


The Effectiveness of a Formal Financial Education Program at Primary Schools and the Role of Informal Financial Education

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Abstract

Objectives: This study examines the effectiveness of a formal financial education program for improving the financial literacy of primary school children and how this effectiveness is influenced by informal financial education provided by parents, such as giving pocket money and discussing money matters. **Method:** A quasi field experiment was carried out at the Museum of Saving in Turin where children participated in a financial education program (the treatment). The first two out of three classes that arrived at the museum were assigned to the treatment group and the third one to the comparison group. Difference-in-differences models are estimated using financial literacy data from a pretest taken about 1 week before the visit to the museum and a posttest taken on the day of the visit; just before starting with the program at the museum for the comparison group and just after program completion for the treatment group. **Results:** In line with previous studies, we find that our formal financial education program had a positive effect on the financial literacy of primary school children. The empirical findings provide weak

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evidence that this effect of formal financial education is stronger for children who received informal financial education from their parents. **Conclusions:** Our study contributes to the previous literature by presenting further evidence that a short extra-curricular course can be effective in increasing economic and financial literacy among students. Furthermore, we present suggestive evidence—worth of further research—that informal financial education can reinforce the effect of formal financial education.

JEL Codes: A29, C93, G40.

Keywords

quasi field experiment, informal financial education, formal financial education, financial literacy, primary school children

Introduction

Previous studies have extensively documented the importance of financial literacy (FL) for financial behavior related to, for instance, investments in stocks or bonds, retirement planning, and debt management (Lusardi and Mitchell 2008; Lusardi and Tufano 2009; van Rooij, Lusardi, and Alessie 2011a, 2011b, 2012). At the same time, studies have warned about the low levels of average financial literacy (Lusardi and Mitchell 2011a) and have stressed the need for educational programs early in life to improve FL.

There is little disagreement among policymakers that people need to be financially literate at a young age and that financial instruction should be offered already as early as in primary school (APEC 2014; OECD 2006). And while there is an ongoing debate in academia on the effectiveness of financial education (Fernandes, Lynch, and Netemeyer 2014; Lusardi and Mitchell 2014), there is also a growing body of empirical evidence in favor of formal financial education of primary school children increasing their level of FL, their intention to save, or their level of patience (Batty, Collins, and Odders-White 2015; Berti and Monaci 1998; Coda Moscarola and Migheli 2017; Go et al. 2012; Kalwij et al. 2019; Kourilsky 1977; Sherraden et al. 2011; Supanantarook, Lensink, and Hansen 2017). Next to formal financial education, several studies presented empirical evidence in favor of financial education provided by parents to their children (informal education) improving levels of FL (Buccioli and Veronesi 2014; Hanson and Olson 2018; Jorgensen and Savla 2010; Maldonado, De Witte, and Declercq 2019; Mandell and Schmid Klein 2007). Moreover, and as argued by Hanson and Olson (2018) and references therein, informal financial education (IFE) provided by the parents can reinforce the effect of formal financial education on children's FL.

Our contribution to the empirical literature is twofold. First, based on a quasi field experiment, we provide insights into the effectiveness of a formal financial education program for increasing the level of FL of primary school children. The evaluation's target population are children who were living in Piedmont (North-West of Italy) and were in the fourth and fifth grades of primary schools. The formal financial education program evaluated is part of the Money Learning (MOLE) project, an initiative of the Museum of Saving in Turin, and consists of a visit to the museum. During this visit, children attend the so-called Money Path (henceforth also referred to as the program), which addresses FL concepts such as compounded interest and inflation, the functioning of a loan, the history of money, and the suboptimality of a barter economy compared to a money exchange economy. For our evaluation, the participating children were assigned to treatment and comparison groups based on the time of their arrival. To mitigate possible biases in the estimated treatment effects that our assignment procedure might cause, our analysis controls for individual heterogeneity in the comparison and treatment groups by estimating difference-in-differences (DiD) models. Second, we provide insights into possible reinforcement effects of informal education on the effectiveness of formal financial education for FL. That is, by also using information on IFE, we estimate how the treatment effect of formal financial education on FL differs between children whose parents provide IFE and for those whose parents do not provide this. Informal financial education includes giving pocket money, allowing children to have own savings and the freedom to spend it, discussing freely of money matters at home, and providing a role model when the mother is the principal financial decision-maker.

Our main empirical findings support that a short-term extra-curricular course, such as the program offered by the Museum of Saving in Turin, can be effective (at least in the short term) in increasing economic and FL among students. In addition, our findings show only weak support for IFE reinforcing the effect of formal financial education on the FL levels of primary school students.

The article is structured as follows: the second section discusses the previous literature, and the third section presents the intervention and evaluation design, after which the fourth section describes the data. The fifth section briefly outlines the statistical models and presents the empirical results. The final section summarizes the main findings and discusses their implications.

Previous Literature

[Fernandes, Lynch and Netemeyer \(2014\)](#) present a cautionary view, arguing that interventions to improve FL explain very little of the variation in financial behavior and that, therefore, financial education plays a limited role in

determining such behavior. However, several other studies have shown the importance of financial education programs, and of financial education early in life in particular. [Bernheim, Garrett and Maki \(2001\)](#) find for the US that mandatory FL programs in high schools have raised both students' exposure to financial curricula and subsequent asset accumulation in adulthood. [Lusardi and Mitchell \(2014\)](#) and [Brown et al. \(2016\)](#) have found that economic and FL learnt at a young age increases the likelihood of saving, decreasing non-schooling related debt, and increasing repayment probabilities in adulthood. Further, [Ashby et al. \(2011\)](#) find that British adolescents' saving behavior at age 16 correlates positively with saving in adulthood at age 34. Finally, [Avery, de Bassa Scheresberg and Guiso \(2016\)](#) suggest that school-based financial education can effectively improve qualitative financial knowledge and change behavior, despite being less effective in improving quantitative FL skills.

Along with this evidence, a wide range of programs aimed at improving people's FL levels have been introduced ([Fox, Bartholomae, and Lee 2005](#)). In some countries, such as Australia and Canada, financial education is now included in the primary school curriculum. In Italy, the country considered in this study, policymakers are debating whether to include such content in schools' curriculum ([Romagnoli and Trifilidis 2013](#)). In such debates, the issue at what age children should be exposed to economic and FL education often emerged. The psychological literature suggests that (upper) primary school children can be taught about personal finances because they are capable of understanding basic economic concepts and of managing their money ([Otto et al. 2006](#); [Webley 2005](#)). The pioneering study of [Kourilsky \(1977\)](#) showed that even children aged five and six can understand such economic concepts as cost-benefit analysis and scarcity. More recently, several studies have examined the effectiveness of financial education at primary schools. [Batty, Collins and Odders-White \(2015\)](#), [Berti and Monaci \(1998\)](#), [Coda Moscarola and Migheli \(2017\)](#), [Go et al. \(2012\)](#), [Kalwij et al. \(2019\)](#), [Sherraden et al. \(2011\)](#), and [Supanantaroek, Lensink and Hansen \(2017\)](#) provided empirical evidence in favor of formal financial education of primary school children increasing their level of FL, intention to save or level of patience.

Next to formal financial education, the financial education provided by parents to their children has been shown to improve children's levels of FL. Informal financial education provided by parents can be explicit when parents enact initiatives to teach children basic economic and financial concepts, or when helping with homework that involves financial concepts. Informal education can also be implicit when parents allow children to observe how they deal with taking household financial decisions. In support of these arguments, [Buccioli and Veronesi \(2014\)](#) found that parental financial education, related to giving pocket money, controlling money affairs, and giving advice about budgeting and saving, had a significant positive effect on their children's propensity to save and the amounts they save as adults. While [Jorgensen and](#)

Savla (2010) found that parental influence had a significant positive effect on students' financial behaviors, mediated through positive financial attitudes. Related to the latter finding, Mandell and Schmid Klein (2007) showed that parents can transmit to children motivation in studying FL and that motivation appears among the determinants of high levels of FL. Maldonado et al. (2019) presented also some evidence in favor of parental involvement in FL homework having a positive impact on children's financial behavior like the knowledge of precautionary measures to prevent frauds (as the theft of one's pin-code).

The Intervention and Evaluation Design

The Museum of Savings was founded in 2012 in Turin—the main city of Piedmont, a region in the North-West of Italy—and it was conceived as an innovative and entertaining place to assist the community in learning the basic financial concepts and in understanding savings and investments related issues. The Museum addresses a diversified audience—adults, teenagers, and children—and aims to stimulate the active participation of its visitors. It is entirely based on audio-visual and interactive materials (videos, documentaries, games, and movie clips), and it makes extensive use of cutting-edge technologies. Besides, the Museum offers teaching activities—thematic visits, labs, workshops, events, and online tools—targeted to schools of all levels, aimed at conveying basic economic and financial concepts to the youngsters. The Museum cooperates with research centers and universities on several topics to continuously update its activities. The project Money Learning (MOLE), which our study evaluates, is a joint project with another local foundation—the Fondazione per la Scuola—and was financed by the European Investment Bank. It offers to elementary schools in and around the city of Turin to attend a special visit to the museum. Transports and ticket entrances to the museum are covered by the project. Priority was initially provided to schools located in zones far from the city of Turin.

The Intervention

The intervention evaluated is an extra-curricular financial education program: the Money Path offered by the Money Learning (MOLE) project that children participating in the project attend during their visit to the Museum of Savings in Turin. This program was tailored towards fourth and fifth graders who are typically aged 8–11. The intervention is assessed for the period May 2017–May 2018. At first—between May 2017 and February 2018—primary schools in the mountainous villages were targeted and towards the end of the field period (March 2018–May 2018) schools from the city of Turin and surrounding areas were added. These schools cannot be considered a random

sample of Italian primary schools. For instance, the schools situated in mountainous areas, about 90% in our sample, have features that mark them as non-representative of the entire Italian population both in terms of socio-economic characteristics of students and parents, and their proximity to advanced educational initiatives (including the Museum of Saving).

The formal financial education program children were exposed to during their tour in the museum consisted of, first, watching four short cartoons (1–2 minutes each) in which the main characters are two museum mascots (two ants called For and Mica) explaining the origins of money, the principles of a loan, the implications of inflation, and barter versus monetary exchange economies. Next, they watched two videos (3–4 minutes each) about the history of the Templars and the concept of interest rates, and the origin of the euro. At the end of the tour, children had access to the experimental hall in which they were allowed to play an interactive game called job search. In each round of the game, players accumulated a score in cash, and they were asked whether they prefer to spend or save it. If they opted to save, they gained an interest rate of five percent. In this way, the concept of interest compounding was taught. After the various sessions, volunteers of the museum offered additional explanations and clarifications.

Evaluation Design

Our study examined the short-term effects of the program on children's FL. We restricted our evaluation of the intervention to children aged 8–11 years, the typical age range for fourth and fifth graders, to avoid it being influenced by a few children who were, arguably, early starters with relatively high cognitive skills or late starters (or repeaters) with relatively low cognitive skills. The evaluation design consisted of three phases: phase 1 was enacted 1 week before and phases 2 and 3 took place during primary school children's visit to the museum (see [Figure 1](#)). The evaluation of the program was based on answers to a questionnaire that children filled in at phases 1 and 3, and that elicited, among other things, their FL skills (see [Supplemental Material](#) Appendixes A and B).

The details of the three phases are as follows. In phase 1, children, parents, and teachers were requested to fill in questionnaires (see [Supplemental Material](#) Appendix A for details). While in class, children filled in a questionnaire under the supervision of their teachers. The children's questionnaire elicited information on their age, gender, and whether they were interested in money matters, received pocket money, or received money in exchange for basic household chores. In addition, their level of patience with respect to saving was elicited and FL questions were asked about loans, coins, budget constraints, interest compounding, inflation, and barter economy. The questionnaire includes the "big five" FL questions used by [Lusardi and Mitchell \(2011a\)](#) to test FL levels all over the world. Also, similar FL

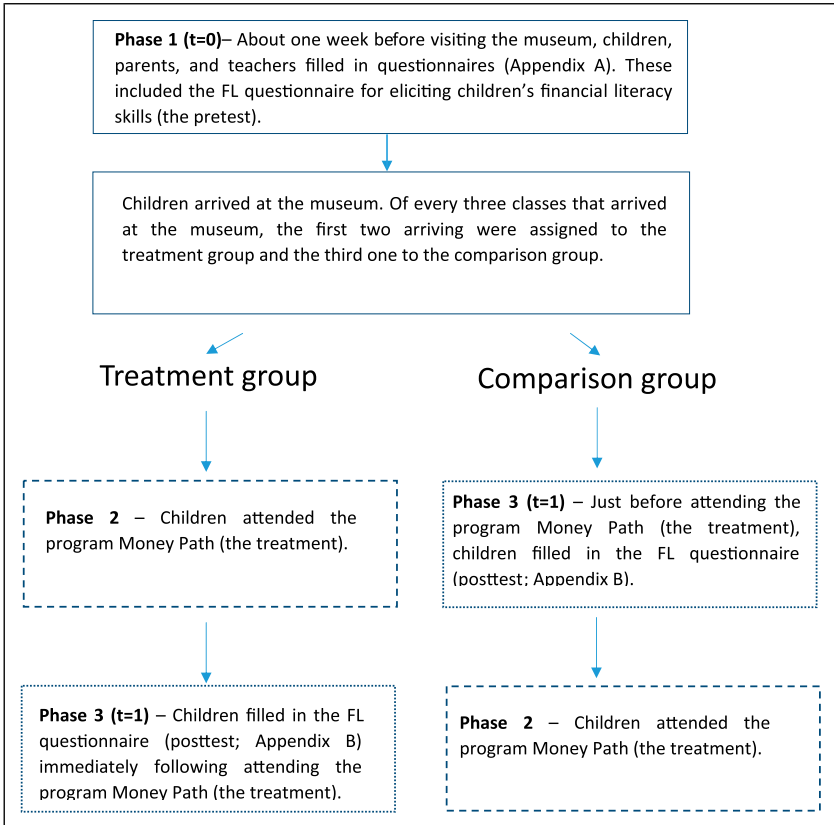


Figure 1. Overview of the design of the evaluation.

questions were used in Kalwij et al. (2019) for assessing the effectiveness of a financial education program in Dutch primary schools. Consequently, we considered our FL questions independent of the Museum experience called Money Path, except for the question about barter economy. This latter question was added as it strongly relates to one of the topics of Money Path.

Parents filled in a questionnaire at home. They were asked about their citizenship, age, and level of education, the number of older and younger siblings their child has, and the child’s grade in mathematics. We proxied for the level of IFE from whether their child received pocket money or had savings and, if so, the degree of freedom their child had to spend it. Furthermore, we had information on whether day by day financial matters are topics of conversation that parents shared with their children, and whether the mother was the principal financial decision maker in the household.

Finally, the questionnaire for teachers collected information on their self-perceived level of FL, as well as on their knowledge of inflation, risk, and time-value of money. These latter were the “big three” FL questions used in previous studies (e.g., [Lusardi and Mitchell 2008, 2011a, 2011b](#); [van Rooij, Lusardi, and Alessie 2011a](#)).

About 1 week after the set of questionnaires described above were completed (phase 1), children visited the Museum of Saving in Turin and went through phases 2 and 3 of the evaluation. When classes arrived at the museum, according to their arrival time, the first two classes that arrived were assigned to the treatment group, and the third class that arrived was assigned to the comparison group. The two classes that arrived next again joined the treatment group and the class that arrived thereafter joined the comparison group, and so forth. This assignment solely depended on the order of arrival at the museum at the day of the visit.

Phase 2 consisted of guiding the children through the Money Path (the program) and phase 3 consisted of eliciting children’s FL once again (see the section *The Intervention*). Although all children went through the same three phases, the order of phases 2 and 3 depended on whether the children were assigned to the comparison or to the treatment group. While the treatment group first went through phase 2 and next through phase 3, the comparison group first went through phase 3 and next through phase 2. Also, phase 3 took place in the museum immediately before following the Money Path (phase 2) for the comparison group and immediately after following the Money Path for the treatment group. The questionnaire of phase 3 includes the same FL questions as the questionnaire of phase 1, but with a different ordering of the answers and different names of the illustrative characters. Finally, we asked both children and teachers to evaluate their visit to the museum, while teachers had an additional question on whether they had taught any economic or financial concepts before (see [Supplemental Material Appendix B](#)). Unfortunately, the latter information was rarely provided with sufficient detail and could not be used for our study.

By reversing the order of phases 2 and 3 for the comparison group, the effectiveness of the program, that is, the treatment effect could be assessed by comparing the answers to the FL questions of children in the treatment group with those of children in the comparison group. An advantage of this design is that the children in each group were equally motivated because they all received the same treatment, that is, the attendance to the Money Path at the museum. Although there is no posttest of FL for the comparison group, but this group has two pretests, we refer in the remainder of this article to pre- and posttests of FL. [Figure 1](#) summarizes the structure of the evaluation design.

The Data

The raw sample of students participating in the evaluation consisted of 1759 children. Of these children, 51 were dropped because it could not be

determined if there were fourth or fifth graders and, in accordance with the evaluation design of the section Evaluation Design, 30 were dropped because they were younger than eight or older than 11 years of age. A further 207 students who did not complete both the pre- and posttests of phases 1 and 3 were also excluded. Moreover, of three students we did not know whether they were in the comparison or treatment group. The resulting estimation sample consisted of 1468 fourth and fifth graders from 49 schools (86 classes).

Table 1 shows the descriptive statistics of the estimation sample. The participants' gender composition was balanced, and the average age was about 9 years. About 47% of the children had an older brother or sister. Most parents had a high school diploma and 13% of the mothers and 9% of the fathers had a university degree. The parents of about 13% of the children were not born in Italy. Further, children's average math grade was 8.22 (on a 0–10 scale) with very little variation and, concerning attitudes, about 57% of the children indicated an interest in money matters.

Information on IFE was provided by both the children and their parents. About 87% of the children reported to have their own savings, and 82% attested to receiving pocket money, although only 16% received it on a regular basis—hence, 67% are listed as occasionally receiving pocket money. The information on pocket money provided by the parents agreed with the children's information, excepting that more parents reported giving pocket money only occasionally (82%). Further, most parents reported that pocket money was not in exchange for chores (70%), and that children had only partial freedom in spending their own savings (65%). The latter means that children had to ask their parents' permission if they wanted to buy something from their own savings. Finally, for about 83% of the households, parents talked openly about financial matters; while for only 9% of the households, mothers were the primary financial decision-makers. Based on these variables, a principal component analysis was carried out to construct the index IFE. Informal financial education refers to the first principal component and was standardized to a mean of zero. It ranges from -4.74 to 0.97 with a standard deviation equal to 1.14.

As for the initial FL levels elicited in phase 1, Table 2 shows that children perform best on the question concerning a budget constraint (86% correct) and worst on the question about the understanding of a loan (45% correct). Also, in phase 1, on average, children answered 3.90 out of the six FL questions correctly.¹ Not shown in the table, the median FL score in this phase is 4, and about 21% of children answered all six questions correctly.

Further, about 69% of the children in the sample were allocated to the treatment group; hence, 31% belonged to the comparison group. This accords with the assignment procedure: one out of every three classes that visited the museum were selected for the comparison group. Assignment to the treatment

Table 1. Sample Statistics of Children's and Parents' Characteristics in Phase 1.

| Variable | N | Mean | Std. Dev. | Min | Max |
|---|------|------|-----------|-------|------|
| Socio-demographic variables | | | | | |
| Male | 1467 | 0.50 | 0.50 | 0 | 1 |
| Age | 1468 | 9.10 | 0.74 | 8 | 11 |
| Grade five | 1468 | 0.55 | 0.50 | 0 | 1 |
| Parent(s) born abroad | 1346 | 0.13 | 0.33 | 0 | 1 |
| Mother at most compulsory schooling | 1387 | 0.28 | 0.45 | 0 | 1 |
| Father at most compulsory schooling | 1337 | 0.40 | 0.49 | 0 | 1 |
| Mother completed at most high school | 1387 | 0.59 | 0.49 | 0 | 1 |
| Father completed at most high school | 1337 | 0.51 | 0.50 | 0 | 1 |
| Mother obtained a university degree | 1387 | 0.13 | 0.34 | 0 | 1 |
| Father obtained a university degree | 1337 | 0.09 | 0.29 | 0 | 1 |
| Older siblings | 1468 | 0.47 | 0.50 | 0 | 1 |
| Individual attitudes/experience | | | | | |
| Grade in mathematics | 1308 | 8.22 | 1.11 | 1 | 10 |
| Interest in money matters | 1461 | 0.57 | 0.49 | 0 | 1 |
| IFE: self-assessed | | | | | |
| Own savings | 1365 | 0.87 | 0.33 | 0 | 1 |
| Pocket money | 1464 | 0.82 | 0.38 | 0 | 1 |
| Pocket money—regularly (self-assessed) | 1464 | 0.16 | 0.36 | 0 | 1 |
| Pocket money—occasionally (self-assessed) | 1464 | 0.67 | 0.47 | 0 | 1 |
| IFE: assessed by parents | | | | | |
| Pocket money—regularly (parents) | 1402 | 0.10 | 0.30 | 0 | 1 |
| Pocket money—occasionally (parents) | 1402 | 0.82 | 0.39 | 0 | 1 |
| Pocket money—no work (parents) | 1402 | 0.70 | 0.46 | 0 | 1 |
| Pocket money—work (parents) | 1402 | 0.13 | 0.34 | 0 | 1 |
| Full autonomy in spending own savings | 1379 | 0.03 | 0.17 | 0 | 1 |
| Partial autonomy in spending own savings | 1379 | 0.65 | 0.48 | 0 | 1 |
| Discussion of money matters at home | 1360 | 0.83 | 0.37 | 0 | 1 |
| Mother decision-maker | 1386 | 0.09 | 0.29 | 0 | 1 |
| IFE index | 1300 | 0.00 | 1.14 | -4.74 | 0.97 |
| Teachers' financial education | | | | | |
| Average by class FL score | 951 | 2.23 | 0.68 | 0 | 3 |
| Average by class auto-evaluation | 951 | 4.27 | 1.70 | 1 | 7 |
| Treatment ^a | 1468 | 0.69 | 0.46 | 0 | 1 |

Note. N = number of children. IFE = informal financial education.

^aEqual to 1 for children in the treatment group and equal to 0 for children in the comparison group.

or comparison group cannot strictly speaking be considered at random (see the section Evaluation Design). Although the treatment sample and comparison sample are balanced with respect to many variables, they are not for all

Table 2. Financial Literacy, Phase I (Pretest).

| Variable | All | | Comparison group | | | Treatment group | | | Equality of means ^a |
|-------------------------|------|-----------|------------------|------|-----------|-----------------|------|-----------|--------------------------------|
| | Mean | Std. Dev. | N | Mean | Std. Dev. | N | Mean | Std. Dev. | p-value |
| FL score | 3.90 | 1.55 | 452 | 4.04 | 1.58 | 1016 | 3.84 | 1.54 | 0.02 |
| Understanding of a loan | 0.45 | 0.50 | 452 | 0.49 | 0.50 | 1016 | 0.43 | 0.50 | 0.02 |
| Knowledge of coins | 0.65 | 0.48 | 452 | 0.64 | 0.48 | 1016 | 0.66 | 0.47 | 0.43 |
| Budget constraint | 0.86 | 0.35 | 452 | 0.87 | 0.34 | 1016 | 0.86 | 0.35 | 0.62 |
| Compounding interest | 0.68 | 0.47 | 452 | 0.70 | 0.46 | 1016 | 0.66 | 0.47 | 0.14 |
| Inflation | 0.58 | 0.49 | 452 | 0.62 | 0.48 | 1016 | 0.56 | 0.50 | 0.02 |
| Barter economy | 0.69 | 0.46 | 452 | 0.72 | 0.45 | 1016 | 0.67 | 0.47 | 0.09 |

Notes. N = number of children. FL = financial literacy. The FL score is defined as the sum of the number of correct answers to the six FL questions.

^aThe null hypothesis is that the mean (or proportion) is the same in the comparison and treatment groups.

characteristics or outcome variables (see [Table 2](#) and [Supplemental Material Table A1](#)). However, additional tests discussed in the section Empirical Results provide empirical support for no association between the FL skills before visiting the museum and being assigned to either the treatment or comparison group (conditional on various individual characteristics).

Empirical Results

The Determinants of Financial Literacy in phase I

We have first examined the association between the FL score of phase 1 and the characteristics of the parents and children. For this, we estimated six linear regression models and these models differ in terms of included characteristics. The results reported in [Table 3](#) show that the child's grade level and his/her grade in mathematics are two of the three statistically significant determinants of the FL score. Being in grade five instead of grade four increases the initial score of about 0.75–0.82 points (depending on which model was estimated) on a scale from 0 to 6. A one-point increase in the grade in mathematics leads to an increase in the score of about 0.23–0.29 points. The importance of the mother's educational attainment on children's scholarly achievement in general, is emphasized by the finding that children whose mothers had completed high school had a significantly higher FL (0.21–0.38) than children

Table 3. The Determinants of the FL Score in Phase I (Pretest).

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---------------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| | b/se | b/se | b/se | b/se | b/se | b/se |
| Man | 0.110 (0.081) | 0.092 (0.081) | 0.078 (0.083) | 0.103 (0.085) | 0.117 (0.110) | 0.094 (0.085) |
| Grade five | 0.751*** (0.208) | 0.800*** (0.197) | 0.814*** (0.193) | 0.821*** (0.192) | 0.800*** (0.288) | 0.821*** (0.192) |
| Parent(s) born abroad | -0.199 (0.167) | -0.073 (0.149) | -0.099 (0.148) | -0.098 (0.157) | -0.009 (0.181) | -0.076 (0.164) |
| Mother high school degree | 0.384*** (0.092) | 0.221** (0.099) | 0.227** (0.098) | 0.247** (0.096) | 0.221** (0.100) | 0.234** (0.100) |
| Father high school degree | 0.077 (0.076) | -0.027 (0.085) | -0.009 (0.079) | 0.006 (0.077) | 0.058 (0.097) | -0.021 (0.078) |
| Mother university degree | 0.382** (0.153) | 0.148 (0.166) | 0.163 (0.169) | 0.157 (0.173) | 0.066 (0.205) | 0.143 (0.170) |
| Father university degree | 0.186 (0.157) | 0.081 (0.151) | 0.116 (0.150) | 0.149 (0.147) | 0.029 (0.178) | 0.126 (0.143) |
| Older siblings | 0.004 (0.072) | 0.027 (0.074) | 0.028 (0.076) | 0.054 (0.079) | 0.060 (0.106) | 0.054 (0.077) |
| Grade in mathematics | | 0.245*** (0.044) | 0.233*** (0.045) | 0.240*** (0.046) | 0.292*** (0.068) | 0.240*** (0.046) |
| Interest in money matters | | 0.259** (0.103) | 0.269** (0.106) | 0.267** (0.106) | 0.231* (0.116) | 0.269** (0.105) |
| Pocket money | | | 0.218* (0.127) | 0.237* (0.132) | 0.239 (0.173) | |

(continued)

Table 3. (continued)

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|-------------------------------------|------------------|------------------|-----------------|-----------------|----------------|------------------|
| | b/se | b/se | b/se | b/se | b/se | b/se |
| Own savings | | | 0.089 (0.109) | 0.107 (0.120) | -0.052 (0.134) | |
| Spending freedom | | | 0.040 (0.095) | 0.063 (0.101) | 0.108 (0.130) | |
| Mother decision maker | | | | 0.274 (0.175) | 0.274 (0.233) | |
| Discussion of money matters at home | | | | -0.158 (0.128) | -0.100 (0.157) | |
| Average by class | | | | | -0.088 (0.214) | |
| FL score | | | | | | |
| Average by class | | | | | 0.047 (0.063) | |
| auto-evaluation | | | | | | 0.023 (0.036) |
| IFE | | | | | | |
| Constant | 3.153*** (0.186) | 1.159*** (0.366) | 0.945** (0.378) | 0.923** (0.392) | 0.551 (0.796) | 1.166*** (0.395) |

(continued)

Table 3. (continued)

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|--|---------|---------|---------|---------|---------|---------|
| | b/se | b/se | b/se | b/se | b/se | b/se |
| H ₀ : No effect of being in the treatment group (p-values) ^a | 0.196 | 0.232 | 0.208 | 0.250 | 0.511 | 0.239 |
| R-squared | 0.078 | 0.113 | 0.119 | 0.126 | 0.150 | 0.119 |
| Number of children | 1302 | 1207 | 1167 | 1133 | 745 | 1133 |

Notes. IFE = informal financial education; FL = financial literacy. Linear regression models are estimated. FL score is the sum of the number of correct answers to the six FL questions. IFE is an index for IFE obtained as principal component from a Principal Component Analysis (PCA) of the following variables: *own savings*, *pocket money*, *spending freedom*, *discussion of money matters at home*, and *mother decision-maker*. Errors clustered at class level.

Standard errors in parentheses; *p < .10, **p < .05, ***p < .01.

^aFor this test we rerun all regressions with the inclusion of the treatment variable.

whose mothers had at most completed compulsory schooling (8 years of school). Interest in money matters is also positively correlated with the test's FL score (0.23–0.27). Finally, the null hypothesis reported near the bottom of the Table ("H₀: No effect of being in the treatment group" in Table 3) is not rejected for any of the specifications. This suggests that being assigned to either the treatment or comparison group (see the section The Data) is not associated with the FL skills before visiting the museum (*ceteris paribus*).

Informal financial education is measured with the variables related to the financial responsibility of children (receiving pocket money, having own savings, and having at least some spending freedom), whether parents freely discuss of money issues (e.g., budget management and investment) at home, and whether the mother is the principal financial decision-maker in the domain of household finance. These variables are gradually included in models 3–5 of Table 3. For model 6, we used the index IFE that synthesizes informal education (see the section The Data). Overall, the results of Table 3 suggest that IFE is unrelated to children's initial FL scores.

Table 4 reports the regression results for correctly answering each of the six FL questions in phase 1. The importance of the grade in mathematics is evident for all questions except the one related to inflation and grade level is important for all six FL questions. The mother's educational level is positively correlated with correctly answering the questions on inflation, barter economy, and compound interest rate, and interest in money matters is positively correlated with correctly answering the question on barter economy.

The Effect of Formal Financial Education on Financial Literacy

We used a DiD setup to estimate the average effect of the program, as provided during the visit to the Museum of Saving in Turin, on children's FL (Angrist & Pischke, 2009). Our DiD setup controls for possible systematic differences in FL and characteristics between children in the comparison and treatment group in phase 1 (see the section The Data), by accounting for individual-specific fixed effects. The outcome variable (Y_{it}) is either a score variable ranging from 0 to 6 (model 1) or a dummy variable (models 2–7) that captures whether the child i answered correctly to each of the six FL questions at time t , where t is equal to 0 in phase 1 and equal to 1 in phase 3, $t \in \{0,1\}$. Our DiD setup is operationalized by estimating the following fixed-effects model

$$Y_{it} = \alpha_i + \theta_1 t + \theta_2 \text{Treatment}_i + \beta \text{Treatment}_i \times t + \varepsilon_{it} \quad (1)$$

where the variable *Treatment* is equal to one if child i is in the treatment group and equal to 0 if in the control group. The child's specific fixed effect, that can potentially be correlated with the treatment effect, is denoted by α_i and the error term is denoted by ε_{it} . The models are estimated using the sample of

Table 4. The Determinants of the Probabilities of Providing a Correct Answer to Each of the Six FL Questions of Phase I (Pretest).

| | (1) Understanding of a loan | (2) Knowledge of coins | (3) Budget constraint | (4) Interest compounding | (5) Inflation | (6) Barter economy |
|------------------------------|--------------------------------|---------------------------|--------------------------|-----------------------------|-----------------|--------------------|
| | b/se | b/se | b/se | b/se | b/se | b/se |
| Man | 0.024 (0.033) | 0.019 (0.026) | 0.007 (0.019) | 0.032 (0.029) | 0.028 (0.028) | -0.015 (0.023) |
| Grade five | 0.184*** (0.064) | 0.247*** (0.050) | 0.083*** (0.030) | 0.131** (0.054) | 0.097** (0.048) | 0.079* (0.046) |
| Parent(s) born abroad | 0.079* (0.046) | -0.072 (0.054) | -0.045 (0.027) | -0.062 (0.057) | -0.038 (0.052) | 0.062 (0.047) |
| Mother high school degree | -0.003 (0.031) | 0.035 (0.033) | 0.021 (0.027) | 0.048 (0.034) | 0.067** (0.031) | 0.066* (0.037) |
| Father high school degree | -0.021 (0.030) | -0.014 (0.028) | 0.018 (0.017) | -0.008 (0.032) | 0.006 (0.032) | -0.003 (0.029) |
| Mother university degree | -0.061 (0.065) | -0.039 (0.052) | 0.039 (0.036) | 0.080* (0.047) | 0.095* (0.055) | 0.029 (0.059) |
| Father university degree | 0.045 (0.054) | -0.010 (0.049) | -0.007 (0.035) | -0.011 (0.042) | 0.038 (0.059) | 0.070 (0.044) |
| Older siblings | 0.007 (0.030) | -0.040 (0.029) | 0.010 (0.019) | 0.021 (0.026) | 0.047* (0.024) | 0.008 (0.023) |
| Grade in mathematics | 0.057*** (0.016) | 0.045*** (0.014) | 0.046*** (0.011) | 0.048*** (0.012) | 0.012 (0.015) | 0.032** (0.014) |

(continued)

Table 4. (continued)

| | (1) Understanding of a loan | (2) Knowledge of coins | (3) Budget constraint | (4) Interest compounding | (5) Inflation | (6) Barter economy |
|------------------------------|--------------------------------|---------------------------|--------------------------|-----------------------------|-----------------|--------------------|
| | b/se | b/se | b/se | b/se | b/se | b/se |
| Interest in money matters | 0.062* (0.036) | 0.016 (0.031) | 0.035 (0.027) | 0.062 (0.037) | 0.013 (0.037) | 0.081*** (0.026) |
| IFE ^a | 0.024* (0.012) | 0.005 (0.012) | 0.007 (0.008) | -0.006 (0.013) | -0.005 (0.014) | -0.002 (0.014) |
| Constant | -0.150 (0.129) | 0.163 (0.127) | 0.397*** (0.094) | 0.132 (0.115) | 0.334** (0.143) | 0.290** (0.123) |
| R-squared | 0.056 | 0.085 | 0.054 | 0.045 | 0.021 | 0.028 |
| Number of children | 1133 | 1133 | 1133 | 1133 | 1133 | 1133 |

Notes. IFE = informal financial education; FL = financial literacy. Linear probability models are estimated. The standard errors are in parentheses and clustered at class level.

* $p < .10$, ** $p < .05$, *** $p < .01$.

^aInformal Financial Education is an index based on the first principal component from a Principal Component Analysis (PCA) of the following variables: own savings, pocket money, spending freedom, discussion of money matters at home, and mother decision-maker.

children who completed both the pre- and posttests. The parameter θ_1 captures time effects such as a learning effect from the repetition of the FL questionnaire. The group effect is captured by θ_2 , that is, the mean difference in Y_{it} between the comparison and treatment groups in the pretest, which is not estimated as it is constant over time. The treatment effect is denoted by β that is the causal effect of a visit at the museum on FL. Standard errors are corrected for heteroscedasticity and clustered by class. All models are linear models and the estimated effect of the treatment on the total score (model 1, Tables 5–7) is the sum of the effects of the treatment on the probability of a correct answer for each of the six FL questions (models 2 to 7, Tables 5–7).

Table 5 reports the estimation results of equation (1) when using the FL score (the sum of the number of correct answers) or the six FL questions separately. The treatment increases the FL score with on average about 0.63 units (on a 0–6 scale). As for the understanding of a loan, inflation, and barter economy, the treatment increases the probability of correct answering with about 23, 19, and 13 percentage points respectively. Interestingly, the topics related to these questions were explicitly addressed during the visit to the museum (see the section Previous Literature). There are significant effects of the treatment on the knowledge of coins, the understanding of interest compounding, and budget constraints. In other FL surveys, the interest compounding question is asked to adults (e.g., Lusardi, Mitchell, and Curto 2010) and therefore might not be suited for fourth or fifth graders as it could be too difficult. In addition, interest compounding was addressed during the Museum visit through an interactive game which could have distracted the children. As for the questions on coins and budget constraint, these topics were not explicitly addressed during the visit to the museum.²

Finally, our main findings of Table 5 were tested and found robust to an alternative empirical specification of regressing the FL scores of phase 3 ($t=1$; posttest) on FL scores of phase 1 ($t=0$; pretest) and the treatment variable, with and without controlling for the socio-demographic characteristics of Table 1 (see Supplemental Material Appendix C, Tables A2 and A3).

The Role of Informal Financial Education

The empirical analysis does not support that IFE reinforced the treatment effect of the program on FL score (Table 6, column 1). If we consider each of the FL questions separately (columns 2–7), the empirical evidence is in support of that IFE reinforced the treatment effect only for understanding a loan (column 2). This reinforcement effect is substantial: A one-standard deviation change in IFE translates in about a 26% higher treatment effect.³ For the question on inflation, the evidence of such a reinforcement is only suggestive, as the estimated coefficient is significant at 10% significance level only (column 6). For the other four FL questions on knowledge of coins,

Table 5. The effects of the Treatment on the FL Score and on the Probabilities of a Correct Answer to Each of the Six FL Questions.

| | (1) FL score | | (2) Understanding of a loan | | (3) Knowledge of coins | | (4) Budget constraint | | (5) Interest compounding | | (6) Inflation | | (7) Barter economy | |
|--------------------|---------------------|--|-----------------------------|--|------------------------|--|-----------------------|--|--------------------------|--|---------------------|--|---------------------|--|
| | b/se | | b/se | | b/se | | b/se | | b/se | | b/se | | b/se | |
| T | -0.100 (0.108) | | 0.046 (0.047) | | 0.164*** (0.046) | | -0.199*** (0.039) | | -0.022 (0.032) | | -0.060* (0.030) | | -0.029 (0.025) | |
| Treatment × t | 0.627*** (0.150) | | 0.234*** (0.059) | | -0.028 (0.053) | | 0.046 (0.050) | | 0.060 (0.040) | | 0.188*** (0.049) | | 0.128*** (0.035) | |
| Constant | 3.902*** (0.047) | | 0.448*** (0.019) | | 0.654*** (0.013) | | 0.858*** (0.010) | | 0.676*** (0.012) | | 0.579*** (0.012) | | 0.686*** (0.011) | |
| R-squared | 0.019 | | 0.055 | | 0.026 | | 0.041 | | 0.000 | | 0.012 | | 0.008 | |
| Number of children | 1468 | | 1468 | | 1468 | | 1468 | | 1468 | | 1468 | | 1468 | |

Notes. FL = financial literacy. For column 1, a fixed effect linear regression model was estimated. For columns 2–7, fixed effect linear probability models were estimated. The FL score is the sum of the number of correct answers to the six FL questions. The time trend is denoted by t , with $t \in \{0, 1\}$, and the treatment effect by (treatment × t). The standard errors are in parentheses and clustered at class level.

* $p < .10$, ** $p < .05$, *** $p < .01$.

Table 6. Reinforcing Effects of IFE.

| | (1) FL score | | (2) Understanding of a loan | | (3) Knowledge of coins | | (4) Budget constraint | | (5) Interest compounding | | (6) Inflation | | (7) Barter economy | |
|---------------------|--------------|---------|-----------------------------|---------|------------------------|---------|-----------------------|---------|--------------------------|---------|---------------|---------|--------------------|---------|
| | b | se | b | se | b | se | b | se | b | se | b | se | b | se |
| T | -0.081 | | 0.055 | (0.048) | 0.159*** | (0.043) | -0.187*** | (0.039) | -0.020 | (0.034) | -0.060* | (0.034) | -0.007 | (0.022) |
| t × IFE | -0.067 | (0.065) | -0.057*** | (0.018) | -0.005 | (0.023) | -0.023 | (0.025) | 0.024 | (0.029) | -0.019 | (0.025) | 0.000 | (0.019) |
| Treatment × t | 0.617*** | | 0.228*** | (0.060) | -0.031 | (0.053) | 0.035 | (0.050) | 0.061 | (0.043) | 0.195*** | (0.052) | 0.100*** | (0.025) |
| Treatment × t × IFE | 0.116 | (0.078) | 0.053** | (0.024) | -0.025 | (0.026) | 0.045 | (0.029) | -0.018 | (0.037) | 0.056* | (0.029) | 0.023 | (0.022) |
| Constant | 3.937*** | (0.048) | 0.455*** | (0.020) | 0.662*** | (0.012) | 0.864*** | (0.009) | 0.683*** | (0.012) | 0.582*** | (0.013) | 0.692*** | (0.012) |
| R-squared | 0.022 | | 0.054 | | 0.021 | | 0.041 | | 0.001 | | 0.013 | | 0.010 | |
| Number of children | 1300 | | 1300 | | 1300 | | 1300 | | 1300 | | 1300 | | 1300 | |

Notes. IFE = informal financial education. For column 1, a fixed effect linear regression model was estimated. For columns 2-7, fixed effect linear probability models were estimated. FL score is the sum of the number of correct answers to the six FL questions. The time trend is denoted by t , with $t \in \{0, 1\}$, and the treatment effect by (treatment $\times t$). Informal Financial Education is an index in between -4.20 and 0.97 based on the first principal component from a Principal Component Analysis (PCA) of the following variables: *own savings, pocket money, spending freedom, discussion of money matters at home, and mother decision-maker*. Reinforcing effects are modeled using interactions between time, treatment effects and IFE. The standard errors are in parentheses and clustered at class level. * $p < .10$, ** $p < .05$, *** $p < .01$.

Table 7. Reinforcing Effect of Informal Financial Education: The Different Components.

| | (1) FL score | (2) Understanding of a loan | (3) Knowledge of coins | (4) Budget constraint | (5) Interest compounding | (6) Inflation | (7) Barter economy |
|--|---------------------|-----------------------------|------------------------|-----------------------|--------------------------|---------------------|---------------------|
| | b/se | b/se | b/se | b/se | b/se | b/se | b/se |
| Treatment x t x own savings | 0.699*** (0.160) | 0.249*** (0.060) | -0.028 (0.053) | 0.049 (0.048) | 0.069* (0.041) | 0.226*** (0.051) | 0.134*** (0.039) |
| Treatment x t x no own savings | 0.080 (0.226) | 0.135 (0.096) | -0.083 (0.139) | -0.040 (0.127) | 0.014 (0.094) | -0.022 (0.102) | 0.076 (0.072) |
| H ₀ : No reinforcement ^a | 0.0106** | 0.1511 | 0.6831 | 0.4596 | 0.5521 | 0.0128** | 0.4709 |
| Treatment x t x pocket money | 0.630*** (0.153) | 0.240*** (0.061) | -0.047 (0.058) | 0.070 (0.053) | 0.085** (0.040) | 0.168*** (0.051) | 0.114*** (0.036) |
| Treatment x t x no pocket money | 0.609** (0.274) | 0.210** (0.086) | 0.063 (0.101) | -0.082 (0.090) | -0.051 (0.079) | 0.279*** (0.079) | 0.190** (0.081) |
| H ₀ : No reinforcement ^a | 0.9342 | 0.6985 | 0.3206 | 0.1047* | 0.0735* | 0.1477 | 0.3603 |
| Treatment x t x discussion of money matters at home | 0.651*** (0.163) | 0.254*** (0.064) | -0.037 (0.055) | 0.064 (0.052) | 0.039 (0.042) | 0.200*** (0.054) | 0.130*** (0.036) |
| Treatment x t x no discussion of money matters at home | 0.360 (0.229) | 0.132** (0.065) | 0.031 (0.092) | -0.081 (0.067) | 0.093 (0.084) | 0.092 (0.089) | 0.093 (0.070) |
| H ₀ : No reinforcement ^a | 0.2234 | 0.0820* | 0.4639 | 0.0380 | 0.5243 | 0.2544 | 0.5997 |
| Treatment x t x mother is the financial decision maker | 1.085*** (0.324) | 0.234** (0.104) | 0.076 (0.106) | 0.084 (0.088) | 0.337*** (0.123) | 0.178 (0.128) | 0.175 (0.106) |
| Treatment x t x mother is not the financial decision maker | 0.555*** (0.153) | 0.235*** (0.062) | -0.042 (0.054) | 0.039 (0.050) | 0.026 (0.041) | 0.184*** (0.050) | 0.112*** (0.037) |
| H ₀ : No reinforcement ^a | 0.0933* | 0.9953 | 0.2717 | 0.5684 | 0.0125** | 0.9570 | 0.5774 |

(continued)

Table 7. (continued)

| | (1) FL score | (2) Understanding of a loan | (3) Knowledge of coins | (4) Budget constraint | (5) Interest compounding | (6) Inflation | (7) Barter economy |
|--|---------------------|-----------------------------|------------------------|-----------------------|--------------------------|---------------------|---------------------|
| | b/se | b/se | b/se | b/se | b/se | b/se | b/se |
| Treatment × t × spending freedom | 0.680*** (0.151) | 0.256*** (0.054) | -0.053 (0.058) | 0.049 (0.056) | 0.042 (0.039) | 0.232*** (0.050) | 0.155*** (0.042) |
| Treatment × t × no spending freedom | 0.529*** (0.224) | 0.175* (0.089) | -0.001 (0.070) | 0.043 (0.066) | 0.114 (0.081) | 0.124 (0.090) | 0.073 (0.053) |
| H ₀ : No reinforcement ^a | 0.4515 | 0.2529 | 0.4601 | 0.9331 | 0.3935 | 0.2295 | 0.2070 |

Notes. For column 1, a fixed effect linear regression model was estimated. For columns 2–7, fixed effect linear probability models were estimated. Reinforcing effects were modeled using interactions between time, treatment effect, and the dummy capturing whether each informal financial education channel (*own savings*, *pocket money*, *spending freedom*, *discussion of money matters at home*, and *mother decision-maker*) is active or not. The list of explanatory variables used in each linear regression includes the time dummy ($t \in \{0, 1\}$), its interaction with the informal financial literacy channel and the constant, here not reported for sake of brevity. The standard errors are in parentheses and clustered at class level.

* $p < .10$, ** $p < .05$, *** $p < .01$; ^a p -values reported.

budget constraint, interest compounding, or barter economy, there is instead no evidence in favor of that IFE reinforced the treatment effect of the program. All in all, we found only weak empirical support for a difference in the effect of the program on FL between students that received IFE and those that did not received it.

To complete the analysis, [Table 7](#) provides insights into the reinforcement effects of each of the different channels for teaching informally financial education considered for building the IFE index (children having their own savings, receiving pocket money, whether money matters were discussed at home, whether the mother is the financial decision maker of the household, and if children have freedom in deciding how to spend own money). The empirical findings in column 1 are in support of children with own savings have a larger program treatment effect than those who do not have their own savings. This latter result is mainly driven by a reinforcement effect for the question on inflation (see columns 2–7). This reinforcement effect is substantial: while for children who do not have their own savings there is no evidence of a treatment effect, for children with their own savings the evidence suggests a 23% increase in the probability of answering the question on inflation correctly because of the treatment. Furthermore, there is empirical evidence—even if weak—of positive reinforcement effects for the question on understanding a loan for children whose mother is the financial decision-maker and for the question on interest compounding for children who receive pocket money.

Conclusions

Our empirical findings showed that the (initial) level of children's FL depended on personal characteristics of the child, namely, the grade level (age), their grades in mathematics, and their interest in money matters, as well as on the mother's level of education. Formal financial education was effectuated in our study by involving children in the Money Learning project (MOLE) of the Museum of Saving in Turin, and we showed it increased their level of FL. However, and in line with findings in [Kalwij et al. \(2019\)](#), this increase was mainly due to increases in the likelihood of correctly answering FL questions that are related to topics that were explicitly addressed in the formal financial education program offered by the museum.

The program effects we measured are short-term effects. Recent studies have investigated the long(er)-term effectiveness of school FL courses and some raised serious concerns about it (cf. [Mandell and Schmid Klein 2009](#)). In addition, peoples' capacity and incentive to retain the information learned depend on their motivation that pushes them to be financially literate ([Mandell and Schmid Klein 2007](#)) and other framing elements such as, for instance, the

wording used to introduce them to the topic (Boggio et al., 2020). These are certainly pivotal issues which future research should address.

Furthermore, our findings provide only weak empirical support for the hypothesis that IFE reinforced the effect of the formal financial education treatment. A tentative conclusion is that the kind of informal education that seems to work is allowing children to have their own savings. Drawing from the literature on the role of auto-motivation in explaining high FL levels (Mandell and Schmid Klein 2007), such a reinforcement can be driven by raising children's interest in financial matters and motivation in learning. This could suggest the importance of parents contributing to the financial education of children; not by directly enlightening them on basic concepts of finance and economics, but indirectly by making these concepts more tangible when children face concrete situations in which they have to, for example, manage a budget. To boost parents' involvement, relatively low-cost interventions such as public information campaigns can be considered by policymakers. However, to address the issue of reinforcement of IFE in more depth, and given our findings are considered suggestive empirical evidence, more targeted field experimental evidence is required. In particular, we refer to field experimental evidence based not only on having randomly assigned formal financial education but also randomly assigned IFE. Maldonado et al. (2019) randomized involvement of parents in a FL homework, and such a setup could be used to, for instance, randomizing own savings, pocket money, and spending autonomy.

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Supplemental Material

Supplemental material for this article is available online.

Notes

1. We considered “don’t know” an incorrect answer. The rate of “don’t know” answers ranged from 2% to 21% in the pretest and from 2 to 14% in the posttest.
2. The coefficient on t not discussed in the main text can capture learning effects due to the repetition of the FL questions but other interpretations are possible, and caution is warranted when interpreting the time effects.
3. IFE’s standard deviation is 1.14 (Table 1): $1.14 \times 0.053 = 0.06$, which is 26% of the estimated treatment effect 0.228.

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