Lusardi and Mitchell 2014), the present work provides a simple method to elicit investors' degree of financial sophistication. Moreover, it shows that lack of financial literacy can make investors exposed to significant mistakes. The extent of these mistakes is severely under-estimated in traditional studies focusing only on static choices and on cross-sectional variations in stock market participation or risk taking. These mistakes are predictable and sometimes large, and they seem of first order importance when assessing households' financial vulnerability.

References

Almenberg, J. and Dreber, A. (2015), 'Gender, stock market participation and financial literacy', *Economics Letters* 137, 140-142.

Ambuehl, S., Bernheim, B. D. and Lusardi, A. (2014), 'Financial education, financial competence, and consumer welfare'. GFLEC Working Paper 2014-6.

Arrondel, L., Debbich, M. and Savignac, F. (2015), 'Stockholding in France: the role of financial literacy and information', *Applied Economics Letters* 22(16), 1315-1319.

Bernanke, B. S. (2006), 'Financial literacy', Testimony before the Committee on Banking, Housing, and Urban Affairs of the United States Senate, May 23, 2006.

Bianchi, M. (2017), 'Financial literacy and portfolio dynamics', *Journal of Finance – forthcoming*.

Bilias, Y., Georgarakos, D. and Haliassos, M. (2010), 'Portfolio inertia and stock market fluctuations', *Journal of Money, Credit and Banking* 42(4), 715- 742.

Calvet, L. E., Campbell, J. Y. and Sodini, P. (2007), 'Down or out: Assessing the welfare costs of household investment mistakes', *Journal of Political Economy* 115(5), 707-747.

Campbell, J. Y. (2006), 'Household finance', *Journal of Finance* 61(4), 1553- 1604.

Christelis, D., Jappelli, T. and Padula, M. (2010), 'Cognitive abilities and portfolio choice', *European Economic Review* 54(1), 18-38.

Fonseca, R., Mullen, K. J., Zamarro, G. and Zissimopoulos, J. (2012), 'What explains the gender gap in financial literacy? the role of household decision making', *Journal of Consumer Affairs* 46(1), 90-106.

Goetzmann, W. N. and Kumar, A. (2008), 'Equity portfolio diversification', *Review of Finance* 12(3), 433- 463.

Greenspan, A. (2002), 'Financial literacy: A tool for economic progress', *The Futurist* 36(4), 37-41.

Greenwood, R. and Nagel, S. (2009), 'Inexperienced investors and bubbles', *Journal of Financial Economics* 93(2), 239-258.

Grinblatt, M., Keloharju, M. and Linnainmaa, J. (2011), 'IQ and stock market participation', *Journal of Finance* 66(6), 2121-2164.

Guiso, L. and Jappelli, T. (2008), 'Financial literacy and portfolio diversification', CSEF Working Paper 212.

Lusardi, A., Michaud, P.-C and Mitchell, O. S. (2017), 'Optimal financial knowledge and wealth Inequality', *Journal of Political Economy* 125(2), 431- 477.

Lusardi, A. and Mitchell, O. S. (2008), 'Planning and financial literacy: How do women fare?', *American Economic Review* 98(2), 413-417.

Lusardi, A. and Mitchell, O. S. (2011), 'Financial literacy around the world: an overview', Journal of *Pension Economics and Finance* 10(04), 497-508.

Lusardi, A. and Mitchell, O. S. (2014), 'The economic importance of financial literacy: Theory and evidence', *Journal of Economic Literature* 52(1), 5-44.

Schuchardt, J., Hanna, S. D., Hira, T. K., Lyons, A. C., Palmer, L. and Xiao, J. J. (2009), 'Financial literacy and education research priorities', *Journal of Financial Counseling and Planning* 20(1), 84-95.

Van Rooij, M., Lusardi, A. and Alessie, R. (2011), 'Financial literacy and stock market participation', *Journal of Financial Economics* 101(2), 449-472.

Von Gaudecker, H.-M. (2015), 'How does household portfolio diversification vary with financial literacy and financial advice?', *Journal of Finance* 70(2), 489-507.

Willis, L. E. (2011), 'The financial education fallacy', *American Economic Review* 101(3), pp. 429-434.

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