Preventing Over-Spending: Increasing Salience of Credit Card Payments through Smartphone Interventions

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Abstract. Credit card related over-spending represents not only an issue on the individual level, but also a growing societal burden. For example, consumers spend over $70bn in interest fees annually in the US alone. As mobile-mediated information systems have been proven effective in behavior change interventions, this study investigates the efficacy of a novel smartphone application to increase the salience of credit card usage. It seeks to motivate credit card users to save money by lowering expenditures, a desirable behavior preventing possible over-spending. In particular, the app suggested weekly saving goals and measured the respective effect of increased transaction salience on spending behavior. The preliminary results from the pre-study cohort (N=95) suggest that increased salience significantly lowers expenditures. We plan a large-scale study (N>1'000) to further examine the relationship between transaction salience and spending volume for low-transparency payment methods such as credit cards.

Keywords: Credit Card Transaction Salience, Exceptional Purchases, Goal-Setting, Financial Literacy

1   Introduction

Most developed countries have witnessed a decline in the use of cash in favor of credit cards and other digital payment forms [1]. The latter provide benefits for customers, *e.g.* forgoing cash withdrawals and the possibility to conveniently track expenses, maintaining digital budgets, thereby informing purchasing behavior adjustments. However, literature provides growing evidence that consumers are more likely to overspend with digital payment forms. People who use cash on average tend to spend less, are more cost-focused, and are less likely to accrue debt compared to credit card users [2]. The rise of credit cards is also reflected in a 36% increase in total outstanding credit card debt in the US between 2000 and 2015 to a level of $925bn [3]. An estimated one third of households carry forward at least some credit card debt from month to month [4], while median income levels have stagnated [5]. These numbers suggest that consumers increasingly use credit cards and debt as an alternative source of income, leaving them more vulnerable to financial hardships, *e.g.* job loss [6]. Aspects related to credit card usage, such as over-spending, carrying forward debt to the following month, and general worry about credit card debt, have been identified as important

stress factors [7, 8]. Thus, when deciding whether to use credit cards, consumers face a trade-off between greater convenience and transparency, or financial discipline. We are collaborating with a card issuer to address the outlined trade-off by increasing transaction salience via feedback loops within a mobile app, thus helping people gain better control over their spending.

2 Theoretical Background

2.1 The Effect of Payment Channels on Salience of Spending Behavior

Research has shown that a chosen means of payment affects consumer choice and price sensitivity. Studies attribute this phenomenon to consumers' 'pain of payment', which is more prominent when paying with cash, compared to more abstract, digital means of payment [9]. The burgeoning adoption of digital payment forms, however, impair the consumer's ability to record and recall transaction information in his consciousness, commonly referred to as decreased salience [10]. This effect is all the more pronounced for credit cards, where the purchase and wealth depletion events are temporally decoupled. This decreased salience, temporal disconnect and monthly transaction aggregation make credit cards a less transparent means of payment than cash, adding to the challenge for consumers to intuitively learn from and adapt their spending behavior [9, 11]. As a wide-spread low-salience payment form, credit cards have received a lot of attention in marketing and consumer behavior research, typically concluding that people exhibit a strong tendency to spend more for the same items than they would have when using cash, as consumers focus more on product properties than on costs when using digital payment methods. Studies have shown this effect for various products, *e.g.* treats and luxury items [9, 10, 12, 13].

2.2 Mental Accounting, Narrow Choice Bracketing, and Exceptional Purchases

Besides the aforementioned negative behavioral changes when switching from cash to credit card payment, consumers are further influenced by mental biases including mental accounting and narrow choice bracketing leading to costly purchase decision-making [14], specifically, when confronted with exceptional (*i.e.* infrequent, unusual) purchases [15]. Scholars argue, that for ordinary (*i.e.* frequent, usual) expenses such as groceries or phone bills, consumers are comparatively proficient at forecasting and managing expenses, as well as mitigating financial distress by using simple preventive techniques like leaving a financial buffer [15]. In contrast, the projection and management of exceptional expenses is more challenging, since they are often regarded in an isolated fashion (narrow choice bracketing), and their frequency is underestimated [15]. Because of this narrow framing of exceptional transactions, there likely are no prior purchases that would deplete the mental category budget. This leads to consumers granting themselves greater financial slack, and ultimately overspending on exceptional expenses [15, 16]. The situational context of transactions as being of ordinary or

exceptional nature hence plays a role in spending behavior, and should thus be taken into consideration when designing interventions aiming to prevent over-spending.

3   Research Model

This study investigated the effect of increased credit card transaction salience on credit card spending compared to the within-subject baseline. Increasing the salience of previous transactions has been shown to affect individuals' decision-making for subsequent purchases [11, 15]. Furthermore, credit cards generally exhibit lower salience than cash, making it harder for consumers to intuitively learn from previous purchases [9, 11]. We hence hypothesize that manipulating transaction salience will be an effective means to influence consumers' credit card spending. Research suggests that individuals might be more proficient in predicting ordinary expenses than exceptional ones, making them particularly prone to over-spending in the latter category [15]. We therefore introduced a high-salience condition in three groups, in which we particularly highlighted either ordinary expenses (T2), exceptional ones (T3), or both categories equally (T1). Our study thereby manipulated the salience of specific groups of transactions and measured the efficacy thereof in terms of reducing participants' total credit card spending, as compared to a control group, which did not receive the salience manipulation. However, the implementation of said experiment design required participants in the treatment groups (T1, T2, T3) to review and classify every credit card transaction. Because this task in itself arguably increased transaction salience, we also tested this task in isolation without increasing transaction salience any further during a two-week warmup period (medium salience). We further hypothesize that frugality will negatively moderate the reduction in spending since frugal consumers are known to be disciplined with their spending, hence any further consumption restriction will be harder to accomplish [17]. Similarly, scholars argue that compulsive buying behavior is in parts rooted in low levels of self-efficacy, therefore goal attainment guidance might lead to stronger behavior adjustments than for non-compulsive buyers [18]. Moreover, individuals with more stable consumption patterns, *i.e.* high regularity of baseline spending, will arguably have an easier time drawing conclusions and adjusting their behavior based on our interventions as compared to those with highly irregular spending patterns; we argue that for individuals with higher baseline variance, more specific action guidelines might be necessary to achieve a behavior change. In addition, individuals with higher previous spending have arguably more room to reduce their spending, hence the baseline spending was introduced as a
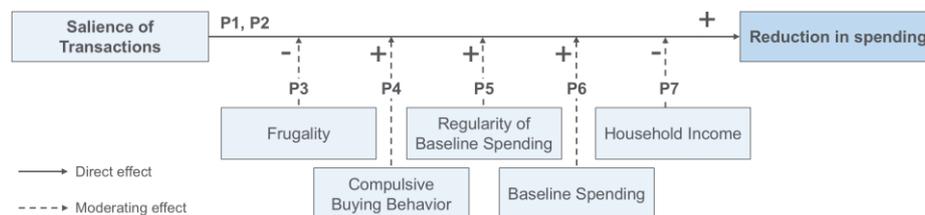

Figure 1. Research Model

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further moderating variable. Finally, economists have established that consumption is positively correlated with household income; we thus argue that the efficacy of our consumption-reducing intervention might be moderated by household income, albeit we suspect the true nature of the moderation to be non-linear, *i.e.* our interventions might be most pronounced for the middle class, while showing weaker effects both at the lower and upper ends of the income spectrum. Figure 1 summarizes our research model that tests a total of seven propositions, two of which evaluate the direct effect of our salience manipulation towards the dependent variable, reduction in spending (P1 – P2), whereas the remaining propositions (P3 – P7) test moderating effects:

P1. By having to reflect on every purchase through a binary categorization task (T1, T2, T3 during warmup), people will spend less[1] compared to a control group without this task in the same period.

P2. Participants in the high-salience setting (T1, T2, T3 after warmup) will spend less than the control group in the same period.

P3–P7. Frugality (P3), compulsiveness (P4), regularity of baseline spending (P5), total baseline spending (P6), and income (P7) will moderate the reduction in spending.

4   Experiment Design

While a lot of research in Behavioral Economics is conducted with surveys or in controlled lab environments, we wanted to investigate the efficacy of our interventions through a quasi-experimental setup in a real-world environment over a sufficient period of time, which we argue will yield more insightful findings. To investigate our research propositions, we thus designed a field study following a controlled randomized trial
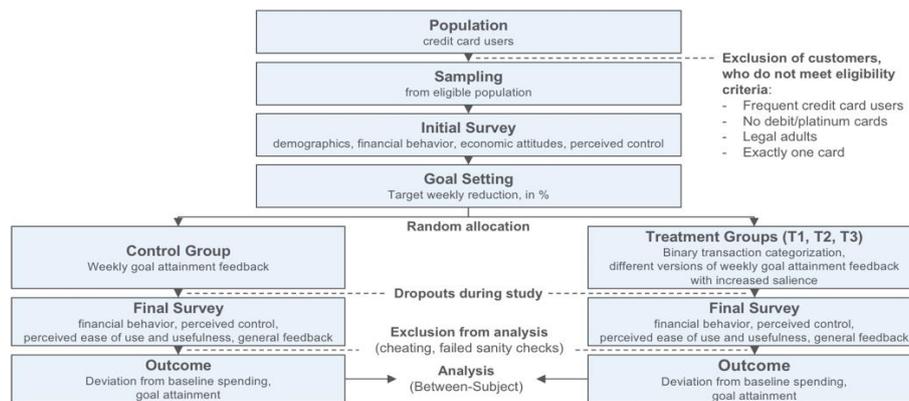

Figure 2. Experiment Design

approach with a sample of at least 1'000 Swiss credit card users, as summarized in Figure 2. A rather extended study duration of 14 weeks (two-week warmup period plus 12 feedback cycles) was chosen to ensure that the study could measure medium-term

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[1] For all propositions, we compared the weekly spending observed during the study with the respective participant's baseline (previous 52-week mean spending).

reactions to feedback. Participants were asked to download a mobile app (offered for iOS and Android, in English, German, French, and Italian), which was then linked to their existing credit card. Inside the app (see Figure 3), users received condition-specific instructions on how to use the app. They were also prompted to fill out a 19-item questionnaire and to define a weekly spending goal, which remained adjustable. Goal-setting was included to provide a meaningful experience for all participants including the control group. As a default goal, the app suggested a 15% spending reduction compared to the individual baseline. Since the efficacy of goal-setting in behavior change interventions has been proven in other domains such as energy consumption [19, 20], we incorporated goal-setting for all groups without further testing its effects. The initial survey inquired demographic data, financial behaviors (*e.g.* existence of a household budget), as well as economic attitudes (frugality, compulsiveness [17, 18]), allowing us to conduct a follow-up subgroup analysis. Furthermore, the credit card firm provided us with 52 weeks of baseline data (weekly cumulative spending) for each opted-in user. All treatment groups received push notifications prompting them to categorize new transactions as 'ordinary' or 'exceptional'. When no new transactions were processed on a particular day, categorization reminders were sent. These notifications were sent out at most once a day, only between 8am and 10pm (to minimize interferences), and included information about transactions that remained uncategorized. For example: "Please categorize your new transaction at Grocery Store X over CHF 49.99 as well as Y previous transactions".

Our study manipulated transaction salience in three levels – from low (control group) to high: During the warmup period, the study design was identical for participants across all treatment groups (T1, T2, T3) due to the absence of feedback. They needed to review and categorize every transaction, without receiving direct goal attainment feedback (medium salience). After the warmup period, participants started to receive push notifications that included personalized goal attainment feedback (high salience). The treatment difference between T1, T2, and T3 lied in the exact content of said
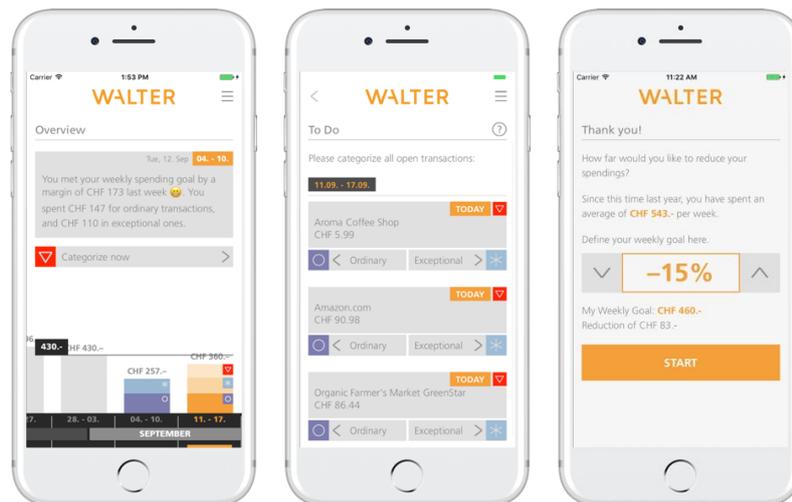

Figure 3. Mobile app: i) goal attainment feedback, ii) expense categorization, iii) goal setting

feedback, as described in the previous section. In contrast, control group participants did not need to categorize transactions at any point. After the warmup period, they received goal attainment feedback on their weekly expenditure, without any focus on a particular expense type. Including a control group was also crucial to control for seasonal effects. In addition, all participants begin the study within a 7-day period, and we deliberately planned the study in a somewhat regular phase of the year, *i.e.* outside major holiday seasons. We also statistically controlled for variables such as occupation, household size, number of transactions per week, and share of wallet. In the final survey, we ask participants to estimate the number of transactions made in the previous seven days as a manipulation check. From the credit card firm we received statistics regarding demographics as well as cumulative weekly spending, which allowed us to gauge the regularity of weekly spending (σ/μ=1.0113, n=74'097). Based on comparable field studies, *e.g.* [19, 21], we conservatively assumed to achieve a 5% decrease in spending in at least one of the treatment groups. An a-priori power analysis with G*Power yielded an estimated total target sample size of 185 at a power level of 0.95. Since our study requires active participation over three months, we aim for a total sample size of at least 1'000 individuals in the beginning, to err on the side of caution. From a population of more than 70'000 eligible credit card users, email invites will be sent to a random subset, whereas the conversation rate is estimated based on prior experience of our partner company. Once customers download the app and agree to participate in the study, they are randomly assigned to one of the four groups.

5 Status Quo and Outlook

We are currently running a pre-study with 95 individuals, who volunteered to sign up from a pool of 495 people (members of our extended research team and employees of the card issuer). The participants do not necessarily match the inclusion criteria applied in our main study, in particular the requirement of being frequent credit card users, and the sample may not be representative of the entire customer base. Moreover, the pre-study cohort did not have a warmup period, *i.e.* they received feedback starting from the first week. Users directly involved in the design or conduct of this study have been excluded from the analysis. Nonetheless, the observations of the first eleven weeks of our pre-study offer encouraging preliminary insights regarding the efficacy of our interventions. Across the sample, consisting of 822 completed weekly budgets, the mean spending-to-baseline ratio was M_{Total}=.858 (SD_{Total}=1.094), *i.e.* participants reduced their weekly spending by 14.2%, on average. While seasonal effects might play a role in this overall reduction, the control group ($M_{Control}$=1.115, $SD_{Control}$=1.574, $n_{Control}$=284) actually increased their spending by 11.5%, while all other groups decreased their spending compared to the previous year (M_{T1}=.736, SD_{T1}=1.149, n_{T1}=231; M_{T2}=.721, SD_{T2}=1.204, n_{T2}=172; M_{T3}=.703, SD_{T3}=.793, n_{T3}=135). An ANOVA test revealed significant differences between groups (F=5.846, p<.001***). Follow-up pairwise t-tests suggest that all treatment groups differed significantly from the control group (Control-T1: t=3.156, p=.002**; Control-T2: t=3.005, p=.003**; Control-T3: t=3.562, p<.001***), while no effect was found between the treatment

groups. If found to be as effective in our main study, with a more representative sample, we believe that such digital interventions could provide a blueprint for helping people navigate the challenges arising from using digital payment channels, and guide user behavior in general. In future work, we plan to investigate the effect of increased salience not only on actual changes to spending behavior, but also on consumers' perceived control over their expenditures.

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