Measuring Valuation of Liquidity with Penalized Withdrawals

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Motivation

- First best → marginal utility smoothing across time
  - deviations capture the household's **equilibrium** valuation of liquidity

- Understanding the determinants of the valuation of liquidity (e.g. individual or local market shocks) is crucial for effective policy design
  - the goal is to direct the marginal $ to individuals with higher valuation

- Yet, inference is challenging. Obstacles: preferences, consumption data is limited/incomplete, lagged timing, state dependence in preferences

This Paper

Literature

- Revealed preference approach to study valuation of liquidity
- Basic insight: borrowing at a high interest rate reveals a high MRS b/w consumption today and tomorrow $\Rightarrow$ high valuation of liquidity
- This approach requires a credit product that has
  1. wide availability to households
  2. uniform and observable price

$\Rightarrow$ **Penalized withdrawals from retirement accounts are close to ideal**

- Penalized withdrawals observed from U.S. tax records to characterize valuation of liquidity across time and space

Data and Institutional Details

Penalized Withdrawals

- Many savings instruments require that money is held for a specified period or until a certain date
  - Retirement savings (IRA/401(k)); Health Savings Accounts (HSAs)

- Account holders may withdraw early, but with a penalty
  - e.g., 10% penalty for 401(k)/IRA withdrawals before age 59.5

- Some early withdrawals are exempt from tax penalties
  - Rollovers
  - Death/disability
  - Funds used for higher education
  - Unreimbursed medical costs over 10% of AGI
  - First time homebuyer
  - Separation from employment for those over age 55

Data

- Tax records of 10% sample of U.S. population from 1999-2018
- Aggregate at the household level (primary filer + partner if any)
- Restrict sample to ages 45-59 (by primary filer) to focus on prime-age households for whom this tool is more relevant
  - leads to a total sample of 10.5 million households
- Key outcomes aggregated to the household level
  - penalized withdrawals (dummy + amounts);
  - employment, earnings, income, employer, IRA balances, 401(k) flows

Motivating Facts

Four Motivating Facts

- Shed light on how households use penalized withdrawals

1. Most households have access to retirement accounts
   - almost 90% of prime-age households have an account
2. Penalized withdrawals are widely used, but infrequently
   - $\sim$ 10% per year; almost $\frac{1}{2}$ of households at least once; few many times
3. Sizable withdrawn amounts, yet accounts are not fully depleted
   - a typical withdrawal $\sim$ \$5000; IRA accounts not depleted after withdrawal
4. Penalized withdrawals are associated with large income losses
   - hhs that withdraw: twice as likely to have very large income losses ($> 50\%$)

$\Rightarrow$ Evidence supports that households optimize on the margin and use penalized withdrawals to mitigate short-run liquidity needs

- less consistent w/ behavioral interpretation (e.g. myopia or narrow bracketing)

Fact 1 Fact 2 Fact 3 Fact 4 Takeaways

Simple Framework

Two-Period Problem of Marginal Utility Smoothing

- Household i in region z chooses how much to borrow/save, solving

$$\max_b u(c_{i,z,t}) + \beta_i E\left[u(c_{i,z,t+1})\right]$$

subject to:

$$\begin{aligned} c_{i,z,t} &= y_{i,z,t} + b \\ c_{i,z,t+1} &= y_{i,z,t+1} - (b + \rho_{i,z,t}(b))(1+r) \end{aligned}$$

- $\rho_{i,z,t}(b)$ is a borrowing *wedge*, which takes into account the optimal borrowing choice across alternative sources of funds
  - i. $\rho_{i,z,t}(b)$ may depend on local supply (e.g. proximity to banks and the interest rate they charge) and household characteristics (e.g. credit score)
  - ii. $\rho_{i,z,t}(b) = 0.1b$ for individuals making a penalized withdrawal

Valuation of Liquidity and Withdrawals

- We define the **equilibrium** excess valuation of liquidity:

$$\underbrace{\theta_{i,z,t}}_{\text{Excess Valuation of Liquidity}} \equiv \underbrace{\frac{u'(c_{i,z,t})}{Eu'(c_{i,z,t+1})}}_{\text{MRS}} \underbrace{\frac{1}{\beta_i(1+r)}}_{\text{Compound Discount Factor}} - 1$$

- Taking the FOC we find that

$$\theta_{i,z,t} \quad \geq \quad \rho'_{i,z,t}(b)$$

$\Rightarrow$ benchmark with perfect markets (i.e. $\rho'_{i,z,t}(b) = 0$, no wedge) $\rightarrow \theta_{i,z,t} = 0$

$\Rightarrow$ households that make a penalized withdrawal: $\theta_{i,z,t} \geq 10\%$

Towards an Empirical Implementation

- Our empirical implementation is based on a simple model's result:

$$\begin{aligned} Prob_{i,z,t} &= \Pr(\theta_{i,z,t} \geq 10\%) \\ Prob_{i,z,t} &= \underbrace{\mathbb{I}\{b > 0; y_{i,z,t}, y_{i,z,t+1}\}}_{\text{Demand}} \times \underbrace{[1 - G(10\%; \Gamma_{z,t}, \alpha_i)]}_{\text{Supply}}, \end{aligned}$$

- $Prob_{i,z,t}$ is the *observable* probability of a penalized withdrawal
- $G(10\%; \Gamma_{z,t}, \alpha_i)$ is *unobservable* CDF of alternative sources of liquidity $\rightarrow$ $[1 - G(10\%; \Gamma_{z,t}, \alpha_i)]$: Prob that penalized withdrawal is cheapest way to borrow

- **Empirics**: characterize the equilibrium liquidity valuation
  1. Determinants of demand: household events $(y_{i,t})$
  2. Determinants of supply: local supply (Γ_z) & hhs access to credit (α_i)
  3. Dynamics in local supply: case study of Great Recession $(\Gamma_{z,t})$

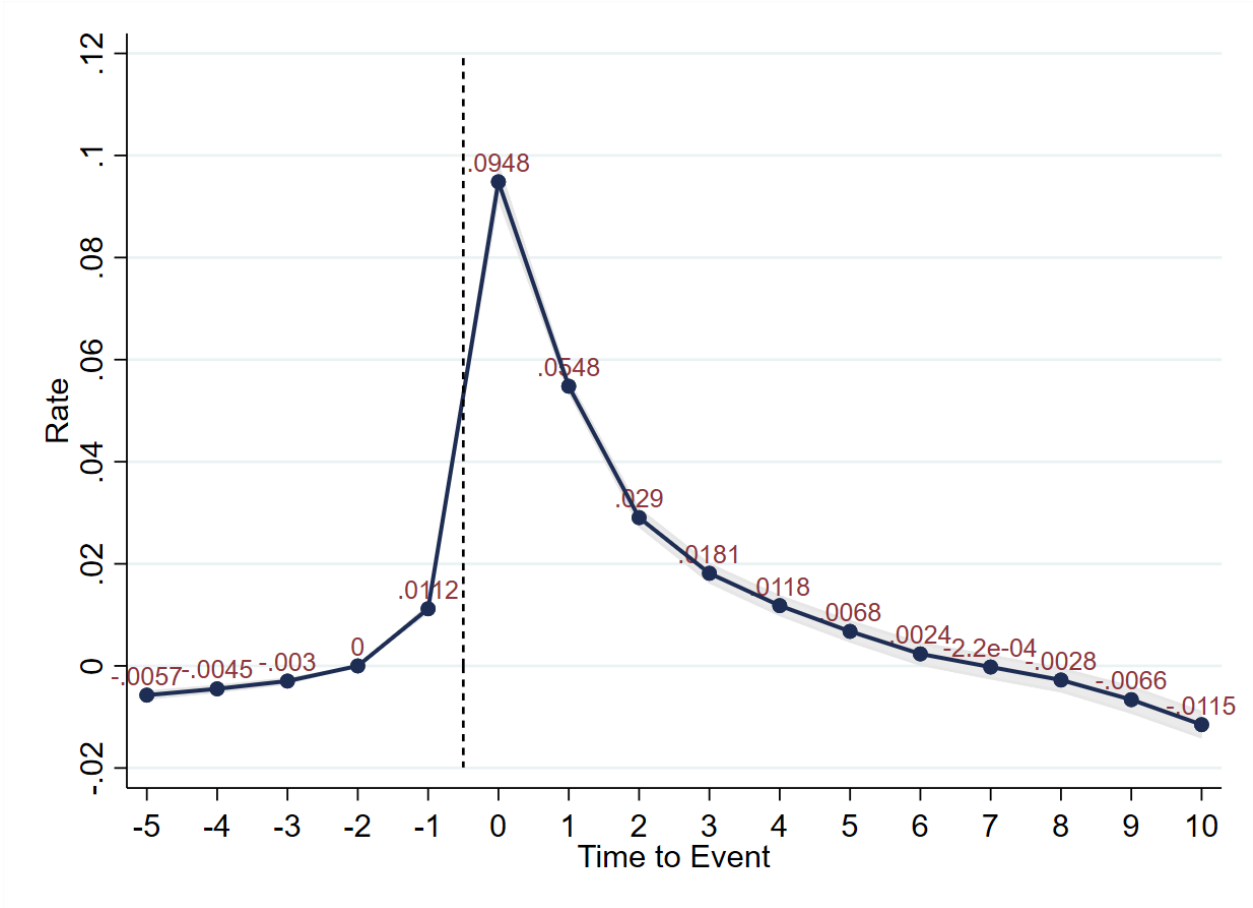
1: Household Events and Valuation of Liquidity

Determinants of Demand

Event Study Design

Unemployment Event

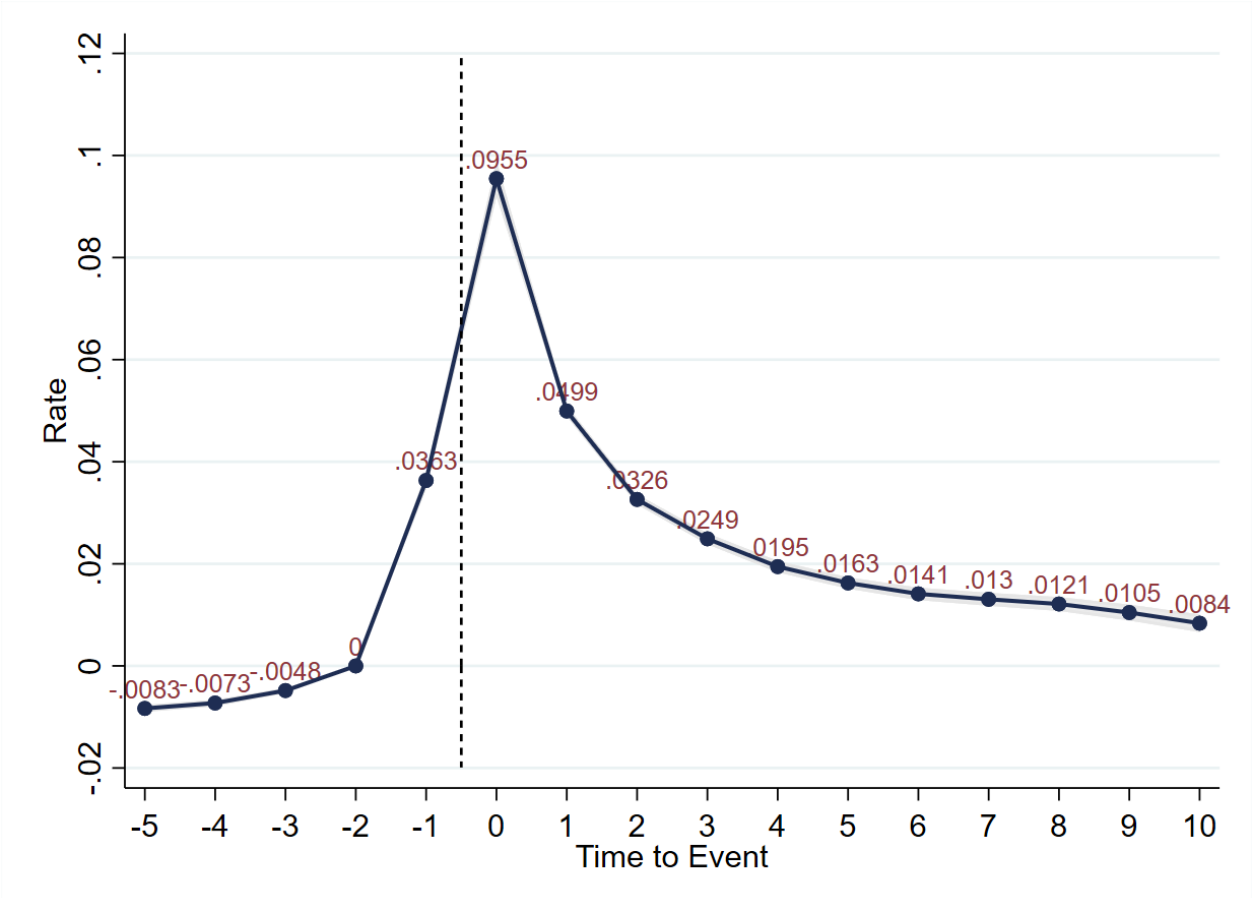
Heterogeneity



- Event: one hh member starts receiving unemployment benefits

$\Rightarrow$ Large and persistent increase in valuation of liquidity: mass of hhs with valuation above 10% more than doubles (rate at $t = -2$ is 0.087)

Large Income Loss Event

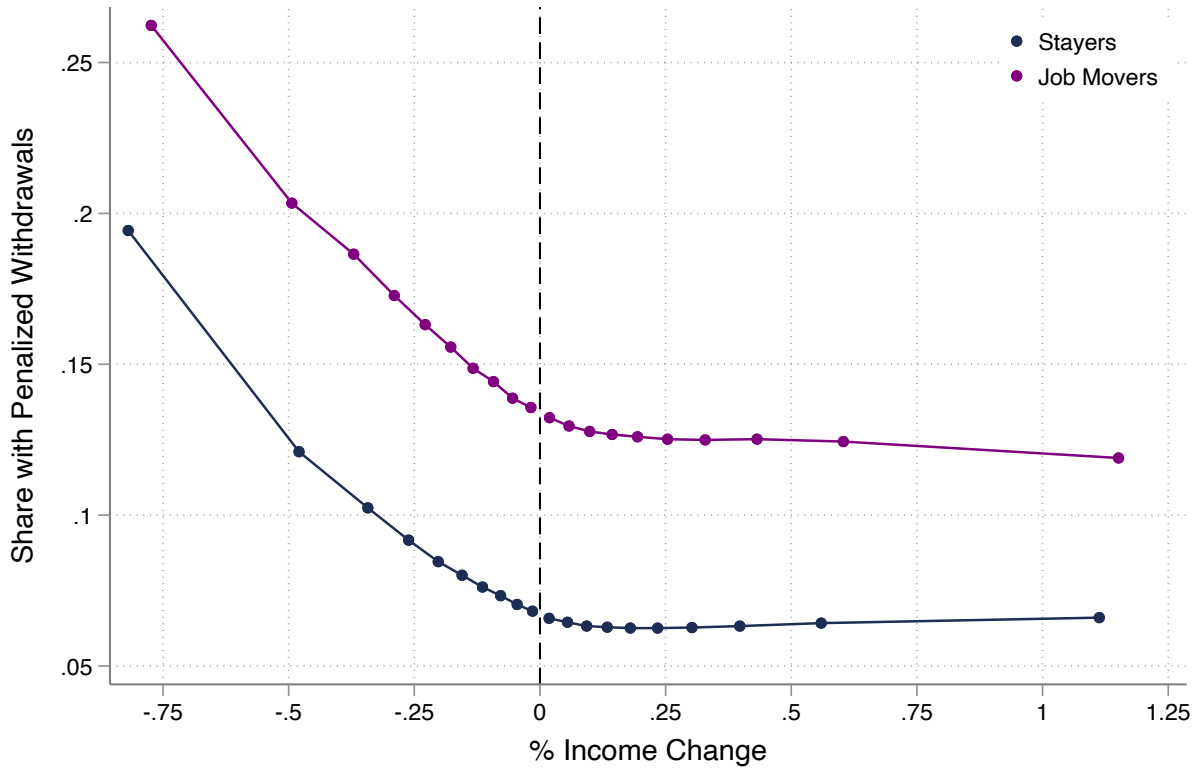


- Event: hh income decreases by more than 20% (rel to previous year)

$\Rightarrow$ Large increases in withdrawals $\rightarrow$ shocks are far from fully insured

Income Changes and Penalized Withdrawals

Amounts



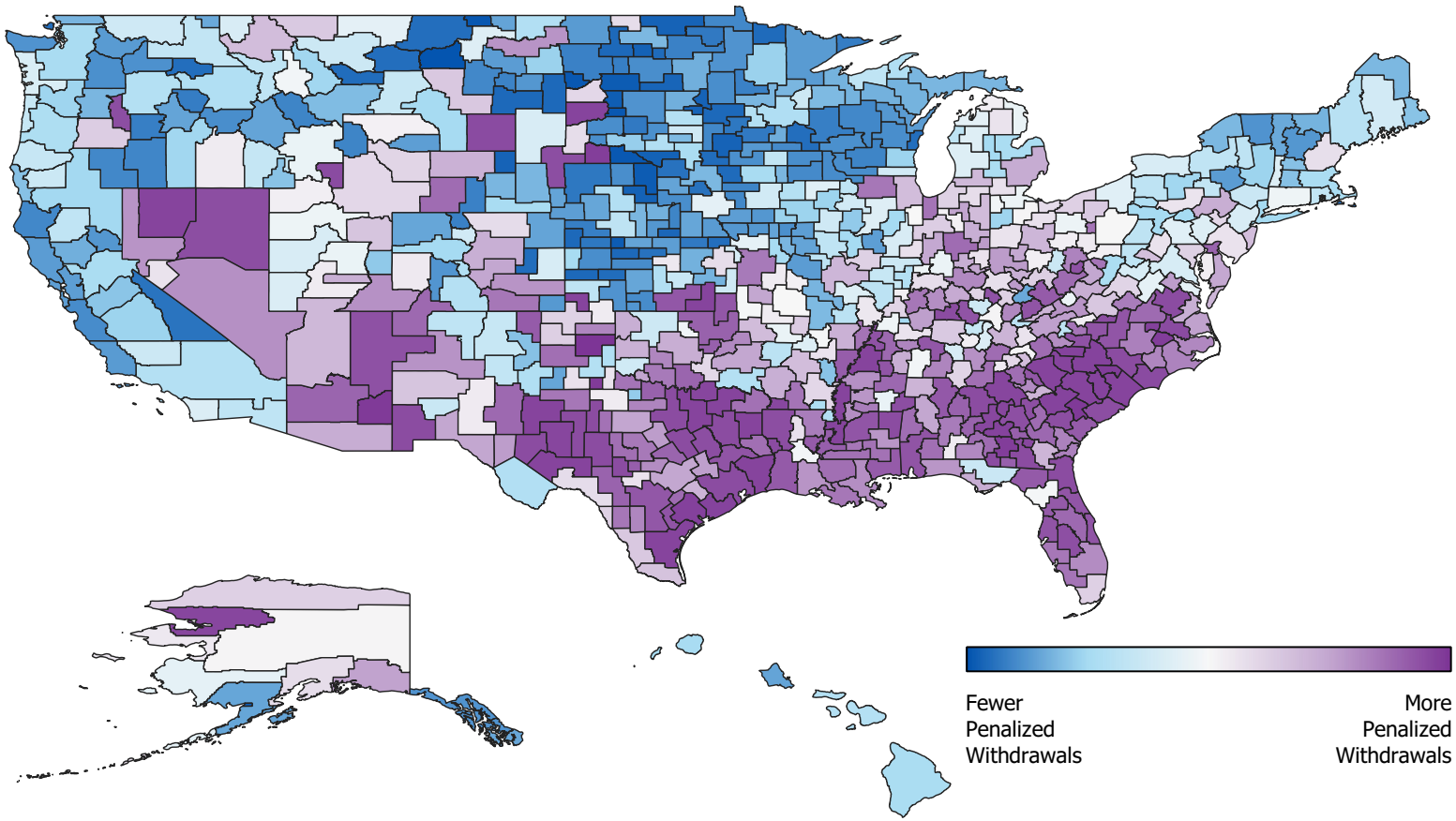
- Strong gradient with respect to income losses → self-insurance
- Stark asymmetry is consistent with self-insurance and rules out alternative explanations (e.g. strategic withdrawals for tax purposes)

2: Local Supply (Γ_z) and hhs Access to Credit (α_i)

Determinants of Supply

Starting point: Large Regional Heterogeneity

(mean: 7.05%. std: 1.30%)



$\Rightarrow$ Next, leverage the spatial variation to study the (supply side) determinants of valuation of liquidity – i.e. Γ_z and α_i

Statistical Model of Household Withdrawals

- Following the conceptual framework, we posit the model

$$y_{izt} = \alpha_i + \Gamma_{z(i,t)} + x_{it}\lambda + \varepsilon_{it}.$$

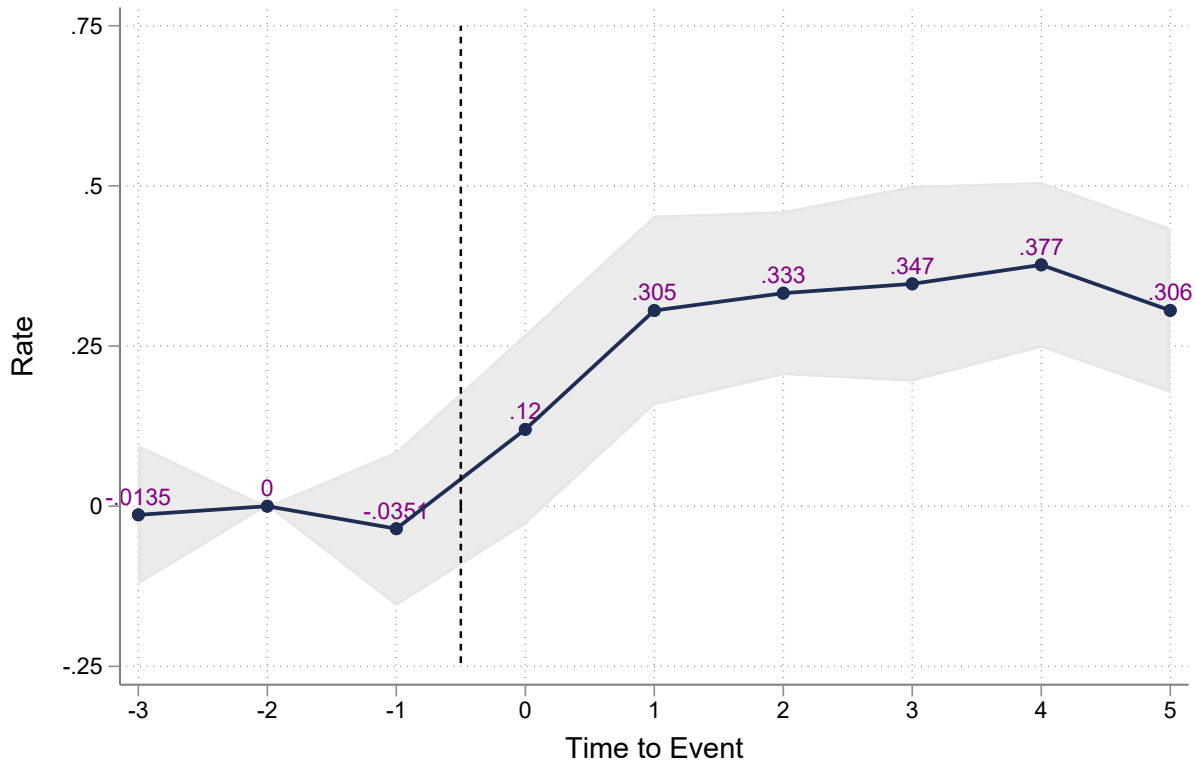
y_{izt} is the outcome for household i is commuting zone (CZ) z at time t

α_i is a household fixed effect

$\Gamma_{z(i,t)}$ are location fixed effects
x_{it} is a vector of time-varying controls (age, year effects, economic indicators)

- We next use this same model for two related analyses
  1. Movers design → quantify role of location + persistence
  2. Study correlates of liquidity needs w/ Γ_z and averages of α_i by CZ

Movers Design: Balanced Sample



$\Rightarrow$ location characteristics pass-through to individual withdrawals

Place Effects Explain $\frac{1}{3}$ of Variation

Interpretation and Threats to Identification

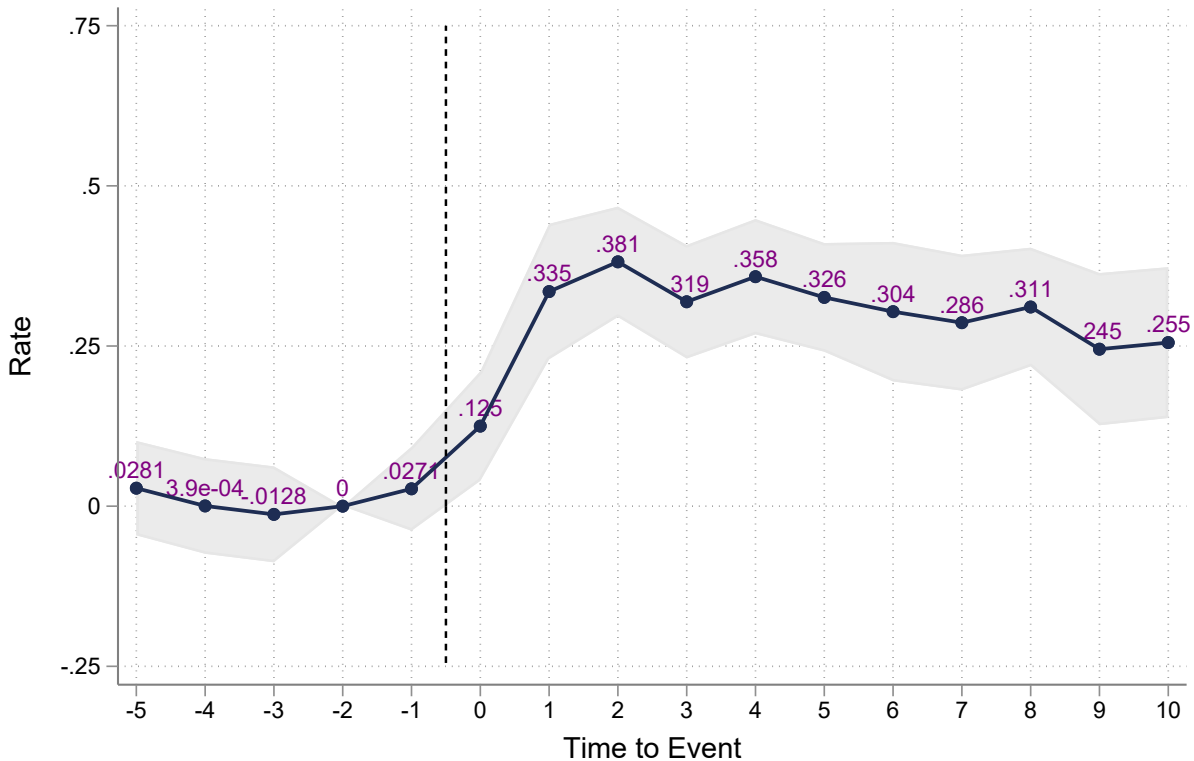
- Our interpretation: when individuals move to locations with worse local supply of credit, they have to rely more on penalized withdrawals for liquidity
  - from last slide: **effect is large** $\rightarrow$ explains $\frac{1}{3}$ of the total spatial variation

- Threats:
  1. cannot account for shocks that align with the timing of moves
  2. alternative mechanism A: learning about withdrawal from peers
  3. alternative mechanism B: tax optimization
  4. limited mobility bias may lead to overestimation of the effects

- Next: several pieces of evidence corroborate our interpretation

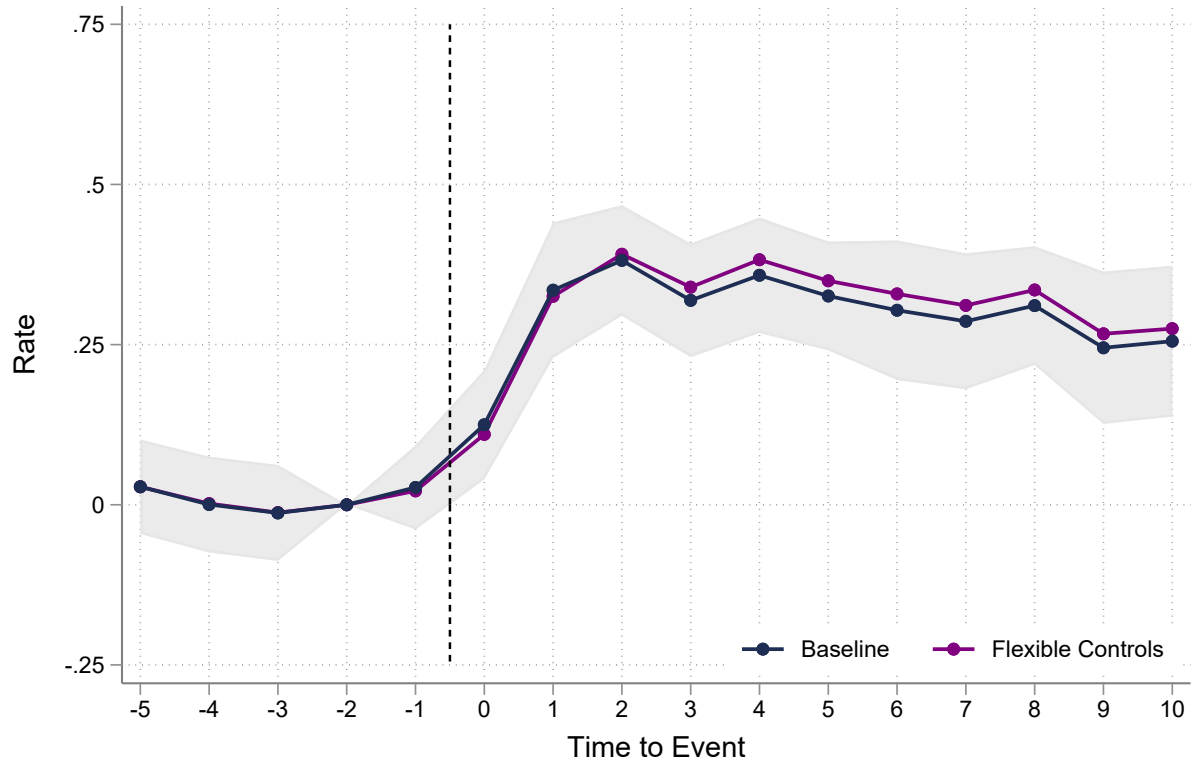
Movers Design: Long-Run Dynamics

Attrition Move Event



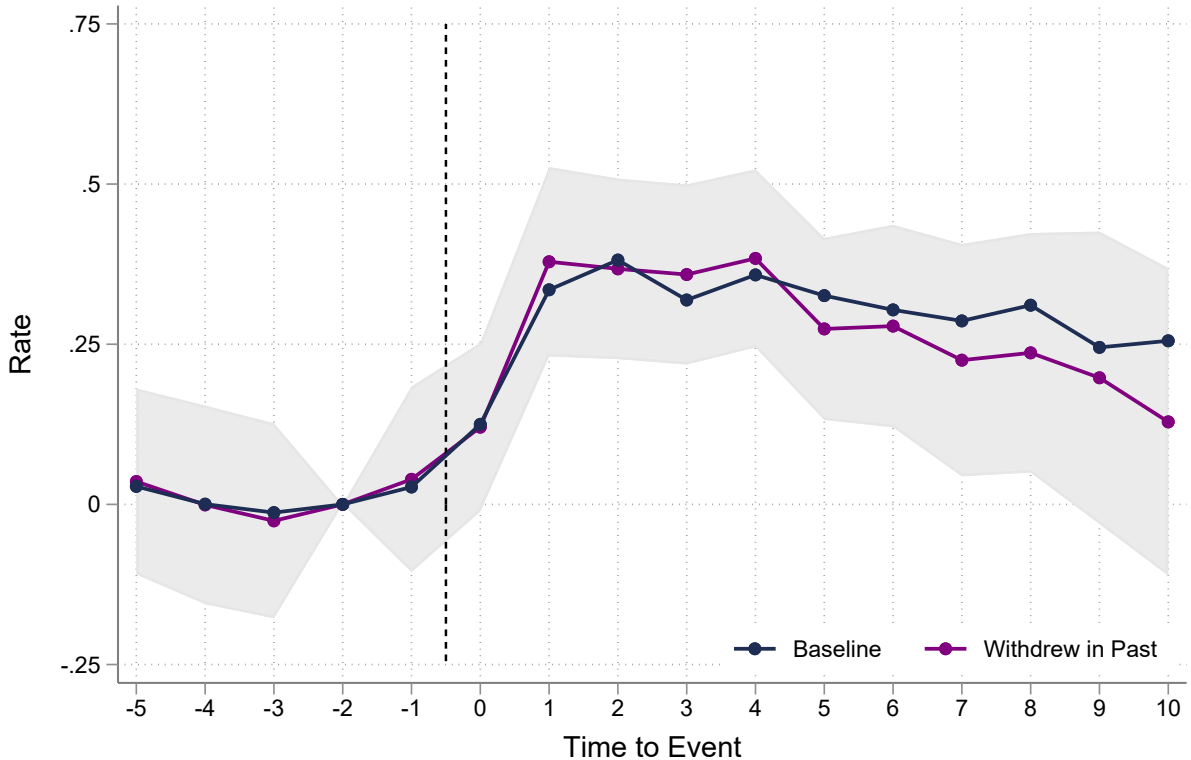
- The effect strongly persists for up to ten years → hard to reconcile with the main effect being driven by shocks aligned with time of the move

Movers Design: Including Rich Set of Controls



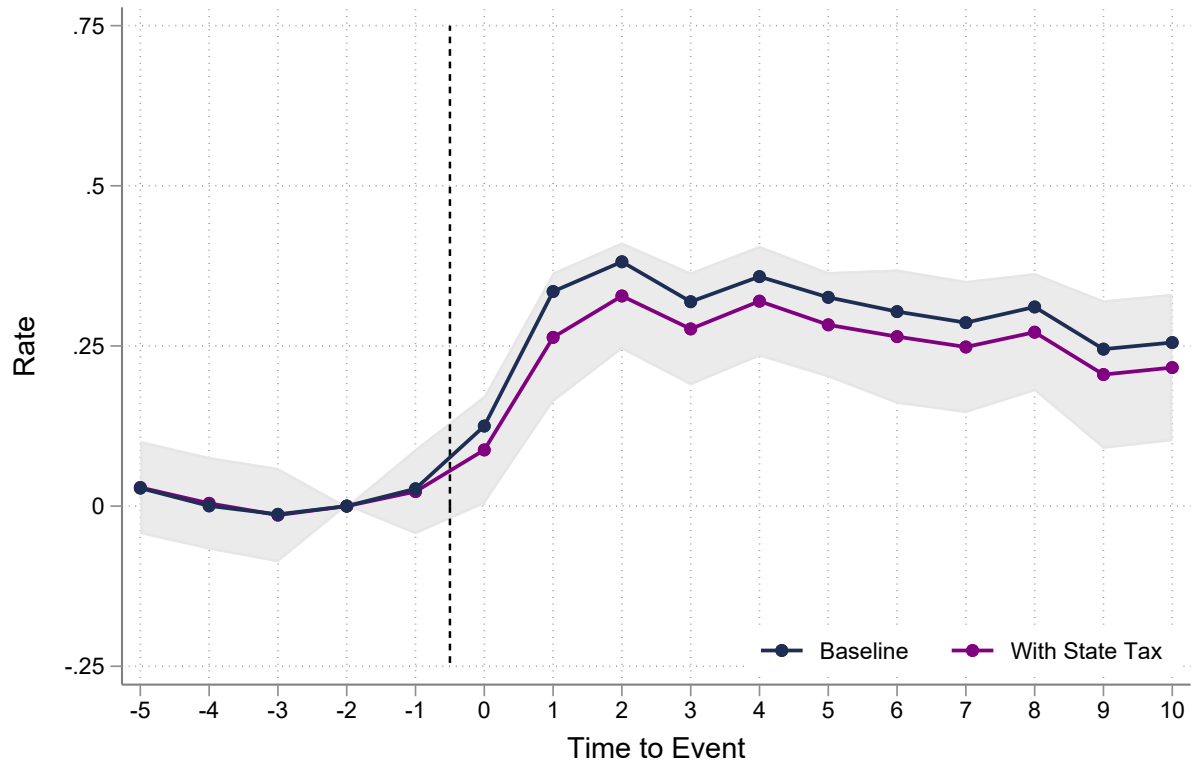
- Controlling directly for hh level shocks does not affect the results
  - include rich controls on income with leads and lags interacted with the move

Movers Design: Only hhs with Previous Withdrawals



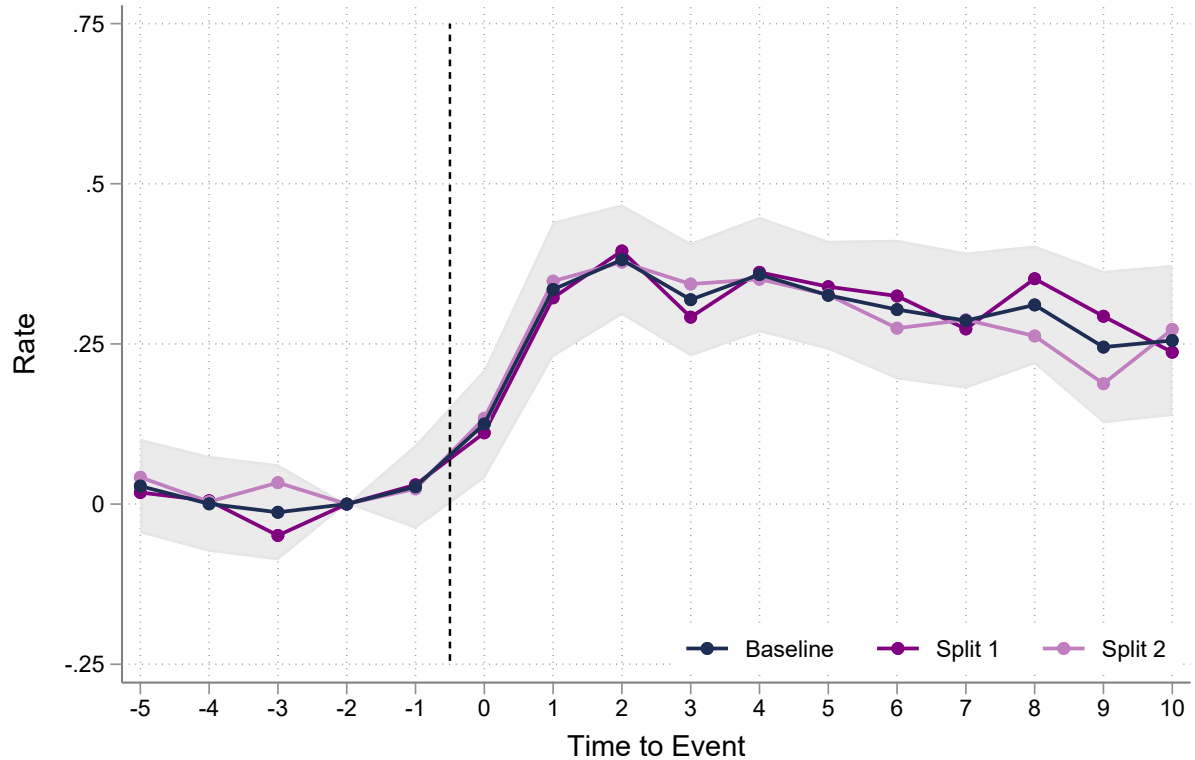
- Focus on hhs that have made a penalized withdrawal before → results unaffected show that alt. mechanism A (learning) is not driving result

Movers Design: Potential Role of Tax Motives



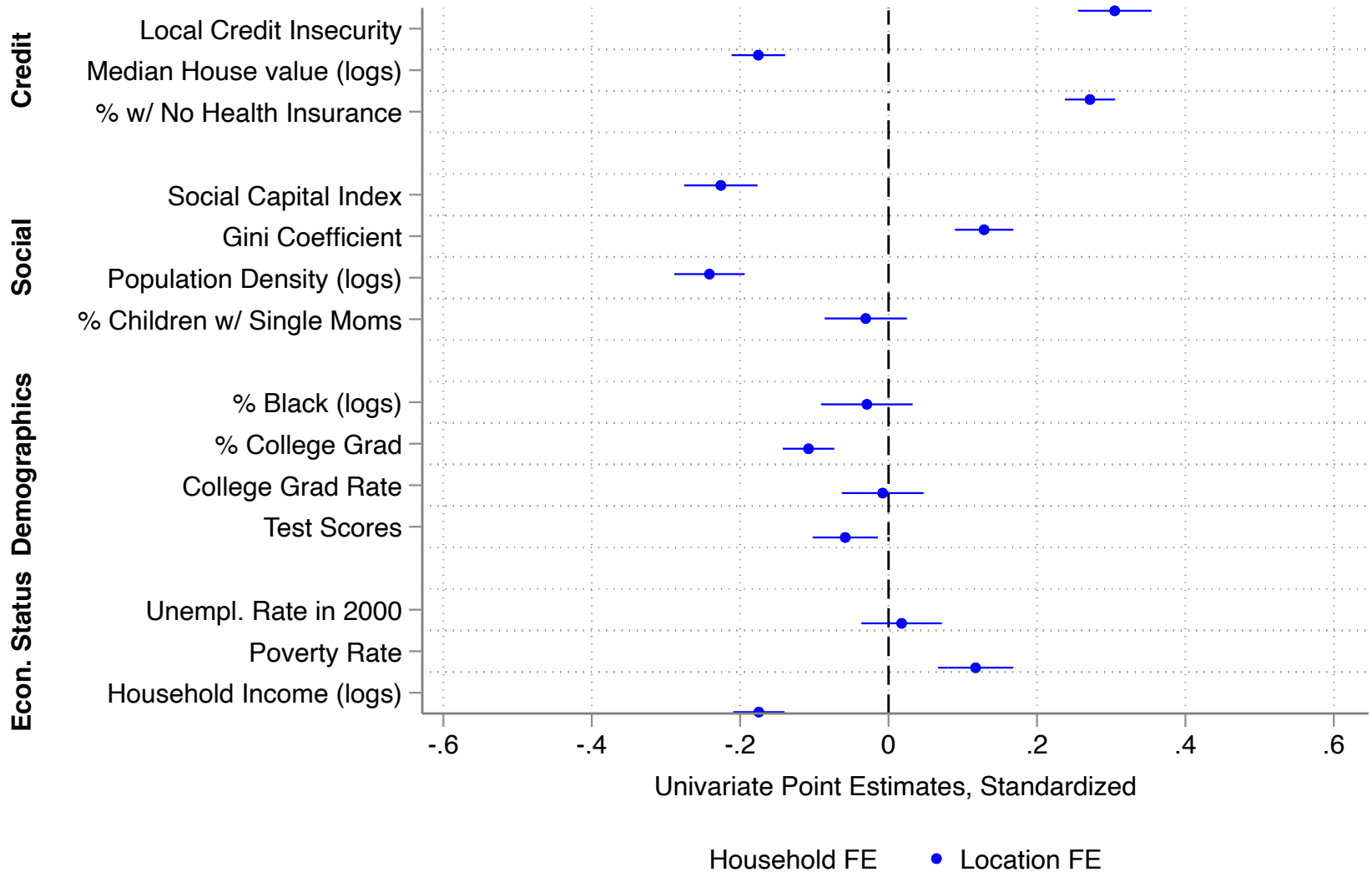
- Location effect reduces only slightly if we control for local tax rates interacted with the time of the move
  - attenuation shows that alt. mechanism B might play a minor role

Movers Design: Sample Split (Limited Mobility Bias)

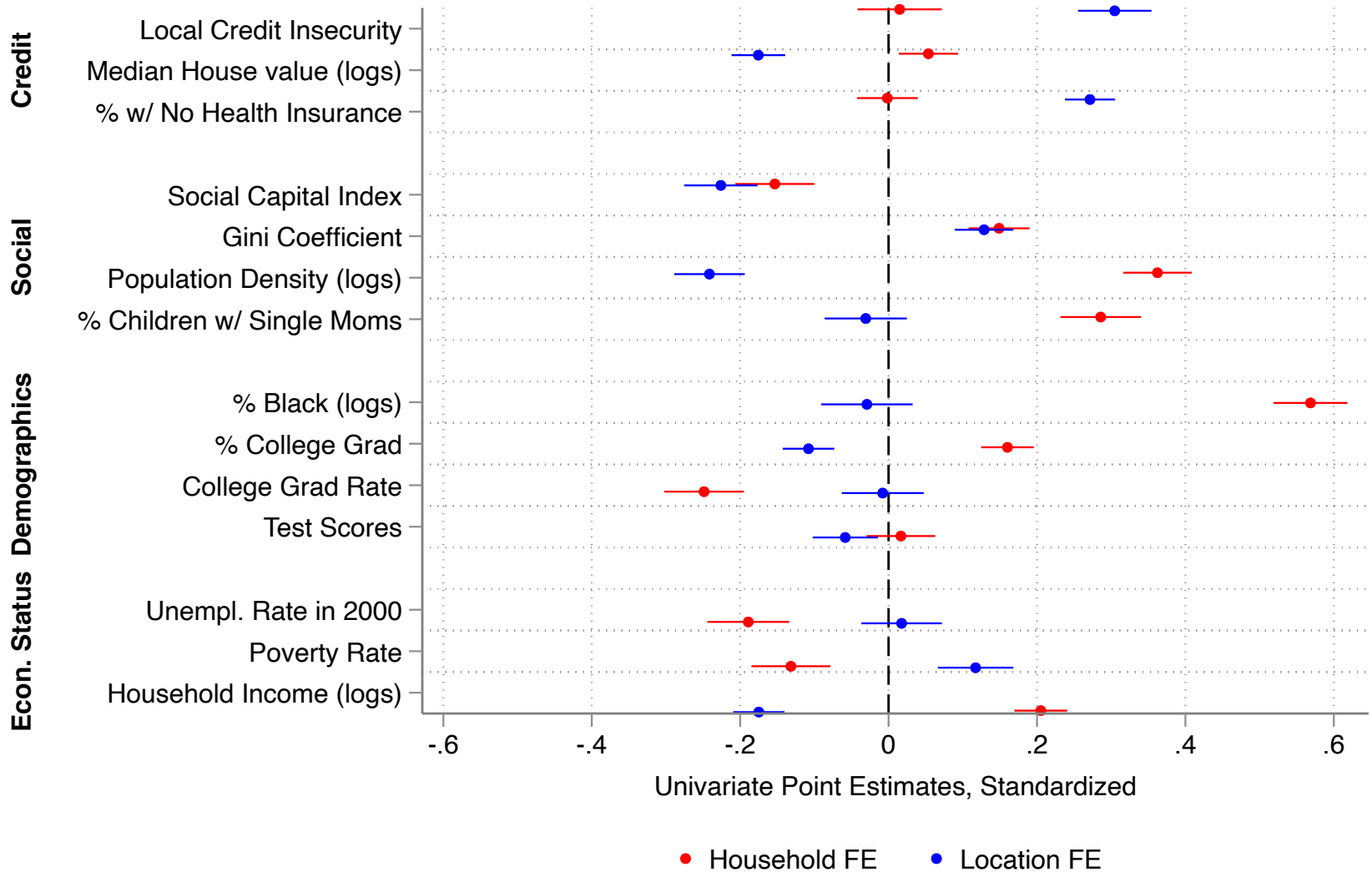


- Concern: limited mobility bias may affect AKM models
- Solution: split sample and estimate movers design on each sample separately → our benchmark results are not subject to limited mobility bias (consistent with frequency of moves in our data)

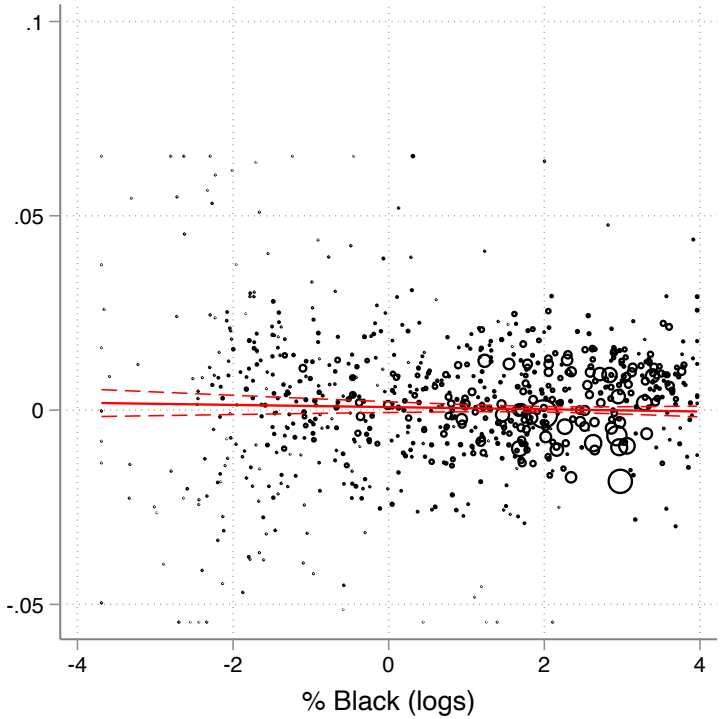
Correlates of Location and Household Effects



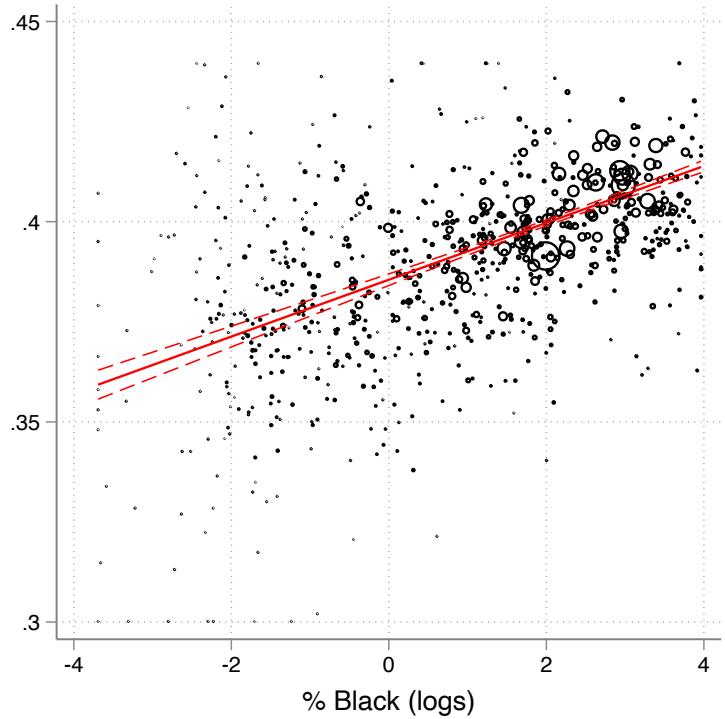
Correlates of Location and Household Effects



% *Black* is Strongest Correlate of Household FE



(a) Location: % Black



(b) Household: % Black

- Households in black communities have high valuation of liquidity
- Interpretation: penalized withdrawals do not discern across different hhs
  $\rightarrow$ frequent withdrawals reveal limited access to alternative credit means

3: Valuation of Liquidity During the Great Recession

Dynamics in Local Supply

Shift-Share Design

Most Affected Areas Saw Large Increase in Valuation

- Large effect which peaked at the height of the Great Recession

Market Spillover

- The flow effect is over 4 times as large as the effect of the unemployment event (0.39 vs 0.095)
- Breakdown of cumulative impact into direct and indirect effects by flexibily accounting for household economic circumstances:

Model	**Increase in Penalized Withdrawals (pp)**
Baseline	1.46
	(0.22)
Spillover	0.98
	(0.20)

- Indirect effect represents $\frac{2}{3}$ of the overall effect

Conclusions

- We introduce and empirically validate penalized withdrawals as a tool that carries information on households' valuation of liquidity

  - features: i. comparable magnitudes; ii. meaningful (welfare-relevant) units

- We use it to characterize the anatomy of valuation of liquidity
  1. Households valuation of liquidity spikes at adverse income events
  2. Valuation of liquidity is strongly affected by local supply
  3. Local supply can change over time as a function of aggregate shocks
  4. Some communites seems to display higher liquidity valuation suggesting that they may have limited access to alternative credit channels

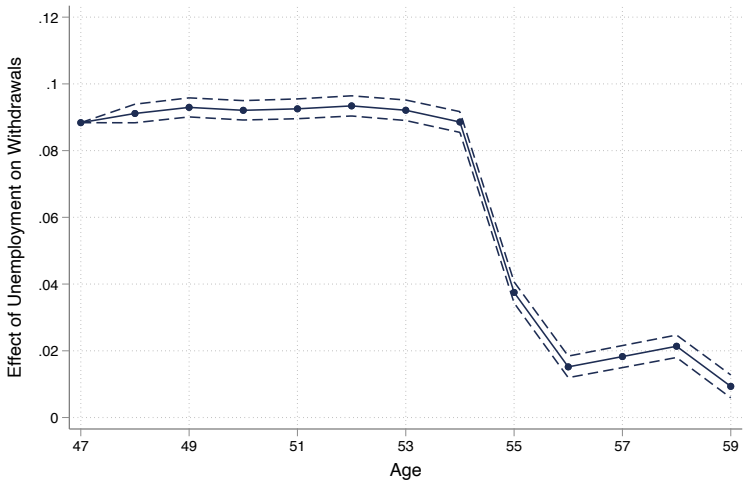
- Takeaways for policy

1. use penalized withdrawals as a tool to monitor local liquidity needs
2. welfare gains from geographic targeting of policy/insurance

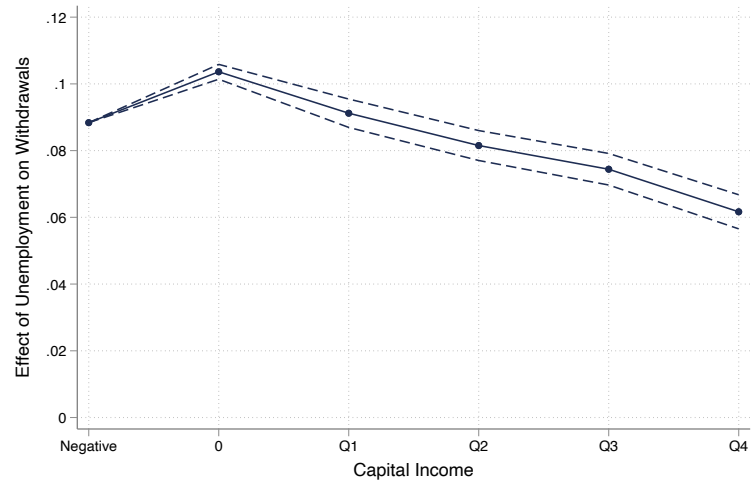
Appendix

Heterogeneity in the Elasticity to *Unemployment*

Back



(c) Elasticity by Age

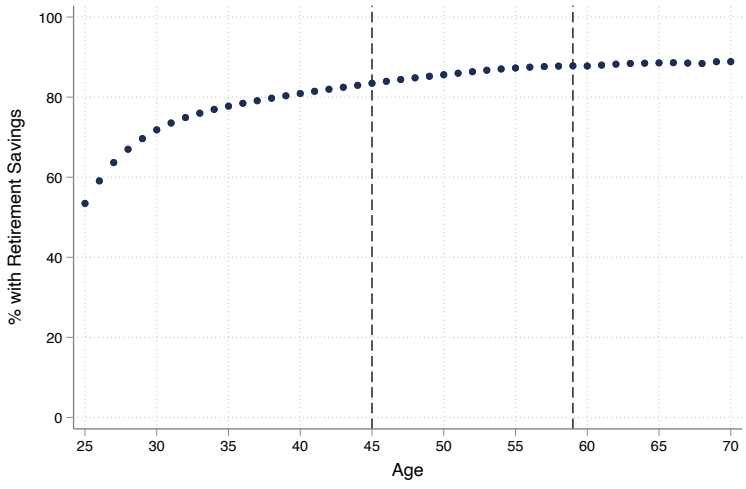


(d) Elasticity by Capital Income

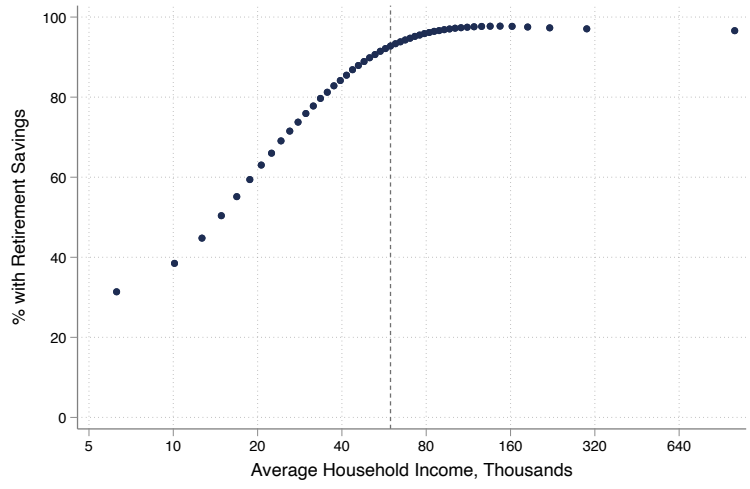
- Age: Evidence not consistent with older individuals being more resilient to shocks due to a buffer stock of savings
- Capital: i) households w\ alternative financial means less likely to rely on withdrawals; ii) a negative capital income may signal access to capital market

Facts 1: Prevalence of Accounts

Back



(a) By Age of Primary-Filer

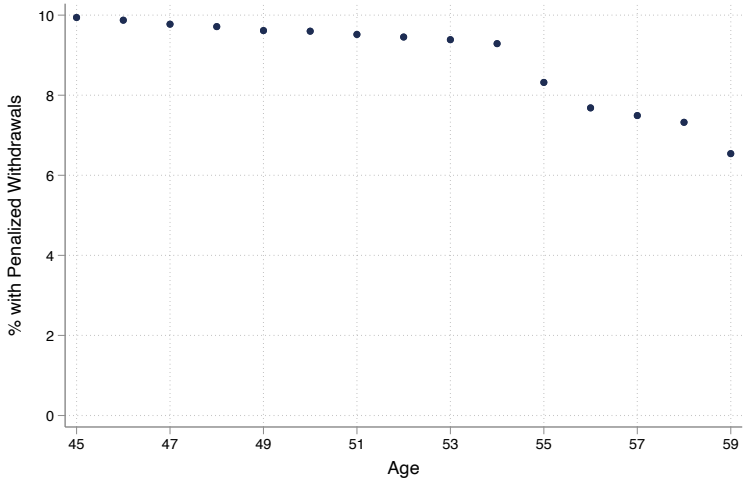


(b) By Household Overall Income

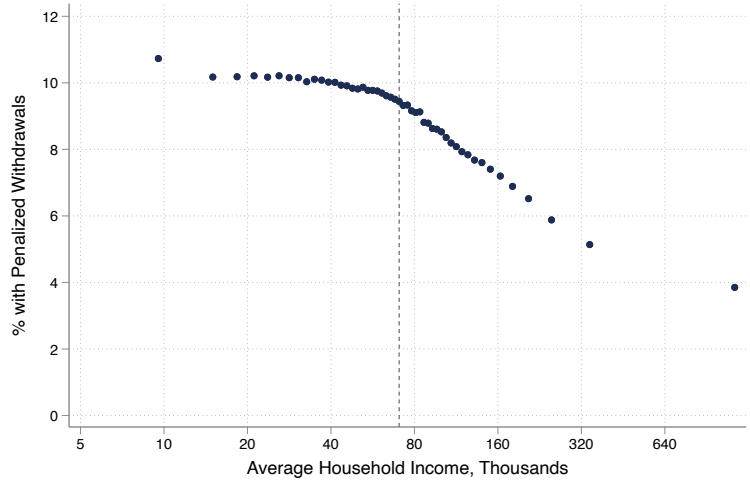
$\Rightarrow$ Most households have access to retirements accounts

Facts 2: Prevalence of Withdrawals

Back



(a) By Age of Primary-Filer

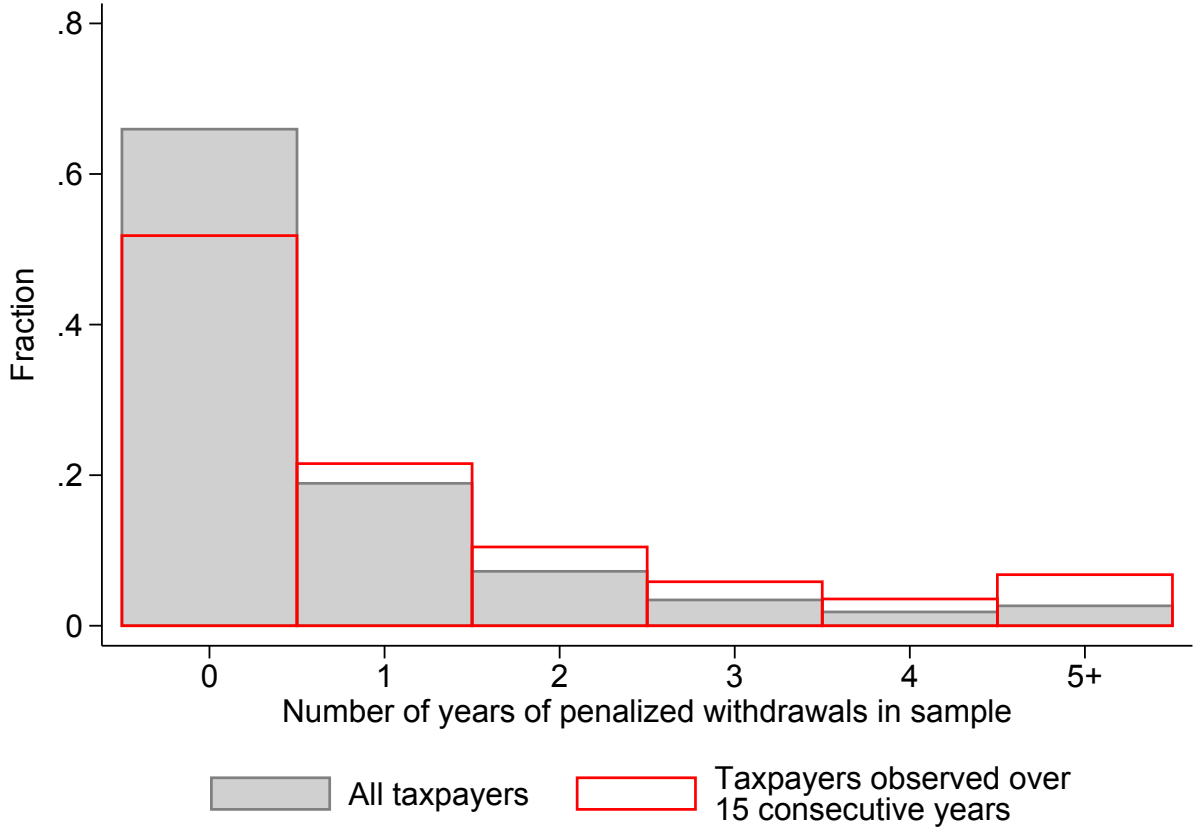


(b) By Household Overall Income

$\Rightarrow$ Throughout age and income distributions, households make penalized withdrawals

Facts 2: Frequency of Withdrawals

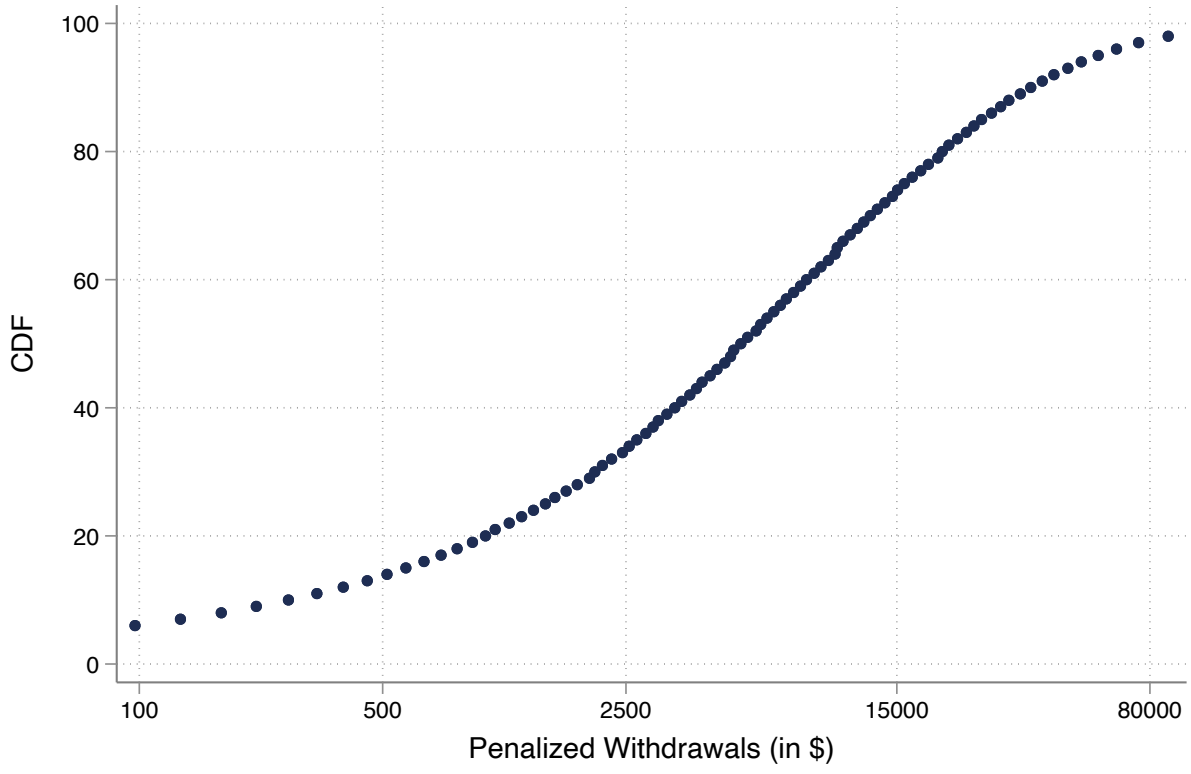
Back



$\Rightarrow$ Typical household withdraws infrequently and almost half of the households observed in all years make at least one withdrawal

Facts 3: Withdrawal Amounts

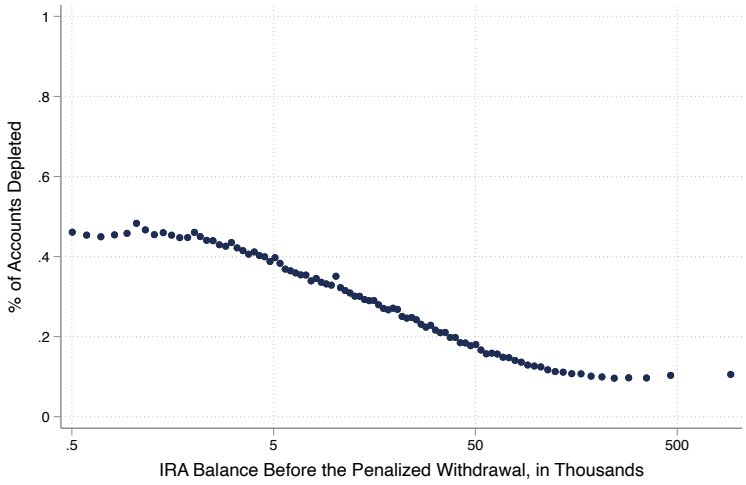
Back



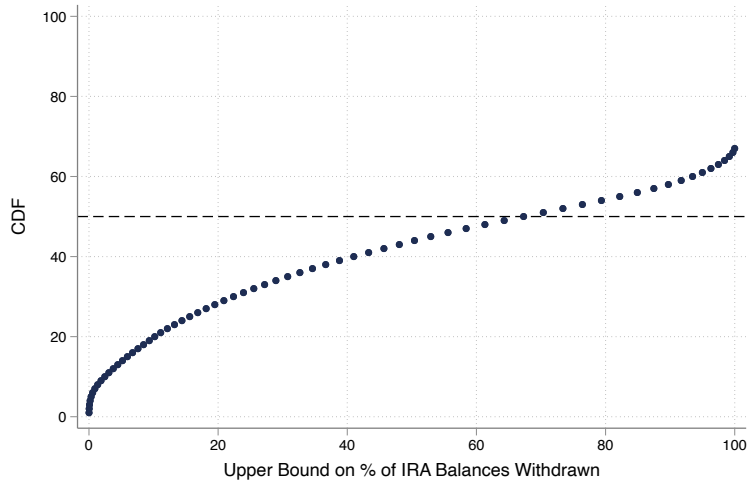
$\Rightarrow$ Typical withdrawal is $\sim$ 5000$

Facts 3: Share of Accounts Depleted

Back



(a) Share of IRA Accounts Fully Depleted after a Withdrawal



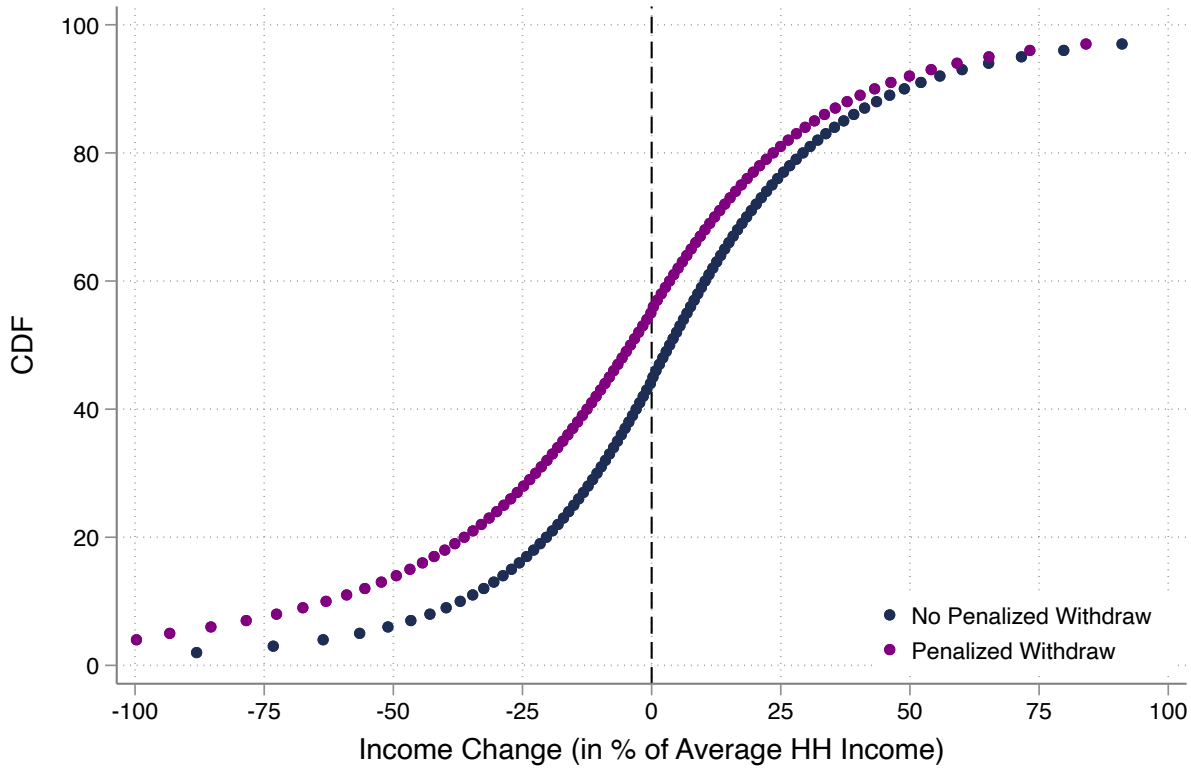
(b) Upper Bound on Share of Balances in IRA Accounts Withdrawn

- Data challenge: observe balances only for IRA accounts, do not observe from which account penalized withdrawal is distributed
  → can compute only an upper bound on depletion due to withdrawals

$\Rightarrow$ at least $\frac{2}{3}$ of households partially withdraw their balances (internal solution)

Facts 4: Distribution of Income Losses

Back



$\Rightarrow$ Households that make a penalized withdrawal are more likely to have suffered large income losses

Takeaways

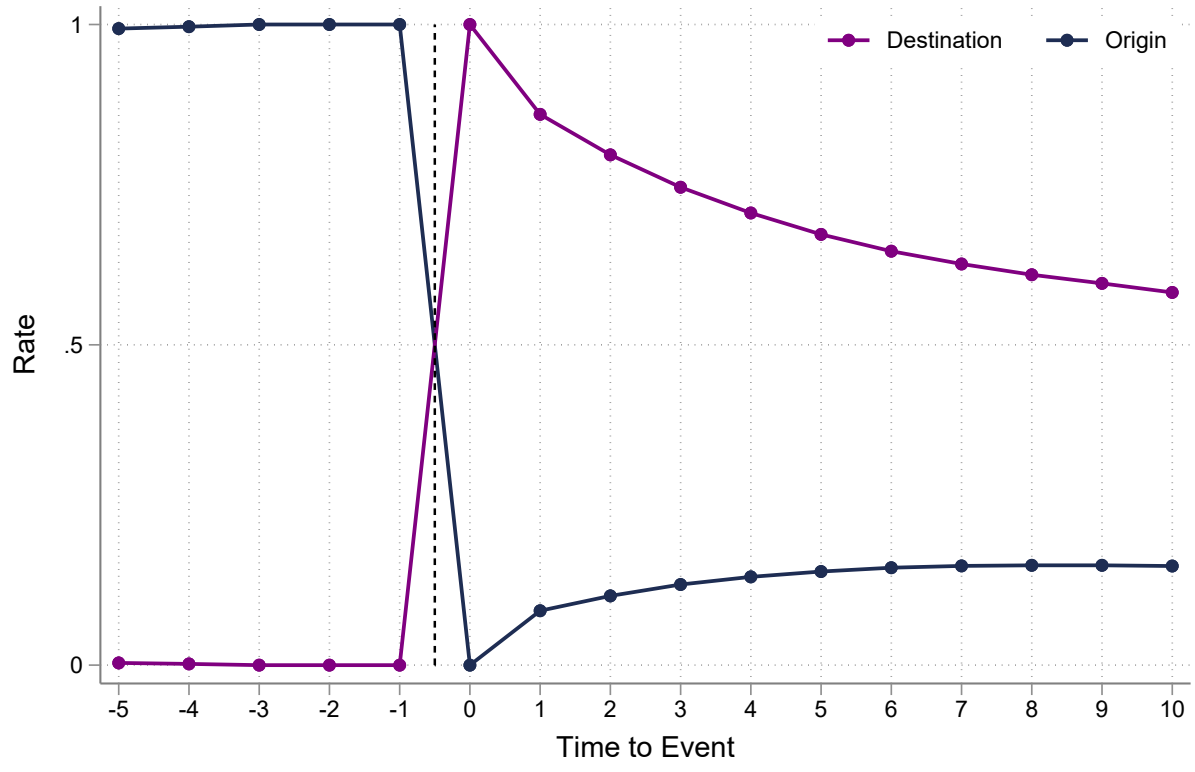
Back

- Evidence supports that households optimize on the margin and use penalized withdrawals to mitigate short run liquidity needs

- Evidence is less consistent with behavioral tendencies
  1. myopia: overall frequency of withdrawals is not driven by a small share of myopic types that make repeated withdrawals
  2. mental accounting/narrow bracketing: most households do not fully close their accounts, but rather only withdraw a fraction of the money as if they are fullfilling a liquidity need

Movers Design: Attrition

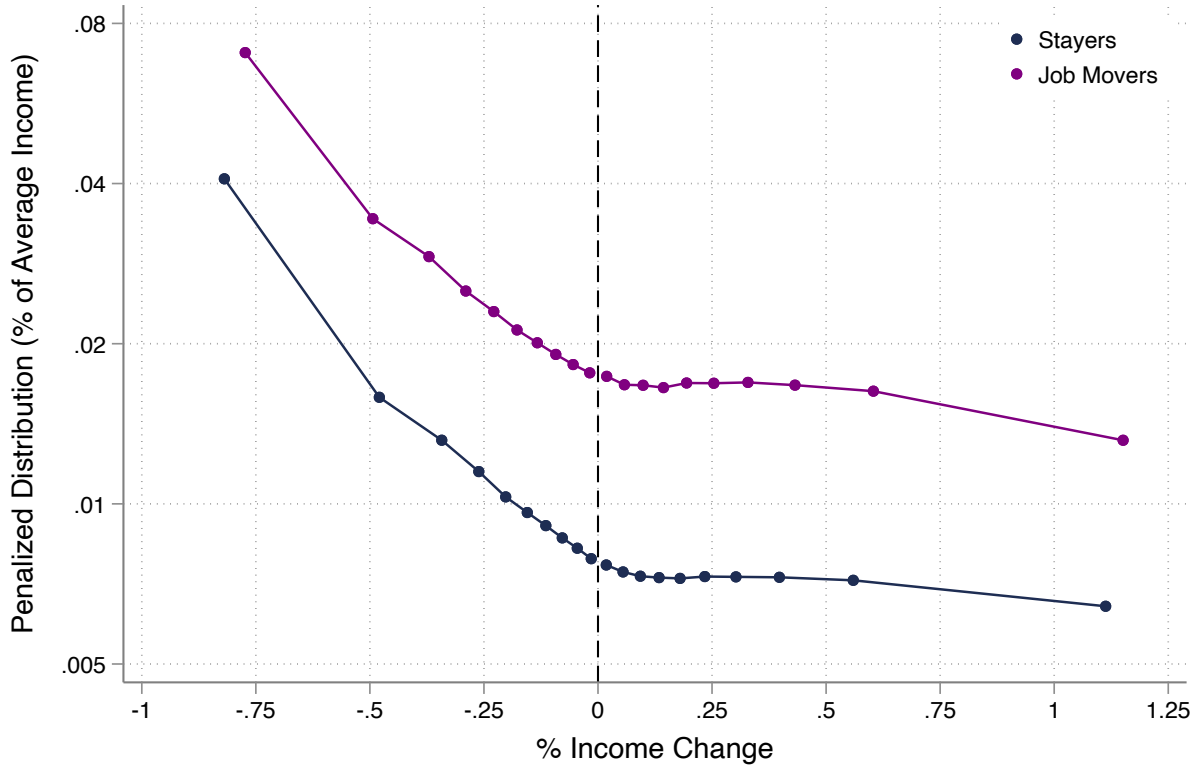
Back



- Attrition + Return moves → attenuate persistence of effects

Income Changes and Penalized Withdrawals

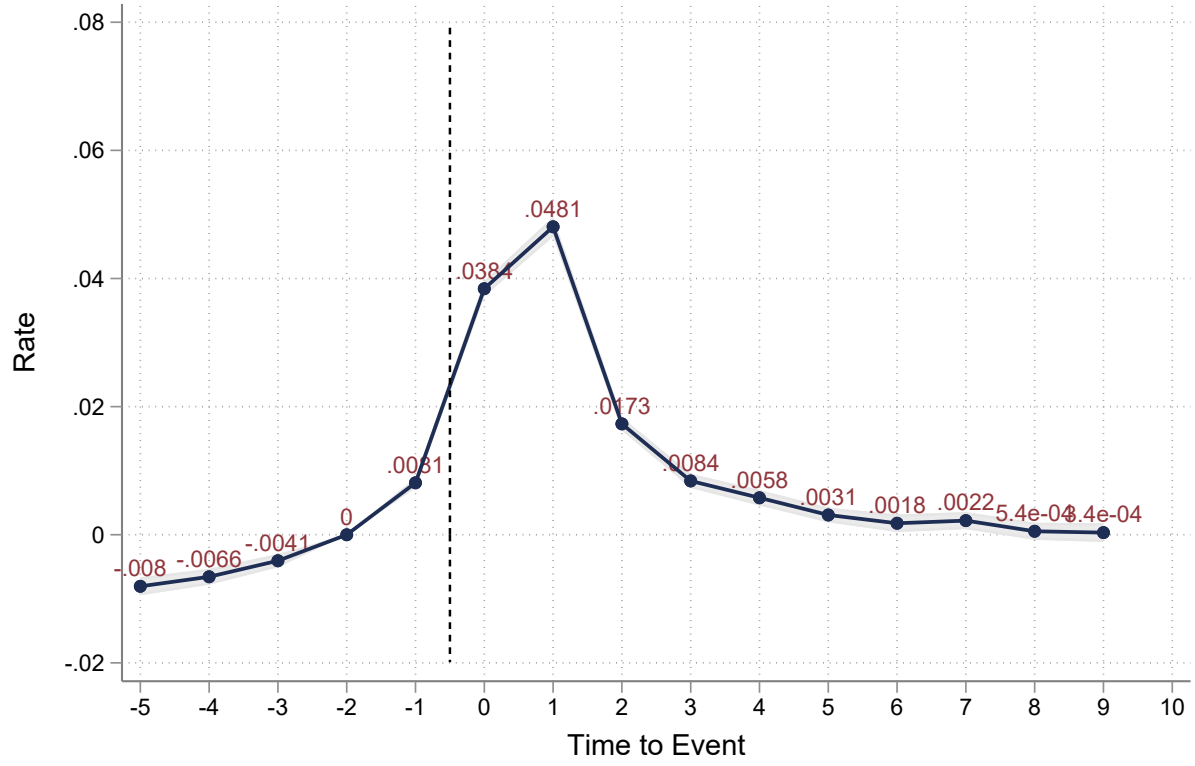
Back



- Strong gradient with respect to income losses → self-insurance
- Stark asymmetry is consistent with self-insurance and rules out alternative explanations (e.g. strategic withdrawals for tax purposes)

Move Event

Back



- Movers have a **transitory** increase in penalized withdrawals
  - moving "shock" leads to a transitory effect, while the location effect is very persistent → further evidence corroborating our interpretation

Household-level Increase in the Liquidity Needs

Back

- We estimate an event study equation of the form

$$y_{it} = \sum_{r \neq -2, r=-5}^{r=10} \beta_r \times I_r + x_{it}\lambda + \alpha_i + \varepsilon_{it},$$

y_{it} is an indicator for a penalized withdrawal for household i at time t

r is the year relative to the event timing [unemployment, income drop, job transition]

I_r are a set of relative time indicators

x_{it} is a full set of age dummies for the primary filer and (cyclical) calendar year dummies

α_i are household fixed effects

Liquidity During the Great Recession

Back

- Apply our tool to a study of the Great Recession

- Use Yagan '19 measure of local labor market shock, and run

$$y_{izt} = \sum_{r \neq 2006, r=2000}^{r=2017} \beta_r \times I_r + \sum_{r \neq 2006, r=2000}^{r=2017} \theta_r \times I_r \times Treat_z + \Gamma_z + \alpha_i + x_{it}\lambda + \varepsilon_{it}$$

y_{izt} is the outcome for household i is commuting zone (CZ) z at time t

α_i is a household fixed effect

Γ_z are location effects

x_{it} is a vector of time-varying controls (age, year effects, economic indicators)

$Treat_z$ is treatment intensity for location z in terms of unemployment shock

Literature

Back

- Two key contributions to literature related to the valuation of liquidity (including PF and macro): insurance and capital market inefficiencies, liquidity constraints and households' ability to smooth marginal utility, optimal design of social insurance
  [e.g., Zeldes (1989), Parker (1999), Souleles (1999), Johnson et al. (2006), Card, Chetty, and Weber (2007), review by Chetty and Finkelstein (2013)]

1. Introduce and empirically validate a new tool to assess household valuation of liquidity, which overcomes key challenges
2. Comprehensive analysis of the anatomy of variation in the valuation of liquidity, identifying underlying driving forces

1) A new tool, overcoming key challenges:

1. Consumption is notoriously hard to measure (partial, durable goods, economies of scale) [recent papers use labor supply: e.g., Shimer and Werning (2007), Chetty (2008), Landais (2015), Hendren (2017), Fadlon and Nielsen (2018), Giupponi (2018), Wettstein (2019).]

   $\Rightarrow$ *Our approach relies on a directly observable and accurately measured behavioral margin*

2. Need to estimate preferences and state dependence [key challenge in welfare evaluations: see, e.g., Finkelstein, Luttmer, and Notowidigdo (2009, 2013), Chetty and Finkelstein (2013), Hendren (2017). Recent studies overcome this: Landais and Spinnewijn (2020), Fadlon et al. (2021).]

   $\Rightarrow$ *Our measure directly carries information on marginal utility and is robust to any form of state dependence*

2) Comprehensive analysis of the valuation of liquidity

1. Adverse household events [e.g., Sullivan and Von Wachter (2009), Kolsrud et al. (2018), Ganong and Noel (2019), Schmieder et al. (2019), Landais and Spinnewijn (2020), Gerard and Naritomi (2021) on unemployment]

   $\Rightarrow$ *We provide a direct look at underinsurance and the valuation of liquidity in short/long run allowing for cons.-leisure complementarities*

2. Location effects on well-being in U.S. [e.g., Chetty and Hendren (2018a,b); Finkelstein et al. (2016); Keys, Mahoney, and Yang (2021)]

   $\Rightarrow$ *We identify an important channel by which location shapes behavior and welfare, motivating policy targeting to locations over time*

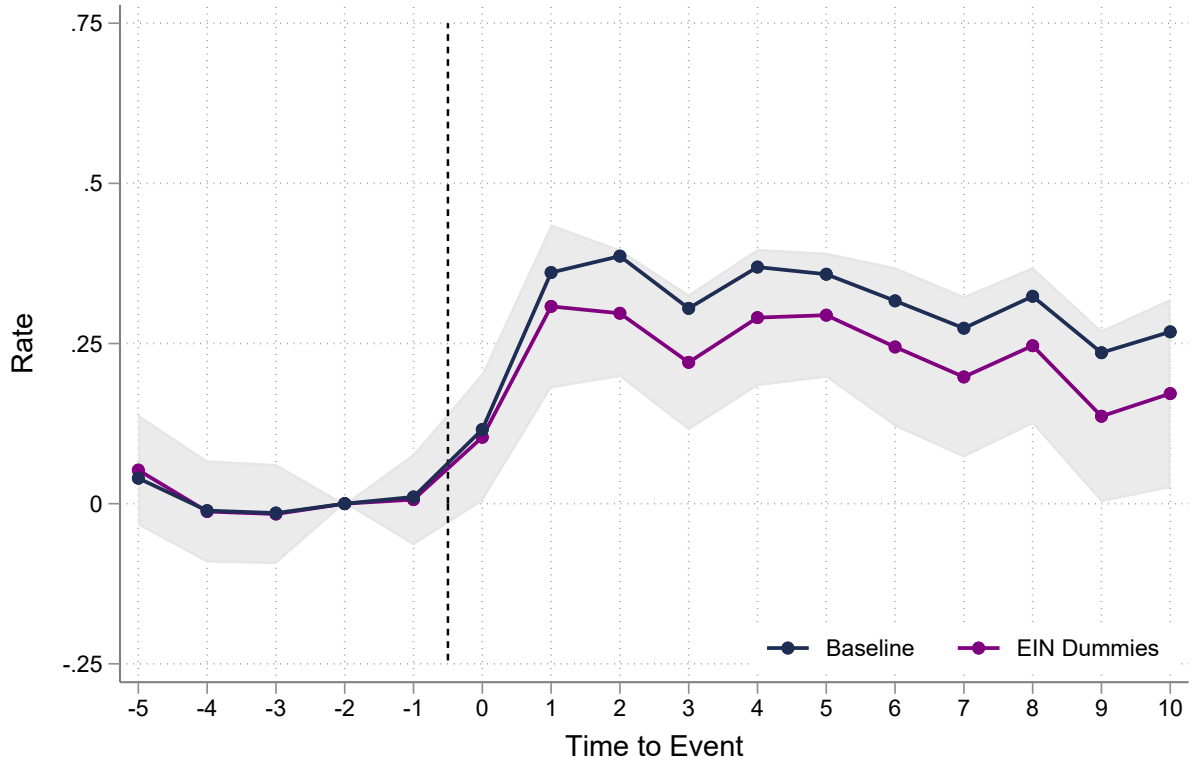
3. Racial disparities in consumption smoothing to shocks [e.g., Ganong et al. (2020)]

   $\Rightarrow$ *We show evidence that households in areas with high percent black may be excluded from alternative credit channels*

4. Analysis of the effects of the Great Recession [e.g., Chodorow-Reich (2014), Chodorow-Reich, Coglianese, Karabarbounis (2018), Yagan (2019)]

   $\Rightarrow$ *We provide direct evidence on dynamics of local valuation of liquidity and novel evidence on a market spillover effect*

Movers Design: Role of Selection to Employers



- Location effect reduces slightly if we control for employer dummies, suggesting a mild within-location selection towards employers with higher intensity