

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

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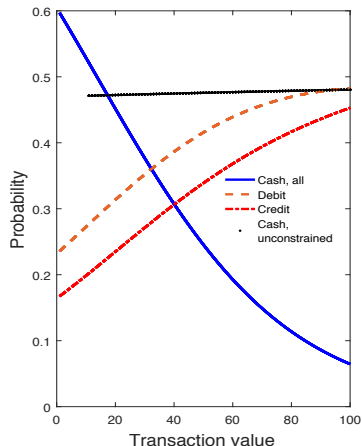
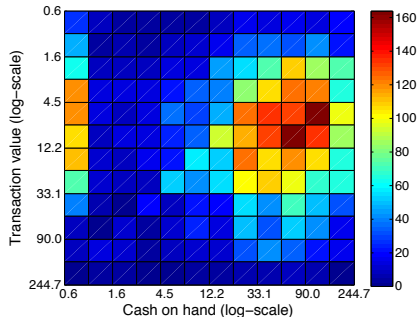
Overview

- ▶ **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?

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

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

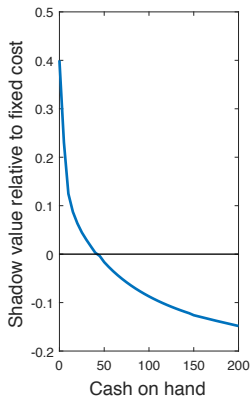
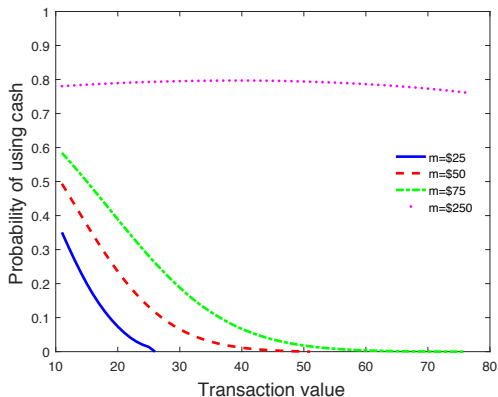
Estimates using Bajari, Benkard and Levine (2007, *ECTA*)

b_L	b_U	R	γ_0^h	$\gamma_{p < 10}^h$	γ_p^h	γ_0^d	$\gamma_{p < 10}^d$	γ_p^d
.0003	7.99	.0049	2.20	.79	-.12	.57	.51	-.0037
(.08)	(1.57)	(.001)	(.43)	(.37)	(.03)	(.13)	(.22)	(.0016)

- ▶ Avg. withdrawal cost \approx holding cost of \$153 ($\sim \frac{\bar{b}}{R}$).
- ▶ Avg. withdrawal cost $\approx 1.8 \times$ utility of med. cash payment
- ▶ Holding-cost (R) elasticity of demand for cash is $-.85$
 - ▶ More negative than basic Baumol-Tobin model ($-.50$)
 - ▶ Cash share of payments also varies (.30-.35)
- ▶ Withdrawal costs ($b^L \in [.0003, 4]$) effects are:
 - ▶ Large for avg. value (\$32-61) and prob. (2.3-5.6%)
 - ▶ Modest for cash share (.28-.32) and payment utility (1.3%)

Cash holdings and simulated cash payments

*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

Model	Cash holdings before		Withdrawal		Cash use share	Cash costs	Payment utility
	transaction	withdrawal	amount	prob.			
Full	25.49	10.68	31.9	.056	.32	16.6	459.0
No cash	0	0	0	0	0	0	336.1
No debit	36.52	15.42	45.3	.072	.47	52.0	357.8
No credit	29.60	12.66	36.8	.063	.37	40.8	401.3
No cards	123.95	55.42	162.1	.177	1.00	219.4	-76.7

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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