

Unemployment, Consumption Smoothing and the Value of UI

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- **Social insurance design:**

- large literature on labour supply responses = **cost** of social insurance
- much less work on the corresponding **value** of social insurance

- **Insurance value:** value of transferring dollar from good to bad state

- *Challenge:* how to evaluate in practice when no choices are made?

- *Response:* consumption-based implementation (CI)

- rely on the observation of consumption responses to insured event
- e.g., Gruber ('97): consumption smoothing when unemployed

- *Unresolved:* how well do consumption responses capture value of insurance?

This paper

We have a unique setting in Sweden:

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

We exploit this opportunity to:

- ① revisit **CI approach** using admin data
 - build registry-based measure of consumption
 - analyze consumption response to unemployment
 - explore importance of heterogeneity in consumption responses
- ② implement alternative **RP approach** based on UI choices
 - provide **unique comparison** between consumption responses & UI valuations for *same* individuals

Related Literature

- Recent literature on UI design and use of sufficient statistics
 - consumption smoothing using surveyed consumption (e.g., Browning and Crossley '01, Stephens '01)
 - alternative implementation of insurance value of UI (e.g., Chetty '08, Landais '15, Hendren '16)
 - other public insurance settings (e.g., Finkelstein, Hendren and Luttmer '15, Low and Pistaferri '15, Cabral '16)
- Large literature on relationship between income shocks and consumption
 - challenge is to identify income shocks and their nature (transitory vs. permanent, anticipated vs. unanticipated,...)
 - our focus on (local) UI design circumvents this challenge
- Building on own previous work
 - optimal dynamics of UI (Kolsrud et al. '16): trade-off value and cost of UI during spell (using CI approach)
 - adverse selection in UI (Landais et al. '16): estimate risk-based selection into UI (using insurance choices)

- 1 Introduction
- 2 Framework
- 3 Consumption-based Implementation
- 4 Revealed Preference Approach

Theoretical Framework

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

$$MRS = \frac{u'_u(c_u)}{u'_e(c_e)}$$

- Baily-Chetty formula: MRS is “sufficient” to evaluate value of raising UI benefits b at the margin

$$W'(b) \propto \frac{u'_u(c_u)}{u'_e(c_e)} - [1 + \varepsilon_{\pi,b}]$$

- Envelope conditions are key:
 - crowd-out of savings and self-insurance has only SO impact on welfare, conditional on consumption levels
 - response of unemployment probability π has FO impact on social welfare due to fiscal externality

Approach I: Consumption-Based Implementation

- MRS depends on wedge in consumption and risk aversion:

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

- Approximation relies on Taylor expansion

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

- Challenges:

- 1 require consumption data → this paper/workshop!
- 2 how to translate consumption in utility?
 - e.g., complementarity between consumption and leisure?

Approach II: Revealed Preference Approach

- MRS revealed by choice given *expected* price per unit of coverage:

$$\frac{u'_u(c_u)}{u'_e(c_e)} \geq \frac{[1 - \pi] \times d\tau}{\pi \times db}$$

- *Idea of proof:* [► Details](#)

$$E_{(b_1, \tau_1)} u \geq E_{(b_0, \tau_0)} u \Leftrightarrow \frac{\pi}{1 - \pi} \frac{\Delta u_u}{\Delta u_e} \geq 1 \Leftrightarrow \frac{\pi}{1 - \pi} \frac{u'_u(c_u) [b_1 - b_0]}{u'_e(c_e) [\tau_1 - \tau_0]} \gtrsim 1$$

- envelope conditions to approximate $E_{(b_1, \tau_1)} u - E_{(b_0, \tau_0)} u$
- “robust” to self-insurance, moral hazard, state-dependent utility,...
- Challenges:
 - 1 require data on choices and unemployment risk
 - 2 need price or risk variation to tighten bounds

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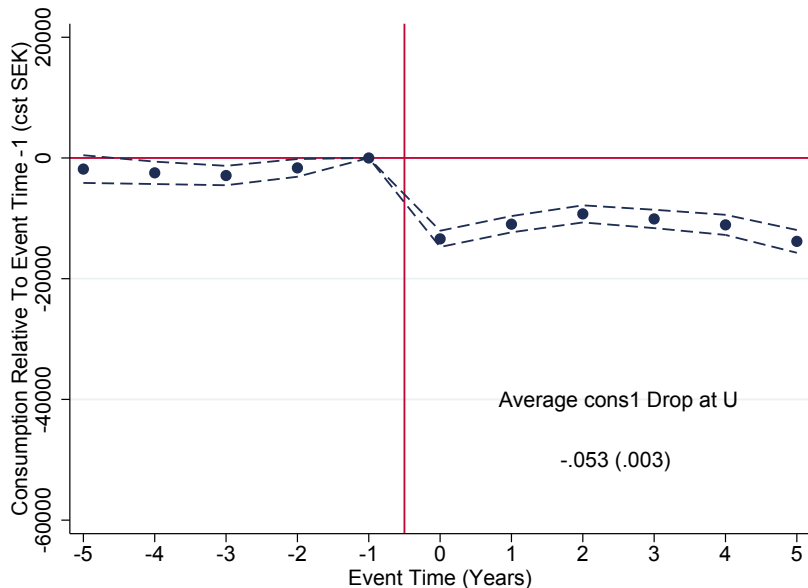
Registry-based Measure of Consumption

- Simple idea: consumption as a residual expenditure measure,

$$consumption_t = income_t - \Delta assets_t$$

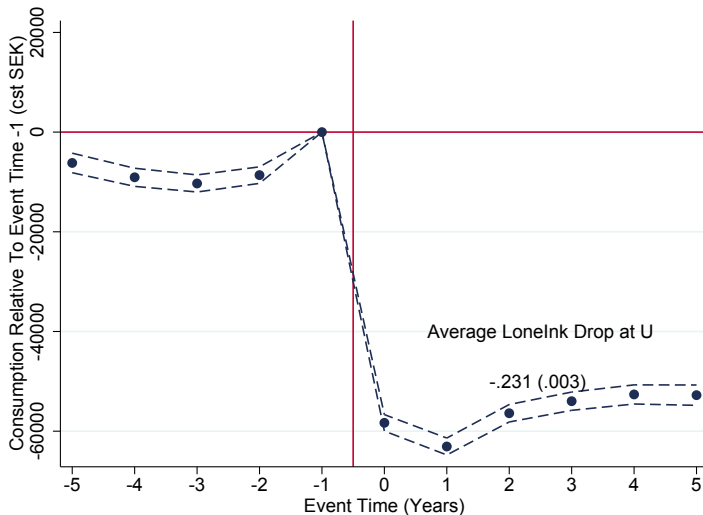
- We use admin data (from tax registers) on earnings y , transfers T , bank savings b , outstanding debt d , other financial assets v and real assets h .
 - Account for returns from assets and changes in stock value [► Details](#)
 - Majority starts unemployment with **no financial nor real assets** [► Table](#)
- We construct yearly 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 and find very similar results (see Kolsrud et al. '16)

Yearly consumption relative to year of displacement



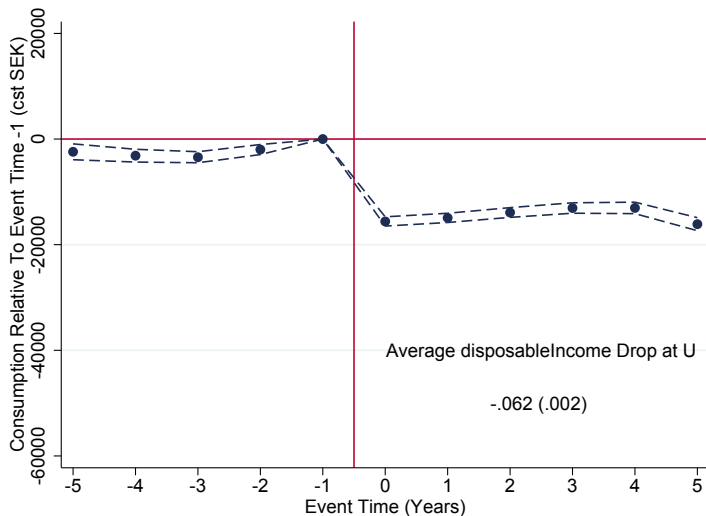
Decomposition of consumption smoothing

Figure: Labor Income



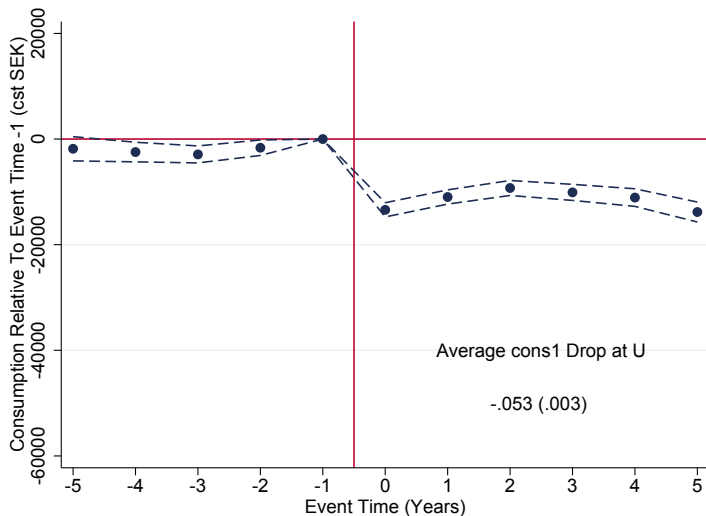
Decomposition of consumption smoothing

Figure: Income + Transfers



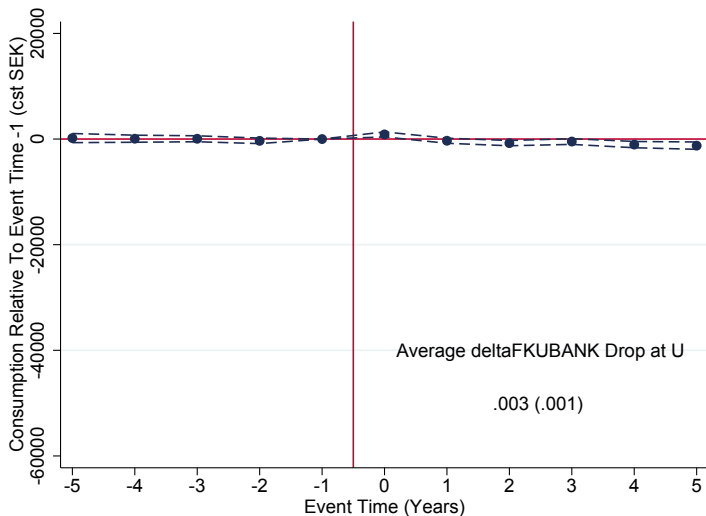
Decomposition of consumption smoothing

Figure: Income + Transfers + Δ Assets



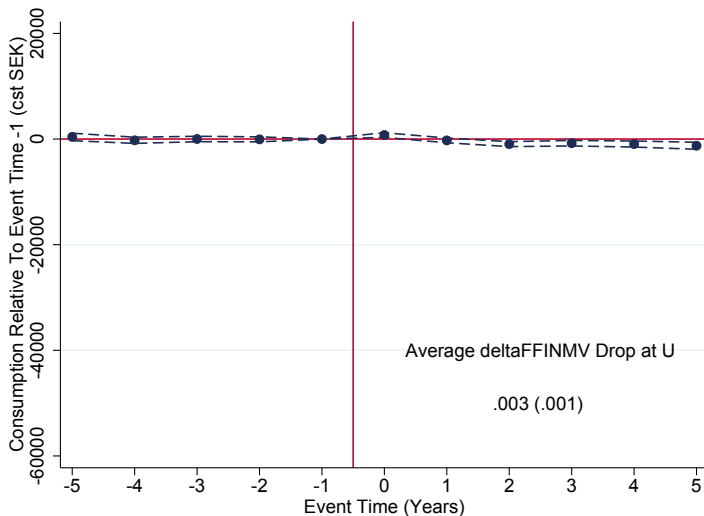
Decomposition of Δ assets: limited average impact

Figure: Consumption from Δ Bank Accounts



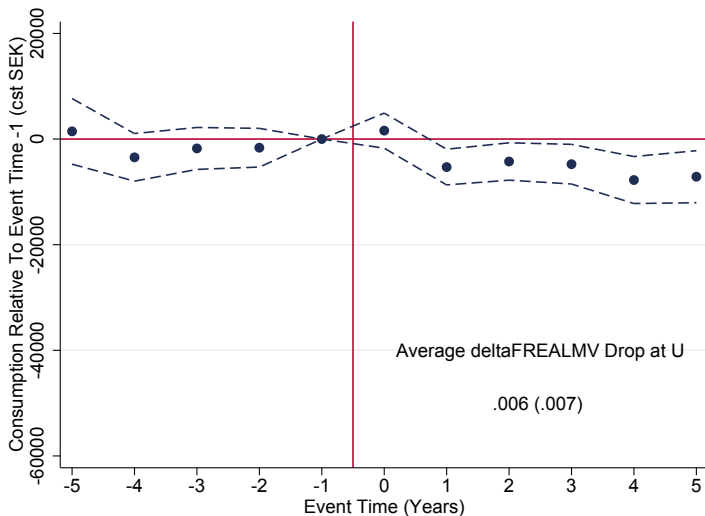
Decomposition of Δ assets: limited average impact

Figure: Consumption from Δ Other Financial Assets



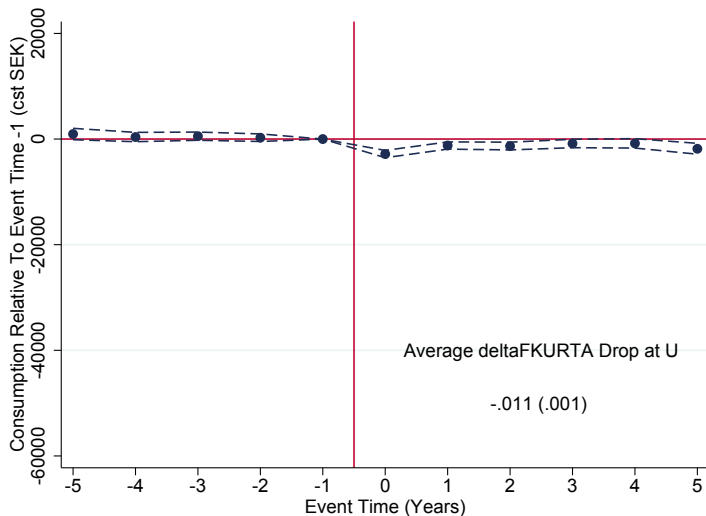
Decomposition of Δ assets: limited average impact

Figure: Consumption from Δ Real Assets



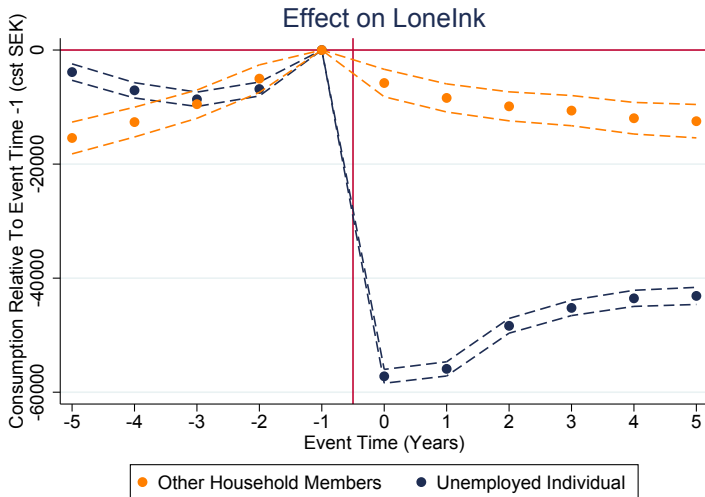
Decomposition of Δ assets: limited average impact

Figure: Consumption from Δ Debt



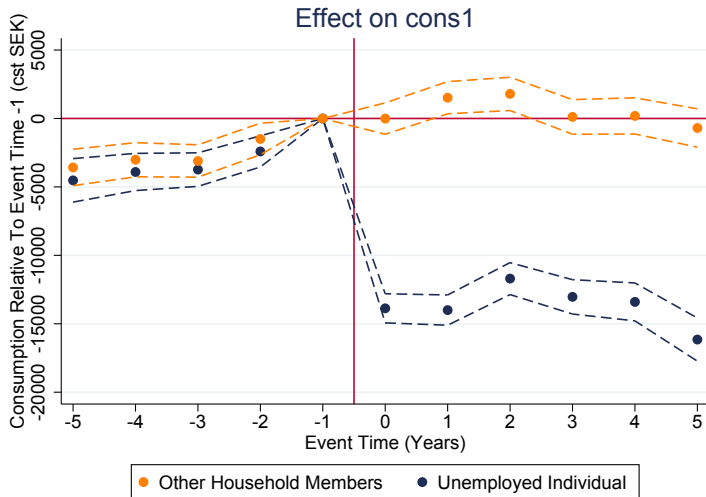
Added worker effect: individual vs. household level

Figure: Labor Income for Individual and Other HH Members



Added worker effect: individual vs. household level

Figure: Contribution to Consumption by Individual and Other HH Members



Estimates of consumption wedge $\Delta c/c$

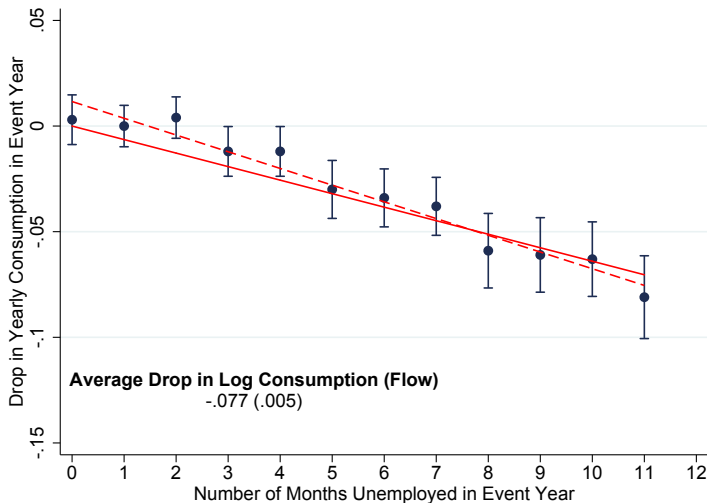
- Estimated consumption drop in year after displacement remains the same when we use matching to construct control group ▶ Matching
- We need to re-cover consumption wedge from yearly aggregates mixing employment and unemployment consumption, c_e and c_u
- Using a parametric approach (including only spells that are still ongoing in December) we find an average consumption wedge of

$$\frac{c_e - c_u}{c_e} = 7.7\% \text{ (0.5)}$$

- Parametric approach nicely fits the non-parametric estimates of the yearly consumption drops for different unemployment spell lengths
- Corresponding estimate using the consumption surveys equals 7.5% (2.0)

Estimates of consumption wedge $\Delta c/c$

Figure: Parametric and non-parametric estimates



Recap: Consumption Implementation

- Consumption Implementation:

$$MRS = 1 + \gamma \times \Delta c / c$$

- Challenge I: **functional form?**

- for $\gamma = RRA \in [1, 3]$, MRS ranges between 1.077 and 1.231
- BUT can we assume $\frac{u'_u(c_u)}{u'_e(c_e)} = \frac{u'(c_u)}{u'(c_e)}$?

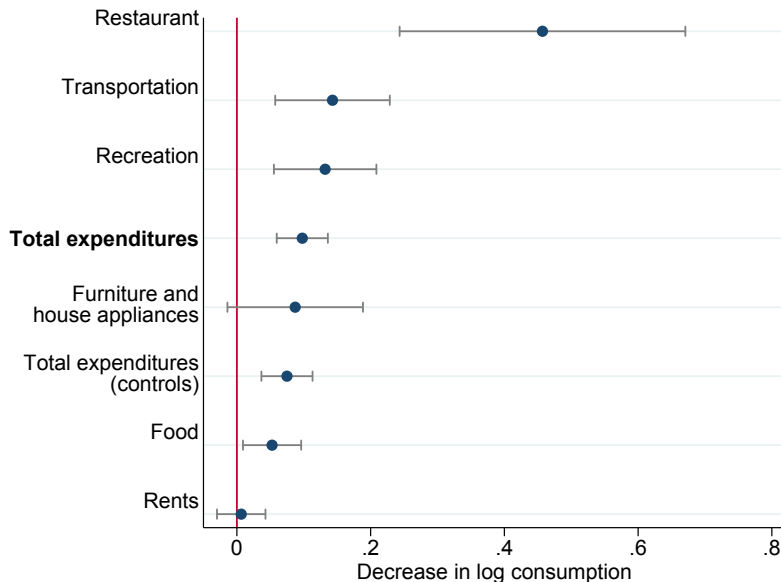
- Challenge II: **heterogeneity?**

- important by itself if unemployment policy can differentiate
- important for calculating average MRS otherwise

Challenge I: expenditure $\Rightarrow$ consumption $\Rightarrow$ utility?

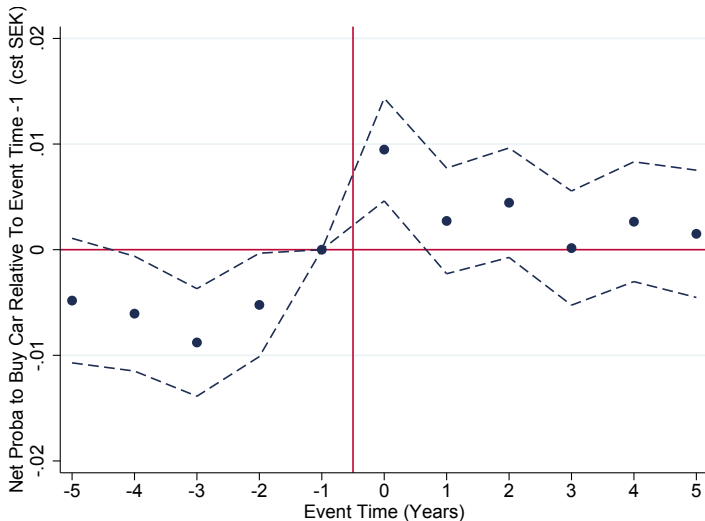
- Using consumption surveys in Kolsrud et al '16, we find
 - committed expenditures (e.g., rent) drop very little
 - durable good consumption (e.g., furniture) drops early on in the spell
 - employment-related, but also leisure expenditures drop substantially
 - home production seems to increase
- Impact on MRS is ambiguous, but seems limited in magnitude (see later!)
- Registry data can be useful again and provide novel insights on consumption smoothing...

Consumption surveys: estimated expenditure drops



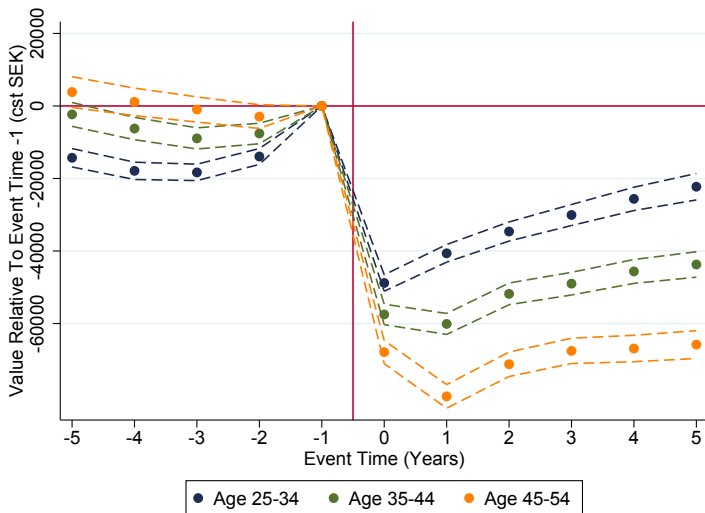
Registry data: car purchases increases after displacement!

Figure: Net purchase of cars



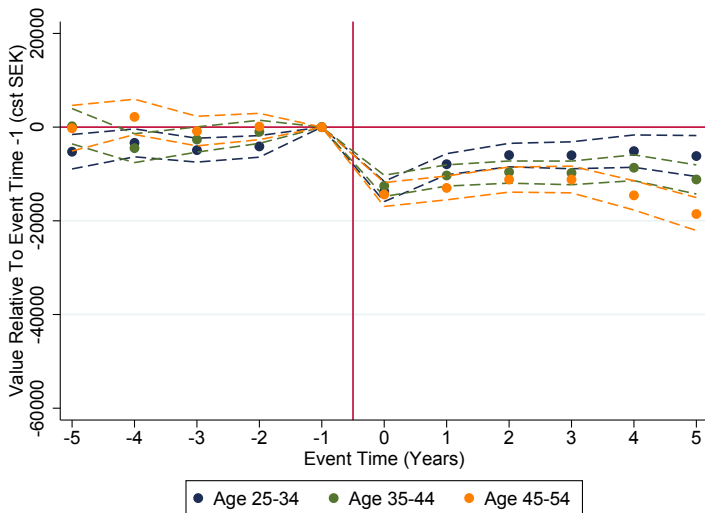
Challenge II: age-related heterogeneity in MRS?

Figure: Income profile, by age



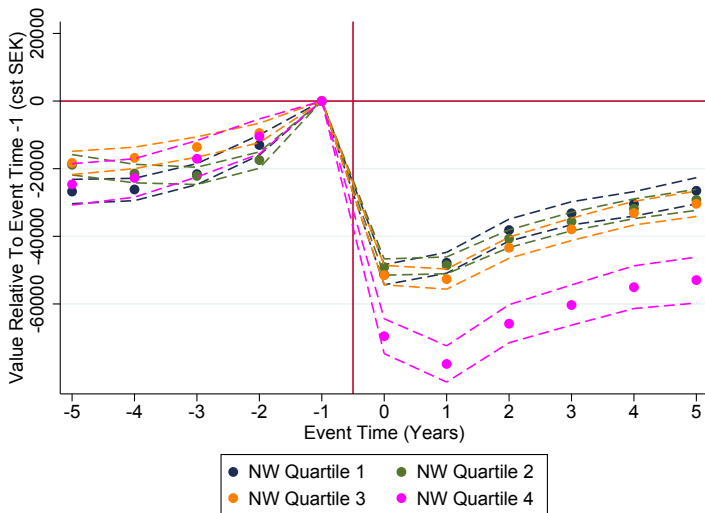
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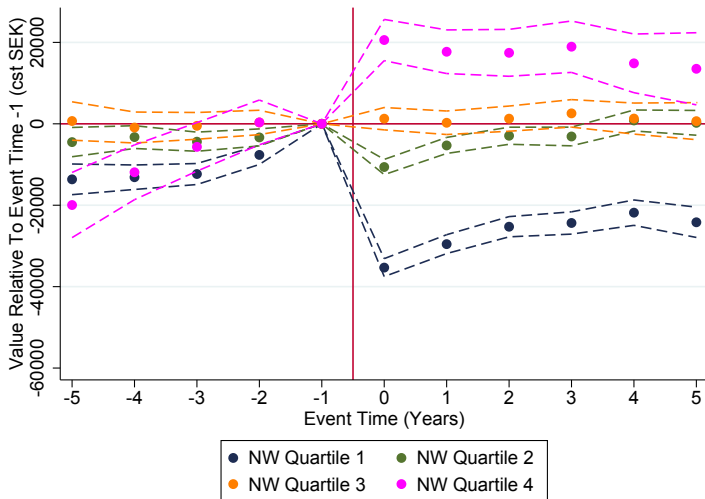
Challenge II: wealth-related heterogeneity in MRS?

Figure: Income profile, by net worth



Challenge II: wealth-related heterogeneity in MRS?

Figure: Consumption profile, by net worth ► Liquidity



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Recap: Validating CI approach

- Consumption Implementation:

$$MRS = 1 + \gamma \times \Delta c / c$$

⇒ What is the appropriate γ ? What about heterogeneity in γ ?

- Revealed Preference:

$$\text{Willingness to Insure} = MRS \times \text{risk} / \text{price}$$

⇒ Use risk/price and insurance choice to infer (bounds on) MRS

- We can apply the two approaches to the same individuals

- Eligible, displaced worker chooses between 2 types of coverage.
- Minimum coverage:
 - mandated and funded by payroll tax (τ_0)
 - uniform, low benefit level ($b_0 \approx 20\%$ for median income earner)
- Supplemental coverage:
 - workers can voluntarily opt for extra coverage
 - pay (uniform) UI premia ($\tau_1 - \tau_0$) to UI funds
 - income-related, generous benefit level ($b_1 \approx 72\%$ of pre-U wage)
- We observe the choice to buy supplemental coverage or not for universe of Swedish workers ($\sim 80\%$ buy b_1)

▶ Institutional details

▶ Summary Statistics

Revealed Preference: Bounding the MRS

- Expected price per unit of coverage equals

$$\frac{[1 - \pi] \times [\tau_1 - \tau_0]}{\pi \times [b_1 - b_0]}$$

- This expected price provides
 - a **lowerbound** on MRS for 'insured' workers on plan (b_1, τ_1)
 - an **upperbound** on MRS for 'uninsured' workers on plan (b_0, τ_0)
- Using time spent unemployed in $t + 1$, we find:

	$\frac{1-\pi}{\pi}$	$\frac{\tau_1-\tau_0}{b_1-b_0}$	$\frac{E([1-\pi][\tau_1-\tau_0])}{E(\pi[b_1-b_0])}$
'insured' in t	128.7	0.012	1.68
'uninsured' in t	253.4	0.013	3.72

Revealed Preference: Bounding the MRS

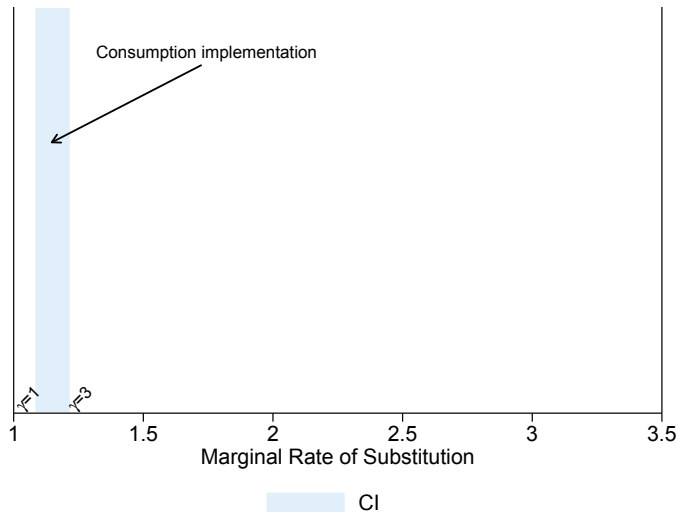
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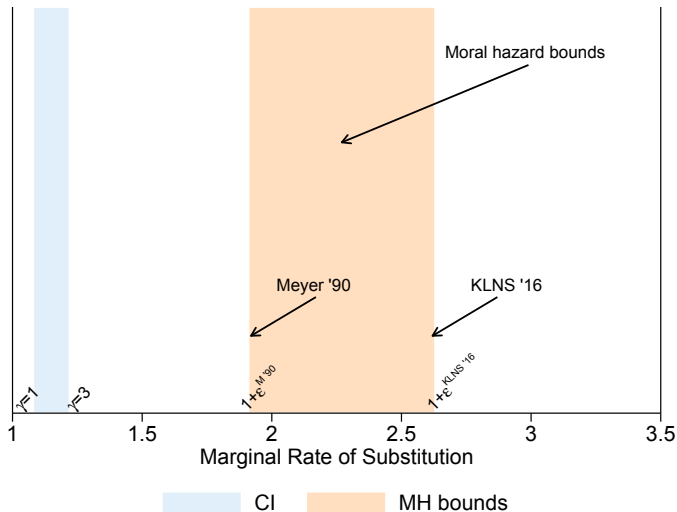
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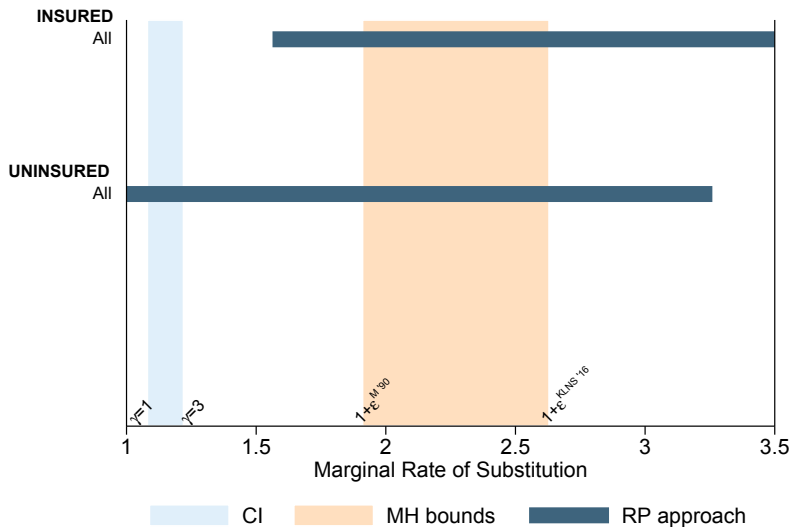
RP & CI: comparing estimates of MRS



RP & CI: comparing estimates of MRS

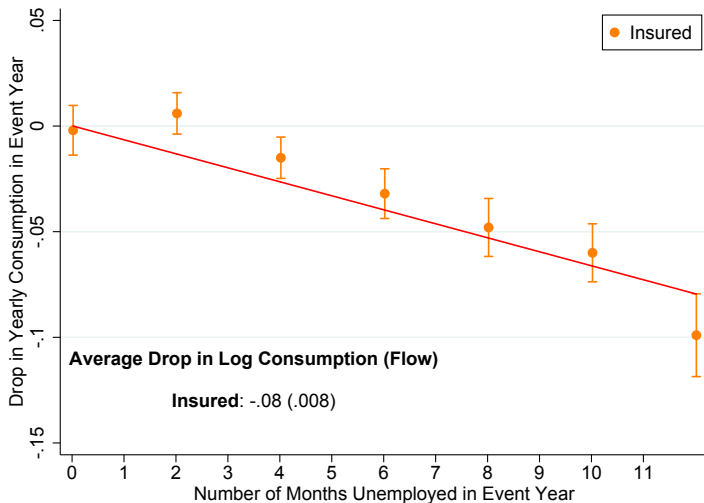


RP & CI: comparing estimates of MRS



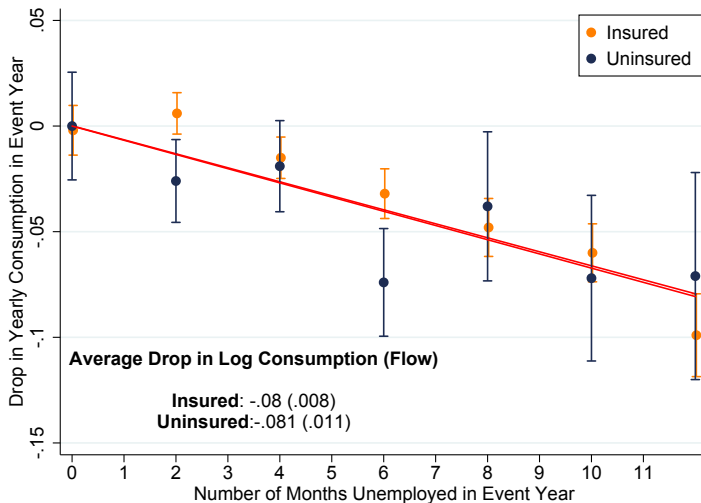
RP & CI combined: consumption profiles

Figure: Estimate of consumption drops, Insured only



RP & CI combined: consumption profiles

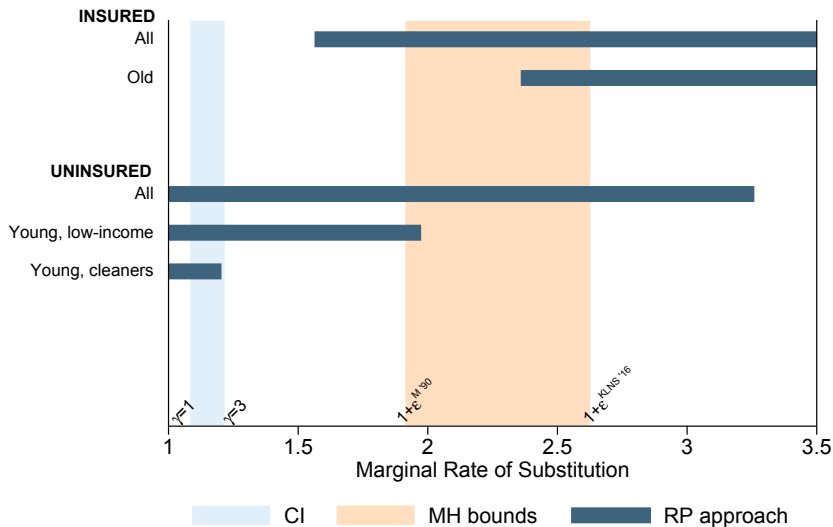
Figure: Estimate of consumption drops, Insured vs. Uninsured



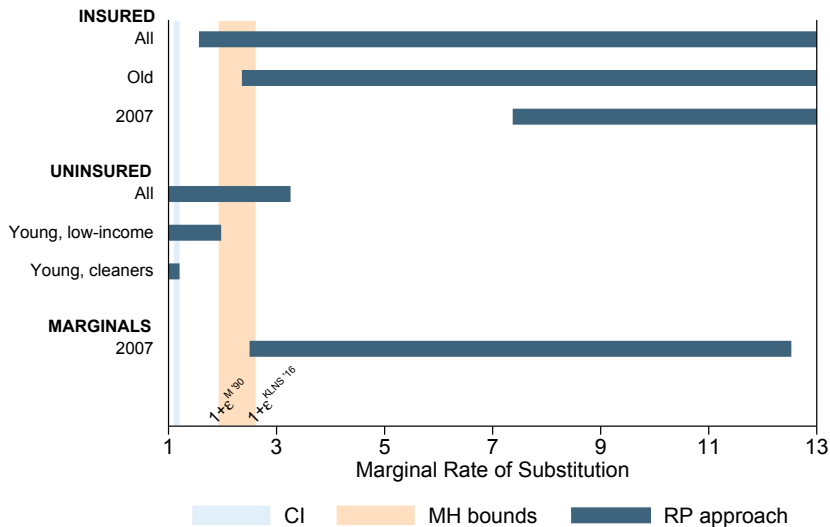
RP approach: how to tighten bounds?

- 1 Compare different groups (facing same price): differences in unemployment risk translate into different 'expected' price per coverage.
- 2 Identify “marginals” using exogenous variation in prices or risks to tighten bounds on MRS (see Landaïs et al. '16)
 - pre- and post price/risk provide lower and upper bound on MRS of “marginals” switching insurance plans
 - example: large “surprise” increase in UI premia in 2007 from 100kr a month to over 300kr a month [► Details](#)

RP & CI: comparing estimates of MRS



RP & CI: comparing estimates of MRS



- RP approach suggests high value of insurance compared to CI
- State-dependent utility may play important role
- RP indicates importance of heterogeneity as well
- What about RP limitations?
 - biased beliefs $\Rightarrow$ combine with elicitation surveys
 - information/ability $\Rightarrow$ combine with IQ test registers
 - inertia $\Rightarrow$ active switchers still have high insurance value

Conclusion

- We exploited unique data and context in Sweden
- We revisited CI using registry-based data providing new insights into means for and heterogeneity in consumption smoothing
- We used alternative RP approach to provide first-time evidence on direct valuation of UI

DETAILS

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

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
<i>% of disp. income</i>	110	-39	0	123	420
Financial assets (A)	75	0	4	48	170
<i>% of disp. income</i>	65	0	4	47	162
Bank holdings	27	0	0	12	63
<i>% of disp. income</i>	20	0	0	8	49
Mutual funds	25	0	0	10	55
<i>% of disp. income</i>	27	0	0	9	65
Stocks	14	0	0	0	8
<i>% of disp. income</i>	9	0	0	0	6
Real Estate (B)	267	0	0	267	888
<i>% of disp. income</i>	178	0	0	159	511
Debt (C)	181	0	50	236	519
<i>% of disp. income</i>	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

Empirical design: event-study, anticipation and control

- We use a simple event-study with a 'balanced' panel:
 - including only individuals observed before and after displacement
 - restrict to individuals' first displacement, happening at start of the year
 - controlling for age fixed effects
- Anticipation of displacement may reduce drop in consumption at displacement
 - underestimates wedge in consumption between employment and unemployment
 - Hendren ('16) finds anticipation using consumption surveys and elicited job loss probabilities
 - absence of pre-trend in consumption (when controlling for age) suggests that anticipation is limited
- We will construct a control group using NN matching:
 - investigate how estimated impact varies when matching on full pre-trend ($t=-5$ to -1), vs partial pre-trend ($t=-5$ to $-k$ for various k)
 - provide further evidence on anticipation of displacement

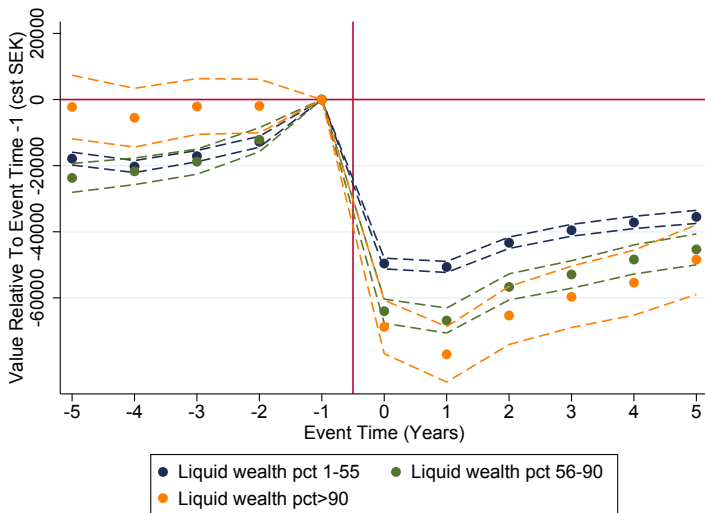
Empirical design: re-covering consumption wedge

- Can we recover unemployment consumption from yearly aggregates mixing c_e and c_u ?
- Non-parametric approach:
 - analyze profile for different realized unemployment spell lengths
- Parametric approach:
 - we focus on ongoing spells and observe consumption at different unemployment spell lengths t in December, but aggregated over the past year (e.g., $C(t) = \sum_{q=0}^{11} c_{t-q}(t)$)
 - estimate average unemployment consumption c_u and pre-unemployment consumption c_e from $C(t)$
- Compare to consumption drops based on consumption survey:
 - measures of consumption expenditures at the household level
 - flow measures at the time of interview

► Back

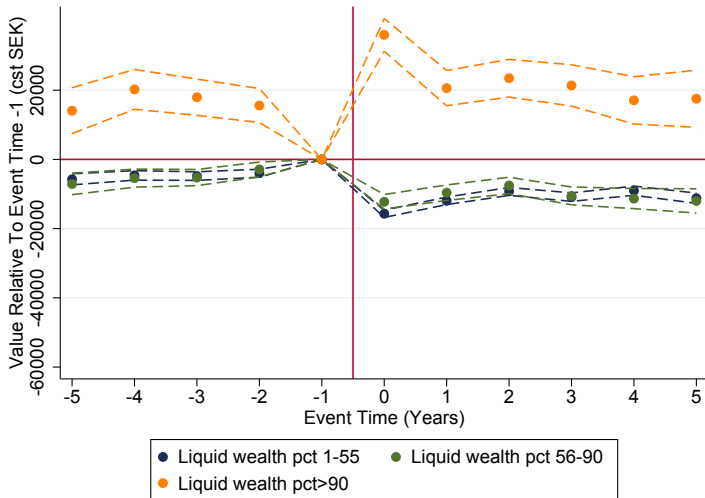
Challenge II: liquidity-related heterogeneity in MRS?

Figure: Income profile, by bank holdings



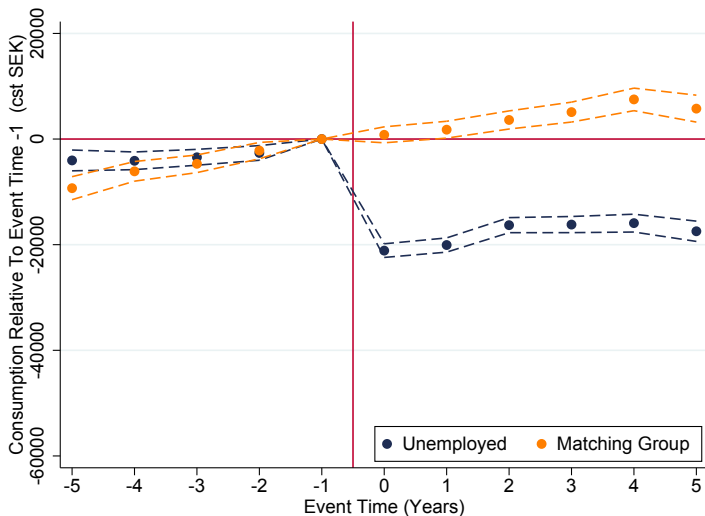
Challenge II: liquidity-related heterogeneity in MRS?

Figure: Consumption profile, by bank holdings [▶ Back](#)



Challenge II: liquidity-related heterogeneity in MRS?

Figure: Consumption profile for unemployed vs. matching group [▶ Back](#)



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:

$$Eu(z_1) - Eu(z_0) \cong \pi(\bar{z}) u'_u(c(\bar{z})) [b_1 - b_0] - (1 - \pi(\bar{z})) u'_e(c(\bar{z})) [\tau_1 - \tau_0]$$

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., committed 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

► Back

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 $\text{corr}\left(\gamma, \frac{\Delta c}{c}\right)$ 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

Revealed Preference: Bounding the MRS

- Using unemployment outcomes during $t+2$:

	$\frac{1-\pi}{\pi}$	$\frac{\tau_1-\tau_0}{b_1-b_0}$	$\frac{E([1-\pi][\tau_1-\tau_0])}{E(\pi[b_1-b_0])}$
Insured	73.3	0.012	1.12
Uninsured	119.2	0.013	1.86

- For insured, MRS exceeds 1.12, indicating that returns to unemployment benefits exceed 12 percent
- For the uninsured, MRS is smaller than 1.86, indicating that returns to unemployment benefits are lower than 86 percent

The Swedish UI System: Details (I)

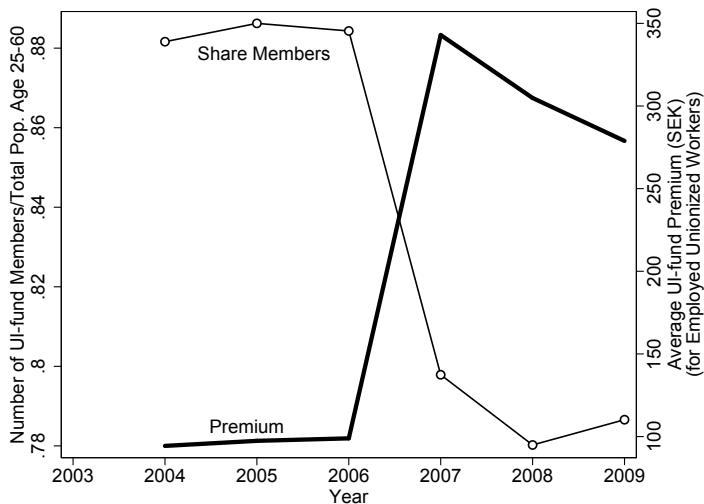
- Eligibility rules for displaced workers:
 - Work requirement to be eligible to any UI coverage (minimum or supplemental):
 - Within the past 12 months have worked more than 6 calendar months at least 80h per month
 - To be eligible to supplemental UI coverage:
 - Fulfill work requirement + have been 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 = $\text{Max}(320, \min(.8 * \text{daily wage}, 680))$

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)

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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.

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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](#)

