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FINANCIAL LITERACY AND RESILIENCE WHEN SURVEY RESPONDENTS PREFER GUESSING TO ADMITTING IGNORANCE

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Financial literacy and resilience when survey respondents prefer guessing to admitting ignorance

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Abstract

The respondent's propensity to guess randomly even though it is possible to answer "I do not know" is a plausible source of measurement error in assessments of financial literacy. Using data from two consecutive waves of a survey on financial literacy and resilience of Italian households during the Covid-19 pandemic we model and estimate the respondents' propensity to guess rather than admit ignorance and find that it implies sizable probabilities of misclassification for standard financial literacy indicators. Classifying as financially literate only respondents who answer correctly in both waves of the survey yields more significant and plausible estimated coefficients of financial literacy as an explanatory variable for financial resilience: truly literate individuals have a lower probability of having difficulty to make ends meet at the end of the month and of not being able to face a mid-size emergency expense; individuals who guessed and were lucky enough to appear literate show lower financial resilience.

Keywords: financial literacy; financial resilience; misclassification.

JEL Classification: D14, D83, G51, G53.

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1. Introduction

Research has extensively analyzed the implications of the lack of basic competences in economics and finance: worldwide only one adult out of three knows the very basic notions of interest rate, inflation and risk diversification (Klapper and Lusardi, 2022). A vast literature documents that financial literacy is sensibly related to behavioral and outcome covariates in survey data (van Rooij et al., 2011; Lusardi and Mitchell, 2023). It improves personal finance in a life cycle perspective, from youth to the working age to retirement, as well as public decisions in the social sphere (Fornero and Lo Prete, 2019 and 2023).

An equally vast literature discusses the reliability of survey indicators (Tourangeau, 2021). Reliability can be assessed by statistical analysis of repeated answers to the same question or of answers to related questions and can be interpreted in terms of how inconsistent answers may be explained by structural features of the process that generates individual survey responses. When formulating opinions, for example, a respondent's limited attention may randomly focus on subsets of the many different possible considerations that bear on a complex issue (Tourangeau et al., 2000), hence answer differently at different times or to similar questions.

This paper connects the two literatures documenting that the financial literacy measured by standard "Big Three" test questions varies considerably over short time periods. Using two consecutive waves of a survey of Italian households, we can observe if the same person who answered correctly to all the three questions on interest rate, inflation, and risk diversification made at least one mistake just a year after. We find that almost one third of the respondents did. Changing competence might be driven by learning or forgetting information: Sconti (2022) finds that the financial competence of young students can be persistently increased by financial education; Boyle et al. (2015) that financial literacy decreases with age. Focusing on the arguably plausible and intriguing idea that respondents may randomly and sometime correctly pick one of the possible answers rather than admitting ignorance, we develop a structural model of random answer patterns, discuss how it may underlie the variation of apparent literacy,

and assess how a refined indicator of financial literacy may purge most of its random components and perform better as a regressor.

This perspective offers an interesting interpretation of reliability statistics. In the data, the difference between the percentage of those who answer correctly only once and those who do so in both surveys is remarkably stable across subsamples by gender, age, education, and confidence levels. The estimated propensity to answer randomly rather than to admit ignorance is high and similar for both genders for the easiest numeracy question. It is alike and lower for both genders for inflation, a concept that males know with higher probability. Females who answer the risk diversification question appear to do so competently as often as males and guess much less frequently. Interestingly, respondents who declare they know enough have a higher probability to know than those who think their understanding of economics and finance is not sufficient, but also do not admit ignorance and prove wrong more often.

We propose a structural model of the sources of wrong answers, that can have different implications depending on whether respondents think they know but confidently give wrong answers or are aware of not knowing and still answer randomly. This data-generating model relates to recent research showing that overconfidence is associated with excessive trading (Daniel and Hirshleifer, 2015), although the performance of the portfolios of assets owned by overconfident individuals is not necessarily worse with respect to the payoffs gained by rational investors (Inghelbrecht and Tedde, 2024), and other recent studies of the implications of lack of financial literacy for financial choices and resilience. Bertola and Lo Prete (2023) use the same data as the present paper to study how financial literacy and financial assets influenced consumption changes during the Covid-19 pandemic. Focusing on the gender gap in financial literacy, Bucker-Koenen et al. (2021) use a latent class model and Cziriak et al. (2023) develop a survey experiment that exploits cross-question consistency in answers to show that females, who admit they do not know more often than males, may lack confidence rather than knowledge.

We assess the relationship of guessing to financial resilience using indicators of financial distress, financial fragility and financial vulnerability. We find that individuals

who guessed correctly only once are less resilient than individuals who answer correctly in both waves of the survey. Those who guessed have a higher probability of financial "distress" i.e. of having some difficulty to make ends meet at the end of the month, and of being financially "vulnerable" i.e. of not being able "for sure" to face a mid-size emergency expense. The results are consistent with previous findings when resilience is measured by the less stringent measure of financial "fragility" (Clark et al., 2021) that focuses on the distinction between respondents who "might be able" and "might not be able" to deal with an unexpected expense. Finding that guessing is relevant for financial vulnerability but not for financial fragility is consistent with the hypothesis that many respondents may randomly focus on subsets of similar options (Tourangeau et al., 2000).

The article proceeds as follows. Section 2 presents the dataset and assesses the reliability of financial literacy statistics for the overall sample and for subsamples. Section 3 outlines a data-generating model that offers a structural interpretation of observed "I do not know" and incorrect answers, and Section 4 examines its implications for misclassification in standard financial literacy indicators. Section 5 brings the resulting errors-in-variables bias to bear on the interpretation of financial resilience regressions. Section 6 concludes.

2. Assessing reliability in a panel data set

We exploit a rich survey of Italian households administered by the Italian Financial Education Committee in collaboration with Doxa on a yearly basis starting in May-June 2020. The survey collects information on financial education, socio-economic characteristics, demographics, preferences towards digitalization and sustainability.

The panel structure of the first two waves offers a rare opportunity to study over time a large sample of 4027 households (Doxa, 2020 and 2021). In both 2020 and 2021 the person responsible for the economic decisions of the household provided information on their situation and answered standard questions meant to assess financial literacy. Following Lusardi and Mitchell (2011), we define financial literacy based on how respondents answer the Big Three basic questions on interest rate, inflation, and risk diversification. Each question includes the option "I do not know/I refuse to answer",

and from two to three other options, among which one is correct (the exact wording of the questions included in the Doxa survey is available in the Appendix to this paper). We summarize the information they provide with an equally standard indicator of financial literacy, set to unity if the person responsible for managing economic matters in the household answers correctly to the three questions.

In 2020, 45% of the households answered correctly all the three basic questions, a higher percentage than the 37% of Italian households in the 2014 Standard & Poor's Ratings Services Global Financial Literacy Survey who answered correctly three out of four questions in Italy.[1] As we observe the same households in two consecutive waves, we can track answers to each question over time.[2] Strikingly, almost one third of the respondents who in 2020 answered correctly all the three questions made at least one mistake just a year after. That is, only 71% of the 45% who appear literate in 2020 continue to appear literate in 2021. The 32% share of those who answer all questions correctly in both periods provides an arguably better approximation to the prevalence of conventionally defined financial literacy in Italy.[3]

Figure 1 shows the gaps between apparent literacy in 2020 and the "true" literacy measure that takes both 2020 and 2021 into account. The dark blue bars represent the percentages of financially literate respondents in 2020, the light blue bars the percentages of respondents who appear literate in both 2020 and 2021. Along the horizontal axis these statistics are measured for the whole sample and then for sub-samples by gender, age, education, and self-assessed competence. Within each group the difference between the standard and the more stringent measure of financial literacy is remarkably stable, and always close to the 13 percentage points that we find in the overall population.

[1] The Standard and Poor's Survey includes four questions on simple interest rate (i.e. numeracy), inflation, risk diversification, and compounding, whose wording is different with respect to the standard Big Three and to standard questions on compounding. Answering three of these four questions correctly is a less stringent definition of financial literacy than requiring correct answers to all the Big Three.

[2] The person in charge of economic decisions might in principle be different in the two waves. In practice the age, gender, education and other socio-demographic characteristics confirm that the respondent is the same person in the two waves.

[3] If we use the Big Three and a question on compound interest from our survey to build a financial literacy indicator comparable to the one adopted by the Standard and Poor, the data convey a similar message: 60% of respondents are defined literate in 2020, but only 45% kept their status in 2021.

Across sub-groups, there are sharp differences in financial literacy levels by gender that previous studies attribute to women's lower knowledge and lower self-confidence (Fornero and Monticone, 2011; Bucher-Koenen et al., 2017; Bottazzi and Lusardi, 2021; Tinghög et al., 2021). Knowledge of basic economics and finance is low among the young and increases in age, confirming the findings in Bottazzi and Oggero (2023): financial literacy in the Italian population does not follow the hump-shaper pattern that other scholars find in US or worldwide surveys (Klapper and Lusardi, 2020; Lusardi and Mitchell, 2023). The histograms also show that financial literacy is lower among the less educated. Education at school does not necessarily imply higher financial knowledge and better personal finance (Lo Prete, 2018) if the curricula do not include specific modules on economics and finance, but those who accumulated more general human capital also show a better understanding of financial concepts (Lusardi and Mitchell, 2023). To consider how individuals self-assess their financial competence, we compare respondents who value their competence "insufficient" (up to 5 points on a rating scale from 0 to 10) to those who value their competence "sufficient" (6 or more points). The level of financial literacy is higher among the latter.

Table 1 reports statistics on the reliability of the financial literacy indicator for the three questions on interest rate, inflation, and risk diversification separately. The repeated answers indicate that two respondents out of five do not consistently know how the simple interest rate works, and that inflation implies a loss of purchasing power. As documented in many studies, financial knowledge is even lower for risk diversification (Lusardi and Mitchell, 2023): one respondent out of two does not know that investing in a single stock is riskier than investing in a basket of stocks.

Again, the gap in financial literacy between those who answer correctly in 2020 and those who do not anymore in 2021 is remarkably stable at about 13 percentage points across population subgroups. The smallest 9 percentage point difference is that for answers to the question on inflation by the oldest age group, who do not appear to suffer cognitive decline in these data. The biggest 15 percentage point difference is that for the young on the same inflation question and for females on all questions: the gender gap is stable across topics as found by Yakoboski et al. (2022) and Klapper and Lusardi (2020).

The reliability of the financial literacy indicator is also lower for respondents with a college degree answering to the question on risk diversification, and for less educated respondents answering to the question on the interest rate. Finally, those who evaluate their financial competence insufficient and those who evaluate their financial competence sufficient record similar gaps in financial knowledge reliability when answering to inflation and risk diversification.

3. A structural interpretation

Many data-generating processes may underlie poor survey assessment of supposedly stable financial knowledge. We focus on the propensity to answer randomly rather than admit ignorance, which offers an interesting interpretation of reliability statistics.

Suppose that each individual either knows or does not know the answer, and neither forgets nor learns anything across waves of the survey. There is a fraction p of individuals who know the answer to a question. Suppose also that individuals who do not know the answer to a question reply "I do not know" with probability $1 - q$, or pick one of the other answers randomly with probability q. Another source of incorrect answers is the fact that respondents who (think they) know the answer can make mistakes. Denote s the probability of an incorrect answer by a respondent who intends to answer correctly. We exclude the possibility that individuals who know the answer reply "I do not know".

Both types of wrong answers when a "I do not know" option is available can simply reflect carelessness. Because incorrect answers to surveys have no real consequences for the respondents, they are likely to give them if they find it unpleasant to concentrate and find the right answer or find it uncomfortable to admit ignorance, which is perhaps more likely if they claimed high competence when answering a previous question: in the data, 18% of respondents express high (8 or more points on a rating scale from 0 to 10) and 63% sufficient (6 or more points on the same rating scale) financial competence.

These different sources of wrong answers can have different implications. Those who think they know but confidently give wrong answers, for example because they are convinced that higher inflation increases real return at given nominal rates, probably also

make mistakes in real life. Those who are aware of being ignorant and still answer randomly may not do that when the stakes are real.

The average propensities to guess q and make mistakes s need to be assumed constant across individuals in a sub-sample. They could more generally be a function of observable individual characteristics, including self-assessed competence.

Recall that p is the fraction of respondents who think they know the answer, of which $1-s$ pick it correctly. If failing to respond correctly is due to ignorance rather than to distraction or carelessness, the fraction of ignorant respondents is $p(1-s)$. As the others reply "I do not know" with probability or frequency $(1-q)$, in the data the fraction D of "I do not know" answers is

$$D = (1-q)(1-p). \tag{1}$$

This expression relates the empirical frequency of "I do not know" answers to q and p, and a similar expression can be derived to relate the empirical frequency of wrong answers to the same two parameters and s. Denoting M the number of possible answers other than "I do not know", the predicted fraction of wrong answers W sums that of individuals who know they "I do not know" but with probability q guess, and pick the wrong answer with probability $(M-1)/M$, and that of the individuals who think they know but, with probability s, give an incorrect answer:

$$W = q(1-p)(M-1)/M + ps. \tag{2}$$

Expressions (1) and (2) form a system of two equations, with solution

$$p = 1 - \frac{M(W-s) - D(1-M)}{M(1-s) - 1}$$

and

$$q = \frac{W - s + sD}{W - s + \left(\frac{M-1}{M}\right)D}.$$

These expressions provide estimates of the truly competent fraction of respondents and of the propensity to guess as a function of the empirical frequencies of wrong and "I do not know" answers, of the number of optional answers M, and of s.

Unfortunately, q and s are not separately identified by the empirical fractions of "I do not know" and incorrect answers in subsamples. To get a sense of what the data say about the prevalence of competence and propensity to guess, suppose that $s = 0$, i.e. respondents who think they know the answer to a question do reply correctly with probability one. Inserting the frequencies $\widehat{W}$ and $\widehat{D}$ observed for some questions and subsamples in these expressions with $s = 0$ yields

$$\hat{p} = 1 - \frac{M}{M-1}\widehat{W} - \widehat{D} \tag{3}$$

and

$$\hat{q} = \frac{\widehat{W}}{\widehat{W} - \frac{1-M}{M}\widehat{D}} \tag{4}$$

as the values of true competence (supposed constant over time) and propensity to guess that can explain why surveyed individuals appear to forget the answer to questions they answered correctly before. Intuitively, as $\widehat{D}$ tends to zero the estimated q tends to unity if $\widehat{W}$ is positive, and the estimated p adjusts the wrong answers to account for correct guesses.

We compute the probability to know p and of the propensity to guess q using the information in the sample of Italian households who participated in the survey in 2020 and 2021 by substituting the empirical fraction $\widehat{D}$ of "I do not know" answers and the empirical fractions $\widehat{W}$ of wrong answers in equations (3) and (4).

Table 2 shows that, in the survey, the fraction of "I do not know" answers is lower than the fraction of wrong answers in the overall population and in all population subgroups we consider. It is also lower for males,[4] 50+ years old adults, individuals with a college degree, and respondents who state that their financial knowledge is insufficient.

The fraction of "I do not know" answers and the fraction of wrong answers are related in possibly interesting ways. When answering on interest rates and inflation, the lack of financial literacy of females and of 49- years old respondents is associated both to

[4] As in previous studies there is evidence of a significant gender gap in financial literacy: women answer almost twice as often than males that they do not know interest rates (9% versus 5%) and inflation (18% versus 9%), one third more in the case of risk diversification (27% versus 18%).

admitting not to know and to mistakes. Although females admit their ignorance more than males on risk diversification, males prove wrong more often. Risk diversification is also the question that causes more mistakes among the oldest respondents.

Respondents with a college degree or higher do not admit ignorance easily, and make as many mistakes as less educated respondents. Those who think their level of financial knowledge is sufficient are two or three times less likely to admit ignorance, and give wrong answers more often. This is consistent with the finding in psychology that flawed self-assessment implies mistakes for individuals who are too optimistic about their skills and expertise (Dunning at al., 2004).

Table 3 shows the estimated probability to know and propensity to guess. The fraction p of individuals who know the answer is higher for easier questions.[5] For each question it is higher for males, for older individuals, for those with a college degree, and for those who think their financial competence is sufficient. The estimated propensity to guess q is lower for the more difficult questions (on inflation and risk diversification). Again, the gender gap is much smaller for the most demanding concept of risk diversification. Education matters to both p and q, but there are relatively small differences between those who hold a college degree and those who do not. A more positive evaluation of personal financial knowledge is associated with a higher probability to know, but also to the highest propensity to guess and be wrong.

The estimated p ranges between 43% and 72%. If the data generating model is correct this means that the complementary fraction does not know the correct answer, and explaining the many wrong answers in terms of propensity to guess requires very high values of q. The estimates indicate that up to 78% of those who do not know the answer to the easier question prefer guessing randomly to giving a "I do not know" answer and even on the more difficult question more than half do so, suggesting that the kind of mistakes parameterized by s may also play a role in generating the survey data.[6]

[5] Correct guesses are less likely when the number of options M is larger, but the question with fewer options (about risk diversification) is more difficult.

[6] Large values of either parameter play similar roles in rationalizing the presence of wrong answers when it is possible to admit ignorance. While in expression (3) a larger s requires a larger q to explain the data when more than M-$1/M$ of those who give an answer get it wrong, in our data the fraction of wrong answers

4. Misclassification of financial literacy indicators

The data generating model can be used to interpret the apparent changes of the competence assessed by correct answers to all the Big Three questions.

To see this, suppose individual i knows the answer to n_i of N questions, and replies correctly to those questions with probability one, i.e. $s = 0$. To the other $N - n_i$ questions the individual with probability q_i randomly picks one of the M multiple choices, and otherwise gives the honest "I do not know" answer. Because the guess is correct with probability $1/M$, for each of these questions the observed answer is correct with probability q_i/M, and the probability that x of these answers are correct is given by the binomial expression

$$p_x = \frac{(N - n_i)!}{x!\,(N - n_i - x)!}\left(\frac{q_i}{M}\right)^x \left(1 - \frac{q_i}{M}\right)^{N - n_i - x}.$$

This makes it possible to gauge the intensity of the misclassification implied by reluctance to admit ignorance for the standard measurement strategy that considers "financially literate" those who know the answer to all the Big Three questions.

An individual who ignores the answer to all the three questions but randomly picks one of three possible answers guesses all three correctly with probability 3.7%. One who knows only one answer guesses the other two correctly with probability 11.1%. And one who knows only two answers guesses the remaining one correctly with probability 33.3% (and 50% if the guessed question has only two possible answers, like the more difficult question on risk diversification). Recalling that ignorant respondents have a propensity to guess higher than 50% for the more difficult questions, and up to 78%, the probability that such individuals are misclassified as fully literate is quite high. For example, if we assume that 33% of the individuals know all three answers to questions with three options and that an equal fraction of the others guesses 1, 2, and 3 answers with probability $q = 0.66$, then 10.59% of the latter will be classified as financially literate. This is similar to the approximately 13 percentage points difference between those who appear literate in

is about 20%, and much lower than the 66% or 50% values of M-1/M. Hence, allowing for a positive fraction s of individuals who think they know the right answer but answer incorrectly reduces the estimated q fraction of those who do not know it but answer randomly anyway.

2020 and those who appear literate in both 2020 and 2021. It is a little lower, indicating that the share of individuals who know 1 or 2 answers (and are more likely to be misclassified when guessing correctly only the other 2 or 1 answers) is plausibly larger than one third.

Misclassification is of course much less likely when appearing literate requires correctly guessing twice as many questions, and this explains why they no longer appear to be so competent when their answers to the next wave of the survey are also considered. For the same individuals considered above, the probabilities of giving all six correct answers are much smaller at 0.14%, 1.23%, and 11.11% for those who guess 3, 2, and 1 answers in both surveys, and overall just 2.75% are misclassified as literate when their propensity to guess is equal to 66%.

5. Regression evidence

An exact expression for the overall probability of misclassification would need to account for the fact that the propensity to guess varies across individuals, that different numbers of individuals know the answer to only one or two questions, and that the number of possible answers varies across the questions to which individuals may guess the answer (two of the Big Three questions offer a choice of three answers, one of just two besides "I do not know"). But even if a convincing estimate of the overall probability r of misclassification could be computed, the variance $r(1-r)$ of the financial literacy dummy's measurement errors would not be straightforwardly related to the resulting bias of its estimated coefficient. Errors in discrete variables are not additive and their empirical implications are more complicated than those of classic errors-in-variables mismeasurement (Höfler, 2005).

For any given set of structural assumptions, however, assessment of financial literacy on the basis of repeated answers is much more reliable, because misclassification requires twice as many correct guesses. To see simply what it implies in practice we report linear probability regressions that relate financial resilience indicators to financial literacy measured in the standard way in 2020 (dummy "FL 2020", coded one if the Big Three are all answered correctly); to a variable that detects possible random guessing

(dummy "Guessed", coded one for respondents who appear literate in 2020 but, based on their answers to the same questions one year after, seem to have just made lucky guesses); and to a measure of financial literacy that requires answering all the three questions correctly in both waves of the survey (dummy "FL 2020-21", coded one only if all answers are correct in both years).

Because guessing correctly twice as many times is much less likely for those who know only some of the answers but do not take the "do not know" option, this last indicator deletes most of the misclassification due to lucky guesses. Hence, the linear probability coefficients of regressions that use the standard measure can be readily, if informally, interpreted in light of the standard prediction that better measurement should drive estimates away from zero and towards unbiased estimated of the effects of interest.

We explore the implications for the estimated coefficients and their significance of using different measures of (lack of) financial resilience as dependent variables in regressions that include such financial literacy and guessing indicators as explanatory variables, along with a variety of economic and socio-demographic control variables.

Table 4 uses a financial "distress" indicator that detects difficulty in making ends meet. It is coded one if in 2020 the respondent states that the household's income covered expenses until the end of the month with "great difficulty" or "with difficulty", which is the case for a 57% fraction of respondents. Among them 39% appear financially literate in 2020, but only 25% in both 2020 and 2021. The empirical models relate financial distress to the available measures of financial literacy and the "Guessed" indicator. Households where the person in charge of managing financial matters answers correctly to the Big Three questions in 2020 are less likely to be distressed in column 1. As expected from an errors-in-variables perspective, that coefficient estimate is more negative when the regression includes an indicator of likely random correct answers, which attracts a negative coefficient in column 2, and similar to the coefficient of the nearly error-free financial competence indicator in column 3.

In Table 5, we relate the level of financial competence and the indicator of guessing behavior to financial "fragility", that is to the ability of the households to come up with a certain amount of money should a financial emergency arise. The indicator we use

defines as in Lusardi et al. (2011) "fragile" those respondents who are certain not to be able to collect 2000 euro as well as those who say they probably would not be able to. According to this definition, 31% of Italian households were financially fragile after the outbreak of the Covid-19 emergency. Of them, 32% were financially literate in 2020, 20% in both 2020 and 2021. In column 1, as in the regressions that Bottazzi and Oggero (2023) run on the 2021 wave, financial fragility is less likely for financially literate households. The results are qualitatively and quantitatively similar in regressions that account for misclassification of financial literacy. The estimated coefficient of guessing correctly is insignificantly different from zero in column 2, and the more stringent definition of financial literacy in column 3 estimates coefficients that are very similar to those of column 1.

Finally, we classify as "vulnerable" only those who answer they are sure they would not be able to come up with 2000 euro if an unexpected need arose. The 62% fraction of financially vulnerable households is close to that of those who declare to be financially distressed (57%) and is almost twice the percentage of financially fragile households based on the looser criterion (31%). Focusing on respondents who are "sure" is sharper than the standard fragility measure, which attempting to draw a fine line between who "might" or "might not" may elicit random survey answers. The resulting imprecise measure of the dependent variable reduces the significance of estimated coefficients, and biases them to the extent that measurement errors are correlated across the dependent and explanatory variables. The estimates in column 1 of Table 6 show that the data support common findings of a negative association between (lack of) financial resilience, here in its more restrictive definition, and financial literacy. Households where the person in charge of financial matters guessed correctly instead, and only appeared to be financially competent, are more likely to be financially vulnerable in column 2. The association is stronger when only those that consistently appear competent in two consecutive years are classified as such in column 3.

Finally, some of the controls included in Tables 4, 5 and 6 deserve to be discussed briefly. Regardless of which indicator is the dependent variable, lack of financial resilience is less likely for households with higher income, wealth (as measured by home

ownership), and education; more likely for respondents in the 50-64 age group and for households that include minors or invalids or live in Southern Italy and the islands, confirming that differences in financial literacy across Italian regions are large and significant (Bottazzi and Oggero, 2023). The estimated coefficients of the financial literacy indicators are broadly similar for different sets of control variables, but those in Table 5 are somewhat different from those of Tables 4 and 6, indicating that misclassification errors in the left-hand measure of financial fragility are correlated with those in financial literacy and with observable characteristics. Among them, the gender dummy is significant only in Table 5, where poor measurement of lack of resilience by the noisier financial fragility indicator may underlie women's apparent financial incompetence.

6. Concluding comments

This paper develops a structural model to investigate the relevance of respondents' propensity to answer randomly to questions on financial literacy instead of admitting ignorance even though it is possible to answer "I do not know", and tests its implications for personal finance using different measures of (lack of) financial resilience.

Data from two consecutive waves of a survey on financial literacy and resilience of Italian households during the Covid-19 pandemic detect large propensities to guess. The empirical relevance of guesses or mistakes varies across more or less difficult questions and observable characteristics. In regressions that account for misclassification truly literate respondents have higher financial resilience, while those who guessed had a higher probability of being in financial distress or of being financially vulnerable.

Our approach offers novel insights on the reliability of financial literacy indicators. As in the large literature on the psychology of survey response, respondents do not always answer the truth to survey questions (Tourangeau et al., 2000). We model the implications of guessing behavior assuming that it reflects reluctance to admit ignorance, and our regressions control for observable individual socio-economic characteristics. Future research might fruitfully consider the possibility that wrong answers may also be given by respondents who think they know the right answer but make mistakes, and

model structurally how the literacy indicator may be a proxy for the unobservable individual features that determine financial behavior and outcomes.

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Figure 1. Percentage of financially literate households.

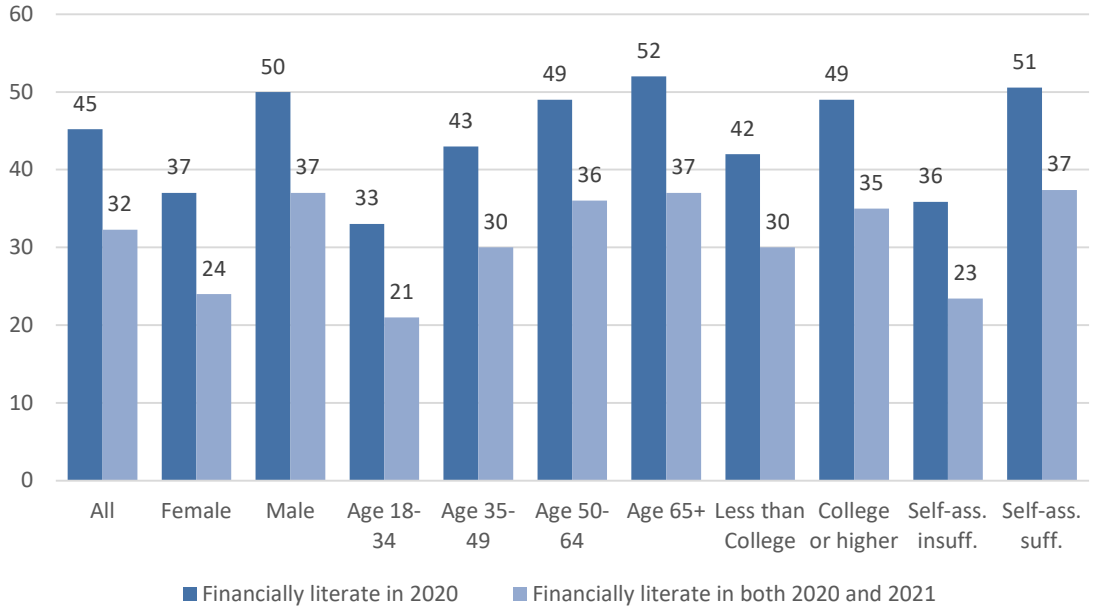

Table 1. Distribution of responses to financial literacy questions.

	Interest		Inflation		Risk	
	FL 2020	FL 2020-21	FL 2020	FL 2020-21	FL 2020	FL 2020-21
All	73.8	61.6	70.0	58.1	64.9	51.1
Gender						
Female	67.8	53.4	62.0	47.4	60.8	45.9
Male	77.3	66.3	74.6	64.3	67.3	54.1
Age						
Age 18-34	66.6	51.6	50.7	36.0	59.9	46.1
Age 35-49	72.6	59.6	66.2	53.1	64.6	51.1
Age 50-64	76.7	65.7	76.0	65.1	66.0	52.1
Age 65+	74.9	63.6	79.2	70.6	66.4	52.0
Education						
Less than College	72.4	59.2	68.1	56.2	62.3	49.0
College or higher	75.7	64.6	72.4	60.5	68.2	53.9
Self-assessment						
Insufficient	69.3	54.8	63.5	50.9	55.3	41.2
Sufficient	76.4	65.5	73.8	62.2	70.4	56.8

Note. The table reports percentage values.

Table 2. Empirical fraction of "I do not know" ($\widehat{D}$) and of wrong answers ($\widehat{W}$).

	Interest		Inflation		Risk	
	$\widehat{D}$	$\widehat{W}$	$\widehat{D}$	$\widehat{W}$	$\widehat{D}$	$\widehat{W}$
All	6.9	19.2	12.4	17.6	21.3	13.8
Gender						
Female	9.4	22.7	17.6	20.4	27.5	11.7
Male	5.5	17.2	9.4	16.0	17.7	15.0
Age						
Age 18-34	8.4	25.1	18.7	30.6	23.9	16.1
Age 35-49	7.7	19.7	14.8	19.0	22.0	13.4
Age 50-64	5.8	17.5	9.8	14.6	20.6	13.4
Age 65+	6.7	18.4	7.1	13.6	18.6	15.0
Education						
Less than College	8.1	19.5	13.9	18.0	24.2	13.5
College or higher	5.5	18.8	10.4	17.2	17.5	14.3
Self-assessment						
Insufficient	11.8	18.9	20.8	15.7	32.4	12.3
Sufficient	4.2	19.4	7.6	18.7	14.9	14.7

Note. The table reports percentage values.

Table 3. Estimated probability to know (p) and propensity to guess (q).

	Interest		Inflation		Risk	
	p	*q*	*p*	*q*	*p*	*q*
All	64.2	80.6	61.2	68.1	51.1	56.5
Gender						
Female	56.5	78.3	51.8	63.5	49.0	46.1
Male	68.7	82.5	66.6	71.8	52.3	63.0
Age						
Age 18-34	54.0	81.8	35.4	71.0	43.8	57.4
Age 35-49	62.8	79.4	56.7	65.9	51.2	54.9
Age 50-64	68.0	82.0	68.4	69.0	52.6	56.5
Age 65+	65.7	80.4	72.4	74.2	51.4	61.8
Education						
Less than College	62.7	78.4	59.1	65.9	48.8	52.7
College or higher	66.3	83.8	63.8	71.2	53.9	61.9
Self-assessment						
Insufficient	59.9	70.7	55.6	53.1	43.0	43.2
Sufficient	66.8	87.5	64.4	78.8	55.7	66.4

Note. The table reports percentage values.

Table 4. Financial distress.

	(1) Financial distress	(2) Financial distress	(3) Financial distress
FL 2020	-0.07***	-0.10***	
	(0.03)	(0.03)	
Guessed		0.09**	
		(0.04)	
FL 2020-21			-0.10***
			(0.03)
Income level	-0.17***	-0.17***	-0.17***
	(0.01)	(0.01)	(0.01)
Home ownership	-0.11***	-0.11***	-0.11***
	(0.02)	(0.02)	(0.02)
High school degree	-0.05	-0.04	-0.04
	(0.03)	(0.03)	(0.03)
College Degree	-0.13***	-0.13***	-0.13***
	(0.03)	(0.03)	(0.03)
Post-graduate Degree	-0.11**	-0.11**	-0.11**
	(0.04)	(0.04)	(0.04)
Age 18-34	-0.04	-0.04	-0.04
	(0.04)	(0.04)	(0.04)
Age 50-64	0.13***	0.13***	0.13***
	(0.03)	(0.03)	(0.03)
Age 65+	0.05	0.05	0.05
	(0.04)	(0.04)	(0.04)
Gender (female)	-0.00	-0.01	-0.01
	(0.03)	(0.03)	(0.03)
Minors	0.11***	0.10***	0.10***
	(0.03)	(0.03)	(0.03)
Invalids	0.09***	0.09***	0.09***
	(0.03)	(0.03)	(0.03)
North-East	0.05	0.05	0.05
	(0.04)	(0.04)	(0.04)
Centre	0.05	0.05	0.05
	(0.04)	(0.04)	(0.04)
South and Islands	0.11***	0.10***	0.10***
	(0.03)	(0.03)	(0.03)
Nr. of observations	4027	4027	4027

Note. The table reports OLS estimates. All specifications include a constant (not reported). The reference categories are less than high school, age 35-49, male, and North-West. Robust standard errors are in parentheses. Significant at * 10 percent, ** 5 percent, *** 1 percent.

Table 5. Financial fragility.

	(1) Financial fragility	(2) Financial fragility	(3) Financial fragility
FL 2020	-0.13***	-0.15***	
	(0.02)	(0.03)	
Guessed		0.06	
		(0.04)	
FL 2020-21			-0.13***
			(0.03)
Income level	-0.12***	-0.12***	-0.12***
	(0.01)	(0.01)	(0.01)
Home ownership	-0.15***	-0.15***	-0.15***
	(0.03)	(0.03)	(0.03)
High school degree	-0.06**	-0.06**	-0.06**
	(0.03)	(0.03)	(0.03)
College Degree	-0.13***	-0.13***	-0.13***
	(0.03)	(0.03)	(0.03)
Post-graduate Degree	-0.04	-0.04	-0.04
	(0.04)	(0.04)	(0.04)
Age 18-34	-0.03	-0.04	-0.04
	(0.04)	(0.04)	(0.04)
Age 50-64	0.03	0.03	0.03
	(0.03)	(0.03)	(0.03)
Age 65+	0.04	0.04	0.04
	(0.04)	(0.04)	(0.04)
Gender (female)	0.09***	0.08***	0.09***
	(0.03)	(0.03)	(0.03)
Minors	-0.00	-0.01	-0.01
	(0.03)	(0.03)	(0.03)
Invalids	0.09***	0.09***	0.10***
	(0.03)	(0.03)	(0.03)
North-East	-0.02	-0.02	-0.03
	(0.04)	(0.04)	(0.04)
Centre	-0.01	-0.01	-0.01
	(0.03)	(0.03)	(0.03)
South and Islands	0.04	0.03	0.04
	(0.03)	(0.03)	(0.03)
Nr. of obs.	3817	3817	3817

Note. The table reports OLS estimates. All specifications include a constant (not reported). The reference categories are less than high school, age 35-49, male, and North-West. Robust standard errors are in parentheses. Significant at * 10 percent, ** 5 percent, *** 1 percent.

Table 6. Financial vulnerability.

	(1) Financial vulnerability	(2) Financial vulnerability	(3) Financial vulnerability
FL 2020	-0.14***	-0.18***	
	(0.03)	(0.03)	
Guessed		0.13***	
		(0.04)	
FL 2020-21			-0.17***
			(0.03)
Income level	-0.16***	-0.16***	-0.16***
	(0.01)	(0.01)	(0.01)
Home ownership	-0.10***	-0.09***	-0.09***
	(0.03)	(0.03)	(0.03)
High school degree	-0.01	-0.01	-0.01
	(0.03)	(0.03)	(0.03)
College Degree	-0.04	-0.04	-0.04
	(0.03)	(0.03)	(0.03)
Post-graduate Degree	0.05	0.06	0.06
	(0.04)	(0.04)	(0.04)
Age 18-34	0.05	0.05	0.05
	(0.04)	(0.04)	(0.04)
Age 50-64	0.08***	0.08***	0.08***
	(0.03)	(0.03)	(0.03)
Age 65+	0.03	0.03	0.03
	(0.04)	(0.04)	(0.04)
Gender (female)	0.01	0.01	0.01
	(0.03)	(0.03)	(0.03)
Minors	0.09***	0.09***	0.08***
	(0.03)	(0.03)	(0.03)
Invalids	0.06*	0.06**	0.06**
	(0.03)	(0.03)	(0.03)
North-East	-0.02	-0.02	-0.02
	(0.04)	(0.04)	(0.04)
Centre	0.01	0.01	0.01
	(0.04)	(0.03)	(0.03)
South and Islands	0.02	0.02	0.02
	(0.03)	(0.03)	(0.03)
Nr. of obs.	3817	3817	3817

Note. The table reports OLS estimates. All specifications include a constant (not reported). The reference categories are less than high school, age 35-49, male, and North-West. Robust standard errors are in parentheses. Significant at * 10 percent, ** 5 percent, *** 1 percent.

Data Appendix

Translated text of survey questions and possible answers:

Understanding of interest rate. "Suppose you had €100 in a savings account that pays an interest rate of 2% per year and has no charges. After 5 years, how much do you think you would have in the account if you left the money to grow?" a) More than €102 b) Exactly €102 c) Less than €102 d) I do not know.

Understanding of inflation. "Suppose you had €100 in a savings account that pays an interest rate of 1% per year and has no charges. Imagine that the inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?" a) More than today b) Exactly the same c) Less than today d) I do not know.

Understanding of risk diversification. "Do you think that the following statement is true or false? 'Investing €1,000 in stocks of a single company usually is less risky than investing €1,000 in stocks of 10 different companies.' " a) True b) False c) I do not know.

Difficulty to make ends meet. "Does the income of your family cover expenses until the end of the month?" a) with great difficulty b) with difficulty c) with some difficulty d) fairly easily e) easily f) very easily.

Financial fragility. "Should an unexpected need arise, how confident are you that you could come up with 2000 euro in the next month:" a) I am certain I could come up with 2000 euro b) I could probably come up with 2000 euro c) I could probably not come up with 2000 euro d) I am certain I could not come up with 2000 euro e) I do not know.

Table A1 - Summary statistics.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Financial literacy in 2020	4027	0.45	0.50	0	1
Guessed	4027	0.13	0.33	0	1
Financial literacy in 2020 and 2021	4027	0.32	0.47	0	1
Financial distress	4027	0.57	0.49	0	1
Financial fragility	3817	0.32	0.46	0	1
Financial vulnerability	3817	0.62	0.49	0	1
Income level (in thousand euro)	4027	2.00	1.00	0.44	4.50
Home ownership	4027	0.61	0.49	0	1
Highschool degree	4027	0.37	0.48	0	1
College Degree	4027	0.16	0.37	0	1
Post-graduate Degree	4027	0.03	0.18	0	1
Age 18-34	4027	0.07	0.26	0	1
Age 35-49	4027	0.32	0.47	0	1
Age 50-64	4027	0.33	0.47	0	1
Age 65+	4027	0.27	0.45	0	1
Female	4027	0.35	0.48	0	1
Male	4027	0.65	0.48	0	1
Minors	4027	0.28	0.45	0	1
Invalids	4027	0.18	0.38	0	1
North-East	4027	0.19	0.40	0	1
Centre	4027	0.20	0.40	0	1
South and Islands	4027	0.34	0.47	0	1
Self-assessment insufficient	4027	0.61	0.49	0	1
Self-assessment sufficient	4027	0.39	0.49	0	1

Notes: The table reports information on the weighted sample.