Earn More Tomorrow: Overconfident Income Expectations and Consumer Indebtedness

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Earn more tomorrow: Overconfident income expectations and consumer indebtedness*

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Abstract

This paper examines whether biased income expectations due to overconfidence lead to higher levels of debt-taking. In a lab experiment, participants can purchase goods by borrowing against their future income. We exogenously manipulate income expectations by letting income depend on relative performance in hard and easy quiz tasks. We successfully generate biased income expectations and show that participants with higher income expectations initially borrow more. Overconfident participants scale back their consumption after feedback. However, at the end of the experiment they remain with higher debt levels, which represent real financial losses. To assess the external validity, we find further evidence for the link between overconfidence and borrowing behavior in a representative survey (GSOEP-IS).

JEL classification: D14 (Personal Finance), D84 (Expectations), G40 (Behavioral Finance).

Keywords: Debt, Consumption, Borrowing, Overconfidence, Income Expectations.

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1. Introduction

Consumer indebtedness is a core economic issue in modern societies. There are millions of individuals in each larger OECD country that are considered over-indebted. For instance, 6.9 million German individuals (or 10% of the adult population) were considered over-indebted in 2018 (Creditreform, 2018). While the share of over-indebted households is estimated to be in the range of 5-10 percent in most developed countries; the US is heading these statistics with shares of up to 20 percent (Fondeville, Özdemir and Ward, 2010; OECD, 2018).[1] An even higher fraction of households self-reports to experience problems with debt (Lusardi and Tufano, 2015; Money Advice Service, 2017). High household indebtedness not only reduces individual welfare, but also has worrying effects at a larger scale and may negatively effect the economy (Melzer, 2011; Livshits, Mac Gee and Tertilt, 2016; Sufi, Mian and Verner, 2017). Its role for growth, financial crises, and unemployment has therefore received increased policy attention (IMF, 2012; 2017).

In this paper, we provide evidence for the effect of income expectations on borrowing behavior and as a potential source of over-borrowing. In contrast to the relevance of excessive consumer debt, there is still little research about its origins. A classical assumption in household finance is that people maximize their inter-temporal utility and smooth consumption by borrowing and saving according to their expectations (e.g., Friedman, 1957). Assuming that households behave rationally, over-indebtedness should only occur in the face of negative shocks which exceed the shock absorbing capacity of the respective household. Such

[1] International statistics often lack comparability, and also the definition of over-indebtedness varies. For example, the OECD uses a debt-to-asset ratio above 75% and a debt-to-income ratio exceeding 3 as measures of over-indebtedness (Murtin and d'Ercole, 2015).

shocks often include unemployment, unexpected illness or divorce (Statistisches Bundesamt, 2018). However, high levels of consumer debt in many countries give reason to believe that consumption behavior contributes to over-borrowing. Moreover, debt decisions of various kinds are often not made optimally due to behavioral limitations in decision making (Amar et al., 2011; Zinman, 2015; Alan et al., 2018; Gathergood et al., 2019). We contribute to this literature by analyzing overconfident income expectations as a specific behavioral bias.

In order to examine the relationship between overconfident income expectations and debt taking we conduct a novel laboratory experiment, in which we exogenously vary the confidence of participants about their future earnings. To create such variation we exploit the "reversed hard-easy effect" (Larrick, Burson and Soll, 2007; Moore and Small, 2007), which refers to the tendency of people to overestimate their relative performance in easy tasks and to underestimate their relative performance in hard tasks. We prime participants with either hard or easy sample questions that are representative for general knowledge questions they answer to earn income. As participants are paid according to their relative ability, the actual income on group level is independent of task difficulty. However in line with the literature, we find that those assigned to easy tasks form higher income expectations than those assigned to hard tasks or a control group.

Income expectations are crucial to the experiment, as income determines the ability to consume (snacks, beverages, and other items), but is only gradually revealed and paid out over time. Participants need to form income expectations to optimally purchase goods in a sequence of markets. They know the price level of goods will increases over time, which provides an incentive to buy goods early. Early purchases therefore allow a higher consumption level at a given budget. To be able to buy early, participants can use interest-free debt.

Earned income cannot be saved and paid out in cash, but can only be spent on goods. Participants thus face a decision in which it is rational to take up as much debt as they expect to earn during the experiment. We repeat the quiz task (to earn income) and the market (to consume) twice after the initial run, which allows us to examine the dynamic interaction between overconfident income expectations and borrowing.

Overall, our results support the hypothesis that higher income expectations raise the level of borrowing, with the experimental design allowing for a causal identification. We first verify that the manipulation of income expectations is successful. Participants in the easy treatment expect significantly higher income than participants in the hard treatment. Moreover, we find that those in the easy treatment initially borrow more and have higher debt levels throughout the experiment. When income is revealed, they reduce their consumption but they are still more likely to remain in debt by the end of the experiment. We confirm that this result is driven by participants with higher income expectations. As the treatment assignment is random, we argue for a causal effect of income expectations on borrowing behavior.

On an individual level, participants with overconfident income expectations realize that their actual income does not match their consumption plans. They more often leave the experiment with a negative balance that is deducted from their show-up fee. We interpret them as over-indebted, as most participants would prefer to avoid this cash penalty. This means that overconfident income expectations predict over-indebtedness in the experiment. In the second and third experimental market, the treatment effect of task difficulty becomes weaker, as participants can adjust to the treatment condition. Instead, we find a stronger effect of overconfidence, defined by the deviation of expected and actual payoff, on final

debt. While overconfidence is successfully induced by the treatment manipulation, within treatment heterogeneity in overconfidence contributes to its overall effect.

We provide external validity for the results by studying the effect of overconfidence on debt taking and over-indebtedness in a representative sample of German households (GSOEP). The survey asks participants to judge their ability in two short tasks relative to a representative group of the German population. We show that those who overestimate their ability in these tasks are more likely to use overdraft and are more likely to report that they feel their debt is a burden. The survey does not contain a viable measure of income expectations, which prevents us from studying the direct relation between income expectations and debt taking. However, we observe that overconfident individuals also expect to be able to make all repayments on time. This may be due to overconfident income expectations.

A number of studies have examined biased expectations as a potential reason for high levels of borrowing by households. Biased expectations have also been associated with poor repayment rates and over-indebtedness. The overestimation of one's own self-control has so far gained most attention in the literature. Heidhues and Köszegi (2010) show in a theoretical model that consumers, who are not aware of their self-control problems, will put off repayment in back-loaded credit contracts. Lack of self-control has empirically been related to sub-optimal borrowing behavior and over-indebtedness (Gathergood, 2012). Relatedly, consumers underestimate their usage of late payments and overdrafts. As a consequence, they pay no attention to these fees when taking out a loan (Gabaix and Laibson, 2006). Another form of biased expectations relevant for debt decisions is the exponential growth bias. People underestimate the exponential growth of a loan amount due to compound interest and more biased households tend to borrow more (Stango and Zinman, 2009).

Our results further contribute to the literature on the link between income expectations and debt-taking. Hyytinen and Putkuri (2018) analyze a survey in which participants are asked to predict how their financial situation will develop over the next year. They compare these predictions with the realizations one year later and find that those who make optimistic forecast errors have higher debt-to-income ratios. Souleles (2004) finds that households underestimate economic shocks and that the too positive sentiment is related to higher consumption. Our findings can help to explain the pattern they find: People with overconfident income expectations will be particularly affected by a negative shocks to the economy or their personal situation, as they already run overly high consumption levels.

Finally, we contribute to the literature on overconfidence in financial decision making. Mostly this literature is concerned with investment decisions (Odean, 1998, 1999; Barber and Odean, 2000). Overplacement relative to other people, which is the type of overconfidence we study, has been related to over-trading and greater risk taking (Glaser and Weber, 2007; Graham, Harvey and Huang, 2009; Merkle, 2017). It has been shown that overconfident corporate managers use more debt, in particular long-term debt (Ben-David, Graham and Harvey, 2013). For household debt, however, overconfidence research is scarce. While sometimes alluded to (Kilborn, 2005) and implicit in the studies on overestimating self-control or the economic situation, it has to the best of our knowledge not been directly empirically tested.

2. Experimental Design

The purpose of the experiment is to study the effect of income expectations, in particular overconfident income expectations, on debt taking behavior. Few household surveys include income expectations and income realizations on a regular basis, and if so they are often elicited as directional estimates rather than in exact monetary terms. In addition, survey data might be subject to endogeneity. We thus turn to an experiment that allows for more control and to exogenously induce income expectations.

The experimental design mimics actual consumption decisions, as participants earn income that they spend on real goods that are handed over to them at the end of the experiment. The possibility of buying on credit gives rise to borrowing decisions, which are the main interest of this study. We implement a between-subjects design with two treatment groups and a control group, which differ in the way income of participants is generated. The two main parts of the experiment are the selection of consumption goods to be bought ("market") and the generation of income by solving questions in a general knowledge quiz ("income task").

Figure 1 illustrates the general structure of the experiment. After the instructions, we conduct a test on the comprehension of the experiment. This is followed by a first elicitation of income expectations. Then the first market stage takes place, with further markets alternating with two rounds of the income task. Importantly, income is earned only after the first consumption decision is made. This introduces uncertainty about income and the opportunity to borrow against future income. The income task differs between the treatments as explained below. Income expectations are elicited a second time after the first income

task. After the final market stage, participants complete a questionnaire on demographics and other control variables (including risk preferences and self-control).

The structure of the experiment and details on the different stages are explained to participants in the written instructions they receive before the start of the experiment. They complete a comprehension test on screen at the beginning of the experiment. The instructions and screenshots of the experiment can be found in Online Appendix A.

2.1. Income task and income expectations

Participants can earn income based on their performance in two rounds of a quiz task. Each of the two quizzes consists of ten general knowledge questions taken from a broad range of topics. Questions are asked in a multiple choice format with four answer alternatives (for the full set of questions see Online Appendix B). There is a time limit of five minutes for the completion of each quiz. Participants are randomly assigned to groups of eight participants and are paid depending on their relative rank within their group. Ranks are determined by the number of correct answers with completion time as a tie-breaker. Participants receive a maximum payment of €5 when finishing in first or second place, and the following pairs of ranks receive a reduced payment of €4, €2, and €1, respectively. Consequently, the range of total earnings in the two income tasks is between €2 and €10.

The treatment variation consists in the difficulty of the quizzes. While in one treatment the general knowledge questions are relatively easy (e.g., *"What does the chemical compound H_2O stand for?"*) in the other treatment the questions are considerably harder (e.g., *"What does the chemical compound NH_3 stand for?"*). We will refer to the respective treatments as the easy treatment and the hard treatment. Questions are matched in terms of topics across

treatments to exclude any unintended effects of topic familiarity. To construct the quizzes, we have tested the difficulty of the questions in a pretest.

Importantly, participants are shown four sample questions representative for quiz difficulty at the beginning of the experiment. Our treatment manipulation builds on the reverse hard-easy effect (Larrick, Burson and Soll, 2007; Moore and Small, 2007), which implies that people overestimate their relative position in easy tasks and underestimate it in hard tasks. Participants in the easy treatment are thus predicted to expect a higher income than participants in the hard treatment. Due to the identical payment scheme, the total actual income does not differ between treatments.

In the control group, income is determined by two independent random lotteries. To match the income distribution in the treatment groups, there is an equal chance to receive a payment of €1, €2, €4, and €5 in each lottery. To avoid any effects of a quicker sequence of markets or a shorter experiment duration, participants in the control group will nevertheless complete two quizzes (either hard or easy). It is made clear to them that the quiz performance is not payoff relevant. Participants in the control group are predicted to have income expectations close to mean lottery payouts.

After the instructions, but before the markets and income tasks, income expectations are elicited. At this stage participants have been informed about the income tasks and have seen sample questions, but have not yet completed the quizzes. They are asked for their total expected income in € from the two quiz tasks. In addition, we follow Merkle and Weber (2011) and elicit probabilities for reaching each rank pair in a task. After an income task is completed, participants' true rank and payoff are revealed. After the first task, we ask for

expected income in € for the remaining task. We do not incentivize the income expectations to avoid strategic behavior in the quiz tasks.[2]

2.2. Market for consumption goods

All three markets have the same structure. A total of ten goods are on display, of which multiple items can be purchased by participants. We select goods based on their assumed desirability for a student population (including chocolate, pens, and soft drinks), and goods remain constant across markets. The current price for each good is shown as well as the future prices in the remaining markets (see online appendix A for a screenshot). There is thus no uncertainty about prices or available quantity of goods. Prices for goods increase substantially over time. We sell products at a discount of 50% to retail price in the first market, at about retail price in the second market, and at a premium of 30% in the final market. This price structure is designed to induce borrowing, as usual borrowing motives are absent in the experiment. In particular, earlier purchases will not result in earlier consumption as all goods are handed out at the same time after the experiment.

The maximum credit for purchases in the first market is €10 which corresponds to the maximum income in the income tasks. As the first market takes place before any income is earned, participants have to borrow against their expected future income. After the first income task, participants' payoff is added to their balance and they can use it in the second market in addition to a maximum credit of €5. After the second income task, participants' payoff is again added to their balance and they can spend any remaining positive balance in the third market. Importantly, the income from the quizzes can only be spent for goods,

[2]See the discussion by Schlag, Tremewan and Van der Weele (2015).

it will not be redeemed for cash at the end of the experiment. It is thus rational to spend any income from the income task on goods as long as the goods have positive utility. On the market screen, participants see their account balance and their debt level.

It follows from the design that participants can over-borrow. As all participants are allowed to take out a maximum of €10, but only few will actually earn €10, some might not be able to repay their debt. To make over-borrowing costly, these participants have to repay the debt out of their show-up fee. In contrast to the income from the income task, the show-up fee is paid out in cash. We assume and empirically corroborate that participants in general prefer cash to the offered goods and would like to avoid digging into their show-up fee. The total show-up fee amounts to €13 and thus sufficiently covers any possible amount of credit.[3]

2.3. Control variables

After the main experiment, a questionnaire asks for demographics of participants (including gender, age, and education). We further test for financial literacy using six standard questions similar to those used by van Rooij, Lusardi and Alessie (2011). We measure risk aversion using a self-assessment on a scale between 0 and 10 (Dohmen et al., 2011) and using the staircase method developed by Falk et al. (2016). Finally, we measure self-control using the 13-item scale developed by Tangney, Baumeister and Boone (2004). After the questionnaire the experiment ends and participants receive the goods they purchased privately in a separate room.

[3]Laboratory rules require a minimum show-up fee of €5 to be paid in cash. The additional €8 correspond to the maximum shortfall from the credit (maximum credit - minimum income = €10 - €2 = €8). To make this clear to participants, the two parts of the show-up fee are designated as "show-up fee" and "participation fee."

2.4. Procedures and participants

The experiment has been registered in the RCT registry of the American Economic Association under the identifier AEARCTR-0002634. We filed our main hypotheses in the registration, a description of the three treatment designs, as well as the planned number of participants ($n = 288$). The registration was filed on December 12, 2017, prior to the first experimental session. The experiment was programmed using the experimental software z-tree (Fischbacher, 2007). The experiment was conducted in the experimental laboratory of Technical University Berlin, Germany, in December 2017. Participants were invited using the recruiting software ORSEE (Greiner, 2015).

A total of 285 participants completed the experiment in sessions of 24.[4] Table 1 shows demographic information of participants. We obtain an almost equal proportion of female and male participants. Average age of participants is 23 and most of them are studying for a Bachelor degree. About a third of the students work and their monthly income by this or other means is on average about €700. They show high financial literacy but moderate risk tolerance and self-control.

Table 1 also provides means by treatment group as a balance test of the randomization. Differences between groups are small for most demographic variables. We find higher average income among participants in the easy treatment and also slightly higher risk tolerance. While we believe these differences are due to chance, we nevertheless control for these variables in the regressions. In the main analysis, we exclude 33 participants from the

[4]The easy and hard treatments require a group of eight participants to enable relative comparisons. An equally large control group was targeted. Sessions were slightly overbooked, but due to no-shows in 2 sessions did not reach the targeted number of participants. In this case, we used a smaller control group.

analysis who answer less than four of the five comprehension questions correctly.[5] As the exclusion restriction is based on comprehension of the general instructions, it is random across treatments. The final sample contains 252 participants.

3. Results

3.1. Income expectations

We first examine whether the treatment variation leads to differences in expected income during the experiment. Participants in the two treatment groups were exposed to different sample questions (hard or easy). Figure 2 shows average expected income at the beginning of the experiment, separately for the two treatments and the control group. The range of possible income in the two quiz tasks is between €2 and €10. Participants in the hard treatment on average expect to earn €5.61, whereas participants in the easy treatment expect to earn €6.67. The difference of more than 1 Euro is highly significant ($p < .001$). Participants in the control group know that they are paid according to the outcome of two lotteries. They expect to earn €6.04, which is very close to the expected value of the lotteries (€6). Unsurprisingly, the variance of income expectations is lowest in this group.

Figure 3 shows income expectations after the first income task and before the second market stage. Participants are asked to provide their expected income for the remaining income task; the range of possible values is thus reduced to between €1 and €5. They respond after receiving feedback on their income in the first quiz task. The average income

[5] As an experimenter has to manually override the responses and talks to participants, we discover in many cases that insufficient comprehension of the German language is responsible for the errors. The laboratory indicates the language of the experiment in the invitation (English or German), but this might be overlooked. To avoid disruptions, participants are allowed to regularly continue with the experiment. We further discuss the exclusion in Online Appendix C.

expectation of participants in the hard treatment is €2.77, while those in the easy treatment expect to earn €3.16. Participants in the easy treatment still expect higher income, but the difference is smaller and statistically significant at a level of 10% (p=0.07). The difference is slightly smaller than a proportional decrease would suggest, which probably results from updating after receiving feedback. However, the feedback is not sufficient to close the gap between the two treatments. The expected income in the control group is again almost exactly in line with the expected value of the lottery.

Overall, we confirm that the manipulation of income expectations is successful. Participants in the easy treatment expect significantly higher income at the beginning of the experiment than participants in the hard treatment. The difference decreases but persists throughout the experiment.

3.2. Actual income and overconfidence

The hard treatment proves to be harder in terms of quiz difficulty, as participants on average answer 5.9 of 20 questions correctly, while in the easy treatment they answer 14.7 questions correctly. In this respect, participants expectations about quiz difficulty induced by the sample questions are confirmed in the income tasks. However, as incentives are based on relative performance, the average actual income does not differ between the treatment groups. It amounts to €6 in all treatment groups.

As a consequence, the income expectations in the easy treatment group are on average too high and in the hard treatment group too low. This has been explained by egocentrism in comparative judgments (Kruger, 1999): people tend to think more about their own performance than about how difficult the task will be for other participants. A simple measure for

individual overconfidence is the difference between income expectations and income realizations. As we elicit income expectations twice, we can likewise calculate two overconfidence variables. We label these variables $overconfidence$ and $overconfidence\ 2$.

Average overconfidence in the full sample is 0.03 and not significantly different from zero (overconfidence 2 = −0.13, see Table 2). There is thus no general tendency to overestimate one's income in the experiment. However, there are large treatment differences resulting from the differences in income expectations. Panel A of Table 2 shows the results by treatment group and the difference between the easy treatment and the hard treatment. Participants in the easy treatment are on average overconfident about their income, while participants in the hard treatment are underconfident. The difference amounts to 1.19 and is statistically significant ($p < 0.01$).

After receiving feedback, the errors in income expectations decrease and overconfidence goes down (Panel B). There still remains a difference between treatment groups, which is no longer statistically significant ($p = 0.29$). While the differences in overconfidence on group level are induced exogenously by the experimental design, we also observe considerable heterogeneity within treatment. This supports the view of overconfidence as an individual trait. We find Pearson correlations between overconfidence and overconfidence 2 of 0.55. In subsection 3.4, we will thus investigate the consequences of overconfidence beyond the treatment effect.

3.3. Consumption and debt taking

We next examine the consumption decisions in the market stage. Participants are active in the markets and spend on average €3.94 in the first market, €1.40 in the second market, and

€0.97 in the final market. Only 20% participants spend less than the minimum income of €2 in round 1. This means that the offered products reasonably appeal to participants and the market rules are understood. The expenditures are highest in the first market, presumably because prices are lowest and participants are still unrestricted by their actual income. Their debt limit corresponds to the maximum possible income.

Importantly, the consumption in the first market is identical with the debt taken out, as participants have not yet earned any income. Panel A of Table 3 shows the debt level of participants after each of the three markets. The average debt level decreases over time as participants repay their debt from the earned income they receive before markets two and three. There is some new borrowing in market two as participants who have not maxed out their credit line can take out additional debt (no new debt is possible in market three). The debt level after market three corresponds to the final debt that participants are unable to repay from their income. We find that 38% of participants have final debt, which is deducted from their show-up fee.[6] The table further shows that participants on average do not spend their entire expected income. At least part of this can be explained by a cautionary motive, as income is uncertain.

Table 3 shows in Panels B-C the borrowing behavior in the different treatment groups. In line with their higher income expectations, participants borrow most in the easy treatment and least in the hard treatment. The differences decrease over time, as the experimental design allows participants have to adjust their spending to their actual income, but remain

[6]The counterpart to leaving the experiment with debt is leaving it with unspent income, which is forfeited after the last market stage ends. However, as the cheapest product in the final market costs €1.20, we consider it only unreasonable if subject leave more than €1.20 on the table (under the assumption that products have positive utility). Such high unspent income is observed for 3% of participants. As our focus is on debt, we will not discuss this issue further.

visible until the end of the experiment. This is a first indication of the treatment effect on borrowing behavior.

We study the effect now more formally in a regression framework. Table 4 shows the results of the debt variables regressed on treatment dummies. In column (1), the dependent variable is the initial debt from consumption in market one. Coefficients have a natural interpretation in terms of Euro. Participants in the easy treatment spend 73 cents more than participants in the hard treatment (omitted category), while participants in the control group spend 59 cents more. Given the baseline consumption of €3.50, the treatment effects are economically and statistically significant. The difference between the hard treatment and the control group, however, is only statistically significant at the 10%-level.

Columns (2) and (3) show how the treatment effect evolves over time. As already evident from the descriptive statistics, the effect decreases, but it remains at least marginally significant until the end of the experiment. This decline is expected as participants receive feedback about their income, and the erroneous income expectations induced by the treatments are gradually corrected. Nevertheless, participants in the easy treatment are consistently more indebted than those in the hard treatment. This means that they are not able to make up for their initial overspending completely and even keep on borrowing.

It is worth noting that the difference in initial borrowing is smaller than the difference in income expectations (see Figure 2). Participants with high income expectations spend proportionally less of their expected income. One reason might be risk aversion, as the risk to fall short of one's expected income is higher for these participants. Another reason might be decreasing marginal utility of consumption. Interestingly, this finding reverses after market two: the between treatment differences in debt levels are now larger than the differences in

income expectations for the second income task. This suggests that income expectations adjust more quickly than debt levels can, a problem that seems relevant for real life debt as well.

Column (4) of Table 4 reports results of a linear probability model with a binary variable whether participants have debt at the end of the experiment (final debt>0) as the dependent variable. The results suggest that participants in the easy treatment are about 11% more likely to have debt at the end of the experiment. This difference, however, is not statistically significant. We conclude that the treatment has a significant and persistent effect on the borrowing behavior of participants in the experiment. Participants in the easy treatment borrow more initially and have higher debt levels throughout the experiment. We do not find strong evidence that they are also more likely to end up in debt.

3.4. Mechanism

In this subsection, we examine the mechanisms that drive the treatment effect on indebtedness. The main variables of interest are income expectations and overconfidence, as these were intended to be manipulated by the treatment. As we now exploit within treatment variation, the observed effects are no longer fully exogenous. We thus add a set of control variables to the regressions to account for observable differences between participants. We analyze the level of debt after each market stage.

In the OLS regression models shown in Table 5, the debt level after the first market stage is the dependent variable. Results shown in column (1) include income expectations (in €) as the sole explanatory variable. For each additional expected Euro of income, participants take out 27 cents more debt, which is economically meaningful and highly statistically sig-

nificant. However, overconfidence as defined above, has no significant effect on indebtedness after the first market (see column (2)). We now add the treatment dummies to the regression model (columns (3) and (4)). The effect of income expectations is only slightly reduced and still strongly significant, while the treatment effect is somewhat reduced and no longer significant. We infer that income expectations are the main channel through which the treatment influences debt taking.

The results are robust to the inclusion of the full set of control variables as shown in columns (5) and (6). The only significant variable among the demographics is gender. Women have significantly lower debt levels after the first market than men. We can only speculate about the reasons behind this: It is possible that women are more averse to debt; alternatively, the products offered in the experiment might appeal more to "male tastes." Higher overconfidence of males as found in the investment context (Barber and Odean, 2001) should not be responsible for the effect as we include a direct measure of overconfidence. Nevertheless, overconfidence that our measure does not capture can still contribute to the gender effect.

We repeat the same regressions for the level of indebtedness after the second market stage as the dependent variable. At this point, participants had the chance to react to one realization of income and adjust their consumption accordingly. However, as results in Table 6 show, the effect of their initial income expectations remains as strong as before. Moreover, overconfidence now becomes significant with about 16 cents more debt for each Euro of overestimated income. As overconfident participants fall short of their expected income, they have a harder time to reduce their debt level. Given the reduced impact of the

treatment dummies (see columns (3) and (4)), the evidence corroborates income expectations and overconfidence as channels of the treatment effect.

For the second market, we alternatively use income expectations for the remaining income task (see Online Appendix C). Results are similar, but weaker, which suggests that initial expectations determine indebtedness in the long run. Among the control variables, gender still shows up negatively but with lower magnitude (see columns (5) and (6) of Table 6). Financial literacy has a positive effect on debt levels, which seems surprising as the literature suggest less indebtedness of the financially literate. However, given that the debt level after the second market is an intermediate one, financially literate participants might just be better in spending their income early at lower prices. This needs to be confirmed using debt at the end of the experiment.

The debt level at the end of the experiment is of particular importance, as we interpret it as a measure for over-indebtedness. The reasoning is that this debt is most likely unintended, as participants have to pay it back out of their cash reward. We assume that participants plan to repay their debt over the course of the experiment and therefore fail to repay and stay in debt involuntarily bears resemblance to over-indebtedness. Several observations support this assumption: first, we directly ask people whether they would prefer the products over cash. Only 15% respond that they do, which means that the vast majority intends to consume only the income that is not convertible to cash.[7] Secondly, we rarely see participants spend more than their expected income (19% in the first market). This also suggests that most

[7]In addition, the lab is an experimental economics lab in which cash incentives are the norm. People, who are responsive to cash incentives, self-select into the subject pool. In Online Appendix C, we show results excluding the group of participants that prefer the products over the cash payout.

participants do not intend to spend more than they earn in the income tasks. The results reported below are robust to the exclusion of either group.

Table 7 shows the results for indebtedness after the final market. Income expectations become less important as they were for intermediate debt. However, overconfidence has a strong and highly significant effect on the debt level at the end of the experiment. The reason is that high income expectations are in some cases backed by high actual income, while overconfidence zooms in on those participants who have unrealistically high income expectations. They are the ones who have a high risk to become over-indebted. A similar effect is observed for *overconfidence 2* (see Online Appendix C). Participants who are still overconfident after receiving feedback are in particular trouble. Again, expectations and overconfidence account for part of the treatment effect, which is no longer significant when including these variables.

Results on the propensity to remain in debt at the end of the experiment shown in Table 8 confirm this general pattern. Overconfident income expectations increase the likelihood that participant are unable to repay their debt by 7% (per €). This result is robust to using a nonlinear model. We thus observe a positive effect of overconfidence on the intensive and extensive margin of over-indebtedness (the effect on debt levels also holds when restricting on participants with positive debt, see Online Appendix C).

We interpret the results presented in Tables 5 to 8 as a clear indication of the mechanisms at work behind the treatment effect. Initially, participants strongly respond in their consumption behavior to their income expectations. This is why we observe a high correlation between income expectations and indebtedness after the first consumption opportunity. Subsequently, they receive feedback on actual income and adjust their consumption. Their debt

levels thus depend less on initial expectations, but on how successful they are in planning inter-temporal consumption. Overconfident participants realize that they lack the means for their initial consumption plan. They therefore have higher debt levels at the end of the experiment. We argue that this debt is most likely unintended and akin to over-indebtedness.

4. Survey Evidence

In the experimental results, we show that people who are overconfident borrow more and have difficulties repaying this debt. The laboratory experiment is very useful to isolate the effect of overconfidence via randomization and to exclude confounding effects. However, the short-term nature of the experiment, the student participants, and the somewhat artificial design to induce debt taking, raise concerns about external validity. To address these concerns, we turn to a representative sample of households in Germany. The German Socio-Economic Panel (GSOEP) is a representative longitudinal survey of German households aimed at examining their social and economic behavior. The variables of interest for this study are part of the Innovation Sample (GSOEP-IS), a supplementary stream of the GSOEP designed for more innovative research questions. We combine data from the 2016 and 2017 waves and our sample comprises a total of 1,085 respondents. For a detailed description of the survey, the participant sample, and the used measures, see Online Appendix D.

4.1. Overconfidence and borrowing behavior

We use two measures of overconfidence available in the GSOEP-IS data. Participants are asked to compare their performance in two short tasks to a random sample of the German

population. The first task asks participants to name as many numbers that are multiples of 9 (or 17) as they can in 20 seconds. The second task asks participants to name as many animals (or insects) as they can in 20 seconds. Similar to the experiment, the questions ask for a judgment of relative performance and the tasks have an easy and a hard version, which is randomly assigned. To measure overconfidence, we compare respondents' belief about their ability to their actual position within the sample of participants who answered the same question (for details, see Online Appendix D).

We next link these overconfidence measures to self-reported borrowing behavior elicited in the survey. Overdraft use and subjective debt burden are considered as indicators of potentially problematic borrowing behavior. Participants state whether or not they used the overdraft facility of their checking account over the past year. Overdrafts are a readily available but particularly expensive form of debt and have been related to low self control (Stango and Zinman, 2009). Continuous overdraft use might also signal that a household is living beyond its means. Participants also report whether they subjectively experience debt as a burden. This feeling might be associated with over-indebtedness, as in this situation the actual debt burden is particularly high (Keese, 2012).[8]

Table 9 shows the results of a linear probability model with overdraft use and subjective debt burden as dependent variables. The first two columns report results for the propensity to use overdraft depending on either of the two overconfidence measures. Both coefficients are positive and significant, indicating that people that are more overconfident are more likely to use the overdraft facility of their checking account. The relationship is stronger

[8]The GSOEP-IS includes further measures of debt taking behavior, which we do not examine as their interpretation is more ambiguous (e.g., mortgage debt). We select the two measures that seem to be related to unintended debt or over-indebtedness. Control variables are selected based on similarity to the control variables used in the experiment.

for overconfidence in the numerical task, suggesting a higher importance of numeracy for financial decisions. Among the control variables, the number of children in a household positively predicts overdraft use.

Columns (3) and (4) of Table 9 displays results for the likelihood that participants experience their debt as a burden. As before, both overconfidence measures relate positively and significantly to this experience. Economically, the likelihood to experience debt as a burden increases by 8.5% ($0.5 \cdot 0.17$) for someone with a performance at the median of the population but believing to be at the top (in the numbers task). Of the control variables, age is negatively related to the feeling of debt as a burden, while personal income is positively related. A reason might be that participants with higher income have larger loans, which make them feel worse about their debt.

4.2. Overconfidence and expected ability to repay

In the experiment, participants seem to overestimate their ability to repay their debt from earned income. The GSOEP contains a question that directly aims at the expected ability to repay outstanding debt. Participants are asked for the probability that they will be able to make all scheduled repayments on time. As 91% of participants are certain to make all repayments on time, we treat this as a binary variable.

We test for a relation between the expected repayment ability and the overconfidence measures. Table 9 shows in columns (5) and (6) results of a linear probability model of the belief to be able to repay on overconfidence measures and controls. Coefficients are positive and significant for overconfidence in the numbers task. However, the coefficient is negative and insignificant for the other overconfidence measure. We thus regard the results

as suggestive but less conclusive as to which extent individual overconfidence is reflected in the expected ability to repay one's debt.

Overall, the survey results confirm the findings from the laboratory experiment. People who are more overconfident are more likely to engage in problematic borrowing behavior that may result in high debt levels and feelings of debt as a burden. Income expectations which are closely related to repayment ability might be a channel through which overconfidence manifests in borrowing behavior. However, this is a conjecture since we use overconfidence measures that are not directly related to income or debt, but are rather generic.

5. Robustness

A concern with the registered experiment is that the artificially low prices may provoke a borrowing behavior that otherwise would be absent. First, people with low income expectations may borrow a lot in the first market, simply because products are cheap and they do not mind having their cash reward reduced in exchange for the cheap products. Second, at low prices, participants are able to buy large quantities of the offered products. Participants with high income expectations may therefore reach the point of satiation before they have spent as much as they expect to earn. Both effects would reduce the sensitivity of consumption behavior to income expectations and thus work against our results. They also should not introduce systematic variation between treatments.

Nevertheless, we conduct a replication of the experiment in which we eliminate the price discounts.[9] In this version, prices in the first market stage correspond to the retail prices of the products. Prices in the second market stage are 40% higher and in the final market stage

[9]The replication study was not pre-registered.

80% higher than the retail price. We keep the ascending price profile to provide an incentive for early borrowing. Otherwise the optimal course of action would simply be to wait with consumption until realized income is revealed. The robustness experiment was conducted in July 2018 in the experimental laboratory of the TU Berlin, excluding entrants who had participated in the main experiment. We run 10 sessions with a total of 219 participants; descriptive statistics on the participants can be found in Online Appendix E. As in the main experiment, we exclude participants with insufficient understanding of the experimental instructions and remain with a final sample of 193 participants.

Panel A of Table 10 shows income expectations and overconfidence of participants regressed on treatment dummies. We find that the manipulation of income expectations by the treatment works less well in this sample. Participants in the easy treatment expect to earn 57 cents more, but the gap between the the easy and the hard treatment is much smaller than in the main experiment and only marginally significant. Treatment differences in overconfidence do not obtain significance. As in the main experiment, differences are reduced after feedback on income is obtained. The change in the price structure cannot be responsible for the weaker effect, as income expectations are submitted before participants learn about prices in the market stage. The instructions, the income task, and the treatments remain the same.[10]

We next examine whether consumption behavior changes in the high price condition. Participants spend €3.86 in the first market, €1.41 in the second market, and €0.95 in the final market. This is very similar compared to the main experiment, but as prices are

[10]We can thus only speculate about the reasons for the smaller effect. There might be attention effects as the robustness experiment takes place during the summer heat wave of 2018 (we observe seasonal effects for the attractiveness of certain products).

considerably higher, participants purchase far fewer products in this condition. Participants again spend less than their expected income, as it is particularly undesirable to pay for the expensive products out of the cash reward. Only 5% state in the high price condition that they would prefer the goods over cash. Nevertheless, 34% remain in debt at the end of the experiment compared to 38% in the main experiment.

Given the small treatment differences in expectations, it is unlikely that we find a strong treatment effect on borrowing behavior. Panel B of Table 10 shows results for debt levels of participants in analogy to Table 4. We observe positive effects of the easy treatment on indebtedness, but coefficients are much smaller than in the main experiment. We further find a negative effect for the control group. It is possible that participants in the control group do not want to consume at high prices given the risk of the income lottery.

To determine, whether the direct effects of income expectations and overconfidence survive the weak treatment effect, we analyze their effect on debt levels throughout the experiment (see Table 11).[11] We find that income expectations have a similarly strong impact on initial debt taking than in the main experiment (column (1)). As before, overconfidence becomes more important in the later stages of the experiment, in particular for final debt (columns (4) and (6) and the likelihood to remain in debt (column (8)). The effect size of overconfidence is very similar to the main experiment and strongly significant. We can thus confirm income expectations and overconfidence as drivers of borrowing behavior.

[11] Online Appendix E includes further regressions with additional controls which mirror the regressions for the main experiment.

6. Conclusion

Household indebtedness is increasingly a problem in many countries, with a rising fraction of households that have to be considered over-indebted. Economic shocks and structual changes in lending technology (Livshits, Mac Gee and Tertilt, 2016) as classic explanations for over-indebtedness can only partly explain the recent trend, as the overall economic situation has been favorable. Little is known about behavioral biases that may play a role in whether and how much debt people take.

In this paper, we examine a particular behavioral bias, overconfident income expectations, and analyze how it influences borrowing behavior. In a laboratory experiment with real consumption, we exogenously manipulate income expectations of participants. In two treatments, we induce either overconfident or underconfident income expectations for income earned in two quiz tasks.

We find that participants with higher income expectations consume more, take out more debt and keep higher debt levels throughout the experiment. In particular, overconfident participants run the risk to stay in debt at the end of the experiment, which we—based on features of the experimental design—interpret as cases of over-indebtedness.

We provide external validity for this result using representative household survey data from Germany. In the survey, overconfidence is measured in domains which are independent from income or debt levels, but still show positive correlations with overdraft use, subjective debt burden, and expected repayment ability.

Overconfident income expectations might interact with other behavioral issues in debt taking such as limited self control and exponential growth bias. It might serve as an early

warning indicator, as overconfident expectations manifest itself long before indebtedness builds up. The findings are important for financial advice and debt counselling, which may help consumers to obtain a more realistic picture of their debt and repayment capacity.

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Table 1. Demographic and control variables

The table shows means of demographic variables and controls for the full sample of participants and by treatment group. Gender is an indicator variable taking a value of one if female. Age is reported in years. Bachelor degree and Masters degree are indicator variables taking a value of one if a participant completed the respective degree. Works is an indicator variable whether a participant works. Income is the monthly income in € irrespective of source. Financial literacy is the number of correct answers in a financial literacy test (six questions taken from the German SOEP-IS 2016 survey). Risk tolerance (choices) is based on lottery choices using the staircase method of Falk et al. (2016) with values from 1 (least risk tolerant) to 32 (most risk tolerant). Self-assessed risk tolerance is measured on a scale from 0="completely unwilling to take risk" to 10="very willing to take risk." Self control is a factor score based on Tangney, Baumeister and Boone (2004) with values from −2.90 (lowest self-control) to 2.44 (highest self-control). Different numbers of observation reflect non-responses. The p-values of one-way ANOVA F-tests for between group differences are reported.

			Mean by treatment			F-test
	n	Mean	Hard	Easy	Control	p-value
Gender (female=1)	285	0.50	0.49	0.45	0.53	0.66
Age	285	22.90	22.15	23.28	23.28	0.12
Bachelor degree	285	0.20	0.18	0.23	0.14	0.70
Masters degree	285	0.06	0.02	0.06	0.10	0.11
Works	285	0.31	0.29	0.32	0.34	0.55
Income	280	702	635	834	627	0.01
Financial literacy	285	5.12	5.10	5.42	5.29	0.12
Risk tolerance (choices)	285	10.28	9.99	11.23	9.60	0.08
Risk tolerance (self-assessed)	285	4.80	4.6	5.15	4.62	0.15
Self control	285	−0.03	−0.14	0.07	0.07	0.69

Table 2. Overconfident income expectations

The table shows summary statistics of overconfidence variables for the full sample of participants and by treatment group. Overconfidence is the difference between the income expectations at the beginning of the experiment and the actual income from both income tasks (Panel A). Overconfidence 2 is the difference between the income expectations before market stage 2 and the actual income from the second income task (Panel B). The table reports the number of observations, the mean, standard deviation, the 5th percentile, and the 95th percentile for both overconfidence variables. Differences in number of observations are due to the exclusion restriction and non-responses. Easy − hard is the difference between overconfidence in the easy treatment and overconfidence in the hard treatment. The p-values of a two-sided t-test are reported, testing for a zero mean or a zero between-group difference, respectively.

Panel A: Overconfidence	n	Mean	Std.dev.	5p	95p	p-value
All participants	252	0.03	3.05	−5	5	0.88
Easy treatment	88	0.67	3.02	−4	6	0.04
Hard treatment	84	−0.52	2.74	−5	3	0.08
Control group	80	−0.10	3.27	−5	5	0.78
Easy − hard		1.19				<0.01
Panel B: Overconfidence 2	n	Mean	Std.dev.	5p	95p	p-value
All participants	218	−0.13	1.95	−3	3	0.33
Easy treatment	76	0.05	1.79	−3	4	0.80
Hard treatment	73	−0.26	1.82	−3	3	0.23
Control group	69	−0.18	2.24	−4	3	0.49
Easy − hard		0.31				0.29

Table 3. Borrowing behavior

The table shows in Panel A summary statistics for the debt level of participants after each of the three market stages. It also shows the new debt taken out in the second market and the difference between income expectations and initial debt. Panels B-D show the debt levels separately for the two treatments and the control group. The table reports the number of observations, the mean, standard deviation, the 5th percentile, and the 95th percentile.

Panel A: All participants	n	Mean	Std.dev.	5p	95p
Debt after market 1	252	3.94	2.30	0	8.53
Debt after market 2	252	2.44	1.97	0	5.99
New debt market 2	252	1.39	1.62	0	4.51
Debt after market 3	252	0.67	1.30	0	3.96
Unspent income after market 3	252	0.41	0.93	0	1.12
Expected income − debt	252	2.17	2.60	−1.98	6.44
Panel B: Easy treatment	n	Mean	Std.dev.	5p	95p
Debt after market 1	88	4.23	2.42	0	8.54
Debt after market 2	88	2.72	2.00	0	5.99
Debt after market 3	88	0.85	1.41	0	3.98
Panel C: Hard treatment	n	Mean	Std.dev.	5p	95p
Debt after market 1	84	3.50	2.38	0	7.93
Debt after market 2	84	2.12	1.90	0	5.78
Debt after market 3	84	0.49	1.09	0	2.97
Panel D: Control group	n	Mean	Std.dev.	5p	95p
Debt after market 1	80	4.10	2.03	0.93	8.09
Debt after market 2	80	2.44	2.00	0	6.40
Debt after market 3	80	0.65	1.37	0	4.36

Table 4. Debt taking and treatment effect

The table shows results of regressions of debt variables on treatment dummies. Columns (1)-(3) show results of OLS regressions with the debt level after each market as the dependent variable (see Table 3). Column (4) shows a linear probability model with a binary variable whether a participant has debt at the end of the experiment (final debt>0) as the dependent variable. Independent variables are treatment dummies with the hard treatment as the omitted category. Coefficients are significant at $^{*}p<.10$, $^{**}p<.05$, $^{***}p<.01$; robust standard errors are shown in parentheses.

	Debt after market 1	Debt after market 2	Final debt	Has debt
	(1)	(2)	(3)	(4)
Easy treatment	0.728**	0.600**	0.361*	0.111
	(0.366)	(0.297)	(0.192)	(0.073)
Control group	0.592*	0.313	0.169	0.028
	(0.345)	(0.305)	(0.194)	(0.074)
Constant	3.501***	2.128***	0.489***	0.310***
	(0.259)	(0.208)	(0.119)	(0.051)
R^2	0.019	0.016	0.013	0.010
Observations	252	252	252	252

Table 5. Indebtedness after market stage 1

The table shows results of OLS regressions of the debt level after market one on income expectations, overconfidence, and control variables. Income expectations is the expected income in Euro for the two income tasks. Overconfidence is the difference between the expected income and the actual income. Easy treatment and control group are indicator variables for the respective treatment (with the hard treatment as the omitted category). All control variables are as defined in Table 1. Ln income is the natural logarithm of participants external income. Coefficients are significant at $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$; robust standard errors are shown in parentheses.

	Debt level after market stage 1					
	(1)	(2)	(3)	(4)	(5)	(6)
Income expectations	0.266***		0.240***		0.219**	
	(0.084)		(0.089)		(0.098)	
Overconfidence		0.060		0.046		0.067
		(0.048)		(0.048)		(0.048)
Easy treatment			0.472	0.673*	0.367	0.485
			(0.377)	(0.371)	(0.366)	(0.362)
Control group			0.488	0.572*	0.528	0.601*
			(0.341)	(0.345)	(0.339)	(0.339)
Gender					−0.833***	−0.922***
					(0.320)	(0.318)
Age					−0.009	−0.006
					(0.046)	(0.045)
Bachelor degree					0.075	0.123
					(0.380)	(0.377)
Masters degree					0.318	0.305
					(0.910)	(0.907)
Works					0.050	0.136
					(0.329)	(0.340)
Log of income					−0.097	−0.094
					(0.140)	(0.144)
Financial literacy					0.181	0.173
					(0.113)	(0.115)
Risk tolerance (choices)					0.017	0.027
					(0.032)	(0.031)
Risk tolerance (self-assessed)					0.086	0.111
					(0.079)	(0.079)
Self control					0.054	0.039
					(0.145)	(0.145)
Constant	2.319***	3.942***	2.154***	3.525***	1.934	2.939**
	(0.498)	(0.145)	(0.512)	(0.262)	(1.429)	(1.409)
R^2	0.04	0.01	0.05	0.02	0.14	0.13
Observations	252	252	252	252	248	248

Table 6. Indebtedness after market stage 2

The table shows results of OLS regressions of the debt level after market two on income expectations, overconfidence, and control variables. All variables are as defined in Tables 1 and 5. Coefficients are significant at $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$; robust standard errors are shown in parentheses.

	Debt level after market stage 2					
	(1)	(2)	(3)	(4)	(5)	(6)
Income expectations	0.275***		0.257***		0.268***	
	(0.075)		(0.081)		(0.088)	
Overconfidence		0.158***		0.148***		0.172***
		(0.040)		(0.041)		(0.040)
Easy treatment			0.327	0.423	0.172	0.213
			(0.314)	(0.300)	(0.305)	(0.292)
Control group			0.202	0.250	0.174	0.213
			(0.300)	(0.293)	(0.292)	(0.280)
Gender					−0.393	−0.508**
					(0.249)	(0.244)
Age					0.005	0.010
					(0.041)	(0.039)
Bachelor degree					-0.282	-0.215
					(0.309)	(0.300)
Masters degree					0.615	0.590
					(0.731)	(0.710)
Works					−0.193	−0.114
					(0.266)	(0.265)
Log of income					−0.103	−0.132
					(0.104)	(0.105)
Financial literacy					0.212**	0.233***
					(0.085)	(0.087)
Risk tolerance (choices)					0.014	0.022
					(0.029)	(0.027)
Risk tolerance (self-assessed)					0.104**	0.132**
					(0.061)	(0.061)
Self control					-0.020	-0.025
					(0.117)	(0.115)
Constant	0.753*	2.433***	0.689	2.206***	−0.290	1.087
	(0.433)	(0.120)	(0.438)	(0.209)	(1.139)	(1.115)
R^2	0.06	0.06	0.07	0.07	0.17	0.18
Observations	252	252	252	252	248	248

Table 7. Indebtedness at the end of the experiment

The table shows results of OLS regressions of the debt level after the final market on income expectations, overconfidence, and control variables. All variables are as defined in Tables 1 and 5. Coefficients are significant at $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$; robust standard errors are shown in parentheses.

	Debt level at the end of the experiment					
	(1)	(2)	(3)	(4)	(5)	(6)
Income expectations	0.104**		0.088		0.095*	
	(0.052)		(0.054)		(0.055)	
Overconfidence		0.176***		0.173***		0.182***
		(0.029)		(0.029)		(0.029)
Easy treatment			0.268	0.155	0.284	0.158
			(0.197)	(0.177)	(0.199)	(0.169)
Control treatment			0.131	0.095	0.187	0.139
			(0.194)	(0.176)	(0.194)	(0.171)
Gender					−0.308*	−0.347**
					(0.178)	(0.159)
Age					0.006	0.004
					(0.026)	(0.024)
Bachelor degree					−0.169	−0.129
					(0.203)	(0.183)
Masters degree					0.430	0.422
					(0.413)	(0.383)
Working					0.061	0.037
					(0.184)	(0.163)
Log of income					−0.161	−0.157
					(0.132)	(0.119)
Financial literacy					0.036	0.092
					(0.063)	(0.063)
Risk tolerance (choice)					0.033	0.031
					(0.025)	(0.021)
Risk tolerance (self-assessed)					−0.035	−0.029
					(0.039)	(0.035)
Self control					−0.092	−0.080
					(0.070)	(0.064)
Constant	0.033	0.663***	−0.007	0.579***	0.564	0.937
	(0.301)	(0.074)	(0.302)	(0.119)	(0.791)	(0.780)
R^2	0.02	0.17	0.03	0.17	0.09	0.25
Observations	252	252	252	252	245	245

Table 8. Propensity to remain in debt at the end of the experiment

The table shows results of a linear probability model (OLS) of an indicator variable whether a participants remains in debt at the end of the experiment. Explanatory variables are income expectations, overconfidence, and control variables. All variables are as defined in Tables 1 and 5. Coefficients are significant at $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$; robust standard errors are shown in parentheses.

	Indicator whether in debt at the end of the experiment					
	(1)	(2)	(3)	(4)	(5)	(6)
Income expectations	0.026		0.021		0.024	
	(0.017)		(0.017)		(0.020)	
Overconfidence		0.071***		0.071***		0.074***
		(0.008)		(0.009)		(0.009)
Easy treatment			0.089	0.026	0.094	0.031
			(0.076)	(0.068)	(0.080)	(0.070)
Control group			0.019	–0.002	0.023	–0.007
			(0.073)	(0.067)	(0.075)	(0.068)
Gender					–0.098	–0.113*
					(0.068)	(0.058)
Age					–0.007	–0.006
					(0.009)	(0.008)
Bachelor					–0.054	–0.042
					(0.087)	(0.077)
Masters					0.215	0.207
					(0.167)	(0.155)
Works					–0.047	–0.058
					(0.070)	(0.061)
Log of income					0.021	–0.002
					(0.025)	(0.022)
Financial literacy					–0.011	0.012
					(0.022)	(0.020)
Risk tolerance (self-assessed)					–0.002	–0.002
					(0.016)	(0.014)
Risk tolerance (choices)					0.001	–0.001
					(0.007)	(0.006)
Self control					–0.015	–0.006
					(0.030)	(0.027)
Constant	0.197*	0.355***	0.193*	0.347***	0.315	0.534**
	(0.104)	(0.027)	(0.109)	(0.050)	(0.278)	(0.247)
R^2	0.009	0.206	0.015	0.206	0.047	0.247
Observations	252	252	252	252	248	248

Table 9. Overconfidence and borrowing behavior in the GSOEP data

The table shows results of OLS regressions of overdraft use, subjective debt burden, and belief in ones ability to repay as dependent variables. Overdraft use is an indicator variable whether a household currently uses the overdraft facility of their checking account, subjective debt burden is an indicator whether a household experiences debt as a burden, and belief to repay is an indicator whether or not a household is certain to repay its debt. Overconfidence (numbers) and overconfidence (animals) are the difference between the believed relative performance and the actual performance in the respective domain. Control variables are as defined in Table D.1. Coefficients are significant at $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$; robust standard errors are shown in parentheses.

	Overdraft use		Subjective debt burden		Belief to repay	
	(1)	(2)	(3)	(4)	(5)	(6)
Overconfidence (numbers)	0.111**		0.171**		0.088**	
	(0.051)		(0.073)		(0.044)	
Overconfidence (animals)		0.065*		0.122**		–0.036
		(0.039)		(0.062)		(0.033)
Gender	0.021	0.026	0.020	0.014	0.008	–0.002
	(0.027)	(0.027)	(0.044)	(0.044)	(0.023)	(0.023)
Age	–0.001	–0.001	–0.010***	–0.010***	0.001	0.001
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
Education	–0.003	–0.001	0.018	0.018	–0.015*	–0.012
	(0.009)	(0.009)	(0.015)	(0.015)	(0.009)	(0.008)
Works	–0.007	–0.000	0.216***	0.233***	–0.038	–0.042*
	(0.032)	(0.032)	(0.058)	(0.057)	(0.025)	(0.024)
Log of income	–0.014	–0.010	0.070	0.060	0.061**	0.056**
	(0.031)	(0.032)	(0.053)	(0.052)	(0.025)	(0.025)
Financial literacy	–0.012	–0.009	–0.003	–0.003	–0.005	–0.006
	(0.010)	(0.010)	(0.015)	(0.015)	(0.007)	(0.007)
Risk tolerance (self assessed)	0.008	0.007	0.004	0.001	–0.001	–0.001
	(0.006)	(0.006)	(0.009)	(0.009)	(0.005)	(0.005)
Risk tolerance (choices)	0.002	0.001	0.003	0.003	–0.002	–0.002
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
Partner in household	–0.045	–0.042	0.027	0.022	–0.033	–0.036
	(0.034)	(0.034)	(0.065)	(0.064)	(0.029)	(0.028)
Children in household	0.069***	0.060***	0.044	0.048	–0.025	–0.022
	(0.024)	(0.023)	(0.037)	(0.037)	(0.017)	(0.016)
Constant	0.260	0.221	0.210	0.296	0.496**	0.569***
	(0.258)	(0.268)	(0.453)	(0.444)	(0.200)	(0.193)
R^2	0.049	0.036	0.326	0.323	0.042	0.035
Observations	613	623	393	398	559	569

Table 10. Robustness test of treatment effects

The table shows in Panel A OLS regression results for income expectations and overconfidence. Income expectations are the income expectations in Euro at the beginning of the experiment for the two income tasks, and income expectations 2 are the income expectations in Euro for the second income task. Overconfidence is the difference between the income expectations at the beginning of the experiment and the actual income from both income tasks, and overconfidence 2 is the difference between income expectations 2 and the actual income from the second income task. Independent variables are treatment dummies with the hard treatment as the omitted category. The table shows in Panel B results of regressions of debt variables on treatment dummies. Columns (1)-(3) show results of OLS regressions with the debt level after each market as the dependent variable (see Table 3). Column (4) shows marginal effects of a probit regression with a binary variable whether a participant has debt at the end of the experiment (final debt$>$ 0) as the dependent variable. Independent variables are treatment dummies with the hard treatment as the omitted category. Coefficients are significant at $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$; robust standard errors are shown in parentheses.

Panel A: Expectations	Income Expectations	Income Expectations 2	Overconfidence	Overconfidence 2
	(1)	(2)	(3)	(4)
Easy treatment	0.569*	0.167	0.113	−0.066
	(0.305)	(0.219)	(0.083)	(0.081)
Control group	0.064	−0.222	−0.054	−0.007
	(0.309)	(0.220)	(0.089)	(0.091)
Constant	5.732***	2.915***	0.380***	0.394***
	(0.237)	(0.149)	(0.058)	(0.058)
R^2	0.02	0.01	0.02	0.00
Observations	193	193	193	193
Panel B: Debt taking	Debt after market 1	Debt after market 2	Final debt	Has Debt
	(1)	(2)	(3)	(4)
Easy treatment	0.367	0.473	0.046	0.019
	(0.406)	(0.373)	(0.289)	(0.079)
Control group	−0.482	−0.467	−0.464**	−0.079
	(0.400)	(0.348)	(0.235)	(0.083)
Constant	3.842***	2.102***	0.818***	0.324***
	(0.283)	(0.275)	(0.201)	(0.056)
R^2	0.02	0.03	0.02	0.01
Observations	193	193	193	193

Table 11. Robustness test of overconfidence and borrowing behavior

The table shows results of OLS regressions with debt levels after market stage 1, 2 and at the end of the experiment as the dependent variable. Income expectations is the expected income in Euro for the two income tasks. Overconfidence is the difference between the expected income and the actual income. Easy treatment and control group are indicator variables for the respective treatment (with the hard treatment as the omitted category). Coefficients are significant at $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$; robust standard errors are shown in parentheses.

	Debt after market 1		Debt after market 2		Final debt		Has debt	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Income expectations	0.241**		0.232**		0.119		0.007	
	(0.115)		(0.096)		(0.082)		(0.020)	
Overconfidence		0.080		0.229***		0.270***		0.076***
		(0.072)		(0.058)		(0.050)		(0.010)
Easy treatment	0.230	0.326	0.295	0.309	–0.021	–0.093	0.014	–0.021
	(0.412)	(0.407)	(0.350)	(0.321)	(0.297)	(0.245)	(0.082)	(0.069)
Control group	–0.498	–0.484	–0.537*	–0.526*	–0.471**	–0.468**	–0.080	–0.080
	(0.401)	(0.403)	(0.316)	(0.308)	(0.232)	(0.217)	(0.084)	(0.075)
Constant	2.461***	3.865***	0.915*	2.307***	0.136	0.894***	0.283**	0.345***
	(0.659)	(0.285)	(0.548)	(0.233)	(0.435)	(0.175)	(0.119)	(0.049)
R^2	0.052	0.030	0.079	0.147	0.036	0.255	0.008	0.221
Observations	193	193	193	193	193	193	193	193

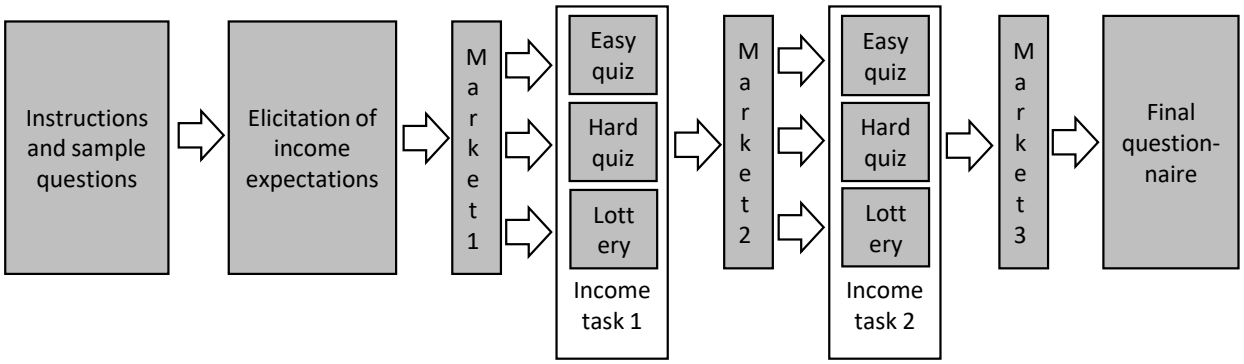


Figure 1. Sequence of the experiment
The figure shows the sequential structure of the experiment. Arrows indicate how participants progress from one stage to another. Multiple arrows indicate instances in which different treatment groups enter different tasks.

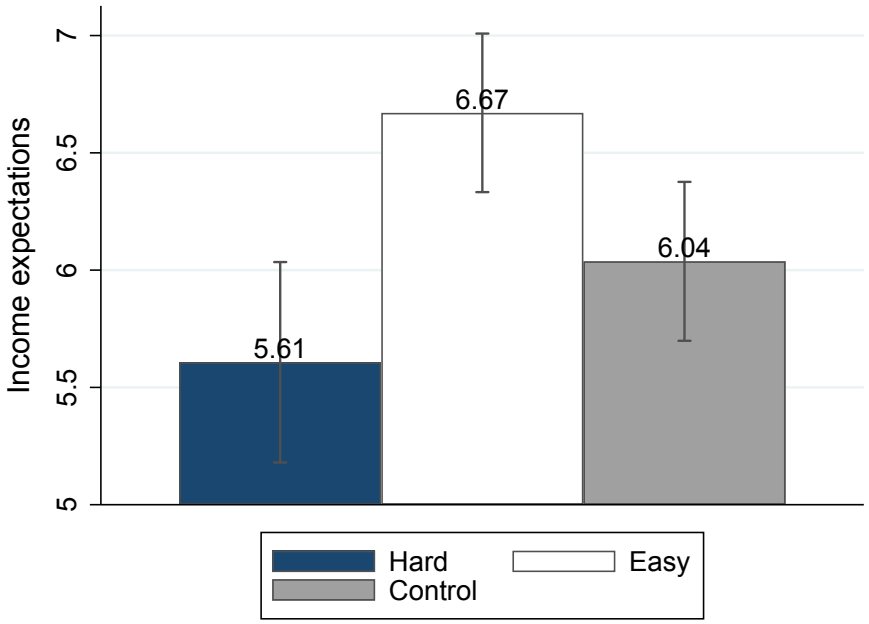


Figure 2. Income expectations by treatment before market 1
Average income expectations in Euro for both income tasks by treatment (possible range is between 2 and 10 Euro). The 95-percent confidence interval is indicated.

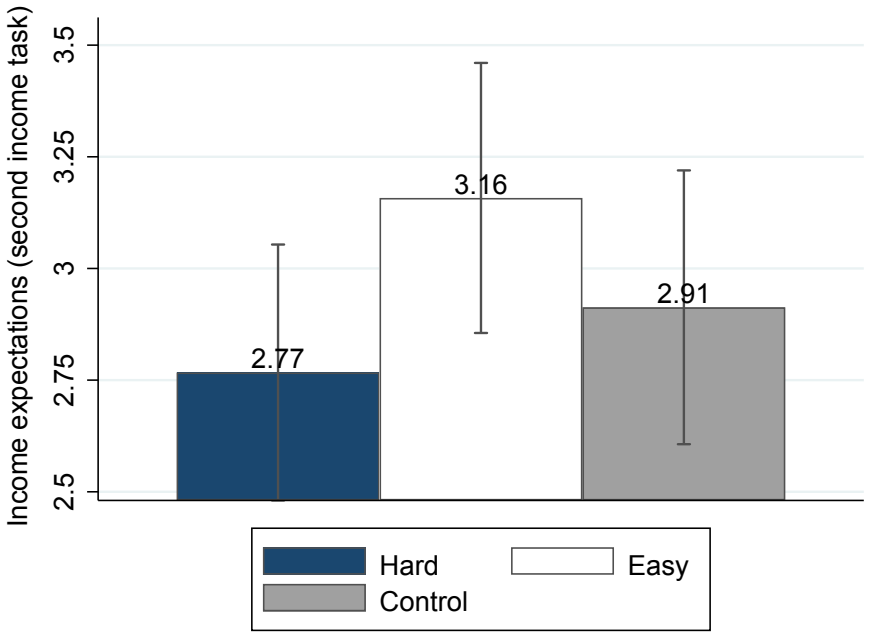


Figure 3. Income Expectations by Treatment before Market 2
Average income expectations in Euro for the second income task by treatment group (possible range is between 1 and 5 Euro). The 95-percent confidence interval is indicated.

Online Appendix

This online appendix contains supplementary material to the paper "Earn more tomorrow: Overconfident income expectations and consumer indebtedness." Section A contains instructions and screenshots from the experiment, section B provides the questions used in the quiz tasks, section C reports robustness tests for the main experiment, section D provides details on the survey evidence from the German SOEP panel, and section E presents further results of the robustness experiment.

A. Experimental Materials

A.1. Paper instructions

The following instructions were distributed to participants on paper prior to the start of the experiment. Original instructions were in German.

Instructions

This experiment is designed to study financial decision making.

You will receive 5 Euro show-up fee. You will receive this irrespective of you decisions during the experiment. In addition to this you will receive further payouts that depend on your performance and your decisions during the experiment. It is therefore very important that you pay attention and follow these instructions carefully.

During the experiment you are not allowed to use electronic devices or to talk to other participants. Please use only the programs and functions that are part of the experiment. If you have a question, please raise your hand. We will then come to you and answer your question quietly. Please do not ask your questions out loud. If the question is relevant for all participants, we will repeat it and answer it out loud. If you violate these rules, we must exclude you from the experiment and the payout.

At the beginning of the experiment you will see short comprehension questions on screen, which we ask you to answer. If you answer one or more of these questions incorrectly, one of the experimenters will come to you to clarify any open questions.

Experimental structure:

1. Measuring income expectations
2. Shopping round 1
3. Opportunity to earn income
4. Shopping round 2
5. Opportunity to earn income
6. Shopping round 3
7. Questionnaire

How is income earned?

You will receive a participation fee of 8 Euro for taking part in this experiment. In the course of the experiment you will have two more opportunities to earn additional income. During these two rounds 25% of the participants will receive 5 Euro, 4 Euro, 2 Euro and 1 Euro respectively. You can hence earn a maximum of 10 € or will get at least 2 €. Details of how you can earn income will be displayed on the screen later on.

You can use this income to buy products. You can take all purchased products with you at the end of the experiment. Unspent income will **not be paid out** (with the exception of the partcipation fee).

Shopping rounds

In the course of the experiment you have the possibility to choose from a range of ten goods three times. The products remain the same in every round. The prices of the goods rise in each

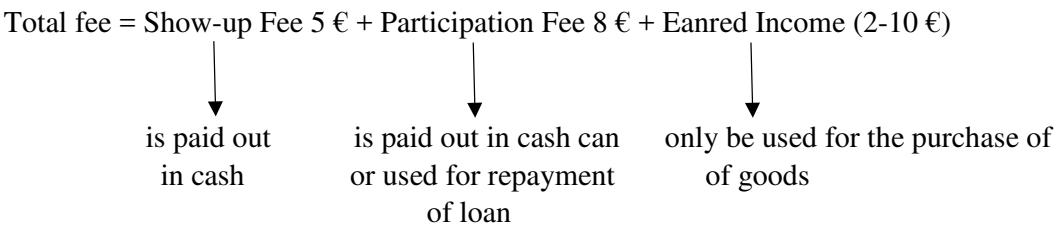
round. In the first round the goods are therefore cheaper than in the second round and in the second round they are cheaper than in the third round. From the very beginning, you will be shown all the prices for the other rounds, so you can think about whether to buy a product immediately or later.

In the early rounds you have the opportunity to take out a loan, which you repay with the income you earn later on in the experiment. The maximum loan amount is 10€ in round 1 and 5€ in round 2. If you cannot repay the loan with income earned in the experiment, this amount will be deducted from your participation fee.

Experimental procedure

After you have read on screen how you can earn income and have answered two short questions about your income expectations, the experiment begins with a shopping round. At this point, you have not yet earned any income. However, you can already buy products using the loan. You then repay the loan using income that you earn later on. If you do not earn enough income to repay this loan, the rest of the loan will be repaid using the participation fee.

Diagram



A.2. Experimental screenshots

In this section we provide screenshots from the experiment. The order of the screenshots is as it has been in the experiment. If there are several similar screens such as for markets 1-3, one screenshot of the market stage is shown as an example. If screens are identical or very similar across treatments, also one example is shown.

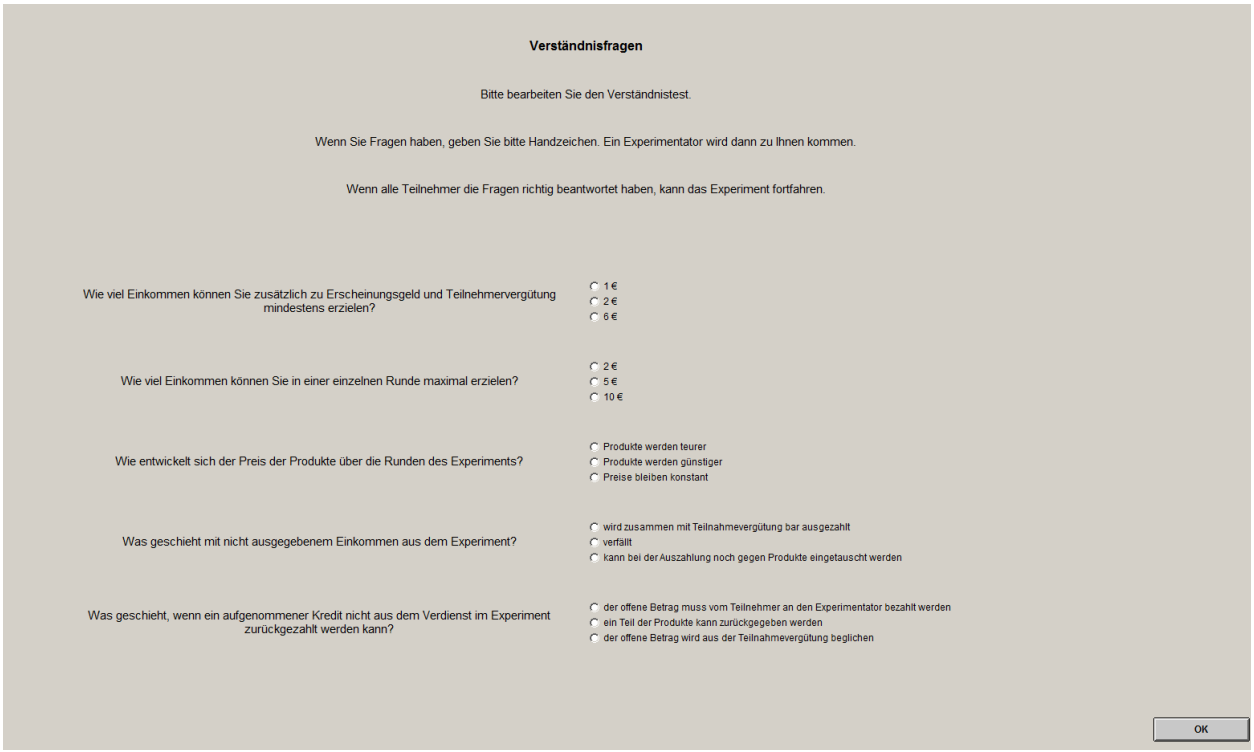


Figure A.1. Screenshot of comprehension questions
The first screen after the welcome screen includes 5 comprehension questions: What income can you minimally earn in addition to the show-up and participation fee? What income can you maximally earn in one round of the experiment? How do the prices of goods evolve in the experiment? What happens to income that is not spend in the experiment? What happens if debt taken cannot be repaid from the income earned in the experiment?

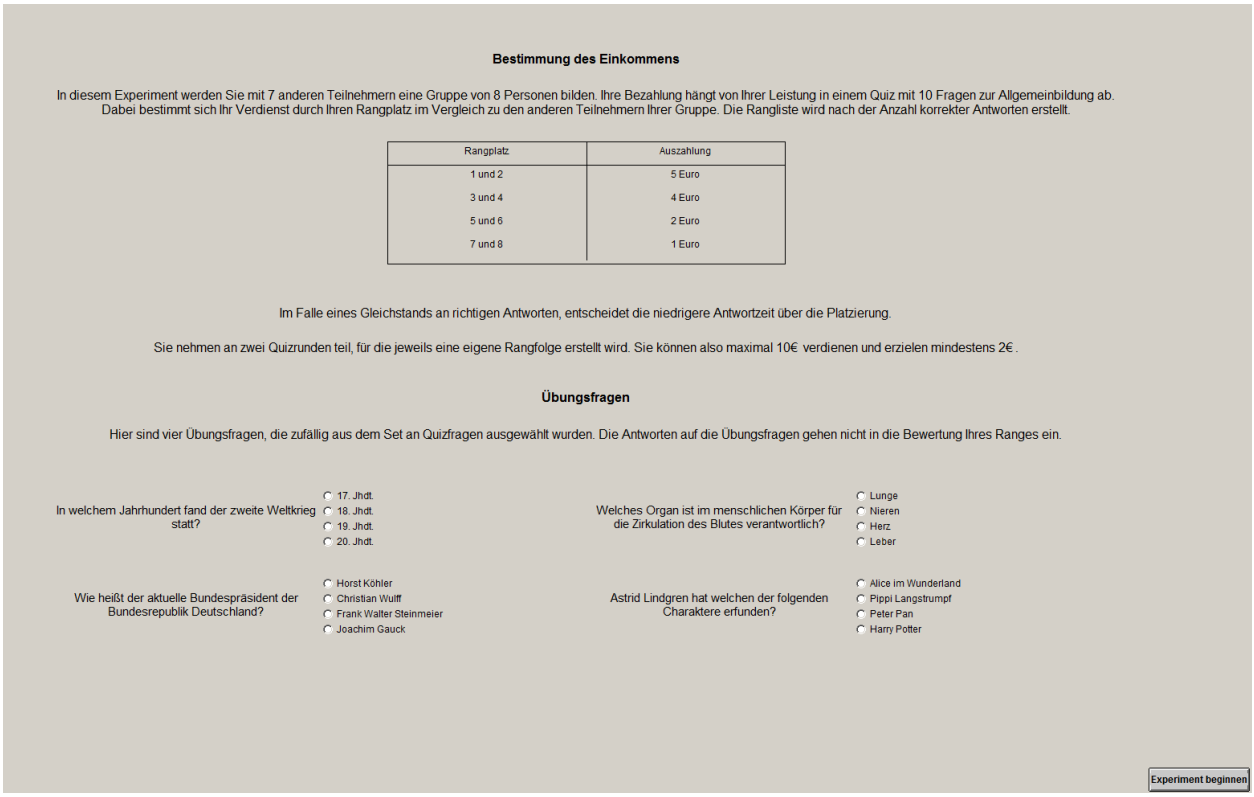


Figure A.2. Screenshot of income task instructions.
On this screen people are informed about the income task, that they are part of a group of eight participants and earn income depending on their rank in this group. This is followed by four sample questions for the respective treatment. This screenshot shows the screen in the easy treatment. For hard treatment only questions were different. Translations of the questions used to prime participants in the hard and the easy treatment can be found in Online Appendix B.

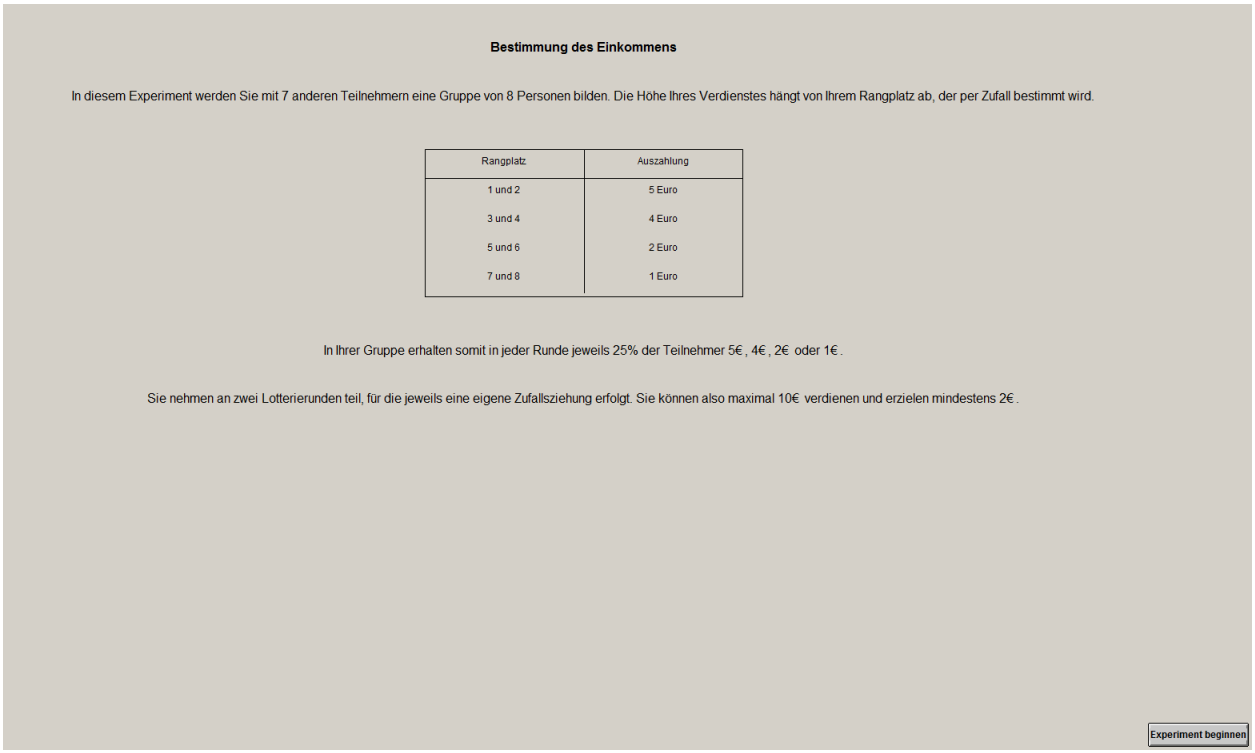


Figure A.3. Screenshot of income instructions in the control group.
Participants in the control group are informed that they are paid according to a lottery in which they earn €5, €4, €2 or €1 with equal probability of 25%.

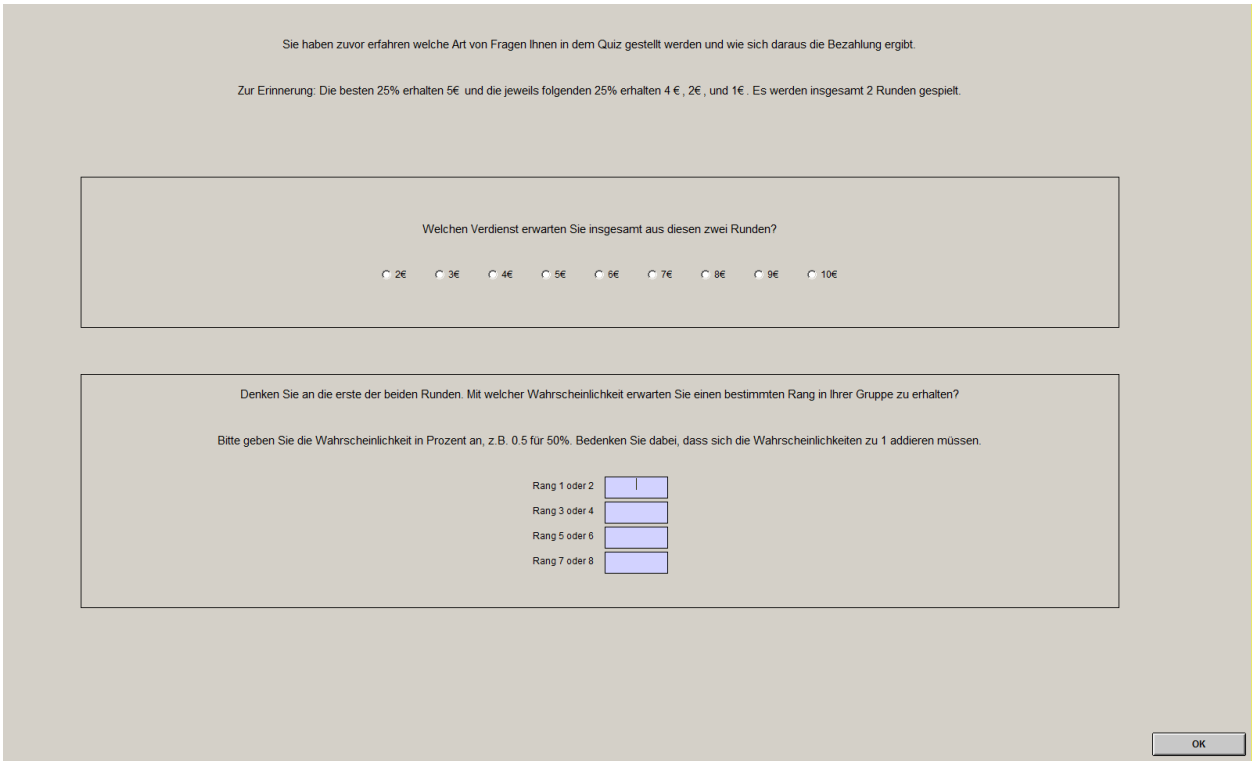


Figure A.4. Screenshot of questions to elicit income expectations.
After the instructions on the income task, income expectations are elicited. The first questions asks participants to state how much they are expecting to earn on a scale from €2 to €10. The second question asks participants for the probability, which with they are expecting to earn each amount in one task selected by chance.

Figure A.5. Screenshot of the first market stage.
The screen displays pictures and names of the ten goods that are available for purchase. The prices of the goods in this round and in all following rounds are displayed below the pictures. With the "+" and "-" buttons, participants can select the number of items they want to purchase. At the top of the screen, the current balance and the maximal credit are displayed in red. The maximal amount still to spend and the current loan amount are displayed as well. The screens in the second and third market stages look very similar.

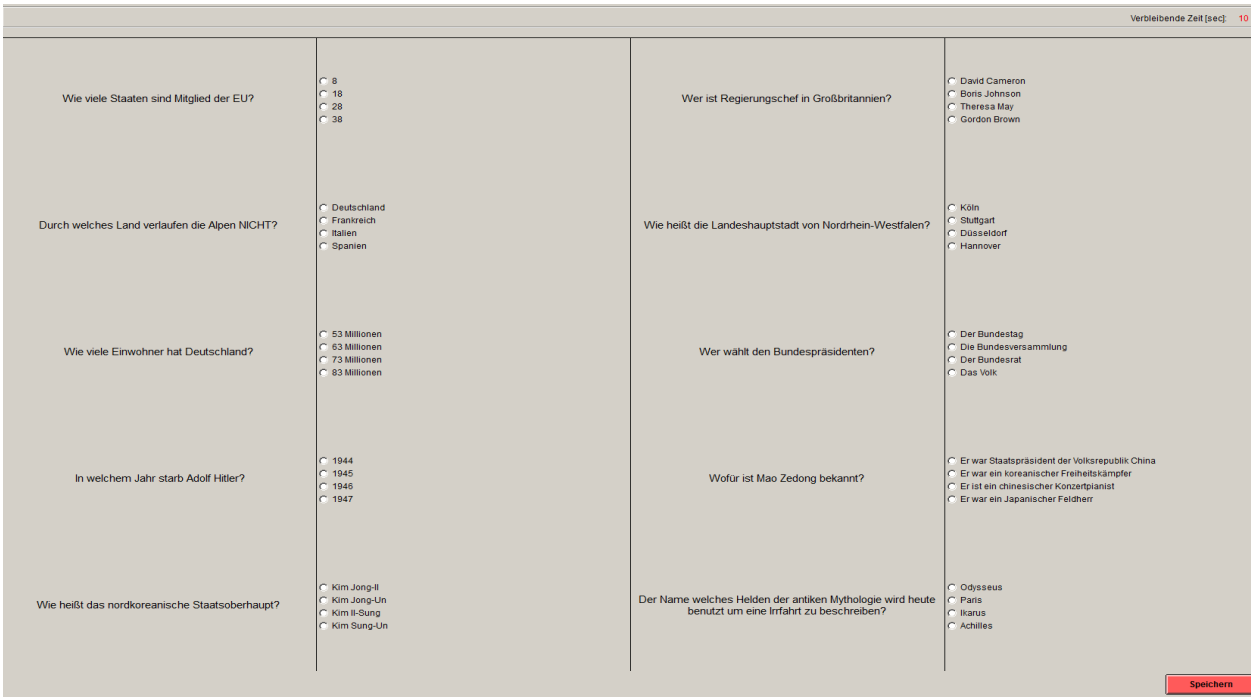


Figure A.6. Screenshot of the first income task.
The screenshot shows the first quiz task in the easy treatment and contains ten general knowledge questions. In the upper right corner, the remaining time is displayed. The screens for the hard treatment and for the second income task are the same. The translated questions for the income tasks in each treatment can be found in Online Appendix B.

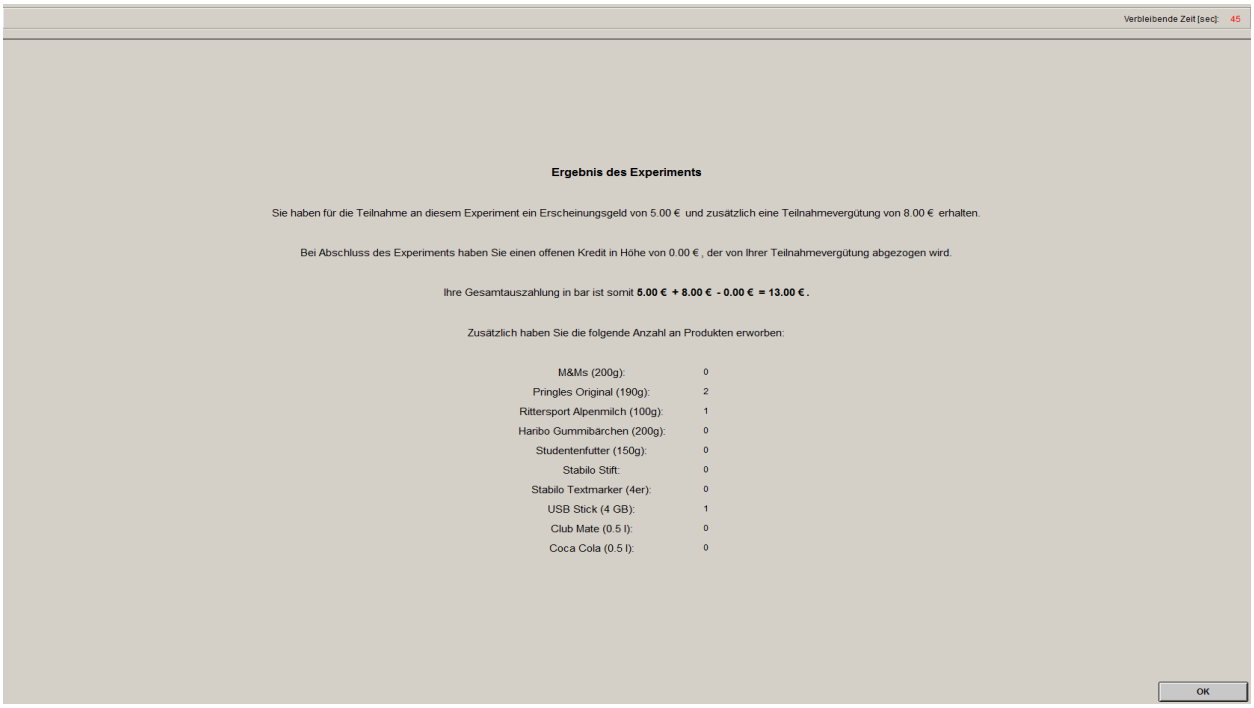


Figure A.7. Screenshot of the pay-off screen.
The screen displays the cash pay-off and the number of goods purchased in the experiment. The cash-payoff is calculated as the show-up fee plus participation fee minus open debt. The lab rules require that a minimum show-up fee of €5 is paid, which is why only the participation fee is subject to deductions. This is the last screen before the socio-demographic questionnaire.

B. General knowledge questions in the income task

B.1. Easy treatment

Sample questions used to prime participants in the easy treatment:

1. During which century did the second world war take place?

   - ☐ 17th century
   - ☐ 18th century
   - ☐ 19th century
   - ☐ 20th century

2. Which organ in the human body is responsible for blood circulation?

   - ☐ Lung
   - ☐ Kidneys
   - ☐ Heart
   - ☐ Liver

3. What is the name of the current President of the Federal Republic of Germany?

   - ☐ Horst Köhler
   - ☐ Christian Wulff
   - ☐ Frank-Walter Steinmeier
   - ☐ Joachim Gauck

4. Astrid Lindgren invented which of the following characters?

   - ☐ Alice in Wonderland
   - ☐ Pippi Longstocking
   - ☐ Peter Pan
   - ☐ Harry Potter

Easy questions used in the two income tasks:

1. How many countries are members of the EU?

   □ 8

   □ 18

   □ 28

   □ 38

2. Who is the head of government in Britain?

   □ David Cameron

   □ Boris Johnson

   □ Theresa May

   □ Gordon Brown

3. Which country does NOT cover part of the Alps?

   □ Germany

   □ France

   □ Italy

   □ Spain

4. What is the name of the state capital of North Rhine-Westphalia?

   □ Cologne

   □ Stuttgart

   □ Düsseldorf

   □ Hanover

5. How many inhabitants does Germany have?

   □ 53 million

   □ 63 million

   □ 73 million

   □ 83 million

6. Who elects the Federal President in Germany?

   - ☐ The Bundestag
   - ☐ The Federal Assembly
   - ☐ The Federal Council
   - ☐ The people

7. In which year did Adolf Hitler die?

   - ☐ 1944
   - ☐ 1945
   - ☐ 1946
   - ☐ 1947

8. What is Mao Zedong known for?

   - ☐ He was President of the People's Republic of China
   - ☐ He was a Korean freedom fighter
   - ☐ He is a Chinese concert pianist
   - ☐ He was a Japanese general

9. What is the name of the North Korean head of state?

   - ☐ Kim Jong-Il
   - ☐ Kim Jong-Un
   - ☐ Kim Il-Sung
   - ☐ Kim Sung-Un

10. The name of which hero in ancient mythology is used today to describe an a long aimless trip?

    - ☐ Ulysses
    - ☐ Paris
    - ☐ Icarus
    - ☐ Achilles

11. In which city does an opera festival take place each summer, during which only operas by Richard Wagner are performed?

    - ☐ Montreux
    - ☐ Wacken
    - ☐ Bayreuth
    - ☐ Bad Segeberg

12. How high was the gross domestic product per capita in Germany in US-$ in 2016?

    - ☐ 10,038
    - ☐ 17,901
    - ☐ 41,902
    - ☐ 103,199

13. Where did industrialization begin?

    - ☐ Flanders
    - ☐ France
    - ☐ Ruhr
    - ☐ Great Britain

14. In which galaxy is the Earth's solar system located?

    - ☐ Milky Way
    - ☐ Centaurus A
    - ☐ Cigar Galaxy
    - ☐ Andromeda Galaxy

15. What is the reason ice cubes do not sink in water?

    - ☐ The surface tension of the water
    - ☐ The air bubbles trapped in the ice
    - ☐ The lower density of the ice
    - ☐ The sublimation effect that creates an upward suction

16. What does the chemical compound H_2O stand for?

- ☐ Water
- ☐ Oxygen
- ☐ Nitrogen
- ☐ Iron

17. What is the title of a bestselling novel by Daniel Kehlmann?

- ☐ "Das Gewicht der Welt"
- ☐ "Volk und Welt"
- ☐ "Die Vermessenheit der Forscher"
- ☐ "Die Vermessung der Welt"

18. Which of the following characters does not appear in Goethe's Faust?

- ☐ Heinrich Faust
- ☐ Mephistopheles
- ☐ Gretchen
- ☐ Don Carlos

19. Which architectural style is NOT be found during the 20th century?

- ☐ Bauhaus
- ☐ Art Deco
- ☐ Postmodernism
- ☐ Gothic Art

20. Which country was a colonial power in India?

- ☐ France
- ☐ Pakistan
- ☐ Germany
- ☐ Great Britain

B.2. Hard treatment

Sample questions used to prime participants in the hard treatment:

1. In which century did the Thirty Years War take place?

   - ☐ 16th century
   - ☐ 17th century
   - ☐ 18th century
   - ☐ 19th century

2. Which sensory cells in the human eye are responsible for colour vision?

   - ☐ Rods
   - ☐ Cones
   - ☐ Plugs
   - ☐ Buttons

3. Who was the second Federal President of the Federal Republic of Germany?

   - ☐ Walter Scheel
   - ☐ Theodor Heuss
   - ☐ Gustav Heinemann
   - ☐ Heinrich Lbke

4. James Joyce invented which of the following characters?

   - ☐ Leopold Bloom
   - ☐ Jarvis Lorry
   - ☐ Oliver Twist
   - ☐ Samuel Pickwick

Hard questions used in the two income tasks:

1. How many states are members of the UNO?

   - ☐ 173
   - ☐ 183
   - ☐ 193
   - ☐ 203

2. Who is the head of government in Finland?

   - ☐ Mari Kiviniemi
   - ☐ Alexander Stubb
   - ☐ Juha Sipil
   - ☐ Jyrki Katainen

3. Which country does NOT cover part of the Atlas Mountains?

   - ☐ Morocco
   - ☐ Algeria
   - ☐ Libya
   - ☐ Tunisia

4. What is the name of the capital of the Austrian province of Styria?

   - ☐ Graz
   - ☐ Innsbruck
   - ☐ Linz
   - ☐ Sankt Pölten

5. How many inhabitants does the EU have?

   - ☐ 499 million
   - ☐ 508 million
   - ☐ 516 million
   - ☐ 523 million

6. According to the German Basic Law, who determines the "politicy guidelines" in Germany?

   - ☐ The Federal Chancellor
   - ☐ The Federal Constitutional Court
   - ☐ The Bundestag
   - ☐ The people

7. Which of these leading National Socialists was already dead at the beginning of the Second World War?

   - ☐ Ernst Röhm
   - ☐ Hjalmar shaft
   - ☐ Julius Strings
   - ☐ Wilhelm Keitel

8. How did Mao Zedong expand his power in China?

   - ☐ Great Jump
   - ☐ Wide Field
   - ☐ Heavenly Peace
   - ☐ Long March

9. Which of these Western orchestras gave a concert in North Korea in 2008?

   - ☐ Vienna Philharmonic Orchestra
   - ☐ Berlin Philharmonic Orchestra
   - ☐ New York Philharmonic Orchestra
   - ☐ Academy of St. Martins in the Field

10. In an ancient tragedy, a woman murders her children to take revenge on her unfaithful husband. What is the woman's name?

    - ☐ Aida
    - ☐ Electra
    - ☐ Pamela
    - ☐ Medea

11. In which year did the Richard Wagner Festival first take place?

    - ☐ 1867
    - ☐ 1876
    - ☐ 1882
    - ☐ 1924

12. What was the average GDP per capita in Tanzania in US-$ in 2016?

    - ☐ 480
    - ☐ 638
    - ☐ 970
    - ☐ 1,170

13. What historical significance do manufactories have?

    - ☐ In manufactories means of production belong to workers
    - ☐ Manufactories were originally prison workshops
    - ☐ Manufactories were forerunners of industrial mass production
    - ☐ Guilds exercised their monopoly in the manufactories

14. What does a so-called red shift suggest?

    - ☐ Vision loss
    - ☐ Expansion of the universe
    - ☐ High blood alcohol level
    - ☐ Beginning of autumn

15. A rocket trying to escape the Earth's gravitational pull must reach a certain escape velocity. How fast does it have to be?

    - ☐ 15,000 km/h
    - ☐ 26,000 km/h
    - ☐ 36,000 km/h
    - ☐ 40,000 km/h

16. What does the chemical compound NH_3 stand for?

- ☐ Ammonia
- ☐ Ethanol
- ☐ Nicotine
- ☐ Hydrochloric acid

17. Which of the following works is NOT by Herta Mller?

- ☐ “Niederungen”
- ☐ “Atemschaukel”
- ☐ “Heute wäre ich mir lieber nicht begegnet”
- ☐ “Wunschlos Unglück”

18. From which work is the quote: “Ich wei, sie tranken heimlich Wein und predigten ffentlich Wasser”?

- ☐ Heine, “Germany. A Winter’s Tale”
- ☐ Goethe, “Faust”
- ☐ Brecht, “Mutter Courage”
- ☐ Lessing, “Minna von Barnhelm”

19. Who was one of the architects who built the Hamburg Elbphilharmonie?

- ☐ Norman Forster
- ☐ Zaha Hadid
- ☐ Jacques Duke
- ☐ Peter Zumthor

20. Which country was a colonial power in Iraq during the last century?

- ☐ France
- ☐ Iran
- ☐ Germany
- ☐ Great Britain

C. Robustness tests for the main experiment

In this section we report robustness tests performed on the data of the main experiment. We first discuss the exclusion of participants based on lack of comprehension or non-standard preferences. We then consider alternative measures of overconfidence. Finally, we provide evidence for the extensive margin of debt taking.

C.1. Exclusion restrictions

We include comprehension questions at the beginning of the experiment to make sure that participants understand the experimental design. We exclude participants with two or more errors, which is a compromise between preserving a substantial sample and reducing noise. As this exclusion was not pre-registered we provide robustness on its effects (we did not anticipate the substantial language problems by some participants).

Table C.1 shows the income expectations for different sub-samples. The treatment effect on income expectations is about the same for the used sample and the full sample. The excluded sample shows a larger effect, which attains marginal significance for this very small sample (n=20). The excluded participants seem to fall for the reversed hard-easy effect more strongly. In this group, participants even believe to outperform in the random lottery condition (another sign for insufficient understanding). We confirm this general tendency by contrasting participants who answer all comprehension questions correctly with those who make at least one error.[12] Again, the treatment effect on income expectations is stronger for those with less comprehension.

We next test for the presence of the treatment effect in the sub-samples. Table C.2 shows the treatment effect in the used sample, the full sample, and for participants who answer all compre-

[12] One error is relatively common (n=115), which is why we refrain from excluding this group but formulate the less strict exclusion restriction of two or more errors.

Table C.1. Participant comprehension and income expectations

The table shows income expectations for different sub-samples in the main experiment. The used sample is the sample for which results are reported in the main text, the full sample are all participants, the excluded sample contains participants with two or more errors in the comprehension test, "all correct" are participants who answer all comprehension questions correctly. The table reports the number of observations, the mean, the mean by treatment, the difference between the easy and the hard treatment, and the p-value of a two-sided t-test for a difference between the the easy and the hard treatment.

			Mean by treatment				
Income expectations	n	Mean	Hard	Easy	Control	Easy–Hard	p-value
Used sample	252	6.12	5.61	6.67	6.04	1.06	<0.01
Full sample	285	6.17	5.61	6.72	6.19	1.10	<0.01
Excluded sample	33	6.64	5.67	7.25	7.15	1.58	0.096
All correct	137	5.88	5.39	6.39	5.76	1.00	<0.01
One or more errors	148	6.45	5.78	7.09	6.60	1.31	<0.01

hension questions correctly. The treatment effect considerably weakens for the full sample. We also find that the correlation between income expectations and consumption is negative for the excluded participants. This raises the concern that they misunderstood how the earned income can be used in the experiment. The results for the participants with the highest comprehension corroborates this assumption, as the treatment effect is stronger in this sub-sample.

A second impediment to the experiment might not be limited understanding, but preferences that contradict basic assumptions of the experimental design, i.e., a preference for goods over the cash reward. In this case, a positive debt level at the end of the experiment would not be unintended. We discuss this issue in subsection 3.4 when justifying the interpretation of final debt as over-indebtedness. A question in the experiment asks whether participants prefer the goods over the cash reward (the exact wording is: "Imagine you received an additional Euro, would you prefer to have it paid out in cash or to purchase additional goods at the prices of the first market stage?"). Panel A of Table C.3 shows the treatment effect for the sample excluding these

Table C.2. Participant comprehension and the treatment effect

The table shows results of regressions of debt levels during the experiment on treatment dummies for different sub-samples. Panel A shows results for the sample used in the experiment, Panel B shows results for the full sample, and Panel C shows results for participants who answered all comprehension questions correct. The regression specifications are as in Table 4. Coefficients are significant at $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$; robust standard errors are shown in parentheses.

Panel A: Used sample	Debt after market 1 (1)	Debt after market 2 (2)	Final debt (3)	Has debt (4)
Easy treatment	0.728**	0.600**	0.361*	0.110
	(0.366)	(0.297)	(0.192)	(0.072)
Control group	0.592*	0.313	0.169	0.029
	(0.345)	(0.305)	(0.194)	(0.075)
Observations	252	252	252	252
Panel B: Full sample	Debt after market 1 (1)	Debt after market 2 (2)	Final debt (3)	Has debt (4)
Easy treatment	0.483	0.356	0.230	0.073
	(0.357)	(0.296)	(0.194)	(0.071)
Control group	0.445	0.289	0.202	0.011
	(0.339)	(0.314)	(0.210)	(0.070)
Observations	285	285	285	285
Panel C: All questions correct	Debt after market 1 (1)	Debt after market 2 (2)	Final debt (3)	Has debt (4)
Easy treatment	1.245**	0.918**	0.563**	0.095
	(0.487)	(0.377)	(0.234)	(0.101)
Control group	0.898*	0.538	0.361	0.061
	(0.493)	(0.399)	(0.251)	(0.104)
Observations	137	137	137	137

participants. Results confirm that the treatment effect is stronger among participants preferring cash. They are the relevant sample, as the experimental structure of borrowing and repaying debt relies on an incentive to avoid over-indebtedness (which is absent if one prefers the goods anyway).

Another way to look at the same issue is to exclude participants who already in market stage one spend more than the total income they expect to earn in the experiment. These participants seem not to worry about ending up in debt as they literally set themselves up for it (and 60% indeed

end in debt). Interestingly, this group has little overlap with the one preferring goods over cash, even though this appears to be the only reasonable explanation for this behavior. As Panel B shows, the results are not stronger using this exclusion. Although the excluded participants behave in a way that is at odds with consumption depending on income expectations, their overspending seems not to interfere with the treatment effect. Additional evidence for the effect of spending motives comes from the robustness experiment reported in section 5 and Online Appendix E, which removes overly cheap products as a borrowing motive.

The other extreme is participants who do not like the offered products at all. We aim at a menu of products that appeals to everyone, but some participants might still not find something they regard worthwhile to purchase.[13] As a proxy for such preferences, we exclude participants who do not spend anything in the first market. Participants know they will earn at least €2, which allows for some risk-less consumption if products have positive utility. As shown in Panel C of Table C.3, the treatment effect is robust against this exclusion.[14]

The results for income expectations and overconfidence are robust to the above reported exclusion criteria (comprehension and preferences). In particular, the effect of income expectations on borrowing behavior becomes stronger when removing participants with non-standard preferences.

C.2. Alternative overconfidence measures

Results reported in the paper mostly use a parsimonious measure of overconfidence based on participants' income expectations at the beginning of the experiment. We also consider alternative measures of overconfidence. Panel A of Table C.4 shows results for overconfidence for the income in the second income task (*overconfidence 2*). This measure is relevant only for the later stage of

[13]Some participants, e.g., complained that they do not eat sweets. However, they could still choose from the non-food items.

[14]Exclusions based on spending behavior are evenly distributed across treatments. Participants who state they prefer goods are more frequent in the hard treatment. Due to their lower consumption they might assign higher marginal utility to additional consumption.

Table C.3. Other exclusion criteria and the treatment effect

The table shows results of regressions of debt levels during the experiment on treatment dummies for different sub-samples. Panel A shows results excluding participants who prefer the goods over the cash reward, Panel B shows results excluding participants who consume more than their income expectations in the first market stage, and Panel C shows results excluding participants who do not consume in the first market stage. The regression specifications are as in Table 4. Coefficients are significant at $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$; robust standard errors are shown in parentheses.

Panel A: Preferring cash	Debt after market 1	Debt after market 2	Final debt	Has debt
	(1)	(2)	(3)	(4)
Easy treatment	0.942**	0.717**	0.409**	0.132*
	(0.397)	(0.318)	(0.203)	(0.079)
Control group	0.633*	0.335	0.223	0.021
	(0.379)	(0.337)	(0.215)	(0.080)
Observations	215	215	215	215
Panel B: Consumption $\leq$ income exp.	Debt after market 1	Debt after market 2	Final debt	Has debt
	(1)	(2)	(3)	(4)
Easy treatment	0.668**	0.558**	0.257	0.082
	(0.325)	(0.271)	(0.173)	(0.077)
Control group	0.576*	0.245	0.067	0.041
	(0.305)	(0.268)	(0.152)	(0.079)
Observations	205	205	205	205
Panel C: Positive consumption	Debt after market 1	Debt after market 2	Final debt	Has debt
	(1)	(2)	(3)	(4)
Easy treatment	0.719**	0.634**	0.379*	0.114
	(0.352)	(0.303)	(0.205)	(0.077)
Control group	0.433	0.242	0.150	0.013
	(0.333)	(0.312)	(0.204)	(0.077)
Observations	236	236	236	236

the experiment as it is elicited after the first income task and first feedback. The findings confirm the impact of overconfident income expectations on final debt levels and the likelihood to remain in debt.

Economically, the coefficients are even somewhat larger than for initial overconfidence (as displayed in Tables 7 and 8). This finding could be interpreted in the sense that those who do not

learn from feedback are in particular trouble. However, also the levels of income expectations (in €) are smaller, as they refer only to the remaining income task. As a consequence, the level of *overconfidence 2* is as well smaller than the level of initial overconfidence, which (more than) offsets the effect of the larger coefficients.

The measures used so far are based on point estimates of expected performance, which have been criticized as not necessarily reflecting true overconfidence (Benoît and Dubra, 2011). Although Merkle and Weber (2011) show that this is rather a theoretical than empirical concern, we nevertheless use their method to elicit a probability distribution of quiz task performance. Participants are asked with what probability they believe to obtain each pair of ranks in their randomly assigned group of eight participants (we ask for pairs of ranks as the payoff is the same for ranks, see screenshot A.4). This allows to calculate an expected income based on probabilities. Unsurprisingly, it is strongly correlated with the income expectation elicited as a point estimate (Pearson correlation 0.61, $p<0.001$).

Results displayed in Panel B of Table C.4 are based on this alternative measure of income expectations. We confirm the importance of income expectations for early borrowing, which is reduced when approaching the end of the experiment. By subtracting the actual income of participants from their expectation one obtains an alternative measure of overconfidence based on the probability information. The correlation of this variable with initial overconfidence based on point estimates is 0.69. Unsurprisingly, results for borrowing behavior using this alternative overconfidence variable reflect the importance of overconfidence in the later stage of the experiment (see Panel C). Different than in the results presented in Table 5, overconfidence based on probabilities is already significant for initial debt levels.

Table C.4. Results for alternative overconfidence measures

The table shows in Panel A results of OLS regressions of the debt level after the final market (columns (1) to (3)) and propensity to remain in debt (columns (4) to (6)) on income expectations, overconfidence for the second income task, and control variables. Panels B and C show results of OLS regressions of the debt level after market stage 1, 2 and at the end of the experiment as the dependent variable. Panel B includes income expectations and Panel C includes overconfidence which are based on elicited income probabilities. Treatment indicators and control variables are as defined in Tables 1 and 5. Coefficients are significant at $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$; robust standard errors are shown in parentheses.

Panel A: Overconfidence 2	Final debt			Has debt		
	(1)	(2)	(3)	(4)	(5)	(6)
Overconfidence 2	0.230***	0.225***	0.230***	0.104***	0.103***	0.110***
	(0.044)	(0.044)	(0.044)	(0.014)	(0.014)	(0.015)
Easy treatment		0.300	0.292		0.074	0.073
		(0.208)	(0.202)		(0.073)	(0.077)
Control group		0.134	0.162		0.025	0.025
		(0.206)	(0.194)		(0.071)	(0.071)
Constant	0.739***	0.592***	0.637	0.376***	0.342***	0.431
	(0.090)	(0.129)	(0.814)	(0.030)	(0.050)	(0.295)
R^2	0.107	0.115	0.185	0.179	0.183	0.216
Observations	218	218	214	218	218	214
Control variables	no	no	yes	no	no	yes
Panel B: Income (probabilites)	Debt market 1		Debt market 2		Final debt	
	(1)	(2)	(3)	(4)	(5)	(6)
Income expectations (probabilities)	0.862***	0.664**	0.867***	0.832***	0.179	0.161
	(0.265)	(0.285)	(0.229)	(0.241)	(0.163)	(0.148)
Easy treatment		0.281		0.059		0.287
		(0.387)		(0.316)		(0.207)
Control group		0.477		0.107		0.172
		(0.352)		(0.301)		(0.197)
Constant	1.306	1.059	–0.213	–1.412	0.121	0.100
	(0.796)	(1.586)	(0.691)	(1.273)	(0.497)	(0.693)
R^2	0.048	0.143	0.067	0.164	0.007	0.076
Observations	252	248	252	248	252	248
Control variables	no	yes	no	yes	no	yes
Panel C: Overconfidence (probabilites)	Debt market 1		Debt market 2		Final debt	
	(1)	(2)	(3)	(4)	(5)	(6)
Overconfidence (probabilities)	0.171*	0.195**	0.428***	0.445***	0.237***	0.242***
	(0.093)	(0.087)	(0.073)	(0.069)	(0.051)	(0.052)
Easy treatment		0.452		0.161		0.220
		(0.360)		(0.281)		(0.179)
Control group		0.584*		0.186		0.145
		(0.334)		(0.268)		(0.177)
Constant	3.932***	3.137**	2.409***	1.507	0.653***	0.910
	(0.144)	(1.410)	(0.114)	(1.052)	(0.077)	(0.677)
R^2	0.016	0.140	0.132	0.256	0.093	0.169
Observations	252	248	252	248	252	248
Control variables	no	yes	no	yes	no	yes

C.3. The intensive margin of debt levels

When we study debt levels in the main experiment, we include participants with no debt. To zoom in on the intensive margin of debt taking, we provide robustness results excluding participants who do not take debt at all (the extensive margin was already analyzed using the indicator "has debt"). Table C.5 shows the treatment effect under this restriction. Results hold for the level of debt and coefficients are economically comparable to the regressions including participants not taking debt. As many participants repay their debt before the end of the experiment the number of observations is low for final debt (column (3)). Therefore, the coefficient does not attain significance in this specification.

Table C.5. Intensive margin of debt and the treatment effect

The table shows results of regressions of debt levels during the experiment on treatment indicators. Participants without debt are excluded. The regression specifications are as in Table 4. Coefficients are significant at $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$; robust standard errors are shown in parentheses.

	Debt after market 1 (1)	Debt after market 2 (2)	Final debt (3)
Easy treatment	0.719**	0.623**	0.443
	(0.352)	(0.300)	(0.383)
Control group	0.433	0.259	0.369
	(0.333)	(0.312)	(0.443)
Constant	3.820***	2.416***	1.578***
	(0.253)	(0.215)	(0.286)
R^2	0.019	0.019	0.014
Observations	236	226	90

We next examine the influence of income expectations and overconfidence on debt levels (see Table C.6). Income expectations have a strong impact on initial debt levels. This relationship is not 1:1, though, as an additional Euro of income expectations results in an additional 30 cents of debt. The influence of income expectations levels off in later stages of the experiment as already observed in the main regressions of Tables 5 to 7. The coefficients for the intensive margin are a

bit higher than in these regressions. An interpretation would be that income expectations are less relevant for the decision to borrow or not (as also the relatively weak results for the debt indicator "has debt" show), but more relevant for the amount of debt taken. Income expectations determine how much debt a participant can subjectively afford.[15]

Table C.6. Intensive margin of debt and mechanisms

The table shows results of OLS regressions of the debt level after market stage 1, 2 and at the end of the experiment as the dependent variable (excluding participants with no debt). Panel A includes income expectations and Panel B includes overconfidence as independent variable. Treatment indicators and control variables are as defined in Tables 1 and 5. Coefficients are significant at $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$; robust standard errors are shown in parentheses.

Panel A: Income expectations	Debt market 1		Debt market 2		Final debt	
	(1)	(2)	(3)	(4)	(5)	(6)
Income expectations	0.302***	0.264***	0.274***	0.267***	0.173	0.189*
	(0.078)	(0.091)	(0.077)	(0.089)	(0.117)	(0.109)
Easy treatment		0.384		0.300		0.270
		(0.338)		(0.309)		(0.374)
Control group		0.318		0.144		0.352
		(0.328)		(0.307)		(0.453)
Constant	2.367***	1.759	1.030**	–0.792	0.772	0.206
	(0.466)	(1.334)	(0.448)	(1.173)	(0.731)	(1.932)
R^2	0.061	0.213	0.064	0.194	0.034	0.248
Observations	236	232	226	222	90	88
Control variables	no	yes	no	yes	no	yes
Panel B: Overconfidence	Debt market 1		Debt market 2		Final debt	
	(1)	(2)	(3)	(4)	(5)	(6)
Overconfidence	0.081*	0.098**	0.158***	0.181***	0.243***	0.306***
	(0.044)	(0.042)	(0.040)	(0.039)	(0.088)	(0.085)
Easy treatment		0.507		0.363		–0.064
		(0.338)		(0.298)		(0.389)
Control group		0.407		0.210		0.035
		(0.334)		(0.297)		(0.391)
Constant	4.211***	2.949**	2.699***	0.442	1.415***	0.967
	(0.138)	(1.354)	(0.120)	(1.172)	(0.187)	(1.653)
R^2	0.013	0.193	0.062	0.219	0.107	0.346
Observations	236	232	226	222	90	88
Control variables	no	yes	no	yes	no	yes

[15] In real financial markets the supply side contributes to this effect by limiting debt levels to individual debt capacity. In the experiment, we abstract from this as all participants receive the same credit line.

The results for overconfidence provided in Panel B are strong and significant even for the regressions with few observations. The level of overconfidence directly translates into the debt level of participants, in particular in later stages of the experiment. The coefficients are higher than in the main regressions. In contrast to income expectations, overconfidence was also strongly significant for the extensive margin (see Table 8). This implies that overconfidence not only increases the risk to become over-indebted, but also has a positive effect on the level of indebtedness.

D. The German Socio-Economic Panel

D.1. GSOEP supplementary data description

The German Socio-Economic Panel Innovation Sample (GSOEP-IS) is an supplementary stream of the much larger GSOEP household survey (Richter and Schupp, 2012). The GSOEP-IS is designed to field more innovative questions to a representative sample of German households. We use data from the panel that started in 2016 and continued in 2017. This sample answers some of the questions that are also covered in the main GSOEP, however households mostly respond to the GSOEP-IS questionnaire, which covers different questions. In 2016, 1,000 households were randomly sampled throughout Germany. The field work includes several attempts to contact selected households. Non-responding households are replaced by similar households to preserve representativeness. In each household all adults complete the survey, which results in 1,556 individuals taking part in 2016. Between 2016 and 2017, the sample shrinks to 1,085 participants due to attrition.

We combine responses from the surveys in 2016 and 2017, as they contain different questions. The 2017 survey includes a number of detailed questions on borrowing behavior by the household and household members (for the code book see Horneber, 2017). We use this sample for our analysis, and Table D.1 shows descriptive about its participants. Just over half of participants are women, the average age is almost 55, and 26% of all participants have a lower secondary degree, whereas 18% have a university degree. Only about have of the respondents is employed. Average net monthly household income is €3041. 72% of participants live with a partner in the same household and on average 0.42 children live in a household.

Some of the control variables in the experiment were modelled after the questions included in the GSOEP. The values for financial literacy and risk tolerance can thus be directly compared between the two samples. Unsurprisingly, financial literacy is worse for the general population (4.3

Table D.1. GSOEP Data Descriptive Statistics

The table shows means, standard deviations, the minimum, and the maximum of demographic variables and controls for the participants in the GSOEP-IS in 2017. Gender is an indicator variable taking a value of one if female. Age is reported in years. Education is an ordinal variable containing the highest achieved educational degree from 0 (no educational degree) to 4 (university degree). Works is an indicator variable taking the a value of one if a participant works. Household income (net) is the monthly net income of the household from all sources. Financial literacy is the number of correct answers in a financial literacy test (six questions taken from the German SOEP-IS 2016 survey). Self-assessed risk tolerance is measured on a scale from 0="completely unwilling to take risk" to 10="very willing to take risk." Risk tolerance (choices) is based on lottery choices using the staircase method of Falk et al. (2016) with values from 1 (least risk tolerant) to 32 (most risk tolerant). Partner in household is an indicator whether a partner of the respondent lives in the same household. Children in household is the number of children living in the same household. Different numbers of observation reflect non-responses.

	n	Mean	Std.dev.	5p	95p
Gender	1085	0.52	0.50	0	1
Age	1084	54.68	18.08	23	81
Education	1085	1.38	1.51	0	4
Works	1085	0.46	0.50	0	1
Household income (net)	1032	3040.92	1737.40	950	6000
Financial literacy	1039	4.31	1.61	1	6
Risk tolerance (self assessed)	1037	4.00	2.26	0	8
Risk tolerance (choices)	1063	9.70	8.21	1	26
Partner in household	909	0.72	0.45	0	1
Children in household	1085	0.42	0.88	0	2

correct responses) than for a student sample (5.1). Self-assessed risk tolerance is similar with 4.0 compared to 4.8 in the student sample. In the choice method, risk tolerance is also similar at 9.7 for the representative sample compared to 10.3 for the students.

D.2. Debt taking behavior

We focus on two questions associated with potentially problematic borrowing behavior. The first of these questions asks whether respondents currently use the overdraft facility of their checking account. In the German context, this is an ubiquitous form of debt as most households have access

to overdrafts (in the sample 82% respond to have access to overdraft). It can be considered a problematic form of debt, as overdrafts are a very expensive form of debt (interest rates often exceed 10%). Overdrafts might occur unplanned and to bridge short-term liquidity needs. However, they might also lead to continuous indebtedness. Using overdraft can be considered quite similar to debt taking in the experiment, as both are typically used to finance consumption.

Secondly, we consider a subjective measure of debt problems, which is whether the respondents feel their debt to be a burden. The response format is binary (yes or no). To understand the link between overconfidence and over-indebtedness we further examine whether respondents expect to be able to repay their current loans. The survey includes the question "What do you think is the probability that you will be able to repay all your current loans until their maturity according the the original agreements?" We derive two variables from this question: one binary variable taking a value of one if a participant is certain to repay all debt on time and zero otherwise, and one continuous variable using the submitted probability.

D.3. Measures of overconfidence

To measure overconfidence, we use two short tasks which are part of the questionnaire. The first task asks participants to name as many numbers that are multiples of 9 (or 17) as they can in 20 seconds. The second task asks participants to name as many animals (or insects) as they can in 20 seconds. The version of the task (9 or 17, animals or insects) is randomly assigned and is intended to reflect different levels of difficulty. Each respondent answers only one question in each domain. Participants manage on average to name 10.7 correct multiples of 9 and 14.1 animals, while they name only 5.8 correct multiples of 17 and 8.2 insects.

After they have completed these tasks, they are asked how many of 100 randomly selected individuals from Germany would perform better than themselves in the tasks. We sort participants

in deciles according to their expected performance and their actual performance. We then subtract their actual performance from their expected performance. We interpret the resulting difference as a measure for overconfidence and normalize it to the interval [-1;1]. We obtain two separate variables for overconfidence related to the numbers task and the animal task, respectively. The overconfidence variables are available for 950 and 972 participants, respectively.

Average overconfidence (numbers) is 0.17, and average overconfidence (animals) is 0.16. The Pearson correlation between the two overconfidence measures is 0.36. The distributions of the two measures of overconfidence are shown in Figures D.1 and D.2. They show that a majority of participants are overconfident.

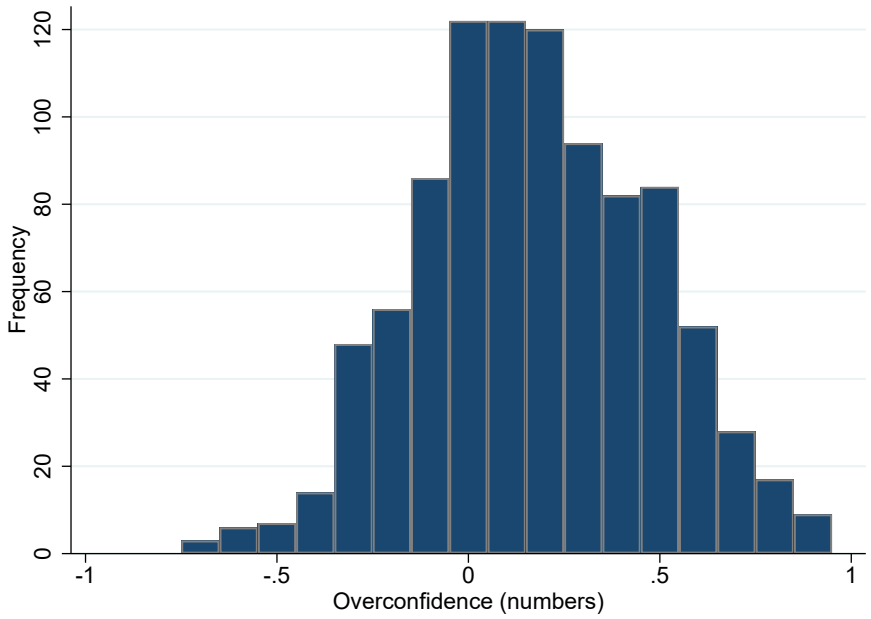


Figure D.1. Overconfidence in the numbers task
Belief about relative performance minus actual performance compared to others.

Similar to the experiment, the overconfidence measures are based on overplacement in relative comparisons (Moore and Healy, 2008; Merkle and Weber, 2011), and they have a hard or easy version. For the purpose of this paper, we pool both versions within each domain. There is no reason to expect an effect of task difficulty on actual borrowing behavior. Different from the experiment,

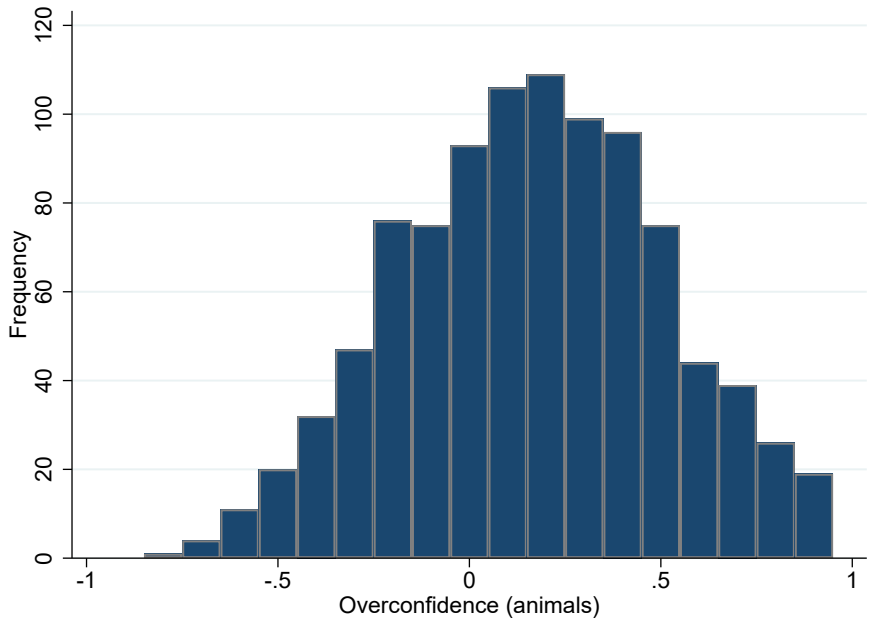


Figure D.2. Overconfidence in the animals task
Belief about relative performance minus actual performance compared to others.

overconfidence is elicited after the completion of the task and is unrelated to participants' income. Moreover, the performance in the task does not affect consumption opportunities.

Table D.2 shows regressions of both measures of overconfidence on socio-demographic variables. Few of these variables show a significant correlation with overconfidence and the regressions have a relatively low R^2. A robust finding is that women are less overconfident than men, both in the numbers and the animals domain. Additionally, participants with higher educational degrees tend to be more overconfident.

Table D.2. Overconfidence GSOEP

The table shows results of OLS regressions of overconfidence in the numbers and animal domain on control variables. All control variables are as defined in Table D.1. Coefficients are significant at $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$; robust standard errors are shown in parentheses.

	Overconfidence (numbers)	Overconfidence (animals)
	(1)	(2)
Gender	–0.052**	–0.096***
	(0.022)	(0.026)
Age	–0.001	0.001
	(0.001)	(0.001)
Education	0.016**	0.023***
	(0.008)	(0.009)
Works	0.012	–0.021
	(0.027)	(0.031)
Log of income	–0.055**	–0.013
	(0.028)	(0.027)
Financial literacy	–0.000	0.008
	(0.008)	(0.009)
Risk tolerance (self assessed)	–0.007	–0.007
	(0.005)	(0.006)
Risk tolerance (choices)	–0.002	–0.001
	(0.001)	(0.002)
Partner in household	0.002	–0.001
	(0.029)	(0.033)
Children in household	0.014	0.001
	(0.015)	(0.018)
Constant	0.668***	0.230
	(0.216)	(0.211)
R^2	0.024	0.042
Observations	733	744

E. Robustness test

Table E.1 contains descriptive statistics on participants in the robustness test. As participants are recruited from the same subject pool, we do not expect systematic differences. The demographic information displayed in the table confirms this expectations.[16] The differences between the participants in the robustness experiment and the main experiment are insignificant except for marginally higher income. Between treatment differences are also insignificant except for risk tolerance based on the lottery choices.

Table E.1. Demographic and control variables in robustness sample

The table shows means of demographic variables and controls for the participants in the robustness sample. All variables are also shown by treatment group. The variables are as defined in Table 1. Different numbers of observation reflect non-responses and the fact that due to technical difficulties, in one session not all demographic data was saved. The p-values of t-tests comparing the robustness sample to the main experiment, and the p-values of one-way ANOVA F-tests for between group differences are reported.

			t-test	Mean by treatment			F-test
	n	Mean	p-value	Hard	Easy	Control	p-value
Gender (female=1)	197	0.47	0.50	0.51	0.46	0.42	0.54
Age	197	24.7	0.96	24.9	24.6	24.7	0.96
Bachelor degree	219	0.23	0.44	0.24	0.20	0.25	0.73
Masters degree	219	0.10	0.12	0.13	0.08	0.12	0.55
Works	219	0.33	0.63	0.31	0.38	0.29	0.52
Income	194	776	0.07	817	766	734	0.50
Financial literacy	219	5.30	0.23	5.33	5.30	5.24	0.94
Risk tolerance (self-assessed)	197	4.86	0.72	5.04	4.82	4.68	0.59
Risk tolerance (choices)	213	10.39	0.72	11.95	9.35	9.76	<0.01
Self control	219	0.04	0.43	0.11	0.08	-0.10	0.40

[16] Due to technical difficulties, in one session not all demographic data was saved (gender, age, income, and self-assessed risk tolerance). This explains the lower number of observations for these variables.

Table E.2 shows results for the debt levels after market one in the robustness test for different sets of control variables. For initial debt there only is an effect of income expectations as already reported in Table 11. In the specifications with full controls part of this effect is picked up by the treatment effect. That the coefficient is not statistically significant anymore, is partly due to the lower number of observations.

Table E.3 shows results for the debt levels after market two in the robustness test for different sets of control variables. A strong positive effect of overconfidence on borrowing is visible in these regressions (in line with Table 11). We also observe a marginally significant treatment effect. The effect of income expectations is smaller compared to initial debt taking.

Tables E.4 and E.5 show results for the final debt level and the propensity to remain in debt at the end of the experiment. The results confirm the important role of overconfidence for over-indebtedness. All results hold, if we pool the main experiment and the robustness test.

Table E.2. Robustness test: Indebtedness after market stage 1

The table shows results of OLS regressions of the debt level after market one on income expectations, overconfidence, and control variables. Income expectations is the expected income in Euro for the two income tasks. Overconfidence is the difference between the expected income and the actual income. Easy treatment and control group are indicator variables for the respective treatment (with the hard treatment as the omitted category). All control variables are as defined in Table E.1. Ln income is the natural logarithm of participants external income. Coefficients are significant at $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$; robust standard errors are shown in parentheses.

	Debt level after market stage 1					
	(1)	(2)	(3)	(4)	(5)	(6)
Income expectations	0.258**		0.226**		0.186	
	(0.112)		(0.113)		(0.124)	
Overconfidence		0.088		0.119		0.102
		(0.071)		(0.073)		(0.076)
Easy treatment					0.668	0.747*
					(0.447)	(0.426)
Control group					0.061	0.068
					(0.424)	(0.425)
Gender			–0.256	–0.442	–0.248	–0.401
			(0.351)	(0.346)	(0.344)	(0.338)
Age			0.082	0.079	0.081	0.078
			(0.056)	(0.059)	(0.054)	(0.056)
Bachelor			0.355	0.437	0.424	0.496
			(0.435)	(0.438)	(0.429)	(0.428)
Masters			–0.383	–0.310	–0.252	–0.184
			(1.059)	(1.099)	(1.031)	(1.064)
Works			–0.240	–0.333	–0.334	–0.418
			(0.386)	(0.380)	(0.391)	(0.378)
Log of income			–0.218	–0.193	–0.186	–0.162
			(0.194)	(0.192)	(0.190)	(0.187)
Financial literacy			0.131	0.187	0.137	0.186
			(0.119)	(0.120)	(0.119)	(0.118)
Risk tolerance (self-assessed)			–0.026	–0.011	–0.020	–0.009
			(0.121)	(0.116)	(0.120)	(0.115)
Risk tolerance (choices)			0.067	0.073	0.078*	0.084*
			(0.045)	(0.044)	(0.045)	(0.044)
Self control			0.009	0.026	–0.008	0.006
			(0.213)	(0.211)	(0.216)	(0.213)
Constant	2.322***	3.866***	0.768	1.692	0.382	1.074
	(0.660)	(0.169)	(1.660)	(1.640)	(1.632)	(1.663)
R^2	0.037	0.011	0.106	0.095	0.122	0.117
Observations	193	193	171	171	171	171

Table E.3. Robustness test: Indebtedness after market stage 2

The table shows results of OLS regressions of the debt level after market two on income expectations, overconfidence, and control variables. All variables are as defined in Tables E.1 and E.2. Coefficients are significant at $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$; robust standard errors are shown in parentheses.

	Debt level after market stage 2					
	(1)	(2)	(3)	(4)	(5)	(6)
Income expectations	0.252***		0.205**		0.161	
	(0.094)		(0.089)		(0.098)	
Overconfidence		0.237***		0.226***		0.209***
		(0.058)		(0.060)		(0.061)
Easy treatment					0.613*	0.602*
					(0.368)	(0.329)
Control group					–0.264	–0.261
					(0.338)	(0.325)
Gender			–0.098	–0.333	–0.107	–0.311
			(0.290)	(0.268)	(0.283)	(0.261)
Age			0.057	0.052	0.056	0.051
			(0.042)	(0.046)	(0.039)	(0.042)
Bachelor			0.213	0.264	0.293	0.326
			(0.374)	(0.368)	(0.357)	(0.351)
Masters			–0.176	–0.228	–0.052	–0.126
			(0.874)	(0.857)	(0.880)	(0.851)
Works			–0.019	–0.073	–0.145	–0.178
			(0.298)	(0.292)	(0.293)	(0.286)
Log of income			–0.274*	–0.243*	–0.239	–0.212
			(0.154)	(0.146)	(0.155)	(0.147)
Financial literacy			–0.083	0.032	–0.080	0.028
			(0.095)	(0.094)	(0.094)	(0.094)
Risk tolerance (self-assessed)			0.080	0.048	0.090	0.053
			(0.098)	(0.093)	(0.095)	(0.091)
Risk tolerance (choices)			0.033	0.038	0.041	0.044
			(0.036)	(0.033)	(0.036)	(0.033)
Self control			–0.058	0.006	–0.077	–0.015
			(0.149)	(0.145)	(0.150)	(0.147)
Constant	0.771	2.291***	1.099	1.849	0.877	1.451
	(0.555)	(0.133)	(1.167)	(1.152)	(1.152)	(1.194)
R^2	0.051	0.119	0.099	0.159	0.136	0.196
Observations	193	193	171	171	171	171

Table E.4. Robustness test: Indebtedness at the end of the experiment

The table shows results of OLS regressions of the debt level after the final market on income expectations, overconfidence, and control variables. All variables are as defined in Tables E.1 and E.2. Coefficients are significant at $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$; robust standard errors are shown in parentheses.

	Debt level at the end of the experiment					
	(1)	(2)	(3)	(4)	(5)	(6)
Income expectations	0.125		0.096		0.083	
	(0.081)		(0.066)		(0.073)	
Overconfidence		0.272***		0.253***		0.250***
		(0.051)		(0.052)		(0.052)
Easy treatment					0.100	0.002
					(0.299)	(0.231)
Control group					–0.302	–0.305
					(0.254)	(0.229)
Gender			0.204	0.011	0.189	0.000
			(0.212)	(0.193)	(0.214)	(0.196)
Age			0.035	0.030	0.035	0.030
			(0.030)	(0.033)	(0.029)	(0.032)
Bachelor			0.168	0.162	0.195	0.176
			(0.301)	(0.278)	(0.302)	(0.278)
Masters			0.251	0.079	0.275	0.080
			(0.661)	(0.624)	(0.644)	(0.603)
Works			–0.177	–0.165	–0.230	–0.200
			(0.225)	(0.202)	(0.227)	(0.201)
Log of income			–0.191	–0.164	–0.180	–0.159
			(0.124)	(0.108)	(0.131)	(0.113)
Financial literacy			–0.096	0.038	–0.097	0.035
			(0.074)	(0.062)	(0.074)	(0.064)
Risk tolerance (self-assessed)			0.098	0.026	0.103	0.029
			(0.083)	(0.071)	(0.084)	(0.071)
Risk tolerance (choices)			–0.012	–0.010	–0.012	–0.012
			(0.023)	(0.021)	(0.024)	(0.022)
Self control			–0.086	0.003	–0.093	–0.001
			(0.108)	(0.102)	(0.111)	(0.104)
Constant	–0.027	0.740***	0.533	0.774	0.604	0.870
	(0.450)	(0.101)	(0.754)	(0.803)	(0.816)	(0.892)
R^2	0.019	0.240	0.083	0.272	0.096	0.280
Observations	193	193	171	171	171	171

Table E.5. Robustness test: Propensity to remain in debt at the end of the experiment

The table shows results of a linear probability model (OLS) of an indicator variable whether a participants remains in debt at the end of the experiment. Explanatory variables are income expectations, overconfidence, and control variables. All variables are as defined in Tables E.1 and E.2. Coefficients are significant at $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$; robust standard errors are shown in parentheses.

	Indicator whether in debt at the end of the experiment					
	(1)	(2)	(3)	(4)	(5)	(6)
Income expectations	0.009		0.007		0.002	
	(0.019)		(0.019)		(0.021)	
Overconfidence		0.077***		0.075***		0.074***
		(0.010)		(0.012)		(0.011)
Easy treatment					0.070	0.023
					(0.088)	(0.071)
Control group					–0.035	–0.038
					(0.089)	(0.079)
Gender			0.130*	0.084	0.128*	0.084
			(0.074)	(0.064)	(0.074)	(0.065)
Age			0.020***	0.018***	0.020***	0.018***
			(0.007)	(0.006)	(0.007)	(0.006)
Bachelor			0.053	0.041	0.062	0.045
			(0.085)	(0.076)	(0.085)	(0.076)
Masters			–0.006	–0.076	0.008	–0.072
			(0.170)	(0.136)	(0.175)	(0.138)
Works			–0.069	–0.054	–0.084	–0.061
			(0.074)	(0.064)	(0.075)	(0.065)
Log of income			–0.082**	–0.076**	–0.078**	–0.074**
			(0.039)	(0.036)	(0.039)	(0.037)
Financial literacy			–0.022	0.019	–0.021	0.019
			(0.024)	(0.022)	(0.024)	(0.023)
Risk tolerance (self-assessed)			–0.011	–0.038**	–0.009	–0.037*
			(0.020)	(0.019)	(0.021)	(0.019)
Risk tolerance (choices)			0.013*	0.013*	0.014*	0.013*
			(0.008)	(0.008)	(0.008)	(0.007)
Self control			–0.048	–0.019	–0.050	–0.020
			(0.037)	(0.036)	(0.037)	(0.037)
Constant	0.258**	0.317***	0.281	0.256	0.258	0.249
	(0.118)	(0.030)	(0.266)	(0.243)	(0.265)	(0.247)
R^2	0.001	0.217	0.110	0.276	0.118	0.279
Observations	193	193	171	171	171	171

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