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**Financial Literacy, Risk and Time Preferences –
Results from a Randomized Educational
Intervention**

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Financial literacy, risk and time preferences – Results from a randomized educational intervention*

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Abstract

We present the results of a randomized intervention in schools to study how teaching financial literacy affects risk and time preferences of adolescents. Following more than 600 adolescents, aged 16 years on average, over about half a year, we provide causal evidence that teaching financial literacy has significant short-term and longer-term effects on risk and time preferences. Compared to two different control treatments, we find that teaching financial literacy makes subjects more patient, less present-biased, and slightly more risk-averse. Our finding that the intervention changes economic preferences contributes to a better understanding of why financial literacy has been shown to correlate systematically with financial behavior in previous studies. We argue that the link between financial literacy and field behavior works through economic preferences. In our study, the latter are also related in a meaningful way to students' field behavior.

JEL Codes: C93, D14, I21

Keywords: Financial literacy, randomized intervention, risk preferences, time preferences, field experiment

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1. Introduction

Financial literacy is generally understood as an individual's capability to handle financial aspects of everyday life and to make meaningful and informed decisions regarding investments, savings, and consumption (OECD, 2017). However, the level of financial literacy is fairly limited across the globe. Many people around the world have difficulties in understanding seemingly simple concepts like compound interest, risk diversification, or the relation of inflation and purchasing power. Lusardi and Mitchell (2014) report that at most around 50% of respondents in countries like the US, Japan, Germany, New Zealand, or Russia are able to answer three standard questions about financial literacy correctly.¹ This is particularly worrying, given that numerous studies have found a correlation between an individual's financial literacy on the one hand side and financial behavior on the other hand side (e.g., Hastings et al., 2013; Fernandes et al., 2014; Ambühl et al., 2017; Kaiser and Menkhoff, 2017). For example, it has been shown that less financially literate subjects are more likely to save too little for retirement (Boisclair et al., 2017), are more likely to earn lower returns from their savings accounts (Deuflhard et al., 2019), and are less likely to engage in recommended credit, savings, and investment practices (Hilgert et al., 2003). Moreover, lower financial literacy correlates with suboptimal mortgage choices (Agarwal et al., 2010), higher credit-card debt (Lusardi and Tufano, 2015), and lower overall wealth (Lusardi et al., 2017).

While a correlation between financial literacy and financial behavior has been established for a wide range of domains, it is less clear whether and how financial literacy affects financial behavior in a causal way. In this paper, we provide evidence that teaching financial literacy in a randomized education intervention has causal effects on the economic preferences of students. Since economic preferences themselves are related in meaningful ways to field behavior, our results suggest that the relation between financial literacy and financial behavior is based on effects of financial literacy on economic preferences.

Here we present a field experiment (Harrison and List, 2004) that examines how teaching financial literacy affects students' risk and time preferences. We study both short-term and longer-term effects of up to about half a year after our intervention that lasts for four weeks and comprises eight hours of teaching in German high schools. We have three touchpoints with

¹ The three questions read as follows: (1) Suppose you had \$100 in a savings account and the interest rate was 2 percent per year. After 5 years, how much do you think you would have in the account if you left the money to grow? [more than \$102; exactly \$102; less than \$102.] (2) Imagine that the interest rate on your savings account was 1 percent per year and inflation was 2 percent per year. After 1 year, would you be able to buy: [more than, exactly the same as, or less than today] with the money in this account? (3) Do you think that the following statement is true or false? "Buying a single company stock usually provides a safer return than a stock mutual fund." [true; false.]

a total of 645 students (with an average age of 16 years); one week before the intervention, one week after it, and finally about six months after the end of the intervention. In these encounters, we measure risk and time preferences, but also knowledge about financial literacy, in an incentivized way. The longer-term nature of our project allows us to address whether some effects of financial education might fade away with time or need some time to build up. Another distinctive feature of our field experiment is the fact that our intervention has three arms (in a within-school design), which includes two different control treatments. One of the latter allows us to contrast an educational intervention on monetary policy with teaching financial literacy. Both interventions focus on the use of money and financial decisions, but from very different perspectives. We consider the monetary policy intervention an insightful (and novel) benchmark for the effects of education in financial literacy. Since monetary policy issues are frequently taught in German high schools, one might ask whether exposing students to concepts like inflation rates or monetary stability can function as a substitute for financial literacy that is not part of German curricula. We are able to give a negative answer to this question.

We find that both of our school interventions, the one on financial literacy and the one on monetary policy, increase knowledge in the respective area. This is reassuring, as it shows that our material helped students to gain knowledge and apply it successfully to problem sets. The effect sizes in the learning progress are relatively large. Most importantly, however, we find a noticeable effect of the financial literacy intervention on both risk and time preferences, while there are no systematic changes in economic preferences in the genuine control condition and in the monetary policy intervention group. These effects of the financial literacy intervention persist both in the short and longer term of about half a year, and there is no noticeable fading out across time. The financial literacy intervention makes subjects more patient and supports more time-consistent behavior. In fact, the fraction of present-biased subjects is reduced through the intervention. Concerning risk preferences, the financial literacy intervention triggers slightly, but significantly, more risk aversion in the aggregate. However, those students with a larger increase in financial literacy shift back most in the direction of risk neutrality. Importantly, the changes in risk and time preferences as a consequence of our financial literacy intervention are significantly correlated, meaning that the intervention has a joint effect on both preferences. From a short survey questionnaire, we also see that both risk and time preferences of students are related in meaningful ways to their field behavior as far as financial behavior is concerned.

Our paper contributes in particular to the literature on randomized intervention studies with respect to financial literacy, but more generally also to the literature on the formation of

economic preferences and their malleability. Concerning the first strand of literature, we focus in particular on previous work with adolescents. Due to demographic changes and the rapid development of innumerable financial products, adolescents will have to make relatively more complex financial decisions in their lives than earlier generations, including decisions regarding retirement savings or risky investment opportunities. Thus, strengthening the financial literacy of teenagers is of great practical importance (OECD, 2017), in particular since the level of financial literacy is typically lower for adolescents than for adult subject pools (Lusardi and Mitchell, 2014; OECD, 2015). While financial education programs need not improve the financial literacy of adolescents or affect their behavior (see reviews by Hastings et al., 2013, or Lusardi and Mitchell, 2014), Brown et al. (2014) have shown that the effects of high-school financial education on knowledge and behavior are most pronounced when courses are taught by trained teachers. Following this insight, Bruhn et al. (2016) evaluate a comprehensive financial education program with about 25,000 Brazilian high-school students. While they find a large increase in the students' financial literacy, the effects on financial behavior are mixed: for instance, the students' savings improve, but at the same time they increase the use of expensive credit to make consumer purchases. Overall, Bruhn et al. (2016) focus on the link between financial education and financial behavior, but they do not take into account economic preferences as the potential source for behavioral changes.

Lührmann et al. (2018) focus explicitly on the possible effects of financial literacy training on time preferences of about 900 students, aged 14 years on average, about half of whom were exposed to a 4.5-hour training session on financial literacy. Lührmann et al. (2018) find in a time preference experiment (between four and twelve weeks after the intervention) that the degree of patience did not change significantly, but that students behaved more frequently in a time-consistent (non-present-biased) manner. However, the authors have not investigated whether the intervention had any impact on financial knowledge or behavior, which makes it impossible to identify whether an improvement in financial literacy has any direct impact on the students' economic preferences.

Of course, financial decisions are hardly ever only characterized by an intertemporal dimension which relates to time preferences. They almost always also entail a risky component (e.g., about the development of inflation and interest rates, or of the stock market). It is therefore important to take into account both dimensions, risk and time preferences, while studying at the same time whether and how financial literacy might affect financial decisions, not least because of the intertwined nature of risk-taking and time discounting (Andersen et al., 2008; Epper and Fehr-Duda, 2019). Bjorvatn et al. (2020) consider both risk and time preferences in their field

study in Tanzania. They exposed more than 2,000 students, aged 18 years on average, to an edutainment program on TV about entrepreneurship, also including elements of financial literacy. Although the show triggered some interest in entrepreneurship and business, it had an unintended side effect by discouraging students from investing in schooling, thus yielding, in effect, a negative outcome on school performance and the likelihood to continue their education. Bjorvatn et al. (2020) have also measured risk and time preferences once after their intervention. However, they find no effect of the TV show on these experimentally elicited preferences, without controlling for potential changes in financial literacy. The null effects may also be due to the medium of information provision being the television, rather than a trained teacher with personal interaction (which could increase the likelihood of a financial education program to have effects according to Brown et al., 2014).²

Our study differs from the previously described ones in the following combination of characteristics: We let trained teachers educate students in financial literacy. We carefully measure both the students' knowledge in financial literacy and elicit risk and time preferences in an incentivized way. By having three touchpoints with students, i.e., repeated measurements, we can observe how the intervention affects both knowledge and economic preferences in the short and the longer term, and can link changes in knowledge on an individual level to changes in economic preferences, on top of identifying the main effect of the intervention *per se* on economic preferences.

Our paper is also related to the literature on the formation of non-cognitive skills (Heckman, 2006; Cunha and Heckman, 2007; Heckman and Mosso, 2014), and here in particular on the formation and malleability of economic preferences (Alan and Ertac, 2018, 2019; Alan et al., 2019; Cappelen et al., 2020; Kosse et al., 2020). The latter have been shown to influence educational achievements (Castillo et al., 2011, 2018; Golsteyn et al., 2014), labor market outcomes (Heckman et al., 2006; Caliendo et al., 2010), financial success (Meier and Sprenger, 2010, 2012; Dohmen et al., 2011), or a subject's health status (Chabris et al., 2008; Moffitt et al., 2011; Sutter et al., 2013). Recently, several papers have addressed how economic preferences might be formed through educational interventions. While any intervention that is run over a longer time period consists of several components that make it difficult to disentangle the effects of each single component, the randomized assignment of interventions to different groups allows for a clean identification of an intervention's effects. Alan and Ertac (2018, 2019)

² More recent evidence by Berg and Zia (2017), however, suggests that edutainment on TV can also increase financial literacy without teacher interaction, though they do not examine any effects of their intervention on economic preferences.

and Alan et al. (2019) have shown that curricular interventions (which are completely unrelated to financial literacy) can affect time preferences, grit, and the competitiveness of children. Cappelen et al. (2020) have presented evidence that pre-school interventions and curricular changes can make young children more fairness-minded and less selfish. Kosse et al. (2020) have studied how a mentoring program for disadvantaged children changes their social preferences and triggers more prosocial behavior. The papers mentioned here included relatively young children, aged 3 to 10 years, an age range that is considered as easily accessible for behavioral changes. Our study with teenagers around the age of 16 examines whether economic preferences are also malleable during that age. Even more importantly, compared to earlier work that focuses on a single economic preference dimension, our study shows that a curricular intervention can affect two important domains of economic preferences at the same time: risk preferences and time preferences, both of which are undeniably important for many decisions in life, in particular financial ones.

The remainder of the paper is organized as follows. Section 2 introduces the design of our field intervention, including its implementation. Section 3 presents the results; first on financial literacy, then on risk and time preferences, and we conclude this section by relating the latter also to some aspects of field behavior of students. Section 4 concludes the paper.

2. Implementation and design of the field experiment

Our study was approved by the IRB of the University of Innsbruck and it was pre-registered at the AER RCT registry (<https://www.socialscienceregistry.org/trials/2953>). We recruited a total of eleven schools in the German states of North Rhine-Westphalia, Rhineland-Palatinate, and Thuringia. Recruitment was done during advanced training courses for teachers, which were given by three of the authors (but which were unrelated to the intervention study). In nine out of eleven schools, we recruited three parallel classes in a particular grade and randomly assigned each class to one of the three treatment arms (explained in Section 2.1 in detail). Two schools (in Ahaus and Heilbad Heiligenstadt) had only two parallel classes per grade, for which reason we could only implement two treatment arms there, i.e., the genuine control treatment and the financial literacy intervention. The classes that participated in a particular school were always in the same grade, but across schools it differed whether they were in the 9th, 10th, 11th, or 12th grade.

The three treatment arms differed with respect to the material covered in the respective courses. Each of the three treatment arms comprised eight hours in total, two in each of four

consecutive weeks. The material was always taught by the students' regular teachers. To standardize the lectures (in particular the two intervention arms), we developed a web platform and trained teachers how to use it in the same way across the different schools. This training was done by two of the authors prior to any intervention, and was done on an individual level to train the teachers as well as possible and to have the lectures – and the style of lecturing and interaction with students – as identical as possible (which was strongly facilitated by the use of the web platform).

While the teaching in the three treatment arms was done by regular teachers, the questionnaires and experimental measurements were executed by us (and additional student helpers). We visited the schools three times: (i) one week before the intervention started; (ii) one week after the end of the four-weeks intervention; and (iii) about half a year after the second visit (ranging from four to nine months later). In each of these visits, we measured the students' literacy and their risk and time preferences in an incentivized way (described in Section 2.2). In order to keep track of the adolescents' decisions, but to preserve anonymity, we asked students to self-generate a personalized code that was identical across all visits.

2.1 The three treatment arms

We implemented our treatment arms in the courses that dealt with business, economics, or social sciences.³ Within each school, all three arms were taught in parallel classes during the four weeks of the intervention.⁴

Our *Control* group was exposed to the regular teaching material in the respective course. The content in the *Control* group differed from school to school (and across grades), but never captured any material that was used in the other two treatment arms (but covered topics such as, e.g., demographic change or climate policy or the European Union's political system).

The *monetary policy* intervention group – henceforth abbreviated as *MP* – served as a second control group. It covered topics such as the functioning of the Euro system, the regulatory framework of the economic and monetary union, the recent financial crisis and possible rescue measures, as well as concepts such as inflation and monetary stability. These topics are typically part of the ordinary curricula, but none of them had been covered before

³ All over Germany, and also in our schools, there are different labels for such courses. In our cases, they were mainly labelled “Sozialwissenschaft”, “Sozialwissenschaften/Wirtschaft“ or “Wirtschafts- und Sozialkunde“.

⁴ Since students did not have access to the material covered in the parallel classes, spillovers are unlikely.

students were exposed to our intervention. The *MP* intervention was based on a textbook on monetary policy published by the German Central Bank (Deutsche Bundesbank, 2017).⁵

The *financial literacy* intervention group – henceforth abbreviated as *FL* – is our main treatment of interest. In this treatment arm, the eight hours of intervention focused on individual decision-making and applied it to individual savings, investment, and consumption decisions. Students in the *FL* intervention learned to comprehend a salary statement, to develop an investment strategy, and to deal with inflation and its influence on purchasing power, to name a few examples. Moreover, they were informed about common mistakes people incur when making financial decisions. These behavioral biases included, among others, the sunk cost fallacy, or loss aversion.⁶ Some of the concepts were also illustrated by getting students engaged in experiments that investigated these concepts in order to place an emphasis on experiential learning. We also exposed them to practice problems (unlike in the *MP* intervention) where students had to apply the concepts taught to typical finance-related situations in the field. None of the material covered in the *FL* intervention was part of the curriculum, and as such was completely new to students (while teachers were familiar with these concepts and were trained by us to deepen their knowledge). Two of the authors (who taught in high schools for many years) had developed this material (of which a full translation is available in the Appendix), and they had trained the teachers in delivering the material with the help of an online platform (www.econ-ebook.de). It is important to stress that the material did not include any normative statements about how “optimal” risk and time preferences should look like.

2.2 Measuring literacy and risk and time preferences

In order to assess the students’ literacy about monetary policy and financial issues, we tested them prior to the intervention, one week after it, and about half a year later. This test (see the Appendix) was structured in two parts and consisted of multiple-choice questions and a few computing tasks. One part contained questions on monetary policy, the other on financial literacy. In both parts, students could earn up to 24 points as their score if they answered all

⁵ The full content is available here: <https://www.bundesbank.de/de/publikationen/schule-und-bildung/geld-und-geldpolitik-606038>. Fritzsche and Schuhen (2015) have adapted this material (actually the previous edition of the German Bundesbank’s book that is identical in content, however) for an online version. Since the monetary policy intervention only serves as a second control treatment (as does the genuine control treatment), we have abstained from translating everything from German into English, but refer to the German website.

⁶ We included insights from behavioral and experimental economics about fallacies in human decision-making in the financial literacy intervention on purpose, due to our conviction that understanding how people tend to behave and how they are prone to biases is useful for making informed and meaningful financial decisions.

questions correctly. After each test, we randomly drew five students per class (and test) and then paid them €1 for each point as an incentive to do their best.

We also measured the students' risk and time preferences (see the Appendix for the instructions). Here we followed the procedure of Sutter et al (2013). Students had to fill in three choice lists: one for risk preferences, two for time preferences. Each choice list contained 20 decisions. In the risk elicitation task, students could either choose a lottery that paid €0 or €10 with equal probability or a safe amount that started with €0.50 and increased in steps of €0.50 until it reached €10.

The two choice lists to measure time preferences let students choose between getting €10.10 sooner or another amount later. The later amount increased in steps of €0.20 from €10.10 to €13.90. In one choice list, the sooner amount of €10.10 was available on the day of the experiment, and the later amount was due one week later. In the second choice list, all payment dates were shifted one week into the future (meaning that the earlier amount was available in one week, and the larger amount in two weeks). The combination of both choice lists allows us to study the intertemporal consistency of choices (Laibson, 1997).

After the students had made all decisions, each was paid according to one randomly selected decision. If a student had chosen the lottery in the risk elicitation task, it was resolved as follows: A student blindly drew one ball from a bag with 10 white and 10 orange balls. A white ball yielded a win of €10, while an orange ball yielded zero earnings. Earnings from the time preference experiment were paid out depending upon the chosen payment date (i.e., either at the day of the experiment, or one or two weeks later). In all cases, payments were handed out in sealed envelopes that only had the individual (anonymous) code of students on it, implying that neither other students nor teachers could identify a student's choices. Payments were executed during regular school hours in order to minimize transaction costs.

In the following Results section, we are going to use *certainty equivalents* (CE) in the risk elicitation task as our measure for risk preferences. The CE will be defined as the midpoint between the largest safe amount over which the lottery is preferred and the smallest safe amount that is preferred over the lottery. Lower certainty equivalents will indicate relatively more risk aversion. In case of multiple switching between the lottery and a safe amount, we check whether a subject's pattern can be rationalized. This applies if the largest safe amount until which a subject always preferred the lottery is smaller than the smallest safe amount from which onwards a subject always preferred the safe amount. In this case, we again take the midpoint between these two values. If multiple switching cannot be rationalized (e.g., if a subject prefers

small amounts over the lottery, but prefers the lottery over larger amounts), we exclude a subject from our analysis.

In the time preference task, we will use a variable called *future premium* that indicates how much money a subject needs to get on top of €10.10 to wait for one more week to receive a larger payment. As an indifference point between taking the sooner and taking the later payment, we take the midpoint between the largest later amount over which a student prefers €10.10 and the lowest later amount that is always preferred over €10.10.⁷ A lower future premium indicates a more patient student, while a larger future premium signals more impatience. With respect to time preferences, we can also classify a subject as present-biased or future-biased. If the future premium is *larger* in the choice list without an upfront delay – i.e., in the list where students choose between €10.10 today and another amount one week later – than in the choice list with an upfront delay of one week, then a student is classified as *present-biased*. In the reverse case, the student is classified as *future-biased*. If both premia are identical, we speak of a non-biased subject.

At the end of an experimental session, we administered a short questionnaire, including three questions targeted at field behavior that relates to financial decision-making. Using a five-point scale (from “never” to “very often”), we asked about the frequency of the following activities over the past month: (i) betting with friends on something; (ii) participating in gambling; (iii) buying something on the internet. Additionally, we also asked with the same scale about smoking. These four questions in total will be used at the end of the results section to illustrate a link between risk and time preferences to financial and health-related behavior.

3. Results

3.1 Sample descriptives

We visited schools three times to run experiments and administer a questionnaire and tests on financial literacy and monetary policy literacy. We will refer to the three visits as follows: *Pre* stands for the pre-intervention visit a week before the intervention started; *Post1* refers to the visit one week after the intervention was finished; *Post2* denotes the second post-intervention visit that took place about half a year after *Post1* (ranging from four to nine months later).

We had 645 participants in *Pre*, 633 in *Post1*, and 573 in *Post2*. The lower number in *Post2* is because of one class not participating in the last visit (as a result of conflicts with other school events) and because some students had moved to different schools (as in a few cases we

⁷ In case of multiple switching, we proceed analogously to our method for determining the certainty equivalents.

conducted the *Post2* visit after the summer break, i.e., in a new academic year). Of the 645 participants in *Pre*, 249 were in the *Control* treatment, 186 in the *MP* treatment, and 210 in the *FL* treatment.⁸

In order to study the causal effects of our interventions, we are going to consider all students who were present in our first visit and then at least in one of the post-intervention visits. For this set of students, we can identify short-term and longer-term effects of participating in the four-week intervention. More precisely, we had 580 students who participated both in *Pre* and *Post1*, and 515 students who participated both in *Pre* and *Post2*. In the analysis, we will only include subjects for whom we have all background data (which will be used in the regressions) and whose experimental choices can be rationalized as consistent. Out of the 645 subjects in *Pre*, 7% made inconsistent choices and were thus excluded from the analysis. In *Post1* and *Post2*, the fraction of subjects with inconsistent choices was as low as 3%.

On average, our subjects were 16 years old, and 52% were female. The data were collected between May 2017 and June 2019 in a staggered way across schools – while within schools the interventions were always run at the same time. Each student earned on average 15 Euro per visit, meaning that those who were present during all three visits earned on average 45 Euro, which is a significant amount of money for 16-year-olds.

3.2 Test scores on financial literacy and monetary policy

Figures 1 and 2 present the test scores for financial literacy and monetary policy literacy. Recall that in each topic subjects could achieve a maximum score of 24 points. In the financial literacy test, students across all treatments scored on average 9 points before the intervention, and 7 points on average in the monetary policy test. Figure 1 shows the test scores for financial literacy, conditional on the treatment arm (*Control*, *MP* or *FL*) and on the time of the test (*Pre*, *Post1*, or *Post2*). In the *Pre*-condition, there is no significant difference across treatments according to pairwise non-parametric Mann-Whitney U-tests. This indicates that randomization was successful. In the *Post1*-condition and the *Post2*-condition, the scores are always significantly higher in *FL* than in both other treatments, on average by about 2 points ($p < 0.05$). Most importantly, there is also a significant difference in the differences across visits. The

⁸ Recall that in two schools we did not have an *MP* treatment arm because we could only work with two parallel classes. Given our primary interest in financial literacy and given that we wanted to have a genuine control condition in each school, we have only nine classes with the monetary policy intervention, which explains the lowest number of students for the *MP* treatment arm. The classes in *Control* were on average slightly larger than those in *FL*, which explains the slightly higher number of students in the former treatment arm.

increase in scores from *Pre* to *Post1* and from *Pre* to *Post2* is significantly larger in the financial literacy treatment *FL* than in the other two treatments by about 1 point ($p < 0.05$ in all cases).⁹ This was to be expected since the *FL* intervention was targeted to improve financial literacy, and so it did. To quantify the effect sizes, we use Cohen’s *d* here, which relates the change in the score to its standard deviation. Hattie (2008) classifies *d*-values that satisfy $0.4 \leq d \leq 0.6$ as medium effects sizes, and this range applies to our findings for the increase in the financial literacy scores, as we find $d = 0.55$ in the short term and $d = 0.42$ in the longer term.

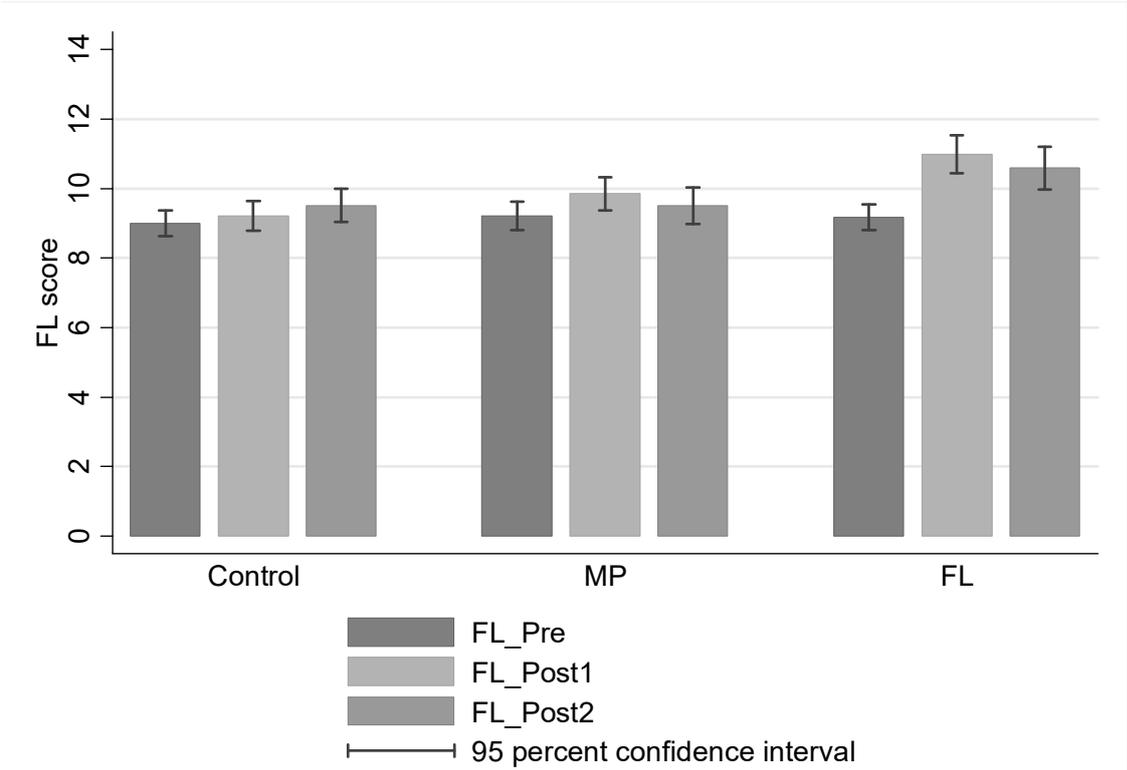


Figure 1. Scores in the financial literacy test, conditional on treatment and time of visit

Figure 2 illustrates how the test scores in the monetary policy test depend on the treatment and the time of the test. As expected, the absolute scores are significantly larger in the MP treatment than in the other treatments after the intervention. On top of that, the difference-in-differences, i.e., the increase in the score, is significantly larger in *MP* than in the other two treatments, both in the short term and the longer term by about 2 points ($p < 0.05$ in all comparisons). This means that teaching students eight hours in monetary policy has the expected positive effects on test scores. According to Cohen’s *d*, this effect is to be considered

⁹ We also see small changes in the financial literacy scores in *Control* and *MP*, but the increases there are significantly smaller than in the *FL* treatment.

as large, given $d = 1.29$ for the short term and $d = 0.74$ for the longer term. We also see that the *FL* treatment shows a small, and significant, increase in the test score on monetary policy, but the increase is much smaller than in the *MP* treatment.

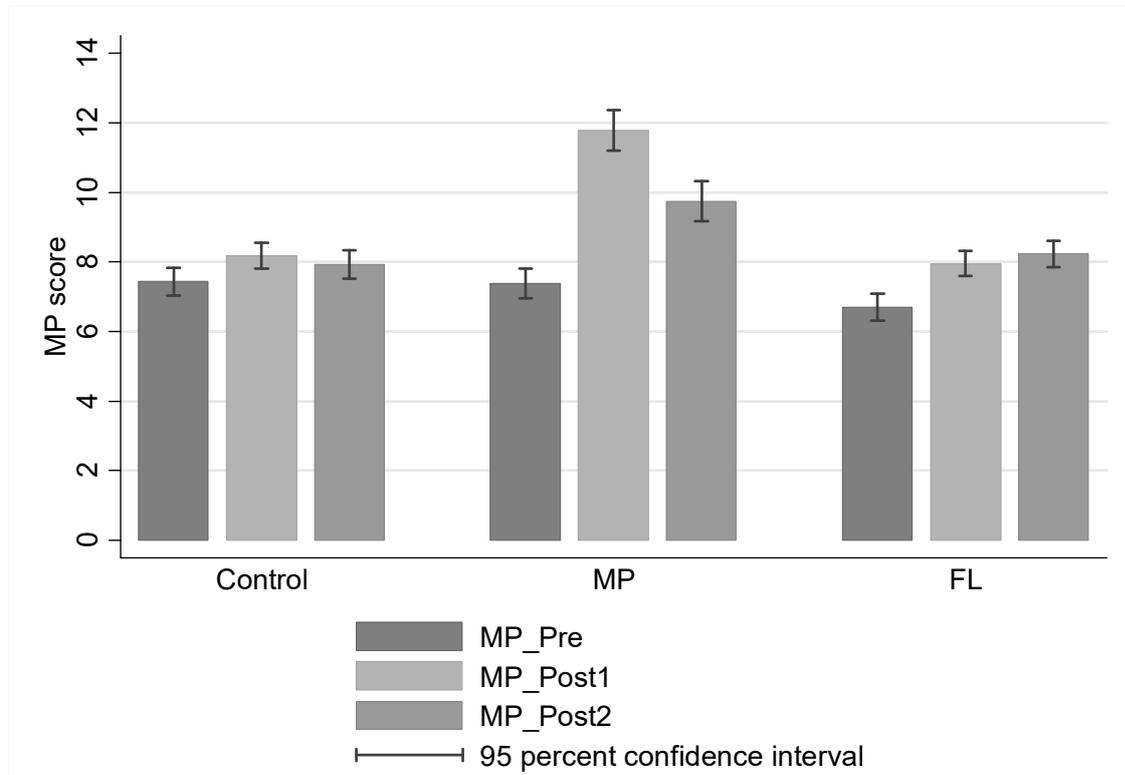


Figure 2. Scores in the monetary policy test, conditional on treatment and time of visit

3.3 Intervention effects on risk and time preferences

3.3.1 Overview and non-parametric tests

Risk preferences. Before our interventions, students had an average certainty equivalent (CE) of €4.85 for the lottery (that had a 50:50 chance of winning €10 or zero). This indicates slight risk aversion on average, but the CE is very close to risk neutrality. Across the three different treatment arms, the CE is €4.82 in *Control*, €4.97 in *MP*, and €4.69 in *FL*. Yet, there are no significant differences across treatments ($p > 0.12$), as one would expect with successful randomization.

Before the intervention, we observed, across all treatments, a significantly negative Pearson correlation between the financial literacy test score and a subject's CE ($\rho = -0.09$; $p < 0.05$). This indicates that subjects with higher financial literacy scores are, on average, slightly more risk-averse (or less risk-seeking). Figure 3 shows that our *FL* intervention reinforces this

relationship. The figure looks at the change in risk preferences in the short and longer term. In treatments *Control* and *MP*, we note that CEs are practically the same across *Pre*, *Post1*, and *Post2*. In the *FL* treatment, however, we note that CEs go down after the intervention, to €4.21 in *Post1* and €4.18 in *Post2*. On the latter two dates, the CEs in *FL* are significantly smaller than in *Control* or *MP* ($p < 0.05$ in all comparisons). Looking at the difference-in-differences, the change in CEs is significantly larger in *FL* than in *Control* in the longer run ($p < 0.05$).

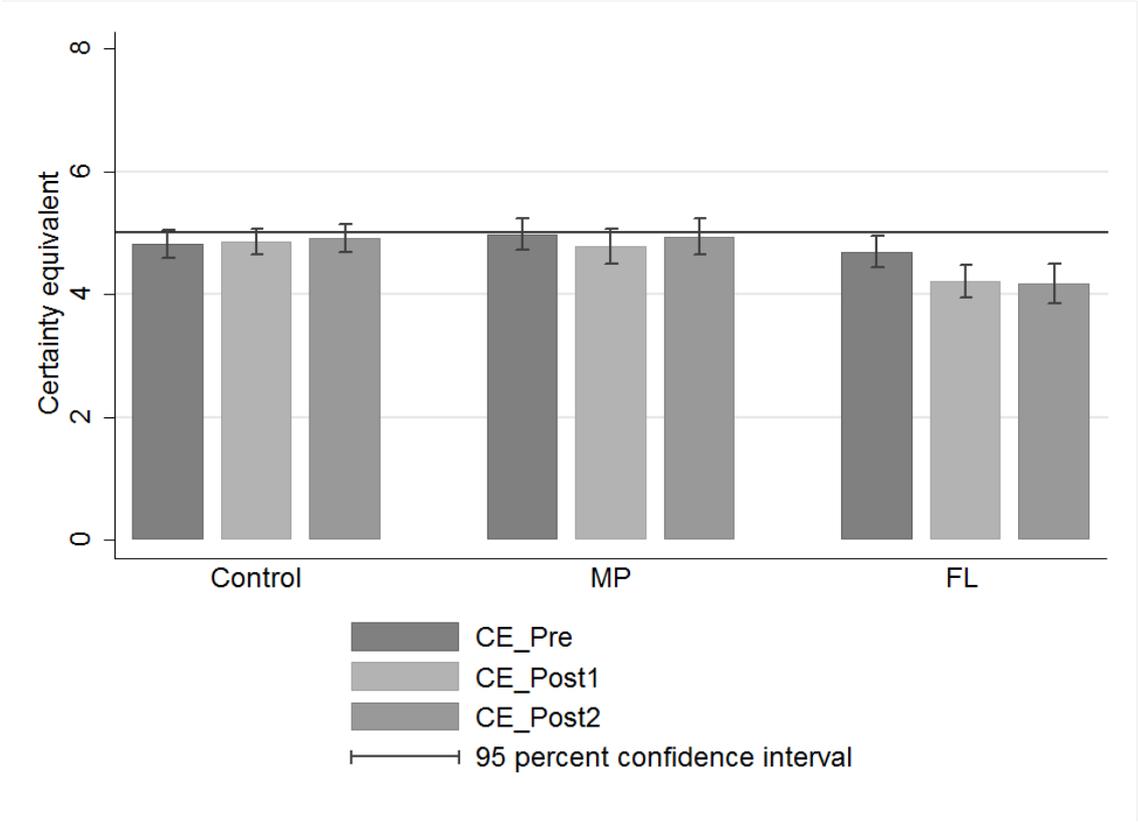


Figure 3. Certainty equivalent (CE) in risk elicitation task, conditional on treatment and time of visit (the bold horizontal line indicates the lottery’s expected value).

Overall, the descriptive presentation and the non-parametric analysis indicates that the financial literacy intervention has a significant impact on risk preferences. This is in line with our pre-registration. In the following, we shall take a closer look at the changes in risk preferences to understand better where the changes in the aggregate level come from. First, we consider the fraction of subjects that are classified as risk-averse (with a $CE < 4.75$), risk-neutral (with $4.75 \leq CE \leq 5.25$), or risk-seeking (with $5.25 < CE$). Figure 4 presents these fractions separately for the three treatments and the three visits. Looking specifically at the *Post2*-date,

we note that the fraction of risk-seeking subjects (11%) is significantly smaller in *FL* than in the other treatments, while the fraction of risk-averse subjects (40%) is larger in *FL* ($p < 0.05$ in all comparisons).

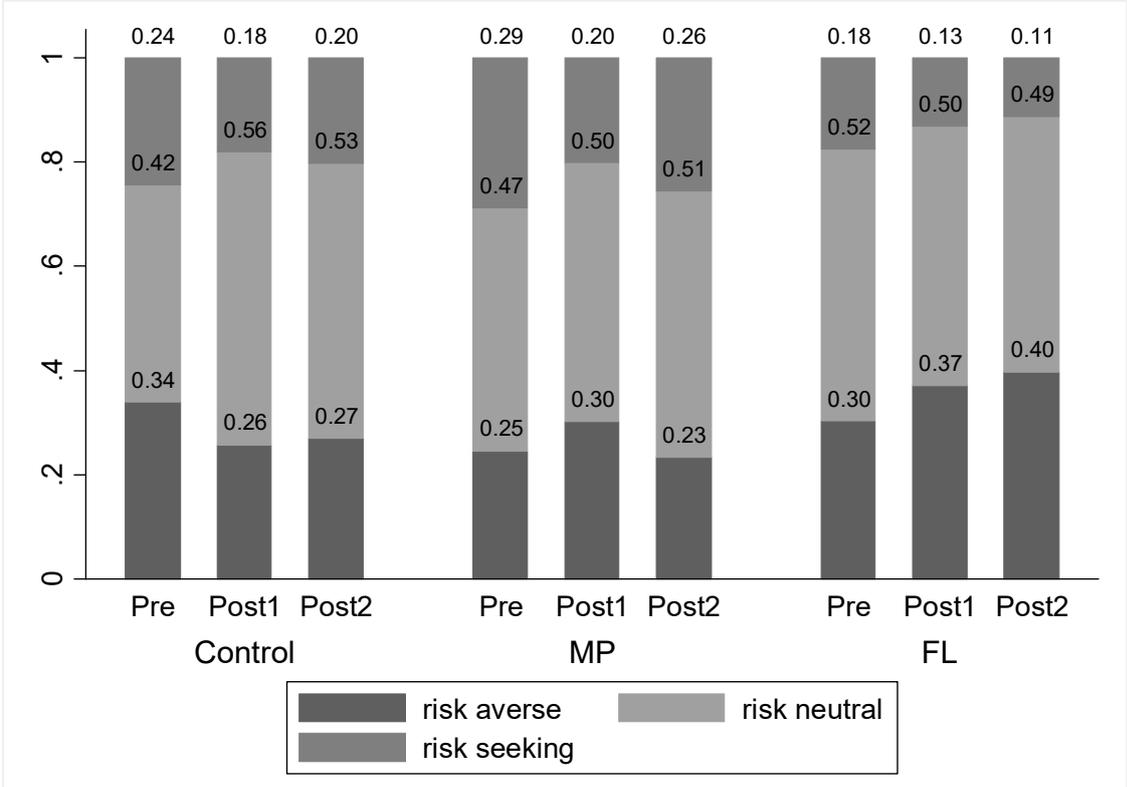


Figure 4. Classification of types in risk elicitation task, conditional on treatment and time of visit (numbers above bars indicate relative frequencies)

Another way of looking at the effects of the intervention on risk preferences is to consider the changes in the certainty equivalents between the *Pre*-date and the two other dates, subject to the different treatments. Figure 5 shows the cumulative density function of these differences. Compared to *Control* and *MP* (where the changes are largely centered around zero), we see a shift towards negative values in *FL*. For the longer-term changes (see the right panel), there is a significant difference in changes between *Control* and *FL* ($p < 0.05$; Mann-Whitney U-test).

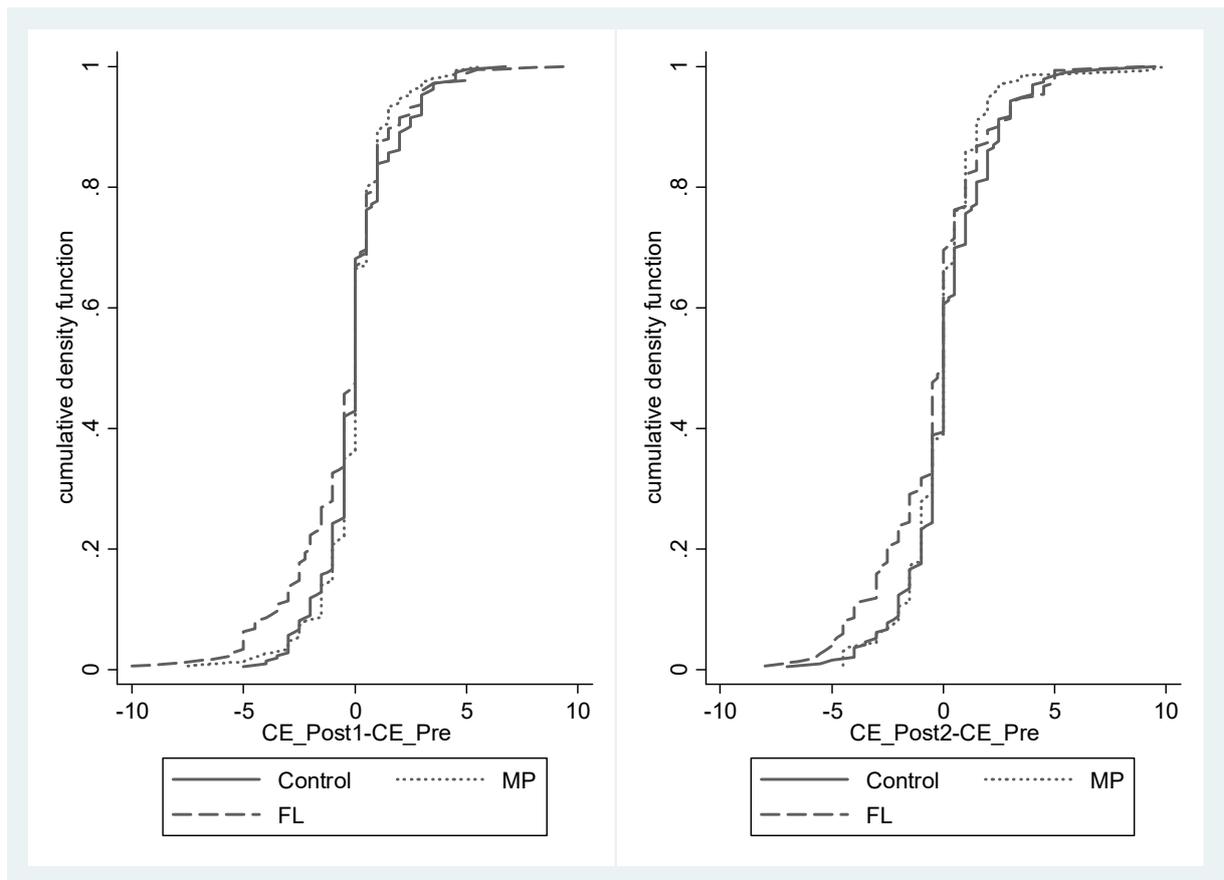


Figure 5. Cumulative density function of the change in certainty equivalents (CE) in the short term (Post1 – Pre; left panel) and the longer term (Post2 – Pre; right panel), conditional on treatment

Time preferences. Now we turn to time preferences. We start by looking at what we have defined as the *future premium*. Recall that this premium indicated the additional amount (on top of the earlier payment of €10.10) that subjects were asking for to wait for one week to receive a larger payment. We are going to call the future premium in the choice between a payment today and in one week the *premium01*, and the premium in the choice between a payment in one week vs. a payment in two weeks the *premium12*.

Like for risk preferences, we note a significantly negative correlation between the subjects' financial literacy scores and their time preferences in *Pre*, i.e., before our intervention. The Pearson correlation is -0.12 (and -0.16 , respectively) between the financial literacy score and *premium01* (*premium12*). Both correlation coefficients are significant at the 5% level. This means that subjects with higher financial literacy are more patient before any intervention starts. It is also noteworthy that both *premium01* and *premium12* are practically the same across all

treatments in *Pre*. Figure 6 then shows how patience develops across our three visits, conditional on the treatment. The upper panel of Figure 6 looks at *premium01*. Here we note that in *Control* and *MP* there is hardly any difference in *premium01* across our three visits. Overall, *premium01* is €1.19 on average, which implies that subjects demand on average at least €11.29 in one week to give up €10.10 right now. In the *FL* treatment, there is a small, yet insignificant, decrease in the future premium to about €1.06 in *Post1* and €1.01 in *Post2*. The latter premium is significantly smaller than in *Control* ($p < 0.05$).

The pattern is stronger in the lower panel of Figure 6 where we look at intertemporal choices with an upfront delay of one week for the earlier payment. Whereas *premium12* remains largely the same across all visits in *Control* and *MP*, this future premium decreases across visits in treatment *FL*, falling to around €0.80 in *Post1* and *Post2*. The difference-in-differences is significant for the short-term effects (of *Pre* vs. *Post1*) when comparing *FL* to each of the other two treatments ($p < 0.05$ in both comparisons), and the effects are weakly significant in the longer run between *Control* and *FL* (for *Pre* vs. *Post2*; $p < 0.1$). Overall, both panels of Figure 6 suggest that the financial literacy intervention makes students more patient.

This effect of the financial literacy is in line with our pre-registration, in which we expected financial literacy to improve patience, as such a relationship would be consistent with the positive correlations found in earlier studies between financial literacy and savings for retirement, less credit card debt, or higher overall wealth (Boisclair et al., 2017; Lusardi et al., 2017).

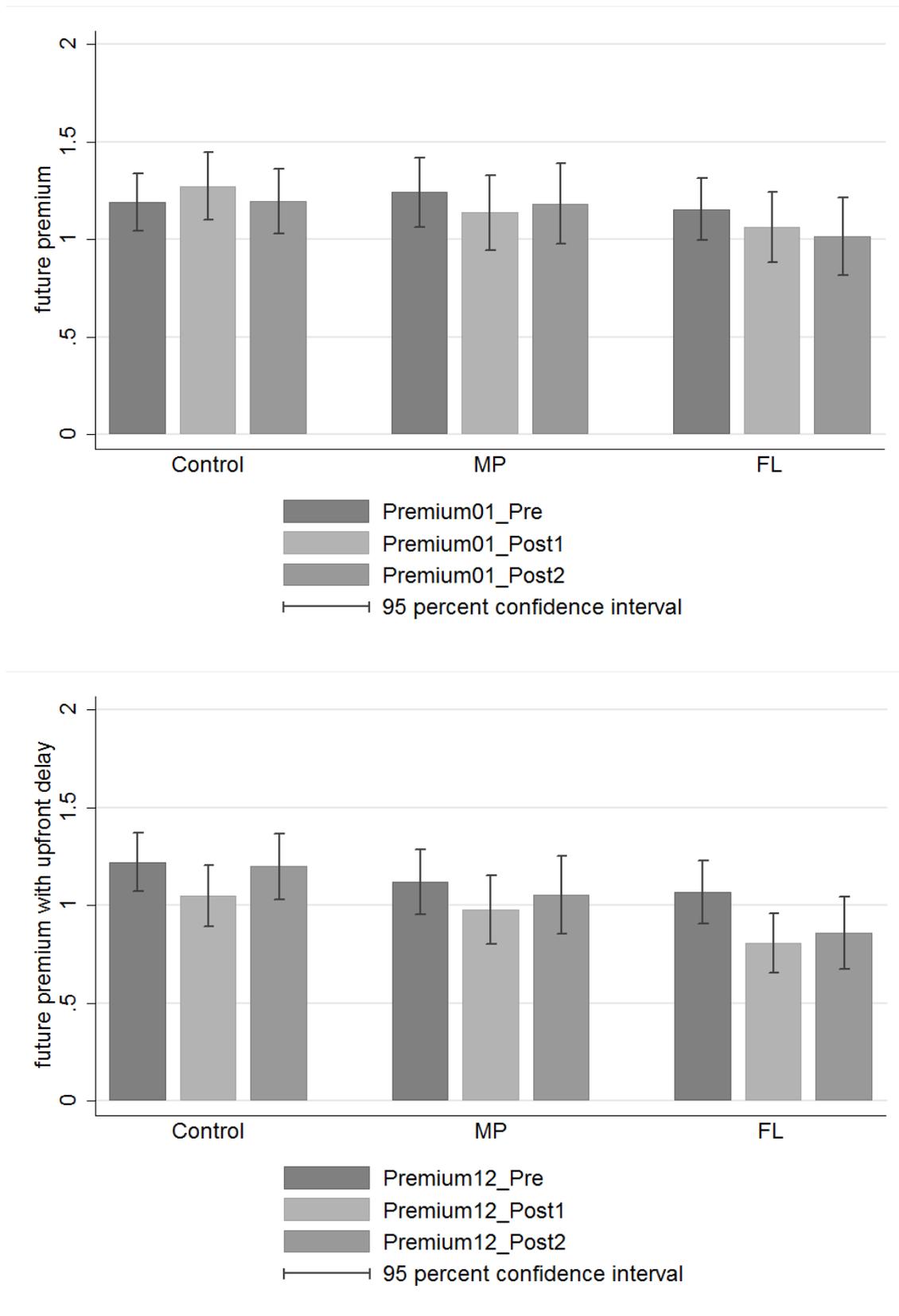


Figure 6. Future premium, conditional on treatment and time of visit. Upper panel: *premium01* (payment today vs. in one week). Lower panel: *premium12* (payment in one week vs. in two weeks).

We can also take joint look at a subject’s choices in both intertemporal choice lists – the one with an upfront delay and the one without it – in order to classify subjects into present-biased, future-biased, and those without any bias of this kind. A subject is classified as present-biased if her *premium01* is larger than her *premium12*. If the reverse is true, the subject is classified as future-biased. If both premia are identical, there is no bias. Figure 7 presents the distributions of types. While in the *Pre* date the distributions look very similar across treatments (and are insignificantly different), in *Post2* we notice that the fraction of non-biased subjects (of 70%) is significantly larger in *FL* than in each of the other two treatments ($p < 0.05$ in both comparisons).¹⁰

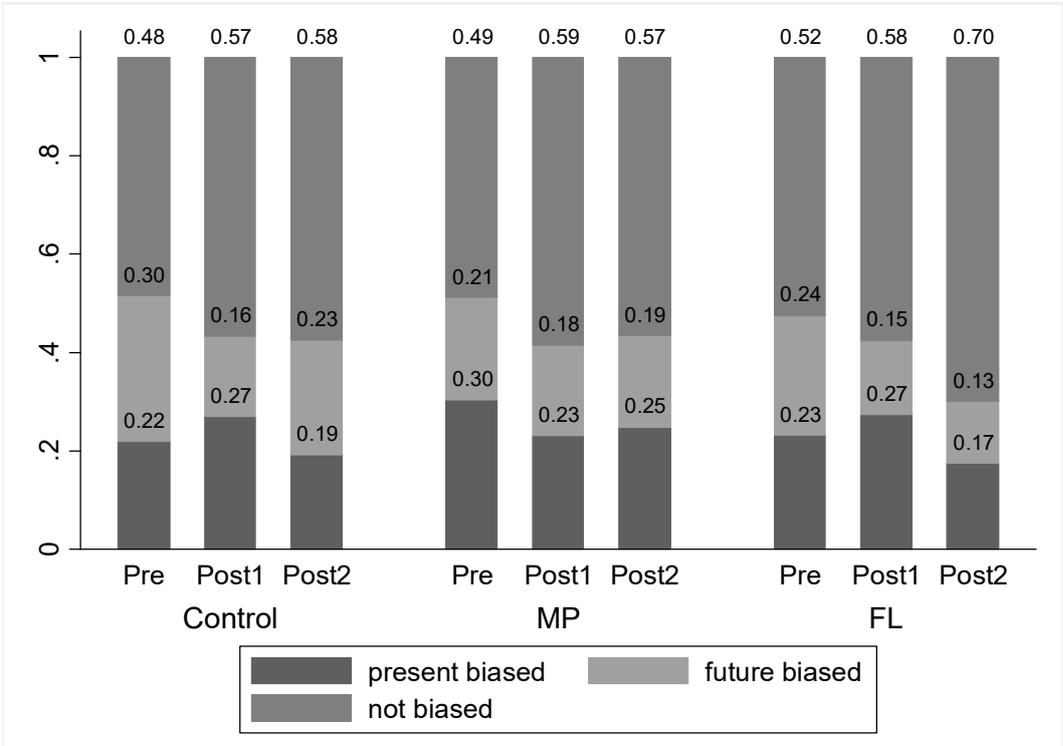


Figure 7. Classification of subjects as present-biased, future-biased or not biased in intertemporal choice, conditional on treatment and date of visit.

3.3.2 Regression analysis

We now analyze the short-term and longer-term effects of our interventions in a regression framework. We take the changes in economic preferences as our dependent variables. The short-term change is defined as the difference between the preference measured one week after

¹⁰ This finding resembles Lührmann et al.’s (2018) major result that financial literacy makes students behave more frequently in a time-consistent manner.

the intervention (*Post1*) and the preference measured one week before it (*Pre*). The longer-term change considers the difference between the *Post2* measurement about half a year after the intervention and the *Pre* measurement. With respect to risk preferences, we consider the short-term and the longer-term changes in the certainty equivalent. With regard to time preferences, we look at the changes in the future premium (either *premium01* or *premium12*).

Table 1. Changes in certainty equivalents (CE) in the short term (column 1) and longer term (column 2)

Dependent variable	(1)		(2)	
	$\Delta CE_{Post1-Pre}$	(s.e.)	$\Delta CE_{Post2-Pre}$	(s.e.)
Age (in years)	-0.014	(0.047)	-0.044	(0.060)
Female (=1)	-0.539***	(0.155)	-0.511***	(0.147)
FL dummy	-0.463**	(0.214)	-0.687*	(0.354)
MP dummy	-0.132	(0.209)	-0.00454	(0.237)
CE_Pre	-0.634***	(0.073)	-0.801***	(0.085)
FL-Score_Pre	-0.001	(0.031)	0.032	(0.052)
MP-Score_Pre	0.063**	(0.031)	-0.003	(0.037)
$\Delta FL\text{-Score}_{Post1-Pre}$	-0.008	(0.024)		
$\Delta MP\text{-Score}_{Post1-Pre}$	0.019	(0.025)		
$\Delta FL\text{-Score}_{Post2-Pre}$			0.065**	(0.028)
$\Delta MP\text{-Score}_{Post2-Pre}$			-0.018	(0.026)
Constant	3.110***	(0.782)	4.630***	(0.984)
N	516		453	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; standard errors (s.e.) in parenthesis.

We use OLS regressions and cluster standard errors at the class level ($N=31$).¹¹ In all regressions shown in Tables 1 to 3, we control for age and gender and take into account preferences and test scores before the intervention started (i.e., at the *Pre*-level). These variables are denoted as *CE_Pre* (*premium01_Pre* and *premium12_Pre*, respectively). The initial test scores are labelled *FL-Score_Pre* and *MP-Score_Pre*. We also include the change in the test scores as explanatory variables, either the short-term change ($\Delta FL\text{-Score}_{Post1-Pre}$ or $\Delta MP\text{-$

¹¹ Our results remain robust to clustering on the school level ($N=11$).

Score_Post1-Pre) or the longer-term change ($\Delta FL\text{-Score_Post2-Pre}$ or $\Delta MP\text{-Score_Post2-Pre}$).¹² Finally, we include dummies for the interventions themselves (*FL dummy* and *MP dummy*).

Table 1 reports short-term and longer-term effects on risk preferences. Column (1) uses the short-term change in the certainty equivalent as dependent variable ($\Delta CE_Post1-Pre$), and column (2) the longer-term change ($\Delta CE_Post2-Pre$). Recall from Figure 3 that the certainty equivalents before the interventions (*CE_Pre*) were practically the same across all treatments. The negative coefficient for the financial literacy intervention (*FL dummy*) indicates that this intervention reduces the subjects' certainty equivalents to a larger extent than this is the case in the *Control* treatment, which serves as benchmark here. So, the financial literacy intervention shifts certainty equivalents in the direction of more risk aversion in the aggregate. This effect of the financial literacy intervention holds both in the short term and the longer term (with the latter effect being weakly significant). In the longer term, we also note an influence of an improvement in financial literacy ($\Delta FL\text{-Score_Post2-Pre}$). Those subjects who improve their score more become less risk-averse, meaning that larger improvements in financial literacy countervail the shift towards more risk aversion of the intervention *per se* and move risk preferences back in the direction of risk neutrality. This means that the FL intervention has two opposing effects; a main effect that makes subjects more risk-averse, and an effect that depends on the improvement in financial literacy that goes in the opposite direction (but that is, in the aggregate, weaker than the main effect). The monetary policy intervention (*MP dummy*) and the change in the test scores on monetary policy have no significant impact on risk preferences in comparison to the *Control* treatment.

On average, women are significantly more risk-averse than men in our sample, with CEs of €4.97 for men and €4.71 for women before the intervention (which matches the stylized findings on gender differences in risk-taking; see Croson and Gneezy, 2009). The change of the certainty equivalent over time is significantly more negative for women than for men, as the variable *Female* shows in Table 1. This means that women become relatively more risk-averse over time, compared to men.

¹² If we excluded these endogenous variables that measure the change in the test scores, our results would practically stay the same. The same would be true if we added changes in time preferences as explanatory variables in Table 1 or changes in risk preferences as explanatory variables in Table 2 and 3. Adding those (endogenous) variables does not change the qualitative insights from Tables 1 to 3.

Table 2. Changes in the future premium *without* upfront delay (*premium01*) in the short term (column 1) and in the longer term (column 2)

Dependent variable	(1)		(2)	
	$\Delta premium01_{Post1-Pre}$	(s.e.)	$\Delta premium01_{Post2-Pre}$	(s.e.)
Age (in years)	0.049*	(0.025)	0.085***	(0.019)
Female (=1)	-0.277**	(0.133)	-0.277**	(0.105)
FL dummy	-0.058	(0.175)	-0.034	(0.160)
MP dummy	-0.080	(0.193)	0.024	(0.169)
premium01_Pre	-0.438***	(0.056)	-0.509***	(0.062)
FL-Score_Pre	-0.050**	(0.024)	-0.044*	(0.022)
MP-Score_Pre	-0.002	(0.024)	-0.011	(0.024)
$\Delta FL\text{-Score}_{Post1-Pre}$	-0.038**	(0.015)		
$\Delta MP\text{-Score}_{Post1-Pre}$	-0.008	(0.023)		
$\Delta FL\text{-Score}_{Post2-Pre}$			-0.045**	(0.020)
$\Delta MP\text{-Score}_{Post2-Pre}$			0.004	(0.021)
Constant	0.432	(0.454)	-0.121	(0.405)
N	537		461	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; standard errors (s.e.) in parenthesis.

Tables 2 and 3 examine time preferences. The dependent variable is the change in the future premium (recall that a smaller premium indicates more patience). Table 2 shows that both the level of financial literacy at baseline ($FL\text{-Score}_{Pre}$) and the improvement of it ($\Delta FL\text{-Score}_{Post1-Pre}$) yield more patience. Both $FL\text{-Score}_{Pre}$ and $\Delta FL\text{-Score}_{Post1-Pre}$ (respectively, $\Delta FL\text{-Score}_{Post2-Pre}$ for the longer-term change) are significantly negative, meaning that the additional amount of money that subjects require to wait for one more week becomes smaller with higher test scores in financial literacy and larger improvements of the scores. There is no main effect of the financial literacy intervention itself ($FL\text{ dummy}$), but this intervention generates improvements in test scores (see Figure 1) and thus contributes to more patient decisions when no upfront delay is given for the sooner payment. Contrary to the FL intervention, the MP intervention (by teaching monetary policy issues) never has any significant effect – neither a main effect nor any indirect effect through changes in the monetary policy score.

Table 2 shows that the change in the future premium becomes larger with age (meaning that when subjects get older, they need to be compensated slightly more for waiting a week). Moreover, the change is smaller for women than for men, which means that women become relatively more patient over time, compared to the change of men.

Table 3. Changes in the future premium *with* upfront delay (*premium12*) in the short term (column 1) and in the longer term (column 2)

Dependent variable	(1)		(2)	
	$\Delta premium12_{Post-Pre}$	(s.e.)	$\Delta premium12_{PostPost-Pre}$	(s.e.)
Age (in years)	0.032*	(0.019)	0.092**	(0.043)
Female (=1)	-0.200*	(0.111)	-0.328**	(0.125)
FL dummy	-0.100	(0.112)	-0.109	(0.159)
MP dummy	0.034	(0.136)	-0.028	(0.166)
premium12_Pre	-0.547***	(0.059)	-0.582***	(0.071)
FL-Score_Pre	-0.019	(0.018)	-0.028	(0.020)
MP-Score_Pre	0.001	(0.022)	0.032	(0.019)
$\Delta FL-Score_{Post1-Pre}$	-0.029**	(0.012)		
$\Delta MP-Score_{Post1-Pre}$	-0.000	(0.020)		
$\Delta FL-Score_{Post2-Pre}$			-0.049***	(0.015)
$\Delta MP-Score_{Post2-Pre}$			-0.025	(0.017)
Constant	0.262	(0.311)	-0.124	(0.689)
N	525		455	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; standard errors (s.e.) in parenthesis.

Table 3 shows basically the same results as Table 2, only now for the change in the future premium when the earlier payment has an upfront delay. The only noticeable difference to Table 2 is that the test score in financial literacy before the intervention (*FL-Score_Pre*) is no longer significant. Here, financial literacy has only an effect through changes in the test scores (both in the short term and in the longer term). The larger the increase in the test performance, the more patient subjects become (i.e., the lower their future premium). Like in Table 3, the *MP* intervention does not have any significant impact on patience.

So, overall, we find that our intervention on financial literacy has impacts on both risk and time preferences. For risk preferences, the intervention has a main effect in itself, making subjects in the aggregate slightly more risk-averse, while those improving their financial literacy score move back towards risk neutrality. With respect to time preferences, we have not seen a main effect of the intervention itself, but the extent of financial literacy before the intervention and in particular the improvement of financial literacy through the intervention have been found to make subjects relatively more patient. All of these results are novel for this literature. Comparing intertemporal choices with and without an upfront delay of the earlier payment, we have seen that the financial literacy intervention increases the number of non-biased subjects as far as a potential present bias or future bias is concerned, which is consistent with the major finding in Lührmann et al. (2018).

3.4 Relation of risk and time preferences to each other and to field behavior

As a final noteworthy piece of empirical evidence, we would like to show that risk and time preferences are related to each other and that they relate in meaningful ways to student behavior in the field. A Spearman rank correlation shows that the students' certainty equivalents and future premia are significantly positively correlated, which provides another rationale to consider both domains of economic preferences. Before our interventions (i.e., in *Pre*), the correlation between CE and *premium01* (*premium12*) was 0.09 (0.11). Both correlations are significant at the 5% level. This means that, in the aggregate, subjects who are relatively more risk-seeking (i.e., have a higher CE) are more impatient (i.e., have a higher future premium). The *changes* in risk and time preferences are also positively correlated (with correlation coefficients of around 0.10; the correlations are significant at the 5% level for the short term between the change in CE and *premium01*, and for the longer term between the change in CE and *premium12*).

Risk and time preferences are not only related to each other, but from the baseline questionnaire before the interventions we can also see that they relate to field behavior in meaningful ways. Smoking is positively correlated with certainty equivalents ($\rho = 0.09$; $p < 0.05$) and future premia ($\rho = 0.17$; $p < 0.05$). This means that more risk-seeking and more impatient students are more likely to smoke. With respect to financial behavior, in which we are particularly interested when dealing with financial literacy, we see that more impatient students are more likely to gamble with their money ($\rho = 0.12$), and to buy goods on the internet more frequently ($\rho = 0.09$; $p < 0.05$ in both cases). While we see a reduction in internet

purchases in the short term and the longer term both in *Control* and *FL*, the reduction is larger in the short term in *FL* than in *Control*, which hints at some behavioral effects of our intervention itself. Yet, we consider this supportive as a side aspect of our study, since the questionnaire had only few items on financial behavior, and since the main aim of our study was to examine how a randomized intervention on financial literacy affects the economic preferences of adolescents.

4. Conclusion

According to the OECD (2017), financial literacy is an essential skill in life. Despite its obvious importance, large fractions of citizens in many countries around the globe are financially illiterate (Lusardi and Mitchel, 2014). Teaching financial literacy may be one potential remedy to improve financial decisions of citizens. While financial literacy is rarely included in standard curricula at school (a few exceptions are discussed in Lusardi and Mitchell, 2014), several recent randomized control trials have provided evidence that education programs would have the potential to increase financial literacy (e.g., Bruhn et al., 2016, Berg and Zia, 2017, Bjorvatn et al., 2020). Given that financial literacy has often been shown to correlate with sounder financial decision-making (e.g., with respect to mortgage choices, savings for retirement, or earnings from savings accounts; Agarwal et al., 2010; Boisclair et al., 2017; Deuflhard et al., 2019), it remains an important question why financial literacy is linked to field choices in many cases.¹³

In this paper, we have presented a field experiment in German high schools that was intended to examine whether teaching financial literacy has an effect on the participants' risk and time preferences. We designed a four-week intervention on financial literacy and contrasted it with two control treatments, one comprising the regular courses (in subjects related to social sciences, economics, business, and politics) and another focusing on monetary policy. A key feature of our design was to have three touchpoints to measure the students' knowledge and their risk and time preferences, one week before the intervention, one week after it, and finally about half a year later. This allowed us to measure both short-term and longer-term effects of both the intervention *per se* and the changes in knowledge. A related study of Lührmann et al. (2018) considered only time preferences, had only one touchpoint (at most 12 weeks after their intervention) to measure these time preferences, and did not measure how changes in financial

¹³ Note that financial education programs may also have unintended side effects. For instance, their focus on money can have negative effects on graduation rates or increase the use of expensive credit for consumer purchase (Bruhn et al., 2016, Bjorvatn et al., 2020).

literacy affect them. Our design takes into account the close relationship of risk and time preferences (Epper and Fehr-Duda, 2019) and allows us to identify both the effects of the intervention and a possible change in financial literacy as a consequence of the intervention.

We have found that the financial literacy intervention makes subjects more patient and more frequently time-consistent. Concerning risk preferences, the intervention *per se* has moved the aggregate towards more risk aversion. However, larger improvements in financial literacy counteract this effect and shift risk preferences back towards risk neutrality. It is noteworthy that adolescents are typically somewhat less risk-averse than young adults (see Sutter et al., 2019, for a survey). This means that the main effect of the financial literacy intervention to make subjects on average more risk-averse shifts the adolescents' risk preferences in the direction of the levels observed in young adults; as if the intervention let the adolescents converge to the adults' risk preferences more quickly.

Both the effects on risk and time preferences are largely stable across the short term and the longer term. So, the least we can say is that they do not vanish quickly. We have also seen that risk and time preferences are related to health issues (like smoking), risk-taking (gambling), and consumption behavior (online shopping) in meaningful (and expected) ways. These findings are in line with earlier work showing that risk and time preferences are associated with individuals' health, education, and lifetime outcomes (e.g., Moffitt et al., 2011; Dohmen et al., 2011; Sutter et al., 2013; Golsteyn et al., 2014). We have also seen that our financial literacy intervention has had some short-term effects on financial behavior. Yet, this was only based on a short survey, and it was not our primary focus of research, as we wanted to identify effects of our intervention on economic preferences.

In fact, we have identified a causal effect of financial literacy on risk and time preferences. This suggests that the well-established link between financial literacy and financial decisions (see Lusardi and Mitchell, 2014) works through the channel of financial literacy affecting risk and time preferences. This effect also links our paper to the larger literature on the formation of economic preferences and their malleability. While the studies by Alan and Ertac (2018, 2019), Alan et al. (2019), Cappelen et al. (2020), and Kosse et al. (2020) have found that educational interventions affect children's economic preferences, we have shown that adolescents around the age of 16 are also accessible to behavioral interventions that change their economic preferences. Our intervention has affected two important domains of economic preferences at the same time: risk preferences and time preferences, both of which are undeniably important for many decisions in life, in particular financial ones.

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Online Appendix to Financial literacy, risk and time preferences – Results from a randomized educational intervention

Matthias Sutter, Michael Weyland, Anna Untertrifaller and Manuel Froitzheim

A1. Instructions to elicit risk and time preferences (originally in German)

GENERAL INTRODUCTION

We will now read the explanatory notes on the experimental games together and discuss examples to ensure everyone has understood the explanations.

During the games and the completion of the final questionnaire, you are not allowed to talk to your classmates or use your mobile phone. Noncompliance with this rule will result in your exclusion from the study and all payments.

You can make money based on your decisions. You will shortly receive further information about this.

At the beginning, we request that you create a personalized code. The code guarantees your anonymity and enables us to make correct payments.

GENERATING A PARTICIPATION CODE

Your personalized code consists of a series of personal building blocks, some of which only you know. Please concentrate on creating your code, as you will need it later.

YOUR CODE IS:	__	__	__	__	__	__
	(1)	(2)	(3)	(4)	(5)	(6)

- | | |
|--|-------------|
| 1) The second letter of your first name (A-Z): | (1) = __ |
| 2) The third letter of your surname (A-Z): | (2) = __ |
| 3) The day of your birthday (01-31): | (3) = __ __ |
| 4) The month you were born (01-12): | (4) = __ __ |
| 5) The number of your siblings (0-...): | (5) = __ |
| 6) The month of your mother's birth (01-12): | (6) = __ __ |

Please write down your participation code on a separate piece of paper, as you will need it frequently!

EXACT INFORMATION ON THE DECISION GAMES

We will now play three games together. You will make a total of 60 decisions. These decisions are numbered from 1 to 60. At the end, a classmate will draw a card from an opaque container. The number on this card indicates the decision that will be relevant to your payment. Please make all decisions carefully, because depending on how you decide, you will earn more money or less. You can make your choices in whichever order you prefer.

PART 1: RANDOM DRAW or SAFE AMOUNT

In each of the following 20 decisions, you can choose between a random draw and a certain and safe amount. The random draw always stays the same, while the safe amount increases by €0.50 from decision to decision (from €0.50 in the first decision to €10 in the 20th decision).

The random draw works as follows: At the end of all the games, we will put ten white and ten orange balls in a container. A student will then pull one of the balls out of the container. The student will not be able to see the color of the balls. The payout will depend on the color of the ball drawn. If a white ball is drawn, you will receive 10 Euro. If an orange ball is drawn, you will not receive anything. If you opt for the random draw, you will therefore receive either 10 Euro or 0 Euro with the same probability.

- white ball → 10 €
- orange ball → 0 €

Now please mark in each of the lines from 1 to 20 which variant you prefer (random draw or safe amount).

No.	Random draw		Safe amount
1)	<input type="radio"/> Random draw	or	<input type="radio"/> 0.50€ safe
2)	<input type="radio"/> Random draw	or	<input type="radio"/> 1.00€ safe
3)	<input type="radio"/> Random draw	or	<input type="radio"/> 1.50€ safe
4)	<input type="radio"/> Random draw	or	<input type="radio"/> 2.00€ safe
5)	<input type="radio"/> Random draw	or	<input type="radio"/> 2.50€ safe
6)	<input type="radio"/> Random draw	or	<input type="radio"/> 3.00€ safe
7)	<input type="radio"/> Random draw	or	<input type="radio"/> 3.50€ safe
8)	<input type="radio"/> Random draw	or	<input type="radio"/> 4.00€ safe
9)	<input type="radio"/> Random draw	or	<input type="radio"/> 4.50€ safe
10)	<input type="radio"/> Random draw	or	<input type="radio"/> 5.00€ safe
11)	<input type="radio"/> Random draw	or	<input type="radio"/> 5.50€ safe
12)	<input type="radio"/> Random draw	or	<input type="radio"/> 6.00€ safe
13)	<input type="radio"/> Random draw	or	<input type="radio"/> 6.50€ safe
14)	<input type="radio"/> Random draw	or	<input type="radio"/> 7.00€ safe
15)	<input type="radio"/> Random draw	or	<input type="radio"/> 7.50€ safe
16)	<input type="radio"/> Random draw	or	<input type="radio"/> 8.00€ safe
17)	<input type="radio"/> Random draw	or	<input type="radio"/> 8.50€ safe
18)	<input type="radio"/> Random draw	or	<input type="radio"/> 9.00€ safe
19)	<input type="radio"/> Random draw	or	<input type="radio"/> 9.50€ safe
20)	<input type="radio"/> Random draw	or	<input type="radio"/> 10.00€ safe

PART 2: MONEY TODAY or MONEY IN ONE WEEK

For the next 20 decisions, you can choose whether you would prefer to receive 10.10€ today or a different amount in one week. The amount in one week increases by 0.20€ from decision to decision (from 10.10€ in the 21st decision to 13.90€ in the 40th decision).

Now, please mark in each of the lines from 21 to 40 which variant you prefer (10.10€ today or the other amount in one week).

No.	Amount today		Amount in 1 week
21)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 10.10€ in 1 week
22)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 10.30€ in 1 week
23)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 10.50€ in 1 week
24)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 10.70€ in 1 week
25)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 10.90€ in 1 week
26)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 11.10€ in 1 week
27)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 11.30€ in 1 week
28)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 11.50€ in 1 week
29)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 11.70€ in 1 week
30)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 11.90€ in 1 week
31)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 12.10€ in 1 week
32)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 12.30€ in 1 week
33)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 12.50€ in 1 week
34)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 12.70€ in 1 week
35)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 12.90€ in 1 week
36)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 13.10€ in 1 week
37)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 13.30€ in 1 week
38)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 13.50€ in 1 week
39)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 13.70€ in 1 week
40)	<input type="radio"/> 10.10€ today	or	<input type="radio"/> 13.90€ in 1 week

PART 3: MONEY IN 1 WEEK or MONEY IN 2 WEEKS

For the next 20 decisions, you can choose whether you would prefer to receive 10.10€ in one week or a different amount in two weeks. The amount in two weeks increases by 0.20€ from decision to decision (from 10.10€ in the 41st decision to 13.90€ in the 60th decision).

Now please mark in each of the lines from 41 to 60 which variant you prefer (10.10€ in one week or the other amount in two weeks).

No.	Amount in 1 week		Amount in 2 weeks
41)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 10.10€ in 2 weeks
42)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 10.30€ in 2 weeks
43)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 10.50€ in 2 weeks
44)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 10.70€ in 2 weeks
45)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 10.90€ in 2 weeks
46)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 11.10€ in 2 weeks
47)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 11.30€ in 2 weeks
48)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 11.50€ in 2 weeks
49)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 11.70€ in 2 weeks
50)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 11.90€ in 2 weeks
51)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 12.10€ in 2 weeks
52)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 12.30€ in 2 weeks
53)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 12.50€ in 2 weeks
54)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 12.70€ in 2 weeks
55)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 12.90€ in 2 weeks
56)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 13.10€ in 2 weeks
57)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 13.30€ in 2 weeks
58)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 13.50€ in 2 weeks
59)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 13.70€ in 2 weeks
60)	<input type="radio"/> 10.10€ in 1 week	or	<input type="radio"/> 13.90€ in 2 weeks

PAYMENT:

We will place the money you have earned today in an envelope at the end of the study and write your personalized code on it.

If a decision from Part 2 or Part 3 is randomly selected for payment, and

- you have opted for receiving the sum today, you will be handed the envelope today.
- you have opted for receiving the sum in a week, you will be handed the envelope in a week.
- you have opted for receiving the sum in two weeks, you will be handed the envelope in two weeks.

In order for us to ensure that all candidates receive their own envelopes rather than someone else's, the handover will proceed as follows:

- 1) Your teacher will hand you your envelopes. Your teacher does not know how much money each envelope contains.
- 2) The teacher will call out the first three elements of the code.
- 3) Should these first three elements correspond to your own code, you should then add the last three, thus completing the code, in order to receive your envelope.

Thank you for participating!

A2. Tests on financial literacy and monetary policy literacy

TEST



Dear student,

We would like to promote economic education in German schools. This is why we have been involved in the design and research of economic educational processes in schools for many years. For this purpose, we are dependent on the cooperation with our partner schools. Our current project involves eleven different schools from different regions in Germany. The focus is on two thematic areas:

- (A) "Financial literacy"
- (B) "Monetary policy".

These areas are part of a learning programme developed by us in cooperation with the Diligentia Foundation for Empirical Research. The Diligentia Foundation is a non-profit organization dedicated exclusively to the promotion of science, research and education.

With our project, we would like to find out, among other things, whether pupils actually acquire economic education through the learning programme and in which areas we need to improve the materials further.

Procedure:

The course consists of a total of eight lessons. At each school, three classes take part in the study. One focuses on financial education, the other on monetary policy. The third class only participates in the entrance and final tests, but does not receive any teaching in the thematic areas.

Today's **entrance test consists of three parts (A, B, C) and will last for 45 minutes**. If you should have finished earlier, please take the time to check whether you have answered all the questions correctly. It goes without saying that the data will be processed anonymously. Regardless of this, we would like to ask you to process all test parts in a concentrated and careful manner, so that we can assess the level of performance in your class realistically.

We will inform you in detail about the results after the evaluation.

Thank you very much for your cooperation, and good luck!

Matthias Sutter and Anna Untertrifaller (Max Planck Institute, Bonn)

Michael Weyland and Manuel Froitzheim (University of Siegen)

Notes on all three test parts:

- You have 45 minutes in total. During this time, please complete all tasks.
- The order in which you work on the tasks is arbitrary.
- Apart from a calculator, no further aids are allowed.
- Please note the following for the multiple-choice tasks: Tick a maximum of one box per task. *No* points are subtracted if you give a wrong answer. If you tick more than one box, your answer will be invalid.
- Legibility: Please write legibly and mark your answers clearly.
- We will randomly select five students per class for payment.

Part A: Financial literacy

Tasks 1A to 1E refer to the topic "payslip".
Please take a look at Clara Homann's payslip:

Metallverarbeitung Schneider GmbH
Albertstraße 74, 50825 Köln

Salary and Wage			
Year: 2016	Month: May	Tax bracket: 1	
Homann, Clara	Born on 10 April 1990	Personnel no. 342012011	
Earnings	Hours	Rate (€)	Euro
Standard wage, gross	175,00	20,20	3535,00
Overtime	20,50	5,05	103,53
Gross wage			3638,53
Deductions		Rate (%)	Euro
1.			604,50
2.			33,24
3.			340,20
4. Health insurance			305,64
5. Nursing care insurance			55,49
6. Unemployment insurance			54,40
7. Church tax			54,58
Amount paid out			2190,48

1A. Please mark the correct answer. The following is <u>not</u> a branch of statutory social insurance:	
Pension insurance.	0
Nursing care insurance.	0
Life insurance.	0
Unemployment insurance.	0
1B. Please mark the correct answer: Apart from the gross wage, Clara's employer has to pay for her...	
... income tax.	0
... social security contributions.	0
... church tax.	0
... solidarity tax.	0
1C. The description of the deductions in lines 1 to 3 is missing in the payslip. Please enter the following unsorted terms in the correct order in lines 1 to 3 of the payslip. Use the abbreviations in brackets to do this: Pension insurance (PI). Solidarity tax (ST). Income tax (IT).	
1D. Assign the correct tax bracket (1, 2, 3, 4, 5) to the following characteristics. Write down the appropriate number after the corresponding definition.	
Married sole or principal earner	Tax bracket
Single or living alone without children	Tax bracket
Married double earners	Tax bracket
Single or living alone with children	Tax bracket
Married with additional income	Tax bracket
1E. Please mark the correct answer: The absolute amounts increase in the following order:	
Net hourly wage, gross hourly wage, labour cost per hour	0
Gross hourly wage, net hourly wage, labour cost per hour	0
Labour cost per hour, gross hourly wage, net hourly wage	0
Net hourly wage, labour cost per hour, gross hourly wage	0

Tasks 2A to 2C refer to the following decision situation:

For a long time, Fritz Müller has wanted to do sports regularly again. His great passion since childhood has been playing table tennis. Now he has made up his mind: Fritz will become a member of the table tennis club "Grün Weiß Lindenthal". The annual fee is 500 euro – for this fee, he can go to training for one year. After three weeks, however, he develops a "tennis elbow". His family doctor explains to him that this is a disease of the tendons around the elbow, which is caused by chronic strain. A typical symptom of this is severe pressure pain on the outside of the elbow. Fritz decides to continue playing on a regular basis because the club does not want to refund the annual fee of 500 euro.

2A. Please mark the correct answer: Fritz's decision can be explained...	
... both by the theory of sunk costs and by the principle of mental accounting.	<input type="radio"/>
... by the theory of sunk costs, but not by the principle of mental accounting.	<input type="radio"/>
... by the principle of mental accounting, but not by the theory of sunk costs.	<input type="radio"/>
... neither by the theory of sunk costs nor by the principle of mental accounting.	<input type="radio"/>
2B. Please mark the correct answer: "Sunk costs" means...	
... sunk costs that do not exist.	<input type="radio"/>
... sunk costs that need to be taken into account for all decisions.	<input type="radio"/>
... costs that have already been incurred and that often lead to correct decisions because they continue to be taken into account.	<input type="radio"/>
... costs that have already been incurred and that often lead to wrong decisions because they continue to be taken into account.	<input type="radio"/>
2C. Please mark the correct answer: Through the principle of "mental accounting", decisions are...	
... optimized only in thought.	<input type="radio"/>
... optimized only within the corresponding partial account.	<input type="radio"/>
... optimized only within the total account.	<input type="radio"/>
... optimized only if banks are included in the decision-making process.	<input type="radio"/>

Tasks 3A and 3B refer to the following decision situation:

In a lottery you are allowed to turn a wheel of fortune on which the numbers 1, 2 and 3 can be seen. The three numbers appear with the following probability:

Number	1	2	3
Probability	1/2	1/4	1/4

3A. Game 1: You have to pay a stake of 50 cents and may then spin the wheel of fortune once. If a "1" appears, 1 € is paid out, and nothing else happens. Enter the expected value for the win!

The expected value for the win is €.

3B. Game 2: You have to pay a stake of 50 cents and may then spin the wheel of fortune twice. If two fields with the same designation appear, 1 € is paid out, and nothing else happens. Enter the expected value for the win!

The expected value is €.

4. There are three balls in an urn, each with a number on it (2, 2, -3). The numbers are drawn in a concealed manner and represent your profit or loss in euro. Is it worthwhile to participate in the lottery? Please mark the correct answer.

Yes, because the expected value is positive.

No, because the expected value is negative.

Yes, because one wins in two out of three cases.

No, because one can lose more than one can win.

5. In casino roulette, there are 18 red and 18 black fields. The last couple of times, the roulette ball stopped on "red" five times in a row. Please mark the correct answer.

It is more likely that "red" will appear again in the next round.

It is more likely that "black" will appear again in the next round.

It is equally probably for "red" or "black" to appear again in the next round.

I can't / don't want to offer an opinion.

6. Please mark the correct answer: "Loss aversion" can explain ...

... the fact that many investors only bet on high returns.

... the fact that many investors want to avoid losses at all costs.

... an investment strategy based on the minimum principle.

... an investment strategy based on the maximum principle.

7. Please mark the correct answer: <i>Homo economicus</i> attempts...	
... to strive for maximum use through minimum means.	<input type="radio"/>
... to achieve a given goal with as little effort as possible.	<input type="radio"/>
... to achieve the maximum with the least possible effort.	<input type="radio"/>
... to strive for minimum use with the given means.	<input type="radio"/>

8. Please mark the correct answer: <i>Homo economicus</i> ...	
... always acts rationally according to the economic principle.	<input type="radio"/>
... pays attention to his or her status within a social group.	<input type="radio"/>
... tries to achieve maximum yield with minimum effort.	<input type="radio"/>
... acts against the interests of his fellow humans.	<input type="radio"/>

9. Please mark the correct answer. The ultimatum game means:	
Most people are not satisfied with 1 euro because they apply the maximum principle.	<input type="radio"/>
Most people offer only 1 euro, as they apply the minimum principle.	<input type="radio"/>
<i>Homo economicus</i> accepts 1 euro, because 1 euro is better than nothing.	<input type="radio"/>
<i>Homo economicus</i> offers nothing.	<input type="radio"/>

10. Assume you have 100 euro in your savings account, and the interest rate is 5% per year. If you leave the money in your savings account for exactly two years, how much money will be in your savings account? Please mark the correct answer.	
100 euro.	<input type="radio"/>
More than 100 euro, but less than 110 euro.	<input type="radio"/>
Exactly 110 euro.	<input type="radio"/>
More than 110 euro.	<input type="radio"/>
11. Compare the following investment strategies: Which usually offers the greatest security? Please mark the correct answer.	
Investing in a single share.	<input type="radio"/>
Investing in an equity fund.	<input type="radio"/>
Investing in fixed-income securities and in an equity fund.	<input type="radio"/>
I can't / don't want to offer an opinion.	<input type="radio"/>

12. The "magic triangle" of investment does <u>not</u> include:	
Security.	<input type="radio"/>
Liquidity.	<input type="radio"/>
Return.	<input type="radio"/>
Capital.	<input type="radio"/>

13. Anton and Barbara are the same age. At the age of 25, Anton starts saving 2,000 euro per year, while Barbara saves nothing. At 50, Barbara starts saving 4,000 euro per year, while Anton continues to save 2,000 euro per year. Today, they are both 75 years old. The interest rate is 1% per year. Who has saved more money?	
Both have saved the same amount.	<input type="radio"/>
Barbara has saved more in total, since she saved more each year.	<input type="radio"/>
Anton has saved more.	<input type="radio"/>
I can't / don't want to offer an opinion.	<input type="radio"/>

14. Assume that in ten years the prices of all goods have doubled due to inflation. Your income doubles as well. In ten years, will you be able to afford as much with your income as you do today, or more, or less?	
As much as today.	<input type="radio"/>
More than today.	<input type="radio"/>
Less than today.	<input type="radio"/>
I can't / don't want to offer an opinion.	<input type="radio"/>

15. Let's assume that the interest rate on your savings account is 1% per year and the inflation rate is 2% per year. After five years, will you be able to buy as much as today, or more, or less with the balance in your savings account? Please mark the correct answer:	
As much as today.	<input type="radio"/>
More than today.	<input type="radio"/>
Less than today.	<input type="radio"/>
I can't / don't want to offer an opinion.	<input type="radio"/>

16. With an average inflation of 4%, the purchasing power of 1,000 euro in five years will be	
1216,65 € .	<input type="radio"/>
821,93 €.	<input type="radio"/>
815,37 €.	<input type="radio"/>
800 €.	<input type="radio"/>

Part B: Monetary policy

17. The Maastricht Treaty...

... was signed in 1994 and envisaged the progressive establishment of an Economic and Monetary Union (EMU) by 1998 at the latest.	O
... was signed in 1992 and envisaged the progressive establishment of an Economic and Monetary Union (EMU) by 1999 at the latest.	O
... was signed in 1992 and envisaged the progressive establishment of an Economic and Monetary Union (EMU) by 2002 at the latest.	O
... was signed in 1992 and envisaged the progressive establishment of an Economic and Monetary Union (EMU) by 2005 at the latest.	O

18. The exchange rate from euro to DM is 1 euro = 1.95583 DM. So, if you exchanged 10,000 DM for euro on 31 December 2001, you received...

... 5,113 euro.	O
... 19,558 euro.	O
... 10,000 euro.	O
... 1,955 euro.	O

19. Which of the following statements correctly represents the regulations governing the issue of euro banknotes and coins?

The authorization to issue euro banknotes and coins must always be granted by the EU Commission.	O
Despite the introduction of euro banknotes, national currencies remain legal tender.	O
The Deutsche Bundesbank continues to have sole responsibility for deciding on the issue of German euro banknotes after the introduction of the euro.	O
The authorization to issue euro banknotes and coins is the exclusive right of the ECB.	O

20. Which of the following statements on the organization of the European Central Bank (ECB) is not correct?

The ESCB consists of the ECB and the national central banks.	O
The ECB's Governing Council consists of the President, the Vice President and four other members.	O
The ESCB is managed by the decision-making bodies of the ECB, namely the Governing Council and the Executive Board.	O
The ECB's Governing Council consists of the members of the Executive Board and the governors of the national central banks.	O

21. The President of the Deutsche Bundesbank attends the meetings of the Governing Council "ad personam". This means that he or she...	
... takes part as a representative of the German government.	0
... takes part as an independent expert.	0
... takes part as a representative of the Deutsche Bundesbank.	0
... does not take part at all.	0

22. The convergence criteria include...	
... exchange rate stability, level of short-term interest rates, price level.	0
... fiscal discipline, exchange rate stability, minimum inflation.	0
... price stability, limitation of long-term interest rates, fiscal discipline.	0
... deflation, falling prices, economic decline.	0

23. Please answer the three questions that follow. These relate to the following table:			
Year	Price of the shopping cart	Price index	
1	1680	100	
2	1790		
3	1840		

23A. For the first year, the inflation rate, based on the data provided, ...	
... is 2.8%.	0
... is 6.5 %.	0
... is 10%.	0
... cannot be calculated for the first year.	0

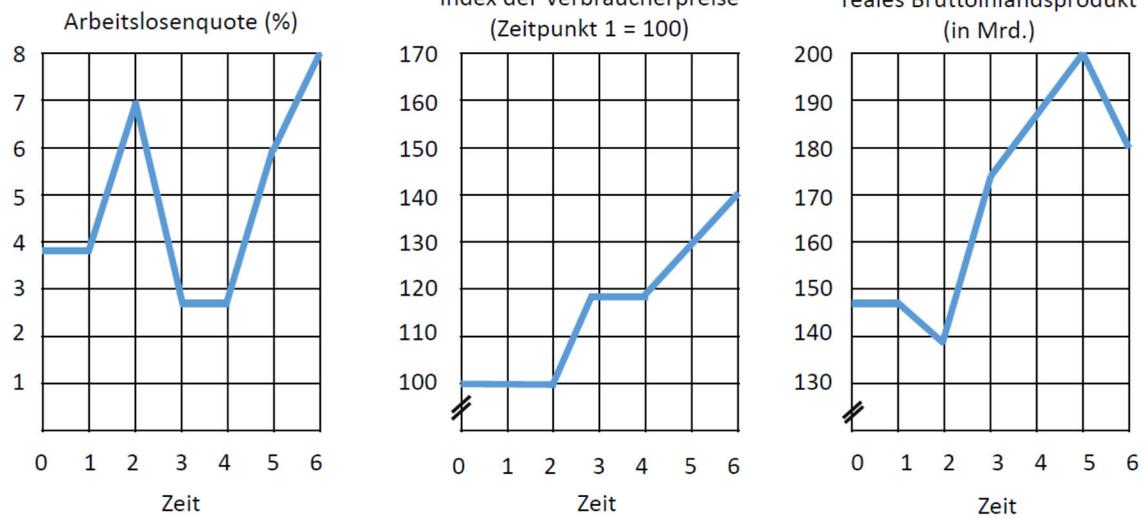
23B. For the second year, the inflation rate, based on the data provided, ...	
... is 2.8%.	0
... is 6.5 %.	0
... is 10%.	0
... cannot be calculated for the second year.	0

23C. For the third year, the inflation rate, based on the data provided, ...	
... is 2.8%.	0
... is 6.5 %.	0
... is 10%.	0
... cannot be calculated for the third year.	0

24. What does the "no bail-out" clause imply?	
No possibility to withdraw from the euro.	0
No communication between the national central banks.	0
No mutual liability of member states.	0
No possibility to withdraw from the EU.	0

25.

Die wirtschaftliche Situation in Land X



25A. In which period did Country X show both rising unemployment and a high inflation rate?

In the period from 1 to 2.	<input type="radio"/>
In the period from 2 to 3.	<input type="radio"/>
In the period from 3 to 4.	<input type="radio"/>
In the period from 4 to 5.	<input type="radio"/>

25B. In which period does production increase in Country X with a relatively low inflation rate?

In the period from 1 to 2.	<input type="radio"/>
In the period from 2 to 3.	<input type="radio"/>
In the period from 3 to 4.	<input type="radio"/>
In the period from 4 to 5.	<input type="radio"/>

26. The convergence criterion of 'budgetary discipline' is breached if...

... the nominal long-term interest rates are more than two percentage points above those of the three EU countries with the best price stability.	<input type="radio"/>
... public debt exceeds 50% of the GDP.	<input type="radio"/>
... the inflation rate is more than 1.5 percentage points above that of the three EU countries with the best price stability.	<input type="radio"/>
... the annual government deficit exceeds 3% of the GDP.	<input type="radio"/>

27. The fact that national and supranational bodies are prohibited from giving instructions to the European Central Bank or the national central banks is called...	
... personal independence.	<input type="radio"/>
... financial independence.	<input type="radio"/>
... functional independence.	<input type="radio"/>
... institutional independence.	<input type="radio"/>
28. With a single currency, exchange rate fluctuations are eliminated. What advantages does this offer?	
It increases costs.	<input type="radio"/>
It creates planning security.	<input type="radio"/>
It leads to less competition.	<input type="radio"/>
It leads to the vulnerability to global disruptions in foreign exchange markets increasing.	<input type="radio"/>

29. The mutual exclusion of liability is understood to mean...	
... the fact that in a monetary union no more debts may be incurred.	<input type="radio"/>
... the fact that no member state of the monetary union is liable for the debts of another country.	<input type="radio"/>
... the fact that in a monetary union no country has to be solely liable for its debts.	<input type="radio"/>
... the fact that each member state of the monetary union is liable for the debts of the other countries.	<input type="radio"/>

30. Suppose Mr Schmitz works as a train conductor and receives a nominal wage of 24,450 euro from his employer in 2014 (after 24,000 euro the year before). Calculate Mr Schmitz's real wage in the event of the Federal Statistical Office calculating an inflation rate of 2.0 percent for 2014 (compared to 2013). Mr. Schmitz's real wage:	

31. Take an appropriate measure to ward off inflation and determine the consequences of your decision.			
Key interest rate	O stays the same	O is raised	O is lowered
Credits for banks	O become more expensive	O become cheaper	O cost the same as before
Credits for consumers	O become more expensive	O become cheaper	O cost the same as before
Credit demand	O decreases	O rises	O stays the same
Demand for goods	O stays the same	O is raised	O is lowered
Prices	O go down	O stabilize or go up	O rise more slowly or go down

32. Take an appropriate measure to ward off deflation and determine the consequences of your decision.			
Key interest rate	O stays the same	O is raised	O is lowered
Credits for banks	O become more expensive	O become cheaper	O cost the same as before
Credits for consumers	O become more expensive	O become cheaper	O cost the same as before
Credit demand	O decreases	O rises	O stays the same
Demand for goods	O stays the same	O is raised	O is lowered
Prices	O go down	O stabilize or go up	O rise more slowly or go down

Part C: Opinion on lessons

The second part is now also over! This final section is about your opinion on the lessons in politics, economics and social sciences. If the lessons were interrupted due your dropping the subject, or because of holidays, etc., please use the last lesson in the subject as a basis. Please tick the answer that you deem most appropriate:

	Completely agree	Tend to agree	Tend to disagree	Completely disagree
1. Most of the students in the course worked in a concentrated manner during the last lesson.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I worked in a concentrated manner during the last lesson.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I have learned a lot in business class recently.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I have the feeling that I have thoroughly absorbed the contents of the last lesson.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I find the topics of the last lesson important.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I would like to learn more about economic topics.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. The teaching methods applied in the last lesson should continue to be used in the future.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. The teaching materials used in the last lesson should continue to be used in the future.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Overall I found the organization of the last lesson to be successful.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. The last lesson was fun.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If the teaching materials and methods used in the last lesson are to be used again in the future, care should be taken to ensure that... (if necessary, use the reverse side)

Further comments (if necessary, use the reverse side):

Thank you for your support!

A3. Questions on field behavior

In the past month, how often did you do the following:

	never	rarely	some- times	frequently	very frequently
... bet with friends	<input type="radio"/>				
... participate in gambling	<input type="radio"/>				
... smoke	<input type="radio"/>				
... buy something on the internet	<input type="radio"/>				

A4. Translation of material covered in the eight units on financial literacy
(this material was originally in German and presented on a tablet on separate screens (that do not always match the page format used here))

1. Case study: Würtgen Construction Machinery

1.A.1 Salary statement from 'Württemberg Construction Machinery'

Simon Hegele works for the company Baumaschinen Würtgen GmbH (Württemberg Construction Machinery Ltd). The company is based in Cologne and is the world market leader. Simon is not married and has no children. After his intermediate school-leaving certificate, an apprenticeship as a specialist for metal technology, and a few years of professional experience at Würtgen, he has completed further training to become a state-certified technician in the field of machine technology. Since May 2017, he has been organizing the manufacture and maintenance of road construction machinery. He has never before given his salary statement any particular attention. But since starting his new job, he has been waiting quite eagerly for his new salary. And at last his salary statement has arrived!

Baumaschinen Würtgen GmbH			
<i>Bertholdstraße 74, 50825 Köln</i>			
Salary statement			
Year: 2017	Month: May	Tax bracket: 1	
Simon Hegele	Born on 10 March 1992	Personnel no.: 472012011	
Designation of earnings	Hours	Rate (€)	Euro
Gross standard wage	175	20.20	3535.00
Overtime supplement	20.5	5.05	103.53
Gross wage			3638.53

Designation of deductions	Euro
Income tax	604.50
Solidarity tax	33.24
Church tax	54.40
Health insurance (employee)	305.64
Nursing care insurance (employee)	55.49
Pension insurance (employee)	340.20
Unemployment insurance (employee)	54.58
Amount paid	2190.48

Simon is quite baffled. He is obviously very happy about the high gross wage and the supplements, but he really hasn't expected the deductions to be that high: **"If I earn over 3600 Euro and get less than 2200 Euro out of it, something is bound to be wrong!"** But before going to his employer to complain, he first wants to find out for himself.

Task 1:

Help Simon to clarify the facts of the case. Please proceed as follows: First fill out the following table. Transfer the missing absolute values, calculate the corresponding percentages, and then determine the percentage of the net employee wage in relation to the gross employee wage.

	Absolute value (in Euro)	Relative value (in percent)
Gross employee wage	3638.53	100,00
Income tax		
Solidarity tax		
Church tax		
Health insurance (employee)		
Nursing care insurance (employee)		
Pension insurance (employee)		
Unemployment insurance (employee)		
Social security contributions (employee)		
Total deductions (employee)		
Net employee wage	2190.48	

Solution suggestion

	Absolute value (€)	Relative value (%)
Gross employee wage	3638.53	100%
Income tax	604.50	16.6%
Solidarity tax	33.24	0.97%
Church tax	54.40	1.5%
Health insurance (employee)	305.64	8.4%
Nursing care insurance (employee)	55.49	1.53%
Pension insurance (employee)	340.20	9.35%
Unemployment insurance (employee)	54.58	1.5%
Social security contributions (employee)	755.91	20.78%
Total deductions (employee)	1448.05	39.8%
Net employee wage	2190.48	60.2%

The percentage of the net employee wage in relation to the gross employee wage is 60.2% for Simon.

Task 2:

Check whether the values match the entries in the glossary – in other words, whether the salary statement is correct.

Work on the task in the electronic textbook or your copybook.

Solution suggestion

All values on the salary statement match those in the glossary, so the statement is correct.

Task 3:

Now fill out the following table and determine the labor costs incurred by Simon's employer. Use the glossary once again.

	Absolute value in Euro	Relative value in percent
Gross employee wage	3638.53	100,00
Net employee wage	2190.48	60.20
Health insurance (employer)		
Nursing care insurance (employer)		
Pension insurance (employer)		
Unemployment insurance (employer)		
Accident insurance (employer)		
Social security contributions (employer)		
Labor costs		
Labor costs per hour		100.00
Gross hourly wage		
Net hourly wage		

Solution suggestion

Net employee wage	2190.48	60.2%
Health insurance (employer)	265.61	7.3%
Nursing care insurance (employer)	46.39	1.275%
Pension insurance (employer)	340.20	9.35%
Unemployment insurance (employer)	54.58	1.5%
Accident insurance (employer)	47.30	1.3%
Social security contributions (employer)	754.08	20.7%
Labor costs	4392.61	120.7%
Labor costs per hour	25.10	100%
Gross hourly wage	20.79	82.8%
Net hourly wage	12.52	49.9%

Didactic note

The questions and comments in the following tasks typically lead to a lively discussion among the students. Important aspects of the debate on the future of the welfare state are initiated here.

Task 4:

Compare the labor costs per hour with Simon's net hourly wage. What do you notice? What would you (not) have expected?

Work on the task in the electronic textbook or your copybook.

Task 5:

- Which deductions do you feel are too high, which are appropriate, and which, in your opinion, should increase further?
- Which deductions – realistically speaking – are likely to increase in the future? Why?

Work on the task in the electronic textbook or your copybook.

Taxes and contributions

These are all monetary payments to the federal, state, and local governments, as well as to religious communities, which citizens are obliged to make. They include taxes (e.g., income tax), contributions (e.g., for health insurance), and fees (e.g., for garbage collection).

Employer contribution

The employer's contribution is the employer's share of social security contributions. As a rule, the contributions to statutory health insurance, statutory nursing insurance, statutory pension insurance, unemployment insurance, and occupational accident insurance are paid in equal measure by the employee and the employer. Exceptions: In the case of accident insurance, the employer is the sole contributor; in the case of statutory health insurance, the employee's contribution rate is slightly higher than that of the employer.

Employee contribution

The employee's contribution is the employee's share of social security contributions. As a rule, the contributions to statutory health insurance, statutory nursing insurance, statutory pension insurance, unemployment insurance, and occupational accident insurance are paid in equal measure by the employee and the employer. Exceptions: In the case of accident insurance, the employer is the sole contributor; in the case of statutory health insurance, the employee's contribution rate is slightly higher than that of the employer.

Remuneration

Compensation for work performed

Labor costs

All expenses incurred by the employer as a result of the employee's engagement, in particular the wage or salary and the employer's contributions to social security.

Unemployment insurance

Unemployment insurance is a state-organized compulsory insurance of the working population, and thus a branch of the statutory social insurance. Contributions are paid in equal parts by the employee and the employer and, since 1 January 2011, amount to 3% of gross wages (1.5% paid by the employer and 1.5% by the employee). This insurance has existed in Germany since 1927 and entitles the employee to the following benefits: unemployment benefit, reduced working hours allowance, financing of further training measures, career guidance, and employment placement services.

Brutto (Gross)

The term comes from the Italian (“raw, whole”) and means “before deduction of taxes and the employee’s social security contributions”. Another example: The gross price already contains the VAT (gross price = net price + VAT). General formula: Gross = net + tare.

Gross wage

The total remuneration (wage or salary, bonus, supplements) received by an employee for work performed, before deduction of tax and social security contributions. The gross wage is the basis for calculating taxes and social security contributions.

Health insurance

The statutory health insurance (SHI) is a state-organized compulsory insurance for the working population, and thus a branch of the statutory social insurance. The contributions are paid by the employee and the employer. The general contribution rate has a binding lower contribution limit of 14.6 percent (7.3 percent each for employee and employer). The health insurance fund can itself determine the employee’s income-dependent additional contribution.

The average additional contribution rate in the statutory health insurance is 1.1 percent in 2017, i.e., the average contribution rate for employees as a whole is 8.4 percent of gross wages. The statutory health insurance has existed in Germany since 1883, and most German citizens are members of it, as there is a compulsory insurance for employees, pensioners, students, and the unemployed. The compulsory insurance threshold determines the income level above which an employee is no longer compulsorily insured in the SHI. It currently amounts to a gross annual wage of 57,600 Euro (as of 1 January 2017). Those who are not, or do not have to be, insured in the statutory health insurance usually conclude a contract with a private health insurance. These are mainly employees with a high income, freelancers, the self-employed, and civil servants.

Income tax

All income from non-self-employment is subject to this tax. It must be withheld by the employer from the gross wage and transferred to the tax office (wage tax deduction procedure). If the income tax withheld in the course of a year is higher than the amount actually payable, the tax office makes a correction (annual adjustment of income tax).

Netto (Net)

The term comes from the Italian (“clean, pure”) and means “after deduction of taxes and employee social security contributions”. Another example: The net price does not yet contain VAT (net price = gross price - VAT). General formula: Net = gross - tare.

Nursing care insurance

The statutory care insurance serves to cover the risk of the need for care. It is a state-organized compulsory insurance for the working population, and thus a branch of the statutory social insurance. Contributions are paid in equal parts by the employee and the employer. They currently amount to 2.55% of the gross wages (1.275% for the employee, and 1.275% for the employer); for childless people, it is 2.8% of the gross wages (1.525% for the employee, and 1.275% for the employer). The statutory care insurance has existed in Germany since 1994. Most citizens in Germany belong to it, because the compulsory insurance for employees, pensioners, students, and the unemployed in the statutory health insurance is transferred to the statutory nursing care insurance (“the nursing care insurance follows the health insurance”).

Pension insurance

The statutory pension insurance serves primarily as a means of providing for the retirement of employees. It is a state-organized compulsory insurance for the working population, and thus a branch of the statutory social insurance. Contributions are paid in equal parts by the employee and the employer and, since 1 January 2017, amount to 18.7% of the gross wage (9.35% for the employee, and 9.35% for the employer). The statutory pension insurance has existed in Germany since 1889.

Solidarity tax

The solidarity tax (known colloquially as “Soli”) is a supplementary levy to income tax. The solidarity surcharge amounts to 5.5 percent of the income tax. Its introduction in 1991 was justified with the cost of German unification.

Social security

State-organized compulsory insurance for the working population, consisting of the following five branches: statutory health insurance, nursing care insurance, statutory pension insurance, unemployment insurance, and statutory accident insurance. The contributions are based on a certain percentage of the gross wage and are usually paid equally by the employee and the employer. Exceptions: In the case of accident insurance, the employer is the sole contributor; and in the case of statutory health insurance, the employee's contribution rate is slightly higher than that of the employer.

Social security contributions in 2017

Social insurance	Total contribution rate	Employee contribution	Employer contribution
Health insurance	15.80%	8.40%	7.30%
Nursing care insurance	2.55% or 2.80%	1.275% or 1.525%	1.275%
Pension insurance	18.70%	9.35 %	9.35%
Unemployment insurance	3.00%	1.50%	1.50%

Taxes / Tax brackets

Payments to the government, normally intended to provide government revenue; they do not constitute compensation for a specific service provided by the government. They should be distinguished from fees (e.g., for garbage collection) and contributions (e.g., for health insurance).

A distinction is made between several tax classes, which are presented here in simplified form:

Tax bracket 1: Single or living alone, no children

Tax bracket 2: Single or living alone, with children

Tax bracket 3: Married single earner or main earner

Tax bracket 4: Married, double income

Accident insurance

State-organized compulsory insurance of the working population. The contributions are based on the accident risk in the respective trade, are borne solely by the employer, and amount to an average of about 1.3% of gross wages. The purpose of the accident insurance is to prevent accidents at work, occupational diseases, and work-related health hazards, and to restore the health and capacity of the insured persons by all appropriate means once accidents at work or occupational diseases have occurred. The accident insurance has existed in Germany since 1884.

2. Calculation tool: Online salary planner

2.A.1 Online salary planner

Task 6:

You will find an [online salary planner](#) on the internet. Try to research the gross earnings of two people you know. Find out all further required information about these two cases, enter it into the online salary planner, and enter the result in the following table to save your results anonymously.

Gross employee wage:

Solution: _____

Income tax:

Solution: _____

Solidarity tax:

Solution: _____

Employee health insurance:

Solution: _____

Employee nursing insurance:

Solution: _____

Employee pension insurance:

Solution: _____

Employee unemployment
insurance:

Solution: _____

Employee social security
contributions:

Solution: _____

Net employee wage:

Solution: _____

Task 7:

What do you notice regarding the amount of the deductions? What did you (not) expect?

Work on the task in the electronic textbook or your copybook.

3. The theater ticket experiment

3.A.1 Decision situation A

Didactic note

The following pages of the textbook contain the theatre ticket experiment. For the experiment, divide the class into two groups as heterogeneously as possible (Group A and Group B). Two students each work together in the following experiment. The students of group A first work on the page “Theatre ticket experiment – Decision situation A”, and the students of group B first work on the page “Theatre ticket experiment – Decision situation B”. After about three minutes, each student should make a decision. Once each decision has been made, the students are asked to open the other decision situation and to work on it during the following two minutes.

Once all students have made a decision, you can continue on the page “Theatre ticket experiment – Developing a hypothesis”.

You want to go to the theatre and have already bought a ticket for 20 Euro. When you arrive at the box office, you realize that you have lost the ticket. But there are still tickets to be had in the same category at the same price.

Task 8:

Do you buy a new ticket for 20 Euro or do you decide not to go to the theatre?

Source: Kahneman/Tversky 1984

3.A.2 Decision situation B

You want to go to the theatre and a ticket costs 20 Euro. You have reserved one, but still have to pick it up at the box office. Once you have arrived there, you realize that you have lost a 20-Euro note that had been in your wallet.

However, you still have enough money for a ticket, and there are still tickets available in the same category at the same price.

Task 9:

Do you buy a new ticket for 20 Euro or do you decide not to go to the theatre?

Source: Kahneman/Tversky 1984

3.A.3 Developing a hypothesis

Decision situation A

You want to go to the theatre, and have already bought a ticket for 20 Euro. When you arrive at the box office, you realize that you have lost the ticket. But there are still tickets to be had in the same category at the same price. Do you buy a new ticket for 20 Euro, or do you decide not to go to the theatre?

I decide to buy a new ticket.

I decide not to go to the theatre.

Decision situation B

You want to go to the theatre, and a ticket costs 20 Euro. You have reserved one, but still have to pick it up at the box office. Once you have arrived there, you realize that you have lost a 20-Euro note that had been in your wallet. However, you still have enough money for a ticket, and there are still tickets in the same category available at the same price. Do you buy a new ticket for 20 Euro, or do you decide not to go to the theatre?

I decide to buy a new ticket.

I decide not to go to the theatre.

Task 10:

Develop hypotheses regarding the extent to which the decisions in situation A differ from the decisions in situation B.

Work on the task in the electronic textbook or your copybook.

3.A.4 Analysis

Didactic note

Both situations are identical from an economic point of view, as both A and B suffered a loss of assets of 20 €. The *type* of asset loss (lost cash or lost theatre ticket) is irrelevant. From a purely rational point of view, it should therefore not be relevant to the decision. For regardless of whether I decide in favor of or against a visit to the theatre, the loss of 20 € has already occurred in both cases. In the language of economics, one speaks here of “sunk costs”. But the decision that has to be made should not be justified retroactively. Rather, the additional costs incurred by the visit to the theatre (20 €) should be weighed against the additional benefits. In short, there should be no difference in the answers to the two questions if the parties involved make a “rational” decision. However, this is usually the case when conducting the experiment. For example, in a study by Nobel Prize winner Kahneman, 54% of people in Situation A decide against buying a new ticket – compared to only 12% in Situation B. And it was similar with us. Both groups tended to decide against buying a new ticket in situation A and, in the case of situation B, tended to buy a new ticket.

Task 11:

You want to go to the theatre, and have already bought a ticket for 20 Euro. When you arrive at the box office, you realize that you have lost the ticket. But there are still tickets to be had in the same category at the same price. Do you buy a new ticket for 20 Euro, or do you decide not to go to the theatre?

Task 12:

You want to go to the theatre, and a ticket costs 20 Euro. You have reserved one, but still have to pick it up at the box office. Once you have arrived there, you realize that you have lost a 20-Euro note that had been in your wallet. However, you still have enough money for a ticket, and there are still tickets available in the same category at the same price. Do you buy a new ticket for 20 Euro, or do you decide not to go to the theatre?

Task 13:

How do the two situations differ?

How can the results be explained? Do you have an explanatory approach (a theory)?

Work on the task in the electronic textbook or your copybook.

Solution suggestion

When an investment of time, money, or other resources – already made – causes people to make decisions that they would not otherwise make, this is referred to as a sunk-costs effect. This distortion particularly affects decisions concerning the continuation of projects.

3.A.5 Further examples**Task 14:**

Do you know any further examples for this phenomenon?

Work on the task in the electronic textbook or your copybook.

4. The calculator experiment

4.A.1 Decision situation A

Didactic note

The following pages of the textbook contain the calculator experiment. For the experiment, divide the class into two groups as heterogeneously as possible (Group A and Group B). Two students each work together in the following experiment. The students of group A first work on the page “Calculator experiment – Decision situation A”, and the students of group B first work on the page “Calculator experiment – Decision situation B”. After about three minutes, each student should make a decision. After each decision has been made, the students are asked to open the other decision situation and to work on it in the following two minutes.

Once all students have made a decision, you can continue on the page “Calculator experiment – Developing a hypothesis”.

You go into a shop and want to buy two things: a pair of trousers for 125 Euro and a calculator for 15 Euro. However, the salesperson points out that the calculator is 5 Euro cheaper in another store, which is about 20 minutes away.

Task 15:

Do you bother to go on a 20-minute bike trip to the other branch to save the 5 Euro?

Source: Kahneman und Tversky 1984

4.A.2 Decision situation B

You go into a shop and want to buy two things: a pair of trousers for 15 Euro and a calculator for 125 Euro. However, the salesperson points out that the calculator is 5 Euro cheaper in another store, which is about 20 minutes away.

Task 16:

Do you bother to go on a 20-minute bike trip to the other branch to save the 5 Euro?

Source: Kahneman und Tversky 1984

4.A.3 Developing a hypothesis

Decision situation A

You go into a shop and want to buy two things: a pair of trousers for 125 Euro and a calculator for 15 Euro. However, the salesperson points out that the calculator is 5 Euro cheaper in another store, which is about 20 minutes away.

Do you bother to go on a 20-minute bike trip to the other branch to save the 5 Euro?

Decision situation B

You go into a shop and want to buy two things: a pair of trousers for 15 Euro and a calculator for 125 Euro. However, the salesperson points out that the calculator is 5 Euro cheaper in another store, which is about 20 minutes away.

Do you bother to go on a 20-minute bike trip to the other branch to save the 5 Euro?

Task 17:

What do you notice about the results? How do the two situations differ?

Work on the task in the electronic textbook or your copybook.

4.A.4 Analysis

Didactic note

Both situations are identical from an economic point of view, as a saving of 5 Euro (benefit) has to be compared with an effort of 20 minutes (cost) for both A and B. The type of economization (cheap calculator versus cheap trousers) is irrelevant. It should therefore not be relevant for the decision – from a purely rational point of view. It doesn't matter whether I decide to take the additional trip in the first or second case: the 20-minute time loss occurs in both cases, and the savings are identical. However, our results show that many more students choose the trip in situation A than in situation B. Kahneman and Tversky explain this effect by means of the theory of mental accounting.

Task 18:

You go into a shop and want to buy two things: a pair of trousers for 125 Euro and a calculator for 15 Euro. However, the salesperson points out that the calculator is 5 Euro cheaper in another store, which is about 20 minutes away. Do you bother to go on a 20-minute bike trip to the other branch to save the 5 Euro?

Task 19:

You go into a shop and want to buy two things: a pair of trousers for 15 Euro and a calculator for 125 Euro. However, the salesperson points out that the calculator is 5 Euro cheaper in another store, which is about 20 minutes away. Do you bother to go on a 20-minute bike trip to the other branch to save the 5 Euro?

Task 20:

How can the results be explained? Do you have an explanatory approach (a theory)?

Work on the task in the electronic textbook or your copybook.

Solution suggestion

People tend to keep so-called “mental accounts”, in which they classify different projects or asset positions. Decisions are then often optimized within the corresponding account, and the overall view of the account is lost. Decisions concerning the continuation of projects are particularly affected by this distortion.

4.A.5 Further examples**Task 21:**

Do you know any further examples for this phenomenon?

Work on the task in the electronic textbook or your copybook.

5. The tennis-elbow task

5.A.1 Tennis-elbow task - Role A

Task 22:

You will work on the following tasks with a partner. Find a partner, and one of you will open this page, while the other will open the following page.

Task 23:

Read the text and then explain the term “sunk costs” to your partner, using the following example.

For a long time, Simon Hegele has been wanting to do sports again regularly. Since his childhood, his great passion has been tennis. Now he has decided to join the tennis club “Blau Weiß Rodenkirchen”. The annual fee is 600 Euro – for this fee, he can use all the club’s tennis courts for one year. After three weeks, however, he develops a so-called tennis elbow. His doctor explains to him that this is a disease of the tendons around the elbow, which is caused by chronic strain. A typical symptom is severe pain on the outside of the elbow. Simon decides to continue playing regularly, as the tennis club does not want to refund his annual fee of 600 Euro.

Task 24:

Your partner will now read the text below and then explain the term “mental accounting” to you, using the example in the text. You can check your partner's explanation by using the overview in the box below.

For a long time, Simon Hegele has been wanting to do sports again regularly and has therefore decided to go to the gym regularly. Immediately after the trial session, which he enjoyed very much, he has therefore booked the annual subscription “Fit with Fun”. The annual fee is 600 Euro – for this fee, he can use all the club’s equipment for one year. After three weeks, however, he develops a pain in his elbow. His doctor explains to him that this is a disease of the tendons around the elbow, which is caused by chronic strain. The typical symptom is severe pain on the outside of the elbow. Simon decides to continue going to the gym regularly, as the gym does not want to refund his annual fee of 600 Euro.

Overview

Mental accounting

People tend to keep so-called “mental accounts”, in which they classify different projects or asset positions. Decisions are then often optimized within the corresponding account, and the overall view of the account is lost. Decisions on the continuation of projects are particularly affected by this distortion. This also applies to Simon: He doesn't want to have paid the 600 Euro for nothing. He wants to “allocate” the project positively to his mental account.

5.A.2 Tennis-elbow task - Role B

Task 25:

You will work on the following tasks with a partner. Find a partner, and one of you will open this page, while the other will open the following page.

Task 26:

Your partner will now read the text below and then explain the term “sunk costs” to you, using the example in the text. You can check your partner's explanation by using the overview in the box below.

For a long time, Simon Hegele has been wanting to do sports again regularly. Since his childhood, his great passion has been tennis. Now he has decided to join the tennis club “Blau Weiß Rodenkirchen”. The annual fee is 600 Euro – for this fee, he can use all the club's tennis courts for one year. After three weeks, however, he develops a so-called tennis elbow. His doctor explains to him that this is a disease of the tendons around the elbow, which is caused by chronic strain. A typical symptom is severe pain on the outside of the elbow. Simon decides to continue playing regularly, as the tennis club does not want to refund his annual fee of 600 Euro.

Overview

Sunk Costs

When an investment of time, money, or other resources – already made – causes people to make decisions that they would not otherwise make, this is referred to as a sunk-costs effect. This distortion particularly affects decisions concerning the continuation of projects. This also applies to Simon: Although the 600 Euro are “sunk costs” and should no longer influence his decision to continue playing, they do have a decisive influence on his decision. He continues playing because he made a (wrong) decision in the past.

Task 27:

Read the text and then explain the term “mental accounting” to your partner, using the following example.

For a long time, Simon Hegele has been wanting to do sports again regularly and has therefore decided to go to the gym regularly. Immediately after the trial session, which he enjoyed very much, he has therefore booked the annual subscription “Fit with Fun”. The annual fee is 600 Euro – for this fee, he can use all the club’s equipment for one year. After three weeks, however, he develops a pain in his elbow. His doctor explains to him that this is a disease of the tendons around the elbow, which is caused by chronic strain. The typical symptom is severe pain on the outside of the elbow. Simon decides to continue going to the gym regularly, as the gym does not want to refund his annual fee of 600 Euro.

6. The first experiment with shares

6.A.1 Decision situation A

Task 28:

Your uncle from Rostock, whom you unfortunately never met, has passed away. He has left you his BASF shares worth 10,000 Euro. What are you going to do with them? (There are only three alternatives.)

Source: Samuelson/ Zeckhauser 1988

6.A.2 Decision situation B

Task 29:

Your uncle from Rostock, whom you unfortunately never met, has passed away. He has left you 10,000 Euro in cash. What are you going to do with that? (There are only three alternatives.)

Source: Samuelson/ Zeckhauser 1988

6.A.3 Developing a hypothesis

Decision situation A

Your uncle from Rostock, whom you unfortunately never met, has passed away. He has left you his BASF shares worth 10,000 Euro. What are you going to do with them? (There are only three alternatives.)

- Acquire shares in money market funds
- Keep the BASF shares
- Acquire government bonds

Decision situation B

Your uncle from Rostock, whom you unfortunately never met, has passed away. He has left you 10,000 Euro in cash. What are you going to do with that? (There are only three alternatives.)

- Acquire shares in money market funds
- Buy BASF shares
- Acquire government bonds

Task 30:

Develop hypotheses on the extent to which the decisions in situation A differ from the decisions in situation B.

Work on the task in the electronic textbook or your copybook.

Overview

Money market funds invest the funds they receive from investors primarily in short-term forms of investment, such as bank deposits, variable-interest securities, and fixed-interest securities with a residual term of no more than twelve months. Investors may redeem the units sold to them by money market funds (money market fund units) at any time, i.e., convert them back into liquid assets.

Shares are interests in a stock corporation, with which corresponding membership rights are associated. The share enables the corporation to raise equity capital. It splits the share capital of the stock corporation into smaller shares. The share certifies a proportion of the share capital, profit distributions, capital increases from company funds, and liquidation proceeds. The price of the share itself is redefined by stock-exchange trading.

Government bonds are interest-bearing securities issued by a government. The government uses the bond to raise money on the international capital market, which it needs for government operations and investments. Government bonds issued by countries with sound government budgets are considered very safe. The safest government bonds are bonds issued by countries with an AAA rating, the highest credit rating (Germany, Switzerland, Canada, and Australia). However, history has provided many examples where even a state could no longer service its debts and had to declare national bankruptcy. Developing countries, but also industrialized countries with high debt burdens, have a lower credit rating and pay higher interest on their bonds to obtain money, because they offer less security, and therefore an investment is riskier for investors. Recent examples of payment defaults on government bonds are Greece and Argentina.

6.A.4 Analysis

Didactic note

Both situations are almost identical from an economic point of view. In situation A, the shares worth €10,000 could easily be sold and then invested in money market fund units or government bonds. So if you prefer an investment in money market fund shares or government bonds to an investment in shares, you should choose this option.

However, our results show, as do all known scientific studies, that the proportion of those who do not want to change anything about the investment is particularly high.

Most people want things to stay the way they are. If they have the choice between an existing situation and change, they are more likely to decide against change – they prefer the status quo. Samuelson & Zeckhauser (1988) describe the tendency to do nothing in decision-making situations, or to stick to a decision made, i.e., to remain in the status quo, as status-quo distortion. The more alternatives are available, and the less knowledge about the alternatives and their consequences is available, the more pronounced the status quo bias is.

Task 31:

Your uncle from Rostock, whom you unfortunately never met, has passed away. He has left you his BASF shares worth 10,000 Euro. What are you going to do with them? (There are only three alternatives.)

Task 32:

Your uncle from Rostock, whom you unfortunately never met, has passed away. He has left you 10,000 Euro in cash. What are you going to do with that? (There are only three alternatives.)

Task 33:

How can the results be explained? Do you have an explanatory approach (a theory)?

Work on the task in the electronic textbook or your copybook.

Solution suggestion

The question whether an alternative leads to a change in the current state (status quo) or preserves it often influences people's decision-making behavior. The status-quo bias says that people tend to want things to stay the way they are. They have a preference for the status quo.

6.A.5 Further examples

Task 34:

Do you know any further examples for this phenomenon?

Work on the task in the electronic textbook or your copybook.

7. The experiment with the wheel of fortune

7.A.1 Decision situation A

Task 35:

Which variant will you choose?

Variant I: You will receive 900 Euro for sure.

Variant II: You will turn a wheel of fortune. Please note:

Source: Kahneman 2014

7.A.2 Decision situation B

Task 36:

Which variant will you choose?

Variant I: You will lose 900 Euro for sure.

Variant II: You will turn a wheel of fortune. Please note:

Source: Kahneman 2014

7.A.3 Developing a hypothesis

Decision situation A

Which variant will you choose?

Variant I: You will receive 900 Euro for sure.

Variant II: You will turn a wheel of fortune. Please note:

The probability of your winning 1,000 Euro is 90%. The probability of not winning anything at all is 10%.

Decision situation B

Which variant will you choose?

Variant I: A certain loss of 900 Euro.

Variant II: You will turn a wheel of fortune. Please note:

The probability of your not losing anything is 10%. The probability of losing 1,000 Euro is 90%.

Task 37:

Develop hypotheses on the extent to which the decisions in situation A differ from the decisions in situation B.

Work on the task in the electronic textbook or your copybook.

7.A.4 Analysis

Task 38:

Which variant will you choose?

Variant I: You will lose 900 Euro for sure.

Variant II: You will turn a wheel of fortune. Please note:

Task 39:

Which variant will you choose?

Variant I: You will lose 900 Euro for sure.

Variant II: You will turn a wheel of fortune. Please note:

Task 40:

From a purely rational point of view, therefore, the decision situations are identical. But how, then, can the different results be explained? Please formulate a well thought-out explanation (a theory) as homework!

Work on the task in the electronic textbook or your copybook.

8. The second experiment with shares

8.A.1 Decision situation A

Simon Hegele is now 50 years old. He needs 5,000 Euro to cover the costs of his daughter's wedding. Therefore he wants to sell some of his shares. Among the shares he owns, which are currently worth about 5,000 Euro, are Strawberry shares and Blueberry shares. The price of both shares has remained stable in recent weeks, and the forecasts are positive for both companies.

Task 41:

Please decide: Which shares should Simon sell?

Source: following Kahneman 2014

8.A.2 Decision situation B

Simon Hegele is now 50 years old. He needs 5,000 Euro to cover the costs of his daughter's wedding. Therefore he wants to sell some of his shares. Among the shares he owns, which are currently worth about 5,000 Euro, are Strawberry shares and Blueberry shares. The Strawberry shares are currently worth considerably more than Simon originally paid for them. The Blueberry shares, however, are currently worth less than Simon originally paid for them. The price of both shares has remained stable in recent weeks, and the forecasts are positive for both companies.

Task 42:

Please decide: Which shares should Simon sell?

Source: following Kahneman 2014

8.A.3 Developing a hypothesis

Decision situation A

Simon Hegele is now 50 years old. He needs 5,000 Euro to cover the costs of his daughter's wedding. Therefore he wants to sell some of his shares. Among the shares he owns, which are currently worth about 5,000 Euro, are Strawberry shares and Blueberry shares. The price of both shares has remained stable in recent weeks, and the forecasts are positive for both companies.

Please decide: Which shares should Simon sell?

He should sell the Strawberry shares.

He should sell the Blueberry shares.

Decision situation B

Simon Hegele is now 50 years old. He needs 5,000 Euro to cover the costs of his daughter's wedding. Therefore he wants to sell some of his shares. Among the shares he owns, which are currently worth about 5,000 Euro, are Strawberry shares and Blueberry shares. The Strawberry shares are currently worth considerably more than Simon originally paid for them. The Blueberry shares, however, are currently worth less than Simon originally paid for them. The price of both shares has remained stable in recent weeks, and the forecasts are positive for both companies.

Please decide: Which shares should Simon sell?

He should sell the Strawberry shares.

He should sell the Blueberry shares.

Task 43:

Develop hypotheses on the extent to which the decisions in situation A differ from the decisions in situation B.

Work on the task in the electronic textbook or your copybook.

8.A.4 Analysis

Didactic note

Economically speaking, the two situations are almost identical. In situations A and B, the price of each share is stable, and the forecasts are positive for both companies. From an economic point of view, it does not matter that the Blueberry shares have lost value – their acquisition costs are “sunk” (on **sunk costs**, see lesson 3).

In fact, however, many investors are guided by the goal of not incurring losses (on **loss aversion**, see above). They form mental accounts and think along the following lines: “If I close the Strawberry shares account, I could make a profit on the Strawberry shares account. I like that better than closing the Blueberry account and posting a failure there. I would rather hold the Blueberry shares and try to book a success there in the long run.” (On **mental accounting**, see lesson 3.)

Task 44:

How can the results be explained? Do you have an explanatory approach (a theory)?

Work on the task in the electronic textbook or your copybook.

Solution suggestion

If a share incurs losses, it is often held until it is back above its entry price. Sunk-cost effects, mental accounting, and loss aversion therefore ensure that investors typically hold loss-making shares for too long.

9. The fund experiment

9.A.1 Decision situation A

Didactic note

The teacher explains the situation as follows:

It's a question of choosing between different types of investment. Both investment forms – building-loan contract and real-estate fund – have advantages and disadvantages. A building-loan contract is a savings contract that the investor enters into with a building society. Building-society loans are mainly used for private property financing. The building-loan contract has the advantage, for example, of being subsidized by the state (with capital-forming benefits, an employee savings bonus, and a housing construction premium) and is a secure form of investment. However, there are also disadvantages to this form of investment. For instance, despite the state subsidy, the average returns are generally lower than those on real-estate fund savings. The idea of real-estate fund saving is based on bundling the capital of several investors to invest it in real estate. If things go well, high value growth is possible with a long savings period. However, this greater increase in value is more uncertain than, for example, in the case of building-society savings.

Task 45:

Which variant will you choose?

Variant I: A “Germany” real-estate fund, with an average return of 5% in the last three years

Variant II: A building-society contract with an average return of 5% in the last three years

Source: DSV 2012

9.A.2 Decision situation B

Task 46:

Which variant will you choose?

Variant I: A “Germany” real-estate fund, with an average return of 5% in the last three years

Variant II: A “Europe” real-estate fund, with an average return of 4% in the last three years

Variant III: A building-society contract with an average return of 5% in the last three years

Source: DSV 2012

9.A.3 Developing a hypothesis

Decision situation A

Which variant will you choose?

Variant I: A “Germany” real-estate fund, with an average return of 5% in the last three years

Variant II: A building-society contract with an average return of 5% in the last three years

Decision situation B

Which variant will you choose?

Variant I: A “Germany” real-estate fund, with an average return of 5% in the last three years

Variant II: A “Europe” real-estate fund, with an average return of 4% in the last three years

Variant III: A building-society contract with an average return of 5% in the last three years

Task 47:

Develop hypotheses on the extent to which the decisions in situation A differ from the decisions in situation B.

Work on the task in the electronic textbook or your copybook.

9.A.4 Analysis

Didactic note

If an advisor wants to convince a customer of a certain form of investment (e.g., A instead of B), it is often sufficient to offer a further, slightly worse variant (A-) in addition to the variant (A) preferred by the customer. The “Europe fund” puts the “Germany fund” in a better light; the customer can compare and feels strengthened in his or her decision.

Task 48:

Look at decision situation A and make a choice.

Task 49:

Look at decision situation B and make a choice.

Task 50:

Please look at the results. What do you notice?

What is the difference between the two situations? And how can the results be explained?

Work on the task in the electronic textbook or your copybook.

Solution suggestion

If the wording of a decision problem influences the decision itself, one speaks of so-called “framing effects”. Such framing effects occur because people make different decisions for the same problem, with different ways of formulating it.

9.A.5 Further examples

Task 51:

Do you know any further examples for this framing effect? Look for an advertisement from magazines, TV, or radio, in which a framing effect occurs. Use this example to explain what is meant by “framing”.

Work on the task in the electronic textbook or your copybook.

10. The ultimatum game

10.A.1 Thinking through financial decisions – The ultimatum game

Didactic note

The interactive learning strand is based on the **ultimatum game**. In this game, a player (Player A) is offered a fictitious sum of 10 Euro by a game master and has to split the 10 Euro between himself (Player A) and another player (Player B). The two players are not allowed to talk to each other. The other player (Player B) can accept or refuse the offered distribution. If the player accepts the distribution, both players keep the money. If the player rejects the distribution, both players lose the money. The game is used to illustrate the importance of social comparisons in financial decisions.

In the first task, the students click on the button “New Game”. The computer automatically assigns two people to each other who are ready to play. Player A is shown the following message:

Imagine you are offered ten euros. There is only one catch: You have to give part of the money to a fellow player, in your case X (name of player B). You decide how much of your money you give away. However, X (name of player B), who knows the rules of the game, must agree with your offer. If X agrees to the split, you will both get your share. If X finds that you are offering him too little and therefore rejects your split, you will both go away empty-handed. Make X (name of player B) an offer. Use the slider and then click on “offer”. In the second step, X (name of player B) will be shown your decision and will have the opportunity to accept or reject the offer. You are not allowed to talk to X (name of player B).

The screenshot shows the game interface for Player A. At the top, there is a text box with instructions. Below it, there are two sliders. The first slider is labeled 'You' and has a value of 0. The second slider is labeled 'Other' and also has a value of 0. Below the sliders is a large orange button labeled 'Offer'.

Figure: Perspective of student A

[Close](#)

The screenshot shows the game interface for Player B. At the top, there is a text box with instructions. Below it, there are two sliders. The first slider is labeled 'You' and has a value of 0. The second slider is labeled 'Other' and also has a value of 0. Below the sliders is a large orange button labeled 'Offer'.

After player A has sent the offer, in our case a division of 6 Euro for player A and 4 Euro for player B, player B will receive the following message:

The offer made by Y (name of player A) is:

X (name of player A): 6 Euro

Y (name of player B): 4 Euro.

Do you accept or reject this decision?

Accept

Reject

Figure: Perspective of student B

[Close](#)

Accept

Reject

Figure: Perspective of student B

On the following pages, the results are discussed.

Task 52:

Carry out the following economic experiment several times.

Didactic note

Both analyses are concealed in the student perspective and are only shown once the experiment has been carried out. The second chart with the values of all students from all learning groups is interesting mainly because of the larger sample.

10.A.2 Analysis

Task 53:

What decisions (amount of offers) have the students from group A made, and why?

Why did the students from group B reject the offers? Why not?

Would the students from group B have accepted a lower offer? How low could the offer have been?

Work on the task in the electronic textbook or your copybook.

Didactic note

The decision on how many Euro to give away would be such that a merely self-interested player would only give away exactly one Euro. He himself would keep 9 Euro. The opponent would also accept this division, as she would get more, with one Euro, than if she rejected the offer and received nothing. This type of decision-maker, who acts according to a selfish calculation, is often labelled as “homo economicus”. In contrast to “homo economicus”, however, “homo sapiens” tends to make a decision that is as fair as possible for both. In other words, homo sapiens has an **inequality aversion**.

10.A.3 Task 1

Task 54:

The ultimatum game shows that (check and discuss whether right or wrong)

- Most people have an unfairness aversion.
- All people take 1 Euro and are satisfied.
- Very few people are satisfied with 1 Euro.
- Almost all people offer only 1 Euro.
- Homo economicus takes 1 Euro, because 1 Euro is better than nothing.
- Homo economicus offers nothing.

10.A.4 Task 2

Task 55:

The classic homo economicus...

- ...acts only according to his own interests and preferences.
- ...acts against the interests of his fellow man.
- ...pays attention to his status within a social group.
- ...always acts rationally according to the economic principle
- ...tries to achieve maximum return with minimum effort.

10.A.5 Transferring the results from the ultimatum game

Task 56:

Transfer the results from the ultimatum game to our other experiments:

How would homo economicus act...

...in the theatre-ticket experiment?

...in the calculator experiment?

...in the tennis-elbow situation?

...in the first experiment with shares?

...in the experiment with the wheel of fortune?

...in the second experiment with shares?

...in the fund experiment?

Are there arguments against the decision-making behavior of homo economicus in the individual situations?

Should we generally base our financial decisions more on the decision-making behavior of homo economicus?

Work on the task in the electronic textbook or your copybook.

11. Developing an investment strategy

11.A.1 Developing an investment strategy

Simon Hegele is still working for the **company** Baumaschinen Würtgen GmbH. By now he completely understands his salary statement. And he is also familiar with typical errors of reasoning when dealing with **money**.

Despite the high deductions (taxes, social security contributions, etc.), he managed to **save** 500 Euro a month last year – not least because until recently he lived with his parents. He now wants to invest the total amount – exactly 6000 Euros – as profitably as possible for three years, because then he wants to buy a new car. He is prepared to give up his savings for three years in return. Initial research by his brother-in-law Rainer – who has completed a bank apprenticeship and is very knowledgeable – leads to the following results:

Offer no.	Name	Return	Special Feature
1	Savings bond of the Versu Bank	1.2% per annum	Annual payment of interest
2	Savings bond of the Europa Bank	1.0% per annum	Interest is credited to the account
3	Savings bond of the Rabö Bank	0.4% per annum	Legal period of notice (3 months)
4	Growth saving with Hanseatenbank	0.8% in Year 1 1.0% in Year 2 1.2% in Year 3	From 1,500 Euro
5	Call money account with Consörsbank	1.5% guaranteed for one year; 50 Euro bonus for new customers	Interest rate from year 2 is 0.5%
6	Fixed deposit with DHF Bank	1.4% per annum	From 10,000 Euro; if less: 1.2% per annum

OVERVIEW

Fixed Deposit

Fixed-term deposits are a form of saving in which the duration and the interest rate are agreed in advance. Whereas the funds invested in a call money account can be accessed on a daily basis, here the saver must wait until the end of the agreed term. As compensation for the investment over an agreed duration in the fixed-term deposit account, the saver receives more interest. Even a fixed-term deposit with a term of 1 year offers significantly higher interest rates than the best call money accounts.

Return

In finance, "return" is the effective interest rate, expressed as a percentage of a reference value, which an investor in financial products – or another form of investment – achieves within one year.

Savings Bond

A savings bond is a fixed-interest and very secure form of investment. Here you invest money over a fixed term (usually you can choose between one and ten years). For this capital investment, you get interest, which is fixed for the entire term and therefore does not change. The biggest disadvantage of savings bonds is that you cannot get hold of the money during the term of the savings bond. Therefore, you should only invest the money in a savings bond that you definitely will not need until the end of the investment. You can get savings bonds at any normal bank. Normally there are no fees for this savings product.

Savings Book

A savings account is an account at a bank where the deposits of a saver are recorded. The standard form of such a savings account is the so-called savings book. This represents a savings certificate in which all deposits and withdrawals as well as the saver's interest income are recorded. Traditionally issued in paper form, the savings book has for years been increasingly replaced by the paperless *SparCard* (savings card), where all deposits and withdrawals as well as the interest income are recorded on a card. A savings account can only be operated with a positive balance. This is referred to as credit-based account management.

Call Money

A call money account is particularly suitable for short-term and temporary investments. There are various call money accounts on the market, which can be compared mainly on the basis of the interest rate offered. The advantage of a call money account is that there is usually no notice period to observe and you can dispose of your money flexibly at any time. Depending on what is on offer, you will receive an attractive interest rate and can switch to a better offer if necessary (bonuses for new customers are popular). The banks usually offer their call money accounts free of charge. However, unlike a current account, a call money account cannot be used as a clearing account.

Growth Saving

Growth saving means you receive interest on your money, which increases the longer you save. Banks usually advertise the particularly high interest rate in the last year of the term ("attractive interest rate"). With growth saving, you usually invest your money over a relatively long period of three to five years. The annual return over the entire term usually does not exceed the return on the best fixed-term deposit offers.

Task 57:

Please begin by calculating the payout amount in increments after 3 years. Complete the following table in order to do that:

Name	Initial Capital	Interest Year 1	Capital after 1 Year	Interest Year 2	Capital after 2 Years	Interest Year 3	Final Capital
1. Savings bond of the Versu Bank							
2. Savings bond of the Europa Bank							
3. Savings bond of the Rabö Bank							
4. Growth saving with Hanseatenbank							
5. Call money account with Consörsbank							
6. Fixed Deposit with DHF Bank							

Evaluation

11.A.2 Inflation-rate task

Task 58:

Calculate the purchasing power of 1,000 € in 5 and 10 years, with an assumed average inflation of 2%, 4%, and 8%.

	2 percent	4 percent	8 percent
after 5 years			
after 10 years			

Suggested solution (and explain calculations)

	2 %	4 %	8%
<i>after 5</i> <i>years</i>	905.73 €	821.93 €	680.58 €
<i>after</i> <i>10</i> <i>years</i>	820.34 €	675.56 €	463.19 €

Task 59

If the same mountain of goods, which will still be worth 1,000 Euro in 2015, costs 1020 Euro after one year, i.e., in 2016, inflation will be 2%. Here, one calculates: $1,000 * 1.02 = 1,020$.

Hence, how much (in 2015 terms) would one be able to buy with 1,000 Euro in 2016?