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ABSTRACT

Gender Gaps in Financial Literacy: A Multi-Arm RCT to Break the Response Bias in Surveys*

Gender gaps in financial literacy are pervasive and persistent. They are partly explained because women choose "I do not know" more frequently. We test for the effectiveness of three interventions to shift this behavior. The control survey includes the possibility of "I do not know". The three treatments either exclude this possibility, offer incentives for correct answers, or inform survey takers of the existing gender gap in choosing this answer option. While all interventions are very effective in reducing this answer option, only the information significantly reduces the gender gap in "I do not know" and in financial literacy.

JEL Classification: C8, C9, D14, D91, G53, I22, J16
Keywords: financial literacy, gender gaps, survey methods

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1 Introduction

Financial literacy, the understanding of basic financial concepts such as inflation and risk diversification, impacts important economic decisions, for example, retirement and saving plans, stock market participation, and, ultimately, households' wealth levels and well-being (IOSCO, 2018; Lusardi and Mitchell, 2014, 2023). Improving the general population's financial literacy, especially for the most vulnerable, has become a major policy goal in many countries (OECD, 2013). For example, many U.S. states now require students to take a personal finance course before graduating from high school. In fact, financial literacy was recently declared an essential skill by the G20 with increasing support towards efforts to design, implement and evaluate financial literacy policies (G20, 2021). Importantly, an appropriate policy response should consider that financial knowledge is not evenly distributed in the population. In particular, women perform more poorly in financial literacy surveys, a fact that is persistent across countries and over time (OECD, 2016; Klapper and Lusardi, 2020). This gender gap is partly explained by differences in observable characteristics such as education, experience in financial decisions, and interest in financial topics.[1] However, a considerable part of this gap remains unexplained.

Financial literacy is typically measured by the percentage of correct answers in financial literacy surveys that allow for "I do not know" answer option. Therefore, observed gender gaps may reflect not only differences in knowledge but also a response bias in choosing "I do not know". For instance, if women are more likely to be unsure about the correct answer than men (gender differences in confidence), or when equally uncertain if women are more likely than men to choose "I do not know" (gender differences in risk preferences), then typical measures will overstate the gender gap in financial knowledge resulting in imprecise measures of the gender gap in financial literacy. Although only a few papers have focused on this finding, women are indeed found to choose the"I do not know" answer option more

[1]See, among others, Chen and Volpe (2002); Fonseca et al. (2012); Driva et al. (2016); Hsu (2016); Bucher-Koenen et al. (2017); Zaccaria and Guiso (2020); Bottazzi and Lusardi (2021).

frequently than men, which is partly explaining the gender gap in financial literacy (Lusardi and Mitchell, 2014; Bucher-Koenen et al., 2021; Hospido et al., 2021).

In this paper, we study gender gaps in financial literacy, switching the focus to *how* survey participants behave in their responses, and evaluate interventions to potentially reduce response bias in the propensity to choose "I do not know" answer option. We circumvent measurement challenges with a multi-arm randomized control trial (RCT) where 6,000 participants from Spain complete an online survey that *only* varies the financial literacy section design. This section builds on the OECD International Network of Financial Education questionnaire (OECD, 2022) and includes our main outcome, the *Big Five* foundational survey questions used to measure financial literacy (Hastings et al., 2013). The *Big Five* questions, developed by Anamaria Lusardi and Olivia Mitchell, measure basic understanding of inflation, compound interest rate, risk diversification, mortgages, and bond pricing. They are either multiple choice or true or false questions that allow for "I do not know" among the answer options.

First, participants in the control group complete this section where the "I do not know" (IDK) answer option is allowed, as is standard in these surveys. The remaining participants are assigned to one of the three treatment arms. The first treatment, "without IDK", presents the same financial literacy section without the "I do not know" answer option. This forces participants to choose an answer, allowing us to measure the extent in which choosing "I do not know" reflects effective knowledge gaps or different response biases. The second treatment, "incentives", provides explicit and immediate monetary incentives for each correct answer and no credit for incorrect and "I do not know" answers. This should induce profit-maximizing participants to strictly prefer selecting an option over "I do not know", and provides a quantifiable measure to which extent participants prefer to forego a chance of receiving credit. Finally, the "information" treatment presents a sentence with statistics based on women's propensity to choose "I do not know" relative to men's. This treatment aims to raise awareness of potential deterrents from women's success, as measured by percent correct,

prompting participants to provide educated guesses when uncertain.

In addition to measuring financial literacy, the survey gathers standard and new individual characteristics, which allow us to test how those can help explain gender differences in financial literacy. It gathers characteristics such as households' and their parents' sociodemographics, interest in financial topics, and experience with financial products, as well as personal traits and experiences, such as risk preferences, confidence and competitiveness, which have been found relevant in explaining other relevant economic decisions (see, for example, Buser et al. 2014). Additionally, the survey keeps track of whether and where participants abandon the survey, their perceived difficulty, and completion time, offering the unique possibility to study relevant outcomes for online surveys.

Overall, we confirm the two key patterns observed in the literature in our control group. First, women are less financially literate than men, as measured by the percent of correct answers. This gap almost reaches a 9 percentage point difference as women have an average of 49 percent of correct answers, while men have 58 percent. Second, women are more likely to choose "I do not know" answer option than men. This gap is over 6 percentage points as women choose "I do not know" 18 percent of the time while men do this 12 percent. Both gaps, on financial literacy and IDK, are reduced to 6 and 4 percentage points, respectively, when adding control variables, but remain significant. Either way, the response bias accounts for about two-thirds of the gender gap in financial literacy.

Interestingly, and the main innovation of this paper, we find that the propensity to provide an answer is malleable, as all three interventions effectively reduce the percent of "I do not know" answers. In the control group, 15 percent of survey takers choose this answer. By design, the treatment without IDK reduces this percent to zero. The incentives reduce this answer choice to 9 percent, and the provision of information to 7 percent. These reductions translate into significant increases in financial literacy, from 53 percent correct in the control group to 60, 56, and 57 percent correct in the without IDK, incentives, and information, respectively.

Importantly, we observe different impacts by treatment and gender. Again, by design, the without IDK reduces this gap to 0. More interestingly, introducing incentives does not significantly reduce the gap in "I do not know" answers, but the information shows very effective in reducing the gap in response bias, reducing it to half, from over 6 to close to 3 percentage points, in the specification without controls and closing it in the specification with controls. In turn, this has implications for the gender gap in financial literacy measures. Eliminating "I do not know" answer seems to go in the direction of reducing the gender gap in financial literacy, but the effect is not significant. The introduction of incentives, if anything, can only increase the gender gap in financial knowledge but the effect is not significant. By contrast, and consistent with the results on reducing the gender gap in the choice of "I do not know", the information treatment is the only one that reduces significantly (at the 10% significance level) the gender gap in financial literacy. The gender gap in financial literacy is reduced by half, from close to 6 to less than 3 percentage points.

We provide an additional evaluation of the three interventions using a random guessing benchmark and studying their effect on alternative outcomes, such as the percent of incorrect answers, the probability of abandoning the survey, perceived difficulty, and completion time. Regarding the random guessing benchmark and the percent of incorrect answers, we find most support for the information treatment. Interestingly, the three interventions do not impact differently the probability of exiting the survey or perceived difficulty. Only the without IDK treatment increases the completion time significantly more for women than men, finding little support for eliminating the IDK answer option in financial literacy surveys.

We conclude that an important part of the observed gender gap in standard financial literacy questions is due to response bias in choosing "I do not know" and therefore, standard financial literacy surveys measure the gender gap in financial knowledge imprecisely, overstating it. According to our estimates, the observed gender gap in financial literacy can be reduced by half when reducing the response bias. Furthermore, we provide evidence of the effectiveness of a simple design tool, the provision of information on the existing gender

gap in choosing "I do not know", that can potentially eliminate the gender gap in the choice of "I do not know" answers and reduce the gender gap in financial literacy in half.

This paper contributes to the literature exploring gender differences in financial literacy. While most of the literature has focused on which observable contributing factors are associated with gender gaps in financial literacy (see, for example, the reviews from Lusardi and Mitchell 2014 and Bucher-Koenen et al. 2017), this paper contributes to the scarce literature that explores a relatively new channel, shifting the focus to *how* financial literacy is measured. Bucher-Koenen et al. (2021) provide a first and significant step in this direction. Their study shows that the gender gaps in financial literacy considerably shrink in a panel, where participants first answer financial literacy questions with the "I do not know" option, and then, six weeks later, they answer the same questions without this option and with subsequent questions about the confidence in their answers. We contribute by implementing the first RCT assessing response bias, and exploring which intervention can help close it. Our extreme treatment, without IDK, is comparable to Bucher-Koenen et al. (2021). The main difference is that there is no concern over potential learning in our design, as it is a between-participant design. We further complement the literature by evaluating alternative interventions, providing relatively more precise estimates on how gender gaps vary with contributing factors, as well as by studying alternative outcomes, which are not typically available in public data.

Another strand of the literature we contribute is the study of gender differences in educational tests. In particular, to a large literature that has studied how gaps vary in multiple-choice tests with and without differential grading for omitting questions and providing wrong answers. Women are found to omit more questions than men (Ben-Shakhar and Sinai, 1991; Baldiga, 2014; Pekkarinen, 2015; Coffman and Klinowski, 2020; Espinosa and Gardeazabal, 2020; Iriberri and Rey-Biel, 2021), which can be related to choosing "I do not know" answers. These studies often find that deleting differential grading of incorrect and omitted answers reduces gender gaps in performance measures. Our study, analyzes a very

different setting with anonymized, non-stakes survey responses on financial literacy, shows how interventions can help reduce gaps and equalize men's and women's answer choices.

The rest of the paper is organized as follows. In Section 2 we describe the survey design and the treatments. Section 3 presents the results. Finally, Section 4 concludes.

2 Survey Design and Treatments

We designed an online survey experiment to test the effectiveness of three interventions to reduce the frequency of choosing "I do not know" answers, and their effect on financial literacy. The main focus is on their effect on gender gaps in these two outcomes: percent IDK and percent correct. The survey design was approved by the Ethics Committee at the Institutional Review Board and the survey design and pre-analysis plan were pre-registered.[2]

The survey consisted of about 40 questions, lasted 15 minutes on average, and was administered by the survey company 40dB in Spain between October 24 and November 18 of 2022. Survey takers received a small fixed payment of 1.20€ for completing the questionnaire. This amount was determined based on the expected time required to complete the survey and is a standard compensation in the survey company. The survey was divided into three main parts, starting with individual demographic questions, continuing with a financial literacy section, and ending with additional questions on perceptions, experiences, and managing finances. For a diagram of the experimental design, see Figure A1 in the Appendix A. All the questions included in the survey can be found in Appendix B.

The survey started with questions about individual demographic information, family and household background, and the elicitation of behavioral traits and perceptions such as interest and perceived knowledge of financial topics and risk preferences. The inclusion of these questions is motivated by the research that shows that these are important variables in

[2]The University of the Basque Country UPV/EHU Ethics Committee certified the exemption (https://www.ehu.eus/en/web/ceid/) because the researchers received anonymized data from the survey company, 40dB, which has configured and implemented a personal data protection program in accordance with the reforms of the European Data Protection Regulation 2016/679 and the Organic Law on Protection of Personal Data 3/2018. The experiment and the pre-analysis plan are pre-registered in the AEA RCT Registry under the RCT ID AEARCTR-0009896.

explaining gender gaps in financial literacy.[3] We also included questions on intergenerational background, such as parental education, to have a richer set of control variables. This section was the same for all survey takers and had no time limit.

Then, the survey included a financial literacy section based on the INFE/OECD questionnaire. The introductory section text is standard and encourages participants to try to avoid choosing the "I do not know" answer option. Specifically, it follows INFE/OECD toolkit for measuring financial literacy suggestion (OECD, 2022) and uses the verbatim text from the Spanish Financial Competences Survey (Bover et al., 2018). Related to "I do not know" answers, it states: "If you do not know the answer, just say so. If you think you have the right answer, it is likely that you do." Of course, this text was excluded in the treatment arm without IDK. This section included 10 questions with a total time limit of 7 minutes to complete. These included the Big Five financial literacy questions that assess the understanding of inflation, compound interest rate, risk diversification, mortgages and bond pricing concepts. These will be the focus for the main results.[4] The goal of providing a time limit to complete was to minimize the probability of section interruptions and searching for answers. We also kept track of the time spent answering the financial literacy section.

Finally, after the financial literacy section, the survey ended with 7 additional questions about participants' experiences, perceptions, and holdings of financial products. Unlike previous studies, we gathered information on individual's experiences which might help explain decision-making and gender gaps. Based on participants' experiences, we construct a lean-in index as a standardized measure combining information such as asking for a job promotion or wage increase. The perceptions refer to behavioral traits such as having the confidence to deal with unexpected events. The financial products questions referred to ownership and means of interacting with banks (e.g., online). Then, the questionnaire ended

[3]See, for instance, Bucher-Koenen et al. (2017) for an overview of the literature exploring gender gaps in financial literacy.

[4]In addition to the Big Five, we included a simple division question, an interest rate question without compounding, a probability question, a question included in the cognitive reflection test, and a simple subtraction exercise that we used to identify those survey takers who did not pay any attention.

with a question on perceived survey difficulty. This last part was the same for all survey takers and had no time limit.

Importantly, we randomly varied the financial literacy section design while keeping the same questions. The survey design included a control version and three treatments to evaluate as interventions to potentially reduce "I do not know". Following standard survey practices, the control group included the financial literacy questions with the option "I do not know" among the answer options. The first treatment arm, without IDK, omitted this option from the possible answers and the standard introductory section text omitted the mention of "I do not know" answers. The second treatment arm, incentives, kept the "I do not know" option in the answers and offered additional monetary incentives for correct answers. Specifically, the incentive consisted of paying 7 additional cents for each correct answer, up to 70 cents if all 10 questions were answered correctly. Although the overall incentives are low, they are substantial in relative terms, as they can earn an additional 60% of their fixed payment of 1.20€. Finally, the third treatment, referred to as information, also kept "I do not know" among the answers and included an introductory text before starting the financial literacy section. This information aimed to increase awareness of gender differences in propensities to choose "I do not know" and repeated the instruction to try to avoid choosing "I do not know" answers to nudge them away from choosing this answer. Specifically, survey takers assigned to this treatment received the following information:

Men typically answer 7 out of 10 financial questions correctly. Women 6 out of 10. This difference is mostly explained (65%) because women choose the answer "I do not know" more often than men. Therefore, we ask you to - please - avoid answering "I do not know".

Any intervention using informational nudges might be susceptible to potential experimenter demand effects. However, it is reassuring that De Quidt et al. 2018 show that experimenter demand effects tend to be small in online experiments.

The survey code randomly assigned each treatment by gender immediately before entering the financial literacy section. The survey was pre-tested in a pilot implemented in September

2022. For the final sample, we received 6,000 completed surveys in total (3,000 men and 3,000 women): 2,400 in the control group (40 percent of the sample: 1,200 men and 1,200 women) and 1,200 (20 percent of the sample: 600 men and 600 women) in each of the three treatment arms. To obtain 6,000 completed surveys, the survey company collected 6,879 surveys, of which 879 survey takers abandoned the survey before completing it. In Subsection 3.3, we test whether there are gender differences in the probability of exiting the survey, and, in particular, we analyze if different treatment arms impact the probability of exiting the survey differently.

3 Results

3.1 Descriptive Statistics and Randomization

Table 1 presents summary statistics for the control and the three treated groups. It includes all characteristics and outcome variables used in the main analysis and shows the p-value for the F-test on differences across groups.

First, regarding respondents' main demographics, they are equally represented by gender by design, are, on average, 46 years old, about 92% were born in Spain, and more than 50% live in big cities. More than half of them have completed at most secondary education, and over 68% are currently working.

Second, regarding respondents' household characteristics, over 70% live with a partner, have an average of about 3 household members, and are most likely the primary income earners. Survey takers' parents have low education, as more than half of mothers and fathers have completed at most primary education. In line with this, close to 75% recall having fewer than a bookshelf of books when they were 10 years old.

Third, regarding their self-assessments on financial knowledge and risk-taking behavior, we find that most participants perceive they have either neutral (over 40%) or good (close to 40%) knowledge of financial topics. In line with this, they believe they would get close to 6 correct answers in a 10-question financial questionnaire and their interest in finance is

about 6 on a scale between 0 and 10. Both risk aversion measures, one qualitative and one lottery choice using the elicitation method by Eckel and Grossman (2002), show that the survey takers are, on average, slightly risk averse.

Finally, they place themselves close to 4 in their self-efficacy, confidence and lean-in measures, which come from statements with an agreement scale between 0 and 5. Regarding their management of finances, they have, on average, 2.5 out of 6 saving or investing products, such as saving accounts or pension plans, and about 1.4 out of 3 debt products, among loans, mortgages, and credit cards. Most have performed online bank operations over the last 12 months, while about 3% had no bank operations.

The last column reports the p-values for the F-test when comparing all control variables across the four treatment groups. Overall, all these values show that the randomization was implemented successfully. The exceptions are the education level (the proportion of those with primary education and university studies), the assessment of having good or very good financial knowledge, the expected number of correct answers. Reassuringly, the results are not sensitive to including these characteristics as controls.

These descriptive statistics are also presented, separately by gender, in Tables A1 and A2 in the Appendix. Consistent with the literature, men and women differ in some characteristics, mainly in behavioral traits and perceptions. They also differ in managing finance variable characteristics. For example, women tend to be more risk-averse (Croson and Gneezy, 2009), less interested in finance (Brown and Graf, 2013), and less confident in their self-perceived financial knowledge than men (Bordalo et al., 2019). They also hold fewer financial products, are less likely to do online bank operations, and are more likely to have no bank operations (Almenberg and Dreber, 2015; Bottazzi and Lusardi, 2021). Most importantly, the p-values in the final columns show that, when split by gender, both men and women have comparable socio-demographics, family background, behavioral traits, and experience managing finances across the four treatment groups.

3.2 Main Results: Evaluation of the Three Interventions

The *main outcomes* panel in Table 1 show the mean values for the percent of "I do not know" answers and the percent of correct answers for the Big Five financial literacy questions, for each of the treatment groups. In the control group, the survey takers choose the "I do not know" answer on average in about 15 percent of the questions, while the three treatment arms reduce this percentage significantly. Mechanically, the biggest decrease is when this option is eliminated, followed by the information treatment, chosen in 7 percent of the questions, and finally, by the introduction of monetary incentives, chosen in 9 percent of the questions. The results in financial literacy are also aligned with the previous results. On average, in the control group, survey takers answer 53 percent of the questions correctly, and the three treatment arms are effective in increasing this percentage. When deleting the "I do not know" option, survey takers answer correctly 60 percent of the questions, followed by providing information and monetary incentives, with about 57 and 56 percent correct each, respectively. As expected by these differences, the p-values in the final column show that the different interventions impacted these two outcome variables significantly.

With respect to gender differences, for the control group, we confirm the two main findings on gender gaps in financial literacy, which we show in Figure 1. First, we observe a gender gap of about 9 percentage points in financial literacy, in line with the literature (see, for example, Bucher-Koenen et al. 2017). Specifically, men, on average, answer about 58 percent of the questions correctly, while women answer correctly 49 percent of them. Second, the about 9 percentage point difference is explained by a 6 percentage point gender gap in "I do not know" answers. Consistent with Bucher-Koenen et al. 2021 and Hospido et al. 2021, about two-thirds of the gender gap in financial literacy corresponds to different propensities to choose "I do not know" answers. Specifically, men choose the "I do not know" in close to 12 percent of the questions. In comparison, women choose it at a higher rate (18 percent). Last, when looking at the percent incorrect answers, an outcome not usually studied in the literature, we find that men's and women's performance differs by less than 2 percentage

points (significant at the 10% significance level).

As a next step, we evaluate the impact of the three interventions on the gender gaps in both, the frequency of "I do not know" and financial literacy. Figure 2a and Table 2 show the results for the choice of "I do not know" and Figure 2b and Table 3 show the results for financial literacy. Figures 2a and 2b show the mean values by gender and by treatment, while Tables 2 and 3 show the estimation results without any controls, shown in column (1), with all controls, shown in column (2), and with a lasso-selected set of controls, shown in column (3). Appendix Tables A3 and A4 report all the estimated coefficients of the corresponding Tables 2 and 3, respectively.

Regarding the impact on "I do not know" answers, with the extreme intervention of deleting the option of "I do not know" from the answers, this is mechanically reduced to 0, and consequently, the gender gap is closed. Offering incentives also reduces significantly this answer option. However, the gender gap is not significantly reduced with this intervention. Finally, the information nudge is also effective in reducing the percent of "I do not know". In this case, however, the effect is significantly larger for women (reduced to 8.6 percent) than for men (reduced to 5.7 percent), at the 1% significance level, such that the gender gap is reduced. In the specification without controls, in column (1), the response bias is reduced to half, from 6 to 3 percentage points, and in the specification with controls, in columns (2) and (3), the gender gap in the propensity to choose "I do not know" is closed. As shown in Table 2, we reject the hypothesis that all treatment effects are equal for each gender.

How do these results in the "I do not know" answers translate into the financial literacy measures? While the extreme intervention of deleting the option of "I do not know" mechanically closed the gender gap on "I do not know" answers, it does not reduce the gap in financial literacy. It raises the percent of correct answers similarly for both men and women. The introduction of incentives significantly increases the percent of correct answers for men with respect to their control group, but it is not effective for women. If anything, this intervention would *increase* the gender gap, although not significantly. Finally, the information increases

the percent of correct answers for men and women. Contrary to incentives, the increase is significantly larger for women (5 percentage points increase) than for men (2 percentage points), such that this policy can decrease the gender gap in the percent of correct answers, although significant at the 10% level. Women are found still to be less financially literate than men, but the gender gap is reduced to half, from 6 to 3 percentage points. As shown in Table 3, we reject the null hypothesis that all treatment effects in percent correct are equal for both men and women.

Overall, this pattern of results remains when analyzing the Big Five questions individually, as shown in Tables A5 in the Appendix. Although the behavioral patterns go in the same direction and are less precise for each of the Big Five questions, the strongest effects in closing the gender gap in the choice of "I do not know" answers with the information treatment seem to come from the questions on inflation, risk diversification and bond pricing. In addition, we re-do the analysis with alternative measures of financial literacy. We use different sets of questions included in the financial literacy section (see Table A6 in the Appendix). Specifically, we include the Big Five but define omitted questions as "I do not know" answers (column 2) [5], the Big Three (column 3), which excludes the questions on the mortgages and bond pricing from the Big Five questions. We add the simple interest rate question to the Big Five questions ("Big Six", column 4), and finally, we include all the questions in the financial literacy section (All, column 5). The results are robust to all the different measures.

The main take-away is that while the three interventions are highly effective in reducing the percent of "I do not know" answers and increasing financial literacy measures, only the information nudge treatment is effective in reducing the gender gap in these two outcomes. With this simple-to-implement information treatment, the gender gap in the choice of "I do not know" answer is eliminated, and the gender gap in financial literacy is reduced to half, from 6 percentage points to 3.

[5]There are 140 participants that skip at least one of the Big Five questions. There are currently considered non-IDK, non-correct, and non-incorrect answers. In this robustness exercise, they are considered IDK answers

3.3 Further Results: Evaluation of the Three Interventions using Random Guessing Framework, and other Outcome Variables

An alternative way to evaluate the effect on financial literacy by treatment and gender is to compare the observed increase in percent correct answers with the expected increase by random guessing. For example, if participants answered one additional question and that question had 4 answer options, we would expect an increase of 25% in financial literacy measured by simple random guessing. For a treatment to be effective, we would like the observed increase in financial literacy to be *higher* than the one expected by random guessing, as this means that those participants who decide to provide the answer with this intervention are providing an informed guess. The differences between the observed increase in percent correct and the expected increase under random guessing are provided in the Appendix Table A7, by treatment and by gender.[6] This alternative evaluation shows that for women the observed increase in percent correct is highest relative to an expected increase from random guessing in the information treatment, for which the average expected random guessing increase is 0.037, and the observed is 0.048. By contrast, this difference is even negative for incentives (0.023 under random guessing versus 0.012 observed). For men, on the contrary, the highest increase is for incentives (0.021 under random guessing versus 0.043 observed), and this difference is negative for information (0.024 under random guessing versus 0.020 observed). For the intervention of deleting the "I do not know" answer option, this difference is positive for both men and women and similar in magnitude. This alternative evaluation suggests that the information treatment is the best candidate to close the gender gap in financial literacy.

Finally, an alternative measure to compare the treatment effects is analyzing the effects in percent incorrect answers, a performance measure that has received little attention in the

[6]To calculate the expected increase in percent correct by random guessing, we first calculate the expected increase question by question, weight it by the increase in provided answers, and then we take the simple average. In particular, as the inflation question has 3 alternative answers, the interest rate question has 4, the risk diversification and mortgages are true/false questions and the bond pricing one has 3 alternative answers, the expected increase for each type of question would differ.

literature. As shown by the bottom part of Table 1, all three interventions also increase the percent of incorrect answers. In addition, Table A8 in the Appendix, shows the estimation results for percent incorrect. Interestingly, we find significant differences by gender. Deleting the option of "I do not know" and introducing incentives increases the percent of incorrect answers significantly more for women than men. In fact, the incentives only impact women's performance in incorrect answers, whereas men's percent incorrect remains unchanged. The only intervention that does not affect the gender gap in the percent of incorrect answers is the information treatment. This result also suggests that the information treatment is the best candidate to reduce the gender gap in financial literacy.

Finally, we also study the impact of the treatments on measures of attrition, perceived difficulty and completion time of the Big Five questions obtained from the survey. These additional results are shown in Table A9 in the Appendix. Overall, there are no outstanding differences by treated group and gender, except for completion time. The probability of abandoning the survey is a policy-relevant outcome, particularly, for online surveys. The survey company 40dB collected 6,879 surveys to obtain 6,000 completed surveys. Therefore, 879 survey takers left the survey before completing it, a metric that is expected by 40dB. Of those, we exclude 115 individuals whose gender is not reported as they exit the survey before reaching the first question. For the 6,764 remaining participants, we can test whether men and women have a different likelihood of exiting the survey, and for the 6,220 remaining participants who stayed until randomization into treatments was implemented, we can further test if the three treatments impact differently the probability of exiting the survey. We find that 13 percent of the survey takers abandon the test and that, on average, they do it early in the questionnaire, in question numbers 1 and 2. However, once participants have passed the first part of the questionnaire and are assigned to different treatments, the exit rate is as low as 4%. Women are more likely to abandon the test early (4.5 percentage points higher) but this gender gap disappears once they complete the first part. More importantly, we find no evidence that the three treatments affect differently the probability of abandoning the

test (columns 1 to 4 in Table A9 in the Appendix).

With respect to perceived difficulty, measured on a scale between 0 and 10, survey takers, on average, give a score slightly over 4, as shown at the bottom part of Table 1. Women, on average, find it more difficult than men. However, we find no evidence that the treatments affect differently participants' perceived difficulty (columns 5 and 6 in Table A9 in the Appendix).

Finally, regarding the completion time of the Big Five questions, the bottom part of Table 1 shows participants take about a minute and a half to do the 5 questions. The only remarkable effect is that the without IDK treatment increases completion time significantly for female survey takers (columns 7 and 8 in Table A9 in the Appendix).

4 Concluding Remarks

This paper shows that, consistent with other studies, there is a gender gap in financial literacy, but that about two-thirds of this gender gap is explained by differences in the propensity to choose "I do not know" answer option. As the main contribution, we carried out the first RCT to evaluate how different interventions impact men's and women's propensity to choose "I do not know" answers and consequently observed financial literacy measures.

We find that all three interventions (removing "I do not know" answer option, providing incentives and information treatments) effectively reduce the propensity to choose "I do not know" answers and increase financial literacy. However, we find important gender differences. The extreme intervention of deleting "I do not know" answers mechanically closes the "I do not know" answer gap, but does not impact the gender gap in financial literacy. The incentives treatment also reduces the "I do not know" but not the gender gap. In fact, if anything, this seems to go in the direction of increasing the gender gap. By contrast, the provision of information is the only one that can close the gender gap in the propensity to choose "I do not know" answer option, and it reduces the gender gap in financial literacy in half, from 6 to 3 percentage points.

These results show that standard surveys to measure financial literacy overstate gender gaps in financial literacy, as women tend to choose "I do not know" more frequently. In addition, we show that an important design policy to increase precision in measuring the gender gap in financial literacy is including a simple information nudge, which is relatively easy to implement. Further research should be devoted to understanding how information treatments can work in repeated surveys.

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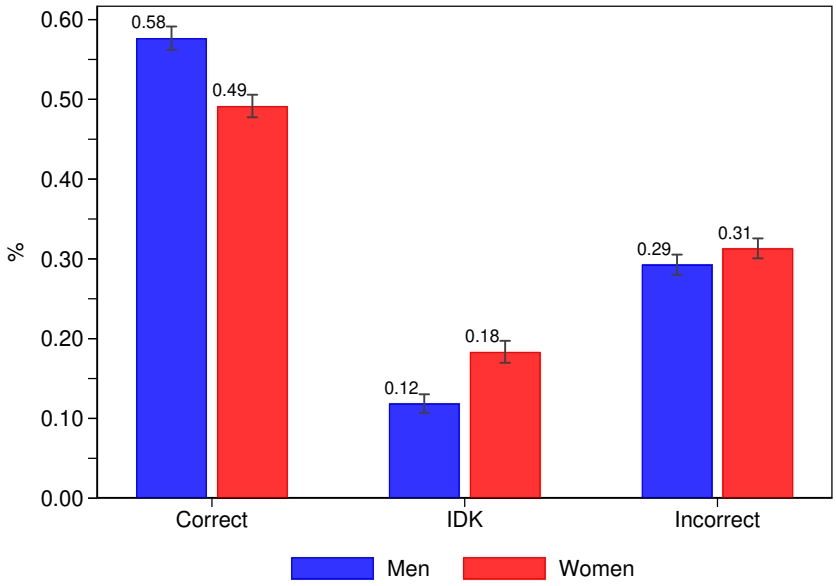
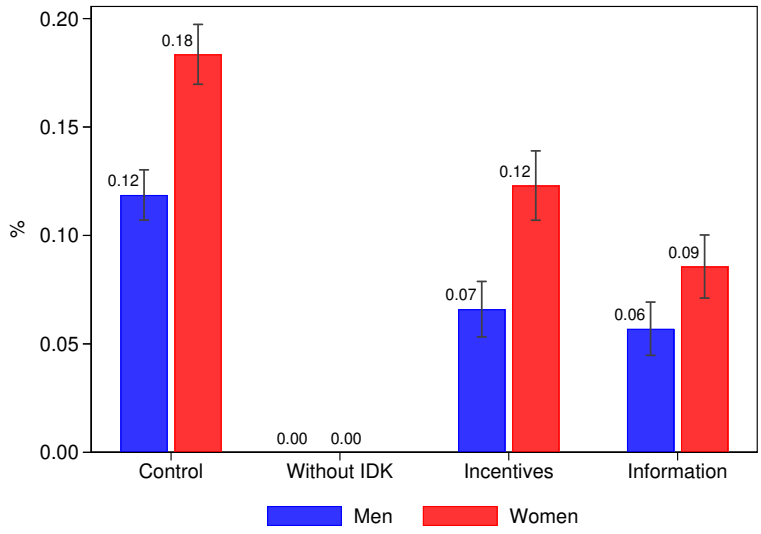
Figures and Tables

Figure 1: Main Outcomes in the Big Five Questions in the Control Group by Gender

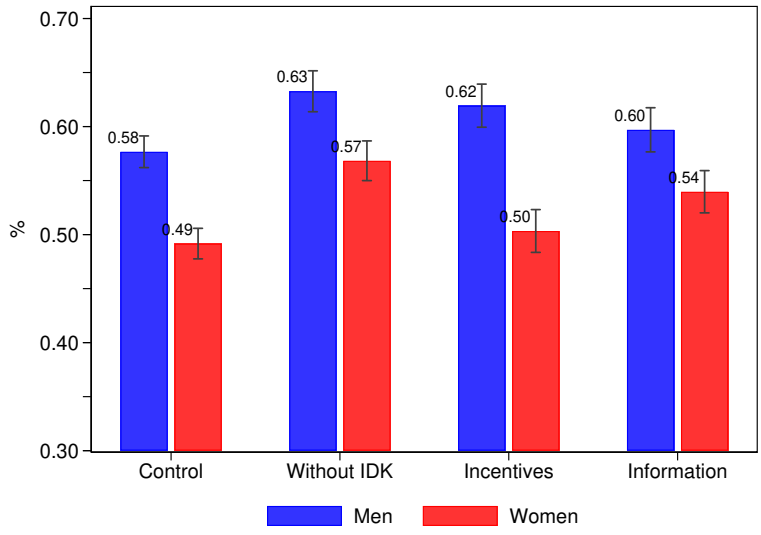


Notes: Raw average percent correct answers, percent IDK answer option, and percent incorrect answers, along with their 95% confidence intervals, for the Big Five questions in the control group, by gender.

Figure 2: Percent IDK and Percent Correct by Treatment Group and Gender



(a) Percent "I do not know"



(b) Percent Correct

Notes: Panel (a) plots raw average percent IDK answer option and Panel (b) plots raw average percent correct answers, along with their 95% confidence intervals, for the Big Five questions by treatment group and gender.

Table 1: Descriptive Statistics (mean values) and Randomization

		(1) Control	(2) Without IDK	(3) Incentives	(4) Information	(5) p-value
Demographics	Woman	0.50	0.50	0.50	0.50	1.00
	Age 18-34	0.19	0.19	0.17	0.18	0.70
	Age 35-44	0.26	0.27	0.26	0.27	0.87
	Age 45-54	0.30	0.30	0.30	0.30	0.97
	Age 55-70	0.25	0.24	0.27	0.26	0.47
	Spaniard	0.91	0.93	0.93	0.91	0.16
	Pop. size 0-20th	0.21	0.18	0.19	0.20	0.16
	Pop. size 20th-100th	0.27	0.26	0.28	0.27	0.70
	Pop. size 100th+	0.52	0.56	0.53	0.53	0.16
	Primary education	0.20	0.17	0.25	0.21	0.00
	Secondary education	0.34	0.37	0.35	0.35	0.36
	University education	0.35	0.35	0.30	0.34	0.02
	Master, PhD education	0.11	0.11	0.10	0.10	0.76
	Working	0.70	0.69	0.67	0.67	0.12
	Retired	0.10	0.10	0.12	0.11	0.37
	Unemployed	0.19	0.19	0.20	0.21	0.31
Household	$<$ 1 bookshelf at age 10	0.75	0.74	0.73	0.73	0.74
	$>$ 2 bookshelves at age 10	0.25	0.26	0.27	0.27	0.74
	Household size	2.99	2.97	3.04	2.97	0.43
	Primary earner	0.67	0.66	0.69	0.66	0.44
	Lives with partner	0.73	0.71	0.72	0.73	0.59
	Mother: Primary education	0.60	0.57	0.59	0.59	0.60
	Mother: Secondary education	0.19	0.21	0.19	0.20	0.43
	Mother: Post-secondary education	0.20	0.19	0.19	0.19	0.80
	Father: Primary education	0.53	0.53	0.55	0.56	0.38
	Father: Secondary education	0.20	0.20	0.20	0.19	0.68
	Father: Post-secondary education	0.23	0.23	0.20	0.22	0.42
	Partner: Primary education	0.17	0.15	0.18	0.18	0.12
	Partner: Secondary education	0.24	0.25	0.24	0.23	0.78
	Partner: Post-secondary education	0.33	0.32	0.30	0.32	0.50
Assessments	Very low financial knowledge	0.02	0.02	0.02	0.03	0.70
	Low financial knowledge	0.12	0.12	0.12	0.12	0.94
	Neutral financial knowledge	0.42	0.41	0.40	0.44	0.20
	Good financial knowledge	0.38	0.41	0.40	0.37	0.09
	Very good financial knowledge	0.06	0.04	0.06	0.05	0.03
	Expected correct answers	5.58	5.73	5.79	5.52	0.00
	Interest in finance	6.10	6.13	6.14	5.97	0.35
	Risk willingness	4.65	4.77	4.74	4.62	0.48
	Lottery choice	3.62	3.58	3.67	3.65	0.77
Perceptions	Lean-in index	0.01	0.01	-0.03	0.00	0.39
	Perceived self-efficacy	3.96	4.00	4.00	4.02	0.20
	Perceived confidence	3.80	3.87	3.83	3.83	0.18
	Perceived lean-in	3.65	3.67	3.64	3.63	0.84
Managing finances	Saving products (N)	2.53	2.60	2.46	2.56	0.07
	Debt products (N)	1.39	1.39	1.36	1.42	0.48
	Online bank operations	0.80	0.82	0.80	0.81	0.66
	No bank operations	0.03	0.03	0.03	0.04	0.34
Main outcomes	Big five: IDK answers (%)	0.15	0.00	0.09	0.07	0.00
	Big five: Correct answers (%)	0.53	0.60	0.56	0.57	0.00
Other outcomes	Big five: Incorrect answers (%)	0.30	0.38	0.33	0.34	0.00
	Perceived survey difficulty	4.23	4.15	4.17	4.13	0.76
	Big-five: Completion time	99.57	102.34	100.77	102.59	0.49
Observations		2,400	1,200	1,200	1,200	

Table 2: Percent "I do not know" Answers: Big Five Questions

	(1)	(2)	(3)
Women	0.065	0.041	0.040
	(0.009)	(0.009)	(0.009)
Without IDK	-0.119	-0.115	-0.115
	(0.006)	(0.006)	(0.006)
Incentives	-0.053	-0.049	-0.049
	(0.009)	(0.008)	(0.008)
Information	-0.062	-0.063	-0.063
	(0.009)	(0.008)	(0.008)
Women x Without IDK	-0.065	-0.067	-0.067
	(0.009)	(0.009)	(0.009)
Women x Incentives	-0.008	-0.015	-0.015
	(0.014)	(0.013)	(0.013)
Women x Information	-0.036	-0.038	-0.038
	(0.013)	(0.012)	(0.012)
Men Control	0.119	0.119	0.119
Controls	No	All	Selected
P-value Test: treatments equal for men	0.000	0.000	0.000
P-value Test: treatments equal for women	0.000	0.000	0.000
Observations	6000	6000	6000
R-squared	0.105	0.239	0.239

Notes: OLS regression of the outcome percent IDK answers in the Big Five questions. The first column includes no control variables, the second column includes all control variables and the third column includes a lasso-selected set of control variables. To see the estimated values of all coefficients in each of the columns see Table A3 in the Appendix. Robust standard errors in parentheses.

Table 3: Percent Correct Answers: Big Five Questions

	(1)	(2)	(3)
Women	-0.085	-0.056	-0.056
	(0.010)	(0.010)	(0.010)
Without IDK	0.056	0.052	0.052
	(0.012)	(0.011)	(0.011)
Incentives	0.043	0.040	0.040
	(0.013)	(0.012)	(0.012)
Information	0.020	0.021	0.021
	(0.013)	(0.012)	(0.012)
Women x Without IDK	0.021	0.021	0.021
	(0.017)	(0.016)	(0.016)
Women x Incentives	-0.031	-0.021	-0.021
	(0.018)	(0.016)	(0.016)
Women x Information	0.028	0.028	0.028
	(0.018)	(0.017)	(0.017)
Men Control	0.577	0.577	0.577
Controls	No	All	Selection
P-value Test: treatments equal for men	0.042	0.077	0.076
P-value Test: treatments equal for women	0.000	0.000	0.000
Observations	6,000	6,000	6,000
R-squared	0.037	0.176	0.176

Notes: OLS regression of the outcome percent correct answers in the Big Five questions. The first column includes no control variables, the second column includes all control variables and the third column includes a lasso-selected set of control variables. To see the estimated values of all coefficients in each of the columns see Table A4 in the Appendix. Robust standard errors in parentheses.

A Additional Figures and Tables

Figure A1: Diagram of the Experimental Design

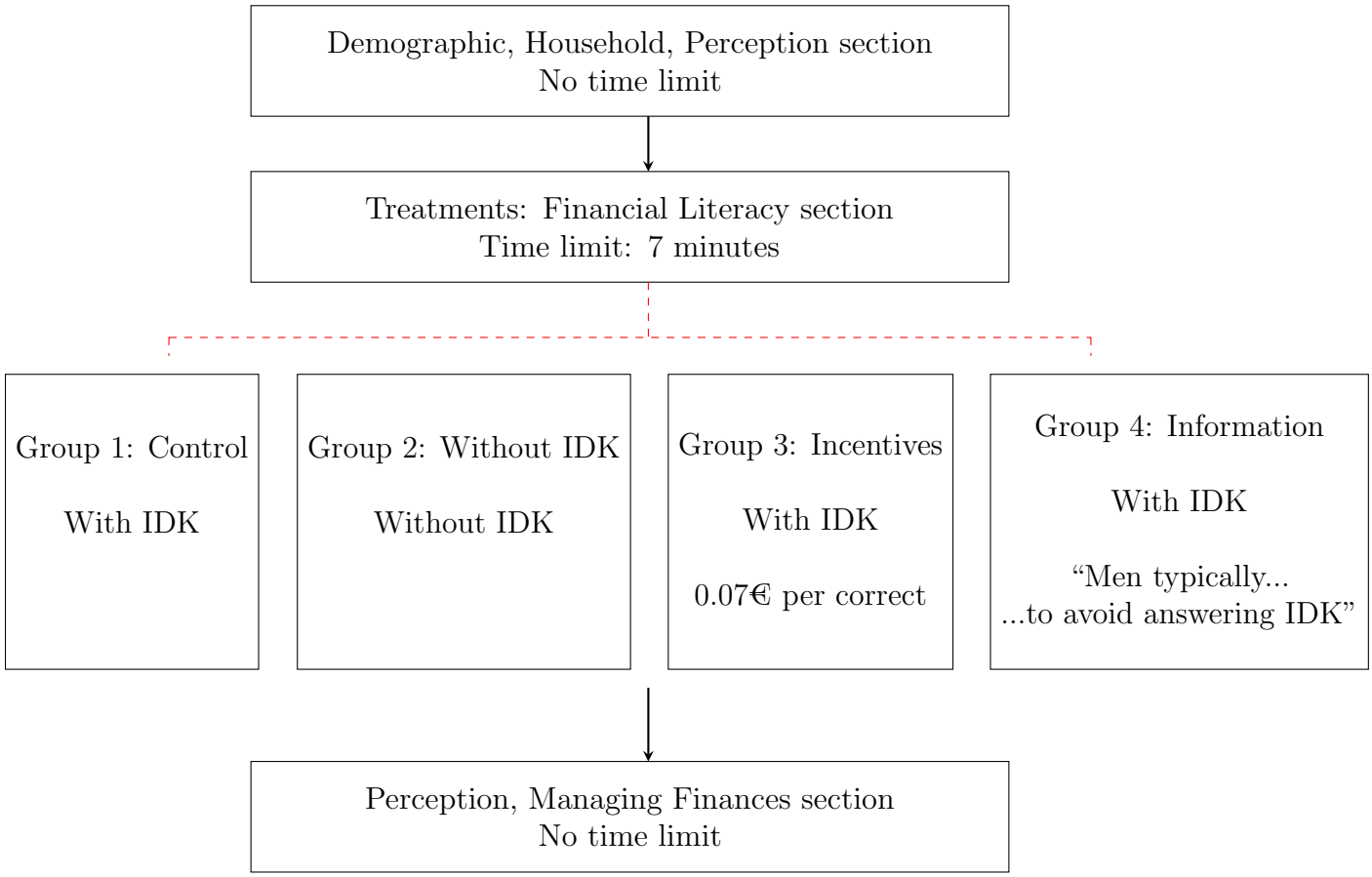


Table A1: Descriptive Statistics (mean values) and Randomization: Women Sample

		(1) Control	(2) Without IDK	(3) Incentives	(4) Information	(5) p-value
Demographics	Age 18-34	0.20	0.21	0.20	0.17	0.35
	Age 35-44	0.28	0.30	0.28	0.27	0.77
	Age 45-54	0.31	0.28	0.29	0.33	0.39
	Age 55-70	0.21	0.21	0.23	0.23	0.63
	Spaniard	0.90	0.91	0.92	0.90	0.56
	Pop. size 0-20th	0.22	0.17	0.20	0.20	0.04
	Pop. size 20th-100th	0.26	0.28	0.28	0.29	0.49
	Pop. size 100th+	0.52	0.55	0.52	0.51	0.37
	Primary education	0.21	0.15	0.26	0.20	0.00
	Secondary education	0.31	0.36	0.36	0.35	0.06
	University education	0.36	0.37	0.28	0.36	0.00
	Master, PhD education	0.12	0.13	0.10	0.08	0.02
	Working	0.67	0.66	0.63	0.61	0.08
	Retired	0.07	0.07	0.08	0.09	0.45
	Unemployed	0.25	0.24	0.28	0.29	0.18
Household	$<$ 1 bookshelf at age 10	0.71	0.73	0.70	0.73	0.64
	$>$ 2 bookshelves at age 10	0.29	0.27	0.30	0.27	0.64
	Household size	3.03	2.98	3.02	3.02	0.85
	Primary earner	0.51	0.50	0.54	0.49	0.35
	Lives with partner	0.72	0.70	0.69	0.70	0.61
	Mother: Primary education	0.59	0.57	0.61	0.60	0.40
	Mother: Secondary education	0.19	0.22	0.20	0.19	0.52
	Mother: Post-secondary education	0.20	0.20	0.17	0.19	0.29
	Father: Primary education	0.54	0.51	0.56	0.54	0.39
	Father: Secondary education	0.20	0.20	0.20	0.22	0.89
	Father: Post-secondary education	0.21	0.25	0.19	0.20	0.10
	Partner: Primary education	0.19	0.16	0.19	0.18	0.38
	Partner: Secondary education	0.23	0.24	0.26	0.25	0.50
	Partner: Post-secondary education	0.30	0.30	0.25	0.27	0.06
Assessments	Very low financial knowledge	0.03	0.02	0.03	0.02	0.29
	Low financial knowledge	0.15	0.16	0.16	0.14	0.84
	Neutral financial knowledge	0.44	0.43	0.39	0.47	0.07
	Good financial knowledge	0.33	0.37	0.38	0.34	0.11
	Very good financial knowledge	0.05	0.03	0.04	0.03	0.03
	Expected correct answers	5.22	5.37	5.35	5.17	0.28
	Interest in finance	5.88	5.73	5.80	5.70	0.50
	Risk willingness	4.24	4.34	4.32	4.18	0.75
	Lottery choice	3.59	3.48	3.48	3.58	0.69
Perceptions	Lean-in index	-0.12	-0.11	-0.16	-0.13	0.41
	Perceived self-efficacy	3.96	3.98	4.00	4.02	0.56
	Perceived confidence	3.82	3.85	3.79	3.83	0.73
	Perceived lean-in	3.64	3.67	3.62	3.65	0.88
Managing finances	Saving products (N)	2.35	2.42	2.21	2.33	0.04
	Debt products (N)	1.35	1.39	1.32	1.34	0.51
	Online bank operations	0.79	0.81	0.78	0.80	0.71
	No bank operations	0.04	0.04	0.04	0.06	0.27
Main outcomes	Big five: IDK answers (%)	0.18	0.00	0.12	0.09	0.00
	Big five: Correct answers (%)	0.49	0.57	0.50	0.54	0.00
Other outcomes	Big five: Incorrect answers (%)	0.31	0.42	0.36	0.36	0.00
	Perceived survey difficulty	4.41	4.45	4.36	4.38	0.94
	Big-five: Completion time	99.23	108.92	103.41	104.36	0.02
Observations		1,200	600	600	600	

Table A2: Descriptive Statistics (mean values) and Randomization: Men Sample

		(1) Control	(2) Without IDK	(3) Incentives	(4) Information	(5) p-value
Demographics	Age 18-34	0.17	0.17	0.15	0.18	0.49
	Age 35-44	0.25	0.25	0.24	0.26	0.87
	Age 45-54	0.30	0.31	0.30	0.28	0.58
	Age 55-70	0.29	0.27	0.30	0.28	0.63
	Spaniard	0.92	0.94	0.94	0.92	0.25
	Pop. size 0-20th	0.20	0.20	0.17	0.20	0.74
	Pop. size 20th-100th	0.28	0.24	0.28	0.25	0.15
	Pop. size 100th+	0.52	0.56	0.54	0.56	0.32
	Primary education	0.20	0.20	0.23	0.21	0.22
	Secondary education	0.36	0.38	0.34	0.35	0.61
	University education	0.34	0.34	0.32	0.31	0.61
	Master, PhD education	0.11	0.10	0.11	0.13	0.30
	Working	0.73	0.72	0.71	0.72	0.77
	Retired	0.14	0.12	0.15	0.13	0.45
	Unemployed	0.12	0.14	0.13	0.13	0.72
Household	$<$ 1 bookshelf at age 10	0.78	0.76	0.76	0.73	0.19
	$>$ 2 bookshelves at age 10	0.22	0.24	0.24	0.27	0.19
	Household size	2.95	2.97	3.06	2.92	0.15
	Primary earner	0.83	0.81	0.83	0.83	0.76
	Lives with partner	0.75	0.73	0.75	0.76	0.69
	Mother: Primary education	0.61	0.58	0.57	0.59	0.60
	Mother: Secondary education	0.18	0.20	0.19	0.20	0.75
	Mother: Post-secondary education	0.19	0.18	0.20	0.18	0.71
	Father: Primary education	0.52	0.54	0.54	0.57	0.18
	Father: Secondary education	0.21	0.21	0.20	0.16	0.09
	Father: Post-secondary education	0.24	0.21	0.22	0.23	0.62
	Partner: Primary education	0.15	0.14	0.17	0.17	0.24
	Partner: Secondary education	0.24	0.26	0.23	0.21	0.31
	Partner: Post-secondary education	0.35	0.34	0.35	0.37	0.71
Assessments	Very low financial knowledge	0.01	0.02	0.01	0.03	0.01
	Low financial knowledge	0.09	0.09	0.09	0.09	0.99
	Neutral financial knowledge	0.40	0.38	0.40	0.41	0.84
	Good financial knowledge	0.43	0.46	0.42	0.40	0.25
	Very good financial knowledge	0.07	0.05	0.08	0.07	0.19
	Expected correct answers	5.94	6.09	6.23	5.87	0.01
	Interest in finance	6.32	6.53	6.48	6.25	0.15
	Risk willingness	5.05	5.19	5.17	5.06	0.69
	Lottery choice	3.66	3.68	3.87	3.72	0.35
Perceptions	Lean-in index	0.13	0.12	0.10	0.13	0.80
	Perceived self-efficacy	3.96	4.01	4.01	4.02	0.41
	Perceived confidence	3.79	3.90	3.87	3.82	0.06
	Perceived lean-in	3.65	3.67	3.65	3.62	0.87
Managing finances	Saving products (N)	2.70	2.79	2.71	2.78	0.52
	Debt products (N)	1.44	1.38	1.41	1.50	0.09
	Online bank operations	0.82	0.83	0.82	0.82	0.93
	No bank operations	0.03	0.01	0.02	0.02	0.38
Main outcomes	Big five: IDK answers (%)	0.12	0.00	0.07	0.06	0.00
	Big five: Correct answers (%)	0.58	0.63	0.62	0.60	0.00
Other outcomes	Big five: Incorrect answers (%)	0.29	0.35	0.30	0.32	0.00
	Perceived survey difficulty	4.04	3.86	3.99	3.88	0.50
	Big-five: Completion time	99.92	95.72	98.16	100.79	0.51
Observations		1,200	600	600	600	

Table A3: Percent IDK Answers with All Coefficients: Big Five Questions

	(1)	(2)	(3)
Women	0.065	0.041	0.040
	(0.009)	(0.009)	(0.009)
Without IDK	-0.119	-0.115	-0.115
	(0.006)	(0.006)	(0.006)
Incentives	-0.053	-0.049	-0.049
	(0.009)	(0.008)	(0.008)
Information	-0.062	-0.063	-0.063
	(0.009)	(0.008)	(0.008)
Women x Without IDK	-0.065	-0.067	-0.067
	(0.009)	(0.009)	(0.009)
Women x Incentives	-0.008	-0.015	-0.015
	(0.014)	(0.013)	(0.013)
Women x Information	-0.036	-0.038	-0.038
	(0.013)	(0.012)	(0.012)
Age 18-34			0.007
			(0.006)
Age 35-44		-0.001	0.007
		(0.007)	(0.006)
Age 45-54		-0.007	
		(0.007)	
Age 55-70		-0.018	-0.011
		(0.007)	(0.006)
Spaniard		-0.002	
		(0.008)	
Pop. size 20th-100th		-0.002	
		(0.007)	
Pop. size 100th+		-0.004	
		(0.006)	
Secondary education		-0.005	
		(0.008)	
University education		-0.016	-0.009
		(0.008)	(0.005)
Master, PhD education		-0.014	-0.007
		(0.010)	(0.006)
Working		-0.002	
		(0.018)	
Retired		-0.003	
		(0.019)	
Unemployed		0.002	0.005
		(0.018)	(0.007)
> 2 bookshelves at age 10		0.002	
		(0.005)	
Household size		0.002	0.002
		(0.002)	(0.002)
Primary earner		-0.008	-0.009
		(0.006)	(0.006)
Lives with partner		-0.029	-0.020
		(0.008)	(0.006)
Mother: Secondary education		0.009	0.008
		(0.006)	(0.006)
Mother: Post-secondary education		0.001	
		(0.007)	
Father: Secondary education		-0.007	-0.007
		(0.006)	(0.005)
Father: Post-secondary education		-0.001	
		(0.007)	
Partner: Secondary education		0.010	
		(0.007)	
Partner: Post-secondary education		0.014	
		(0.008)	
Very low financial knowledge			0.082
			(0.025)
Low financial knowledge		-0.056	0.027
		(0.026)	(0.009)
Neutral financial knowledge		-0.082	
		(0.025)	
Good financial knowledge		-0.106	-0.024
		(0.026)	(0.005)
Very good financial knowledge		-0.113	-0.031
		(0.027)	(0.008)
Interest in finance		-0.008	-0.008
		(0.001)	(0.001)
Expected correct answers		-0.001	-0.001
		(0.002)	(0.002)
Risk willingness		-0.002	-0.002
		(0.001)	(0.001)
Lottery choice		-0.001	-0.001
		(0.001)	(0.001)
Saving products (N)		-0.004	-0.004
		(0.002)	(0.002)
Debt products (N)		-0.006	-0.006
		(0.003)	(0.003)
Online bank operations		-0.006	-0.006
		(0.007)	(0.007)
No bank operations		0.104	0.105
		(0.024)	(0.024)
Lean-in index		-0.016	-0.016
		(0.003)	(0.003)
Perceived self-efficacy		-0.004	-0.004
		(0.003)	(0.003)
Perceived confidence		-0.013	-0.013
		(0.004)	(0.004)
Perceived lean-in		-0.006	-0.006
		(0.003)	(0.003)
Constant	0.119	0.433	0.332
	(0.006)	(0.035)	(0.020)
Controls	No	All	Selected
Observations	6000	6000	6000
R2	0.105	0.239	0.239

Notes: OLS regression of the outcome percent IDK answers in the Big Five questions. The first column includes no control variables, the second column includes all control variables and the third column includes a lasso-selected set of control variables. Robust standard errors in parentheses.

Table A4: Percent Correct Answers with All Coefficients: Big Five Questions

	(1)	(2)	(3)
Women	-0.085	-0.056	-0.056
	(0.010)	(0.010)	(0.010)
Without IDK	0.056	0.052	0.052
	(0.012)	(0.011)	(0.011)
Incentives	0.043	0.040	0.040
	(0.013)	(0.012)	(0.012)
Information	0.020	0.021	0.021
	(0.013)	(0.012)	(0.012)
Women x Without IDK	0.021	0.021	0.021
	(0.017)	(0.016)	(0.016)
Women x Incentives	-0.031	-0.021	-0.021
	(0.018)	(0.016)	(0.016)
Women x Information	0.028	0.028	0.028
	(0.018)	(0.017)	(0.017)
Age 18-34			-0.036
			(0.009)
Age 35-44		0.013	-0.023
		(0.009)	(0.008)
Age 45-54		0.036	
		(0.009)	
Age 55-70		0.071	0.035
		(0.010)	(0.009)
Spaniard		0.008	0.008
		(0.011)	(0.011)
Pop. size 20th-100th		0.007	0.007
		(0.009)	(0.007)
Pop. size 100th+		-0.000	
		(0.008)	
Secondary education		0.033	0.033
		(0.009)	(0.009)
University education		0.079	0.079
		(0.011)	(0.010)
Master, PhD education		0.074	0.074
		(0.014)	(0.014)
Working		-0.002	
		(0.025)	
Retired		0.003	0.005
		(0.027)	(0.011)
Unemployed		-0.010	-0.008
		(0.025)	(0.009)
> 2 bookshelves at age 10		0.009	0.009
		(0.007)	(0.007)
Household size		-0.005	-0.005
		(0.003)	(0.003)
Primary earner		0.004	0.004
		(0.008)	(0.008)
Lives with partner		0.012	0.012
		(0.010)	(0.008)
Mother: Secondary education		-0.021	-0.021
		(0.009)	(0.008)
Mother: Post-secondary education		-0.018	-0.018
		(0.011)	(0.010)
Father: Secondary education		0.001	
		(0.008)	
Father: Post-secondary education		-0.011	-0.011
		(0.010)	(0.009)
Partner: Secondary education		-0.000	
		(0.010)	
Partner: Post-secondary education		0.010	0.010
		(0.011)	(0.008)
Very low financial knowledge			-0.031
			(0.022)
Low financial knowledge		0.031	
		(0.023)	
Neutral financial knowledge		0.030	
		(0.023)	
Good financial knowledge		0.033	0.003
		(0.024)	(0.007)
Very good financial knowledge		0.011	-0.019
		(0.028)	(0.015)
Interest in finance		0.011	0.011
		(0.002)	(0.002)
Expected correct answers		0.008	0.008
		(0.002)	(0.002)
Risk willingness		-0.002	-0.002
		(0.001)	(0.001)
Lottery choice		-0.002	-0.002
		(0.001)	(0.001)
Saving products (N)		0.011	0.011
		(0.003)	(0.003)
Debt products (N)		0.005	0.005
		(0.004)	(0.004)
Online bank operations		0.062	0.062
		(0.009)	(0.009)
No bank operations		-0.050	-0.050
		(0.021)	(0.021)
Lean-in index		0.026	0.026
		(0.005)	(0.005)
Perceived self-efficacy		0.011	0.011
		(0.004)	(0.004)
Perceived confidence		0.007	0.007
		(0.005)	(0.005)
Perceived lean-in		0.005	0.005
		(0.003)	(0.003)
Constant	0.577	0.189	0.254
	(0.007)	(0.039)	(0.026)
Controls	No	All	Selected
Observations	6000	6000	6000
R2	0.037	0.176	0.176

Notes: OLS regression of the outcome percent correct answers in the Big Five questions. The first column includes no control variables, the second column includes all control variables and the third column includes a lasso-selected set of control variables. Robust standard errors in parentheses.

Table A5: Percent IDK Answers Question by Question: Big Five Questions

	(1) Inflation	(2) Compound Interest Rate	(3) Risk Diversification	(4) Mortgages	(5) Bond Pricing
Women	0.027	0.023	0.064	0.010	0.079
	(0.010)	(0.011)	(0.017)	(0.013)	(0.017)
Without IDK	-0.046	-0.051	-0.196	-0.090	-0.193
	(0.006)	(0.006)	(0.011)	(0.008)	(0.012)
Incentives	-0.013	-0.017	-0.100	-0.040	-0.073
	(0.009)	(0.010)	(0.016)	(0.012)	(0.017)
Information	-0.024	-0.031	-0.123	-0.039	-0.098
	(0.009)	(0.009)	(0.015)	(0.012)	(0.017)
Women x Without IDK	-0.045	-0.039	-0.104	-0.030	-0.118
	(0.011)	(0.011)	(0.018)	(0.013)	(0.018)
Women x Incentives	-0.017	-0.012	-0.003	-0.012	-0.029
	(0.016)	(0.016)	(0.026)	(0.018)	(0.026)
Women x Information	-0.029	-0.010	-0.051	-0.022	-0.079
	(0.014)	(0.015)	(0.024)	(0.018)	(0.025)
Constant	0.317	0.265	0.622	0.353	0.609
	(0.045)	(0.044)	(0.063)	(0.051)	(0.063)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	6000	6000	6000	6000	6000
R2	0.101	0.091	0.163	0.102	0.149

Notes: OLS regression of the outcome percent IDK answers in each of the Big Five questions with all control variables included. Robust standard errors in parentheses.

Table A6: Percent IDK Answers with Big Five, Big Five, Big Three, Big Six and All Nine Questions

	(1) Big Five	(2) Big Five	(3) Big Three	(4) Big Six	(5) All Nine
Women	0.041	0.040	0.038	0.040	0.037
	(0.009)	(0.009)	(0.009)	(0.008)	(0.007)
Without IDK	-0.115	-0.108	-0.098	-0.113	-0.108
	(0.006)	(0.008)	(0.006)	(0.006)	(0.005)
Incentives	-0.049	-0.046	-0.043	-0.047	-0.044
	(0.008)	(0.009)	(0.008)	(0.008)	(0.007)
Information	-0.063	-0.050	-0.059	-0.061	-0.056
	(0.008)	(0.010)	(0.008)	(0.008)	(0.007)
Women x Without IDK	-0.067	-0.072	-0.063	-0.064	-0.057
	(0.009)	(0.012)	(0.009)	(0.009)	(0.008)
Women x Incentives	-0.015	-0.009	-0.011	-0.012	-0.005
	(0.013)	(0.014)	(0.013)	(0.012)	(0.011)
Women x Information	-0.038	-0.048	-0.030	-0.032	-0.027
	(0.012)	(0.014)	(0.013)	(0.012)	(0.011)
Constant	0.433	0.442	0.401	0.429	0.400
	(0.035)	(0.037)	(0.037)	(0.033)	(0.029)
Controls	All	All	All	All	All
Observations	6000	6000	6000	6000	6000
R2	0.239	0.191	0.204	0.249	0.251

Notes: OLS regression of the outcome percent IDK answers in different set of question with all control variables included. Column (1) reproduces our main results for the Big Five answers, Column (2) shows the results for the Big Five answers redefining the IDK to include the skipped answers, Column (3) uses the Big Three answers, corresponding to inflation, compound interest rate and risk diversification, Column (4) adds the simple interest rate answer to the Big Five, and Column (5) includes all questions of the section. Robust standard errors in parentheses.

Table A7: Big-Five: Benchmark of Random Guessing

	(1) Δ Answers	(2) Δ Correct	(3) Δ Correct by Random Guessing	(4) Difference
		All		
Without IDK	0.15	0.066	0.057	0.010
Incentives	0.06	0.027	0.022	0.005
Information	0.08	0.034	0.030	0.004
		Women		
Without IDK	0.18	0.077	0.069	0.008
Incentives	0.06	0.012	0.023	-0.011
Information	0.10	0.048	0.037	0.011
		Men		
Without IDK	0.12	0.056	0.045	0.011
Incentives	0.05	0.043	0.021	0.022
Information	0.06	0.020	0.024	-0.003

Notes: The first column shows the increase in the percent of provided answers. The second column shows the observed increase in percent correct. The third column shows the expected increase under random guessing. The fourth column shows the difference between Columns (2) and (3).

Table A8: Percent Incorrect Answers: Big Five Questions

	(1)	(2)	(3)
Women	0.021	0.017	0.016
	(0.009)	(0.009)	(0.009)
Without IDK	0.056	0.056	0.056
	(0.011)	(0.011)	(0.011)
Incentives	0.008	0.006	0.007
	(0.011)	(0.011)	(0.011)
Information	0.028	0.029	0.029
	(0.011)	(0.011)	(0.011)
Women x Without IDK	0.048	0.051	0.051
	(0.016)	(0.016)	(0.016)
Women x Incentives	0.034	0.030	0.030
	(0.016)	(0.015)	(0.015)
Women x Information	0.018	0.019	0.019
	(0.016)	(0.016)	(0.016)
Women Control	0.293	0.293	0.293
Controls	No	All	Selected
P-value Test: treatments equal for men	0.001	0.001	0.001
P-value Test: treatments equal for women	0.000	0.000	0.000
Observations	6000	6000	6000
R-squared	0.026	0.080	0.080

Notes: OLS regression of the outcome percent incorrect answers in the Big Five questions. The first column includes no control variables, the second column includes all control variables and the third column includes a lasso-selected set of control variables. Robust standard errors in parentheses.

Table A9: Further Results: Prob. of Exiting, Perceived Difficulty and Completion Time

	(1) Exit	(2) Exit Q N.	(3) Exit	(4) Exit Q N.	(5) Difficulty	(6) Difficulty	(7) Time	(8) Time
Women	0.045	0.520	0.006	0.170	0.368	0.246	-0.692	0.064
	(0.008)	(0.126)	(0.007)	(0..175)	(0.113)	(0.116)	(2.930)	(2.732)
Without IDK			0.002	0..007	-0.183	-0.146	-4.195	-3.843
			(0.008)	(0.197)	(0.137)	(0.132)	(3.084)	(3.067)
Incentives			0.005	0.151	-0.052	-0.027	-1.765	-1.952
			(0.009)	(0.217)	(0.139)	(0.133)	(3.166)	(3.225)
Information			0.006	0.248	-0.162	-0.180	0.866	1.793
			(0.009)	(0.231)	(0.145)	(0.140)	(3.136)	(3.054)
Women x Without IDK			-0.000	-0.085	0.222	0.212	13.887	13.514
			(0.012)	(0.287)	(0.196)	(0.191)	(4.565)	(4.467)
Women x Incentives			0.011	0.192	-0.002	-0.010	5.947	5.343
			(0.013)	(0.332)	(0.195)	(0.190)	(4.552)	(4.470)
Women x Information			-0.005	-0.265	0.130	0.198	4.265	1.638
			(0.013)	(0.319)	(0.200)	(0.196)	(4.325)	(4.225)
Men control	0.089	1.326	0.029	0.681	4.042	4.042	99.920	99.920
Sample	All	All	Treated	Treated	Treated	Treated	Treated	Treated
Controls	No	No	No	No	No	Yes	No	Yes
Observations	6764	6764	6220	6220	6000	6000	5844	5844
R2	0.000	0.001	0.001	0.001	0.007	0.067	0.003	0.058

Notes: Columns (1) and (3) show the probability abandoning or exiting the survey. Columns (2) and (4) show the number of question in which the survey taker abandons the survey. Columns (5) and (6) show the survey perceived difficulty measured in a scale between 0 and 10. Columns (7) and (8) show the time spent in responding the Big Five questions in seconds. Men control row refers to the mean value of each outcomes variable for men in the control group, except for Columns (1) and (2) that show this value for men. Robust standard errors in parentheses.

B Survey Questions in the Four Different Versions

The text in squared brackets [] is not shown to the survey respondents but we include it here to ease the understanding of the survey design to readers.
[The survey starts here:]
This Bank of Spain survey aims to measure the familiarity of the Spanish population with basic economic and financial concepts. Its duration is approximately 15 minutes. The survey is carried out in accordance with the applicable regulations on the protection of personal data, which guarantees that your data will be processed solely for statistical purposes and for quality control of the survey, guaranteeing their due integrity and confidentiality. We inform you that both your personal identification and contact data provided by 40db, as well as the academic-professional, economic-financial and related to your personal characteristics that you provide us, are processed by the Bank of Spain exclusively for (i) measure for statistical purposes the familiarity of the Spanish population with basic economic and financial concepts; and (ii) supervise and control the quality of the survey. You can withdraw your consent by sending an email to micro@bde.es and exercise your rights regarding the protection of personal data, proving your identity, either in person, by postal mail to C/Alcalá 48, 28014, Madrid (A/A Data Protection Officer) or electronically through the procedure indicated in the Virtual Office of the Bank of Spain, available at: link

For more information, you can consult the Record of Processing Activities available at:link

Q1. Do you agree to participate and the processing of your data for the purposes indicated?
a. Yes
b. No

[First part of the questionnaire: questions include socio-demographic variables, family background variables and variables measuring behavioral traits: Q2-Q29]

Q2. Are you a ...?
a. Man
b. Woman

Q3. How old were you on your last birthday?

Q4. In which country were you born?
a. Spain
b. Other, which one?

Q5. About how many books were in your home when you were 10 years old? (Do not include magazines, newspapers, or textbooks)
a. None or very few (between 0 and 10 books)
b. Enough to fill a shelf (between 11 and 25 books)
c. Enough to fill a bookshelf (between 26 and 100 books)
d. Enough to fill two bookshelves (between 101 and 200 books)
e. Enough to fill more than two bookshelves (more than 200 books)

Q6. Zip Code

Q7. What is your current relationship status?
a. I live with a partner
b. I do not live with a partner

Q8. What is your current legal marital status?
a. Single (never married or domestic partner before)
b. Married or common-law partner
c. Divorced or separated
d. Widower
e. Other, which one?

Q9. Including yourself, how many people live in your household?
a. 1 person
b. 2 people
c. 3 people
d. 4 people
e. 5 people
f. 6 or more people

Q10. Including yourself, how many people receive some type of income?
a. 0
b. 1
c. 2
d. 3
e. 4 or more

Q11. Are you the person who contributes the most income to the household?
a. Yes
b. No

[If Q11 is answered with "a" then jump to Q17]

Q12. What is your relationship with the person who contributes the most income to the household?
a. It is my partner
b. It is my father
c. It is my mother
d. He is my son
e. She is my daughter
f. Other, which one?

Q13. What are the highest level official studies that the main breadwinner of the household

has completed? (We understand the main breadwinner or head of the family to be the person from whom the basic income of the family comes).
a. Can't read or write
b. Without studies or with unfinished primary studies
c. First Grade (School certificate, 1st stage of EGB, more or less up to 10 years old)
d. Second Grade - 1st Cycle (School graduate, or EGB 2nd stage, or 1st and 2nd ESO, up to 14 years old)
e. Second Grade - 2nd Cycle (FP I and II, High School, BUP, ESO 3 and 4, COU, PREU, 1 and 2 Baccalaureate, up to 18 years old)
f. Third Degree - 1st Cycle (Equivalent to Technical Engineer, 3 years, University Schools, Technical Engineers, Technical Architects, Experts, Teaching, ATS, University Diplomas, 3-year degree, Social Graduates, Social Assistants, etc.)
g. Degree, Degree - 2nd Cycle (Universities, Higher Graduates, Faculties, Higher Technical Schools, etc.)
h. Third Degree (Master)
i. Third Degree (PhD)
j. Others

Q14. What is the employment status of the main breadwinner in the household?
a. Currently working
b. Retired/pensioner/disabled
c. Unemployed, have previously worked
d. Unemployed, has not previously worked
e. Student
f. Unpaid household work

Q15. What is the current employment status of the main breadwinner? (If he/she is not currently working, please indicate the status of the last job he/she had)
a. Employee account (eg: employee)
b. Own account (eg: self-employed or entrepreneur)

Q16. What is the profession of the main breadwinner? (If not currently working, please indicate the last job held)
a. Agricultural entrepreneur with 6 or more employees
b. Agricultural entrepreneur with 1 to 5 employees
c. Farm owner with no employees
d. Member of agricultural cooperatives
e. Entrepreneur/Businessperson with 6 or more employees
f. Entrepreneur/Trader with 1 to 5 employees
g. Businessman/Trader without employees
h. Non-agricultural cooperative member
i. Self-employed Professional or Technician (Doctor, Lawyer, etc.)
j. Self-employed manual worker and Craftsman (Bricklayer, Painter, Plumber, Electrician, Upholsterer, etc.)
k. None of the above

l. Director of a Public or Private Company with 25 or more workers
m. Director of a Public or Private Company with less than 25 workers
n. Senior Management/Employee at a higher level of Companies, Public Administration or Army Chiefs (Occupations associated with 2nd and 3rd cycle university degrees)
o. Intermediate Management/Employee at the medium level of Companies, Public Administration or Army Officers (Occupations associated with 1st cycle university degrees, diplomas, etc...)
p. Foreman, Supervisor, Warrant Officer Army
q. Commercial Agent, Representative, etc...
r. Administrative
s. Specialized worker, Civil Guard and Police number
t. Seller, Clerk, etc...
u. Junior Clerk (Janitor, etc.)
v. Unskilled worker, Laborer, Domestic Service
x. Farm laborer
y. Other unqualified personnel
z. None of the above

Q17. What are the highest level official studies that you have completed? (obtaining the corresponding official degree)
[Answers as in Q13]

Q18. In which of the following situations do you currently find yourself?
a. I currently work
b. Retired/pensioner/disabled
c. Unemployed, I have worked before
d. Unemployed, has not previously worked
e. Student
f. Unpaid household work

[If Q18 answered with ("d", "e", or "f") then Q21]
Q19. What is the current labor regime in which you find yourself? (If you are not currently working, please indicate the status of the last job you had)
a. Employee account (eg: employee)
b. Own account (eg: self-employed or entrepreneur)

Q20. What is your profession? (If you are not currently working, please indicate the last job you had)
[Answers as in Q16]

[Do not show if Q8 answered with "a" or Q7 answered with "b"]
Q21. What are the highest level official studies that your partner completed? (obtaining the corresponding official degree)
[Answers as in Q13.]

[Do not show if Q8 answered with "a" or Q7 answered with "b"]

Q22. In which of the following situations is your partner currently?
a. I currently work
b. Retired/pensioner/disabled
c. Unemployed, I have worked before
d. Unemployed, has not previously worked
e. Student
f. Unpaid household work

[Show only if (Q11=b and Q12!=c) or Q11=a)]

Q23. What are the highest level official studies that your mother has completed? (obtaining the corresponding official degree)
[Answers as in Q13]

[Show only if (Q11=b and Q12!=b) or Q11=a]

Q24. What are the highest level official studies that your father has completed? (obtaining the corresponding official degree)
[Answers as in Q13.]

Q25. How would you rate your level of general knowledge on financial topics?
a. Very good
b. good
c. Neutral
d. Bad
e. Very bad

Q26. How many correct answers do you think you could have in 10 questions about basic financial topics? Use a scale of 0 to 10, where 0 means "none correct" and 10 "all correct"

Q27. What is your interest in financial matters? (We refer to the management of personal finances) Use a scale from 0 to 10, where 0 indicates "No interest" and 10 "Maximum interest"

Q28. Are you generally willing to take risks? Use a scale from 0 to 10, where 0 indicates "I am not willing to take any risk" and 10 "I am totally willing to take risk"

Q29. Choose which of the following 8 lotteries you would prefer to participate in. Each lottery has two possible payouts, each with a 50% probability:
a. Lottery 1 1.1€ with 50% and 1.1€ with 50%
b. Lottery 2 1.0€ with 50% and 1.2€ with 50%
c. Lottery 3 0.7€ with 50% and 1.6€ with 50%
d. Lottery 4 0.6€ with 50% and 1.8€ with 50%
e. Lottery 5 0.5€ with 50% and 1.9€ with 50%

f. Lottery 6 0.3€ with 50% and 2.0€ with 50%
g. Lottery 7 0.1€ with 50% and 2.1€ with 50%
h. Lottery 8 0€ with 50% and 2.2€ with 50%

[Middle part of the questionnaire: Financial Literacy questions, FQ1-FQ10. We will also underline the questions included in the big-five, which will be the main focus of our main results. Define 4 groups. Group 1: *Control*, group 2: *Without IDK*, group 3: *Incentives*, and group 4: *Information*]

The next 10 questions include various exercises. It is okay if you can not answer them all, but it is important that you try to answer each one.

If you do not know the answer, just say so. If you think you have the right answer, it is likely that you do. [Filter show if Group = 1, 3 or 4]

[If *Incentives* treatment only:]
You will earn an additional 7 cents for each correct answer. If all 10 answers are correct, you can earn 70 more cents, increasing your payment for participating by more than 60%.

[If *Information* treatment only:]
Men typically answer 7 out of 10 financial questions correctly. Women 6 out of 10. This difference is explained mostly (65%) because women choose the answer "I do not know" more often than men. Therefore, we ask you - please - to avoid answering "I do not know".

The section must be completed in a maximum of 7 minutes. Once started, you will not be able to interrupt it. If you exceed this time, the screen will take you to the next section and you will not be able to go back. When you are ready to start, click "next".

FQ1: Imagine that 5 brothers receive a gift of 1,000 euros in total. If they share the money equally, how much will each get?
a.
b. I do not know [Filter show if Group = 1, 3 or 4]

FQ2 [Big Five.1: Inflation]: Now imagine that the 5 brothers had to wait a year to get their share of the 1,000 euros, and that inflation for that year was 8%. With that money and within a year they will be able to buy:
a. More than they could buy today with their share of the money
b. The same amount
c. Less than they could buy today
d. I do not know [Filter show if Group = 1, 3 or 4]

FQ3: Suppose you deposit 100 euros in a savings account with a fixed interest of 2% per year. If you do not make any other deposits or withdraw any money, how much money will be in the account at the end of the first year, after interest is paid? (In this account there are no commissions or taxes)

a.
b. I do not know [Filter show if Group = 1, 3 or 4]

FQ4 [Big Five.2: Interest Rates and Compounding]: Again, if you do not make any deposits or withdraw any money, how much money will be in the account after 5 years, after the interest payment is paid? (Remember that the savings account has a fixed interest of 2% per year).
a. More than 110 Euros
b. Exactly 110 Euros
c. Less than 110 Euros
d. It is impossible to say with the information given
e. I do not know [Filter show if Group = 1, 3 or 4]

FQ5 [Big Five.3: Risk Diversification]: Generally, it is possible to reduce the risk of investing in the stock market by buying a wide variety of stocks. True or false?
a. True
b. False
c. I do not know [Filter show if Group = 1, 3 or 4]

FQ6 [Big Five.4: Mortgages]: A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less. True or false?
a. True
b. False
c. I do not know [Filter show if Group = 1, 3 or 4]

FQ7 [Big Five.5: Bond Pricing]: What happens to the price of the bonds if the interest rate increases?
a. Falls
b. Goes up
c. Stays the same
d. The price of the bonds is not related to the interest rate
e. I do not know [Filter show if Group = 1, 3 or 4]

FQ8: In a lottery, the probability of winning a prize is 1%. How many people do you think will win a prize if 1,000 people each buy a single different ticket?
a.
b. I do not know [Filter show if Group = 1, 3 or 4]

FQ9a: If 5 machines take 5 minutes to make 5 objects, how long would it take 100 machines to make 100 objects?
FQ9b: If 5 microwaves take 5 minutes to heat 5 plates, how long would it take 100 microwaves to heat 100 plates?
FQ9c: If 5 microwaves take 5 minutes to heat 5 plates, how long would it take 100 microwaves to heat 100 plates?

a. 15 minutes
b. 10 minutes
c. 100 minutes
d. 200 minutes
e. I do not know [Filter show if Group = 1, 3 or 4]

FQ10: Imagine that you are reviewing your household budget. What is 10 – 2?
a. 3
b. 8
c. 10
d. 20

[Final part of the questionnaire: variables measuring behavioral traits.]

POSTQ1: Thinking about this section with 10 questions, how many do you think you have answered correctly?

POSTQ2: If the Spanish population answered these same 10 questions, on average, how many correct answers do you think the following groups would have? The average grade can take values between 0 and 10 where 0 indicates that none would be correct and 10 indicates that all would answer the 10 questions correctly.
a. The entire population:
b. Women:
c. Men:
d. Young people (between 18 and 30 years old):

POSTQ3: Do you have any of the following products? Click on any of the four possible answers: Yes-No-I do not know-I do not know the product
a. Checking account:
b. Savings accounts or deposits:
c. Credit card:
d. Mortgage:
e. Personal loans:
f. Individual or company pension plans:
g. Mutual funds or stocks:
h. Cryptocurrencies:
i. Life or medical insurance:

POSTQ4: In the last 12 months, have you done banking in any of the following ways? (Check all that apply)
a. By personally visiting a bank branch
b. Using an ATM
c. Calling on the phone
d. Using the computer or tablet
e. Using mobile phone apps

f. Otherwise, which one?
g. None of the above

POSTQ5: Of the following options, mark all that you have done at least once:
a. I applied for a promotion at work
b. I asked for an increase in my payroll/salary/pay
c. I was a class representative at school/institute/university
d. I competed in an individual sport (for example: swimming, tennis, judo, fencing, etc.)
e. I competed in a team sport (for example: soccer, gymnastics, basketball, volleyball, etc.)
f. None of the above

POSTQ6: Tell us to what extent you agree with each of the statements. Use a scale of 1 to 5, where 1 indicates strongly disagree and 5 strongly agree.
a. I can solve most problems if I put in the necessary effort
b. I am confident that I can handle unexpected events efficiently
c. I tend to ask questions in class/work meetings
d. Men tend to handle financial problems better than women

POSTQ7: How complicated did you find the survey? Use a scale from 0 to 10, where 0 indicates no complexity and 10 maximum complexity