Perceived Precautionary Savings Motives: Evidence from FinTech

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WU Vienna

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Motivation

- High household credit $\rightarrow$ business cycles contraction around the world (Mian, Sufi, and Verner, QJE 2017)
  - Household debt and credit growth predictor of financial crises
  - Financial crises often deep and protracted

- Fiscal and monetary policy operates through household credit, spending (Agarwal et al., QJE 2018; D’Acunto, Hoang, and Weber, 2019)
  - Household spending largest component GDP worldwide

- Understanding the link household credit $\leftrightarrow$ business cycles crucial

- So far, mainly intensive margin results: credit line increase $\rightarrow$ spending
  - Only captures the behavior of those that already borrow (selected)
  - What if give credit to non-borrowers (extensive margin)?
This Paper

Introduction of overdraft facility to customers of online bank

- Unique setting: extensive margin of credit availability
- High-frequency spending data, consumption categories, etc.
- Observe all spending and characteristics before and after overdraft

Questions:

- How do non-borrowing agents react to availability of credit?
- Heterogeneous reaction based on characteristics policy can target?
Main Findings

Evidence of *perceived precautionary savings*

- Average spending / income up by 5.3% after overdraft available
- Largest reaction if do not need credit AND do not use it!
  - Users with highest liquidity (deposits / inflows) react the most
  - Bin 5: 80% increase consumption, only 10% negative deposits
- Perceived precautionary savers do not spend, overdraft insures?
Other Findings

Alternative explanations we can rule out directly
- Different demographics
- Liquidity constraints
- Different income paths
- Different income volatility

For already borrowers, patterns as in earlier research
- Consumption reallocation effect: to discretionary from non-discretionary
- Bank fees increase steadily & credit scores worsen

Intriguing policy implications
- Crises often protracted due to excessive savings of liquid households
- Perceived precautionary savers: do not spend even if could
- Credit line to them might increase AD without effects on credit
Institutional Setting

- Data from largest European FinTech Bank
- Digital-only bank
- Bank operates under European banking license
- > 1 million customers
- Account setup less than 10 minutes via online chat
- Overdraft facility btw EUR 500 and EUR 5,000 depending on credit risk
- 10% rate on used overdraft
- No credit cards
Our Sample

Observe all financial transactions, time stamp

All users that were granted Overdraft until 2017-09-30

► All transactions until 2019-04-30

Aggregate individual transactions to month level

► 39,477 users
► 718,003 user-months

Average user characteristics

► 34 years old
► Monthly inflows $\sim 2,121$ EUR
► 79% male
► 52% live in large cities (>500k inhabitants)
► Average overdraft of 1,143 EUR
Empirical Design 1: Difference-in-Differences Strategy

Compare users after overdraft was available to users before overdraft was available

- First difference: before and after overdraft is available
- Second difference: other customers that don’t have overdraft yet
- Estimate treatment effect of overdraft activation (extensive margin)

Outcome Variable \( i,t = \beta \times \text{Overdraft Available}_{i,t} + \text{Fixed Effects}_{i,t} + \epsilon_{i,t} \)

- Overdraft Available\(_{i,t} = 1\) if user has access to credit facility
- Fixed Effects\(_{i,t} \): user & NUTS3\( \times \)year-month fixed effects
- Double cluster standard errors at the NUTS2 and year-month level
Overdraft and Spending Behavior

<table>
<thead>
<tr>
<th>Dependent Variable (×100):</th>
<th>Consumption(<em>t) \text{ Inflows}</em>{t-1}</th>
<th>Card Consumption(<em>t) \text{ Inflows}</em>{t-1}</th>
<th>Cash Withdrawals(<em>t) \text{ Inflows}</em>{t-1}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overdraft Available(_t)</td>
<td>5.264***(12.26)</td>
<td>3.456*** (10.96)</td>
<td>1.370*** (7.87)</td>
</tr>
</tbody>
</table>

Fixed Effects:
- User: Yes
- NUTS3 × Year-Month: Yes

Standard Error Clusters:
- NUTS2: 48
- Year-Month: 49

Adjusted \(R^2\):
- 0.257
- 0.284
- 0.328

User-Year-Month Obs.:
- 626,106
- 626,094
- 626,318

- Overdraft availability increases consumption by 11% of average
- 2/3 of increase due to card consumption
Spending Pattern around Overdraft Availability

- Largest increase on impact
- Permanent effect in the long run
How do changes distribute across mobile and cash spending?

- D’Acunto, Rossi, and Weber (2019) find discretionary spending and especially cash withdrawals can be cut quickly and substantially by users.
- Consistently, these are the categories that increase with overdraft.
Change in Probability of Big Ticket Expenses

<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>Big Ticket Expense (E. 1000)</th>
<th>Big Ticket Expense (E. 2000)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Overdraft Available</td>
<td>0.020*** (4.15)</td>
<td>0.012*** (4.07)</td>
</tr>
<tr>
<td>Fixed Effects:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>User</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>NUTS3 × Year-Month</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Standard Error Clusters:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NUTS2</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>Year-Month</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.568</td>
<td>0.559</td>
</tr>
<tr>
<td>User-Year-Month Obs.</td>
<td>715,137</td>
<td>715,137</td>
</tr>
</tbody>
</table>

- Increases unconditional probability by 5%
Credit Risk Pattern around Overdraft

- Credit changes rare
- No improved credit due to longer credit history
- Conditional on change, downgrade by 1 notch in long run
Fee Pattern around Mobile Overdraft Availability

- Overdraft fees increase by 1% of inflows in long run
Empirical Design 2: Regression Discontinuity Analysis

- So far correlation between consumption spending and overdraft
- Users might activate in anticipation of future expenses
- Omitted variables affect both activation and spending (advertisement)
- Solution: sharp regression discontinuity design
- Condition on selection & exploit heterogeneity in overdraft amount
Exploit Discontinuity in Overdraft Allocation Mechanism

Overdraft allocation mechanisms introduces exogenous variation

Allocation mechanism unknown to users

App rounds to closest EUR 250 of $2 \times \text{income}$

▶ Do users with higher overdraft amounts increase consumption by more?
Visualization of Sharp Treatment

- Rounded Up
- Threshold
- Rounded Down

Distance to Threshold
Regression Discontinuity Plots: Overdraft Amount

- Higher overdraft to the right of threshold
- Negative slope due to normalization by income
Regression Discontinuity Plots: Spending Change

Users consume more if assigned EUR 250 more
## Spending Growth around Rounding Threshold

<table>
<thead>
<tr>
<th>Dependent Variable (×100):</th>
<th>Consumption_{t+1:t+3} − Consumption_{t−3:t−1}</th>
<th>Inflows_{t−3:t−1}</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Conventional</td>
<td>17.63**</td>
<td>23.48**</td>
</tr>
<tr>
<td></td>
<td>(2.19)</td>
<td>(2.20)</td>
</tr>
<tr>
<td>Robust</td>
<td>21.56**</td>
<td>26.52**</td>
</tr>
<tr>
<td></td>
<td>(2.37)</td>
<td>(2.31)</td>
</tr>
<tr>
<td>Covariates</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>User Observations</td>
<td>876</td>
<td>876</td>
</tr>
<tr>
<td>Order Local Polynomial (p)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Order Bias (q)</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Bandwidth Left</td>
<td>25.47</td>
<td>35.89</td>
</tr>
<tr>
<td>Bandwidth Right</td>
<td>25.47</td>
<td>35.89</td>
</tr>
<tr>
<td>Effective Obs. Left</td>
<td>89</td>
<td>114</td>
</tr>
<tr>
<td>Effective Obs. Right</td>
<td>101</td>
<td>128</td>
</tr>
</tbody>
</table>

- Coefficients imply MPC of 80% of EUR 250 additional overdraft
RD Spending Effect over Time

- RD effects temporary possibly due to weak treatment of only EUR 250
- Implies substantially heterogeneity in effect of overdraft on consumption
RD Robustness Checks

- User characteristics on both sides of the threshold
- Density manipulation tests
- Local continuity of user characteristics around threshold
- Bandwidth choice robustness
- Donut hole radius test
Heterogeneity in Spending Response

- Lifecycle permanent income hypothesis → consumption smoothing
- Implies younger users and users on steeper income paths use facility more
- Liquidity constraints imply low savings users respond more
- Study sample splits by age, income growth, savings-to-income
Largest Effect: High Liquidity

- Largest consumption response for high liquidity individuals
- No differential income volatility pre-activation
- No difference in age across bin
- No difference in income growth, level
- Difference in deposits not due to big inflow in months before activation
Heterogeneity by Age

- No difference by age bin
Heterogeneity by Income Path

- No difference by income growth
Perceived Precautionary Savings

Those who react most did not need credit to spend more

We label this phenomenon **perceived precautionary savings**

- Perceived precautionary savers do not spend despite high liquidity
- They seem to have strong precautionary savings motives
- Not justified by observed income vol, path, age, medical expenses, ...
- Once they have credit, 80% of them spend more ...
- ... BUT only 10% tap into negative deposits (vs. 67% in bottom bin)
- Overall, overdraft makes them spend the resources they could have already spent well before access to the overdraft facility
- Overdraft might act as a form of insurance against potential negative states, reduce the (perceived) precautionary savings motive
Alternative Interpretations

- LCPIH unlikely explanation
- Buffer stock models (with durable assets) cannot explain results in full
- Liquidity constraints predicts opposite results for splits by deposits
- New channel: perceived precautionary savings?
  - Need direct evidence on perceived risks, risk aversion, beliefs
  - At this stage, we cannot disentangle across potential drivers of this phenomenon
  - Currently working with the provider to design ad-hoc survey
Wrapping Up

- Understanding how households react to credit provision important
- We study the *extensive margin* of credit provision
- As expected, households on average increase spending
- But, surprisingly:
  - Largest reaction by households that did not need credit
  - They spend more but still do not use the credit line they receive
  - Need more data to analyse this phenomenon
- Potentially relevant policy implications
  - If anything, would need to provide credit lines to highly liquid households during crises
  - Credit lines might not be tapped, yet make liquid households spend
  - Higher spending by those who can spend could push the economy out of a slump
Appendix
### User Characteristics on Both Sides of the Threshold

<table>
<thead>
<tr>
<th></th>
<th>Rounded Up</th>
<th></th>
<th>Rounded Down</th>
<th></th>
<th>Difference in Means</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td>Diff. Mean</td>
<td>t-Stat.</td>
</tr>
<tr>
<td>Age [Years]</td>
<td>32.318</td>
<td>9.343</td>
<td>33.023</td>
<td>10.123</td>
<td>0.705</td>
<td>(1.13)</td>
</tr>
<tr>
<td>Female [0/1=Yes]</td>
<td>0.248</td>
<td>0.432</td>
<td>0.238</td>
<td>0.427</td>
<td>-0.010</td>
<td>(-0.35)</td>
</tr>
<tr>
<td>Time Since Account Opening [Years]</td>
<td>0.866</td>
<td>0.377</td>
<td>0.852</td>
<td>0.405</td>
<td>-0.013</td>
<td>(-0.53)</td>
</tr>
<tr>
<td>Rating [1-6]</td>
<td>3.930</td>
<td>1.608</td>
<td>3.584</td>
<td>1.459</td>
<td>-0.346***</td>
<td>(-3.51)</td>
</tr>
<tr>
<td>Inflows$_{t-3:t-1}$ [Euro]</td>
<td>1405.639</td>
<td>1530.103</td>
<td>1458.917</td>
<td>1454.291</td>
<td>53.278</td>
<td>(0.56)</td>
</tr>
<tr>
<td>Consumption$_{t-3:t-1}$ [Euro]</td>
<td>558.893</td>
<td>522.392</td>
<td>620.036</td>
<td>597.384</td>
<td>61.143*</td>
<td>(1.70)</td>
</tr>
<tr>
<td>Observations</td>
<td>500</td>
<td></td>
<td>474</td>
<td></td>
<td>974</td>
<td></td>
</tr>
</tbody>
</table>
Density Manipulation Tests

![Density Manipulation Tests Graph](image)
## Local Continuity of User Characteristics Around Threshold

**Dependent Variable:**

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Female</th>
<th>Time Since Acc. Opening</th>
<th>Cons. Pre</th>
<th>Inflows Pre</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(1)</strong></td>
<td>3.485</td>
<td>-0.00263</td>
<td>0.0568</td>
<td>-347.1*</td>
<td>-535.2*</td>
</tr>
<tr>
<td><strong>(2)</strong></td>
<td>4.192</td>
<td>-0.0407</td>
<td>0.0432</td>
<td>-391.4*</td>
<td>-554.4</td>
</tr>
<tr>
<td><strong>(3)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(4)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(5)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Covariates
- Yes

### User Observations
- 972

### Order Local Polynomial \(p\)
- 1

### Order Bias \(q\)
- 2

### Bandwidth Left
- 29.77

### Bandwidth Right
- 29.77

### Effective Obs. Left
- 116

### Effective Obs. Right
- 129

### Effective Obs. Left
- 129
Bandwidth Choice Robustness

![Graph showing the relationship between Conventional RD Effect on Consumption Growth and Bandwidth, with the horizontal axis labeled Bandwidth and the vertical axis labeled Conventional RD Effect on Consumption Growth. The graph includes a shaded area representing MSE Optimal Bandwidth.](image-url)
Donut Hole Radius Test

![Graph showing the Robust RD Effect on Consumption Growth vs Donut Hole Radius]
# Consumption Reallocation Effects of Mobile Overdrafts

<table>
<thead>
<tr>
<th>Dep. Variable ($\times 100$):</th>
<th>Discretionary&lt;sub&gt;t&lt;/sub&gt; Card Consumption&lt;sub&gt;t&lt;/sub&gt;</th>
<th>Entertainment&lt;sub&gt;t&lt;/sub&gt; Card Consumption&lt;sub&gt;t&lt;/sub&gt;</th>
<th>Shopping&lt;sub&gt;t&lt;/sub&gt; Card Consumption&lt;sub&gt;t&lt;/sub&gt;</th>
<th>Gastronomy&lt;sub&gt;t&lt;/sub&gt; Card Consumption&lt;sub&gt;t&lt;/sub&gt;</th>
<th>Travel&lt;sub&gt;t&lt;/sub&gt; Card Consumption&lt;sub&gt;t&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overdraft Available&lt;sub&gt;t&lt;/sub&gt;</td>
<td>1.865** (2.54)</td>
<td>0.069 (1.50)</td>
<td>0.302** (2.55)</td>
<td>0.141** (2.12)</td>
<td>0.607*** (6.21)</td>
</tr>
</tbody>
</table>

**Fixed Effects:**
- User: Yes
- NUTS3 \times Year-Month: Yes

**Standard Error Clusters:**
- NUTS2: 48
- Year-Month: 50

Adjusted $R^2$
- 0.159
- 0.295
- 0.169
- 0.293
- 0.164

User-Year-Month Obs.
- 544,437
- 583,469
- 583,461
- 583,425
- 583,419
**Credit Risk after Overdraft**

<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>Rating_t</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td></td>
<td>All Users</td>
</tr>
<tr>
<td>Overdraft Available_t</td>
<td>0.026** (2.81)</td>
</tr>
</tbody>
</table>

**Fixed Effects:**
- User: Yes
- NUTS3 × Year-Month: Yes

**Standard Error Clusters:**
- NUTS2: 48
- Year-Month: 24

<table>
<thead>
<tr>
<th>Adjusted $R^2$</th>
<th>User-Year-Month Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.998</td>
<td>259,705</td>
</tr>
<tr>
<td>0.698</td>
<td>622</td>
</tr>
</tbody>
</table>
### Mobile Overdraft Availability on Mobile Overdraft Usage

<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>Overdraft Enabled</th>
<th></th>
<th>Negative Deposits</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) (2) (3) (4)</td>
<td>Extensive Margin</td>
<td>Intensive Margin</td>
<td>Extensive Margin</td>
</tr>
<tr>
<td>Overdraft Available_t</td>
<td>0.807***</td>
<td>0.526***</td>
<td>0.044***</td>
<td>0.035***</td>
</tr>
<tr>
<td></td>
<td>(67.15)</td>
<td>(42.51)</td>
<td>(8.32)</td>
<td>(9.54)</td>
</tr>
<tr>
<td>Log(Max Amount_t)</td>
<td>0.044***</td>
<td>0.035***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(8.32)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Fixed Effects:**
- User: Yes Yes Yes Yes
- NUTS3 × Year-Month: Yes Yes Yes Yes

**Standard Error Clusters:**
- NUTS2: 48 48 48 48
- Year-Month: 41 41 41 41

**Adjusted R\^2:**
- 0.866 0.868 0.540 0.542

**User-Year-Month Obs.:**
- 668,752 646,657 668,752 646,657
# Bank and Late Fees Paid around Overdraft

<table>
<thead>
<tr>
<th>Dependent Variable ($\times 100$):</th>
<th>$\frac{\text{Fees}_q}{\text{Inflows}_q}$</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overdraft Available$_{q-1}$</td>
<td>0.091</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.44)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overdraft Enabled$_{q-1}$</td>
<td>0.391**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.01)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Fixed Effects:**

- **User**: Yes
- **NUTS3 $\times$ Year-Quarter**: Yes

**Standard Error Clusters:**

- NUTS2: 48

**Adjusted $R^2$**

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusted $R^2$</td>
<td>0.131</td>
<td>0.131</td>
</tr>
<tr>
<td>User-Year-Quarter Observations</td>
<td>215,799</td>
<td>215,799</td>
</tr>
</tbody>
</table>
## Cross-Sectional Heterogeneity in Spending Response

**Dependent Variable (×100):**

<table>
<thead>
<tr>
<th>Consumption&lt;sub&gt;t&lt;/sub&gt;</th>
<th>Inflows&lt;sub&gt;t−1&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td>Overdraft Available&lt;sub&gt;t&lt;/sub&gt;</td>
<td>4.017***</td>
</tr>
<tr>
<td></td>
<td>(6.53)</td>
</tr>
<tr>
<td>Overdraft Available&lt;sub&gt;t&lt;/sub&gt; * Inflows Growth &gt; Median</td>
<td>-1.772**</td>
</tr>
<tr>
<td></td>
<td>(-2.06)</td>
</tr>
<tr>
<td>Overdraft Available&lt;sub&gt;t&lt;/sub&gt; * Age &gt; Median</td>
<td>0.788***</td>
</tr>
<tr>
<td></td>
<td>(3.41)</td>
</tr>
<tr>
<td>Overdraft Available&lt;sub&gt;t&lt;/sub&gt; * Deposits / Inflows &gt; Median</td>
<td>7.433***</td>
</tr>
<tr>
<td></td>
<td>(7.35)</td>
</tr>
</tbody>
</table>

**Fixed Effects:**

- User: Yes, Yes, Yes
- NUTS3 × Year-Month: Yes, Yes, Yes

**Standard Error Clusters:**

- NUTS2: 41, 45, 43
- Year-Month: 49, 49, 49

**Adjusted R<sup>2</sup>:**

- 0.256, 0.253, 0.252

**User-Year-Month Obs.:**

- 74,612, 298,145, 242,239

---

- Steeper income path users and younger users react less
- Highest savings users react most

[Descriptive Statistics]