The Value of Unemployment Insurance

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Motivation: Value of Insurance

- Key for social insurance design:
  - Large literature on labour supply responses = **cost** of social insurance
  - Much less work on corresponding **value** of social insurance
- Conceptually easy; value of transferring dollar from good to bad state
- *Challenge:* how to evaluate in practice - especially when social insurance is mandated?

Unemployment and Consumption Drops

- Large literature studies consumption response to income shock and tests for presence of (partial) insurance
- "Consumption-Based Implementation" (Baily-Chetty, Gruber '97)
  - Consumption response to U sufficient for value of UI
  - Overcomes challenge to observe means used to smooth consumption
  - But **conditional on knowing preferences**
- How well do consumption responses capture value of insurance?
  - Can we simply translate Δ consumption in Δ marginal utility?
  - Lack of smoothing: low value? or price high?
  - Huge debate $\Rightarrow$ **Unresolved**

This Paper:

We have a unique setting in Sweden:

1. **rich admin data** on income, wealth, unemployment, etc
2. **voluntary** UI coverage

We implement three alternative approaches in same setting/sample:

1. Revisit **CB approach** using admin data
   - Study different margins and heterogeneity in consumption responses
2. Propose novel **MPC approach**
   - State-specific MPCs reveal price of smoothing consumption
3. Implement **RP approach** based on UI choices
   - Study heterogeneity in valuations (conditional on unemployment risk)

This Paper: **Findings**

We have a unique setting in Sweden:

1. **rich admin data** on income, wealth, unemployment, etc
2. **voluntary** UI coverage

We implement three alternative approaches in same setting/sample:

1. Revisit **CB approach** using admin data
   - CB indicates low value of UI ($<$ MH costs)
2. Propose novel **MPC approach**
   - MPCs indicate high value of UI ($\gtrsim$ MH costs)
3. Implement **RP approach** based on UI choices
   - RP confirms high value of UI and reveals large dispersion

Related Literature

- Recent literature on value of UI:
  - CB approach using admin data *(Ganong and Noel '16, Gerard and Naritomi '18)* rather than surveyed consumption *(Browning and Crossley '01, Stephens '01)*
  - 'optimization methods' *(Chetty '08, Landais '15, Hendren '17)*
  - other social insurance settings *(Finkelstein et al. '15,'17, Low and Pistaferri '15, Cabral '16, Autor et al. '17, Fadlon and Nielsen '17)*
- Our new approaches relate to:
  - heterogeneity in MPCs *(e.g., Kreiner et al '16, Kekre '17, ...)*
  - RP vs. choice frictions *(e.g., Abaluck and Gruber '11, Handel '13, Handel and Kolstad '15, ...)*
- Building on own previous work:
  - use CB approach to study optimal dynamics of UI *(Kolsrud et al. '18)*
  - use UI choices to study adverse selection in UI *(Landais et al. '18)*

Outline

Stylized Model of Unemployment

- Worker maximizes:

$$\pi(z)\, u_u(c_u, x_u) + (1 - \pi(z))\, u_e(c_e, x_e) - z$$

subject to

$$c_s = y_s + \frac{1}{p_s} x_s \text{ for } s = e, u$$

- Consumption smoothing behavior:

$$u_s'(c_s) = p_s v_s'(x_s)$$

- Model can capture different types of resources used to smooth consumption:
  - household labor supply: $p_s v'(x_s) = \frac{1}{w_s} c'(x_s)$
  - savings/credit: $p_s v'(x_s) = R_s \beta V_s'(a_s - x_s)$
  - insurance/securities: $p_s v'(x_s) = p_s V_0'(a_0) / \pi_s$

Stylized Model (cont'd)

- UI value depends on MRS btw employment and unemployment consumption:

$$MRS = \frac{u_u'(c_u)}{u_e'(c_e)}$$

- MRS "sufficient" to evaluate value of (marginal) changes to UI design
  - Baily-Chetty formula:

$$W'(b) \propto MRS - \left[1 + \varepsilon_{\frac{\pi}{1-\pi}, b}\right]$$

- Envelope conditions are key
  - consumption smoothing responses to change in UI have only SO impact on welfare

Context & Data

- Data from tax registers on all earnings/income, transfers/taxes, debt & assets (balance & transactions), some durables
  - Consumption as a residual expenditure measure (Kolsrud et al. '17)

$$consumption_t = income_t - \Delta assets_t$$

▸ Consistency with survey data ▸ Details

  - Sources of income variation (UI benefits, transfers, asset price shocks)
- Data on UI coverage choices [2002-2008] ▸ Institutional details
  - workers can opt for comprehensive coverage ($\sim$ 80% replacement rate)
  - alternative is a flat minimum benefit level
  - uniform price (subsidized): 4 out of 5 take comprehensive coverage
- Data on unemployment outcomes:
  - On unemployment spells & benefit receipt
  - On determinants of U risk ▸ Predicted Risk Model
  - On elicited unemployment risk (surveys)

Approach I: Consumption-Based Approach

CB Approach

MRS is determined by consumption drop and risk aversion:

$$\frac{u'_u(c_u)}{u'_e(c_e)} \cong 1 + \gamma \times \frac{c_e - c_u}{c_e}$$

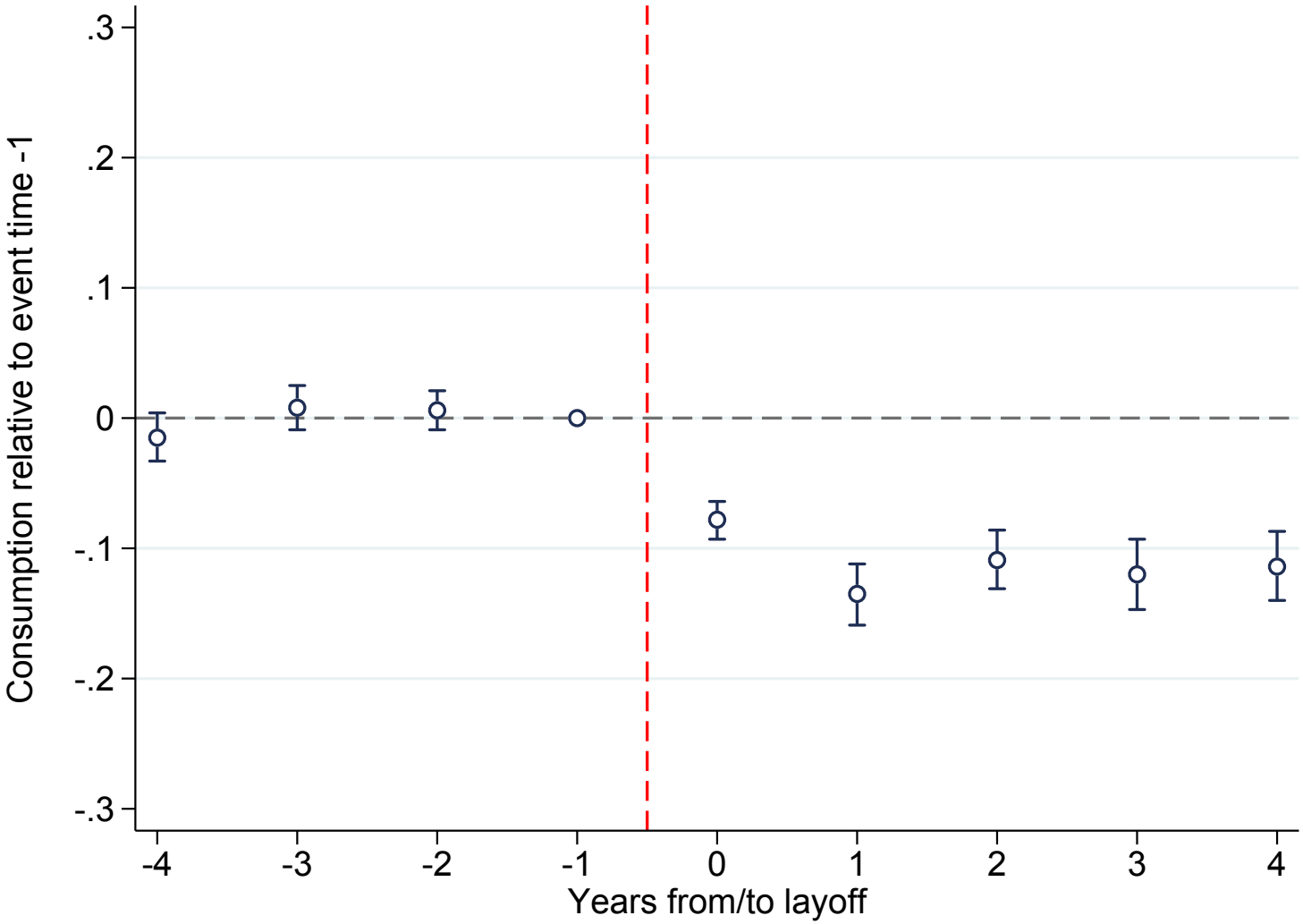
where $\gamma = c_e \cdot u''(c_e)/u'(c_e)$

- Approximation ignores state-dependent preferences and relies on Taylor expansion

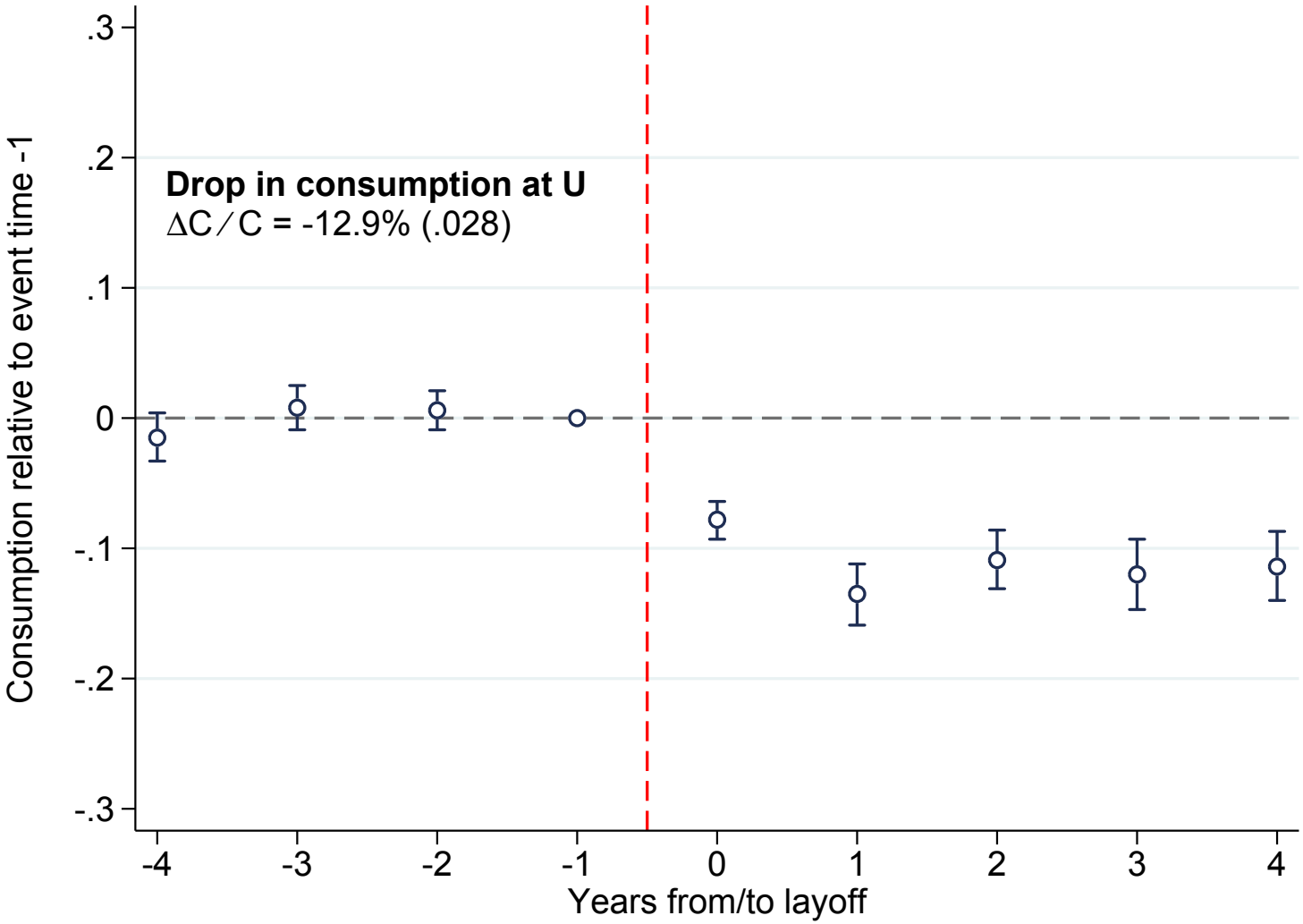
$$u'(c_u) \cong u'(c_e) + u''(c_e)[c_e - c_u]$$

- Remarkably easy to implement if preferences are known...

Yearly Consumption Relative to Year of Displacement

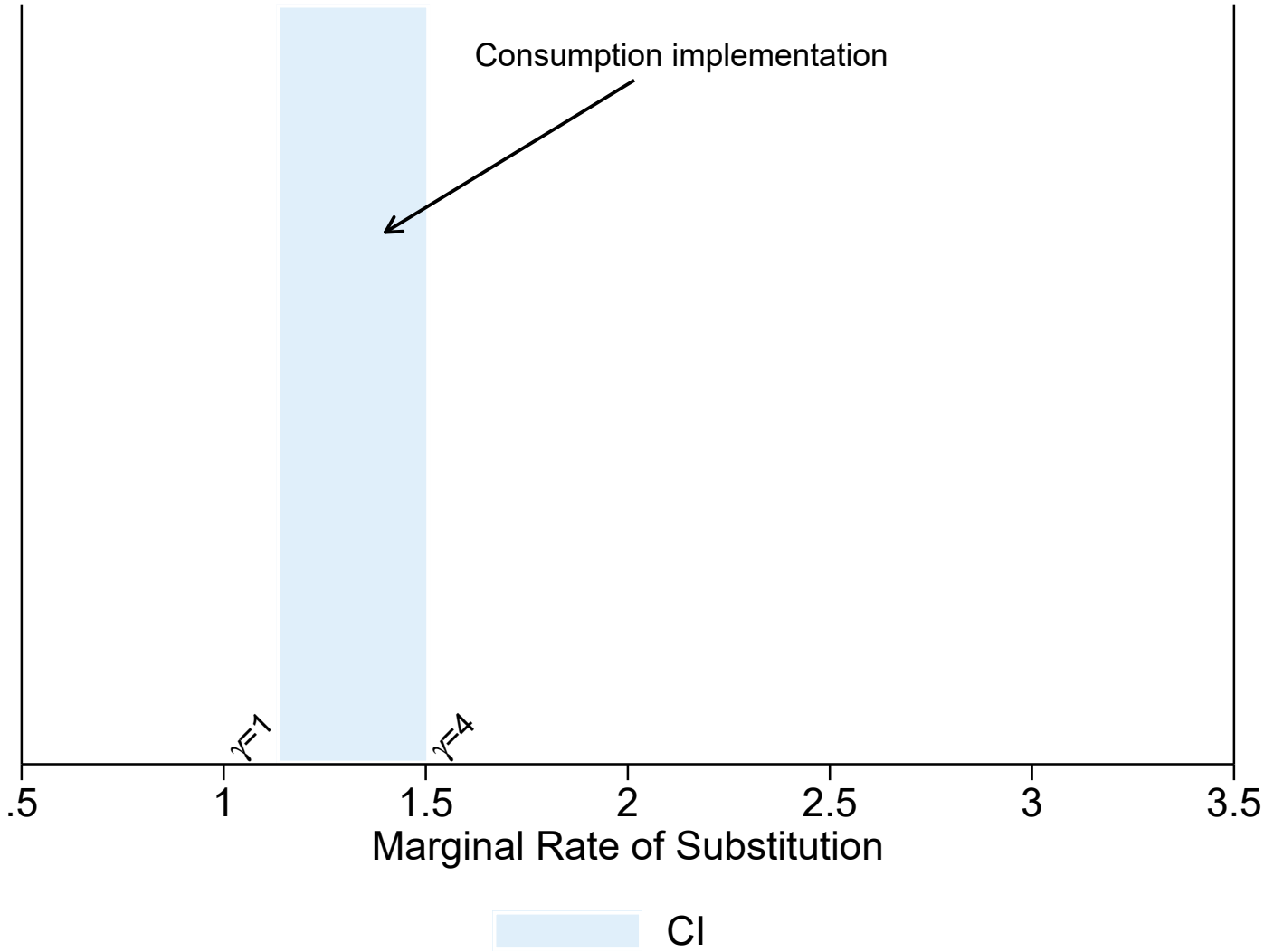


Yearly Consumption Relative to Year of Displacement



Comparing Value vs. Cost of UI

Baily-Chetty



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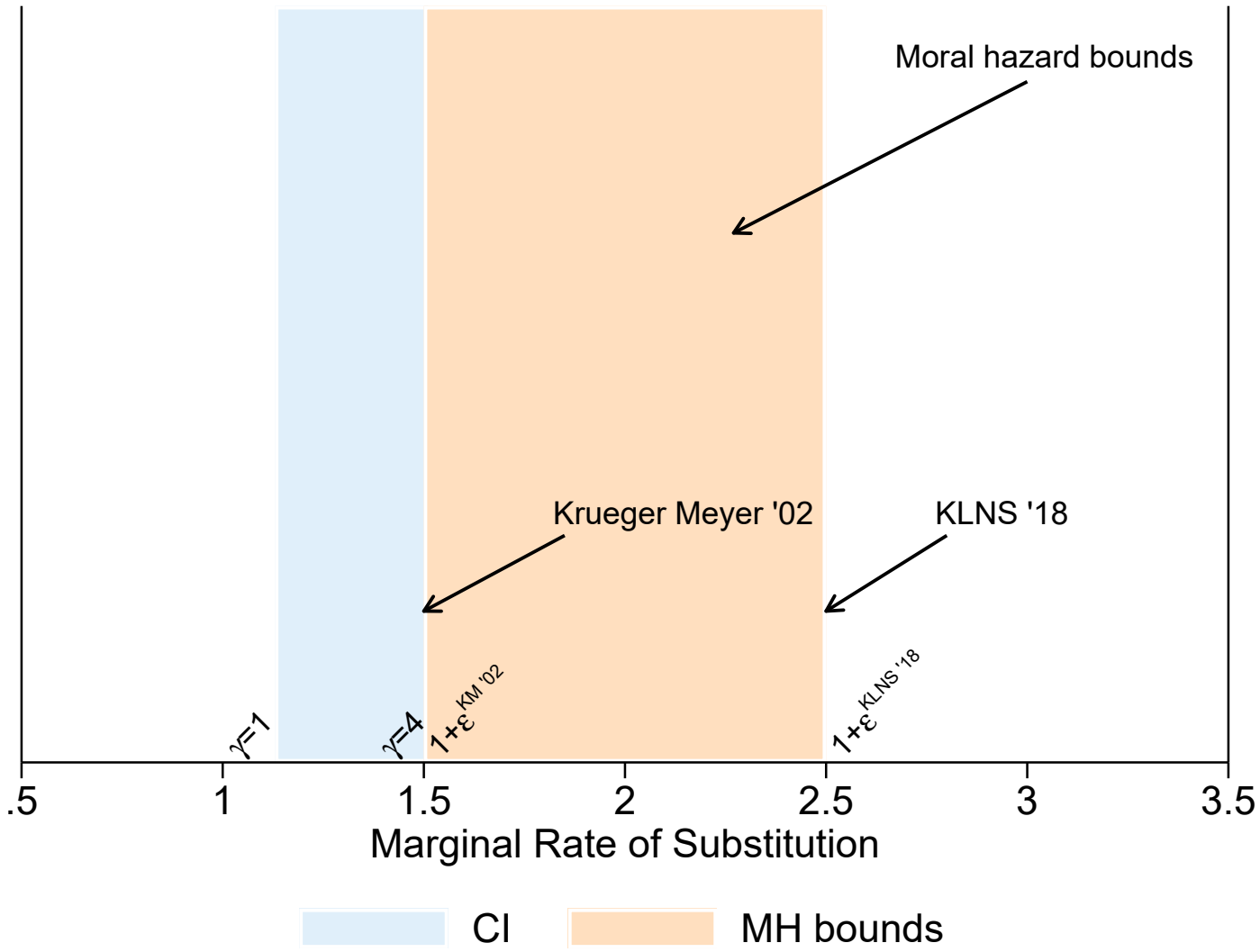
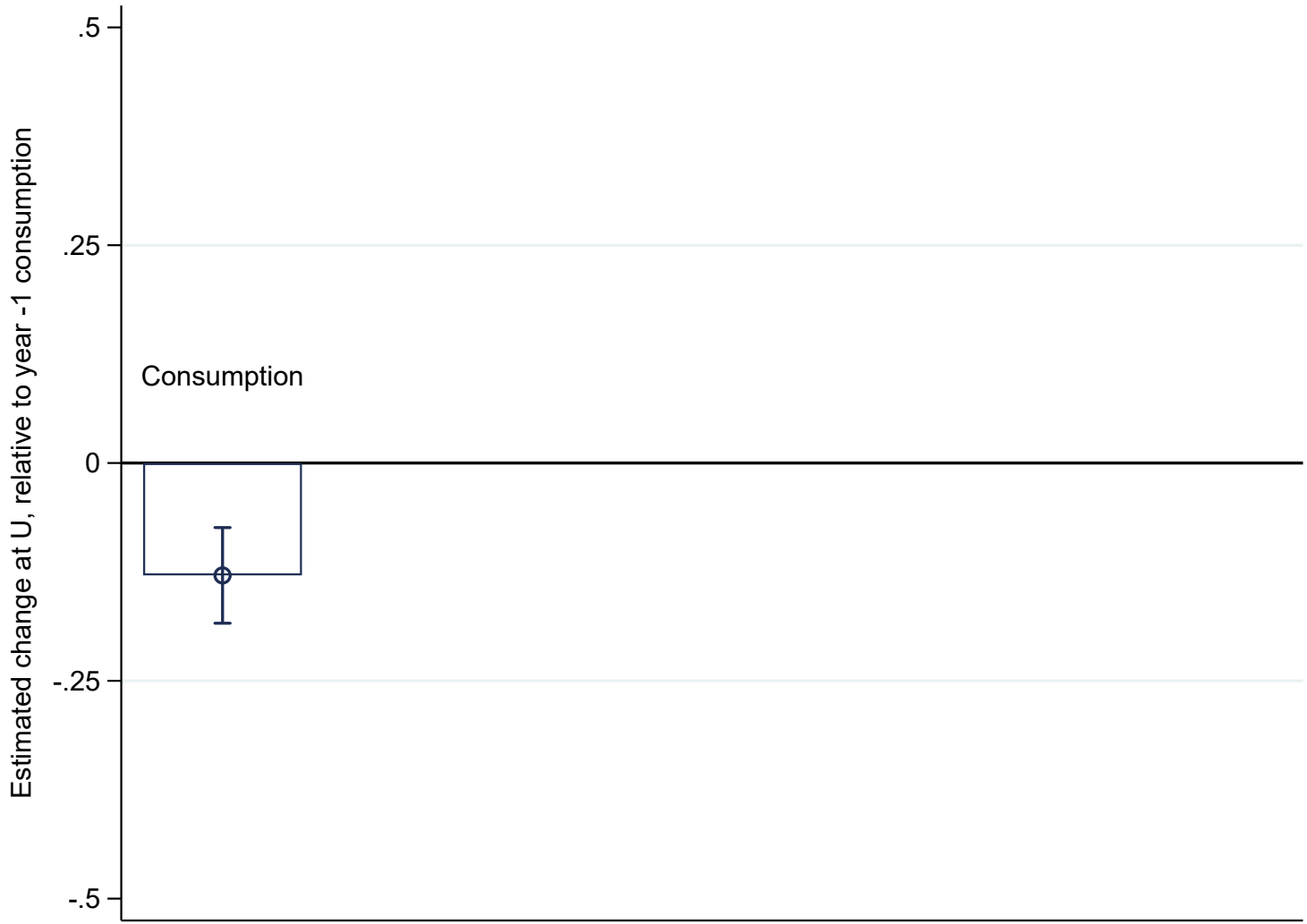
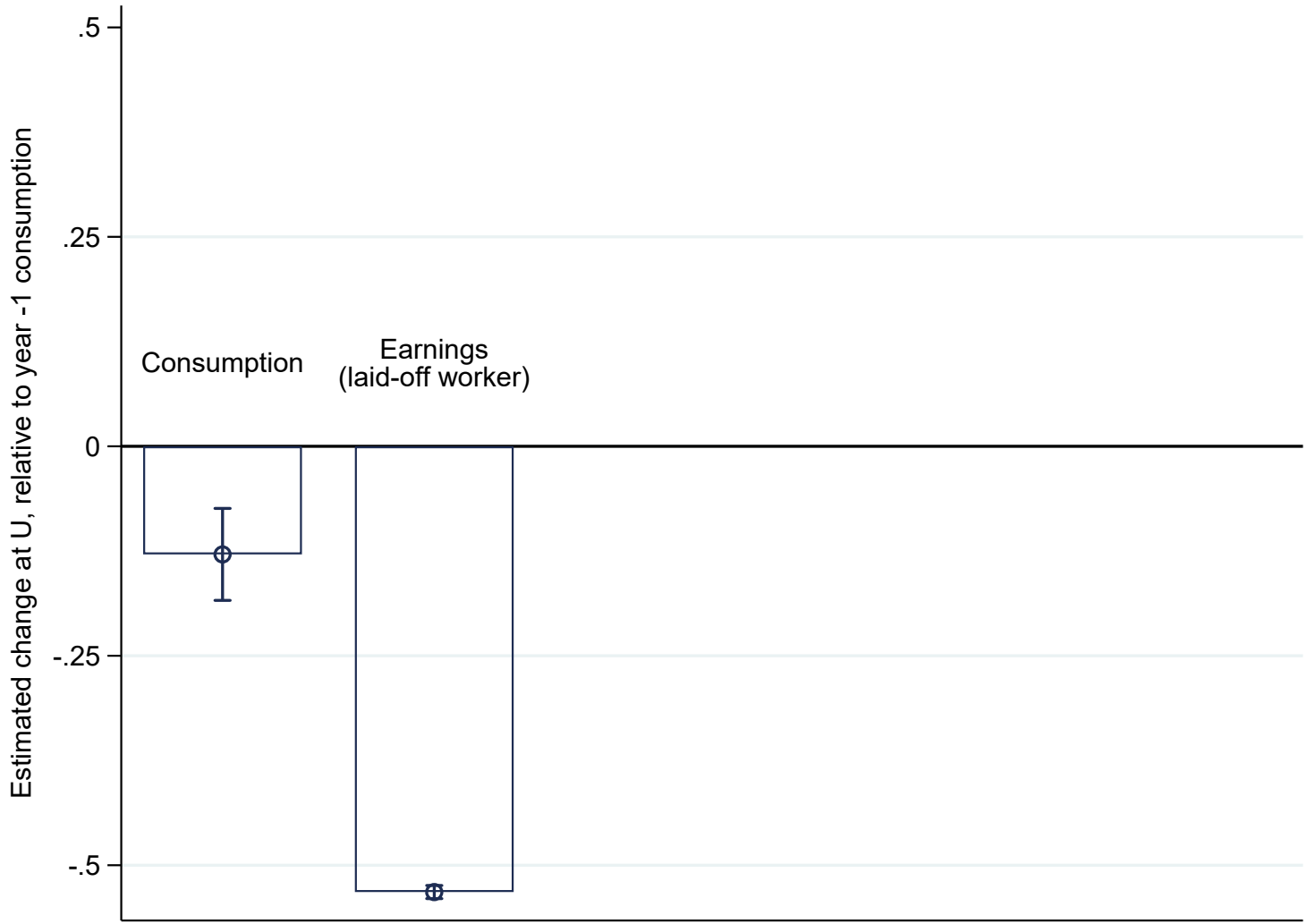


Decomposition of Cons. Responses: HH Consumption



Details

Decomposition of Cons. Responses: Labor Income



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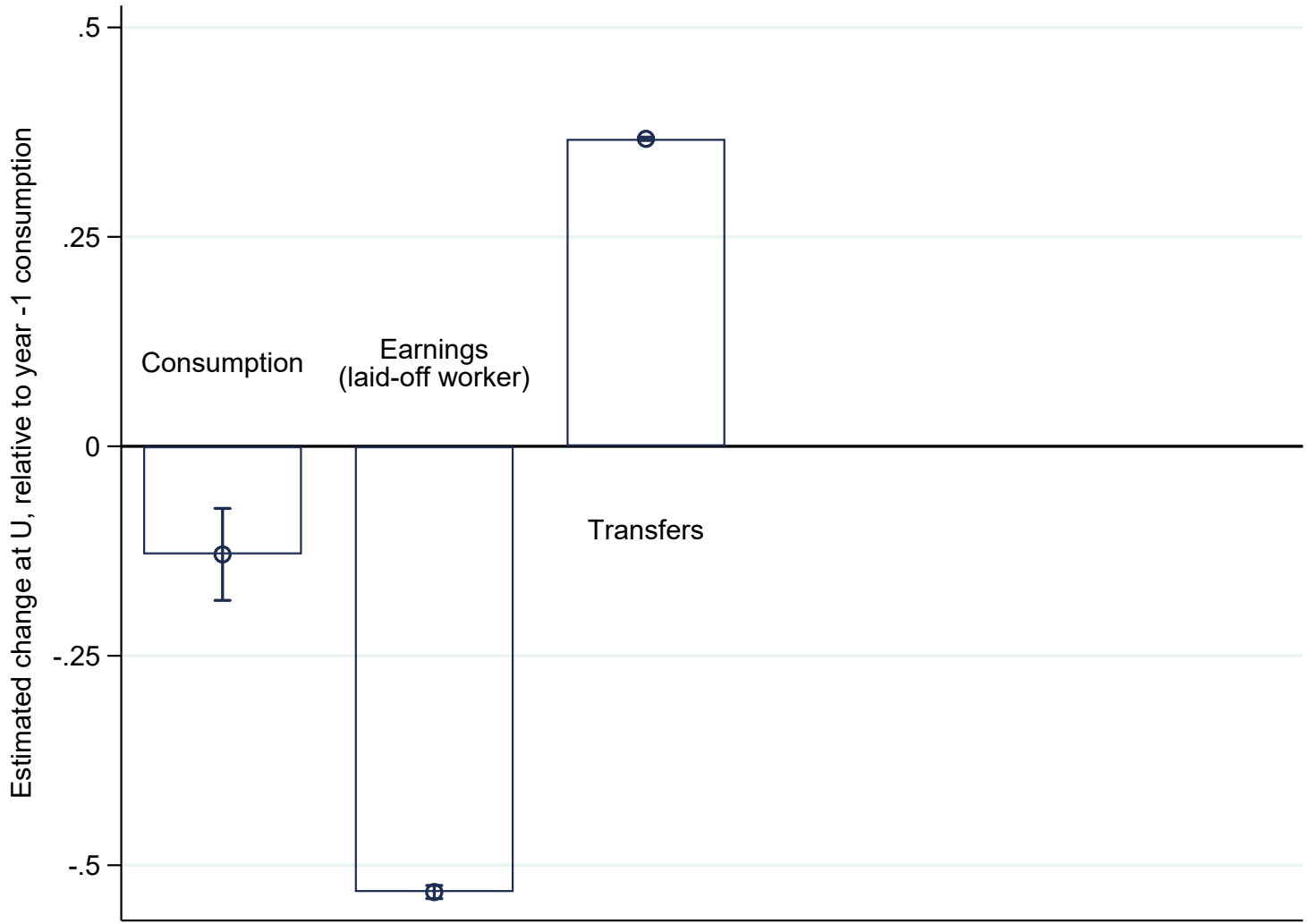
Decomposition of Cons. Responses: Transfers



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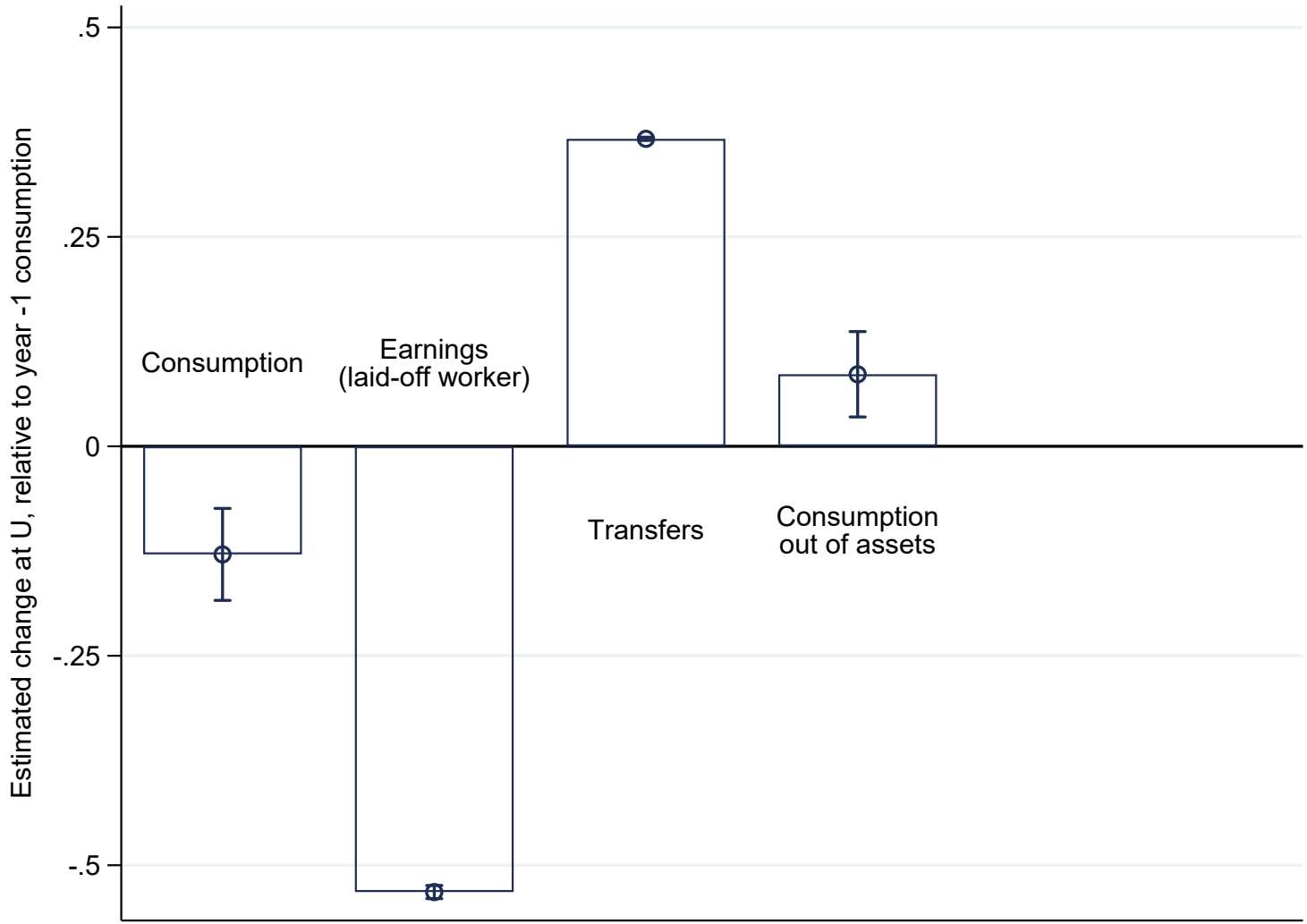
Decomposition of Cons. Responses: -Δ Assets



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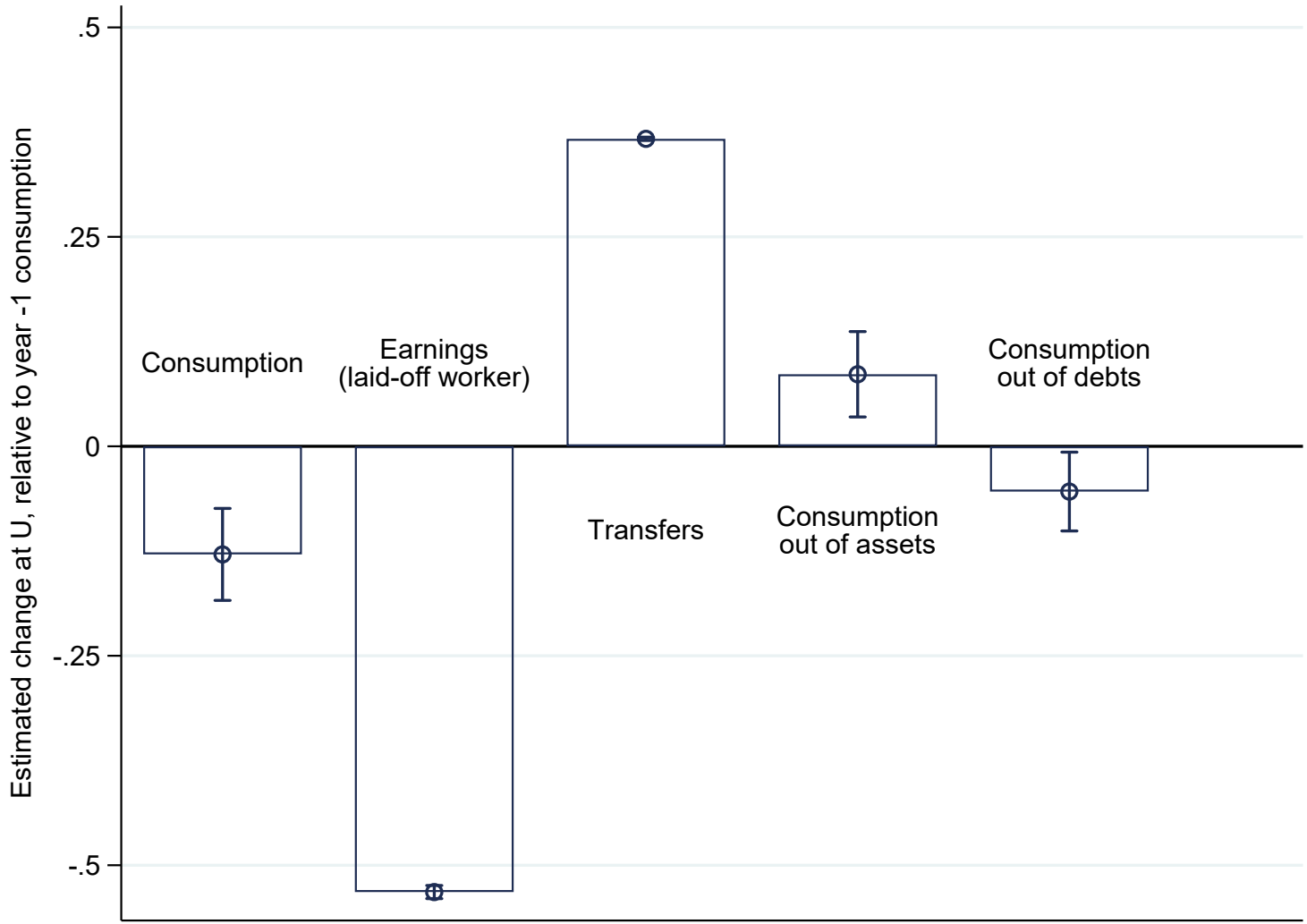
Decomposition of Cons. Responses: Δ Debt



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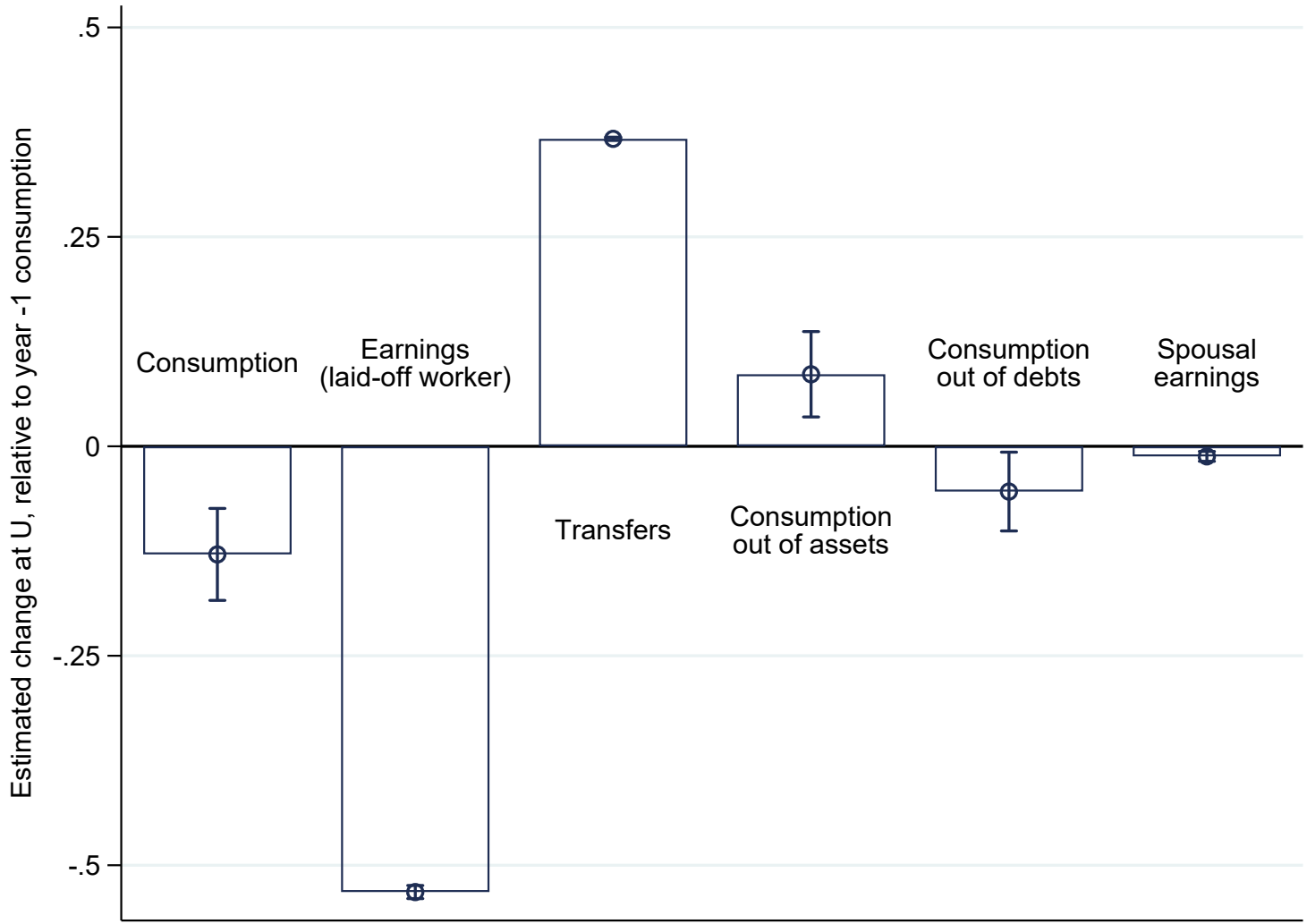
Decomposition of Cons. Responses: Spousal Earnings



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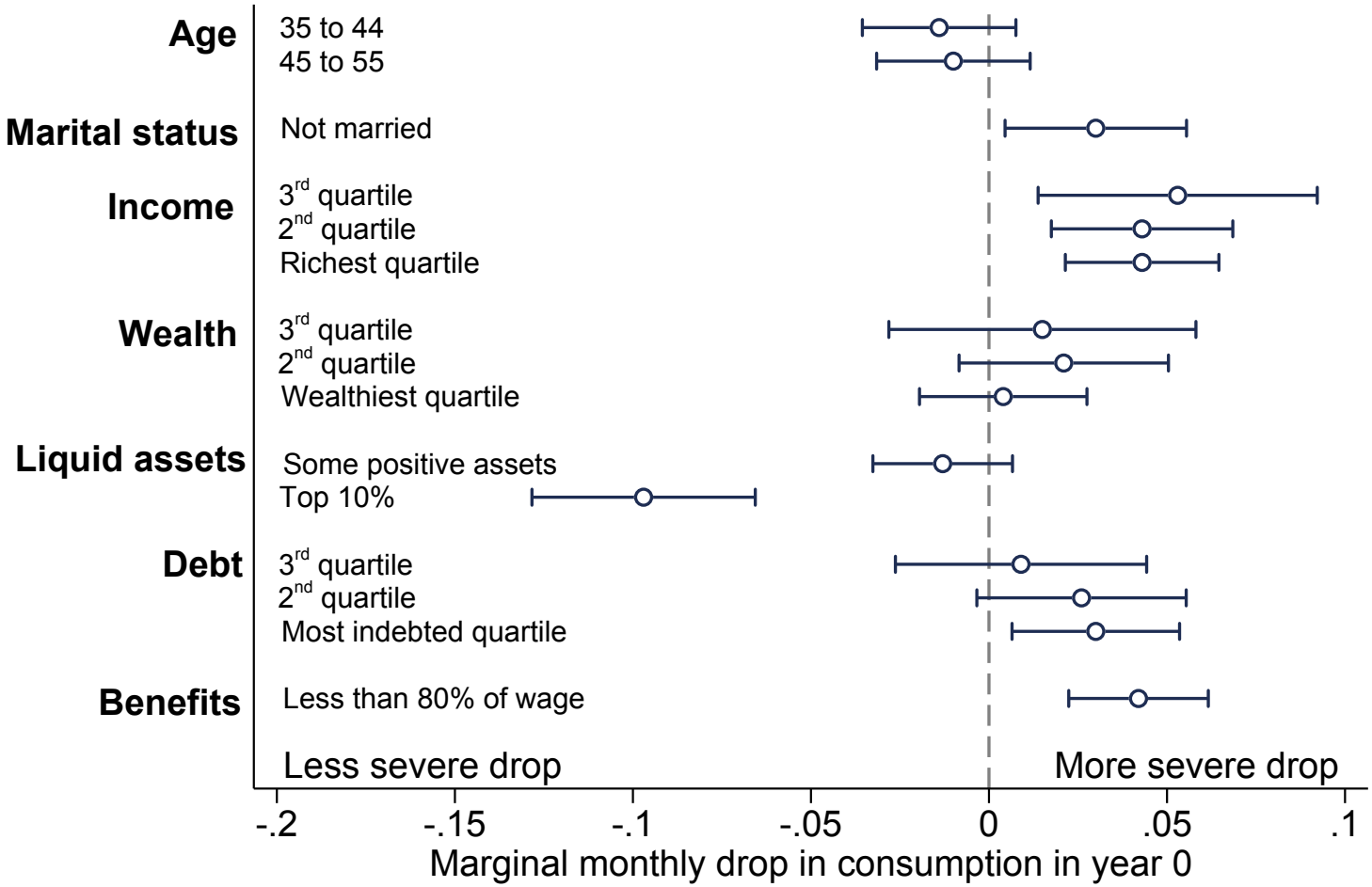
Heterogeneity in Consumption Responses



Details

CB Approach: Discussion and Challenges

Can we translate Δ consumption in Δ marginal utility?

- Consumption drops are endogenous:
  - Large ΔC relative to ΔY at displacement $\Rightarrow$ low γ? or high p_u/p_e?
  - Large ΔC for liquidity or debt-constrained $\Rightarrow$ high p_u/p_e?
- Other challenges:
  1. State-dependent Expenditures
  2. State dependent utility
  3. Anticipation (e.g. Hendren [2017, 2018])
  4. Heterogeneity (e.g. Andrews & Miller [2013])

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- Other challenges:
  1. State-dependent Expenditures

     Using consumption surveys, we find: Expenditure Categories
     - committed expenditures (e.g., rent) drop very little
     - durable good consumption (e.g., furniture) drops early on in the spell
     - employment-related, but also leisure expenditures drop substantially
     - increase in home production
  2. State dependent utility
  3. Anticipation (e.g. Hendren [2017, 2018])
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- Other challenges:
  1. State-dependent Expenditures
  2. State dependent utility
     - Complementarities btw C & L, reference-dependence, etc.

$$\frac{u_u'(c_u)}{u_e'(c_e)} \cong 1 + \gamma_e \times \frac{c_e - c_u}{c_e} + \theta$$

     - $\theta = \frac{u_u'(c_u) - u_e'(c_u)}{u_e'(c_e)}$
  3. Anticipation (e.g. Hendren [2017, 2018])
  4. Heterogeneity (e.g. Andrews & Miller [2013])

CB Approach: Discussion and Challenges

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- Other challenges:
  1. State-dependent Expenditures
  2. State dependent utility
  3. Anticipation (e.g. Hendren [2017, 2018])
     - Drop at U = drop conditional on U risk already revealed at U
     - Individuals who end up unemployed were also more risky
     - Anticipation reduces drop in C at U
     - **Solution:** Rescale changes in C at job loss by risk revealed
       Or rescale change in C before U by amount of risk revealed before U

Implementation

CB Approach: Discussion and Challenges

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- Consumption drops are endogenous:
  - Large ΔC relative to ΔY at displacement $\Rightarrow$ low γ? or high p_u/p_e?
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- Other challenges:
  1. State-dependent Expenditures
  2. State dependent utility
  3. Anticipation (e.g. Hendren [2017, 2018])
  4. Heterogeneity (e.g. Andrews & Miller [2013])
     - Heterogeneity in MRS important for policy design
     - Mapping btw heterogeneity in Δc & in MRS is tricky!
     - Need to account for $Cov(\gamma, \Delta c)$

Approach II: State-Specific MPC's

MPC approach

Under 'regularity conditions', MRS is bounded by:

$$\frac{u'_u(c_u)}{u'_e(c_e)} \geq \frac{MPC_u/(1-MPC_u)}{MPC_e/(1-MPC_e)}$$

with $MPC_s \equiv dc_s/dy_s$.

- **Idea:** smoothing behavior depends on state-specific price of increasing consumption, p_s:

$$\frac{u'_u(c_u)}{u'_e(c_e)} = \frac{p_u}{p_e} \times \frac{v'_u(x_u)}{v'_e(x_e)}$$

  - In 'standard' models: $\frac{v'_u(x_u)}{v'_e(x_e)} \geq 1 \Rightarrow \frac{u'_u(c_u)}{u'_e(c_e)} \geq \frac{p_u}{p_e}$

- **Challenge:** what is p_u/p_e? what is binding margin of adjustment?

Approach II: State-specific MPC's (cont'd)

- **Solution:** state-specific MPC_s reveals state-specific price p_s
  - MPC is higher when price of increasing consumption is higher

$$\frac{dc_s}{dy_s} = \frac{p_s \times \frac{\sigma_s^x}{\sigma_s^c}}{1 + p_s \times \frac{\sigma_s^x}{\sigma_s^c}}$$

  - Mitigated by curvature over consumption c vs. used resource x
- **'Trick':** rescaling of MPC_u vs. MPC_e
  - Takes out impact of relative curvature (e.g., CARA prefs)
  - Overcomes challenges to CB approach (e.g., work exps, home prodn)
- Builds on 'optimization approaches':
  - See Chetty 2008, Landais 2015, Hendren 2017
  - Choices (e.g., spousal labor, precautionary savings) reveal value of UI...
  - ... but requires the studied margin of adjustment to be binding

Further Details

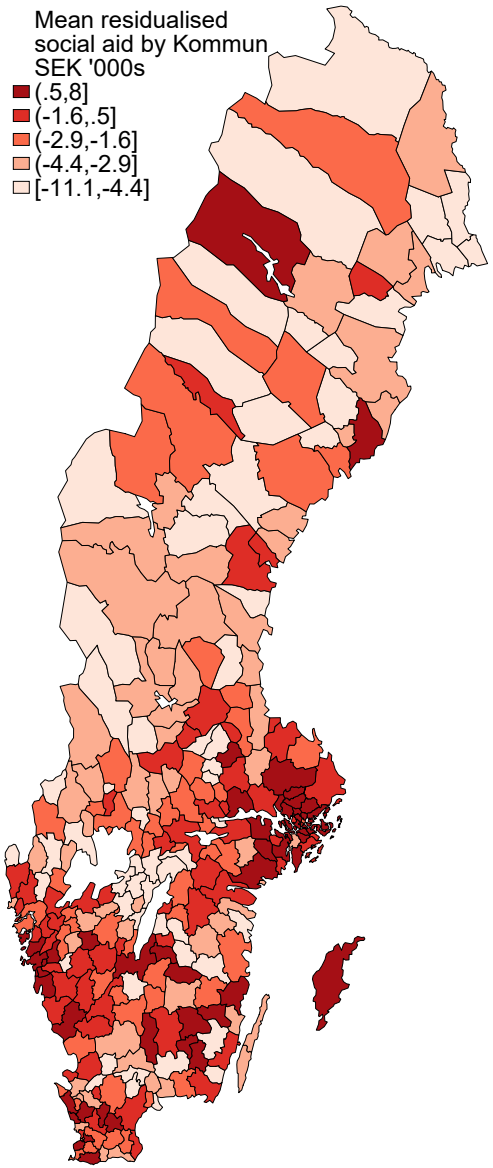
MPC: Variation in Local Transfers

- **Challenge:** need comparable exogenous variation in income when employed vs. unemployed
- Use variation in local transfers
  - Local transfers = large fraction of HH transfers
    - Means-tested/categorical transfers, housing benefits, ...
    - Regulated at national level, large discretion at municipality level
  - Large variation across municipalities / over time / across HH types Examples
    - Use interaction of sources of transfer variation in FD approach

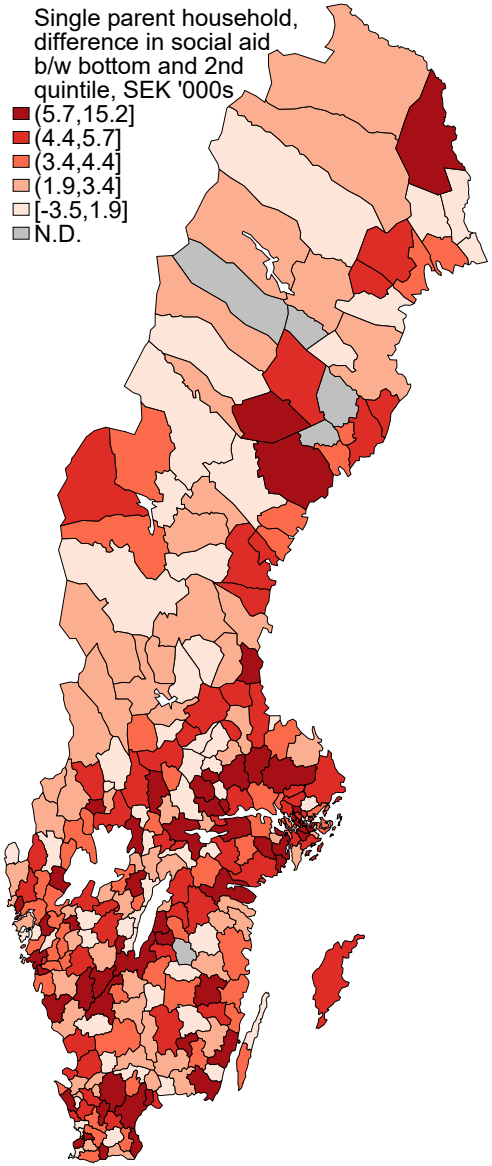
$$C_{ijt} = \alpha_i + \eta_j + \delta_t + \gamma h_{ijt} + X'_{it}\beta$$

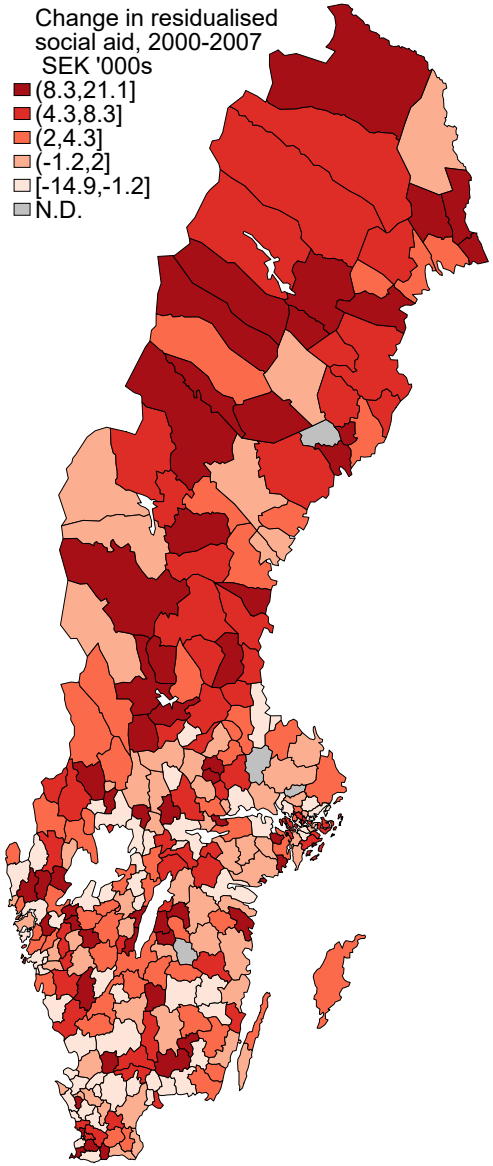
    - X: rich vector of characteristics determining transfers Details
- Estimate on sample of individuals who become unemployed
  - Compare them when employed vs unemployed

Variation in Local Transfers:

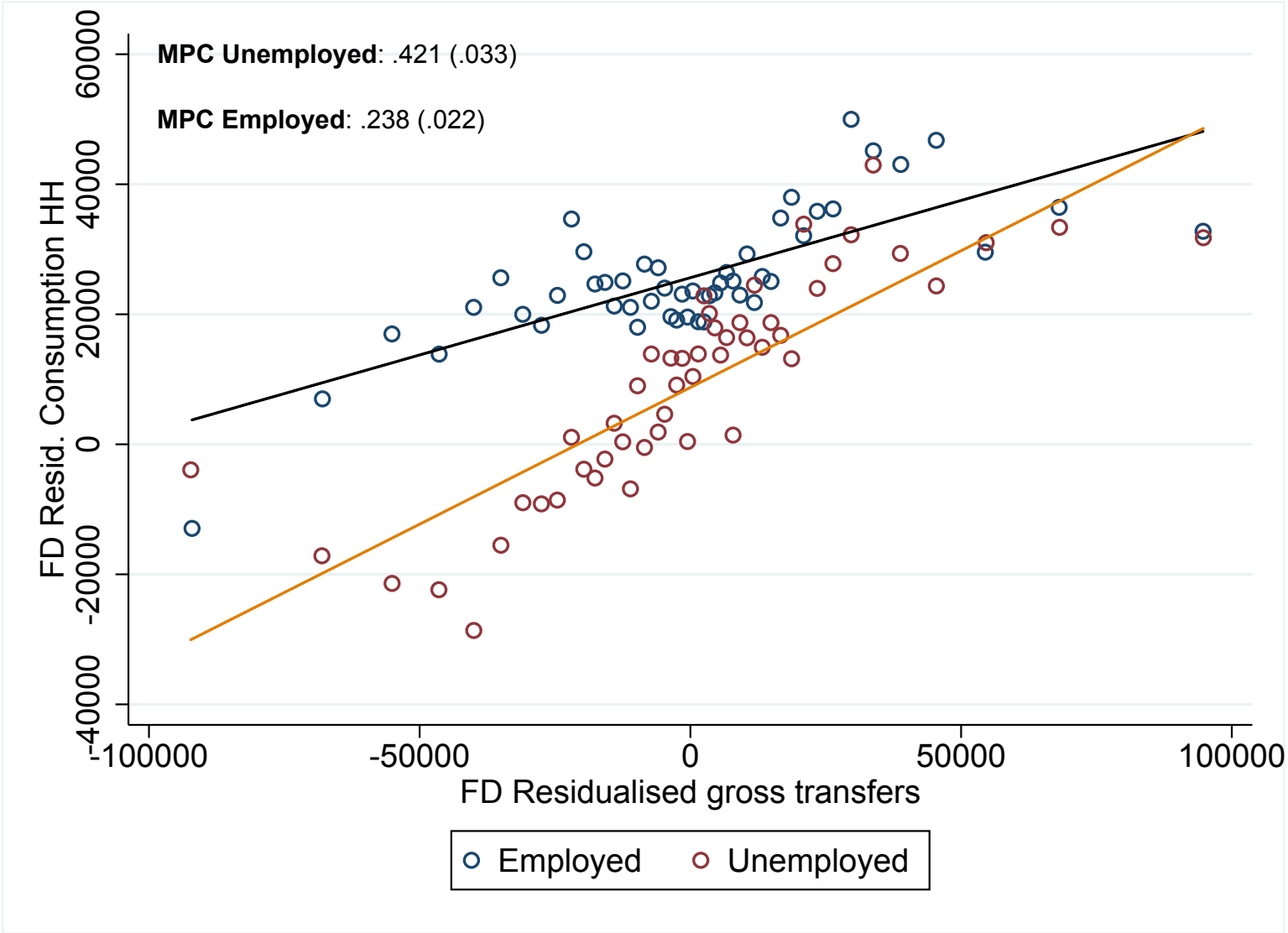


Variation in Local Transfers:



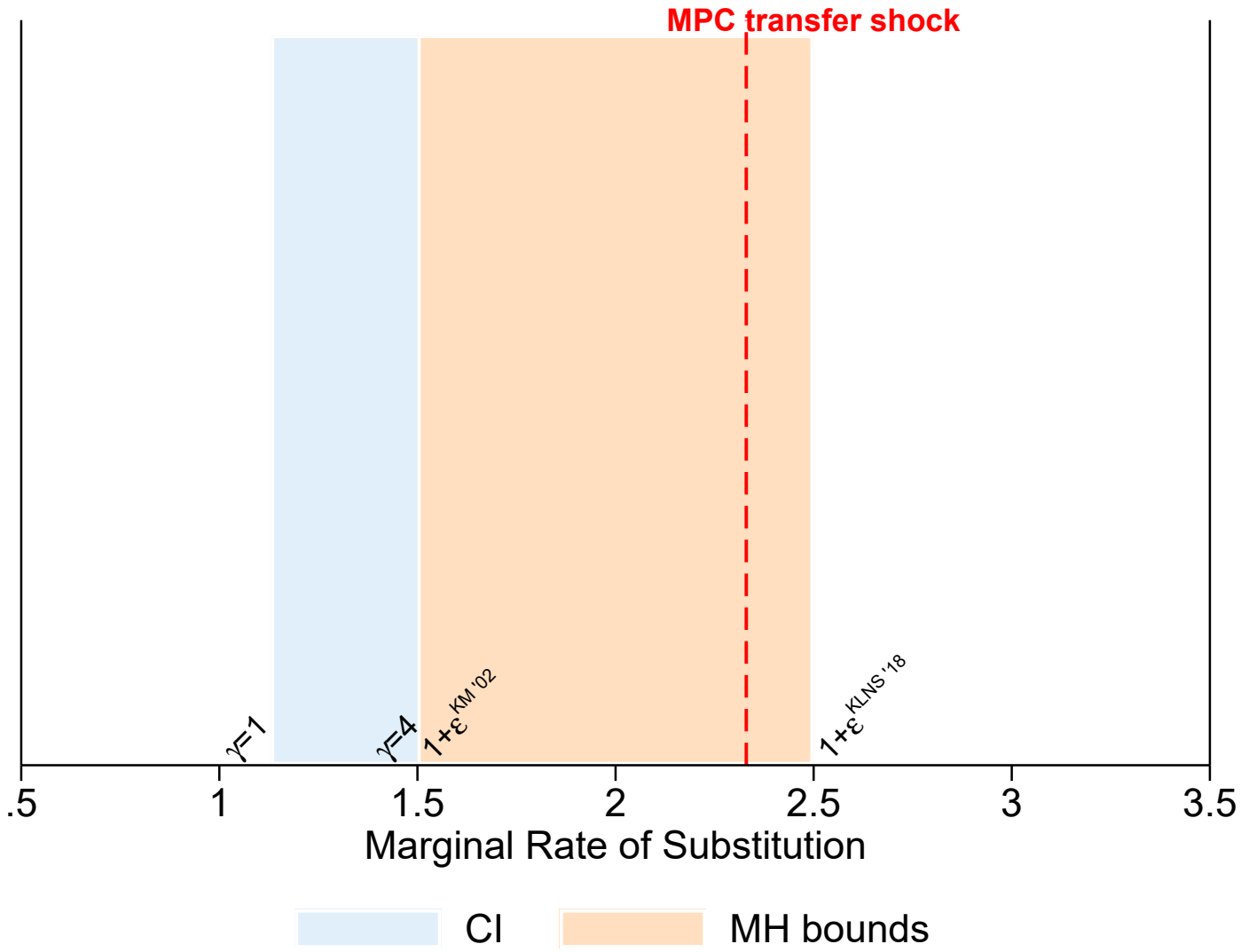


MPC: Transfer



Additional Evidence - UI benefit kink
Additional Evidence - K income shock

Estimates of MRS: CB vs. MPCs



Approach III: Revealed Preference Approach

RP approach

When offered insurance, choice reveals MRS given *expected* price per unit of coverage:

$$\frac{u'_u(c_u)}{u'_e(c_e)} \gtrless \frac{p_u}{p_e} \times \frac{[1-\pi]}{\pi}$$

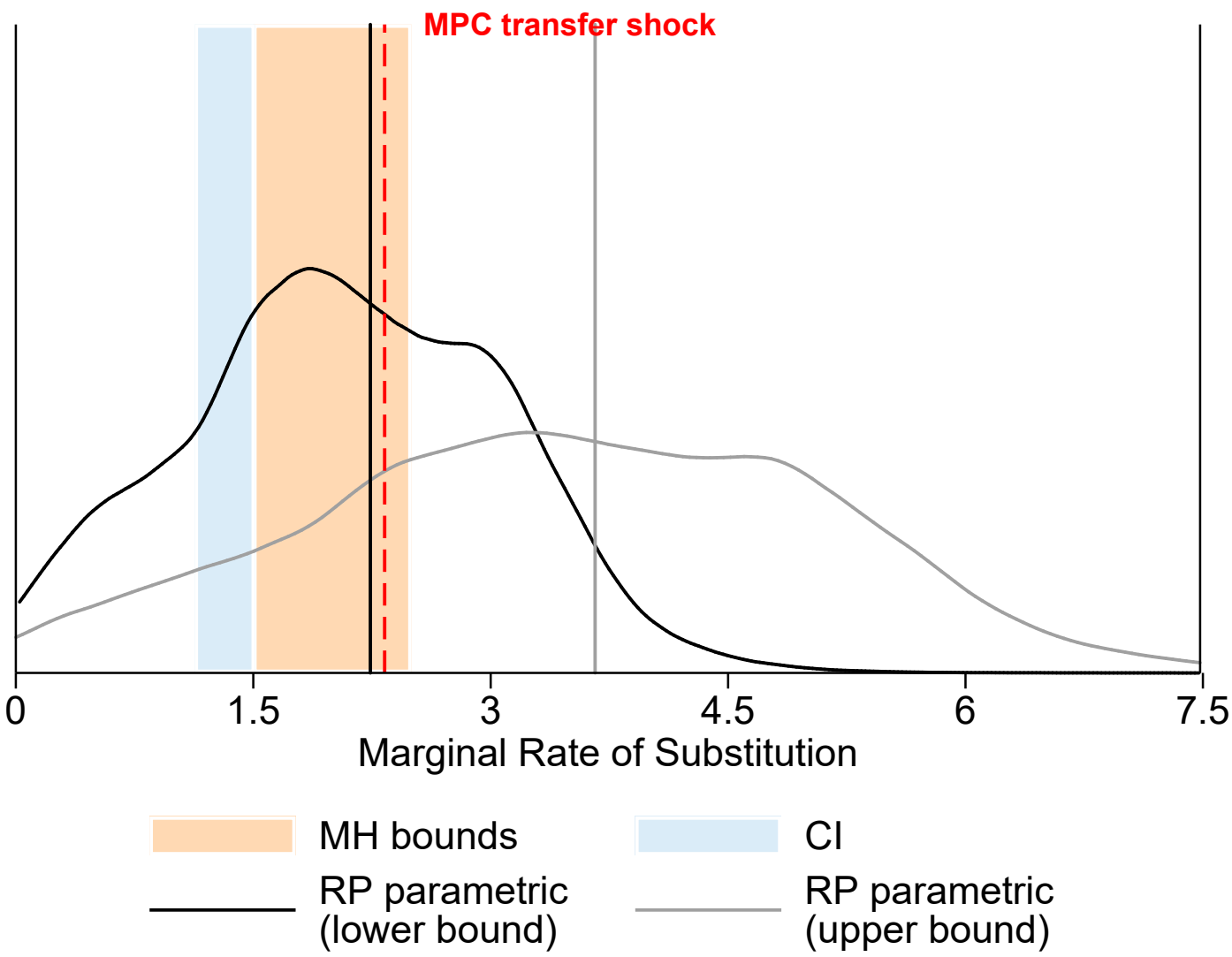
- Most direct approach?
  - When prices are known, could infer value from insurance choice
  - But ex-ante choice: need to account for unemployment risk π!
- Challenges:
  1. Requires data on choices and unemployment risk
  2. Need variation in 'expected' price to tighten bounds
  3. Tackle potential choice frictions: e.g., risk misperception, inertia

RP Approach: Implementation

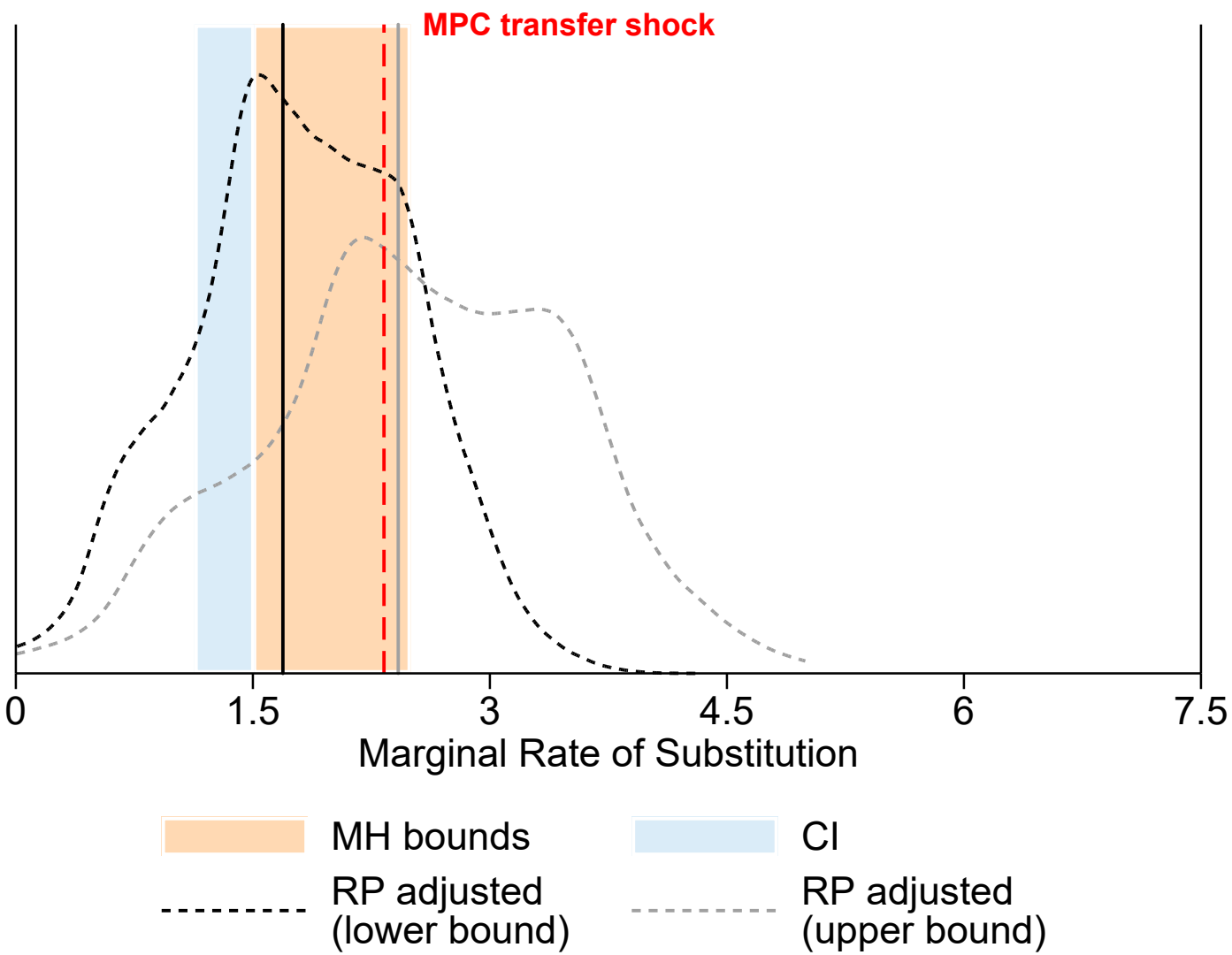
- Swedish Context:
  - Basic plan (b_0, τ_0) vs comprehensive plan (b_1, τ_1)
  - Expected price $E[P] = \frac{[1-\pi_i]\times[\tau_1-\tau_0]}{\pi_i\times[b_1-b_0]}$
- Use non-parametric approach to put bounds on MRS Example
- Use parametric approach to estimate MRS distribution:
  - Estimate random effect logit model:
    - 'insured' if $\underbrace{\text{MRS}}_{\alpha_i+X'\beta} - E[P]_{it} + \varepsilon_{it} \geq 0$
    - X: vector of observables affecting MRS (age, education, income, etc.)
  - Predict unemployment risk π_i based on $X + Z$:
    - Z: risk shifters ($\perp X$) (relative tenure rank, layoff notifications)
    - account for MH: estimate separately on 'insured' and 'uninsured'
    - account for frictions: (i) salient risk shifters, (ii) elicited beliefs

▸ Predicted Risk Model ▸ Moral Hazard ▸ Frictions

RP Parametric: MRS distributions



Adjusted RP Parametric: MRS distributions



Conclusion

- Revisited consumption-implementation using registry-based measure
  - find 'small' consumption drops which translate in low value of UI for standard preferences
  - limited consumption smoothing beyond (generous) social transfers
- Alternative approaches suggest high mean and variance in the value of UI
  - high mean: generous UI is desirable
  - high variance: allow for choice or differentiate UI policy
  - need caution when using CB approach to guide policy
- State-specific MPCs seem robust alternative to CB approach & extendible to other social insurance settings when no choice is available

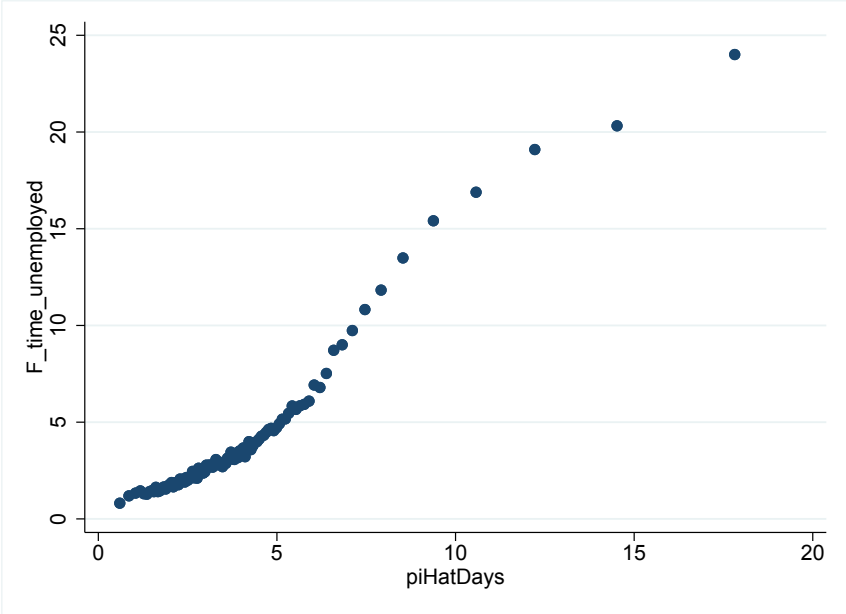
DETAILS

Predicted risk model: Specification

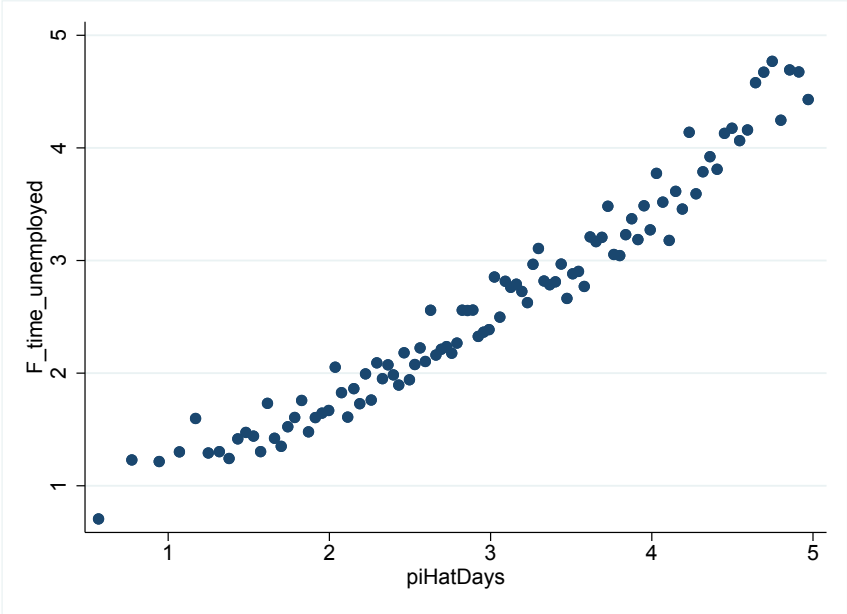
- Using a **Zero-Inflated Poisson** model to predict the number of days unemployed in $t+1$.
  - **Logit** part of the model predicts excess zeroes using layoff history (layoff dummies in $t-1$ and $t-2$), notifications (in t, $t-1$ and $t-2$), average firm layoff probability by year, union membership, individual's tenure in firm, tenure$\times$notification, firm layoff probability$\times$tenure, year$\times$industry fixed effects and firm size.
  - **Poisson count** part of the model predicts length of unemployment spell based on income history (ln(income) in t, $t-1$ and $t-2$), family type, age bins, gender, education level, region of residence and industry of activity in t

▸ Back

Predicted risk model: Fit



Less than 20 days



Less than 5 days

▸ Back

Registry-based Measure of Consumption

- Simple idea: consumption as a residual expenditure measure,

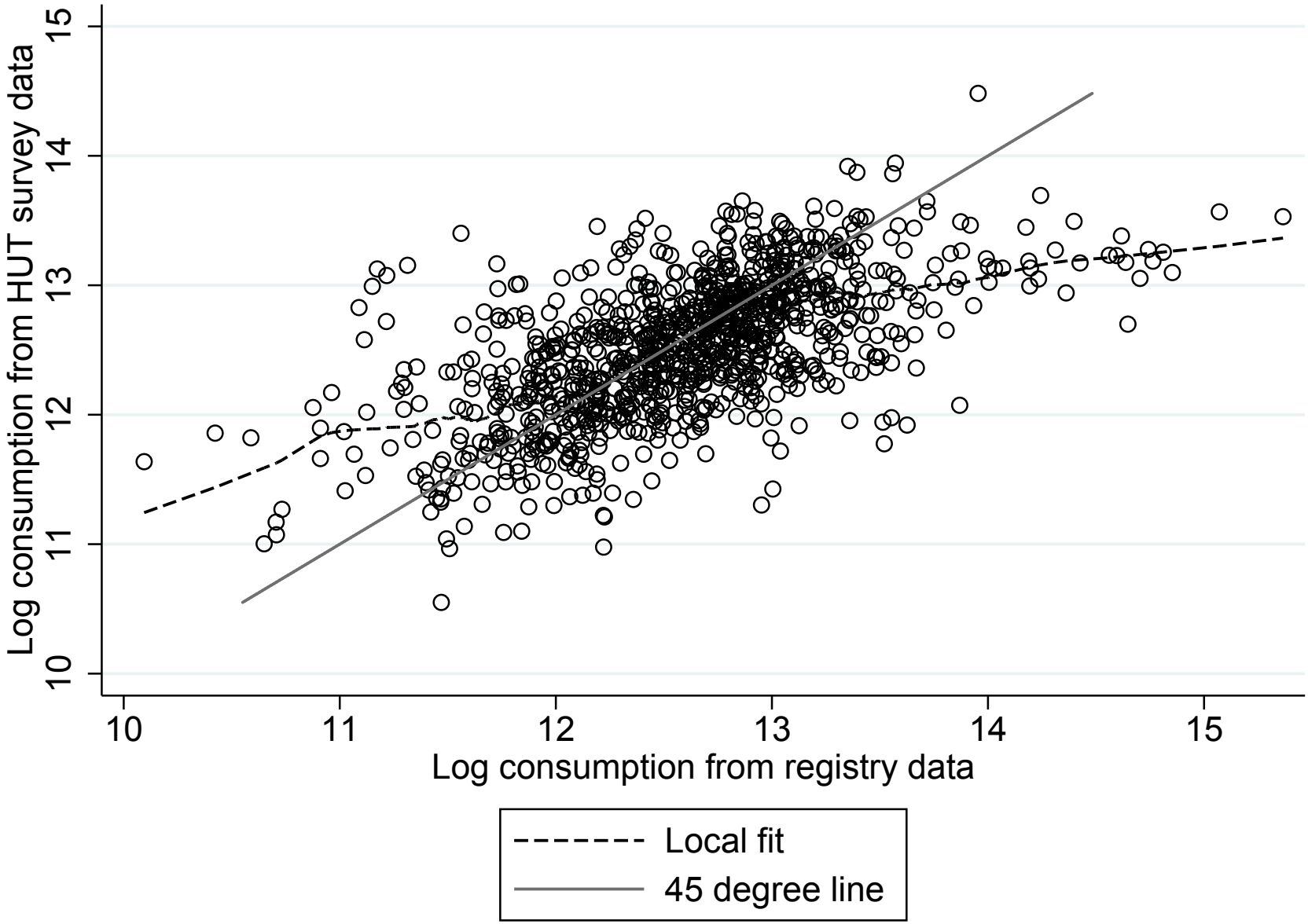
$$consumption_t = income_t - \Delta assets_t$$

- We use admin data (from tax registers) on earnings y, transfers T, bank savings b, outstanding debt d, other financial assets v and real assets h.
  - Account for returns from assets and changes in stock value ▸ Details
  - Majority starts unemployment with **no financial nor real assets** ▸ Table

- We construct annual household consumption C for panel of Swedish workers and analyze how it evolves around job loss using event-study ▸ Details

- Note that we check consistency with consumption survey data

Consistency with survey data



Consumption Equation

$$c_t = y_t + T_t + \tilde{c}_t^b + \tilde{c}_t^d + \tilde{c}_t^v + \tilde{c}_t^h$$

- Bank savings: $\tilde{c}_t^b = y_t^b - \Delta b_t$
  - y_t^b : earned interests ; Δb_t : change in bank savings
- Debt: $\tilde{c}_t^d = -y_t^d + \Delta d_t$
  - y_t^d : paid interests ; Δd_t : change in debt
- Other financial assets: $\tilde{c}_t^v = y_t^v - \Delta v_t$
  - y_t^v : interests, dividends, price change $\Delta p_t^v \times q_{t-1}^v$
  - Δv_t : change in stock value $p_t^v q_t^v - p_{t-1}^v q_{t-1}^v$
- Real assets: $\tilde{c}_t^h = y_t^h - \Delta h_t$
  - y_t^h : rent, imputed rent, price change
  - Δh_t : change in stock value

Back

Identifying Dynamic Consumption Responses to U

- Event Study Methodology:

$$Y_{it} = \alpha_i + \nu_t + \sum_{j=-N_0}^{N_1} \beta_j \cdot \mathbb{1}[J_{it} = j] + \varepsilon_{it} \tag{1}$$

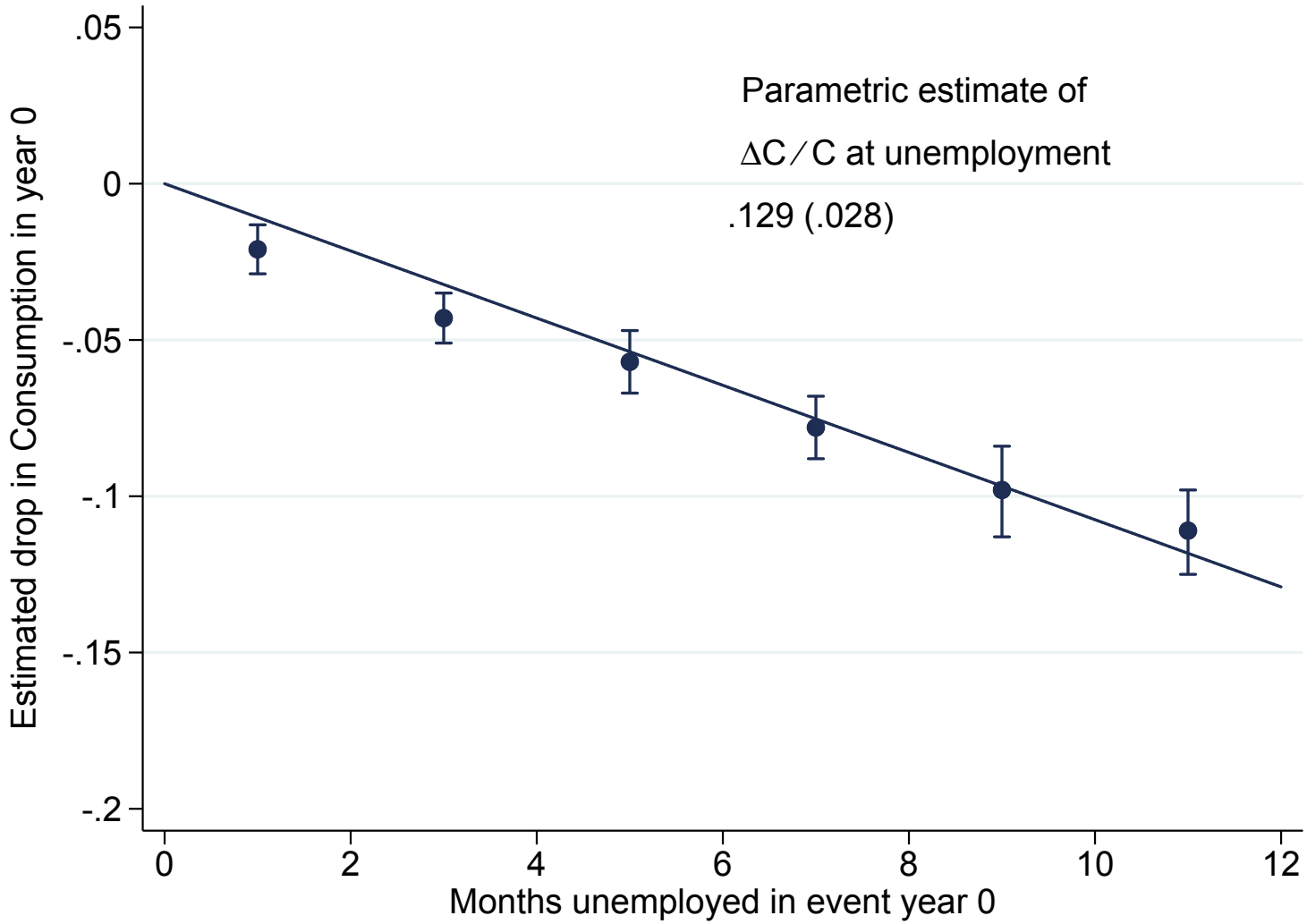
  - $[-N_0; N_1]$: window of dynamics effects
  - $J_{it} = t - E_{it}$: event time
- Potential concern: only identifies β_j up to a trend (cf. Borusyak & Jaravel [2017])
- Solution: control group to fully identify ν_t
  - NN matching based on pre-characteristics

Back

From Annual to Flow Drops in Consumption

- How to re-cover consumption wedge from yearly aggregates mixing employment and unemployment consumption, c_e and c_u?
- Focus on spells ongoing in December, and compute drop by time spent unemployed during the year

From Annual to Flow Drops in Consumption



From Annual to Flow Drops in Consumption

- How to re-cover consumption wedge from yearly aggregates mixing employment and unemployment consumption, c_e and c_u?
- Focus on spells ongoing in December, and compute drop by time spent unemployed during the year
- Parametric approach nicely fits the non-parametric estimates

$$\frac{c_e - c_u}{c_e} = \frac{12}{N} \cdot \frac{\Delta C}{C} = .129(.028)$$

- Fully non-parametric approach gives similar results (KLNS [2018])
- Similar estimates (but 10 times less precise!) using consumption surveys (KLNS [2018])

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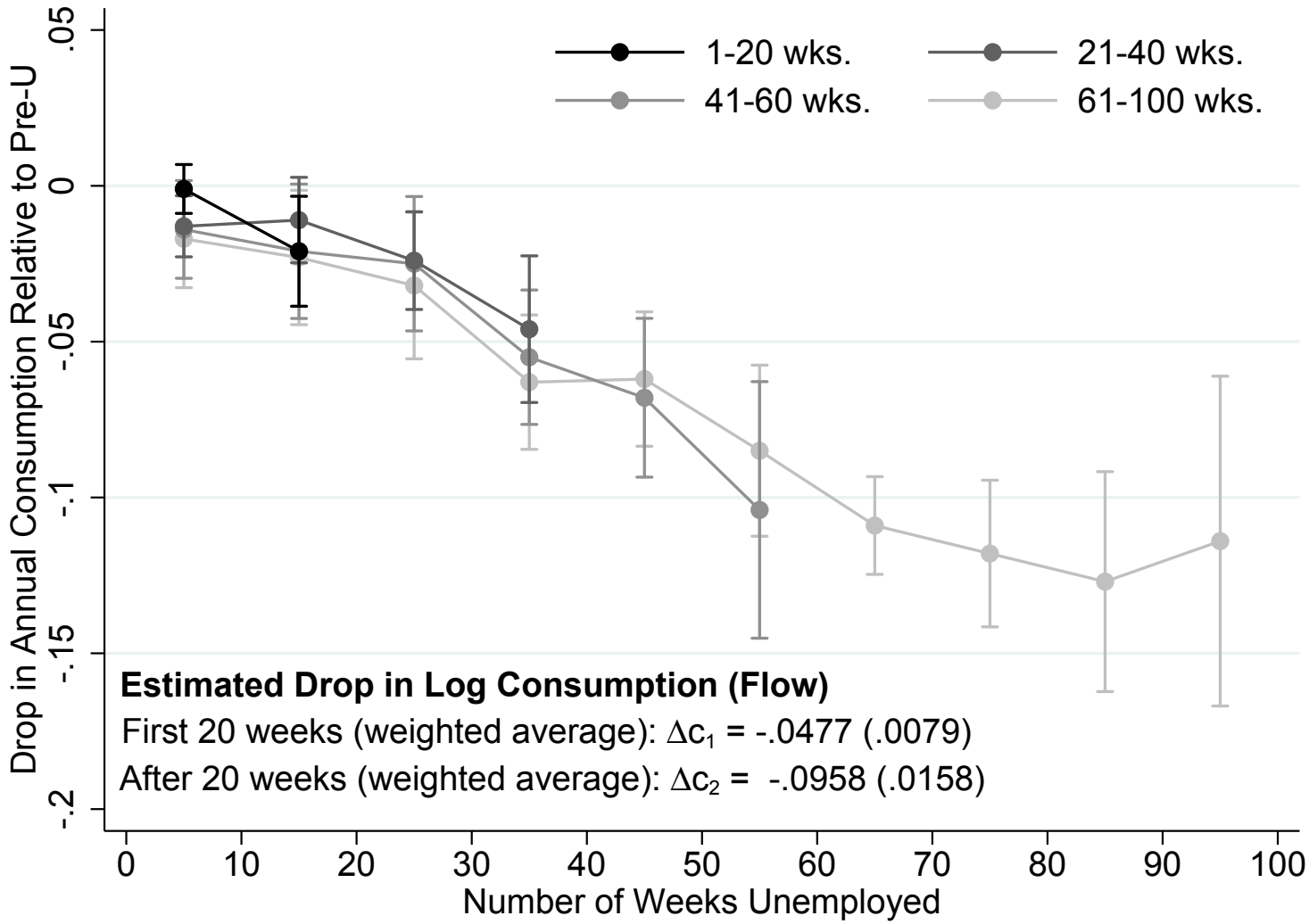
From Annual to Flow Drops in Consumption: Selection



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Event Study: Treated vs. NN

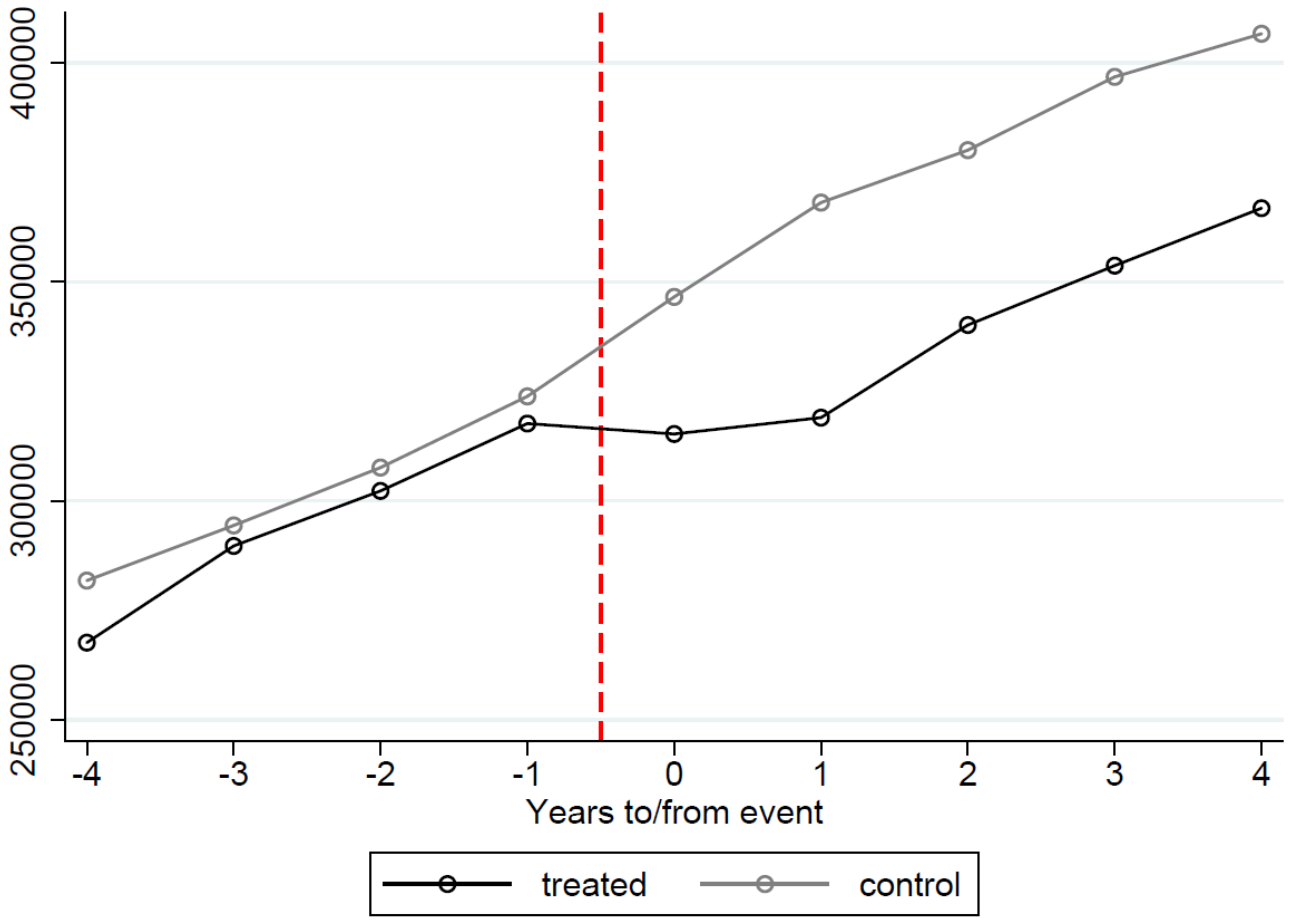

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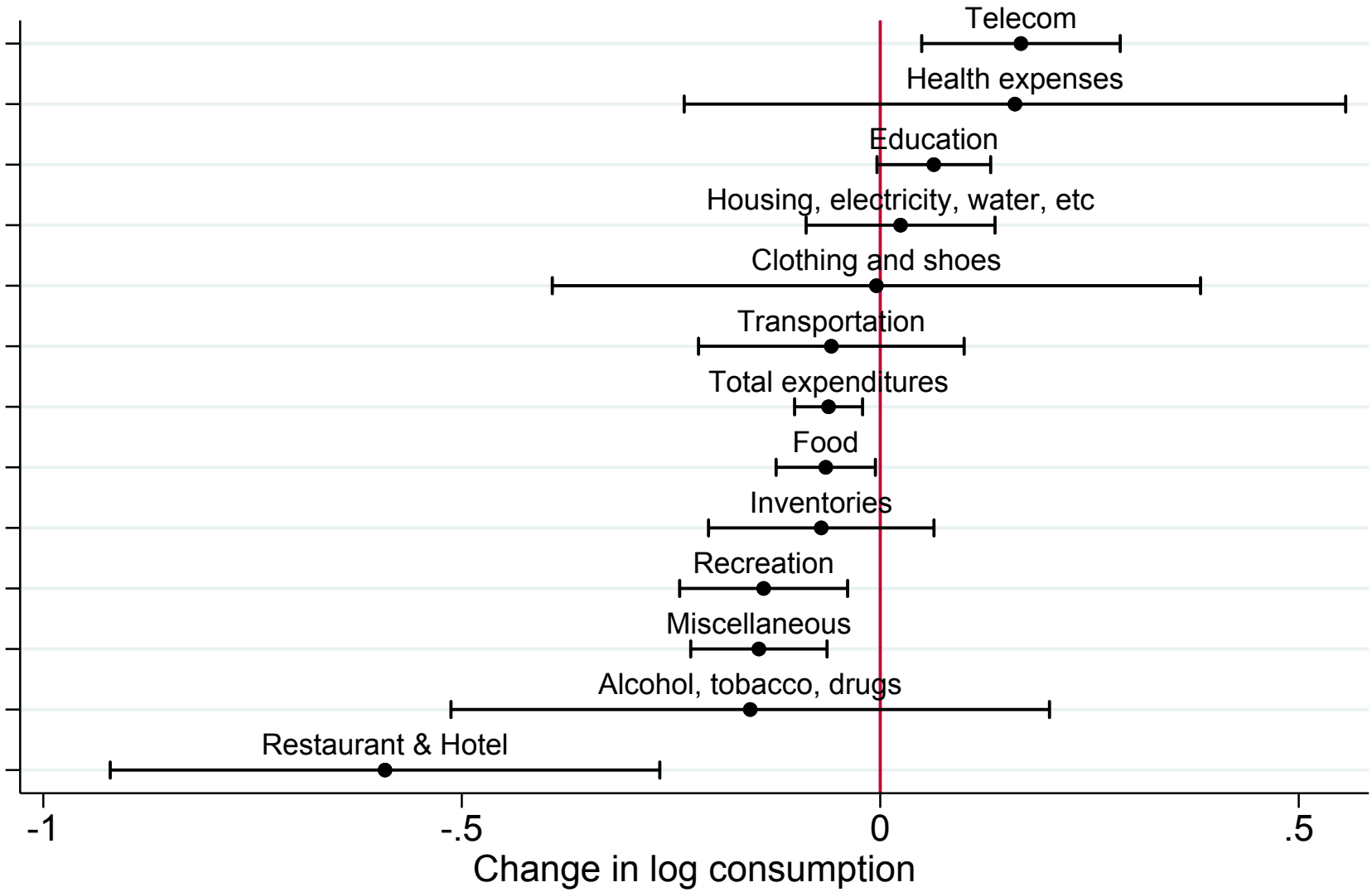
Table: Summary statistics pre-unemployment - 2003KSEK

	Mean	P25	P50	P75	P90
Gross earnings	151	43	134	229	296
Capital Income	0	0	0	.2	2.5
Disposable Income	148	91	140	186	236
Net worth (A+B-C)	162	-52	0	124	617
% of disp. income	110	-39	0	123	420
Financial assets (A)	75	0	4	48	170
% of disp. income	65	0	4	47	162
Bank holdings	27	0	0	12	63
% of disp. income	20	0	0	8	49
Mutual funds	25	0	0	10	55
% of disp. income	27	0	0	9	65
Stocks	14	0	0	0	8
% of disp. income	9	0	0	0	6
Real Estate (B)	267	0	0	267	888
% of disp. income	178	0	0	159	511
Debt (C)	181	0	50	236	519
% of disp. income	132	0	37	161	326

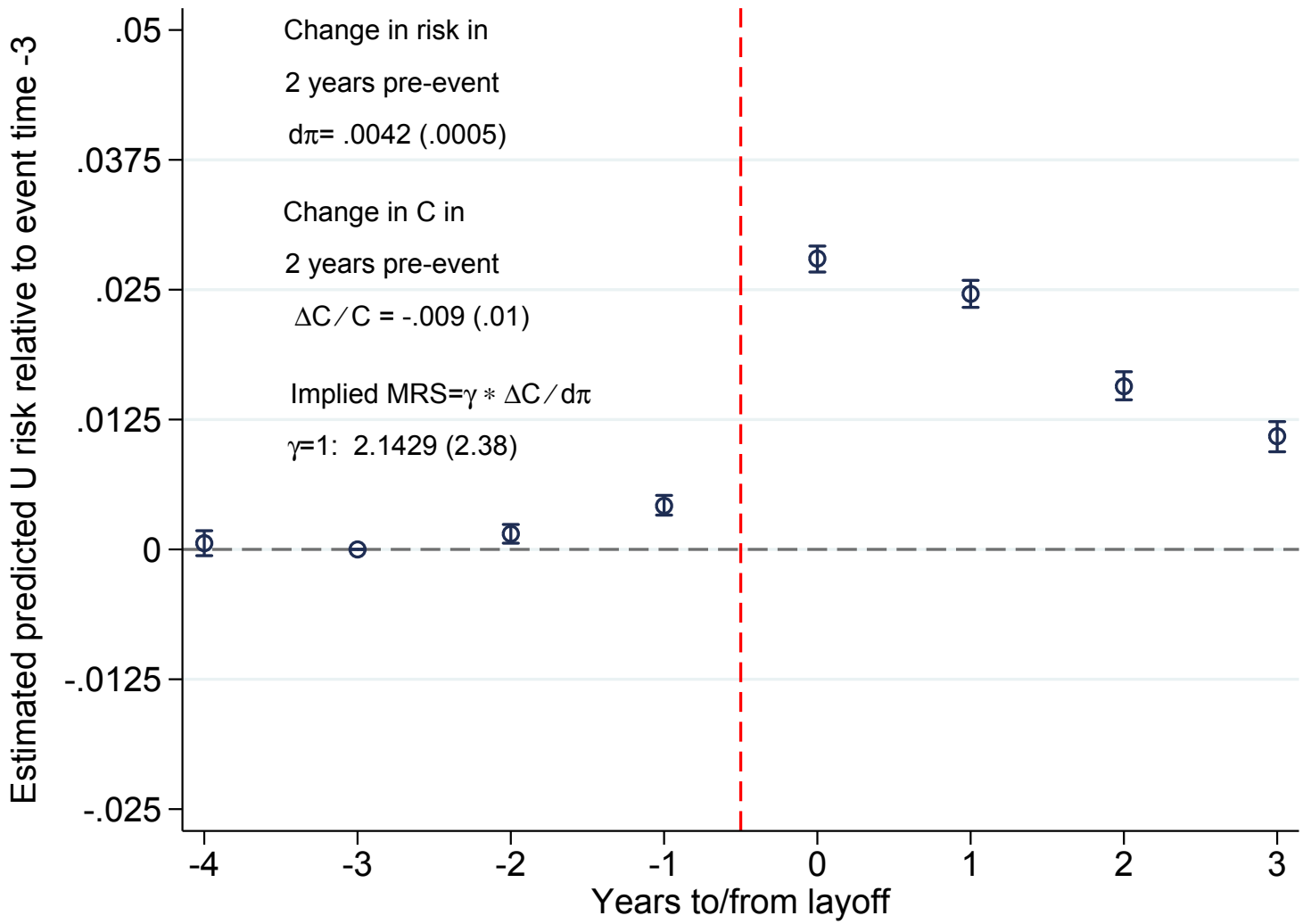
Notes: From Kolsrud et al. (2016): sample of individuals observed in December of year t starting unemployment spell in first 6

Consumption surveys: estimated expenditure drops



Note: The graph shows estimates and CIs of DiD coefficients, in regressions with HH-level controls.
Log expenditure is averaged pre [-3, -2, -1] and post-event [0, 1, 2, 3]
Control households are created via p-score matching

Anticipation: Predicted Risk Over Event Time



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MPC: Transfer

- Residualise transfers wrt rich vector X:
  - Age, Year, Gender, Education, Family type, # HH members dummies
  - HH level: decile dummies of: net wealth + lag, labour income (ForvInk), lag of disposable income, FKURTA (debt), real estate wealth + lag, capital income
  - Dummies for municipality of residence j
  - Dummy for no of earners in HH (1 earner or more than 1 earner)
- First-difference model:

$$\Delta C_{ijt} = \gamma_E \Delta h_{ijt} \cdot \mathbf{1}[E = 1] + \gamma_U \Delta h_{ijt} \cdot \mathbf{1}[U = 1] + \Delta X'_{ijt} \beta$$

- Exploit both variation across municipalities over time, and within municipality across individuals over time
- IV:
  - Instrument FD T_{ijt} by FD residualized $h_i jt$
  - Ideally: grouping instrument (FD of average local transfers $h_i jt$ in bin of Xs)

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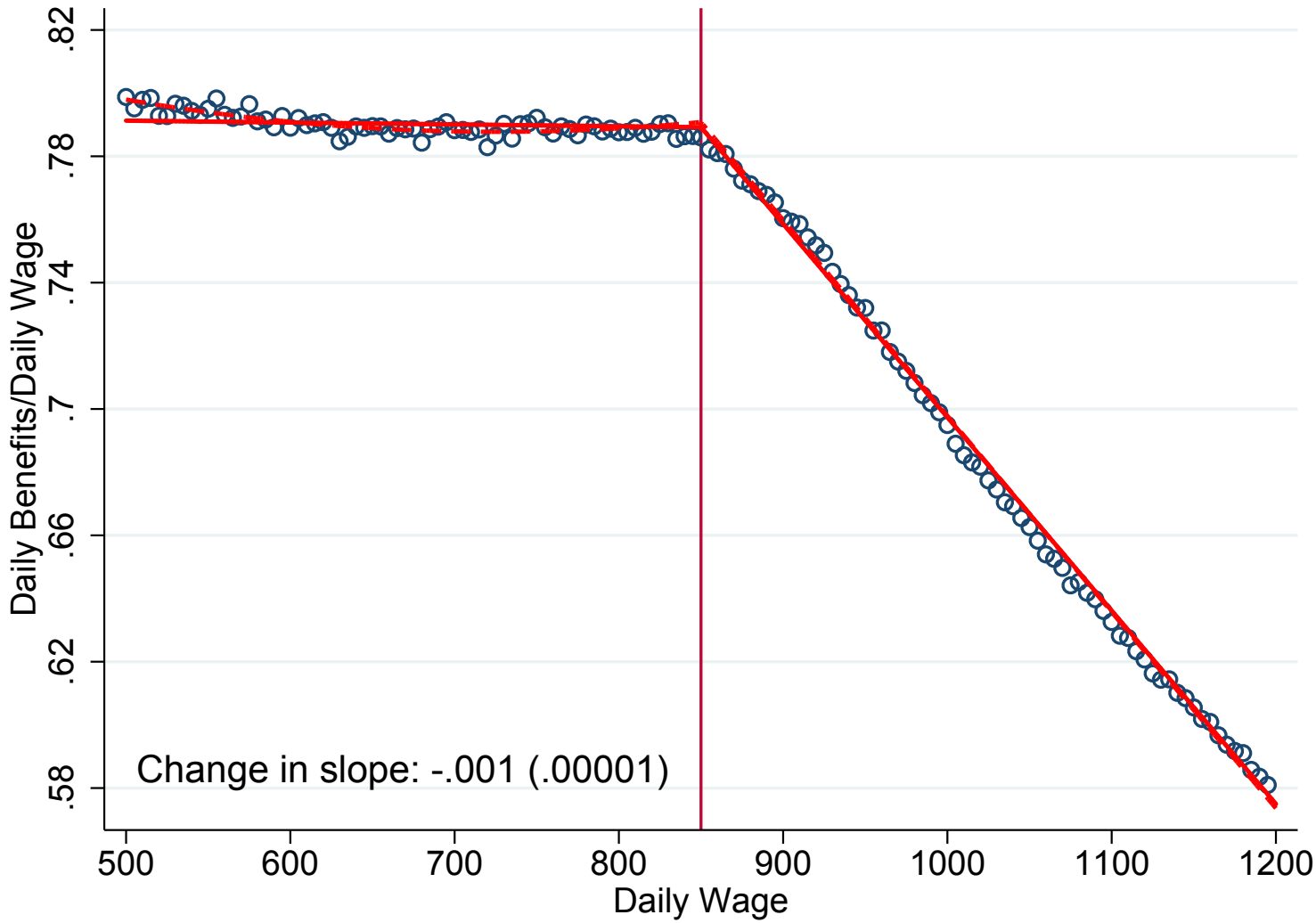
RKD: UI Benefits As Function of Daily Wage



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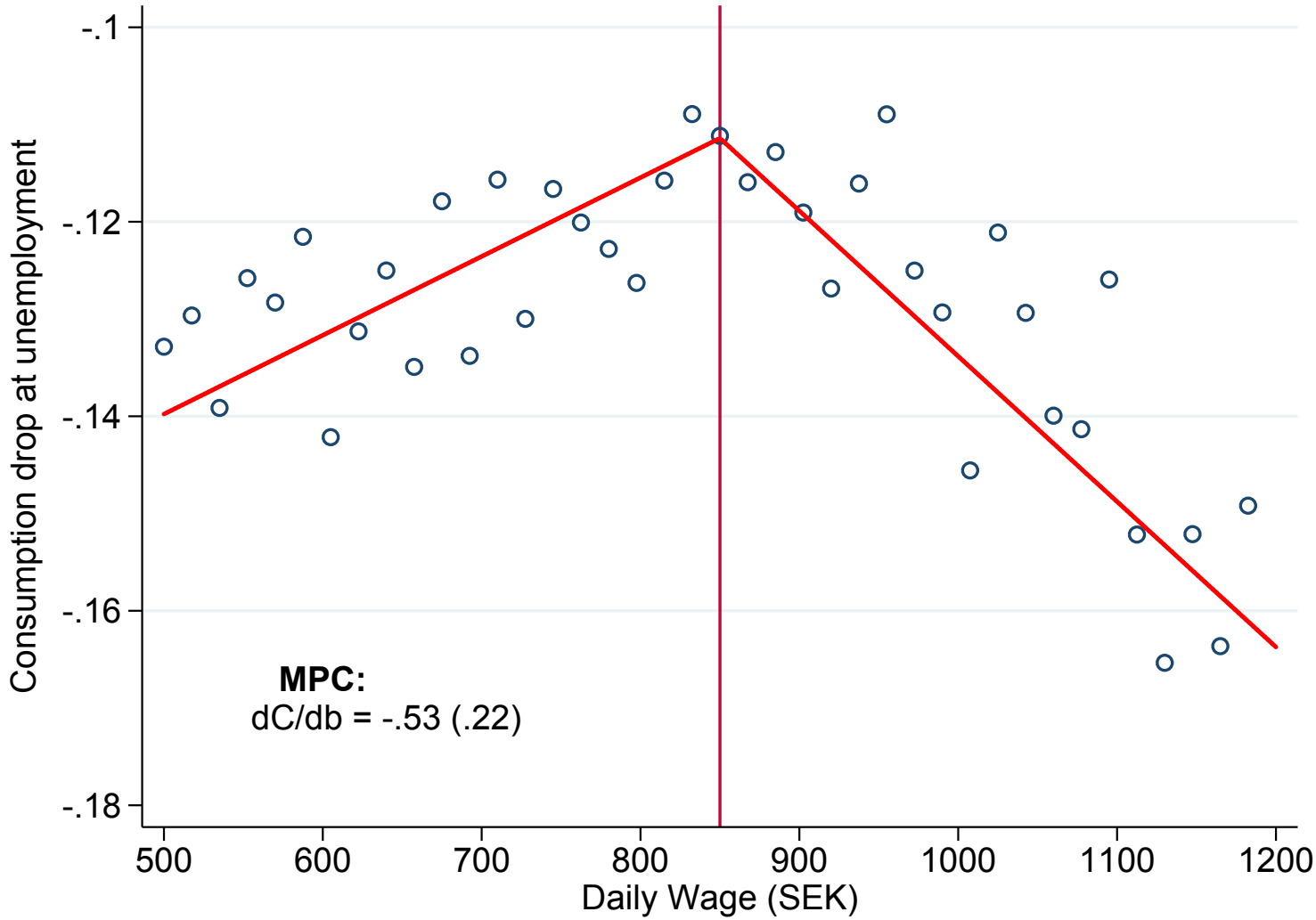
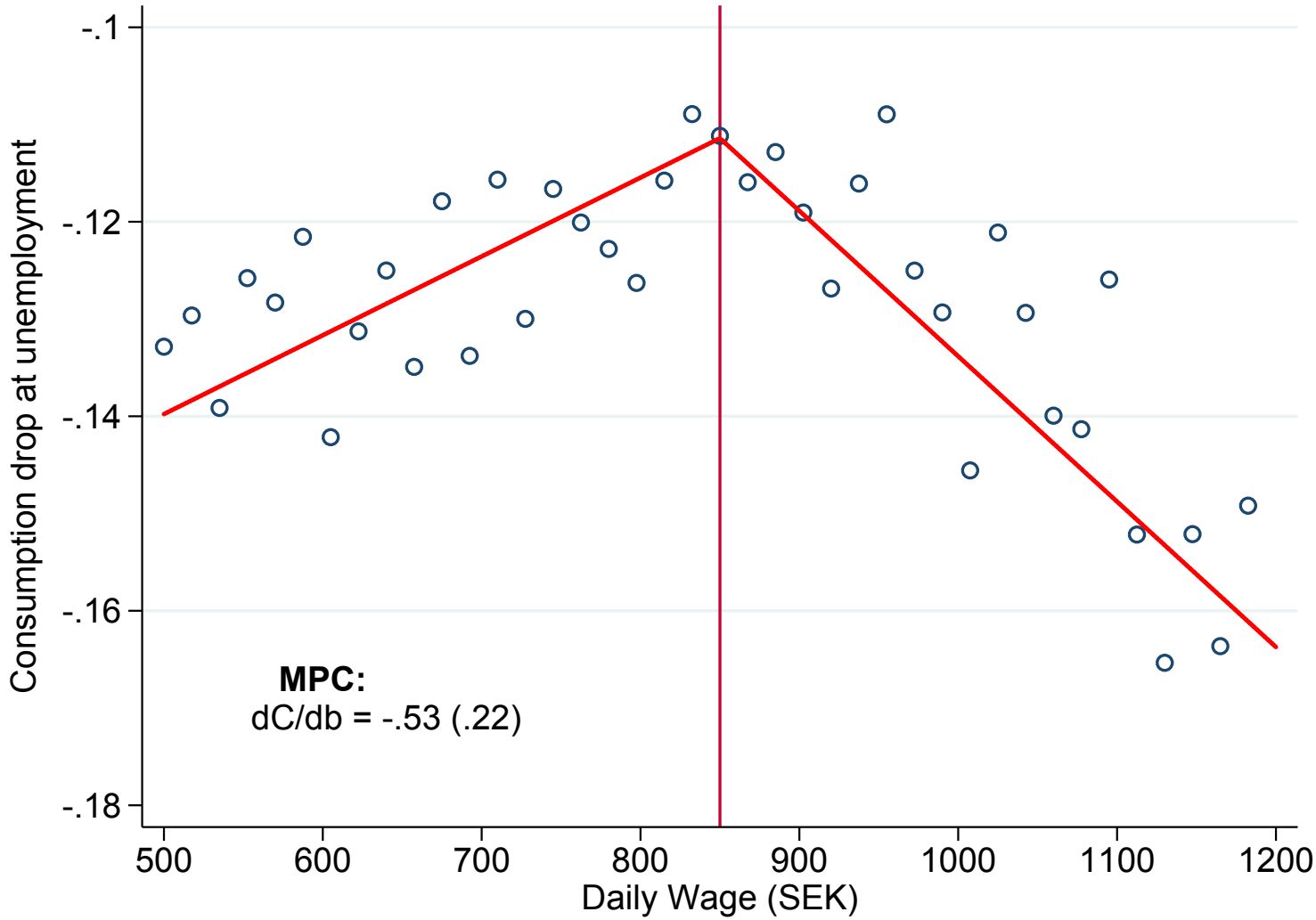
RKD: Drop in Consumption vs Daily Wage



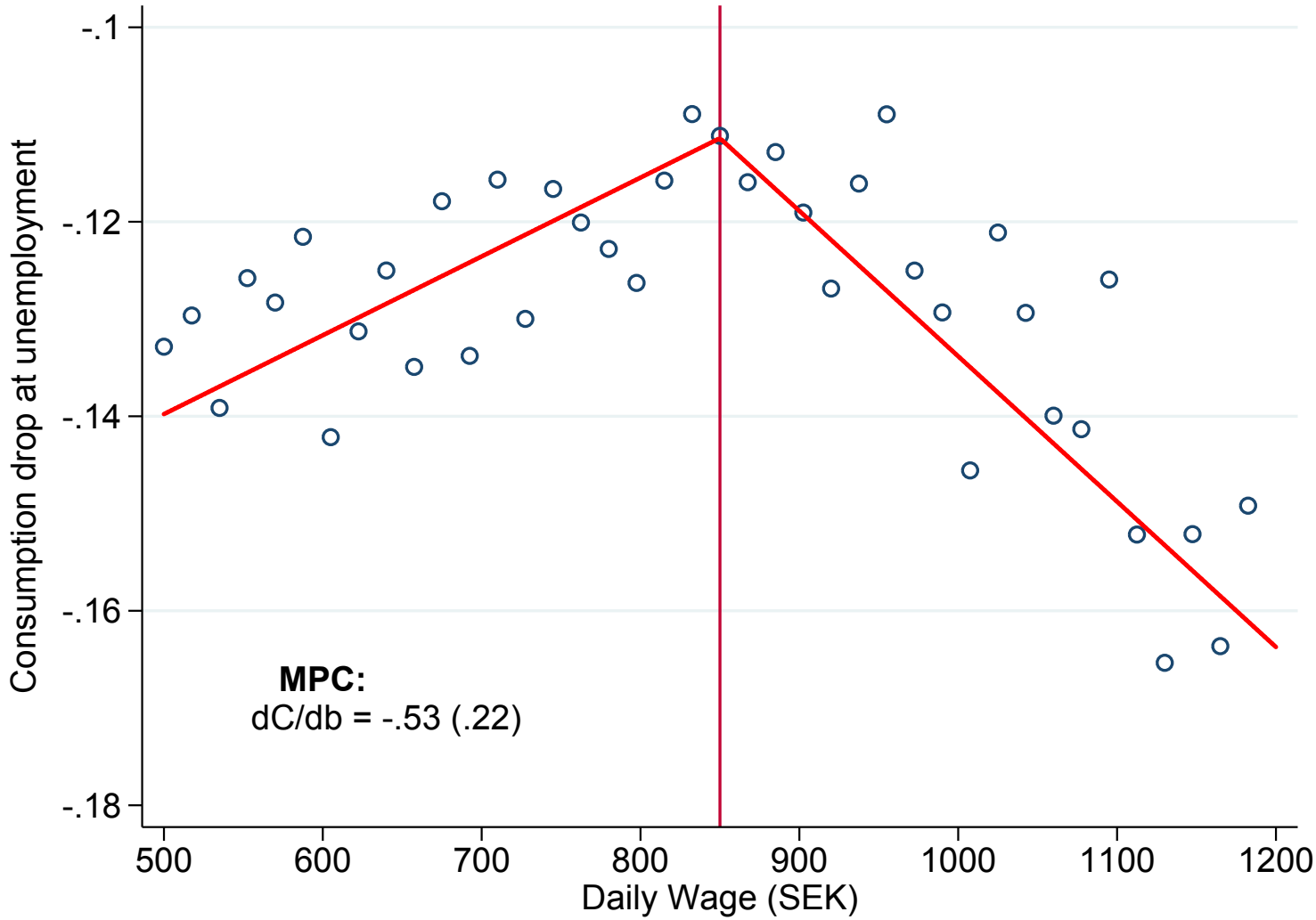
RKD Details | Bandwidth

RKD: Drop in Consumption vs Daily Wage



RKD Details | Bandwidth

RKD: Drop in Consumption vs Daily Wage



RKD Details | Bandwidth

RKD: Estimation

- Validity of RKD setting: see KLNS [2018]
- RKD specification:

$$\Delta C_i = \beta_0 \cdot (w - k) + \beta_1 \cdot (w - k) \cdot \mathbf{1}[w > k] + \sum_j \mathbf{1}[D = j] + X'\beta$$

  - ΔC: drop in yearly consumption at U (btw event years -1 and 0)
  - UI schedule kinked function of daily wage at $w = k$
  - **Control function approach**
    - D: duration of U spell in months
- MPC:

$$\frac{dC}{db} = \frac{\Delta_{w^-,w^+}(\partial \Delta C / \partial w)}{\Delta_{w^-,w^+}(\partial b / \partial w)} = \frac{\hat{\beta}_1}{.8 \cdot 30 \cdot \bar{D}}$$

  - Multiply .8 by $30 \cdot \bar{D}$ to translate into yearly benefit variation

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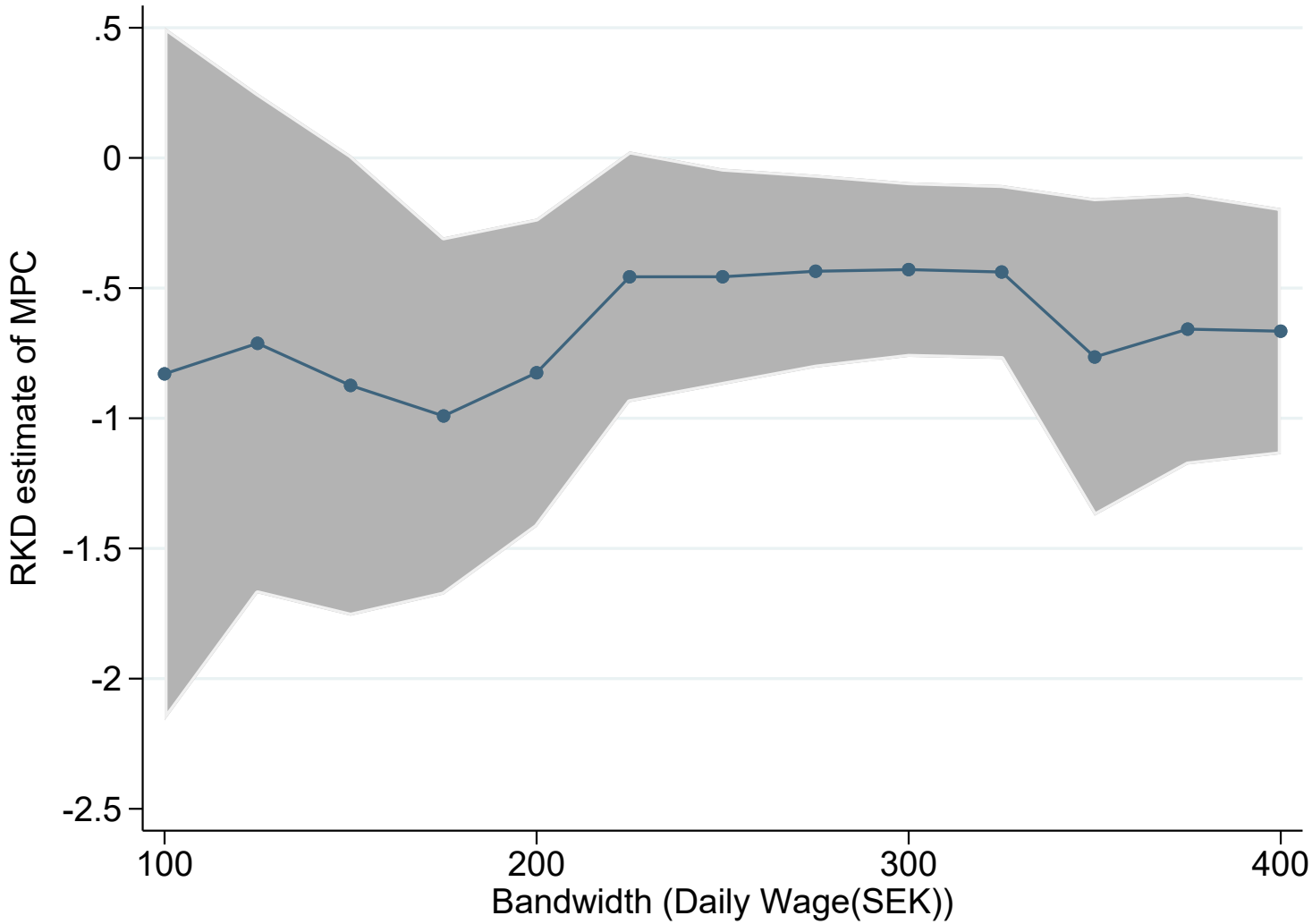
RKD Robustness: Bandwidth



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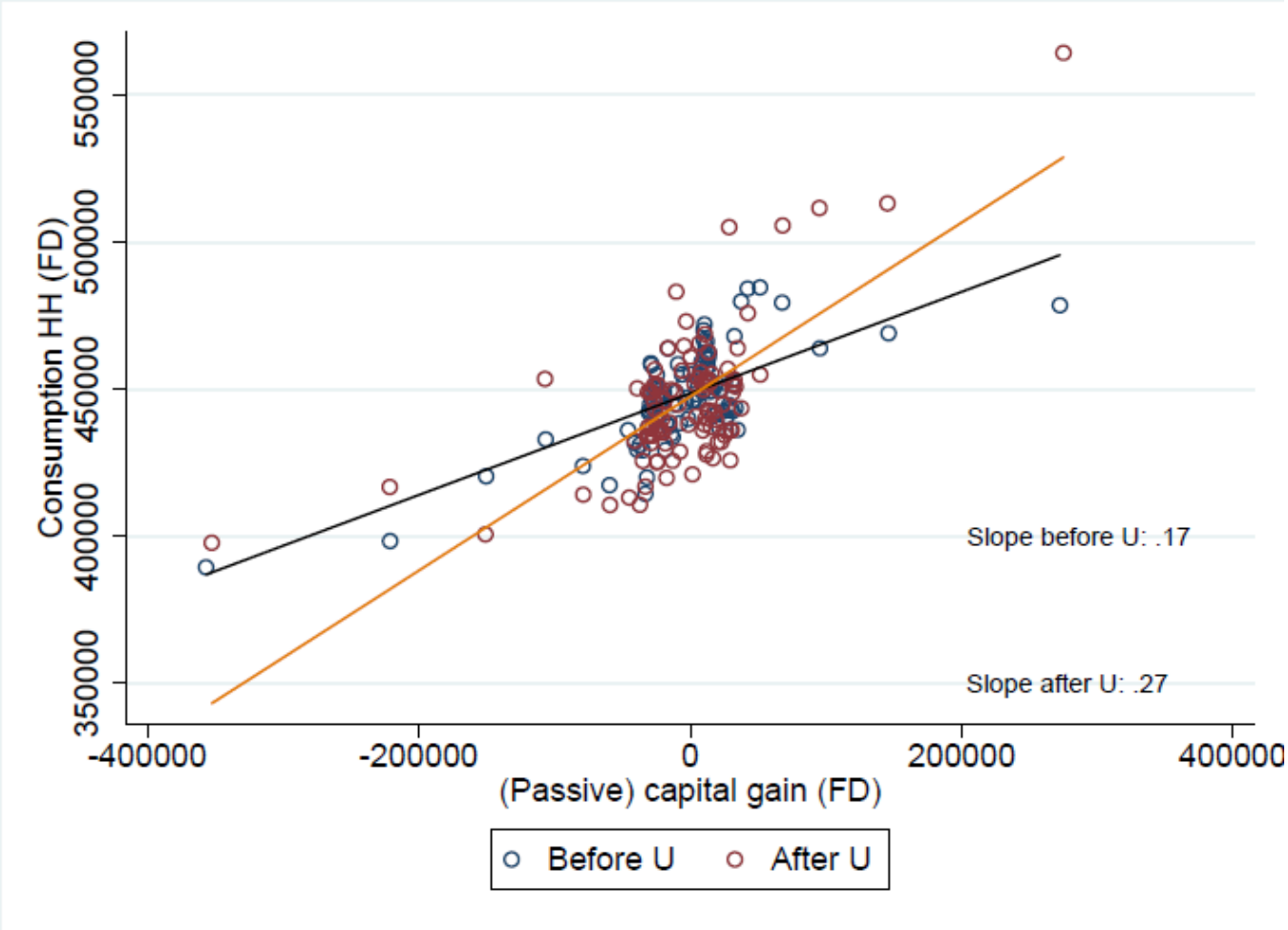
MPC: K gain shocks



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MPC out of capital income shocks

Table: Response of Annual Consumption to Capital Income Shocks

	Pre U shock IV	After U shock IV	Implied MRS
Stock returns	0.165***	0.276***	1.87
	(.00414)	(.00491)	
Dividends	0.123***	0.216***	1.95
	(.0268)	(0.0165)	
N	884,736	164,707	

MPC approach: Details

- Combining and implicitly differentiating FOC's:

$$\frac{u_u'(c_u)}{u_e'(c_e)} = \frac{p_u}{p_e} \times \frac{v_u'(x_u)}{v_e'(x_e)} \quad \& \quad \frac{dc_s}{dy_s} = \frac{p_s \frac{v_s''/v_s'}{u_s''/u_s'}}{1 + p_s \frac{v_s''/v_s'}{u_s''/u_s'}}$$

- 'Regularity' conditions:
  1. $\frac{v_u'(x_u)}{v_e'(x_e)} > 1$
  2. $\frac{v_u''/v_u'}{u_u''/u_u'} = \frac{v_e''/v_e'}{u_e''/u_e'}$
  3. preferences separable in c and x
  4. interior optimum

- Note that bound may be uninformative
  - e.g., insurance setting: $\frac{v_u'(x_u)}{v_e'(x_e)} = \frac{\pi_e}{\pi_u} >> 1$
  - in fact, insurance lowers p_u/p_e below 1 $\Rightarrow$ simple test for insurance!

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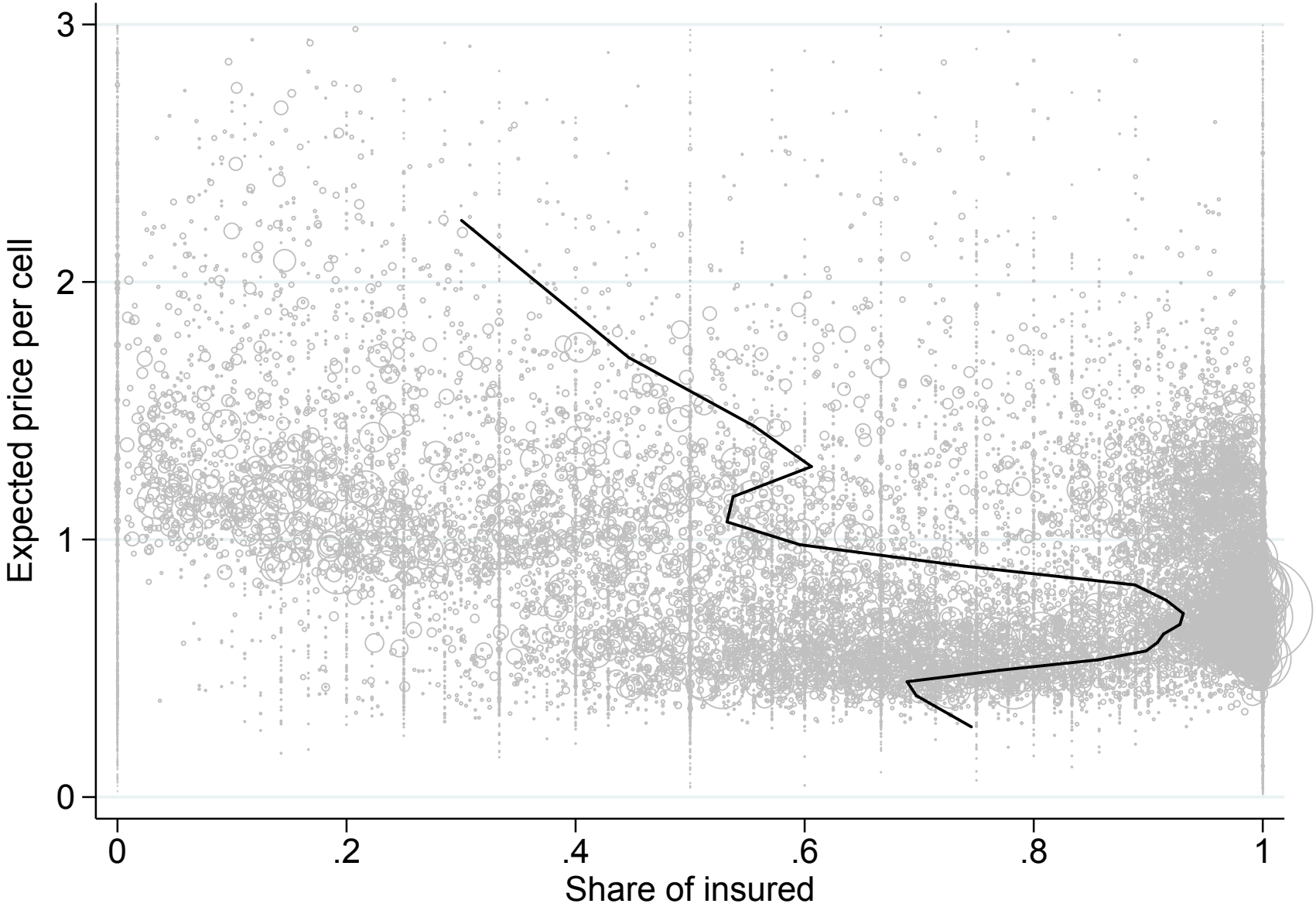
Optimization methods

- Well-known idea: individuals' choices reveal their value for insurance
  - Most obvious/direct case: UI choices
  - Other margins of adjustment: labour supply, search effort, savings, reservation wage, etc.
    - Extend CB approach to wedges in other behavior (Fadlon and Nielsen 2017, Hendren 2017, Finkelstein et al. 2017)
    - Extend CB approach to changes in anticipation of unemployment (Hendren 2017)
    - Study response in unemployment to unemployment benefits vs. other sources of income (Chetty [2008], Landais [2015])
- Optimization approaches require the studied margin of adjustment to be binding or even unique
  - Consumption is encompassing all potential margins of self-insurance
  - MPC reflects the price of the binding margin of self-insurance

RP non-param: Expected price vs UI Coverage



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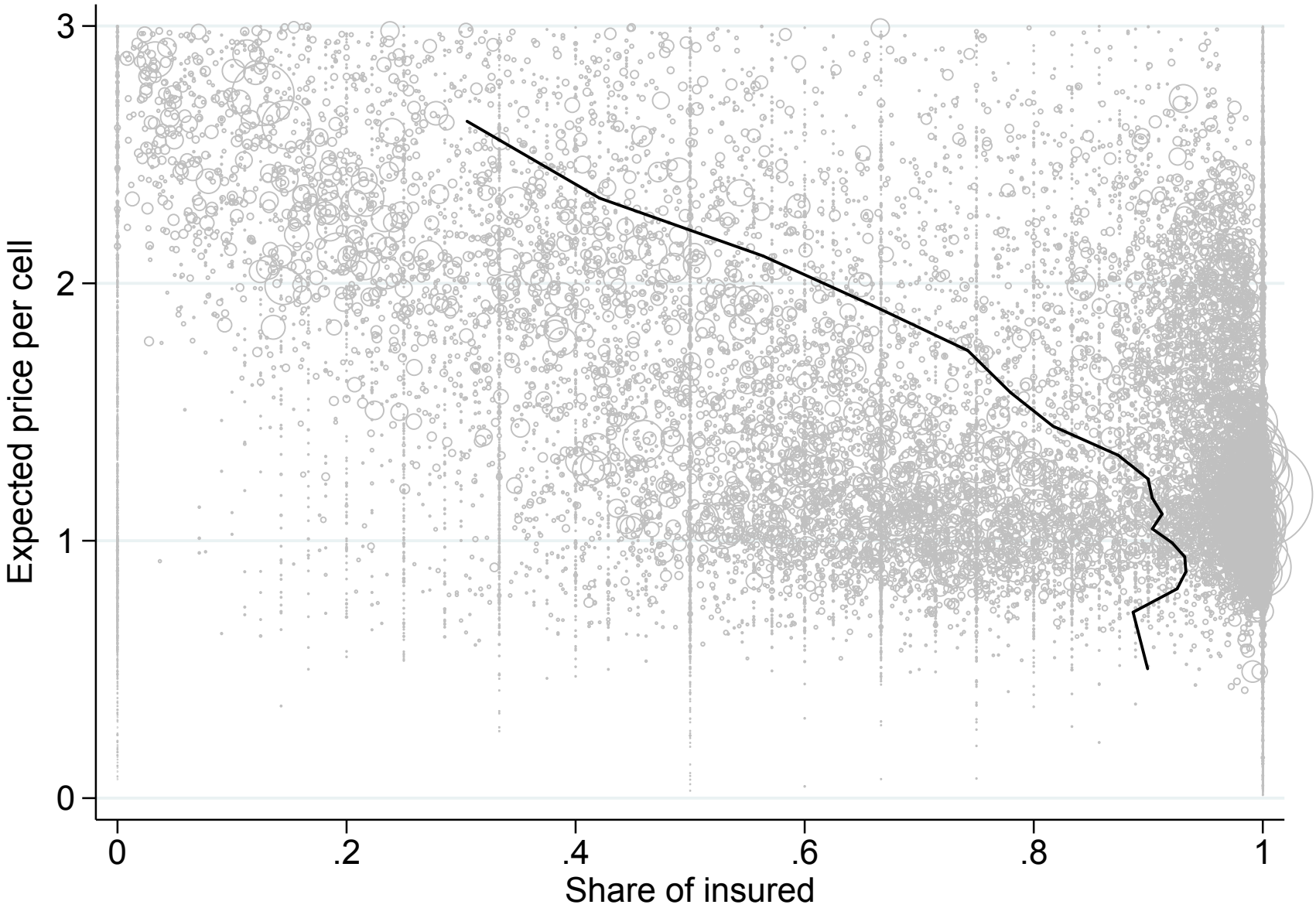

RP Approach: Role of Frictions?

- RP approach relies on EU optimization
  - Assume absence of choice and information frictions
  - e.g., Abaluck and Gruber '11, Barseghyan et al. '13, Handel and Kolstad '15, ...

- Predicted risk π_i = perceived risk $\tilde{\pi}_i$?
  - Private info vs. imperfect info, biased beliefs, salience, etc.
  - Study elicited risk belief in survey matched with our data
    - Little bias on average, but $Corr(\pi_i, \tilde{\pi}_i) << 1$

- Account in structural estimation for wedge $\pi_i \neq \tilde{\pi}_i$:
  1. Correct for misperception $\hat{\beta}[\pi_i - \bar{\pi}_i]$ in calculation of expected price
  2. Use salient risk 'shifters' (firm layoff rate and worker's unemployment) to predict risk

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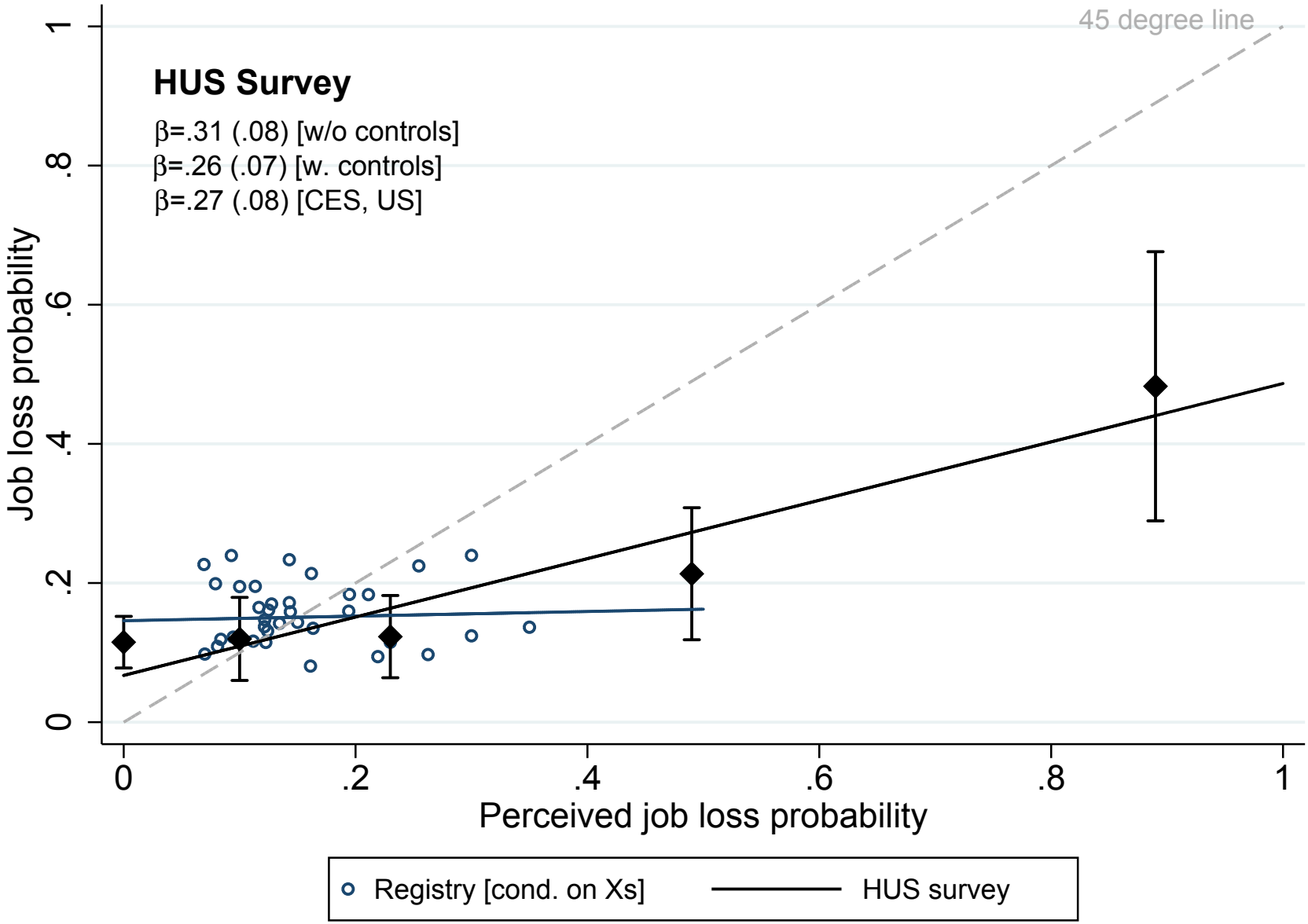
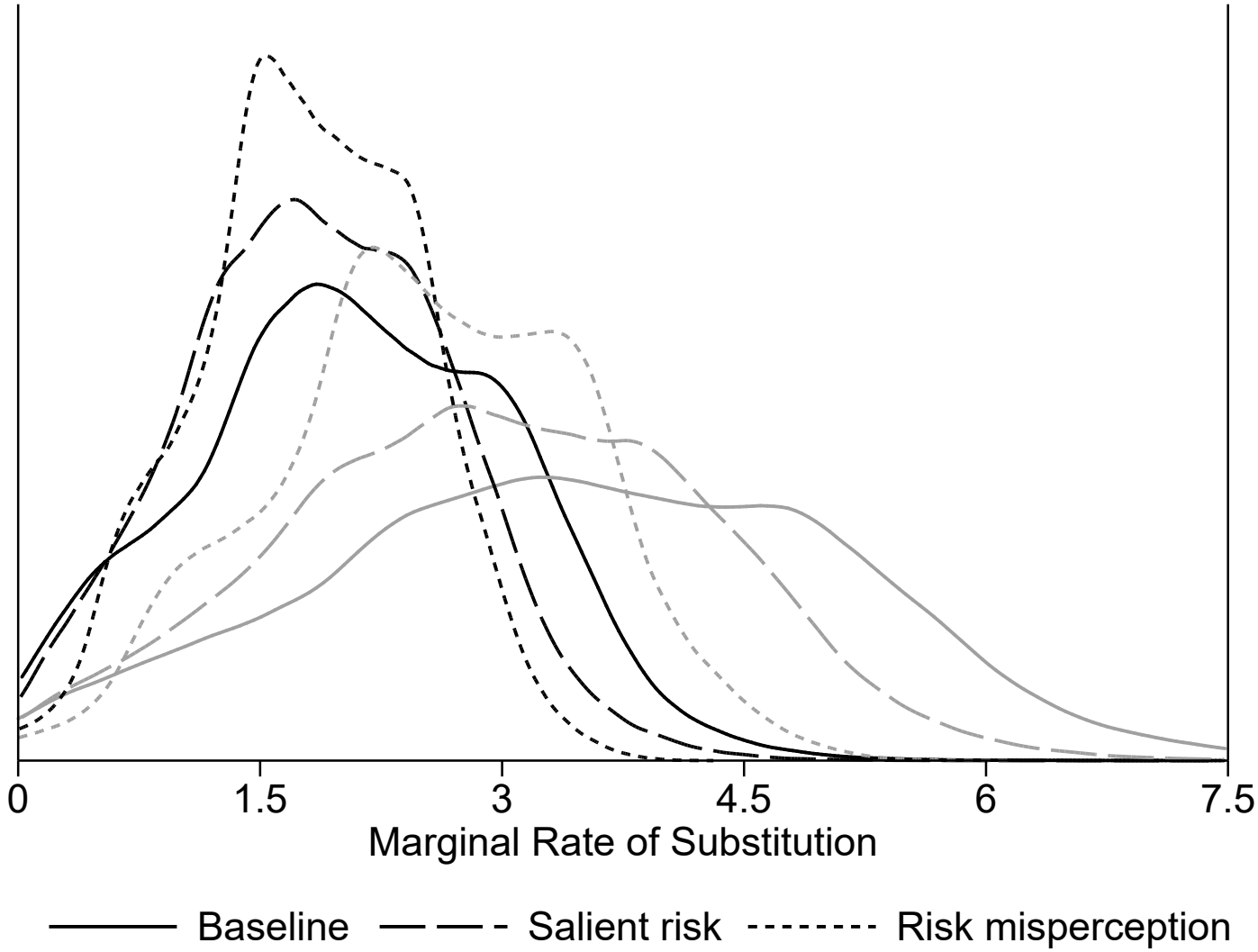
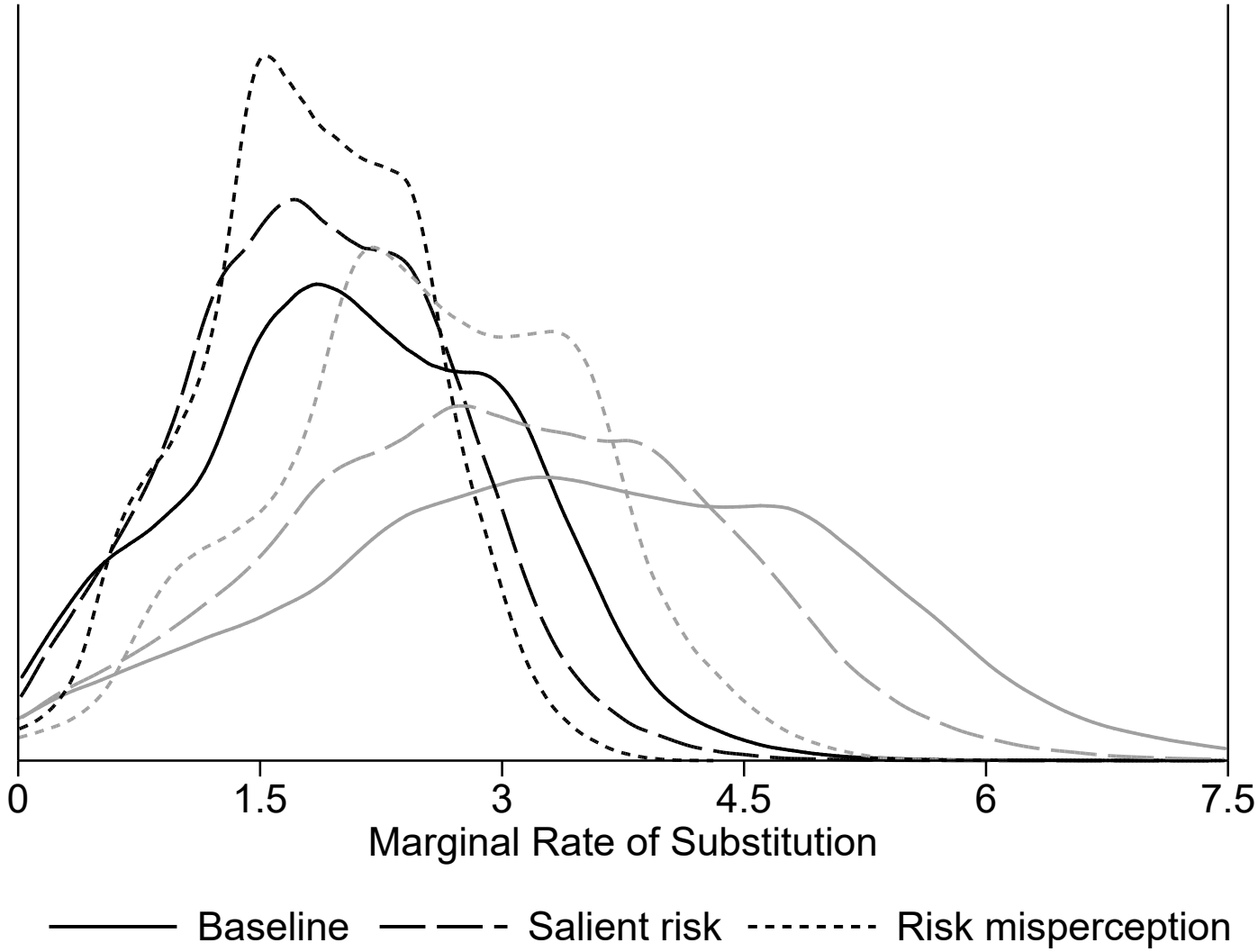
Evidence from Elicited Risk Perceptions



Adjusted RP Parametric: MRS distributions



Adjusted RP Parametric: MRS distributions



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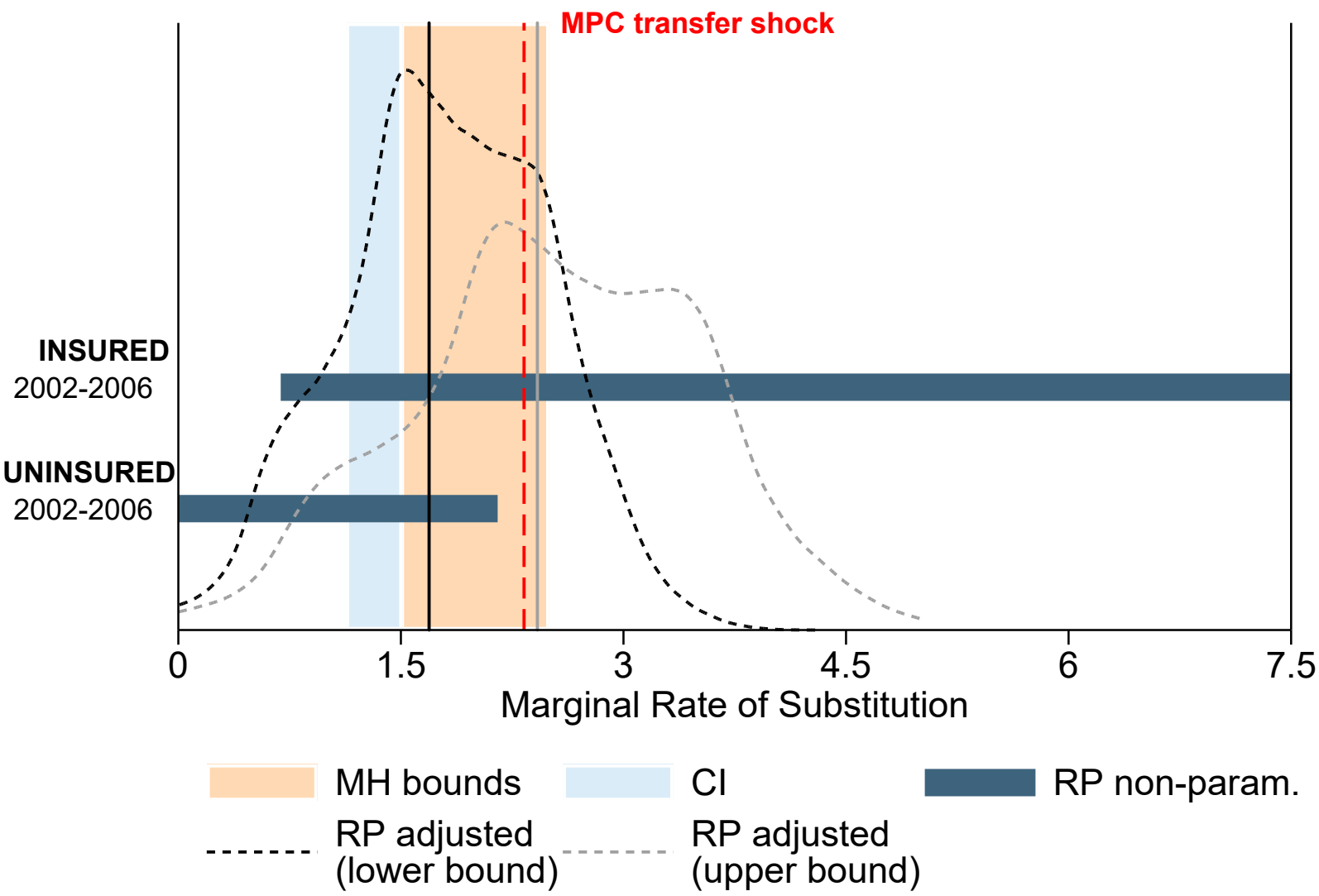

RP approach: Envelope Conditions - Details

- Setup:
  - consider contract $z_1 = (b_1, \tau_1)$ and contract $z_0 = (b_0, \tau_0)$
  - denote agent's behavior for contract z_j by $x(z_j)$
  - denote agent's resulting unemployment risk by $\pi(z_j)$ and consumption by $c(z_j)$
- Incremental value:

$$Eu(z_1) - Eu(z_0) = \int_{z_0}^{z_1} Eu'(z)\, dz$$

- Envelope condition:

$$Eu'(z)\, dz = \pi(z) \frac{\partial u_u(c_u(z), x(z))}{\partial c_u} db - (1 - \pi(z)) \frac{\partial u_e(c_e(z), x(z))}{\partial c_e} d\tau$$

using

$$\frac{\partial \pi}{\partial x}[u_u - u_e] + \pi \frac{\partial u_u}{\partial x} + (1 - \pi) \frac{\partial u_e}{\partial x} = 0$$

- Approximation:

$$Eu(z_1) - Eu(z_0) \cong \pi(\bar{z})\, u_u'(c(\bar{z}))[b_1 - b_0] - (1 - \pi(\bar{z}))\, u_e'(c(\bar{z}))[\tau_1 - \tau_0]$$

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RP approach: Robustness - Details

- Self-insurance / Savings:
  - presence of alternative means to smooth consumption reduces value of UI
  - social insurance may crowd-out private insurance
  - conditional on consumption, private insurance responses have only SO impact
- Liquidity constraints:
  - liquidity or borrowing constraints tend to increase value of UI
  - however, value is still entirely captured by $u'_u(c_u)$
  - only when consumption cannot respond (e.g., commited expenditures), $u'_u(c_u)$ will under-estimate value of UI
- Moral hazard:
  - envelope conditions again apply; individual unaffected by fiscal externality
  - using $\pi(z_1) > \pi(\bar{z})$ for approximation, we overestimate insurance value and thus RHS provides a (weaker) lower bound
  - using $\pi(z_0) < \pi(\bar{z})$ for approximation, we underestimate insurance value and thus RHS provides a (weaker) upper bound

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Combining CI and RP: Details

- How do approximations for two methods interact?
  - CI approach provides estimate of $MRS|_{z_1}$ and $MRS|_{z_0}$ for insured and uninsured respectively
  - RP approach provides estimates of $MRS|_{\bar{z}}$ for both groups
  - Under risk-aversion, $MRS|_{z_1} \leq MRS|_{\bar{z}} \leq MRS|_{z_0}$
  - Hence, for the insured:
    - RP approach provides a (weaker) lower bound for $MRS|_{z_0}$ ($> MRS_{\bar{z}}$), but not necessarily for $MRS|_{z_1}$
    - BUT CI approach indicates that $MRS|_{z_0} \leq MRS|_{z_1} + \gamma \frac{\Delta b}{c} \leq 1 + \gamma \left[\frac{\Delta c + \Delta b}{c}\right]$
    - Using Δb as the upper bound on the additional consumption drop when unemployed under z_0 rather than z_1, we find conservative lowerbound on $\gamma : \left[\frac{1-\pi}{\pi} \frac{\tau_1 - \tau_0}{b_1 - b_0} - 1\right] / \left[\frac{\Delta c + \Delta b}{c}\right]$
  - Differences in consumption under the two contracts seem small though. So assuming $MRS|_{z_1} \cong MRS|_{\bar{z}} \cong MRS|_{z_0}$We will investigate this further.
- Selection into unemployment:
  - We estimate the revealed value of insurance for all workers, but the consumption drops only for displaced workers.
  - If expected consumption drops for non-displaced workers would be lower (higher), we are underestimating (over-estimating) γ

Combining CI and RP (cont'd): Details

- Within-group heterogeneity:
  - CI approach over-estimates *MRS* if *corr* $\left(\gamma, \frac{\Delta c}{c}\right)$ is negative. Evidence that the uninsured (with lower γ) have smaller consumption drops goes in the other direction
  - RP approach would be robust to heterogeneity if we had info on individual risk types π_i. Instead, we are using risk-realizations to get average group risks.
  - That is, by using $\frac{E(1-\pi)}{E(\pi)}$ we are overestimating $E\left(\frac{1-\pi}{\pi}\right)$ and more so if heterogeneity within-group is important
- Eligibility and ex-post risk realizations:
  - individuals can switch in and out of UI, but need to be contributing for 12 months to be eligible
  - we consider unemployment risk in $t+1$ for individuals making UI choice in t
  - we restrict sample to individuals who would be eligible when becoming unemployed in $t+1$ (i.e., sufficient earnings and no unemployment in t)
  - this sample restriction + choice of outcome variable reduces estimated unemployment risk relative to average unemployment risk
  - e.g., unemployment risk for our sample is higher in $t+2$, so when they factor in inertia when deciding at t, we would be underestimating the decision-relevant unemployment risk and thus overestimate the MRS

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The Swedish UI System: Details (I)

- Eligibility rules for displaced workers:
  - Work requirement to be eligible to any UI coverage (minimum or supplemental):
    - Within the past 12 months have worked more than 6 calendar months at least 80h per month
  - To be eligible to supplemental UI coverage:
    - Fulfill work requirement + have been contributing to a UI-fund for 12 mths prior to layoff
- Quits
  - Cannot receive UI benefits for first 10 weeks of U spell
  - In our data, we can identify quits to control for potential extra moral hazard from quits vs layoffs
- Basic coverage:
  - Fixed daily amount of 320 SEK ($\approx$ 20% of median daily wage)
- Supplemental coverage:
  - Identical for all UI funds
  - 80% of daily wage up to cap
  - Daily benefit = Max(320, min(.8*daily wage, 680))

The Swedish UI System: Details (II)

- Premia determination:
  - Government controls formula for premia of supplemental coverage
  - No price discrimination (by gender, age, etc.)
  - No price differentiation across UI funds (until 2007, limited differentiation after 2007)
- Link between Kassas and Unions:
  - UI funds were historically linked to Unions
  - But not necessary to be member of Union to be member of Kassa
  - Being member of Kassa does not buy Union membership
  - We observe and always control for Union membership in regressions

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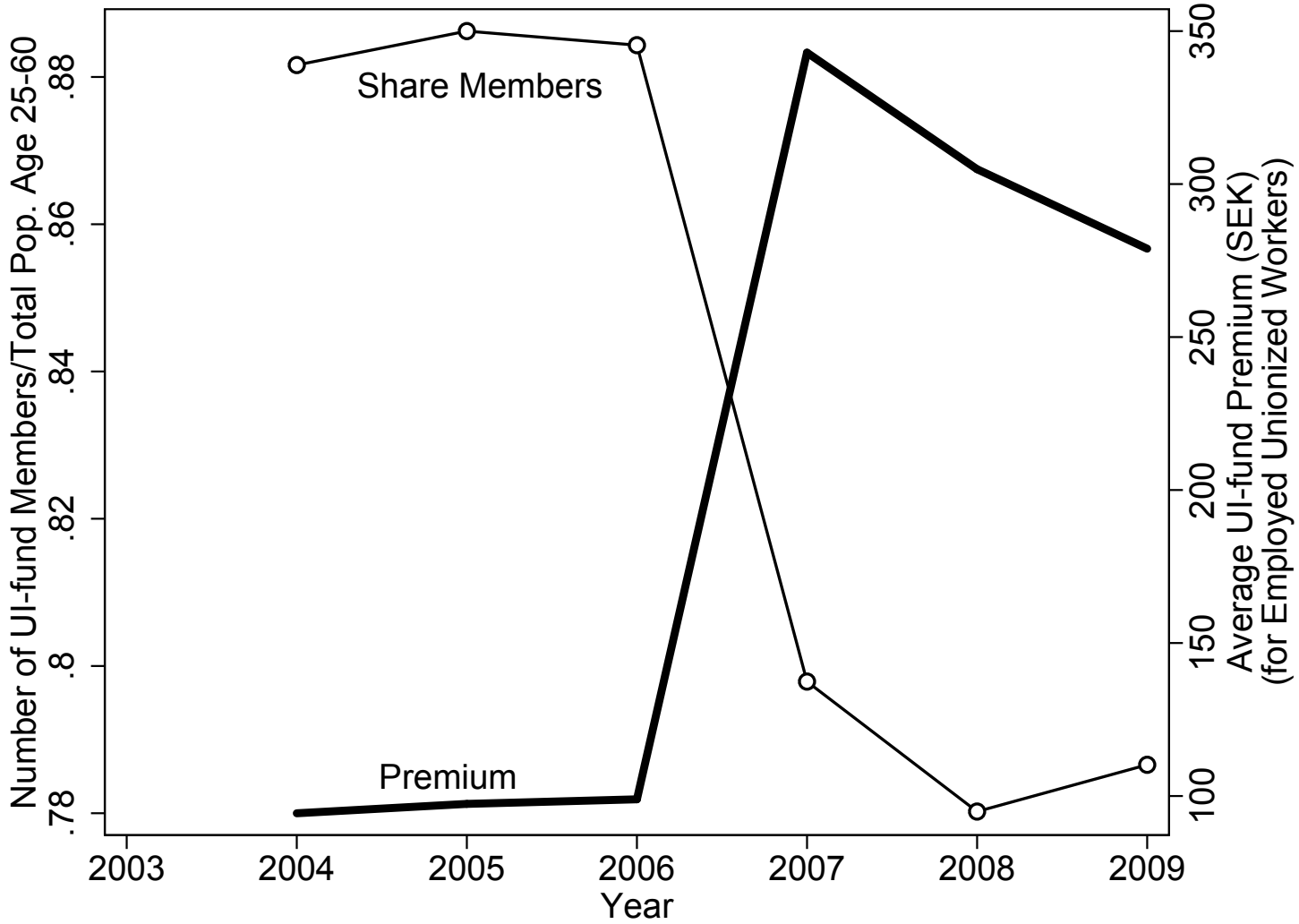
Price Variation: the 2007 Reform



Source: Landais et al. ('16) ▸ Back

Table: Summary statistics

	Mean	P10	P50	P90
	I. Unemployment			
Layoff probability	2.41%	-	-	-
Unemployment probability	2.41%	-	-	-
Unemployment spell (days)	1.88	0	0	0
Duration of spell (days)	223.7	28	126	529
	II. Union and UI Fund Membership			
Union membership	0.76	-	-	-
UI fund membership	0.88	-	-	-
	III. Demographics			
Age	40.99	29	41	53
Fraction men	0.52	-	-	-
Fraction married	0.46	-	-	-
	IV. Income and Wealth, SEK 2003(K)			
Gross earnings	261	118.4	240.5	399.5
Net wealth	354	-181.2	100	1065.8
Bank holdings	47	0	0	114.9

Note: Sample consists of 23,535,839 distinct person-year observations, ages 25-55, years 2002-2006. Back

Table: Summary statistics: individuals with supplemental UI

	Mean	P10	P50	P90
	I. Unemployment			
Layoff probability	2.57%	-	-	-
Unemployment probability	2.57%	-	-	-
Unemployment spell (days)	2	0	0	0
Duration of spell (days)	224.84	27	126	533
	II. Union and UI Fund Membership			
Union membership	0.85	-	-	-
UI fund membership	1	-	-	-
	III. Demographics			
Age	41.25	30	41	53
Fraction men	0.5	-	-	-
Fraction married	0.47	-	-	-
	IV. Income and Wealth, SEK 2003(K)			
Gross earnings	259.1	126.7	241.2	392.4
Net wealth	315.4	-171.6	102.8	1003.2
Bank holdings	42.5	0	0	110.6

Note: Sample consists of 23,535,839 distinct person-year observations, ages 25-55, years 2002-2006. Back

Table: Summary statistics: individuals without supplemental UI

	Mean	P10	P50	P90
	I. Unemployment			
Layoff probability	1.31%	-	-	-
Unemployment probability	1.31%	-	-	-
Unemployment spell (days)	1.02	0	0	0
Duration of spell (days)	207.98	35	137	455
	II. Union and UI Fund Membership			
Union membership	0.14	-	-	-
UI fund membership	0	-	-	-
	III. Demographics			
Age	39.17	27	39	52
Fraction men	0.67	-	-	-
Fraction married	0.4	-	-	-
	IV. Income and Wealth, SEK 2003(K)			
Gross earnings	275.6	79.7	232.9	463.3
Net wealth	645.1	-249.6	69.4	1723.5
Bank holdings	80.5	0	0	159.5

Note: Sample consists of 23,535,839 distinct person-year observations, ages 25-55, years 2002-2006. Back