Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Finance for All: The Impact of Financial Literacy Training in Compulsory Secondary Education

Laura Hospido (BdE,IZA), **Ernesto Villanueva** (BdE) **Gema Zamarro** (U. Arkansas)

Cherry Blossom Financial Education Institute, April 10th, 2015

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

* The opinions and analyses are the responsibility of the authors and do not necessarily coincide with those of the Banco de España or the Eurosystem.

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

1. **Introduction**
2. Evaluation
3. Selection bias
4. Conclusions

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Financial literacy in schools

Many educational systems have incorporated Financial Education (FE):

- **US:** since 1957 various states have been adopting mandates to include FE in the curriculum of high school students.
  - Impacts on outcomes debated (Cole and Shastry, 2010, Brown, et al, 2013)

Controlled trials in US, Germany, Italy, Turkey, Brazil, Ghana

- **Spain:** low incidence of FE courses in Financial PISA 2012

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

What do we do?

1. **Evaluate** impact of a short program on the students' financial knowledge.
   - Heterogeneity, implementation
2. **Characterize (and address) selection bias**.
   - Participation in FE programs voluntary
   - Compare financial knowledge of participants and rest using PISA

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Related Literature

- US Walstad et al (2010) show that a short video course on financial literacy increased performance .
- GER: Lührmann et al. (2012) 90 minutes FL course delivered by experts increased self-assessed financial knowledge and the ability to assess risks correctly
- IT Romagnoli and Trifilidis (2013) Increase in financial knowledge of Italian students more than a year after completing the program. Evidence less clear cut in Beccheti et al (2013).
- BRA: Bruhn et al. (2013) randomized experiment that randomly assigns a 78-hours course across Brazilian states. The course increase financial knowledge in an objective test by 1/4 of a standard deviation.

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Financial education in Spain

- **BdE-CNMV program:** Spanish Central Bank and SEC provide materials since 2010 in some 500 high schools.
  - **Student's Guide:** contents on financial education tailored to the cognitive characteristics of secondary students.
  - **Teacher's Guide:** same materials + solutions.
  - **Online support:** teachers and students have access to a public Web offering practical exercises,
- Web-based 10-hour course. Delivered by school teachers.

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Financial education in Spain: Topics

Saving: definition + how to reach targets in the future

- Elaborating a budget, allocating expenses and income.

Sustainable consumption

- Recycling, environmentally friendly expenses

Money and bank accounts

Notion of interest rate
Opening and comparing bank accounts
Fees

Credit and debit cards: definition

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

What does Financial Education do?

Awareness about consequences of current actions

- (Alan and Ertac, 2014, Lürmann et al, 2014)

Clarifying difficult choices

- (Ambuehl, Bernheim and Lusardi, 2014)
- Comparing assets with different returns difficult.
- Comparing consumption choices over time is not.

The BdE-CNMV program emphasizes both concepts

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Effectiveness

We measure its effectiveness through tests piloted and developed by education experts

- Mostly fictional situations: how much to save toward a target?

Challenges

- (Heterogeneous) implementation and effects of offering FE courses,
- Unobservable variables that prompt certain schools to participate.
    - Random assignment of the treatment may not solve the problem entirely.

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

1. Introduction
2. Selection bias
3. **Evaluation**
4. Conclusions

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

The BdE-CNMV Program: evaluation tools

In February-May 2013 students **in Madrid** of the 3rd grade of Compulsory Secondary Education (aged 15-16) received FE lessons. Evaluation tools:

- **Pre- and post- test:** Students of 23 schools took the test and course at 15-16 years.
  - Two (three) schools convinced to implement the tests without teaching the course (not random).
- **On-line survey to all parents:** parental occupation and education.
- **Surveyed teachers.** details on implementation.

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Estimating the impact

We compare the score in the post-test of treated students to a predicted score obtained had they not received classes.

- The counterfactual performance in the test inferred using grades in post-test of controls.

Valid comparisons require similar characteristics of both groups: initial financial knowledge and family environment.

- Use observables to reweight the sample of controls so that they provide a counterfactual for grades of the treated students.

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Estimating the impact

Estimate the probability of participating in the program as a function of school and student characteristics.

- Fitted probability permits identifying "similar" treatments and controls

Obtain a counterfactual grade in non-participant schools by giving students similar to those in volunteer schools a higher weight

- The weight increases with the *predicted* probability of participating.

Compare average financial literacy of treated and (re-weighted) controls.

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Implementation

Table 2: Implementation of the program by type of school.

	Rest of schools	Private schools
Female child	0.52	0.37
Child has repeated a grade	0.14	0.06
Mother works	0.71	0.77
Father works	0.85	0.97
Mother has a college degree	0.48	0.83
Father has a college degree	0.48	0.86
Completed at least 7 modules (out of 9)	0.91	0.88
Median hours	12	10
Teacher's year of experience	16.07	21.75
Used the Webpage	0.85	0.63
Made an evaluation	0.55	0.00
Number of treated students	799	182

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Evaluation sample

Table 7: Descriptive Statistics of 3rd grade ESO students in Madrid.

	Treatment	Control	Weighted control
Number of schools*	20	3	
Number of students	981	242	
VARIABLES INCLUDED IN THE LOGIT			
Girl	0.49	0.28	0.52
Grade repetition:			
- Yes	0.12	0.18	0.13
- Do not answer	0.09	0.19	0.12
Private school	0.18	0.40	0.18
Average rating on initial exam	5.09	5.16	5.09
Average rating on initial exam x Private school	6.01	7.34	5.98
Employment status of the mother:			
- Working	0.65	0.48	0.65
- Do not answer	0.10	0.22	0.13
Education of the mother:			
- Primary education	0.04	0.04	0.03
- Secondary education	0.37	0.25	0.41
- University middle grade	0.24	0.16	0.24
- University higher grade	0.24	0.31	0.18
- Do not answer	0.11	0.23	0.14
Occupation of the mother:			
- High skilled	0.27	0.35	0.27
- Middle skilled	0.46	0.25	0.43
- Low skilled	0.14	0.15	0.14
- Do not answer	0.13	0.25	0.16

Notes: * One school with treated and control classes.Grades on a scale of 0 to 10.

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Evaluation sample

Table 7: Descriptive Statistics of 3rd grade ESO students in Madrid (cont'd).

	Treatment	Control	Weighted control
VARIABLES NOT INCLUDED IN THE LOGIT			
Average rating on final exam	5.24	4.74	4.88
Employment status of the father:			
- Working	0.78	0.68	0.75
- Do not answer	0.11	0.22	0.13
Education of the father:			
- Primary education	0.04	0.04	0.04
- Secondary education	0.34	0.23	0.37
- University middle grade	0.20	0.12	0.16
- University higher grade	0.27	0.37	0.27
- Do not answer	0.14	0.23	0.15
Occupation of the father:			
- High skilled	0.36	0.43	0.34
- Middle skilled	0.31	0.14	0.25
- Low skilled	0.20	0.18	0.25
- Do not answer	0.13	0.25	0.16

Notes:Grades on a scale of 0 to 10.

Differences in outcomes

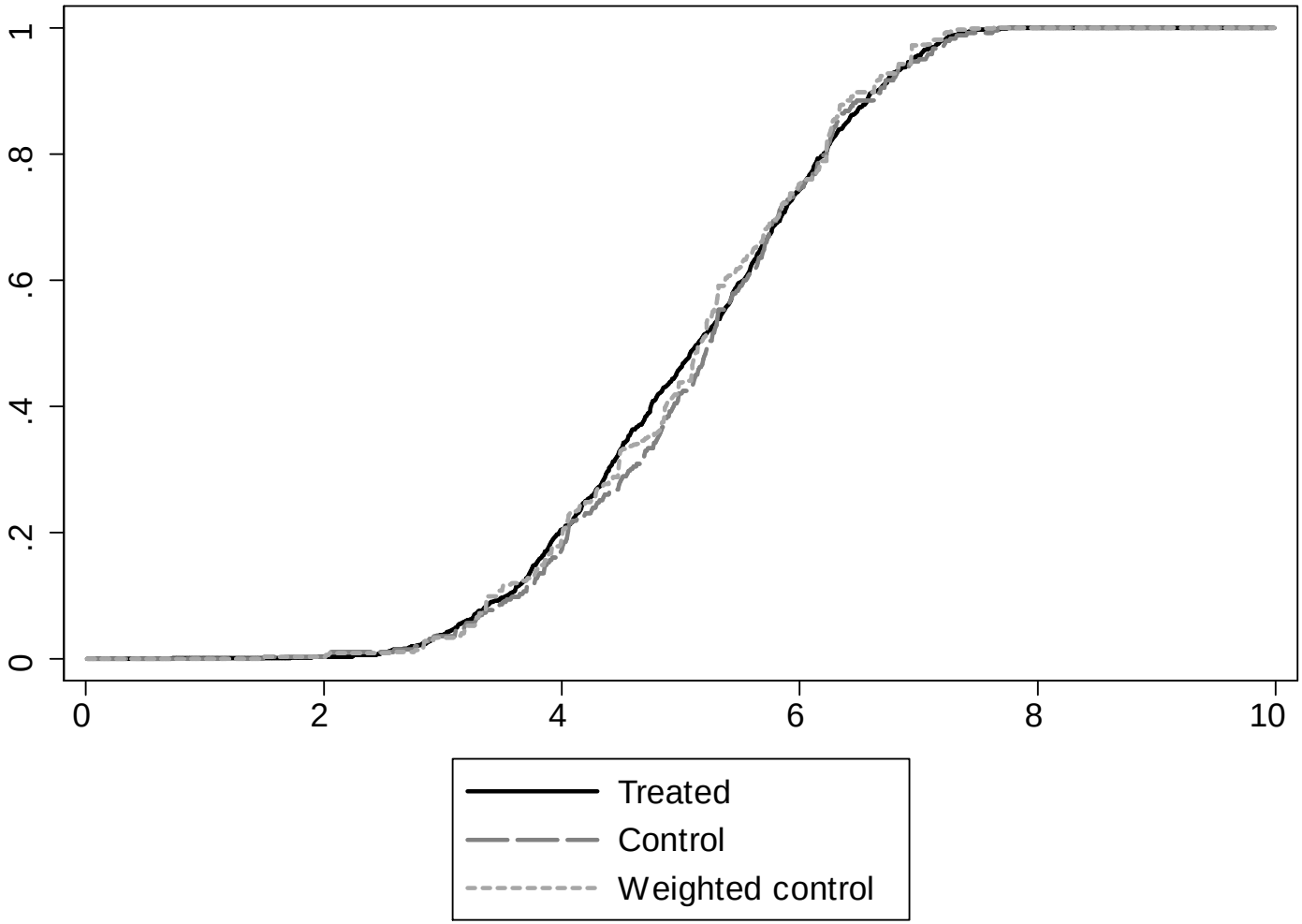
Table 9: The effect of financial literacy courses on post-test scores.

	Normalized inverse probability weighting		Nearest neighbor PS matching
	No covariates	With covariates	
Treatment	0.3569	0.3493	0.3630
	(0.2108)	(0.0981)	(0.0912)
Mean of the normalized scores		5.14	
Sd of the normalized scores		1.27	
Number of observations		1,223	

Notes:Grades on a scale of 0 to 10. Robust standard errors, clustered at the school level, in parentheses. Covariates: female, grade repetition, private school, pre-test, private school x pre-test, labor market status, education and occupation of the mother. Column 2 also includes these covariates in the regression.

Unconfoundedness (distribution)

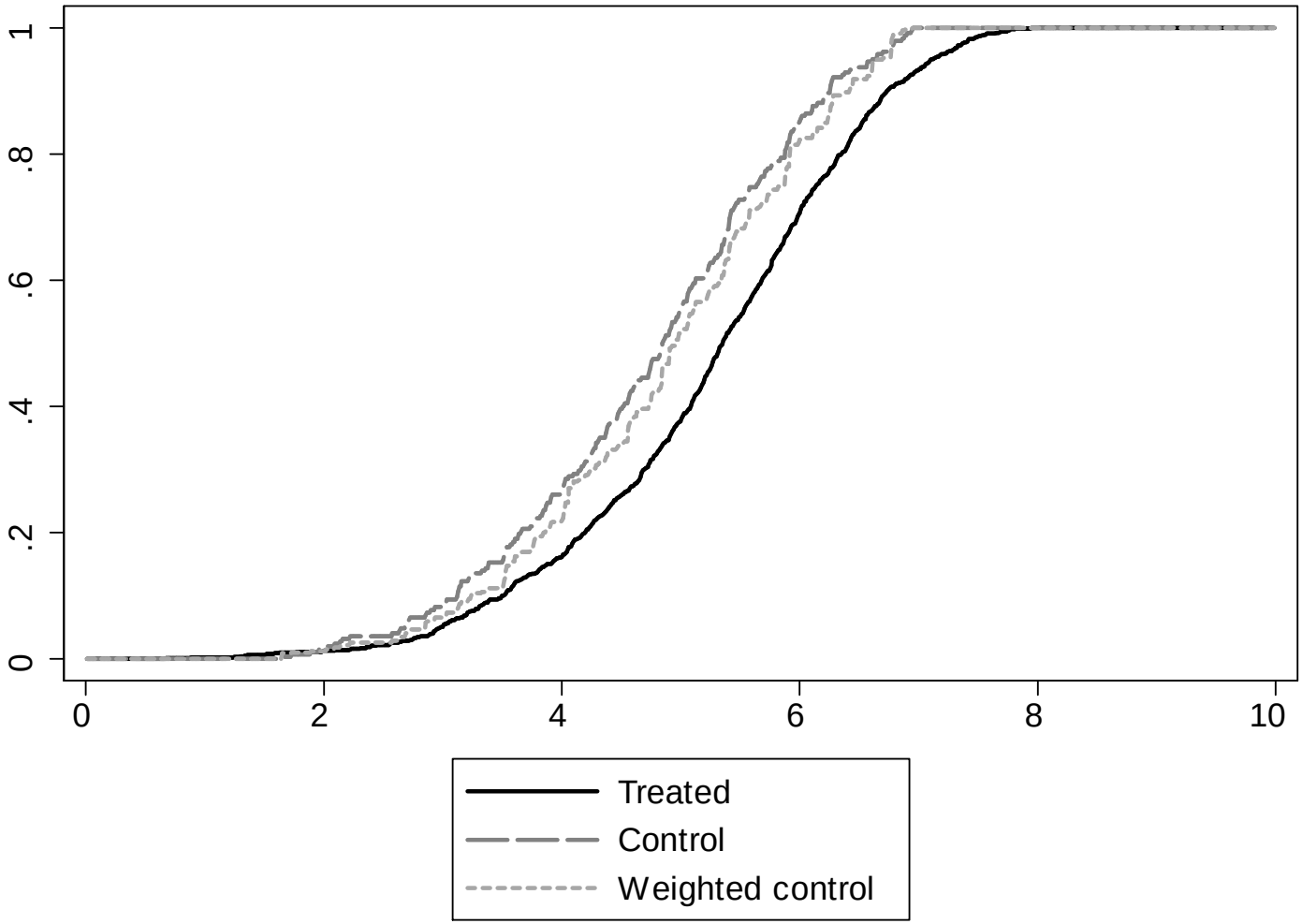
Figure 4: Estimated cdf of the pre-test normalized scores.



Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Outcomes (distribution)

Figure 5: Estimated cdf of the post-test normalized scores.



Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Outcomes (topics)

Table 10: The effect of financial literacy courses on the post-test sum of correct answers by topic.

	Total score	Numeracy	No numeracy	Saving and planning	Banking	Sustainable Consumption
Treatment - no c.	0.4102	0.2423	0.5073	0.4207	0.4956	-0.1340
	(0.2406)	(0.218)	(0.2636)	(0.1643)	(0.2798)	(0.5143)
Treatment - with c.	0.3943	0.2247	0.4925	0.3957	0.4842	-0.1493
	(0.1291)	(0.1896)	(0.1000)	(0.2198)	(0.1243)	(0.1374)
Mean of the scores	6.91	7.09	6.81	7.04	6.72	7.67
Sd of the scores	1.43	1.69	1.55	1.79	1.60	2.88
Number of observations	1,223					

Notes: Grades on a scale from 0 to 10. Robust standard errors, clustered at the school level, in parentheses. The covariates included in the logit are female, grade repetition, private school, pre-test, private school x pre-test, labor market status, education and occupation of the mother. Specifications *Treatment-with c.* also includes these covariates in the regression.

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Outcomes (type of school)

Table 11: The effect of financial literacy courses on post-test scores by type of school.

	Private schools	Rest of schools
Treatment - no c.	0.0065	0.5159
	(0.2380)	(0.1424)
Treatment - with c.	0.0058	0.4953
	(0.1741)	(0.0869)
Mean of the scores	4.66	5.25
Sd of the scores	1.42	1.19
Number of observations	278	1,041

Notes: Grades on a scale from 0 to 10. Robust standard errors, clustered at the school level, in parentheses. The covariates included in the logit are female, grade repetition, private school, pre-test, private school x pre-test, labor market status, education and occupation of the mother. Specifications *Treatment-with c.* also includes these covariates in the regression.

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

1. Introduction
2. **Selection bias**
3. Evaluation
4. Conclusions

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Characterizing selection bias

- Assume we had a **representative** sample of schools that have not delivered Financial Literacy in the past.
- A subset volunteer for a FL program **in 2013 or later** ($T = 1$). Y measures financial knowledge (in **PISA 2012**), X are covariates

$$E(Y|X = x, T = t) = x'\beta + \alpha t.$$

- No training was given, so $\hat{\alpha}$ cannot pick up the effect of the program.

If $\hat{\alpha}$ is not zero, its magnitude measures how important selection bias is.

Meier and Sprenger (2007).

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Estimating selection bias

Three steps:

- Estimate the probability of volunteering for the program as a function of school and student characteristics.
- Obtain a counterfactual grade in non-volunteer schools by giving students similar to those in volunteer schools a higher weight $\widehat{W}$
  - The weight increases with the *predicted* probability of volunteering
- **Selection bias:** the (nonexistent) effect of participating in the program for the treated students is the sample counterpart of $S = E(Y|T=1) - E(\widehat{W}Y|T=0)$.

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Sample selection

Students who took the PISA financial literacy test in schools that do not offer FE.

Table 2: Sample sizes (PISA 2012 - Spain).

	(1) Financial w/o FE	(2) Financial linked w/o FE
Number of schools	151	151
Number of students:		
Total	919	4,130
Students in treated schools	119	492
Students in control schools	800	3,638

Notes: treated schools are those that volunteered for the CNMV-BdE program in 2013 and/or 2014.

Are participants different?

Table 3: Differences btw participants in the program and the rest.

	Weighted averages*		Reweighted averages	
	Volunteer schools	Non-volunteer schools	Non-volunteer schools (model 1**)	Non-volunteer schools (model 2***)
SCHOOL CHARACTERISTICS				
Public school	0.57	0.68	0.70	0.55
State-subsidized school	0.18	0.13	0.13	0.10
Private school	0.25	0.19	0.17	0.35
Religious school	0.36	0.19	0.18	0.36
Does not admit students according to residence	0.41	0.19	0.17	0.46
Transfers students to other schools for bad behavior	0.33	0.25	0.27	0.32
Competes with at least one school in the area	0.95	0.82	0.76	0.95
High teacher morale	0.27	0.12	0.11	0.17
STUDENT CHARACTERISTICS				
Average score on Financial Education	482	484	481	482
Girl	0.49	0.46	0.50	0.53
Has repeated grade	0.27	0.34	0.27	0.25
Father works	0.91	0.83	0.91	0.93
Father with college degree	0.31	0.35	0.31	0.33
Mother works	0.66	0.66	0.60	0.66
Mother with college degree	0.36	0.36	0.33	0.31
CONTEXT CHARACTERISTICS				
South (Andalusia, Canary Islands, Ceuta and Melilla, Murcia)	0.62	0.24	0.62	0.60
Number of students	119	800	800	800

Notes: *Averages weighted by sample weights. ** Model 1 contains school location, father's work status, student's gender and rate of repetition. *** Model 2 adds type of institution, student selection capacity, school competition, teacher morale or if the school is religious.

Are participants different?

Table 4: Differences btw participants in the program and the rest (by gender).

	Boys		Girls	
	Volunteer schools	Non-volunteer schools	Volunteer schools	Non-volunteer schools
SCHOOL CHARACTERISTICS				
Public school	0.55	0.70	0.61	0.67
State-subsidized school	0.22	0.12	0.13	0.14
Private school	0.23	0.18	0.26	0.19
Does not admit students according to residence	0.35	0.18	0.48	0.18
Transfers students to other schools for bad behavior	0.35	0.28	0.30	0.20
Competes with at least one school in the area	0.97	0.81	0.92	0.83
STUDENT CHARACTERISTICS				
Average standardized score on Financial Education	0.23	0.09	-0.27	-0.07
Has repeated grade	0.25	0.40	0.28	0.27
CONTEXT CHARACTERISTICS				
South (Andalusia, Canary Islands, Ceuta and Melilla, Murcia)	0.58	0.25	0.65	0.22
Number of students	63	428	56	372

Notes: Sample 1. All averages weighted by the sample weights.

Selection bias

Table 6: Differences in performance: participants in the FE program vs rest.

	Difference treatment - control	Model 1		Model 2	
		W/o covariates	With covariates	W/o covariates	With covariates
FE program applicants: Boys	0.234*	0.164	0.167	0.142	0.073
	(0.144)	(0.151)	(0.138)	(0.166)	(0.148)
FE program applicants: Girls	-0.274*	-0.131	-0.126	-0.147	-0.098
	(0.148)	(0.160)	(0.148)	(0.169)	(0.149)

Notes: The dependent variable is the results on PISA financial, standardized in such a way that it has an average of 0 and standard deviation 1. in Columns 2-5. Model 1 contains gender and repetition, regional location and father's employment status. Model 2 adds type of school, whether the school admits students according to residence criteria and teacher characteristics.

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Take aways

1. A short program increased treated students' financial knowledge by 1/3 of a standard deviation.
   - Very limited impacts on private schools.
   - Survey responses from teachers: partly attributable to a less intensive implementation.
2. Significant selection bias in volunteering for financial literacy programs, positive for boys and negative for girls.
   - Adjusting for grade retention, parents' employment status and location of the school, we can eliminate between 33% and 50% of the bias.
   - When controlling for similar admissions criteria, we correct 65% of the bias.

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

Wish list

- Random assigment of treated and control students.
- Wider geographical scope.
- Follow these individuals in the future:
  - Any effect in the medium/long run
  - Other outcomes apart from tests scores.
- New evaluation 2014-2015 in 78 schools (some 5000 students).

Introduction
Financial literacy in schools
Evaluation
Background
Estimation
Data
Results
Selection bias
Estimation
Data
Results
Conclusions

THANK YOU!