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Teaching teenagers in finance: does it work?

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Abstract

Many initiatives worldwide aim at improving financial literacy through targeted education programs, yet there is little evidence regarding their effectiveness. We examine the impact of a short financial education program on teenagers in German high schools. Our findings reveal that the training program significantly increases teenagers' interest in financial matters and their financial knowledge, especially their ability to properly assess the riskiness of assets. Behaviorally, we observe a decrease in the prevalence of self-reported impulse purchases, but at the same time find no evidence of a significant increase in savings.

Keywords: Financial literacy, economic education
JEL classification: A21, D14, I20

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, *inter alia*, Engen, Gale and Scholz, 1996; Skinner, 2007), recent research has shown that households' actual decision processes face many limitations and poor decisions occur frequently. For example, some individuals repeatedly pay expensive overdraft fees on their credit cards (Stango and Zinman, 2009), they seem to be taken advantage of by brokers when choosing a mortgage (Woodward and Hall, 2011), a large portion feel overburdened with debt (e.g., Lusardi and Tufano, 2009).

One explanation for inadequate financial decisions is a lack of financial knowledge. Literacy levels are low among the young and persist over the life cycle (Lusardi and Mitchell, 2008), and measures of financial literacy are generally correlated with household wealth (van Rooij et al., 2012). Disney and Gathergood (2013) and Klap-

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per et al. (2013) show – for two countries with loan markets of very different maturity – that there is an association between financial literacy and the probability of holding high cost debt or relying on informal sources of borrowing. Christelis et al. (2010) highlight the impeding role of information constraints in portfolio choice, and Jappelli and Padula (2013) stress the effects of financial literacy on savings decisions. Given the concern that many individuals lack the ability to make solid financial decisions, Lusardi and Mitchell (2007a, b) 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 (see Hastings et al., 2012).[1]

In this paper, we assess the effects of a short financial education program on financial literacy and financial decision-making among German high school teenagers. We study a financial education program for teenagers rather than adults for four reasons: First, cognitive abilities peak in young adulthood so that learning efficiency is likely to be highest at younger ages (Heckman, 2006). Second, attitudes towards financial decisions, such as shopping and saving, are already important at young ages and have large cumulative effects over the life cycle. This is quantified in Lusardi et al. (2013) who study investment into financial knowledge in a dynamic life cycle model. They find that over half of lifetime wealth inequality can be attributed to heterogeneity in financial knowledge in early adulthood. They conclude that "educational efforts to enhance financial savvy early in the life cycle so as to produce one percentage point excess return per year would be valued highly by people in all educational groups." In a similar model, Padula and

Jappelli (2013) stress the fact that the investment motive can rationalise the low levels of financial knowledge in populations of low socio-economic status. An education program in schools, directed at teenagers from these population groups, may lower the (opportunity) cost of the acquisition of financial knowledge. Thus, a targeted program may compensate population heterogeneity in the motivation to acquire this knowledge.

Third, keeping program scalability in mind, integration of financial education into the school curriculum is attractive: coverage and outreach can be achieved across all population groups as attendance is mandatory (Hastings et al., 2012). Fourth, existing studies document low levels of financial literacy among the young. For example, Lusardi et al. (2010) find that "fewer than one-third of young adults possess basic knowledge of interest rates, inflation and risk diversification". We put a particular focus on teenagers in the two lower tracks of the German school system.[2] Dustmann et al. (2014) show that students attending these come, on average, from families of low socio-economic status (SES), resulting in low intergenerational (education) mobility in Germany.[3] The non-profit training provider targets teenagers in these schools since previous studies show particularly strong deficiencies in financial literacy in the low-SES strata of the population (e.g., Lusardi and Mitchell, 2008; Jappelli, 2010).

The financial education program we examine consists of three 90-minute training modules,

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[1] Lusardi and Mitchell (2014) provide a comprehensive review of the emerging literature on financial literacy.

[2] Tracking in Germany happens at age 10. Tracking decisions usually depend on recommendations by elementary school teachers, but ultimately hinge upon the decision of the parents, or, in some states, upon special tests (for a more detailed description of tracking, see Dustmann et al., 2014).

[3] Dustmann et al. find that the proportion of children from low-income families in the lowest track is 76% compared to 39% in the highest track. They also use the number of books in the household as a measure of SES and find a disparity of, on average, 5 versus 40 books between the lowest and highest track, and an average difference in parental years of schooling of 4 years.

focused on shopping, planning, and saving. The module on shopping provides information about the aims of advertising and raises awareness about impulsive vs. deliberated shopping decisions. The module on planning discusses the difference between one-off and repeated costs and provides students with budgeting tools to help them reach their financial goals. Finally, the training on saving discusses the characteristics of different financial products, focusing on the trade-off between risk, liquidity, and return.

The program is offered to by a non-profit organization in Germany (henceforth, the "provider"). The modules are typically administered during a week in normal class hours by volunteers who visit the class, and participation is compulsory. Hence, our setting rules out self-selection of students.[4] In our analysis of the effects of the training modules, we need to distinguish treated classes and those in a control group. Allocation to treatment and control occurs at the school level, avoiding spillover effects, and is determined by scheduling restrictions. Towards the end of the school year, teachers who had previously shown an interest in the program were asked whether they would have time in their schedule for the financial education program during the remainder of the school year. If teachers and volunteers were available, the school was allocated to the treatment group. Otherwise, trainings were scheduled for the next school year, and the classes belong to the control group. To control for potential biases arising from the non-random assignment process, we implemented a before-after design by fielding two surveys in each group, which allows us to use a difference-in-differences approach. This allows us to remove any systematic differences between treatment and control, as measured before treatment. When comparing students on an array of background characteristics, including numeracy and cognitive ability, as well as outcome variables (financial interest, knowledge and behavior) across treatment and control classes at baseline, we find no significant differences. Moreover, the potential for selection at the class/school level into the treatment group is mitigated by the fact that the financial training modules we study are provided by outsiders (volunteers of the provider), and not by the teachers themselves. Teachers did not examine students about the trainings nor were they evaluated themselves. Further, our results remain robust across different robustness checks.

At baseline, teenagers' interest in finance and knowledge is limited. More than 38% of the surveyed students have no interest in financial matters and only 21% of students stating that their knowledge is good or very good. Probing into their knowledge using factual questions, we find mixed results: Many students can identify the least risky financial product but over a quarter (26%) believe that smartphones do not have repeated costs. When it comes to behaviors, almost half the students report that they shop impulsively. At the same time, about 60% report to have enough money left at the end of the week and save.

Our analysis reveals that the relatively short financial education program significantly increases both knowledge of, and interest in, financial matters. Interest in financial matters increases by about 20%, and the difference is strongly statistically significant. This is an important goal of the program and hence an important result. Further, raising their interest is a first step towards increasing their financial literacy and engagement with financial matters in the future. We find increases in literacy. Self-assessed financial knowledge increases by about 21%. Students' actual financial knowledge improves with the training, at least in some dimensions. In particular, a significant increase is observed in the

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[4]The fact that the trainings are compulsory is important, given the presence of self-selection from more patient individuals into financial literacy trainings offered to adults (Meier and Sprenger, 2013).

percentage of students who assess the riskiness of assets correctly.

We also observe a significant change in self-reported shopping behavior. The likelihood that a student identifies herself as an impulse buyer decreases with the training. Impulse decisions, especially impulse purchases (Vohs and Faber, 2007), have been widely interpreted in psychology and economics as a manifestation of instant gratification resulting from lack of self-control. Succumbing to temptation may result from lack of self-control, which has been shown to be particularly prevalent among children (Mischel and Metzner 1962; Mischel and Mischel, 1983; see Bucciol et al., 2010 for a review). Baumeister et al. (2007) develop the strength model of self-control and argue that self-control can be raised through interventions and "exercised like a muscle". Cognitive exercises can help increase self-control and thus reduce time-inconsistent behavior such as impulse shopping (Sultan et al., 2011). One module of the training whose effects we study here is dedicated to purchasing decisions. It amply discusses spending priorities, manipulations of consumer choices through advertising, and conflicts between needs and wants. The module thus raises students' awareness of the choices they make, and it can be viewed as providing cognitive exercises to strengthen self-control in this domain.

The change in impulse purchases is also important since shopping is one of the main dimensions along which teenagers make financial choices, i.e., they receive pocket money from their parents and then face the decision of what to do with this money. At the same time, we do not observe a change in students' reported savings. This suggests that an alternative interpretation of the decrease in impulse shopping, namely that it is driven by the fact that students have learnt what desired and undesired behaviors are, is unlikely since self-reported savings should be subject to the same "demand" effect.

Our data allow us to investigate the correlates of financial literacy at baseline. One predictor clearly stands out: We find strong gender differences already at these young ages of 13 to 15 years. These are robust to controlling for numeracy and cognition and are present in all dimensions of financial matters: financial knowledge, interest, and behavior. Girls are less likely to be interested in financial matters to start with, and their self-assessed knowledge is also lower. Girls are also 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 those associated with the gender gap among adults (e.g., differential responsibility for managing household finances or the wage gap) must be at play as well. Hence further research is needed to better understand the formation of gender differences in the financial domain.

Our paper is among the first to assess the impact of a financial education program on the financial knowledge and behaviors of teenagers. A large literature has focused on adults and small entrepreneurs and found mixed results, (e.g., Bruhn and Zia, 2011; Cole et al., 2011; Carpena et al., 2011; Collins, 2012; Drexler et al., 2010; Gibson et al., 2012; and Karlan and Valdivia, 2011). A growing literature focuses on teenagers and the impact of financial education programs offered in schools. Some studies have focused on nation-wide programs, using the timing of implementation at the state level to identify impacts (Bernheim et al., 2001; Cole et al., 2012). These studies also find mixed results. An event study of the introduction of financial education to high-school curriculums in the U.S. by Brown et al. (2013) provides evidence of significant favorable effects of financial education on youth indebted-

ness, reducing the likelihood of having a credit report, the incidence of delinquent accounts, and the amount of debt held.

A couple of recent studies focus on the impact of different programs on knowledge (Walstad et al., 2010, Bechetti and Pisani, 2012) or behavior on a virtual platform (Carlin and Robinson, 2012). An important contribution of our paper is that we measure knowledge and elicit behavior through a survey, and hence provide a more complete analysis of the impact of financial education. We also collect a large set of background characteristics, including numeracy (math grade) and cognitive ability (Raven's progressive matrices). Both are highly predictive of human capital accumulation and important for later life financial outcomes (Heckman and Kautz, 2013). Recent evidence argues that cognitive ability is an important factor in learning, but most malleable in childhood. Since our sample comprises teenagers, we control for students' ability when assessing the impact of the training. As most of the literature, we measure short-run effects. However, our finding of changes in the attitude towards financial matters and in shopping behavior suggests a more fundamental effect on teenagers' mentality, which may potentially have long-run impacts as well.

The remainder of this paper is structured as follows. We describe the context of the study, the training units offered by the financial training provider and the design of our study in Section 2. Section 3 presents the results. In Section 4, we summarize our findings and discuss their implications.

2. Context and study design

2.1. The financial literacy initiative

The financial education program we examine is provided by a non-profit organization, My Finance Coach, which has offered financial education to over 35,000 German high school students, aged mainly between 13 and 15 years,

since its startup in October 2010 (see My Finance Coach, 2012).[5] We evaluate the impact of financial education offered through visits of "finance coaches" to schools. These coaches are employees of the (for-profit) firms that sponsor the (non-profit) provider, and they are not compensated for the training they provide to high-school students. They volunteer to conduct several visits of 90 minutes, each of which is dedicated to one of the training modules. The provider offers a set of materials for each module and trains the coaches; hence, visits are standardized.

We measure the joint impact of three training modules that are provided to all treated classes: Shopping, Planning, and Saving. These three basic modules have been developed by educational experts together with school principals. They are designed to build on each other and to be taught as a set. As we describe in detail below, they target components of financial behavior that are relevant to teenagers one by one: first consumption, then (intertemporal) planning, and finally savings and investment choices. The Shopping module deals with acting as an informed consumer in high-school students' own social environment. It focuses on increasing students' awareness of their everyday shopping behavior. It emphasizes the difference between needs and wants, with the objective that students prioritize their purchasing decisions. The module also stresses that the objective of advertising is to sell specific products, which is particularly important as advertising tends to be increasingly blended with entertainment. The Planning module discusses the concepts of income and expenses, as well as one-off and repeated costs. It further discusses planning tools to help students reach their financial

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[5]The provider also trains teachers directly in order to accelerate the program outreach, and organizes extra-curricular activities related to finance, such as a nationwide competition on financial topics. Overall, the provider has reached around 150,000 students through these various channels.

goals, like buying a motorbike. The last module, Saving, discusses the characteristics of different savings products. It also introduces the "magic triangle", which has risk, return, and liquidity in each corner, illustrating that any financial product implies a trade-off between these three dimensions. The module emphasizes that the adequacy of each product depends on the person's needs.[6] Although one might expect that these modules affect different outcome variables and knowledge domains, we cannot trace the effects of each module separately.

The high schools covered in our study pertain to the lower stream of German high schools, in which most students continue with vocational training after graduation (rather than attending college).[7] Dustmann (2004) shows that there is a strong association between family background (parents' education as well as occupational status) and the level of children's school stream. Moreover, children in the lower streams also end up having lower income and occupational outcomes as adults. Training programs that focus on lower stream schools hence provide the opportunity to increase financial knowledge among those students who are likely to have the lowest levels of knowledge (e.g. Lusardi and Mitchell, 2008; Jappelli, 2010).

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[6]We provide a detailed summary of the content of each training module and how the questions in our survey relate to these in the online supplementary material. Further detailed information about the training materials can be found at http://en.myfinancecoach.org/, retrieved July 23, 2013.

[7]The school system in Germany has three types of high schools, starting as of age 10. These streams comprise schools in which students pursue vocational training (*Hauptschule*, *Sekundarschule*, *Mittelschule*), combine both vocational training with the option of accessing university later on (*Realschule*, *Gesamtschule*, *Werkrealschule*) or focus on preparation for university studies (*Gymnasium*). All participating students in our study belong to the first two types of schools.

2.2. Study design

During the spring of 2012, students answered two paper-and-pencil questionnaires: the baseline survey and the follow-up survey. In the treatment classes, the baseline questionnaire was filled in before the three financial education modules started. Directly thereafter, the three training modules took place (mostly, all within the same week). Approximately three weeks after baseline, the students completed the follow-up questionnaire. Students in the control group completed the questionnaires approximately over the same timespan, with no training in between. Their training was postponed until after the end of the study, sometimes to the next school year, and no finance coach visited the control classes between the two surveys.

Importantly, students and parents were informed that the survey was part of a study of financial knowledge and behavior of teenagers by the University of Munich. It was not presented as a tool to evaluate the training that would be (or had been) provided to them.

Treatment assignment occurred at the school level. Early in the Spring of 2012 (before Easter), teachers that had expressed an interest in participating in the provider's financial literacy trainings were contacted by staff of the provider. They were asked whether they would have time in their schedule to host the three training modules before the summer break – within the next two months – and volunteers were scheduled to act as coaches for the trainings. Scheduling towards the end of the school year (in May and June) is mostly determined by end-of-year examinations which all students have to take, and by one to two practical training weeks during which students visit companies to learn about future potential occupations and are hence out of school. If the class schedule allowed and volunteers were available, the class received the training and was assigned to the treatment group. If time constraints did not allow for the training to be completed before the summer

holidays, the training modules were scheduled for the next academic year, and classes were invited to participate in our study nevertheless. These classes form the control group.[8]

Importantly, at the time of treatment assignment, both control and treatment teachers were interested in having their students participate in the financial education program, but scheduling restrictions affect its timing and hence allocation of classes to treatment or control. Since scheduling of the training took place in the end of April and in the beginning of May, whether or not the class was available at the same time a volunteer was available was largely pre-determined. Nevertheless, to control for potential biases arising from the non-random assignment process, we take the following steps. First, to control for *ex ante* differences between the treatment and control groups, our analysis follows a difference-in-differences approach, comparing changes between the two surveys in the treatment and control groups. This also filters out potential survey effects, i.e., any changes in attitudes and knowledge induced by repeated participation in a survey alone. Second, we examine whether there are differences between treatment and control students at baseline and observe basically none, as detailed below. We also examine differences in class characteristics and again observe none. Third, we focus on a financial education program provided by outsiders, i.e., volunteers who work for the sponsors and partners of the provider. Hence, the teacher is not directly involved in the training and is not evaluated in any way for its success. Further, the contents are not examined and graded, as the financial education program is not part of the school curriculum. Fourth, while our focus is on the differences-in-differences approach, we also conducted several robustness checks, including (i) only focusing on the difference between the

baseline survey and the follow-up survey and (ii) propensity score matching, with very similar results.[9]

Our sample consists of 32 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 group also filled in the follow-up survey.[10] The total numbers of questionnaires by time period and treatment status are reported in Table 1.[11] Within participating classes, only students who had written parental consent could be asked to complete the surveys. Students were handed out informed consent forms by the teacher ahead of time and returned them if their parents decided to consent. Overall, unit response rates within participating classes are high, with an average of 85% – in spite of absenteeism and the requirement of written parental consent.

Table 1 here

The questionnaire contained questions on financial attitudes, knowledge, behavior and socio-economic characteristics.[12] Table 2 presents definitions of all variables in these outcome domains, all socio-demographics, and the class and school characteristics used in this study. Attitude, and generally interest and motivation, play an important role in the learning behavior of teenagers. Hence, we asked two questions to measure student's attitudes toward finance: one asked the

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[8]Nearly all teachers whose classes were eligible for the control group consented to participate in our study.

[9]Results of these robustness checks are provided in the Appendix.

[10]Results remain qualitatively the same if we concentrate only on those classes that filled in the survey at both points in time.

[11]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.

[12]The survey questions are presented in the online supplementary material.

student about his interest in finance[13] and the other about his self-assessed knowledge about finance (*interest* and *knowledge*).

Four questions tested the financial knowledge of students. Two of these questions aim at measuring students' awareness of advertising aims, the main knowledge component of the Shopping module. The questions requested students to assess whether advertising wants to sell (*advertising 1*) and whether it shows what one needs (*advertising 2*). A further question tests one of the main concepts of the Planning module: whether students have become aware of the difference between one-off and repeated costs with respect to durables (*costs*). A final question measured whether students had learned about the risk of different financial products, related to the Saving module (*risk*). 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.

Our questions differ from the basic financial literacy questions used by Lusardi et al. (2010) for a number of reasons. First, in 7th and 8th grade students are between 13 and 15 years old, while to date, the basic financial literacy questions have only been asked to adults. Second, the concepts of interest compounding, inflation, and risk diversification are not known to students at these ages[14] and, most importantly, they are not part of the financial education program, which is adapted to teenagers' everyday financial decision-making environment: shopping decisions, cost planning for new durables like a smartphone, and simple savings products.

In addition to financial knowledge, the questionnaire contained several questions about students' behavior. The shopping module aims at making students reflect on their purchasing behavior. To elicit purchasing behavior, we ask students how much they agree or disagree with the statement "I often buy spontaneously, what I like to have" (*impulse shop*). This question is the item with the highest factor loading (out of 9) from the buying impulsiveness scale developed by Rook and Fischer (1995); they also show that this item is correlated with actual impulse purchases. We define impulse shoppers as those students who report that they agree much or very much with the statement.[15] Since the second module of the training deals with budgeting and planning towards a financial goal, students were also asked how they deal with money by the end of the month and about their savings behavior. We measure whether they make ends meet (*just enough money*), and we ask whether they save (*savings*) and if so how much (*ln(savings)*).[16] Finally, they were asked how they would allocate 100 Euro, within a month, if they had no other sources of income. Several categories were available: savings, food and drinks, clothing, magazines, sweets, going out, computer and internet, music, and others. We focus on the share of the 100 Euro that is saved by each teenager (*hypoth. savings*).

Table 2 here

The survey ended by asking students about their gender (*girl*), age, and household characteristics (*German, single parent, household size, books at home*). These questions are taken from the PISA student and family background questionnaire (e.g., OECD, 2006), based on the German wording (Frey et al., 2009). We additionally

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[13]The literal translation of the question on self-rated interest in finance is: "I enjoy dealing with financial matters...", followed by a five-point scale.

[14]For example, in the math classes within our schools students just start to cover basic percentage calculations in 7th and 8th grade.

[15]Responses were given on a Likert scale from 1 (strongly disagree) to 5 (strongly agree), and the dummy variable we use is based on answers 4 or 5.

[16]We transform reported savings amounts to log savings, i.e., $s = ln(S + 1)$, where S are reported savings. allowing for observations with zero savings.

asked for their math grade and elicited a measure of student's cognitive ability using a subset of 4 questions from the Standard Progressive Matrices by Raven (1989). We chose the questions with varying degrees of complexity based on test results in German schools by Heller et al. (1998), in order to capture the distribution of cognitive ability as well as possible with just a few items.[17] We report the average of these measures as well as class (*class size, 8th grade*) and school characteristics in Table 3. Average class size is 23 and students are almost evenly split between 7th and 8th grade, with 53.8% in 7th grade. In addition, about 18% of our sample are in lowest track schools ("Hauptschule"), about 21% in the second lowest ("Realschule"), and 61% attend schools in which these tracks are combined in one school. We construct a dummy variable (*higher track*), which takes the value of one if students attend the higher track or a selected class in the joint track schools – only these allow students to continue to university studies, and find that about a quarter of teenagers attends these.

The table also reports the *p*-values of the *t*-statistics obtained from a series of OLS regressions in which the background characteristics are the dependent variables and the treatment dummy is always the single explanatory variable. The coefficients are generally insignificant; the two exceptions (low math, p=0.07 and household size 5+, p=0.08) are only marginally significant when seen in isolation and insignificant once multiple testing is accounted for. We conclude that there are no relevant differences in background variables between the treatment and control groups.

Table 3 here

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[17]As a robustness check, we estimated non-parametric alternative specifications for the variables regarding household size, math grades and cognition and found similar results. Thus, we chose this more parsimonious parametric specification.

3. Results

In this section, we first assess students' attitudes toward financial issues, their financial knowledge and financial behavior before the training. In the second part of our empirical analysis, we evaluate whether the training affects these outcomes. The variables that are used throughout this section are those defined in Table 2.

3.1. Determinants of attitudes, knowledge, 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 (OECD, 2012). However, numerous countries, among them Germany and the UK, are not participating in this extension. We thus provide the first evidence on the socio-economic determinants of financial knowledge of German students, which may help assess whether financial literacy should gain more priority in education policies.

We analyze the determinants of the main outcome variables at baseline by estimating linear regression models specified as

$$y_i = \alpha + \beta' z_i + \gamma' x_i + \delta T_i + \epsilon_i, \qquad (1)$$

where an outcome y_i of student i in the baseline survey depends on a set of individual characteristics collected in the vector z_i and the characteristics of the student's class collected in the vector x_i. We also include a dummy for the treatment, T_i, which is 1 if the student was in a treated class and 0 otherwise, to allow for differences between treatment and control groups in the baseline survey. We include the following individual characteristics in z: gender, dummies for household size (for 2, 3, 4, 5+ person households), a dummy for whether the student has a single parent, a dummy for whether German is spoken at

home (migrant background), dummies for ordinal categories of the number of books present in the household (socio-economic background), and dummies for a low math grade[18] in the past term (numeracy) and for low cognitive score (defined as having correctly answered less than 50% of the cognition questions).[19] The school and class characteristics x include the school grade (a dummy which is 1 if the student is in 8th grade, 0 if in 7th grade), class size, whether the school or class gives the option of continuing to university studies, and state (*Bundesland*) dummies. Finally, α is the constant and ϵ_i the error term for student i.

Table 4 presents the determinants at baseline for three broad categories: attitudes, financial knowledge and financial behavior. At baseline, more than a third of students (38%) show a low interest in financial matters. A majority assess their interest and knowledge in finance as being at a low to medium level (scores 2 and 3 on a 1–5 Likert scale). Their self-assessed knowledge is not high either. Again, around 38% assess their knowledge as low. Further, a majority answer at least one question about financial knowledge incorrectly. While the rate of mistakes is between 16% and 25% in each separate question, students appear to lack good knowledge across a variety of dimensions.

Table 4 here

Regarding their financial behavior, almost half of the students report to shop on impulse.

This indicates that students may not be developing controlled shopping habits, and may not be able to prioritize spending in a time-consistent manner. Psychologists have linked impulse shopping to lack of self-control and to time-inconsistent preferences (see Vohs and Faber, 2007, for a review). For example, Baumeister (2002) and Strayhorn (2002) find that individuals with strong self-control are more likely to spend less money and are less likely to shop on impulse. In our sample, students do appear to make ends meet: only a few say that they just have enough money while a majority had money left over, and also a majority report that they save at least some. Hence, teenagers receive sufficient income (from pocket money from their parents and from other irregular sources, as these children are typically too young to work) to allow them to make their own (impulsive) shopping decisions. However, due to their (very) limited access to credit, impulse shopping may simply crowd out other spending priorities rather than leading to debt in this age group.

Importantly, we do not observe systematic differences in baseline financial knowledge or behavioral measures between the treatment and control groups. We find a statistically significant and quantitatively important gender difference in attitudes towards finance. As shown in Table 4, girls' financial interest is on average about 10% lower than that of boys. This gap is even stronger in self-assessed knowledge. The latter may be partly explained by boys' overconfidence, as we do not find evidence of a gender gap in tested financial knowledge, and gender differences in overconfidence are known to exist among adults (e.g., Barber and Odean, 2001). There is however a consistent and significant gap in savings behavior. Girls are more likely to have just enough money left at the end of the week, around 10% say so. In line with this result, they are less likely to save than boys, again about 10%. The difference in savings also appears in the hypothetical savings task

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[18]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 yield similar results.

[19]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 to reflect the differing degree of complexity of the questions. Again, the results, which are available on request, do not change qualitatively.

where both girls and boys decide how to spend 100 Euro; we return to this finding below.

Existing studies have found that numeracy and cognitive skills are related to financial knowledge and behavior (e.g., Banks and Oldfield, 2007; Banks et al., 2010; Cole et al., 2011). Hence, we examine whether numeracy, measured by students' 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. Students with lower numeracy are more likely to answer the financial knowledge questions incorrectly, especially the question asking whether advertising wants to sell (*advertising 1*). Their financial behavior reflects somewhat less savings and more impulse shopping, but the effects are not significant. In contrast to numeracy, financial literacy and behavior does not vary much by cognition score.[20] Students of low socio-economic status, i.e., those living in a household with 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 little evidence that it is a determinant of knowledge on the purpose of advertising or the assessment of the risk structure of assets.

3.2. The impact of financial education

To measure the effects of financial education, 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 and class characteristics. Specifically, for each outcome, we estimate a linear regression

model,

$$y_{it} = \alpha + \mu_1 Post_t + \mu_2 T_i + \mu_3 Post_t T_i + \beta' z_{it} + \gamma' x_i + \epsilon_{it},$$
(2)

where an outcome y_{it} for student i at time t depends on individual characteristics z_{it}, some of which may vary between the baseline and the follow-up survey, and class characteristics x_i, as in section 3.1, and exposure to the financial training T_i. $Post_t$ is a dummy which takes the value zero for the baseline survey and 1 for the follow-up. Throughout we conservatively cluster standard errors at the school level, as treatment allocation occurred at this level. As before, α is the constant and ϵ_{it} the error term.[21]

3.2.1. Attitudes towards finance

Figure 1 shows a strong increase in financial interest among the treated students after the training. In the two bottom histograms of Figure 1, we observe that the proportion of responses in the categories "much" and "very much" both increase, so that about 30% of teenagers state that they are interested in financial matters after the training compared to about 16% before the training. In contrast, the control group experiences no positive change in these categories. When we use multivariate regression to condition on individual characteristics such as gender, numeracy, cognitive score and socio-economic status, and on class characteristics, this strong effect of the program on students' interest in financial matters persists (Table 5). The difference-in-difference estimate is about 0.56, which corresponds to about a 20%

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[20]This is potentially due to the fact that numeracy captures math ability better. As expected, results remain qualitatively the same if only numeracy is included.

[21]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-level heterogeneity. As mentioned above, results remain qualitatively the same when we follow this approach.

increase in interest in finance through the training. We find no evidence that girls are affected by the training any differently from boys[22], 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.

Figure 1 here

The strong training effect on students' interest in financial matters may be due to three factors: (a) that students' motivation and interest to engage with financial topics and with their own finances increases, and (b) that the training provides them with a definition what financial matters are, or (c) a demand effect. Since our survey is not presented as an evaluation of the program but as a survey conducted by university researchers, and both treatment and control students have participated or will participate in the program, a demand effect only in the treated group seems unlikely. Further, since the training in question does not define the term financial matters precisely, we cannot disentangle between (a) and (b). 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 building students' awareness for the fact that they make financial choices on a daily basis, so that they do not view dealing with finances as an alien process.

After the training, we see a similarly strong change in self-reported knowledge as for self-reported interest: While the fraction of those with no or little knowledge about finance decreases to 17% (from 39%), the fraction of teenagers who feel financially literate increases to 42% (from 21%). When controlling for individual and class characteristics, we find an 0.61 increase in self-assessed

financial knowledge, corresponding to a 21% increase in their self-assessed knowledge, as shown in column 2 of Table 5.[23] Again, girls report to know substantially less about financial matters due to their lower baseline level. In addition, we find a weaker treatment effect among girls than boys.

Table 5 here

3.2.2. Financial knowledge

Figure 2 reports the proportion of students who answered all financial knowledge questions correctly. While in the control classes, a similar percentage of students answer all questions correctly in the baseline and follow-up survey (38% and 40%), we observe an increase in the proportion of students who answer all questions correctly in the treatment group, from 39.5% to 46.5%. This suggests that financial knowledge increases with the training. This effect is confirmed in Table 6, where controls are added. The likelihood that students answer all questions correctly increases (marginally) significantly more among the treated students (see column (1) of Table 6).[24]

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[22]The estimation results for heterogeneous treatment effects are available from the authors upon request.

[23]Teenagers' self-assessments of knowledge may vary due to differences in confidence or reporting styles (see Crossley and Kennedy, 2002). Since we cannot distinguish between these two, we do not have a metric to compare self-assessed knowledge with the tested knowledge of students. However, we find that only two-thirds of those who correctly answered all knowledge questions assessed their financial knowledge as medium or high, and one-third assessed it as low. Hence, either these students have very high self-assessment standards or there is an initial lack of confidence in their own financial knowledge. After the training, the proportion of "correct" self-assessments rises to 86% among participating students, suggesting that the training raises awareness of existing knowledge and increases confidence to better match knowledge.

[24]We cannot distinguish between individual heterogeneity in confidence and heterogeneity in response behavior when self-assessed knowledge is reported on an ordinal scale, so we do not have a metric to compare self-assessed knowledge with the tested knowledge of students. However, we find that only two-thirds of those who correctly answered all knowledge questions assessed their financial

Figure 2 here

If we examine each question separately, we observe that the overall improvement in objective knowledge mainly stems from an improvement in the assessment of the risks inherent to different financial products. When asked whether a bank savings account, a house, or company shares are the least risky asset, students shift from real estate to bank account deposits and the percentage giving the correct answer increases by 0.12 percentage points, as shown in column (5) in Table 6. Hence, the assessment of risk and the familiarity with different types of assets increase after the training.

We do not find evidence that students agree significantly more strongly with the statements that advertising wants to sell and that it shows one's needs in the treatment group, or that students are more aware of the difference between one-off and repeated costs of durables. A potential reason is that the contents of the shopping and planning modules are more complex and answers are context-dependent, while the savings module does incorporate simpler and more general factual information. For example, when discussing advertising within the shopping module, the aim is to make students aware of the *different* purposes of advertising and the *multiple* channels through which it reaches them.

Table 6 here

Overall, we find strong evidence that the assessment of risk and familiarity with different types of assets increases after the training.

3.2.3. Financial behavior

As Figure 3 shows, the fraction of students who buy on impulse in our sample is high.

Figure 3 here

Figure 3 reveals that the propensity for frequent impulse purchases declines to about 40% after the financial training. When controlling for individual and class characteristics (see Table 7), we find that the training decreases the proportion of students reporting that they are buying on impulse frequently by 0.1, corresponding to a 21% decrease in the fraction of impulse buyers.

Table 7 here

Table 7 also shows the estimates of the training effect on teenagers' ability to make ends meet and on their savings behavior. We do not find evidence of a decrease in the number of students who just have enough money, nor a significant increase in savings.[25] On the one hand, this result is not surprising. The module on savings only provides information about the trade-off between risk, liquidity, and return of different savings products. Second, the short time span covered by our quasi-experiment, with no more than three weeks between the training and the follow-up survey, makes it unlikely that strong behavioral changes in savings could be observed.[26] On the other hand, if students adopt new planning habits to save up for a durable good after the financial education program, we would have expected an increase in savings. Such an intention

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knowledge as medium or high, and one-third assessed it as low. Hence, either these students have very high self-assessment standards or there is an initial lack of confidence in their own financial knowledge. After the training, the proportion of "correct" self-assessments rises to 86% among participating students, suggesting that the training raises awareness of existing knowledge and increases confidence to better match knowledge.

[25]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.

[26]Ideally, we would like to measure the behavioral effects of financial education for teenagers by following 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 measurement problems are even more severe in the context of this study where survey time is very limited.

to save could potentially reveal itself in the hypothetical budget allocation task.

In the hypothetical question students allocated a monthly budget of 100 Euros across savings and several consumption categories. Three quarters of students allocate the budget fully across 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%. However, the control group also increases its savings from 25 to 27%. Hence, the results presented in Column (5) of Table 7 reveal that hypothetical savings do not increase significantly more in the treatment group. Overall, while there is a slight tendency to increase savings in this hypothetical task as well as in actual savings, we do not find strong evidence that the training generated a sizeable increase in savings.

Figure 4 here

4. Discussion and 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. To address these concerns, several initiatives around the world have started to offer financial education 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 a lack of information and training or to poor cognitive ability and numeracy skills, and (ii) whether – as is hoped – increasing literacy will lead to better financial outcomes.

In this paper, we evaluate the effect of financial education on teenagers in lower stream schools in Germany. Our study was implemented within a large-scale training program, with compulsory participation of students in treated classes. 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 study reveals that a financial training intervention raises teenagers' interest and self-assessed financial knowledge significantly. This is an expected result, but an important one. Increasing the interest of teenagers in financial matters is not easy – the right media must be used. Further, their interest is a first step towards increasing their financial literacy and engagement with financial matters in the future. The financial training also increases actual financial knowledge in some dimensions. Teenagers get better at identifying the riskiness of assets, and overall an increase in the number of correct answers is observed.

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 purchase durables with considerable running costs without being aware of these costs. The fact that, after the training units, teenagers define themselves as less impulsive buyers suggests that their purchases are less likely to be due to a lack of self-control and more the result of some deliberation. Hoch and Lowenstein (1991) suggest that cognitive exercises help increase self-control and reduce such time-inconsistent choices. The shopping module in the financial training program considered in our study 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. The long-run effects of such behavioral interventions on shopping behavior appear to be

an important object for future research.

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, interest, and behavior. Girls show lower interest 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 education programs to address the gender gap in financial literacy – a worrisome phenomenon which has been documented among adults, and for the first time in this study, also already at these young ages.

Given the lack of effects of many financial education programs among adults, the results of this study suggest that a successful strategy may be to start early on. The program is successful in raising teenagers' interest in financial matters and their subjective knowledge, as well as in changing their attitudes towards buying. These findings thus suggest that even a relatively short financial education program has the potential to help teenagers become more informed and sovereign consumers.

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Appendix

In this appendix, we present some corroborative evidence. Tables A.1 to A.3 present the results of a simple difference estimator with clustered standard errors for financial interest and self-rated motivation, assessed financial knowledge, and finally behavior. These estimates are valid if assignment to training is exogenous. We find similar results as in Tables 5 to 7 which report the results of the difference-in-difference estimator. Financial interest and self-assessed knowledge are significantly higher among those teenagers who receive the training. Effect sizes are slightly more moderate here but otherwise similar.

We also find similar qualitative results for our measures of financial knowledge: overall knowledge – measured as the sum of correct answers – increases with training, and students' risk assessments improve. Finally, we find that our result on impulse shopping is robust: trained students report less frequent impulse shopping.

As a further robustness check, we also performed propensity score matching which accounts for potential selection on observables if assignment is not at random (Becker and Ichino, 2002). We perform Kernel matching with an Epanechikov kernel and a bandwidth of 0.06. Standard errors are bootstrapped using 50 replications. Balancing conditions are satisfied. The matched sample is balanced with respect to sex, household size, family background (dummy for single parent family), numeracy score (math grade), cognitive ability, and language spoken at home. We obtain estimates in the same order of magnitude for financial interest and self-assessed knowledge (Table A.4). Due to the resulting loss in sample size, the results are less precisely estimated, and we do not find statistically significant impacts on impulse shopping and overall financial knowledge. However, our estimates are very similar for students' risk assessment.

Figure 1: Interest in finance, by treatment and control
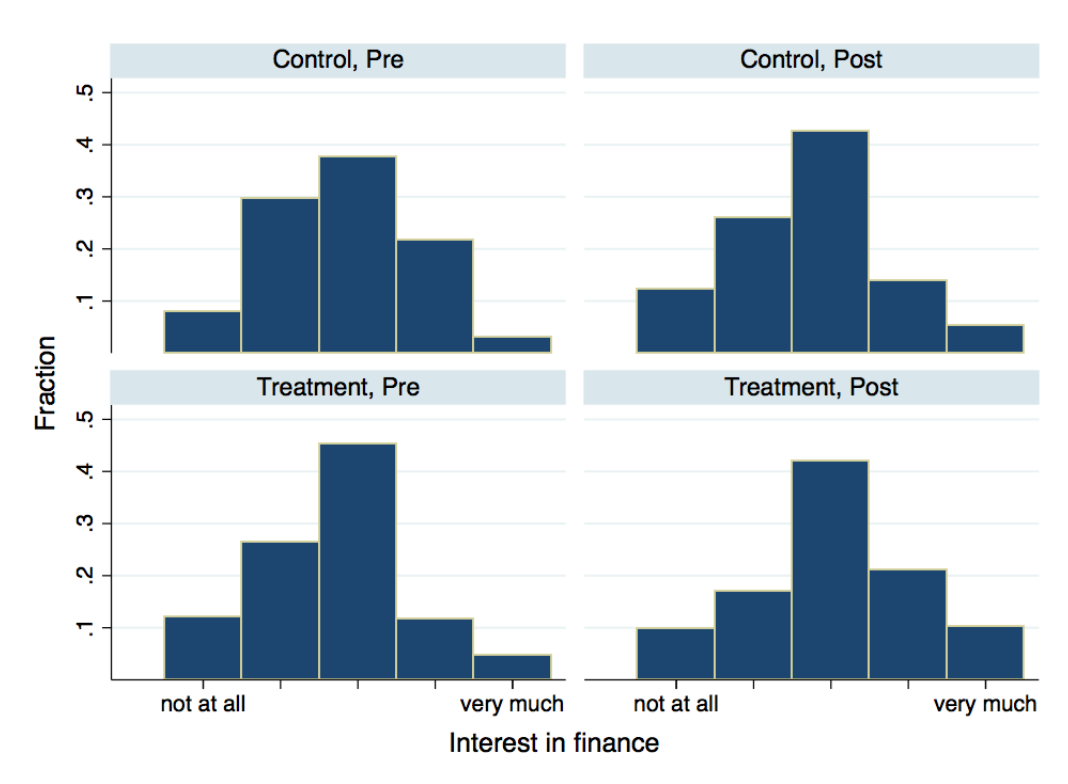
Figure 2: Financial knowledge, by treatment and control
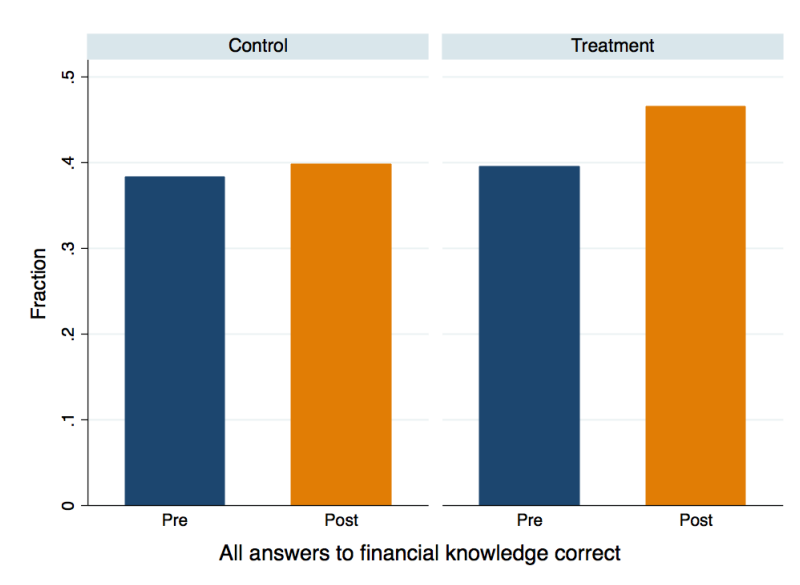
Figure 3: Impulse shopping, by treatment and control
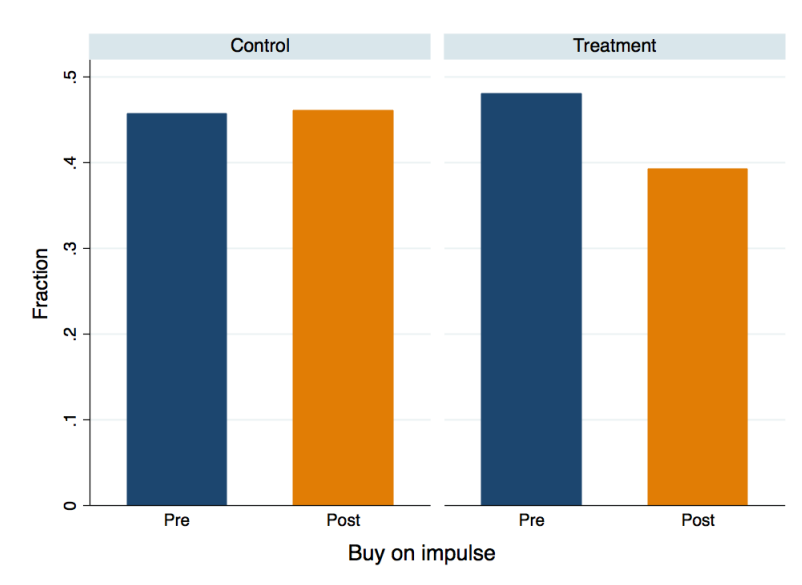
Figure 4: Hypothetical savings-consumption behavior, by treatment and control
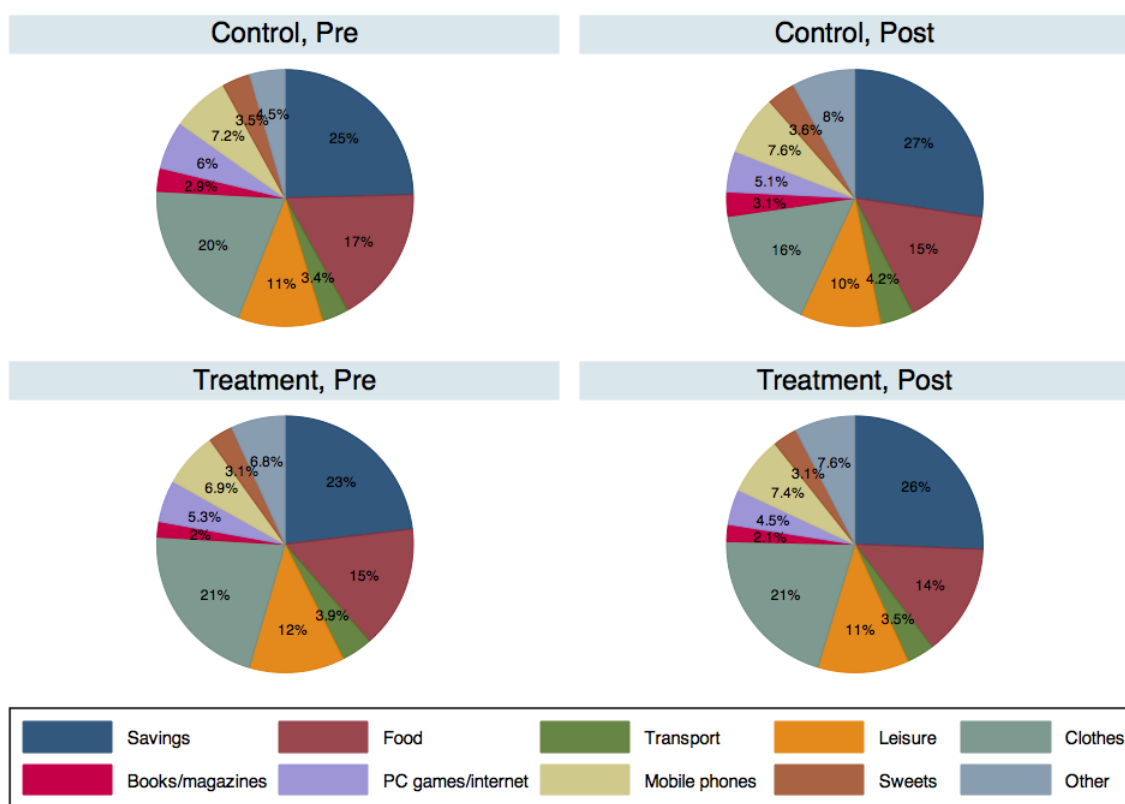
Note: The legend shows the categories in the order as they appear in the pie charts, clock-wise from the top.

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

Variable	Survey instrument
Attitudes towards finance	
Interest	I enjoy dealing with financial matters...
	Answers given on a Likert scale (1=not at all, 5=very much)
Knowledge	I am knowledgeable in financial matters...
	Answers given on a Likert scale (1=not at all, 5=very much)
Financial knowledge	
Advertising 1	Advertising wants to sell
	Correct if answers 4 or 5 (agree, strongly agree)
Advertising 2	Advertising wants to show me what I need
	Correct if answers 1 or 2 (disagree, strongly disagree)
Costs	When I buy a smartphone I have repeated costs
	Correct if answers 4 or 5 (agree, strongly agree)
Risk	Which of the following investment options has the least risk?
	Correct if least risky asset is identified
Financial behavior	
Impulse shop	I buy impulsively
	=1 if answers 4 or 5 (agree, strongly agree), = 0 otherwise
Just enough money	How did you manage your money last week?
	Dummy, =1 if "I had just enough money", =0 otherwise
Savings	Do you save?
	Dummy, =1 if "Yes", =0 if "No"
ln(savings)	Log of savings amount
Hypoth. savings	% saved in hypothetical savings task
Socio-demographics	
Girl	=1 if student is female, =0 otherwise
Low math	=1 if student's math grade was 4, 5 or 6 in previous year, =0 otherwise
	(German grade scale: 1 to 6 with 1 being the highest grade).
Low cognition	=1 if student answered 0, 1 or 2 out of 4 Raven's progressive
	matrices correctly; =0 otherwise
German	=1 if the language spoken at home is German, 0 otherwise
Single parent	=1 if student only lives with one parent, 0 otherwise
n person household	=1 if household size is n; =0 otherwise
	where $n \in N = \{2, 3, 4, 5+\}$.
n books at home	=1 if number of books is n; =0 otherwise
	where $n \in N = \{0 - 10, 11 - 25, 26 - 100, 101 - 200, > 200\}$
School and class characteristics	
8th grade	=1 if student is in 8th grade, 0 if he is in 7th grade
Class size	number of students in the class
Higher track	=1 if student attends a vocational training school (or a special class
	in a comprehensive school) that provide an option to access university.

Table 3: Background characteristics

	Mean	SD	Treatment (p-value)	N
Student characteristics				
Girl	48.44%	0.50	0.400	768
Low math	32.16%	0.47	0.069	768
Low cognition	60.16%	0.49	0.615	768
German	79.92%	0.40	0.499	767
Single parent	22.35%	0.42	0.968	756
2 person household	8.99%	0.29	0.717	756
3 person household	19.84%	0.40	0.960	756
4 person household	39.02%	0.49	0.170	756
5+ person household	32.14%	0.47	0.080	756
$0-10$ books at home	20.66%	0.41	0.626	760
$11-25$ books at home	25.00%	0.43	0.736	760
$26-100$ books at home	27.63%	0.45	0.741	760
$101-200$ books at home	13.95%	0.35	0.513	760
$+201$ books at home	12.76%	0.33	0.251	760
Class and school characteristics				
8th grade	46.22%	0.50	0.779	47
Class size	22.75	5.40	0.112	47
Higher track	24.22%	0.43	0.205	47

Note: This table reports the average value of the background characteristics of students, classes and schools. All variables are defined in Table 2. The column Treatment (p-value) reports the p-value of the t-statistic on the coefficient of Treatment, obtained through an OLS regression of each background characteristic on Treatment, estimated with standard errors clustered at the school level. N corresponds to the number of students that answered each question for the student characteristics and to the number of class for the class and school characteristics.

Table 4: Outcomes at baseline

Dependent Variable	Mean	St. Dev	Treatm.	Girl	Low math	Low cogn.	German	N
Attitudes								
Interest	2.729	0.980	-0.127	-0.256**	0.026	-0.031	-0.151	716
Self-ass. knowledge	2.754	0.988	-0.116	-0.385***	-0.123	0.024	-0.067	760
Financial knowledge								
1+ incorrect answers	0.608	0.489	-0.044	0.020	0.084*	-0.062	-0.0166	688
Advert. 1 incorrect	0.164	0.371	-0.034	-0.018	0.098***	-0.061*	-0.014	768
Advert. 2 incorrect	0.171	0.376	-0.025	-0.035	0.003	0.019	0.035	768
Costs incorrect	0.255	0.436	0.020	0.046	0.036	-0.049	-0.046	768
Risk incorrect	0.219	0.414	-0.024	-0.033	0.007	0.046	0.003	688
Financial behavior								
Impulse shop	0.475	0.500	0.002	0.001	0.019	0.050	-0.003	768
Just enough money	0.224	0.418	0.010	0.107***	0.017	-0.004	-0.093**	744
Saving (Y/N)	0.581	0.494	-0.030	-0.097***	-0.056	0.045	0.072	755
ln(savings)	1.997	1.959	-0.125	-0.457**	-0.253	0.173	0.003	713
Hypoth. Savings (%)	0.213	0.230	-0.026	-0.036**	-0.001	-0.002	0.028	756

Table 4, continued: Outcomes at baseline

| Dependent Variable | Number of books at home | | | | Single | Household size | | |
	11 − 25	26 − 100	101 − 200	> 200		3	4	5+
Attitudes								
Interest	0.054	0.135	0.292**	0.303***	0.038	0.216**	0.187	0.150
Self-ass. knowledge	0.025	0.064	0.121	-0.001	0.103	0.174	0.238	0.161
Financial knowledge								
1+ incorr. answers	-0.001	-0.053	0.005	0.042	-0.033	0.025	0.036	
Advert. 1 incorrect	0.038	-0.018	0.011	-0.032	-0.026	-0.029	0.025	0.048
Advert. 2 incorrect	0.014	0.045	0.070*	0.129**	0.320	0.043	0.013	-0.001
Costs incorrect	-0.023	-0.050	-0.104*	-0.171***	-0.024	-0.102	-0.060	-0.011
Risk incorrect	-0.066	-0.037	0.028	-0.042	-0.010	0.031	-0.016	-0.058
Financial behavior								
Impulse shop	-0.213***	-0.098	-0.130**	-0.171**	0.058	-0.016	-0.040	-0.047
Just enough m.	0.055	-0.019	-0.017	0.028	0.143**	-0.004	-0.004	-0.002
Saving (Y/N)	0.076*	0.063	0.147***	0.052	-0.032	-0.001	0.012	-0.022
ln(savings)	0.197	0.205	-0.628**	0.179	-0.101	0.067	0.157	-0.071
Hyp. Savings (%)	0.003	0.018	0.095***	0.085**	-0.002	0.08188	0.071*	0.025

Note: This table reports the mean and standard deviation of the outcome variables at baseline under columns Mean and St. Dev. Each row displays a different outcome variable as defined in Table 2, and one additional variable *At least 1 incorrect answer*, which takes value 1 if the student answered incorrectly one or more of the financial knowledge questions. The table also reports the coefficient estimates for all socio-demographics described in Table 2 and for the variable Treatment, stemming from a separate regression on each outcome at baseline. OLS estimates are presented and each regression additionally included class size, 8th grade, the dummy for attending the higher track with university option, and state fixed effects. Robust standard errors, clustered at the school level were estimated, *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 5: The effect of the financial education program on attitudes towards finance

	(1) Interest in finance	(2) Self-assessed knowledge
Treatment*Post	0.561***	0.607***
	[0.134]	[0.136]
Post	-0.210*	-0.038
	[0.108]	[0.115]
Treatment	-0.189*	-0.181
	[0.101]	[0.113]
Socio-demographics		
Girl	-0.263***	-0.285***
	[0.059]	[0.042]
Low math	-0.010	-0.105
	[0.096]	[0.091]
Low cognition	-0.063	0.053
	[0.065]	[0.049]
$11-25$ books at home	0.087	0.024
	[0.073]	[0.082]
$26-100$ books at home	0.179*	0.045
	[0.086]	[0.090]
$101-200$ books at home	0.190**	0.101
	[0.077]	[0.073]
> 200 books at home	0.224*	0.061
	[0.124]	[0.145]
German	-0.055	0.130**
	[0.108]	[0.058]
Single parent	0.003	0.056
	[0.084]	[0.078]
3 person household	0.119	0.133
	[0.133]	[0.125]
4 person household	0.141	0.155
	[0.128]	[0.157]
5+ person household	0.099	0.125
	[0.130]	[0.132]
Class characteristics		
8th grade	0.099	0.075
	[0.111]	[0.113]
Class size	0.004	0.006
	[0.008]	[0.013]
Higher track	-0.204	-0.245**
	[0.154]	[0.113]
Constant	2.941***	2.715***
	[0.306]	[0.400]
Observations	1,293	1,294
R-squared	0.065	0.106

Note: This table reports the coefficient estimates for difference-in-difference regression on attitudes towards finance (interest in column (1) and self-assessed knowledge in column (2)). Each regression also includes state fixed effects. OLS robust standard errors, clustered at the school level were estimated and are presented in brackets, *** p<0.01, ** p<0.05, * p<0.1.

Table 6: The effect of the financial education program on financial knowledge

	(1) All answers correct	(2) Advertising 1 correct	(3) Advertising 2 correct	(4) Costs correct	(5) Risk correct
Treatment *Post	0.074*	0.011	-0.045	0.009	0.118**
	[0.037]	[0.032]	[0.051]	[0.074]	[0.058]
Post	-0.005	0.027	-0.020	0.039	-0.063
	[0.015]	[0.027]	[0.039]	[0.068]	[0.047]
Treatment	0.030	0.026	0.018	-0.031	0.023
	[0.036]	[0.032]	[0.038]	[0.058]	[0.041]
Socio-demographics					
Girl	0.033	0.021	0.041*	-0.005	0.044
	[0.039]	[0.021]	[0.022]	[0.023]	[0.029]
Low math	-0.074*	-0.067***	-0.028	-0.051**	0.002
	[0.037]	[0.022]	[0.025]	[0.025]	[0.029]
Low cognition	0.041	0.020	-0.013	0.057**	0.001
	[0.025]	[0.021]	[0.023]	[0.022]	[0.028]
$11 - 25$ books at home	-0.063*	0.005	-0.031	-0.020	-0.010
	[0.031]	[0.036]	[0.039]	[0.039]	[0.039]
$26 - 100$ books at home	-0.016	0.038	-0.062	0.006	0.019
	[0.027]	[0.038]	[0.038]	[0.036]	[0.039]
$101 - 200$ books at home	-0.005	0.011	-0.059	0.072*	-0.030
	[0.053]	[0.038]	[0.042]	[0.039]	[0.044]
> 200 books at home	0.034	0.083**	-0.097*	0.110***	0.004
	[0.041]	[0.035]	[0.048]	[0.040]	[0.044]
German	0.033	0.026	-0.047	0.063*	0.010
	[0.027]	[0.023]	[0.036]	[0.036]	[0.045]
Single parent	-0.053	0.036	-0.027	0.013	-0.000
	[0.063]	[0.033]	[0.034]	[0.039]	[0.040]
3 person household	-0.010	-0.013	0.019	0.032	-0.038
	[0.083]	[0.036]	[0.051]	[0.061]	[0.053]
4 person-household	-0.077	-0.020	-0.021	-0.005	0.003
	[0.081]	[0.041]	[0.056]	[0.047]	[0.052]
5+ person household	-0.097	-0.017	-0.010	-0.054	0.017
	[0.081]	[0.048]	[0.057]	[0.062]	[0.051]
Class characteristics					
8th grade	0.027	0.056**	-0.061**	0.099***	-0.079**
	[0.046]	[0.025]	[0.030]	[0.036]	[0.034]
Class size	0.002	0.001	-0.000	-0.003	0.007*
	[0.003]	[0.004]	[0.004]	[0.004]	[0.004]
Higher track	-0.018	0.011	0.048	0.031	-0.061
	[0.027]	[0.035]	[0.054]	[0.040]	[0.046]
Constant	0.313**	0.691***	0.895***	0.695***	0.598***
	[0.149]	[0.112]	[0.132]	[0.146]	[0.124]
Observations	1,199	1,298	1,298	1,298	1,191
R-squared	0.028	0.039	0.027	0.053	0.058

Note: This table reports the coefficient estimates for difference-in-difference regression on tested financial knowledge. Each regression includes state fixed effects. OLS robust standard errors, clustered at the school level were estimated and are presented in brackets, *** p<0.01, ** p<0.05, * p<0.1.

Table 7: The effect of the financial education program on financial behavior

	(1) Impulse shop	(2) Just enough money	(3) Saving	(4) ln(saving)	(5) Hypoth. Savings
Treatment*Post	-0.101**	0.035	0.048	0.254	0.008
	[0.048]	[0.063]	[0.070]	[0.367]	[0.021]
Post	0.023	-0.041	0.001	-0.082	0.024
	[0.034]	[0.049]	[0.061]	[0.346]	[0.017]
Treatment	-0.009	0.015	-0.044	-0.163	-0.034
	[0.054]	[0.036]	[0.043]	[0.212]	[0.022]
Socio-demographics					
Girl	0.011	0.062**	-0.082***	-0.416***	-0.046***
	[0.020]	[0.029]	[0.028]	[0.128]	[0.015]
Low math	0.056**	0.030	-0.050*	-0.225*	-0.011
	[0.021]	[0.027]	[0.027]	[0.124]	[0.019]
Low cognition	0.020	-0.001	0.021	0.069	-0.004
	[0.029]	[0.023]	[0.034]	[0.122]	[0.015]
$11-25$ books at home	-0.122**	0.054*	0.085*	0.373**	-0.004
	[0.048]	[0.029]	[0.043]	[0.156]	[0.028]
$26-100$ books at home	-0.055	0.039	0.085**	0.346***	-0.013
	[0.058]	[0.037]	[0.033]	[0.117]	[0.023]
$101-200$ books at home	-0.091	-0.021	0.142***	0.577**	0.050*
	[0.055]	[0.031]	[0.037]	[0.207]	[0.025]
> 200 books at home	-0.136**	0.053	0.105***	0.551***	0.048
	[0.051]	[0.044]	[0.035]	[0.153]	[0.029]
German	-0.015	-0.091**	0.041	0.018	0.017
	[0.050]	[0.033]	[0.054]	[0.207]	[0.022]
Single parent	0.088**	0.084	0.013	0.156	0.010
	[0.037]	[0.059]	[0.042]	[0.217]	[0.026]
3 person household	0.086	-0.011	-0.064	-0.082	0.030
	[0.054]	[0.043]	[0.054]	[0.164]	[0.036]
4 person household	0.074	0.006	-0.007	0.196	0.042
	[0.058]	[0.052]	[0.059]	[0.227]	[0.034]
5+ person household	0.092	-0.003	0.002	0.134	-0.004
	[0.054]	[0.056]	[0.061]	[0.231]	[0.026]
Class characteristics					
8th grade	0.048	-0.020	-0.061*	-0.133	-0.026
	[0.036]	[0.016]	[0.031]	[0.123]	[0.021]
Class size	-0.000	-0.005*	0.005	0.013	0.002
	[0.005]	[0.002]	[0.003]	[0.014]	[0.002]
Higher track	0.033	-0.008	-0.000	-0.069	0.061**
	[0.031]	[0.051]	[0.050]	[0.184]	[0.023]
Constant	0.358**	0.373***	0.460***	1.565***	0.208***
	[0.134]	[0.099]	[0.126]	[0.473]	[0.072]
Observations	1,307	1,269	1,290	1,222	1,282
R-squared	0.031	0.032	0.053	0.043	0.070

Note: This table reports the coefficient estimates for difference-in-difference regression on financial behavior. Each regression included state fixed effects. OLS robust standard errors, clustered at the school level were estimated and are presented in brackets, *** p<0.01, ** p<0.05, * p<0.1.

Table A.1: The effect of the financial education program on attitudes – simple differences

	(1) Interest in finance	(2) Self-assessed knowledge
Post	0.353***	0.568***
	[0.100]	[0.072]
Socio-demographics		
Girl	-0.264***	-0.277***
	[0.075]	[0.045]
Low math	-0.004	-0.048
	[0.119]	[0.103]
Low cognition	-0.077	-0.013
	[0.073]	[0.052]
$11-25$ books at home	0.167*	0.035
	[0.082]	[0.098]
$26-100$ books at home	0.227**	0.038
	[0.092]	[0.087]
$101-200$ books at home	0.248***	0.081
	[0.079]	[0.095]
200+ books at home	0.314**	0.140
	[0.132]	[0.154]
German	-0.018	0.085
	[0.115]	[0.066]
Single parent	0.125	0.138*
	[0.071]	[0.078]
3 person household	0.236	0.226**
	[0.138]	[0.084]
4 person household	0.289**	0.267*
	[0.107]	[0.140]
5+ person household	0.264**	0.241**
	[0.117]	[0.111]
Class characteristics		
8th grade	0.106	0.206
	[0.155]	[0.140]
Class size	0.017	0.037**
	[0.017]	[0.017]
Higher track	-0.298	-0.378**
	[0.182]	[0.138]
Constant	2.239***	1.691***
	[0.531]	[0.557]
hline Observations	1,023	1,023
R-squared	0.077	0.130

Note: This table reports the coefficient estimates for a simple differences regression on attitudes towards finance. OLS robust standard errors, clustered at the school level were estimated and are presented in brackets, *** p<0.01, ** p<0.05, * p<0.1.

Table A.2: The effect of the financial education program on financial knowledge – simple differences

	(1) All answers correct	(2) Advertising 1 correct	(3) Advertising 2 correct	(4) Costs correct	(5) Risk correct
Post	0.068*	0.039*	-0.068*	0.048	0.054
	[0.035]	[0.020]	[0.035]	[0.031]	[0.033]
Socio-demographics					
Girl	0.021	0.014	0.034	-0.007	0.046
	[0.046]	[0.023]	[0.023]	[0.026]	[0.029]
Low math	-0.057	-0.075***	-0.043	-0.036	0.016
	[0.045]	[0.027]	[0.029]	[0.025]	[0.035]
Low cognition	0.032	-0.006	-0.027	0.061**	0.012
	[0.029]	[0.021]	[0.028]	[0.025]	[0.033]
$11-25$ books at home	-0.041	0.008	-0.036	-0.004	0.006
	[0.040]	[0.036]	[0.042]	[0.042]	[0.047]
$26-100$ books at home	0.003	0.019	-0.054	0.040	0.037
	[0.032]	[0.039]	[0.043]	[0.041]	[0.046]
$101-200$ books at home	-0.008	-0.000	-0.091*	0.064	-0.044
	[0.058]	[0.041]	[0.046]	[0.046]	[0.052]
>200 books a home	0.053	0.074**	-0.139**	0.143***	0.032
	[0.045]	[0.036]	[0.053]	[0.041]	[0.052]
German	0.019	0.039	-0.038	0.046	0.006
	[0.032]	[0.026]	[0.040]	[0.046]	[0.054]
Single parent	-0.037	0.022	-0.001	0.024	0.000
	[0.080]	[0.037]	[0.038]	[0.046]	[0.048]
3 person household	-0.032	-0.013	0.003	-0.003	-0.022
	[0.100]	[0.039]	[0.060]	[0.068]	[0.057]
4 person household	-0.092	-0.036	-0.010	-0.027	0.007
	[0.100]	[0.045]	[0.068]	[0.048]	[0.061]
5+ person household	-0.100	-0.043	0.012	-0.058	0.028
	[0.100]	[0.055]	[0.064]	[0.066]	[0.060]
Class characteristics					
8th grade	0.049	0.072**	-0.040	0.076	-0.103**
	[0.058]	[0.035]	[0.042]	[0.047]	[0.040]
Class size	0.002	0.004	0.002	-0.001	-0.003
	[0.005]	[0.005]	[0.007]	[0.005]	[0.004]
Higher track	-0.021	0.006	0.045	0.044	-0.011
	[0.036]	[0.045]	[0.066]	[0.044]	[0.046]
Constant	0.343	0.685***	0.847***	0.644***	0.817***
	[0.202]	[0.151]	[0.185]	[0.148]	[0.151]
Observations	946	1,026	1,026	1,026	938
R-squared	0.025	0.040	0.031	0.049	0.061

Note: This table reports the coefficient estimates for a simple differences regression on tested knowledge about finance. OLS robust standard errors, clustered at the school level were estimated and are presented in brackets, *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table A.3: The effect of the financial education program on financial behavior – simple differences

	(1) Impulse shop	(2) Just enough money	(3) Saving	(4) ln(saving)	(5) Hypoth. Savings
Post	-0.074*	-0.009	0.047	0.160	0.031***
	[0.036]	[0.039]	[0.029]	[0.109]	[0.010]
Socio-demographics					
Girl	-0.015	0.060*	-0.084**	-0.428**	-0.038**
	[0.022]	[0.030]	[0.034]	[0.158]	[0.016]
Low math	0.061**	0.029	-0.067**	-0.306**	-0.012
	[0.026]	[0.034]	[0.024]	[0.118]	[0.023]
Low cognition	0.006	0.006	0.019	0.006	-0.007
	[0.034]	[0.030]	[0.038]	[0.126]	[0.016]
$11-25$ books at home	-0.131***	0.073**	0.099*	0.455**	0.011
	[0.044]	[0.029]	[0.051]	[0.175]	[0.027]
$26-100$ books at home	-0.052	0.087**	0.065*	0.290**	-0.005
	[0.064]	[0.037]	[0.031]	[0.108]	[0.017]
$101-200$ books at home	-0.110	-0.018	0.151***	0.659***	0.073***
	[0.068]	[0.035]	[0.040]	[0.211]	[0.020]
>200 books at home	-0.154***	0.086	0.116**	0.579***	0.051
	[0.051]	[0.054]	[0.041]	[0.152]	[0.033]
German	-0.017	-0.071*	0.058	0.016	0.016
	[0.063]	[0.040]	[0.049]	[0.195]	[0.024]
Single parent	0.091*	0.104	0.047	0.239	0.003
	[0.043]	[0.076]	[0.046]	[0.259]	[0.026]
3 person household	0.070	0.045	-0.048	0.026	0.043
	[0.066]	[0.040]	[0.052]	[0.160]	[0.033]
4 person household	0.078	0.077	0.025	0.291	0.045*
	[0.058]	[0.050]	[0.063]	[0.242]	[0.023]
5+ person household	0.107*	0.079	0.059	0.337	-0.001
	[0.060]	[0.056]	[0.058]	[0.226]	[0.023]
Class characteristics					
8th grade	0.026	0.000	-0.056	-0.166	0.009
	[0.060]	[0.022]	[0.048]	[0.172]	[0.025]
Class size	-0.003	-0.005	0.008	0.014	0.008**
	[0.010]	[0.004]	[0.005]	[0.020]	[0.003]
Higher track	0.076	-0.000	-0.033	-0.068	0.008
	[0.054]	[0.054]	[0.063]	[0.207]	[0.023]
Constant	0.420	0.256*	0.306*	1.312*	0.003
	[0.274]	[0.124]	[0.170]	[0.658]	[0.079]
Observations	1,035	1,005	1,024	970	1,013
R-squared	0.039	0.032	0.062	0.052	0.085

Note: This table reports the coefficient estimates for a simple differences regression on financial behavior. OLS robust standard errors, clustered at the school level were estimated and are presented in brackets, *** p<0.01, ** p<0.05, * p<0.1.

Table A.4: Propensity score matching results

	Average treatment effect on the treated		
	ATT	Std. Err.	t-value
Interest in finance	0.383	0.105	3.644
Self-assessed knowledge	0.413	0.105	3.912
All answers correct	0.083	0.060	1.382
Advertising 1 correct	0.020	0.046	0.436
Advertising 2 correct	0.032	0.039	0.816
Costs correct	0.005	0.042	0.106
Risk correct	0.144	0.058	2.494
Impulse shop.	-0.059	0.060	0.990
Just enough money	0.045	0.043	1.060
Saving	-0.010	0.053	0.184
$\ln(Saving)$	-0.027	0.212	0.129
Hypoth. Saving	-0.024	0.029	0.826

Note: Estimation using Kernel matching with an epanechikov kernel, 0.06 bandwidth and bootstrapped standard errors (with 50 replications). Balancing conditions are satisfied. The matched sample is balanced based on sex, family background (dummy for single parent family and household size dummies), numeracy score (math grade), cognitive ability, and language spoken at home. We are applying the estimation tools discussed in Becker and Ichino (2002).