The Payday Loan Puzzle: A Credit Scoring Explanation

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Introduction

Motivation

- Payday loans: Unsecured, small amount ($300), short-term (2 weeks), and high-cost (400%)
- 12 million user and $50 billion (Stagman, 2007; PEW, 2016)
- Hotly debated regulatory topic

- **Payday loan puzzle** in U.S. (Agarwal et al, 2009):
  - **2/3** of payday loan borrowers have liquidity left on credit cards ($< 20\%$)
  - Significant extra monetary costs about **$200** over a year

Credit Scoring Explanation

"Why are people taking out [payday] loans instead of using their cards?" Ranney told me, "This guy was implying that these people weren't smart enough to make the 'right' decision. I laughed in his face. ***'They're protecting the card!'*** *I told him. [...]"* ***Whereas failure to repay a payday loan won't affect a consumer's credit score, failure to repay a credit card will.***

— Lisa Servon (2017): *The Unbanking of America*

What We Do

- Reputation protection: **"Using payday loans to protect credit scores!"**
  - Credit scores very important in U.S. ▸ Credit Scores
  - Payday lenders do not report to credit bureaus in U.S. (CFPB, 2017)
- Build a Huggett-type model of two assets, two default options, both hidden information (type scores) and hidden actions
  - Rationalize the puzzling behavior via type score protection
- Use calibrated model to understand payday loan puzzle
- Policy experiments: Quantity caps, full ban

Intuition — Type Score Protection via Payday Loans

- HHs' types (discount factors) β are unobservable
- Types score: Probability of being patient (good type)
- Types score updated with observable bank loan choice and default
- Credit terms thus condition on type scores
- Income $\downarrow \implies$ Borrowing bank loans $\implies$ Type score $\downarrow$ (today)
  $\implies$ Fail to repay bank loans $\implies$ Type score $\downarrow$ (tomorrow)
- Payday loans and payday default are unobservable "to banks"
- HHs might use more expensive payday loans to protect type scores

Key Findings

- Endogenously generate the payday loan puzzle
  - Account for 40% of the puzzle occurrence
  - Match the magnitude of monetary losses
- Restricting the size of or banning payday loans are welfare-reducing
  - Heterogeneity across types

Literature / Contribution

- **Consumer finance and default**: Chatterjee et al. (2007), Livshits et al. (2007), **Chatterjee et al. (2020)**, Exler (2020), Saldain (2021)

  First to model defaultable bank and payday loans with hidden information and actions
- **Pecuniary mistakes**: Agarwal et al. (2009), Cartel et al. (2011)

  First to endogenously generate and rationalize the payday loan puzzle
- **Payday loan policy debate**: Zinman (2010), Morgan et al. (2012), Skiba and Tobacman (2019), Melzer (2011)

  First to analyze welfare implications of policies in a richer framework

Model

Model Environment

- Time is discrete
- Endowment economy with idiosyncratic shocks
- Incomplete market: Bank assets, payday loans
- Banks, payday lenders, and households
- Households' hidden types (discount factors) $\Longrightarrow$ Type scores
- Banks cannot see payday loans

Households

- Infinitely-lived with survival rate ρ
- Risk-averse, derive utility from consumption c
- Two types of HHs: $\boldsymbol{\beta_L}$ and $\boldsymbol{\beta_H}$ (stochastic persistent)
- Receive stochastic earnings $\boldsymbol{z}$ (transitory) and $\boldsymbol{e}$ (persistent)
- Have bank assets $\boldsymbol{b}$, payday debts $\boldsymbol{p}$, type score $\boldsymbol{s}$ (Prob. of β_H)
- Repay or default $\boldsymbol{d}$
  - Formal default (both), payday default (payday loan only)
  - Filing costs, stigma costs, exclusion in the filing period
- Can borrow/save $\boldsymbol{b'}$ in banking sector
- Can borrow $\boldsymbol{p'}$ in payday lending sector (if $b' \leq 0$)
- Subject to action-specific utility shocks $\boldsymbol{\epsilon} \implies \boldsymbol{\sigma^{(d,b',p')}(\beta,z,e,b,s,p)}$

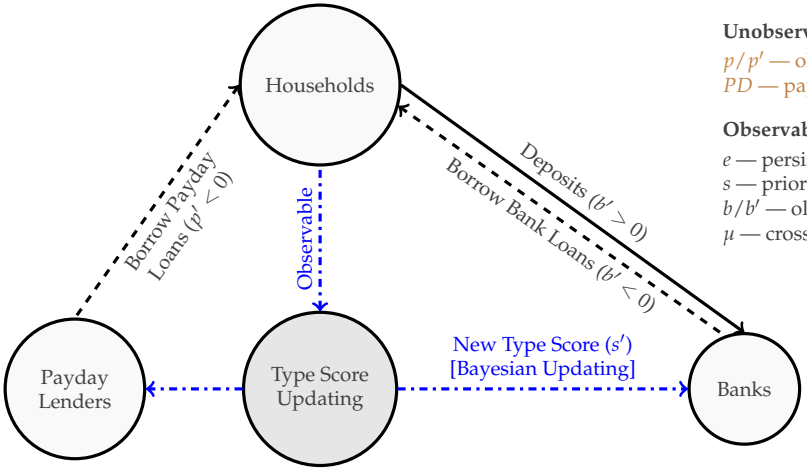
▸ Budget Constraint ▸ Value Function ▸ Choice Probability

Banks and Payday Lenders

- Risk-neutral
- **Different information set**
  - Banks cannot observe payday variables (p, p', and PD)
- **Different operating costs**: $r_p \gg r_f$
- **Different default probabilities**
  - Banks: Formal default
  - Payday lenders: Formal default, payday default
- Both can't see z (i.i.d.) and β (persistent) $\rightarrow$ Type score s
- Perfect competition: Risk-based discount loan prices q_b and q_p

▸ Bank Problem ▸ Bank Loan Price Schedule ▸ Payday Problem ▸ Payday Loan Price Schedule

Information Structure



Unobservable to Both

β — type (discount factor)
z — transitory earnings

Unobservable to Banks only

p/p' — old/new payday loans
PD — payday default

Observable to Both

e — persistent earnings
s — prior type score
b/b' — old/new bank assets
μ — cross-sectional distribution

Type Score Updating

- Bank-observable choice probabilities $\omega_b \equiv (e, b, s)$:

$$\sigma^{(d,b',p')}(\beta, z, \omega_b, \boldsymbol{p}) \xrightarrow{\tilde{\boldsymbol{\mu}}(\boldsymbol{p})} \sigma^{(\boldsymbol{d},b',\boldsymbol{p}')}(\beta, z, \omega_b) \xrightarrow{\boldsymbol{p}', \tilde{\boldsymbol{d}}=R\vee PD} \tilde{\sigma}_b^{(\tilde{d},b')}(\beta, z, \omega_b)$$

- Type score s (Prob. of β_H) updated via Bayes rule:

$$\underbrace{s'(\beta_H)}_{\text{posterior}} = \overbrace{Q^{\beta}_{H\to H}}^{\text{transition}} \cdot \frac{\overbrace{\tilde{\sigma}_b^{(\tilde{d},b')}(\beta_H)}^{\text{updating}} \cdot \overbrace{s(\beta_H)}^{\text{prior}}}{\sum_{\hat{\beta}} \tilde{\sigma}_b^{(\tilde{d},b')}(\hat{\beta}) \cdot s(\hat{\beta})} + Q^{\beta}_{L\to H} \cdot \frac{\tilde{\sigma}_b^{(\tilde{d},b')}(\beta_L) \cdot (1 - s(\beta_H))}{\sum_{\hat{\beta}} \tilde{\sigma}_b^{(\tilde{d},b')}(\hat{\beta}) \cdot s(\hat{\beta})}$$

▸ Rigorous ψ ▸ Rigorous $\tilde{\sigma}_b$ ▸ Likelihood Ratio and Type Score ▸ Stationary Equilibrium ▸ Grid Specification

Calibration

Strategy

- Model period is a year
- Whole population in 2004
- Two sets of parameters
  - Exogenouslly calibrated
    - Discount factors from Chatterjee et al. (2020)
    - Earnings processes from Floden and Linde (2001)
    - Standard values or direct empirical evidence
  - Internally calibrated to match formal and payday default rates

Exogenous Calibration

Parameter		Value	Source
Low discount factor	β_L	0.886	Chatterjee et al. (2020)
High discount factor	β_H	0.915	Chatterjee et al. (2020)
Transition from low to high	$Q^{\beta}(\beta_L \vert \beta_H)$	0.013	Chatterjee et al. (2020)
Transition from high to low	$Q^{\beta}(\beta_H \vert \beta_L)$	0.011	Chatterjee et al. (2020)
Discount factor at birth	G_{β}	(0.72,0.28)	Chatterjee et al. (2020)
AR(1) of persistent earnings	ρ_e	0.9136	Floden and Linde (2001)
S.D. of persistent earnings	σ_e^2	0.0426	Floden and Linde (2001)
S.D. of transitory earnings	σ_z^2	0.0421	Floden and Linde (2001)
Persistent earnings at birth	G_e	(1,0,0)	Upward earnings profile
Transitory earnings at birth	G_z	(1/3,1/3,1/3)	Upward earnings profile

Exogenous Calibration (cont.)

Parameter		Value	Source
CRRA	γ	2	Standard
Survival probability	ρ	0.975	40 years
Risk-free rate	r_f	0.014	Effective interest rate = 4%
Formal default cost	κ_{FD}	0.02	Albanesi and Nosal (2020)
Payday default cost	κ_{PD}	0.002	Montezemolo and Wolff (2015)
Operating cost for payday lenders	r_p	1.925	Flannery and Samolyk (2005)
Dispersion of extreme value shocks	α	0.005	

Internal Calibration

Parameter		Value	Target	Data	Model
Formal stigma cost	ξ_{FD}	0.02235	Formal default rate	0.99%	0.99%
Payday stigma cost	ξ_{PD}	0.00704	Payday default rate (cond.)	29.7%	29.7%

Source: ABI, CPS, Skiba and Tobacman (2018)

Untargeted Moments Aligned with Data

Moment (in %)	Data	Model
Households in Debt		
Fraction of bank loan users	20.9	24.26
Fraction of payday loan users	5.61	9.46
Bank debt-to-earnings (cond. on borr.)	11.75	6.48
Interest Rate		
Avg. interest rate for bank loans	9.26	8.56
Avg. interest rate for payday loans	447.88	410.85

Source: SCF (2004, 2010), Skiba and Tobacman (2018)

Pooling and Cross-Subsidization

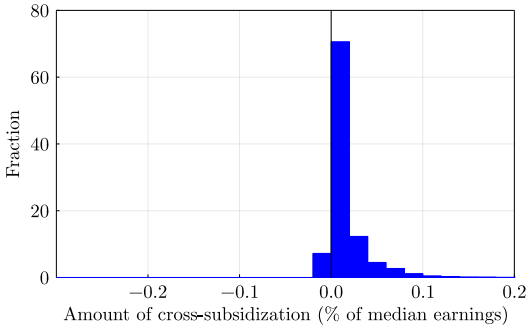
Pooling

- Banks cannot see types and payday loan choices
- Conditional on the same borrowing of bank loans
  - Impatient $\rightarrow$ Default $\uparrow$ $\rightarrow$ **Riskier**
  - Payday loan users $\rightarrow$ Total debt burden $\uparrow$ $\rightarrow$ Default $\uparrow$ $\rightarrow$ **Riskier**
- **Riskier** faces lower bank loan rates than "actuarially fair rates" (FI)
- Cross-subsidization in "bank loan market"

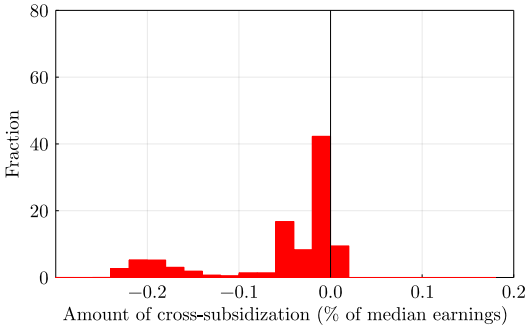
▸ Formal Default Prob. by Types and Payday Users ▸ Equilibrium Outcomes by Types

Cross-Subs. of Bank Loans across Types

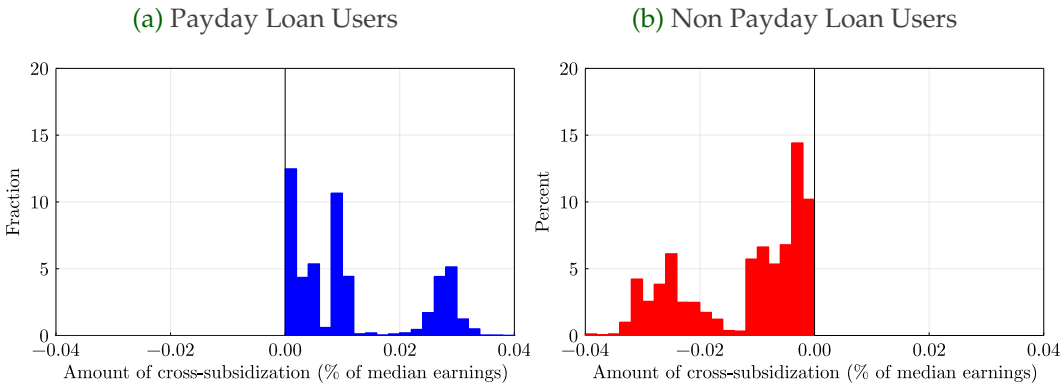
(a) Impatient Households



(b) Patient Households



Cross-Subs. of Bank Loans across Payday Loan Users



Payday Loan Puzzle

Account for 40% of Puzzle Occurrence

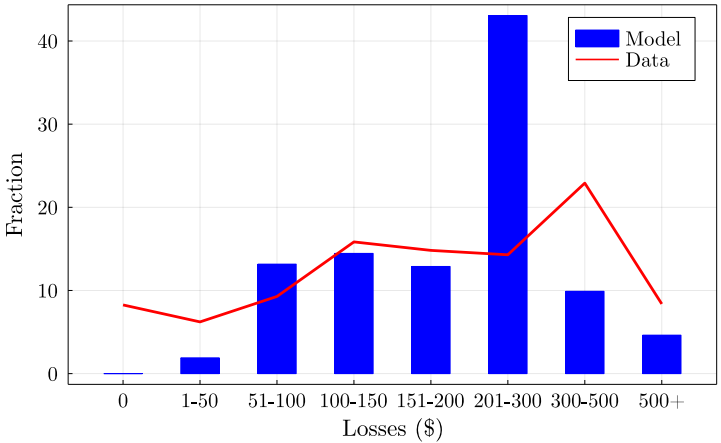
- Payday loan puzzle: Using payday loans before maxing out credit cards
- In data $\approx$ 66% (Agarwal et al., 2009)
- Define **"Rate of Puzzle Occurrence"** as:

$$\left(\frac{\text{Both loan users making } \textbf{"Seeming Pecuniary Mistake"}}{\text{Both loan users}} \right) \times 100$$

- In model $= 26.44\% \implies$ 40% of puzzle occurrence
- Puzzle users: HHs of this puzzling behavior

▸ Rigorous Puzzle Definition ▸ Type Score Protection

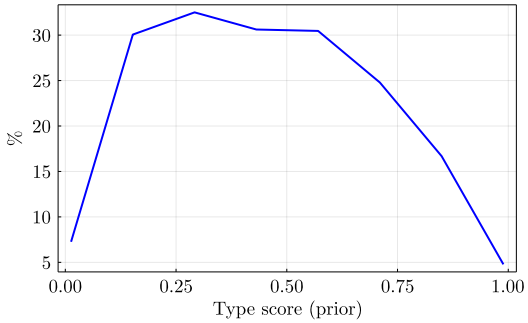
Match Magnitude of Monetary Losses



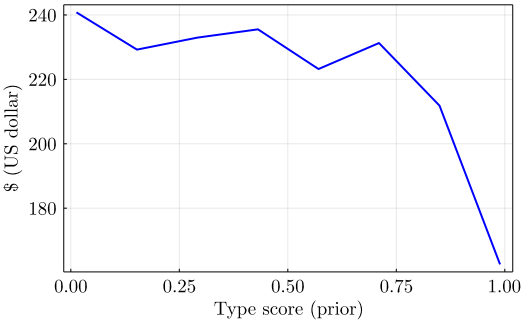
Source: Agarwal et al. (2009)

Reputation Gain vs. Interest Loss

(a) Reputation Gain



(b) Interest Loss

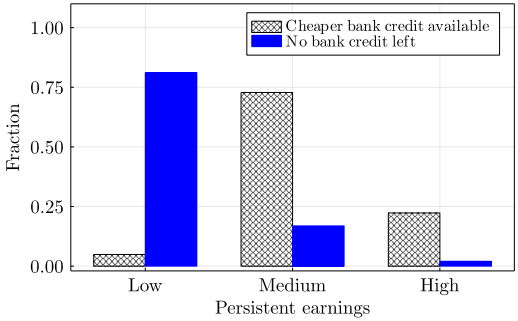


▸ Type Score Dynamics ▸ Interest Loss Dynamics

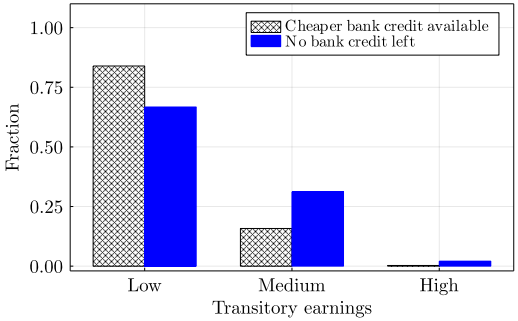
Note: Avg. Losses ≈ $200 (Agarwal et al., 2009)

Why? Smooth Out Temporary Shortfall in Earnings

(a) Persistent Earnings (Observable)



(b) Transitory Earnings (Unobservable)

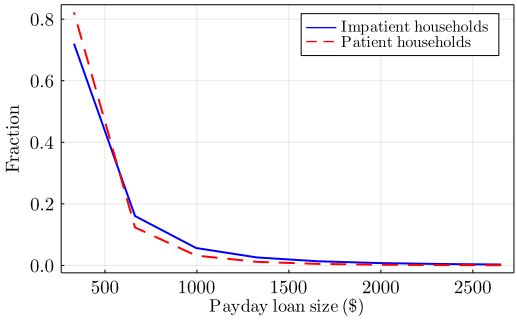


▸ Payday Loan Users Across Earnings ▸ Type Score Updating Across e ▸ Fraction of Payday Users Across Income in SCF

Quantity Caps

Policy Debate about Payday Lending

- Hotly debated policy topic
- Benchmark: $p \in [0, \$6000]$
- Two counterfactuals
  - Quantity Cap: $p \in [0, \$300]$
  - Full Ban: $p = 0$



Pooling vs. Insurance of Payday Loans

Variables	Benchmark	Quantity Cap	Full Ban
Welfare (CEV)	–	−0.0012%	−0.0291%
Welfare (CEV) – Impatient	–	−0.0029%	−0.0331%
Welfare (CEV) – Patient	–	0.0013%	−0.0233%
Avg. Cross-Sub. of Bank Loans (β_L)	\$4.57	\$4.09	\$3.88
Avg. Cross-Sub. of Bank Loans ($p' < 0$)	\$30.33	\$23.95	–

- Quantity cap → Less pooling → Good: Patient / Bad: Impatient
- Insurance of payday loans → Smoothing bad shocks (e.g., puzzle users)

▸ Moments

Conclusion

Conclusion

- Payday loan puzzle can be rationalized by "credit scoring protection"
  - Account for 40% of puzzle occurrence
  - Match magnitude of monetary losses
- Puzzle users are not "stupid"—They want to maintain access to credit market in the future via type score protection!
- Restricting the size of payday loans affects (im)patient HHs differently: Impatient, worse off while patient, better off
  - Less cross-subsidization in bank loan market (less pooling)
- Eliminating payday loans is overall welfare-reducing
  - Both types do use payday loans to smooth out bad shocks (insurance)