This Is What’s in Your Wallet... and Here’s How You Use It

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Overview

- **Motivation:** consumers have thicker wallets and more varieties of liquidity with which to pay
- **Literature:** theory and data have not kept pace with innovations in payments systems and liquidity
- **Theory:** we propose and estimate a dynamic optimizing model that blends monetary and payment approaches
- **Estimation:** with U.S. payment diary data (DCPC); daily balanced longitudinal panel
- **Key results:** cash still matters a lot!
  - Cash-in-wallet, cash payment share are endogenous
  - Shadow value of cash turns negative above $50
  - Welfare costs of inflation larger, more nuanced
  - Cash management costs are non-trivial, affect withdrawals
  - Eliminating cash or cards lowers consumer welfare a lot
- **Broader implications:** for consumption, HH finance
Payment choices and cash holdings

**LEFT:** Most transactions are low $ value; CIA constraint non-binding

**RIGHT:** Cash-in-wallet strongly influences payment choices
Model – optimization problem

**STEP 1** *(monetary)*: Withdraw cash?

\[ W(m, p) = \max_{m^*} \left\{ -b \cdot \mathcal{I}(m^* \neq m) - R \cdot m^* + E[V(m^*, p)] \right\}, \]

**STEP 2** *(payments/IO)*: Cash/credit/debit at point-of-sale?

\[ V(m, p) = \max_{i \in \{h,c,d\}} u^i(p) + \epsilon(i) + \beta E[W(m', p')] \]

\[ u^i(p) = \gamma_0^i + \gamma_{p \leq 10}^i \cdot \mathcal{I}(p \leq 10) + \gamma_p^i \cdot p \quad i \in \{h, d, c\} \]

- \(\epsilon(i)\) i.i.d Type I Extreme value shocks
- Cost of holding cash interpreted broadly (e.g. inconvenience)
- \(b \sim \mathcal{U}(-b_U, -b_L)\) random withdrawal cost
  - Sometimes it is particularly inconvenient to make a withdrawal
  - Consumer knows this better than the econometrician
- Continuation values same after debit and credit \(\Rightarrow\) No dynamic considerations without deposits or revolving debt
Estimation – cash management costs


<table>
<thead>
<tr>
<th>$b_L$</th>
<th>$b_U$</th>
<th>$R$</th>
<th>$\gamma_{0}^{h}$</th>
<th>$\gamma_{p&lt;10}^{h}$</th>
<th>$\gamma_{p}^{h}$</th>
<th>$\gamma_{0}^{d}$</th>
<th>$\gamma_{p&lt;10}^{d}$</th>
<th>$\gamma_{p}^{d}$</th>
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<tbody>
<tr>
<td>.0003</td>
<td>7.99</td>
<td>.0049</td>
<td>2.20</td>
<td>.79</td>
<td>-.12</td>
<td>.57</td>
<td>.51</td>
<td>-.0037</td>
</tr>
<tr>
<td>(.08)</td>
<td>(1.57)</td>
<td>(.001)</td>
<td>(.43)</td>
<td>(.37)</td>
<td>(.03)</td>
<td>(.13)</td>
<td>(.22)</td>
<td>(.0016)</td>
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</tbody>
</table>

- Avg. withdrawal cost $\approx$ holding cost of $\$153$ ($\sim \frac{\tilde{b}}{R}$).
- Avg. withdrawal cost $\approx 1.8 \times$ utility of med. cash payment
- Holding-cost ($R$) elasticity of demand for cash is $-0.85$
  - More negative than basic Baumol-Tobin model ($-0.50$)
  - Cash share of payments also varies ($0.30$-$0.35$)
- Withdrawal costs ($b_L \in [0.0003, 4]$) effects are:
  - Large for avg. value ($\$32$-$61$) and prob. (2.3-$5.6\%$)
  - Modest for cash share ($0.28$-$0.32$) and payment utility (1.3%)
Probabilities of choosing cash are quite sensitive to cash holdings; with $250, cash choice is uncorrelated with transaction values.
Counterfactual simulations of instrument availability

Eliminating any payment instrument reduces consumer welfare considerably, especially cash; eliminating both cards is worst

<table>
<thead>
<tr>
<th>Model</th>
<th>Cash holdings before transaction</th>
<th>Withdrawal amount</th>
<th>Cash use share</th>
<th>Cash costs</th>
<th>Payment utility</th>
</tr>
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<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Full</td>
<td>25.49</td>
<td>10.68</td>
<td>31.9</td>
<td>.056</td>
<td>.32</td>
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<td>0</td>
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<td>0</td>
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<tr>
<td>No debit</td>
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<td>15.42</td>
<td>45.3</td>
<td>.072</td>
<td>.47</td>
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<td>12.66</td>
<td>36.8</td>
<td>.063</td>
<td>.37</td>
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<tr>
<td>No cards</td>
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<td>55.42</td>
<td>162.1</td>
<td>.177</td>
<td>1.00</td>
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</table>
Summary

Conclusions:
- Cash management and payment choices are jointly determined
- Cash holdings have first-order effect on payment choice
- Cash preferred for low value transactions, even after accounting for CIA constraint
- Cash use is moderately influenced by cash management costs

Future research directions:
- Allow for different withdrawal methods
  - Parameterize $b_k$ and $R$
- Add stocks, flows for demand deposits, revolving credit/debt
- Build better model of consumer transaction choices
- Include bill payments
- Model merchant acceptance of cards

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