RATIONALITY & COMPETITION
CRC TRR 190

The Effect of Self-Control on Borrowing: Experimental Evidence

Antonia Grohmann (Aarhus University & DIW Berlin)
Jana S. Hamdan (HU & DIW Berlin)

Discussion Paper No. 264

December 22, 2020

The Effect of Self-Control on Borrowing: Experimental Evidence[*]

Antonia Grohmann[†]and Jana S. Hamdan[‡]

December 21, 2020

Abstract

This paper examines the effect of reduced self-control on debt-taking in a laboratory experiment. We manipulate self-control using an ego depletion task and show that it is effective. Following the ego depletion task, participants can anonymously buy hot drinks on credit. We find no significant average effects, but find that treated individuals that have low financial literacy are more likely to buy drinks. We complement our experimental analysis with survey evidence that suggests that people with low self-control have more problems with the repayment of consumption debt, but this relationship is, in line with the experimental results, weaker for individuals with high financial literacy.

JEL classification: D14 (Personal Finance), G51 (Household Borrowing), C91 (Lab Experiments)

Keywords: Debt, Consumption, Borrowing, Self-Control, Ego depletion

[†]Aarhus University, Denmark and DIW Berlin, Germany; Email: agrohmann@econ.au.dk
[‡]Humboldt-Universität zu Berlin and DIW Berlin, Germany; Email: jhamdan@diw.de

1. Introduction

About 10% of German adults are over-indebted, meaning that they cannot meet their debt obligations over a longer period of time, even when reducing their living standards (Creditreform Wirtschaftsforschung, 2020). The issue is also prevalent elsewhere: for example, in the United States every third household is under pressure by debt collectors (Urban Institute, 2019). Over-indebtedness can have serious effects for households, as it puts a strain on individual welfare, correlating negatively with physical health and mental health, and psychological well-being (Drentea and Lavrakas, 2000; Brown et al., 2005; Sweet et al., 2013). At the same time, too much household debt can jeopardize economic stability and growth as those affected are highly sensitive to income and interest rate shocks (Debelle, 2004; Mian et al., 2017). Moreover, consumption debt dampens consumption growth (Ekici and Dunn, 2010).

A variety of factors, including job loss, divorce, and health problems, are typically given as reasons why people borrow too much. However, these factors neither account for the full extent of borrowing observed nor explain and quantify non-optimal borrowing decisions (Zinman, 2015; Beshears et al., 2018). At the same time, financial literacy explains borrowing decisions less well than asset decisions (Lusardi and Tufano, 2015) and financial education is less effective at improving borrowing decisions than savings decisions (Kaiser and Menkhoff, 2017). An intuitive, but so far not fully understood, cause of over-indebtedness is impulsive and excessive consumption even though this factor is responsible for a significant share of hardship cases: about 10% of German debt counseling cases are classified as mainly due to consumption behavior (Institut für Finanzdienstleistungen, 2020). In this paper, we investi-

gate the role of self-control problems as a behavioral bias that affects impulsive purchases. As these are often financed by debt, impulsive purchasing, in turn, possibly results in over-borrowing for consumption.

Although prior research provides valuable insights into a potential link between self-control and impulsive consumption leading to over-borrowing, these are, to the best of our knowledge, all based on surveys and, hence, suffer from endogeneity. Unobserved variable bias as well as reverse causality are a concern. In this paper, we aim to provide the first causal evidence for the effect of self-control on impulsive buying and borrowing, thus aiming to contribute to the understanding of over-indebtedness. We also collect data on financial literacy, thus aiming to shed light on the interrelationship of self-control with financial literacy.

In this paper, we run a lab experiment during which we implement an exogenous variation of self-control. In order to achieve this in an experimental treatment and measure effects on borrowing decisions, we use a well-established ego depletion exercise commonly used in psychology, namely the crossing out letter task (Baumeister et al., 1998). It aims to reduce the ability for self-control by demanding constant suppression of a habituated behavior. This approach assumes that self-control is a finite resource (Baumeister and Tice, 1994; Baumeister and Heatherton, 1996).[1] The letter-crossing tasks are considered to be the most effective ego depletion exercises (Hagger et al., 2010). These include that the treated first complete a habituation exercise, immediately followed by a depletion task. In parallel, the

---

[1]Within-person variation in self-control due to tasks such as these does not contradict the evidence from longitudinal studies that self-control is considered to be a relatively stable personality trait as they also find some variation over time (Turner and Piquero, 2002; Burt et al., 2006; Hay and Forrest, 2006). This is also true for self-control dubbed as time preferences, for which the observed stability holds under the condition of some instability (Meier and Sprenger, 2015).

control group continues with a second habituation exercise instead of the depletion task. In order to check the effectiveness of this intervention, we perform manipulation checks.

Following this, participants enter a shopping stage. All participants are offered hot drinks that they can purchase with money that they will earn later during the experiment. To make hot drinks more appealing and the temptation more visceral, we artificially cooled down the lab to about 17 degrees Celsius (63 degrees Fahrenheit). Drinks are served during the experiment, while the participants still have other tasks to perform. Specifically, they continue with a second round including depletion exercises, manipulation checks, and a shopping stage. Both consumption rounds are completely anonymous to rule out social signalling concerns. After the main part of the experiment, we ask a number of questions to measure financial literacy, socio-economic characteristics, and financial behavior.

Results regarding manipulation checks are as follows: We find that the letter-crossing treatment reduces the participant's ability to concentrate significantly. Treated participants are also more likely to choose a hard puzzle to perform at the end of the experiment, although this difference is insignificant. When constructing an index from all manipulation checks, we find that the treated are, on average, significantly more depleted. Therefore, we consider our treatment to be successful.

Looking at the link between our treatment and whether someone makes an impulsive purchase, by buying a hot drink on credit, we find that treated participants are slightly more likely to impulsively borrow. In the first, more expensive, consumption round, they are 6 percentage points more likely to borrow than the control group. However, the average differences are statistically insignificant. This also applies to the amount borrowed and the

3

amount of interest paid. Overall, only 16 percent of the full sample borrow in the more expensive first consumption round, twice as much as in the second round.

We perform heterogeneity analysis with a special focus on financial literacy to determine if participants with higher financial literacy have a better understanding of the financial downsides of their impulsive purchases. We find that the relationship between our treatment and buying hot drinks is positive, significant, and large in magnitude for people with low financial literacy. This result is driven by borrowing choices in the first, more expensive, borrowing round.

To assess the external validity of our results, we add survey evidence from a representative German household panel. In line with our experimental results, self-control is related to significantly fewer debt repayment problems and slightly less consumption borrowing overall. When we interact financial literacy with self-control ability, we can show that the interaction term between the two variables is always positive, indicating a weaker relationship between self-control and debt problems for people with high financial literacy.

This paper brings together two strands of literature: (1) studies on the effect of self-control on economic behaviors and (2) observational studies on self-control and levels of (expensive) consumption debt.

First, self-control is linked to a large number of economic and health outcomes. The ability to regulate one's impulses is positively linked to better health and educational outcomes, success in the labor market, stronger relationships, interpersonal skills, and overall life satisfaction (Tangney et al., 2004; Cobb-Clark et al., 2019). Self-control is also positively correlated with well-being at within- and between-person levels (Buyukcan-Tetik et al., 2018). It further positively correlates with financial assets (Liu et al., 2019).

4

In experimental economics, few existing studies focus on self-control problems and its consequences. In a public goods experiment, self-reported self-control correlates with more cooperation (Kocher et al., 2017). The experimental intervention that we use is similar to Gerhardt et al. (2017), who use an ego depletion task to reduce self-control and subsequently measure risk preferences, finding no causal effect of depletion on risk aversion.

Secondly, a number of studies provide evidence of a consistent relationship between self-control and financial behaviors related to over-indebtedness. Self-control problems are associated with compulsive buying (Achtziger et al., 2015), over-indebtedness (Gathergood, 2012), financial distress (Biljanovska and Palligkinis, 2018), and, when elicited as time preferences, credit card borrowing (Meier and Sprenger, 2010). To the best of our knowledge, this is the first study that examines this relationship in an experimental setting.

Following this introduction, this paper proceeds as follows. Section 2 presents our experimental design. We discuss our main experimental results in Section 3, provide survey evidence in Section 4, and conduct robustness checks in Section 5. Section 6 concludes.

2. Experimental Evidence

2.1. Experimental Design

The main elements of the experiment consist of two rounds, each including an ego-depletion task and a shopping stage. It is the aim of our treatment to reduce the self-control ability in the short term among our treated participants and to let all participants choose to buy hot drinks on credit. We are interested in the causal difference in purchases between treated

and non-treated individuals. A summary of the structure of the experiment is displayed in Figure 1. We here outline each stage of the experiment in detail.

2.1.1. Instructions and Comprehension

When first entering the lab, participants read the instructions. These are given in written form (see English translation in the Appendix IV.1). Then, the participants answer comprehension questions regarding the procedure of the experiment and consumption costs on screen (see Appendix IV.2 for detailed questions). In case a participant answers the comprehension questions incorrectly, one of the experimenters approaches the participant and asks to re-think the answer. If the participant continues to misunderstand, the experimenter explains the right answer. The experiment starts once all participants understand the experimental procedure.

2.1.2. Letter-crossing task

For the purpose of reducing self-control in our experimental treatment, we make use of the letter-crossing task, one of the most commonly used and well-established methods for ego-depletion, first introduced by Baumeister et al. (1998).

In general, ego depletion methods are designed to induce lower self-control in a laboratory environment. The depletion exercises are both strenuous and unrewarding, thereby causing mental fatigue and leading the subjects to a state of "ego depletion." The evoked state of depletion is then assumed to reduce the ability to exert self-control in subsequent tasks (Muraven and Baumeister, 2000). In such a state, the energy available to the self is low and the capacity to control the mind over habituated responses is impaired.

In our experiment, we decided to use the well known crossing-out letters task, as this is shown to be most effective at reducing self-control according to the meta-analysis by Hagger et al. (2010). The task consists of two exercises. The first exercise asks both treatment and control group to cross out all letters 'e' in a paper-based text for three minutes. This first exercise is designed to instill a habit among all participants. Following this, participants are given a new text and task description. The treated participants are requested to cross out the letter 'e' for ten minutes according to a new rule. This rule is as follows: always cross out the letter 'e' except for these cases: when a vowel follows the 'e' by one or two letters, or when a vowel precedes the 'e' by two letters. Thus, when no vowels follow or precede the 'e' in such a way, the 'e' shall be crossed out. The control participants, on the other hand, are given the same new text but are asked to continue crossing out all letters 'e' for ten minutes, hence the rules for them are the same as during the first exercise. The selected text is an extract on the history of statistical recording in Germany, see a description and example in Appendix IV.3. These were chosen as the authors believe the content to be fairly uninteresting to a mostly student population.

In sum, the treatment serves as an exogenous shock to the mental state of participants as it is designed to first instill a habit among all subjects for the first three minutes. As the instructions change for the treatment group, they are forced to suppress this habituated behavior. As a result, the treated participants use up mental resources linked to self-control.

The text exercises are not incentivized as they are designed to be unrewarding and effortful. Secondly, by not incentivizing these tasks we prevent that financial performance in the letter-crossing tasks influences shopping behavior during the next stage of the experiment.

It is notable that manipulation failure is raised as a concern to ego depletion studies. Thus, performing manipulation checks following an ego-depletion task is important. Hagger et al. (2010) find significant evidence for the effectiveness of ego-depletion tasks across 198 studies, however Carter et al. (2015) strongly challenge this view and indicate that a publication bias and small sample sizes overestimates the actual effects. These concerns produced a sudden surge in further meta analyses and responses (Alós-Ferrer et al., 2019; Cunningham and Baumeister, 2016; Baumeister and Vohs, 2016). It seems relatively certain now that a habituation phase is necessary to obtain an ego depletion effect. Moreover, paper-based letter crossing tasks seem a little less controversial than electronic tasks and the depletion task must not be too short. We believe that we follow all of these points in our chosen ego-depletion task to deplete self-control in this experiment. Inzlicht and Friese (2019) further point to the importance of validating manipulations and ensuring transparent good scientific practices, therefore we put considerable effort into ensuring that our manipulations were successful.

2.1.3. Manipulation check

Manipulations checks follow the crossing-out letters task. This stage consists of questions about perceived participant exhaustion levels before the experiment and exhaustion after the experiment. We also ask for perceived concentration difficulty during each text exercise. These items are measured on a Likert-scale from one to ten.

All participants are further tested using the cognitive reflection test (CRT), introduced by Frederick (2005). Ego depletion can be seen as a shift from "system two" to "system one" as resources are being depleted (Gerhardt et al., 2017). The CRT measures the ability

to turn on "system two" (exert effort for conscious thinking) and, thus, we expect that ego depleted individuals are less able to answer these questions correctly.

Lastly, participants are asked to choose either a difficult or an easy puzzle to complete at the end of the experiment. This further serves as an estimate for ego depletion. We believe that ego-depleted individuals are more likely to choose the easier puzzle rather than the hard puzzle. These measures of ego-depletion are shown to be effective by Gerhardt et al. (2017). Other ways to measure if a person is ego-depleted involve letting participants perform further ego-depletion tasks. This is not possible in our setting as it would confound with the original treatment in the following rounds.

2.1.4. Debt-taking in the lab

As the main aim of the experiment is to test if there is a causal relationship between ego deletion and taking on debt, we strive to recreate debt-taking in the lab. The questions to check for manipulation are, hence, followed by a shopping stage during which all participants can anonymously purchase hot drinks. This is done by letting participants select from a choice of hot drinks in combination with milk and sugar (see Appendix IV.4 for details of setting). To make hot drinks more appealing, we cooled down the lab to about 17 degrees Celsius (62.6 degrees F.). Purchase options are advertised with prices on the computer screen to the participants. Importantly, the indicated prices are higher for hot drinks than in the retail outlet in the same building. Since the participants have not earned any money at this point of the experiment, they must take out a loan to purchase the drinks. The loan has an interest rate. These interest rates are relatively high and decrease between rounds. In the first shopping round the loan charges 20% interest and in the second round 10%. Both the

loan and the interest rate are taken off the participation fee at the end of the experiment. Credit costs are framed as being added on top of prices. The prices for goods remain the same throughout the experiment. Participants are made aware of the prices and both interest rates at the beginning of the experiment and again on the computer screen during the shopping stages.

Participants are further informed both before the experiment and during the shopping stages that they will receive free tap water if no purchase is made. Thus, borrowing to buy a hot drink should not be linked to social status or signalling concerns. Participants are unaware who makes purchases and who does not within the laboratory environment as everybody receives a drink in identical paper cups as pre-announced. After each shopping stage, all drinks for all participants are prepared in a separate room and quietly delivered to the participants' work stations in the lab whilst they are continuing with the next experimental stage.

As mentioned above, the three experimental stages (text exercises, manipulation check, shopping round) are completed twice.

2.1.5. Control variables

The last shopping round is followed by a questionnaire during which we collect extensive information regarding the participants' socio-demographics, financial characteristics, and experimental experience.

As we are mostly dealing with students, we asked about working for more than ten hours a week and whether participants earned more than 1000 € per month, thus roughly above the poverty line for single households in Germany. As part of this experiment is

to examine the interaction between self-control and financial literacy, we also included six questions to measure financial literacy. These questions, which are standard in the literature (see, for example, Van Rooij et al. (2011) and Lusardi and Mitchell (2008)), are shown in Appendix IV.5.

We also included a number of questions regarding the participant's previous financial behavior. These were included to establish if there is a certain financial type that displays certain financial behaviors that will translate to the experiment. Moreover, we included the self-control scale by Bertrams and Dickhäuser (2009) translated from Tangney et al. (2004) after the main experiment, see Appendix IV.6.

2.2. Sample

Our experiment took place at the Technische Universität Berlin in December 2019. This was preceded by a pilot study in November 2019. Including the two pilot sessions, 12 experimental sessions were conducted, each lasting 60 minutes.[2]

All sessions had between 20 and 23 participants. In total, 283 people participated in the experiment. On average, participants earned 16.7 €, including a show-up fee of 7 € and a participation fee of up to 10 €.

Treatments were randomized at the individual level using a computerized process. All sessions included participants in the treatment and in the control groups. The experiment is programmed using z-Tree (Fischbacher, 2007) and participants are recruited from the subject pool of the Technical University laboratory via ORSEE (Greiner, 2015). This study

---

[2]For the main sessions, the following changes to the experimental design were implemented in order to ensure that the experiment only took 60 minutes: (1) shorter instructions comprehension test; (2) a 2 minute timer in the CRT test and for the puzzle task; and (3) shortening the second text exercise from 12 to 10 minutes in in both rounds.

was registered before the main sessions in the AEA RCT Registry and the unique identifying number is $AEARCTR - 0005185.5185 - 1.0$.

2.3. Summary statistics

In Table 1, we present descriptive statistics comparing treatment and control groups. Current university students made up 96% of all participants. They were mostly in the fields of engineering, natural sciences, mathematics, and economics. The groups are fairly gender balanced and the average participant was around 22 years old, an undergraduate, and had a monthly income below 1000 €. About a third of participants have previous experience with consumption debt or currently have consumption debt. Every third participant reports to be always or often stressed about money issues.

Regarding the experiment, on average, participants felt slightly cold. Further, 18% know another subject in the same session and 20% have participated in five or more lab experiments.

The t-tests comparing group averages indicate that the computerized randomization succeeded in rendering balanced groups based on observable characteristics. To complement this evidence, the test result for joint orthogonality renders an *F statistic* of 0.77 ($p = 0.744$), which allows us to infer that average outcome differences across groups will be a causal consequence from our treatment (see Appendix Table II.I for more detailed summary statistics on the full sample).

3. Experimental Results

3.1. Manipulation check

In this section we test whether the crossing-out letters exercise was effective in depleting participants' egos in the treatment group, thus and so reduces their self-control.

Table 2 displays results of t-tests of our manipulation check of the ego depletion tasks, comparing the treatment and control groups. Panel A shows the number of completed paragraphs for each round of text exercises. As expected in the short, 3 minute, exercises during which treatment and control groups perform the same task, the number of paragraphs completed is the same. In the longer tasks, during which the treatment group performed the task designed to deplete the ego, the number of paragraphs completed is significantly lower. This is understandable as the task that is performed by the treatment group is considerably harder and more time consuming. This shows also that participants exerted effort even though none of the text exercises were incentivized.

We measure whether our manipulation was effective in depleting self-control resources in three different ways. First, we asked participants how exhausted they felt at the beginning of the experiment and then after each text round. Here, we calculate the difference between the two reported values. Additionally, after each round we asked how hard participants had to concentrate during the first and the second tasks. Lastly, after the first round of the ego depletion task, we asked participants if they would like to participate in a hard or an easy puzzle at the end of the experiment. This way of checking if manipulations are successful is in line with Gerhardt et al. (2017). In addition, we also ask the three cognitive

13

reflection questions Frederick (2005) after the first round of the experiment. Panel B in Table 2 shows the respective results comparing treatment and control groups. There are no significant differences between the treatment and control groups when it comes to reported exhaustion. There are also no significant differences for the cognitive reflection questions. We do, however, find a difference in the reported level of concentration. The treatment group is also borderline more likely to choose the easier puzzle, suggesting that they are more ego deleted at the end of the first round of crossing-out letters tasks.

We collect these indicators together to form a depletion index in line with Gerhardt et al. (2017), see details below Table 2. This is significantly higher for the treatment group than it is for the control group. This holds for the overall depletion index and both rounds separately. Hence, we argue that we successfully depleted participants using the crossing-out letters task. We use this index in the following regressions.

3.2. Shopping and borrowing

We show the average effect of our treatment in Table 3. The table shows mean values as well as p-values for t-test and Wilcoxon rank sum tests. It examines the total amount borrowed for both rounds, the interest rate paid, as well as whether drinks were purchased in any of the rounds. On average, ego-depleted participants spend 53% more than control group participants in the more expensive round 1. Similarly, they are also 6 percentage points more likely to purchase a drink in this round. In round 2, the treated participants are no more likely to purchase any drink than the control participants. However, their average spending in round two is still 29% higher than the control groups. These results, although economically

14

large, are not statistically significant on the common levels according to t-tests and Wilcoxon signed-rank tests.

In Table 4, we present our findings using regression analysis with session fixed effects. In this table, we use a dummy that is 1 if a person has bought any drinks as the outcome variable. We show the results for other outcome variables (such as borrowing amount or interest paid) in Appendix II. Columns (1) to (3) show results for drinks round 1, while columns (4) to (6) show results for round 2. In columns (1) and (4), we look at simple correlations between our treatment indicator and whether a participant bought a drink. We see a positive, non-significant relationship. In the next columns, we include the depletion index and see that there is a slight drop in the coefficient between the treatment and buying a drink. This indicates that some of this relationship is because people in the treatment group are more depleted. However, none of these relationships are significant.

In the last columns, we include a large set of control variables for the full sample. Few coefficients are significantly different from zero. Students are less likely to buy drinks in round 1 but are just as likely to buy drinks in round 2. Participants with lower financial literacy are more likely to buy drinks in the more expensive round 1.

There are also some significant relationships between variables that measure factors surrounding the experiment. People with more previous sessions in the lab are less likely to buy drinks, whereas people who know another participant are more likely to buy drinks in round 2. It is possible that people with more lab sessions are more money focused.

3.3. Self-Control, financial literacy and debt

We here examine the link between our treatment and the in lab purchasing decisions separately for people with high and low financial literacy. We examine financial literacy as it is shown to be linked to a number of positive financial behaviors (Lusardi and Mitchell, 2014).

Table 5 is similar to the table above. By experimental round, it shows the regression results with the binary dependent variable for buying a drink on credit. In addition, we include an interaction term between below median financial literacy and our treatment. Again, we include the full set of control variables in columns (3) and (6).

The interaction term between financial literacy and our treatment is always positive. In the first more expensive round, the results are very consistent across specifications and statistically significant at the 5% level. Moreover, the coefficients in round 1 are large in magnitude: The treated below median financially literate are about 20 percentage points more likely to borrow than the untreated. In sum, this shows that people with low financial literacy who were treated are more likely to buy hot drinks than treated individuals with high financial literacy. We examine a potential mechanism behind this in Appendix III.

These results indicate that the relationship between low self-control and impulsive purchasing on credit is stronger for those with lower financial literacy. This sub-group seem more prone to buy drinks on credit in the more expensive first round, thus leading to expensive impulsive buying on credit. These results suggest interesting policy implications. Higher levels of financial literacy may protect people from going into debt as a result of impulsive buying. However, as this is a lab experiment with students, it is unclear from these results

if they also hold in a more general sample. We examine this in the next section by looking at survey data on the relationship between self-control, debt, and financial literacy.

4. Survey Evidence

In this section, we add to our experimental results by examining data from a representative survey of German households, containing information on self-control, debt, and financial literacy. Thereby, we hope to add external validity of our experimental findings.

4.1. GSOEP-IS

We aim to establish the link between low self-control and consumption debt as well as repayment difficulties. In addition, we aim to test how the role financial literacy interacts with this relationship. In order to do this, we use the German Socio-Economic Panel (GSOEP), a representative sample of German households. The data that we examine in this study was collected as part of a smaller survey for which a new sample was drawn in 2016, generally known as the innovation sample (IS). Hence the survey that we use here is known as the GSOEP-IS. We combine data from waves collected in 2016, 2017, and 2018. For details of data and sampling see Appendix I and specifically Table I.I.

The GSOEP-IS collects a large number of standard socio-economic characteristics that are also collected as part of the main GSOEP. In addition, the 2018 wave of the GSOEP-IS includes 13 question designed to measure individual self-control. These questions are widely used in psychology (Tangney et al., 2004; Bertrams and Dickhäuser, 2009) and identical to those elicited in the questionnaire at the end of our experiment. All questions require partic-

ipants to place themselves on a scale between 1 and 5, with 1 meaning disagree completely and 5 meaning completely agree. Out of these questions, we generate a score to measure self-control by aligning questions such that a higher number is associated with greater self-control and taking the mean of all questions. Descriptive statistics of this variable are shown in the Table I.II in the Appendix and in Figures I.I and I.II.

We are particularly interested in the interaction between self-control and financial literacy. Therefore, we also include the six question on financial literacy into the GSOEP-IS. These are standard questions that have previously been used in the literature in similar forms (Van Rooij et al., 2011). We take the sum over the correct questions to measure individual financial literacy.

We perform t-tests to determine if the average self-control scale scores differ across socio-demographic variables. Results are shown in Table I.III in the Appendix. We find some common patterns that are known from the literature (Tangney et al., 2004); younger people tend to have less self-control. People with higher self-control also tend to be healthier and have higher life satisfaction in this sample. We find than women and men, on average, do not rate themselves differently with respect to self-control. There is no difference in self-control between people with higher and lower financial literacy. As expected, the scale is also positively associated with higher household income and individual regular precautionary savings; the latter is seen in Appendix section I.

Further, we asked about objective as well as subjective measures regarding debt levels. As this paper is about over-indebtedness and problematic debt, when looking at objective measures of debt, we mostly focus on consumption debt.

18

4.2. Survey results

First, we examine if self-control is linked to different measures of debt-taking and, second, we are interested in how self-control interacts with financial literacy. Below, we examine two different types of measures for over-indebtedness, namely the existence of problematic debt and the existence of debt repayment problems.

Table 6 shows results for the link between self-control, financial literacy, and measures of a stock of debt. In columns (1), we look at whether the household that someone lives in holds consumption debt; columns (2) examines the relationship for personal consumption debt; and column (3) looks at any other debt except for mortgages. Within each column, we first only look at the relationship between self-control and debt, in a second step, we introduce financial literacy together with an interaction term between self-control and financial literacy. Lastly, we introduce further control variables.

A clear pattern emerges. The regressions show that higher self-control is linked to less consumption debt. When we introduce financial literacy and an interaction term between the two variables, we see that people with higher financial literacy are also less likely to hold less debt. The interaction term between the two variables is positive, which shows that the link between self-control and debt taking is weaker for people with higher financial literacy. Lastly, we add a full set of control variables. Consequently, the relationships between self-control, financial literacy, and debt become insignificant, but all signs remain the same.

From this Table we can clearly see that both people with higher self-control as well as those with higher financial literacy tend to have less debt. From the interaction term, we find

that the relationship between self-control and debt is weaker for people with higher financial literacy, which confirms our experimental results.

Table 7 is synonymous with Table 6, but here we look at two measures of subjective repayment as outcome variables. Column (1) examines whether participants believe that they will be unable to repay their consumption debt without problems. In column (2) the outcome variable measures if participants will be unable to repay all their debt on time.

We find the same pattern as before and see in column (1) that the relationship between self-control and our measure of over-indebtedness is negative, meaning that people with high self-control are less likely to believe that they will have problems repaying their debt. When we add financial literacy and the interaction between the two variables, we again see that people with higher financial literacy are less likely to be over-indebted. Again, the interaction term between the two variables is positive, indicating a weaker relationship between self-control and debt for people with high financial literacy. In columns (2), we find the same patterns; however, these relationships are insignificant when we add further control variables.

This section confirms our experimental findings. Using a representative survey of households in Germany, we show that there is a link between low levels of self-control and higher, unsustainable levels of debt, especially consumption debt. We further confirm our findings above and show that the relationship between limited self-control and over-indebtedness is weaker for people with higher financial literacy.

5. Robustness

We perform a number of robustness checks to see if our results persist when excluding the pilot sessions or using alternative continuous outcome variables. All results are presented in the Appendix II. First, we do not find differences in results when excluding the participants from the two pilot sessions where the treatment was slightly more intense as the text exercises were longer. Second, instead of looking at a simple dummy, we repeat our analysis using the amount borrowed or paid interest amount as outcome variables. We do this for our general results as well as for the heterogeneity analysis. The results remain the same. In addition, we perform further heterogeneity analysis and split the sample by two measures of financial worries, by the self-control scale median and consumption debt history. We find no heterogeneous effects along these lines.

6. Conclusion

High personal and household debt is a growing problem. These high levels cannot be explained by conventional economic theory (Zinman, 2015). Thus, in this paper, we focus on a behavioral bias that can potentially explain high levels of debt through impulsive purchases, namely self-control problems.

In a laboratory experiment, we aim to contribute causal evidence on the link between low self-control and impulsive buying, which may lead to excessive and expensive borrowing. We manipulate participant's self-control by letting them perform an ego depletion task. The task involves crossing out certain letters from a text. The treatment group must cross out letters

following a harder pattern than the control group, demanding them to override habituated behavior. After this, participants can buy hot drinks on credit. Whilst the prices of hot drinks stay constant, the separately published interest rate decreases over time. During the shopping rounds, money spent is presented to participants as a loan against their future earnings. At the end of experiment, the loan is deducted from the show up fee.

We perform manipulation checks and the evidence suggests that our treatment is generally successful depleting egos. Looking at the link between our treatment and the likelihood of buying drinks during the experiment, we see that the treatment does not significantly increase the likelihood of buying drinks on average but borrowing rates are higher among treatment group members. However, we do find that the treatment leads to significantly more purchases for participants with lower financial literacy, especially in the more expensive first round with a higher interest rate.

From a representative German household survey, we find that both people with higher self-control as well as those with higher financial literacy tend to have less debt. Moreover, the relationship between self-control and debt is weaker for people with higher financial literacy, which confirms our experimental results.

Policy lessons can be drawn from this: The link between financial literacy, self-control, and impulsive buying suggests that improving financial literacy could reduce impulsive buying due to low levels of self-control. Further work could be done to design training that specifically target self-control problems.

References

Achtziger, A., Hubert, M., Kenning, P., Raab, G., and Reisch, L. (2015). Debt out of control: The links between self-control, compulsive buying, and real debts. *Journal of Economic Psychology*, 49:141–149.

Alós-Ferrer, C., Ritschel, A., García-Segarra, J., and Achtziger, A. (2019). Habituation does not rescue depletion: Two tests of the ego-depletion effect. *Journal of Economic Psychology*, 75:102122.

Baumeister, Roy F, H. T. F. and Tice, D. M. (1994). *Losing control: How and why people fail at self-regulation.* San Diego, CA: Academic Press.

Baumeister, R. F., Bratslavsky, E., Muraven, M., and Tice, D. M. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology*, 74(5):1252–1265.

Baumeister, R. F. and Heatherton, T. F. (1996). Self-regulation failure: An overview. *Psychological Inquiry*, 7(1):1–15.

Baumeister, R. F. and Vohs, K. D. (2016). Misguided effort with elusive implications. *Perspectives on Psychological Science*, 11(4):574–575.

Bertrams, A. and Dickhäuser, O. (2009). Messung dispositioneller Selbstkontroll-Kapazität: Eine deutsche Adaptation der Kurzform der Self-Control Scale (SCS-KD). *Diagnostica*, 55(1):2–10.

Beshears, J., Choi, J. J., Laibson, D., and Madrian, B. C. (2018). Behavioral household finance. In *Handbook of Behavioral Economics: Applications and Foundations 1*, volume 1, pages 177–276.

Biljanovska, N. and Palligkinis, S. (2018). Control thyself: Self-control failure and household wealth. *Journal of Banking & Finance*, 92:280–294.

Brown, S., Taylor, K., and Price, S. W. (2005). Debt and distress: Evaluating the psychological cost of credit. *Journal of Economic Psychology*, 26(5):642–663.

Burt, C. H., Simons, R. L., and Simons, L. G. (2006). A longitudinal test of the effects of parenting and the stability of self-control: Negative evidence for the general theory of crime. *Criminology*, 44(2):353–396.

Buyukcan-Tetik, A., Finkenauer, C., and Bleidorn, W. (2018). Within-person variations and between-person differences in self-control and wellbeing. *Personality and Individual Differences*, 122:72–78.

Carter, E. C., Kofler, L. M., Forster, D. E., and McCullough, M. E. (2015). A series of meta-analytic tests of the depletion effect: Self-control does not seem to rely on a limited resource. *Journal of Experimental Psychology: General*, 144(4):796.

Cobb-Clark, D. A., Dahmann, S., Kamhöfer, D., and Schildberg-Hörisch, H. (2019). Self-control: Determinants, life outcomes and intergenerational implications.

Creditreform Wirtschaftsforschung (2020). SchuldnerAtlas Deutschland 2020. Technical Report, Verband der Vereine Creditreform e.V., Neuss 2020.

Cunningham, M. R. and Baumeister, R. F. (2016). How to make nothing out of something: Analyses of the impact of study sampling and statistical interpretation in misleading meta-analytic conclusions. *Frontiers in Psychology*, 7:1639.

Debelle, G. (2004). Macroeconomic implications of rising household debt. *BIS Working Paper No. 153*. Available at SSRN: https://ssrn.com/abstract=786385 or http://dx.doi.org/10.2139/ssrn.786385.

Drentea, P. and Lavrakas, P. J. (2000). Over the limit: the association among health, race and debt. *Social Science & Medicine*, 50(4):517–529.

Ekici, T. and Dunn, L. (2010). Credit card debt and consumption: Evidence from household-level data. *Applied Economics*, 42(4):455–462.

Fischbacher, U. (2007). z-tree: Zurich toolbox for ready-made economic experiments. *Experimental Economics*, 10(2):171–178.

Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic Perspectives*, 19(4):25–42.

Gathergood, J. (2012). Self-control, financial literacy and consumer over-indebtedness. *Journal of Economic Psychology*, 33(3):590–602.

Gerhardt, H., Schildberg-Hörisch, H., and Willrodt, J. (2017). Does self-control depletion affect risk attitudes? *European Economic Review*, 100:463–487.

Greiner, B. (2015). Subject pool recruitment procedures: Organizing experiments with ORSEE. *Journal of the Economic Science Association*, 1(1):114–125.

Hagger, M. S., Wood, C., Stiff, C., and Chatzisarantis, N. L. (2010). Ego depletion and the strength model of self-control: A meta-analysis. *Psychological Bulletin*, 136(4):495–525.

Hay, C. and Forrest, W. (2006). The development of self-control: Examining self-control theory's stability thesis. *Criminology*, 44(4):739–774.

Institut für Finanzdienstleistungen (2020). iff Überschuldungsreport 2020. https://www.iff-hamburg.de/ueberschuldungsreport-ergebnisse/ [Online; accessed 30-November-2020].

Inzlicht, M. and Friese, M. (2019). The past, present, and future of ego depletion. *Social Psychology*, 50(5-6):370–378.

Kaiser, T. and Menkhoff, L. (2017). Does financial education impact financial literacy and financial behavior, and if so, when? *World Bank Economic Review*, 31(3):611–630.

Kocher, M. G., Martinsson, P., Myrseth, K. O. R., and Wollbrant, C. E. (2017). Strong, bold, and kind: Self-control and cooperation in social dilemmas. *Experimental Economics*, 20(1):44–69.

Liu, F., Yilmazer, T., Loibl, C., and Montalto, C. (2019). Professional financial advice, self-control and saving behavior. *International Journal of Consumer Studies*, 43(1):23–34.

Lusardi, A. and Mitchell, O. S. (2008). Planning and financial literacy: How do women fare? *American Economic Review*, 98(2):413–17.

Lusardi, A. and Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature*, 52(1):5–44.

Lusardi, A. and Tufano, P. (2015). Debt literacy, financial experiences, and overindebtedness. *Journal of Pension Economics & Finance*, 14(4):332–368.

Meier, S. and Sprenger, C. (2010). Present-biased preferences and credit card borrowing. *American Economic Journal: Applied Economics*, 2(1):193–210.

Meier, S. and Sprenger, C. D. (2015). Temporal stability of time preferences. *Review of Economics and Statistics*, 97(2):273–286.

Mian, A., Sufi, A., and Verner, E. (2017). Household debt and business cycles worldwide. *The Quarterly Journal of Economics*, 132(4):1755–1817.

Muraven, M. and Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin*, 126(2):247–259.

Sweet, E., Nandi, A., Adam, E. K., and McDade, T. W. (2013). The high price of debt: household financial debt and its impact on mental and physical health. *Social Science & Medicine*, 91:94–100.

Tangney, J. P., Baumeister, R. F., and Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality*, 72(2):271–324.

Turner, M. G. and Piquero, A. R. (2002). The stability of self-control. *Journal of Criminal Justice*, 30(6):457–471.

Urban Institute (2019). Debt in America: An interactive map. https://apps.urban.org/features/debt-interactive-map/?type=overall&variable=pct_debt_collections [Online; accessed 30-November-2020].

Van Rooij, M., Lusardi, A., and Alessie, R. (2011). Financial literacy and stock market participation. *Journal of Financial Economics*, 101(2):449–472.

Zinman, J. (2015). Household debt: facts, puzzles, theories, and policies. *Annual Review of Economics*, 7(1):251–276.

Table 1: Descriptives across Treatments

Variable	Full Sample (Mean)	Treatment (Mean)	Control (Mean)	Diff.	t-test (p-value)	N
Socio-economic						
Female	0.49	0.53	0.46	-0.07	0.233	280
Age	22.56	22.43	22.70	0.26	0.637	282
Bachelor degree or higher	0.31	0.31	0.31	0.00	0.968	283
Student	0.96	0.96	0.96	0.01	0.769	283
Working at least 10h/week	0.29	0.30	0.28	-0.01	0.823	283
Mthl. net income above 1000 €	0.18	0.20	0.16	-0.04	0.365	275
Financial literacy (std.)	0.00	-0.01	0.01	0.02	0.892	283
Financial characteristics						
Spontaneous buyer (1-5 scale)	2.67	2.78	2.57	-0.21	0.146	283
Ever in debt on overdraft	0.28	0.25	0.30	0.06	0.273	283
Currently in consumption debt	0.10	0.10	0.10	0.00	0.984	283
Previously in consumption debt	0.14	0.12	0.17	0.05	0.229	283
Always/often worried about finances	0.23	0.26	0.21	-0.05	0.277	283
Always/often stressed about money	0.34	0.38	0.30	-0.08	0.183	283
Experiment						
Exhaustion prior to experiment (1-10 scale)	4.89	4.80	4.98	0.18	0.503	283
Felt cold (1-5 scale)	2.52	2.59	2.45	-0.14	0.342	239
Knows earlier subject	0.18	0.19	0.18	-0.01	0.781	283
Lab experience above 5x	0.20	0.21	0.20	-0.01	0.792	283
Truthful survey information (1-5 scale)	4.64	4.59	4.68	0.09	0.241	283

Table 2: Manipulation Check across Treatments

Variable	Full Sample (Mean)	Treatment (Mean)	Control (Mean)	Diff.	t-test (p-value)
A Number of completed paragraphs					
Text exercise 1 (3min)	2.05	2.04	2.06	0.02	0.774
Text exercise 2 (10min)	4.13	2.14	6.12	3.97	0.000
Text exercise 3 (3min)	1.90	1.85	1.95	0.10	0.144
Text exercise 4 (10min)	3.73	1.91	5.56	3.65	0.000
Overall	11.80	7.93	15.68	7.75	0.000
Observations	232	116	116		
B Reported mental state					
Exhaustion Δ after R1 rel. start	0.80	0.73	0.86	0.13	0.548
Exhaustion Δ after R2 rel. start	1.24	1.30	1.18	-0.12	0.671
Concentr. difficulty Δ from task 1-2 in R1	1.70	2.63	0.76	-1.87	0.000
Concentr. difficulty Δ from task 1-2 in R2	2.02	2.82	1.21	-1.60	0.000
Number of correct CRT questions	1.72	1.72	1.73	0.01	0.929
C Motivation					
Easy puzzle chosen	0.47	0.51	0.42	-0.10	0.108
Observations	283	142	141		
Aggregate*					
Depletion Index after R1 (std.)	0.00	0.24	-0.24	-0.48	0.000
Depletion Index after R2 (std.)	0.00	0.21	-0.21	-0.41	0.000
Depletion Index overall (std.)	0.00	0.26	-0.26	-0.51	0.000
Observations	283	142	141		

Depletion Index
*The depletion index for round 1 consists in equal parts of the (1) standardized concentration difficulty change within round 1, (2) standardized exhaustion change within round 1 and (3) the standardized probability of the easy puzzle being chosen. For round 2, it consists in equal parts of the (4) standardized concentration difficulty change within round 2, (5) standardized exhaustion change within round 2 and (6) the standardized number of wrong questions in the CRT test. The overall depletion index includes all six components.
Note: After taking the average of the standardized components, the resulting values are standardized again to form the depletion index values.

Table 3: Comparing Outcomes across Treatments

Variable	Full Sample	Treatment	Control	t-test	Wilcoxon signed-rank test
	(Mean)	(Mean)	(Mean)	(p-value)	(p-value)
Debt taken (€)	0.30	0.34	0.25	0.216	0.181
Debt taken in R1 (€)	0.24	0.29	0.19	0.153	0.119
Debt taken in R2 (€)	0.16	0.18	0.14	0.451	0.430
Total interest paid (€)	0.04	0.05	0.04	0.190	0.185
Any drink (%)	0.22	0.25	0.18	0.205	0.205
Any drink in R1 (%)	0.16	0.19	0.13	0.152	0.151
Any drink in R2 (%)	0.08	0.08	0.07	0.671	0.670
Observations	283	142	141		

* Spending is in € including interest paid. Any drink refers to at least one drink purchased by participants and is set up as a dummy variable.

Table 4: Treatment Effect on Impulsive Buying

Dependent variable	In Round 1			In Round 2		
At least one drink purchased	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.0621	0.0548	0.0706	0.0138	0.0153	0.0240
	(0.0439)	(0.0454)	(0.0498)	(0.0323)	(0.0331)	(0.0387)
Manipulation check						
Depletion Index after R1 (std.)		0.0151	0.0160			
		(0.0231)	(0.0257)			
Depletion Index after R2 (std.)					-0.00346	-0.0122
					(0.0168)	(0.0211)
Socio-economic						
Female			-0.0420			-0.0220
			(0.0531)			(0.0415)
Age			0.00802			0.00620
			(0.00656)			(0.00513)
Bachelor degree or higher			0.0231			-0.00164
			(0.0606)			(0.0473)
Student			-0.299**			0.0825
			(0.146)			(0.114)
Working at least 10h/week			0.0306			0.0537
			(0.0582)			(0.0454)
Financial characteristics						
Mthl. net income above 1000 €			0.0612			0.00108
			(0.0697)			(0.0546)
Financial literacy (std.)			-0.0585**			-0.00244
			(0.0275)			(0.0220)
Spontaneous buyer (1-5 scale)			-0.0142			0.00217
			(0.0210)			(0.0165)
Ever in debt on overdraft			-0.0638			0.00888
			(0.0573)			(0.0449)
Currently in consumption debt			-0.197*			0.00597
			(0.102)			(0.0800)
Previously in consumption debt			0.129			-0.0753
			(0.0871)			(0.0682)
Always/often worried about finances			-0.0405			-0.0418
			(0.0706)			(0.0557)
Always/often stressed about money			-0.0564			-0.0750
			(0.0650)			(0.0513)
Experiment						
Felt cold (1-5 scale)			0.0134			0.00289
			(0.0234)			(0.0183)
Knows earlier subject			0.0471			0.124**
			(0.0622)			(0.0493)
Lab Experience above 5x			-0.120*			-0.0417
			(0.0638)			(0.0499)
Constant	0.177**	0.182**	0.181	0.0764	0.0752	0.503**
	(0.0785)	(0.0789)	(0.321)	(0.0577)	(0.0581)	(0.252)
Observations	283	283	236	283	283	236
R-squared	0.027	0.028	0.146	0.021	0.021	0.146

[*] Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS Regression Results with Session Fixed Effects.

Table 5: Treatment Effect on Impulsive Buying by Financial Literacy

Dependent variable	In Round 1			In Round 2		
At least one drink purchased	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	-0.0292	-0.0325	-0.0476	-0.0469	-0.0448	-0.0311
	(0.0614)	(0.0624)	(0.0685)	(0.0457)	(0.0463)	(0.0535)
Below median FL	0.0136	0.0120	-0.0367	-0.0574	-0.0548	-0.0237
	(0.0623)	(0.0626)	(0.0703)	(0.0464)	(0.0473)	(0.0557)
Treatment*Below median FL	0.195**	0.194**	0.234**	0.122*	0.123*	0.121
	(0.0873)	(0.0875)	(0.0978)	(0.0650)	(0.0651)	(0.0766)
Manipulation check						
Depletion Index after R1 (std.)		0.00709	0.0199			
		(0.0229)	(0.0254)			
Depletion Index after R2 (std.)					-0.00517	-0.0159
					(0.0175)	(0.0209)
Socio-economic						
Female			-0.0423			-0.0307
			(0.0528)			(0.0413)
Age			0.00816			0.00738
			(0.00652)			(0.00509)
Bachelor degree or higher			0.0134			-0.0107
			(0.0605)			(0.0472)
Student			-0.321**			0.0950
			(0.143)			(0.112)
Working at least 10h/week			0.0321			0.0508
			(0.0578)			(0.0451)
Financial characteristics						
Mthl. net income above 1000 €			0.0474			-0.00683
			(0.0696)			(0.0546)
Spontaneous buyer (1-5 scale)			-0.0156			0.000813
			(0.0210)			(0.0165)
Ever in debt on overdraft			-0.0601			0.00592
			(0.0570)			(0.0446)
Currently in consumption debt			-0.191*			-0.00422
			(0.101)			(0.0792)
Previously in consumption debt			0.114			-0.0808
			(0.0877)			(0.0688)
Always/often worried about finances			-0.0525			-0.0509
			(0.0705)			(0.0557)
Always/often stressed about money			-0.0284			-0.0699
			(0.0643)			(0.0506)
Experiment						
Felt cold during experiment (1-5 scale)			0.0149			0.00389
			(0.0234)			(0.0183)
Knows earlier subject			0.0449			0.120**
			(0.0619)			(0.0491)
Lab Experience above 5x			-0.129**			-0.0482
			(0.0636)			(0.0498)
Constant	0.151*	0.154*	0.164	0.0972	0.0938	0.466*
	(0.0829)	(0.0835)	(0.320)	(0.0617)	(0.0628)	(0.250)
Observations	283	283	236	283	283	236
R-squared	0.066	0.066	0.159	0.034	0.034	0.159

[*] Below median financially literate participants are those with a standardized financial literacy (FL) score below the median, see Appendix IV.5. These are 49.82% of the full sample, or 141 participants. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS Regression Results with Session Fixed Effects.

Table 6: Debt-taking and the Self-Control Scale (std.) in the GSOEP Data

Variable	(1) Household consumption debt Dummy			(2) Personal consumption debt Dummy			(3) Other debt excl. mortgages Dummy		
Average SCS (std.)	-0.07***	-0.06	-0.00	-0.01	-0.02	0.01	-0.01**	-0.05***	-0.03*
	(0.013)	(0.037)	(0.041)	(0.012)	(0.035)	(0.038)	(0.006)	(0.017)	(0.018)
FL sum		-0.00	-0.00		-0.01*	-0.02**		0.00	0.00
		(0.008)	(0.010)		(0.008)	(0.009)		(0.004)	(0.004)
Interaction Average SCS (std.)*FL sum		-0.00	-0.01		0.00	-0.00		0.01**	0.01*
		(0.008)	(0.009)		(0.008)	(0.008)		(0.004)	(0.004)
Female			-0.01			-0.04*			0.01
			(0.028)			(0.026)			(0.013)
Age			0.02***			0.01**			-0.01**
			(0.005)			(0.005)			(0.002)
Age squared			-0.00***			-0.00***			0.00
			(0.000)			(0.000)			(0.000)
Education			-0.04**			0.01			0.02**
			(0.021)			(0.020)			(0.010)
Net monthly HH income			0.00			-0.00			-0.00**
			(0.000)			(0.000)			(0.000)
Constant	0.18***	0.19***	-0.12	0.14***	0.20***	0.11	0.03***	0.02	0.18***
	(0.013)	(0.038)	(0.128)	(0.012)	(0.036)	(0.129)	(0.006)	(0.018)	(0.062)
Interaction	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes	No	No	Yes
Observations	849	849	769	786	786	713	787	787	714
R-squared	0.030	0.030	0.066	0.001	0.005	0.058	0.006	0.014	0.048

OLS regression results based on the GSOEP-IS wave data from 2016, 2017 and 2018. FL sum refers to the number of correctly answered financial literacy questions. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Over-Borrowing and the Self-Control Scale (std.) in the GSOEP data

Variable	(1) Unable to repay consumption debt without problems *Dummy*			(2) Unable to pay all debt on time *Dummy*		
Average SCS (std.)	-0.05***	-0.18***	-0.13*	-0.01***	-0.01	-0.01
	(0.020)	(0.068)	(0.076)	(0.005)	(0.013)	(0.014)
FL sum		-0.05***	-0.05***		-0.00	-0.00
		(0.013)	(0.015)		(0.003)	(0.004)
Interaction Average SCS (std.)*FL sum		0.03*	0.02		-0.00	0.00
		(0.014)	(0.015)		(0.003)	(0.003)
Female			0.02			-0.03**
			(0.038)			(0.011)
Age			-0.00			-0.00
			(0.009)			(0.002)
Age squared			0.00			-0.00
			(0.000)			(0.000)
Education			-0.04			0.00
			(0.033)			(0.009)
Net monthly HH income			0.00			-0.00**
			(0.000)			(0.000)
Constant	0.10***	0.35***	0.52**	0.01***	0.02	0.09*
	(0.019)	(0.063)	(0.234)	(0.005)	(0.014)	(0.052)
Interaction	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes
Observations	249	249	240	594	594	542
R-squared	0.030	0.115	0.116	0.013	0.013	0.039

OLS regression results based on the GSOEP-IS wave data from 2016, 2017 and 2018. Here, for sub-sample conditional on the presence of consumption debt (column 1) and any debt (column 2). Both include repayment rates and interest rates. In column 2, the ability to pay all debt on time is measured as able to repay all obligations in the past year without any delay. Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
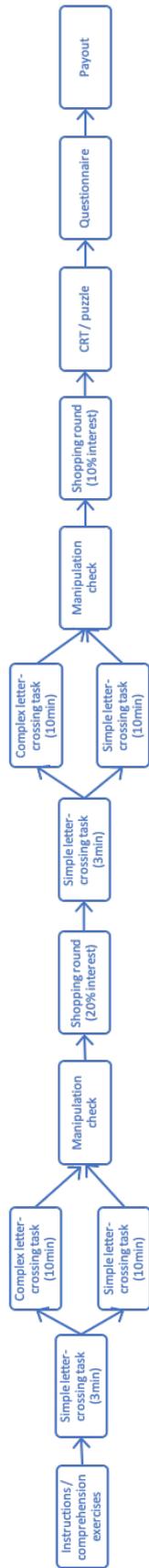
Figure 1: Experimental flow

Appendix for "The Effect of Self-Control on Borrowing: Experimental Evidence"

Contents:

I. The German Socio-Economic Panel

I.1. Sample Description and Summary Statistics

Table I.I provides information about the main socio-demographic characteristics of selected waves from the German Socio-Economic Panel (SOEP) Innovation Sample (IS). The GSOEP is one of the largest and longest-running multidisciplinary household surveys worldwide and an independent research-driven infrastructure. Data from the GSOEP surveys are made available to researchers worldwide. More information about the GSOEP can be found here.

In Table I.I, we present data from the GSOEP-IS waves 2016, 2017 and 2018. The sample consists of 51% female and 49% male respondents. Their age ranges from 17 to 96 years. 57% of respondents are married. In terms of education, the average respondent has upper secondary education and completed a vocational degree. The sample has a moderate financial literacy and an average monthly net household income of 2,946 €. The respondents differ with respect to their work situation (32% work full-time, 20 % work part-time and are 46% economically inactive).

Table I.I: GSOEP-IS Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max	N
Socio-demographics					
Female	0.51	0.50	0	1	901
Age	53.80	18.13	17	96	901
Married (share)	0.57	0.50	0	1	898
Education	1.99	0.71	0	3	864
Financial literacy	4.34	1.59	0	6	901
General health status (1-5 scale)	2.52	0.98	1	5	901
Overall life satisfaction (0-10 scale)	7.71	1.74	0	10	901
Income and Employment					
Monthly net household income (in €)	2,945.83	1,660.74	300	10,000	853
Fulltime worker (share)	0.32	0.47	0	1	901
Parttime worker (share)	0.20	0.40	0	1	901
Not working (share)	0.46	0.50	0	1	901
Saving Behavior and Assets					
No ability to save regularly (share)	0.35	0.48	0	1	893
Regular saving for wealth accumulation (share)	0.31	0.46	0	1	901
Regular precautionary saving (share)	0.55	0.50	0	1	901
Monthly saving for wealth accumulation (in €)	140.43	385.59	0	4000	895
Monthly precautionary saving (in €)	228.76	421.07	0	4000	892
Assets (share)	0.59	0.49	0	1	892
Borrowing Behavior					
Current household consumption debt (share)	0.17	0.38	0	1	898
Current personal consumption debt (share)	0.13	0.34	0	1	832
Other personal loans excl. mortgages (share)	0.03	0.17	0	1	833
Able to repay consumption debt without problems	0.89	0.31	0	1	257
Unable to repay debt on time (1-3 scale)	1.03	0.21	1	3	624

Note: The table provides summary statistics for the SOEP-IS waves 2016, 2017 and 2018. Variables refer to individual characteristics unless specified otherwise. Education is an ordinal variable containing the highest achieved educational degree from 0 (no or basic educational degree), 1 (middle or upper secondary education), 2 (vocational degree) to 3 (university degree). Financial literacy is measured by the number of correctly answered questions out of 6. Both general health status and life satisfaction are self-assessed. Assets refers to the presence of personal saving accounts and/or life insurance, stocks, bonds or mutual funds. Being unable to meet debt obligations on time includes the repayment for all loans, mortgages and leasing in the past year. It is measured with 3 responses: 1 being all debt obligations were met on time, 2 being one obligation was late or was not met, 3 being more than one obligation being late or not met. The last two variables are conditional on debt obligations.

Table I.II: Self-control Scale (SCS)

Variable	Mean	Std. Dev.	Min	Q25	Q50	Q75	Max	N
Average SCS score	3.60	0.585	1.77	3.23	3.62	4	5	893

Note: The table provides summary statistics for the self-control scale (SCS) module deployed in the SOEP-IS 2018 survey. Respondents rated their self-perceived trait, measured via the 13-item-scale identical to the experimental version presented in IV.6. The responses are measured on a Likert scale from 1 to 5, where 1 indicates 'Completely disagree' and 5 indicates 'Completely agree'. The 13 responses are first recoded to be increasing in the ability for self-control and second are equally weighed to calculate the average score.

Figure I.I: Histogram of Average SCS Score
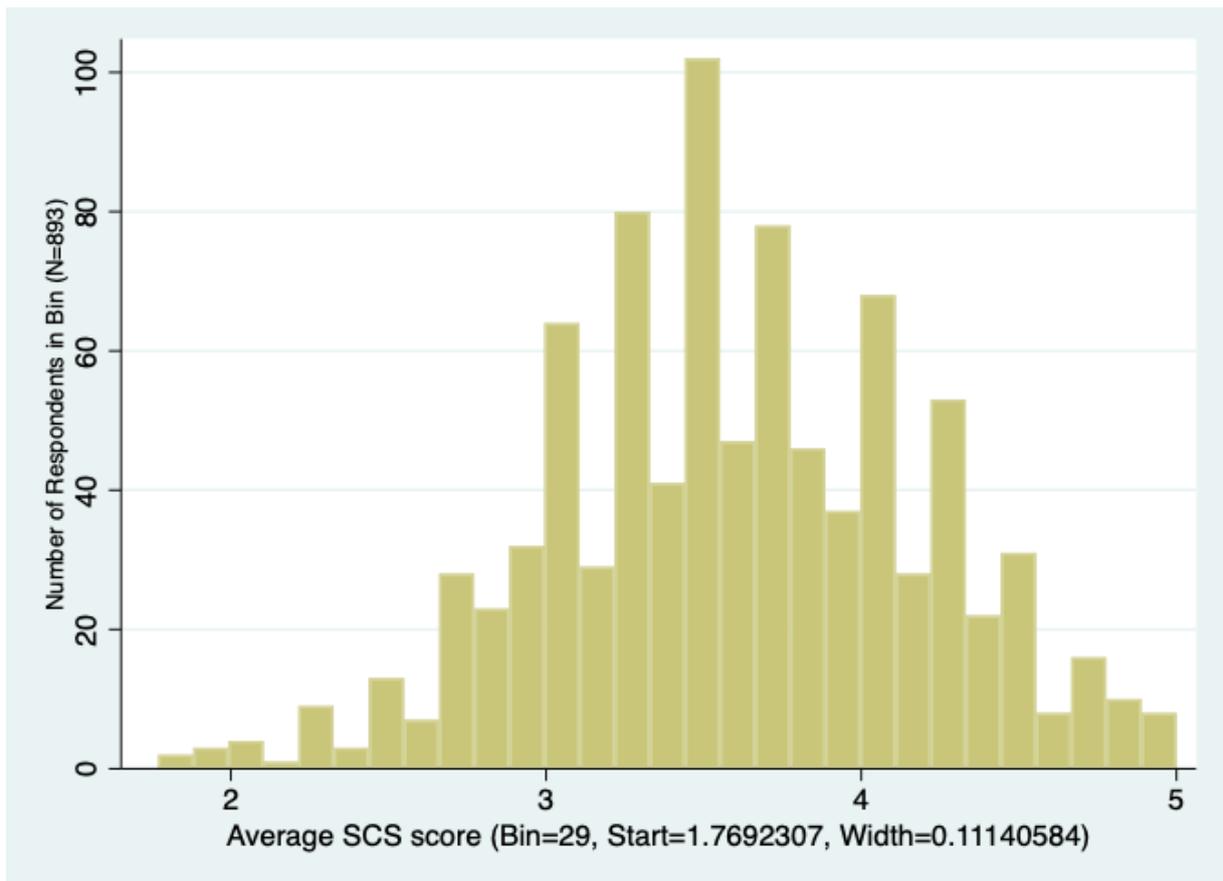
Figure I.II: Distribution of responses to first item in SCS

I am good at resisting temptation.

Response	Percent
1	4.7
2	11.5
3	35.8
4	28.4
5	19.5

Percent of Respondents (N=893)
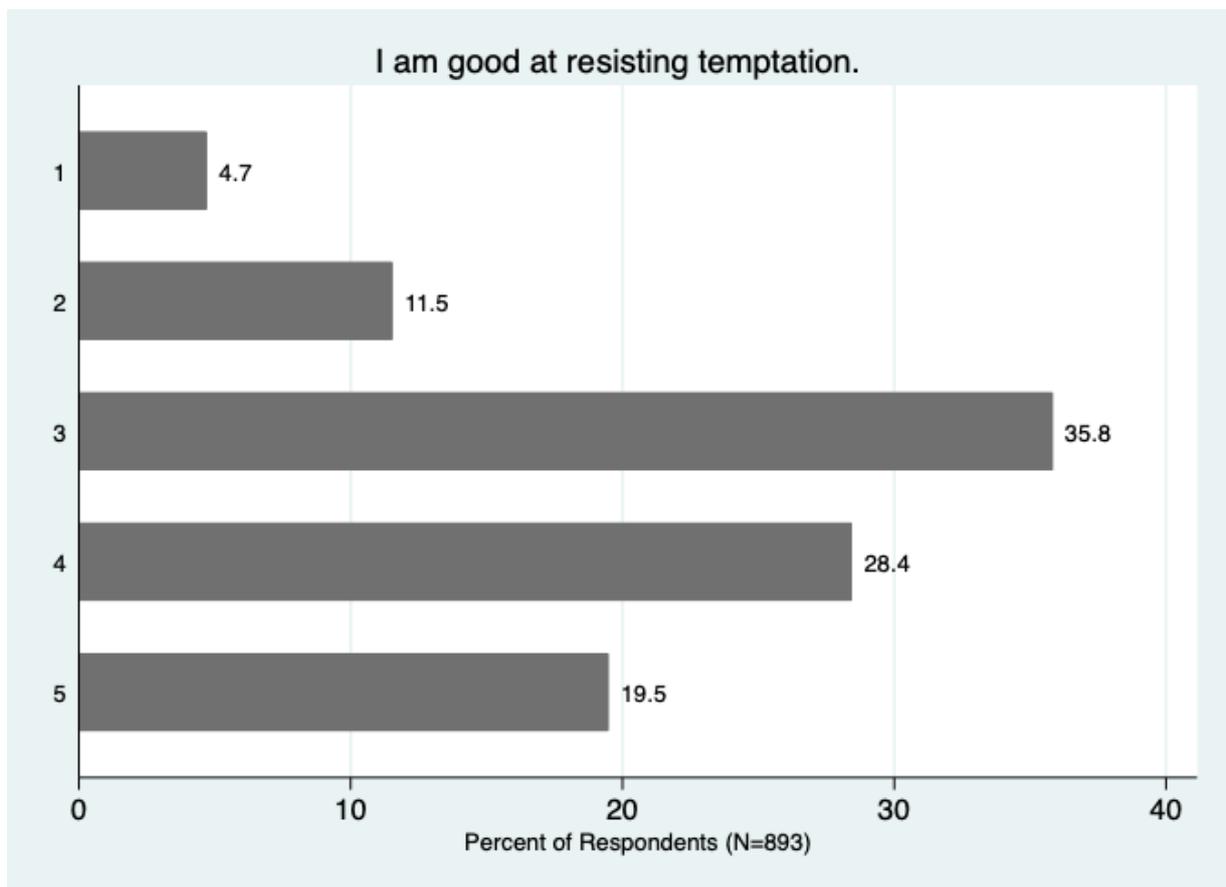
Note: The responses are measured on a Likert scale from 1 to 5, where 1 indicates 'Completely disagree' and 5 indicates 'Completely agree'. See full list of items in Appendix IV.6.

Table I.III: Average SCS Score by Attribute

Attribute	Mean SCS Score	t-test (p-value)	N
Gender			
Female	3.61	0.661	457
Male	3.59	0.661	436
Age			
≤ 35	3.35	0.000	172
36 - 45	3.53	0.124	132
> 45	3.69	0.000	589
Education			
None, basic, middle or upper secondary degree	3.43	0.001	109
Tertiary degree	3.64	0.001	747
Financial Literacy			
< 6 correct answers	3.61	0.536	625
$= 6$	3.58	0.536	268
Household net income			
$< 2950€$	3.46	0.002	325
$\geq 2950€$	3.59	0.002	358
Health			
Bad health rating	3.55	0.015	402
High health rating	3.64	0.015	491
Overall life satisfaction			
Life satisfaction < 8	3.44	0.000	306
Life satisfaction ≥ 8	3.68	0.000	587

Note: The table depicts descriptive results based on the 901 respondents in the SOEP-IS survey, both 2017 and 2018 responses. For each attribute, the mean score in the self-control scale (SCS) is displayed. This scale is measured on a Likert scale from 1 to 5, where 1 indicates 'Does not apply at all' and 5 indicates 'Fully applies'. The p-value of the t-test indicates the statistical significance of the difference in average SCS score compared to the other dummy variable outcome(s) in its group (e.g. male vs. female). Tertiary education refers to any vocational or university degree. The household income attribute is only compared for the sub-sample of those aged ≤ 68. It is compared along this group's median monthly household income equal to 2950€. High health rating refers to health self-perceived as good or very good, respectively bad health rating refers to self-perceived health rated as only sufficient, less than sufficient or bad. Overall life satisfaction is rated on a Likert scale from 0 to 10.

Table I.IV: OLS for Saving Behavior by SCS (std.) with Controls

Variable	(1) No ability to save Dummy	(2) Regular wealth saving Dummy	(3) Regular precautionary saving Dummy	(4) Monthly wealth saving In €	(5) Monthly precautionary saving In €
Average SCS (std.)	-0.13***	-0.00	0.10**	-24.99	-3.33
	(0.046)	(0.047)	(0.050)	(40.127)	(40.782)
FL sum	-0.04***	0.03***	0.02*	-1.89	3.40
	(0.011)	(0.011)	(0.011)	(9.287)	(9.426)
Average SCS (std.)*FL sum	0.02**	0.00	-0.02*	6.48	-0.03
	(0.010)	(0.010)	(0.011)	(8.604)	(8.746)
Female	-0.02	0.01	0.06*	-21.97	8.26
	(0.032)	(0.032)	(0.034)	(27.238)	(27.701)
Age	0.01**	0.00	-0.02***	-2.32	-2.08
	(0.005)	(0.006)	(0.006)	(4.764)	(4.844)
Age squared	-0.00**	-0.00	0.00***	0.01	0.05
	(0.000)	(0.000)	(0.000)	(0.044)	(0.045)
Education	-0.06***	0.03	0.09***	24.39	40.37**
	(0.023)	(0.023)	(0.025)	(19.949)	(20.304)
Net monthly HH income	-0.00***	0.00***	0.00***	0.10***	0.13***
	(0.000)	(0.000)	(0.000)	(0.009)	(0.009)
Constant	0.60***	-0.09	0.48***	-86.21	-298.11**
	(0.145)	(0.147)	(0.154)	(125.884)	(128.004)
Observations	767	772	772	766	767
R-squared	0.189	0.153	0.161	0.190	0.267

OLS regression results. Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

I.2. Self-Control Scale and Saving Behavior

II. Additional Results from Experiment

Table II.I: Summary Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Socio-economic					
Female	0.49	0.501	0	1	280
Age	22.56	4.657	16	54	282
Bachelor degree or higher	0.31	0.464	0	1	283
Student	0.96	0.194	0	1	283
Working at least 10h/week	0.29	0.454	0	1	283
Financial characteristics					
Mthl. net income above 1000 €	0.18	0.386	0	1	275
Financial literacy (std.)	0.00	1.000	-2.76	1.14	283
Spontaneous buyer	2.67	1.238	1	5	283
Ever in debt on overdraft	0.28	0.448	0	1	283
Currently in consumption debt	0.10	0.299	0	1	283
Previously in consumption debt	0.14	0.353	0	1	283
Always/often worried about finances	0.23	0.424	0	1	283
Always/often stressed about money	0.34	0.475	0	1	283
Experiment					
Exhaustion prior to experiment	4.89	2.202	1	10	283
Felt cold during experiment	2.52	1.118	1	5	239
Knows earlier subject	0.18	0.388	0	1	283
Lab Experience above 5x	0.20	0.404	0	1	283
Truthful survey information	4.64	0.640	1	5	283

Table II.II: Manipulation Check across Treatments excluding Pilot

Variable	Treatment (Mean)	Control (Mean)	t-test (p-value)
Exhaustion Δ after round 1 rel. start	0.79	0.85	0.765
Exhaustion Δ after round 2 rel. start	1.26	1.31	0.881
Concentration difficulty Δ from task 1-2 in round 1	2.78	0.78	0.000
Concentration difficulty Δ from task 1-2 in round 2	2.96	1.22	0.000
Easy puzzle chosen	0.50	0.44	0.327
Number of correct CRT questions	1.69	1.66	0.806
Observations	118	117	

Table II.III: Treatment Effect on Borrowing

Dependent variable	In Round 1			In Round 2		
Borrowed amount (€)	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.0975	0.0900	0.122	0.0464	0.0457	0.0597
	(0.0689)	(0.0712)	(0.0804)	(0.0603)	(0.0618)	(0.0685)
Manipulation check						
Depletion Index after R1 (std.)		0.0156	0.00540			
		(0.0362)	(0.0415)			
Depletion Index after R2 (std.)					0.00170	-0.0435
					(0.0314)	(0.0374)
Socio-economic						
Female			-0.0872			-0.0437
			(0.0857)			(0.0736)
Age			0.0162			0.0140
			(0.0106)			(0.00909)
Bachelor degree or higher			0.0139			-0.0347
			(0.0978)			(0.0838)
Student			-0.315			0.132
			(0.235)			(0.202)
Working at least 10h/week			0.0817			0.111
			(0.0939)			(0.0804)
Financial characteristics						
Mthl. net income above 1000 €			0.0584			-0.0199
			(0.112)			(0.0968)
Financial literacy (std.)			-0.111**			-0.0407
			(0.0445)			(0.0390)
Spontaneous buyer (1-5 scale)			-0.00396			0.0133
			(0.0339)			(0.0293)
Ever in debt on overdraft			-0.125			-0.0387
			(0.0924)			(0.0795)
Currently in consumption debt			-0.274*			-0.0367
			(0.165)			(0.142)
Previously in consumption debt			0.114			-0.133
			(0.141)			(0.121)
Always/often worried about finances			-0.0620			-0.0592
			(0.114)			(0.0988)
Always/often stressed about money			-0.116			-0.111
			(0.105)			(0.0909)
Experiment						
Felt cold during experiment (1-5 scale)			0.0279			0.0108
			(0.0377)			(0.0325)
Knows earlier subject			0.164			0.265***
			(0.100)			(0.0873)
Lab Experience above 5x			-0.177*			-0.102
			(0.103)			(0.0885)
Constant	0.323***	0.327***	0.775	0.348***	0.349***	0.390
	(0.123)	(0.124)	(0.518)	(0.108)	(0.108)	(0.446)
Observations	283	283	236	283	283	236
R-squared	0.026	0.027	0.136	0.043	0.043	0.133

[*] Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS Regression Results with Session Fixed Effects.

Table II.IV: Treatment Effect on Paid Interest

Dependent variable **Interest paid overall (€)**	(1)	(2)	(3)
Treatment	0.0136	0.0119	0.0184
	(0.0105)	(0.0109)	(0.0122)
Manipulation check			
Depletion Index overall (std.)		0.00330	0.000494
		(0.00555)	(0.00645)
Socio-economic			
Female			-0.0138
			(0.0129)
Age			0.00197
			(0.00159)
Bachelor degree or higher			0.00799
			(0.0147)
Student			-0.0496
			(0.0355)
Working at least 10h/week			0.0107
			(0.0141)
Financial characteristics			
Mthl. net income above 1000 €			0.0150
			(0.0170)
Financial literacy (std.)			-0.0140**
			(0.00682)
Spontaneous buyer (1-5 scale)			-0.00357
			(0.00515)
Ever in debt on overdraft			-0.0113
			(0.0139)
Currently in consumption debt			-0.0392
			(0.0249)
Previously in consumption debt			0.0168
			(0.0212)
Always/often worried about finances			-0.0128
			(0.0173)
Always/often stressed about money			-0.0217
			(0.0159)
Experiment			
Felt cold (1-5 scale)			0.00438
			(0.00569)
Knows earlier subject			0.0218
			(0.0152)
Lab Experience above 5x			-0.0311**
			(0.0155)
Constant	0.0482**	0.0494***	0.0902
	(0.0188)	(0.0189)	(0.0782)
Observations	283	283	236
R-squared	0.019	0.021	0.132

[*] Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS Regression Results with Session Fixed Effects.

Table II.V: Treatment Effect on Borrowing by Financial Literacy excluding Pilot

Dependent variable	In Round 1			In Round 2		
At least one drink purchased	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	-0.0448	-0.0496	-0.0461	-0.0430	-0.0403	-0.0403
	(0.0675)	(0.0683)	(0.0691)	(0.0512)	(0.0517)	(0.0529)
Below median FL	-0.0435	-0.0451	-0.0349	-0.0552	-0.0518	-0.0348
	(0.0688)	(0.0690)	(0.0709)	(0.0522)	(0.0529)	(0.0551)
Treatment*Below median FL	0.216**	0.212**	0.234**	0.102	0.103	0.126*
	(0.0959)	(0.0963)	(0.0982)	(0.0728)	(0.0730)	(0.0755)
Manipulation check						
Depletion Index after R1 (std.)		0.0129	0.0204			
		(0.0249)	(0.0256)			
Depletion Index after R2 (std.)					-0.00806	-0.0137
					(0.0196)	(0.0206)
Socio-economic						
Female			-0.0425			-0.0300
			(0.0531)			(0.0407)
Age			0.00813			0.00648
			(0.00656)			(0.00503)
Bachelor degree or higher			0.0118			-0.0155
			(0.0611)			(0.0467)
Student			-0.320**			0.0774
			(0.144)			(0.111)
Working at least 10h/week			0.0313			0.0512
			(0.0582)			(0.0445)
Financial characteristics						
Mthl. net income above 1000 €			0.0505			-0.0160
			(0.0707)			(0.0543)
Spontaneous buyer (1-5 scale)			-0.0152			-0.00208
			(0.0212)			(0.0163)
Ever in debt on overdraft			-0.0602			0.00806
			(0.0572)			(0.0440)
Currently in consumption debt			-0.192*			-0.00682
			(0.102)			(0.0782)
Previously in consumption debt			0.115			-0.0760
			(0.0882)			(0.0679)
Always/often worried about finances			-0.0525			-0.0634
			(0.0710)			(0.0551)
Always/often stressed about money			-0.0289			-0.0442
			(0.0656)			(0.0507)
Experiment						
Felt cold during experiment (1-5 scale)			0.0152			0.00317
			(0.0235)			(0.0181)
Knows earlier subject			0.0449			0.117**
			(0.0622)			(0.0484)
Lab Experience above 5x			-0.129**			-0.0670
			(0.0645)			(0.0496)
Constant	0.194**	0.205**	0.368	0.129*	0.124*	-0.0865
	(0.0949)	(0.0970)	(0.253)	(0.0720)	(0.0731)	(0.194)
Observations	235	235	232	235	235	232
R-squared	0.056	0.057	0.157	0.030	0.031	0.112

[*] Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. OLS Regression Results with Session Fixed Effects.

Table II.VI: Treatment Effect on Borrowing by Financial Literacy

Dependent variable	In Round 1			In Round 2		
Borrowed amount (€)	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	-0.0662	-0.0668	-0.0768	-0.0693	-0.0617	-0.0720
	(0.0957)	(0.0974)	(0.110)	(0.0847)	(0.0857)	(0.0942)
Below median FL	0.0210	0.0207	-0.0132	0.00219	0.0119	-0.0116
	(0.0971)	(0.0977)	(0.113)	(0.0859)	(0.0876)	(0.0980)
Treatment*Below median FL	0.349**	0.349**	0.400**	0.245**	0.247**	0.283**
	(0.136)	(0.136)	(0.157)	(0.120)	(0.121)	(0.135)
Manipulation check						
Depletion Index after R1 (std.)		0.00123	0.0115			
		(0.0357)	(0.0408)			
Depletion Index after R2 (std.)					-0.0191	-0.0483
					(0.0323)	(0.0367)
Socio-economic						
Female			-0.0920			-0.0592
			(0.0849)			(0.0726)
Age			0.0168			0.0160*
			(0.0105)			(0.00895)
Bachelor degree or higher			-0.00509			-0.0534
			(0.0973)			(0.0830)
Student			-0.353			0.138
			(0.231)			(0.198)
Working at least 10h/week			0.0855			0.109
			(0.0930)			(0.0793)
Financial characteristics						
Mthl. net income above 1000 €			0.0346			-0.0375
			(0.112)			(0.0960)
Spontaneous buyer (1-5 scale)			-0.00797			0.00963
			(0.0337)			(0.0290)
Ever in debt on overdraft			-0.122			-0.0434
			(0.0916)			(0.0785)
Currently in consumption debt			-0.264			-0.0495
			(0.163)			(0.139)
Previously in consumption debt			0.0752			-0.158
			(0.141)			(0.121)
Always/often worried about finances			-0.0839			-0.0788
			(0.113)			(0.0980)
Always/often stressed about money			-0.0656			-0.0880
			(0.103)			(0.0890)
Experiment						
Felt cold during experiment (1-5 scale)			0.0291			0.0120
			(0.0376)			(0.0322)
Knows earlier subject			0.159			0.258***
			(0.0995)			(0.0863)
Lab Experience above 5x			-0.193*			-0.116
			(0.102)			(0.0876)
Constant	0.277**	0.278**	0.733	0.323***	0.311***	0.319
	(0.129)	(0.130)	(0.514)	(0.114)	(0.116)	(0.441)
Observations	283	283	236	283	283	236
R-squared	0.076	0.076	0.155	0.072	0.073	0.158

[*] Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS Regression Results with Session Fixed Effects.

Table II.VII: Treatment Effect on Impulsive Buying by SCS and Past Borrowing

	In Round 1				In Round 2			
	Self-control scale (std.)		Current/past consumption debt		Self-control scale (std.)		Current/past consumption debt	
Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
At least one drink purchased	Below median	Above median	No	Yes	Below median	Above median	No	Yes
Treatment	0.106	0.0645	0.0682	-0.0664	0.0113	0.0114	0.0161	0.00876
	(0.0675)	(0.0881)	(0.0539)	(0.228)	(0.0592)	(0.0590)	(0.0452)	(0.102)
Manipulation check								
Depletion Index after R1 (std.)	0.0294	-0.00887	0.00571	0.0613				
	(0.0335)	(0.0453)	(0.0278)	(0.0943)				
Depletion Index after R2 (std.)					-0.0163	-0.0269	-0.0252	0.0586
					(0.0322)	(0.0310)	(0.0247)	(0.0385)
Socio-economic								
Female	0.00715	-0.0996	-0.0414	-0.361	-0.0265	-0.0355	-0.0198	-0.0505
	(0.0706)	(0.0911)	(0.0579)	(0.257)	(0.0594)	(0.0635)	(0.0483)	(0.110)
Age	0.0140	0.00672	0.00953	0.0406	-0.00149	0.0118	0.00848	-0.0124
	(0.00980)	(0.0116)	(0.00759)	(0.0280)	(0.00829)	(0.00812)	(0.00630)	(0.0124)
Bachelor degree or higher	0.0812	0.0386	-0.0157	-0.204	0.0378	-0.0440	-0.0286	0.0986
	(0.0939)	(0.103)	(0.0692)	(0.264)	(0.0784)	(0.0715)	(0.0574)	(0.115)
Student	0.114	-0.610***	-0.423***	1.267*	0.166	-0.0428	0.115	-0.251
	(0.245)	(0.221)	(0.160)	(0.653)	(0.208)	(0.154)	(0.134)	(0.276)
Working at least 10h/week	0.134	-0.0820	0.0604	0.0250	0.137*	0.00277	0.0595	0.0359
	(0.0893)	(0.0893)	(0.0651)	(0.227)	(0.0750)	(0.0618)	(0.0542)	(0.0955)
Financial characteristics								
Mthl. net income above 1000 €	-0.0378	0.101	0.0445	0.298	-0.0158	-0.0260	0.0107	-0.245**
	(0.0974)	(0.119)	(0.0783)	(0.250)	(0.0822)	(0.0828)	(0.0654)	(0.107)
Financial literacy (std.)	-0.0758*	-0.0324	-0.0591*	-0.210	-0.0358	0.0679*	-0.0153	0.0539
	(0.0386)	(0.0514)	(0.0303)	(0.146)	(0.0344)	(0.0363)	(0.0262)	(0.0597)
Spontaneous buyer (1-5 scale)	-0.0300	0.0182	-0.00456	0.0588	-0.0389	0.0439*	-0.00219	-0.0462
	(0.0305)	(0.0365)	(0.0231)	(0.0928)	(0.0259)	(0.0249)	(0.0192)	(0.0409)
Ever in debt on overdraft	-0.0499	-0.0854	-0.0507	-0.862**	-0.0717	0.0493	0.00429	0.224
	(0.0740)	(0.105)	(0.0634)	(0.355)	(0.0623)	(0.0732)	(0.0530)	(0.152)
Currently in consumption debt	-0.231	-0.257		-0.430*	-0.138	0.0203		0.122
	(0.150)	(0.176)		(0.213)	(0.128)	(0.125)		(0.0942)
Previously in consumption debt	0.225*	0.163		0.232	-0.0371	-0.0398		0.115
	(0.131)	(0.150)		(0.334)	(0.112)	(0.106)		(0.144)
Always/often worried about finances	-0.0152	-0.0846	-0.0553	0.0807	0.0274	-0.0941	-0.0221	-0.00696
	(0.0947)	(0.124)	(0.0854)	(0.263)	(0.0797)	(0.0876)	(0.0723)	(0.112)
Always/often stressed about money	-0.0812	0.0252	-0.0468	-0.482	-0.118	0.0195	-0.116*	0.276*
	(0.0887)	(0.116)	(0.0767)	(0.302)	(0.0747)	(0.0813)	(0.0646)	(0.126)
Experiment								
Felt cold during experiment (1-5 scale)	-0.00254	0.0295	0.0160	-0.00497	0.0300	-0.0168	0.00590	-0.0323
	(0.0314)	(0.0385)	(0.0261)	(0.0816)	(0.0266)	(0.0265)	(0.0217)	(0.0350)
Knows earlier subject	0.0260	0.104	0.0915	-0.0880	-0.00178	0.181**	0.130**	0.0620
	(0.0823)	(0.106)	(0.0702)	(0.205)	(0.0693)	(0.0763)	(0.0589)	(0.0925)
Lab Experience above 5x	-0.110	-0.0622	-0.127*	-0.599*	-0.00406	0.000156	-0.0285	0.261*
	(0.0880)	(0.112)	(0.0699)	(0.313)	(0.0742)	(0.0779)	(0.0584)	(0.133)
Constant	-0.312	0.278	0.269	-1.583	0.362	0.895**	0.431	0.599
	(0.463)	(0.590)	(0.344)	(1.350)	(0.396)	(0.410)	(0.288)	(0.578)
Observations	118	118	198	38	118	118	198	38
R-squared	0.272	0.194	0.154	0.733	0.263	0.301	0.163	0.716

* Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS Regression Results with Session Fixed Effects. The median is excluded from the analysis.

Table II.VIII: Treatment Effect on Borrowing by SCS and Past Borrowing

	In Round 1				In Round 2			
	Self-control scale (std.)		Current/past consumption debt		Self-control scale (std.)		Current/past consumption debt	
Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Borrowed amount (€)	Below median	Above median	No	Yes	Below median	Above median	No	Yes
Treatment	0.188	0.0938	0.117	-0.0915	0.0919	0.0234	0.0543	0.00964
	(0.123)	(0.126)	(0.0899)	(0.268)	(0.121)	(0.0851)	(0.0815)	(0.112)
Manipulation check								
Depletion Index after R1 (std.)	0.00798	-0.0204	-0.0105	0.0760				
	(0.0612)	(0.0647)	(0.0463)	(0.111)				
Depletion Index after R2 (std.)					-0.0659	-0.0562	-0.0623	0.0645
					(0.0660)	(0.0447)	(0.0446)	(0.0423)
Socio-economic								
Female	-0.0180	-0.154	-0.0874	-0.488	-0.0411	-0.0602	-0.0381	-0.0555
	(0.129)	(0.130)	(0.0965)	(0.302)	(0.122)	(0.0916)	(0.0871)	(0.121)
Age	0.0150	0.0236	0.0197	0.0603*	-0.00307	0.0302**	0.0186	-0.0137
	(0.0179)	(0.0166)	(0.0127)	(0.0329)	(0.0170)	(0.0117)	(0.0114)	(0.0137)
Bachelor degree or higher	0.222	-0.0540	-0.0460	-0.309	0.104	-0.164	-0.0806	0.108
	(0.171)	(0.147)	(0.115)	(0.311)	(0.161)	(0.103)	(0.103)	(0.126)
Student	0.244	-0.803**	-0.471*	1.683*	0.332	-0.118	0.166	-0.276
	(0.447)	(0.316)	(0.267)	(0.767)	(0.427)	(0.222)	(0.241)	(0.304)
Working at least 10h/week	0.308*	-0.0819	0.148	0.0364	0.269*	0.0382	0.144	0.0395
	(0.163)	(0.128)	(0.109)	(0.267)	(0.154)	(0.0891)	(0.0976)	(0.105)
Financial characteristics								
Mthl. net income above 1000 €	-0.177	0.140	0.0220	0.406	-0.0908	-0.0485	-0.0187	-0.269**
	(0.178)	(0.170)	(0.131)	(0.294)	(0.169)	(0.120)	(0.118)	(0.118)
Financial literacy (std.)	-0.158**	-0.0306	-0.113**	-0.328*	-0.112	0.0886*	-0.0598	0.0593
	(0.0705)	(0.0735)	(0.0506)	(0.171)	(0.0705)	(0.0524)	(0.0472)	(0.0656)
Spontaneous buyer (1-5 scale)	-0.0420	0.0507	0.00953	0.0963	-0.0540	0.0880**	0.00986	-0.0509
	(0.0556)	(0.0522)	(0.0385)	(0.109)	(0.0530)	(0.0360)	(0.0346)	(0.0449)
Ever in debt on overdraft	-0.142	-0.129	-0.118	-1.145**	-0.169	0.0227	-0.0507	0.247
	(0.135)	(0.151)	(0.106)	(0.417)	(0.128)	(0.106)	(0.0955)	(0.167)
Currently in consumption debt	-0.374	-0.297		-0.508*	-0.288	0.0333		0.134
	(0.273)	(0.252)		(0.250)	(0.262)	(0.181)		(0.104)
Previously in consumption debt	0.295	0.173		0.396	-0.00171	-0.0835		0.127
	(0.240)	(0.215)		(0.393)	(0.231)	(0.153)		(0.158)
Always/often worried about finances	0.0213	-0.148	-0.0868	0.0721	0.0685	-0.145	-0.0398	-0.00766
	(0.173)	(0.177)	(0.142)	(0.309)	(0.163)	(0.126)	(0.130)	(0.124)
Always/often stressed about money	-0.182	0.0555	-0.0975	-0.726*	-0.198	0.0538	-0.150	0.303*
	(0.162)	(0.165)	(0.128)	(0.355)	(0.153)	(0.117)	(0.116)	(0.138)
Experiment								
Felt cold during experiment (1-5 scale)	0.0114	0.0488	0.0331	-0.00846	0.0463	-0.0111	0.0122	-0.0356
	(0.0573)	(0.0550)	(0.0436)	(0.0960)	(0.0545)	(0.0383)	(0.0391)	(0.0385)
Knows earlier subject	0.167	0.172	0.250**	-0.116	0.133	0.265**	0.304***	0.0682
	(0.150)	(0.152)	(0.117)	(0.241)	(0.142)	(0.110)	(0.106)	(0.102)
Lab Experience above 5x	-0.153	-0.111	-0.175	-0.814*	-0.0742	-0.0214	-0.0845	0.288*
	(0.161)	(0.160)	(0.117)	(0.368)	(0.152)	(0.112)	(0.105)	(0.147)
Constant	0.0956	1.111	0.843	-2.501	0.292	0.674	0.274	0.659
	(0.846)	(0.843)	(0.574)	(1.587)	(0.812)	(0.592)	(0.518)	(0.636)
Observations	118	118	198	38	118	118	198	38
R-squared	0.265	0.205	0.158	0.767	0.250	0.316	0.149	0.716

*Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS Regression Results with Session Fixed Effects. The median is excluded from the analysis.

Table II.IX: Treatment Effect on Impulsive Buying by Financial Worries

	In Round 1				In Round 2			
	Always/often worried about finances		**Always/often stressed about money**		**Always/often worried about finances**		**Always/often stressed about money**	
Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
At least one drink purchased	No	Yes	No	Yes	No	Yes	No	Yes
Treatment	0.0670	-0.0239	0.0122	0.0516	0.0367	0.0263	0.00440	0.0673
	(0.0621)	(0.101)	(0.0691)	(0.0786)	(0.0518)	(0.0523)	(0.0569)	(0.0435)
Manipulation check								
Depletion Index after R1 (std.)	0.0132	0.0960	0.0338	-0.0154				
	(0.0305)	(0.0588)	(0.0354)	(0.0420)				
Depletion Index after R2 (std.)					-0.0219	-0.00443	-0.0268	0.0406*
					(0.0281)	(0.0247)	(0.0317)	(0.0229)
Socio-economic								
Female	-0.0455	-0.0313	-0.116	0.0828	-0.0237	-0.0523	-0.0188	-0.0387
	(0.0651)	(0.109)	(0.0714)	(0.0879)	(0.0541)	(0.0557)	(0.0584)	(0.0497)
Age	0.00811	0.0230**	0.00429	0.0139	0.00750	0.00303	-0.00574	0.00961**
	(0.00872)	(0.0108)	(0.0109)	(0.00840)	(0.00718)	(0.00572)	(0.00892)	(0.00474)
Bachelor degree or higher	0.0148	0.0659	0.00584	0.0300	-0.0203	-0.0108	0.0341	0.0246
	(0.0803)	(0.126)	(0.0947)	(0.0886)	(0.0659)	(0.0649)	(0.0769)	(0.0503)
Student	-0.299	-0.0699	-0.597***	0.357	0.100	-0.0542	0.0608	-0.0730
	(0.186)	(0.301)	(0.192)	(0.274)	(0.155)	(0.155)	(0.158)	(0.155)
Working at least 10h/week	0.0331	-0.0320	0.0281	0.0139	0.0391	0.0529	0.0515	0.0304
	(0.0731)	(0.141)	(0.0838)	(0.0860)	(0.0606)	(0.0685)	(0.0688)	(0.0477)
Financial characteristics								
Mthl. net income above 1000 €	0.0416	0.500***	0.0980	0.105	0.0147	-0.0383	0.0370	-0.0432
	(0.0835)	(0.177)	(0.0948)	(0.131)	(0.0694)	(0.0918)	(0.0771)	(0.0723)
Financial literacy (std.)	-0.0573	-0.0231	-0.0511	-0.0569	-0.00435	-0.0279	0.00301	-0.0151
	(0.0363)	(0.0544)	(0.0417)	(0.0365)	(0.0317)	(0.0276)	(0.0358)	(0.0206)
Spontaneous buyer (1-5 scale)	-0.0168	0.0279	-0.00612	-0.0391	0.00555	-0.0151	-0.0256	0.0186
	(0.0276)	(0.0432)	(0.0293)	(0.0333)	(0.0226)	(0.0224)	(0.0241)	(0.0188)
Ever in debt on overdraft	-0.0193	-0.246**	-0.0736	-0.0901	0.0332	-0.0197	0.00459	0.0924*
	(0.0727)	(0.115)	(0.0787)	(0.0896)	(0.0606)	(0.0596)	(0.0644)	(0.0506)
Currently in consumption debt	-0.300**	-0.140	-0.0569	-0.226	0.0153	0.0111	0.0272	-0.00156
	(0.144)	(0.178)	(0.170)	(0.141)	(0.120)	(0.0915)	(0.140)	(0.0799)
Previously in consumption debt	0.177	-0.122	0.0497	0.103	-0.0728	-0.0546	-0.137	-0.0147
	(0.121)	(0.147)	(0.128)	(0.128)	(0.101)	(0.0759)	(0.104)	(0.0710)
Always/often worried about finances			0.00124	-0.0452			-0.0868	-0.0332
			(0.144)	(0.0859)			(0.118)	(0.0488)
Always/often stressed about money	-0.0203	-0.0751			-0.0849	-0.0360		
	(0.0838)	(0.141)			(0.0705)	(0.0745)		
Experiment								
Felt cold during experiment (1-5 scale)	0.0369	-0.000335	0.0401	-0.0153	-0.00961	0.0259	-0.00351	0.0121
	(0.0296)	(0.0455)	(0.0343)	(0.0312)	(0.0248)	(0.0236)	(0.0282)	(0.0176)
Knows earlier subject	0.0474	0.114	0.0114	0.0299	0.115*	0.143*	0.117	0.159***
	(0.0757)	(0.139)	(0.0845)	(0.0960)	(0.0634)	(0.0725)	(0.0707)	(0.0542)
Lab Experience above 5x	-0.139*	-0.0959	-0.221**	0.000697	-0.0502	-0.0277	-0.0708	-0.101*
	(0.0811)	(0.128)	(0.0919)	(0.103)	(0.0673)	(0.0656)	(0.0755)	(0.0589)
Constant	0.0972	-0.404	0.603	-0.587	0.516	0.0518	1.197***	-0.137
	(0.381)	(0.494)	(0.470)	(0.477)	(0.316)	(0.256)	(0.385)	(0.269)
Observations	181	55	154	82	181	55	154	82
R-squared	0.142	0.610	0.189	0.378	0.145	0.436	0.215	0.450

* Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS Regression Results with Session Fixed Effects.

Table II.X: Treatment Effect on Borrowing by Financial Worries

	In Round 1				In Round 2			
	Always/often worried about finances		Always/often stressed about money		Always/often worried about finances		Always/often stressed about money	
Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Borrowed amount (€)	No	Yes	No	Yes	No	Yes	No	Yes
Treatment	0.129	-0.00608	0.0336	0.130	0.0801	0.0699	0.0699	0.152
	(0.101)	(0.172)	(0.112)	(0.127)	(0.0883)	(0.139)	(0.139)	(0.0978)
Manipulation check								
Depletion Index after R1 (std.)	-0.0131	0.159	0.0235	-0.00770				
	(0.0495)	(0.0995)	(0.0574)	(0.0679)				
Depletion Index after R2 (std.)					-0.0701	-0.0118	-0.0118	0.0485
					(0.0479)	(0.0658)	(0.0658)	(0.0516)
Socio-economic								
Female	-0.104	-0.137	-0.199*	0.0948	-0.0568	-0.139	-0.139	-0.0466
	(0.105)	(0.185)	(0.116)	(0.142)	(0.0923)	(0.148)	(0.148)	(0.112)
Age	0.0172	0.0320*	-0.000269	0.0275**	0.0176	0.00806	0.00806	0.0221**
	(0.0141)	(0.0183)	(0.0177)	(0.0136)	(0.0123)	(0.0152)	(0.0152)	(0.0106)
Bachelor degree or higher	-0.0158	0.0834	0.0254	0.0161	-0.0933	-0.0287	-0.0287	0.00638
	(0.130)	(0.213)	(0.154)	(0.143)	(0.112)	(0.173)	(0.173)	(0.113)
Student	-0.269	-0.155	-0.727**	0.449	0.201	-0.144	-0.144	-0.0648
	(0.301)	(0.510)	(0.312)	(0.442)	(0.264)	(0.413)	(0.413)	(0.348)
Working at least 10h/week	0.0727	0.00317	0.112	0.00704	0.0824	0.141	0.141	0.0271
	(0.118)	(0.239)	(0.136)	(0.139)	(0.103)	(0.182)	(0.182)	(0.107)
Financial characteristics								
Mthl. net income above 1000 €	0.0468	0.562*	0.118	0.140	0.00774	-0.102	-0.102	-0.0403
	(0.135)	(0.300)	(0.154)	(0.211)	(0.118)	(0.244)	(0.244)	(0.163)
Financial literacy (std.)	-0.118**	-0.0600	-0.0994	-0.104*	-0.0533	-0.0742	-0.0742	-0.0565
	(0.0589)	(0.0921)	(0.0676)	(0.0589)	(0.0540)	(0.0733)	(0.0733)	(0.0463)
Spontaneous buyer (1-5 scale)	0.0114	0.0156	-0.00111	-0.0410	0.0326	-0.0401	-0.0401	0.0279
	(0.0447)	(0.0731)	(0.0475)	(0.0538)	(0.0385)	(0.0596)	(0.0596)	(0.0423)
Ever in debt on overdraft	-0.0717	-0.304	-0.162	-0.0918	-0.00523	-0.0523	-0.0523	0.120
	(0.118)	(0.194)	(0.128)	(0.145)	(0.103)	(0.158)	(0.158)	(0.114)
Currently in consumption debt	-0.425*	-0.155	-0.0217	-0.334	-0.0628	0.0295	0.0295	-0.0677
	(0.234)	(0.301)	(0.276)	(0.227)	(0.204)	(0.243)	(0.243)	(0.180)
Previously in consumption debt	0.199	-0.212	0.0249	0.0885	-0.0985	-0.145	-0.145	-0.0601
	(0.196)	(0.249)	(0.207)	(0.206)	(0.172)	(0.202)	(0.202)	(0.160)
Always/often worried about finances			-0.0548	-0.0623				-0.0462
			(0.234)	(0.139)				(0.110)
Always/often stressed about money	-0.0690	-0.132			-0.108	-0.0958	-0.0958	
	(0.136)	(0.239)			(0.120)	(0.198)	(0.198)	
Experiment								
Felt cold during experiment (1-5 scale)	0.0397	0.0386	0.0466	0.0179	-0.0222	0.0688	0.0688	0.0525
	(0.0480)	(0.0770)	(0.0556)	(0.0504)	(0.0423)	(0.0628)	(0.0628)	(0.0396)
Knows earlier subject	0.139	0.329	0.109	0.175	0.234**	0.380*	0.380*	0.321**
	(0.123)	(0.236)	(0.137)	(0.155)	(0.108)	(0.193)	(0.193)	(0.122)
Lab Experience above 5x	-0.191	-0.165	-0.318**	-0.124	-0.114	-0.0737	-0.0737	-0.247*
	(0.131)	(0.217)	(0.149)	(0.166)	(0.115)	(0.175)	(0.175)	(0.132)
Constant	0.661	-0.427	2.056***	-1.076	0.382	0.138	0.138	-0.539
	(0.618)	(0.836)	(0.762)	(0.770)	(0.540)	(0.680)	(0.680)	(0.604)
Observations	181	55	154	82	181	55	55	82
R-squared	0.133	0.537	0.175	0.359	0.142	0.436	0.436	0.388

*Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS Regression Results with Session Fixed Effects.

III. Experimental Mechanism

III.1. Mechanism

The question that arises here is whether those with lower financial literacy are more prone to give in to temptation because they have lower self-control or whether the treatment had a stronger effect on them. Table III.I shows correlations between the depletion index after round 1 and after round 2 and control variables. We can see from this regression that people with low financial literacy seem more ego depleted both after the effort task in both round 1 and after round 2.

This indicates to us that it is not necessarily having low financial literacy *per se* that means having low self control and so being more prone to impulsive spending. Instead, we believe that the manipulation was more successful for participants with these character traits. Hence this suggests to us that there is a causal relationship between low self-control and impulsive buying, which we can here only measure for people with low financial literacy.

We further investigate the mechanism behind the results above by looking at the effect of our treatment on self-reported self-control. It is possible that self-control as a character trait explains borrowing behavior in the lab, therefore we analyze how a questionnaire measure correlates with expensive debt-taking. The self-control scale by Tangney et al. (2004) is constructed after asking participants to state to which extent they agree with a set of statements, such as "I am good at resisting temptations" on a scale from 1-5. We employ a shortened version with 13 items and translated to German by Bertrams and Dickhäuser (2009) which proved to be nonetheless reliable and valid in measuring individual differences in perceived self-control. For the full list of items, see Appendix IV.6. We re-arrange the items so that they are increasing in self-control, standardize the individual items, take the mean and standardize the score again to construct an estimate for individual self-control capacity.

Results are reported in Table III.II. We can see that people in the treatment group are more likely to report that they have low self-control. This relationship is significant at 10%, which disappears when control variables are included. Columns (4) and (5) show the relationship separately for participants that purchased drinks and those that did not. The relationship is large and significant for participants that purchased a hot drink. It is not significant for people that did not purchase any hot drinks. There are two possible reasons for this, either people that purchased drinks were more affected by the ego depletion treatment or that they perceive their self-control to be lower.

In Tables III.III - III.IV we show that those who complete more paragraphs in the long depletion exercises rate themselves on average slightly higher in self-control, however, this is not driven by any treatment group in particular. Buying any drinks with sugar in the first shopping stage does not affect depletion in round 2, as seen in Table III.V.

Table III.I: Depletion Effect by Participant Characteristics

Dependent variable Depletion Index after Round	Round 1			Round 2		
	(1)	(2)	(3)	(4)	(5)	(6)
Socio-economic						
Female	0.268**	0.177	0.135	0.183	0.0313	0.00196
	(0.120)	(0.123)	(0.147)	(0.120)	(0.120)	(0.139)
Age			-0.0200			0.0114
			(0.0182)			(0.0172)
Bachelor degree or higher			0.276			-0.124
			(0.168)			(0.158)
Student			0.264			0.201
			(0.406)			(0.383)
Working at least 10h/week			0.202			0.000830
			(0.161)			(0.152)
Financial characteristics						
Mthl. net income above 1000 €			0.286			0.283
			(0.193)			(0.182)
Financial literacy (std.)		-0.175***	-0.147*		-0.290***	-0.248***
		(0.0620)	(0.0755)		(0.0602)	(0.0713)
Spontaneous buyer (1-5 scale)			0.140**			0.145***
			(0.0577)			(0.0545)
Ever in debt on overdraft			-0.0589			0.0159
			(0.159)			(0.150)
Currently in consumption debt			-0.188			0.209
			(0.284)			(0.268)
Previously in consumption debt			-0.178			-0.172
			(0.241)			(0.228)
Always/often worried about finances			0.212			0.409**
			(0.196)			(0.185)
Always/often stressed about money			-0.129			-0.300*
			(0.180)			(0.170)
Experiment						
Felt cold (1-5 scale)			0.0524			-0.0272
			(0.0650)			(0.0614)
Knows earlier subject			0.0740			0.389**
			(0.173)			(0.163)
Lab Experience above 5x			0.0675			0.0180
			(0.177)			(0.168)
Constant	-0.153	-0.100	-0.156	-0.305	-0.217	-0.317
	(0.219)	(0.217)	(0.894)	(0.219)	(0.211)	(0.844)
Observations	280	280	236	280	280	236
R-squared	0.047	0.075	0.141	0.041	0.118	0.182

* Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS Regression Results with Session Fixed Effects.

Table III.II: Self-Reported Self-Control by Treatment and Consumption

Dependent variable	Full sample			Sample Split	
	(1)	(2)	(3)	(4)	(5)
Self-control scale (std.)				No purchase	Any drink purchased
Treatment	-0.213*	-0.221*	-0.141	-0.161	-0.743**
	(0.120)	(0.124)	(0.141)	(0.165)	(0.308)
Depletion Index (std.)		0.0150	0.00995	0.0468	0.0968
		(0.0633)	(0.0747)	(0.0907)	(0.130)
Socio-economic					
Female			0.0189	0.102	-0.435
			(0.150)	(0.170)	(0.390)
Age			-0.0141	-0.00699	-0.0399
			(0.0185)	(0.0246)	(0.0309)
Bachelor degree or higher			0.302*	0.347*	-0.362
			(0.170)	(0.203)	(0.366)
Student			-0.292	0.278	-1.911**
			(0.411)	(0.580)	(0.721)
Working at least 10h/week			0.137	0.218	-0.935**
			(0.164)	(0.193)	(0.344)
Financial characteristics					
Mthl. net income above 1000 €			-0.0831	0.133	0.412
			(0.197)	(0.253)	(0.342)
Financial literacy (std.)			-0.108	-0.137	0.231
			(0.0789)	(0.0924)	(0.152)
Spontaneous buyer (1-5 scale)			-0.0823	-0.139**	0.159
			(0.0596)	(0.0698)	(0.144)
Ever in debt on overdraft			-0.193	-0.223	-0.182
			(0.161)	(0.192)	(0.342)
Currently in consumption debt			-0.179	-0.153	-0.0143
			(0.288)	(0.319)	(0.961)
Previously in consumption debt			0.319	0.303	-0.425
			(0.246)	(0.297)	(0.461)
Always/often worried about finances			-0.0214	0.106	0.148
			(0.200)	(0.229)	(0.528)
Always/often stressed about money			-0.466**	-0.544**	1.028*
			(0.184)	(0.209)	(0.525)
Experiment					
Felt cold (1-5 scale)			0.0282	0.00837	0.305*
			(0.0659)	(0.0783)	(0.163)
Knows earlier subject			-0.00501	-0.124	0.563
			(0.176)	(0.215)	(0.346)
Lab Experience above 5x			0.105	-0.0517	1.112*
			(0.180)	(0.205)	(0.581)
Constant	0.148	0.153	0.296	-0.910	0.858
	(0.214)	(0.216)	(0.905)	(1.302)	(2.063)
Observations	283	283	236	184	52
R-squared	0.028	0.029	0.131	0.182	0.680

*Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS Regression Results with Session Fixed Effects.

Table III.III: Effect of Completed Paragraphs on Self-Reported Self-Control

Dependent variable **Self-control scale (std.)**	(1)	(2)	(3)
Number paragraphs in short exercises	0.0488 (0.0714)		
Number paragraphs in long exercises		0.0251* (0.0136)	
Number paragraphs in total			0.0230* (0.0126)
Constant	-0.0414 (0.350)	-0.0615 (0.264)	-0.126 (0.280)
Observations	232	232	232
R-squared	0.020	0.033	0.033

* Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table III.IV: Effect of Completed Paragraphs on Self-Reported Self-Control by Treatment

Dependent variable **Self-control scale (std.)**	(1) Control	(2) Treatment	(3) Control	(4) Treatment	(5) Control	(6) Treatment
Number paragraphs in short exercises	0.0246 (0.0947)	-0.0375 (0.113)				
Number paragraphs in long exercises			0.0209 (0.0291)	-0.0173 (0.0333)		
Number paragraphs in total					0.0175 (0.0253)	-0.0143 (0.0278)
Constant	0.390 (0.480)	-0.179 (0.516)	0.242 (0.470)	-0.253 (0.362)	0.216 (0.505)	-0.214 (0.390)
Observations	116	116	116	116	116	116
R-squared	0.068	0.099	0.072	0.100	0.072	0.100

[*] Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. OLS Regression Results with Session Fixed Effects.

Table III.V: Depletion Effect by (sugary) drink consumption

Dependent variable **Depletion Index after Round 2**	(1)	(2)	(3)	(4)	(5)	(6)
At least one drink purchased						
Any drink in R1	0.250	0.202	0.0934			
	(0.165)	(0.162)	(0.180)			
Any drink with sugar in R1				0.265	0.229	0.117
				(0.194)	(0.190)	(0.202)
Treatment						
Treatment		0.402***	0.380***		0.406***	0.381***
		(0.117)	(0.125)		(0.117)	(0.125)
Socio-economic						
Female			-0.0165			-0.0165
			(0.137)			(0.137)
Age			0.0110			0.0117
			(0.0169)			(0.0169)
Bachelor degree or higher			-0.139			-0.145
			(0.156)			(0.156)
Student			0.235			0.252
			(0.380)			(0.384)
Working at least 10h/week			0.0141			0.0189
			(0.150)			(0.150)
Financial characteristics						
Mthl. net income above 1000 €			0.225			0.224
			(0.180)			(0.180)
Financial literacy (std.)			-0.261***			-0.261***
			(0.0711)			(0.0708)
Spontaneous buyer (1-5 scale)			0.138**			0.138**
			(0.0536)			(0.0536)
Ever in debt on overdraft			0.0469			0.0507
			(0.148)			(0.149)
Currently in consumption debt			0.174			0.166
			(0.266)			(0.264)
Previously in consumption debt			-0.109			-0.104
			(0.226)			(0.225)
Always/often worried about finances			0.384**			0.380**
			(0.182)			(0.182)
Always/often stressed about money			-0.325*			-0.326*
			(0.168)			(0.168)
Experiment						
Felt cold during experiment (1-5 scale)			-0.0364			-0.0363
			(0.0604)			(0.0603)
Knows earlier subject			0.345**			0.344**
			(0.161)			(0.161)
Lab Experience above 5x			0.00894			0.00605
			(0.166)			(0.165)
Constant	-0.185	-0.376*	-0.357	-0.155	-0.356*	-0.384
	(0.208)	(0.211)	(0.829)	(0.206)	(0.210)	(0.832)
Observations	283	283	236	283	283	236
R-squared	0.037	0.077	0.219	0.035	0.077	0.220

* Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. OLS Regression Results with Session Fixed Effects. Any drink with sugar refers to any of the following sugary drinks purchased: coffee with sugar (and milk), black tea with sugar (and milk), herbal tea with sugar, hot chocolate (with or without extra sugar).

IV. Experimental Material

IV.1. Instructions

The experiment in which you will now participate is designed to analyze decision-making behavior. The room temperature is part of the experiment. We ask you not to wear your coats in the laboratory.

For your participation in this experiment you will receive an amount of **7 euros**. You will receive this amount regardless of your decisions and other events in the experiment. Furthermore, you can earn a sum of money in this experiment, which depends on your decisions. It is therefore very important that you read these instructions thoroughly and carefully.

During the experiment you are not allowed to use electronic devices or communicate with other participants. Please use only the programs and functions intended for the experiment. Please do not talk to the other participants.

If you have a question, please raise your hand. We will then come to you and answer your question in silence. Please do not ask your questions out loud. If the question is relevant for all participants, we will repeat it out loud and answer it. If you violate these rules, we must exclude you from the experiment and the payout.

At the beginning of the experiment you will find short comprehension questions on the screen, which we kindly 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.

Structure of the experiment

1. Working round 1
2. Questions about working round 1
3. Round of drinks 1
4. Working round 2
5. Questions about working round 2
6. Drinks round 2
7. Puzzle
8. Questionnaire

What happens in a work session?

During a work round, you have to process two tasks. For each of these tasks you have to cross out letters from a text. For detailed instructions, please refer to the screen in front of you. The first task is three minutes long, the second is 10 minutes long. It is better to work thoroughly on fewer paragraphs than to work inaccurately on many paragraphs. The remaining time is shown on the screen in front of you in the upper right corner. For both work rounds you will receive a total **of 5 euros**.

After each work round, there are a few questions about your perception during the work round.

What happens during the drinks round?

In these rounds you can buy hot drinks. These are coffee, tea and hot chocolate. These drinks cost 1€: Milk and sugar are an extra 30 cents each. Since you have not earned any money at this point, you will have to pay back the purchase from the money you earned at the end of the experiment. So you take out a loan in the meantime. Interest is charged on this loan. In the first round of drinks the interest rate is 20% of the loan. In the second round of drinks, the interest rate is 10% of the loan.

If you do not buy a drink, you will get a free cup of tap water. The other participants cannot see what they have bought.

Questionnaire and puzzle:

After the second round of drinks, there will be a short puzzle and a questionnaire. For answering both you will get **5 euros**.

Payout:

This experiment will take about 60 minutes. You will receive a flat rate of 7 euros and will earn another 10 euros during the experiment. The borrowed credit will be deducted from these earnings.

Comprehension questions

Here are six questions to test your understanding of the instructions. The answers to the questions will not affect your payout.

1. In this experiment, I will work on texts independently and not interact with other participants.
   a. Correct
   b. False

2. **(Note: this question is only included in the pilot session due to time constraints)** After each working round, I will have the opportunity to buy a hot drink. The price of the hot drink (without credit costs) will be lower after the first working round than after the second working round.
   a. Correct
   b. False

3. How many tasks are there in a working round?
   a. 1
   b. 2
   c. 4

4. How is a working round remunerated?
   a. I get 2 cents for every letter crossed out correctly
   b. I get 5 euro for both work rounds together
   c. I get 5 euro if I finish two paragraphs

5. What does a hot drink with milk and sugar cost?
   a. 1 euro
   b. 1.30 euro
   c. 1.60 euro

6. How can I repay a loan?
   a. Not at all
   b. The loan will be deducted from my earnings in the experiment
   c. I have to pay off the loan with cash

Figure IV.I: Six comprehension questions as displayed to participants during pilot

Figure IV.II: Five comprehension questions as displayed to participants during main sessions

IV.3. Ego Depletion Material: Example

The selected material for the ego depletion exercises are extracted pages from the 1987 book "Praktische Wirtschaftsstatistik" by Dietrich Kunz. The selected parts describe and discuss methods for statistical recording from 1950 until 1987 in Germany. Below one example, namely the first text in working round 1 handed out to both treatment and control group.

II Bereichsübergreifende Erhebungen

1 Arbeitsstättenzählungen

Arbeitsstättenzählungen sind totale Bestandsaufnahmen sämtlicher Arbeitsstätten außerhalb der Landwirtschaft[157]. Sie umfassen auch die Arbeitsstätten des öffentlichen Dienstes und der Organisationen ohne Erwerbszweck. In der Bundesrepublik Deutschland gab es derartige Erhebungen bisher in den Jahren 1950, 1961 und 1970. Die nächste Arbeitsstättenzählung ist für 1987 geplant.

Mit dem Auf- und Ausbau bereichsgebundener Berichtssysteme in der Zeit seit dem Zweiten Weltkrieg haben die Arbeitsstättenzählungen ihre einstige Bedeutung größtenteils verloren. Während sie früher für fast alle Wirtschaftszweige die wichtigste Informationsquelle waren, sind sie inzwischen zu einer Art Rahmenerhebung geworden. Ihr Erkenntniswert liegt nach wie vor darin, daß sie für einen bestimmten Zeitpunkt einen Gesamtüberblick über alle Arbeitsstätten und Unternehmen außerhalb der Landwirtschaft vermitteln. Auch sind sie weiterhin von spezieller Bedeutung für diejenigen Wirtschaftszweige, in denen es keine besonderen Berichtssysteme gibt. Das gilt vor allem für bestimmte Zweige des Dienstleistungsbereichs.

Arbeitsstättenzählungen erfordern einen großen Erhebungsapparat. Sie werden daher in Verbindung mit Volkszählungen durchgeführt. Bei diesen Großzählungen werden die Gemeinden in Zählbezirke eingeteilt. Ein Zähler muß alle Grundstücke und Gebäude seines Zählbezirks aufsuchen, um festzustellen, welche Haushalte und Arbeitsstätten sich dort befinden. Dabei hat er jeder Arbeitsstätte einen Fragebogen, den Arbeitsstättenbogen, auszuhändigen und ihn nach Ausfüllung wieder abzuholen. Das Erhebungsprogramm beschränkt sich auf verhältnismäßig wenige, leicht zu beantwortende Fragen. Das ist notwendig, da der Kreis der Befragten sehr groß und mannigfaltig ist (vom Zeitungskiosk bis zum Automobilwerk) und das Zählgeschäft von ehrenamtlichen Zählern innerhalb weniger Tage abgewickelt werden muß.

Bei der Aufbereitung werden die Arbeitsstätten nach Wirtschaftszweigen und in einer sehr tiefen regionalen Gliederung dargestellt. Das wichtigste quantitative Merkmal ist die Anzahl der in den Arbeitsstätten tätigen Personen, gruppiert nach Männern und Frauen – mit »Darunterzahlen« für Teilzeitbeschäftigte und für Ausländer – sowie nach der Stellung im Betrieb. Die Ergebnisse vermitteln ein Gesamtbild aller Beschäftigten außerhalb der Landwirtschaft nach dem Arbeitsortkonzept[158]. Vor allem regionalstatistischen Zwecken dient auch die Erfragung der Bruttolohn- und -gehaltsumme.

Im Rahmen der Arbeitsstättenzählungen lassen sich mit verhältnismäßig geringem Aufwand auch Ergebnisse für Unternehmen gewinnen. Dazu wird bei jeder Arbeitsstätte die Niederlassungsart festgestellt, d. h. es wird gefragt, ob es sich um die einzige Arbeitsstätte, die Hauptniederlassung oder die Zweigniederlassung eines Unternehmens handelt. Die Anzahl der Unternehmen ergibt sich dann als Summe der einzigen Niederlassungen (weitaus häufigster Fall) und der Hauptniederlassungen. Für die Zwecke der Unternehmensaufbereitung machen die Hauptniederlassungen einige zusätzliche Angaben für das Unternehmen als Ganzes (Wirtschaftszweig, tätige Personen in vereinfachter Gruppierung, Bruttolohn- und -gehaltsumme, Rechtsform[159]).

IV.4. Shopping Information

Figure IV.III: Shopping information in round 1 as displayed to participants

IV.5. Financial literacy

To measure financial literacy, we use the following 7 questions, measuring a basic understanding of interest rates, inflation, the function of the stock market, risk diversification and volatility. On average, the experimental participants answer 4.82 questions correctly.

To construct a single standardized score of financial literacy, we standardize the accuracy of each response, average over the seven values, and standardize this number again.

The questions are translated from German.

1. Assume you have 100 € in your savings account. This balance will earn interest at 2% per year and you will leave it in your account for 5 years. How much money will be in your savings account after 5 years?

   - More than 102 €

   - Exactly 102 €

   - Less than 102 €

   - Don't know

2. Suppose the interest rate on your savings account is 1% per year and the inflation rate is 2% per year. What do you think: After one year, will you be able to buy as much, more or less than today with the balance of your savings account?

   - More

   - Just as much

   - Less

   - Don't know

3. What is the main function of the stock market?

   - The stock market helps to predict stock profits

   - The stock market leads to an increase in stock prices

   - The stock market brings together buyers and sellers of shares

   - None of the above

   - Don't know

4. Is the following statement correct or false: investing in shares of a single company is less risky than investing in a share fund.

   - Correct

   - False

   - Don't know

5. Which of the following investment forms shows the highest fluctuations in return over time?

   - Savings accounts

   - Time deposits

   - Fixed-interest securities

   - Shares

   - Don't know

6. Assume you have 100 € in your savings account. This balance will earn interest at 20% per year and you will leave it in this account for five years. How much money will be in your savings account after 5 years?

- More than 200 €

- Exactly 200 €

- Less than 200 €

- Don't know

7. Let's assume you have 2,000 € on your savings account and you receive 10% interest every year. How much money do you have on your savings account after two years?

   Answer: _____

IV.6. Self-Control Scale

The 13 item scale to elicit self-perceived self-control capacity is the SCS-K-D taken from Bertrams and Dickhäuser (2009), translated to German but directly based on Tangney et al. (2004). Participants are asked to judge themselves on a scale from 1 (disagree completely) to 5 (completely agree) for each statement.

1. I am good at resisting temptation.

2. I have a hard time breaking bad habits.

3. I am lazy.

4. I say inappropriate things.

5. I do certain things that are bad for me, if they are fun.

6. I wish I had more self-discipline.

7. Pleasure and fun sometimes keep me from getting work done.

8. Sometimes I can't stop myself from doing something, even if I know it is wrong.

9. I often act without thinking through all the alternatives.

10. I have trouble concentrating.

11. I am able to work effectively toward long-term goals.

12. I refuse things that are bad for me.

13. People would say that I have iron self- discipline.