

Winter, Joachim; Lührmann, Melanie; Serra Garcia, Marta

## Conference Paper

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# The effects of financial literacy training: Evidence from a field experiment in German high schools\*

Melanie Lührmann<sup>†</sup>, Marta Serra-Garcia<sup>‡</sup> and Joachim Winter<sup>§</sup>

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## Abstract

We report the results of a field experiment evaluating the impact of financial literacy training on teenagers between 14 and 16 years in German high schools. After the training, treated teenagers exhibit a significant increase in both interest in financial matters and self-assessed knowledge relative to the control group. We also find a strong decrease in the prevalence of impulse purchases after the training, suggesting that teenagers become more sovereign consumers. Our data reveals strong gender differences in financial matters already before adulthood: Girls show less interest in and self-assessed knowledge about financial matters, and are less likely to save.

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<sup>†</sup>Institute for Fiscal Studies, London; Royal Holloway, University of London; and Munich Center for the Economics of Aging. E-mail: melanie.luhrmann@rhul.ac.uk

<sup>‡</sup>University of Munich. E-mail: Marta.SerraGarcia@lmu.de

<sup>§</sup>University of Munich and Munich Center for the Economics of Aging (MEA). Corresponding author. E-mail: winter@lmu.de

# 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. While these concerns have been raised for decades (see Skinner, 2007, and Engen, Gale and Scholz, 1996, among others), the focus of research has more recently shifted from the optimal saving decisions of rational households to an analysis of households' actual decision processes and their limitations. Studies that document poor decision-making now abound. For example, empirical studies show that individuals constantly pay overdraft fees on their credit cards (Stango and Zinman, 2009a); they seem to be taken advantage off by mortgage brokers when they choose a mortgage (Woodward and Hall, 2011), and a large portion of individuals feel overburdened with debt (e.g., Lusardi and Tufano, 2009).

One explanation for inadequate financial decisions is the lack of financial knowledge. Lusardi et al. (2010) find that “fewer than one-third of young adults possess basic knowledge of interest rates, inflation and risk diversification”. Literacy levels are particularly low among younger adults and persist over time (see also Lusardi and Mitchell 2008, 2011). In a review of the empirical literature on household finance, Campbell (2006) concludes that poorer and less well educated households are particularly prone to making significant financial mistakes (measured in the dimensions participation, diversification, and mortgage refinancing). Given the concern that many individuals lack the ability to make solid financial decisions, Lusardi and Mitchell (2007a, b), Stango and Zinman (2009b), and Hastings et al. (2012) call for systematic efforts to increase financial literacy. While several policy interventions aimed at increasing financial literacy have been proposed and implemented, there is to date little evidence on whether and how financial literacy increases through training. There is even less causal evidence on the link between financial literacy and savings and retirement planning behavior (see Hastings et al., 2012, for a review).

In this paper, we assess the impact of financial training on financial literacy and financial decision-making among German high school teenagers, with a particular focus on teenagers who come, on average, from families of low socio-economic status (SES). We study financial literacy training for teenagers rather than adults for three reasons: First, cognitive abilities

peak in young adulthood so that learning efficiency is likely to be highest at younger ages (Heckman, 2006). Second, wealth accumulation and financial provision for old age depend crucially on financial decisions made in early adulthood, e.g., due to interest compounding. Third, keeping program scalability in perspective, integration of financial education into the school curriculum is well-suited to increase its coverage and outreach across all population groups as attendance is mandatory (Hastings et al. 2012).

We target schools with teenagers from low-SES families since recent studies show that deficiencies in financial literacy are particularly concentrated in these low-SES strata of the population (e.g., Lusardi and Mitchell, 2008; Jappelli, 2010).

Our paper is among the first to assess the impact of a financial literacy training on high school teenagers. To the best of our knowledge, the only completed experimental study addressing teenagers is documented in Bechetti et al. (2011) and Becchetti and Pisani (2012).<sup>1</sup> In that study, 17 to 19 year-old high school students in major Italian cities are treated with a 16-hour course on finance which lasts three months. Both papers find a positive effect in students' financial literacy. Becchetti et al. (2011), however, find that both treatment and control group in Italian high schools exhibit a "survey effect", i.e. that students learn about finance in repeated surveys.<sup>2</sup> Once they use a difference-in-differences approach, they do not find a treatment effect of the training module. Although much shorter and delivered to younger teenagers, we find sizeable treatment effects of the training that we evaluate (also using a differences-in-differences approach).

Existing field experiments on financial literacy have otherwise focused on teaching adults (e.g., Bayer et al., 2009, Cole et al., 2011, and Carpena et al., 2011) or small entrepreneurs (e.g., Drexler et al., 2010, and Karlan and Valdivia, 2010) in developing countries. These studies show mixed results. Cole et al. (2011) and Carpena et al. (2011) find weak effects of financial literacy training provided in India and Indonesia. In the context of remittances, Gibson et al. (2012) conclude that training reduces the risk of switching to costlier remit-

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<sup>1</sup>Non-randomized 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. Also, 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.

<sup>2</sup>This may result partially from the multiple choice nature of a large fraction of literacy questions.

tance products, but does not affect the level or frequency of remittances. Focusing on entrepreneurs, Karlan and Valdivia (2010) in Peru and Bruhn and Zia (2011) in Bosnia and Herzegovina do not find an increase in profits, but changes in some dimensions of behavior such as record-keeping, business practices or investment. Drexler et al. (2010) show that the type of training offered is important: a simple rules-of-thumb training is more effective than a more complex financial accounting training, offered to microfinance clients in the Dominican Republic.<sup>3</sup>

In contrast to these mixed results, the important role of financial literacy in increasing net wealth is highlighted in many studies (see, for example, Banks and Oldfield 2007 and 2010; Bozio et al. 2011; Jappelli and Padula, 2011; van Rooij et al. 2012). They use instrumental variables techniques to circumvent an important endogeneity problem: While on the one hand financial literacy may increase the quality of investment and other financial choices, the decision whether and how much (time and money) to invest in the acquisition of financial literacy may depend on the current and future financial situation. Our experimental setup exogenously increases financial literacy in the treatment group, enabling us to identify a causal effect of financial literacy on financial choices.

We study an intervention that consists of three short training modules, provided typically within a week, to high-school students aged 14 to 16 by a non-profit organization in Germany. The training modules which focus on shopping, planning, and saving. Their main aim is to provide students with knowledge about the importance of planning expenses, reflecting between fixed and running costs when they purchase a product, such as a smartphone, as well as the trade-offs between risk, return and liquidity that characterize savings products. It is important to note that the aim of the training is not to increase savings of teenagers per se. Rather, its aim is to show students the importance of financial planning, and to acquaint them with various financial markets products which correspond to different needs. The training provider has wide expertise in providing such training to teenagers, having taught more than 35,000 students in the two years of its operation. Each of training module

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<sup>3</sup>In the US, Duflo and Saez (2003) find a small effect of incentivised benefits information sessions on tax deferred savings plan enrolment which extends to the peers of people who attended the training and thus point to spill-over 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%.

was taught in class, for 90 minutes, by “finance coaches”. Finance coaches are professionals from partner companies who volunteer to teach teenagers in high schools.

For the field experiment, the organization contacted teachers of classes that had not 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 which received no training. We observe both the treatment and control group before and after the training units are provided, or at two similar points in time, if in the control group. The baseline survey was filled in before any training took place, the follow-up survey approximately three weeks later. In the meantime, the treatment group received the training. We conducted over 1400 surveys in 49 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 choices between differently risky assets. If financial training is effective, we would expect students’ interest and knowledge about financial matters to increase with the training. Our survey also includes 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 pose a hypothetical consumption-savings choice and asked about shopping behavior, 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 a task that measures cognitive abilities.

Our main results are the following: Before receiving any training, teenager’s interest in financial matters is low: more than 38% of students have no interest in 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.

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 16% to about 31% in the treatment group, while it does not change much in the control group. Across different specifications, the increase in interest, by 12 to 20%, is strongly statistically significant. We obtain a similar result for self-assessed financial knowledge, which increases by 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 increase sales.

Interestingly, we observe a significant change in attitudes. The likelihood that a student identifies herself as an impulse buyer decreases with the training. This is important as one of the main aims of the training is to make teenagers more sovereign consumers: resist temptation when facing an attractive product, such as an expensive smartphone, and think about whether they have sufficient regular income, such as pocket money, to cover its running costs. 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.

Our results also reveal interesting heterogeneity in behavior within the sample. We find a deep-rooted, strong gender bias already at the age of 14 to 16. It is present in all dimensions of financial matters: financial knowledge, motivation, *and* behavior. Girls are less likely to be interested in financial matters to start with, and their self-assessed knowledge is also lower. The latter may be partly explained by boys' overconfidence (as shown by adults, e.g. Barber and Odean, 2001). 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. Similar gender differences have been found, especially for financial literacy, among adults (e.g., Lusardi and Mitchell, 2008, Almenberg and Dreber, 2012, Bucher-Koenen et al., 2012). The fact that we find them already at such young ages suggests that other factors than gender biases specific

to adults (e.g., differential responsibility for managing household finances or women having lower financial stakes due to the gender wage gap) must be at play as well.

Student’s math grades, which we use 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.

The remainder of this paper is structured as follows. We describe the context of the study, the training units offered by the financial literacy training provider and the design of the field experiment in Section 2. Section 3 presents the results, and Section 4 concludes.

## 2 Context and experimental design

### 2.1 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>4</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 14 to 16.

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’

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<sup>4</sup>Overall, the provider has reached around 150,000 students through these various channels.



own social environment. It aims to increase student’s knowledge about when and how advertising reaches them. The Planning module asks students to reflect on the future 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 risk, return and liquidity 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.<sup>5</sup>

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 degree (*Gymnasium*). The school system has three tracks and separates children by ability at the age of 10.<sup>6</sup> The financial training provider concentrates training in the two lower streams of German high schools.<sup>7</sup> All participating students in our experiment belong to these schools.<sup>8</sup>

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

## 2.2 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,

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<sup>5</sup>We provide a more detailed summary of the content of the detailed summary of the content of each training module and how the questions in our survey relate to these in the Supplementary Material for the referees.

<sup>6</sup>There is an extensive discussion about the consequences of such “early tracking”, but this is not the focus of the present study where we take the allocation of children to the three tracks as given.

<sup>7</sup>These streams comprise schools in which students pursue vocational training (*Hauptschule*, *Sekundarschule*, *Mittelschule*), or combine both vocational training with the option of accessing university later on (*Realschule*, *Gesamtschule*, *Werkrealschule*).

<sup>8</sup>Dustmann (2004) shows that there is a strong correlation between parents’ education as well as occupational status with their children’s stream choice; moreover, children in the lower streams also end up having lower income and occupational outcomes as adults.

the three training modules were delivered. The training modules were mostly provided within one week. One to four 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. Their training was postponed until after the end of the experiment, so no expert visited the class between surveys. Between one to four weeks later, the students filled in the follow-up survey.

The survey contained questions about financial knowledge, behavior and socio-economic characteristics.<sup>9</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 risk of different financial products (related to the Saving module). These questions were not taken directly from the training content, but adapted to similar situations to examine whether their newly acquired financial knowledge had transferred to broader domains. 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>10</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 the timing. Then, a list of interested teachers is compiled and experts and classes are matched according to capacity and time constraints. Experts always visit classes in pairs and offer the training to classes of 20 to 30

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<sup>9</sup>The survey questions are presented in the Supplementary Materials for the referees.

<sup>10</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.

students.

For our experiment, the organization contacted the teachers on their list. 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 host the three training 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 did not allow for training to be scheduled before the summer holidays, teachers were 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. Furthermore, we use the information from baseline and follow-up survey for both groups to additionally estimate training effects with a difference-in-differences approach (DiD) for two reasons: first, to show the robustness of our results as the approach allows us to control for any potential differences in the treatment and control groups ex-ante, and secondly, to filter out potential survey effects, which were found to be significant in Becchetti et al. (2011).

The surveys were conducted by the teachers and sent back directly to us via mail. Teachers were also asked to fill in a short survey eliciting class size and some other class characteristics, and any comments on or problems with the survey.<sup>11</sup> Overall, response rates within participating classes are high, with an average 85% – 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. 27 classes in the treatment group and 11 in the control

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<sup>11</sup>We received no report of problematic occurrences during the survey.

group also filled in the follow-up survey. The total numbers of questionnaires by time period and treatment status are reported in Table 1.<sup>12</sup>

In the following, we first assess the financial motivation, self-assessed financial literacy, and financial knowledge in different areas – advertising attitudes, awareness of consumer electronics’ running costs and awareness of the risk structure of different assets, before the training. In the second part of our empirical analysis, we evaluate whether the training affects the financial motivation, self-assessed financial literacy, and financial knowledge of students. We then examine whether the training changes their consumption decisions and the managing of their finances regarding debt, savings and the ability to make ends meet, as increased knowledge through the training could (a) help them manage their money better, e.g., reduce debt or increase their ability to make ends meet, and (b) motivate them to save more. Given the limited time between the baseline and follow-up survey in our experiment and the limited financial capability of students, it may be difficult to observe a significant change in behavior. Hence, we expect to be able to identify training effects predominantly in terms of financial knowledge and interest. Any training effects we observe on financial behavior are likely to be lower bounds on the potential training effect. The variables that will be used throughout this Section are defined in Table 2. In Appendix A, we present complete regression tables, including all control variables. In Appendix B, we present summary statistics of all variables measured in the baseline survey.

## 3 Results

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

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 include financial literacy and numeracy modules in its 2012 edition. However, numerous countries, e.g., Germany, are not participating in

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<sup>12</sup>The questionnaires of 6 control-group classes (127 observations) were sent back without indication whether the survey was a baseline or follow-up survey and are thus excluded from our empirical analysis.

this extension. We provide the 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. Thus, we start with the analysis of 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:

$$y_i = \alpha + \sum_k \beta_k * z_{ki} + \sum_j \beta_j * x_{ji} + \gamma * T_i + \epsilon_i \quad (1)$$

where outcome  $y$  of student  $i$  in the baseline survey depends on a set of  $k$  individual characteristics  $z$ , school and class characteristics  $x$ . We also include a dummy for the treatment  $T_i$  to control for possible differences between treatment and control group 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 for a low math grade<sup>13</sup> in the past term (numeracy) and for low cognitive score (if the student correctly answered 50% of the cognition questions).<sup>14</sup> The school and class characteristics  $x_j$  include the school grade (a dummy which is 1 if the student is in 8th grade, 0 if in 7th grade), class size, school type dummies and state (*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)

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<sup>13</sup>We define a low math grade as 4 or worse in the German grade scale ranging from 1 (best) to 6 (worst) where 5 and 6 denote fails. Robustness checks with a cutoff at grade 3 yields similar results.

<sup>14</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.

–, 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). 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 females 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).

Existing studies have found that numeracy and cognitive skills are related to financial knowledge and behavior (e.g., Banks and Oldfield, 2007, Cole et al., 2011). Hence, we examine whether numeracy, measured by student’s math grade, and cognitive abilities, measured through a battery of four questions taken from Raven’s Standard Progressive Matrices, relate to teenagers’ responses in the baseline survey.<sup>15</sup> 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 con-

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<sup>15</sup>The role of other individual characteristics, such as socio-economic status or migrant background is reported in Appendix B.

trast 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.

Importantly, we rarely observe differences in the baseline financial knowledge and behavioral measures between treatment and control group, suggesting that there is little unobserved heterogeneity between the treatment and control group.<sup>16</sup> Statistical tests for pre-experimental differences between the two groups in our outcome measures also reject the hypothesis of equal means only infrequently.<sup>17</sup> To highlight the robustness of our results with respect to any pre-treatment differences between the groups, we will present behavioral differences before and after the training among the treated teenagers only as well as differences-in-differences estimates.

### 3.2 The effects of financial literacy training

To measure the effects of financial literacy training, we estimate our empirical model in two 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. 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 3.1, 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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<sup>16</sup>Treatment and control group are also similar in terms of their other observed characteristics: 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 has a slightly higher fraction of students who speak German at home and somewhat lower math grades. In terms of school characteristics, control and treatment group do not differ systematically in their class year (7th or 8th graders). We do find differences in their school characteristics, e.g., the *Bundesland* (state) and class size that we control for throughout our analysis.

<sup>17</sup>Results are available from the authors upon request.

The validity of these DiD estimates hinges on reliable measurement of the control group’s behavior. Our control group is relatively small with 280 observations compared to 1126 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 within the treatment group, but add class-level fixed effects to filter out any class- or school-level heterogeneity. We cluster standard errors at the class-level in all specifications estimated in the following.

### 3.2.1 Financial interest and self-assessed knowledge

Motivation plays an important role in the learning behavior of teenagers. Hence, we first asked kids about their motivation to engage with financial topics, rated 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 teenagers show no interest in financial questions. Columns 1 and 2 in 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, so that ca. 30% of teenagers 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 (Table 6). The point estimates are with 0.33 lower in the difference estimates (column 2) compared to the difference-in-difference estimates of about 0.57. Overall, this corresponds to a 12 to 20% increase in interest in finance through the training. We find no evidence that girls are affected by the training any differently from boys<sup>18</sup>, but they start from a much lower level, so that the lower interest in finance among girls documented for the baseline survey persists after the training.

This strong training effect on students’ interest in financial matters may be due to two factors: (a) that students’ motivation to engage with financial topics and with their own finances increases, and (b) that the training provides them with a definition what financial

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<sup>18</sup>The estimation results for heterogeneous treatment effects are available from the authors upon request.



matters are. Since our survey question does not define the term financial matters precisely, we cannot disentangle the two channels. However, both represent positive training effects. The accumulation of financial literacy is not only enhanced by students' motivation to learn about finances. The first step towards financial literacy is the building of awareness in students that they make financial choices on a daily basis and do not view finances as an alien process that is dealt with by the financial sector.

Similar to financial interest, self-reported knowledge about financial matters before the experiment is low. About 38% of teenagers 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 teenagers 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 columns 3 and 4 of Table 6. Again, girls report to know substantially less about financial matters due to their lower baseline level, but in addition we find a weaker treatment effect among girls than boys.

### 3.2.2 Financial knowledge

Table 7 shows the results for two of our financial knowledge questions, advertising and mobile phone costs. These questions are tailored to the training content but require some ability to transfer the training content to new questions and real life examples; e.g., we switch the consumer durable in the question on running costs from the in-class example motorbikes to smartphones. The columns alternately show the estimation results of the DiD and the difference approach (labeled DIFF) using class fixed effects. We do not find evidence that awareness of the repeated costs incurred in mobile phone usage increased through the training (see columns 7 through 10).

Financial training increases the percentage of teenagers who think advertising is (somewhat or very) informative and shows needs in simple differences. In the DiD approach, we find no evidence of a statistically significant treatment effect (see columns 1 and 2 for infor-

mativeness and columns 5 and 6 for the statement “advertisement shows needs”). 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 for companies, one of the major functions of advertising is to increase 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%.

A more conclusive picture emerges when looking at the impact of the financial training on the awareness of asset-specific risk (see Table 8). 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 a mean increase in correct answers from 78 in the 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 because of the restrictions we faced in designing our questionnaire, we conclude that financial training among teenagers from lower stream German schools increases their financial knowledge, at least, in some dimensions.

### **3.2.3 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. We define impulse shoppers as those students who report that they agree much or very much with the following statement: “I often buy spontaneously

what I like to have .”<sup>19</sup> As Figure 3 shows, the fraction of impulse purchases among our sample is high. About 48% of teenagers report that they often make spontaneous, unplanned consumption decisions.

Impulse decisions, especially impulse purchases (Vohs and Faber, 2007), have been widely discussed in psychology and economics as a phenomenon of deviation from rational behaviour. They are the result of time-inconsistent preferences (Frederick et al., 2002), which are related to willpower depletion. Psychologists view the individual often in struggle between desire and restraint and find that the repeated exertion of effort leads to willpower depletion (for a survey of the economic literature, see Bucciol et al., 2010). Succumbing to temptation thus may result from lack of self-control which has been shown to be particularly prevalent among teenagers and decreasing in age (Mischel and Metzner 1962, Mischel and Mischel, 1983).

In our experiment, the propensity for frequent impulse purchases declines to about 40% after the financial training. When controlling for individual and class characteristics (see Table 9) 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. This large change is consistent with the hypothesis that willpower can be increased through training. Hoch und Lowenstein (1991) suggest that cognitive exercises help increase self-control and reduce such time-inconsistent choices. The shopping module in the training administered in our experiment is geared at increasing teenagers’ awareness of how they make consumption choices. Hence, the self-reported reduction of impulse purchases may be due to improved cognitive reflection that helps increase self-control and thus resisting to temptation.

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

Table 10 shows the estimates of the training effect on teenagers’ ability to make ends meet (columns 1 to 6) and their coping strategies when they run out of money (columns 7 to 12). In the baseline survey, about 60% of teenagers report to have money left at the end of a

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<sup>19</sup>Responses were given on a Likert scale from 1 (strongly disagree) to 5 (strongly agree), and our dummy variable is based on answers 4 or 5.

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. Columns 1 to 4 of Table 11 shows the estimation results for debt propensity and debt amount.

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. Columns 5 to 8 in Table 11 reports our estimates of treatment effects on the propensity to save, and the amount of savings in the last four weeks, measured in logs to avoid strong outliers<sup>20</sup>. Columns 9 to 14 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>21</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>22</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

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<sup>20</sup>We transform savings to log savings, i.e.  $s = \log(S + 1)$  where S are reported savings to incorporate observations with zero savings. We also tested log savings conditional on positive savings, i.e.  $s = \log(S)$  if  $S > 0$ , and did not find evidence of increased savings among savers. We do not include negative savings as debt is measured separately.

<sup>21</sup>Teenagers were allowed to report multiple savings motives, so that percentages do not add up to 100.

<sup>22</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.

have money left over at the end of the month and, unlike girls, they are also much more likely to be in financial distress. The characteristic that systematically increases the likelihood of running out of money is low numeracy. Basic mathematical skills seem to play an important role in budget planning.

### 3.2.5 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 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.<sup>23</sup>

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 12. Column (1) presents the difference-in-difference estimate, column (2) the difference estimate with class-level fixed effects for the treatment group. We find a significant increase in savings amounts and savings rates in the difference estimates<sup>24</sup> The effects are in the order of magnitude of a 2.5 to 3 percentage point increase in savings, representing roughly a 12 to 15% savings increase. However, the estimates for the DiD specifications are not significant, since the control group also increases its hypothetical savings.<sup>25</sup>

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<sup>23</sup>These categories are: Food & drinks, transport, leisure, clothes, shoes & cosmetics, magazines & books, computer games & internet, mobile phones, sweets, ringtones & music downloads and other.

<sup>24</sup>Since savings are bounded between zero and 100 here, we do not need the log transformation. We only consider positive savings as borrowing is not allowed in our savings-consumption allocation task.

<sup>25</sup>When we allow for heterogeneous treatment effects, we find evidence of higher savings increases among those of low socio-economic status following the training. This effect is statistically significant in all specifications and has an order of magnitude of 7 to 11%.

## 4 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 lower participation in stock markets. 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 dimensions of financial behavior?

Our field experiment reveals that financial education raises teenager’s interest and self-assessed financial knowledge significantly. This is an expected result, but not an unimportant one. Increasing the interest of teenagers in financial matters is not easy – the right media must be used. Further, their interest is a first basic step in increasing their literacy and engagement with financial matters in the future.

The financial literacy training also increases actual financial knowledge in several dimensions. Teenagers get better at identifying the riskiness of assets 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. This reveals that the knowledge transfer from the training was successful, at least in some dimensions.

Students’ behavior with respect to shopping also changes: they are less likely to define themselves as impulse buyers. Such a change in buying attitudes is important given concerns that teenagers may buy durables with considerable running costs without being aware of these costs. This could potentially lead to harmful spirals of debt. The fact that after the training units teenagers define themselves as less impulsive buyers offers a strong indication that their purchases are less likely to be product of lack of self-control and more the result of some deliberation.

A second dimension of behavioral change is elicited in a hypothetical allocation task of income to savings and consumption. Treated teenagers increase their savings in this task, but not significantly more than the control group. It would be interesting to explore in future studies whether financial literacy training leads to long-term behavioral changes in consumption and saving levels.

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. Girls show lower motivation in financial matters, a lower self-assessed knowledge, and are less likely to save. Yet we do not find evidence that girls and boys are differently affected by the training – with one exception that may be related to self-confidence: self-assessed knowledge increases less for girls than boys, though we find no differences in the treatment effect on their actual knowledge. 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 successful in raising teenagers' interest in financial matters and their subjective knowledge. It is also successful in changing their attitudes towards buying and hypothetical savings. These findings thus suggest that a 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

Figure 1: Interest in finance, by treatment and control

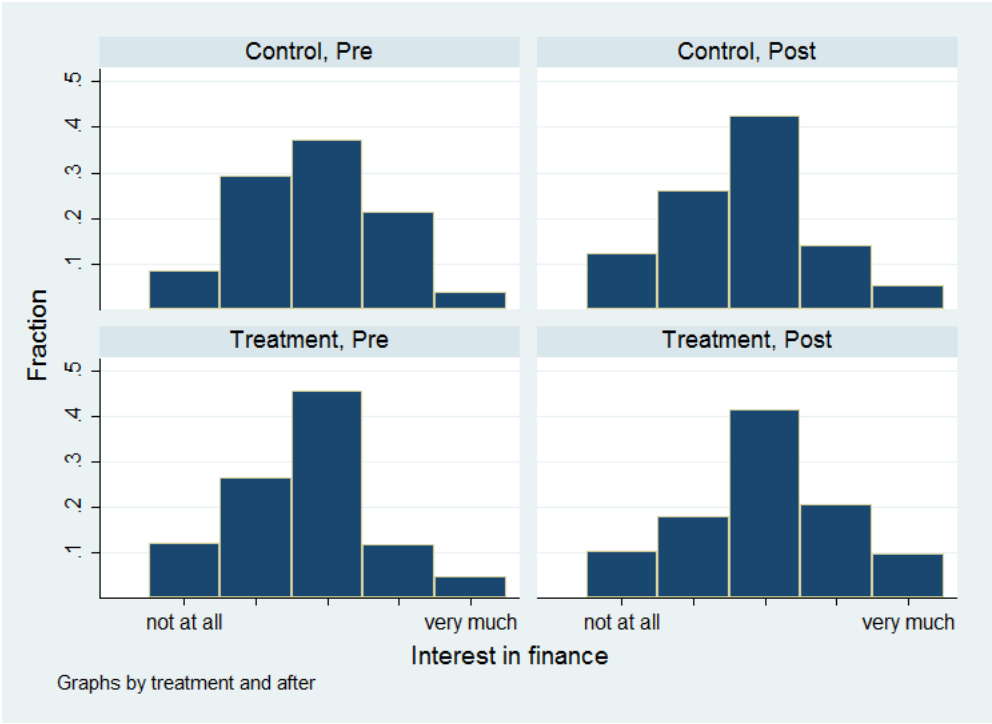


Figure 2: Self-assessed knowledge about finance, by treatment and control

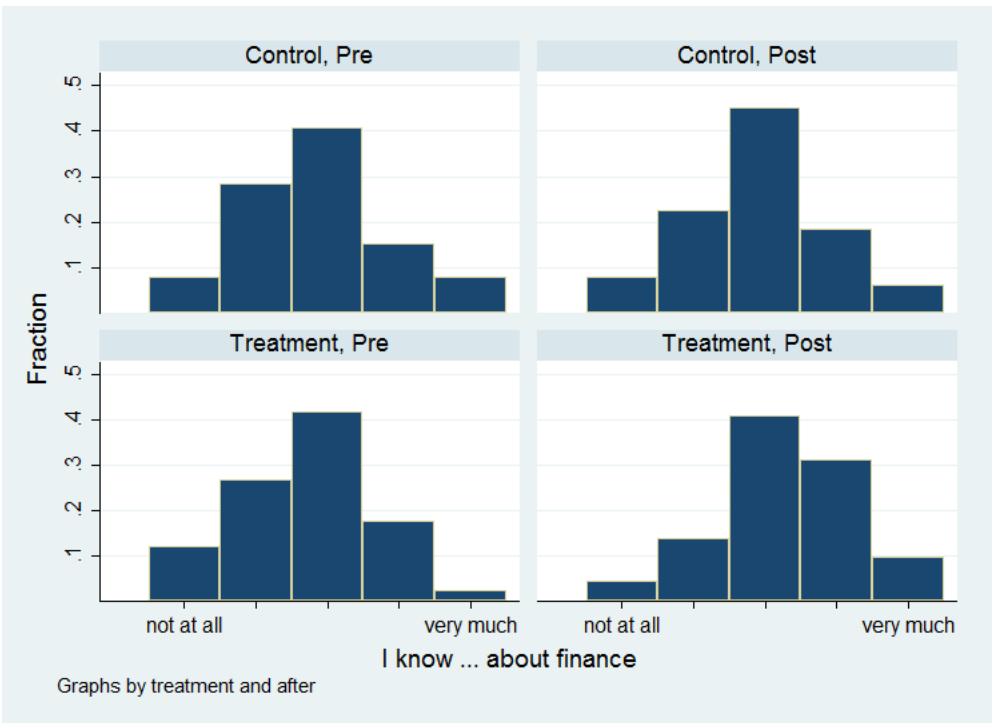


Figure 3: Shopping behavior – spontaneous versus planning, by treatment and control

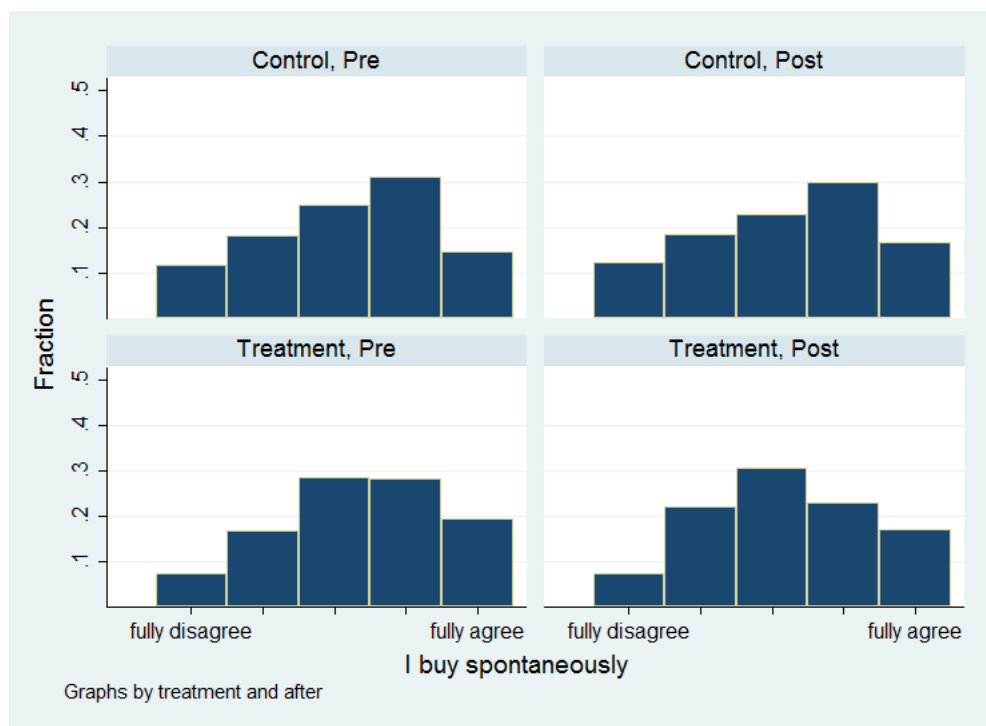


Figure 4: Hypothetical savings-consumption behavior, treatment group

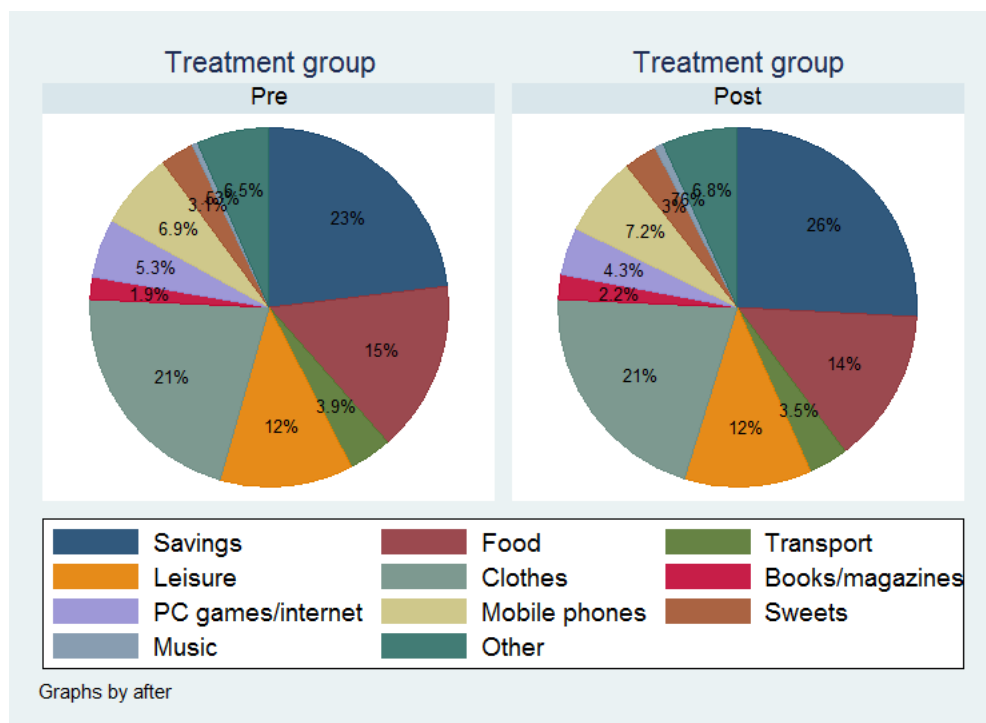


Table 1: Sample size by group and time period

	Treatment	Control	
Before training period (“pre”)	605	165	
After training period (“post”)	521	115	
Total	1126	280	1406

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 (CM)	Dummy, =1 if Call money is selected, =0 otherwise
Real estate (RE)	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 (1)	Knowledge (2)	Advertising attitude			Mobile costs		Risk assessment			
			ADV1 (3)	ADV2 (4)	ADV3 (5)	P1 (6)	P2 (7)	Correct (8)	CM (9)	RE (10)	Shares (11)
Girl	-0.268 (2.85)***	-0.396 (4.56)***	-0.038 (0.92)	-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)	-0.051 (1.47)	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)	0.096 (2.37)**	-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)
Treatment	-0.134 (1.35)	-0.130 (0.95)	0.008 (0.21)	-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)
Observations	707	708	716	716	716	705	707	644	644	644	643
R-squared	0.04	0.07	0.05	0.06	0.03	0.06	0.09	0.07	0.07	0.08	0.03

Note: Individual controls for gender, school grade, single parents, log of household size, German as main spoken language, number of books in the household (0-10,11-25,26-100,101-200,201-500,500+). OLS Standard errors are clustered at the class-level. T-statistics in parentheses and \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

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

	Savings			Savings motives			Debt		
	Y/N (1)	$\ln(Amount)$ (2)	$\ln(Amount) > 0$ (3)	to buy (4)	for emergency (5)	for future (6)	no saving (7)	Y/N (8)	$\ln(Amount)$ (9)
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)
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)
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

Note: Individual controls for gender, school grade, single parents, log of household size, German as main spoken language, number of books in the household (0-10,11-25,26-100,101-200,201-500,500+). OLS Standard errors are clustered at the class-level. T-statistics in parentheses and \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

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 (1)	BT2 (2)	money left (3)	just enough (4)	too little (5)	borrowed (6)	no spending (7)	use savings (8)
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)***
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)
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

Note: Individual controls for gender, school grade, single parents, log of household size, German as main spoken language, number of books in the household (0-10,11-25,26-100,101-200,201-500,500+). OLS Standard errors are clustered at the class-level. T-statistics in parentheses and \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table 6: Effects of financial literacy training on teenagers' interest in financial matters and self-assessed financial knowledge

	Interest in finance		I know ... about finance	
	DiD (1)	DIFF (2)	DiD (3)	DIFF (4)
Treatment*Post	0.572 (3.20)***		0.617 (3.20)***	
Post	-0.217 (1.37)	0.323 (3.40)***	-0.044 (0.27)	0.561 (5.67)***
Treatment	-0.203 (1.95)*		-0.200 (1.45)	
Girl	-0.283 (4.65)***	-0.307 (3.62)***	-0.300 (5.38)***	-0.279 (4.92)***
Low math score	-0.022 (0.24)	-0.029 (0.25)	-0.108 (1.25)	-0.052 (0.55)
Low cognition	-0.062 (0.88)	-0.059 (0.75)	0.048 (0.87)	-0.016 (0.30)
FE-level	state	class	state	class
School/class characteristics	Y		Y	
Observations	1289	1042	1290	1042
R-squared	0.06	0.13	0.10	0.20

Note: Individual controls for gender, school grade, single parents, log of household size, German as main spoken language, number of books in the household (0-10,11-25,26-100,101-200,201-500,500+). OLS Standard errors are clustered at the class-level. T-statistics in parentheses and \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table 7: 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 (1)	DIFF (2)	DiD (3)	DIFF (4)	DiD (5)	DIFF (6)	DiD (7)	DIFF (8)	DiD (9)	DIFF (10)
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)**
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

Note: Individual controls for gender, school grade, single parents, log of household size, German as main spoken language, number of books in the household (0-10,11-25,26-100,101-200,201-500,500+). OLS Standard errors are clustered at the class-level. T-statistics in parentheses and \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table 8: Effects of financial literacy training on teenagers' awareness of the risk structure of assets

	Correct choice		Call money		Real estate		Shares	
	DiD (1)	DIFF (2)	DiD (3)	DIFF (4)	DiD (5)	DIFF (6)	DiD (7)	DIFF (8)
Treatment*Post	0.116 (2.03)**		0.112 (1.96)*		-0.067 (1.36)		-0.048 (1.48)	
Post	-0.061 (1.29)	0.058 (1.71)*	-0.054 (1.12)	0.064 (1.92)**	0.007 (0.17)	-0.062 (2.05)**	0.055 (1.89)*	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)
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

Note: Individual controls for gender, school grade, single parents, log of household size, German as main spoken language, number of books in the household (0-10,11-25,26-100,101-200,201-500,500+). OLS Standard errors are clustered at the class-level. T-statistics in parentheses and \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table 9: Effects of financial literacy training on teenagers' purchase behavior

	Impulse buyer	
	DiD (1)	DIFF (2)
Treatment*Post	-0.102 (1.69)*	
Post	0.027 (0.49)	-0.062 (1.95)*
Treatment	-0.006 (0.11)	
Girl	0.012 (0.51)	-0.012 (0.39)
Low math score	0.048 (1.33)	0.065 (1.66)
Low cognition	0.021 (0.73)	0.029 (0.93)
FE-level	state	class
School/class characteristics	Y	
Observations	1303	1054
R-squared	0.03	0.07

Note: Individual controls for gender, school grade, single parents, log of household size, German as main spoken language, number of books in the household (0-10,11-25,26-100,101-200,201-500,500+). OLS Standard errors are clustered at the class-level. T-statistics in parentheses and \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 10: Effects of financial literacy training on teenagers' ability to make ends meet and coping strategies in financial distress

	I had money left		enough money		not enough money		borrow		no spending		use savings	
	DID (1)	DIFF (2)	DID (3)	DIFF (4)	DID (5)	DIFF (6)	DID (7)	DIFF (8)	DID (9)	DIFF (10)	DID (11)	DIFF (12)
Treatment*Post	-0.021 (0.35)		0.020 (0.32)		-0.002 (0.04)		-0.001 (0.02)		-0.043 (0.51)		-0.031 (0.33)	
Post	0.048 (0.86)	0.026 (1.11)	-0.031 (0.53)	-0.011 (0.45)	-0.018 (0.40)	-0.019 (0.83)	0.035 (0.51)	0.035 (0.58)	-0.013 (0.18)	-0.055 (1.34)	0.044 (0.50)	0.011 (0.30)
Treatment	0.273 (10.35)***		0.113 (4.09)***		0.060 (2.02)**		0.653 (7.37)***		-0.660 (5.57)***		0.317 (3.01)***	
Girl	-0.059 (1.92)*	-0.062 (1.72)*	0.061 (1.92)*	0.057 (1.60)	0.015 (0.82)	0.026 (1.27)	0.011 (0.21)	-0.005 (0.08)	0.068 (0.98)	0.059 (0.82)	-0.077 (1.21)	-0.068 (1.00)
Low math score	-0.140 (3.76)***	-0.155 (3.67)***	0.039 (1.18)	0.034 (0.89)	0.085 (3.13)***	0.102 (3.27)***	0.032 (0.77)	0.013 (0.27)	-0.071 (1.04)	-0.110 (1.53)	0.050 (0.94)	0.089 (1.42)
Low cognition	-0.006 (0.20)	0.010 (0.31)	-0.001 (0.05)	0.002 (0.06)	0.010 (0.45)	-0.009 (0.37)	0.046 (1.13)	0.042 (0.86)	-0.110 (1.80)*	-0.121 (1.68)	0.085 (1.48)	0.097 (1.47)
FE-level	state	class	state	class	state	class	state	class	state	class	state	class
School & class controls	Y		Y		Y		Y		Y		Y	
Observations	1289	1024	1289	1024	1288	1023	400	307	400	307	400	307
R-squared	0.08	0.07	0.07	0.07	0.07	0.07	0.20	0.20	0.16	0.14	0.16	0.15

Note: Individual controls for gender, school grade, single parents, log of household size, German as main spoken language, number of books in the household (0-10,11-25,26-100,101-200,201-500,500+). OLS Standard errors are clustered at the class-level. T-statistics in parentheses and \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table 11: Effects of financial literacy training on teenagers' debt, savings and savings motives

	Debt		ln(Amount)		Savings		Savings motives		Savings motives		Savings motives		for emergency		for future	
	Y/N	DiD	DIFF	DiD	DIFF	Y/N	DiD	DIFF	DiD	DIFF	DiD	DIFF	DiD	DIFF	DiD	DIFF
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)		
Treatment*Post	0.020 (0.69)		0.023 (0.39)		0.054 (0.79)		0.265 (0.92)		0.079 (1.03)		0.071 (1.09)		-0.071 (1.30)			
Post	-0.003 (0.15)	-0.006 (0.31)	0.007 (0.19)	-0.001 (0.02)	-0.005 (0.09)	0.043 (1.22)	-0.107 (0.40)	0.136 (1.23)	-0.049 (0.73)	0.014 (0.36)	-0.052 (0.87)	0.017 (0.66)	0.033 (0.70)	-0.028 (0.98)		
Treatment	0.029 (0.82)		0.035 (0.40)		-0.047 (0.95)		-0.179 (0.87)		-0.085 (2.13)**		-0.033 (0.98)		-0.077 (1.33)			
Girl	0.029 (1.63)	0.004 (0.18)	0.047 (1.31)	-0.005 (0.13)	-0.085 (2.42)**	-0.103 (2.30)**	-0.437 (3.32)***	-0.498 (2.92)***	0.048 (1.59)	0.047 (1.25)	0.078 (3.12)***	0.080 (2.66)**	-0.009 (0.25)	-0.035 (0.87)		
Low math score	0.052 (2.26)**	0.058 (2.14)**	0.095 (1.71)*	0.104 (1.65)	-0.047 (1.48)	-0.056 (1.73)*	-0.207 (1.40)	-0.260 (1.65)	-0.001 (0.03)	-0.046 (0.97)	-0.025 (0.90)	-0.037 (1.15)	-0.113 (3.30)***	-0.056 (1.57)		
Low cognition	-0.020 (1.08)	-0.033 (1.46)	-0.041 (1.16)	-0.069 (1.73)*	0.021 (0.71)	0.013 (0.40)	0.070 (0.59)	-0.002 (0.02)	0.017 (0.56)	0.005 (0.14)	-0.011 (0.35)	-0.037 (0.99)	-0.038 (1.38)	-0.042 (1.39)		
FE-level	state	class	state	class	state	class	state	class	state	class	state	class	state	class	state	class
School & class controls	Y		Y		Y		Y		Y		Y		Y		Y	
Observations	1290	1042	1265	1018	1285	1042	1217	983	1276	1031	1276	1031	1276	1031	1276	1031
R-squared	0.04	0.09	0.03	0.07	0.05	0.10	0.04	0.09	0.02	0.05	0.04	0.07	0.06	0.07	0.06	0.12

Note: Individual controls for gender, school grade, single parents, log of household size, German as main spoken language, number of books in the household (0-10,11-25,26-100,101-200,201-500,500+). OLS Standard errors are clustered at the class-level. T-statistics in parentheses and \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.



Table 12: Effects of financial literacy training on teenagers' hypothetical savings

	Savings		Savings rate (in %)	
	DiD (1)	DIFF (2)	DiD (3)	DIFF (4)
Treatment*Post	2.178 (0.59)		0.015 (0.41)	
Post	1.307 (0.38)	2.313 (1.90)*	0.020 (0.61)	0.025 (2.14)**
Treatment	-4.033 (1.59)		-0.037 (1.54)	
Girl	-4.340 (2.86)***	-2.790 (1.69)	-0.042 (2.68)**	-0.028 (1.62)
Low math score	-1.942 (1.00)	-2.999 (1.45)	-0.020 (1.05)	-0.029 (1.44)
Low cognition	-0.685 (0.43)	-1.319 (0.74)	-0.005 (0.33)	-0.012 (0.67)
FE-level School& class controls	state Y	state Y	class Y	state Y
Observations	1278	1032	1277	1031
R-squared	0.06	0.11	0.06	0.11

Note: Individual controls for gender, school grade, single parents, log of household size, German as main spoken language, number of books in the household (0-10,11-25,26-100,101-200,201-500,500+). OLS Standard errors are clustered at the class-level. T-statistics in parentheses and \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.