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Gender gaps in financial literacy: a multi-arm RCT to break the response bias in surveys

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DIRECCIÓN GENERAL DE ECONOMÍA Y ESTADÍSTICA

Motivation

- Financial literacy (FL): the understanding of basic financial concepts
  - Usually measured as the percent of correct answers to the BIG Five questions on inflation, compound interest rate, risk diversification, mortgages, and bond pricing (Lusardi and Mitchell)
- FL impacts important economic decisions: retirement and saving plans, stock market participation. Ultimately, households' wealth levels and well-being (IOSCO, 2018; Lusardi and Mitchell, 2014)
- Improving the general population's FL, especially for the most vulnerable, has become a major policy goal (OECD, 2013)
- Existence of gender gaps
  - Persistent across countries and time (OECD, 2016; Klapper and Lusardi, 2020)

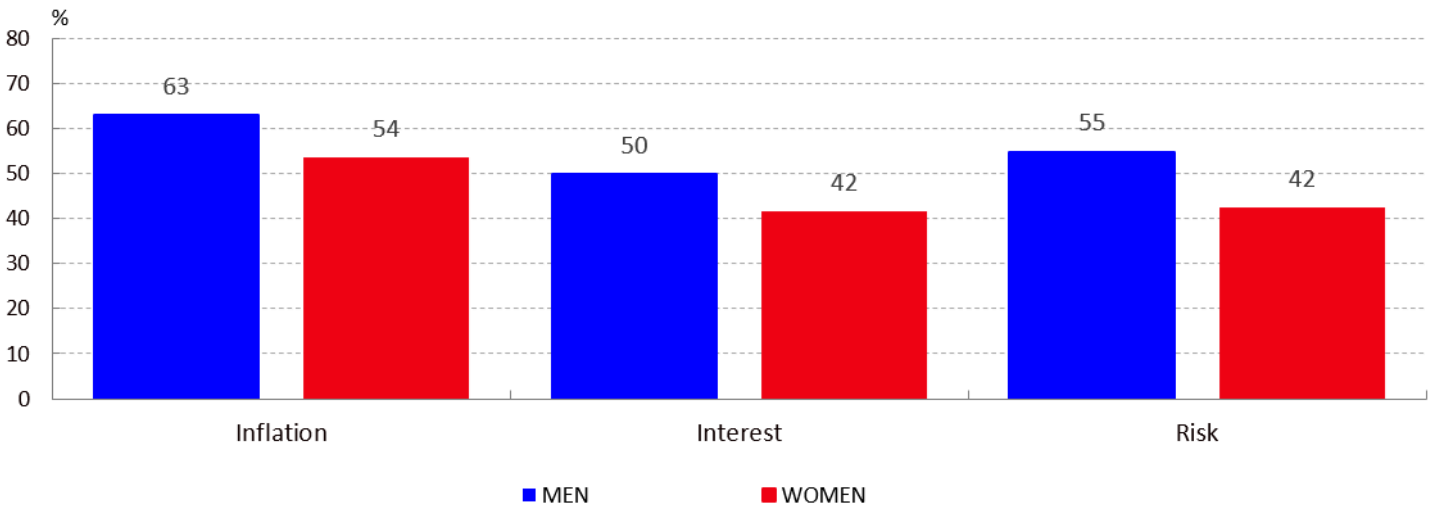
Motivation

- Gender gaps partly explained by differences in observable characteristics:
  - Education, labor, household decision making, risk attitudes, stereotypes, interest, self-assessed financial knowledge, social norms (Chen and Volpe (2002), Hadar, Sood, and Fox (2010), Klapper and Panos (2011), Fonseca et al. (2012), Brown and Graf (2013), Jappelli and Padula (2013), Mahdavi and Horton (2014), Driva et al. (2016), Hsu (2016), Bucher-Koenen et al. (2017), Zaccaria and Guiso (2020), Botazzi and Lusardi (2020), Hospido et al. (2021))
- Yet, considerable gender gaps remain

Motivation

- Less focus on measurement (Bucher-Koenen et al. (2021)):
  - FL is measured by the percentage of correct answers on questions that allow for "I do not know" (IDK) answers
  - Ideal measure: "scan" machine that measures directly $p(correct) = p(correct|ans) \times p(ans) + p(correct|no-ans) \times p(no-ans)$ for any individual (those who provide an answer and those who do not)
  - In surveys with the IDK option, we only observe: $p(correct|ans)$ and $p(ans) = 1 - p(IDK)$

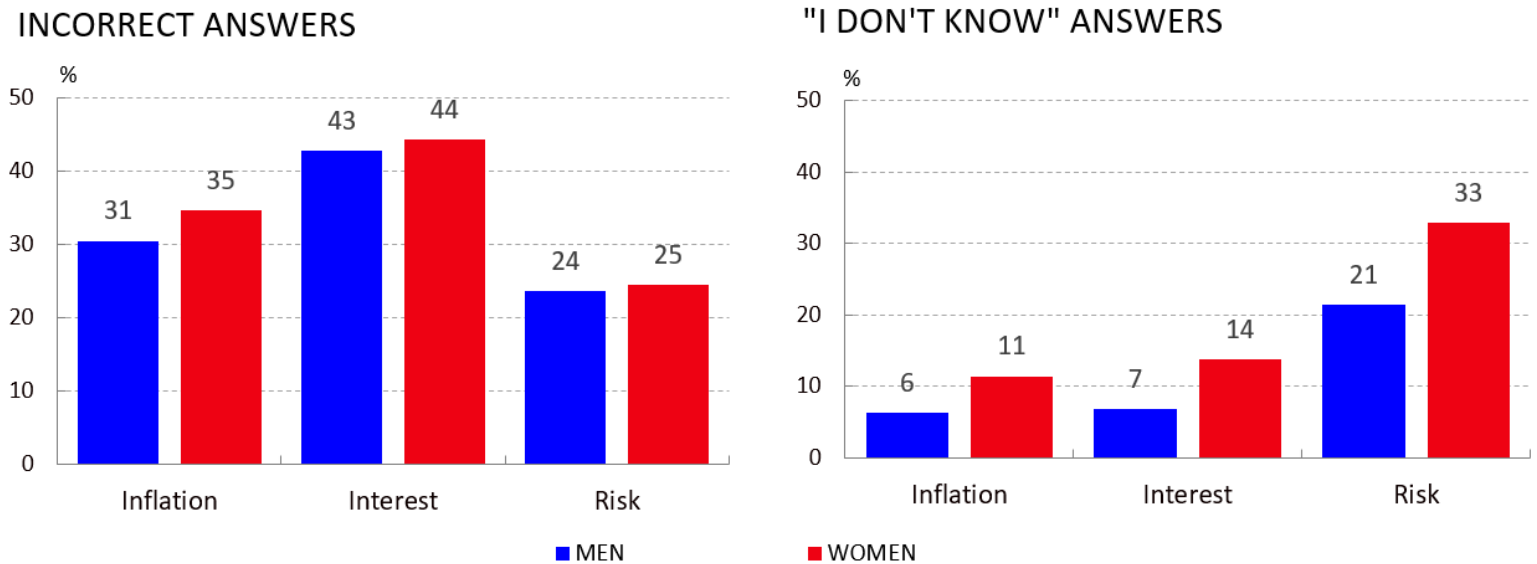
PERCENTAGE OF CORRECT ANSWERS



SOURCE: Banco de España calculations drawing on ECF (2016) microdata.

Motivation

- Less focus on measurement (Bucher-Koenen et al. (2021)):
  - In practice, FL is measured by $p(correct|ans) \times p(ans)$ ignoring $p(correct|no-ans) \times p(no-ans)$
  - When comparing men and women we may have a problem if men and women have a different $p(ans)$
  - Extreme example: same (perfect) knowledge for men and women, but $p(ans) = 1$ for men and $p(ans) = 0$ for women. We would conclude men's FL is perfect and that women's FL is null



SOURCE: Banco de España calculations drawing on ECF (2016) microdata.

This paper

1. Measure gender gaps in financial literacy beyond correct answers
2. Evaluate how survey interventions impact the probability of response
3. Complement analysis with attrition, survey difficulty, time spent

Contributions:

$\Rightarrow$ Relatively new channel

$\Rightarrow$ First RCT, potential interventions to inform policy and assess gaps

$\Rightarrow$ Condition on novel data on demographics, able to observe attrition

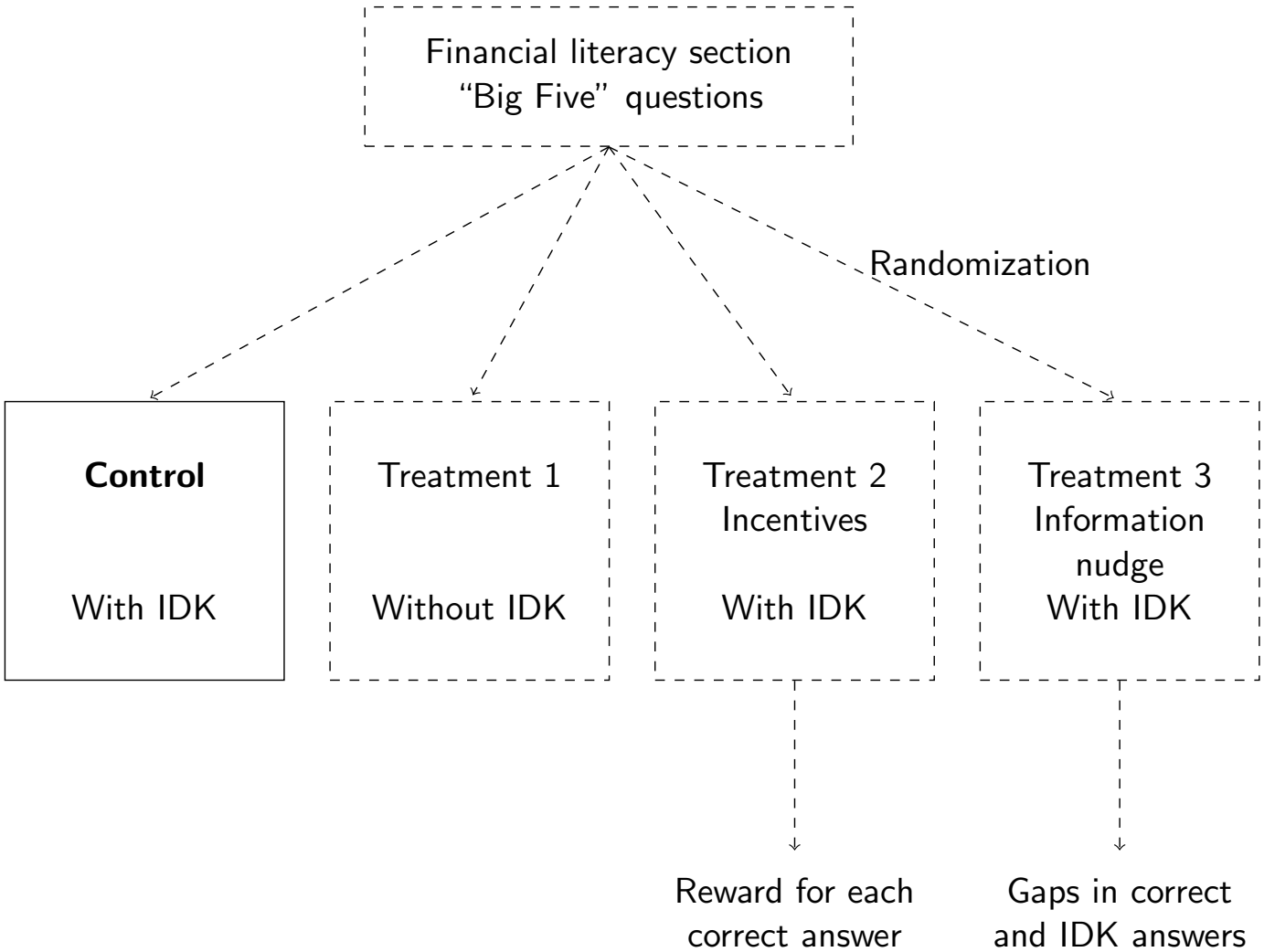
Approach

- Large-scale experiment: Online survey (6,000 participants)
- Randomized components: Financial literacy section with identical questions varying only treatment component
  1. Baseline, with 'I do not know' option (control)
  2. Without 'I do not know' option (treatment 1)
  3. Incentives (treatment 2)
  4. Information nudge (treatment 3)
- Pre-test survey: Pilot, IRB exemption and AEA RCT Registry (*AEARCTR-0009896*)

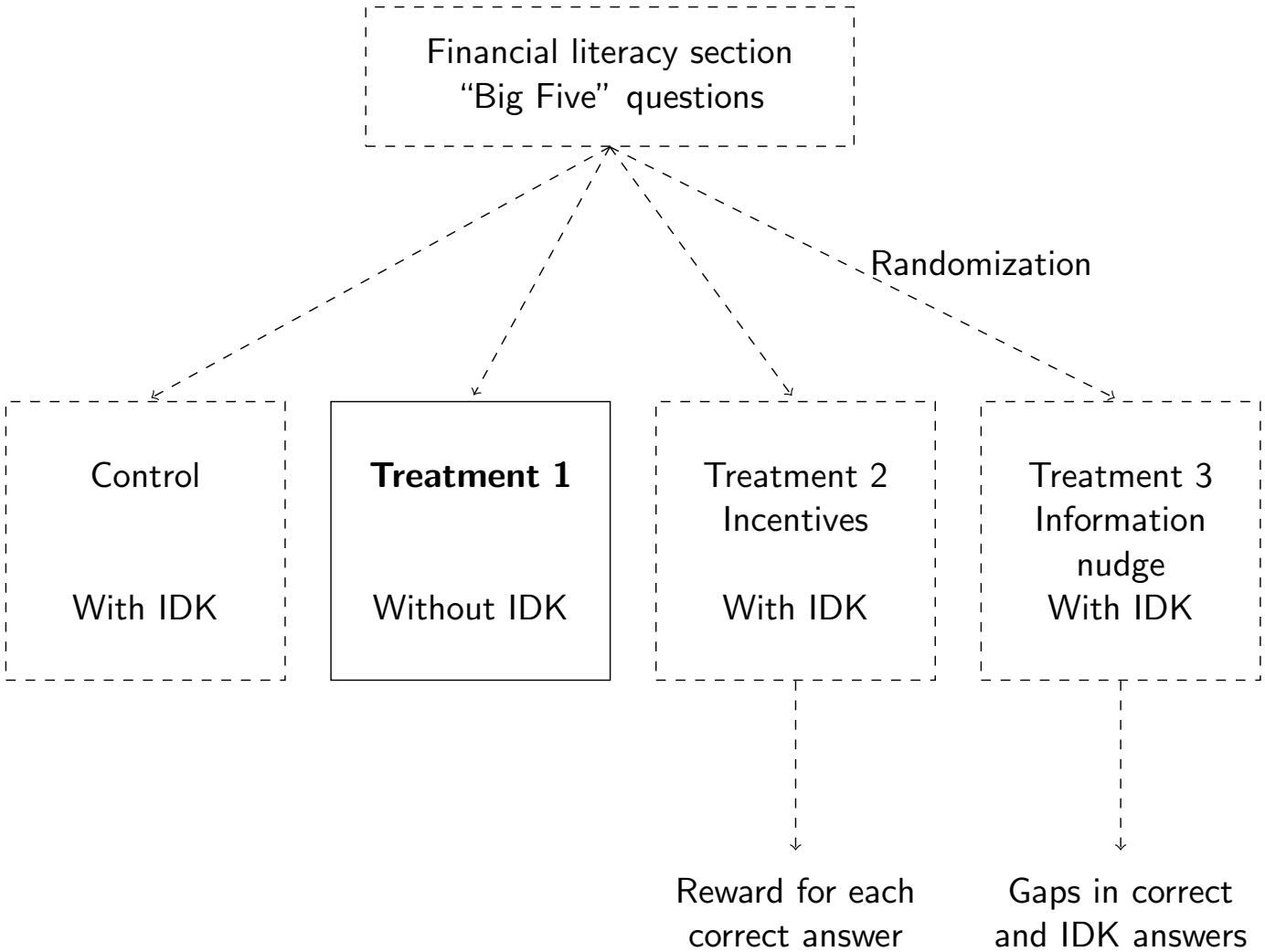
Survey outline

- Online survey, 15 minutes, 40 questions
- Wide array of questions: Demographics, partner and parents, risk aversion, confidence, self-assessed knowledge in finance, managing financial products, ...
- Financial literacy section:
  - OECD International Network of Financial Education
  - "Big Five" questions ▸ Big-Five
    - Inflation
    - Compound interest
    - Risk diversification
    - Mortgages
    - Bond pricing
- Survey attrition, time spent on questions, perceived difficulty

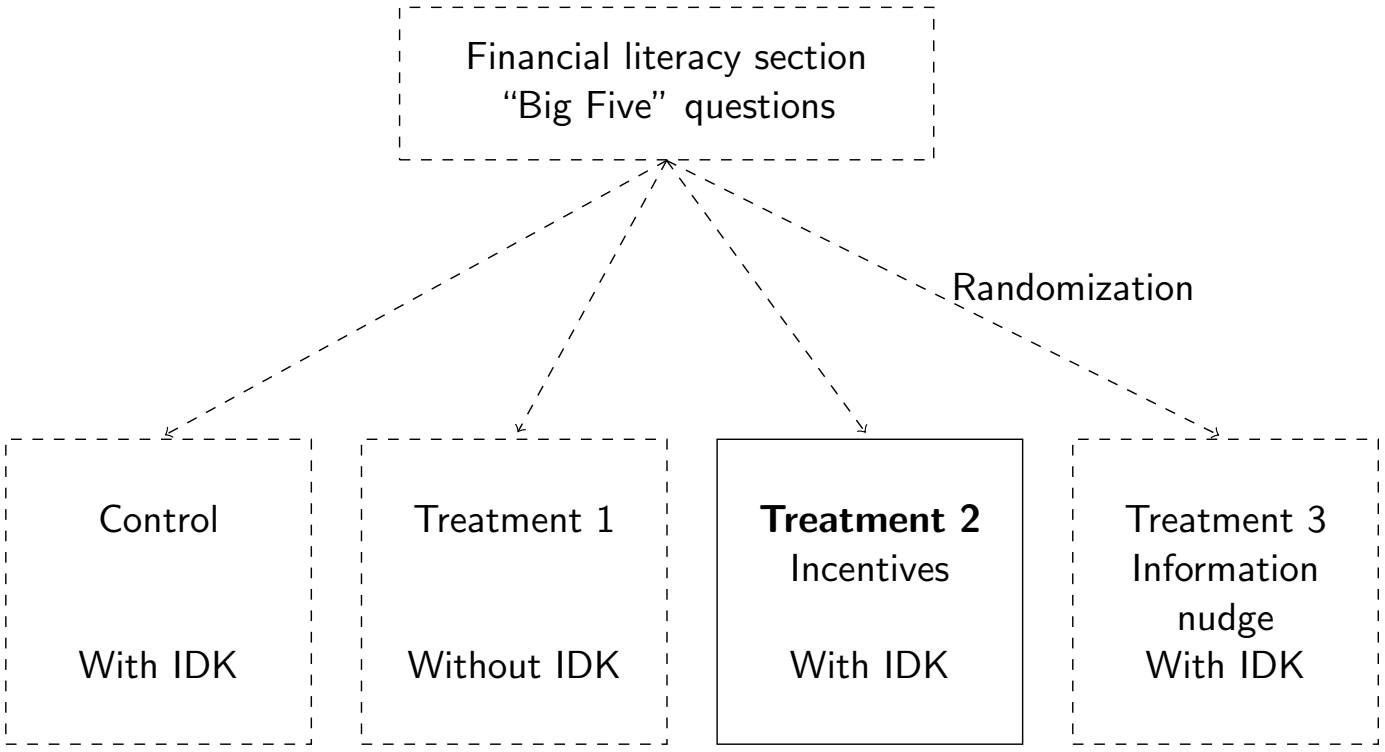
Survey randomized components



Survey randomized components

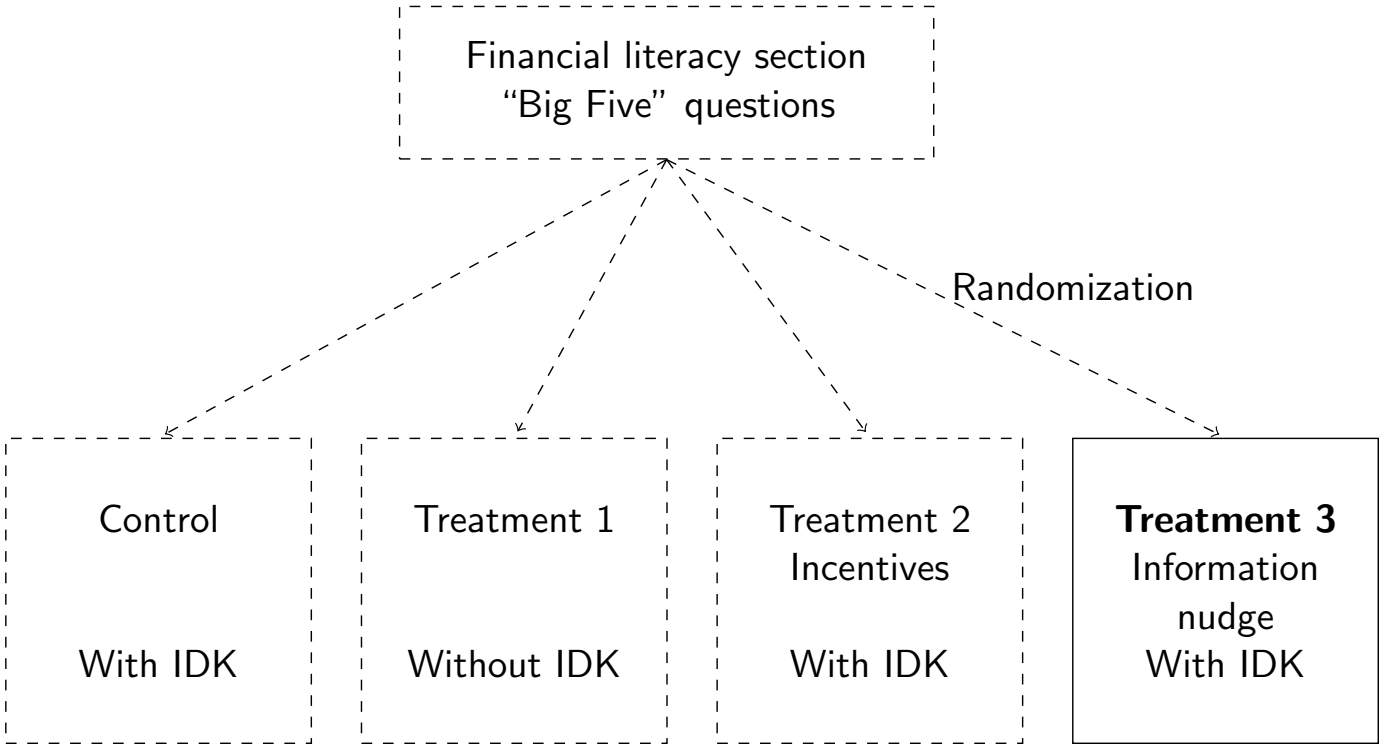


Survey randomized components



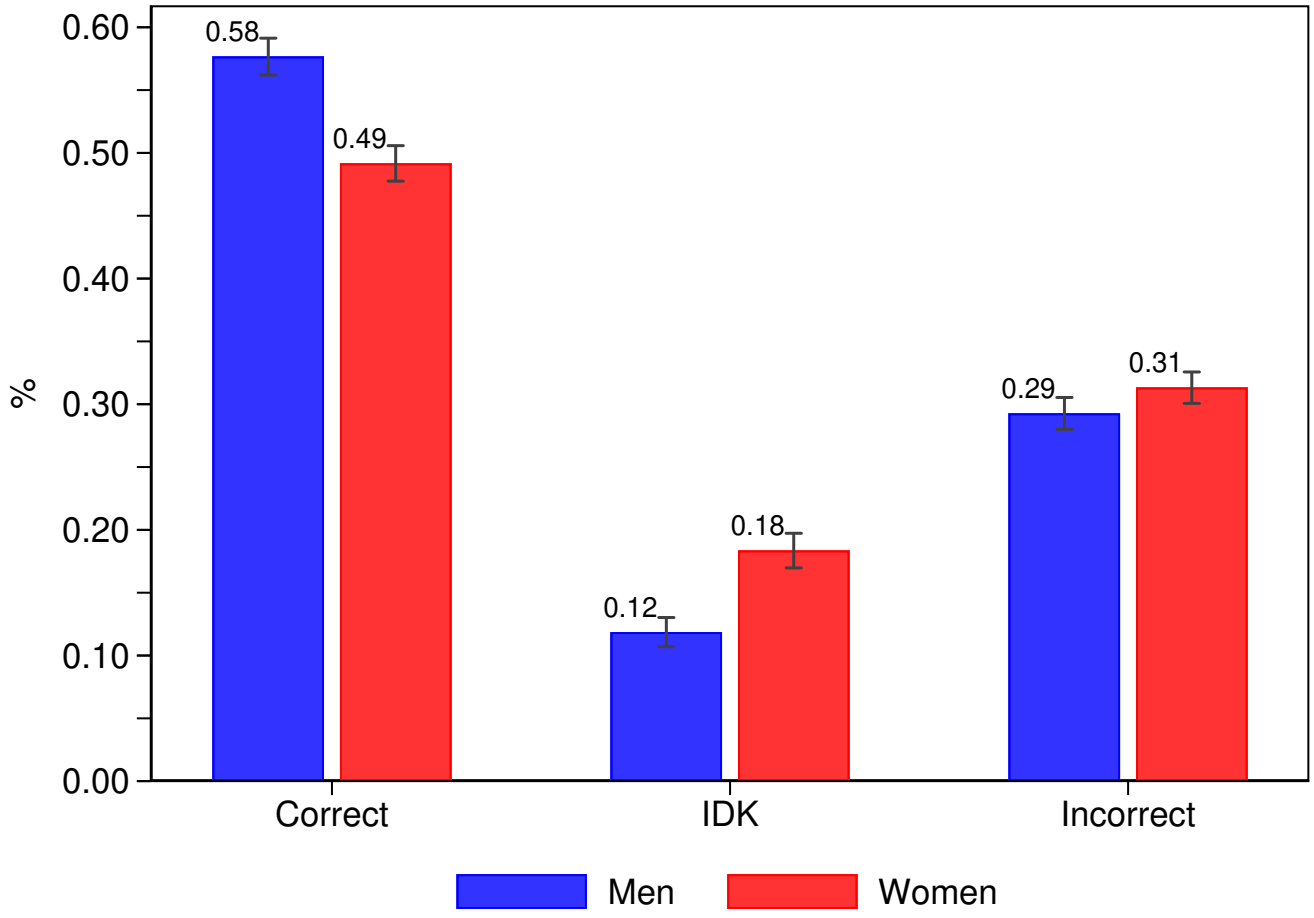
"You will earn an additional 7 cents for each correct answer. If all 10 answers are correct, you can earn 70 more cents, increasing your payment for participating by more than 60%."

Survey randomized components



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 to please avoid answering "I do not know". ▸ Text ▸ Balance

Big Five: Main Outcomes in the Control Group

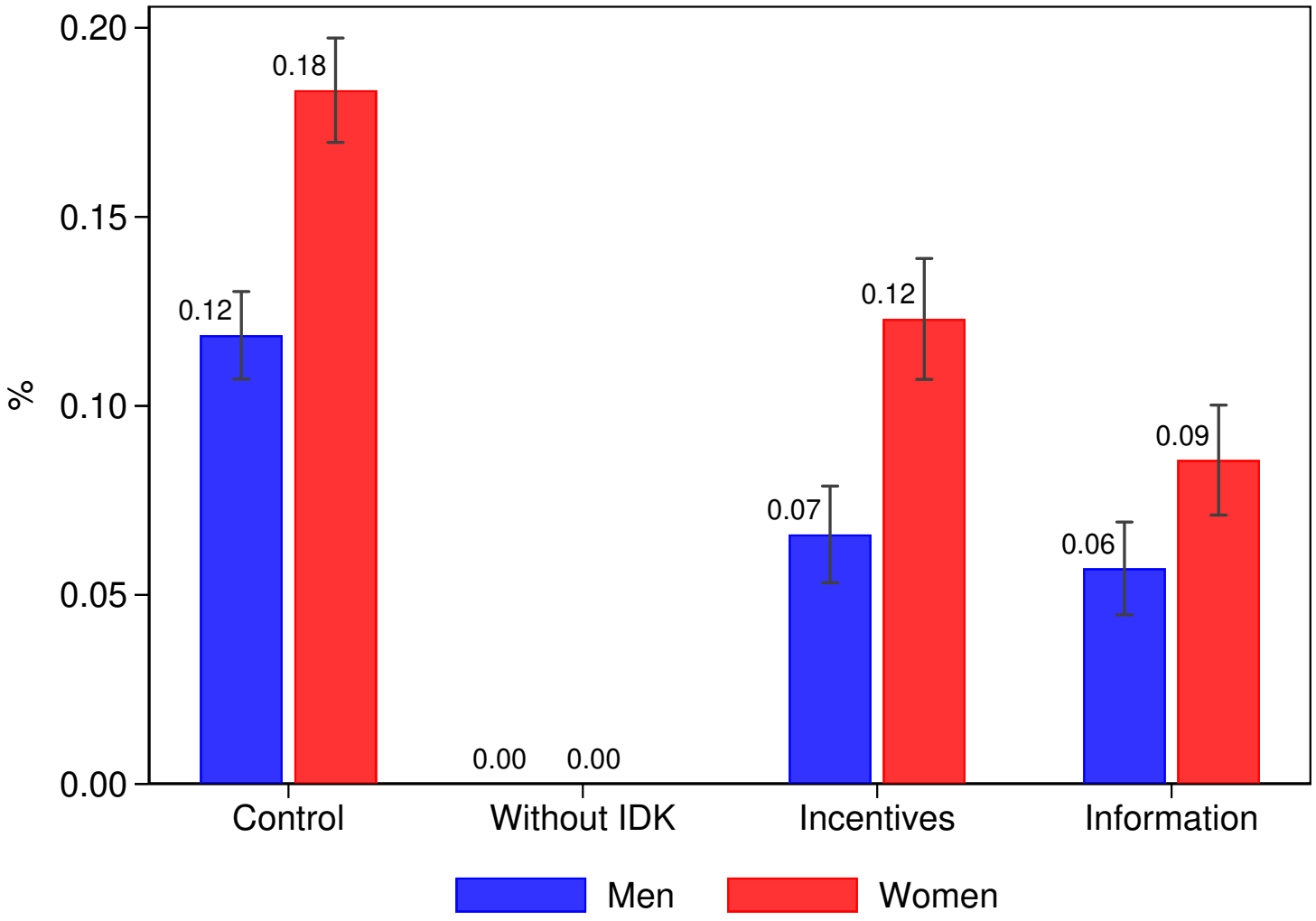


⇒ Gender gap on correct answers: 8.5 pp less for women

⇒ Difference remains once adjusting for covariates (5.6 pp)

⇒ Correct answers gap: 1/3 from incorrect answers, 2/3 from IDK

Big Five: Percent of 'I do not know' answers

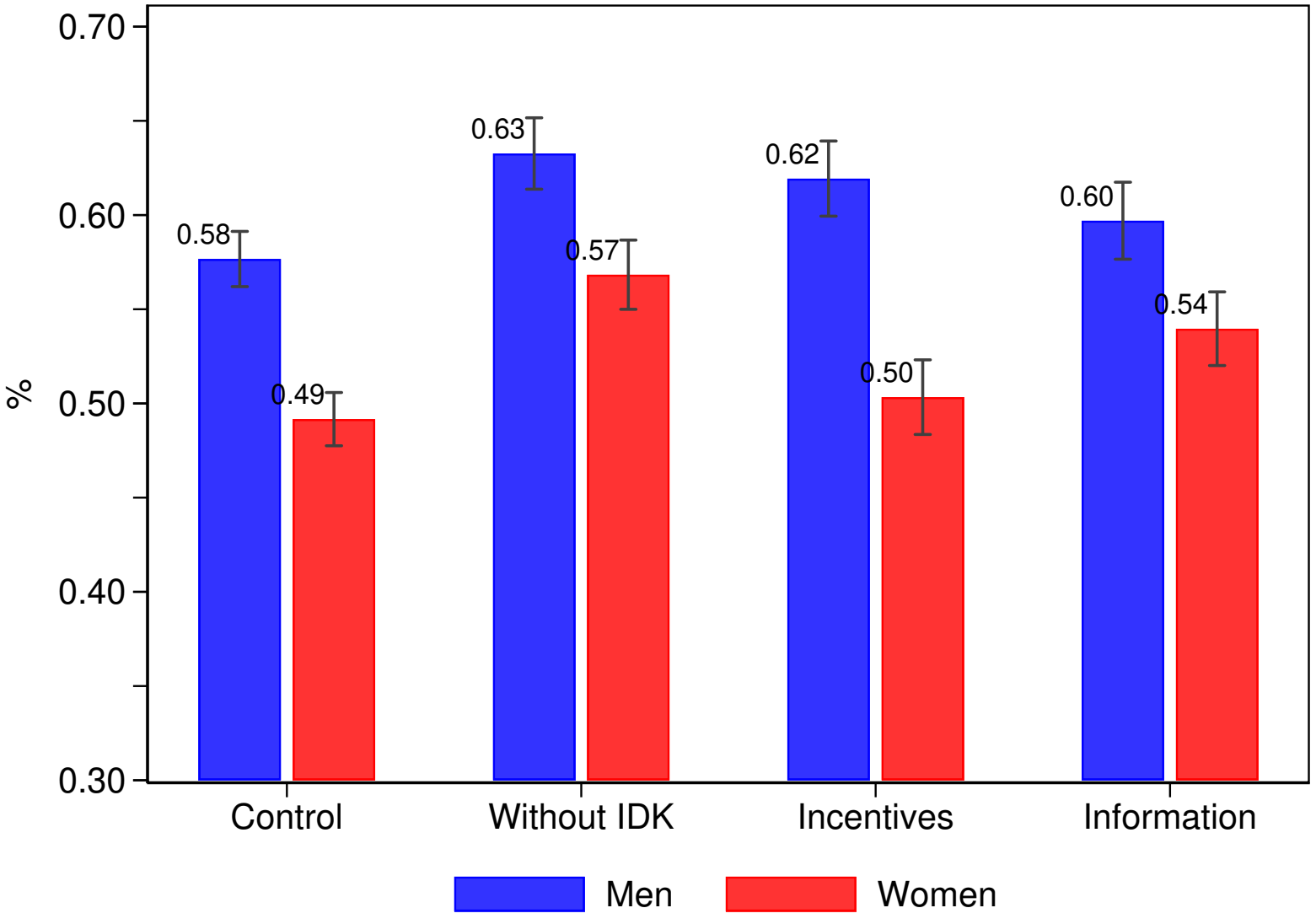


Big Five: Percent of 'I do not know' answers

	(1)	(2)	(3)
Female	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 nudge	-0.062***	-0.063***	-0.063***
	(0.009)	(0.008)	(0.008)
Female x Without IDK	-0.065***	-0.067***	-0.067***
	(0.009)	(0.009)	(0.009)
Female x Incentives	-0.008	-0.015	-0.015
	(0.014)	(0.013)	(0.013)
Female x Information nudge	-0.036***	-0.038***	-0.038***
	(0.013)	(0.012)	(0.012)
Av. male control	0.119	0.119	0.119
Controls	No	Yes	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 SE in parentheses. *** p<0.01, ** p¡0.05, * p¡0.1.

Big Five: Percent of Correct answers

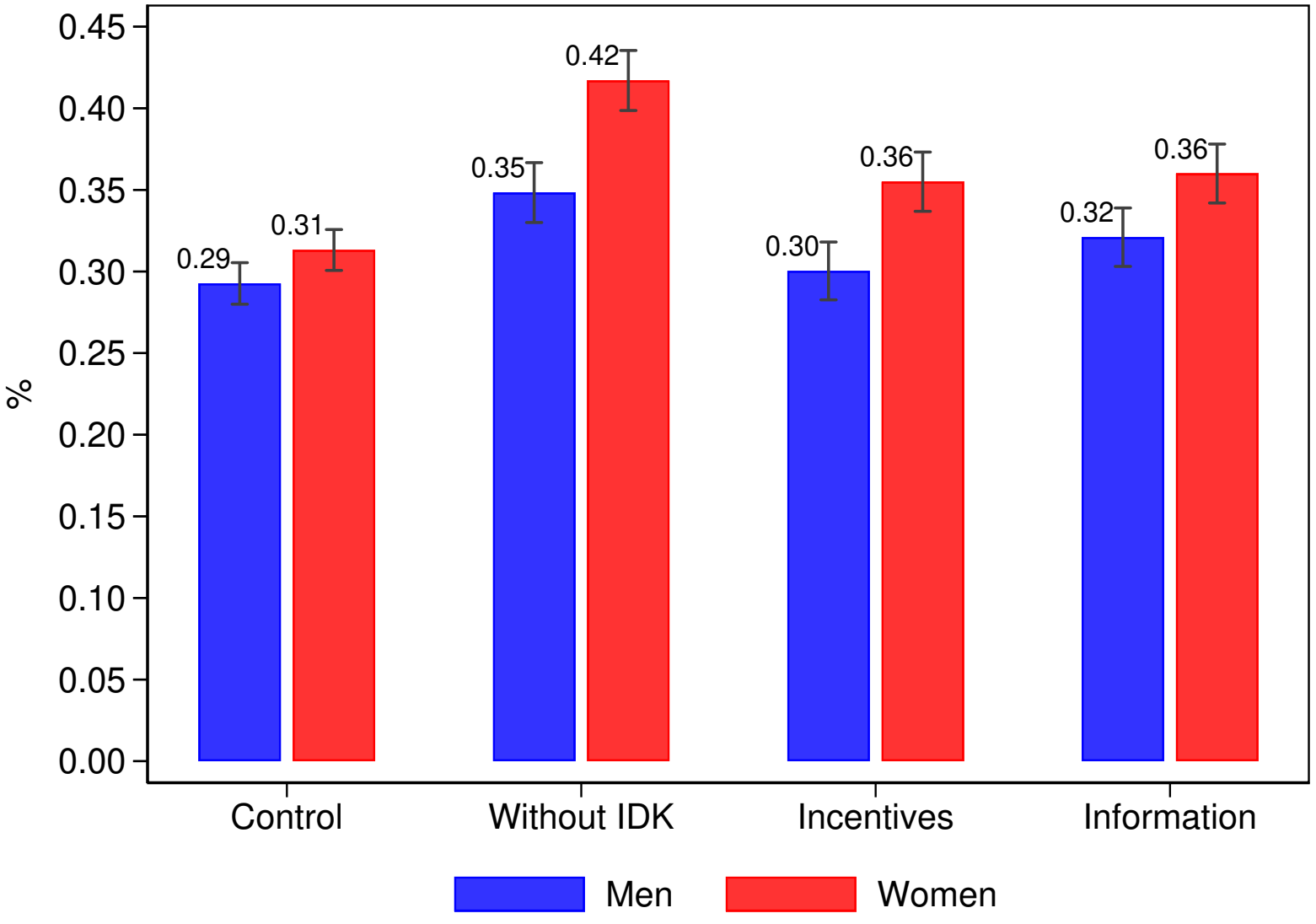


Big Five: Percent of Correct answers

	(1)	(2)	(3)
Female	-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 nudge	0.020	0.021*	0.021*
	(0.013)	(0.012)	(0.012)
Female x Without IDK	0.021	0.021	0.021
	(0.017)	(0.016)	(0.016)
Female x Incentives	-0.031*	-0.021	-0.021
	(0.018)	(0.016)	(0.016)
Female x Information nudge	0.028	0.028*	0.028*
	(0.018)	(0.017)	(0.017)
Av. male control	0.577	0.577	0.577
Controls	No	Yes	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 SE in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Big-Five: Percent of Incorrect answers



Big-Five: Percent of Incorrect answers

	(1)	(2)	(3)
Female	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 nudge	0.028**	0.029***	0.029***
	(0.011)	(0.011)	(0.011)
Female x Without IDK	0.048***	0.051***	0.051***
	(0.016)	(0.016)	(0.016)
Female x Incentives	0.034**	0.030*	0.030*
	(0.016)	(0.015)	(0.015)
Female x Information nudge	0.018	0.019	0.019
	(0.016)	(0.016)	(0.016)
Av. male control	0.293	0.293	0.293
Controls	No	Yes	Selected
Observations	6000	6000	6000
R2	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 SE in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Additional results

1. No impacts on perceived difficulty, impacts on time spent on Big Five ▸ Difficulty
2. No differential attrition by groups ▸ Attrition
3. Results robust to alternative FL definitions ▸ Robustness

Random Guessing Benchmark

To measure whether those who indeed provide an answer, who would have otherwise chosen IDK, are the ones who are knowledgeable, we compare the estimated increase in correct answers by treatment with the expected increase with pure random guessing:

1. We estimate the increase in non-IDK answers for each question.
2. We weight the probability of randomly guessing each question by the increase in its non-IDK answers. This is the expected increase in correct answers we would observe for each individual question under pure random guessing.
3. We average those individual increases to obtain the probability for the index of the Big-Five (column 3).
4. In column 4, we take the difference between the observed estimated increase in correct answers by treatment (column 2) and the expected increase with random guessing (column 3).

Random Guessing Benchmark

	(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: Column (1) shows the increase in the percent of provided answers. Column (2) shows the observed increase in the percent of correct answers. Column (3) shows the expected increase under random guessing. Column (4) shows the difference between columns (2) and (3).

Conclusions

- Baseline gender gaps in financial literacy
  - Women give 50% correct answers, men 58%
  - 2/3 of the gap from 'I do not know' answers
- Treatments reduce 'I do not know' answers
  - Information most effective for women
- Differences on correct answers
  - Without IDK and incentives most effective for men
  - Information for women
- Differences on incorrect answers
  - Incentives do not significantly impact men but increases for women
  - Information does not significantly increase more for women

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THANK YOU!

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Big-Five questions

- **Inflation:** Imagine (...) and that the inflation of that year was 8%. With that money and after a year, will they be able to buy: more, the same, less than what they can buy today
- **Compound interest:** Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account?
- **Risk diversification:** Buying a single company's stock usually provides a safer return than a stock mutual fund.
- **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.
- **Bond pricing:** If interest rates rise, what will typically happen to bond prices?

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Randomized components: Exact wording

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.

- Incentives: *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%.*

- Information: *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 to please 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".

▸ Back

Sample statistics and balance

		(1) Control	(2) Without IDK	(3) Incentives	(4) Information	(5) p-value
Demographics	Female	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
	Working	0.70	0.69	0.67	0.67	0.12
Household	Primary earner	0.67	0.66	0.69	0.66	0.44
	Mother: Primary education	0.60	0.57	0.59	0.59	0.60
	Father: Primary education	0.53	0.53	0.55	0.56	0.38
Assessments	Very low financial knowledge	0.02	0.02	0.02	0.03	0.70
	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
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
	Big five: Incorrect answers (%)	0.30	0.38	0.33	0.34	0.00
	Observations	2,400	1,200	1,200	1,200	

$\Rightarrow$ Overall balance across groups

▸ Back ▸ Demographics ▸ Household ▸ Assessments & perceptions ▸ Managing finances

Sample statistics: Demographics

		(1) Control	(2) Without IDK	(3) Incentives	(4) Information nudge	(5) p-value
Demographics	Female	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
	Observations	2,400	1,200	1,200	1,200	

▸ Back

Sample statistics: Household

		(1) Control	(2) Without IDK	(3) Incentives	(4) Information nudge	(5) p-value
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
	Observations	2,400	1,200	1,200	1,200	

Back

Sample statistics: Assessments and perceptions

		(1) Control	(2) Without IDK	(3) Incentives	(4) Information nudge	(5) p-value
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
	Observations	2,400	1,200	1,200	1,200	

▸ Back

Sample statistics: Managing finances

		(1) Control	(2) Without IDK	(3) Incentives	(4) Information nudge	(5) p-value
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
	Observations	2,400	1,200	1,200	1,200	

▸ Back

Perceived difficulty, time spent

	(1) Perceived difficulty	(2) Perceived difficulty	(3) Time on Big Five	(3) Time on Big Five
Female	0.368***	0.246**	-0.692	0.064
	(0.113)	(0.116)	(2.930)	(2.732)
Without IDK	-0.183	-0.146	-4.195	-3.843
	(0.137)	(0.132)	(3.084)	(3.067)
Incentives	-0.052	-0.027	-1.765	-1.952
	(0.139)	(0.133)	(3.166)	(3.225)
Information nudge	-0.162	-0.180	0.866	1.793
	(0.145)	(0.140)	(3.136)	(3.054)
Female x Without IDK	0.222	0.212	13.887***	13.514***
	(0.196)	(0.191)	(4.565)	(4.467)
Female x Incentives	-0.002	-0.010	5.947	5.343
	(0.195)	(0.190)	(4.552)	(4.470)
Female x Information nudge	0.130	0.198	4.265	1.638
	(0.200)	(0.196)	(4.325)	(4.225)
Male control	4.042	4.042	99.920	99.920
Controls	No	Yes	No	Yes
Observations	6000	6000	5844	5844
R2	0.007	0.067	0.003	0.058

Notes: Columns (1) and (2) show the survey perceived difficulty measured in a scale between 0 and 10. Columns (3) and (4) 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. Robust SE in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Attrition: Incomplete surveys

	(1) Exit	(2) Exit Q N.	(3) Exit	(4) Exit Q N.
Female	0.006	0.476***	0.016*	0.461*
	(0.009)	(0.145)	(0.009)	(0.250)
Without IDK			0.008	0.188
			(0.011)	(0.293)
Incentives			0.001	0.023
			(0.011)	(0.285)
Information nudge			0.011	0.375
			(0.012)	(0.311)
Female x Without IDK			-0.019	-0.616
			(0.016)	(0.415)
Female x Incentives			0.001	-0.048
			(0.016)	(0.430)
Female x Information nudge			-0.012	-0.557
			(0.017)	(0.438)
Male control	0.201	2.067	0.053	1.336
Sample	All	All	Treated	Treated
Controls	No	No	No	No
Observations	7542	7542	6397	6397
R2	0.000	0.001	0.001	0.001

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. 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 SE in parentheses. *** p<0.01,

Robustness: Alternative definitions - IDK

	(1) Big five	(2) Big three	(3) FL: 6Q	(4) FL: All
Female	0.041***	0.038***	0.040***	0.037***
	(0.009)	(0.009)	(0.008)	(0.007)
Without IDK	-0.115***	-0.098***	-0.113***	-0.108***
	(0.006)	(0.006)	(0.006)	(0.005)
Incentives	-0.049***	-0.043***	-0.047***	-0.044***
	(0.008)	(0.008)	(0.008)	(0.007)
Information nudge	-0.063***	-0.059***	-0.061***	-0.056***
	(0.008)	(0.008)	(0.008)	(0.007)
Female x Without IDK	-0.067***	-0.063***	-0.064***	-0.057***
	(0.009)	(0.009)	(0.009)	(0.008)
Female x Incentives	-0.015	-0.011	-0.012	-0.005
	(0.013)	(0.013)	(0.012)	(0.011)
Female x Information nudge	-0.038***	-0.030**	-0.032***	-0.027**
	(0.012)	(0.013)	(0.012)	(0.011)
Av. male control	0.433	0.401	0.429	0.400
Controls	Yes	Yes	Yes	Yes
Observations	6000	6000	6000	6000
R2	0.239	0.204	0.249	0.251

Back

Robustness: Alternative definitions - Correct

	(1) Big five	(2) Big three	(3) FL: 6Q	(4) FL: All
Female	-0.056***	-0.068***	-0.070***	-0.076***
	(0.010)	(0.012)	(0.009)	(0.009)
Without IDK	0.052***	0.052***	0.041***	0.037***
	(0.011)	(0.014)	(0.011)	(0.010)
Incentives	0.040***	0.047***	0.040***	0.046***
	(0.012)	(0.014)	(0.011)	(0.010)
Information nudge	0.021*	0.024*	0.021*	0.020*
	(0.012)	(0.014)	(0.011)	(0.010)
Female x Without IDK	0.021	0.009	0.026*	0.028**
	(0.016)	(0.020)	(0.015)	(0.014)
Female x Incentives	-0.021	-0.027	-0.020	-0.025*
	(0.016)	(0.020)	(0.015)	(0.014)
Female x Information nudge	0.028*	0.030	0.021	0.020
	(0.017)	(0.020)	(0.016)	(0.014)
Av. male control	0.189	0.158	0.200	0.213
Controls	Yes	Yes	Yes	Yes
Observations	6000	6000	6000	6000
R2	0.176	0.185	0.228	0.256

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Robustness: Alternative definitions - Incorrect

	(1) Big five	(2) Big three	(3) FL: 6Q	(4) FL: All
Female	0.017*	0.031***	0.031***	0.040***
	(0.009)	(0.011)	(0.009)	(0.008)
Without IDK	0.056***	0.040***	0.064***	0.063***
	(0.011)	(0.013)	(0.010)	(0.010)
Incentives	0.006	-0.006	0.004	-0.004
	(0.011)	(0.013)	(0.010)	(0.009)
Information nudge	0.029***	0.023*	0.027***	0.022**
	(0.011)	(0.013)	(0.010)	(0.009)
Female x Without IDK	0.051***	0.057***	0.044***	0.034**
	(0.016)	(0.019)	(0.015)	(0.013)
Female x Incentives	0.030*	0.032*	0.026*	0.024*
	(0.015)	(0.019)	(0.014)	(0.013)
Female x Information nudge	0.019	0.007	0.021	0.016
	(0.016)	(0.019)	(0.014)	(0.013)
Av. male control	0.369	0.431	0.361	0.380
Controls	Yes	Yes	Yes	Yes
Observations	6000	6000	6000	6000
R2	0.080	0.095	0.120	0.144

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