

Financial education and investment attitudes in high schools: evidence from a randomized experiment

Leonardo Becchetti^{a,*}, Stefano Caiazza^b and Decio Coviello^c

^a*Department of Economics and Institutions, University of Rome Tor Vergata, Rome 00133, Italy*

^b*Department of Business Government Philosophy Studies, University of Rome Tor Vergata, Rome 00133, Italy*

^c*Institute of Applied Economics, HEC Montreal, Montreal, QC, Canada*

We experimentally study the effect of financial education on investment attitudes in a large sample of high school students in Italy. Students in the treated classes were taught a course in finance and interviewed before and after the study, while controls were only interviewed. Our principal result is that the difference-in-difference estimates of the effect of the course are not statistically significant. However, the course in finance reduces the virtual demand for cash and increases the level of financial literacy and the propensity to read (and the capacity to understand) economic articles in both treated and control classes compared with pre-treatment baseline levels. A breakdown of the cognitive process, which is statistically significant for the classes treated, suggests that error and ignorance reduction is sizable and that the progress in financial literacy is stronger in subgroups which exhibit lower *ex ante* knowledge levels.

Keywords: financial education; financial literacy; demand for money balances; randomized experiment

JEL Classification: I22; E41; G10; G20

I. Introduction

Financial education is becoming an increasingly investigated dimension among the determinants of human capital formation and development, especially in the wake of the global financial crisis. This is because amid the turbulent financial environment of globally integrated economies, in which individuals are increasingly required to take financial decisions, the lack of a financial education may produce a number of negative effects on individual and aggregate

well-being. From an individual point of view, it may lead people to be over-indebted and to fall into debt traps, with serious consequences not only on their productivity and financial conditions but also on their health (Keese and Schmitz, 2010), thereby increasing the number of borrower bankruptcies at aggregate level and imposing a high burden on government assistance.¹ More generally, financial ignorance generates measurement biases (Almenberg and Gerdes, 2012) and increases the information asymmetry between the investor and the financial advisor, thereby

*Corresponding author. E-mail: Becchetti@economia.uniroma2.it

⁰ To provide an example on this point, Lusardi and Mitchell (2008) underline that baby boomers in the United States are approaching retirement with very low levels of financial wealth, thereby creating a potential factor which is likely to increase individual bankruptcies and the cost of social assistance in the future.

worsening the impact of potential conflicts of interest of the latter. Both factors have the effect of exacerbating the economic and social consequences of financial shocks and crises. These considerations emphasize the importance of research in financial education, which performs the important role of documenting a novel, original contribution of human capital to individual well-being, following the well-known contributions in the literature relating to its impact on individual earnings (returns to schooling),² growth (Sarkar, 2007), crime (Wolfe and Haveman, 2002), health (Lleras-Muney, 2005; Cutler and Lleras-Muney, 2008) and social capital (see, among others, Gibson, 2001; Dee, 2004; Milligan *et al.*, 2004).

According to the Organisation for Economic Co-operation and Development (OECD), financial education is the process by which financial consumers/investors improve their understanding of financial products and concepts and, through information, instruction and/or objective advice, develop the skills and confidence to become more aware of financial risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being (OECD, 2005).

Financial education may therefore be conceived as involving two main steps (both of which will be considered in our empirical analysis): the first, related to *financial literacy*, in which individuals learn concepts and understand the way financial systems and products function; and the second, one related to *financial empowerment*, in which what they have learned helps them to improve their decision-making processes.

Given that a fundamental part of our knowledge is developed at school, it is no wonder that recommendations by international institutions and financial education programs consider it crucial to begin cultivating financial literacy in the school years, even though most financial decisions are taken in adulthood.³ Financial education at a young age is also important because an increasing number of young people are becoming involved with debt and financial management issues with the accumulation of credit card debts, or because

they are required to repay student loans at the end of their university studies (Lusardi *et al.*, 2010).

The burgeoning interest in financial education since the financial crisis makes understanding whether *ad hoc* courses can significantly improve financial education in schools an urgent matter. Starting from a wider perspective, even though the field is relatively new, there have been several contributions which have looked at levels of financial literacy and education among adults (see, among others, Clancy *et al.*, 2001; Lusardi, 2004; and Lusardi and Mitchell, 2008) but very few papers which have attempted to evaluate the impact of financial education on the young. Among these, Boyce and Danes (1998) show that a minority of students who took part in the High School Financial Planning Program started to save or increased their savings, Mandell (2008) documents that Chicago students in ten classes slightly improved their financial literacy after the course, while Mandell (2005) finds no evidence of an increase in knowledge (but a higher propensity to save) in 17- to 19-year-old students who were taught financial education in high schools. Only a very few papers in this literature go beyond descriptive evidence. Among these, econometric findings from an *ex post* survey show that adults who participated in a financial education course at a young age have slightly higher saving rates (Bernheim *et al.*, 2001), while a pseudo-randomized, natural field experiment documents that 13- to 19-year-old students exhibit higher saving rates and modify their budgeting choices based on the information received during the course (Carlin and Robinson, 2010).

The goal of our research is to make an original contribution to this literature by implementing a randomized experiment (to our knowledge the first in this field) measuring the causal impact on financial literacy and virtual portfolio investment of a 16-hour course in finance held for a large sample of students in 36 Italian classes. The effect was evaluated with a questionnaire which was administered before and after the standardized course.

⁰ For a survey and results on returns to schooling in various countries, see, among others, Psacharopoulos and Patrinos (2004) and Card (1999).

⁰ According to the OECD, 'Financial education should start at school, for people to be educated as early as possible' (OECD, 2006). The importance of financial education has also been noted by the European Commission in the *White Paper on Financial Service Policy* in the period between 2005 and 2007 and the *Green Paper on Retail Financial Service in the Single Market* in 2007. The importance of financial education in the United States has been emphasized, among others, by the 2006 review 'Taking Ownership of the Future'. In the United Kingdom, after verifying the poor performances in primary and secondary schools, the Financial Services Authority (FSA) launched a national plan (*the National Strategy for Financial Capability*), while other projects (*Citizens Advice Frontline Training*, *On Your Own 2 Feet*, *Money Doctors*) focus on 11- to 19-year-old students and adults. In 2006, the *Consumer Financial Education? Body (CFEB)* was created with the goal of promoting financial education. In France, the 'Federation Bancaire Francaise' has organized courses of financial education in French schools, and in 2006 the *Institut pour l'Education Financière du Public* was created to coordinate state and private initiatives on financial education. In Germany, the 'SchülerBanking' project provides financial education to scholars in collaboration with the *Jugend und Bildung association*, which includes financial experts, members of labour and industrial unions and representatives of the Ministry of Education. Recently, a joint project has been instituted between the *Bundesbank* and the Ministry of Finance to create a network of institutions which will support financial lectures in schools. In Spain, the 'Educación y asesoramiento financiero' project, a private initiative with economic support from the *Ministerio de Educación, Política Social y Deporte*, provides financial education to families in order to help them to solve their financial problems.

Our approach is original in the literature, especially if we consider impact evaluations of financial education and the narrower subfield of impact studies of financial education in schools. The distinctive feature of the article is that (as typically occurs in randomized experiments) the construction of the treatment and control samples was devised *ex ante* (i.e. before the treatment), and not derived *ex post*, thereby controlling for all possible confounding factors and limiting the problems of endogeneity which typically affect those impact studies in which treatment occurs before empirical analysis, which are designed for and usually targeted at less-educated students. A typical example of endogeneity is well described by Jappelli and Padula (2011). With a simple two-period model in which financial education is a form of investment in human capital, the two authors show that lower inter-temporal discount rates generate both higher investment in financial education and higher savings, thereby creating a spurious positive correlation between the last two variables. In our article, we show that the difference-in-difference estimations of the impact of the course are not statistically significant. However, the course in finance reduces virtual demand for cash, and increases the level of financial literacy and the propensity to read (and the capacity to understand) economic articles in both treated and control classes compared to pre-treatment baseline levels. In this article, we also try to shed light on the ‘black box’ of cognitive processes by looking at transitions among the three states (ignorance, error and correctness) measured in our treatment. We also look at gender, motivation (the desire to go to university) and school performance splits and find the evidence of ‘learning convergence’, since the effect of the course is stronger in subgroups with lower *ex ante* financial literacy. The findings from our empirical analysis are intended to provide insights for policy advice as to the most effective use of resources invested in financial education, even though our short-run measurements of the effects of financial education would suggest prudence, given that other authors have shown that measures of intended behaviour are likely to dramatically overstate the actual effects of financial education (Choi *et al.*, 2004).

The article is divided into six sections (including Introduction and Conclusions included). In Section II, we outline our experimental design. In Sections III and IV, we describe the data and illustrate the descriptive results. In Section V, we present findings from the econometric model. In Section VI, we draw our conclusions.

II. The Experimental Design and the Information Available

The sample was composed of 944 students in 36 classes enrolled in the final year before graduation from high school. The school curricula were classical studies (*liceo classico*) and vocational training (*istituto professionale*⁴), and the schools were located between Rome and Milan. For the purpose of randomization, we divided the classes into two groups (see Table 1). In the first group (treatment with course, TC), we devised a 16-hour course⁵ on finance and ran a survey before and 4 months after the course. The course lasted approximately 3 months. In the second group (treatment without course, TWC), we ran only two surveys (before and after) at the same time intervals, and no course was taught. Each pair of treated and control classes belonged to a different school. In our analysis, we are aware of the fact that both treated and control groups were exposed to the survey twice within a limited amount of time. Both the treated and the control groups might, therefore, have learned how to answer the specific questions of the test, thereby obtaining higher scores without showing higher levels of financial literacy (Fig. 1). In this sense, as Fig. 1 suggests, the TC and TWC approaches can also be regarded as two different treatments (with and without course), and compared with the absence of any intervention, on the reasonable assumption that within a third framework of this kind, no progress is achieved by school students in financial education given the short time interval.

The course was taught by different teachers in different classes. However, so that it could be standardized across all the classes, the teachers used the same materials. The course consisted of (i) a set of slides; (ii) a short guide for the teacher which illustrated the guidelines to be followed in their lessons and (iii) a more detailed guide to the available materials specifically designed for the students.⁶ The teachers were carefully trained in the rules of the experiment. The questionnaires handed out before and after the treatment were identical and were answered by the students in the presence of the teachers.

Table 1. The sample

	Rome	Milan	Raw total
Treatment group	17	8	25
Control group	11		
Column total	28		36

⁴ The *Liceo Classico* has historically been considered the most prestigious type of high school in Italy. Its curriculum is mainly in the humanities (Latin, Greek, Italian and philosophy), but also includes mathematics, physics, chemistry and biology. The *Istituto Professionale* is a technical school in which the curriculum includes accounting and basic economic principles together with Italian, mathematics, and principles of law.

⁵ The details of the structure of the course are omitted for reasons of space, but are available upon request.

⁶ The remaining heterogeneity due to the influence of class-specific financial education teachers or school teachers (and/or the impact of the socioeconomic environment in which the school is located) will be controlled for in the econometric analysis with class dummies, or by clustering standard errors at class level according to the various specifications estimated (see Section V for details).

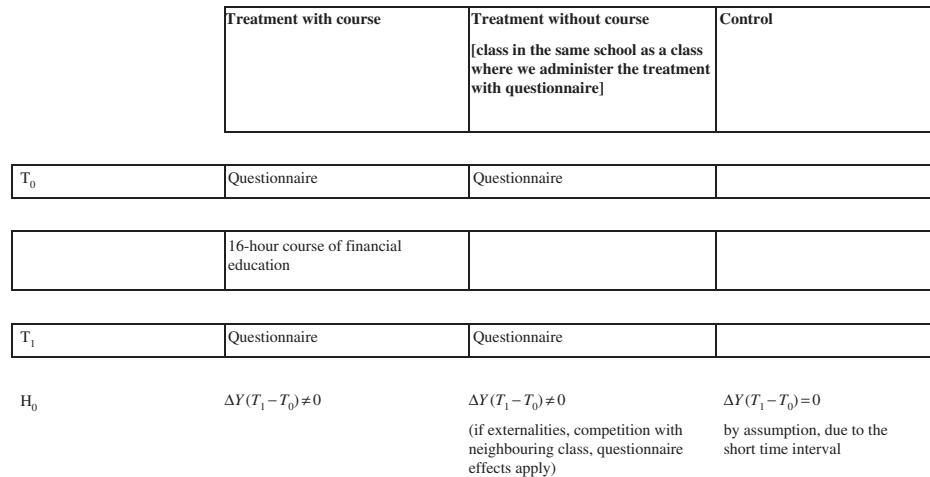


Fig. 1. The experiment design

The survey comprised (i) 27 multiple choice questions on financial literacy (each with four possible answers: a correct answer, two wrong answers and a ‘don’t know’ (DK) option); (ii) four questions on financial skills (comprehension of simple financial graphs and simple and compounded interest calculations); (iii) questions intended to measure the students’ levels of trust of institutions including banks and financial intermediaries; (iv) a question on a virtual portfolio investment (in cash, stocks and private and government bonds) of an inherited sum of 100 000 euros which the students were told had to be used in 4 years to buy a flat; (v) a question on the consumption/saving choice regarding the monthly allowance that the students received from their parents (if any) and (vi) socio-demographic characteristics, including questions on parental education and jobs, and relationships of the students and their families with banks and finance (i.e. whether the students had a current account, or their experience with online purchases, household mortgages and loans).

We also measured the students’ scholastic ability by looking at their final grades in middle school and at their previous high school year final grade in mathematics and Italian.⁷ Finally, we asked them whether they planned to go to university and, in the case of an affirmative response, whether they intended to choose Economics.⁸

III. Descriptive Statistics

Table 1 reports the composition of the sample by treatment and control classes, the latter being present only in Rome. Table 2 reports the summary statistics. Fifty percent of the

Table 2. Descriptive statistics of the main variables of interest (before the treatment)

Variable	Obs	Mean	SD	Min	Max
TotRight	1063	15.053	4.014	0	26
FatherClerk	1063	0.182	0.386	0	1
FatherWorker	1063	0.177	0.382	0	1
FatherPublicSector	1063	0.068	0.252	0	1
MotherHousewife	1063	0.302	0.459	0	1
MotherClerk	1063	0.202	0.402	0	1
FatherDegree	1063	0.073	0.261	0	1
MotherDegree	1063	0.089	0.285	0	1
Mortgage	888	0.339	0.473	0	1
Loan	775	0.317	0.466	0	1
MathGrade	891	6.59	1.111	3	10
ItalianGrade	901	6.648	0.862	2	10
IntermediateGrade	882	7.880	1.266	5	10
Male	1026	0.501	0.500	0	1
MathDebt	824	0.214	0.410	0	1
Volunteering	995	0.076	0.266	0	1
Humanities	1063	0.034	0.18	0	1
WouldBeUniversity	985	0.534	0.499	0	1
WouldBeEconomics	1063	0.180	0.385	0	1

Variable legend: see Appendix.

students turn out to be males, 53% declare that they want to attend university and around 18% intend to study economics. The fact that the minimum grade in mathematics is below sufficiency level is consistent with the fact that 21% had been given a ‘*debito*’ (a grade below pass) in this subject. Around one-third of student households borrow from a bank or have a mortgage. The mother or father has a university degree or higher in only 9% and 7% of cases, respectively.

Pre-treatment baseline characteristics (available upon request) also document that students already take several financial decisions: 30% of them have a current account,

⁰ These grades are on a scale of 0–10, with 6 being the pass level.

⁰ The questionnaire is in an Appendix available upon request.

Table 3. Tests for random assignment

	TWC classes	TC classes	H0: no significant difference (<i>p</i> -value)
MathGrade	6.496	6.616	0.2727
ItalianGrade	6.598	6.657	0.4881
IntermediateGrade	7.917	7.881	0.7766
Male	0.484	0.504	0.6416
Foreigner	0.048	0.056	0.8052
Volunteering	0.015	0.042	0.2984
Humanities	0.044	0.037	0.781
WouldBeUniversity	0.58	0.524	0.1972
WouldBeEconomics	0.145	0.187	0.2016
FatherDegree	0.109	0.067	0.057
MotherDegree	0.097	0.088	0.6989
FatherClerk	0.176	0.184	0.8094
FatherWorker	0.194	0.174	0.5386
FatherPublicSector	0.073	0.068	0.8204
MotherHousewife	0.309	0.301	0.834
MotherClerk	0.212	0.201	0.7461

Notes: TC classes, treatment with course classes; TWC classes, treatment without course classes. Variable legend: see Appendix.

32% have used a credit card at least once and 38% have made online purchases. Opinions on banks are divided: 49% have enough confidence in banks, only 10% have a high degree of confidence, 6% have none at all and the rest only a small amount.

Finally, in Table 3, we check whether randomization was successful. We report covariate balance differences in means and test statistics by treatment status before the students were exposed to the treatment. For all the observable characteristics, we find that the null hypothesis of no significant difference between treatment and control sample is not rejected.

IV. Nonparametric Tests of the Effects of the Course

In what follows, we describe our findings from noneconometric tests related to the impact of the treatment on financial literacy (see the next section), virtual investment and readership of economic journals (see section ‘Economic journals’).

Financial literacy

The students’ level of financial ability is reasonable, even though based on very simple questions: the simple (compounded) interest calculation is correct in 82 (76)% of cases. By contrast, pre-treatment financial literacy is in some cases extremely low. Only 20 (30)% of the students

correctly answer questions on the meaning of deposit interest rates and government bonds (of the European Central Bank), and only 30% acknowledge the existence of a positive risk-return relationship in financial assets. The correct meaning of inflation is understood by only 57%. Around one-quarter of the students believe that inflation is ‘*the change in the quantity of goods and services domestically produced*’, while a share between one-fifth and one-quarter confuses government deficit with government debt, and government bonds with public investments, and believes that the Bank of Italy is in charge of fiscal policy. In general, students tend to be more familiar with concepts related to those aspects of financial markets with which they are in contact (current accounts, credit cards, etc.) with those related to macro-economics or economic and financial institutions. These descriptive findings are omitted for the reasons of space and available upon request.

When looking at factors discriminating between *ex ante* levels of financial literacy, we find that the latter is higher for students attending classical rather than vocational high schools. This is a paradox, since economics is taught at vocational schools but not at classical schools (see footnote 5). This paradox is generally explained by the different family backgrounds of students attending *liceo classico*, since a larger proportion of them belong to high-income classes.⁹ Mathematics and language grades are, as expected, positively correlated with the number of correct answers *ex ante*, consistently with the cross-sectional country evidence provided by Jappelli (2009) on the positive relationship between financial literacy and mathematical ability measured with the Pisa-OECD grading system.

A preliminary idea of progress in financial literacy at a descriptive level is provided by the histograms showing the distribution of the number of correct answers per individual before and after the treatment, presented in Figs 2–4 for the overall Rome–Milan sample and for the Rome and Milan subsamples. The two main findings are that *ex ante* financial literacy is higher in Milan than in Rome (in terms of mean, median and mode), while progress in financial literacy is greater in Rome.

To test whether financial literacy improves significantly after the course, we define as A_{ijk} the three possible answer modalities ($A = R$ (right), $A = W$ (wrong) and $A = DK$ (don’t know)) that an individual i belonging to school class j ($j = 1, \dots, 39$) may give to the k ($k = 1, \dots, 27$) multiple choice questions in the survey, with $t = 0$ and $t = 1$ being, respectively, the pre- and post-treatment periods. We also define an *index of progress in financial literacy* (henceforth also ‘*PFL index*’) based on ΔA_{ijk} values, understood as the difference in the answers by the i th individual

⁹ The puzzle remains, however, since the effect persists when we control for income and parental education in the econometric estimates discussed in Section V (see Table 11). Hence the *Liceo Classico* effect must be related to a teaching quality factor, or to socioeconomic factors which are not captured by parental job and education variables.

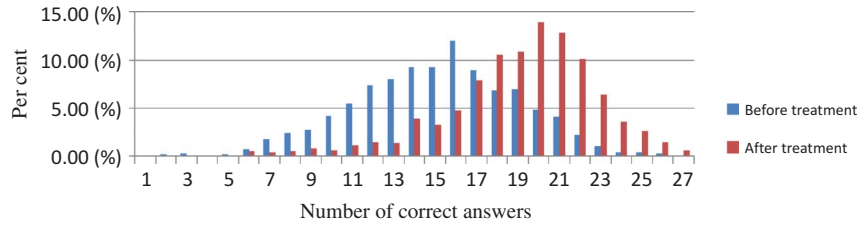


Fig. 2. Total number of correct answers in the 27 multiple choice questions on financial literacy – All sample

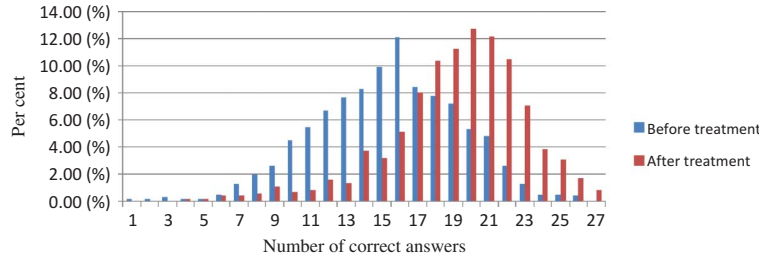


Fig. 3. Total number of correct answers in the 27 multiple choice questions on financial literacy – TC classes

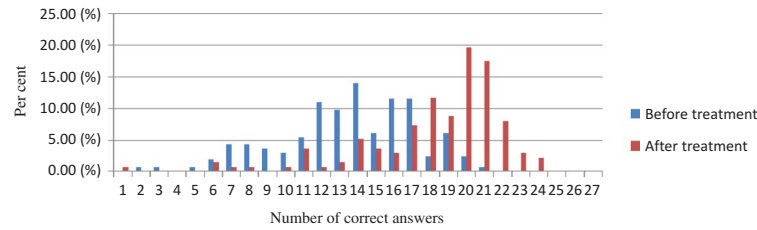


Fig. 4. Total number of correct answers in the 27 multiple choice questions on financial literacy – TWC classes

(belonging to the j th class) to the same question k from period 0 to period 1. The attribution of values to changes of state among error, ignorance and correctness is arbitrary. Our choice (the robustness of which is checked)¹⁰ is to rate (i) +1, a passage from a wrong or DK answer to a correct answer after the treatment; (ii) 0, a nonright (wrong or DK) response before and after the treatment and (iii) -1, the passage from a right answer to a wrong or DK answer after the treatment. More formally, this implies that

$$\Delta A_{ijk} = 1 | A_{1ijk} = R \text{ and } A_{0jk} = W \text{ or DK}$$

$$\Delta A_{ijk} = 0 | A_{1ijk} = W \text{ or DK and } A_{0jk} = W \text{ or DK}$$

$$\Delta A_{ijk} = 0 | A_{1ijk} = R \text{ and } A_{0jk} = R$$

$$\Delta A_{ijk} = -1 | A_{1ijk} = W \text{ or DK and } A_{0jk} = R$$

Finally, we define ΔA_k^{ALL} , ΔA_k^{TC} and ΔA_k^{TWC} as the average values of ΔA_{ijk} for the k th financial literacy question related to the overall (ALL), TC and TWC samples, respectively.

The generalized null hypothesis that we test for the ALL sample and the TC and TWC subsamples is $H_0: \Delta A_k^{\text{ALL}}, \Delta A_k^{\text{TC}}, \Delta A_k^{\text{TWC}} = 0$.

Table 4 synthesizes our results on parametric (t -test) and nonparametric (Wilcoxon rank sum) tests for the null hypothesis on each of the 27 questions for the ALL the TC and the TWC samples.

If we consider the ALL sample, we find that the index of progress in financial literacy is significant 25¹¹ and 19¹² times for the TC and TWC classes, respectively. The breakdown between Rome and Milan shows that

¹⁰ Opinions on the comparative value of wrong and DK answers are mixed. According to some, DK answers acknowledge ignorance, and are therefore better than giving wrong answers on the presumption that they are right. In order to see whether our findings were affected by small perturbations of the indicator, we devised a robustness check in which we set to missing transitions from right to right answers. The results were substantially unchanged, and are available upon request.

¹¹ The two questions where we do not register progress in the treatment group are those on the exchange rate and the role of the Bank of Italy. More specifically, in the case of exchange rates the majority of students choose 'the price you pay to buy foreign goods' instead of 'the price paid to exchange domestic with foreign currency', while in the case of the Bank of Italy, they prefer the answer 'the Bank of Italy decides the monetary policy in Europe', to 'the Bank of Italy is in charge of banking supervision in Italy'.

¹² The mistakes are on CONSOB (the Stock Exchange Regulatory Authority), banking foundations, the Bank of Italy, current accounts, mortgages, ATMs, risks and exchange rates.

Table 4. Progress in financial literacy (parametric and nonparametric tests on the 27 multiple choice questions)

	H0: IPFL = 0 [parametric test <i>t</i> -stat with <i>p</i> -value in parentheses]			H0: IPFL = 0 [nonparametric rank test-stat and <i>p</i> -value in parentheses]			Difference in the impact between TC and TWC classes
	All sample	TC classes	TWC classes	All sample	TC classes	TWC classes	
Current account	2.815 (0.005)	2.785 (0.006)	0.687 (0.493)	-2.904 (0.004)	-2.290 (0.022)	-1.710 (0.087)	0.478 (0.633)
Mortgage	1.889 (0.059)	1.924 (0.055)	0.301 (0.764)	-1.123 (0.261)	-0.619 (0.536)	-1.014 (0.311)	0.540 (0.589)
ATM	2.275 (0.023)	2.438 (0.015)	1.837 (0.042)	-2.445 (0.015)	-2.003 (0.045)	-1.465 (0.143)	1.030 (0.303)
Credit Card	15.570 (0.000)	13.847 (0.000)	7.152 (0.000)	-12.637 (0.000)	-10.845 (0.000)	-6.540 (0.000)	-1.131 (0.258)
Deposit Rate	13.701 (0.000)	11.320 (0.000)	8.689 (0.000)	-11.456 (0.000)	-9.335 (0.000)	-7.434 (0.000)	-2.915 (0.004)
Treasury Bills	16.171 (0.000)	13.754 (0.000)	9.081 (0.000)	-14.056 (0.000)	-12.143 (0.000)	-7.187 (0.000)	-1.553 (0.121)
Corporate Bonds	15.4795 (0.000)	13.900 (0.000)	6.709 (0.000)	-14.593 (0.000)	-13.065 (0.000)	-6.383 (0.000)	-1.287 (0.198)
Risk-Return	16.271 (0.000)	14.498 (0.000)	7.415 (0.000)	-14.722 (0.000)	-12.891 (0.000)	-7.061 (0.000)	-1.141 (0.254)
Shares	7.516 (0.000)	6.135 (0.000)	4.633 (0.000)	-5.856 (0.000)	-4.440 (0.000)	-4.148 (0.000)	-1.444 (0.149)
Share value	2.911 (0.004)	2.843 (0.005)	0.904 (0.368)	-2.819 (0.005)	-2.635 (0.008)	-0.970 (0.332)	0.057 (0.954)
Stock Exchange	7.776 (0.000)	7.537 (0.000)	2.374 (0.019)	-6.975 (0.000)	-6.433 (0.000)	-2.625 (0.009)	0.448 (0.655)
Risk	2.682 (0.007)	2.585 (0.010)	0.816 (0.416)	-2.805 (0.005)	-2.441 (0.015)	-1.291 (0.197)	0.239 (0.811)
Rating Companies	23.486 (0.000)	20.960 (0.000)	10.672 (0.000)	-19.853 (0.000)	-17.467 (0.000)	-9.696 (0.000)	-1.041 (0.298)
Deposit Insurance	8.496 (0.000)	6.103 (0.000)	7.659 (0.000)	-7.258 (0.000)	-4.970 (0.000)	-6.815 (0.000)	-3.794 (0.000)
Investment Risk	12.388 (0.000)	10.292 (0.000)	7.365 (0.000)	-10.312 (0.000)	-8.549 (0.000)	-6.014 (0.000)	-2.665 (0.008)
Inflation	9.938 (0.000)	8.603 (0.000)	5.011 (0.000)	-8.323 (0.000)	-6.983 (0.000)	-4.515 (0.000)	-2.046 (0.041)
Money	7.657 (0.000)	6.725 (0.000)	3.698 (0.000)	-6.194 (0.000)	-5.423 (0.000)	-2.880 (0.004)	-0.743 (0.458)
ECB	15.883 (0.000)	12.879 (0.000)	10.679 (0.000)	-13.383 (0.000)	-11.033 (0.000)	-8.028 (0.000)	-3.460 (0.001)
Monetary Policy	8.829 (0.000)	7.406 (0.000)	5.018 (0.000)	-8.144 (0.000)	-6.882 (0.000)	-4.464 (0.000)	-1.811 (0.070)
Exchange Rate	-11.256 (0.000)	-8.793 (0.000)	-8.071 (0.000)	9.441 (0.000)	7.173 (0.000)	7.468 (0.000)	4.785 (0.000)
Public Deficit	5.018 (0.000)	5.074 (0.000)	0.446 (0.656)	-4.875 (0.000)	-4.713 (0.000)	-1.057 (0.291)	2.001 (0.045)
Public Debt	4.363 (0.000)	3.921 (0.000)	2.090 (0.039)	-2.709 (0.007)	-2.614 (0.009)	-0.800 (0.424)	0.456 (0.648)
Bank of Italy	-2.336 (0.020)	-1.693 (0.091)	-2.363 (0.020)	1.192 (0.233)	0.895 (0.371)	1.121 (0.262)	0.836 (0.403)
CONSOB	9.322 (0.000)	9.395 (0.000)	1.615 (0.109)	-8.336 (0.000)	-8.621 (0.000)	-0.738 (0.460)	2.874 (0.004)
FED	8.987 (0.000)	8.846 (0.000)	1.985 (0.049)	-7.722 (0.000)	-7.704 (0.000)	-1.563 (0.118)	2.692 (0.007)
Foundations	3.857 (0.000)	4.542 (0.000)	-1.823 (0.071)	-3.646 (0.000)	-4.298 (0.000)	0.871 (0.384)	3.198 (0.001)
Microfinance	7.949 (0.000)	7.382 (0.000)	2.918 (0.004)	-6.613 (0.000)	-6.500 (0.000)	-1.154 (0.249)	1.750 (0.080)

Notes: ^BNonparametric rank test (H₀: IPFL (TC classes) – IPFL (TWC classes) = 0).

Dependent variable: Index of Progress in Financial Literacy (PFL index) in which we rate: (i) +1, a passage from a wrong or DK answer to a right answer after the treatment; (ii) 0, a nonright (wrong or DK) response before and after the treatment and (iii) -1, a passage from a right answer to a wrong or DK answer after the treatment.

progress is much greater (in fact, twice as great!) in Rome than in Milan.¹³ This is partly justified by the fact that the *ex ante* number of correct answers was higher in Milan. Nonparametric results are slightly more severe for TWC classes, since they document progress on only 15 questions.

One somewhat surprising result is that financial literacy also progresses in control classes (TWC) and not just in treated classes (TC). This may be due to several factors. First, questionnaire learning cannot be ruled out. Second, there may have been spillovers among students from different classes. Third, spillovers may have been generated by the same teachers in neighbouring classes which competed with each other and wanted to perform well to avoid stigma. A fourth possibility is that spillovers were generated by the fact that the teachers of economics in the TWC classes and in the neighbouring TC classes may have been the same.

To test whether progress is also significant at class level, we calculate class average values for the index of progress in financial literacy for each of the 27 questions, and then average these values within each class. More formally, we calculate $\sum_i \Delta A_{ijk}$ and test the following null hypothesis: $H_0: \sum_j \sum_i \Delta A_{ijk} = 0$. The number of observations available for this test is given by the product of the number of multiple choice questions on financial literacy times the number of classes ($n \times k$ or 27×39). The results from this test show that the null is always rejected. The average value of the PFL index is 18.89 in Rome and 8.81 in Milan and is slightly larger in the treatment group than in the control group (Table 5).

By calculating the index for relevant subgroups, we can identify characteristics which increased the impact of our treatment on students. What emerges from this analysis (see Table 6) is a sort of ‘financial learning convergence’ since subgroups with lower *ex ante* numbers of correct answers progress more.¹⁴ More specifically, females learn significantly more than males, and students in the lower half of the distribution of mathematics, Italian and final middle school grades perform better than those in the upper half. Finally, progress is more significant for those who do not intend to attend university or study economics (and report *ex ante* a lower number of correct answers).

To analyse further what happens inside the ‘black box’ of progress in financial literacy, we create a (pre- to post-treatment) transition matrix for each of the 27 questions and compute average values of all cells across the same 27

Table 5. Parametric tests on class averages of the index of progress in financial literacy

Test type	Average difference (per cent)	p-Value
Tests on Distributions		
[One-sample t-test]		
Overall sample	17.093	(0.000)
Rome	18.467	(0.000)
Milan	11.766	(0.000)
TC classes	16.687	(0.000)
TWC classes	18.269	(0.000)
Rome – TC classes	18.572	(0.000)
Rome – TWC classes	18.260	(0.000)

Notes: TC classes, treatment with course classes; TWC classes, treatment without course classes. The value we calculated for the Index of Progress in Financial Literacy is $\sum_i \Delta A_{ijk}$ where A_{ijk} is the three possible answer modalities ($A = R$ (right), $A = W$ (wrong) and $A = DK$ (don’t know)) that an individual i belonging to school class j ($j = 1, \dots, 39$) may give to the k ($k = 1, \dots, 27$) multiple choice questions in the survey, with $t = 0$ and $t = 1$ being, respectively, the pre- and post-treatment periods. The IPFL index is built in the following way: (i) $\Delta A_{ijk} = 1$ if $A_{1ijk} = R$ and $A_{0ijk} = W$ or DK ; (ii) $\Delta A_{ijk} = 0$ if $A_{1ijk} = W$ or DK and $A_{0ijk} = W$ or DK ; (iii) $\Delta A_{ijk} = 0$ if $A_{1ijk} = R$ and $A_{0ijk} = R$ and (iv) $\Delta A_{ijk} = -1$ if $A_{1ijk} = W$ or DK and $A_{0ijk} = R$. The null hypothesis we test for the relevant subgroup is $H_0: \sum_j \sum_i \Delta A_{ijk} = 0$.

questions. In this way, we can calculate persistence and reduction in the three states of correctness, ignorance (DK) and error and transition from one state to another. The results are illustrated in Tables 7 and 8 and document that ‘persistence in correctness’ (*ex ante* and *ex post* right answers) accounts for around 85% of *ex ante* correct answers. Error reduction (transition from wrong to right out of total *ex ante* wrong questions) is around 52%, while ignorance reduction (transition from DK to right out of total *ex ante* DK questions) is around 57%.¹⁵ All transition averages across the 27 questions are significantly different from zero.

Virtual investment

From an economics point of view, one crucial issue is whether and how knowledge of financial concepts and instruments translates into behavioural changes (investment planning, portfolio allocation, etc.), at this age at least virtually. One of the directions from which we can investigate this is whether our treatment affects the virtual portfolio choices of the participants. To do so, we use the following question in our survey:

¹³ As a robustness check we built the index by considering as missing values situations in which the response was right both before and after the treatment. The results were substantially unchanged, and are available upon request.

¹⁴ The result obviously depends in part (but not completely) on the higher potential increase in correct answers for groups with lower *ex ante* financial literacy.

¹⁵ The idea that ignorance (DK answer) may be a better status than error seems to be confirmed by the fact that the transition to correctness is higher (and persistence in the same state is lower) in the first than in the second case, even though more than 10% of ignorance moves to error. Consider, however, that the difference between average error reduction and average ignorance reduction across the 27 questions is not statistically significant.

Table 6. Relative performance for selected subgroups in the index of financial literacy

Variable	Tests on distributions (one-sample <i>t</i> -test)		Nonparametric tests (Wilcoxon Rank sum Mann–Whitney test)		
	Average	Average difference	<i>p</i> -Value	<i>z</i> -Statistic	<i>p</i> -Value
Gender					
Males	0.131		(0.000)		
Females	0.166		(0.000)		
Males versus Females		0.035	(0.000)	5.093	(0.000)
Last year final Mathematics grade					
≤6	0.152		(0.000)		
>6	0.148		(0.000)		
Low versus high grade		0.004	(0.504)	0.841	(0.4)
Last year final Italian grade					
≤6	0.158		(0.000)		
>6	0.143		(0.000)		
Low vs high grade		0.015	(0.035)	2.189	(0.029)
Final middle school grade					
≤6	0.169		(0.000)		
>6	0.142		(0.000)		
Low versus high grade		0.027	(0.001)	3.554	(0.000)
Want to attend university					
Yes	0.140		(0.000)		
No	0.167		(0.000)		
Yes versus No		0.027	(0.000)	4.034	(0.000)
Want to study Economics					
Yes	0.130		(0.000)		
No	0.154		(0.000)		
Yes versus No		0.024	(0.008)	2.952	(0.003)

Notes: The value we calculated for the Index of Progress in Financial Literacy is $\sum_i \Delta A_{ijk}$, where A_{ijk} is the three possible answer modalities ($A = R$ (right), $A = W$ (wrong) and $A = DK$ (don't know)) that an individual i belonging to school class j ($j = 1, \dots, 39$) may give to the k ($k = 1, \dots, 27$) multiple choice questions in the survey, with $t = 0$ and $t = 1$ being, respectively, the pre- and post-treatment periods. The IPFL index is built in the following way: (i) $\Delta A_{ijk} = 1 | A_{1ijk} = R$ and $A_{0jk} = W$ or DK ; (ii) $\Delta A_{ijk} = 0 | A_{1ijk} = W$ or DK and $A_{0jk} = W$ or DK ; (iii) $\Delta A_{ijk} = 0 | A_{1ijk} = R$ and $A_{0jk} = R$ and (iv) $\Delta A_{ijk} = -1 | A_{1ijk} = W$ or DK and $A_{0jk} = R$. The null hypothesis we test for the relevant subgroup is $H_0: \sum_j \sum_i \Delta A_{ijk} = 0$.

Table 7. Transition matrix of changes in financial literacy

	Right	Wrong	Don't know
Right	Correctness persistence	Correctness reduction	Loss of knowledge
Wrong	Error reduction	Error persistence	Error to ignorance
Don't Know	Ignorance reduction	Ignorance to error	Ignorance persistence

You inherit 100 000 euros with which you plan to buy a flat in 4 years. How do you invest the money?

The respondents were required to answer by providing investment shares in current accounts, government bonds, corporate bonds and stocks. Descriptive evidence on average responses to the questions shows that after the course, the share invested in cash decreased from around 65% to 60%, with the 5% points being redistributed over the other three assets (around 2% more on government bonds and 1% more on stocks and shares) (see Fig. 5).

Table 8. Transition matrix of changes in financial literacy

	ALL sample	TWC classes	TC classes
Right to right/total right <i>ex ante</i>	84.01	86.18	82.72
Right to wrong/total right <i>ex ante</i>	14.03	11.32	15.67
Right to DK/total right <i>ex ante</i>	1.96	2.49	1.63
Wrong to right/total wrong <i>ex ante</i>	50.37	47.87	51.8
Wrong to wrong/total wrong <i>ex ante</i>	47.72	49.52	46.57
Wrong to Do not know/total wrong <i>ex ante</i>	1.9	2.64	1.63
DK to right/total DK <i>ex ante</i>	55.33	54.33	54.82
Don't know to wrong/total DK <i>ex ante</i>	12.43	11.61	16.61
DK to DK/total DK <i>ex ante</i>	32.24	34.33	29.93

Notes: Percentage values of the transition matrix for each of the 27 multiple choice questions averaged for individuals and relevant group (ALL sample, TWC classes and TC classes). All values are significantly different from zero at 1%.

Parametric and nonparametric tests document that the reduction in the demand for money is significant in the TC, while in the TWC it is not (Table 9). This last finding marks

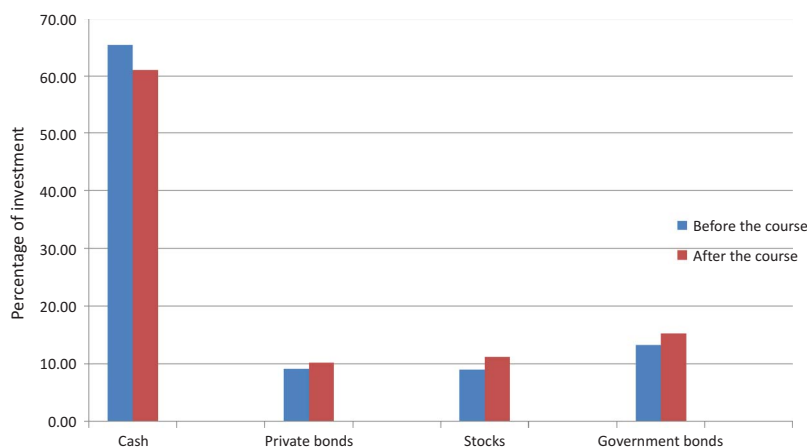


Fig. 5. Share invested in cash, government and corporate bonds and stocks before and after the treatment in TC classes

Table 9. Effect of the treatment on the propensity to invest in cash – Rome–Milan database – parametric tests

Test type	Parametric test (<i>t</i> -test)		Nonparametric rank sum test	
	<i>p</i> -Value		<i>p</i> -Value	
All sample	−4.506	(0.000)	2.890	(0.004)
Treatment group	−4.935	(0.000)	2.866	(0.004)
Control group	−1.041	(0.509)	0.550	(0.582)

Notes: Shares of money held in current account when individuals interviewed answer the following question: *You inherit 100 000 euros with which you plan to buy a flat in 4 years. How do you invest the money? (Please indicate shares invested in the four available options: current account, government bonds, corporate bonds and shares).*

an important difference between progress in financial literacy and the results on virtual investment choices: the former also occurs in the treatment without a course, while this is not the case for the latter. The course in financial education therefore affects the propensity to hold cash, but in this case there are no externalities in the neighbouring TWC classes.

As we well know, the optimal share of a portfolio to be invested in different assets remains a subjective issue, because it should be the outcome of a maximization process depending on the degree of risk aversion of the individuals, and on expectations of returns and the variance–covariance matrix of assets in the investors' portfolios. What we can observe, however, is that the

ex post average share of money held in the current account remains high (around 60%), and the overall profile of the investor cannot be regarded as particularly risky (around 15% in government bonds and 10% in stocks). Furthermore, if we inspect the distribution of the share held in cash before and after the course in TC classes, we find that the share of extremely prudent individuals (share of cash above 80%) falls by 4% points, while the share of very aggressive individuals (share of cash below 20%) does not rise in the same way (from 12.33% to 13.06%) and that the share of those who invest less than 2% in cash falls from 5% to 3.8%. The fall in the demand for money balances produced by the course is therefore obtained by reducing extreme prudence and in spite of a reduction in extremely aggressive investment attitudes.¹⁶

Finally, we look at the impact of the course on financial literacy on the reading of economic and financial articles in newspapers and magazines (Table 10). The question on the perceived improvement in understanding economic and financial articles was the following: ‘*Do you read economic articles in newspapers?*’ The four possible answers were (i) *no*; (ii) *yes, but I do not understand anything*; (iii) *yes, but I understand only some of them* or (iv) *yes, and I understand them fully*.

We find that the share of students who read news of this kind increased significantly after the course in both the treatment and the control groups (around 34% and 21%, respectively), and that the share of students who read and understood (choice (iii) or (iv)) increased by around 24% in both the groups.

¹⁶ We also tested the effect of the course on the share of students who saved money out of funds received monthly from their parents. The increase in the share of those who saved was 1%. Unfortunately, we do not have information on the share saved. Consider, however, that, differently from the virtual investment question, in the case of their monthly allowance, students received only a very small amount of money, which was explicitly intended to satisfy their expenditure needs, and therefore they may have reasonably believed that savings attitudes must be delegated to parents. Furthermore, it is possible that in several cases parents also saved money for their children over and above their monthly allowance.

Table 10. Parametric and nonparametric test on the readership of economic and financial articles in journals

Test type	Average difference (from t_1 to t_0)	z-Statistic	p-Value
Tests on distributions (one-sample <i>t</i> -test)			
Change in readership			
ALL sample	0.165		[0.000]
TWC classes	0.256		[0.000]
TC classes	0.209		[0.000]
TC versus TWC	0.046		[0.337]
Nonparametric tests (Wilcoxon Rank-sum Mann–Whitney test)			
Change in readership			
ALL sample		−6.782	[0.000]
TWC classes		−5.06	[0.000]
TC classes		−8.057	[0.000]
Tests on distributions (One-sample <i>t</i> -test)			
Change in readership and understanding			
ALL sample	0.130		(0.000)
TWC classes	0.226		(0.000)
TC classes	0.165		(0.000)
TC versus TWC	−0.061		(0.191)
Nonparametric tests (Wilcoxon Rank-Sum Mann–Whitney test)			
Change in readership and understanding			
ALL sample		−5.220	(0.000)
TWC classes		−4.237	(0.000)
TC classes		−6.385	(0.000)

Notes: Change in readership: dummy which takes value of 1 if respondents chose item (ii), (iii) or (iv) and 0 otherwise for the question which follows: ‘Do you read economic articles in newspapers?’ The four possible answers are: (i) no; (ii) yes, but I do not understand anything; (iii) yes, but I understand only some of them or (iv) yes, and I understand them fully. Change in readership and understanding: dummy which takes value of 1 if respondents chose item (iii) or (iv).

V. Econometric Model and Results

To further investigate the causal impact of the course in finance, we specify an empirical model in this section which allows a reduction in the sampling variability left after the randomization. We include both students’ observable characteristics and class fixed effects in the model. The empirical model also allows us to evaluate the impact of concurring factors and, more specifically, we can disentangle the Milan effect from the TWC class effect (remember that in the tests on the index of progress in financial literacy, we documented that the Milan classes had lower increases in performance (see Table 5), and therefore TWC classes may have performed well not only due to externalities but also because of the Rome effect).

In order to check if the treatment is significant, net of the impact of a series of standard socio-demographic controls and variables measuring motivations (intention to go to university and to study economics) and skills (mathematics, Italian and middle school grades), we estimated the following model:

$$\text{Totright}_i = \alpha_0 + \alpha_l \text{TreatTCpost}_i + \sum_l \alpha_l X_{li} + \varepsilon_i \quad (1a)$$

where the dependent variable $\text{Totright}_i = \sum_k A(R)_{ijk}$ (where $A(R)_{ijk}$ stands for $A_{ijk} = R$), that is, the total number of right answers given by the i th individual and TreatTCpost_i is a dummy variable which takes the value of one under the following two conditions: (i) post-treatment period and (ii) the individual is part of the treatment group. In this estimation and in order to evaluate the effect of the TC treatment separately, *ex post* observations of students in TWC classes were excluded from the sample.

A second test was run to check whether the treatment without a course was significant. In this case, we estimated the following specification:

$$\text{Totright}_i = \alpha_0 + \alpha_l \text{TreatWCpost}_i + \sum_l \alpha_l X_{li} + \varepsilon_i \quad (1b)$$

where TreatWCpost_i is a dummy variable which takes the value of one under the following two conditions: (i) post-treatment period and (ii) the individual is part of the control group. Following the same approach and in order to evaluate the effect of the TWC treatment separately, *ex post* observations of students in TC classes were ruled out of the sample.

Tables 11 and 12 report the results from several specifications testing the effect of the treatment with and without a course. The selected specifications vary according to the use of a restricted and enlarged set of controls (omission/inclusion of parental job and education dummies) and the introduction or nonintroduction of class fixed effects. When class fixed effects are absent, standard errors are clustered at class level. Class fixed effects are intended to capture all class-specific influences which affect all students belonging to that class equally. These effects may include several unmeasured factors, such as (i) the specific ability of the financial education teacher teaching the course in that class; (ii) the ability of the class teacher who is present for the course and who is one of the students’ regular teachers; (iii) the class atmosphere created by the students and (iv) common local socio-demographic factors which are typical of the area in which the school is located.

Our econometric findings show that the effect of the treatment is positive and significant, and robust in the

Table 11. The determinants of financial literacy – treatment with course

	(1)	(2)	(3)	(4)
MathGrade	0.336* (0.182)	0.353* (0.190)	0.391*** (0.128)	0.394*** (0.128)
ItalianGrade	0.246 (0.165)	0.229 (0.149)	0.265 (0.162)	0.265 (0.163)
IntermediateGrade	0.422** (0.156)	0.407** (0.163)	0.257** (0.113)	0.250** (0.115)
Male	0.294 (0.385)	0.254 (0.364)	0.586** (0.266)	0.590** (0.270)
MathDebt	0.481 (0.461)	0.455 (0.458)	0.305 (0.332)	0.279 (0.333)
Volunteering	−0.507 (0.654)	−0.559 (0.644)	−1.017** (0.473)	−1.031** (0.477)
Humanities	2.323*** (0.627)	2.421*** (0.600)		
WouldBeUniversity	0.723* (0.400)	0.760* (0.416)	1.073*** (0.292)	1.116*** (0.295)
WouldBeEconomics	1.143** (0.420)	1.163*** (0.413)	0.38 (0.364)	0.42 (0.365)
TreatTWCPost	3.676*** (0.960)	3.685*** (0.945)	4.789*** (0.442)	4.825*** (0.442)
FatherClerk		0.331 (0.356)		0.195 (0.322)
FatherWorker		−0.085 (0.499)		0.22 (0.341)
FatherPublicSector		0.882 (0.537)		1.114** (0.463)
MotherHousewife		−0.382 (0.299)		−0.289 (0.295)
MotherClerk		0.840* (0.425)		0.459 (0.329)
FatherDegree		0.196 (0.464)		0.213 (0.487)
MotherDegree		−0.494 (0.537)		−0.31 (0.448)
BrothSistUniversity		0.0001 (0.001)		0.0001 (0.001)
HouseholdSize		−0.052 (0.220)		−0.042 (0.159)
ClassFixedEffects	NO	NO	YES	YES
Constant	6.450*** (1.487)	6.579*** (1.432)	10.056*** (1.445)	9.991*** (1.532)
Observations	750	748	750	748
R ²	0.219	0.236	0.418	0.427

Note: Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

various specifications. In terms of economic significance, the course on financial literacy accounts for around four more correct answers. Among the controls, we observe the positive and significant effect of the final grade in middle school (*IntermediateGrade*), the desire to go to university (*WouldBeUniversity*) and the affiliation with a *liceo classico* high school (*Humanities*) with almost two more correct answers. The desire to study economics (*WouldBeEconomics*) is significant only if we do not control for class fixed effects. Parental variables do not seem to matter much, with the exception of the mothers'

Table 12. The determinants of financial literacy – treatment without course

MathGrade	0.171 (0.154)	0.145 (0.160)	0.276** (0.112)	0.249** (0.112)
ItalianGrade	0.208 (0.169)	0.238 (0.168)	0.294** (0.139)	0.320** (0.140)
IntermediateGrade	0.518*** (0.136)	0.506*** (0.127)	0.297*** (0.094)	0.303*** (0.095)
Male	0.007 (0.360)	0.096 (0.355)	0.540** (0.217)	0.650*** (0.221)
MathDebt	0.357 (0.348)	0.31 (0.344)	0.244 (0.278)	0.237 (0.278)
Volunteering	−0.078 (0.487)	−0.034 (0.520)	−0.506 (0.367)	−0.442 (0.368)
Humanities	1.861*** (0.560)	1.886*** (0.577)		
WouldBeUniversity	0.702** (0.316)	0.862** (0.326)	1.011*** (0.243)	1.138*** (0.244)
WouldBeEconomics	0.774** (0.337)	0.814** (0.315)	0.048 (0.289)	0.109 (0.290)
TreatTCPost	4.066*** (0.518)	4.071*** (0.510)	3.773*** (0.208)	3.792*** (0.208)
Milan	0.479 (0.636)	0.456 (0.599)		
FatherClerk		0.514 (0.355)		0.025 (0.262)
FatherWorker		0.51 (0.414)		0.592** (0.277)
FatherPublicSector		0.473 (0.407)		0.4 (0.393)
MotherHousewife		−0.243 (0.288)		−0.243 (0.245)
MotherClerk		0.811** (0.344)		0.525** (0.267)
FatherDegree		−0.655 (0.543)		−0.757* (0.398)
MotherDegree		−0.734 (0.482)		−0.395 (0.376)
BrothSistUniversity		0.0001 (0.001)		0.0001 (0.001)
HouseholdSize		0.06 (0.161)		0.011 (0.130)
ClassFixedEffects	NO	NO	YES	YES
Constant	7.683*** (1.413)	7.240*** (1.475)	10.226*** (1.166)	9.948*** (1.245)
Observations	1176	1172	1176	1172
R ²	0.3	0.318	0.441	0.452

Note: Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

employment. Male gender and mathematics and Italian grades become positively significant once we control for class fixed effects. Consider that, since we have a heterogeneous mix of classes – from technical and humanities schools – and due to the many class-specific factors mentioned above, class fixed effects are expected to be relevant, as indeed they are, since goodness of fit is 15% higher when we control for them. Consider, also, that when we estimate model (1b), we have the same significant findings as in model (1a) (Table 12). These results show that the progress in financial literacy in TWC classes

is robust when controlling for concurring factors and fixed class effects.

However, when we run a regression that pools together and compares TC and TWC classes before and after the treatment, we find that the difference-in-difference coefficient (the dummy variable representing TC classes after the treatment) is not statistically different from zero.

In order to see whether the course has heterogeneous effects within certain specific subgroups, we interact our *TreatTCpost* variable with dummies for foreigners, male gender, students with above average mathematics and Italian grades, and students who want to attend university or, more specifically, study economics, each of them in a separate specification (Table 13). Three interacted dummies are significant: the course is slightly less effective for males and for students who want to attend university and study economics, confirming the convergence learning phenomenon already observed in parametric and nonparametric tests in Table 6.

As a robustness check of these findings, we estimate the different specifications, ruling out the worst-performing classes (we can evaluate their performance by looking at class fixed effects), looking only at the Rome and Milan subsamples, considering a balanced sample in the case of Rome which includes only TC classes in schools where we also have TWC classes. In all cases, the effect of the course remains positive and significant, with a magnitude varying in the 4–7 range.¹⁷ In a robustness check, we look at the effect of the treatment on all deciles of the distribution of the dependent variable with quantile regressions. The effects move monotonically from 3.9 to around 4.9 going from the

10th to the 90th percentile. These findings again show that the impact of the course on financial literacy is stronger on those respondents who have lower levels of financial literacy *ex ante*. The results are omitted for reasons of space and are available upon request.

A different econometric approach adopted for a final robustness check considers as the dependent variable the index of progress in financial literacy for each of the 27 multiple choice questions, while controls are the same as in (1a), and observations are clustered at an individual level, since in this case we have multiple (27) observations for each student. More specifically we have

$$\Delta A_{ik} = \alpha_0 + \sum_l \alpha_l X_{li} + \varepsilon_{ik} \quad (2)$$

With this specification, the null of the absence of progress in financial literacy is rejected if the intercept is not significantly different from zero. Our findings on the reshaped sample show that this is never the case in any of the considered estimates (with or without class fixed effects, in the treatment with a course and in the treatment without a course, with restricted or extended sets of controls), with the exception of TWC classes with the extended set of controls and fixed effects (see Table 14).

Econometric findings on the virtual investment

Two other important findings from the econometric estimates are the self-perceived improvement in understanding economic news and the reduced propensity to hold money balances. These findings are illustrated in Tables 15–18.

Table 13. Differential impact of the course on different groups of students

	(1)	(2)	(3)	(5)	(6)	(7)
TreatPost	4.301*** (0.291)	3.738*** (0.272)	3.817*** (0.268)	3.806*** (0.212)	4.366*** (0.291)	4.076*** (0.232)
Treat × Male	-0.979** (0.392)					
Treat × top50%ItalianGrade		0.109 (0.352)				
Treat × top50%MathGrade			-0.051 (0.342)			
Treat × HighSchool				-0.39 (1.133)		
Treat × FutureUnivStudents					-1.096*** (0.391)	
Treat × FutureStudentsOfEconomics					-1.310*** (0.483)	
ClassFixedEffects	YES	YES	YES	YES	YES	YES
Constant	4.889** (1.967)	5.203** (2.033)	4.997** (2.001)	5.044** (1.971)	4.937** (1.965)	5.068** (1.965)
Observations	1172	1172	1172	1172	1172	1172

Note: Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$.

⁰ The results are omitted for reasons of space, and are available upon request.

Table 14. Progress in financial literacy synthesis of econometric findings from the reshaped sample

TWC classes						
Parental job and education	Not included	Not included	Not included	Included	Included	Included
Class fixed effects	No	No	No	No	No	No
Constant	0.405*** (0.059)	0.439*** (0.066)	0.298** (0.131)	0.414*** (0.082)	0.511*** (0.094)	0.243 (0.149)
Observations	12657	8289	4342	9181	6103	3078
R ²	0.004	0.005	0.009	0.01	0.013	0.023
TC classes						
Parental job and education	All sample	Treatment	Control	All Sample	Treatment	Control
Class fixed effects	Not included	Not included	Not included	Included	Included	Included
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.266*** (0.048)	0.502*** (0.069)	0.406*** (0.102)	0.336*** (0.072)	0.588*** (0.183)	0.443*** (0.125)
Observations	12631	8289	4342	9181	6103	3078
R ²	0.04	0.032	0.05	0.04	0.033	0.057

Note: Dependent variable: the index of progress in financial literacy for each of the 27 multiple choice questions, while controls are the same as in Equation 1a, and observations are clustered at an individual level.

*** $p < 0.01$, ** $p < 0.05$.

Table 15. The determinants of virtual demand for money

	(1)	(2)	(3)	(4)
MathGrade	0.478 (1.260)	0.41 (1.252)	1.018 (1.089)	0.846 (1.091)
ItalianGrade	-1.753 (1.426)	-1.429 (1.466)	-1.79 (1.361)	-1.303 (1.369)
IntermediateGrade	1.703* (0.919)	1.412 (0.920)	1.255 (0.896)	0.862 (0.901)
Male	-5.008* (2.685)	-4.732* (2.760)	-7.233*** (2.093)	-7.102*** (2.136)
MathDebt	1.647 (2.333)	1.145 (2.359)	2.093 (2.700)	1.727 (2.703)
Volunteering	-5.699 (4.482)	-5.614 (4.143)	-7.014** (3.430)	-7.871** (3.435)
Humanities	-1.293 (3.213)	-1.59 (3.347)		
WouldBeUniversity	-4.684 (2.995)	-4.21 (2.931)	-3.903* (2.351)	-3.435 (2.359)
WouldBeEconomics	-2.388 (3.718)	-2.196 (3.687)	-1.735 (2.680)	-1.452 (2.689)
TreatPost	-3.916** (1.667)	-3.697** (1.663)	-4.710** (1.968)	-4.621** (1.962)
Milan	-1.001 (2.401)	-0.358 (2.558)		
FatherClerk		4.983 (2.992)		5.649** (2.507)
FatherWorker		0.995 (3.566)		2.271 (2.651)
FatherPublicSector		2.834 (5.147)		4.959 (3.697)
MotherHousewife		-1.327 (3.398)		-4.111* (2.338)
MotherClerk		-0.268 (3.013)		-2.873 (2.537)
FatherDegree		-7.977**		-5.985

(continued)

Table 15. Continued

	(1)	(2)	(3)	(4)
MotherDegree		(3.093) 0.099		(3.723) −3.696
BrothSistUniversity		(4.865) −0.009		(3.484) −0.004
HouseholdSize		(0.005) 1.483		(0.005) 1.726
ClassFixedEffects	NO	(2.038) NO	YES	(1.240) YES
Constant	65.075*** (10.631)	60.722*** (12.385)	66.629*** (11.436)	63.260*** (12.068)
Observations	973	969	973	969
R ²	0.029	0.044	0.117	0.134

Notes: Dependent variable: share of the money held in current account indicated when answering the following question: *You inherit 100 000 euros with which you plan to buy a flat in 4 years. How do you invest the money?* (Shares of the money held in current account or invested in government bonds, corporate bonds and shares before and after the course in financial education).

Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 16. The determinants of virtual demand for money– share in cash below 20 percent

Variables	After the course (all sample)		Before the course (all sample)	
	(1)	(2)	(3)	(4)
MathGrade	−0.003 (0.010)	0.002 (0.014)	0.001 (0.010)	0.006 (0.009)
ItalianGrade	0.011 (0.011)	0.005 (0.012)	0.016 (0.011)	0.015 (0.010)
IntermediateGrade	−0.009 (0.006)	−0.014* (0.008)	−0.019** (0.008)	−0.019** (0.008)
Male	0.067*** (0.019)	0.078*** (0.026)	0.043** (0.019)	0.037 (0.023)
MathDebt	−0.036* (0.020)	−0.008 (0.019)	−0.039** (0.018)	−0.022 (0.021)
Volunteering	0.099** (0.043)	0.055 (0.049)	0.029 (0.027)	0.041 (0.037)
Humanities	−0.038 (0.026)		−0.008 (0.029)	
WouldBeUniversity	0.020 (0.027)	−0.011 (0.043)	0.019 (0.021)	0.002 (0.025)
WouldBeEconomics	−0.004 (0.021)	0.015 (0.031)	−0.002 (0.020)	0.011 (0.027)
Milan	0.031 (0.025)		0.037* (0.021)	
Treatment	−0.077** (0.035)	−0.081** (0.032)	−0.050 (0.035)	−0.050 (0.032)
Foreigner		0.095 (0.059)		0.050 (0.044)
Observations	642	422	651	467

Notes: Dependent variable: (0/1) dummy taking value of one if the share of the money held in current account indicated when answering to the following question: *You inherit 100 000 euros with which you plan to buy a flat in 4 years. How do you invest the money?* (Shares of the money held in current account or invested in government bond, corporate bonds and shares before and after the course of financial education) – is below 20%.

Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 17. The determinants of virtual demand for money – share in cash above 80 percent

Variables	(1)	(2)	(3)	(4)
MathGrade	0.014 (0.021)	0.022 (0.027)	0.013 (0.018)	0.008 (0.020)
ItalianGrade	-0.040* (0.021)	-0.046* (0.025)	-0.036 (0.026)	-0.027 (0.029)
IntermediateGrade	-0.018 (0.019)	-0.011 (0.018)	-0.009 (0.016)	-0.028 (0.019)
Male	-0.090** (0.044)	-0.043 (0.058)	-0.044 (0.059)	-0.026 (0.078)
MathDebt	0.025 (0.022)	0.026 (0.037)	0.012 (0.009)	0.012* (0.007)
Volunteering	-0.051 (0.069)	-0.022 (0.098)	0.055 (0.084)	0.071 (0.106)
Humanities	-0.152** (0.069)		-0.280*** (0.096)	
WouldBeUniversity	-0.077 (0.049)	-0.036 (0.063)	-0.071 (0.066)	-0.026 (0.080)
WouldBeEconomics	-0.058 (0.070)	-0.195*** (0.065)	-0.092 (0.064)	-0.115 (0.075)
Milan	-0.120** (0.048)		-0.189** (0.076)	
Treatment	-0.060 (0.061)	-0.065 (0.065)	-0.036 (0.116)	-0.028 (0.121)
Foreigner		0.002 (0.080)		0.009 (0.064)
Observations	642	422	651	467

Notes: Dependent variable: (0/1) dummy taking value of one if the share of the money held in current account indicated when answering the following question: *You inherit 100 000 euros with which you plan to buy a flat in 4 years. How do you invest the money?* (Shares of the money held in current account or invested in government bond, corporate bonds and shares before and after the course of financial education) is above 80%.

Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In Tables 15–17, we estimate the following model:

$$\text{Investincash}_i = \alpha_0 + \alpha_1 \text{Treatpost}_i + \sum_l \alpha_l X_{li} + \varepsilon_i \quad (3)$$

where the dependent variable is the share of the virtual inherited sum which is invested in cash according to the question described in Section 4.1, and among the regressors, we include the dummy taking the value of 1 for TC observations in the post-course period and 0 otherwise. Observations from TWC classes are excluded from the sample in the second period, as when estimating Equation 1a. The results displayed in Table 15 show that the treatment dummy is always negative and significant, with a magnitude ranging from a minimum of 3.7% points to a maximum of over 4.7 points when we control for class fixed effects in the estimates with the extended set of controls which include parental job and education. Among other controls, we also document a remarkable gender effect (males invest up to 6% less in cash).

In order to test more directly whether the treatment makes the difference, we test whether the treatment

dummy is significant on the probability of investing less than 20% in cash net of the impact of standard controls. We perform the regression in the before-course and after-course samples, respectively. The treatment dummy (*treatment*) is not significant before the course, but it is after (Table 16).

We want to check further that the reduced propensity to keep money balance does not generate excessively risky attitudes. We therefore consider as a dependent variable with a 0/1 dummy taking value of 1 if the amount of money held in cash is above 80% (an extremely prudent attitude which may be regarded as nonoptimizing under reasonable parameters of risk aversion and considering the 4-year investment horizon) and 0 otherwise. We find in this case that the course is not significant in any of the four different specifications (Table 17). These findings confirm that, beyond the effect on the mean investment in cash, we have a significant and strong reduction in extremely prudent attitudes without any increase in extremely risky investment strategies.

Finally, we look at the question on reading and understanding economic articles in newspapers (see end of Section IV). In this regard, we run a logit estimation:

$$\text{Readeconomics}_i = \alpha_0 + \alpha_1 \text{Treatpost}_i + \sum_1 \alpha_1 X_{1i} + \varepsilon_i \quad (4)$$

where the dependent variable takes the value of 1 if the student reads economic articles in newspapers and 0 otherwise, and the controls are the same as in (1). Our findings show that the course significantly affects readership by increasing the probability of reading economic articles in newspapers by 20–21%. The result is robust in the four different specifications, with and without the extended set of controls and class fixed effects. Readership is also affected positively by a ‘*debito*’ in Mathematics, good

Italian grades, having a mother with at least a university degree, and negatively by having a father who is a civil servant (Table 18).

Since the second answer to this question is responded to positively by those who read but do not understand economic articles at all, we create another variable which takes value of 1 if individuals give positive answers only to point (iii) or (iv); that is, a dummy for those who read and understand economic articles (at least in part). Again, we find that the course increases the share of those who read and understand economic articles by around 16–17% (Table 19).

Table 18. The determinants of the decision to read economic and financial articles on newspapers

	(1)	(2)	(3)	(4)
MathGrade	0.011 (0.023)	0.015 (0.025)	0.011 (0.018)	0.016 (0.018)
ItalianGrade	0.066*** (0.025)	0.061*** (0.023)	0.066*** (0.023)	0.061*** (0.023)
IntermediateGrade	-0.016 (0.015)	-0.015 (0.015)	-0.031** (0.015)	-0.030* (0.015)
Male	0.025 (0.039)	0.015 (0.040)	-0.017 (0.035)	-0.024 (0.036)
MathDebt	0.086** (0.037)	0.092** (0.040)	0.108** (0.043)	0.116*** (0.043)
Volunteering	-0.001 (0.073)	-0.012 (0.071)	-0.035 (0.059)	-0.052 (0.059)
Humanities	0.017 (0.039)	0.03 (0.040)		
WouldBeUniversity	0.049 (0.037)	0.033 (0.038)	0.056 (0.039)	0.038 (0.039)
WouldBeEconomics	0.074 (0.060)	0.071 (0.056)	0.107** (0.045)	0.104** (0.046)
TreatPost	0.208*** (0.040)	0.213*** (0.041)	0.209*** (0.032)	0.214*** (0.032)
Milan	-0.136** (0.067)	-0.141** (0.065)		
FatherClerk		-0.048 (0.038)		-0.079* (0.042)
FatherWorker		-0.072 (0.055)		-0.068 (0.045)
FatherPublicSector		-0.224*** (0.066)		-0.237*** (0.058)
MotherHousewife		0.044 (0.044)		0.024 (0.039)
MotherClerk		-0.07 (0.052)		-0.103** (0.043)
FatherDegree		0.004 (0.066)		0.015 (0.066)
MotherDegree		0.137** (0.062)		0.127** (0.058)
ClassFixedEffects	NO	NO	YES	YES
Observations	1158	1158	1153	1153

Notes: Probit estimate: coefficient measures the effect of a unit change in the regressors on the probability of reading economic articles in newspapers.

Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 19. The determinants of the decision to read (and ability to understand) economic and financial articles on newspapers

	(1)	(2)	(3)	(4)
MathGrade	0.006 (0.021)	0.009 (0.022)	0.002 (0.018)	0.006 (0.018)
ItalianGrade	0.072*** (0.024)	0.067*** (0.023)	0.079*** (0.022)	0.073*** (0.023)
IntermediateGrade	-0.012 (0.016)	-0.011 (0.016)	-0.033** (0.015)	-0.032** (0.015)
Male	0.028 (0.039)	0.02 (0.039)	-0.015 (0.035)	-0.019 (0.036)
MathDebt	0.081** (0.036)	0.085** (0.037)	0.100** (0.044)	0.106** (0.044)
Volunteering	0.017 (0.074)	0.011 (0.070)	-0.023 (0.059)	-0.034 (0.059)
Humanities	0.076* (0.041)	0.080* (0.043)		
WouldBeUniversity	0.06 (0.037)	0.046 (0.038)	0.070* (0.039)	0.054 (0.039)
WouldBeEconomics	0.065 (0.061)	0.061 (0.058)	0.090** (0.046)	0.088* (0.047)
TreatPost	0.166*** (0.036)	0.170*** (0.036)	0.163*** (0.033)	0.169*** (0.033)
Milan	-0.091 (0.067)	-0.09 (0.065)		
FatherClerk		-0.029 (0.042)		-0.065 (0.042)
FatherWorker		-0.073 (0.060)		-0.063 (0.045)
FatherPublicSector		-0.198*** (0.061)		-0.204*** (0.057)
MotherHousewife		0.076* (0.045)		0.058 (0.039)
MotherClerk		-0.076 (0.058)		-0.112*** (0.042)
FatherDegree		-0.022 (0.070)		-0.019 (0.066)
MotherDegree		0.152** (0.061)		0.140** (0.059)
ClassFixedEffects	NO	NO	YES	YES
Observations	1158	1158	1153	1153

Note: Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

VI. Conclusions

Financial education is a partially unexplored but increasingly investigated dimension of the determinants of human capital formation and development. It is becoming more and more important since the global financial crisis and, more generally, in a turbulent financial environment in which individuals are ever more frequently asked to take financial decisions which crucially affect their present and future wealth.

As we emphasize in our introduction, financial institutions stress the importance of starting to teach introductory notions of financial education in school. This article has provided an original contribution to the analysis of the impact of financial education in this period by means of a randomized experiment.

Our findings document that a 16-hour course of financial education significantly affects students' financial literacy, their propensity to read (and capacity to understand) economic articles in newspapers and their virtual investment attitudes. On the first point, we find significant improvements when we consider both individual student and class average observations. We also document that the effect is significant not only in TC but also in TWC classes; that is, we also register significant progress in financial literacy in classes in which students fill in the two (*ex ante* and *ex post*) questionnaires within the same time interval but do not attend the course. However, we find that the difference-in-difference estimates of the effects of the course are not statistically different from zero. Pinning down the determinants of this phenomenon falls outside the immediate scope of this article. However,

our candidate explanations are learning through the test and communication externalities generated by students or teachers working in both the classes or competition among classes in the same school.

Finally, from our analysis of the learning process of different subgroups of students, we find a greater level of progress in terms of financial literacy within those categories which have *ex ante* poorer notions of financial literacy (females, students with poorer mathematics and Italian grades, and students who do not intend to attend university or study economics). This implies that, as far as financial literacy is concerned, courses in financial education are more effective where the *ex ante* background of notions is poorer.

While progress in financial literacy also occurs with the repetition of questionnaires without the course, the effect on the change in virtual investment attitudes is confined to TC classes. This finding indicates that changes in investment attitudes may not be obtained from emulation, questionnaire learning effects or via externalities, but only from the course. More specifically, we find that after the course, students reduce the share of money held in cash in a virtual investment of 100 000 euros over a 4-year horizon by around 4%. Given that it may be not clear whether or not, this is a desirable result, depending on individual risk aversion and the financial and economic scenario postulated by the investor, we look at the effect of the course on the tails of the distribution of the amount invested in cash. In this respect, we find that the result is highly asymmetric. The course reduces extremely risky attitudes (less than 20% in cash) without significantly increasing extremely prudent attitudes (more than 80% in cash).

Our findings pose additional relevant research questions relative to the eventual decay or persistence of the observed effects. Is progress in financial literacy permanent, or does it fade over time? Will the reduced propensity to hold money balances in virtual portfolio choices be confirmed by actual portfolio choices made by these students in the future? Are the virtual responses obtained after the finance course proxies for actual responses and modification of financial decisions? We hope that our findings may represent a reference for further studies in this area which will extend results in the above-mentioned directions in the future.

Acknowledgements

We thank Gianpaolo Barbetta, Stefano Cima, Iftekhar Hasan, Tullio Jappelli, James Lothian, Chiara Monticone, Mario Padula, Paul Wachtel and all participants at the XIXth Tor Vergata Financial Conference for their useful comments and suggestions. Managerial support from Marco Bracaglia and the Osservatorio sul Credito, institutional support from the Ministry of Education and financial

support from Unicredit, Fondazione Cariplo, Fondazione Carige and JP Morgan are gratefully acknowledged.

References

- Almenberg, J. and Gerdes, C. (2012) Exponential growth bias and financial literacy, *Applied Economic Letters*, **19**, 1693–6.
- Bernheim, B. D., Garrett, D. M. and Maki, D. M. (2001) Education and saving: the long-term effects of high school financial curriculum mandates, *Journal of Public Economics*, **80**, 435–65.
- Boyce, L. and Danes, S. (1998) *Evaluation of the NEFE High School Financial Planning Program*, National Endowment for Financial Education (NEFE), Engelwood, CO.
- Card, D. (1999) The causal effect of education on earnings, in *Handbook of Labour Economics*, Vol. 3 (Eds) O. Ashenfelter and D. Card, Elsevier, North Holland, pp. 1801–63.
- Carlin, B. and Robinson, D. T. (2010) What does financial literacy training teach us? NBER Working Papers, 16271.
- Choi, J. J., Laibson, D., Madrian, B. C., *et al.* (2004) Saving for retirement on the path of least resistance, in *Behavioral Public Finance: Toward a New Agenda* (Eds) E. J. McCaffrey and J. Slemrod, Russell Sage Foundation, New York, pp. 304–51.
- Clancy, M., Grinstein-Weiss, M. and Schreiner, M. (2001) Financial education and savings outcomes in individual development accounts, *Center for Social Development, Working Paper*, 1–12.
- Cutler, D. and Lleras-Muney, A. (2008) Education and health: evaluating theories and evidence, in *Making Americans Healthier: Social and Economic Policy as Health Policy* (Eds) J. House, R. Schoeni, G. Kaplan, *et al.*, Russell Sage Foundation, New York.
- Dee, T. S. (2004) Are there civic returns to reduction ?, *Journal of Public Economics*, **88**, 1697–720.
- Gibson, J. (2001) Unobservable family effects and the apparent external benefits of education, *Economics of Education Review*, **20**, 225–33.
- Jappelli, T. (2009) Economic literacy: an international comparison, *Economic Journal*, **119**, F429–51.
- Jappelli, T. and Padula, M. (2011) Investment in financial literacy and savings decisions, CEPR Discussion Papers, 8220.
- Keese, M. and Schmitz, H. (2010) Broke, ill, and obese: the effect of household debts on health, SOEP Papers, No. 350.
- Lleras-Muney, A. (2005) The relationship between education and adult mortality in the US, *Review of Economic Studies*, **72**, 189–221.
- Lusardi, A. (2004) Saving and the effectiveness of financial education, in *Pension Design and Structure: New Lessons from Behavioral Finance* (Eds) O. Mitchell and S. Utkus, Oxford University Press, Oxford, pp. 157–84.
- Lusardi, A. and Mitchell, O. S. (2008) Planning and financial literacy: how do women fare?, *American Economic Review*, **98**, 413–17.
- Lusardi, A., Mitchell, O. S. and Curto, V. (2010) Financial literacy among the young, *The Journal of Consumer Affairs*, **44**, 358–80.
- Mandell, L. (2005) The financial literacy of young African-American adults. Report prepared for Operation Hope.
- Mandell, L. (2008) High school financial literacy, in *Overcoming the Savings Slump. How to Increase the Effectiveness of*

- Financial Education and Savings Programs* (Ed.) A. Lusardi, University of Chicago Press Chicago, IL, pp. 257–79.
- Milligan, K., Moretti, E. and Oreopoulos, P. (2004) Does education improve citizenship? Evidence from the US and the UK, *Journal of Public Economics*, **88**, 1667–95.
- OECD (2005) Recommendation on principles and good practices for financial education and awareness.
- OECD (2006) The importance of financial education. OECD Policy Brief.
- Psacharopoulos, G. and Patrinos, H. A. (2004) Returns to investment in education: a further update, *Education Economics*, **12**, 111–34.
- Sarkar, D. (2007) *The role of human capital in economic growth revisited*, *Applied Economics Letters*, **14**, 419–23.
- Wolfe, B. L. and Haveman, R. H. (2002) Social and non-market benefits from education in an advanced economy, *Conference Series, Federal Reserve Bank of Boston*, 97–142.

Appendix

Table A1. Variables definitions

Variable	
TotRight	Total number of correct answers
FatherClerk	Dummy taking value of one if the father is an employee in the private sector
FatherWorker	Dummy taking value of one if the father is a manual worker
FatherPublicSector	Dummy taking value of one if the father is an employee in the public sector
MotherHousewife	Dummy taking value of one if the mother is a housewife
MotherClerk	Dummy taking value of one if the mother is an employee
FatherDegree	Dummy taking value of one if the father has a university degree
MotherDegree	Dummy taking value of one if the mother has a university degree
Foreign	Dummy taking value of one if the student does not have Italian citizenship
BrothSistUniversity	Number of brothers or sisters attending University
HouseholdSize	Number of people living in the household
Mortgage	Dummy taking value of one if the student's family has a mortgage
Loan	Dummy taking value of one if the student's family is a borrower
MathGrade	Final grade in mathematics in the previous school year
ItalianGrade	Final grade in Italian in the previous school year
IntermediateGrade	Final grade at middle school
Male	Dummy taking value of one if the student is male.
MathDebt	Dummy taking value of one if the student had 'debito' ('insufficient' grade) in mathematics in the previous year
Volunteering	Dummy taking value of one if the student takes part in volunteering activities
Humanities	Dummy taking value of one if the student is at <i>liceo classico</i> *\high school
WouldBeUniversity	Dummy taking value of one if the student intends to go to University
WouldBeEconomics	Dummy taking value of one if the student intends to study economics at university
TotRightPost	Total number of correct answers after the treatment
Milan	Dummy taking value of one if the student attends school in Milan