

# KNOWING WHAT NOT TO DO: FINANCIAL LITERACY AND CONSUMER CREDIT CHOICES\*

Christian D. Dick    Lena M. Jaroszek\*\*

October 31, 2013

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\*We are grateful to Stefan Ruenzi, Zwetelina Iliewa, Ulrich Seubert and participants of SMYE 2013, IFABS 2013 and FDIC's Consumer Research Symposium 2013 for valuable comments. We thank Philipp Jamschikov for able research assistance. This paper has been partly derived from an analysis made in the context of a project report by ZEW on behalf of the German Federal Ministry of Food, Agriculture and Consumer Protection.

\*\*Centre for European Economic Research (ZEW) Mannheim and University of Mannheim, Germany, Email: jaroszek@zew.de

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## **Abstract**

Based on a rich panel of household data, we investigate the determinants of the use of consumer credit in Germany. We find that the usage frequency of an easily accessible, but relatively expensive source of consumer credit is not only related to individuals' self-control but decreases with financial literacy. This result is robust to household structure, income, wealth, age, formal education, and occupational status. We document that impulsive people, with a tendency to choose intuitive but incorrect answers on a test in the survey, use (expensive) overdraft credits less frequently if they possess financial literacy skills. Hence, financial education plays an important role improving consumer choices.

*JEL-Classification:* D12, D14

*Keywords:* Household finance, cognitive reflection, financial literacy, self-control

# 1 Introduction

Economic theory assumes that households save, consume and take out loans according to the life-cycle hypothesis (Modigliani and Brumberg, 1954). This normative framework predicts that younger households borrow in expectation of increasing future income in order to smooth their consumption over time. The model presumes that households act rationally in the sense that they maximize their lifetime utility according to their time-consistent preferences. However, empirical studies reveal substantial limitations of traditional finance theory in explaining financial decisions by private households (Campbell, 2006; Bernheim, Skinner, and Weinberg, 2001).

We consider two explanations for households' systematic deviations from the normative framework. First, individuals' behavior may be influenced by myopia; in credit decisions, short-sighted behavior will lead to an overvaluation of immediate benefits and an undervaluation of future costs. Such hyperbolic discounting will drive households to demand higher levels of consumer credit when they have to decide whether to consume on credit. Secondly, few households will be able to correctly conduct the present value calculations necessary to determine the optimal consumption path in the life-cycle theory and few will know enough about the functioning of financial markets and appropriate financial products (Lusardi and Mitchell, 2011). The idea that a lack of self-control as opposed to poor financial literacy is responsible for suboptimal financial decisions challenges the claim that financial education has a beneficial impact on consumer behavior. We therefore study the interplay between consumers' self-control and financial literacy for credit decisions taken in their daily lives.

In order to explain the behavior of consumers, normative theory is enriched by behavioral aspects. In their seminal paper Shefrin and Thaler (1988) incorporate myopic behavior into their behavioral life-cycle theory. In order to capture formally the internal conflict between the rational and emotional aspects of an individual's personality they model the individual's optimization problem by a dual preference structure. In such dual preference models the decision process is described as a conflict between two coexisting selves with mutually inconsistent preferences: a far-sighted planner concerned with the long term and a pathologically myopic doer.<sup>1</sup> Since the doer strives for immediate gratifica-

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<sup>1</sup>Dual processing theory is backed by neuroeconomic evidence that short-term impulsive behavior is associated with activity of different areas of the brain than long-term planned behavior (McClure, Laibson, Loewenstein, and Cohen, 2004). It has recently also become a topic in popular scientific discourse thanks to Kahneman (2011) "Thinking, Fast and Slow".

tion, the planner has to exert self-control in order to reduce the consumption level suggested by the doer and to assure future benefits. Theoretical models such as Laibson (1997), Gul and Pesendorfer (2001, 2004), Benhabib and Bisin (2005) or Bertaut, Haliassos, and Reiter (2009) predict that present bias or temptation increase households' desire for immediate consumption and therefore will increase borrowing. It is important to stress that in these theoretical models irrational decisions are usually made despite agents' ability to rationally judge that the level of debt taken out is unsustainable in consideration of future income. However, they are tempted to deviate from the ideal strategy. In this way, short-sighted behavior can distract people from realizing the consequences of their consumption decisions for the sustainability of personal debt.

From an empirical side, Bucciol (2012) demonstrates that models incorporating temptation come closer to reality than previous normative approaches. Meier and Sprenger (2010) document that present-biased individuals who prefer immediate gratification in experimental choices are more likely to have credit-card debt as well as higher amounts outstanding. Present-biased preferences have also been linked to impulsivity (Zermatten, Van der Linden, d'Acremont, Jermann, and Bechara, 2005) and correspondingly, impulsive individuals are found to be biased towards immediate rewards and less sensitive to the negative consequences of their decisions (Martin and Potts, 2009). Accordingly, Ottaviani and Vandone (2011) analyze impulsivity as a determinant of households' participation in the credit market. Their study of employees of international asset management companies provides evidence that impulsivity is a significant predictor of the probability that households hold unsecured debt. Furthermore, Ottaviani and Vandone (2011) carve out that the effect of behavioral factors on household debt demand is different for secured and unsecured debt. While secured debt cannot be taken out ad hoc and the process is usually professionally consulted and includes an assessment of the loan's sustainability, it follows the life-cycle more closely. On the contrary, unsecured debt can be taken out without any consultation and the decision may be determined by short-term benefits, such as financing daily shopping, so that short term credit decisions are more likely to be prone to behavioral aspects such as a lack of self-control. <sup>2</sup>

The second strand of literature abstracts from behavioral aspects and assumes that a poor understanding of products and mechanisms in financial markets (i.e., low *financial literacy*) spurs suboptimal

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<sup>2</sup>The aspect of temptation is also included formally in the behavioral life-cycle theory by Shefrin and Thaler (1988) who postulate that the temptation to spend is greatest for current income and least for future wealth. This argument is particularly interesting, given that we analyze overdraft credit on current income accounts.

financial decisions.<sup>3</sup> This notion is widely acknowledged in the investment domain where financial illiteracy is associated with inadequate saving decisions (Lusardi and Mitchell, 2007; Bucher-Koenen and Lusardi, 2011; van Rooij, Lusardi, and Alessie, 2012), with lower stock market participation (van Rooij, Lusardi, and Alessie, 2011) and with lower portfolio diversification (Guiso and Jappelli, 2009). More recently, research on financial literacy has extended its focus to credit-related issues, such as credit conditions and in particular high cost credit (Disney and Gathergood, 2013), usage behavior of credit cards and over-indebtedness (Lusardi and Tufano, 2009), the delinquency on (general) debt (Disney and Gathergood, 2011) and subprime mortgages (Gerardi, Goette, and Meier, 2010). Evidence from this research suggests that financial literacy, i.e. the understanding of simple economic concepts and the ability to perform computations necessary for most financial choices, enhances financial decision making.

This study contributes to the field of consumers' debt demand, which has so far been much less investigated than the investment side. Furthermore, it aims at identifying whether mainly behavioral aspects, namely a lack of self-control, or consumers' financial illiteracy should be held accountable for consumers' credit decisions. The conclusions provide implications for regulatory actions aiming at increasing individuals' welfare or at consumer protection.

Identifying determinants of credit usage decisions is important due to the availability of consumer credit: it is available to the vast majority of the adult population in almost all developed countries, either by means of credit cards, or (as in the case of Germany considered here) by credit facilities associated with current accounts. As households typically make such decisions without consulting financial advisers, our study determines the role of financial education in the improvement of credit decisions.<sup>4</sup> Taking into account that overdraft limits or limits on credit card accounts usually amount to a multiple of the consumer's net monthly income, the influence of lacking self-control or sophistication raises concerns that affected individuals will be unable to fully conceive the consequences of their debt decision. They are likely to roll over their outstanding balances from month-to-month which may lead to over-indebtedness in the long-run.

Our results show that self-control elicited by a three-item performance test correlates with the usage

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<sup>3</sup>For a discussion of the relation between cognitive ability and character traits, see Borghans, Duckworth, Heckman, and ter Weel (2008).

<sup>4</sup>Complementarily, Clark, Morrill, and Allen (2012) demonstrate that external influences affect retirement savings decisions.

frequency of overdraft credit lines (*H1*). In our sample, individuals who exhibit low self-control are about 20 percent (around 4 percentage points) more likely to overly rely on overdraft accounts than their more patient counterparts.<sup>5</sup> However, we find a mitigating effect of financial literacy, which compensates for the effect of lacking self-control (*H2*). According to our evidence mainly the knowledge of financial products and understanding of financial markets rather than numeracy lead to a change in credit usage behavior. This result is reassuring given the concerns by [Smith, McArdle, and Willis \(2010\)](#), who argue that a lack of numeracy is a more fundamental issue than a lack of financial literacy, and by [Banks \(2010\)](#), who highlights the importance of disentangling financial literacy and numeracy. On the one hand, our results on self-control may raise concerns that impulsive individuals take out unsustainable levels of debt and that this may lead to over-indebtedness. On the other hand, financial literacy remains a crucial determinant of the use of credit products. Therefore, financial education programs could substantially improve households' financial decisions.<sup>6</sup>

Our analysis seems related to a recent theoretical model by [Heidhues and Kőszegi \(2010\)](#) in which non-sophisticated consumers with a taste for immediate gratification will over-borrow and are hoodwinked by unfavorable contract terms such that they suffer considerable welfare losses. However, in the model sophistication does not relate to the concept of financial literacy, i.e. understanding the features of the financial products, but to the notion that unsophisticated individuals only partially understand their taste for immediate gratification. In empirical work, [Gathergood \(2012\)](#) examines the relation between individuals' self-control issues, financial illiteracy and use of quick-access, high-cost credit products such as in-store credit cards, mail order catalogues, home credit and pay day loans. The credit product we analyze - overdraft lines on current accounts - can be accessed with even greater ease simply by withdrawals from the current account or by cashless payments. Furthermore, while [Gathergood \(2012\)](#) relies on a measure of self-control based on the self-assessments of survey participants' impulsiveness, our proxy is derived from a performance test. In line with [Gathergood \(2012\)](#) we find that consumers with self-control issues make more frequent use of quick-access credit. Contrary to his evidence on over-indebtedness we find a more pronounced effect of financial literacy than of lack of self-control on consumer credit decisions. In another recent contribution [Hastings and](#)

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<sup>5</sup>A comparison with an alternative form of consumer credit (installment credit) shows differences in line with the results by [Ottaviani and Vandone \(2011\)](#) in their analysis of unsecured and secured credit products.

<sup>6</sup>Similar arguments in favor of financial education have been made in different contexts by [van Rooij, Lusardi, and Alessie \(2011\)](#), [Guiso and Jappelli \(2009\)](#) or [Bucher-Koenen and Lusardi \(2011\)](#).

Mitchell (2011) analyze present-bias and financial illiteracy as competing explanations for Chilean consumers making suboptimal financial decisions. However, their proxy for present-biased preferences may capture other behavioral aspects than self-control.<sup>7</sup> The relevance of our analysis is backed by evidence on the negative correlation between present-biased preferences and financial literacy by Almenberg and Gerdes (2012), who point out that controlling for financial literacy is necessary when analyzing the impact of a present-bias on financial decision making in order to avoid biased results.

The remainder of this study is organized as follows: Section 2 introduces the dataset and the institutional background of consumer credit in Germany. Section 3 describes the details of the regression strategies and discusses the results. Section 4 presents the results of various robustness exercises, whereas Section 5 concludes.

## 2 Data

Our empirical analysis relies on a micro dataset from a household panel study (SAVE Study), which has been conducted among households in Germany by the Munich Research Institute for the Economics of Aging (MEA) since 2001. The data are representative for the German population and cover information on demographic and economic characteristics focusing on savings and old-age provisions. The sampling unit of the panel is the household. For the purposes of our analysis, we mainly rely on data collected in the survey year 2009 because this survey questionnaire is the only one including the Cognitive Reflection Test suggested by Fredrick (2005) on which we will base our proxy for self-control. The survey of 2009 also contains a comprehensive module of financial literacy questions which is broader than the set of questions in previous survey waves. Also, for the first time the respondents can actively refrain from answering financial literacy questions by choosing the option "I cannot/do not want to answer". This option reduces the probability that individuals try to guess the correct answer and therefore allows for a cleaner definition of the proxy for financial literacy. The

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<sup>7</sup>Hastings and Mitchell (2011) deduct impatience from survey participants' decision to fill out a short questionnaire immediately after the end of the survey and receive a gift card of a certain value right away or to delay the reply of the questionnaire. In the latter situation the questionnaire needs to be completed at home and sent back in a pre-paid envelope. The participant would then receive a gift card with a higher but uncertain value. However, survey participants may be aware of their tendency to "forget" to send back the letter in time. Or they may mistrust that they will receive the gift card later or that it may get lost while in transit by mail. Furthermore, although the uncertain amount of the gift card will in any case be higher than the value of the gift card obtained when completing the questionnaire immediately, respondents may want to circumvent ambiguity. Therefore, a study design in which the questionnaire needs to be completed right away and only the decision about the gratification is at choice would have yielded a cleaner measure for impatience.

data has also been used for research on financial literacy by, e.g., [Bucher-Koenen and Lusardi \(2011\)](#), [Bucher-Koenen and Ziegelmeier \(2011\)](#) and [Glaser and Klos \(2012\)](#), and is particularly well suited to link individual traits such as financial knowledge to detailed information about the household balance sheet and socio-demographic characteristics. Contrary to earlier studies, we do not rely on imputed values in the SAVE data but instead reconstruct missing values using the indicator file provided by MEA which identifies imputed values.<sup>8</sup>

Concerning **consumer credit**, we primarily focus on data on overdraft facilities on checking accounts ("Dispokredite"). Due to the specific institutional setup in Germany (credit limits are based on current accounts instead of credit cards), the use of consumer credit lines is independent from the method of payment. Hence, unlike most literature on the use of credit cards (e.g., [Klee, 2008](#); [Koulayev, Rysman, Schuh, and Stavins, 2012](#)), we unambiguously measure credit decisions rather than a mixture of credit decisions and transaction method choices. Furthermore, due to the broad availability of overdraft credit lines among the German population a differentiation between usage of this credit form and access to it is not an important hurdle. As documented by the household survey, about 80 percent of all households in Germany are eligible to use a credit line on their current account, and in fact, half of them do so at least occasionally. The size of these credit lines is substantial (on average three times the monthly net income), and the interest rates charged at between 10 and 20 percent p.a. are considered to be rather expensive.<sup>9</sup> Unlike consumer installment credit (which we consider in this study for comparison), the credit line is meant to be used on a short-term basis, and it is not associated with a specified purpose (as opposed to e.g., an installment credit for a car purchase). In this sense, a credit line is a convenient, but also costly way to smooth consumption in the face of temporary liquidity gaps.

In 2009, 2,176 out of 2,222 respondents (98 percent) indicate whether their checking accounts possess an overdraft credit facility. Of the 1,733 households with an available overdraft facility, 97 percent indicate the frequency of consumer credit use. The panelists can choose among the four predefined answers "never", "1 to 3 times a year", "4 to 6 times a year", "more often or constantly"; hence, the variable of interest regarding the usage of overdraft is of categorical nature and censored on both sides

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<sup>8</sup>In Section 4 we include a robustness test, verifying that our result are not driven by non response bias.

<sup>9</sup>Although a subjective, this judgment is the prevailing view in the political debate in which, e.g., the German Federal Ministry of Consumer Protection (BMELV) has appealed to credit institutions to decrease interest charges on credit limits.



(naturally censored by zero on the lower bound and by questionnaire design on the upper bound). The distribution of answers on usage frequency is displayed in Table 1. The largest share of 46.8 percent of respondents indicate to never use overdraft credit, but there is also a considerable fraction of 17 percent who answer that they use overdraft credit more than six times a year or constantly (we will refer to this group as frequent usage group).

[Insert Table 1 here.]

Since we ask whether **self-control** determines credit usage, we construct a proxy for this unobservable trait, derived from the cognitive reflection test (CRT) introduced by [Fredrick \(2005\)](#).<sup>10</sup> The CRT is comprised of three tasks. The tasks are constructed in a way to trigger an automatic response which comes to mind effortlessly but is incorrect. An individual with higher self-control is likely to question the automatic response and eventually to detect the mistake. The CRT allows measuring this tendency to exert self-control and dismiss the intuitive but incorrect answer. We hypothesize that respondents will behave analogically in everyday financial decision making. Speaking in terms of planner and doer, we expect that low scores on the CRT correspond to a strong doer whereas high CRT scores correspond to a strong planner. The CRT has proven to predict a wide sample of tasks from the literature on heuristics and biases (see [Toplak, West, and Stanovich, 2012](#), and the overview therein). One advantage of the CRT as a measure of self-control stems from the fact that it is a performance measure. Self-control is otherwise often deducted from respondents' self-assessed impulsivity (e.g. [Gathergood, 2012](#)). Social desirability of self-control may bias the self-reported results, which is not an issue in the case of CRT.

Responses to the questions are reported in Table 2, Panel A. While two out of the three exercises were answered correctly by about 40 percent of respondents in each case, the prominent "bat and ball" problem triggered the intuitive wrong answer in two thirds of responses. Strikingly, the number of refusals is lowest for this problem, indicating that respondents are vastly unaware of the question's difficulty. Nearly one half of survey participants answer all three questions incorrectly (see Table 2, Panel B). The proportion of respondents answering all questions correctly amounts to only 13.9 percent. On average 1.26 questions are answered correctly. The results compare closest to those of web-based studies reported in [Fredrick \(2005\)](#). This is plausible, given that the resemblance between

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<sup>10</sup>The questions are provided in Appendix A.

our sample and the online participants is probably higher compared to students of US universities who formed the other test groups.

[Insert Table 2 here.]

As common in the literature on **financial literacy** we deduct our proxy from survey data.<sup>11</sup> We rely on responses to a set of questions which comes closest to the questions of [van Rooij, Lusardi, and Alessie \(2011\)](#). The questions aim at evaluating the ability to solve basic mathematical problems occurring in financial markets (interest rate compounding, real vs. nominal quantities), and to test the intuition behind specific financial products. In this way, our measure of financial literacy aggregates information from mathematical and institutional questions, as is common in the literature.<sup>12</sup> The subset of four questions which capture basic financial concepts which do not go much beyond pure percentage calculus numerical skills are also used in [Lusardi and Mitchell \(2008\)](#) and [Bucher-Koenen and Lusardi \(2011\)](#). These skills are certainly necessary in the context of financial decision making and compounding interest as well as inflation considerations. Since the questions do not demand much financial markets specific knowledge, we will refer to them as basic financial literacy or numeracy as also suggested by [Lusardi \(2012\)](#). Five advanced questions assess more innate financial concepts regarding knowledge of financial assets' characteristics, the stock market, risk-return relationship and diversification.<sup>13</sup>

The empirical distribution of responses is reported in Table 3. Panel A shows that some basic and advanced financial concepts are conceived better or worse than others. Very broadly speaking, each question is answered correctly by about 50 to 80 percent of respondents. Especially the concepts of interest compounding when a realistic interest rate for a savings account is assumed (basic question 1) and return volatility of different assets (advanced question 1) are well understood. However, one more difficult advanced question about the relation between interest rate and fixed coupon bonds is answered correctly by only 9.4 percent of respondents. For advanced questions respondents indicated much more frequently that they cannot or do not want to answer a question instead of answering

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<sup>11</sup>An exception is [Carlin and Robinson \(2012\)](#), who take a direct approach and conduct an experiment in which they provide only some participants with financial training, or [Bernheim and Garrett \(2003\)](#), who conduct a field study.

<sup>12</sup>In the context of investment decisions financial literacy is often suspected to be an endogenous variable. However, it is highly unlikely that people can learn about the principles of stock, bond and fund investments from their experience with short-term consumer credit products. We therefore decided to consider financial literacy an exogenous variable in our analysis.

<sup>13</sup>A translation of the original questions in multiple choice format is provided in Appendix B.

incorrectly than for the basic questions. Panel B reports the fractions of respondents who were able to answer a specified number of answers correctly. If the number of correct answers is zero, respondents answered either incorrectly, indicated that they do not know the correct answer or completely refused to answer questions. About 40 percent of respondents answer at least 4 questions correctly. The mean of correct answers is 5. Close to 60 percent of panelists indicate at least once that they do not know the correct answer, which is evidence for the importance to provide this answering option.

[Insert Table 3 here.]

The analysis takes into account several **demographic characteristics** of the respondent and the household as a whole which potentially play a role in the context of overdraft credit usage. These characteristics include the quartile of household net wealth<sup>14</sup>, monthly net income, respondent age, family status, education, occupation and employment status. More specifically, the family status is captured by a dummy variable indicating whether the household is a single person or lives together with a partner and we consider the number of children in the household. For the occupational status, respondents indicate whether they are blue- or white-collar worker, civil servant, self-employed, retired or others (e.g. student). Education is measured by respondents’ schooling experience: as in Germany at least a lower secondary education (“Hauptschulabschluss”) is compulsory, we capture higher education by mid-level education (“Mittlere Reife” or equivalent) and A-level education (“(Fach-)Hochschulreife”). We furthermore include the self-assessed extent of respondents economics education at school or during an apprenticeship (measured by a seven point Likert scale). For descriptive statistics of demographic control variables please refer to [Bucher-Koenen and Lusardi \(2011\)](#).

### 3 Empirical Analysis

**Empirical approach.** We take a systematic look at the determinants of the usage frequency of short-term consumer credit (“Dispokredite”),  $Creditfreq^*$ . We first focus on the role of cognitive reflection,  $CRT$ , and include (depending on the specification) a battery of control variables  $\Phi$  on the RHS of the equation, i.e.

$$Creditfreq_i^* = \beta CRT_i + \gamma' \Phi_i + \epsilon_i \tag{1}$$

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<sup>14</sup>Since the values of asset and debt positions do not need to be reported from documents, the figures reported may be estimated imprecisely. We include quartiles of net log wealth in order to reduce noise.

The vector of control variables  $\Phi$  includes (log) income, wealth quartiles, age, gender, family status, dummy variables for the occupational status (with white-collar employees being the base group), for the educational status (with a lower secondary degree being the base group), respondents' self-assessed extent of economic education, as well as a dummy variable capturing unemployment of the respondent and/or the respondent's spouse. As the data about the usage of consumer credit is of categorical nature (there are four subgroups),  $Creditfreq^*$  is not directly observable; hence, we consider Eq. (1) a latent variable model and run ordered probit regressions. By means of the latter approach, we are able to compute, e.g.,  $P[(Creditfreq_i = \text{"Never"})|CRT_i, \Phi_i]$ , i.e., the probability of not using short-term credit depending on cognitive reflection and other control variables. Likewise, we are also able to compute  $P[(Creditfreq_i = \text{"More often than six times or constantly"})|CRT_i, \Phi_i]$ , i.e., the probability of using short-term credit relatively frequently.

**Self-control and consumer credit.** We conclude from theoretical models that individuals with low self-control may not be able to resist the temptation to consume right away instead of after the next payroll, even though they are aware that overdraft credit is expensive. If this is the case, their credit decisions are driven by a lack of self-control. We analyze this hypothesis (*H1*) by taking Eq. (1) to the SAVE data. The results of our baseline analysis are displayed in Table 4.

[Insert Table 4 here.]

The first two rows include the measures based on the CRT. The measure "CRT score" (columns ii to iv) corresponds to the measure used by [Fredrick \(2005\)](#) and counts the number of correct answers. Its counterpart, "TF score" (columns v to vii), records the number of automatic (i.e. intuitive but incorrect) answers.<sup>15</sup> "TF" stands for "thinking fast" in the spirit of [Kahneman \(2011\)](#). The two measures differ in the way they treat incorrect but non-automatic responses. While for CRT score all incorrect responses are grouped together no matter whether they were intuitive or incorrect after reflection, TF score focuses on the automatic responses and otherwise does not consider whether the respondent failed in the task. We therefore presume TF score to be a better measure of self-control.

The regression results confirm our hypotheses concerning self-control and credit decisions: CRT enters the regression with a negative coefficient and TF score is positively correlated with the frequency

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<sup>15</sup>For both scores we require that there all three CRT items are answered. In case of refusals the scores will turn to missing values.

of overdraft credit usage frequency. I.e. when the planner in an individual is strong (high CRT score) the individual is likely to use short-term credit facilities seldom and when the doer in an individual is more distinct (high TF score) the individual is likely to use overdraft credit frequently or even permanently. The relation between overdraft credit usage frequency and both CRT measures is highly significant in all regression specifications. This finding speaks in favor of the hypothesis that subjects with low levels of self-control use credit lines more often (*H1*). The results indicate that the tendency to fall back on overdraft facilities more frequently is driven by individuals who fail to consider the longer-term consequences of their consumption decisions.

In our analyses we control for different sets of household characteristics. As we can see from columns (ii) and (v) wealth and age are the most important control variables determining credit decisions, which is in line with normative theory. The coefficient estimates on the CRT measures remain stable when adding control variables accounting for household structure and occupational status (columns iii and vi) or education (columns iv and vii).

In order to interpret the magnitude of coefficient estimates, Table 5 presents predicted probabilities for a subject with certain characteristics to be in each of the four usage frequency groups when varying the level of self-control (TF score), e.g.  $P[(Creditfreq_i = \text{"Never"}) | TF\ score_i, \Phi_i]$ . Probabilities are calculated based on specification (v) of the baseline analysis (Table 4), which does not require to determine characteristics with respect to household structure, respondents' occupation or education. This simplification is reasonable since coefficient estimates on the self-control measure, log income and age vary modestly between the full specification (column vii) and the reduced specification. Three exemplary households are analyzed for differing levels of self-control. Regarding household specifications, in the upper panel households in the second wealth quartile with average age and average (log) income are analyzed.

In our sample, the average probability for an individual to fall into the frequent overdraft usage group amounts to 17.0 percent. However, if a person is likely to exert high self-control, i.e. if none of the CRT questions is answered intuitively this probability decreases to 13.4 percent for a typical household. To the contrary, for individuals with low self-control who always answer automatically the probability for frequently using the overdraft limit rises to 19.6 percent. This picture reverses for the group which never uses overdraft credit: While the average probability for a household in our sample to be in this group amounts to 46.8 percent, the probability increases for highly self-controlled

individuals and decreases for people with low self-control. The difference in predicted probabilities for self-controlled and impulsive individuals is even higher for the group which never uses overdraft facilities than for the group that frequently relies on short-term credit. Being highly self-controlled increases the probability to never use the credit line to 50.7 percent, whereas the probability for people with weak self-control amounts to only 40.8 percent.

As expected from regression results and theory, for younger households (results in the second panel) the probabilities to use credit more frequently rises for all individuals abstracting from their level of self-control. Overdraft facilities are used by low-wealth households with higher probability. Our results provide evidence that a lack of self-control is particularly severe for low-wealth households, since being poor particularly increases the predicted probability to be in the group of frequent users of short-term credit. This finding is in line with the behavioral life-cycle theory by [Shefrin and Thaler \(1988\)](#) who postulate that exerting self-control will be particularly painful for poorer individuals.

[Insert Table 5 here.]

**Further demographic determinants.** While the role of self-control remains unaffected when adding demographic characteristics to the RHS, it is interesting to look at these control variables in detail: Somewhat surprisingly, household income itself is not significant in explaining overdraft credit use frequency. Still, it enters with a negative sign which seems reasonable. This finding may be connected to the evidence that household wealth is a very important predictor for short-term credit usage. Although the effect of increasing wealth is non-monotonic, not being in the lowest wealth group significantly reduces the probability to frequently rely on overdraft credit, which is reflected in the negative coefficients of the indicators for wealth quartiles 2 to 4. Furthermore, age plays an important role in determining credit usage which is in line with the life cycle hypothesis. While the coefficient on age is positive, that of squared age is negative. In unreported results we observe a hump shape for the predicted probabilities for frequent overdraft users with a peak at around age 40. This means, that households around 40 years of age are most likely to frequently overdraw their current accounts. The situation is inverted for the group which never uses overdraft facilities. Children increase the frequency of overdraft credit usage. This argument is plausible in light of unexpected expenses in connection with children. Unexpected expenses are all the more a problem for single parents who cannot balance their budget with their partner internally. The coefficient on the variable indicating whether a person

lives in a relationship is not significant, but enters with the hypothesized negative sign.

Taking into account subjects' occupation can be important because of two different aspects: on the one hand banks could prefer certain occupations when granting credit, especially installment credit. Overdraft facilities can then work as a substitute for consumer credit. On the other hand, households with irregular income may especially be forced to bridge short-term liquidity shortages by using overdraft credit. However, we find no clear pattern for the relationship between occupational situation and overdraft credit usage when controlling for age and wealth. Alike, neither general education nor self-assessed economics education have significant effects on credit decisions.

**Interplay between self-control and financial literacy.** Since short-term credit decisions are shaped by consumers' self-control or their lack thereof, we can question whether financial literacy will have any further impact on credit taking behavior (*H2*). We analyze the interplay between financial literacy and self-control in Table 6. To facilitate presentation and interpretation, the explanatory variables are included as indicator variables. "Lack of self-control" corresponds to the TF score in Table 4 and indicates whether at least one of the CRT tasks was answered intuitively. The dummy on "Financial literacy" turns to 1 when the respondent answered at least 7 out of 9 questions correctly (i.e. more than the median number in the sample which is 6 correct answers).

[Insert Table 6 here.]

The regression of overdraft credit usage frequency on financial literacy and control variables without the inclusion of self-control effects (column ii) confirms a significant role of financial literacy for credit taking decisions. This finding speaks in favor of the hypothesis that subjects with higher levels of financial literacy better understand financial concepts such as compound interest. Since they are more likely to be aware of high costs of overdraft credit usage they fall back on it less frequently. The evidence which confirms a relation between credit decisions and financial literacy is in line with findings by Disney and Gathergood (2011, 2013), Lusardi and Tufano (2009), and Gerardi, Goette, and Meier (2010). Since we include information on schooling in our control variables we can conclude that neither general education nor self-assessed economics education or knowledge gained in the workplace can account for the effect of financial literacy. This result is in line with earlier research reporting that financial literacy covers concepts different from general knowledge and that education is only an

imperfect proxy for financial literacy (van Rooij, Lusardi, and Alessie, 2011).

Turning to the question whether it is a lack of self-control or a lack of knowledge which leads individuals to consume excessively on overdraft facilities, we simultaneously include both explanatory variables into our estimation model (column iii). We observe that both effects remain statistically significant and the coefficient estimates are only slightly decreased compared to the estimations when only considering one of the two factors. The stability of the coefficient estimate confirms that self-control and financial literacy cover different aspects of personal traits and have explanatory power on their own. This finding is particularly relevant for undermining the role of financial education, since it is easily imaginable that impulsive spending is not at all influenced by better knowledge.

In order to evaluate whether financial literacy or lacking self-control matter more for the usage of overdraft credits in economic terms Figure 1 displays predicted probabilities for households to fall into the group of people who never use overdraft credit, or to the other extreme, frequently use short-term credit. More specifically, we calculate the probabilities by considering specification (iv) from the ordered probit regression of overdraft usage on self-control, financial literacy, household wealth, net income and age presented in Table 6 column (iv). Since the coefficient estimates for the explanatory variables are smaller in absolute terms when not controlling for the full set of household characteristics, we consider the results on the economic significance as conservative estimates. We analyze predicted probabilities for a household in the second wealth quartile with average age and average monthly income over the life-cycle. In the figures we term individuals with low self-control "impulsive" and those with high self-control "controlled".

[Insert Figure 1 here.]

Generally, the shape of the curves shows that credit demand is highest for households around the age of 40. While the probability to be in the group that never uses overdraft credit is at its global minimum at this age (upper figure) it peaks for the frequent credit user group (lower panel). Probabilities for impulsive households are displayed in solid other lines, whereas those of households with high self-control are in blue dashed lines. Low financial literacy is indicated by a darker color and high financial literacy by a light shade. For the group of frequent overdraft users (lower panel) the graph reveals that individuals who lack self-control are more likely to use their overdraft accounts frequently (by comparison of the upper two curves for illiterate individuals or the lower two curves



for financially literate households). However, we can infer that financial literacy can compensate for a lack of self-control, since an impulsive but knowledgeable individual (light solid curve) is less likely to be in the group of frequent short-term credit users, than one which has high self-control but low literacy (dark dashed curve). The effects of self-control and financial literacy are most pronounced at the age when credit demand is highest. The picture is inverted for people who never use their overdraft credit (upper panel).

**Financial literacy and numeracy.** In order to deepen our understanding of the aspects of financial literacy, we analyze its components in Table 7. The explanatory variables are again defined as indicator variables. "Numeracy" and "Advanced literacy" take a value of 1 if the numbers of correct answers are above the sample median. "Numeracy" denotes the subgroup of basic financial literacy questions which refer to basic mathematical problems occurring in financial markets. Lusardi (2012) gives a review of numeracy questions included in financial literacy surveys in different countries. The numeracy indicator variable marks if a person was able to correctly answer all 4 questions. "Advanced literacy" indicates whether at least 4 out of 5 advanced financial literacy questions (pertaining to knowledge about financial products and markets) are answered correctly.

[Insert Table 7 here.]

The regression results confirm the significant impact of advanced financial literacy on consumers' credit decisions (column i). Although numeracy (basic financial literacy) enters with the expected negative sign, the coefficient estimates are not significant. This is in line with evidence provided by van Rooij, Lusardi, and Alessie (2011) who include basic financial literacy as a control variable and focus on advanced financial literacy as their explanatory variable for households' decision to participate in the stock market. At first, our evidence seems to stand in contradiction to Gerardi, Goette, and Meier (2010) who provide evidence that borrowers' numerical ability predicts subprime mortgage delinquency and default. However, their measure of financial literacy does not include any advanced literacy questions at all, such that a potential impact of advanced financial literacy is omitted in their analysis. The relevance of advanced financial literacy for short-term credit decisions also persists when incorporating self-control in the analysis (column ii). The coefficient estimate on advanced literacy remains stable and significant, whereas self-control is only a weakly significant predictor of short-term

credit usage when we control for financial literacy.

In order to compare the magnitude of the effects, in Figure 2 we again turn to the analysis of predicted probabilities. The assumptions about the characteristics of the exemplary household are unchanged compared to Figure 1. We base the analysis on regression specification (iii) in Table 7 in order to avoid further inputs concerning household characteristics. The curves show the probabilities for a consumer to never (upper panel) or frequently (lower panel) rely on overdraft facilities depending on age (x-axis) and personal traits (self-control (SC is the counterpart to "TF" and indicates whether more than one CRT item was answered intuitively), numeracy (num) and financial literacy (FL) as indicated in the graph's legend).

[Insert Figure 2 here.]

Figure 2 confirms our previous findings: a lack of self-control is associated with a higher probability for frequent overdraft usage. Furthermore, financial literacy and numeracy have a diminishing effect on the probability for extensive short-term credit demand. Curves for households that are literate at least in one dimension (numeracy and/or financial literacy) are depicted in light shades. Some curves indicating different household traits overlap closely: An individual who is impulsive (low self-control) but possesses advanced financial knowledge has a similar probability to frequently use overdraft credit as a self-controlled individual lacking both kinds of literacy. We conclude that advanced financial literacy can compensate for lacking self-control. This conclusion also pertains to impulsive but literate individuals (with both numeracy skills and financial knowledge) who are as likely as a self-controlled individual that lacks financial literacy (but has numeracy skills) to often rely on overdraft credit. The situation for people who never use their overdraft credit (upper panel) can be explained analogously. This evidence provides a strong argument in favor of financial education as opposed to attempts fostering mathematical skills.

**Consumer installment credit.** So far, we have argued that impulsive people or those with lower financial literacy make use of a relatively expensive source of credit. For comparison, we also investigate the determinants of a cheaper, albeit less accessible and less liquid form of credit: consumer installment credit. Generally, consumer installment credit comes relatively close to overdraft credit in terms of purchasing goals (SAVE explicitly cites purposes such as buying clothes, electronic devices, cars or

vacation trips as examples for what was funded with the loan). However, compared to overdraft credit facilities to which close to 80 percent of respondents have access, there can be groups of people who are credit constrained in the sense that they will not be granted consumer credit by credit providers. I.e., even if these groups would like to take out a consumer loan in order to cover a financing need, they are not able to do so. In order to disentangle consumer credit access and credit demand we estimate a bivariate probit model with partial observability. This approach is necessary to determine factors shaping consumer credit demand, since it is difficult to distinguish the reason why a household does not have outstanding consumer credit. We cannot observe those cases in which a consumer would like to take out a loan but is not granted one by the bank or those cases in which the bank would agree to provide credit but the household does not request a loan. However, we include information from the SAVE survey, which provides a direct indicator capturing credit constraints: In the survey participants are asked whether in the past five years they were fully or partly denied credit requests, and whether they actually did request a loan. Furthermore, respondents can state whether they refrained from requesting credit for fear of denial. Close to half of the respondents indicate to have requested credit during the five years preceding the survey, while 8 percent did not dare to ask for credit.

Table 8 documents the results of the bivariate probit. On the household side, income, wealth, age, and family structure will matter for the decision to take out a loan. Besides, it may matter whether an individual is self-employed and we control for the volume of overdraft credit. Furthermore, we include the information on credit demand. A "Desire for credit" indicates whether an individual has requested a loan (abstracting from whether it was granted) or refrained from asking for credit for fear of denial. On the side of the bank, we control for customer's age, assets and outstanding loans (including the volume of overdraft facilities),<sup>16</sup> monthly income and rent as well as marital status and number of children. We also consider whether the "Bank received (a) request" for credit, which indicates whether the individual has requested a loan.

[Insert Table 8 here.]

The results of the bivariate probit regression indicate that wealthier households have a lower demand for consumer installment credit and that those with higher income are more likely to have credit

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<sup>16</sup>On the bank's side we do not include total net wealth, since not all items may be observable for the bank, e.g. company pension schemes or loans from family and friends.

outstanding. As for the results on overdraft credit usage, the probability to have installment credit outstanding depends on household age. The same factors also play a role in the decision of the bank to grant credit, with income being the most important determinant. Unsurprisingly, households that requested credit are also more likely to have consumer installment credit outstanding. Turning to personal traits, self-control is a factor increasing credit demand, however coefficient estimate are small and the significance of self-control vanishes when financial literacy is included in the regressions. We also include a probit model as a mini robustness test in column (v). The results from the probit regressions also indicate that behavioral traits do not shape the process of taking out consumer installment credit. We see two possible explanations: (i) customers with low self-control may want to consume more by the means of consumer installment credit, but banks' credit counselors can restrict customers' credit demand when the requested level of debt is unsustainable, (ii) requesting consumer installment credit is a much more deliberate decisions which involves paperwork and communication with the bank, compared to financing consumption by overdraft accounts. Either way we conclude that accessibility and liquidity are features of overdraft credit lines which are particularly inviting for behavioral biases.

## 4 Robustness

As robustness exercises, we demonstrate that the results in the main part are not driven by our proxy for self-control, by the simplicity of the measure of financial literacy, by the choice of our econometric approach or by some households that are credit-constrained and have to rely on overdraft credit because they do not have access to consumer credit.

**Alternative proxy for self-control.** We construct an alternative measure of self-control which is unrelated to current consumption and saving decisions and, hence, exogenous to current credit decisions: we use information regarding the respondents' childhood behavior (spending or saving their pocket money) to determine the level of self-control of the adult person. This approach relies on the validity of the assumption that character traits (in particular patience and self-control) are relatively stable for an individual person. An influential line in psychological literature backs our argumentation: [Mischel and Peake \(1988\)](#), [Mischel and Rodriguez \(1989\)](#) and [Mischel and Peake \(1990\)](#) demonstrate

that individual differences in self-control measured at the pre-school stage predict the same persons' behavior more than a decade later. Coming to similar conclusions, Moffitta, Arseneault, Belsky, Dickson, Hancox, Harrington, Houts, Poulton, Roberts, Ross, Sears, Thomson, and Caspi (2011) present a longitudinal study which demonstrates that self-control in childhood predicts personal finance (among other criteria) at the age of 32. Therefore, our childhood-based measure of self-control is an imperfect, but valid proxy for self-control of the adult respondent which is not caused by current spending behavior. To the best of our knowledge, this approach to identify determinants of decisions has not been used before.

Concretely, we assess respondents' self-control by considering participants' agreement to the statement "[As a child] I used to spend my pocket money immediately" as the alternative proxy. For this purpose we enrich cross-sectional data from the 2009 SAVE survey with two additional variables from the 2008 questionnaire. Respondents can indicate their agreement to the statement on a scale ranging from 0 ("strongly disagree") to 10 ("agree completely"). Low values therefore imply higher levels of self-control. In our regressions we also include respondents' agreement to the statement "As a child I regularly received pocket money". The respondents answer question by indicating higher agreement on an 11 point Likert-Scale (0-10).

The results of the regression analysis including our self-control proxy are presented in Table 9.

[Insert Table 9 here.]

Columns (i) and (ii) provide regression results when explanatory variables are of categorical nature whereas columns (iii) and (iv) show results for dummy variable specifications. As in our earlier analyses lacking self-control, which is approximated by immediately having spent pocket money in childhood, is associated negatively with overdraft usage frequency. Whether a respondent received pocket money regularly does not impact the results. In order to analyze the results we can compare closest column (iii) (or column iv) to evidence presented Table 6 columns (iii). Both model specifications employ indicators for the explanatory variables and the measure of financial literacy is based on all nine (basic and advanced) financial literacy questions. While the coefficient estimate on the proxy for self-control is a little higher for the pocket money spending variable compared to the measure based on the cognitive reflection test the estimate for financial literacy remains remarkably stable.

[Insert Table 10 here.]

According to the correlations between the different explanatory variables provided in Table 10 there is no overlap in our different proxies for self-control. This finding is not very surprising given that they cover very different aspects: While our alternative proxy is a self-assessed measure capturing an individuals' behavior in childhood from which we draw conclusions about current self-control, the cognitive reflection test is a performance based measure eliciting respondents' tendency to exert self-control and dismiss the intuitive but incorrect answer. We see a low positive correlation between the financial literacy measures and the cognitive reflection test which is plausible given that both measures are related to individuals' cognitive abilities. The correlation between the self-assessed extent of financial education at school is also very little positively correlated with the performance measures of financial literacy. The correlation is a little higher for advanced financial literacy compared to basic financial literacy. The fact that self-assessed financial literacy proxies are only mildly correlated with performance based measures underlines the importance of quiz questions for approximating financial literacy. From the robustness analysis we can infer that our conclusions drawn so far hold true, when employing a completely different proxy for self-control.

**Alternative measurement of financial literacy.** In the following, we document that the results of our study are not driven by the way we define our baseline financial literacy measure. As described above, this measure is derived from nine questions on financial literacy contained in the 2009 SAVE survey, which are aggregated into a score measure (counting the number of correct answers) or a dummy variable (indicating whether more than the median number of answers were given correctly). While "I cannot/do not want to answer" is counted as a wrong answer, a missing answer turns the score to missing. In addition to this relatively simple and straightforward measure of financial literacy, we also follow [van Rooij, Lusardi, and Alessie \(2011\)](#) who use an iterated principal factor analysis to construct an index for financial literacy from the quiz questions. When applying factor analysis we assume that financial literacy (which we cannot observe directly) is not mirrored equally well in the answers to the quiz questions. For each question, we construct a dummy variable which indicates correct answers, such that we obtain 9 items which enter the factor analysis (missing values remain in the coding of the binary variables). Furthermore we construct 9 items indicating whether a respondent decided to admit that he does not know the correct answer.

An indicative principal component analysis leads us to retain two main factors when analyzing all nine financial literacy items. Given the factor loadings from the iterative principal factor analysis of all nine items, we find that one of the factors loads stronger on the basic financial literacy items whereas the other factor loads on the advanced items. We follow the approach by [van Rooij, Lusardi, and Alessie \(2011\)](#) and conduct two separate iterated factor analyses for basic and advanced financial literacy questions. We first only consider items based on correct answers to basic and advanced questions. In a second step we also include "Do not know" answers into the set of items for the iterated principal factor analysis.

[Insert Table 11 here.]

Columns (i) and (ii) reproduce the results when measuring financial literacy (and the proxy indicating a lack of self-control) by dummy variables or scores. In columns (iii) and (iv) the results for the analysis of financial literacy measures obtained from principal factor analysis are displayed. The coefficient estimates on different financial literacy proxies are always negative. While basic financial literacy is not significant in any of the specifications the coefficient estimates for the advanced financial literacy measures remain significant for the different specifications. We conclude that our results are not driven by the relatively simple approach we employ in our main regressions to measure financial literacy.

**Alternative econometric approaches.** As the SAVE data on overdraft credit usage frequency are of categorical nature and censored on both sides, ordered probit estimation is the natural choice. However, to make sure that the results on the negative relations between self-control or financial literacy and overdraft credit usage frequency are not due to the ordered probit approach, we also conduct three other regression models, reported in [Table 12](#). Columns (i) and (ii) display the coefficient estimates obtained in an OLS regression. In columns (iii) and (iv) we reduce the information on overdraft usage frequency to a dummy variable indicating whether the credit line has been used at least 4 times in the preceding year (i.e. usage groups 3 and 4). We are now able to run probit regressions instead of ordered probit estimation. In columns (v) and (vi) we analyze whether our results are prone to an item non-response bias. For this purpose, we make use of five imputed data sets provided by MEA. While we do not rely on imputed values for our dependent and explanatory

variables, we use the imputed values for the control variables. We run ordered probit regressions on all five imputed data sets. The results are obtained by using Rubin’s Method (Rubin, 1987).

[Insert Table 12 here.]

Our results turn out to be qualitatively similar to those from the baseline approach reported in Tables 4 and 6. For the OLS results it is remarkable that coefficient estimates are of similar magnitude as in the ordered probit but are now much more straightforward to interpret. Interestingly the intercept turns out to be very high, considering that the dependent variable can only take on values between 1 (never use overdraft credit) and 4 (more frequently than six times a year or constantly in overdraft use). However, this fact becomes plausible when taking into account that wealth enters the regression negatively. Considering the average respondent age of 55 years further reduces the starting level of the intercept. The OLS regression results once more confirm the compensational effect of advanced financial literacy for a lack of self-control.

Statistical significance stays unaffected compared to the ordered probit approach and coefficient estimates are also similar. We also analyze, whether our results are influenced by a non-response bias stemming from the control variables. We can reject this skepticism since the results from repeating our analysis with imputed data are very similar to our estimations when excluding observations with missing data. The value added by the comparably extensive analysis therefore appears to be negligible.

**Potentially credit-constrained groups.** Credit-constrained people, who do not have access to consumer credit can be forced to rely on overdraft credit lines when they experience financing needs. We explicitly take into account two measures for objective and subjective credit constraints in Table 13. These measures rely on the information whether a household has previously been partly or fully denied credit or refrained from requesting credit for fear of denial. While this aspect influences the results for self-control it does not affect the relation between financial literacy and overdraft usage frequency. Additional to these direct measures we also take a more indirect approach: since for credit providers one important aspect in their decision to grant credit is regular income streams such that future interest and repayments can be covered (also compare our results in Table 8), groups with irregular or low incomes may be denied credit. As such groups we identify the unemployed, self-employed and retired.



[Insert Table 13 here.]

According to the results in Table 13 column (ii), access to consumer credit is an important aspect in the overdraft usage decision: constrained households use overdraft credit lines significantly more often compared to unconstrained households. In these cases, overdraft credit serves as a substitute for consumer credit. Especially respondents fearing credit denial use overdraft credits more frequently, probably for convenience and ease. Excluding potentially credit constrained groups in columns (iii) to (v), does not impact the relation between self-control or financial literacy and overdraft credit use.

## 5 Conclusion

Our analysis aims at extending our knowledge about households' financial decisions. By connecting two strands of literature, academic research on self-control and recent studies on financial literacy, we investigate whether determinants of credit decisions can be explained by a lack of self-control or a lack of understanding of financial products. More specifically, we focus on an easily accessible, but expensive credit form (overdraft credit) which is available to a vast majority of German households.

Based on a micro dataset on German households, we test several hypotheses: we test whether self-control is central to credit decisions, whether there is role for financial education when individuals are impulsive, and whether education in the field is more promising for expanding numerical skills or financial knowledge.

Financial literacy is in fact a crucial determinant of the use of credit products even after controlling for self-control issues. Financial literacy is a qualification on its own which cannot be substituted by general education or cognitive training (i.e. numeracy). Our findings suggest that, while financial literacy is certainly not the unique determinant of credit decisions, financial education programs could substantially improve households' financial decisions.

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**Table 1:** Descriptive statistics on overdraft credit usage frequency

The table shows the distribution of household overdraft credit usage frequency. Only those households indicating that they have access to an overdraft facility on their checking account are taken into consideration. Percentages do not add up to unity because of refusals.

	Frequency	Percent
never	811	46.8
1-3 times p.a.	438	25.3
4-6 times p.a.	152	8.8
more often or constantly	295	17.0

**Table 2:** Cognitive Reflection Test - Empirical distribution of answers to the CRT by [Fredrick \(2005\)](#)

Panel A reports the proportion of households providing correct, intuitive but incorrect and other incorrect answers as well as the proportion of refusals to answer for each of the three questions in the cognitive reflection test. The questionnaire does not provide the possibility to choose "I cannot/do not want to answer" for the cognitive reflection test. Panel B shows which percentages answer correctly (incorrectly/do not answer at all) to a given number of questions, i.e. if no question is answered correctly some of the three questions of the cognitive reflection test were either not or falsely answered.

Panel A: Numeracy - percentages of correct, incorrect and missing answers (N= 2,222)				
	Correct	Intuitive	Incorrect	Refusal
1) Bat and ball	19.4	66.7	3.1	10.8
2) Production time	40.3	32.1	11.8	15.8
3) Lily pond	42.6	33.3	6.3	17.8

Panel B: Summary of responses - percentages of numbers of correct, incorrect and missing answers (N=2,222)				
	None	1	2	All
Correct	45.1	21.4	19.6	13.9
Incorrect	23.9	25.5	24.6	26.3
Refusal	78.8	7.2	4.9	9.1

**Table 3:** Financial literacy - Empirical distribution of answers to nine questions

Panel A reports the proportion of households providing correct and incorrect answers as well as the proportion of "I cannot/do not want to answer" and refusals to answer for each of the nine financial literacy questions. Panel B shows which percentages answer correctly (incorrectly/do not know) to a given number of questions, i.e. if no question is answered correctly the answers were either wrong, do not know or complete refusal or a combination of these possibilities. Means do not add up to nine due to refusals.

Panel A: Financial literacy - percentages of correct, incorrect and do not know answers (N= 2,222)											
	Correct	Incorrect	Do not know	Refusal							
Basic FL questions											
1) Interest (2%)	82.8	5.3	9.1	2.8							
2) Interest (20%)	63.7	23.2	10.7	2.5							
3) Inflation	78.1	4.0	15.0	2.9							
4) Money illusion	54.8	31.1	11.3	2.7							
Advanced FL questions											
1) Return volatility	70.0	9.4	17.1	3.6							
2) Stock market	51.0	16.2	29.6	3.2							
3) Diversification	63.7	6.4	27.5	2.4							
4) Balanced funds	44.7	7.1	44.6	3.7							
5) Bond prices	9.4	52.9	33.4	4.3							
Panel B: Summary of responses - percentages of numbers of correct, incorrect and do not know answers (N=2,222)											
	None	1	2	3	4	5	6	7	8	All	Mean
Correct	8.1	3.7	5.6	8.1	10.6	10.9	15.6	16.1	17.1	4.5	5.18
Incorrect	20.3	35.3	24.6	11.9	5.2	2.1	0.5	0.1	-	-	1.55
Do not know	42.0	16.0	11.2	7.5	7.5	4.7	3.0	2.5	1.6	4.0	1.98

**Table 4:** Ordered probit regression of overdraft usage frequency on CRT results

This table shows our baseline ordered probit regression of overdraft credit usage frequency on a score calculated based on the responses to the cognitive reflection test by Fredrick (2005). Respondents indicate their overdraft credit usage frequency by choosing among four usage frequency intervals: "never", "1 to 3 times a year", "4 to 6 times a year", "more often or constantly". We therefore employ an ordered probit estimation procedure with heteroskedasticity robust standard errors in all regressions. The cognitive reflection test mutually captures reflectivity and cognitive ability. We construct two different scores termed "CRT score" and "TF score". CRT score is in parallel to the measure suggested in the original paper by Fredrick (2005) and counts the correct responses in the CRT. The CRT score takes values from 0 to 3 where higher values are mutually associated with higher patience and higher cognitive. Estimation results are included in columns (ii) to (iv). In contrast, TF score counts the number of intuitive but incorrect answers. It is therefore linked more closely to impatience than to a lack of cognitive abilities. When at least one answer to the questions is missing the scores will turn to missing. Concerning the control variables, we omit the dummy indicating a single household. With regard to occupation, white-collar employment is taken as the base group. Unemployment is included as a dummy variable indicating whether the respondent and/or the spouse is unemployed. Among the educational variables lower secondary education is excluded. Economics education is a self-assessed measure from 0 indicating "no economics education at all" to 7 "very intensive education" in school or other educational courses. Robust standard errors are given in parentheses. Significant at the \*\*\* 1%-level, \*\* 5%-level, \* 10%-level.

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
CRT score		-0.088*** (0.032)	-0.096*** (0.032)	-0.098*** (0.033)			
TF score					0.084** (0.033)	0.090*** (0.034)	0.093*** (0.034)
2nd wealth quartile	-0.525*** (0.106)	-0.476*** (0.106)	-0.500*** (0.106)	-0.495*** (0.107)	-0.477*** (0.106)	-0.500*** (0.107)	-0.495*** (0.107)
3rd wealth quartile	-0.435*** (0.104)	-0.359*** (0.104)	-0.399*** (0.105)	-0.395*** (0.105)	-0.359*** (0.104)	-0.397*** (0.105)	-0.393*** (0.105)
4th wealth quartile	-0.791*** (0.109)	-0.699*** (0.108)	-0.750*** (0.110)	-0.744*** (0.110)	-0.700*** (0.108)	-0.751*** (0.111)	-0.743*** (0.111)
Log income	-0.100 (0.078)	-0.059 (0.068)	-0.077 (0.078)	-0.078 (0.079)	-0.064 (0.068)	-0.083 (0.078)	-0.082 (0.079)
Age	0.054*** (0.019)	0.048** (0.019)	0.051*** (0.019)	0.048** (0.019)	0.049*** (0.019)	0.051*** (0.019)	0.049** (0.019)
Age <sup>2</sup>	-0.073*** (0.019)	-0.066*** (0.017)	-0.070*** (0.019)	-0.068*** (0.019)	-0.066*** (0.017)	-0.070*** (0.019)	-0.068*** (0.019)
Gender (male)	0.048 (0.072)		0.072 (0.072)	0.098 (0.073)		0.070 (0.072)	0.097 (0.073)
Couple	-0.031 (0.095)		-0.035 (0.095)	-0.036 (0.095)		-0.037 (0.095)	-0.039 (0.095)
Number of children	0.111*** (0.042)		0.115*** (0.042)	0.116*** (0.042)		0.112*** (0.042)	0.113*** (0.042)
Blue-collar worker	-0.061 (0.120)		-0.096 (0.119)	-0.104 (0.121)		-0.097 (0.119)	-0.108 (0.121)
Civil servant	0.068 (0.160)		0.077 (0.161)	0.055 (0.161)		0.070 (0.161)	0.048 (0.161)
Self-employed	0.285 (0.204)		0.292 (0.206)	0.302 (0.206)		0.285 (0.204)	0.295 (0.205)
Other occupation	-0.025 (0.132)		-0.036 (0.133)	-0.026 (0.134)		-0.039 (0.133)	-0.030 (0.134)
Retired	0.183 (0.123)		0.162 (0.123)	0.167 (0.124)		0.157 (0.124)	0.161 (0.125)
Unemployed	0.038 (0.186)		0.045 (0.186)	0.063 (0.185)		0.037 (0.186)	0.057 (0.185)
Mid-level education				0.112 (0.089)			0.110 (0.089)
A-level education				0.063 (0.098)			0.056 (0.098)
Economics education				-0.033 (0.022)			-0.034 (0.022)
$\mu_1$	-0.497 (0.726)	-0.498 (0.671)	-0.529 (0.719)	-0.613 (0.718)	-0.279 (0.678)	-0.294 (0.728)	-0.375 (0.726)
$\mu_2$	0.239 (0.726)	0.235 (0.672)	0.210 (0.719)	0.126 (0.718)	0.454 (0.679)	0.445 (0.727)	0.365 (0.726)
$\mu_3$	0.598 (0.725)	0.593 (0.672)	0.571 (0.719)	0.489 (0.718)	0.811 (0.678)	0.805 (0.727)	0.726 (0.726)
<i>N</i>	1120	1120	1120	1120	1120	1120	1120
<i>Pseudo - R</i> <sup>2</sup>	0.148	0.144	0.153	0.156	0.143	0.152	0.155



**Table 5:** Predicted probabilities for overdraft usage frequency groups

We report probabilities for exemplary households to be in the different usage frequency groups when varying the level of self-control. For self-control we employ the measure "TF score" which counts the number of automatic responses to the CRT. We rely on our baseline specification from Table 4 column (v) describing the regression of overdraft usage frequency on TF score, wealth quartile, log income, and age. This way, we do not have to impose numerous assumptions on household structure, respondent's occupation and education. We start with an average age and average income household in the second wealth quartile and then vary assumptions about age and wealth in the lower panels. A young person is considered to be younger than 35. The average age of all respondents below 35 is employed for the young respondent scenario. For the low wealth scenario the lowest wealth quartile is chosen.

	Probabilities for average age, average income			
	P(Y=never)	P(Y=1-3 times)	P(Y=4-6 times)	P(Y=more often)
TF=0	50.1	26.7	9.2	13.4
TF=1	47.4	27.4	9.9	15.3
TF=2	44.0	28.0	10.6	17.3
TF=3	40.8	28.4	11.3	19.6
	Probabilities for young respondents with average income			
	P(Y=never)	P(Y=1-3 times)	P(Y=4-6 times)	P(Y=more often)
TF=0	43.2	28.1	10.8	17.9
TF=1	39.9	28.4	11.4	20.2
TF=2	36.7	28.6	12.0	22.6
TF=3	33.6	28.6	12.6	25.2
	Probabilities for lowest wealth quartile, average age and average income households			
	P(Y=never)	P(Y=1-3 times)	P(Y=4-6 times)	P(Y=more often)
TF=0	32.3	28.5	12.8	26.4
TF=1	29.4	28.2	13.2	29.2
TF=2	26.6	27.7	13.6	32.1
TF=3	23.9	27.0	13.9	35.2

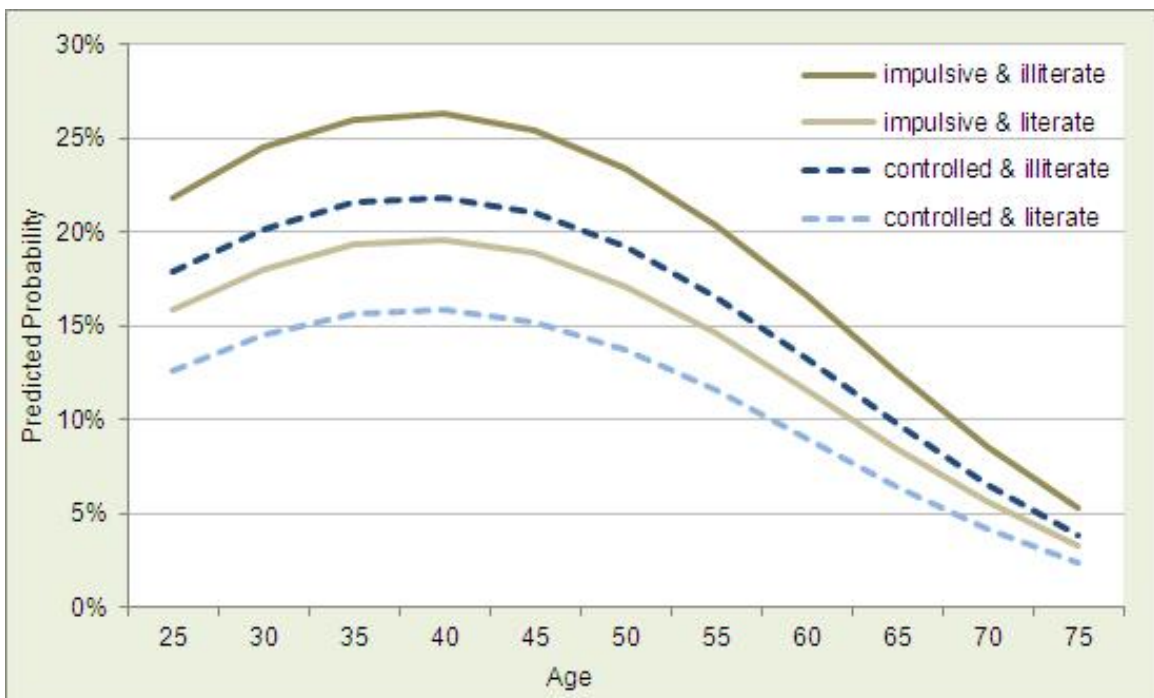
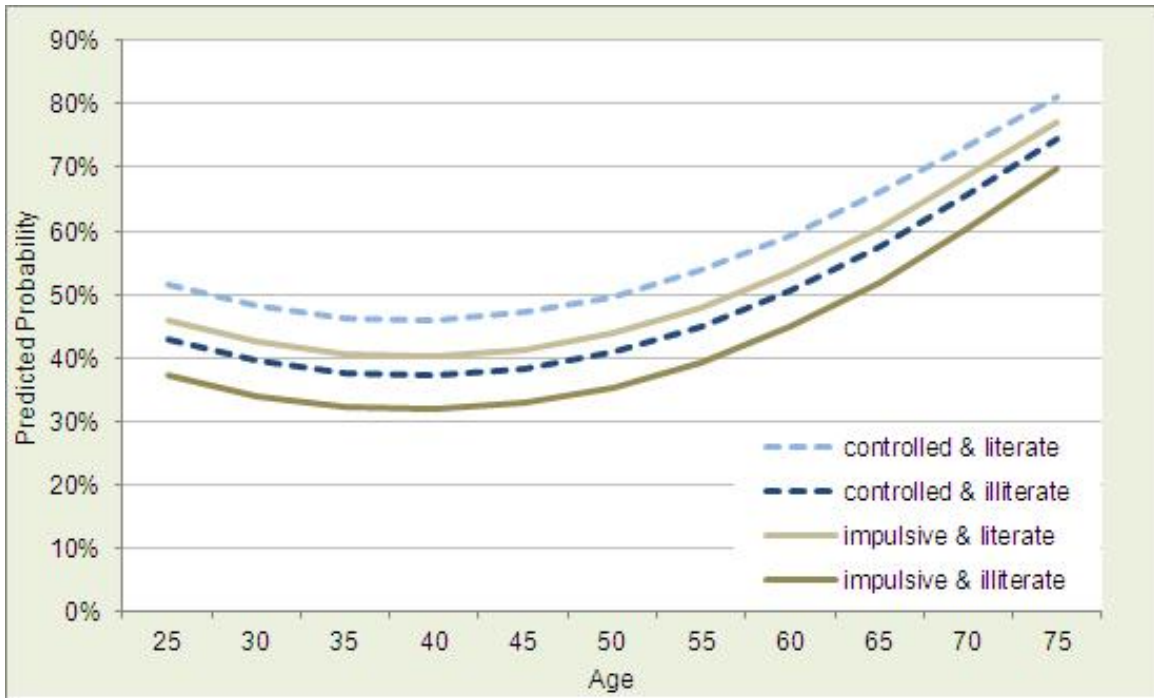
**Table 6:** Ordered probit regression - impact of self-control and financial literacy

In this table we try to disentangle the effects of impatience and cognitive abilities on credit usage. To facilitate interpretation we define our key explanatory variables as dummy variables. "Lack of self-control" indicates whether a person responded at least once intuitively but incorrectly in the CRT. "Financial literacy" indicates whether at least seven out of nine financial literacy questions are answered correctly. For reasons of brevity we only report the coefficients on the most important control variables, although all demographic and educational control variables are included in regression specifications if not indicated otherwise. Robust standard errors are given in parentheses. Significant at the \*\*\* 1%-level, \*\* 5%-level, \* 10%-level.

	(i)	(ii)	(iii)	(iv)
Lack of self-control	0.188** (0.081)		0.162** (0.082)	0.145* (0.080)
Financial literacy		-0.251*** (0.072)	-0.237*** (0.073)	-0.223*** (0.070)
2nd wealth quartile	-0.508*** (0.101)	-0.507*** (0.101)	-0.505*** (0.101)	-0.482*** (0.100)
3rd wealth quartile	-0.396*** (0.098)	-0.383*** (0.097)	-0.371*** (0.098)	-0.338*** (0.097)
4th wealth quartile	-0.776*** (0.104)	-0.748*** (0.104)	-0.737*** (0.105)	-0.683*** (0.103)
Log income	-0.057 (0.074)	-0.025 (0.074)	-0.021 (0.074)	0.006 (0.065)
Age	0.062*** (0.018)	0.061*** (0.018)	0.060*** (0.018)	0.059*** (0.018)
Age <sup>2</sup>	-0.080*** (0.018)	-0.079*** (0.018)	-0.079*** (0.018)	-0.076*** (0.016)
Other demographics	Yes	Yes	Yes	No
Educational controls	Yes	Yes	Yes	No
$\mu_1$	0.228 (0.696)	0.179 (0.692)	0.332 (0.700)	0.376 (0.654)
$\mu_2$	0.985 (0.697)	0.938 (0.692)	1.092 (0.700)	1.130* (0.655)
$\mu_3$	1.336* (0.697)	1.291* (0.692)	1.446** (0.700)	1.478** (0.656)
$N$	1240	1240	1240	1240
$Pseudo - R^2$	0.153	0.158	0.161	0.147

**Figure 1:** Predicted probabilities for self-control and financial literacy

These plots represent predicted probabilities for a household in the second wealth quartile with average income to be in the group that never uses overdraft facilities (upper panel) or frequently (lower panel). The probabilities are calculated based on the regression specification from Table 6 column (iv). Individuals with low self-control are termed "impulsive" and those with high self-control "controlled".



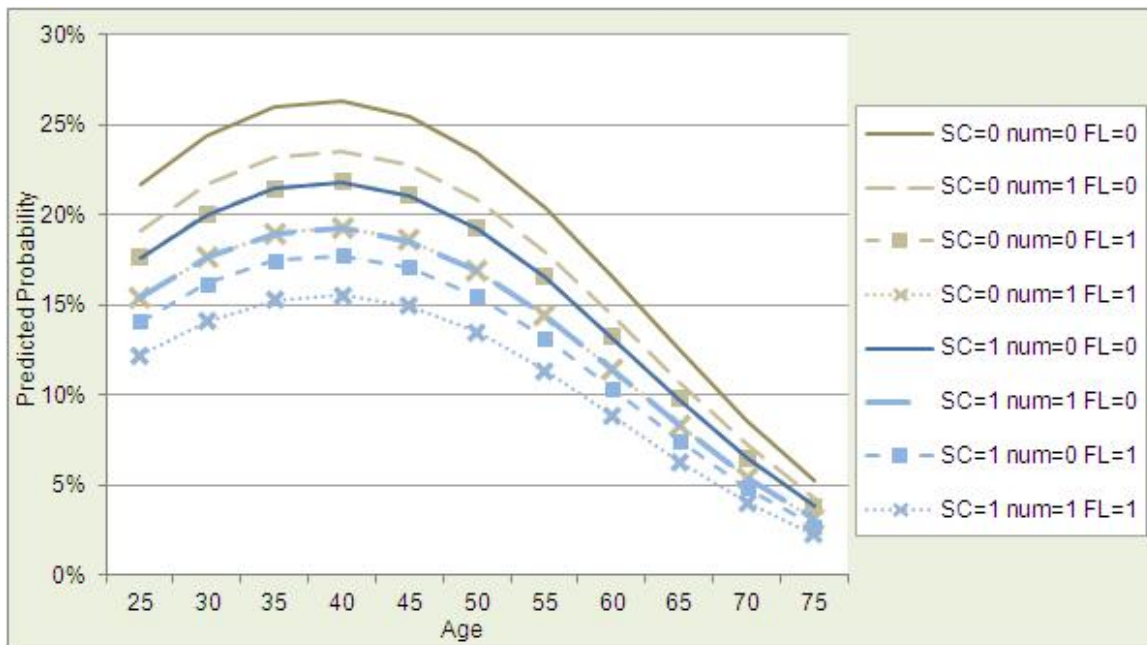
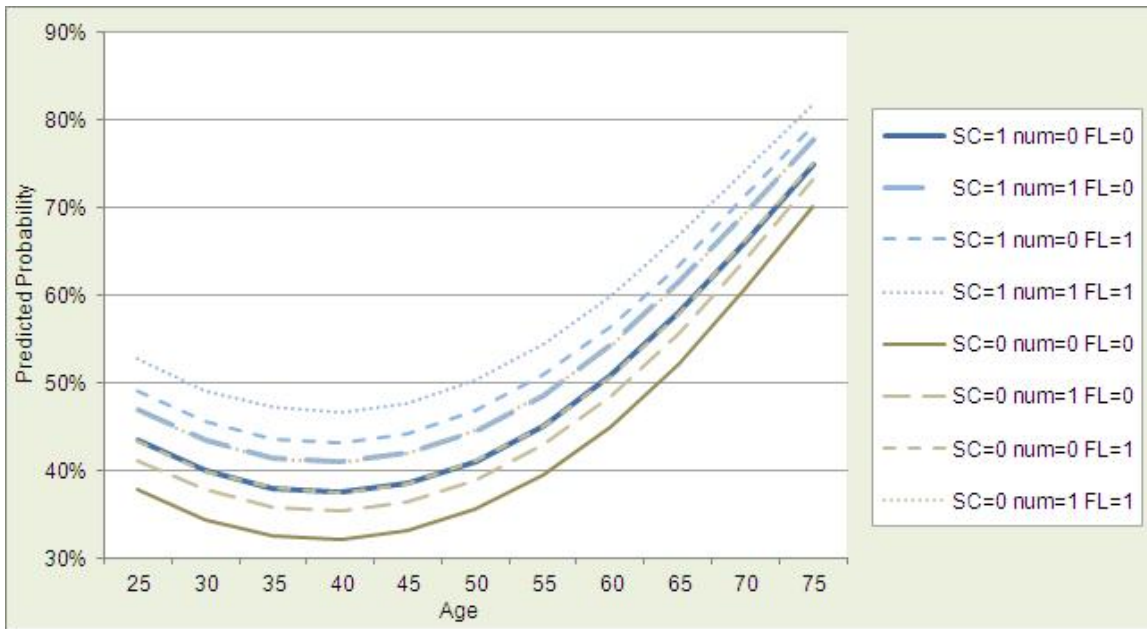
**Table 7:** Ordered probit regression - analyzing components of financial literacy

In this table we try to disentangle the effects of impatience and cognitive abilities on credit usage. To facilitate interpretation we define our key explanatory variables as dummy variables. "Lack of self-control" indicates whether a person responded at least once intuitively but incorrectly in the CRT. The indicators "numeracy" and "advanced literacy" focus on subgroups of the financial literacy questions. Numeracy pertains to 4 basic financial literacy questions whereas advanced literacy covers five advanced financial knowledge questions. Both literacy variables indicate whether more than the median number of questions have been answered correctly (i.e. all of the 4 basic questions and at least 4 out of 5 advanced questions). For reasons of brevity we only report the coefficients on the most important control variables, although all demographic and educational control variables are included in regression specifications if not indicated otherwise. Robust standard errors are given in parentheses. Significant at the \*\*\* 1%-level, \*\* 5%-level, \* 10%-level.

	(i)	(ii)	(iii)
Lack of self-control		0.159*	0.146*
		(0.082)	(0.081)
Numeracy	-0.111	-0.099	-0.089
	(0.069)	(0.070)	(0.069)
Advanced literacy	-0.178**	-0.168**	-0.145**
	(0.074)	(0.074)	(0.072)
2nd wealth quartile	-0.498***	-0.496***	-0.475***
	(0.101)	(0.101)	(0.100)
3rd wealth quartile	-0.371***	-0.360***	-0.331***
	(0.098)	(0.098)	(0.097)
4th wealth quartile	-0.741***	-0.731***	-0.681***
	(0.104)	(0.105)	(0.103)
Log income	-0.023	-0.019	0.002
	(0.074)	(0.074)	(0.065)
Age	0.062***	0.061***	0.060***
	(0.018)	(0.019)	(0.018)
Age <sup>2</sup>	-0.080***	-0.080***	-0.077***
	(0.018)	(0.018)	(0.016)
Other demographics	Yes	Yes	No
Educational controls	Yes	Yes	No
$\mu_1$	0.235	0.385	0.396
	(0.694)	(0.702)	(0.654)
$\mu_2$	0.993	1.144	1.149*
	(0.695)	(0.703)	(0.655)
$\mu_3$	1.343*	1.495**	1.493**
	(0.695)	(0.703)	(0.656)
$N$	1238	1238	1238
$Pseudo - R^2$	0.156	0.159	0.145

**Figure 2:** Predicted probabilities for self-control and components of financial literacy

These plots represent predicted probabilities for a household in the second wealth quartile with average income to be in the group that never uses overdraft facilities (upper panel) or frequently (lower panel). The probabilities are calculated based on the regression specification from Table 7 column (iii). In the legend, we display the values of the indicator variables. SC is the self-control indicator, FL stands for (advanced) financial literacy, whereas num identifies the dummy for numeracy (basic financial literacy).



**Table 8: Bivariate probit regression of consumer installment credit usage on cognitive reflection and financial literacy**

In this table we analyze how different household characteristics are related to the prevalence of consumer credit. The dependent variable is respondents' indication on whether they have any outstanding balances on consumer credit (e.g. car loan, credit for buying clothes or electronic devices). We estimate a bivariate probit regression with partial observability according to the model by Poirier (1980), since we can only observe cases in which a person applied for credit and was granted one. In columns (i)-(iv) we report coefficient estimates for the variables potentially influencing customers' decision to apply for credit as well as the banks' decision to grant credit. In column (iii) we include the "desire for credit" which is a dummy variable indicating whether a person has asked for credit during the last five years or whether a person did not dare to apply for credit out of fear of being refused. On the side of the bank we include the variable "bank received request" if a person has asked for credit within the last five years. We include a probit model for comparison in column (v). Robust standard errors are given in parentheses; significant at the \*\*\* 1%-level, \*\* 5%-level, \* 10%-level.

	bivariate probit					probit	
	(i)	(ii)	(iii)	(iv)	(v)	compare (iii)	compare (iv)
	customer	customer	customer	customer	customer	bank	bank
Lack of self-control	0.004*** (0.001)	0.005 (0.033)	0.005*** (0.001)	0.004 (0.008)	0.120 (0.111)	0.101 (0.111)	0.101 (0.111)
Financial literacy		-0.002 (0.015)		-0.007 (0.031)			-0.147 (0.094)
Age	0.049** (0.020)	0.049** (0.020)	0.041* (0.022)	0.04 (0.025)	0.036 (0.023)	0.035 (0.023)	0.035 (0.023)
Age <sup>2</sup>	-0.065*** (0.020)	-0.065*** (0.020)	-0.050*** (0.021)	-0.050* (0.026)	-0.046** (0.022)	-0.046** (0.022)	-0.046** (0.022)
Couple	0.081 (0.098)	0.08 (0.113)	0.041*** (0.012)	0.041 (0.074)	0.051 (0.118)	0.037 (0.118)	0.037 (0.118)
Married		0.08 (0.098)		0.038 (0.074)			
Number of children	-0.008 (0.045)	-0.008 (0.046)	-0.001 (0.048)	-0.002 (0.048)	0.000 (0.049)	-0.006 (0.049)	-0.006 (0.049)
Self-employed	-0.095 (0.208)	-0.095 (0.215)	-0.045 (0.206)	-0.045 (0.218)	-0.112 (0.202)	-0.112 (0.202)	-0.112 (0.202)
Log income	0.404*** (0.083)	0.404*** (0.083)	0.317*** (0.083)	0.320*** (0.114)	0.391*** (0.105)	0.419*** (0.106)	0.419*** (0.106)
Rent	0.000*** (0.000)	0.000 (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
Log wealth	-0.033*** (0.008)	-0.033*** (0.011)	-0.037*** (0.011)	-0.037*** (0.012)	-0.037*** (0.012)	-0.036*** (0.013)	-0.036*** (0.013)
Log total assets	-0.038*** (0.010)	-0.038*** (0.012)	-0.038*** (0.011)	-0.038*** (0.012)	-0.038*** (0.012)	-0.038*** (0.012)	-0.038*** (0.012)
Log building soc. loans	0.016 (0.016)	0.016 (0.016)	0.005*** (0.002)	0.005*** (0.002)	0.006 (0.005)	0.006 (0.005)	0.006 (0.005)
Log mortgages	0.019*** (0.005)	0.019*** (0.007)	0.019*** (0.007)	0.019*** (0.007)	0.010*** (0.003)	0.010*** (0.003)	0.010*** (0.003)
Log educational loans	-0.000* (0.000)	0.000 (0.013)	-0.000** (0.000)	-0.000** (0.000)	0.003 (0.053)	0.003 (0.053)	0.004 (0.052)
Volume overdraft	-0.001 (0.009)	-0.001 (0.011)	-0.001 (0.010)	-0.001 (0.010)	-0.001 (0.012)	-0.001 (0.011)	-0.001 (0.011)
Desire for credit			1.300*** (0.109)	1.296*** (0.119)	1.535*** (0.133)	1.524*** (0.133)	1.524*** (0.133)
Bank received request					1.296*** (0.109)	1.296*** (0.109)	1.296*** (0.109)
$\mu$	-4.560*** (0.719)	-4.556*** (0.726)	-4.819*** (0.751)	-4.829*** (1.027)	-4.666*** (0.851)	-5.432*** (0.848)	-5.533*** (0.854)
$N$	1480	1480	1480	1466	1466	1466	1466
Pseudo $R^2$							0.248

**Table 9:** Robustness: Ordered probit regressions of overdraft usage considering an alternative proxy for self-control

This table shows ordered probit regression results when analyzing an alternative proxy for respondents' self-control. We use respondents pocket money (PM) spending behavior as a proxy for self-control assuming that quick spending indicates low self-control and that character traits persist over time. The variable termed "spent PM quickly" indicates the agreement to the statement "I used to spend my pocket money immediately". In columns (i) and (ii) the variable spans values 0-10 where a value of 10 signals high agreement. In columns (iii) and (iv) the variable is defined as a dummy indicating whether the value on the agreement scale is larger than five. We furthermore consider, whether it is important if a respondent received pocket money on a regular basis in columns (ii) and (iv). In column (ii) the variable assesses respondents' agreement on the statement "As a child I regularly received pocket money" on a range from 0 ("strongly disagree") to 10 ("agree completely"). In column (iv) we again create a dummy indicating whether respondents chose at least a value of six. We also include a measure of financial literacy (based on all nine questions). The dummy variable in columns (iii) and (iv) turns to one when at least seven out of nine questions were answered correctly. Columns (i) and (ii) differ from columns (iii) and (iv) in that we employ indicator variables for the explanatory variables instead of scores or categorical variables. Robust standard errors are given in parentheses; significant at the \*\*\* 1%-level, \*\* 5%-level, \* 10%-level.

	Categorical variables		Indicator variables	
	(i)	(ii)	(iii)	(iv)
Received PM regularly		-0.012 (0.010)		0.030 (0.078)
Spent PM quickly	0.048*** (0.012)	0.053*** (0.013)	0.232*** (0.085)	0.227*** (0.086)
Financial literacy	-0.052*** (0.018)	-0.052*** (0.018)	-0.218*** (0.076)	-0.221*** (0.076)
2nd wealth quartile	-0.426*** (0.105)	-0.428*** (0.105)	-0.460*** (0.106)	-0.460*** (0.106)
3rd wealth quartile	-0.360*** (0.105)	-0.358*** (0.105)	-0.385*** (0.103)	-0.386*** (0.103)
4th wealth quartile	-0.626*** (0.112)	-0.626*** (0.112)	-0.659*** (0.110)	-0.659*** (0.110)
Log income	-0.076 (0.078)	-0.069 (0.078)	-0.072 (0.079)	-0.074 (0.078)
Age	0.056*** (0.020)	0.055*** (0.020)	0.052*** (0.020)	0.053*** (0.020)
Age <sup>2</sup>	-0.071*** (0.020)	-0.071*** (0.020)	-0.069*** (0.020)	-0.069*** (0.020)
Gender (male)	0.002 (0.074)	0.005 (0.074)	0.025 (0.073)	0.023 (0.074)
Couple	0.092 (0.096)	0.083 (0.096)	0.101 (0.096)	0.103 (0.096)
Number of children	0.112*** (0.041)	0.109*** (0.041)	0.106*** (0.041)	0.107*** (0.041)
Occupational controls	Yes	Yes	Yes	Yes
Educational controls	Yes	Yes	Yes	Yes
$\mu_1$	-0.188 (0.736)	-0.225 (0.738)	-0.179 (0.737)	-0.162 (0.739)
$\mu_2$	0.585 (0.737)	0.548 (0.739)	0.590 (0.737)	0.607 (0.739)
$\mu_3$	0.920 (0.738)	0.884 (0.740)	0.925 (0.738)	0.942 (0.740)
$N$	1107	1107	1107	1107
$Pseudo - R^2$	0.148	0.149	0.144	0.144

**Table 10:** Robustness: Correlations of alternative financial literacy proxies and competing explanatory variables

This table shows Pearson correlations between the different proxies for impatience, financial literacy and numeracy. All variables are defined as scores.

	TF	PM Spending	Full FL	Basic FL	Adv. FL
PM spending	0.02				
Full FL score	-0.34	0.04			
Basic FL score	-0.27	0.01	0.85		
Advanced FL score	-0.31	0.06	0.91	0.56	
Economics education	-0.05	0.01	0.16	0.10	0.18



**Table 11:** Robustness: Ordered probit regressions of overdraft usage considering alternative measurements of financial literacy

This table reports ordered probit regressions on different proxies for financial literacy which are obtained applying an iterated principal factor analysis as in [van Rooij, Lusardi, and Alessie \(2011\)](#). Column (i) replicate the results from Table 7 column (ii). Column (ii) displays results when scores are analyzed instead of indicator variables. Columns (iii) and (iv) show the results for two financial literacy factors. The basic financial literacy index is obtained from an iterated principal factor analysis of the four basic financial literacy questions (in column (iv) we also include four items indicating whether a respondent answered "Do not know"). The advanced financial literacy index is obtained analogically considering the five advanced financial literacy questions (and the respective "Do not know" items in column (iv)). Robust standard errors are given in parentheses; significant at the \*\*\* 1%-level, \*\* 5%-level, \* 10%-level.

	(i) indicator variables	(ii) scores	(iii) indices for FL only correct items	(iv) indices for FL with don't know items
Lack of self-control	0.159* (0.082)	0.078** (0.037)	0.082** (0.036)	0.081** (0.036)
Basic financial literacy	-0.099 (0.070)	0.015 (0.041)	0.079 (0.048)	0.030 (0.062)
Advanced financial literacy	-0.168** (0.074)	-0.058* (0.031)	-0.094** (0.042)	-0.084* (0.048)
2nd wealth quartile	-0.496*** (0.101)	-0.459*** (0.109)	-0.468*** (0.109)	-0.467*** (0.109)
3rd wealth quartile	-0.360*** (0.098)	-0.379*** (0.110)	-0.391*** (0.110)	-0.386*** (0.110)
4th wealth quartile	-0.731*** (0.105)	-0.698*** (0.115)	-0.711*** (0.115)	-0.708*** (0.115)
Log income	-0.019 (0.074)	-0.052 (0.081)	-0.055 (0.082)	-0.055 (0.081)
Age	0.061*** (0.019)	0.044** (0.020)	0.045** (0.020)	0.045** (0.020)
Age <sup>2</sup>	-0.080*** (0.018)	-0.063*** (0.019)	-0.064*** (0.019)	-0.064*** (0.019)
Other demographics	Yes	Yes	Yes	Yes
Educational controls	Yes	Yes	Yes	Yes
$\mu_1$	0.385 (0.702)	-0.276 (0.751)	-0.182 (0.753)	-0.185 (0.750)
$\mu_2$	1.144 (0.703)	0.473 (0.751)	0.565 (0.752)	0.563 (0.750)
$\mu_3$	1.495** (0.703)	0.822 (0.751)	0.916 (0.752)	0.913 (0.750)
$N$	1238	1054	1054	1054
$Pseudo - R^2$	0.159	0.149	0.150	0.149

**Table 12:** Robustness: Applying different regression models

This table reruns the regression from Table 6 column (iii) and Table 7 for different estimation procedures. Columns (i) and (ii) display the coefficient estimates of regressing overdraft credit usage frequency on the full set of explanatory and control variables by an OLS regression with heteroskedasticity-robust standard errors. In columns (iii) and (iv), overdraft credit usage is defined as a dummy indicating whether the credit line has been used at least 4 times in the preceding year (i.e. usage groups 3 and 4). The coefficient estimates are obtained in a probit regression. In columns (v) and (vi) we analyze whether our results are prone to an item non-response bias. For this purpose, we make use of five imputed data sets provided by MEA. While we do not rely on imputed values for our dependent and explanatory variables, we use the imputed values for the control variables. We run ordered probit regressions on all five imputed data sets. The results are obtained by using Rubin's Method (Rubin, 1987). Although not fully reported, we employ the complete set of control variables as in Table 6. Robust standard errors are given in parentheses; significant at the \*\*\* 1%-level, \*\* 5%-level, \* 10%-level.

	OLS		Probit		mi ordered probit	
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Lack of self-control	0.155** (0.071)	0.155** (0.071)	0.204** (0.103)	0.207** (0.103)	0.159** (0.076)	0.153** (0.077)
Financial literacy	-0.218*** (0.065)		-0.267*** (0.090)		-0.184*** (0.068)	
Numeracy		-0.076 (0.062)		-0.036 (0.086)		-0.073 (0.065)
Advanced literacy		-0.164** (0.066)		-0.251*** (0.093)		-0.128* (0.069)
2nd wealth quartile	-0.484*** (0.097)	-0.476*** (0.097)	-0.481*** (0.115)	-0.471*** (0.115)	-0.470*** (0.112)	-0.476*** (0.111)
3rd wealth quartile	-0.384*** (0.097)	-0.374*** (0.097)	-0.378*** (0.118)	-0.360*** (0.118)	-0.483*** (0.110)	-0.488*** (0.111)
4th wealth quartile	-0.677*** (0.096)	-0.675*** (0.097)	-0.738*** (0.132)	-0.727*** (0.132)	-0.842*** (0.110)	-0.854*** (0.110)
Log income	0.005 (0.061)	0.006 (0.061)	0.034 (0.092)	0.040 (0.092)	0.001 (0.071)	0.009 (0.072)
Age	0.029** (0.015)	0.031** (0.015)	0.033 (0.022)	0.036 (0.022)	0.064*** (0.017)	0.065*** (0.017)
Age <sup>2</sup>	-0.046*** (0.013)	-0.047*** (0.013)	-0.052** (0.021)	-0.055** (0.022)	-0.079*** (0.016)	-0.080*** (0.016)
Mid-level education	0.095 (0.076)	0.099 (0.076)	0.054 (0.101)	0.068 (0.101)	0.110 (0.077)	0.116 (0.078)
A-level education	0.072 (0.079)	0.073 (0.079)	0.039 (0.115)	0.043 (0.115)	0.057 (0.088)	0.057 (0.088)
Economics education	-0.028 (0.018)	-0.029 (0.018)	-0.029 (0.026)	-0.027 (0.026)	-0.022 (0.019)	-0.023 (0.019)
Household structure	Yes	Yes	Yes	Yes	Yes	Yes
Occupational controls	Yes	Yes	Yes	Yes	Yes	Yes
$\alpha / \mu_1$	2.005*** (0.598)	1.956*** (0.601)	-0.816 (0.841)	-0.974 (0.844)	0.598 (0.660)	0.680 (0.663)
$\mu_2$					1.38 (0.661)	1.462** (0.663)
$\mu_3$					1.722 (0.661)	1.801*** (0.664)
$N$	1240	1238	1240		1446	1443
adj./pseudo $R^2$	0.149	0.147	0.108			

**Table 13:** Robustness: Ordered probit regressions of overdraft usage considering potentially credit-constrained groups

This table shows ordered probit regression results when different, potentially credit-constrained groups are excluded from the regression analysis. Furthermore, we include two dummy variables indicating whether a household is credit-constrained objectively (i.e. was fully or partly denied credit in the past five years) or subjectively (i.e. in the past five years a household did not request credit for fear of denial). Column (i) reprints the results from Table 6. In columns (iii) to (vi) we exclude households according to their occupation or occupational status. Robust standard errors are given in parentheses; significant at the \*\*\* 1%-level, \*\* 5%-level, \* 10%-level.

	(i)	(ii)	(iii)	(iv)	(v)
Lack of self-control	0.162** (0.082)	0.135 (0.083)	0.165** (0.082)	0.163** (0.082)	0.160* (0.082)
Financial literacy	-0.237*** (0.073)	-0.219*** (0.074)	-0.235*** (0.073)	-0.245*** (0.073)	-0.239*** (0.073)
2nd wealth quartile	-0.505*** (0.101)	-0.442*** (0.103)	-0.507*** (0.101)	-0.502*** (0.101)	-0.504*** (0.101)
3rd wealth quartile	-0.371*** (0.098)	-0.296*** (0.100)	-0.372*** (0.098)	-0.373*** (0.098)	-0.366*** (0.098)
4th wealth quartile	-0.737*** (0.105)	-0.654*** (0.106)	-0.742*** (0.105)	-0.732*** (0.105)	-0.719*** (0.105)
Log income	-0.021 (0.074)	0.012 (0.076)	-0.037 (0.074)	-0.029 (0.074)	-0.016 (0.074)
Age	0.060*** (0.018)	0.065*** (0.019)	0.062*** (0.019)	0.056*** (0.018)	0.061*** (0.018)
Age <sup>2</sup>	-0.079*** (0.018)	-0.083*** (0.018)	-0.080*** (0.018)	-0.071*** (0.017)	-0.079*** (0.018)
Blue-collar worker	-0.025 (0.117)	0.019 (0.118)	-0.021 (0.117)	-0.085 (0.112)	-0.065 (0.115)
Civil servant	0.023 (0.155)	0.051 (0.154)	0.021 (0.154)	-0.028 (0.152)	-0.023 (0.153)
Self-employed	0.391** (0.189)	0.396** (0.194)	0.398** (0.188)	0.330* (0.187)	
Retired	0.195* (0.116)	0.214* (0.118)	0.193* (0.116)		0.147 (0.115)
Other occupation	-0.052 (0.124)	-0.054 (0.125)	-0.016 (0.120)	-0.111 (0.118)	-0.090 (0.122)
Unemployed	0.189 (0.174)	0.107 (0.176)		0.183 (0.175)	0.200 (0.172)
Obj. constrained		0.608*** (0.180)			
Subj. constrained		0.920*** (0.194)			
Household structure	Yes	Yes	Yes	Yes	Yes
Educational controls	Yes	Yes	Yes	Yes	Yes
$\mu_1$	0.332 (0.700)	0.762 (0.722)	0.255 (0.701)	0.199 (0.692)	0.368 (0.698)
$\mu_2$	1.092 (0.700)	1.554** (0.722)	1.015 (0.702)	0.959 (0.692)	1.128 (0.699)
$\mu_3$	1.446** (0.700)	1.936*** (0.723)	1.368* (0.702)	1.312* (0.692)	1.480** (0.699)
$N$	1240	1217	1240	1240	1240
$Pseudo - R^2$	0.161	0.201	0.160	0.159	0.158

## A Cognitive Reflection Test

This appendix provides the cognitive reflection test introduced by [Fredrick \(2005\)](#) which is translated into German in the 2009 SAVE survey. In the questionnaire the questions of the cognitive reflection test are captioned "brain teasers" and are provided in fill in format. We indicate correct answers in brackets.

1. A bat and a ball cost 110 cents in total. The bat costs 100 cents more than the ball. How much does the ball cost? - Price of the ball: \_ \_ \_ cents (please fill in) [5]
2. If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets? - Time required: \_ \_ \_ minutes (please fill in). [5]
3. In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake? - Duration, until lake is covered half with water lilies: \_ \_ \_ days (please fill in). [47]

## B Financial Literacy Questions

This appendix provides a translation of the questions on financial literacy in the 2009 SAVE questionnaire. Correct answers are in bold font. The first four questions displayed here, refer to basic financial literacy while the latter five gauge more advanced financial concepts. The order in the original questionnaire deviates from ours. The designations in quotation marks of the basic financial literacy items refer to [van Rooij, Lusardi, and Alessie \(2011\)](#) as do the numbers in brackets for the advanced financial literacy questions.

Basic financial literacy questions:

1. "Numeracy": Suppose you own €100 in a savings account. This balance yields interest of 2% per year and you leave it on this account for 5 years. What do you think: What is the deposit account balance after 5 years? - **More than €102**; Exactly €102; Less than €102; Don't know.
2. "Interest compounding": Suppose you had €100 in a savings account and the interest rate is 20% per year and you leave it on this account for 5 years. What do you think: What is the deposit account balance after 5 years? - **More than €200**; Exactly €200; Less than €200; Don't know.
3. "Inflation": Assuming your savings account yields interest of 1% per year and inflation amounts to 2 % per year. What do you think: Will you be able to buy more, less, or as much as today with your deposit account balance after one year? - More; As much as today; **Less**; Don't know.
4. "Money illusion": Suppose that in the year 2012 your income has doubled and prices of all goods have doubled too. How much will you be able to buy with your income in 2012? - More than today; **As much as today**; Less; Don't know.

Advanced financial literacy questions:

1. Which of the following assets exhibits the highest return volatility? - Savings books, bonds, **stocks**, don't know. [11]

2. Which is the main function of the stock market? - The stock market predicts stock earnings; results in an increase in the price of stocks; **The stock market brings people who want to buy stocks together with those who want to sell stocks;**; None of the above; Don't know. [6]
3. Is the following statement true or false: An investment in a single stock is less risky than an investment in an equity mutual fund? - True; **False;** Don't know. [15]
4. Which of the following statements is correct? - If you invest in a balanced fund, you cannot withdraw money within the first year of your investment; **Balanced funds invest in several asset classes like stocks and bonds;** Balanced funds guarantee a fixed interest rate which is based on past performance; None of the above statements is correct; Don't know. [8]
5. How does a fixed-coupon bond price react to decreasing interest rates? - **Bond price increases;** Bond price remains constant; Bond price decreases; Don't know. [16]