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# The effects of financial literacy training: Evidence from a field experiment with German high-school children\*

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## Abstract

We report the results of a field experiment evaluating the impact of financial literacy training on teenagers of between 14 and 16 years of age in lower stream high schools in Germany. Before the training, teenagers in treatment and control groups show little interest in financial matters and low levels of self-assessed knowledge. After the training, teenagers exhibit a significant increase in both their interest in financial matters and their self-assessed knowledge. Their objective knowledge also increases in some dimensions, e.g. their ability to assess risks correctly. We find that after the training, the prevalence of impulse purchases decreases, so teenagers can be steered towards being more sovereign consumers. We also find an increase in intended savings in a hypothetical task. Finally, our data show that already at these young ages, there are strong gender differences in all dimensions of financial matters: financial knowledge, motivation, and behavior.

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# 1 Introduction

Insufficient savings and bad financial decision-making are major concerns in the face of increasingly complex financial markets and larger reliance on individual financial provision for old age. These concerns are particularly important given recent evidence showing that adult consumers often lack a solid financial knowledge (e.g., Lusardi and Mitchell 2007a, b). Hence, policies aimed at increasing financial literacy are being proposed. Yet there is little evidence whether and how financial literacy increases through training, and little causal evidence on the link between financial literacy and behavior.

We assess the impact of financial training on financial literacy and financial decision-making among high-school children. Recent studies show that deficiencies in financial literacy are particularly concentrated among population groups of low socio-economic status (e.g., Lusardi and Mitchell, 2008, Almenberg and Dreber, 2011, Bucher-Koenen et al., 2012). Our field experiment is conducted in lower stream German schools, thus targeting teenagers from lower wealth families and lower socio-economic status. This group presents the weakest financial knowledge and generally exhibits low numeracy and low cognitive ability, which may hamper the acquisition of financial literacy most.

Our paper is among the first to assess the impact of a financial literacy training to high-school children. The intervention consists of three compact training models typically administered with a week. We target children instead of adults for three reasons: First, cognitive abilities peak in young adulthood so that learning efficiency is likely to be highest at younger ages. Second, an integration of financial education into the school curriculum is well-suited to increase the coverage and outreach of training across all population groups as attendance is mandatory. Third, wealth accumulation and financial provision for old age depend crucially on financial decisions made in early adulthood due to interest compounding.

The important role of financial literacy in increasing net wealth is highlighted in many studies (see, for example, Banks et al. 2007 and 2010; Bozio et al. 2011; Jappelli and Padula, 2011; van Rooij et al. 2012). They use instrumental variables techniques to circumvent a complex endogeneity problem: While on the one hand financial literacy may affect the quality and frequency with which investment choices are made, successful decision-making (or larger financial stakes) is likely to be a strong incentive to invest in financial literacy on the other hand. Our experimental setup exogenously increases financial literacy in the treatment group so that we can identify a causal

effect of financial literacy on financial choices.

Recent field experiments on financial literacy have focused on teaching adults (e.g., Cole et al., 2010 and Carpena et al., 2011) or small entrepreneurs (e.g., Drexler et al., 2010 or Karlan and Valdivia, 2010) in developing countries, with mixed results. To the best of our knowledge, only two other studies - Berry et al. (2012) and Bechetti et al. (2011)- address children. A key difference between our work and the study of Berry et al. (2012), who focus on schools in Ghana, is that all students within a class were obliged to participate in the training. Hence, we avoid selection problems into training, as documented by Meier and Sprenger (2008). Bechetti et al. (2011) find that both treatment and control groups in Italian schools exhibit a “survey effect”, i.e. that students learn about finance in repeated surveys. Once this is controlled for, they do not find a treatment effect of their training module, while the training we evaluate is effective in raising literacy, although much shorter and delivered to younger children.

Our field experiment evaluates the effects of financial literacy training provided by a non-profit organization in Germany. The training provider has wide expertise in providing such training to teenagers, having taught already more than 35,000 students. We test the joint effect of their three most important training modules: shopping, planning and saving. Each of them was taught in class, during 90 minutes, by “finance coaches”. Finance coaches are professionals from partner companies who volunteer to teach teenagers in schools. The training targets teenagers aged 14 to 16 in lower stream high-schools in Germany.

For the field experiment, the organization contacted teachers of classes that had not yet received any training and asked them to participate in our study. Among those interested teachers, some were assigned to the treatment group, and received the three training modules, while others were assigned to the control group and received no training. The study uses a 2x2 design in which treatment and control group are observed before and after the experiment. The baseline survey was filled in before any training took place, the follow-up approximately three weeks later, after the training had been conducted in the treatment group. We conducted over 1500 surveys in 53 different classes across Germany.

The survey instrument was designed to elicit the students’ interest in financial matters, their self-assessed and actual financial knowledge, as well as some dimensions of financial behavior. The financial knowledge questions refer to the training content, and asked about advertising, mobile phone expenses and saving products. Questions on financial behavior and decision-making included shopping behavior, and questions on savings and debt.

If financial training is effective, we would expect students' interest and knowledge about financial matters to increase through the training. Our survey also included some questions about financial behavior, asking about how students manage their money, whether they save or have debt. The scope for behavioral changes in these dimensions is limited due to the short (three-week) lag between the two surveys and given the relatively scarce financial resources of teenagers (e.g., they cannot take on credit). For this reason, we further posed a hypothetical consumption-savings choice, asking how they would allocate 100 Euros across savings and various consumer categories. Finally, the survey instrument included questions on socio-economic background, math grade and cognitive abilities.

Our main results are the following: Before receiving any training, teenager's interest in financial matters is low: more than 80% of students have no interest or are indifferent to financial matters. Their self-assessed financial knowledge is also low, with only 21% of students affirming that their knowledge is good or very good. Probing into their knowledge, we find that it is at an intermediate level: most students can identify the least risky financial product, but over a quarter (26%) believe that smart phones do not have running costs. Most worryingly, about half the students agree with the statement that they frequently buy on impulse.

We find a strong and significant increase in the knowledge and interest in financial matters of students after the training. The share of students who are interested in financial matters increases from 19% to about 30% in the treatment group, while it does not change much in the control group. Across different specifications, the increase in interest, from 12 to 20%, is strongly statistically significant. We obtain a similar result for self-assessed financial knowledge, which increases between 19 and 21%.

Students do not only *feel* more informed, their financial knowledge actually improves with the training along some dimensions: the percentage of students who correctly identify the least risky savings product increases significantly through the treatment. Similarly, the percentage of students who understand that the purpose of advertising is to sell increases.

Interestingly, we observe a significant change in attitudes. The likelihood that a student identifies herself as an impulse buyer decreases with the training. Furthermore, treated students increase their savings in the hypothetical consumption-savings allocation task. As one might expect given the short amount of time between the two surveys, students' reported savings and debt levels do not change significantly after the training, though most of the coefficients have the expected signs.

Empirical evidence on children's and teenagers' levels of financial literacy in Europe is lacking

to date. To fill this gap, PISA, a comparative cross-country survey of pupils' education levels, has been extended in some countries to cover financial literacy and numeracy modules in its 2012 edition. However, numerous countries, e.g. Germany, are not participating in this extension. We provide first evidence on the socio-economic determinants of financial knowledge in Germany which may help in assessing whether financial literacy should gain more priority in education policies.

Our results also reveal interesting heterogeneity in behavior within the sample. Girls are less likely to be interested in financial matters to start with and also assess their knowledge as lower. This is an important result given the extensive literature documenting a lower literacy among adult women (e.g., Lusardi and Mitchell, 2008, Almenberg and Dreber, 2011, Bucher-Koenen et al., 2012). Further, girls are less likely to save and, consistent with this, more likely to have just enough money to make ends meet at the end of the month. Thus, we find a deep-rooted, strong gender bias already at the age of 14 to 16. And it is present in all dimensions of financial matters: financial knowledge, motivation, *and* behavior.

Student's math grades, which we elicit as a measure of numeracy, are positively correlated with financial knowledge. Students with low math grades are less aware that smartphones may have running costs. Importantly, they are more likely to be in debt, and consistent with this, to be left without money by the end of the month and be impulsive buyers. In future work we aim to examine the impact of financial literacy treatments on these different groups, girls and students with lower math grade.

The remainder of this paper is structured as follows: Section 2 reviews the literature. Section 3 describes the training components and the design of the field experiment. Section 4 presents the results, while Section 5 concludes.

## 2 Related literature

Several studies have shown the inadequacy of many households' financial decisions. Skinner (2007) discusses the inadequacy of savings for old age in the US. Stango and Zinman (2009b) highlight inefficient behavior with regards to credit: they show that a significant fraction of individuals in their sample constantly pay over-draft fees on their credit cards. Ausubel (1999) shows that consumers overreact to initial interest rates offers from credit card companies, while Woodward and Hall (2011) show that mortgage brokers take advantage of consumer's poor understanding and experience.

One explanation for inadequate financial decisions may be the lack of financial knowledge or a low ability to make informed financial choices. Campbell (2006) concludes that a minority of poorer and less well educated households make significant mistakes in their finance decisions (measured in the dimensions participation, diversification and mortgage refinancing). These individuals tend to avoid financial strategies which might be optimal but for which they feel unqualified. Bucher-Koenen and Ziegelmeyer (2011) suggest in an analysis of financial decisions during the recent (and ongoing) financial crisis that households with less financial knowledge are less exposed to stock market risks due to their low participation. However, those who do invest in stock markets make worse financial decisions through a larger propensity to realize losses.

Systematic studies into the link between financial literacy and net wealth tend to find higher wealth among more numerate and financially literate households (Banks et al., 2007 and 2010; Bozio et al., 2011; van Rooij et al., 2012). Using an instrumental strategy based on initial financial literacy, Jappelli and Padula (2011) find a strong effect of financial literacy on wealth accumulation and national savings in a sample of households across Europe. However, this literature suffers from a complex selection problem: while financial literacy may affect the quality and frequency with which investment choices are made, successful decision-making (or larger financial stakes) are likely to be strong incentives to invest in financial literacy (for a detailed discussion see Jappelli and Padula, 2011). Hence, in spite of the use of instrumental variables techniques to circumvent this problem, identifying the causal effect of financial literacy on financial choices is difficult and subject to an ongoing research agenda.

Studies of the level of financial literacy generally conclude that financial literacy is low. Lusardi and Tufano (2009) document the low level in debt literacy in the US, especially the poor judgement in borrowing decisions among a large share of individuals. Stango and Zinman (2009a) identify interest rate compounding as a widespread obstacle to the understanding of even simple financial products. Lusardi et al. (2010) find that “fewer than one-third of young adults possess basic knowledge of interest rates, inflation and risk diversification”. They find particularly low literacy levels among the young, who are between age 23 and 28, that persist over age (see also Lusardi and Mitchell 2008, 2011). Furthermore, they stress the role of family background, i.e. stock market participation of the parents. Jappelli (2010) shows in a panel of 55 countries that financial literacy is associated with overall educational achievement, social interactions and mandated savings in the form of social security contributions.

While deficiencies in financial literacy are widely recognized and undisputed, there is little

evidence and no consensus whether and how financial literacy can be increased (see, e.g. Willis, 2008, who argues against financial literacy training). Evaluation studies of training formats can help test whether and which training formats could be effective in increasing financial literacy. Assuming that effective training formats can be found, randomized control trials also provide a random exogenous increase in literacy levels whose impact on financial choices can be analyzed without exposure to the complex endogeneity issues discussed above.

The experimental literature on financial literacy is small but growing and mostly concentrates on developing countries. Cole et al. (2010) find no effect of an education program on financial literacy in a field experiment in Indonesia, only a small increase in the probability of opening a bank account among those with low initial financial literacy. Carpena et al. (2011) evaluate the efficacy of an incentivized, individually programmable, video-based financial literacy program in India. They combine the treatment with individual financial counseling and task-setting exercises in which individuals apply the taught skills. They find an increase in interest and basic awareness of financial choices, but no improvement in the evaluation of complex financial decisions that require high numeracy skills. Gibson et al. (2012) conduct a randomized training about remittance payment methods and costs and short-term credit financing among migrants in New Zealand and Australia. They conclude that the training increases financial knowledge and information seeking behavior and reduces the risk of switching to costlier remittance products. However, they find no effect on the level or frequency of remittances.

The effects of financial literacy training to entrepreneurs are somewhat stronger. Karlan and Valdivia (2010) find increased record-keeping, but no increase in profits of entrepreneurs after a business training program in Peru, while Bruhn and Zia (2011) find an increase in investment, business practices and loan terms after a training offered to young entrepreneurs in Bosnia and Herzegovina. Drexler et al. (2010) examine two training designs for microfinance clients in the Dominican Republic: a basic financial accounting training and a simpler rules-of-thumb training. They find large effects of this simpler treatment on savings, financial planning and management, but no effect of the complex treatment.

A few studies have been conducted in the US. Bernheim et al. (2003) and Cole et al. (2012) find conflicting effects of financial education mandates in schools on savings rates. Another non-randomized study – The Junior Achievement’s Finance Park quasi-natural experiment by Carlin and Robinson (2010) – measures the effect of financial literacy on hypothetical savings, investment, and consumption outcomes among high school students in the US and finds that trained students



make poor present value judgements and have a tendency to over-save.

Duflo and Saez (2003) expose employees randomly to a benefits information fair (with a monetary reward for attendance) to raise awareness about retirement savings. They find a small effect on tax deferred savings plan enrolment which extends to the peers of people who attended the training and thus point to spillover effects of information dissemination. Bertrand and Morse (2011) also find that providing simplified information to payday borrowers, about the costs of their loan and alternative sources of credit, decreases payday borrowing by 11%.

While some literature has examined the efficacy of financial training for adults, there is even less evidence on the effectiveness of financial literacy training of children. To the best of our knowledge, we are aware of only two experiments that evaluate the effectiveness of training among young people. Berry et al. (2012) conduct a school-based financial education program in Ghana in the form of a savings club combined with financial education. The target group are children in grades 5-7. The authors find no increase in financial literacy, a small positive increase of savings by about 4 percent which arises solely from increased participation in savings activities, but not through an increase of previous savings activities. Furthermore, there is some evidence that children become more risk averse through the treatment.

The second experiment is a study among 17 to 19 year old high school students in major Italian cities whose results are documented in Becchetti et al. (2011) and Becchetti and Pisani (2012). The treatment in this experiment is a 16-hour course on finance which lasts three months. Both studies find a positive effect in the students' financial literacy. High grades at final middle school exams, willingness to study Economics and household borrowing status also significantly and positively affect financial education. Becchetti et al. (2011), however, show that this increase may be due as much to the repeated exposure to a financial literacy questionnaire as to the training itself. This surprising result may result partially from the multiple choice nature of a large fraction of literacy questions.

### **3 Context and experimental design**

#### **3.1 The financial literacy initiative**

The financial literacy training modules we examine are provided by a non-profit organization, My Finance Coach (MFC), which has offered financial literacy training to over 35,000 German high-school students, aged mainly between 14 and 16, since its startup in October 2010 (MFC, 2012).

The organization also trains teachers directly in order to accelerate the programme outreach, and organizes extra-curricular activities related to finance, such as a nationwide competition on financial topics.<sup>1</sup>

We evaluate the impact of the financial literacy training offered through visits of experts to schools. The experts are employees of the sponsors and partners of the provider, who volunteer to conduct visits of 90 minutes dedicated to one of the training modules. The organization provides teaching materials and offers training modules on seven topics. The first, an introduction to spark student’s interest in business and finance, is targeted at younger students of ages 11 and 12. The other modules, Shopping, Planning, Saving, Managing Risks, Environment and Business, and Online, are targeted to students aged 12 to 15.

Our experiment evaluates the joint impact of three of these modules: Shopping, Planning, and Saving. The Shopping module deals with acting as an informed consumer in students’ own social environment. It aims to increase student’s awareness about advertising: that it tries to sell, but not only to show what the student needs. The Planning module asks students to reflect on what the future holds and helps them plan their finances. For example, it raises awareness of the difference between expenses that occur once and the repeated costs for consumer electronics and other durables, like those generated after buying a motorbike or a smartphone. The last module, Saving, introduces the trade-offs between liquidity, safety and return of different financial products and discusses how savings motives – like precautionary savings versus saving up for a specific item purchase – affect the choice between various investment options.

High-school students in Germany can be in different types of schools, depending on whether they aim to pursue a vocational training or prepare for a university (Gymnasium). The financial training provider concentrates training in schools where students pursue a vocational training (Hauptschulen, Sekundarschulen and Mittelschulen), and also in those schools where students combine both vocational training with the option of accessing university later on (Realschule, Gesamtschule, Werkrealschule). The vast majority of participating students in our experiment belong to these schools.<sup>2</sup>

One of the main aims of the provider, as of most financial education programs targeted at children, is to raise the interest of children in financial topics and increase their competency in financial matters. This creates the basis for further acquisition of financial knowledge and enables

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<sup>1</sup>Overall, the provider has reached around 150,000 students through these various channels.

<sup>2</sup>Only one school in our sample is a higher stream school (Gymnasium).

children to become financially literate adults.

### 3.2 Experimental design

During the spring of 2012 we conducted the evaluation of the financial training modules. In all classes, students filled in two surveys: the baseline survey and the follow-up survey. Treatment assignment occurred at the class level. In the treatment group, the baseline survey was filled in before the three financial literacy training modules started. Directly thereafter, the three training modules were delivered. The training modules were mostly provided within one week. One to three weeks after the last training, the students filled in the follow-up survey. In the control group, students filled in the baseline survey approximately at the same time. However, training was postponed until after the end of the experiment, so no expert visited the class between surveys. Between one to three weeks later, the students filled in the follow-up survey.

The survey contained questions about financial knowledge, behavior and socio-economic characteristics.<sup>3</sup> The questions about financial knowledge included two questions about the student's interest in finance and perceived knowledge about finance. Clearly, one of the main aims of the training is to increase both interest and knowledge. There were also three questions about advertising (related to the Shopping module), two questions about the costs of a mobile phone (related to the Planning module) and one question about the liquidity of different financial products (related to the Saving module) to examine whether students had understood the training content and increased their financial knowledge. Then, the survey asked students to report (1) how much pocket money they received per month, as well as other income sources, (2) how they deal with money by the end of the month and whether they have debt, (3) whether they have a bank account, (4) whether they save, how much and for which purpose and (5) what they would spend 100 Euro on, within a month, if they had no other sources of income. Finally, the survey ended by asking students about their gender, age, household characteristics, math grade and cognitive ability.<sup>4</sup> The fieldwork of the experiment was organized by the training provider. Scheduling and organization of training usually works as follows: throughout the year, flyers and other materials are sent to schools informing them of the financial education opportunity. When teachers signal their interest, they are contacted by the provider to discuss which modules would be of her interest and during

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<sup>3</sup>The survey questions are available from the authors upon request

<sup>4</sup>We used a subset of 4 questions from the Standard Progressive Matrices by Raven (1989). We chose questions with varying degrees of complexity based on test results in German schools by Heller et al. (1998) to capture the distribution of cognitive ability as well as possible.

which period these would need to be taught. Thus, a list of interested teachers is compiled and experts and classes are matched according to capacity and time constraints. Experts always go in pairs and offer the training to classes ranging from 20 to 30 students.

For our experiment, the organization contacted the teachers on their list – in particular those who had previously shown an interest in the modules Shopping, Planning and Saving. Due to the short time until the end of the academic year, these teachers were asked whether they would have time in their schedule to receive the three modules before the summer break. Those who were available received the training and were assigned to the treatment group. Also those who had scheduled these modules earlier on and already had appointments during the study phase were asked to participate and assigned to the treatment group. If time constraints prohibited the training before the summer holidays, teachers asked whether they would be interested in participating in a study now, and receive the training modules after the end of our experiment, i.e. in the next academic year. Consenting teachers were assigned to the control group. If a new teacher contacted the organization during the study phase (from May to July, 2012), they were also asked to participate in the study as control group if their scheduling allowed to conduct the baseline and follow-up survey before the summer break. Hence, while the allocation of treatment and control groups is not strictly randomized, it is based on external scheduling restrictions which are unrelated to the intervention.

The surveys were conducted by the teachers and sent back directly to us via mail. Teachers were also asked to fill in an additional short survey eliciting class size and some other class characteristics, and any comments on or problems with the survey. Overall, response rates within participating classes are with an average of about 85% high – in spite of absenteeism and the data protection requirement of provision of written parental consent.

Our sample is composed of 34 classes in the treatment group and 15 in the control group. Of the participating classes, some did not manage to have students fill in the follow-up survey before the summer break. Hence, we have 31 who filled the baseline survey in the treatment group, of which 29 also filled in the follow-up survey. In the control group, 15 filled in the baseline survey and 11 the follow-up survey. The surveys of 6 control classes were sent back without indication whether the survey was a baseline or follow-up survey and are thus excluded from our empirical analysis. The total number of surveys in each treatment is summarized in Table 1.

Given the content and purpose of the evaluated training modules, we first assess the training impact on financial motivation and self-assessed financial literacy, and then proceed to a battery of

questions on different areas of financial knowledge – advertising attitudes, awareness of consumer electronics’ running costs and awareness of the risk structure of different assets. Students’ increased knowledge could potentially change their spending and saving decisions. While students have a limited income, the training could (a) help them manage their money better, i.e. reduce debt, if any, or avoid being broke by the end of the month, and (b) motivate them to save more. The Planning module teaches students how to make a savings plan for the purchase of a specific item such as a bicycle. Hence, in the second part of our empirical analysis, we evaluate whether the training affects their consumer behavior and the managing of their finances regarding debt, savings and the ability to make ends meet. Given the limited time between the baseline and follow-up survey and the limited financial capability of students, it may be difficult to observe a significant change in behavior. Hence, any training effects we observe on financial behavior are likely to be lower bounds on the potential training effect.

## 4 Results

In what follows we describe our results, starting with the determinants students’ behavior in the baseline survey. We also check for any differences between the treatment and control groups. Then we turn to analyze the effect of receiving financial literacy training. The variables that will be used throughout are defined in Table 2. In Appendix A, we present the summary statistics of all variables measured in the baseline survey.

### 4.1 Determinants of financial interest, literacy, and behavior

First, we analyze the determinants of financial interest, literacy and behavior in a regression of the answers on individual characteristics, conditional on school and class characteristics in the baseline survey, i.e. before any training takes place. We estimate the following specification:

$$y_{it} = \alpha + \sum_k \beta_k * z_{kit} + \sum_j \beta_j * x_{jit} + \gamma * T_i + \epsilon_{it} \quad (1)$$

where outcome  $y$  depends on individual characteristics  $z$ , school and class characteristics  $x$ . We also include a dummy for the treatment  $T_i$  to control for possible differences in the treated classes in the baseline survey. We control for the following individual characteristics  $z$ : gender, log of household size, a dummy whether the child has a single parent, a dummy whether German is spoken at home

(migrant background), dummies for the number of books present in the household (socio-economic background), and dummies a low math grade in the past term (numeracy) and for low cognitive score (if the student correctly answered 50% of the cognition questions).<sup>5</sup> The school and class characteristics  $x_j$  include the school grade (a dummy which is 1 if the grade is 8th, 0 if 7th), class size, school type dummies and Bundesland dummies (the latter are not reported for brevity).

We find a statistically significant and quantitatively important gender bias in financial interest (column 1 in Table 3). Girls' financial interest is about 10% lower than that of boys. This bias is even stronger in self-assessed financial literacy (column 2). As shown in columns 3 to 11, we do not find evidence of a gender bias in perceptions of the purposes of advertising – providing information (ADV1), increasing product sales (ADV2), showing needs (ADV3) –, the awareness of running costs in mobile phone use or the riskiness of assets. While girls do not perform worse in these questions about financial knowledge, the statistically significant and quantitatively worse motivation and self-assessed financial literacy of girls translates into systematic differences in financial behavior (see Table 4). Column 1 shows that girls are less likely to save than boys, which translates into overall lower savings amounts among females (column 2). However, conditional on some savings activity, the amounts females save are only marginally lower (column 3). In Appendix B, we examine whether the differences in savings stem from differences between the income or the expenses of girls and boys. The latter report higher earnings, while both groups spend similar amounts. Hence, the difference in savings seems to come from differences in earnings.

In terms of their savings motives (columns 4 to 7), we find them to be somewhat more oriented towards saving for a specific future consumption purpose or for emergencies, potentially in line with women's higher risk aversion (Cohen and Einav, 2007). We find no evidence of differential debt propensities or amounts between girls and boys. These answers are consistent with the results of the question whether they are able to make ends meet (see columns 3 to 5 of Table 5): girls are less likely to have money left, i.e. save, at the end of the week, but are more likely to answer that they make ends meet. Finally, girls are also more likely to make impulse purchases (column 1 of Table 5).

Other determinants of financial interest, knowledge and behavior are socio-economic status, as measured by the number of books in the household, teenagers' cognitive abilities, measured through

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<sup>5</sup>As a robustness check, we also define the cutoff at 25% correct answers. The results are very similar. Additionally, we create a cognition index which weights correct answers with the inverse of the proportion of correct answers in our sample population to reflect the differing degree of complexity of the questions. Again, the results which are available on request, do not change significantly.

a battery of four questions taken from Raven’s Standard Progressive Matrices, and their numeracy, measured through their math score. In particular, we find that children who live in households with more than 100 books report an about 16% higher interest in financial matters than kids of low socio-economic status, i.e. those living in a household less than 10 books, are more likely to save and less likely to make impulse purchases. We find no evidence of socio-economics status on self-assessed financial knowledge and surprisingly little evidence that it is a determinant of knowledge on the purpose of advertising or the assessment of the risk structure of assets.

Teenagers with low numeracy levels are less likely to be aware of the running costs of mobile phones (columns 6 and 7 of Table 3) and more likely not to make ends meet (columns 3 and 5 of Table 5). This result is supported by column (8) in Table 4, which shows that teenagers with low numeracy are more likely in debt. There is some further indication that low numeracy teenagers are less long-term oriented in their savings motives and less likely to make provisions for emergencies. In contrast to numeracy, financial literacy and behavior does not vary much by cognition score. A low cognition score makes teenagers less aware of the motives of advertising and more believing in the informativeness of advertising. In terms of behavior, they are more likely to be impulse buyers and to use their savings to cope with financial distress.

We also find that older teenagers (in 8th rather than 7th grade) are more aware of the sales purpose of advertising, but less aware of the running costs of mobile phones and less likely to assess the riskiness of different savings options correctly. Their behavior is not significantly different to that of 7th graders, though they tend to save more, if they save. This is probably due to their larger resources.

Importantly, we rarely find differences in the baseline financial knowledge and behavior of treatment and control group. Teenagers in treated classes do not differ in their interest in financial matters, their financial knowledge (only differ on whether mobile costs do not have costs only once), or their behavior. They only two dimensions on which they differ is that they are less likely to save with the purpose of buying something and at the same time more likely not to save. However, their reported savings in the last weeks are not significantly lower. Further, if we run tests for pre-experimental differences between the two groups in our outcome measures, we seldom reject the hypothesis of equal means.<sup>6</sup>

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<sup>6</sup>For continuous variables, we report simple t-tests, for ordered responses we use the Wilcoxon rank sum (Mann Whitney) test, for binary variables, we report a  $\chi^2$  and a proportions test. Throughout, we find very little differences between the treatment and the control group in their answers *before* the experiment. The exceptions are: the questions on attitudes towards advertising: the treatment group finds advertising less informative and is more aware that advertising is geared at increasing product sales. The treatment group is also more aware of the subsequent user

If we compare treatment and control groups in terms of their average individual characteristics before the treatment, as in Table 6, we observe that they are very similar in most dimensions. There are no significant differences in gender, the number of books per household or the size and composition of the households that our respondents live in. The treatment group though has a slightly higher fraction of students who speak German at home. In terms of school characteristics, control and treatment group do not differ systematically in their class year (7th or 8th graders). However, we do find differences in their school characteristics, e.g. the Bundesland (state) and class size. The treatment group has somewhat lower math grades.

These differences in pre-experimental attitudes and behavior are quantitatively small and likely due in part to the small number of control classes in our sample. This results from the fact that classes were given the identical survey twice in a short time-span of about a month with no training component in between. The survey response rates in our experiment depend on the teacher’s participation motivation and on that of the children. With no financial participation incentives, the low number of observations in the control group is not surprising. Hence, our data on the behavior of the control group is somewhat noisy. In the following, we will thus concentrate on behavioral differences before and after the experiment among the treated children and report differences-in-differences estimates as additional sensitivity checks.

## 4.2 The effects of financial literacy training

To measure the effects of financial literacy training, we estimate our empirical model in four specifications. First, we estimate a classical difference-in-difference (DiD) estimator, comparing the change in outcomes between the baseline and follow-up survey across control and treatment group. We control for individual, school and class characteristics and cluster standard errors at the class-level. Specifically, we estimate the following model:

$$y_{it} = \alpha + \beta_1 * Post_t + \beta_2 * T_i + \beta_3 * Post_t * T_i + \sum_k \beta_k * z_{kit} + \sum_j \beta_j * x_{jit} + \epsilon_{it} \quad (2)$$

where outcome  $y$  depends on individual characteristics  $z$ , school and class characteristics  $x$ , as in section 4.1, and exposure to the financial literacy training  $T$ .  $Post$  is a dummy which takes the value zero for the baseline survey and 1 for the follow-up.

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costs of mobile phones. Finally, they would spend less on books but more on other consumption goods if given 100 Euros.



Second, since control and treatment groups differ in some of their school characteristics and to filter out any class-level heterogeneity, we introduce class fixed effects. The validity of these DiD estimates hinges strongly on reliable measurement of the control group’s behavior. Our control group is relatively small with 281 observations compared to 1145 observations in the treatment group, making the measurement of effects in the control group rather noisy. Since we observed no or small differences in the individual characteristics of students before the baseline survey, we also estimate the change in outcomes only in the treatment group, using the same covariates as in the DiD specification. We then also include a third specification adding class-level fixed effects to this DIFF specification.

#### **4.2.1 Financial interest and self-assessed knowledge**

Motivation plays an important role in the learning behavior of children. Hence, we first asked kids about their motivation to engage with financial topics. They rate their interest in financial matters on a scale from 1 to 5, where 1 means no interest and 5 a strong interest. The pre-experimental level of financial interest is low: about 39% of children show no interest in financial questions and about 43% are indifferent.

Figure 1 shows the strong change in financial motivation among the treated kids after the training. Both the categories for “much” and “very much” interest increase, and about 30% of children now state that they are interested in financial matters. In contrast, the control group experiences no positive change in these categories. When we condition on individual and class characteristics, such as gender, numeracy, cognitive score and socio-economic status, this strong effect of the training on the kids’ interest in financial matters persists across all specifications. The point estimates are lower in the difference estimates and range between 0.33 and 0.36. The difference-in-difference estimates are about 0.47 when controlling for class fixed effects. Overall, this corresponds to a 12 to 20% increase in their interest in finance.

As in our analysis of the determinants of financial interest before the training, the lower interest among girls persists. Similarly, we find that teenagers with high socio-economic status show a larger interest in financial matters.

Similar to financial interest, self-reported knowledge about financial matters before the experiment is low. About 38% of children state before the training that they know little or nothing about finances, and only 21% declare their knowledge as good or very good.

After the training, we see a similarly strong change in knowledge as for the interest variable:

while the fraction of those with no or little knowledge about finance decreases to 18%, the fraction of children who feel financially literate increases to 41% (see Figure 2).

When controlling for individual and class characteristics, we find an 0.57 to 0.61 increase in self-assessed financial literacy, corresponding with a 19 to 21% increase in their literacy, as shown in Table 8. Again, girls report to know substantially less about financial matters, while teenagers with high socio-economic status know more.

#### 4.2.2 Financial knowledge

Table 9 shows the results for two of our financial knowledge questions, advertising and mobile phone costs. The columns show the estimation results of the DiD (uneven numbered columns) and the difference approach (even numbered columns) using class fixed effects.<sup>7</sup> The treatment increases the percentage of teenagers who think advertising is (somewhat or very) informative and shows needs in simple differences, while in the DiD approach, we find no evidence of a treatment effect (see columns 1 and 2 for informativeness and columns 5 and 6 for the statement “advertisement shows needs”). While this is striking, there is no normative prior as to how the teenagers were supposed to answer these questions; advertising has informative components and can show needs via providing information about new products. On the contrary, financially literate teenagers should be aware that the main purpose of advertising is to increase product sales. Our estimates show that the percentage who think that advertising does not (or not at all) want to induce them to purchase goods declines in response to the training. This effect is statistically significant at the 5% significance level (see column (4)) and in the range of 5 percentage points – corresponding to a decline by around 28%. Further, we find no evidence that awareness of the repeated costs incurred in mobile phone usage increased through the training. Awareness of repeated costs arising from use of consumer durables and related products like PCs and mobile phones is an interesting dimension of financial literacy, as it has been highlighted as a potential factor in childrens’ indebtedness.

A more conclusive picture emerges when looking at the impact of the financial literacy training on awareness of asset-specific risk. Asked whether call money, a house or company shares are the least risky assets, teenagers clearly shifted from real estate to call money in reaction to the financial literacy training and the percentage giving the correct answer – call money – increased by 0.12 to 0.56 percentage points. This corresponds to the mean increase in correct answers from 78 in the

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<sup>7</sup>The estimates of the specifications without class fixed effects are omitted for readability here and are available from the authors upon request.

baseline survey to 82% in the treatment group after the training.

Overall, we find strong evidence that the assessment of risk and familiarity with different types of assets increases after the training, and some evidence that teenagers are more aware that advertising wants to lead them into buying products. Though our range of questions on financial knowledge is limited<sup>8</sup>, we cautiously summarize that financial training among teenagers from lower stream German schools increases their financial knowledge, at least, in some dimensions.

### **4.2.3 Financial behavior: impulse purchases**

Financial literacy is not only relevant for savings and investment choices, but can also help make informed purchase decisions. Since the first of the three 90 minute training modules focuses on purchase behavior and the influence of advertising, we also included questions on impulse purchases in our survey.

As Figure 3 shows, the fraction of impulse purchases among our sample is high. About 48% of children report that they often make spontaneous, unplanned consumption decisions. After the training, this propensity declines to about 40%. Table 11 shows the treatment effect when controlling for individual and class characteristics. We find that the training decreases the proportion of students reporting that they are buying on impulse frequently by 0.06 to 0.1, corresponding to a 12 to 21% decrease in the fraction of impulse buyers.

### **4.2.4 Financial behavior: making ends meet, coping strategies with financial distress and savings behavior**

Tables 12 and 13 show the estimates of the training effect on teenagers' ability to make ends meet and their coping strategies when they run out of money. In the baseline survey, about 60% of teenagers report to have money left at the end of a month, while only 16% cannot make ends meet. Asked what they do when they have no money left, only 17% of these borrow money and 18% use their savings to cover the shortfall. The remaining 64% reduces expenses to get by. Complementarily, we ask them whether and how much they are currently in debt. About 14% report to be in debt. We do not find evidence of high teenage debt as the amounts are small – those in debt have an average debt of 9 Euros and a median debt of 4 Euros. Table 14 shows the estimation results for debt propensity and debt amount.

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<sup>8</sup>This is partially due to the time limits set by the attention span of our subjects and partially by the time constraints of a school lesson.

When asked about their savings behavior in the last four weeks, 58% of students report that they save a positive amount. This number is roughly consistent with 60% of teenagers answering they had money left over when asked how they made ends meet in the last week. Table 15 reports our estimates of treatment effects on the propensity to save, the amount of savings in the last four weeks and the amount of positive savings. Columns 7 to 15 examine changes in the savings motives of students. On average across both surveys, about 56% of students reported that they save to buy a specific item, 38% save for emergencies and 48% for the future.<sup>9</sup> We do not find evidence of a change in the reported levels of savings or debt of teenagers. This result does not imply that financial training does not affect behavior: the short-term nature of our experiment with no more than three weeks between the training and the post-experimental survey, the limited budget of teenagers, fewer observations in the control group, and other reasons make it unlikely that behavioral changes can be observed during such a short time interval.<sup>10</sup>

In line with our results from the baseline survey, we find that girls are less likely to have money left for savings, but a higher probability of making ends meet by having just enough money to get to the end of the week. Low numeracy appears to affect the ability to manage one's funds quite substantially: students with low math grades are significantly less likely to have money left over at the end of the month and, unlike girls, they are also much more likely to be in financial distress. Furthermore, we see that teenagers with foreign parents (who do not speak German at home) are less likely to have money left at the end of the month, but not more likely to run out of money. Children in single parent households are less likely to have money left for savings but more likely to get by. Interestingly, the only characteristic that systematically increase the likelihood of running out of money is low numeracy. Basic mathematical skills seem to play an important role in budget planning.

#### **4.2.5 Hypothetical financial decision-making**

Given the difficulty to capture significant behavioral changes in savings, debt, and making ends meet in the short timespan of a few weeks in our experiment, we designed a survey task to capture

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<sup>9</sup>Teenagers were allowed to report multiple savings motives, so that percentages do not add up to 100.

<sup>10</sup>Ideally, we would like to measure the behavioral effects of financial literacy training for teenagers by following the changes in realized consumption and saving levels over longer time horizons. However, obtaining reliable estimates of saving or consumption using survey methods is generally difficult (e.g., Crossley and Winter, 2012), and these measurement problems are even more severe in the current context where survey time is very limited. Since teenagers' transactions are mainly in cash, following bank account statements is not a feasible alternative since it would miss most of their behavior. Most importantly, data protection and confidentiality concerns are particularly relevant for underage high-school students in the age range of 14 to 16 years, and they make obtaining detailed financial information as well as following individuals over longer periods in a longitudinal study very difficult.

intended changes in behavior. In a hypothetical financial decision-making question, we ask teenagers how they would allocate a monthly budget of 100 Euros across savings and several consumption categories.

Three quarters of students allocate the budget fully across the available categories, while allocations do not add up to 100 Euros for 14% and exceed 100 Euros for 9% of teenagers. We graph the average allocation of the treatment group before and after the training in Figure 4. The main discernible change in the treatment group is the increase in hypothetical savings from 23 to 26%.

We present estimation results for the treatment effect on hypothetical savings in Table 16. Column (1) presents the difference-in-difference estimate, columns (2) and (3) the difference estimates for the treatment group. We find a significant increase in savings (in levels and logs) and shares (and log shares) across all transformations of savings in the difference estimates. The effects are in the order of magnitude of a 2.5 to 3 percentage point increase in savings, roughly a 12 to 15% increase in savings. However, the estimates for the DID specifications are not significant, since the control group also increases its hypothetical savings.

Comparing results from Tables 15 and 16, we further find that teenagers with medium-high socio-economic status (100 books or more) save most, while we find lower savings among girls also in this hypothetical budget allocation task.

## 5 Conclusion

A wide range of studies have shown that adult financial literacy is low. Further, the lack of financial knowledge is correlated with worse financial outcomes: less saving, lower wealth and less likely participation in the stock market. As a remedy, several initiatives around the world have started to offer financial literacy training in recent years. Yet, there is little consensus or evidence on (i) what constitutes effective financial training and whether low financial literacy levels are due to lack of information and training or lacking cognitive ability and numeracy skills, or (ii) whether -as is hoped- increasing literacy will lead to better financial outcomes.

In this paper we evaluate the impact of financial literacy training on teenagers in lower stream schools in Germany. Our focus has been on the short term effect of training: does it awake interest in financial matters? Does it increase knowledge? And if so, can we find short-term changes in some dimension of financial behavior?

Our field experiment reveals that financial education raises teenager's interest and increases

self-assessed financial knowledge significantly. It also increases actual financial knowledge in several dimensions. Teenagers are able to better identify the least risky asset and the aim of advertising to sell. Though not significant, they also reckon more frequently that mobile phones have running costs in addition to one-time purchase cost.

Interestingly, students' behavior with respect to shopping also changes: they are less likely to define themselves as impulse buyers. Asked for their hypothetical income allocation, treated teenagers also increase their savings, but not significantly more than the control group. An important objective of future research on the behavioral effects of financial literacy training for teenagers should be to measure the changes in realized consumption and saving levels. Longer time horizons than the one provided in this field experiment are needed to identify whether financial literacy training has behavioral effects in these dimensions. For institutional reasons, following high-school students in the age range of 14 to 16 years over longer periods of time is quite challenging, however.

One of the most striking results of our study is that already among teenagers, there are strong gender differences in all dimensions of financial matters – financial knowledge, motivation, and behavior. It should be an important goal for financial literacy training programmes to address this gender bias already at these young ages.

While the jury is still out when it comes to the long-run behavioral impacts of financial literacy training for high-school students, the results of this study show that one such program is quite successful in raising teenagers' interest in financial matters and their subjective knowledge. Along with the objective knowledge and hypothetical behavior changes that we can already document over very short time horizons, these findings suggest that an even relatively short financial literacy training has the potential to help teenagers become more informed and sovereign consumers.

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## Tables and Figures

Table 1: Sample size by group and survey

	Treatment	Control
Pre	613	167
Post	533	115
unclear	0	127
		1555

Table 2: Definition of variables

Outcome variable	Survey instrument
<b>Interest</b>	I am .... Interested in finance. Answers given on a Likert scale (1=not at all, 5=very much)
<b>Knowledge</b>	I know.... about money and finances. Answers given on a Likert scale (1=not at all, 5=very much)
<b>Advertising motives</b>	Answers given on a Likert scale (1=strongly disagree, 5=strongly agree)
ADV1	Advertising wants to give me information about best products Dummy, =1 if answers 4 or 5, =0 otherwise
ADV2	Advertising wants to sell Dummy, =1 if answers 1 or 2, =0 otherwise
ADV3	Advertising wants to show me what I need Dummy, =1 if answers 4 or 5, =0 otherwise
<b>Mobile costs</b>	What happens if you buy a smart phone? (Likert scale)
P1	I have costs once Dummy, =1 if answers 1 or 2, =0 otherwise
P2	I have running costs Dummy, =1 if answers 1 or 2, =0 otherwise
<b>Risk assessment</b>	Which of the following investment options has the least risk?
Call money	Dummy, =1 if Call money is selected, =0 otherwise
Real estate	Dummy, =1 if Real estate is selected, =0 otherwise
Shares	Dummy, =1 if Shares is selected, =0 otherwise
<b>Buyer type</b>	
BT1	I am an impulsive buyer Answers given on a Likert scale (1=strongly disagree, 5=strongly agree)
BT2	Dummy, =1 if BT1 is 4 or 5, =0 otherwise
<b>Making ends meet</b>	How did you manage your money last week?
Money left	Dummy, =1 if "I had money left", =0 otherwise
Just enough money	Dummy, =1 if "I had just enough money", =0 otherwise
Not enough money	Dummy, =1 if "I did not have enough money", =0 otherwise
<b>Coping strategies</b>	If you did not have enough money, what did you do?
Borrowed money	Dummy, =1 if "I borrowed money", =0 otherwise
No spending	Dummy, =1 if "I did not spend", =0 otherwise
Use savings	Dummy, =1 if "I used my savings", =0 otherwise
<b>Debt</b>	Do you have debt?
Y/N	Dummy, =1 if "Yes", =0 if "No"
Ln(amount)	Log of debt amount
<b>Savings</b>	Do you save
Y/N	Dummy, =1 if "Yes", =0 if "No"
Ln(amount)	Log of savings amount
Ln(amount) >0	Log of savings amount if positive
<b>Savings motives</b>	Why do you save?
To buy	Dummy, =1 if "to buy something", =0 otherwise
For emergency	Dummy, =1 if "for an emergency", =0 otherwise
For future	Dummy, =1 if "for the future", =0 otherwise
Not save	Dummy, =1 "I do not save", =0 otherwise

Table 3: Financial interest and knowledge about finances, baseline survey

	Interest	Knowledge			Advertising attitude			Mobile costs			Risk assessment		
		ADV1	ADV2	ADV3	P1	P2	Correct	CM	RE	Shares			
Girl	-0.268 (2.85)***	-0.396 (4.56)***	-0.021 (0.71)	-0.037 (1.48)	-0.155 (1.60)	-0.066 (0.63)	0.020 (0.59)	0.013 (0.37)	-0.007 (0.20)	-0.009 (0.54)			
Low math score	0.023 (0.24)	-0.114 (1.19)	0.106 (3.49)***	-0.001 (0.02)	0.168 (1.87)*	-0.251 (2.50)**	0.009 (0.24)	0.011 (0.31)	-0.007 (0.23)	-0.006 (0.28)			
Low cognition	-0.038 (0.52)	0.013 (0.18)	-0.066 (2.17)**	0.021 (0.67)	-0.206 (1.86)*	0.195 (1.85)*	-0.043 (1.22)	-0.037 (1.08)	0.067 (2.17)**	-0.027 (1.23)			
11-25 books	0.062 (0.51)	0.021 (0.20)	0.035 (0.79)	0.015 (0.30)	0.221 (1.33)	0.068 (0.48)	0.065 (1.24)	0.064 (1.21)	-0.026 (0.56)	-0.038 (1.25)			
26-100 books	0.132 (1.38)	0.061 (0.61)	-0.025 (0.56)	0.037 (0.80)	0.038 (0.24)	0.181 (1.27)	0.038 (0.73)	0.044 (0.86)	-0.009 (0.18)	-0.035 (1.09)			
101-200 books	0.260 (2.01)*	0.093 (0.71)	0.000 (0.01)	0.064 (1.30)	-0.118 (0.57)	0.222 (1.45)	-0.040 (0.66)	-0.040 (0.65)	0.070 (1.16)	-0.031 (0.82)			
201+ books	0.262 (1.80)*	-0.041 (0.29)	-0.041 (0.86)	0.122 (1.85)*	-0.172 (0.87)	0.669 (3.27)***	0.031 (0.54)	0.044 (0.75)	0.011 (0.20)	-0.044 (1.10)			
German	-0.161 (1.17)	-0.091 (0.94)	-0.016 (0.49)	0.026 (0.60)	-0.171 (1.22)	0.269 (1.77)*	-0.022 (0.42)	-0.023 (0.44)	0.050 (1.09)	-0.026 (1.17)			
Single parent	0.055 (0.73)	0.097 (0.91)	-0.002 (0.04)	0.035 (0.78)	0.028 (0.25)	-0.064 (0.43)	0.027 (0.54)	0.028 (0.55)	-0.050 (1.06)	0.020 (0.67)			
$\$\ln(\text{hsize})$	0.087 (1.02)	0.080 (0.83)	0.057 (1.44)	0.020 (0.52)	0.178 (1.40)	-0.184 (1.35)	0.062 (1.32)	0.056 (1.17)	-0.066 (1.63)	0.010 (0.50)			
School grade	0.089 (1.04)	-0.001 (0.01)	-0.067 (2.53)**	0.052 (1.43)	-0.114 (0.87)	0.440 (3.12)***	-0.123 (2.87)***	-0.117 (2.72)***	0.113 (2.93)***	0.008 (0.36)			
Class size	-0.005 (0.51)	-0.006 (0.44)	-0.004 (1.10)	-0.002 (0.51)	0.003 (0.26)	0.003 (0.18)	0.004 (0.84)	0.004 (0.81)	-0.005 (1.24)	0.001 (0.54)			
Treatment	-0.134 (1.35)	-0.130 (0.95)	-0.037 (1.09)	-0.026 (0.75)	-0.410 (2.60)**	0.020 (0.13)	0.028 (0.78)	0.034 (0.91)	0.003 (0.09)	-0.038 (1.29)			
Constant	2.967 (7.92)***	2.985 (7.06)***	0.331 (2.38)**	0.128 (0.84)	3.297 (7.13)***	3.005 (4.98)***	0.627 (3.74)***	0.626 (3.68)***	0.225 (1.46)	0.145 (2.50)**			
Observations	707	708	716	716	705	707	644	644	644	643			
R-squared	0.04	0.07	0.06	0.03	0.06	0.09	0.07	0.07	0.08	0.03			

Table 4: Financial behavior: savings and debt, baseline survey

	Savings			Savings motives			Debt		
	Y/N	$\ln(Amount)$	$\ln(Amount) > 0$	to buy	for emergency	for future	no saving	Y/N	$\ln(Amount)$
Girl	-0.103 (2.93)***	-0.491 (3.17)***	-0.172 (1.91)*	0.084 (2.26)**	0.070 (1.83)*	-0.024 (0.66)	-0.041 (1.58)	0.024 (1.08)	0.043 (0.83)
Low math score	-0.054 (1.21)	-0.226 (1.11)	-0.112 (0.70)	0.008 (0.16)	-0.061 (2.00)*	-0.149 (3.88)***	0.079 (2.87)***	0.069 (2.08)**	0.087 (1.45)
Low cognition	0.042 (1.03)	0.167 (1.00)	0.003 (0.02)	0.015 (0.36)	-0.045 (1.06)	-0.043 (1.17)	0.025 (1.00)	-0.007 (0.29)	-0.025 (0.53)
11-25 books	0.081 (1.75)*	0.217 (1.09)	-0.103 (0.60)	-0.032 (0.58)	0.121 (2.27)**	0.067 (1.48)	-0.082 (1.94)*	-0.031 (0.98)	-0.058 (1.29)
26-100 books	0.066 (1.55)	0.195 (1.08)	-0.090 (0.49)	0.001 (0.01)	0.143 (2.51)**	0.125 (2.49)**	-0.072 (1.74)*	-0.028 (0.79)	-0.027 (0.35)
101-200 books	0.143 (2.89)***	0.594 (2.65)**	0.096 (0.49)	-0.043 (0.73)	0.130 (2.01)*	0.141 (2.32)**	-0.092 (2.32)**	0.015 (0.34)	-0.004 (0.05)
201+ books	0.044 (0.83)	0.123 (0.52)	0.148 (0.65)	-0.039 (0.56)	0.100 (1.58)	0.161 (2.58)**	-0.116 (2.61)**	-0.001 (0.03)	-0.030 (0.38)
German	0.056 (1.05)	-0.042 (0.19)	-0.217 (1.59)	0.020 (0.37)	-0.047 (0.93)	0.062 (1.15)	0.008 (0.27)	0.075 (2.39)**	0.092 (1.36)
Single parent	-0.035 (0.61)	-0.133 (0.52)	0.038 (0.16)	0.044 (0.87)	0.075 (1.28)	0.020 (0.44)	-0.070 (2.17)**	0.059 (1.61)	0.112 (1.72)*
$\$\ln(hsize)\$$	-0.018 (0.37)	-0.061 (0.29)	-0.008 (0.04)	-0.008 (0.15)	0.105 (2.33)**	0.080 (1.52)	-0.015 (0.60)	0.033 (0.94)	0.066 (0.89)
School grade	-0.071 (1.43)	-0.048 (0.30)	0.291 (2.32)**	-0.059 (1.84)*	0.055 (1.40)	-0.041 (0.92)	0.047 (2.03)**	-0.009 (0.28)	-0.018 (0.37)
class size	0.003 (0.69)	0.022 (1.21)	0.006 (0.40)	0.004 (0.83)	-0.005 (1.44)	0.001 (0.28)	0.003 (0.88)	0.001 (0.36)	0.002 (0.32)
Treatment	-0.030 (0.63)	-0.125 (0.62)	-0.039 (0.26)	-0.087 (1.81)*	-0.005 (0.16)	-0.058 (0.96)	0.070 (2.17)**	0.015 (0.42)	0.033 (0.38)
Constant	0.492 (2.51)**	1.447 (2.30)**	3.617 (9.06)***	0.420 (2.75)***	0.274 (1.97)*	0.400 (2.07)**	0.060 (0.51)	-0.062 (0.74)	-0.102 (0.56)
Observations	706	666	374	707	707	707	706	713	703
R-squared	0.06	0.05	0.07	0.03	0.05	0.06	0.05	0.04	0.03

Table 5: Financial behavior: purchase behavior, making ends meet, and coping strategies with financial distress, baseline survey

	Buyer type		Make ends meet				Coping strategy			
	BT1	BT2	money left	just enough	too little	borrowed	no spending	use savings		
Girl	0.167 (2.18)**	0.006 (0.18)	-0.107 (3.01)***	0.100 (2.88)***	0.015 (0.62)	0.050 (1.04)	0.006 (0.08)	-0.041 (0.58)		
Low math score	0.162 (1.77)*	0.012 (0.27)	-0.126 (2.95)***	0.025 (0.65)	0.085 (2.67)**	0.050 (1.07)	-0.039 (0.51)	-0.007 (0.14)		
Low cognition	0.230 (2.63)**	0.051 (1.34)	0.015 (0.42)	0.002 (0.08)	-0.004 (0.12)	-0.001 (0.02)	-0.122 (1.90)*	0.134 (2.72)***		
11-25 books	-0.460 (3.10)***	-0.203 (3.22)***	-0.061 (0.98)	0.060 (1.09)	-0.009 (0.24)	-0.073 (0.94)	0.142 (1.36)	-0.016 (0.24)		
26-100 books	-0.298 (1.71)*	-0.087 (1.24)	-0.005 (0.10)	-0.017 (0.32)	0.012 (0.31)	-0.174 (2.62)**	0.128 (1.36)	0.057 (0.83)		
101-200 books	-0.321 (1.82)*	-0.118 (1.66)	0.015 (0.24)	-0.022 (0.37)	-0.002 (0.04)	-0.048 (0.63)	0.082 (0.78)	0.020 (0.26)		
201+ books	-0.424 (2.31)**	-0.158 (2.00)*	-0.068 (1.01)	0.021 (0.37)	0.048 (0.98)	-0.094 (1.05)	0.027 (0.25)	0.072 (0.72)		
German	0.009 (0.08)	0.003 (0.05)	0.128 (2.23)**	-0.099 (1.89)*	-0.024 (0.56)	-0.024 (0.37)	0.056 (0.68)	-0.026 (0.36)		
Single parent	0.141 (1.09)	0.053 (0.86)	-0.144 (2.21)**	0.153 (2.61)**	-0.020 (0.50)	0.050 (0.72)	0.032 (0.45)	-0.110 (2.05)**		
$\$\ln(\text{hsize})$	-0.030 (0.27)	-0.034 (0.73)	-0.061 (1.14)	0.016 (0.34)	0.040 (1.24)	0.041 (0.72)	-0.033 (0.44)	-0.046 (0.81)		
School grade	0.182 (1.45)	0.076 (1.54)	0.024 (0.70)	-0.065 (2.20)**	0.043 (1.56)	0.115 (2.03)**	-0.091 (1.66)	-0.061 (1.23)		
Class size	0.011 (1.04)	0.003 (0.80)	0.007 (1.80)*	-0.007 (1.94)*	0.001 (0.45)	0.012 (2.27)**	-0.017 (2.24)**	0.002 (0.32)		
Treatment	0.151 (0.95)	0.006 (0.10)	-0.040 (1.07)	0.014 (0.37)	0.012 (0.33)	0.039 (0.73)	-0.043 (0.52)	-0.010 (0.11)		
Constant	2.771 (7.45)***	0.422 (2.84)***	0.542 (4.38)***	0.462 (4.23)***	-0.026 (0.26)	-0.223 (1.20)	1.175 (4.59)***	0.172 (0.95)		
Observations	709	716	693	693	692	238	238	238		
R-squared	0.05	0.04	0.08	0.06	0.04	0.11	0.07	0.07		

Table 6: Summary statistics by group, pre-treatment

	Control		Treatment	
	Mean	SD	Mean	SD
Girl	0.46	0.50	0.50	0.50
German	0.75	0.44	0.82	0.38
Single parent	0.22	0.41	0.22	0.42
$\ln(hhs\text{ize})$	1.05	0.43	1.07	0.48
Books	2.76	1.35	2.82	1.40
School grade	0.49	0.50	0.47	0.50
Class size	19.34	5.64	23.77	4.96
Math grade	2.93	0.92	3.14	0.98
Low math score	0.27	0.45	0.33	0.47
Cognitive ability	0.45	0.26	0.46	0.27
Low cognition	0.65	0.48	0.61	0.49
No. obs	158		558	

Figure 1: Interest in finance, by treatment and control

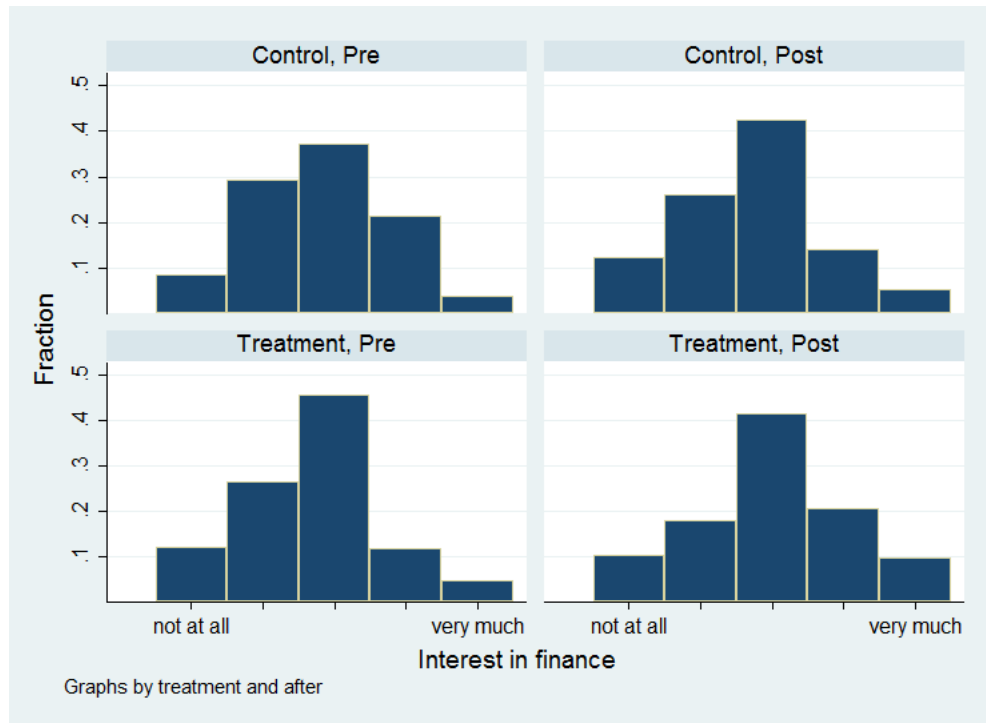




Table 7: Effects of financial literacy training on teenagers' interest in financial matters

	Interest in finance		
	DiD (1)	DIFF (2)	(3)
Treatment*Post	0.572 (3.20)***		
Post	-0.217 (1.37)	0.356 (4.17)***	0.323 (3.40)***
Treatment	-0.203 (1.95)*		
Girl	-0.283 (4.65)***	-0.292 (3.85)***	-0.307 (3.62)***
Low math score	-0.022 (0.24)	-0.014 (0.12)	-0.029 (0.25)
Low cognition	-0.062 (0.88)	-0.074 (0.94)	-0.059 (0.75)
11-25 books	0.097 (0.91)	0.180 (1.63)	0.147 (1.34)
26-100 books	0.183 (1.87)*	0.240 (2.31)**	0.225 (1.91)*
101-200 books	0.176 (1.70)*	0.232 (2.00)*	0.248 (2.13)**
201+ books	0.200 (1.62)	0.290 (2.21)**	0.239 (1.74)*
German	-0.065 (0.59)	-0.022 (0.19)	-0.007 (0.06)
Single parent	0.021 (0.28)	0.122 (1.54)	0.124 (1.52)
$\ln(hsize)$	0.090 (1.15)	0.182 (2.17)**	0.208 (2.27)**
School grade	0.083 (0.88)	0.036 (0.29)	0.667 (10.46)***
Constant	2.948 (9.27)***	2.471 (5.58)***	1.944 (8.72)***
State FE	Y	Y	
School & class controls	Y	Y	
Class FE			Y
Observations	1289	1018	1042
R-squared	0.06	0.07	0.13

Figure 2: Self-assessed knowledge about finance, by treatment and control

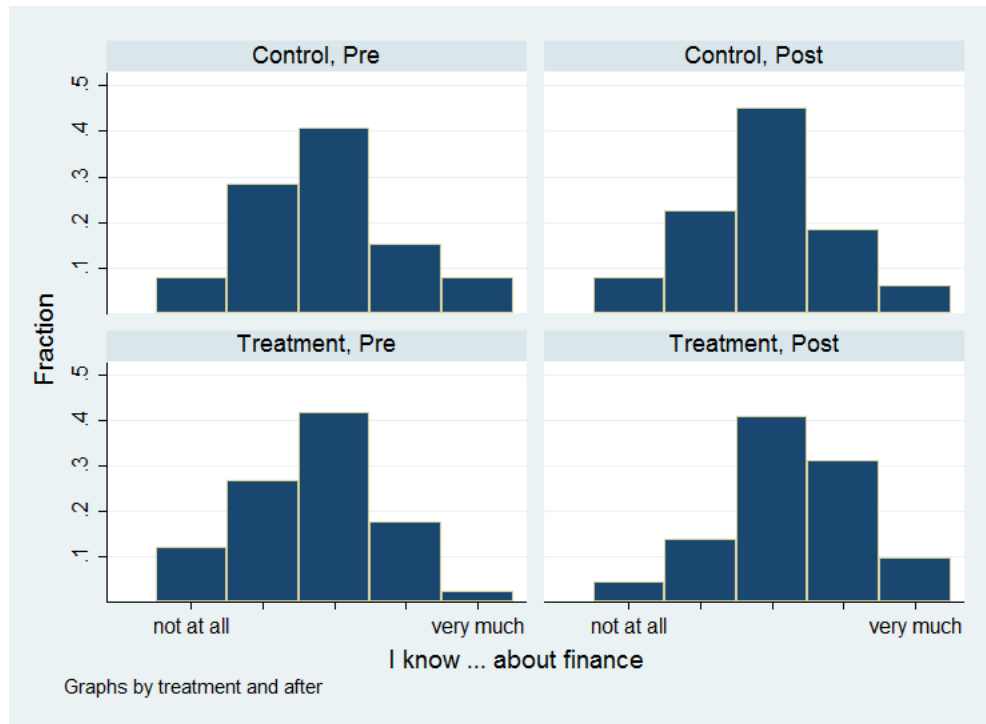


Table 8: Effects of financial literacy training on teenagers' self-assessed financial knowledge

	I know ... about finance		
	DiD (1)	DIFF (2)	(3)
Treatment*Post	0.617 (3.20)***		
Post	-0.044 (0.27)	0.571 (6.03)***	0.561 (5.67)***
Treatment	-0.200 (1.45)		
Girl	-0.300 (5.38)***	-0.299 (4.73)***	-0.279 (4.92)***
Low math score	-0.108 (1.25)	-0.044 (0.46)	-0.052 (0.55)
Low cognition	0.048 (0.87)	-0.020 (0.35)	-0.016 (0.30)
11-25 books	0.023 (0.26)	0.034 (0.35)	0.023 (0.26)
26-100 books	0.049 (0.53)	0.050 (0.49)	0.076 (0.75)
101-200 books	0.086 (0.90)	0.062 (0.55)	0.119 (1.05)
201+ books	0.035 (0.30)	0.112 (0.87)	0.167 (1.41)
German	0.106 (1.56)	0.063 (0.81)	0.034 (0.42)
Single parent	0.061 (0.70)	0.118 (1.21)	0.093 (0.92)
$\ln(hsize)$	0.069 (1.12)	0.125 (1.90)*	0.150 (2.16)**
School grade	0.065 (0.59)	0.128 (0.89)	-0.526 (9.65)***
Constant	2.771 (8.11)***	2.032 (4.25)***	2.513 (17.74)***
State FE	Y	Y	
School & class controls	Y	Y	
Class FE			Y
Observations	1290	1018	1042
R-squared	0.10	0.12	0.20

Table 9: Effects of financial literacy training on knowledge about the role of advertising and mobile phone costs

	Advertising motives				Mobile costs					
	informative		increase sales		shows needs		once		multiple	
	DiD	DIFF	DiD	DIFF	DiD	DIFF	DiD	DIFF	DiD	DIFF
Treatment*Post	0.061 (1.09)		-0.010 (0.33)		0.049 (0.96)		0.079 (0.37)		0.028 (0.13)	
Post	0.043 (0.95)	0.099 (2.55)**	-0.028 (1.10)	-0.046 (2.05)**	0.016 (0.43)	0.076 (1.97)*	-0.198 (1.02)	-0.131 (1.34)	0.091 (0.50)	0.130 (1.28)
Treatment	0.001 (0.03)		-0.027 (0.86)		-0.022 (0.58)		-0.314 (1.68)*		-0.050 (0.31)	
Girl	-0.051 (1.62)	-0.050 (1.36)	-0.020 (0.98)	-0.006 (0.27)	-0.046 (2.09)**	-0.062 (2.18)**	-0.124 (1.53)	-0.081 (0.85)	-0.016 (0.17)	-0.036 (0.31)
Low math score	-0.035 (1.21)	-0.017 (0.46)	0.068 (3.20)**	0.068 (2.69)**	0.029 (1.16)	0.035 (1.10)	0.183 (2.34)**	0.175 (1.82)*	-0.233 (2.47)**	-0.130 (1.28)
Low cognition	0.085 (2.49)**	0.054 (1.38)	-0.022 (1.03)	-0.004 (0.18)	0.015 (0.64)	0.027 (0.91)	-0.143 (1.52)	-0.175 (1.62)	0.225 (2.74)**	0.267 (2.47)**
11-25 books	0.093 (2.15)**	0.070 (1.50)	-0.002 (0.06)	0.004 (0.12)	0.034 (0.87)	0.020 (0.48)	0.193 (1.51)	0.163 (1.16)	0.001 (0.00)	0.069 (0.51)
26-100 books	0.074 (2.00)*	0.068 (1.71)*	-0.038 (1.01)	-0.012 (0.30)	0.061 (1.64)	0.037 (0.83)	0.102 (0.79)	0.116 (0.83)	0.112 (0.87)	0.179 (1.20)
101-200 books	0.079 (1.39)	0.058 (0.94)	-0.012 (0.31)	0.016 (0.39)	0.055 (1.36)	0.067 (1.51)	-0.095 (0.61)	0.015 (0.08)	0.277 (1.85)*	0.363 (2.13)**
201+ books	0.021 (0.48)	0.029 (0.62)	-0.086 (2.46)**	-0.050 (1.28)	0.093 (2.00)*	0.093 (1.97)*	-0.192 (1.24)	-0.152 (0.84)	0.581 (3.54)**	0.669 (3.81)**
German	0.014 (0.34)	0.013 (0.26)	-0.026 (1.08)	-0.018 (0.57)	0.043 (1.19)	0.038 (0.93)	-0.210 (2.05)**	-0.094 (0.81)	0.380 (3.06)**	0.289 (1.59)
Single parent	-0.024 (0.53)	-0.001 (0.02)	-0.038 (1.22)	-0.020 (0.64)	0.029 (0.81)	-0.010 (0.25)	-0.009 (0.08)	-0.081 (0.73)	-0.054 (0.46)	0.014 (0.11)
$\ln(hsize)$	-0.001 (0.02)	-0.006 (0.13)	0.010 (0.36)	0.028 (1.03)	0.023 (0.71)	-0.021 (0.60)	0.240 (2.64)**	0.185 (1.77)*	-0.170 (1.54)	-0.081 (0.72)
School grade	0.009 (0.29)	-0.129 (4.11)**	-0.056 (2.24)**	-0.205 (13.58)**	0.059 (1.89)*	0.031 (1.13)	-0.226 (2.00)*	0.012 (0.18)	0.475 (3.46)**	-1.152 (12.47)**
Constant	0.253 (1.99)*	0.219 (2.48)**	0.323 (2.89)**	0.220 (5.38)**	0.090 (0.76)	0.145 (2.48)**	3.542 (9.38)**	2.675 (16.35)**	2.901 (4.99)**	4.657 (18.08)**
FE unit	state	class	state	class	state	class	state	class	state	class
School & class controls	Y		Y		Y		Y		Y	
Observations	1303	1054	1303	1054	1303	1054	1287	1039	1289	1043
R-squared	0.04	0.06	0.04	0.08	0.03	0.07	0.06	0.09	0.09	0.16

Table 10: Effects of financial literacy training on teenagers' awareness of the risk structure of assets

	Correct choice		Call money		Real estate		Shares	
	DiD	DIFF	DiD	DIFF	DiD	DIFF	DiD	DIFF
Treatment*Post	0.116 (2.03)**		0.112 (1.96)*		-0.067 (1.36)		-0.048 (1.48)	
Post	-0.061	0.058 (1.71)*	-0.054	0.064 (1.92)*	0.007	-0.062 (2.05)**	0.055	0.006 (0.47)
Treatment	0.019 (0.49)		0.023 (0.59)		0.003 (0.11)		-0.027 (0.86)	
Girl	0.041 (1.43)	0.043 (1.36)	0.029 (1.04)	0.029 (0.93)	-0.033 (1.28)	-0.021 (0.75)	-0.005 (0.33)	-0.021 (1.35)
Low math score	0.007 (0.26)	0.018 (0.52)	0.010 (0.33)	0.023 (0.65)	0.011 (0.44)	0.003 (0.11)	-0.021 (1.40)	-0.025 (1.38)
Low cognition	0.003 (0.10)	0.020 (0.61)	0.000 (0.01)	0.021 (0.66)	0.015 (0.57)	-0.013 (0.39)	-0.019 (1.28)	-0.010 (0.58)
11-25 books	-0.009 (0.23)	0.000 (0.01)	-0.005 (0.13)	0.002 (0.04)	0.010 (0.31)	0.014 (0.40)	0.000 (0.01)	-0.013 (0.42)
26-100 books	0.015 (0.39)	0.020 (0.44)	0.025 (0.64)	0.028 (0.62)	-0.004 (0.12)	-0.007 (0.17)	-0.015 (0.62)	-0.017 (0.62)
101-200 books	-0.034 (0.77)	-0.036 (0.74)	-0.033 (0.75)	-0.035 (0.71)	0.056 (1.46)	0.035 (0.76)	-0.023 (0.77)	0.001 (0.02)
201+ books	-0.002 (0.05)	0.016 (0.31)	0.011 (0.24)	0.031 (0.57)	0.029 (0.71)	0.033 (0.67)	-0.028 (0.89)	-0.050 (1.59)
German	0.002 (0.04)	-0.009 (0.17)	-0.002 (0.04)	-0.014 (0.26)	0.044 (1.41)	0.046 (1.22)	-0.046 (1.93)*	-0.037 (1.34)
Single parent	-0.001 (0.03)	-0.004 (0.10)	0.004 (0.09)	0.001 (0.03)	-0.019 (0.59)	0.001 (0.02)	0.019 (0.90)	0.003 (0.14)
$\ln(hhsize)$	0.021 (0.72)	0.013 (0.38)	0.020 (0.71)	0.012 (0.35)	-0.014 (0.51)	-0.010 (0.29)	-0.004 (0.25)	0.000 (0.01)
School grade	-0.076 (2.37)**	-0.468 (13.25)***	-0.074 (2.17)**	-0.467 (13.29)***	0.053 (1.88)*	0.291 (9.04)***	0.022 (0.88)	0.063 (7.28)***
Constant	0.582 (4.84)***	0.927 (10.79)***	0.604 (4.67)***	0.931 (11.20)***	0.267 (2.64)**	-0.003 (0.04)	0.152 (2.92)***	0.065 (1.87)*
FE-level	state	class	state	class	state	class	state	class
School & class controls	Y		Y		Y		Y	
Observations	1196	966	1196	966	1196	966	1195	965
R-squared	0.05	0.09	0.05	0.10	0.04	0.07	0.03	0.06

Figure 3: Shopping behavior – spontaneous versus planning, by treatment and control

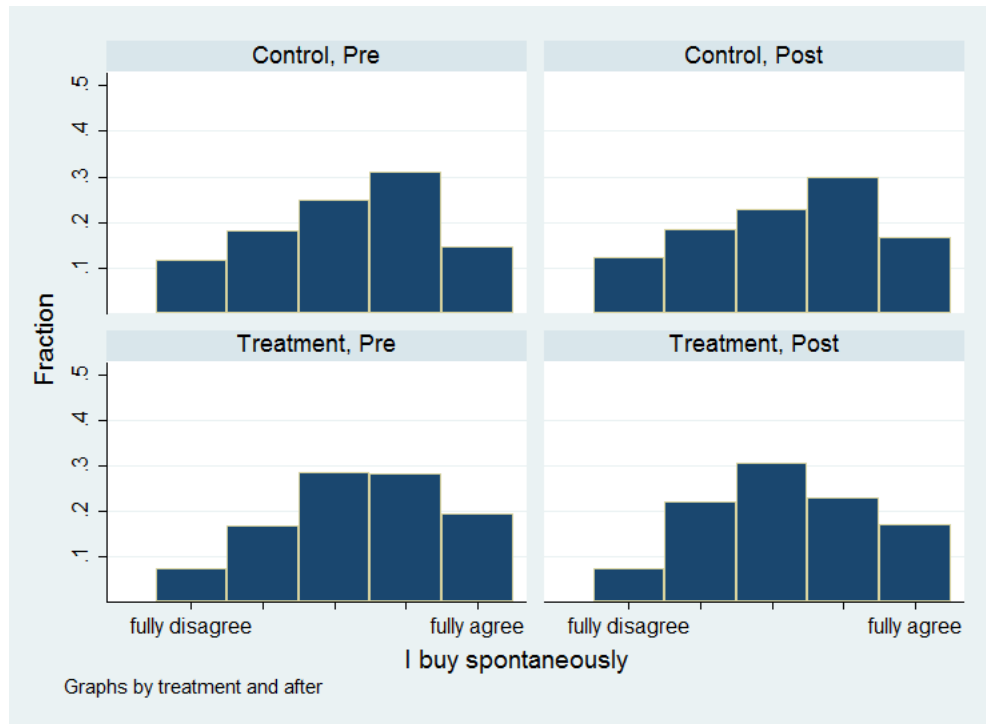


Table 11: Effects of financial literacy training on teenagers' purchase behavior

	Impulse buyer		
	DiD (1)	DIFF (2)	(3)
Treatment*Post	-0.102 (1.69)*		
Post	0.027 (0.49)	-0.071 (2.64)**	-0.062 (1.95)*
Treatment	-0.006 (0.11)		
Girl	0.012 (0.51)	-0.013 (0.48)	-0.012 (0.39)
Low math score	0.048 (1.33)	0.050 (1.30)	0.065 (1.66)
Low cognition	0.021 (0.73)	0.009 (0.28)	0.029 (0.93)
11-25 books	-0.112 (1.96)*	-0.121 (1.91)*	-0.117 (1.83)*
26-100 books	-0.046 (0.84)	-0.044 (0.78)	-0.048 (0.80)
101-200 books	-0.084 (1.41)	-0.102 (1.44)	-0.101 (1.36)
201+ books	-0.134 (1.98)*	-0.151 (2.09)**	-0.138 (2.01)*
German	-0.013 (0.24)	-0.013 (0.20)	-0.050 (0.76)
Single parent	0.084 (1.87)*	0.085 (1.58)	0.093 (1.68)
$\ln(hhsize)$	0.049 (1.39)	0.059 (1.44)	0.065 (1.59)
School grade	0.044 (1.20)	0.038 (0.94)	0.012 (0.38)
Constant	0.372 (2.80)***	0.366 (1.87)*	0.557 (7.32)***
State FE	Y	Y	
School/class controls	Y	Y	
Class FE			Y
Observations	1303	1030	1054
R-squared	0.03	0.04	0.07

Table 12: Effects of financial literacy training on teenagers' ability to make ends meet

	money left		just enough money		not enough money	
	DiD	DIFF	DiD	DIFF	DiD	DIFF
Treatment*Post	-0.044 (0.79)		0.027 (0.46)		0.016 (0.34)	
Post	0.073 (1.43)	0.026 (1.11)	-0.035 (0.68)	-0.011 (0.45)	-0.038 (0.89)	-0.019 (0.83)
Treatment	-0.020 (0.50)		0.016 (0.44)		0.002 (0.05)	
Girl	-0.058 (2.10)**	-0.062 (1.72)*	0.058 (1.99)*	0.057 (1.60)	0.018 (1.05)	0.026 (1.27)
Low math score	-0.138 (3.82)***	-0.155 (3.67)***	0.035 (1.11)	0.034 (0.89)	0.087 (3.35)***	0.102 (3.27)***
Low cognition	-0.003 (0.12)	0.010 (0.31)	0.005 (0.22)	0.002 (0.06)	0.002 (0.08)	-0.009 (0.37)
11-25 books	-0.057 (1.21)	-0.082 (1.51)	0.054 (1.46)	0.069 (1.56)	0.001 (0.04)	0.015 (0.47)
26-100 books	-0.034 (0.69)	-0.071 (1.41)	0.042 (0.92)	0.085 (1.59)	0.002 (0.06)	0.006 (0.21)
101-200 books	0.015 (0.30)	-0.033 (0.57)	-0.022 (0.56)	-0.007 (0.16)	0.010 (0.31)	0.049 (1.27)
201+ books	-0.070 (1.19)	-0.123 (1.97)*	0.051 (1.27)	0.090 (2.02)*	0.038 (0.95)	0.057 (1.29)
German	0.116 (2.53)**	0.105 (1.92)*	-0.093 (2.24)**	-0.067 (1.31)	-0.042 (1.18)	-0.060 (1.74)*
Single parent	-0.102 (2.06)**	-0.110 (1.98)*	0.084 (1.88)*	0.090 (1.72)*	0.020 (0.65)	0.020 (0.64)
$\ln(hhs\text{size})$	-0.039 (0.87)	-0.067 (1.28)	0.010 (0.29)	0.041 (0.96)	0.029 (1.52)	0.027 (1.29)
School grade	0.008 (0.31)	0.325 (9.60)***	-0.021 (0.90)	-0.283 (9.15)***	0.023 (1.19)	-0.012 (0.49)
Constant	0.618 (5.35)***	0.423 (4.31)***	0.356 (3.46)***	0.462 (5.86)***	-0.027 (0.35)	0.111 (1.88)*
FE-level	state	class	state	class	state	class
School & class controls	Y		Y		Y	
Observations	1265	1024	1265	1024	1264	1023
R-squared	0.05	0.07	0.03	0.07	0.04	0.07



Table 13: Effects of financial literacy training on teenagers' coping strategies with financial distress

	borrowed money		no spending		use savings	
	DiD	DIFF	DiD	DIFF	DiD	DIFF
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment*Post	0.002		-0.091		0.005	
	(0.02)		(1.14)		(0.05)	
Post	0.067	0.035	0.021	-0.055	-0.011	0.011
	(1.07)	(0.58)	(0.28)	(1.34)	(0.12)	(0.30)
Treatment	0.078		-0.083		-0.004	
	(1.37)		(0.95)		(0.05)	
Girl	0.050	-0.005	0.033	0.059	-0.058	-0.068
	(1.08)	(0.08)	(0.55)	(0.82)	(1.04)	(1.00)
Low math score	0.039	0.013	-0.067	-0.110	0.031	0.089
	(1.01)	(0.27)	(1.14)	(1.53)	(0.69)	(1.42)
Low cognition	0.008	0.042	-0.089	-0.121	0.096	0.097
	(0.26)	(0.86)	(1.88)*	(1.68)	(2.13)**	(1.47)
11-25 books	-0.062	-0.039	0.083	0.076	0.034	0.006
	(0.97)	(0.47)	(0.93)	(0.62)	(0.51)	(0.08)
26-100 books	-0.112	-0.049	0.086	0.045	0.061	0.062
	(1.98)*	(0.63)	(1.26)	(0.48)	(0.93)	(0.73)
101-200 books	-0.020	0.008	0.060	0.033	0.018	0.043
	(0.32)	(0.09)	(0.85)	(0.35)	(0.25)	(0.42)
201+ books	-0.041	-0.101	0.088	0.025	-0.005	0.068
	(0.49)	(0.86)	(1.14)	(0.21)	(0.08)	(0.94)
German	-0.097	-0.151	0.086	0.058	0.011	0.018
	(1.66)	(2.13)**	(1.35)	(0.57)	(0.21)	(0.27)
Single parent	0.057	0.113	-0.058	-0.100	-0.063	-0.044
	(0.97)	(1.98)*	(1.02)	(1.87)*	(1.55)	(0.75)
$\ln(hhs\text{size})$	0.025	0.036	-0.060	-0.044	-0.020	-0.037
	(0.51)	(0.61)	(0.96)	(0.60)	(0.42)	(0.70)
School grade	0.051	-0.154	-0.068	0.118	-0.043	-0.004
	(1.11)	(1.15)	(1.38)	(0.81)	(1.07)	(0.05)
Constant	0.058	0.149	0.959	0.507	0.218	0.470
	(0.31)	(1.04)	(4.14)***	(2.07)**	(1.50)	(3.36)***
FE-level	state	class	state	class	state	class
School & class controls	Y		Y		Y	
Observations	396	307	396	307	396	307
R-squared	0.07	0.20	0.06	0.14	0.03	0.15

Table 14: Effects of financial literacy training on teenagers' debt

	Debt		ln(amount)	
	Y/N			
	(1)	(2)	(3)	(4)
Treatment*Post	0.020 (0.69)		-0.011 (0.21)	
Post	-0.003 (0.15)	-0.006 (0.31)	0.009 (0.29)	-0.001 (0.02)
Treatment	0.029 (0.82)		-0.069 (1.68)*	
Girl	0.029 (1.63)	0.004 (0.18)	0.030 (0.80)	-0.005 (0.13)
Low math score	0.052 (2.26)**	0.058 (2.14)**	0.113 (2.00)*	0.104 (1.65)
Low cognition	-0.020 (1.08)	-0.033 (1.46)	-0.046 (1.33)	-0.069 (1.73)*
11-25 books	0.010 (0.33)	0.025 (0.74)	0.025 (0.55)	0.025 (0.48)
26-100 books	-0.018 (0.61)	0.004 (0.11)	0.014 (0.27)	0.011 (0.18)
101-200 books	0.023 (0.65)	0.032 (0.83)	0.104 (1.41)	0.082 (1.01)
201+ books	0.021 (0.56)	0.035 (0.95)	0.053 (0.84)	0.039 (0.59)
German	0.059 (2.26)**	0.028 (0.97)	0.069 (1.04)	0.007 (0.11)
Single parent	0.065 (2.11)**	0.073 (1.93)*	0.157 (2.52)**	0.174 (2.41)**
$\ln(\text{hhsiz})$	0.040 (1.75)*	0.045 (1.62)	0.072 (1.42)	0.077 (1.39)
School grade	-0.009 (0.30)	0.070 (3.24)***	0.273 (6.63)***	0.360 (7.22)***
Constant	-0.032 (0.40)	-0.020 (0.48)	-0.151 (1.47)	-0.146 (1.71)*
FE-level	state	class	state	class
School & class controls	Y		Y	
Observations	1290	1042	1288	1018
R-squared	0.04	0.09	0.09	0.07

Table 15: Effects of financial literacy training on teenagers' savings motives and behavior

	Y/N	Savings		to buy		for emergency		for future		no saving	
		$\ln(amount)$	$\ln(amount) > 0$	state	class	state	class	state	class	state	class
Treatment*Post	0.054 (0.79)	0.265 (0.92)	0.023 (0.11)	0.079 (1.03)	0.071 (1.09)	-0.071 (1.30)	-0.011 (0.28)				
Post	-0.005 (0.09)	-0.107 (1.23)	-0.108 (0.61)	-0.049 (0.73)	-0.052 (0.87)	0.017 (0.66)	-0.028 (0.98)	0.018 (0.57)	0.015 (0.70)		
Treatment	-0.047 (0.95)	-0.179 (0.87)	-0.050 (0.31)	-0.085 (2.13)**	-0.033 (0.98)	-0.077 (1.33)	0.080 (2.43)**				
Girl	-0.085 (2.42)**	-0.437 (3.32)**	-0.241 (3.01)**	0.048 (1.59)	0.078 (3.12)**	-0.009 (2.66)**	-0.035 (0.87)	0.002 (0.08)			
Low math score	-0.047 (1.48)	-0.207 (1.40)	-0.098 (0.84)	-0.001 (0.03)	-0.046 (0.90)	-0.037 (1.15)	-0.056 (1.57)	0.074 (3.11)**	0.074 (2.80)**		
Low cognition	0.021 (0.71)	0.070 (0.59)	-0.002 (0.03)	0.017 (0.56)	-0.011 (0.35)	-0.037 (0.99)	-0.042 (1.39)	0.023 (1.26)	0.023 (1.06)		
11-25 books	0.085 (1.91)*	0.377 (2.24)**	0.123 (0.87)	-0.057 (1.35)	-0.103 (2.11)**	0.035 (0.65)	0.142 (3.33)**	-0.056 (1.76)*	-0.056 (1.45)		
26-100 books	0.082 (1.93)*	0.329 (1.77)*	0.049 (0.33)	-0.004 (0.09)	-0.006 (0.12)	0.084 (1.34)	0.064 (1.40)	-0.040 (1.53)	-0.040 (0.95)		
101-200 books	0.144 (3.14)**	0.570 (3.05)**	0.083 (0.46)	-0.046 (0.88)	-0.084 (1.25)	0.090 (1.51)	0.150 (2.88)**	-0.066 (2.88)**	-0.066 (2.17)**		
201+ books	0.108 (2.02)**	0.541 (2.22)**	0.366 (1.82)*	-0.074 (1.40)	-0.058 (0.87)	0.094 (1.47)	0.135 (2.41)**	-0.078 (1.78)*	-0.090 (2.03)*		
German	0.034 (0.66)	-0.004 (0.02)	-0.129 (0.61)	-0.011 (0.33)	0.005 (0.14)	0.018 (0.49)	0.084 (3.09)**	-0.005 (0.25)	0.011 (0.53)		
Single parent	0.018 (0.36)	0.145 (0.70)	0.146 (0.73)	0.054 (1.29)	0.075 (1.44)	0.066 (1.41)	-0.048 (1.13)	-0.030 (1.00)	-0.051 (1.44)		
$\ln(hsize)$	0.028 (0.64)	0.161 (0.91)	0.113 (0.84)	-0.010 (0.26)	-0.026 (0.64)	0.082 (1.84)*	0.091 (0.96)	0.003 (0.14)	-0.020 (0.91)		
School grade	-0.059 (1.73)*	-0.143 (1.08)	0.110 (16.68)**	-0.046 (1.30)	-0.061 (2.12)**	0.035 (1.02)	0.356 (16.61)**	0.029 (1.24)	0.157 (6.71)**		
Constant	0.417 (2.64)**	1.524 (8.07)**	4.008 (13.55)**	0.529 (4.11)**	0.620 (11.06)**	0.092 (1.12)	0.009 (0.11)	0.054 (0.48)	0.206 (3.63)**		
FE-level	state	state	state	state	state	state	state	state	state	state	state
School & class controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1285	1217	708	1276	1031	1276	1031	1276	1031	1275	1030
R-squared	0.05	0.04	0.05	0.02	0.05	0.04	0.07	0.06	0.12	0.04	0.11

Figure 4: Hypothetical savings-consumption behavior, treatment group

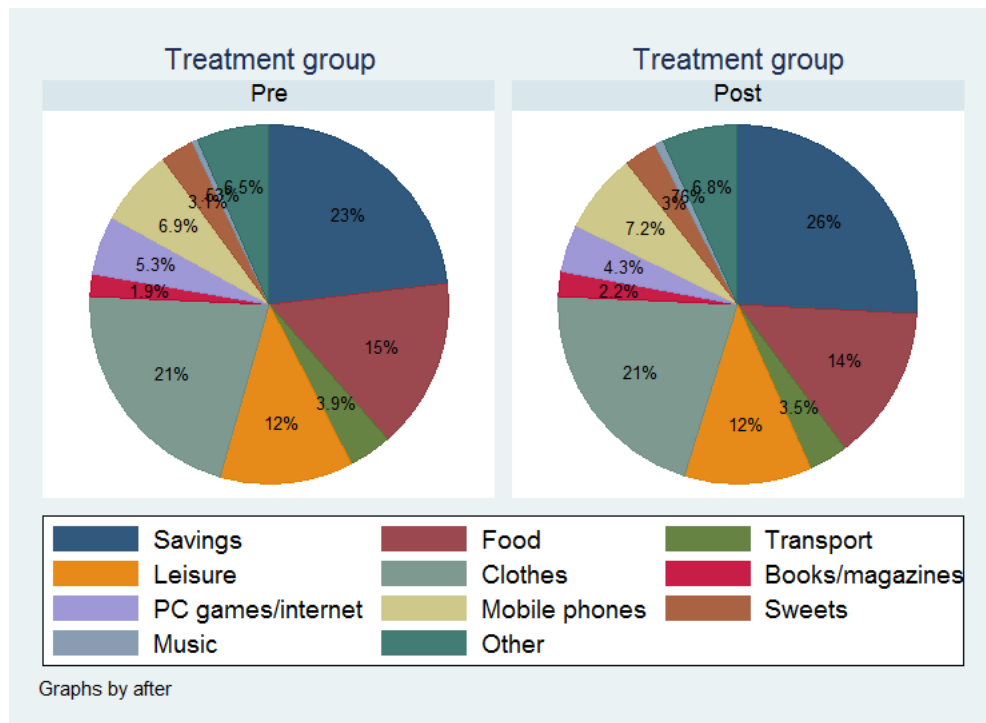


Table 16: Effects of financial literacy training on teenagers' hypothetical savings

	DiD	Savings DIFF	DIFF	DiD	DIFF	DIFF	DIFF	DiD	Savings DIFF	DIFF	DIFF	DIFF	DiD	In(savings share) DIFF	DIFF
Treatment	2.178			0.260				0.015					0.015		
*Post	(0.59)			(1.22)				(0.41)					(0.56)		
Post	1.307		2.313	-0.077		0.164	0.111	0.020		0.031	0.025		0.010	0.023	0.017
Treatment	(0.38)	(2.32)**	(1.90)*	(0.42)	(1.79)*	(1.79)*	(1.24)	(0.61)	(2.50)**	(2.14)**			(0.42)	(2.43)**	(1.99)*
	-4.033			-0.220				-0.037					-0.027		
	(1.59)			(1.30)				(1.54)					(1.52)		
Girl	-4.340	-3.697	-2.790	-0.057	-0.034	-0.034	-0.004	-0.042	-0.036	-0.028	-0.028	-0.028	-0.028	-0.024	-0.018
	(2.86)***	(2.48)**	(1.69)	(0.53)	(0.29)	(0.29)	(0.03)	(2.68)**	(2.33)**	(1.62)	(1.62)	(1.62)	(2.31)**	(1.95)*	(1.31)
Low math	-1.942	-2.060	-2.999	-0.212	-0.214	-0.214	-0.243	-0.020	-0.021	-0.029	-0.029	-0.029	-0.016	-0.017	-0.023
score	(1.00)	(1.02)	(1.45)	(1.94)*	(1.87)*	(1.87)*	(2.06)**	(1.05)	(1.03)	(1.44)	(1.44)	(1.44)	(1.17)	(1.16)	(1.57)
Low cognition	-0.685	-0.926	-1.319	-0.042	-0.081	-0.081	-0.130	-0.005	-0.008	-0.012	-0.012	-0.012	-0.005	-0.006	-0.010
	(0.43)	(0.54)	(0.74)	(0.43)	(0.72)	(0.72)	(1.14)	(0.33)	(0.44)	(0.67)	(0.67)	(0.67)	(0.38)	(0.49)	(0.75)
11-25 books	-0.128	1.520	1.852	0.256	0.306	0.306	0.330	-0.006	0.014	0.017	0.017	0.017	0.000	0.014	0.016
	(0.05)	(0.61)	(0.66)	(1.76)*	(1.97)*	(1.97)*	(2.02)*	(0.20)	(0.59)	(0.62)	(0.62)	(0.62)	(0.02)	(0.76)	(0.80)
26-100 books	-1.021	0.174	0.428	0.155	0.148	0.148	0.194	-0.011	0.001	0.003	0.003	0.003	-0.004	0.003	0.005
	(0.35)	(0.07)	(0.14)	(1.19)	(1.22)	(1.22)	(1.35)	(0.39)	(0.04)	(0.10)	(0.10)	(0.10)	(0.20)	(0.16)	(0.23)
101-200 books	5.326	7.209	8.282	0.508	0.542	0.542	0.579	0.053	0.073	0.082	0.082	0.082	0.044	0.057	0.064
	(1.61)	(2.60)**	(2.71)**	(3.66)***	(4.67)***	(4.67)***	(4.17)***	(1.60)	(2.70)**	(2.78)**	(2.78)**	(2.78)**	0.044	0.057	0.064
201+ books	4.787	4.991	5.907	0.404	0.299	0.299	0.361	0.045	0.048	0.057	0.057	0.057	0.036	0.035	0.042
	(1.28)	(1.47)	(1.61)	(2.08)**	(1.59)	(1.59)	(1.80)*	(1.23)	(1.47)	(1.62)	(1.62)	(1.62)	(1.34)	(1.46)	(1.62)
German	2.532	1.597	1.064	0.079	0.022	0.022	-0.009	0.023	0.015	0.010	0.010	0.010	0.017	0.011	0.007
	(1.12)	(0.64)	(0.43)	(0.71)	(0.18)	(0.18)	(0.08)	(1.04)	(0.62)	(0.42)	(0.42)	(0.42)	(1.05)	(0.61)	(0.40)
Single	-1.057	-1.116	-1.778	-0.115	-0.119	-0.119	-0.169	-0.011	-0.013	-0.020	-0.020	-0.020	-0.009	-0.011	-0.016
parent	(0.48)	(0.46)	(0.68)	(0.88)	(0.80)	(0.80)	(1.07)	(0.49)	(0.53)	(0.77)	(0.77)	(0.77)	(0.57)	(0.57)	(0.81)
In( <i>hsize</i> )	-2.463	-1.976	-1.622	-0.156	-0.135	-0.135	-0.107	-0.023	-0.019	-0.016	-0.016	-0.016	-0.018	-0.016	-0.013
	(1.50)	(1.16)	(0.90)	(1.52)	(1.21)	(1.21)	(0.91)	(1.41)	(1.10)	(0.84)	(0.84)	(0.84)	(1.48)	(1.19)	(0.90)
School grade	-2.753	0.858	1.022	-0.179	0.033	0.033	-0.153	-0.029	0.007	-0.105	-0.105	-0.105	-0.021	0.005	-0.076
	(1.24)	(0.35)	(0.62)	(1.25)	(0.18)	(0.18)	(1.54)	(1.33)	(0.28)	(8.16)***	(8.16)***	(8.16)***	(1.29)	(0.29)	(7.95)***
Class size	0.370	0.918		0.027	0.058	0.058		0.004	0.009				0.003	0.007	
	(1.77)*	(3.41)***		(1.93)*	(2.84)***	(2.84)***		(1.76)*	(3.29)***				(1.91)*	(3.27)***	
Constant	25.118	3.861	21.134	2.176	1.068	1.068	2.397	0.252	0.047	0.325	0.325	0.325	0.196	0.045	0.255
	(3.58)***	(0.59)	(6.01)***	(5.83)***	(2.02)*	(2.02)*	(10.98)***	(3.70)***	(0.71)	(10.98)***	(10.98)***	(10.98)***	(4.03)***	(0.87)	(11.73)***
FE-level	state	state	class	state	state	state	class	state	state	class	class	class	state	state	class
School& class	Y	Y		Y	Y	Y		Y	Y				Y	Y	
controls															
Observations	1278	1008	1032	1278	1008	1008	1032	1277	1007	1031	1031	1031	1277	1007	1031
R-squared	0.06	0.07	0.11	0.05	0.07	0.07	0.12	0.06	0.08	0.11	0.11	0.11	0.06	0.08	0.11

## Appendix A: Summary statistics

This appendix summarizes all variables measured in the baseline survey.

Table 17: Survey date and location measures, baseline survey

Variable	Obs	Mean	Std. Dev.	Min	Max
<b>Survey date</b>					
Date of interview	722	17.271	8.807	2	29
Month of interview	750	6.056	0.544	5	7
<b>School &amp; class characteristics</b>					
School type	760	4.395	2.449	1	7
Grade <sup>a</sup>	768	0.462	0.499	0	1
Bundesland (state)	768	3.488	2.013	1	7
School	751	10.463	5.123	1	21
City	768	9.503	4.845	1	17
Class	733	24.598	15.351	1	53

Note: <sup>a</sup> Our survey was conducted in grades 7 (coded as 0 here) or 8 (=1)

Table 18: Measures of self-rated and actual financial literacy and financial interest and shopping behavior, baseline survey

Variable	Obs	Mean	Std. Dev.	Min	Max
Financial Interest (Likert scale 1-5)	757	2.729	0.980	1	5
Proportion with low financial interest (1 and 2 on Likert scale)	768	0.378	0.485	0	1
Financial Knowledge (Likert scale 1-5)	760	2.754	0.988	1	5
Proportion with low financial knowledge (1 and 2 on Likert scale)	768	0.378	0.485	0	1
ADV1 "Advertising is informative" (Likert scale 1-5)	757	2.919	1.205	1	5
Proportion thinking advertising is informative (4 and 5 on Likert scale)	768	0.302	0.459	0	1
ADV2 "Advertisers want to sell products" (Likert scale 1-5)	760	3.901	1.269	1	5
Proportion thinking advertising does not aim to sell (1 and 2 on Likert scale)	768	0.164	0.371	0	1
ADV3 "Advertising shows what I need" (Likert scale 1-5)	764	2.321	1.252	1	5
Proportion thinking advertising shows my needs (4 and 5 on Likert scale)	768	0.171	0.376	0	1
Phone1 "When buying a smartphone, I incur costs once" (Likert scale 1-5)	754	2.789	1.355	1	5
Proportion disagreeing with one-time costs statement (1 and 2 on Likert scale)	768	0.396	0.489	0	1
Phone2 "When buying a smartphone, I incur repeated costs as long as I use it" (Likert scale 1-5)	756	3.431	1.382	1	5
Proportion disagreeing with repeated cost statement (1 and 2 on Likert scale)	768	0.255	0.436	0	1
Risk assessment correct (Correct choice of the least risky of 3 assets)	688	0.781	0.414	0	1
"Call money is the least risky asset"	688	0.783	0.412	0	1
"Housing is the least risky asset"	688	0.154	0.361	0	1
"Shares are the least risky assets"	687	0.064	0.245	0	1
<b>Shopping behavior</b>					
Frequent impulse buyer (Likert scale 1-5)	761	3.338	1.192	1	5
Proportion buying frequently on impulse (4 and 5 on Likert scale)	768	0.475	0.500	0	1

Table 19: Measures of students' income and income sources, baseline survey

Variable	Obs	Mean	Std. Dev.	Min	Max
<b>Earnings</b>					
Proportion with a paid job	249	0.618	0.487	0	1
Earnings <sup>a</sup>	247	44.326	73.815	0	400
Earnings if have job <sup>a</sup>	152	72.030	82.873	1	400
<b>Pocket money</b>					
Proportion receiving pocket money	761	0.796	0.403	0	1
Amount of pocket money (4 weeks) <sup>a</sup>	736	33.228	36.109	0	200
Amount of pocket money (weekly) <sup>a</sup>	736	8.307	9.027	0	50
Amount of pocket money if receive pocket money <sup>a</sup>	581	10.523	8.939	1.25	50
<b>Monetary presents</b>					
Proportion who were given money as a present (last 4 weeks)	768	0.810	0.393	0	1
Amount of monetary present <sup>a</sup>	750	54.847	102.833	0	700
Amount of monetary present if received present <sup>a</sup>	604	68.104	110.591	0.5	700
<b>Borrowing</b>					
Proportion who borrowed money (last 4 weeks)	768	0.246	0.431	0	1
Amount of money borrowed <sup>a</sup>	759	2.106	6.669	0	50
Amount of money borrowed if borrowed <sup>a</sup>	180	8.881944	11.30465	0.2	50
<b>Other income</b>					
Proportion with other sources of income	730	0.311	0.463	0	1
Amount of other income <sup>a</sup>	714	8.663	20.008	0	155
Amount of other income if have other income <sup>a</sup>	210	29.455	27.393	0.01	155
<b>Overall income</b>					
Total income <sup>a</sup>	753	124.729	170.537	0	1080
<b>Overall expenditure</b>					
Expenses <sup>a</sup>	685	31.394	40.310	0	230

Note: <sup>a</sup> These variables are trimmed at the top by 1% to avoid outliers caused by obvious non-sensical answers



Table 20: Measures of expenditure, debt, savings, making ends meet and financial management, baseline survey

Variable	Obs	Mean	Std. Dev.	Min	Max
<b>Debt</b>					
Proportion with current debt	765	0.127	0.333	0	1
Amount of debt (1% trimmed)	754	0.958	4.412	0	45
Amount of debt (1% trimmed), if indebted	83	8.701	10.516	0.2	45
<b>Savings</b>					
Proportion of savers (last 4 weeks)	755	0.581	0.494	0	1
Amount of savings (1% trimmed)	713	35.570	68.761	0	420
Amount of savings (1% trimmed) if saved	398	63.722	81.738	0.5	420
<b>Savings motives: Proportion ....</b>					
Saving for specific purchase	756	0.556	0.497	0	1
Saving for emergencies	756	0.368	0.483	0	1
Saving for future	756	0.483	0.500	0	1
Not saving	755	0.142	0.349	0	1
<b>Making ends meet</b>					
Proportion with money left (last week)	744	0.601	0.490	0	1
Proportion making ends meet exactly (Last week)	744	0.224	0.418	0	1
Proportion short of money (last week)	742	0.160	0.367	0	1
<b>Coping with money shortfall</b>					
Broke: borrow	257	0.152	0.359	0	1
Broke: nothing spent	257	0.654	0.477	0	1
Broke: use savings	257	0.179	0.384	0	1
<b>Financial management</b>					
Proportion with a bank account	760	0.655	0.476	0	1
Proportion with permission to withdraw money independently	693	0.413	0.493	0	1

Table 21: Students' individual characteristics and family background, baseline survey

<b>Variable</b>	<b>Obs</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<b>Individual characteristics &amp; Family background</b>					
Month of birth	761	6.503	3.220	1	12
Year of birth	756	1997.589	1.015	1994	1999
Age	758	13.817	1.067	12	19
Gender (1=Male)	768	0.484	0.500	0	1
Living with mother	753	0.948	0.222	0	1
Living with father	753	0.778	0.416	0	1
Proportion with siblings	750	0.784	0.412	0	1
Number of siblings	753	1.267	1.075	0	8
Proportion with other hh members	753	0.104	0.305	0	1
Number of other hh members	753	0.205	0.783	0	9
Household size	756	3.194	1.427	1	12
Living with single parent	756	0.224	0.417	0	1
Speak German at home	767	0.799	0.401	0	1
0-10 books	756	0.205	0.404	0	1
11-25 books	756	0.250	0.433	0	1
26-100 books	755	0.278	0.448	0	1
101-200 books	754	0.139	0.346	0	1
201-500 books	750	0.080	0.271	0	1
500+ books	754	0.048	0.213	0	1
Books category	760	2.780	1.387	1	6
Proportion with fewer than 100 books	768	0.725	0.447	0	1

Table 22: Numeracy and cognition, baseline survey

<b>Variable</b>	<b>Obs</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<b>Cognitive ability &amp; numeracy</b>					
Math grade (scale from 1 -6 with 1 =best grade)	734	3.116	0.965	1	6
Low math grade (4,5 or 6)	768	0.322	0.467	0	1
Low cognition score (less than or equal to 50% correct)	768	0.602	0.490	0	1
Proportion of correctly answered cognition questions	637	0.460	0.269	0	1
Proportion answering 1st question correctly	705	0.688	0.464	0	1
Proportion answering 2nd question correctly	691	0.638	0.481	0	1
Proportion answering 3rd question correctly	669	0.410	0.492	0	1
Proportion answering 4th question correctly	671	0.095	0.294	0	1

Table 23: Hypothetical consumption-savings choice: Average allocation of 100 Euros across items, baseline survey

Variable	Obs	Mean	Std. Dev.	Min	Max
<b>Hypothetical question</b>					
Proportion allocating the entire sum	757	0.762	0.426	0	1
Savings	756	21.245	23.273	0	100
Food & Drinks	747	14.574	13.421	0	50
Transport	744	3.509	5.224	0	21
Leisure	742	10.827	9.145	0	40
Clothes, shoes and makeup	746	19.353	17.517	0	70
Books and magazines	749	1.979	3.819	0	20
PC games & Internet	744	5.022	8.745	0	40
Mobile Phones	747	6.416	7.699	0	30
Sweets	748	2.911	3.560	0	15
Music and music downloads	742	0.527	1.880	0	10
Other Expenses	741	5.491	8.301	0	40