

Cashless payments and consumer spending

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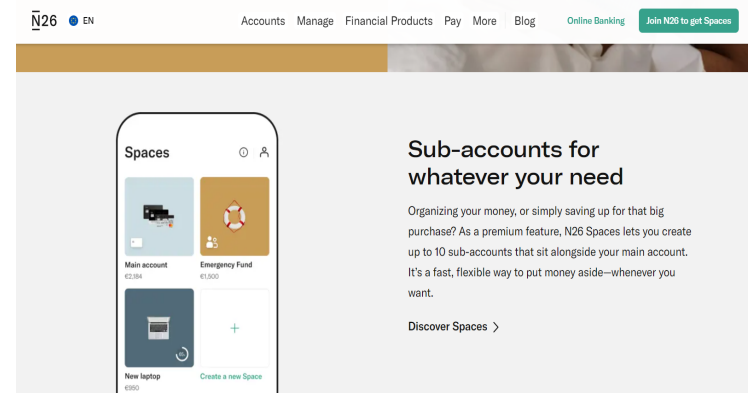
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Motivation

- Some consumers have present biased preferences
 - spend too much, save too little, engage in costly borrowing, ...
- Presumption: Payment cards facilitate overspending
 - Initiatives of some payment services providers for helping consumers to restrain impulsive shopping
- Do cashless payment methods lead to overspending? Does cash help consumers self-control their spending?



<https://simplifinances.com/using-the-money-jars-system-to-manage-your-money/>



<https://n26.com/en-eu/spaces>

Research questions

Do electronic payment instruments lead consumers to spend more?

Present bias

Consumption

Payment choice
Money management

Contribution

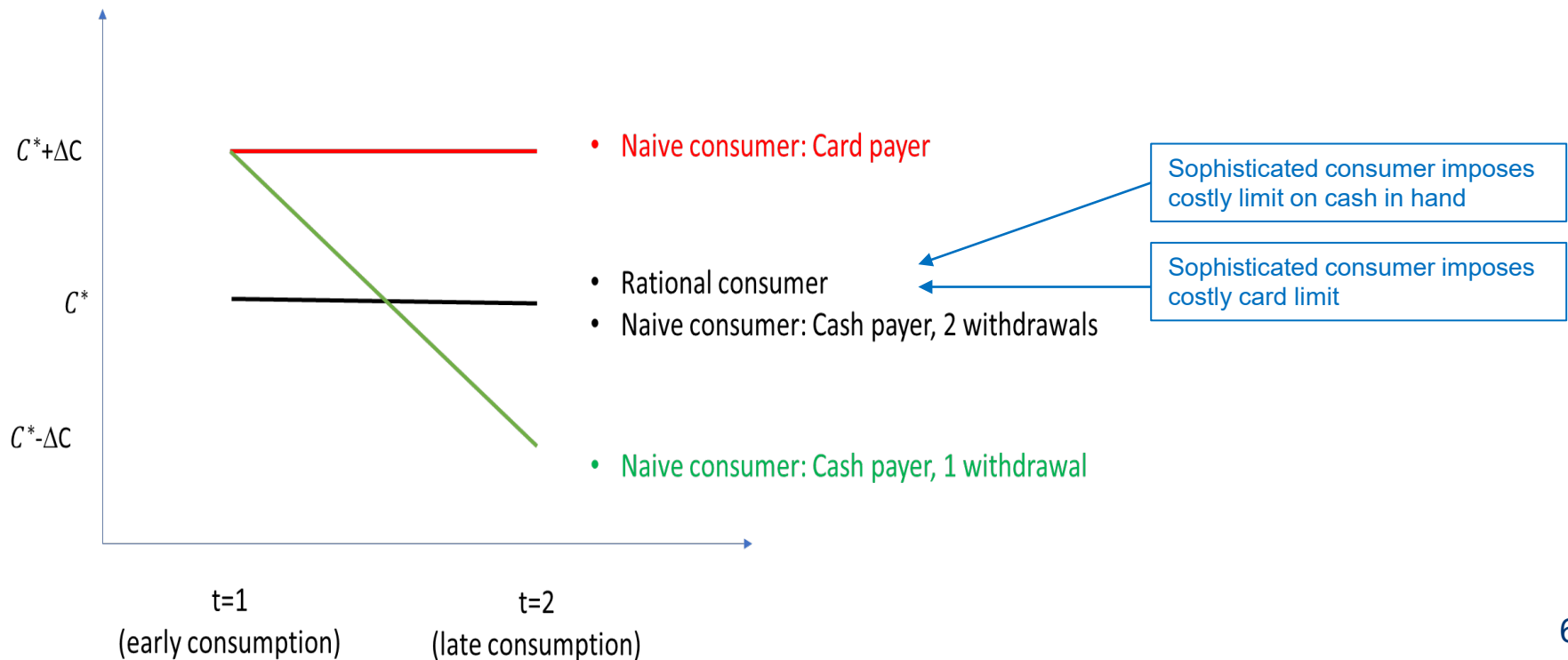
- We study how present bias interacts with payment instrument choice and money management to affect discretionary consumer spending
 - We match payment diary, payment survey and behavioral survey data for a representative sample of consumers
 - Pre-registered analysis
 - We provide evidence that greater card usage results in overspending by present-biased consumers *due to increased liquidity*
-
- Consumer payment choice and spending
 - Shy (JEL 2022) for an overview
 - Aggarwal et al (2022), Bachas et al. (2021), Brown et al. (JME 2022)
 - Liquidity and consumption
 - Gelman et al. (AER 2022), Ganong & Noel (AER 2019)
 - Vellekoop (2018)
 - Present bias and consumer financial behavior
 - Meier and Sprenger (AEJAE 2010), Allcott et al. (REStud 2021), Kuchler and Pagel (JFE 2021)
 - Bertaut et al. (RoF 2009), Gill et al. (2022)

Model: Basic idea

- Consumer decisions
 - adopt a payment instrument (either cash or card or both)
 - manage available liquidity (cash inventory or account balance)
 - choose consumption in early- / late-period of the month subject to available liquidity
- Tightness of money-in-advance constraint depends on chosen payments instrument.
 - Card payers: spending limited by the balance on transaction account
 - Cash payers: spending limited by the amount of cash in wallet
- Consumer types
 - **Rational consumers** - **Present-biased consumers**
Naïve - Sophisticated
- Costs are inspired by an inventory model of money
 - fear of cash loss (proportional to average cash holding)
 - shoe leather costs of ATM withdrawals (fixed per withdrawal)
 - *fear of card non acceptance or operational outage (proportional to consumption)*
 - *effort costs of card management such as setting limits (fixed)*

Model predictions

- All consumers plan to consume smoothly over the month in $t=0$ ($t=1$ & $t=2$)
- They choose strategies to minimize costs, but their consumption pattern will depend on their choices of payment instrument and money management...
- ...that may serve to *commit* their present-biased “future self” to stick to the optimal consumption plan (imposing liquidity constraints)



Main hypotheses we (can) test with the data

- **H1 (Consumption):** For consumers with high present bias, a higher card intensity is associated with higher spending. For consumers with low present bias, payment behavior is unrelated to discretionary spending.
- **H2 (Payment choice):** For consumers with high present bias, the relationship between cash management costs, card payment costs and payment choice is weaker than for consumers with low present bias.
- **H3 (Cash management):** For consumers with high present bias, the relationship between cash management costs and ATM withdrawal frequency is weaker than for consumers with low present bias.

SNB Survey on Payment Methods 2020

- Payment Survey & Payment Diary (n=2'144)
 - Adoption / use of payment instruments
 - Discretionary spending during 7-days (day, amount, merchant-type, payment method)
 - Socioeconomic characteristics
 - Average daily spending in our sample: 78 CHF (Median 53 CHF)
- Behavioral Survey (n= 1'138)
 - Time preferences, Risk preferences,
 - Numeracy, Memory, Conscientiousness, Trust
- Representative sample of Swiss population, implemented in 2020:08 – 2020:11

Present bias

Impulsivity [0,10]

„Do you generally think things over for a long time before acting ... Or do you generally act without thinking things over for long...?“

Source: SOEP 2018

Procrastination [0,10]

“I tend to postpone tasks, even though I know that it would be better to deal with them immediately.”

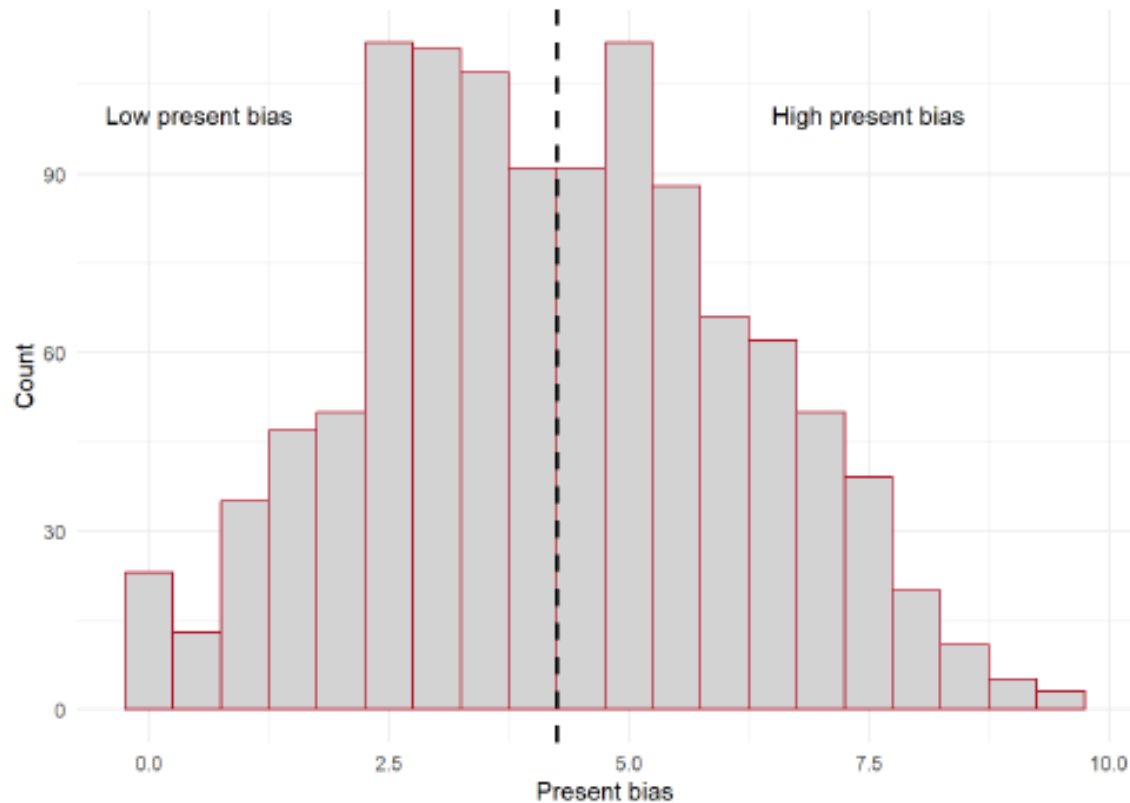
Source: Global Economic Preferences, Falk et al. (2018)



Present bias score [0,10]

Present-bias dummy = 1 if score above median

Present bias



Cannot differentiate between naive and sophisticated consumers

Note: The figure presents the distribution of the variable Present bias across the full sample. In our empirical analysis, respondents with above-median (below-median) levels are categorized as High or Low present bias consumers.

Cashless payments & Consumption

Hypotheses

- **H1 (Consumption):** For consumers with high present bias, a higher frequency of cashless payments is associated with higher spending. For consumers with low present bias, payment behavior is unrelated to discretionary spending.
- **H2 (Payment choice):** For consumers with high present bias, the relationship between cash management costs, card payment costs and payment choice is weaker than for consumers with low present bias.
- **H3 (Cash management):** For consumers with high present bias, the relationship between cash management costs and ATM withdrawal frequency is weaker than for consumers with low present bias.

$$\log(\text{Consumption})_i = \alpha_{r*t} + \beta_1 * \text{CardIntensity}_i + \gamma * X_i + \varepsilon_i$$

	(1)	(2)	(3)	(4)
Outcome variable	Consumption	Consumption	Consumption	Consumption
Sample	All	High Present Bias	Low Present Bias	All
Card Intensity	0.07** (0.03)	0.09** (0.04)	0.05 (0.04)	0.05 (0.04)
High Present Bias	0.00 (0.06)			-0.17 (0.14)
Card Intensity * High Present Bias				0.05 (0.04)
P-value: Card Intensity			0.080	
Mean of outcome variable	3.94	3.90	3.98	3.94
Adj. R2	0.17	0.24	0.10	0.17
Observations	1019	492	527	1019
Socioeconomic controls	Yes	Yes	Yes	Yes
Behavioral controls	No	No	No	No
Transaction structure	No	No	No	No
Method	OLS	OLS	OLS	OLS

- OLS
- Broad set of sociodemographic controls

Identification challenges (1)

- Challenge: Potential omitted variable problem
- *Solution:* We run an **IV regression** in which we instrument payment choice with *Cash rating* as IV variable
 - *Cash Rating* captures respondents' subjective assessment of **cash vs. card payments** on six different dimensions (*Ease of use, Acceptance, (monetary) Costs, Transaction speed, Security, and Hygiene*)
 - Strong correlation between *Cash Rating* and *Card Intensity*
 - Our identifying assumption is that – conditional on covariates – *Cash Rating* affects discretionary spending only through its influence on payment choice

Identification challenges (2)

- Challenge: Our model implies two-way causality between consumption and payment choice
 - Expected costs of money management by cash or card are proportional to planned spending
 - If so, consumers with higher planned spending levels will be more (less) likely to choose card payments...
 - ...and at the same time they will be more likely to exceed planned spending, if they are high present bias consumers and use cards
- *Solution:* We control for **planned consumption** using a «spending forecast» from the payment diary
- We run both solutions: all solutions provide qualitatively similar results

Card Intensity & consumption

(IV, controlling for predicted consumption)

$$\log(\text{Consumption})_i = \alpha_{r*t} + \beta_1 * \widehat{\text{CardIntensity}}_i + \beta_2 * \log(\text{PredictedConsumption})_i + \gamma * X_i + \varepsilon_i$$

Outcome variable	(1) Consumption	(2) Consumption	(3) Consumption
Sample	All	High Present Bias	Low Present Bias
Card Intensity	0.16** (0.08)	0.27** (0.12)	0.09 (0.10)
Predicted Consumption (Log)	0.49*** (0.04)	0.40*** (0.07)	0.54*** (0.06)
High Present Bias	0.02 (0.05)		
Mean of outcome variable	3.95	3.90	3.99
Kleibergen-Paap F-statistics	151.80	57.75	80.51
Adj. R2	0.36	0.37	0.35
Observations	951	455	496
Socioeconomic controls	Yes	Yes	Yes
Behavioral controls	No	No	No
Transaction structure	No	No	No
Method	OLS	OLS	OLS

Note: The table shows the results of IV (2SLS) regressions. The dependent variable is the log of Consumption. Instrument: Cash Rating. All regressions include socioeconomic controls. Behavioral controls are added in regressions of columns (4-6). All regressions include Language X Month fixed effects. Robust standard errors in parentheses. ***(**)[*] denotes statistical significance at the 1(5)[10]% level

Payment Choice and Money Management

Results Payment choice and Cash management

- **H2 (Payment choice):** For consumers with high present bias, the relationship between cash management costs, card payment costs and payment choice is weaker than for consumers with low present bias.
- **H3 (Cash management):** For consumers with high present bias, the relationship between cash management costs and ATM withdrawal frequency is weaker than for consumers with low present bias.
- Idea:
 - Impulsive consumers choose payment instruments and manage cash balances in order to self-constrain spending
 - (Sophisticated) High present-bias consumers should react less sensitively to money management costs than rational consumers
- Results: No robust evidence that consumers strategically choose payment instruments and cash management to self-control their spending.

Conclusion

- Our results reveal that digital payments may indeed induce higher discretionary spending by impulsive consumers.
- However, these consumers seem not to strongly engage in choosing payment instruments or money management strategies that allow them to better cope with overspending.
- Heterogeneity tests based on small sample → for firm policy conclusions larger sample size necessary (vulnerable groups)

Thank you

[Cashless payments and consumer spending \(snb.ch\)](#)

or

https://www.snb.ch/de/publications/research/working-papers/2023/working_paper_2023_06

Appendix

Pre-registered analysis

<https://osf.io/epmuv/>

The screenshot shows the OSF Registries interface for a public registration. The header includes the OSF logo and navigation links: Add New, My Registrations, Help, Donate, Join, and Login. The main title is "Money Management, Self-control and Intra-Month Consumption". Below the title, it indicates "Public registration" and "Updates".

Left Sidebar:

- Overview (selected)
- Files
- Resources
- Wiki
- Components: 0
- Links: 0
- Analytics
- Comments: 0
- Open practice resources (with a question mark icon):
 - Data
 - Analytic code
 - Materials
 - Papers
 - Supplements

Main Content Area:

Study Information

Hypotheses
See attached file

Design Plan

Study type
Observational Study - Data is collected from study subjects that are not randomly assigned to a treatment. This includes surveys, "natural experiments," and regression discontinuity designs.

Blinding
No blinding is involved in this study.

Is there any additional blinding in this study?
see attached file (Money Management Self Control and Intra-Month Consumption PAP.pdf)

Study design
see attached file (Money Management Self Control and Intra-Month Consumption PAP.pdf)

Right Sidebar:

Contributors
Helmut Stix, Martin Brown, Thomas Nellen, and Yves Nacht

Description
This project studies how the choice of payment instruments and liquidity management are related to intra-month consumption patterns. We ask the following research question: Do present-focused consumers purposely choose to pay by cash and make regular ATM withdrawals because this helps them to self-control intra-month spending?
[Show more](#)

Registration type
OSF Preregistration

Date registered
March 3, 2022

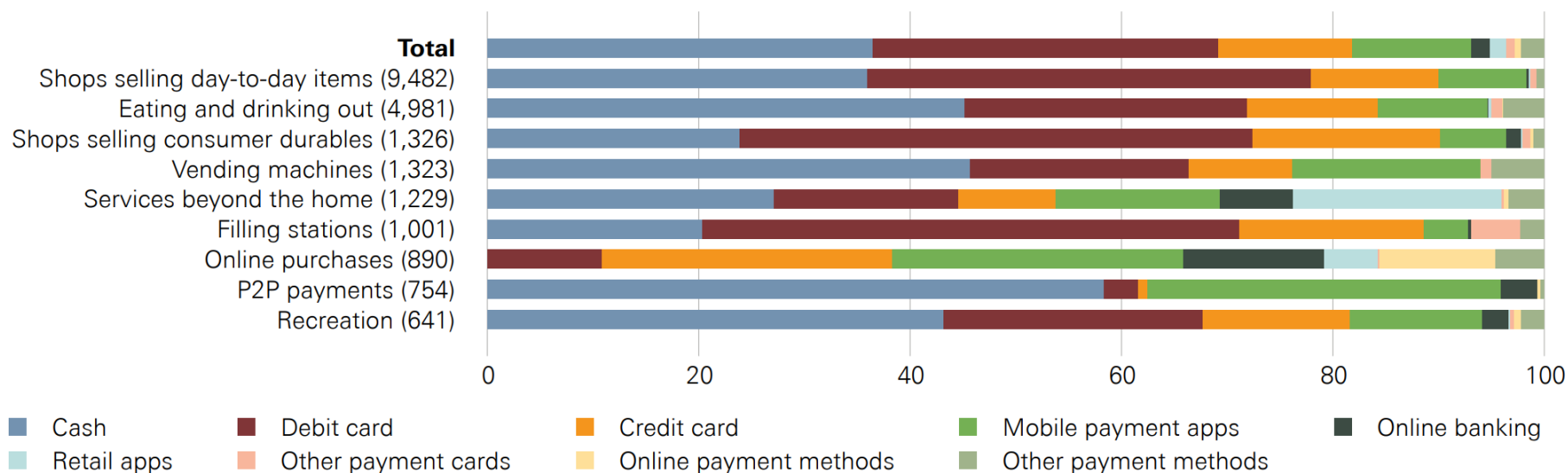
Date created
March 3, 2022

SNB Survey on Payment Methods provides rich information also on consumption

Chart 4.7

VOLUME SHARE BY PAYMENT METHOD AT SELECTED PAYMENT LOCATIONS

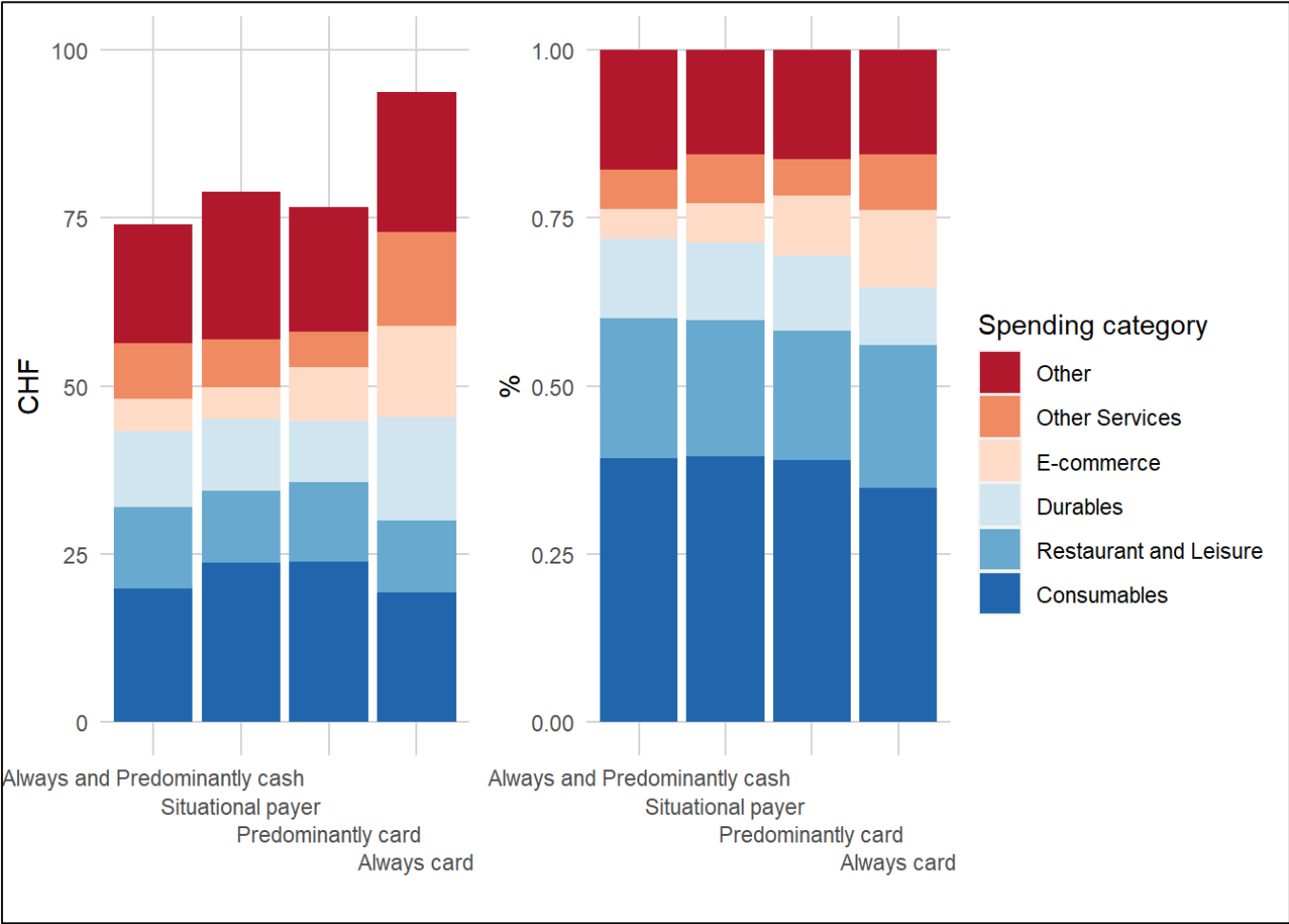
Shares of relevant basis in percent; from payment diary



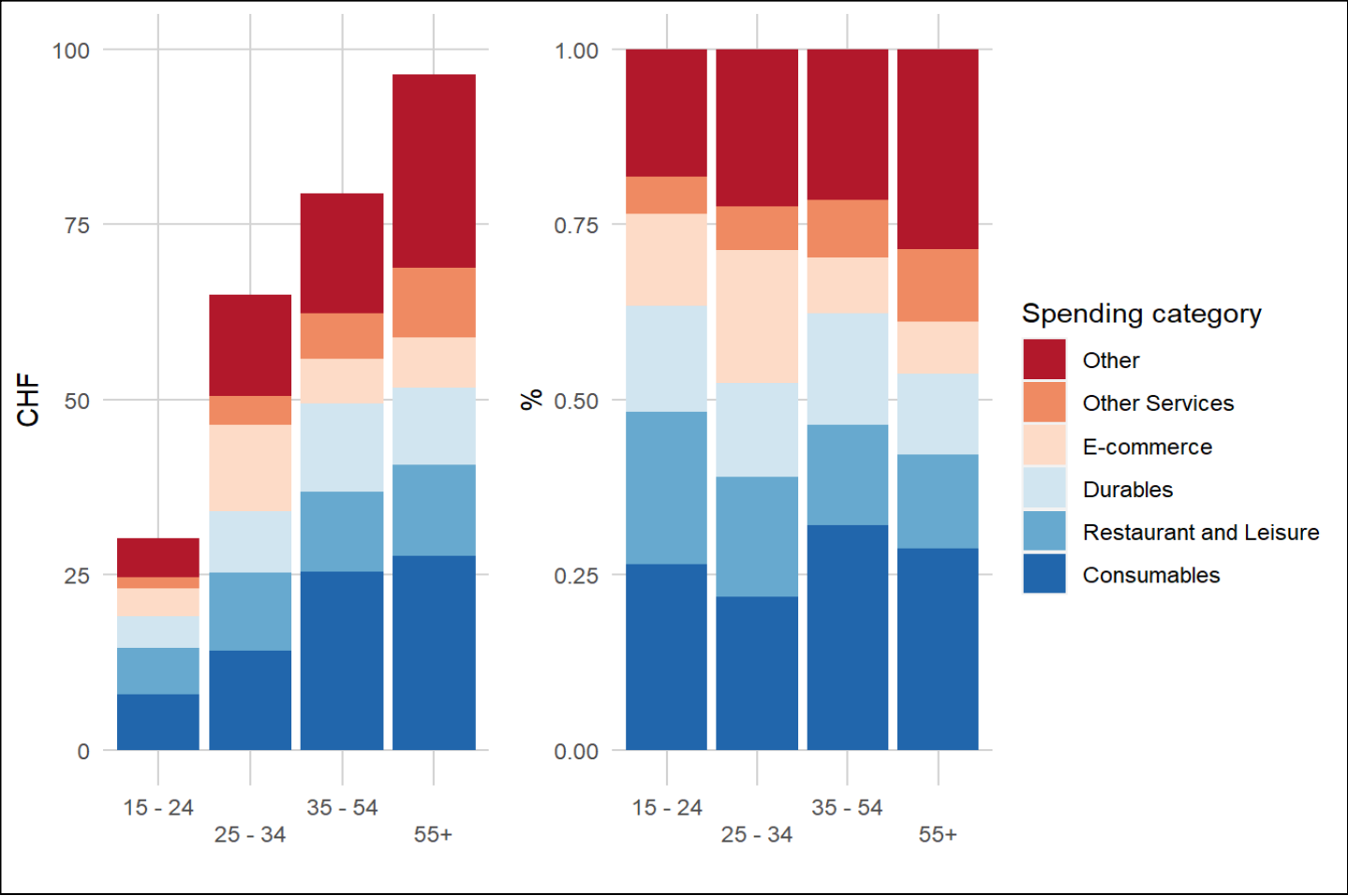
Basis: 22,355 transactions (in total) or by payment location (cf. figures in brackets above)

Source(s): SNB

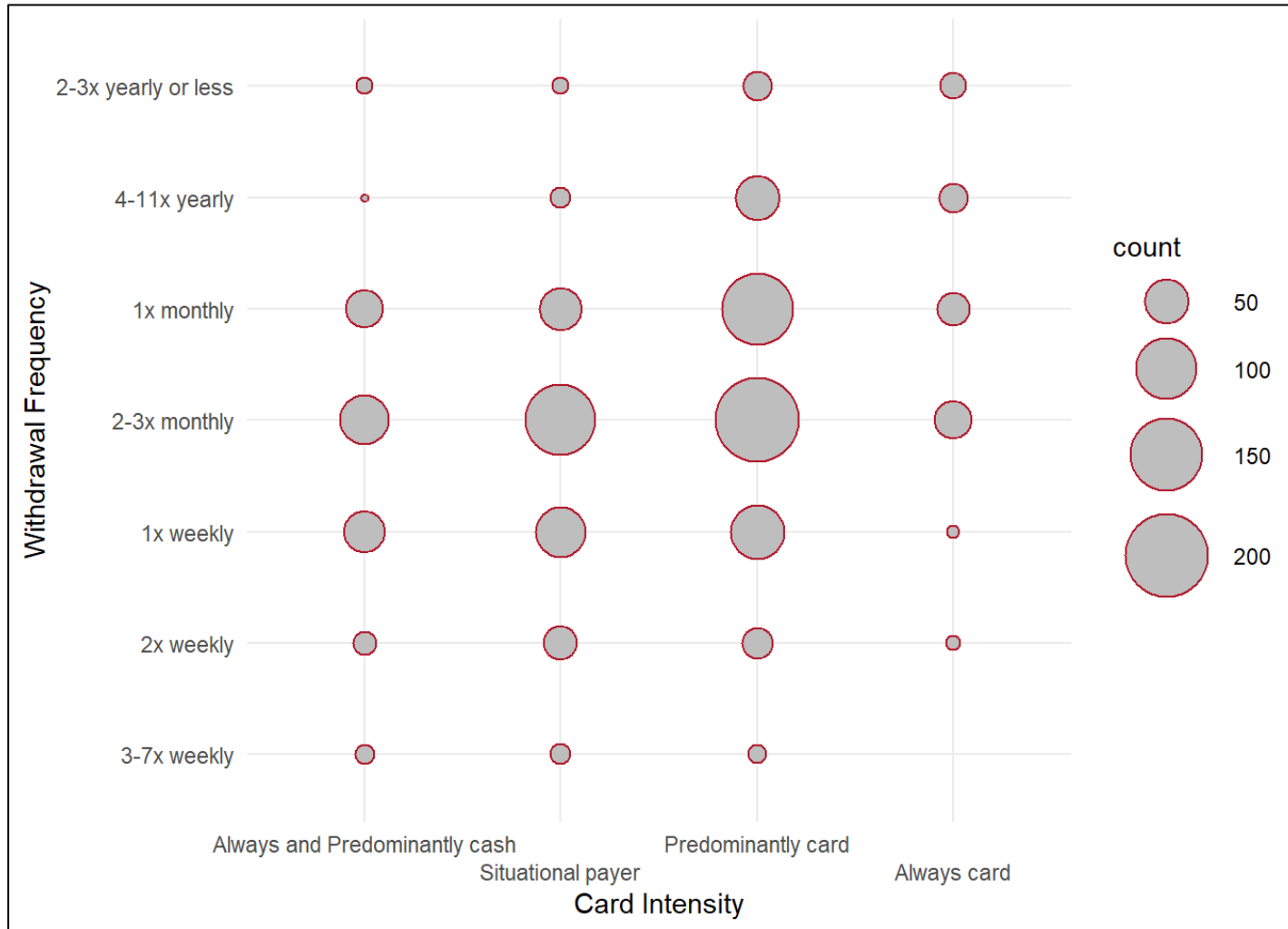
Consumer spending and card intensity



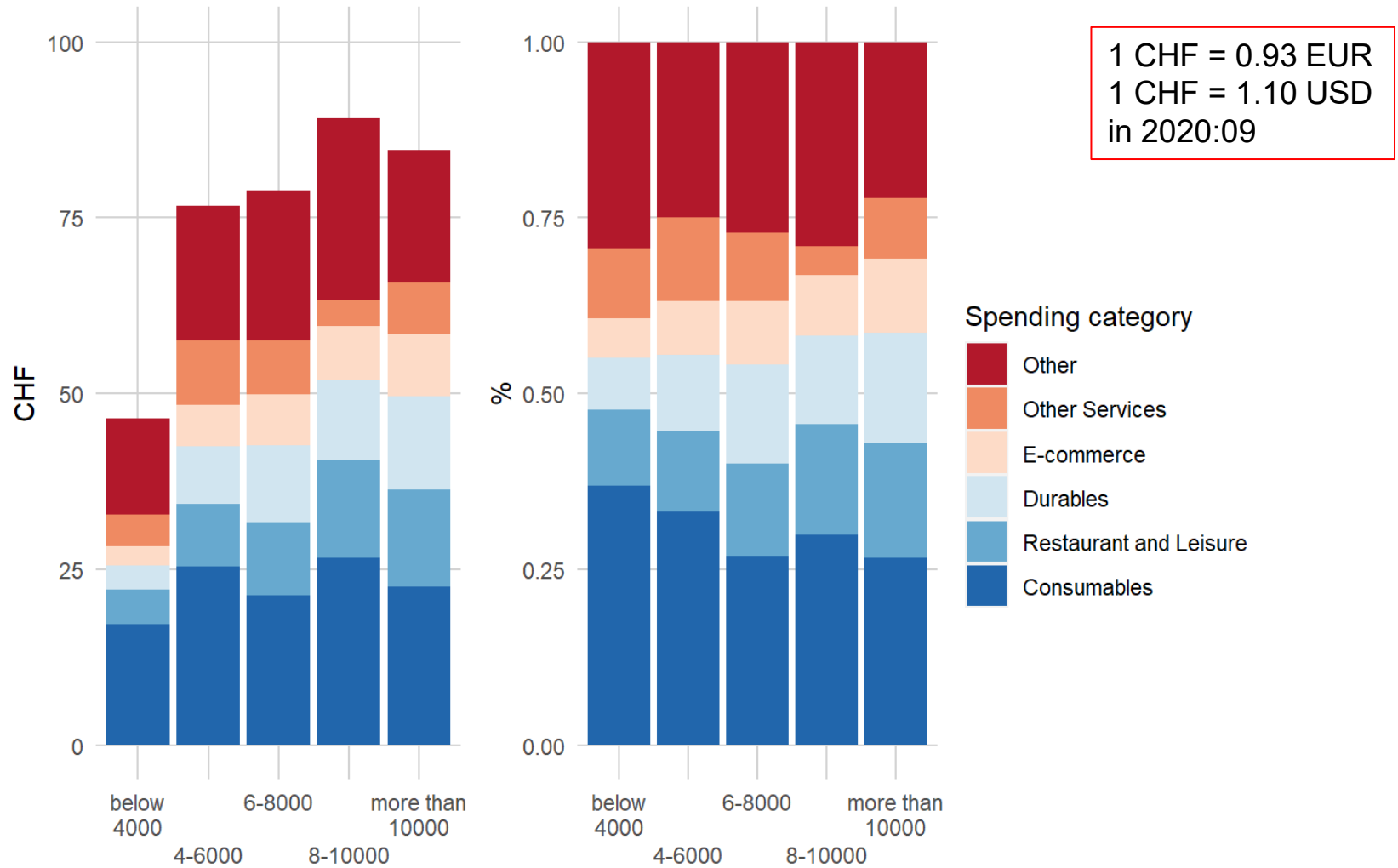
Consumer spending by age-group



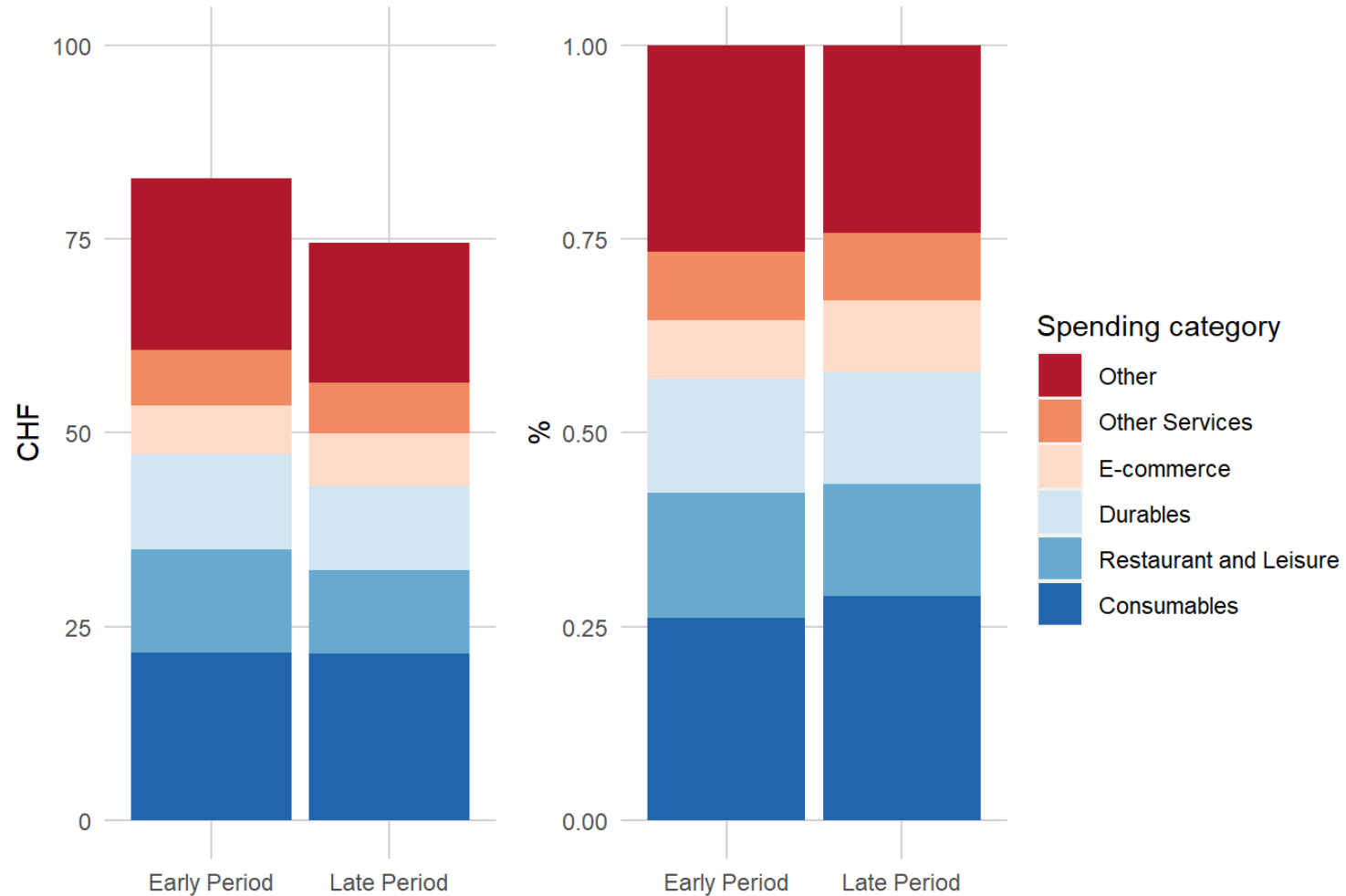
Payment Choice and Cash Management



Consumer spending by income-group



A1: Consumer spending by period of month



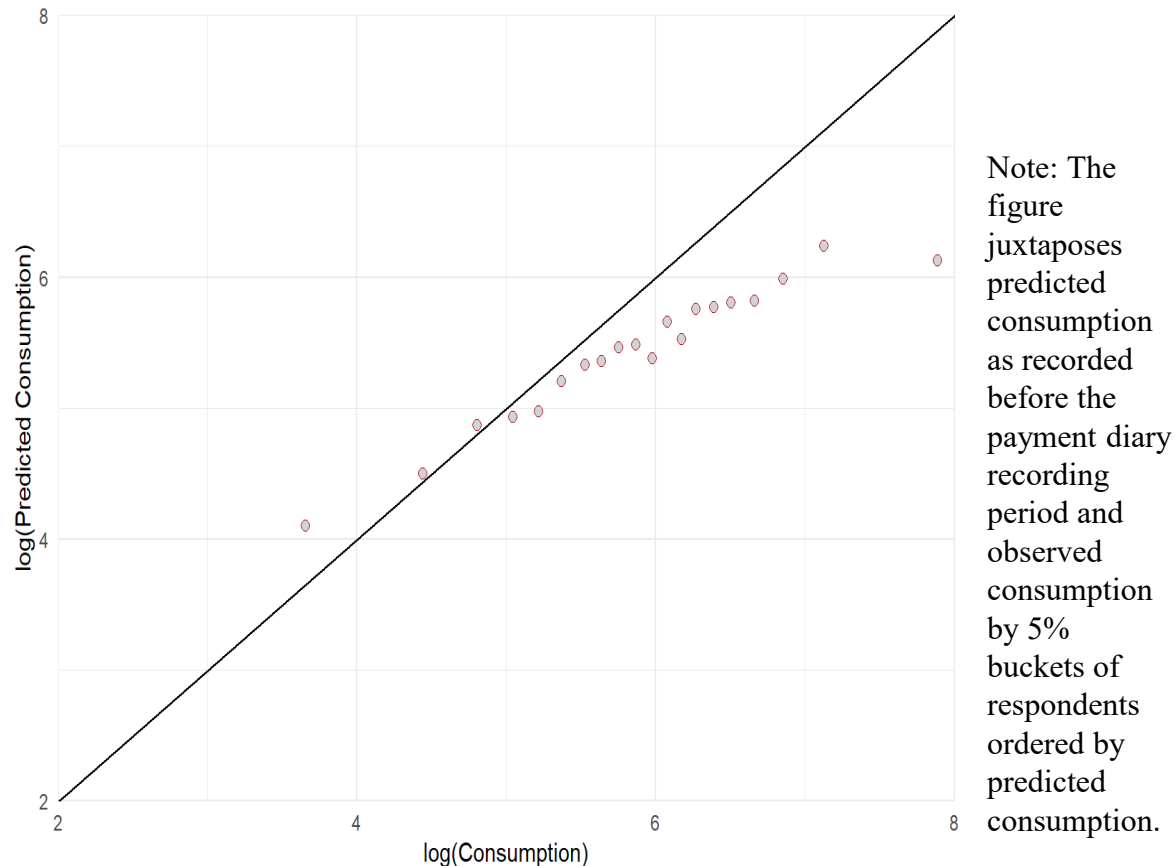
Outcome variables

Outcome variables						
	mean	p50	sd	min	max	n
<i>Main outcome variables</i>						
Consumption	78.47	52.55	104.45	1.03	1293.60	1138
Card Intensity	3.48	4.00	0.95	1.00	5.00	1138
Withdrawal Frequency	5.84	6.00	1.22	1.00	10.00	1081
<i>Consumption by category</i>						
Consumables	22.83	18.16	28.56	0.00	711.97	1138
Restaurants and Leisure	11.41	4.97	18.73	0.00	324.96	1138
Durables	10.50	0.00	32.92	0.00	576.82	1138
E-commerce	7.11	0.00	22.05	0.00	248.26	1138
Other Services	7.02	0.00	28.98	0.00	482.03	1138
Other	19.59	4.55	76.69	0.00	1160.00	1138

Notes: The table reports descriptive statistics for our outcome variables. Variable definitions are presented in Appendix A2.

Actual vs. predicted consumption

- All survey respondents are asked to estimate their weekly discretionary spending prior to starting the payment diary
- Most respondents underestimate their spending - but this is less so for low-income households



A2: Payment choice & money management

Payment Choice

- *CashRating*: Relative cost of cash versus card usage based on subjective ratings of cash vs. card payments on 6 dimensions: Ease of use, acceptance, costs, speed, security, hygiene
- *ATM Distance*: Travel time between midpoint of Postcode to nearest ATM
- *Income*: Proxy variable for cash holding costs and fear of operational failure
- *Conscientiousness*: Two survey questions about respondents' degree of self-organization. We hypothesize that the effort costs of imposing spending limits are lower if well organized
- X_i : *Sociodemographic (& Behavioral) Controls*
- α_{r*t} : fixed effects for language-region of respondent and month when survey conducted

Payment choice - Card Intensity

$$\text{Card Intensity}_i = \alpha_{r*t} + \beta_1 \cdot \text{Cash Rating}_i + \beta_2 \cdot \text{Distance to ATM}_i + \beta_3 \cdot \text{Income}_i + \beta_4 \cdot \text{Conscientiousness}_i + \gamma \cdot X_i + \epsilon_i$$

Outcome variable	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Card Intensity All	Card Intensity High Present Bias	Card Intensity Low Present Bias	Card Intensity All	Card Intensity High Present Bias	Card Intensity Low Present Bias
Cash Rating	-3.46*** (0.30)	-3.03*** (0.41)	-3.77*** (0.60)	-3.56*** (0.31)	-3.15*** (0.48)	-3.89*** (0.60)
Distance to ATM (log)	0.04 (0.05)	0.05 (0.06)	0.03 (0.07)	0.03 (0.06)	0.01 (0.06)	0.05 (0.08)
Income	0.00 (0.03)	0.04 (0.03)	-0.03 (0.05)	-0.01 (0.03)	0.04 (0.03)	-0.06 (0.05)
Conscientiousness	-0.01 (0.02)	0.00 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.01 (0.03)	-0.04* (0.02)
High Present Bias	0.07 (0.05)			0.06 (0.05)		
P-value: Cash Rating			0.182			0.187
P-value: Distance to ATM			0.389			0.329
P-value: Income			0.127			0.042
P-value: Conscientiousness			0.210			0.199
Mean of outcome variable	3.50	3.55	3.47	3.52	3.55	3.49
Adj. R2	0.21	0.22	0.21	0.21	0.20	0.24
Observations	997	478	519	878	421	457
Socioeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Behavioral controls	No	No	No	Yes	Yes	Yes
Transaction structure	No	No	No	No	No	No
Method	OLS	OLS	OLS	OLS	OLS	OLS

Note: The table shows the results of OLS regressions. The dependent variable is Card Intensity. All regressions include socioeconomic controls. Behavioral controls are added in regressions of columns (4-6). All regressions include Language X Month fixed effects. Clustered standard errors (Region X Month) in parentheses. "P-value: Cash Rating" denotes the p-value of a one-sided test whether the coefficient of Cash Rating is the same in columns 2 and 3 (or 5 and 6, respectively). Similar for Distance to ATM, Income and Conscientiousness. ***(**)[*] denotes statistical significance at the 1(5)[10]% level.

Money Management – Withdrawal Frequency

$$\text{Withdrawal frequency}_i = \alpha_{r*t} + \beta_1 \cdot \text{Distance to ATM}_i + \beta_2 \cdot \text{Income}_i + \beta_3 \cdot \text{Card Intensity}_i + \gamma \cdot X_i + \epsilon_i$$

Outcome variable	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Withdrawal frequency	Withdrawal frequency	Withdrawal frequency	Withdrawal frequency	Withdrawal frequency	Withdrawal frequency
	All	High Present Bias	Low Present Bias	All	High Present Bias	Low Present Bias
Distance to ATM (log)	0.03 (0.06)	0.10 (0.08)	-0.04 (0.07)	0.03 (0.07)	0.13 (0.11)	-0.06 (0.09)
Income	0.07*** (0.02)	0.00 (0.06)	0.15*** (0.04)	0.09*** (0.02)	0.02 (0.06)	0.15** (0.06)
Card Intensity	-0.29*** (0.04)	-0.26*** (0.09)	-0.27*** (0.06)	-0.29*** (0.03)	-0.27** (0.10)	-0.24*** (0.06)
P-value: Distance to ATM			0.034			0.055
P-value: Income			0.041			0.079
P-value: Card Intensity			0.498			0.425
Mean of outcome variable	5.93	5.9	5.95	5.94	5.91	5.96
Adj. R2	0.05	0.04	0.05	0.07	0.08	0.08
Observations	901	423	477	786	369	417
Socioeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Behavioral controls	No	No	No	Yes	Yes	Yes
Transaction structure	No	No	No	No	No	No
Method	OLS	OLS	OLS	OLS	OLS	OLS

Note: The table shows the results of OLS regressions. The dependent variable is Withdrawal frequency. In all specification the sample is restricted to Card Intensity < 5. All regressions include socioeconomic controls. Behavioral controls are added in regressions of columns (4-6). All regressions include Language X Month fixed effects. Clustered standard errors (Region X Month) in parentheses. "P-value: Distance to ATM" denotes the p-value of a one-sided test whether the coefficient of Distance to ATM is the same in columns 2 and 3 (or 5 and 6, respectively). Similar for Income and Card Intensity. ***(**)[*] denotes statistical significance at the 1(5)[10]% level.