

Borrower Heterogeneity and the (Ir)Rational Demand for Short-Term Credit*

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ABSTRACT

Short-term credit serves bridging short-term liquidity gaps. Instead, short-term credit is often used over an extended period of time. Such behavior could stem from individuals' preference for immediate consumption. We thus analyze, whether short-term credit usage, specifically overdraft usage, is related to time preferences. Combining bank account data with survey responses provides us with evidence that individuals with higher implied discount rates use overdrafts more frequently. We disentangle a normative and a behavioral explanation. Our results are consistent with the existence of self-control problems in the form of present-biased time preference.

JEL classification: D14, D18, G02, G21

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1 Introduction

In economic consumption models, individuals' time preferences are a key determinant of intertemporal choice. They determine individuals' decisions about how much to consume today or later, and accordingly how much to save or to borrow. Whereas long-term decisions, such as housing, are financed by long-term mortgages, short-term liquidity-gaps can be bridged by short-term credit. However, short-term credit can finance current consumption in general, beyond short-term liquidity needs. A preference for current consumption may thus also affect short-term credit demand.

We elicit individual time preferences in a large field study based on a choice task and match the resulting time preferences to participants' bank account data on borrowing. In particular, we relate individuals' preference for immediate consumption to the incidence, frequency, and the amount of their overdraft usage. We find a strong and persistent relation between time preferences and overdraft usage: A higher implied discount rate is significantly related to both a higher probability of frequent usage in the past 12 months and a higher probability of current usage. A 5% increase in the discount rate (one step in the choice table) increases the probability that individuals have outstanding overdrafts by 1.2 percentage points. This translates into a 6.0% increase in the unconditional probability. For individuals' past overdraft usage, we compare three different usage groups frequent, sporadic and never users. Individuals are 1.9% (0.9%) more likely to have been frequent (sporadic) overdraft users in the past if they are one step up in the choice table. Thus, time preferences differentiate frequent users from non-users, but less so sporadic users from non-users.

We furthermore disentangle two competing views on the relation between time preferences, consumption, and borrowing. On the one hand, the relation could reflect rational impatience due to a high long-run discount rate. On the other hand, the relation could reflect a present bias, in which case the demand for overdrafts could be a time-inconsistent choice. Whereas present bias as a driver of short-term credit decisions is theoretically well-established,¹ there exists only little direct evidence that present-biased individuals borrow more (one important exception is Meier and Sprenger, 2010). Our paper fills into this gap and tests whether heterogeneity in individual time preferences predicts short-term credit use, specifically overdraft use.

Specifically, *normative models* propose that a preference for current consumption can result from a high implied discount rate. According to the neoclassical life-cycle models, individuals borrow to smooth consumption over their life-cycle (Friedman, 1957; Modigliani and Brumberg, 1954). If

¹See, e.g., Laibson (1997); Fehr (2002); Heidhues and Köszegi (2010) and for an excellent general review Frederick et al. (2002)

they have high discount rates, they put more weight on current consumption, which leads to higher consumption levels and hence more borrowing. If discount rates are sufficiently high and other, cheaper credit sources are depleted, individuals would resort to expensive overdrafts. In contrast, *behavioral models* propose that a preference for current consumption could result from a present bias (Loewenstein and Prelec, 1992). In case of hyperbolic discounting, for example, borrowing choices can become time-inconsistent (see e.g., Laibson, 1997; O’Donoghue and Rabin, 1999). Although hyperbolic discounters are patient in the long-term, they are impatient in the short-term, which eventually leads to higher levels of current consumption. Alternatively, time-inconsistent preferences are captured by the behavioral life-cycle model of Shefrin and Thaler (1988), which incorporates an internal conflict between a short-sighted ‘doer’ with a taste for immediate consumption, and a far-sighted ‘planner’.

To disentangle the two different explanations, we analyze whether the effect of time preferences is in line with the normative or the behavioral model predictions. According to the normative model, individuals will use overdrafts if the consumption utility exceeds borrowing costs. Individuals’ self-control in the form of a present bias is not considered. Furthermore, high credit limits are a desirable insurance against future financing constraints, independent of current overdraft use. By contrast, the behavioral model predicts a significantly positive relation between self-control and overdraft usage. Furthermore, individuals that are aware of their self-control problems constrain themselves to lower overdraft limits as a self-commitment device. High credit limits can then be observed among naive individuals, that are unaware of their self-control problems, and those who do not face self-control problems.

Our empirical results are in line with the behavioral predictions. Individuals with low self-control are more likely to be frequent overdraft users, controlling for a large set of observable characteristics including demographics such as income, (checking) account characteristics, use of mortgages and brokerage, net wealth, self-reported confidence in managing financial matters, risk tolerance, and financial literacy. Frequent overdraft users with a preference for immediate consumption are significantly more likely report using overdrafts for other reasons than covering unexpected expenses.

Despite higher borrowing costs, individuals might use overdrafts instead of cheaper alternatives out of convenience. If individuals use overdraft out of convenience, overdraft use should occur over shorter time-periods only. In case of prolonged use, individual should instead substitute to cheaper types of credit. The convenience hypothesis is hard to align with prolonged overdraft use observed

in the U.S. market and Germany.² We find that individuals use overdrafts despite unused cheaper credit, which cannot be explained by credit constraints or convenience use. Thus, it is important to understand why individuals use overdrafts and in particular, why they use them over an extended period of time.

We obtain our data from a large German direct bank. For the purpose of this study, the bank selects a large number of customers and allocates these customers to three groups based on their overdraft usage in the past 12 months from June 2015 until May 2016. The first group, *Never*, contains individuals who did not use overdrafts during this period. The second group, *Sporadic*, contains individuals who used overdrafts during at least two consecutive or three non-consecutive months. The third group, *Frequent*, contains individuals who used overdrafts during at least four consecutive or six non-consecutive months. From each group, 12,000 individuals were randomly selected and invited to participate in a web-based survey on July 4, 2016. 1,198 individuals completed our survey questionnaire. The questions elicit (i) individuals' time preferences and further personal traits such as impulsiveness, (ii) their reasons for overdraft usage, and (iii) demographics. Individuals' survey responses were matched with selected bank account information and account balances as of July 4, 2016. We also obtain a second snapshot of the bank account data as of August 1, 2016. Combining bank and survey data avoids potential biases that might arise in self-reported data.

Overdrafts on checking accounts are the most common form of short-term credit in Germany. Overdrafts work as a negative account balance. They balance against the next income payment or other cash inflow. Access to an overdraft facility depends on a regular payment inflow and the limit is established at the time of the account opening depending on the account holder's creditworthiness. By contrast, the interest rate charged does not depend on the individual's creditworthiness. Borrowing on overdrafts is convenient. It occurs automatically, is possible at any point in time, and does not require the prior consent of the lender. Finally, overdrafts can be repaid whenever possible independent of a specific repayment schedule.³

Overdrafts are a very popular type of credit in Germany. About 80% of the German households report having access to overdrafts and about half of these households use overdrafts at least once a

²Relevant evidence is documented for the U.S. credit card market (Meier and Sprenger, 2010), as well as for German overdraft accounts (Dick and Jaroszek, 2015).

³An overdraft facility shares many characteristics with a credit line. It can thus be considered to be a special type of credit line. Therefore, it is also important to note that overdrafts are not simply a credit line that is linked to the checking account but instead a distinct feature of the checking account. Overdrafts are also related to revolving credit cards in the U.S. These three credit products have in common that they allow individuals to borrow as much as the credit limit and to roll over this debt, if necessary for an extended period of time.

year (Dick and Jaroszek, 2015). According to the European Household Finance and Consumption Survey (HFCS), the fraction of German households that use overdrafts is somewhat lower (19.8%) but nevertheless relatively high and of the same magnitude as the fraction that use regular loans (21.7%) (European Central Bank, 2013). Despite the overall low level of interest rates, the rates on overdrafts remain relatively high. At the beginning of December 2016, they range from 4.2% to 12.4% per year (mean: 9.4%), while at the same time the 3-months Euribor was negative (-0.3%).⁴

Our study contributes to a better understanding of overdraft usage and is related to several strands of research. First, we contribute to the literature documenting the effects of the present bias on borrowing decisions (Laibson et al., 2003; Meier and Sprenger, 2007, 2010; Shui and Ausubel, 2005). Whereas existing papers focus on the U.S., most notably on the U.S. credit card market, we extend this research to overdraft usage and to a different institutional setting. Our results indicate that the present bias is indeed a widespread and influential regarding borrowing decisions. Further, our findings relate to the extensive literature on credit card usage also more generally. Revolving credit cards and overdrafts share important characteristics such as the embedded financial flexibility. The results suggest that this common set of characteristics may induce borrowing by individuals with self-control problems (Meier and Sprenger, 2010). Consistent with our results, credit card borrowers also do not reduce borrowing costs (Stango and Zinman, 2016). Second, we also extend the small literature on overdraft usage in the U.S. (e.g., Alan et al., 2015; Stango and Zinman, 2014). These papers attribute overdraft usage to the limited attention of individuals towards account balances and overdraft fees. Third, we complement the findings of Dick and Jaroszek (2015), who show that overdraft usage in Germany is related to individuals' thinking dispositions and to financial literacy.

Our findings have implications for the current policy debate on overdraft protection. The German government argues that overdraft users often lack the knowledge about cheaper alternatives.⁵ We cannot exclude that some overdraft users indeed lack this knowledge, but we show that personal characteristics such as impatience and impulsiveness predictably affect overdraft usage. Therefore, public policies that aim at reducing overdraft usage as well as institutions aiming at consumer financial protection such as the Financial Conduct Authority (FCA) in the UK and the Consumer Financial Protection Bureau (CFPB) in the U.S. should take these findings into account.

⁴The data are taken from FMH Finanzberatung, an interest rate monitoring firm in Germany. See www.fmh.de.

⁵See <http://www.bmju.de/SharedDocs/Pressemitteilungen/DE/2015/07152015.Wohnimmobilienkreditrichtlinie.html> for an official press release by the Federal Ministry of Justice and Consumer Protection in Germany. The press release is available only in German.

2 Theory and Predictions

We analyze which factors explain overdraft usage and to what extent observed overdraft usage is excessive, i.e. to what extent it is related to behavioral factors. A natural starting point for our analysis is a *rational model*. We first derive predictions based on the rational model and then contrast them with predictions that we derive based on a behavioral model.

In the neoclassical life-cycle models, specifically according to the life-cycle theory of Modigliani and Brumberg (1954) and the permanent income hypothesis of Friedman (1957), households borrow to smooth consumption over time. A smooth consumption path is the result of the optimization problem in which households with time-consistent preferences maximize utility over their (expected) lifetime consumption. We show that households which behave in accordance with the permanent income hypothesis increase current consumption if their discount rates increase. The household maximizes the following utility function (see also Hall, 1978, for the case with uncertainty):⁶

$$U = \sum_{t=0}^{T-1} \delta^t u(C_t) \quad (1)$$

where $u(\cdot)$ is a strictly concave utility function, $0 < \delta = \frac{1}{1+\rho} < 1$ is the discount factor that captures the time preferences of households (with ρ the discount rate), and C_t denotes consumption in time t . The household has a finite horizon T and maximizes utility subject to the following flow budget constraint:

$$A_{t+1} = A_t(1+r) + Y_t - C_t \quad (2)$$

where A is assets and Y is labor income, r is the real interest rate, and $0 \leq t \leq T-1$. The household has no debt at time T : $A_T \geq 0$. Then, from the first order conditions, one obtains the following marginal rate of substitution between t and $t+1$:

$$\frac{u'(C_t)}{u'(C_{t+1})} = \frac{1+r}{1+\rho} \Leftrightarrow u'(C_t) = \left(\frac{1+r}{1+\rho} \right) u'(C_{t+1}). \quad (3)$$

The partial derivative of this expression w.r.t. ρ shows how current consumption responds to changes

⁶The notation largely follows Burnside (2009).

in the discount rate:

$$\frac{\partial}{\partial \rho} u'(C_t) = \frac{\partial}{\partial \rho} \left(\frac{1+r}{1+\rho} \right) u'(C_{t+1}) = -\frac{1+r}{(1+\rho)^2} u'(C_{t+1}) < 0 \quad \forall u'(\cdot) > 0 \wedge u''(\cdot) < 0. \quad (4)$$

This implies that $\frac{\partial}{\partial \rho} C_t > 0$, i.e., individuals with larger discount rates have a stronger preference for current consumption. Further, an increase in current consumption has to be financed either by a reduction in savings or by an increase in debt. Therefore, a high discount rate is typically associated with higher debt levels.

An important aspect, which is beyond the scope of the permanent income hypothesis, is that rational individuals prioritize different sources of credit to minimize their borrowing costs. They borrow using the cheapest credit first and then, once this credit is depleted, they turn to the more expensive credit. Thus, a key prediction of the rational model is that individuals who borrow using expensive overdrafts have no unused cheaper credit. However, independent of whether they borrow or not, individuals should prefer to have access to overdraft credit. An overdraft facility allows individuals to borrow also during periods in which banks tend to reduce the credit supply, e.g., during economic downturns (but banks may tighten overdraft credit limits as well, see e.g., Puri et al., 2016). During such periods, individuals may have no (or less) access to other credit or other credit may become too expensive. Thus, overdrafts provide liquidity when it is needed the most, such that individuals can smooth fluctuations in income and consumption.⁷ Rational individuals therefore demand a large overdraft limit that provides them with a large reserve to bridge (short-term) liquidity gaps. In addition, if discount rates are large enough and cheaper credit is depleted (or not available), overdrafts may also be used to smooth consumption.

In the rational model, time preferences are captured by exponential discounting, which implies that discount rates are constant over time and preferences are time-consistent. Alternatively, in the *behavioral model*, individuals have preferences that are time-inconsistent. In particular, individuals are relatively patient in the long-term but impatient in the short-term. Consider for example an individual who plans today to restrict consumption at a point in time in the future. Then, if she approaches this point in time, she violates her plan and prefers the immediate reward: current consumption. Consequently, individuals are more concerned about current consumption than would

⁷The use of credit lines by firms highlights this point. In theoretical work, Holmström and Tirole (1998) argue that firms who experience a liquidity shock may have to draw on liquidity reserves to avoid canceling projects with positive continuation values. A potential liquidity reserve is a credit line that is arranged in advance. This credit line can protect firms from such liquidity risks. In their empirical work, Jiménez et al. (2009) find that firms which are close to default make strong use of credit lines. Furthermore, they show that credit line usage is negatively related to GDP growth, pointing to the use of credit lines as insurance against liquidity shortages. The role of credit lines in liquidity management is further shown by Sufi (2009).

be optimal in a model with exponential discounting, i.e. they suffer from a present bias. This idea is formally captured by hyperbolic discounting, which implies that discount rates are not constant but decline with the distance in time of the event (Ahlbrecht and Weber, 1995; Loewenstein and Prelec, 1992). Research has shown that hyperbolic discounting is indeed a reasonable description of individual behavior (see e.g., Fehr, 2002; Frederick et al., 2002, for a review). An analytically tractable version of hyperbolic discounting are quasi-hyperbolic preferences (Phelps and Pollak, 1968; Laibson, 1997; O’Donoghue and Rabin, 1999):

$$U = u(C_0) + \beta \sum_{t=1}^T \delta^t u(C_t). \quad (5)$$

In this model, δ captures the long-run discount factor, as before, but it is modified by the parameter β that captures the degree of present bias. If $\beta = 1$, we obtain the standard case of exponential discounting. If $\beta < 1$, we obtain the case of hyperbolic discounting.

It is important to note that based on this representation of the present bias, individuals who are subject to the present bias are in fact subject to self-control problems. In particular, individuals lack the self-control (or the willpower) to stick to plans they have made in the past (Strotz, 1956).⁸ Hence, the lower the degree of self-control, the more pronounced is the present bias, which translates into a stronger preference for current consumption. The behavioral model therefore predicts that borrowing increases not only with the long-run discount rate, but also with the degree of present bias. Previous empirical work supports this prediction, notably in the U.S. credit card market (see Laibson et al., 2003; Meier and Sprenger, 2007, 2010; Shui and Ausubel, 2005).

The idea that (a lack of) self-control is related to strong preferences for current consumption is also captured by the behavioral life-cycle model of Shefrin and Thaler (1988). Individuals behave as if they have two sets of competing preferences, concerned either with the short-term (doer) or with the long-term (planner). The doer is myopic and generates utility only from current consumption (i.e., $U = u(C_t)$). By contrast, the planner maximizes lifetime doer utilities. Individuals need self-control to restrict the doer and hence current consumption. Also in this case, the model predicts that lower degrees of self-control lead to higher levels of current consumption and therefore to higher levels of debt.

We have shown that both the behavioral life-cycle model and hyperbolic discounting capture the

⁸Self-control problems are often studied jointly with self-commitment devices. For example in the context of retirement savings, joining a savings plan may prevent individuals from postponing savings into the future. In theory, commitment devices are useful to overcome self-control problems. However, in practice, commitment devices are costly and hence individuals may avoid these devices (see e.g., Laibson, 1997; Laibson et al., 1998; Laibson, 2015).

concept of self-control problems. Individuals with self-control problems consume more and hence borrow more than a rational model with exponential discounting would predict. Typically, the current consumption decision deviates from the originally planned consumption path. Individuals with stronger self-control problems may also behave more impulsively, i.e. they are less likely to resist the temptation to purchase a good or a service at the particular point in time instead of some later point in time. Therefore, it is very likely that if these individuals have to decide on the type of credit to borrow from, they place more attention on its convenience than on its costs. Overdrafts fulfill the convenience criterion much better than other credit products. They can be used instantaneously and neither require a credit application beforehand nor adherence to a specific repayment schedule afterwards. Consequently, the behavioral model predicts that individuals who use overdrafts may nevertheless have unused cheaper credit.

Moreover, regarding the effects on overdraft limits, it is important to highlight that individuals with self-control problems can be sophisticated or naive.⁹ Sophisticated individuals are aware of their self-control problems and are thus more likely to demand self-commitment devices to limit its impact (e.g., Bryan et al., 2010; O’Donoghue and Rabin, 1999). In the context of overdrafts, a possible commitment device are low overdraft credit limits, since they limit the credit available to the individual.¹⁰ Therefore, the predictions of the behavioral model are two-fold. First, sophisticated individuals require low overdraft limits to commit themselves to low borrowing levels. Second, naive individuals do not recognize the need for such commitments but instead recognize that overdrafts are convenient to realize consumption. Thus, they require large overdraft limits. This implies that we should observe larger limits for individuals who use overdrafts extensively. In the following, we investigate whether observed overdraft usage is better explained by the behavioral model or by the rational model.

3 Data

We collaborate with a large German direct bank. The data we use was specifically collected to address our research questions. In particular, the data set consists of two different parts. The first part are the responses to a web-based survey and the second part are individual level account

⁹Firms may exploit naive individuals with self-control problems by designing contracts that target this bias (DellaVigna and Malmendier, 2004; Eliaz and Spiegler, 2006).

¹⁰This argument is also related to the model of Bertaut and Haliassos (2002), Bertaut et al. (2009), and Haliassos and Reiter (2007). With respect to credit card usage, they propose that individuals are at the same time an “accountant” with control over payments, which is responsible for the long-term planning, and a “shopper”, which uses the credit card to pay for consumption. The shopper’s spending depends on the available unused credit, thus the accountant tends to hold some credit to limit the shopper’s spending.

information that are matched by the bank with the survey responses.

3.1 Selection Procedure and Survey Design

We designed a questionnaire to elicit the variables of interest, in particular, demographic characteristics, personal traits, and reasons for overdraft usage. We then analyze how these variables relate to observed overdraft usage. A key feature of our analysis is that the individuals who are invited to participate in the survey are randomly drawn from three groups based on their overdraft usage prior to the survey (never, sporadic, or frequent). The bank both implemented the questionnaire and selected the individuals. These individuals were invited by email on July 4, 2016 and could participate in the survey until July 18, 2016.

Selection of customers. To be included in the sample, individuals had to fulfill the following criteria. First, individuals are at least 18 years old to ensure that they are of full age and that they are contractually capable. Second, they have a checking account with the bank since at least three years and this account has an overdraft facility. The three year horizon ensures that the bank has had enough time to reduce asymmetric information in the bank-client relationship but more importantly, that the individual has a sufficiently long customer history. This ensures that the observed behavior is not influenced by a recent switch to this bank and most likely reflects her usual behavior. Third, the relationship with the bank is not subject to any legal issues such as collection procedures. Fourth, individuals have a valid email address and have not objected to receive emails from the bank.

Individuals who fulfilled these criteria were allocated to three different groups based on their overdraft usage during the 12 months from June 2015 until May 2016. Whether an individual used overdrafts in a given month was evaluated at the 20th of that month. The reason for this choice is the typical pattern of checking account balances. Balances typically decrease during the month. By the end of the month, individuals receive their labor income, which results in a jump in balances. Around the turn of the month, expenses such as rent reduce balances immediately, and balances continue to decrease as further expenses are deducted. Therefore, with our choice we avoid confounding effects at the end of the month and at the same time can reliably differentiate between individuals who use overdrafts and those who do not. Individuals who did not use overdrafts during these 12 months were allocated to the group *Never*. Individuals who used overdrafts during at least two consecutive or three non-consecutive months were allocated to the group *Sporadic*. Finally, individuals who used overdrafts during at least four consecutive or six non-consecutive months

were allocated to the group *Frequent*. From each group, 12,000 individuals were randomly selected. On July 4, the selected individuals were sent an email and invited by the bank to participate in the survey.

Participation. In the email, individuals received a link to the web-based survey. Out of the 36,000 individuals who were invited to participate, 1,306 individuals (3.6%) completed the survey (see Table 1). The response rate is highest for individuals in group Never (4.2%) and lowest for individuals in group Frequent (3.3%). The experiences of the bank are such that about 30% of individuals open such emails and about 10% of individuals then follow the invitation. Therefore, the observed participation rate lies well within the expected participation rate of 3% to 5%. The response rates are also comparable to what e.g., Bhattacharya et al. (2012) find regarding the acceptance of an advice offer distributed via email.

[Insert Table 1 here]

We perform two consistency checks. First, we ask individuals to indicate their gender. The additional data we receive from the bank also includes a gender variable. The bank variable indicates gender as either male, female, or unspecified in case two individuals share the responsibility for the checking account (we call these accounts joint account). We drop individuals with individual accounts from the data if the gender recorded by the bank and their self-reported gender differ. Second, we have included a question to measure individuals' time preferences. Since this variable is one of the key variables in our analyses, we drop individuals who did not respond to this question or whose responses to this question are inconsistent. The remaining individuals constitute our final sample ($N = 1,198$, 3.3% of selected individuals). We did not require that individuals answer every question. Therefore, we recorded a few missing observations for many of the questions. For now, we nevertheless include these individuals in our sample since the average number of non-answered questions per individual is small (mean: 0.48). In particular, 281 individuals did not respond to every question, on average they skipped two questions. Later, as one of our robustness checks, we restrict the sample to individuals who responded to every question ($N^{reduced} = 917$, 2.5% of selected individuals).

3.2 Elicited Variables

The questionnaire comprises (i) questions to elicit the demographic characteristics gender, age, education, and net income, (ii) questions to elicit individuals' (personal) traits, and (iii) one question

regarding the reasons for overdraft usage. Since the main part of the analyses draws on parts (i)–(iii), we describe these questions in detail below. Table 2 presents the respective statistics.¹¹

[Insert Table 2 here]

Demographics. Individuals are asked to indicate whether they are male or female. The majority of individuals in the sample is male (67%). Male individuals are somewhat more common in the group Never and less common in the group Frequent. Regarding age, education, and net income, we provide individuals with four intervals or items in each case and ask them to indicate their respective values. We provide the four age categories (a) 18 until 35 years, (b) 36 until 50 years, (c) 51 until 65 years, and (d) above 65 years. The majority of individuals in the sample is between 36 and 65 years old. 17% of individuals are 35 years or younger and 10% of individuals are above 65 years old. These numbers vary across groups. Individuals who sporadically or frequently use overdrafts tend to be younger than individuals who never use overdrafts. To elicit education, we ask for their highest school degree, including university degree. Thereby, a low school degree refers to 9 years of schooling, a medium school degree refers to 10 years of schooling, and a high school degree refers to 12 or 13 years of schooling. The latter degree is required to attend university. 41% of individuals in the sample have a university degree, and this fraction is lowest among individuals who frequently use overdrafts. To elicit an individual’s monthly net income, we provide the four categories (a) at most €1,000, (b) €1,001 until €2,500, (c) €2,501 until €5,000, and (d) more than €5,000. Thereby, we define net income as the amount that remains to cover any expenses or to be saved after the deduction of taxes and social security payments. The sample is quite evenly split between individuals who earn €2,500 or less and individuals who earn more than €2,500. This distribution remains relatively stable across the three groups. This already indicates that the level of income does not necessarily explain the use of overdrafts.

Personal traits. As additional explanatory variables, we elicit a set of individual characteristics or traits, which we refer to broadly as personal traits. The most important characteristic is individuals’ impatience. To measure the degree of impatience, we measure individuals’ implied discount rate by following Dohmen et al. (2010). Specifically, individuals are presented with a table of eight hypothetical choices between €100 today and some amount X in 12 months. Whereas the amount today stays constant, the amount X increases row by row, providing an annual return

¹¹The questionnaire further includes questions regarding individuals’ expectations of interest rates and of the economic development that we do not use in this paper. Appendix A provides the wording of the entire questionnaire, including both the questions we use and the questions we do not use.

of $x\%$. The starting value for the amount X is €100.00 (implied annual return: 0%). The next value is €102.00 (implied annual return: 2%). All subsequent values are calculated by increasing the implied rate of return each time by 5%.¹² Individuals are asked to indicate their preference for the sooner or later payment row by row, starting with the first row. The particular point at which the individual switches from receiving the smaller sooner payment to receiving the larger later payment reveals her implied discount rate as it reflects the return that she requires to wait 12 months. Discount rates between 0% and 32% are possible. It may also be possible that individuals do not switch at all, i.e. that an implied return of 32% is not sufficient. In these cases, we assign individuals a discount rate of 37%.¹³

A second characteristic is individuals' impulsiveness. We measure impulsiveness by referring to the revised form of the Barratt Impulsiveness Scale (BIS-11) (Patton et al., 1995). This scale consists of 31 items or questions. However, due to the scope of the survey, we had to restrict ourselves to two questions. We choose one question that is informative about self-control according to the derived factor structure of the scale. Individuals are asked to indicate on a seven point Likert-scale how strongly they agree with the statement: *I plan tasks carefully*. The more they agree with the statement, the less impulsive they behave. We choose a second question that is informative about cognitive complexity. Individuals are asked to indicate on a seven point Likert-scale how strongly they agree with the statement: *I like to think about complex problems*. These two aspects belong to the overall factor Non-planning Impulsiveness. This is exactly what we want to measure and we expect that a high degree of impulsiveness (i.e., weak agreement with the statements) positively affects overdraft usage. Our measure of impulsiveness differs from Dick and Jaroszek (2015), who use a cognitive reflection task to distinguish between impulsive and reflective individuals.

Furthermore, we ask individuals for their self-reported confidence in own financial abilities (*Confidence*), willingness to take financial risks (*Risk Tolerance*) and knowledge of financial concepts (*Financial Literacy*). To elicit confidence, we ask them to indicate on a seven point Likert-scale how strongly they agree with the following statement: *I think I am better than others in managing my financial matters*. To elicit risk tolerance, we ask them *How large do you rate your risk tolerance*

¹²Consistent with Dohmen et al. (2010), we assume semiannual compounding. First, this choice reflects a compromise between the quarterly compounding on German bank accounts and the annual reporting of the rates of return on savings accounts, pension accounts, and brokerage accounts. Second, with semiannual compounding, we avoid round numbers in the choice table. We have set the starting value of X to €100 to avoid the perception that interest rates have to be always strictly positive. In fact, due to the currently low level of interest rates, individuals may expect to earn negative interest rates on their checking accounts in the future. In this case, they may prefer €100 in 12 months over €100 today. Although this is unlikely, we do not want to exclude this possibility. The wording of the choice table is included in Appendix A.

¹³An alternative to a choice task is to elicit time preferences using a matching task. In this case, individuals have to state the amount today that makes them indifferent to some amount X at some future point in time t . See e.g., Ahlbrecht and Weber (1997) for a comparison of the two approaches.

in financial matters? To elicit financial literacy, we ask *How large do you rate your knowledge in financial matters?* They can answer on a Likert-scale with values from one (very low) to seven (very high).

Panel B of Table 2 presents the statistics for these six variables. The average implied discount rate is 14.7%, but varies between the three groups. The discount rate is on average lowest for individuals who never used overdrafts during the 12 months window (12.9%) and highest for individuals who frequently used overdrafts (17.0%). This difference in implied rates is economically meaningful and is a possible explanation for overdraft usage, as we show in our empirical analysis. The measures for impulsiveness, *Self-Control* and *Complexity*, also differ across groups, but a clear pattern emerges only in the case of self-control: individuals who (frequently) use overdrafts have lower self-control. Individuals who use overdrafts are also less confident in managing their financial matters, are more risk tolerant, and less financially literate.

Reasons for overdraft usage. In a further set of questions, we ask individuals to rate on a seven point Likert-scale how likely it is that they would use overdrafts for the following four reasons (from one (very unlikely) to seven (very likely)). First, to cover recurring expenses, such as rent or other regular payments. Second, to cover expenses that occurred unexpectedly. This case captures the notion of a temporary liquidity facility. Third, to cover planned expenses of larger amounts, e.g., the purchase of a washing machine. Fourth, to cover holiday-related expenses. We included this specific case since individuals who are on holidays may be short of cash but at the same time may have difficulties to draw on money from savings accounts if they stay abroad. Therefore, they could borrow using overdrafts. Alternatively, individuals may tend to spend more while on holidays and thus may borrow using overdrafts.

The statistics in Panel C of Table 2 reveal two patterns. Individuals are more likely to use overdrafts to cover unexpected expenses (mean: 4.9) than to cover larger planned expenses (2.6) and they are least likely to use overdrafts to cover recurring expenses (2.1) or expenses related to holidays (2.1). This holds independent of the group. Comparing the three groups, we find that for any stated reason, the likelihood that an individual uses overdrafts for this reason is larger in group Frequent than in group Sporadic and larger in group Sporadic than in group Never. Hence, individuals who frequently use overdrafts are more willing to use overdrafts also for other than emergency liquidity needs.

3.3 Bank Account Information

The bank also provides account-related variables for individuals that participated in the survey and completed the questionnaire. This data consists of two snapshots of the respective variables. The first snapshot is as of July 4, 2016, which is the starting date of the survey. The second snapshot is as of August 1, 2016. If not stated otherwise, the analyses are based on the first snapshot. The second snapshot is used for robustness tests. In the following, we define the variables and provide summary statistics. The statistics (based on the first snapshot) are presented in Table 3.

As noted before, we know whether an individual’s checking account is an individual account or a joint account. 31% of the individuals in the sample have a joint account, i.e., they share the rights and responsibilities associated with the account with a further person. The account characteristics of joint accounts may differ from individual accounts and therefore we control for joint accounts in our empirical analyses. Further, we know the average number of logins per month, measured over the past 180 days, and the average number of calls per month, measured over the past 180 days. These variables provide information about bank customer activity. The statistics show that customers predominantly use their online accounts to manage their financial matters. Individuals log into their online accounts on average 16 times per month (median: 9 times), but they only rarely call customer service employees. This suggests that they call the bank only in very specific cases, most likely if they have specific questions or problems, whereas the day to day bank business is conducted online.

[Insert Table 3 here]

In addition to that, we observe individuals’ accounts with the bank and the balances on these accounts. The average checking account balance (*Balance*) of individuals in the sample amounts to €1,901.7 and varies strongly between €-5,502.7 and €14,523.5. This reflects that some individuals indeed have negative balances and rely on overdrafts, whereas other individuals have large positive balances. To ease interpretation of the variables, we apply the following notation. For each bank product, the name of the product denotes the associated amounts, whereas we add the term (*I*) to the variable name to denote a dummy variable that indicates whether an individual uses the product or not. Since not every individual uses every product, the statistics of the amount variables in Table 3 are based only on individuals who use the product (for the remaining individuals, the values are zero). Regarding overdraft usage, we find that 20% of the individuals in the sample use overdrafts (*Overdraft(I)*) and that for these individuals, average overdrafts amount to €1,709.4 (*Overdraft*,

negative values represent debt). As shown before, for 41% of individuals, this amount corresponds roughly to their monthly net income. The average overdraft credit limit equals €3,162.1, but it is larger for individuals who use overdrafts (mean: €4,004.6). Thus, individuals who use overdrafts on average utilize 42.7% of this credit facility.

Besides using overdrafts, individuals can also borrow using stand-alone credit lines or other credit products such as installment loans and mortgages. 16% of individuals in the sample have a credit line and conditional on having a credit line, the associated debt amounts to €4,197.8 on average. The fraction of individuals who have a loan or a mortgage is much smaller and equals 4% in both cases. Moreover, individuals can borrow using credit that is linked to e.g., vehicles, but we do not report this credit separately in the table. Instead, we calculate total debt for individuals in the sample (*Debt*). Individuals on average carry debt of €1,922.9. However, the fact that the median equals zero confirms that only a minority of individuals is actually indebted. This observation is also reflected in the amount of total savings, which includes balances on brokerage accounts (*Savings*). The majority of individuals has savings, the median equals €2,875.1, but the distribution is highly positively skewed. A large fraction of individuals, 32%, has a brokerage account and their assets amount to €26,307.1 on average. Finally, we combine all account information in the measure of net wealth. It is the total of individuals' checking account balance and savings less their debt. Average net wealth equals €22,421.8.

4 Empirical Results

4.1 Time Preferences and Overdraft Usage

The first question we address is whether individuals who use overdrafts have a higher preference for immediate consumption. We begin by comparing individuals' implied discount rates across the three groups Never, Sporadic, and Frequent. Figure 1 shows the cumulative distributions of the discount rates separately for each group.

[Insert Figure 1 here]

Clearly, the figure indicates that individuals who never used overdrafts during the past 12 months have lower discount rates than individuals who used overdrafts sporadically or frequently. For every discount rate x , the probability that an individual has a discount rate smaller or equal to x is in most cases larger for group Never than for group Sporadic and larger for group Sporadic

than for group Frequent. Formally, with $F(x) = \Pr(\text{Discount Rate} \leq x)$ we find that for almost every x

$$F^{\text{Never}}(x) \leq F^{\text{Sporadic}}(x) \leq F^{\text{Frequent}}(x). \quad (6)$$

We test whether the three distributions are significantly different using the two-sample Kolmogorov-Smirnov test (K-S test) and find that this is the case. The p-values of the K-S test are below 1% in all three cases. The figure also reveals the following pattern. 47.2% of individuals who never use overdrafts have a discount rate that is smaller or equal to 7%. By contrast, of the individuals who sporadically (frequently) use overdrafts, the share is much lower: 32.0% (27.3%) of individuals have a discount rate that is smaller or equal to 7%. Thus, individuals who use overdrafts are less likely to have a low discount rate. However, if one considers a discount rate of 12%, we find that the share of individuals among sporadic overdraft users who have a discount rate smaller or equal to 12% (= 60.2%) is now closer to the share among never users (63.8%) than to the share among frequent users (47.4%). Hence, individuals who sporadically use overdrafts have discount rates of an intermediate magnitude, whereas individuals who frequently use overdrafts have large discount rates. This is also reflected in the different reasons for overdraft usage (sporadic: liquidity; frequent: liquidity and consumption).¹⁴

In a next step, we analyze whether these results continue to hold once we control for additional factors such as demographic characteristics or (additional) personal traits such as risk tolerance and financial literacy. We measure the degree of overdraft usage based on the allocation to the three groups. Hence, the dependent variable is a categorical variable with a natural ordering, it increases with the extent of overdraft usage (Never < Sporadic < Frequent). Therefore, we estimate ordered logistic regressions to analyze the relationship between past overdraft usage and discount rates. In particular, the model we estimate reads as follows:

$$p_{ij} = \Pr(\text{GROUP}_i = j) = \Pr(\kappa_{j-1} < \beta_0 \text{Discount Rate}_i + \mathbf{x}'_i \mathbf{b} + \epsilon < \kappa_{j+1}) \quad (7)$$

where GROUP_i takes the values $j \in \{\text{Never}, \text{Sporadic}, \text{Frequent}\}$ for individual i . The vector \mathbf{x}_i comprises the set of control variables. κ denotes the different cut-points with κ_0 defined as $-\infty$

¹⁴An alternative way to test whether individuals' discount rates differ across the three groups are t -tests. If we test whether the differences in the average discount rates reported in Table 2 are significantly different, we find that this is the case. The t -statistics (p-values) of the three t -tests are -2.8 (0.005, Never–Sporadic), -3.0 (0.003, Sporadic–Frequent), and -5.8 (0.000, Never–Sporadic).

and κ_3 defined as $+\infty$.

We estimate four different specifications of this regression model. In specification (1), we only include the demographic characteristics age, gender, education, and net income as control variables. In specification (2), we extend the set of controls and also include the (checking) account characteristics *Joint Account*, *Avg Logins*, and *Overdraft Limit*. In specification (3), we further add dummy variables that indicate whether the individual has a mortgage or a brokerage account with the bank, and net wealth. Finally, in the fourth specification, we also add confidence, risk tolerance, and financial literacy. In all specifications, the variable *Same Day* indicates whether an individual responded to the questionnaire on July 4, 2016 or on a subsequent day. The models are estimated with robust standard errors. Table 4 reports the results.

[Insert Table 4 here]

As one can see from Table 4, the relationship between discount rates and overdraft usage is positive and statistically significant at the 1% level. This finding remains valid across the four different specifications. Although the effect becomes smaller as we increase the number of control variables, it remains highly significant. In the most comprehensive specification, the coefficient equals 0.022. Based on the (non-reported) average marginal effects, the economic interpretation of the effect is as follows. An increase in the implied discount rate by 5%, which corresponds to one step in the choice table, the probability that an individual never uses overdrafts decreases by 2.0%. By contrast, the probability that an individual uses overdrafts sporadically increases by 0.1%, which is not significant, and that she uses overdrafts frequently by 1.9%. Thus, whether an individual uses overdrafts frequently or not at all is due to her preference for immediate consumption. This is consistent with the interpretation that regular overdraft usage constitutes a habit and that this habit is related to persistent preferences. Interestingly, a larger discount rate does not predict sporadic overdraft usage. Sporadic usage may be due to transitory factors such as a short-term need for liquidity rather than due to impatience.

Regarding the demographic characteristics, we find that overdraft usage is related to age and education. First, the age profile is hump-shaped. Overdraft usage is most pronounced for individuals who are between 36 and 50 years old, closely followed by individuals who are between 18 and 35 years old. These individuals may face large expenses, e.g., they may want to furnish a flat, build a house, or send their children to school or university. Alternatively, the decrease in overdraft usage for older individuals and individuals in retirement age may be due to learning. They may

improve their skills on how to manage their finances and may acquire more knowledge on how to balance their income and spending over time. It may also be the case that older individuals have in general a less favorable view on credit usage than younger individuals and may put in more effort to avoid credit. However, we do not argue that the observed pattern reflects an irrational behavior since life-cycle models predict that individuals use debt earlier in life to smooth their lifetime consumption path. But then, the question is why frequent overdraft users do not switch to less expensive credit lines or installment loans. Second, despite controlling for income, the education profile is also hump-shaped. Overdraft usage is most pronounced for individuals with medium or high school degrees and least pronounced for individuals with a university degree. One potential reason is that education captures variation in cognitive capabilities and financial knowledge, which have been shown to influence overdraft usage (Dick and Jaroszek, 2015), but which are not entirely captured by the set of control variables. By contrast, net income is not significantly related to overdraft usage, which shows that the reason for overdraft usage is not necessarily low levels of income but rather high levels of consumption.

Moreover, the results show that overdraft limits are positively related to overdraft usage, which points towards a demand side explanation. Individuals who rely on overdrafts may request larger limits, or alternatively, individuals who want to avoid overdrafts use low limits as a self-commitment device. In the latter case, a lower limit would reflect a stronger willingness to restrict current consumption. By contrast, we find no evidence that the bank restricts access to overdrafts for individuals who frequently use overdrafts. Further, low levels of net wealth are a strong determinant of overdraft usage. Sophisticated individuals would tend to invest a portion of their wealth at the stock market and hence would have a brokerage account. Thus, controlling for wealth, the absence of a brokerage account itself predicts overdraft usage. Finally, we find that overdraft usage is negatively related to confidence in managing financial matters and positively related to risk tolerance. Contrary to Dick and Jaroszek (2015), however, we find no significant effect of financial literacy. But whereas they measure financial literacy using a subset of the questions of Van Rooij et al. (2011), we measure self-reported literacy.

So far, we have only discussed the extensive margin, i.e., whether individuals use overdrafts or not, based on overdraft usage during the past 12 months. In the following, we now turn to current overdraft usage and look at both the extensive and the intensive margins. In particular, we analyze whether discount rates are also related to the amount of overdrafts. Therefore, we estimate (logit and OLS) regression models with the same set of independent variables as before, but we vary the

dependent variable. The dependent variables measure current overdraft usage based on the bank account data from July 4, 2016. Table 5 presents the results.

[Insert Table 5 here]

The first two specifications of Table 5 are based on the entire sample. In column (1), the dependent variable indicates whether an individual uses overdrafts or not and hence captures the extensive margin. We find that individuals with larger discount rates are significantly more likely to use overdrafts. This shows that the discount rate not only explains the frequency of overdraft usage in the past, but also current overdraft usage. However, the economic magnitude of the effect is rather small. If the discount rate increases by 5%, which corresponds to one step in the choice table, the likelihood that an individual uses overdrafts on the particular day (July 4, 2016) increases by only 1.2%. But if one considers the unconditional likelihood of overdraft usage on that day of 20.1%, this corresponds to an increase in the likelihood of 6.0%. In column (2), the dependent variable is individuals' checking account balances, with negative balances denoting the amount of overdrafts. The results show that a larger discount rate is associated with a significantly lower balance. An increase in the discount rate of 5% is associated with a decrease in balances of €212.2. But we have to be careful with the interpretation, since checking account balances capture two distinct effects. First, lower balances differentiate overdraft users from non-users and hence capture the incidence of overdraft usage. Second, lower balances also capture the amount of overdraft usage.

However, since we are interested in the direct effect of time preferences on overdraft amounts, we need to disentangle the two effects. Thus, we restrict the sample to individuals who use overdrafts on July 4, 2016 and re-estimate the model from column (2) based on this subsample. As one can see from the results in column (3), the discount rate is now insignificant, i.e., it does not predict the *amount* of overdrafts. This result continues to hold as we measure the amount of overdrafts relative to the overdraft limit, which represents the credit available to the individual. In this case, the discount rate stays insignificant (column (4)). This also does not change once we exclude the overdraft limit from the set of control variables since the information contained in this variable is already captured by the dependent variable (column (5)).¹⁵

One concern is that individuals have a stronger preference for current consumption *due* to their

¹⁵In the regressions, we exclude the checking account balances from the wealth measure, since they are already reflected in the dependent variables. As a robustness check, we also exclude the wealth measure completely from the set of control variables. This does not change the results. In addition, we re-estimate the regression in column (1) using OLS. The results remain unaffected, i.e., the discount rate is a significant predictor of whether individuals use overdrafts or not, and the economic magnitude of the effect is slightly larger. A 5% increase in the discount rate corresponds to a 1.5% increase in the likelihood of overdraft usage.

financial circumstances. Individuals who have negative checking account balances may not want to plan ahead of time but rather want to focus on how they can raise money in the short-term to repay their debt. To address this point, we proceed as follows. We consider individuals in group Never, who did not use overdrafts during the past 12 months. Based on the bank account data, we also know whether these individuals currently use overdrafts on July 4, 2016. We then compare the discount rates of individuals who currently use overdrafts to the discount rates of individuals who continue to avoid overdrafts. If the concern is valid, the discount rates should be larger for individuals who start to use overdrafts. If, by contrast, they do not differ, the financial difficulties do not affect the discount rates. We find that the discount rates vary between individuals who start to use overdrafts (mean: 15.6) and individuals who do not (mean: 12.8) but the difference is not statistically significant (t -value: -0.933). This provides some indication that discount rates are a personal trait that does not react strongly to the financial circumstances of individuals but instead affects borrowing behavior. The statement is also in line with the view of other authors, e.g., Meier and Sprenger (2010).¹⁶

A further approach to address the concern of reverse causality relies on the second snapshot of bank account information. Specifically, we estimate the probability that an individual who does not use overdrafts in July 4, 2016 uses overdrafts on August 1, 2016. The main independent variable is the measure of individuals' discount rates. In unreported logit regressions, which include the standard control variables, we find that the probability that an individual uses overdrafts on August 1, 2016 is significantly positively related to the discount rate elicited one month earlier. This result continues to hold if we restrict the sample to individuals who do not use overdrafts on July 4, 2016 and furthermore, do not belong to the group of frequent users. These results strengthen the view that time preferences affect overdraft usage and not the other way around.

To summarize, we show that discount rates affect overdraft usage. In particular, we find that individuals with larger discount rates are more likely to be frequent overdraft users. But whereas the implied discount rate can predict the incident of overdraft usage, it cannot predict the associated amounts. How much individuals borrow depends on other factors, most notably education, the overdraft limit, and wealth. One question that remains to be answered is whether impatience that underlies overdraft usage reflects a rational preference for immediate consumption and hence

¹⁶As a robustness test, we analyze whether individuals who used overdrafts during the past 12 months have higher implied discount rates if they currently use overdrafts than if they currently do not use overdrafts. This is not the case. Individuals in group Frequent who currently use (do not use) overdrafts have a discount rate of 17.4% (16.6%) and the difference in discount rates is not significant. Furthermore, if we exclude individuals who currently use overdrafts from the sample, we still get a positive and significant relationship between discount rates and overdraft usage. These results are further evidence that discount rates are not (strongly) influenced by individuals' current financial conditions.

increases borrower welfare or whether it reflects a behavioral bias, a present bias. In the following, we address this question.¹⁷

4.2 Rational Impatience or Present Bias?

The previous results establish a relationship between time preferences and overdraft usage. However, it is not clear whether the measure of individuals' discount rates captures their long-run discount factor δ consistent with a rational life-cycle model, or whether it captures $\beta\delta$ consistent with a behavioral model. To disentangle both explanations, we test the empirical predictions of the two competing models. Figure 2 illustrates our approach. It shows the main relation between time preferences and overdraft usage, the measurement of overdraft usage, and the predictions of the two models. In the following, we test these predictions regarding (i) the influence of self-control problems, (ii) the use of cheaper credit, and (iii) the size of credit limits.

[Insert Figure 2 here]

Impulsiveness. In the behavioral model, the present bias is equivalent to self-control problems of individuals. Thus, if the observed relationship between overdraft usage and time preferences is due to the present bias, a variable that captures individuals' self-control should explain overdraft usage equally well. By contrast, if the relationship is explained by a strong preference for immediate consumption due to rational impatience, overdraft usage should be unrelated to self-control, since self-control problems do not exist in the rational model. Further, self-control problems are a particular form of impulsiveness since they capture whether individuals cannot resist a certain impulse or a certain temptation (in this case the temptation of immediate consumption). In our analysis, we are also interested in whether impulsiveness more generally affects overdraft usage. Therefore, we consider an additional form of impulsiveness, cognitive complexity, which captures the degree to which individuals enjoy challenging cognitive tasks. The two concepts belong to the overall factor Non-Planning Impulsiveness according to the revised form of the Barratt Impulsiveness Scale (BIS-11) (Patton et al., 1995). We use the variables *Self-Control* and *Complexity* described before to capture both concepts, whereby higher values indicate less impulsiveness. With the empirical

¹⁷Two further explanations for overdraft usage are inattention and lack of information (e.g., Alan et al., 2015; Gabaix and Laibson, 2006; Grubb, 2015; Stango and Zinman, 2014). However, information about overdraft interest rates is easily available to all bank customers, therefore it is unlikely that some customers have systematically different information about these interest rates than others and that asymmetric information explains the differences in overdraft usage at this bank. Further, regarding inattention, the results in Table 4 suggest that inattention is no explanation for overdraft usage either. Individuals who use overdrafts are not less likely than others to log into their accounts and hence not less informed about their checking account balances once we control for the availability of brokerage accounts. For these reasons, we focus on the two models mentioned above.

findings on impatience and borrowing in mind, we expect that higher levels of impulsiveness are positively related to overdraft usage.

To test for such a relationship, we first estimate the ordered logit model with the *GROUP* allocation as the dependent variable and the full set of control variables. However, we exclude the discount rate and include our measures of impulsiveness.¹⁸ In a second step, we use the bank account data to analyze the relationship between impulsiveness and current overdraft usage, considering both the extensive and intensive margins. Table 6 presents the results.

[Insert Table 6 here]

In Panel A of Table 6, the dependent variable *GROUP* measures overdraft usage during the past 12 months. In column (1), we include the measure of individuals' self-control as the main independent variable. The results show that high levels of self-control are associated with less frequent overdraft usage. This effect is statistically significant at the 1% level. The economic magnitude of the effect compares nicely with the magnitude that is observed for the discount rate. If individuals self-control is increased by one step on a seven point Likert-scale, the probability that an individual never uses overdrafts increases by 3.0%. At the same time, the probability that an individual uses overdrafts frequently decreases by 2.8%. By contrast, an increase in self-control does not significantly affect the probability of sporadic overdraft usage. Again, this is evidence that sporadic overdraft usage is driven by temporary factors rather than persistent personal traits. Further, these results show that overdraft usage is indeed (partially) explained by self-control problems. This fact and the fact that the economic magnitudes are comparable provide strong evidence that the elicited time preferences are influenced by the present bias, and that a stronger present bias leads to more overdraft usage.

In column (2), we include the measure of how much individuals enjoy complex cognitive tasks as the main independent variable. The results show that enjoying complexity is associated with more frequent overdraft usage. This effect is also statistically significant at the 1% level, but the economic significance is lower than in the case of self-control: if enjoying complexity increases by one step, the probability that an individual uses overdrafts never (frequently) decreases (increases) by 2.2% (2.1%). Thus, although both concepts are supposed to measure impulsiveness, they have distinct effects on overdraft usage. The effect of self-control is consistent with the prediction of the

¹⁸The reason for the exclusion of the discount rate is that the discount rate and the measure of self-control are highly correlated if we assume the behavioral model. However, this choice is not critical. If we include both the measure of self-control and the discount rate, the results remain unchanged.

behavioral model, suggesting that self-control problems are associated with higher levels of current consumption and hence higher levels of borrowing.

The effect of complexity can be explained by the concept of scarcity as proposed by Mani et al. (2013) and Mullainathan and Shafir (2013). Hereby, scarcity can take various forms, but in our context refers to a lack of financial resources. The authors argue that if individuals face scarcity, e.g. poverty, they adopt a mindset that differs from their mindset if they would be rich, and that this difference is directly attributable to the fact that they are poor. Poor individuals devote their cognitive resources disproportionately to financial matters. This, in turn, results in low cognitive abilities in other domains. Consequently, individuals who use overdrafts face financial troubles and thus devote a large share of their cognitive capacity to making ends meet. It is indeed possible that these individuals enjoy complex tasks more than others simply because it is their main focus. However, one should not misinterpret this argument. It does not mean that they are more successful than other individuals in managing their finances. Further, the effects of self-control and complexity do not disappear but become stronger once we control jointly for both forms of impulsiveness (column (3)).

These findings are further supported by the results in Panel B of Table 6. In column (1), the dependent variable indicates whether individuals currently use overdrafts. Whereas self-control is not significantly related to the probability of current overdraft usage, enjoying complex tasks has a significantly positive effect on this probability. A one step increase in enjoying complexity on a seven point Likert-scale is associated with a 2.9% increase in the probability of negative checking account balances on July 4, 2016. By contrast, we find no significant effect of cognitive complexity on the amount of overdrafts (columns (2) and (3)). Instead, we find that self-control has a significantly positive effect on checking account balances and hence a negative effect on the amount of overdrafts. Accordingly, impulsiveness as captured by self-control problems and complexity aversion has indeed a twofold effect on overdraft usage. Individuals who used overdrafts in the past and who (continue to) use overdrafts in the present suffer from scarcity and devote their cognitive capacity to financial decisions. However, self-control does not predict the particular incident of overdraft usage, but it predicts how much individuals borrow as well as the general frequency of overdraft usage. Thus, our results on self-control suggest that consistent with the behavioral model, the present bias can explain overdraft usage.

Our results are also consistent with prior empirical findings. Dick and Jaroszek (2015) show that German individuals who perform poorly in a cognitive reflection task, which they use as a proxy

for impulsiveness, use overdrafts more often. Meier and Sprenger (2010) show that individuals in the U.S. who are subject to the present bias are more likely to have credit card debt and have credit card debt of larger amounts. Our results differ, however, from the findings of Harrison et al. (2002), who find no significant relation between individuals' discount rates and a dummy variable indicating whether individuals have positive balances on credit cards or credit lines. One potential reason is that the authors have to rely on individuals' self-reported balances, whereas we base our analyses on their actual balances.

Credit usage. In a next step, we analyze whether individuals who use overdrafts have no unused cheaper credit. To address this question, we estimate a number of regressions with essentially the same control variables as before. First, we investigate whether overdraft users are more or less likely than non-users to use other credit products. Thereby, we focus on two important alternatives: installment loans and credit lines. Installment loans are consumer loans with a fixed repayment schedule. The contract terms depend on amount and duration of the loan and may also depend on the borrowers' creditworthiness. Compared to credit lines and overdrafts, they are the cheapest type of credit. Credit lines are very similar to overdrafts. Once a credit line is opened, the bank approves a credit limit. Individuals can then borrow from this line without further consent by the bank and are not required to adhere to any specific repayment schedule. In this case, the contract terms do not depend on the borrowers' creditworthiness. Credit lines at this bank are cheaper than overdrafts but more expensive than regular loans. In our logit regressions, *LOAN(I)* and *CREDIT LINE(I)* indicate whether individuals have such credit products on July 4, 2016. The main independent variables are dummies indicating whether an individual belongs to group Sporadic or to group Frequent. Table 7 presents the results.

[Insert Table 7 here]

We find that sporadic and frequent overdraft users are not significantly more or less likely to use installment loans (Panel A, columns (1)). By contrast, Individuals who use overdrafts are significantly more likely to use credit lines (column (2)). The raw numbers add to these results. Regarding installment loans, 8.4% of frequent overdraft users have such a loan and only 1.1% of individuals who never use overdrafts. The picture is much clearer for credit lines: 7.2% of individuals who never use overdrafts use credit lines, but about a quarter (24.5%) of frequent overdraft users use credit lines. Consequently, overdraft users are more likely to use cheaper credit. However, the absolute numbers do not suggest that they indeed prioritize based on borrowing costs.

Second, we restrict the sample to individuals who use credit lines. We want to understand whether the corresponding credit limit is depleted or not. We do not observe the limits for credit lines, but we know that the minimum limit is €2,500. Hence, if individuals borrow at least €2,500 from the credit line, the variable $DEPLETION(I)$ takes the value one and zero otherwise. Clearly, this is a very conservative approach, since we classify credit lines as depleted that are actually not depleted. The results of the logit regression in column (3) show that frequent overdraft users are more likely than non-users to have a credit line that is depleted. But if we look again at the raw number, this is the case for 65.9% of frequent users. So, even if we make the strong assumption that all these cases are true cases of depletion, still about one third of frequent overdraft users have unused cheaper credit. Accordingly, while some overdraft users use cheaper sources of credit, it is only a minority of individuals, and many of those who use e.g., credit lines do not make full use of the available credit.

One potential reason is that overdraft users are borrowing constraint and lack access to cheaper credit when they need it. We test whether this is the case. In Panel B of Table 7, we again analyze whether individuals use loans or credit lines (columns (1) and (2)). Thereby, we restrict the sample to frequent overdraft users and we argue that among these individuals, those with larger savings and those with larger income are less credit constraint. We include therefore as the main independent variables (i) a dummy that indicates whether individuals' savings are larger than the median in group Frequent, or (ii) a dummy that indicates whether their monthly net income is larger than €2,500. With the proxy based on savings, we find that individuals who are more constraint are more likely to use credit lines. With the proxy based on income, individuals with constraints are more likely to use loans but less likely to use credit lines. Thus, we find no convincing evidence that a low demand for other credit products is due to *binding* credit constraints. This is also shown in column (3), where we use individuals total debt as the dependent variable ($DEBT$, which takes negative values) in an OLS regression. We find that individuals with more constraints have more debt. A more convincing explanation for overdraft usage is that it is more convenient. Overdrafts allow individuals to borrow immediately.

Overdraft limits. The rational model predicts that independent of overdraft usage, individuals have large overdraft limits. Thus, the limits should be unrelated to actual overdraft usage. If anything, they should be lower for frequent users if the bank reduces the credit access of these individuals. By contrast, the behavioral model predicts that individuals can be classified in naive and sophisticated individuals. Naive individuals do not know that they have self-control problems

and demand high limits to increase current consumption. Sophisticated individuals are aware of their self-control problems and prefer low limits as a commitment device. Thus, if the behavioral model holds, we should observe larger limits for frequent overdraft users. In the following, we show that our evidence is consistent with the behavioral model.

We compare overdraft limits across the three different groups Never, Sporadic, and Frequent based on their distributions. In Figure 3, we plot the cumulative distributions of overdraft limits separately for each of the groups. The figure shows that the distributions are quite similar for individuals who never or who only sporadically use overdrafts. However, the differences between these distributions and the distribution for frequent overdraft users are indeed pronounced. We find that overdraft limits are higher for sporadic users than for never users, and again higher for frequent users. Specifically, the probability that overdraft limits are at most €3,000 equals 78.3% (71.3%) for never (sporadic) users. For frequent users, this probability is much lower and equals 55.4%. The large jump at €2,000 is explained by the large number of individuals whose overdraft limit is €2,000, which is the default limit assigned by the bank. The fact that this jump is smallest for frequent users further shows that the share of individuals who have their limits actively changed (upwards) is largest among this group. This suggests that frequent overdraft users have a preference for large overdraft limits. However, this fact alone does not imply that they are naive about their self-control problems. The question is whether their limits are significantly larger than the limits of non-users.

[Insert Figure 3 here]

We formally test whether the distributions differ using the two-sample K-S test. We find that this is the case. The differences in the distributions are significant at the 1% level for the comparisons between frequent users and sporadic users as well as between frequent users and never users (p-values ≤ 0.000). The difference between sporadic users and never users is less pronounced, but nevertheless statistically significant (p-value = 0.039). In addition, we also compare the mean values across groups. Average overdraft limits are €2,682.3 (Never), €2,957.7 (Sporadic), and €4,000.3 (Frequent), respectively. Whereas the *t*-tests confirm that overdraft limits are significantly different between frequent users and the other two groups (at the 1% level), the limits do not significantly differ between sporadic and never users. As an additional test, we also estimate OLS regressions with the overdraft limit as the dependent variable and group indicators as the main independent variables. These regressions again show that overdraft limits differ significantly across all three

groups. They are highest for frequent users, lower for sporadic users, and lowest for individuals who never use overdrafts. The regression results are reported in the Appendix, Table B.1. On balance, our findings on overdraft limits clearly support the behavioral model.

To summarize, we document that individuals who use overdrafts are subject to self-control problems. In addition, we find no evidence that these individuals prioritize different types of credit based on their costs and that they have no unused cheaper credit (which is consistent with evidence in the credit card market, see Stango and Zinman, 2016). Finally, we also show that individuals who use overdrafts have larger overdraft limits. These results provide strong support for a behavioral explanation of overdraft usage. In particular, they suggest that a present bias can explain overdraft usage better than rational impatience. Furthermore, we document that the differences between non-users and sporadic users are less pronounced than the differences between frequent users and the other groups. Thus, a strong preference for current consumption can explain the persistent use of overdrafts that differentiates frequent users from others, whereas sporadic users may have other motives (e.g., covering unexpected expenses). We now explore this point in more detail.

4.3 How is the Money Spent?

We have shown that time preferences are related to overdraft usage, notably to frequent usage. A natural follow-up question is whether individuals who use overdrafts frequently, only sporadically, or not at all also have different views on the reasons for overdraft usage. It could be that the three groups share the same views but that the frequent users just happen to face one reason more often than non-users. Alternatively, the three groups could have different views and this then explains, to some degree, the variation in observed overdraft usage. To address this question, we ask individuals to indicate on a seven point Likert-scale (from one (very unlikely) to seven (very likely)) how likely they think it is that they would use overdrafts for a given reason. Then, we test whether responses significantly differ across groups using *t*-tests. We consider the four reasons (i) to cover recurring expenses, (ii) to cover expenses that occurred unexpectedly, (iii) to cover planned expenses of larger amounts, and (iv) to cover holiday-related expenses. The results are presented in Table 8.

[Insert Table 8 here]

We find that the primary reason for overdraft usage is to cover unexpected expenses. Frequent overdraft users on average respond with a value of 5.8, sporadic users with a value of 5.1, and non-users with a value of 4.1 to this particular reason for overdraft usage. This reason is followed

by planned expenses. Individuals are least likely to use overdrafts to cover recurring expenses or holiday-related expenses. Thereby, the findings show that the reasons for overdraft usage indeed significantly differ across groups. For each stated reason, frequent overdraft users are more likely than sporadic users, and sporadic users are more likely than non-users to use overdrafts for that reason. These differences are significant at the 1% level. We get similar results in regression analyses with the reasons for overdraft usage as the dependent variables and group indicators as the main independent variables (see Appendix, Table B.2).

Accordingly, for many individuals, overdrafts are a short-term liquidity facility. They would rely on overdrafts if unexpected expenses occur and their (checking) account balance is not sufficient to cover these expenses. If this would be the only reason, this would imply that sporadic or frequent overdraft users face unexpected expenses more often than non-users or that non-users have more precautionary savings or higher income to cover such expenses. However, this would not explain why especially the frequent users do not use cheaper credit first. Hence, whereas these factors may explain the difference in overdraft usage between non-users and sporadic users, they cannot entirely explain the behavior of frequent users. This is also reflected in the fact that frequent users are more likely to use overdrafts for any reason. They may view overdrafts as a convenient source of credit and use this credit to cover regular and planned expenses as well, which can then explain the persistence in overdraft usage.

The finding that frequent users rely on overdrafts also to cover other than unexpected expenses suggests that the reasons for overdraft usage and individuals' time preferences are related. In the following, we analyze whether this is the case. Specifically, we estimate OLS regressions with the reasons for overdraft usage as the dependent variables and group indicators as control variables. We also include the set of control variables from previous regressions. The main independent variable are individuals' implied discount rates. The results are presented in Table 9.

[Insert Table 9 here]

According to the results in columns (1) to (3) of Table 9, individuals with high implied discount rates and hence with strong preferences for current consumption are significantly more likely to use overdrafts to cover recurring expenses, to cover unexpected expenses, and to cover planned expenses. These results confirm that impatient individuals use overdrafts as a convenient credit facility. By contrast, impatient individuals are not more or less likely to use overdrafts to cover holiday-related expenses (column (4)). One potential reason is that holiday expenses are treated

inherently differently than general living expenses. Individuals may prioritize expenses based on their necessity. In this case, even impatient individuals may go on holidays only if they can afford it. An alternative explanation is that individuals are willing to borrow to cover holiday-related expenses, but they do so using other types of credit.

5 Robustness Checks

5.1 Sample Adjustments

To test the robustness of our main results, we adjust the sample in several ways and re-estimate our main regressions. We exclude, separately, three sets of individuals to verify whether the responses of these individuals affect our results. First, we exclude individuals who do not respond to each question in the survey. These individuals may not understand a particular question and omit it or they may simply not be willing to answer a particular question. If this is the case, their answers may be less reliable than the answers of individuals who respond to the entire questionnaire. Second, we exclude individuals who have an implied discount rate of 0%. In the choice table, these individuals choose the later payment already in the first step. Accordingly, they prefer €100 in 12 months over €100 today. This could make sense if individuals do not want to spend the money but to save it and if they can only save it at a negative interest rate. However, since the alternative option is to keep the money at home, negative interest rates should not matter. It is more likely that these individuals did not understand the choice task or that they did not spend much time thinking about the task. Also in this case, their answers may be less reliable.

Third, we exclude individuals who are classified as frequent overdraft users if they borrow only small amounts. These individuals are still frequent users, but overdraft usage may not matter for them since the associated borrowing costs are low. Instead, they may prefer the financial flexibility and liquidity. Thus, these individuals may differ from the “serious” (frequent) overdraft users and the adjustment allows us to analyze the behavior of these serious users. One caveat is that we do not observe individuals’ overdraft usage during the past 12 months directly. Therefore, we identify frequent overdraft users who use small amounts of overdrafts based on their checking account balances on July 4, 2016. In particular, we exclude frequent overdraft users who do not use overdrafts on that day or who use overdrafts on that day but in the amount of less than €100 from the sample.¹⁹

¹⁹Table B.3 in the Appendix shows how the different adjustments affect the sample sizes.

We re-estimate the main regressions of overdraft usage on discount rates for each of the adjusted samples described above. The dependent variables are the group allocation, which captures past overdraft usage (estimated as ordered logit model), the variable indicating whether individuals currently use overdrafts ($Overdraft(I)$, estimated as logit model), and individuals' current checking account balances (absolute and divided by their overdraft limits, estimated using OLS). Table 10 presents the results for the three adjusted samples (Panels A, B, and C, respectively).

[Insert Table 10 here]

Table 10 shows that the adjustments do not affect our main results. We find a significantly positive relationship between the implied discount rate and overdraft usage during the past 12 months (column (1)). The discount rate is also positively related to the likelihood that an individual uses overdrafts currently, on July 4, 2016, but the effect is not always significant (column (2)). As before, the discount rate of individuals who use overdrafts currently is not significantly related to their checking account balances and hence not related to the amount of overdrafts (columns (3) and (4)). In addition to these main regressions that establish the link between individuals' discount rates and overdraft usage, we also test whether the adjustments affect the further results (not reported). These tests show that excluding the three sets of individuals does not lead to different conclusions and hence does not bias our findings.

5.2 Second Snapshot of Account Information

In our analyses, we use data on individuals' account characteristics and account balances as of July 4, 2016. This particular day has the advantage that it coincides with the starting date of our survey, which is also the day on which most individuals in the sample (71.5%) answered the questionnaire. Thus, the data reflects very well the financial conditions of individuals on the day of the survey. However, the fact that we rely on a single snapshot of individuals' balances has the disadvantage that these balances may be influenced, e.g., by idiosyncratic events. To analyze whether this is the case, we compare individuals' balances on July 4, 2016 with their balances one month later, on August 1, 2016.²⁰

Table 11 reports the average values of the different variables separately based on the data of July and the data of August. We test whether the values significantly differ on the two days using paired t -tests. We find the differences to be insignificant for most variables. However, some variables

²⁰Table B.4, Panel A, presents descriptive statistics of the bank account information as of August 1, 2016.

yield significant differences. Individuals have lower checking account balances and are more likely to use overdrafts on August 1, 2016 than on July 4, 2016. A possible explanation is that individuals tend to spend more during the holiday season. By contrast, consumer loan amounts are smaller, potentially since the principal decreased with a further installment, and brokerage balances are larger, potentially since security prices increased. But the magnitudes of the differences are small, suggesting that both snapshots provide a consistent picture of individuals' finances.

[Insert Table 11 here]

Next, we also test whether our results hold if we base the analyses on the bank account information as of August 1, 2016. Panel A in Table 12 summarizes the regression results regarding the effects of discount rates on overdraft usage (see Tables 4 and 5 for the previous results). Panel B reports the results regarding the effect of impulsiveness on overdraft usage (see Table 6), and Panels C and D report the results regarding individuals' credit usage (see Table 7).

[Insert Table 12 here]

The results in the four panels of Table 12 show that the second snapshot of individuals' bank account information does not lead to entirely different conclusions. We find that the implied discount rate is significantly positively related to overdraft usage during the past 12 months. The discount rate is also a significant predictor of whether an individual uses overdrafts on August 1, 2016, about one month after the survey. Contrary to our previous finding, we now find that the discount rate can also predict the amount of overdrafts. Higher discount rates are associated with larger amounts of overdrafts, and this effect is significant at the 10% level (Panel A, column (3)). These findings illustrate that high discount rates are an important determinant of overdraft usage.

Further, we find that *Self-Control* is negatively and that *Complexity* is positively associated with past overdraft usage. The results on current overdraft usage slightly differ from the results based on the first snapshot. Complexity is only related to current overdraft usage, as before, but the negative effect of self-control is now significant. If we consider both snapshots jointly, this suggests that self-control predicts the incidence and the amount of overdraft usage, consistent with the explanation that individuals with low self-control consume too much. A positive attitude towards complexity, however, only predicts the incidence of overdraft usage, consistent with the explanation that the attitude towards complexity results from the existence of (persistent) financial difficulties and not necessarily from the size of these difficulties.

With respect to individuals' credit usage, the significance of the effects slightly varies, but the direction of the effects, the overall pattern, and the conclusions that we draw remain valid. In unreported tests, we also verify that the results regarding overdraft limits, and reasons for overdraft usage remain unaffected. On balance, although a second (later) snapshot of account information generates slightly different results, we find no evidence that the results based on the first snapshot would be biased in any way. Instead, the results based on the second snapshot complement and extend the previous findings.²¹

6 Conclusion

In this paper, we analyze the relationship between time preferences and overdraft usage. We find that time preferences as captured by high implied discount rates are an important determinant of (frequent) overdraft usage. We also analyze whether the observed behavior is more in line with a rational model in which individuals use overdrafts due to high long-run discount rates or whether it is in line with a behavioral model in which individuals suffer from a present bias. In our analyses, we disentangle the two competing views. Our results suggest that overdraft usage can be explained by a present bias in the form of self-control problems. Self-control problems can result in high levels of current consumption, which increases the propensity to use overdrafts. By contrast, we find no convincing evidence that high long-run discount rates alone can explain overdraft usage.

We base our analyses on a sample of customers of a large German direct bank. For the purpose of this study, the bank allocated its customers to three groups based on past overdraft usage. They were classified as non-users, sporadic users, and frequent users. From each group, individuals were randomly selected to participate in our survey. The data comprises bank account information and survey responses of the 1,198 individuals who responded to the questionnaire. The strength of this data is that we do not rely on self-reported overdraft usage to address the research questions.

In addition to documenting the importance of individuals' time preferences, we also show that frequent users are willing to use expensive overdrafts not only as temporary liquidity facility, but also to finance regular consumption. To conclude, our findings provide strong support for a behavioral explanation of overdraft usage. It is not so much related to individuals' income but to how they spend the money. Thus, policies aimed at reducing the reliance on overdrafts are more effective if

²¹An alternative approach is to combine the information in the two snapshots and to calculate the variables based on the average values of the data on July 4, 2016 and on August 1, 2016. This also remove some of the idiosyncratic variation in the data. Table B.4, Panel B, presents descriptive statistics of these variables. We also re-estimate our regressions using the average bank account data. The results in Table B.5 reflect the results based on the two single snapshots, indicating that they remain relatively stable.

they take these behavioral results into account.

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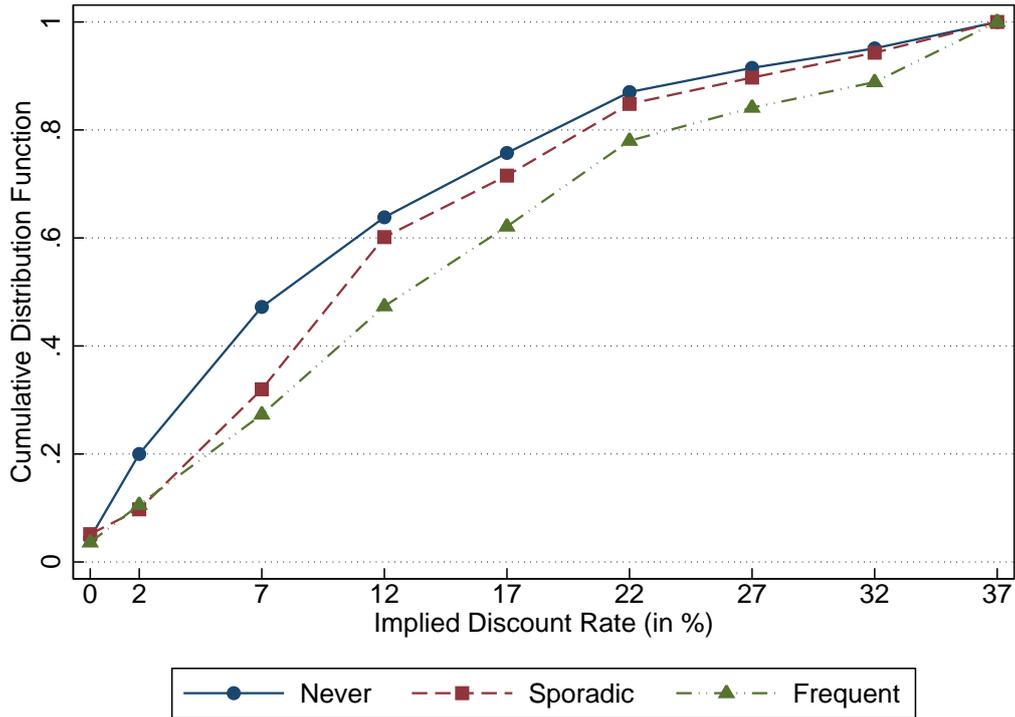


Figure 1: Distribution of Implied Discount Rates Across Groups

This figure shows the cumulative distribution functions of the implied discount rates of individuals in the sample, separately for each of the three groups. Following Dohmen et al. (2010), the discount rates are elicited using a choice task. Individuals are asked to answer eight questions, row by row, starting with the first row. In each question, individuals have to choose between €100 today and some amount $X \geq €100$ in 12 months, whereby the amount X increases each row. The discount rate is derived from the point at which individuals switch from the payment today to the payment in 12 months. It is the interest rate implied by the corresponding larger payment.

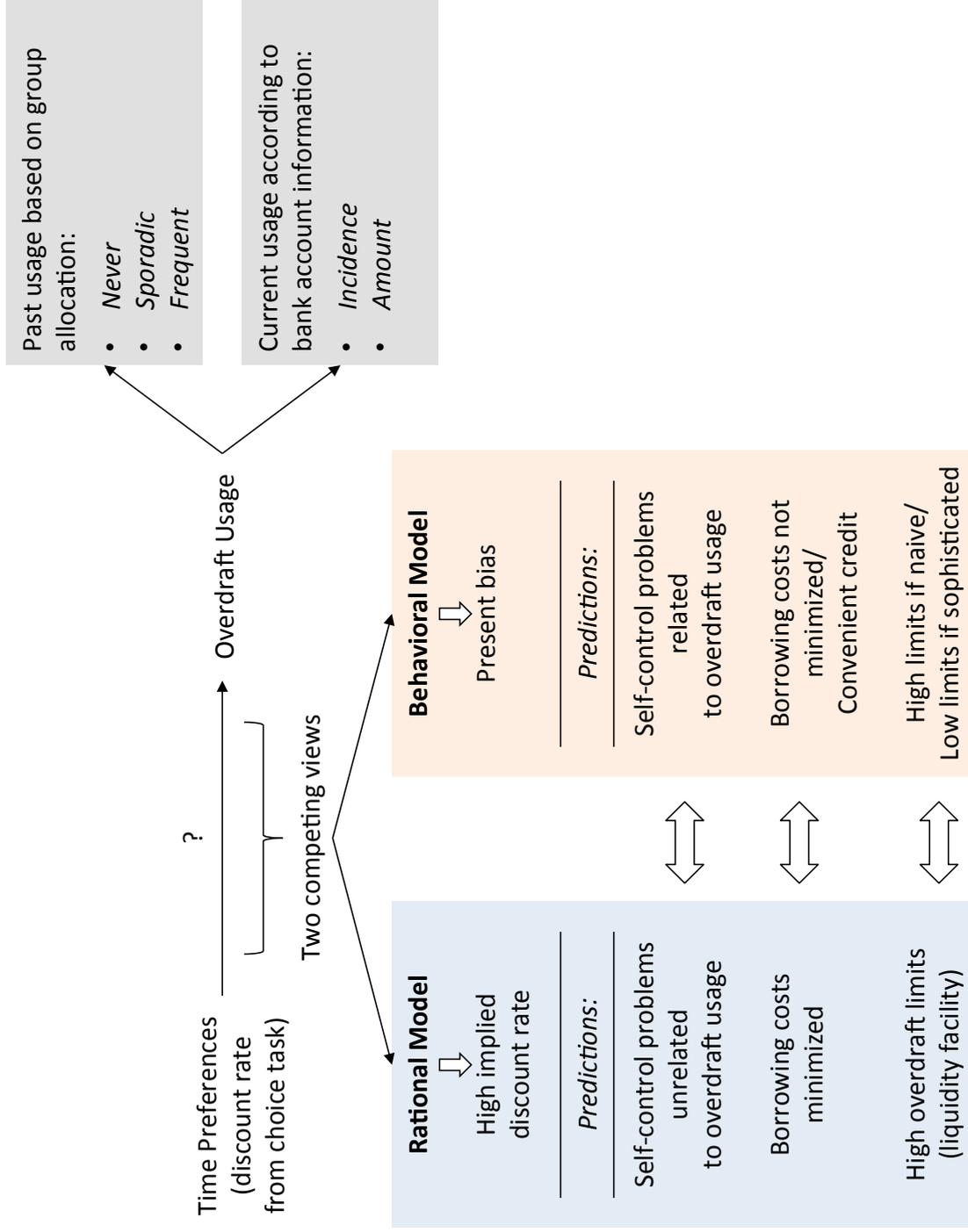


Figure 2: Disentangling the Rational and the Behavioral Model

This figure shows the empirical approach that we follow to disentangle the rational from the behavioral explanation of the relation between time preferences and overdraft usage. Time preferences, measured as the implied discount rate of individuals, are elicited using a choice task. Overdraft usage is measured as overdraft usage during the past 12 months based on the allocation of individuals to the three groups Never, Sporadic, and Frequent, and as current overdraft usage based on the bank account data. The figure summarizes the different predictions of the two competing models.

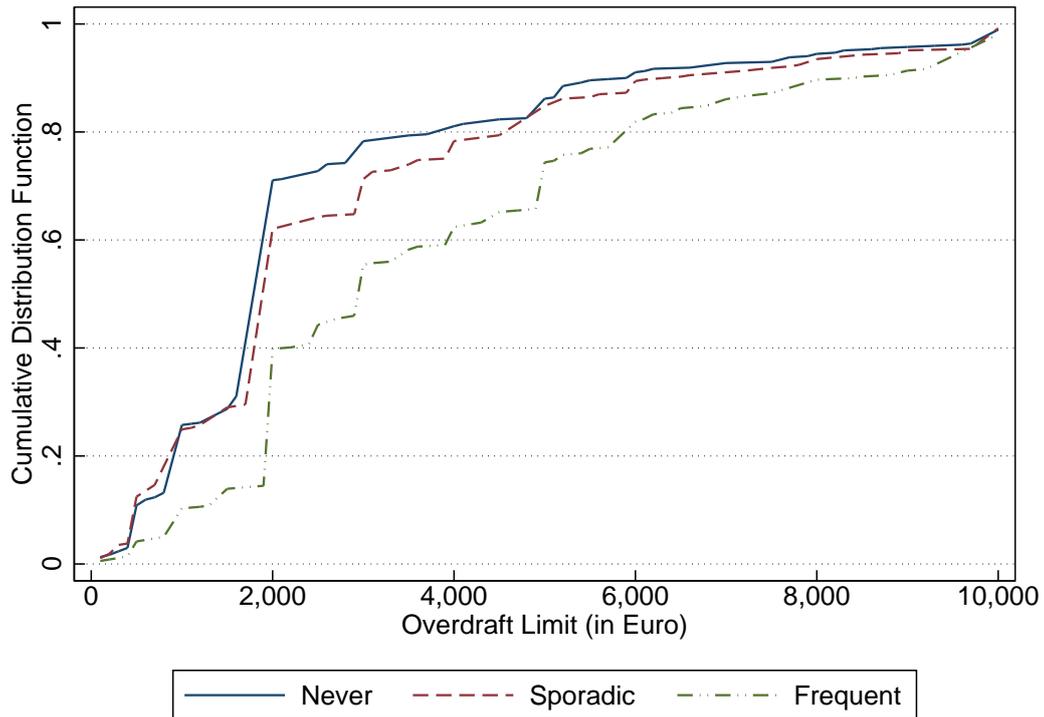


Figure 3: Distribution of Overdraft Limits Across Groups

This figure shows the cumulative distribution functions of the overdraft limits of individuals in the sample, separately for each of the three groups Never, Sporadic, and Frequent. Information regarding individuals' overdraft limits is included in the bank account data. The respective values are as of July 4, 2016. The figure shows the distributions only for limits smaller or equal to €10,000.

Table 1: Survey Participation

This table presents the participation of individuals in the survey across the three groups. Bank customers were allocated to three different groups based on their overdraft usage from June 2015 until May 2016. Individuals who did not use overdrafts during these 12 months are allocated to the group *Never*. Individuals who used overdrafts during at least two consecutive or three non-consecutive months are allocated to the group *Sporadic*. Individuals who used overdrafts during at least four consecutive or six non-consecutive months are allocated to the group *Frequent*. 12,000 individuals were randomly selected from each group and were invited to participate in the survey on July 4, 2016. Individuals are recorded as participant if they completed the survey. The table also presents the number of individuals in the sample after the cleaning of the data.

Group	Selection		Participation			Sample	
	Individuals	Percent	Individuals	Percent	Response	Individuals	Percent
Never	12,000	33.3	507	38.8	4.2%	470	39.2
Sporadic	12,000	33.3	404	30.9	3.4%	369	30.8
Frequent	12,000	33.3	395	30.3	3.3%	359	30.0
Total	36,000	100.0	1,306	100.0	3.6%	1,198	100.0

Table 2: Summary Statistics of Elicited Variables

This table presents the descriptive statistics for individuals in the sample and separately for the three groups. Bank customers were allocated to the three groups based on their overdraft usage during the 12 months from June 2015 until May 2016. *Never* includes individuals who did not use overdrafts during these 12 months. *Sporadic* includes individuals who used overdrafts during at least two consecutive or three non-consecutive months and *Frequent* includes individuals who used overdrafts during at least four consecutive or six non-consecutive months.

Variable	Measure	Sample			Never		Sporadic		Frequent	
		N	Mean	SD	N	Mean	N	Mean	N	Mean
Panel A. Demographics										
Male	Dummy	1,191	0.67	0.47	467	0.69	368	0.67	356	0.66
<i>Age</i>										
Age [18; 35]	Dummy	1,196	0.17	0.38	469	0.15	368	0.21	359	0.17
Age [36; 50]	Dummy	1,196	0.38	0.49	469	0.31	368	0.40	359	0.45
Age [51; 65]	Dummy	1,196	0.34	0.47	469	0.39	368	0.32	359	0.30
Age > 65	Dummy	1,196	0.10	0.31	469	0.16	368	0.07	359	0.07
<i>Education</i>										
School Low	Dummy	1,195	0.07	0.25	469	0.08	368	0.05	358	0.07
School Medium	Dummy	1,195	0.29	0.45	469	0.27	368	0.29	358	0.32
School High	Dummy	1,195	0.24	0.43	469	0.19	368	0.26	358	0.28
University	Dummy	1,195	0.41	0.49	469	0.46	368	0.41	358	0.33
<i>Income</i>										
Net Inc ≤ €1,000	Dummy	1,176	0.06	0.24	461	0.06	364	0.06	351	0.07
Net Inc [€1,001; €2,500]	Dummy	1,176	0.41	0.49	469	0.40	364	0.42	351	0.43
Net Inc [€2,501; €5,000]	Dummy	1,176	0.44	0.50	469	0.44	364	0.45	351	0.42
Net Inc > €5,000	Dummy	1,176	0.09	0.28	469	0.10	364	0.07	351	0.08
Panel B. Personal Traits										
Discount Rate	Rate in %	1,198	14.71	10.15	470	12.89	369	14.78	359	17.01
Self-Control	Likert [1; 7]	1,187	5.58	1.13	467	5.78	365	5.54	355	5.36
Complexity	Likert [1; 7]	1,190	5.24	1.34	468	5.24	364	5.18	358	5.31
Confidence	Likert [1; 7]	1,194	4.36	1.43	469	4.57	366	4.40	359	4.03
Risk Tolerance	Likert [1; 7]	1,194	3.02	1.51	469	2.90	366	2.91	359	3.30
Financial Literacy	Likert [1; 7]	1,192	3.97	1.29	469	4.02	365	3.95	358	3.92
Panel C. Reasons for Overdraft Usage										
<i>Expenses</i>										
Recurring	Likert [1; 7]	1,111	2.08	1.79	440	1.38	346	2.08	325	3.01
Unexpected	Likert [1; 7]	1,173	4.89	2.03	460	4.07	362	5.10	351	5.76
Planned	Likert [1; 7]	1,109	2.62	1.97	437	2.00	348	2.57	324	3.53
Holidays	Likert [1; 7]	1,076	2.08	1.73	429	1.45	341	2.20	306	2.82

Table 3: Summary Statistics of Customer Account Data

This table presents the descriptive statistics of bank account information for individuals in the sample as of July 4, 2016. A joint account, in contrast to an individual account, is a checking account with two account holders who share the rights and responsibilities associated with the account. The average number of logins per month into individuals' online accounts and the average number of calls per month are measured over the past 180 days. *Balance* denotes the checking account balance. *Overdraft(I)* indicates whether an individual uses overdrafts whereas *Overdraft* denotes the amount, in this case the amount that is borrowed. The same applies to credit lines, installment loans, mortgages, and brokerage accounts. Regarding these amounts, we report the respective statistics only for individuals who use the particular product. *Debt* and *Savings* measure individuals' total debt and total savings. Net wealth is calculated as $Net\ Wealth = Balance + Savings - |Debt|$. Negative amounts represent borrowing and all amounts are in euro.

Variable	Measure	N	Mean	SD	Percentiles		
					1st	Median	99th
Joint Account	Dummy	1,198	0.31	0.46	0	0	1
Avg Logins	Number	1,198	16.16	21.54	0	9.17	114.5
Avg Calls	Number	1,198	0.11	0.28	0	0	1.33
Balance	Amount	1,198	1,901.70	6,574.75	-5,502.67	1,294.46	14,523.50
Overdraft(I)	Dummy	1,198	0.20	0.40	0	0	1
Overdraft	Amount	241	-1,709.44	2,038.24	-9,927.03	-1,254.77	-5.58
Overdraft Limit	Amount	1,198	3,162.10	2,698.14	100.00	2,000.00	11,000.00
Credit Line(I)	Dummy	1,198	0.16	0.37	0	0	1
Credit Line	Amount	197	-4,197.79	6,020.10	-25,121.46	-1,910.00	0
Loan(I)	Dummy	1,198	0.04	0.20	0	0	1
Loan	Amount	51	-11,377.10	8,402.88	-38,891.17	-10,086.44	0
Mortgage(I)	Dummy	1,198	0.04	0.19	0	0	1
Mortgage	Amount	44	-91,336.09	78,446.26	-307,500.00	-62,231.60	0
Brokerage(I)	Dummy	1,198	0.32	0.46	0	0	1
Brokerage	Amount	378	26,307.12	85,031.51	0	3,057.93	368,902.90
Debt	Amount	1,198	-1,922.87	5,451.92	-28,118.87	0	0
Savings	Amount	1,198	22,442.95	75,161.70	0	2,875.05	272,184.10
Net Wealth	Amount	1,198	22,421.77	76,918.61	-26,785.44	4,247.10	292,718.50

Table 4: Ordered Logisitic Regressions of Overdraft Usage on Discount Rates

This table presents the results of ordered logistic regressions. The dependent variable *GROUP* indicates whether an individual belongs to the group Never, Sporadic, or Frequent and hence measures the extent of overdraft usage during the past 12 months. The main independent variable is the measure of individuals' implied discount rates, *Discount Rate*. The four specifications include additional control variables. Specification (1) includes individuals' demographic characteristics. Specification (2) adds (checking) account characteristics. Specification (3) adds the dummy variables *Mortgage(I)* and *Brokerage(I)* as well as individuals' net wealth. Specification (4) adds self-reported confidence in managing ones financial matters, risk tolerance, and financial literacy. All models include the control variable *Same Day*, which indicates whether an individual answered the questionnaire on July 4, 2016 or on a subsequent day. Account information (including balances) is as of July 4, 2016. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, the 5%, and the 10% levels, respectively.

	<i>GROUP</i>			
	(1)	(2)	(3)	(4)
Discount Rate	0.030*** (0.01)	0.032*** (0.01)	0.022*** (0.01)	0.022*** (0.01)
Male	0.097 (0.13)	0.039 (0.13)	0.099 (0.13)	-0.041 (0.14)
Age [18; 35]	0.869*** (0.24)	1.195*** (0.26)	0.623** (0.27)	0.562** (0.28)
Age [36; 50]	1.038*** (0.23)	1.194*** (0.23)	0.714*** (0.25)	0.721*** (0.25)
Age [51; 65]	0.558** (0.23)	0.525** (0.23)	0.235 (0.24)	0.258 (0.25)
School Low	0.126 (0.27)	0.138 (0.27)	0.144 (0.27)	0.216 (0.29)
School Medium	0.404*** (0.14)	0.404*** (0.14)	0.284* (0.15)	0.271* (0.15)
School High	0.454*** (0.14)	0.454*** (0.14)	0.324** (0.15)	0.321** (0.15)
Net Inc ≤ €1,000	-0.000 (0.32)	0.622* (0.34)	0.144 (0.37)	0.272 (0.37)
Net Inc [€1,001; €2,500]	0.008 (0.23)	0.558** (0.25)	0.094 (0.29)	0.209 (0.30)
Net Inc [€2,501; €5,000]	-0.003 (0.22)	0.415* (0.24)	0.181 (0.27)	0.252 (0.28)
Joint Account		-0.087 (0.14)	-0.188 (0.14)	-0.168 (0.15)
Avg Logins		-0.005** (0.00)	-0.002 (0.00)	-0.002 (0.00)
Overdraft Limit		0.000*** (0.00)	0.000*** (0.00)	0.000*** (0.00)
Mortgage(I)			0.448 (0.34)	0.507 (0.34)
Brokerage(I)			-0.123 (0.15)	-0.328** (0.16)
Net Wealth			-0.000*** (0.00)	-0.000*** (0.00)
Confidence				-0.179*** (0.05)
Risk Tolerance				0.219*** (0.04)
Financial Literacy				0.075 (0.05)
Same Day	-0.085 (0.13)	-0.054 (0.13)	-0.187 (0.13)	-0.175 (0.13)
κ_1	0.964*** (0.33)	2.036*** (0.38)	0.516 (0.43)	0.621 (0.51)
κ_2	2.340*** (0.34)	3.493*** (0.39)	2.132*** (0.44)	2.270*** (0.52)
Pseudo R ²	0.033	0.066	0.134	0.151
Observations	1,165	1,165	1,165	1,156

Table 5: Current Overdrafts and Discount Rates: Extensive and Intensive Margins

This table presents the results of regressions of overdraft usage on discount rates. Specification (1) is estimated as a logit model, the remaining specifications are estimated using OLS. The dependent variable and the sample vary across specifications. Specifications (1) and (2) are based on the entire sample. In specification (1), the dependent variable indicates whether an individual uses overdrafts or not ($OVERDRAFT(I)$). In specification (2), it is individuals' checking account balance ($BALANCE$). The remaining three specifications are estimated based on individuals who use overdrafts (i.e., for whom $OVERDRAFT(I) = 1$). The dependent variable in specifications (4) and (5) is the (negative) checking account balance divided by the overdraft limit and measures to what degree an individual uses the overdraft credit available to her. Overdraft usage and checking account balances are as of July 4, 2016. The main independent variable is the measure of individuals' implied discount rates, *Discount Rate*. The five specifications include the following control variables: individuals' demographic characteristics, (checking) account characteristics, indicators for mortgages and brokerage accounts, individuals' net wealth, self-reported confidence in managing financial matters, risk tolerance, and financial literacy. We have excluded checking account balances from the measure of net wealth (*Net Wealth(Ex)*) since the dependent variables capture these balances. All models further include the control variable *Same Day*, which indicates whether an individual answered the questionnaire on July 4, 2016 or on a subsequent day. Account information (including balances) is as of July 4, 2016. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, the 5%, and the 10% levels, respectively.

	Individuals in the Sample		Individuals Who Use Overdrafts on July 4, 2016		
	$OVERDRAFT(I)$	$BALANCE$	$BALANCE$	$BALANCE /$ <i>Overdraft Limit</i>	$BALANCE /$ <i>Overdraft Limit</i>
	(1)	(2)	(3)	(4)	(5)
Discount Rate	0.018** (0.01)	-42.435*** (14.53)	-10.474 (10.75)	-0.003 (0.00)	-0.003 (0.00)
Male	-0.151 (0.19)	424.065 (384.16)	119.375 (227.45)	0.054 (0.05)	0.053 (0.05)
Age [18; 35]	-0.020 (0.39)	103.528 (432.46)	442.186 (538.98)	-0.047 (0.11)	-0.039 (0.11)
Age [36; 50]	0.433 (0.35)	216.760 (605.31)	307.182 (521.30)	-0.070 (0.09)	-0.065 (0.09)
Age [51; 65]	0.264 (0.34)	567.566 (521.45)	888.183 (556.24)	0.043 (0.09)	0.047 (0.09)
School Low	0.399 (0.36)	-37.596 (459.70)	-1,088.767* (605.46)	-0.207* (0.11)	-0.209* (0.11)
School Medium	0.322 (0.21)	-47.993 (373.69)	-481.133* (259.67)	-0.105* (0.06)	-0.104* (0.06)
School High	0.515** (0.21)	-627.843*** (245.75)	-340.427 (239.78)	-0.090 (0.06)	-0.089 (0.06)
Net Inc \leq €1,000	0.490 (0.42)	-4,024.044** (2,039.68)	-661.132 (613.68)	-0.061 (0.12)	-0.045 (0.12)
Net Inc [€1,001; €2,500]	0.156 (0.34)	-3,409.402 (2,074.09)	-739.274 (564.19)	-0.099 (0.09)	-0.086 (0.09)
Net Inc [€2,501; €5,000]	-0.363 (0.31)	-2,485.614 (1,975.53)	-828.764 (558.38)	-0.076 (0.08)	-0.067 (0.08)
Joint Account	-0.368* (0.20)	-32.226 (434.53)	-283.648 (264.21)	-0.089 (0.06)	-0.090 (0.06)
Avg Logins	0.001 (0.00)	-10.224 (6.42)	4.205 (6.70)	0.002* (0.00)	0.002* (0.00)
Overdraft Limit	0.000*** (0.00)	-0.189* (0.10)	-0.424*** (0.08)	-0.000 (0.00)	
Mortgage(I)	0.223 (0.48)	-582.107 (448.44)	79.740 (492.41)	0.026 (0.11)	0.025 (0.11)
Brokerage(I)	-0.147 (0.19)	996.204 (642.30)	90.254 (282.45)	-0.045 (0.07)	-0.049 (0.07)
Net Wealth(Ex)	-0.000** (0.00)	0.007* (0.00)	0.012*** (0.00)	0.000*** (0.00)	0.000*** (0.00)
Confidence	-0.243*** (0.07)	212.916 (131.61)	56.668 (84.90)	-0.015 (0.02)	-0.014 (0.02)
Risk Tolerance	0.239*** (0.06)	-447.573*** (217.60)	-2.608 (64.91)	0.001 (0.02)	0.002 (0.02)
Financial Literacy	0.203*** (0.08)	-317.944 (220.43)	-180.262 (112.11)	-0.036 (0.02)	-0.036 (0.02)
Same Day	-0.288* (0.17)	-86.240 (615.29)	136.177 (222.23)	0.027 (0.05)	0.028 (0.05)
Constant	-2.615*** (0.63)	6,939.649** (2,992.67)	981.723 (883.06)	-0.053 (0.18)	-0.083 (0.17)
Pseudo/Adjusted R ²	0.132	0.040	0.413	0.068	0.071
Observations	1,156	1,156	235	235	235

Table 6: The Twofold Effect of Impulsiveness

This table presents the results of regressions of overdraft usage on impulsiveness. Panel A reports the results of ordered logistic regressions. In all three specifications, the dependent variable *GROUP* indicates whether an individual belongs to the group Never, Sporadic, or Frequent and hence measures the extent of overdraft usage during the past 12 months. In Panel B, specification (1) is estimated as a logit model, the remaining specifications are estimated using OLS. The dependent variable and the sample vary across the three specifications. Specification (1) is based on the entire sample and the dependent variable indicates whether an individual uses overdrafts or not (*OVERDRAFT(I)*). Specifications (2) and (3) are based on individuals who use overdrafts (i.e., for whom *OVERDRAFT(I) = 1*). In specification (2), the dependent variable is individuals' (negative) checking account balance (*BALANCE*). In specification (3), it is the (negative) checking account balance divided by the overdraft limit and measures to what degree an individual uses the overdraft credit available to her. Overdraft usage and checking account balances are as of July 4, 2016. In both panels, the main independent variables are the measures of individuals' impulsiveness, *Self-Control* and *Complexity*. All specifications include the full set of control variables: individuals' demographic characteristics, (checking) account characteristics, indicators for mortgages and brokerage accounts, individuals' net wealth, self-reported confidence in managing financial matters, risk tolerance, and financial literacy. We have excluded checking account balances from the measure of net wealth in Panel B since the dependent variables capture these balances. All models further include the control variable *Same Day*, which indicates whether an individual answered the questionnaire on July 4, 2016 or on a subsequent day. Account information (including balances) is as of July 4, 2016. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, the 5%, and the 10% levels, respectively.

Panel A. Overdraft Usage Over the Past 12 Months			
	<i>GROUP</i> (1)	<i>GROUP</i> (2)	<i>GROUP</i> (3)
Self-Control	-0.163*** (0.05)		-0.249*** (0.06)
Complexity		0.119** (0.05)	0.200*** (0.05)
<i>Controls</i>			
Demographics	Yes	Yes	Yes
Account Characteristics	Yes	Yes	Yes
Products and Wealth	Yes	Yes	Yes
Personal Traits	Yes	Yes	Yes
Same Day	Yes	Yes	Yes
κ_1	-0.484 (0.55)	0.698 (0.53)	-0.120 (0.57)
κ_2	1.162** (0.55)	2.329*** (0.54)	1.535*** (0.57)
Pseudo R ²	0.149	0.148	0.155
Observations	1,148	1,152	1,144
Individuals	Sample	Sample	Sample
Panel B. Current Overdraft Usage (Extensive and Intensive Margins)			
	<i>OVERDRAFT(I)</i> (1)	<i>BALANCE</i> (2)	<i>BALANCE /</i> <i>Overdraft Limit</i> (3)
Self-Control	-0.102 (0.08)	170.253** (83.26)	0.043** (0.02)
Complexity	0.204*** (0.08)	5.632 (80.93)	0.002 (0.02)
<i>Controls</i>			
Demographics	Yes	Yes	Yes
Account Characteristics	Yes	Yes	Yes
Products and Wealth	Yes	Yes	Yes
Personal Traits	Yes	Yes	Yes
Same Day	Yes	Yes	Yes
Constant	-2.681*** (0.73)	164.525 (1,028.63)	-0.270 (0.21)
Pseudo/Adjusted R ²	0.136	0.414	0.071
Observations	1,144	234	234
Individuals	Sample	Individuals Who Use Overdrafts	

Table 7: Credit Usage and Credit Constraints

This table presents the results of regressions to analyze the usage of alternative credit products. Panel A reports the results of logit regressions. In specification (1), the dependent variable *LOAN(I)* indicates whether an individual has an installment loan. In specification (2) the dependent variable *CREDIT LINE(I)* indicates whether an individual has a credit line. Specification (3) is based on individuals who have a credit line. The dependent variable *DEPLETION(I)* indicates whether the credit limit associated with the credit line is depleted or not. We do not observe these credit limits, thus we assume the lowest possible credit limit of €2,500. The main independent variables are two dummy variables that indicate whether an individual is a frequent or a sporadic overdraft user. Individuals who never use overdrafts are the base case. The regressions in Panel B are based on frequent overdraft users. Specifications (1) and (2) are logit regressions, again with *LOAN(I)* and *CREDIT LINE(I)* as the dependent variables. Specification (3) is an OLS regression with total debt (*DEBT*) as the dependent variable. The main independent variable is either a dummy variable indicating whether individuals' savings are larger than the median among frequent overdraft users or a dummy variable indicating whether individuals' net income is larger than €2,500. Product usage and debt amounts are as of July 4, 2016. All specifications use the full set of control variables, with two exceptions. Models that include the savings dummy exclude net wealth and models that include the income dummy exclude net income as controls. Account information (including balances) is as of July 4, 2016. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, the 5%, and the 10% levels, respectively.

Panel A. Usage of Alternative Credit Products			
	<i>LOAN(I)</i> (1)	<i>CREDIT LINE(I)</i> (2)	<i>DEPLETION(I)</i> (3)
Group = Sporadic	0.385 (0.58)	0.886*** (0.24)	0.118 (0.61)
Group = Frequent	0.534 (0.59)	0.860*** (0.27)	1.370** (0.63)
<i>Controls</i>			
Demographics	Yes	Yes	Yes
Account Characteristics	Yes	Yes	Yes
Products and Wealth	Yes	Yes	Yes
Personal Traits	Yes	Yes	Yes
Same Day	Yes	Yes	Yes
Constant	-3.951** (1.69)	-1.947** (0.76)	-4.518*** (1.72)
Pseudo R ²	0.332	0.135	0.313
Observations	1,156	1,156	190
Individuals	Sample	Sample	Credit Line(I) = 1
<i>Frequencies by Group:</i>			
Never	1.06%	7.23%	17.65%
Sporadic	4.34%	20.33%	33.33%
Frequent	8.36%	24.51%	65.91%
Panel B. Potential Credit Constraints			
	<i>LOAN(I)</i> (1)	<i>CREDIT LINE(I)</i> (2)	<i>DEBT</i> (3)
<i>Proxy: Savings</i>			
Savings > Median	-0.678 (0.47)	-0.674** (0.30)	1,688.516** (767.01)
<i>Controls</i>	Yes	Yes	Yes
Pseudo/Adj. R ²	0.094	0.109	0.163
Observations	347	347	347
Individuals	Frequent	Frequent	Frequent
<i>Proxy: Net Income</i>			
Net Income > €2,500	-1.456** (0.62)	1.217*** (0.31)	-1,054.194 (658.45)
<i>Controls</i>	Yes	Yes	Yes
Pseudo/Adj. R ²	0.351	0.122	0.433
Observations	355	355	355
Individuals	Frequent	Frequent	Frequent

Table 8: Reasons for Overdraft Usage: Bivariate Tests

This table presents the results of bivariate tests of the reasons for overdraft usage. Survey participants were asked to rate on a seven point Likert-scale how likely they think it is that they would use overdrafts for each of the stated reasons (from one (very unlikely) to seven (very likely)). The four reasons are (i) to cover recurring expenses, (ii) to cover expenses that occurred unexpectedly, (iii) to cover planned expenses of larger amounts, and (iv) to cover holiday-related expenses. Columns (1) to (3) report the mean values for each reason and for the three groups Never, Sporadic, and Frequent. For each reason, the significance of the differences in answers across groups is tested using t -tests. ***, **, and * indicate significance at the 1%, the 5%, and the 10% levels, respectively.

Expense Type	Group (Means)			Δ	Δ	Δ
	Never (0)	Sporadic (1)	Frequent (2)	(0) – (1) t -value	(1) – (2) t -value	(0) – (2) t -value
Recurring	1.38	2.08	3.01	-6.52***	-6.25***	-14.14***
Unexpected	4.07	5.10	5.76	-7.31***	-4.90***	-12.67***
Planned	2.00	2.57	3.53	-4.54***	-6.12***	-11.43***
Holidays	1.45	2.20	2.82	-6.94***	-4.19***	-11.66***

Table 9: Time Preferences and Reasons for Overdraft Usage

This table presents the results of OLS regressions. Survey participants were asked to rate on a seven point Likert-scale how likely they think it is that they would use overdrafts for each of the stated reasons (from one (very unlikely) to seven (very likely)). The four reasons are (i) to cover recurring expenses, (ii) to cover expenses that occurred unexpectedly, (iii) to cover planned expenses of larger amounts, and (iv) to cover holiday-related expenses. The dependent variables are the values assigned by the individuals to the particular reasons. The main independent variable are individuals' implied discount rates. As control variables, the specifications include two dummy variables that indicate whether an individual belongs to group Frequent or to group Sporadic. Individuals in group Never are the base case. Further, the specifications include individuals' demographic characteristics, (checking) account characteristics, indicators for mortgages and brokerage accounts, individuals' net wealth, self-reported confidence in managing financial matters, risk tolerance, and financial literacy as well as the variable *Same Day*, which indicates whether an individual answered the questionnaire on July 4, 2016 or on a subsequent day. Account information (including balances) is as of July 4, 2016. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, the 5%, and the 10% levels, respectively.

	<i>RECURRING</i>	<i>UNEXPECTED</i>	<i>PLANNED</i>	<i>HOLIDAYS</i>
	(1)	(2)	(3)	(4)
Discount Rate	0.016*** (0.01)	0.018*** (0.01)	0.020*** (0.01)	0.008 (0.01)
Group = Sporadic	0.582*** (0.12)	0.840*** (0.15)	0.404*** (0.13)	0.628*** (0.12)
Group = Frequent	1.406*** (0.14)	1.386*** (0.15)	1.249*** (0.16)	1.081*** (0.14)
<i>Controls</i>				
Demographics	Yes	Yes	Yes	Yes
Account Characteristics	Yes	Yes	Yes	Yes
Products and Wealth	Yes	Yes	Yes	Yes
Personal Traits	Yes	Yes	Yes	Yes
Same Day	Yes	Yes	Yes	Yes
Constant	0.893** (0.38)	4.665*** (0.43)	2.110*** (0.41)	1.739*** (0.38)
Adjusted R ²	0.160	0.153	0.130	0.114
Observations	1,073	1,131	1,070	1,038

Table 10: Robustness Checks: Sample Adjustments

This table presents the results of regressions based on different samples. In Panel A, the sample excludes individuals who have not responded to each question in the survey. In Panel B, the sample excludes individuals who have an implied discount rate of 0%. In Panel C, the sample excludes frequent overdraft users who use overdrafts of less than €100. The dependent variable is *GROUP* (specification (1)), *OVERDRAFT(I)* (specification (2)), *BALANCE* (specification (3)), or *BALANCE* divided by the overdraft limit (specification (4)). Model (1) is estimated as ordered logistic regression, model (2) is estimated as logit model, models (3) and (4) are estimated using OLS. The main independent variable is the discount rate. All specifications include the full set of control variables: individuals' demographic characteristics, (checking) account characteristics, indicators for mortgages and brokerage accounts, individuals' net wealth, self-reported confidence in managing financial matters, risk tolerance, and financial literacy, as well as the control variable *Same Day*. Account information (including balances) is as of July 4, 2016. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, the 5%, and the 10% levels, respectively.

Panel A. Exclusion of Individuals Who Do Not Respond to Each Question				
	<i>GROUP</i>	<i>OVERDRAFT(I)</i>	<i>BALANCE</i>	<i>BALANCE/</i> <i>Overdraft Limit</i>
	(1)	(2)	(3)	(4)
Discount Rate	0.017** (0.01)	0.005 (0.01)	-20.599 (12.95)	-0.003 (0.00)
<i>Controls</i>				
Demographics	Yes	Yes	Yes	Yes
Account Characteristics	Yes	Yes	Yes	Yes
Products and Wealth	Yes	Yes	Yes	Yes
Personal Traits	Yes	Yes	Yes	Yes
Same Day	Yes	Yes	Yes	Yes
Constant		-2.734*** (0.76)	691.596 (1,025.58)	-0.185 (0.21)
κ_1	0.920 (0.57)			
κ_2	2.612*** (0.57)			
Pseudo/Adjusted R ²	0.147	0.125	0.399	0.044
Observations	917	917	175	175
Individuals	Sample	Sample	Individuals Who Use Overdrafts	
Panel B. Exclusion of Individuals With Discount Rates = 0%				
	<i>GROUP</i>	<i>OVERDRAFT(I)</i>	<i>BALANCE</i>	<i>BALANCE/</i> <i>Overdraft Limit</i>
	(1)	(2)	(3)	(4)
Discount Rate	0.024*** (0.01)	0.020** (0.01)	-11.834 (10.89)	-0.003 (0.00)
<i>Controls</i>				
Demographics	Yes	Yes	Yes	Yes
Account Characteristics	Yes	Yes	Yes	Yes
Products and Wealth	Yes	Yes	Yes	Yes
Personal Traits	Yes	Yes	Yes	Yes
Same Day	Yes	Yes	Yes	Yes
Constant		-2.614*** (0.65)	668.739 (928.77)	-0.119 (0.18)
κ_1	0.777 (0.52)			
κ_2	2.413*** (0.53)			
Pseudo/Adjusted R ²	0.152	0.134	0.407	0.072
Observations	1,104	1,104	225	225
Individuals	Sample	Sample	Individuals Who Use Overdrafts	

Table 10: Robustness Checks: Sample Adjustments

(continued)

Panel C. Exclusion of Frequent Overdraft Users With Overdrafts < €100				
	<i>GROUP</i>	<i>OVERDRAFT(I)</i>	<i>BALANCE</i>	<i>BALANCE/</i> <i>Overdraft Limit</i>
	(1)	(2)	(3)	(4)
Discount Rate	0.020*** (0.01)	0.021** (0.01)	-10.053 (11.09)	-0.002 (0.00)
<i>Controls</i>				
Demographics	Yes	Yes	Yes	Yes
Account Characteristics	Yes	Yes	Yes	Yes
Products and Wealth	Yes	Yes	Yes	Yes
Personal Traits	Yes	Yes	Yes	Yes
Same Day	Yes	Yes	Yes	Yes
Constant		-2.514*** (0.69)	981.723 (883.06)	-0.053 (0.18)
κ_1	1.078* (0.56)			
κ_2	3.242*** (0.57)			
Pseudo/Adjusted R ²	0.154	0.182	0.416	0.085
Observations	975	975	227	227
Individuals	Sample	Sample	Individuals Who Use Overdrafts	

Table 11: First and Second Snapshot of Account Balances: t -Tests

This table compares the bank account information from the first (July 4, 2016) and the second (August 1, 2016) snapshot for individuals in the sample. The table reports the mean values of the different variables separately based on the data in each of the two snapshots and tests whether they differ significantly across the two dates using paired t -tests. Regarding the variables *Credit Line*, *Loan*, *Mortgage*, and *Brokerage*, the paired test requires that we only consider individuals who have the respective accounts on both days.

Variable	Measure	N	July 4, 2016	August 1, 2016	t -value
			Mean	Mean	
Joint Account	Dummy	1,198	0.31	0.31	—
Avg Logins	Number	1,198	16.16	16.07	1.19
Avg Calls	Number	1,198	0.11	0.10	1.32
Balance	Amount	1,198	1,901.70	1,473.36	6.80***
Overdraft(I)	Dummy	1,198	0.20	0.27	-5.76***
Overdraft	Amount	184	-2,075.05	-2,145.52	0.76
Overdraft Limit	Amount	1,198	3,162.10	3,164.44	-1.92*
Credit Line(I)	Dummy	1,198	0.16	0.17	-1.41
Credit Line	Amount	197	-4,197.79	-4,249.86	0.39
Loan(I)	Dummy	1,198	0.04	0.04	1.00
Loan	Amount	48	-11,919.90	-11,809.10	-4.78***
Mortgage(I)	Dummy	1,198	0.04	0.04	—
Mortgage	Amount	44	-91,336.09	-91,780.13	0.98
Brokerage(I)	Dummy	1,198	0.32	0.32	-1.00
Brokerage	Amount	378	26,307.12	27,859.43	-4.94***
Debt	Amount	1,198	-1,922.87	-1,988.75	1.31
Savings	Amount	1,198	22,442.95	22,585.52	-0.52
Net Wealth	Amount	1,198	22,421.77	22,070.13	1.23

Table 12: Robustness Check: Second Snapshot of Account Balances

This table presents the results of regressions with account balances measured as of August 1, 2016. In Panels A and B, the dependent variable is *GROUP*, *OVERDRAFT(I)*, *BALANCE*, or *BALANCE* divided by the overdraft limit. In Panel A, the main independent variable is the discount rate. In Panel B, the main independent variables are the measures of individuals' impulsiveness, *Self-Control* and *Complexity*. The models with the group allocation as the dependent variable are estimated as ordered logistic regressions, the models with *OVERDRAFT(I)* as the dependent variable are estimated as logit models, the remaining models are estimated using OLS. In Panel C, the dependent variable is *LOAN(I)*, *CREDIT LINE(I)*, or *DEPLETION(I)*. The main independent variables indicate whether individuals belong to the group of frequent overdraft users or to group of sporadic overdraft users. Individuals who never use overdrafts are the base case. These models are estimated as logit models. In Panel D, the dependent variable is *LOAN(I)* (specification (1)), *CREDIT LINE(I)* (specification (2)), or *DEBT* (specification (3)). The main independent variable either indicates whether individuals' savings are larger than the median for individuals in the same group or indicates whether individuals' net income is larger than €2,500. Models (1) and (2) are estimated as logit models, model (3) is estimated using OLS. In Panel D, we restrict the sample to individuals in group Frequent. All specifications include the full set of control variables: individuals' demographic characteristics, (checking) account characteristics, indicators for mortgages and brokerage accounts, individuals' net wealth, self-reported confidence in managing financial matters, risk tolerance, and financial literacy, as well as the control variable *Same Day*. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, the 5%, and the 10% levels, respectively.

Panel A. Time Preferences and Overdraft Usage				
	<i>GROUP</i>	<i>OVERDRAFT(I)</i>	<i>BALANCE</i>	<i>BALANCE/</i> <i>Overdraft Limit</i>
	(1)	(2)	(3)	(4)
Discount Rate	0.022*** (0.01)	0.017** (0.01)	-13.864* (8.05)	-0.003 (0.00)
<i>Controls</i>				
Demographics	Yes	Yes	Yes	Yes
Account Characteristics	Yes	Yes	Yes	Yes
Products and Wealth	Yes	Yes	Yes	Yes
Personal Traits	Yes	Yes	Yes	Yes
Same Day	Yes	Yes	Yes	Yes
Constant		-1.381** (0.56)	995.704 (756.89)	-0.240 (0.18)
κ_1	0.621 (0.51)			
κ_2	2.274*** (0.52)			
Pseudo/Adjusted R ²	0.154	0.114	0.370	0.099
Observations	1,156	1,156	311	311
Individuals	Sample	Sample	Individuals Who Use Overdrafts	
Panel B. Twofold Effect of Impulsiveness				
	<i>GROUP</i>	<i>OVERDRAFT(I)</i>	<i>BALANCE</i>	<i>BALANCE/</i> <i>Overdraft Limit</i>
	(1)	(2)	(3)	(4)
Self-Control	-0.251*** (0.06)	-0.250*** (0.07)	70.152 (79.00)	0.018 (0.02)
Complexity	0.196*** (0.05)	0.129** (0.06)	-66.037 (69.86)	-0.011 (0.02)
<i>Controls</i>				
Demographics	Yes	Yes	Yes	Yes
Account Characteristics	Yes	Yes	Yes	Yes
Products and Wealth	Yes	Yes	Yes	Yes
Personal Traits	Yes	Yes	Yes	Yes
Same Day	Yes	Yes	Yes	Yes
Constant		-0.449 (0.64)	627.408 (851.50)	-0.347* (0.20)
κ_1	-0.133 (0.57)			
κ_2	1.525*** (0.57)			
Pseudo/Adjusted R ²	0.157	0.120	0.363	0.090
Observations	1,144	1,144	309	309
Individuals	Sample	Sample	Individuals Who Use Overdrafts	

Table 12: Robustness Check: Second Set of Account Balances

(continued)

Panel C. Usage of Alternative Credit Products			
	<i>LOAN(I)</i> (1)	<i>CREDIT LINE(I)</i> (2)	<i>DEPLETION(I)</i> (3)
Group = Sporadic	0.123 (0.53)	0.895*** (0.24)	-0.183 (0.61)
Group = Frequent	0.113 (0.53)	0.890*** (0.26)	1.278** (0.61)
<i>Controls</i>			
Demographics	Yes	Yes	Yes
Account Characteristics	Yes	Yes	Yes
Products and Wealth	Yes	Yes	Yes
Personal Traits	Yes	Yes	Yes
Same Day	Yes	Yes	Yes
Constant	-3.929** (1.67)	-1.901** (0.77)	-4.164*** (1.58)
Pseudo R ²	0.331	0.140	0.286
Observations	1,156	1,156	192
Individuals	Sample	Sample	Credit Line(I) = 1
Panel D. Potential Credit Constraints			
	<i>LOAN(I)</i> (1)	<i>CREDIT LINE(I)</i> (2)	<i>DEBT</i> (3)
<i>Proxy: Savings</i>			
Savings > Median	-0.647 (0.47)	-0.158 (0.29)	1,912.411** (743.40)
<i>Controls</i>			
	Yes	Yes	Yes
Pseudo/Adj. R ²	0.092	0.097	0.119
Observations	347	347	347
Individuals	Frequent	Frequent	Frequent
<i>Proxy: Net Income</i>			
Net Income > €2,500	-1.273* (0.67)	1.158*** (0.31)	-1069.657* (642.69)
<i>Controls</i>			
	Yes	Yes	Yes
Pseudo/Adj. R ²	0.412	0.125	0.496
Observations	355	355	355
Individuals	Frequent	Frequent	Frequent

Appendix

A Survey Questionnaire

Question 1:

Which of the following bank products do you currently use in general?

(Multiple answers possible)

- Checking account
- Overdrafts
- Savings products
- Brokerage account
- Mortgage
- Other credit (e.g., credit line, installment loan)

Question 2:

Independent of whether you actually use overdrafts, for which reasons could you imagine to use overdrafts? Please state for the reasons mentioned below how likely you think it is that you would use overdrafts for these reasons.

	very unlikely						very likely
	1	2	3	4	5	6	7
Recurring expenses	<input type="radio"/>						
Occurred, unexpected expenses	<input type="radio"/>						
Planned, larger purchases	<input type="radio"/>						
Holidays	<input type="radio"/>						

Other reasons (please state):

Question 6:

Now, please have a look at the following table. Imagine that you have the choice between €100 today and a certain amount X in 12 months, which varies from row to row. Please state for every row whether you prefer the €100 today (column A) or the stated amount in 12 months (column B). Please start with the first row.

A		B		A	B
€100 today	or	€100.00 in 12 months		<input type="radio"/>	<input type="radio"/>
€100 today	or	€102.00 in 12 months		<input type="radio"/>	<input type="radio"/>
€100 today	or	€107.10 in 12 months		<input type="radio"/>	<input type="radio"/>
€100 today	or	€112.40 in 12 months		<input type="radio"/>	<input type="radio"/>
€100 today	or	€117.70 in 12 months		<input type="radio"/>	<input type="radio"/>
€100 today	or	€123.20 in 12 months		<input type="radio"/>	<input type="radio"/>
€100 today	or	€128.80 in 12 months		<input type="radio"/>	<input type="radio"/>
€100 today	or	€134.60 in 12 months		<input type="radio"/>	<input type="radio"/>

Question 7:

What do you guess, which of the following bank products do your friends and/or acquaintances use?

	rather no	rather yes	do not know
Checking account	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overdrafts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Savings products	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brokerage account	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mortgage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other credit (e.g., credit line, installment loan)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Question 8:

Do you talk with your friends and acquaintances about your financial matters?

not at all	very rarely					very often
	1	2	3	4	5	6
<input type="radio"/>						

Question 9:

How strongly do you agree with the following statement: I plan tasks carefully?

do not							completely
agree at all							agree
1	2	3	4	5	6	7	
<input type="radio"/>							

Question 10:

How strongly do you agree with the following statement: I like to think about complex problems?

do not							completely
agree at all							agree
1	2	3	4	5	6	7	
<input type="radio"/>							

Question 11:

How strongly do you agree with the following statement: I believe that I am better than others in managing my financial matters?

do not							completely
agree at all							agree
1	2	3	4	5	6	7	
<input type="radio"/>							

Question 12:

Are you in general rather patient or rather impatient?

very						very
patient						impatient
1	2	3	4	5	6	7
<input type="radio"/>						

Question 13:

How large do you rate your risk tolerance to be in financial matters?

very low							very high
1	2	3	4	5	6	7	
<input type="radio"/>							

Question 14:

How large do you rate your knowledge to be in financial matters?

very low							very high
1	2	3	4	5	6	7	
<input type="radio"/>							

Finally, we ask you for some demographic information.

Question 15:

Please indicate your gender.

- female male

Question 16:

Please indicate to which age group you belong.

- 18 to 35 years
 36 to 50 years
 51 to 65 years
 older than 65 years

Question 17:

Which is your highest school degree?

- Low school degree (“Hauptschulabschluss”)
- Medium school degree (“Realschulabschluss”)
- High school degree (“Fachabitur/Abitur”)
- University degree

Question 18:

Finally, please state your monthly net income, i.e., the amount that remains, after the deduction of taxes and social security payments, to pay expenses or to save. Hereby, please indicate into which of the following groups your income falls.

- Up to €1,000
- More than €1,000 and up to €2,500
- More than €2,500 and up to €5,000
- more than €5,000

B Additional Tables

Table B.1: Regressions of Overdraft Limits on the Frequency of Overdraft Usage

This table presents the results of OLS regressions. In specification (1), the dependent variable *OVERDRAFT LIMIT* measures the approved limit associated with individuals' overdraft facilities. In specification (2), the dependent variable is the natural logarithm of the overdraft limit. The main independent variables are two dummy variables that indicate whether an individual belongs to group Frequent or to group Sporadic. Individuals in group Never are the base case. The two specifications include the following control variables: individuals' demographic characteristics, (checking) account characteristics, indicators for mortgages and brokerage accounts, individuals' net wealth, self-reported confidence in managing financial matters, risk tolerance, and financial literacy. The models further include the control variable *Same Day*, which indicates whether an individual answered the questionnaire on July 4, 2016 or on a subsequent day. Account information (including balances) is as of July 4, 2016. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, the 5%, and the 10% levels, respectively.

	<i>OVERDRAFT LIMIT</i> (1)	$\ln(\text{OVERDRAFT LIMIT})$ (2)
Group = Sporadic	417.563** (164.61)	0.132** (0.06)
Group = Frequent	1,457.421*** (194.36)	0.516*** (0.06)
Male	324.101** (151.29)	0.118** (0.05)
Age [18; 35]	-1,484.640*** (323.44)	-0.679*** (0.09)
Age [36; 50]	-672.771** (325.92)	-0.195** (0.08)
Age [51; 65]	347.166 (324.54)	0.119 (0.08)
School Low	-23.858 (285.39)	0.035 (0.09)
School Medium	-0.283 (173.60)	0.004 (0.06)
School High	-28.976 (176.33)	-0.010 (0.06)
Net Inc \leq €1,000	-3,149.973*** (471.80)	-0.873*** (0.13)
Net Inc [€1,001; €2,500]	-2,705.163*** (414.13)	-0.632*** (0.09)
Net Inc [€2,501; €5,000]	-2,127.362*** (402.29)	-0.483*** (0.09)
Joint Account	176.145 (186.09)	0.032 (0.05)
Avg Logins	9.001*** (2.99)	0.003*** (0.00)
Mortgage(I)	661.903 (449.98)	0.222** (0.11)
Brokerage(I)	297.447* (176.22)	0.079 (0.05)
Net Wealth	-0.002*** (0.00)	-0.000* (0.00)
Confidence	-65.287 (55.88)	-0.011 (0.02)
Risk Tolerance	0.393 (56.57)	0.008 (0.02)
Financial Literacy	59.989 (67.64)	0.015 (0.02)
Same Day	-82.678 (153.40)	-0.039 (0.05)
Constant	4,851.712*** (611.95)	8.036*** (0.16)
Adjusted R ²	0.224	0.238
Observations	1,156	1,156

Table B.2: Reasons for Overdraft Usage: OLS Regressions

This table presents the results of OLS regressions. Survey participants were asked to rate on a seven point Likert-scale how likely they think it is that they would use overdrafts for each of the stated reasons (from one (very unlikely) to seven (very likely)). The four reasons are (i) to cover recurring expenses, (ii) to cover expenses that occurred unexpectedly, (iii) to cover planned expenses of larger amounts, and (iv) to cover holiday-related expenses. The dependent variables in specifications (1) to (4) are the values assigned by the individuals to the particular reasons. The main independent variables are two dummy variables that indicate whether an individual belongs to group Frequent or to group Sporadic. Individuals in group Never are the base case. The four specifications include the following control variables: individuals' demographic characteristics, (checking) account characteristics, indicators for mortgages and brokerage accounts, individuals' net wealth, self-reported confidence in managing financial matters, risk tolerance, and financial literacy. The models further include the control variable *Same Day*, which indicates whether an individual answered the questionnaire on July 4, 2016 or on a subsequent day. Account information (including balances) is as of July 4, 2016. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, the 5%, and the 10% levels, respectively.

	<i>RECURRING</i>	<i>UNEXPECTED</i>	<i>PLANNED</i>	<i>HOLIDAYS</i>
	(1)	(2)	(3)	(4)
Group = Sporadic	0.599*** (0.12)	0.860*** (0.15)	0.423*** (0.13)	0.633*** (0.12)
Group = Frequent	1.457*** (0.14)	1.446*** (0.15)	1.306*** (0.16)	1.102*** (0.14)
Male	0.264** (0.12)	-0.067 (0.13)	0.016 (0.14)	-0.110 (0.12)
Age [18; 35]	-0.089 (0.21)	0.238 (0.26)	0.183 (0.24)	-0.143 (0.22)
Age [36; 50]	0.077 (0.19)	0.494** (0.22)	0.138 (0.20)	0.109 (0.20)
Age [51; 65]	-0.051 (0.18)	0.055 (0.22)	0.028 (0.20)	-0.205 (0.19)
School Low	0.222 (0.25)	-0.074 (0.27)	0.595** (0.27)	0.245 (0.26)
School Medium	0.341** (0.13)	0.011 (0.15)	0.447*** (0.15)	0.041 (0.13)
School High	0.124 (0.13)	0.203 (0.15)	0.580*** (0.15)	0.231* (0.14)
Net Inc ≤ €1,000	0.353 (0.30)	-0.266 (0.34)	-0.293 (0.32)	-0.167 (0.26)
Net Inc [€1,001; €2,500]	0.246 (0.20)	-0.218 (0.24)	0.003 (0.22)	0.091 (0.18)
Net Inc [€2,501; €5,000]	0.001 (0.18)	-0.302 (0.21)	0.034 (0.19)	0.059 (0.16)
Joint Account	-0.076 (0.12)	-0.129 (0.13)	-0.171 (0.13)	-0.133 (0.12)
Avg Logins	0.002 (0.00)	-0.001 (0.00)	0.000 (0.00)	-0.001 (0.00)
Overdraft Limit	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.000* (0.00)
Mortgage(I)	-0.311 (0.25)	0.489* (0.26)	-0.206 (0.27)	-0.206 (0.22)
Brokerage(I)	-0.185 (0.12)	-0.071 (0.14)	-0.265* (0.14)	-0.208* (0.12)
Net Wealth	-0.000 (0.00)	-0.000** (0.00)	-0.000 (0.00)	-0.000* (0.00)
Confidence	-0.045 (0.04)	-0.052 (0.05)	-0.043 (0.05)	-0.057 (0.05)
Risk Tolerance	0.103** (0.04)	-0.063 (0.04)	0.064 (0.05)	0.071* (0.04)
Financial Literacy	-0.039 (0.05)	-0.053 (0.06)	-0.143** (0.06)	-0.045 (0.06)
Same Day	-0.092 (0.12)	-0.077 (0.13)	-0.069 (0.13)	-0.084 (0.12)
Constant	1.131*** (0.37)	4.927*** (0.42)	2.416*** (0.41)	1.855*** (0.37)
Adjusted R ²	0.154	0.146	0.122	0.113
Observations	1,073	1,131	1,070	1,038

Table B.3: Survey Participation (Adjusted Samples)

This table presents the participation of individuals in the survey across the three groups. Bank customers were allocated to three different groups based on their overdraft usage from June 2015 until May 2016. Individuals who did not use overdrafts during these 12 months are allocated to the group *Never*. Individuals who used overdrafts during at least two consecutive or three non-consecutive months are allocated to the group *Sporadic*. Individuals who used overdrafts during at least four consecutive or six non-consecutive months are allocated to the group *Frequent*. 12,000 individuals were randomly selected from each group and were invited to participate in the survey on July 4, 2016. Individuals are recorded as participant if they completed the survey. The table also presents the number of individuals in the adjusted samples after the cleaning of the data and after additional adjustments. Panel A shows the number of individuals if individuals are excluded who do not respond to each question in the survey. Panel B shows the respective numbers if individuals are excluded who have an implied discount rate of 0%. Panel C shows the respective numbers if frequent overdraft users are excluded who use overdrafts of less than €100 based on the checking account balances as of July 4, 2016.

Group	Selection		Participation			<i>Adjusted Sample</i>	
	Individuals	Percent	Individuals	Percent	Response	Individuals	Percent
Panel A. Exclusion of Individuals Who Do Not Respond to Each Question							
Never	12,000	33.3	507	38.8	4.2%	371	40.5
Sporadic	12,000	33.3	404	30.9	3.4%	289	31.5
Frequent	12,000	33.3	395	30.3	3.3%	257	28.0
Total	36,000	100.0	1,306	100.0	3.6%	917	100.0
Panel B. Exclusion of Individuals With Discount Rates = 0%							
Never	12,000	33.3	507	38.8	4.2%	449	39.2
Sporadic	12,000	33.3	404	30.9	3.4%	350	30.6
Frequent	12,000	33.3	395	30.3	3.3%	346	30.2
Total	36,000	100.0	1,306	100.0	3.6%	1,145	100.0
Panel C. Exclusion of Frequent Overdraft Users With Overdrafts < €100							
Never	12,000	33.3	507	38.8	4.2%	470	46.5
Sporadic	12,000	33.3	404	30.9	3.4%	369	36.5
Frequent	12,000	33.3	395	30.3	3.3%	171	17.0
Total	36,000	100.0	1,306	100.0	3.6%	1,010	100.0

Table B.4: Summary Statistics of Bank Account Data: Second Snapshot

This table presents the descriptive statistics of bank account information for individuals in the sample using also the second snapshot of bank data. Panel A reports the descriptive statistics based on this second snapshot as of August 1, 2016. The definitions of the variables are the same as in Table 3. We also calculate the respective variables based on the average values of the data in the first (July 4, 2016) and in the second (August 1, 2016) snapshot. Panel B reports the descriptive statistics of the variables based on the average account data. It is not possible to calculate an average for the joint account variable, thus it takes the value as of July 4, 2016. Regarding the dummy variables, *Overdraft(I)* indicates whether the average checking account balance is negative. *Credit Line(I)*, *Loan(I)*, *Mortgage(I)*, *Brokerage(I)* take the values zero or one. If on one day the value is zero and on the other day the value is one, the dummy variable takes the value one. *Overdraft* denotes the amount, in this case the amount that is borrowed. The same applies to credit lines, installment loans, mortgages, and brokerage accounts. Regarding these amounts, we report the respective statistics only for individuals who use the particular product on at least one of the two days.

Variable	Measure	N	Mean	SD	Percentiles		
					1st	Median	99th
Panel A. Account Data as of August 1, 2016							
Joint Account	Dummy	1,198	0.31	0.46	0	0	1
Avg Logins	Number	1,198	16.07	21.44	0	9.00	110.00
Avg Calls	Number	1,198	0.10	0.27	0	0	1.33
Balance	Amount	1,198	1,473.36	6,557.15	-5,361.67	580.38	16,024.88
Overdraft(I)	Dummy	1,198	0.27	0.44	0	0	1
Overdraft	Amount	320	-1,459.49	1,798.16	-8,858.66	-848.59	-1.18
Overdraft Limit	Amount	1,198	3,164.44	2,697.47	100.00	2,000.00	11,000.00
Credit Line(I)	Dummy	1,198	0.17	0.37	0	0	1
Credit Line	Amount	199	-4,264.93	6,167.70	-25,000.00	-1,950.00	0
Loan(I)	Dummy	1,198	0.04	0.20	0	0	1
Loan	Amount	49	-11,670.14	8,263.88	-38,891.17	-10,086.44	-1,847.28
Mortgage(I)	Dummy	1,198	0.04	0.19	0	0	1
Mortgage	Amount	44	-91,780.13	79,037.60	-307,500.00	-62,191.60	0
Brokerage(I)	Dummy	1,198	0.32	0.47	0	0	1
Brokerage	Amount	379	27,785.92	88,307.68	0	3,142.80	385,479.00
Debt	Amount	1,198	-1,988.75	5,700.46	-30,077.43	0	0
Savings	Amount	1,198	22,585.52	76,321.72	0	2,850.50	278,758.00
Net Wealth	Amount	1,198	22,070.13	78,024.67	-28,113.22	3,519.17	292,649.30
Panel B. Average Values Based on Both Account Data Snapshots							
Joint Account	Dummy	1,198	0.31	0.46	0	0	1
Avg Logins	Number	1,198	16.11	21.45	0	9.00	111.75
Avg Calls	Number	1,198	0.10	0.27	0	0	1.33
Balance	Amount	1,198	1,687.53	6,474.90	-5,066.62	1,076.25	15,285.05
Overdraft(I)	Dummy	1,198	0.21	0.40	0	0	1
Overdraft	Amount	247	-1,643.63	1,920.22	-9,607.71	-1,040.03	-8.08
Overdraft Limit	Amount	1,198	3,163.27	2,697.72	100.00	2,000.00	11,000.00
Credit Line(I)	Dummy	1,198	0.17	0.37	0	0	1
Credit Line	Amount	199	-4,210.26	6,006.71	-25,060.73	-2,000.00	0
Loan(I)	Dummy	1,198	0.04	0.20	0	0	1
Loan	Amount	52	-11,077.58	8,448.50	-38,891.17	-9,878.52	0
Mortgage(I)	Dummy	1,198	0.04	0.19	0	0	1
Mortgage	Amount	44	-91,558.11	78,728.03	-307,500.00	-62,211.60	0
Brokerage(I)	Dummy	1,198	0.32	0.46	0	0	1
Brokerage	Amount	379	27,011.82	86,581.50	0	3,128.12	377,190.90
Debt	Amount	1,198	-1,955.81	5,509.50	-28,216.05	0	0
Savings	Amount	1,198	22,514.23	75,597.25	0	2,828.72	275,471.10
Net Wealth	Amount	1,198	22,245.95	77,315.15	-26,800.71	3,988.43	285,879.00

Table B.5: Robustness Check: Average Values of Account Balances

This table presents the results of regressions with account balances measured as the average of the balances on July 4, 2016 and on August 1, 2016. In Panels A and B, the dependent variable is *GROUP*, *OVERDRAFT(I)*, *BALANCE*, or *BALANCE* divided by the overdraft limit. In Panel A, the main independent variable is the discount rate. In Panel B, the main independent variables are the measures of individuals' impulsiveness, *Self-Control* and *Complexity*. The models with the group allocation as the dependent variable are estimated as ordered logistic regressions, the models with *OVERDRAFT(I)* as the dependent variable are estimated as logit models, the remaining models are estimated using OLS. In Panel C, the dependent variable is *LOAN(I)*, *CREDIT LINE(I)*, or *DEPLETION(I)*. The main independent variables indicate whether individuals belong to the group of frequent overdraft users or to group of sporadic overdraft users. Individuals who never use overdrafts are the base case. These models are estimated as logit models. In Panel D, the dependent variable is *LOAN(I)* (specification (1)), *CREDIT LINE(I)* (specification (2)), or *DEBT* (specification (3)). The main independent variable either indicates whether individuals' savings are larger than the median for individuals in the same group or indicates whether individuals' net income is larger than €2,500. Models (1) and (2) are estimated as logit models, model (3) is estimated using OLS. In Panel D, we restrict the sample to individuals in group Frequent. All specifications include the full set of control variables: individuals' demographic characteristics, (checking) account characteristics, indicators for mortgages and brokerage accounts, individuals' net wealth, self-reported confidence in managing financial matters, risk tolerance, and financial literacy, as well as the control variable *Same Day*. Robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, the 5%, and the 10% levels, respectively.

Panel A. Time Preferences and Overdraft Usage				
	<i>GROUP</i>	<i>OVERDRAFT(I)</i>	<i>BALANCE</i>	<i>BALANCE/</i> <i>Overdraft Limit</i>
	(1)	(2)	(3)	(4)
Discount Rate	0.022*** (0.01)	0.021*** (0.01)	-6.278 (9.46)	-0.001 (0.00)
<i>Controls</i>				
Demographics	Yes	Yes	Yes	Yes
Account Characteristics	Yes	Yes	Yes	Yes
Products and Wealth	Yes	Yes	Yes	Yes
Personal Traits	Yes	Yes	Yes	Yes
Same Day	Yes	Yes	Yes	Yes
Constant		-2.699*** (0.61)	629.085 (824.70)	-0.291 (0.18)
κ_1	0.609 (0.51)			
κ_2	2.261*** (0.52)			
Pseudo/Adjusted R ²	0.153	0.131	0.445	0.097
Observations	1,156	1,156	241	241
Individuals	Sample	Sample	Individuals Who Use Overdrafts	
Panel B. Twofold Effect of Impulsiveness				
	<i>GROUP</i>	<i>OVERDRAFT(I)</i>	<i>BALANCE</i>	<i>BALANCE/</i> <i>Overdraft Limit</i>
	(1)	(2)	(3)	(4)
Self-Control	-0.250*** (0.06)	-0.183** (0.08)	163.657** (79.09)	0.031 (0.02)
Complexity	0.198*** (0.05)	0.222*** (0.07)	16.283 (83.00)	0.008 (0.02)
<i>Controls</i>				
Demographics	Yes	Yes	Yes	Yes
Account Characteristics	Yes	Yes	Yes	Yes
Products and Wealth	Yes	Yes	Yes	Yes
Personal Traits	Yes	Yes	Yes	Yes
Same Day	Yes	Yes	Yes	Yes
Constant		-2.410*** (0.71)	-200.946 (972.78)	-0.478** (0.21)
κ_1	-0.137 (0.57)			
κ_2	1.521*** (0.57)			
Pseudo/Adjusted R ²	0.156	0.136	0.448	0.100
Observations	1,144	1,144	239	239
Individuals	Sample	Sample	Individuals Who Use Overdrafts	

Table B.5: Robustness Check: Second Set of Account Balances

(continued)

Panel C. Usage of Alternative Credit Products			
	<i>LOAN(I)</i> (1)	<i>CREDIT LINE(I)</i> (2)	<i>DEPLETION(I)</i> (3)
Group = Sporadic	0.179 (0.52)	0.892*** (0.24)	-0.227 (0.60)
Group = Frequent	0.331 (0.53)	0.894*** (0.26)	1.053* (0.58)
<i>Controls</i>			
Demographics	Yes	Yes	Yes
Account Characteristics	Yes	Yes	Yes
Products and Wealth	Yes	Yes	Yes
Personal Traits	Yes	Yes	Yes
Same Day	Yes	Yes	Yes
Constant	-4.113** (1.62)	-1.892** (0.76)	-4.384*** (1.67)
Pseudo R ²	0.315	0.139	0.312
Observations	1,156	1,156	192
Individuals	Sample	Sample	Credit Line(I) = 1
Panel D. Potential Credit Constraints			
	<i>LOAN(I)</i> (1)	<i>CREDIT LINE(I)</i> (2)	<i>DEBT</i> (3)
<i>Proxy: Savings</i>			
Savings > Median	-0.777* (0.46)	-0.369 (0.30)	1463.522* (756.30)
<i>Controls</i>			
	Yes	Yes	Yes
Pseudo/Adj. R ²	0.098	0.100	0.113
Observations	347	347	347
Individuals	Frequent	Frequent	Frequent
<i>Proxy: Net Income</i>			
Net Income > €2,500	-1.463** (0.62)	1.159*** (0.31)	-1080.402* (642.83)
<i>Controls</i>			
	Yes	Yes	Yes
Pseudo/Adj. R ²	0.368	0.125	0.455
Observations	355	355	355
Individuals	Frequent	Frequent	Frequent