# Topic 9: Optimal Social Insurance: The Case of UI

Nathaniel Hendren

Harvard

Spring, 2022

# Social Insurance

- The government is a major provider of social insurance
  - Unemployment Insurance
  - Disability Insurance
  - Long-term care insurance
  - Social Security
  - Health Insurance
- Why does the government (instead of private market) provide this insurance?

# Adverse Selection in Social Insurance

- Today: Focus on unemployment insurance
- Why does this market not exist and what should the government do about it?
- Discussed Landais et al. (2021 AER) last class – documents presence of adverse selection in private (subsidized) UI

# UI in Sweden: Price Change

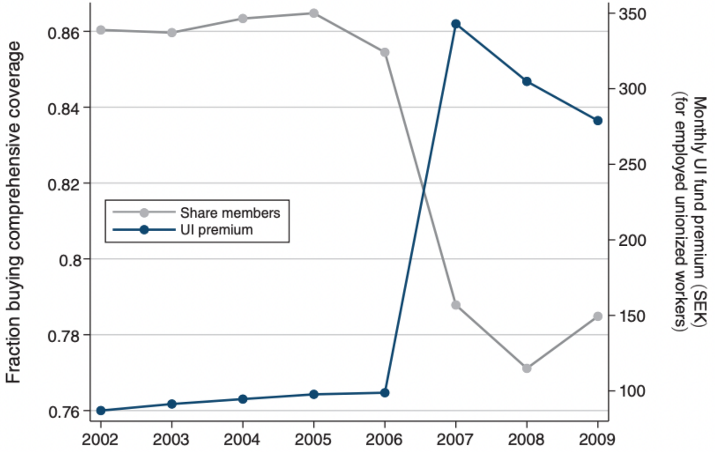
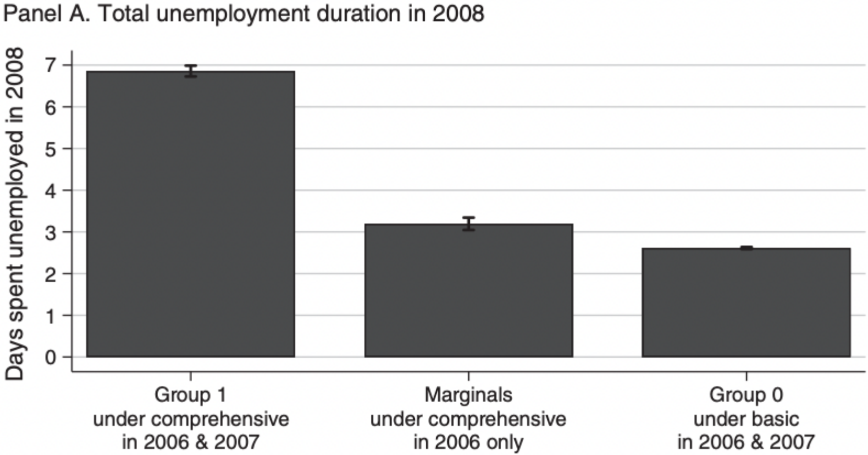



FIGURE 4. PRICE VARIATION: EVOLUTION OF PREMIA **p** AND OF THE FRACTION OF WORKERS BUYING THE COMPREHENSIVE COVERAGE AROUND THE 2007 REFORM

*Notes:* The figure reports the evolution of monthly premium for the supplemental UI coverage over time. As explained in Section IA, there are no sources of premium differentiation up to 2008, apart from small rebates for union members and for unemployed individuals. Here, we report the value of the premium for employed union

# UI in Sweden: Price Change

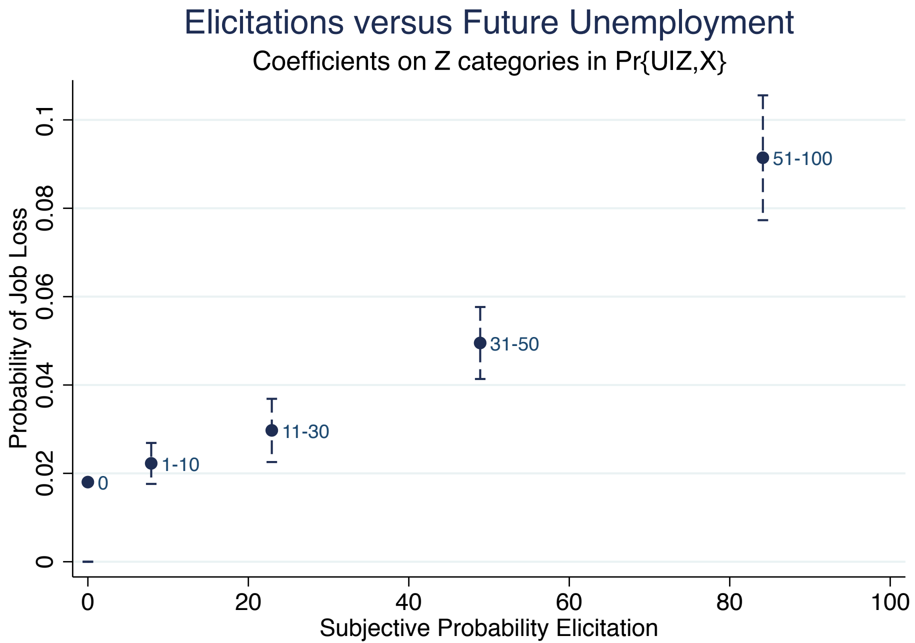


# Adverse Selection in Social Insurance

- Alternative approach: use subjective probability elicitations to identify asymmetric information (Hendren 2017 AER)

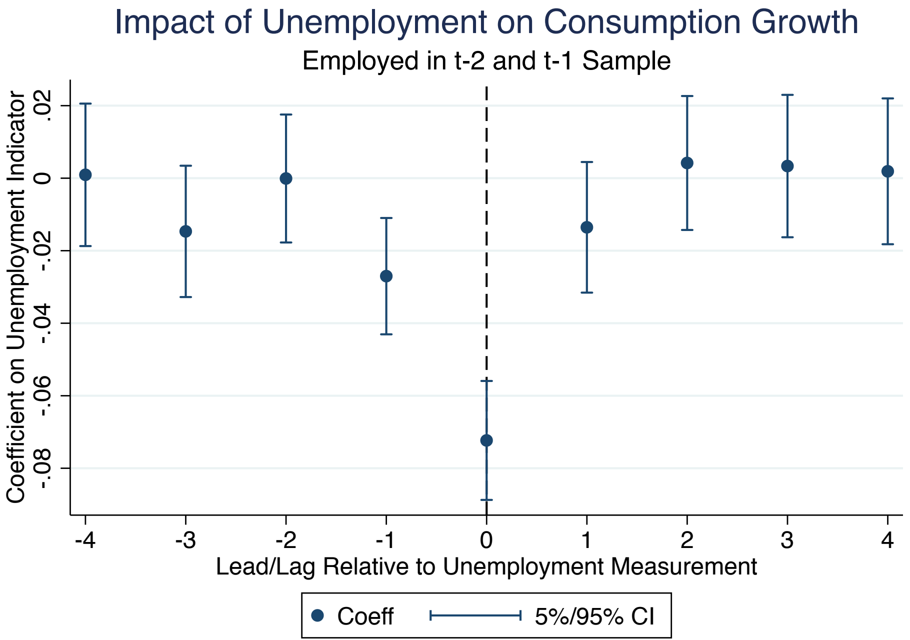
# Adverse Selection in Social Insurance

- Alternative approach: use subjective probability elicitations to identify asymmetric information (Hendren 2017 AER)
- Use data from Health and Retirement Study (1993-2013)
  - Survey asks subjective probability elicitations, $Z$
    - *"What is percent chance (0-100) that you will lose your job in the next 12 months?"*
- Do the elicitations predict future job loss conditional on observables?Why does this market not exist and what should the government do about it?


Elicitations versus Future Unemployment
Coefficients on Z categories in Pr{U|Z,X}
Probability of Job Loss
0
0.02
0.04
0.06
0.08
0.1
0
1-10
11-30
31-50
51-100
0
20
40
60
80
100
Subjective Probability Elicitation

# Regression of Job Loss on Elicitation

| *Specification* | Baseline | Demo Only | Demo, Job, Health | Ind FE |
|---|---|---|---|---|
| **Elicitation** | **0.0836*** ** | **0.0956*** ** | **0.0822*** ** | **0.0715*** ** |
| **s.e.** | **(0.00675)** | **(0.00685)** | **(0.00736)** | **(0.0107)** |
| Controls | | | | |
| Year Dummies | X | X | X | X |
| Demographics | X | X | X | X |
| Job Characteristics | X | | X | X |
| Health Characteristics | | | X | |
| Individual FE | | | | X |
| Num of Obs. | 26640 | 26640 | 22831 | 26640 |
| Num of HHs | 3467 | 3467 | 3180 | 3467 |



Impact of Unemployment on Consumption Growth
Employed in t-2 and t-1 Sample
Coefficient on Unemployment Indicator
.02
0
-.02
-.04
-.06
-.08
-4
-3
-2
-1
0
1
2
3
4
Lead/Lag Relative to Unemployment Measurement
Coeff
5%/95% CI

# Minimum Pooled Price Ratio

| *Specification* | Baseline | Alternative Controls | |
|---|---|---|---|
| | | Demo | Health |
| | (1) | (2) | (3) |
| **Inf T(p) - 1** | **3.360** | **5.301** | **3.228** |
| **s.e.** | **(0.203)** | **(0.655)** | **(0.268)** |
| Controls | | | |
| Demographics | X | X | X |
| Job Characteristics | X | | X |
| Health Characteristics | | | X |
| Num of Obs. | 26,640 | 26,640 | 22,831 |
| Num of HHs | 3,467 | 3,467 | 3,180 |

# Optimal Unemployment Insurance

- The private market can't provide UI because of adverse selection
- How should the government intervene?
- Baily 78 + Chetty 06 provide classic model motivating optimal social insurance literature
    - Translate optimality results into 'sufficient statistics' that can be estimated

# Optimal Unemployment Insurance

- Setup (Baily 1978; Chetty 2006; Chetty and Finkelstein 2012 Handbook Chapter)
- Two states of the world: Employed and Unemployed
  - Consumption $c^u$ and $c^e$
- Individuals exert effort $p$ ($=$ probability of unemployed or fraction of life in unemployed state)
- Utility $U\left(p, c^e, c^u\right)$ assumed to have a particular structure:

$$\left(1-p\right) v\left(c^e\right) + pu\left(c^u\right) - \psi\left(1-p\right)$$

where $\psi\left(\circ\right)$ is the cost of effort

# Unemployment Insurance: Binary Model

- Consumption has constraints

$$c^u \leq A + b$$

$$c^e \leq A + w - \tau$$

where $\tau$ are taxes and $b$ are unemployment benefits; $A$ is assets.

- Indirect utility

$$V(\tau, b) = \max_p pu(A + b) + (1 - p)v(A + w - \tau) - \Psi(1 - p)$$

- Budget / resource constraint

$$(1 - p)\tau = pb$$

# Unemployment Insurance: Binary Model

- Goal: What value of $\tau$ and $b$ maximize representative agent's utility?
- Maximization program

$$\max_{\tau,b} V\left(\tau, b\right) \; s.t. \; pb \leq \left(1-p\right)\tau$$

or

$$\max_{b} V\left(\tau\left(b\right), b\right)$$

Or

$$\frac{\partial V}{\partial \tau}\frac{d\tau}{db} + \frac{\partial V}{\partial b} = 0$$

or

$$\frac{\frac{\partial V}{\partial b}}{\frac{\partial V}{\partial \tau}} = -\frac{d\tau}{db}$$

where $\frac{d\tau}{db}$ captures the budget impact

# Budget Impact

- Budget impact

$$\tau = \frac{p}{1-p}b$$

- So

$$\begin{aligned} \frac{d\tau}{db} &= \frac{p}{1-p} + b\frac{\frac{dp}{db}(1-p) + p\frac{dp}{db}}{(1-p)^2} \\ &= \frac{p}{1-p} + \frac{1}{(1-p)^2}b\frac{dp}{db} \\ &= \frac{p}{1-p}\left(1 + \frac{1}{1-p}\frac{b}{p}\frac{de}{db}\right) = \frac{p}{1-p}\left(1 + \frac{\epsilon_{p,b}}{1-p}\right) \end{aligned}$$

# Envelope Theorem

- Envelope theorem implies

$$\frac{\partial V}{\partial \tau} = -\left(1-p\right) v'\left(c^e\right)$$

$$\frac{\partial V}{\partial b} = pu'\left(c^u\right)$$

- Optimality condition requires:

$$\frac{\frac{\partial V}{\partial b}}{\frac{\partial V}{\partial \tau}} = -\frac{d\tau}{db}$$

which implies

$$\frac{p}{1-p}\frac{u'\left(c^u\right)}{v'\left(c^e\right)} = \frac{p}{1-p}\left(1+\frac{\epsilon_{p,b}}{1-p}\right)$$

# Envelope Theorem

- Dividing, yields the "Baily-Chetty" condition:

$$\frac{u'(c^u) - v'(c^e)}{v'(c^e)} = \frac{\epsilon_{p,b}}{1-p}$$

where

$$\epsilon_{p,b} = \frac{dp}{db}\frac{b}{p}$$

- Baily (1978); Chetty (2006)

# Empirical Quantities

- What is $\frac{\epsilon_{p,b}}{1-p}$?
    - Causal impact of simultaneous increase in benefits financed by increase in taxes on the cost of unemployment
        - Fiscal externality
    - Generally assumed to be from increased unemployment duration

# Empirical Quantities

- But there could be other factors that generate fiscal externalities
  - Increased wages
  - Increased entry into unemployment
  - Impact of taxes on labor supply
  - Impact on "job creation"
- Other factors that generate WTP:
  - Search Externalities

# Schmeider and Von Wachter Annual Review (2018)

Table 1: Estimates of the Effects of Potential Benefit Durations on Unemployment Durations

| Country / States | Study | Design | Source of Variation | $\frac{dD}{dP}$ | $\frac{dD}{dP}\frac{P}{D}$ | $\frac{dB}{dP}$ | $\frac{dB}{dP}\frac{P}{B}$ | Behavioral cost per 1 USD increase in transfer - tax = 3% | Behavioral cost per 1 USD increase in transfer - tax wedge |
|---|---|---|---|---|---|---|---|---|---|
| **Panel A: Studies from Europe** | | | | | | | | | |
| Austria | Lalive, van Ours, Zweimueller, 2006 | DiD | Regional variation, increase from 30 to 39 weeks | 0.05 | 0.10 | | | 0.24 | 0.55 |
| | | | Regional variation, increase from 30 to 52 weeks | 0.10 | 0.21 | | | 0.58 | 1.29 |
| Austria | Lalive, 2007 | RD | Age 50; increase 39 to 52 weeks; men | -0.03 | -0.09 | | | -0.81 | -1.54 |
| | | | Age 50; increase 39 to 52 weeks; women | 0.47 | 0.73 | | | 1.17 | 3.05 |
| | | | Age 50; increase 39 to 209 weeks; men | 0.09 | 0.45 | | | 39.54 | 71.59 |
| | | | Age 50; increase 39 to 209 weeks; women | 0.65 | 0.98 | | | 1.52 | 4.04 |
| Austria | Card, Chetty, Weber, 2007 | RD | Cutoff at 36 months UI contributions in prev. 5 years, increase from 20 to 30 weeks of PBD. | 0.10 | 0.11 | | | 0.11 | 0.37 |
| Austria | Lalive, 2008 | RD | Border RD; increase 30 to 209 weeks; men | 0.08 | 0.37 | | | 32.95 | 59.66 |
| | | | Border RD; increase 30 to 209 weeks; women | 0.28 | 0.56 | | | 2.13 | 4.58 |
| Slovakia | van Ours and Vodopivec, 2008 | DiD | Policy change in 1998, decrease 9 to 6 months | 0.43 | 0.63 | | | 0.94 | 2.36 |
| | | | Policy change in 1998, decrease 12 to 6 months | 0.30 | 0.43 | | | 0.67 | 1.67 |
| | | | Policy change in 1998, decrease 18 to 9 months | 0.40 | 0.72 | | | 1.54 | 3.44 |
| Portugal | Centeno and Novo, 2009 | RD | Age 30 / 40 Disc, increase from 12 to 18 months | 0.22 | 0.45 | | | 1.15 | 2.16 |
| Germany | Schmieder, von Wachter, Bender, 2012 | RD | Age 42 discontinuity - increase 12 to 18 months | 0.13 | 0.14 | 0.30 | 0.58 | 0.12 | 0.41 |
| | | | Age 44 discontinuity - increase 18 to 22 months | 0.10 | 0.12 | 0.26 | 0.54 | 0.13 | 0.38 |
| | | | Age 49 discontinuity - increase 22 to 26 months | 0.11 | 0.13 | 0.35 | 0.67 | 0.14 | 0.42 |
| France | Le Barbanchon, 2016 | RD | Threshold in past experience at 8 months, increase from 7 to 15 months of PBD | 0.31 | 0.40 | | | 0.52 | 1.35 |
| **Panel B: Studies from the United States** | | | | | | | | | |
| CWBH, 13 states | Moffit, 1985 | | | 0.15 | 0.34 | | | | |
| CWBH, all states | Katz and Meyer, 1990 | | | 0.20 | 0.41 | 0.23 | 0.52 | 1.05 | 1.89 |
| New Jersey | Card and Levine, 2000 | DiD | Extended Benefit program, increased benefits by 13 weeks | 0.45 | 0.1 | 0.08 | | | |
| Missouri | Johnston and Mas, 2015 | Temporal RD | Benefit cut from 73 to 57 weeks for some cohorts | 0.30 | | 0.54 | | 0.36 | 0.69 |
| CWBH, Louisiana/Washington | Landais, 2015 | RKD | Maximum potential duration cap | | 0.33 | | 1.35 | | |

**Notes:** All calculated behavioral cost terms use the constant hazard approximation described in Section 4.2. The behavioral cost in the last column represents the extra cost (in dollars) to the government budget of increasing the mechanical transfer (that is the transfer in the absence of behavioral responses) to the unemployed by 1 dollar. For example, a behavioral cost of $0.55 suggests that to finance a $1 transfer from a benefit extension one has to raise $1.55 to cover the mechanical cost ($1) and behavioral cost ($0.55). The last two columns differ in whether the budget shortfall is measured using the employee's UI contribution rate (at 3

# Schmeider and Von Wachter Annual Review (2018)

Table 2: Estimates of the Effects of Benefit Increases on Unemployment Durations

| Country / States | Study | Design | Source of Variation | $\frac{dD}{db}\frac{b}{D}$ | $\frac{dB}{db}\frac{b}{B}$ | Behavioral cost per 1 USD increase in transfer - $\tau = 0.03$ | Behavioral cost per 1 USD increase in transfer - tax wedge |
|---|---|---|---|---|---|---|---|
| **Panel A: Studies from Europe** | | | | | | | |
| Sweden | Carling et al, 2001 | DiD | Replacement rate change from 80% to 75% | 1.60 | | 0.60 | 2.36 |
| Norway | Roed and Zhang, 2003 | | Timing of UI Start - Male | 0.95 | | 0.87 | 1.41 |
| | | | Female | 0.35 | | 0.35 | 0.55 |
| Austria | Lalive et al., 2006 | DiD | replacement rate change for target income range from 41% to 47% | 0.15 | | 0.06 | 0.47 |
| Spain | Arranz et al, 2009 | Pre-Post | Reduction in benefits and duration | 0.80 | | 0.29 | 1.24 |
| Austria | Card, Lee, Pei, Weber, 2015 | RKD | Kinks formed by minimum and maximum benefit levels - High Income | 2.00 | | 0.71 | 5.56 |
| | | | Kinks formed by minimum and maximum benefit levels - Low Income | 1.00 | | 0.36 | 2.79 |
| **Panel B: Studies from the United States** | | | | | | | |
| CWBH - 13 states | Moffitt, 1985 | Cross-Sectional | | 0.36 | | | |
| US – Georgia | Solon, 1985 | DiD | Tax policy change (non-taxable to taxable benefits) | 0.10 | 0.07 | 0.08 | 0.14 |
| CWBH - all states | Katz and Meyer, 1990 | State-by-year | | 0.80 | | 0.29 | 1.74 |
| US - New York | Meyer and Mok, 2007 | Pre-post | Increase in maximum weekly benefit level from $180 to 245$ | 0.60 | 0.30 | 0.41 | 0.81 |
| | | | | 0.12 | 0.30 | 0.08 | 0.16 |
| | | | | 0.23 | 0.30 | 0.16 | 0.31 |
| US | Chetty, 2008 | DiD | cross-state maximum benefit level | 0.53 | | 0.36 | 0.71 |
| US - ID, LA, MO, NM, WA | Landais, 2015 | RKD | Kink at maximum UI benefit level | 0.29 | 0.73 | 0.14 | 0.40 |
| US | Kroft and Notowidigdo, 2015 | DiD | cross-state maximum benefit level | 0.63 | | 0.23 | 1.43 |
| US - Missouri | Card, Johnston, Leung, Mas, Pei, 2015 | RKD | Missouri,kink at maximum level of UI benefits - during-recession - Recession | 1.21 | 0.78 | 0.95 | 1.68 |
| | | | Missouri,kink at maximum level of UI benefits - pre recession / Boom | 0.38 | 0.35 | 0.38 | 0.59 |

**Notes:** See notes to Table 1.

# Value of Insurance Benefits

- How much of a markup are individuals willing to pay, $\frac{u'(c_u)}{v'(c_e)}$?
- Five approaches:
  - Approach #1: Exploit impact of unemployment on consumption (Gruber 1997)
  - Approach #2: Exploit ex-ante impact of learning about unemployment on consumption (Hendren 2016)
  - Approach #3: Exploit liquidity vs. moral hazard benefit response (Chetty 2008)
  - Approach #4: Reservation wages (Shimer and Werning 2010)
  - Approach #5: Measure WTP directly (Nekoei et al. 2017; Landais and Spinnewijn 2021 RESTUD)
  - Approach #6: Heterogeneity in MPCs (Landais and Spinnewijn 2021 RESTUD)

# Approach #1: Impact of Unemployment on Consumption

- Approach #1 (Baily 1978, Chetty 2006,...): Assume state dependence: $u = v$
  - This implies:

$$\frac{u'(c_u)}{v'(c_e)} \approx 1 + \sigma \frac{\Delta c}{c}$$

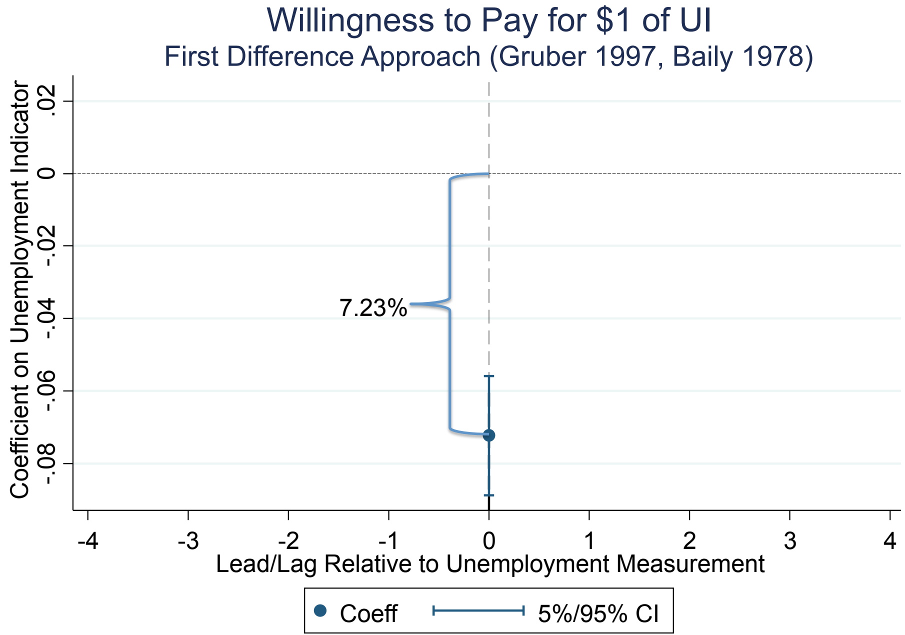
    where

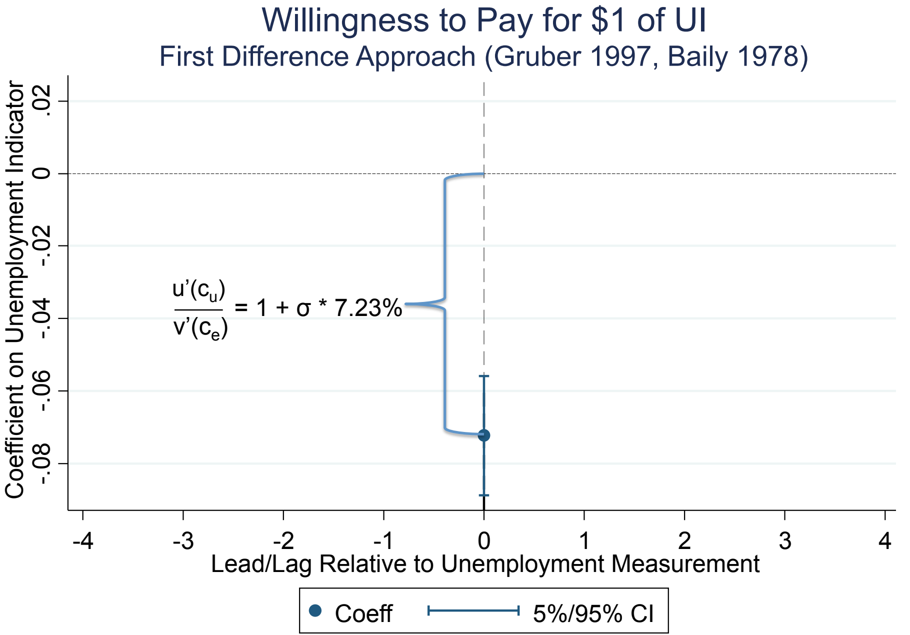
$$\frac{\Delta c}{c} = \frac{c_e - c_u}{c_e} \approx log(c_e) - log(c_u)$$

  - $\sigma = \frac{u''c}{u'}$ is relative risk aversion [Chetty 2006 has 3rd order adj.]
  - Generally implemented using first difference as proxy for $\frac{\Delta c}{c}$

# Value of Insurance Benefits

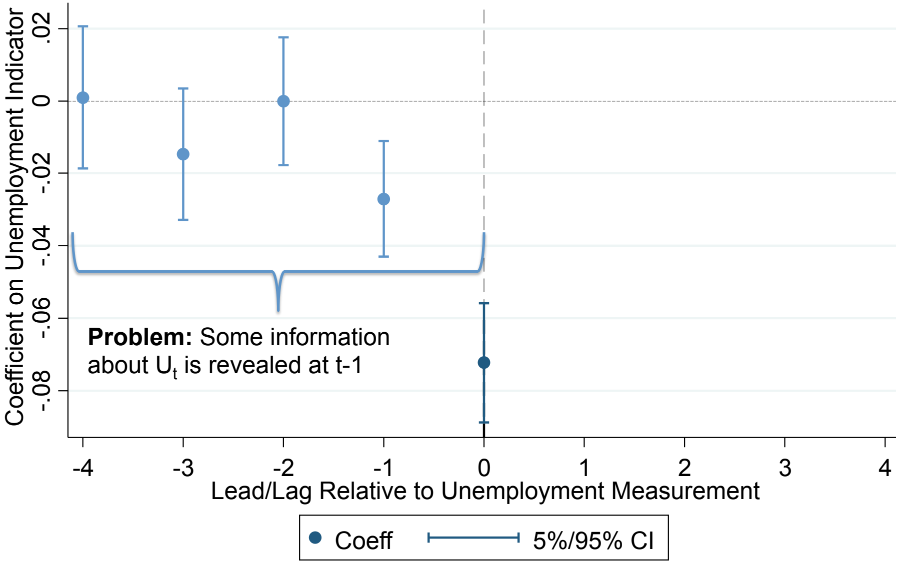
- Gruber (1997) estimates $\frac{\Delta c}{c}$ using first difference impact of unemployment on consumption expenditure (food expenditure) in PSID
- Studies how it varies heterogeneously with benefit level
- Uses this to solve for optimal benefits, $b^*$
- Problem: ex-ante responses bias first difference estimates (Hendren, 2016)

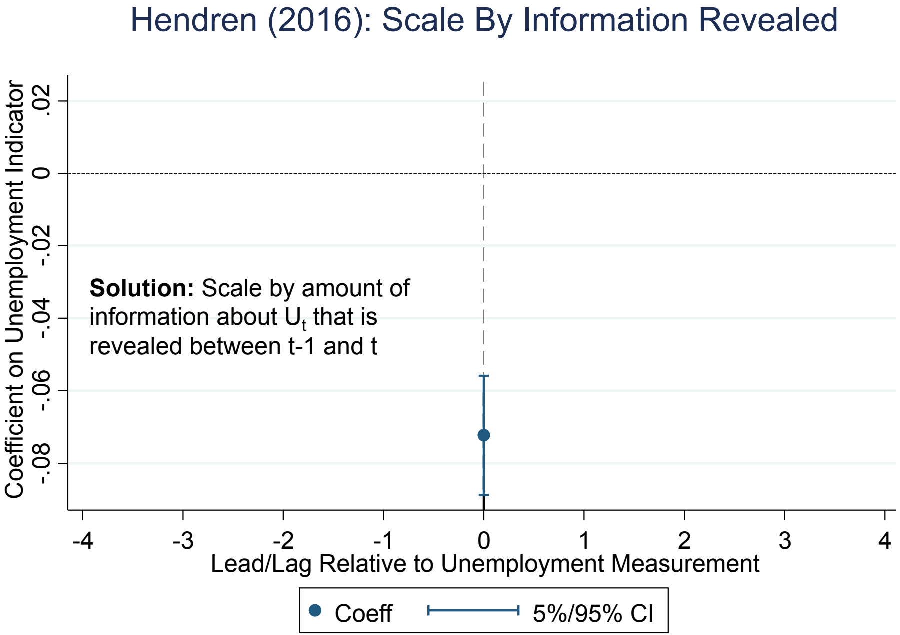

Willingness to Pay for $1 of UI
First Difference Approach (Gruber 1997, Baily 1978)
Coefficient on Unemployment Indicator
.02
0
-.02
-.04
-.06
-.08
7.23%
-4
-3
-2
-1
0
1
2
3
4
Lead/Lag Relative to Unemployment Measurement
Coeff
5%/95% CI

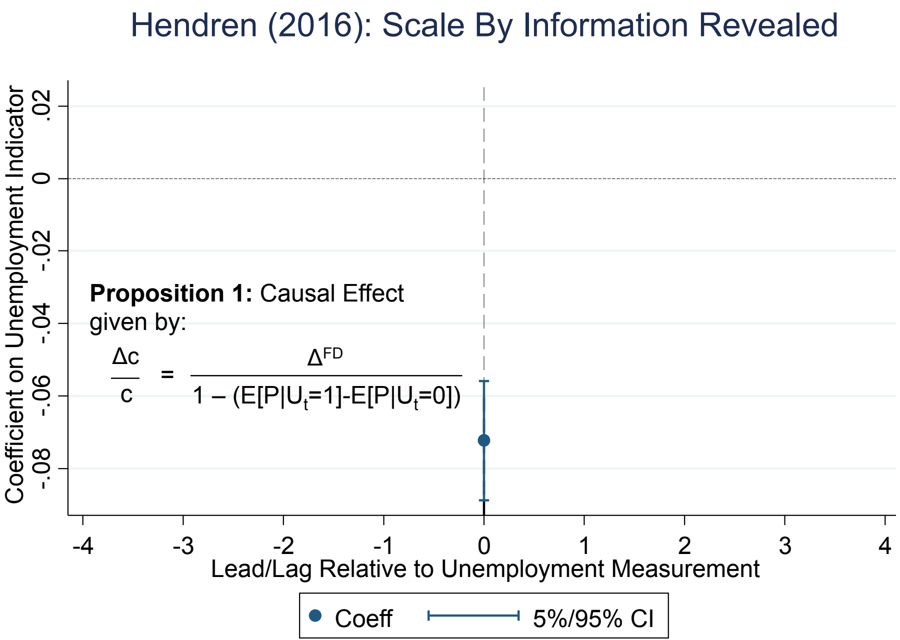


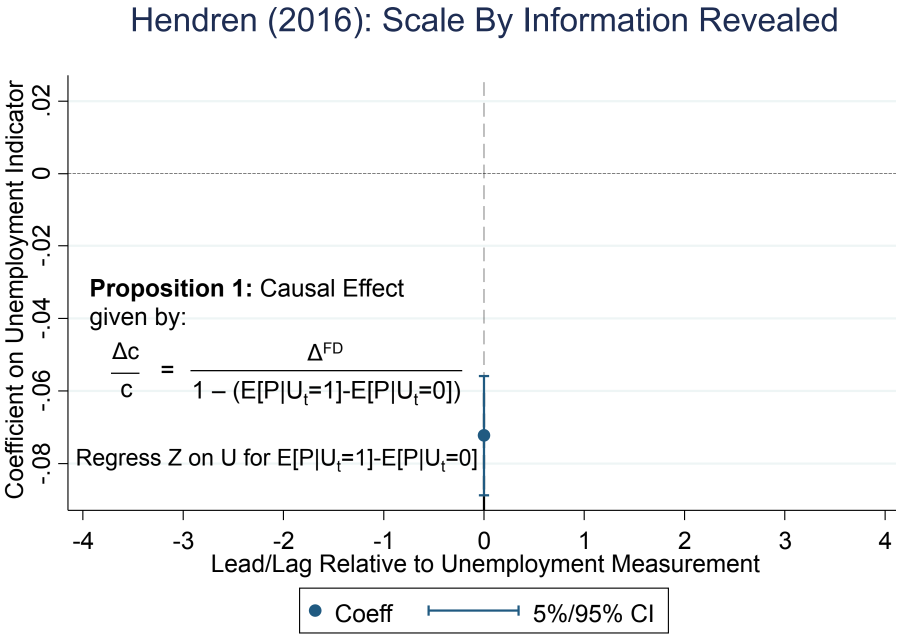
Willingness to Pay for $1 of UI
First Difference Approach (Gruber 1997, Baily 1978)
Coefficient on Unemployment Indicator
.02
0
-.02
-.04
-.06
-.08
$\frac{u'(c_u)}{v'(c_e)} = 1 + \sigma * 7.23\%$
-4
-3
-2
-1
0
1
2
3
4
Lead/Lag Relative to Unemployment Measurement
Coeff
5%/95% CI

# Hendren (2016): Scale By Information Revealed

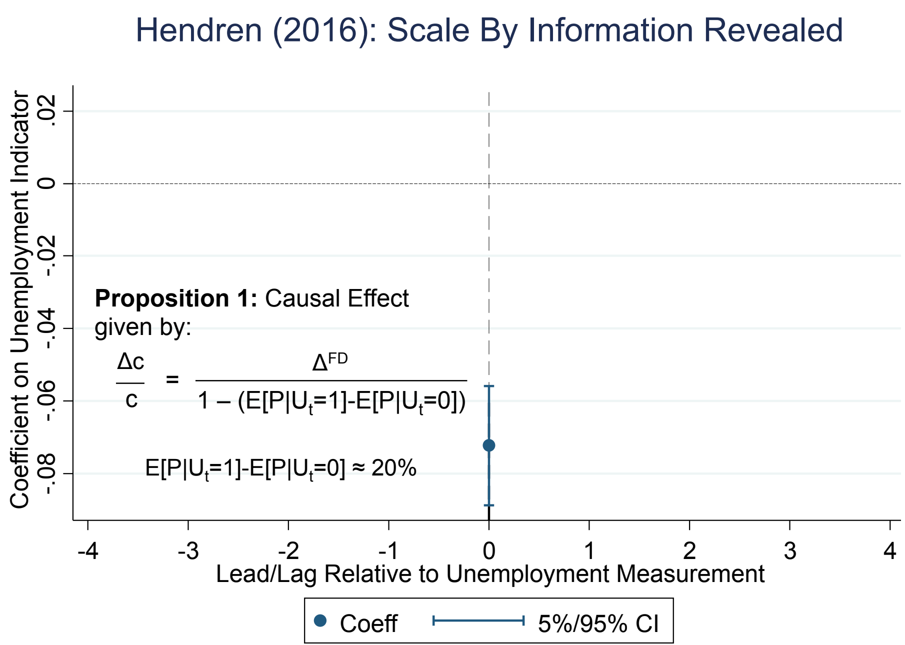


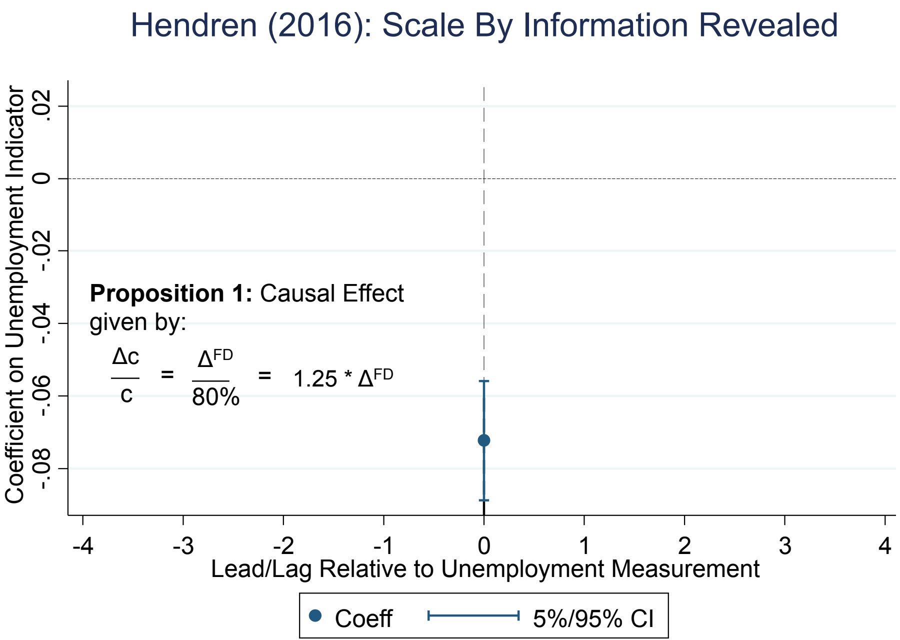

Hendren (2016): Scale By Information Revealed
Coefficient on Unemployment Indicator
.02
0
-.02
-.04
-.06
-.08
**Solution:** Scale by amount of information about $U_t$ that is revealed between t-1 and t
-4
-3
-2
-1
0
1
2
3
4
Lead/Lag Relative to Unemployment Measurement
Coeff
5%/95% CI

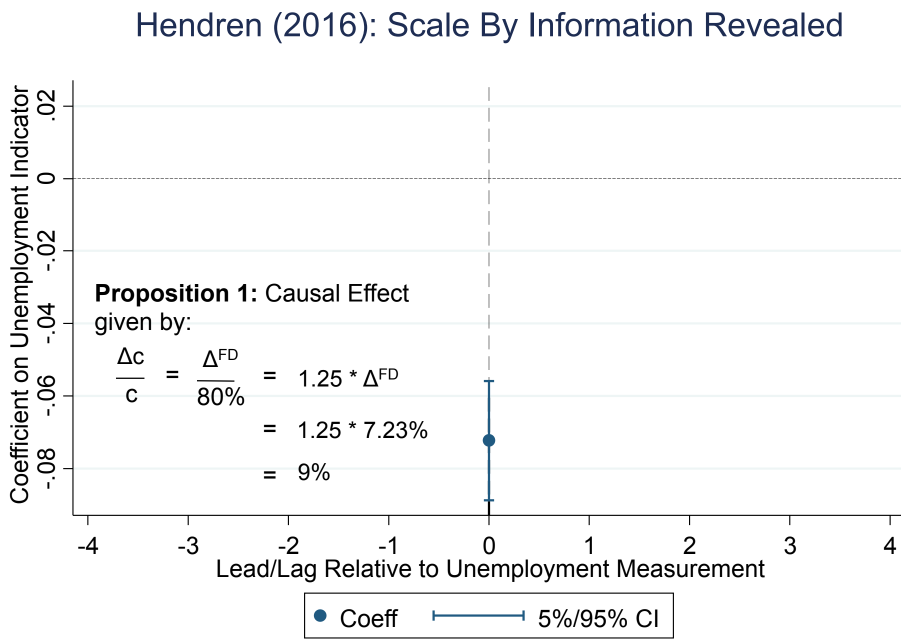

Hendren (2016): Scale By Information Revealed
Coefficient on Unemployment Indicator
.02
0
-.02
-.04
-.06
-.08
Proposition 1: Causal Effect given by:
$\frac{\Delta c}{c} = \frac{\Delta^{FD}}{1 - (E[P|U_t=1]-E[P|U_t=0])}$
-4
-3
-2
-1
0
1
2
3
4
Lead/Lag Relative to Unemployment Measurement
Coeff
5%/95% CI



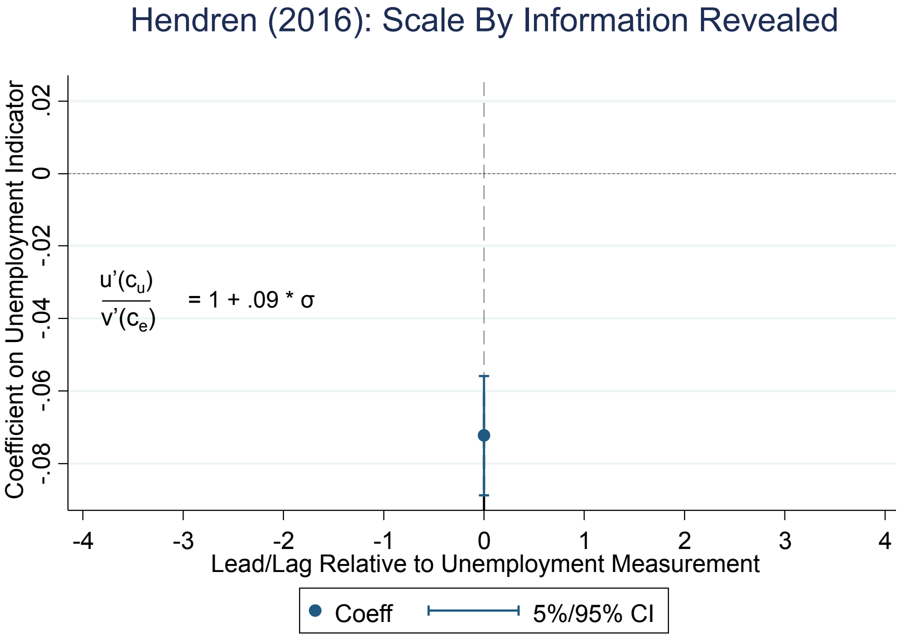
Hendren (2016): Scale By Information Revealed
Coefficient on Unemployment Indicator
.02
0
-.02
-.04
-.06
-.08
Proposition 1: Causal Effect given by:
$\frac{\Delta c}{c} = \frac{\Delta^{FD}}{1-(E[P|U_t=1]-E[P|U_t=0])}$
Regress Z on U for $E[P|U_t=1]-E[P|U_t=0]$
-4
-3
-2
-1
0
1
2
3
4
Lead/Lag Relative to Unemployment Measurement
Coeff
5%/95% CI


Hendren (2016): Scale By Information Revealed
Coefficient on Unemployment Indicator
.02
0
-.02
-.04
-.06
-.08
Proposition 1: Causal Effect given by:
$\frac{\Delta c}{c} = \frac{\Delta^{FD}}{1 - (E[P|U_t=1]-E[P|U_t=0])}$
$E[P|U_t=1]-E[P|U_t=0] \approx 20\%$
-4
-3
-2
-1
0
1
2
3
4
Lead/Lag Relative to Unemployment Measurement
Coeff
5%/95% CI

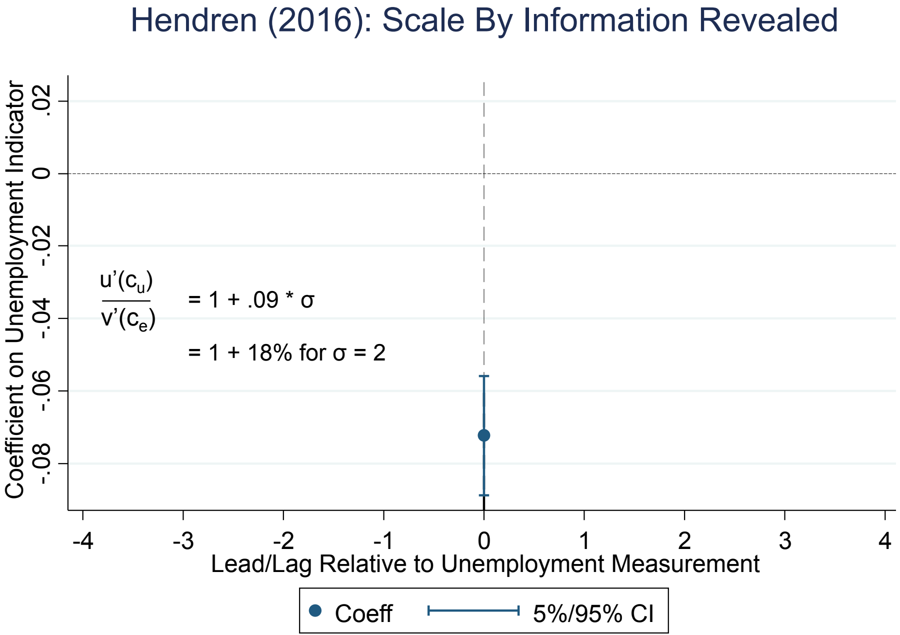

Hendren (2016): Scale By Information Revealed
Coefficient on Unemployment Indicator
.02
0
-.02
-.04
-.06
-.08
Proposition 1: Causal Effect given by:
$\frac{\Delta c}{c} = \frac{\Delta^{FD}}{80\%} = 1.25 * \Delta^{FD}$
-4
-3
-2
-1
0
1
2
3
4
Lead/Lag Relative to Unemployment Measurement
Coeff
5%/95% CI



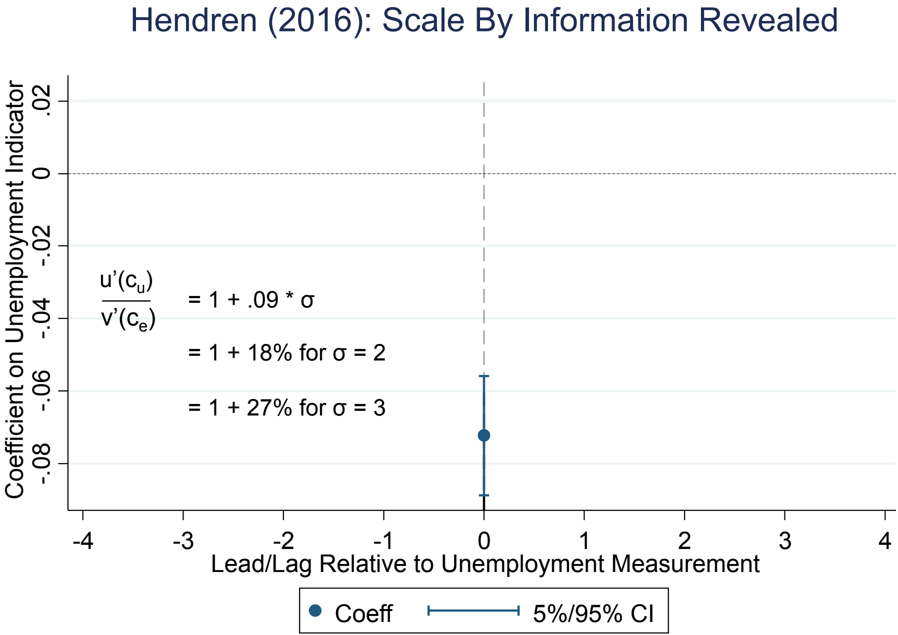
Hendren (2016): Scale By Information Revealed
Coefficient on Unemployment Indicator
.02
0
-.02
-.04
-.06
-.08
Proposition 1: Causal Effect given by:
$\frac{\Delta c}{c} = \frac{\Delta^{FD}}{80\%} = 1.25 * \Delta^{FD}$
$= 1.25 * 7.23\%$
$= 9\%$
-4
-3
-2
-1
0
1
2
3
4
Lead/Lag Relative to Unemployment Measurement
Coeff
5%/95% CI



Hendren (2016): Scale By Information Revealed
Coefficient on Unemployment Indicator
.02
0
-.02
-.04
-.06
-.08
$\frac{u'(c_u)}{v'(c_e)}$ = 1 + .09 * σ
-4
-3
-2
-1
0
1
2
3
4
Lead/Lag Relative to Unemployment Measurement
Coeff
5%/95% CI



Hendren (2016): Scale By Information Revealed
Coefficient on Unemployment Indicator
.02
0
-.02
-.04
-.06
-.08
$\frac{u'(c_u)}{v'(c_e)}$ = 1 + .09 * σ
= 1 + 18% for σ = 2
-4
-3
-2
-1
0
1
2
3
4
Lead/Lag Relative to Unemployment Measurement
Coeff
5%/95% CI



Hendren (2016): Scale By Information Revealed
Coefficient on Unemployment Indicator
.02
0
-.02
-.04
-.06
-.08
$\frac{u'(c_u)}{v'(c_e)}$ = 1 + .09 * σ
= 1 + 18% for σ = 2
= 1 + 27% for σ = 3
-4
-3
-2
-1
0
1
2
3
4
Lead/Lag Relative to Unemployment Measurement
Coeff
5%/95% CI

# Aguiar and Hurst (2005) Critique

- Large literature using consumption changes to proxy for marginal utilities
  - e.g. literature on impact of retirement on consumption
  - Suggests people 'under save' for retirement
- Aguiar and Hurst (2005) critique this by noting that those who retire have more time to shop and find lower prices
  - Suggests that even if $u = v$ we would expect those with more time to have higher consumption for the same level of expenditure
- More generally, many reasons not to like the state independence assumption
  - Maybe you value money more when unemployed because you have search expenditures that arise?
- Bias could go either way...
  - Approaches 2-3 deal with this...

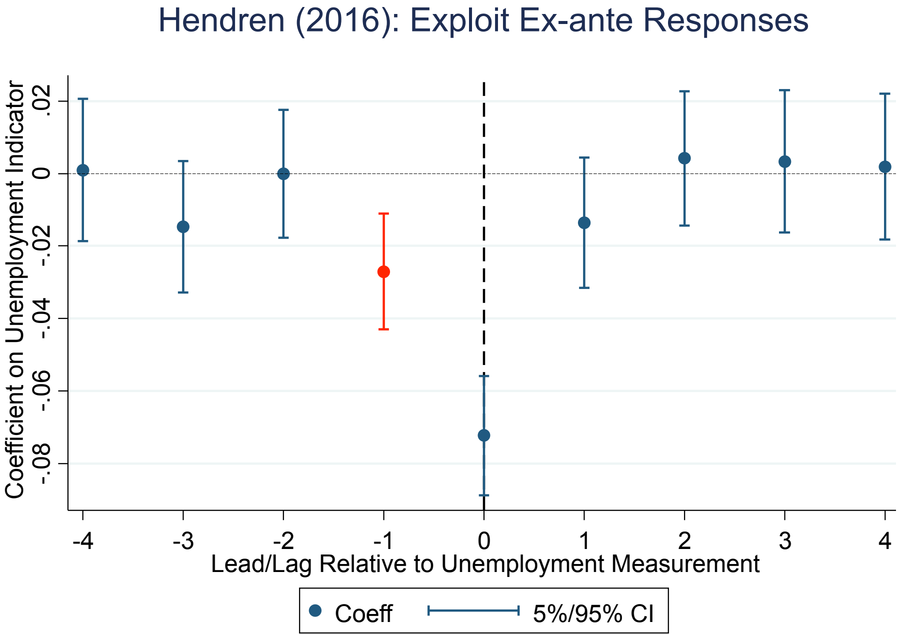
# Approach #2: Exploit Ex-Ante Responses

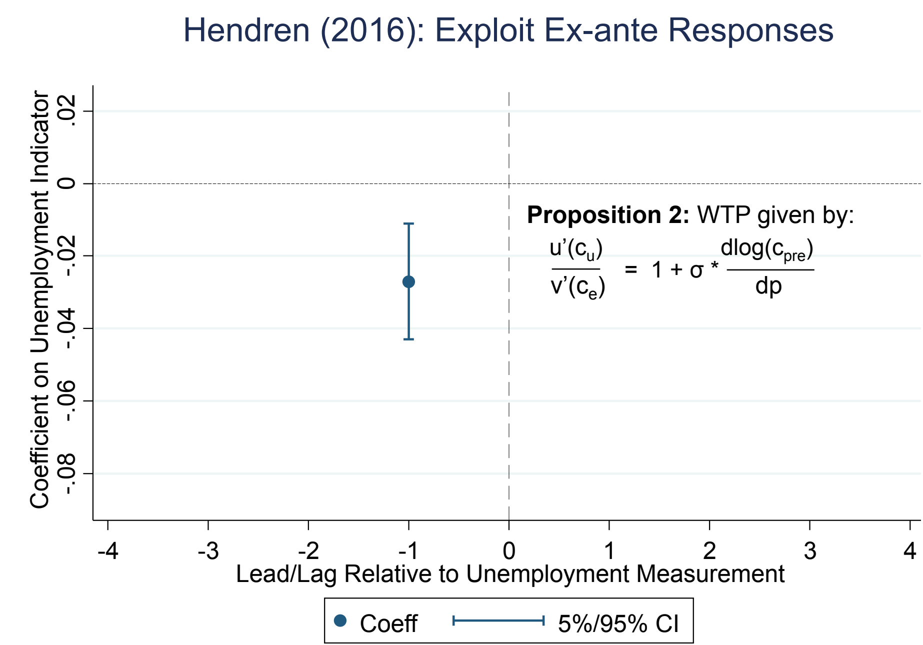
- Approach #1 compares consumption **across states of the world**
  - Most common approach (e.g. Gruber (1997))
- Alternative approach: Compare ex-ante consumption **within states of the world**
- Euler Equation:

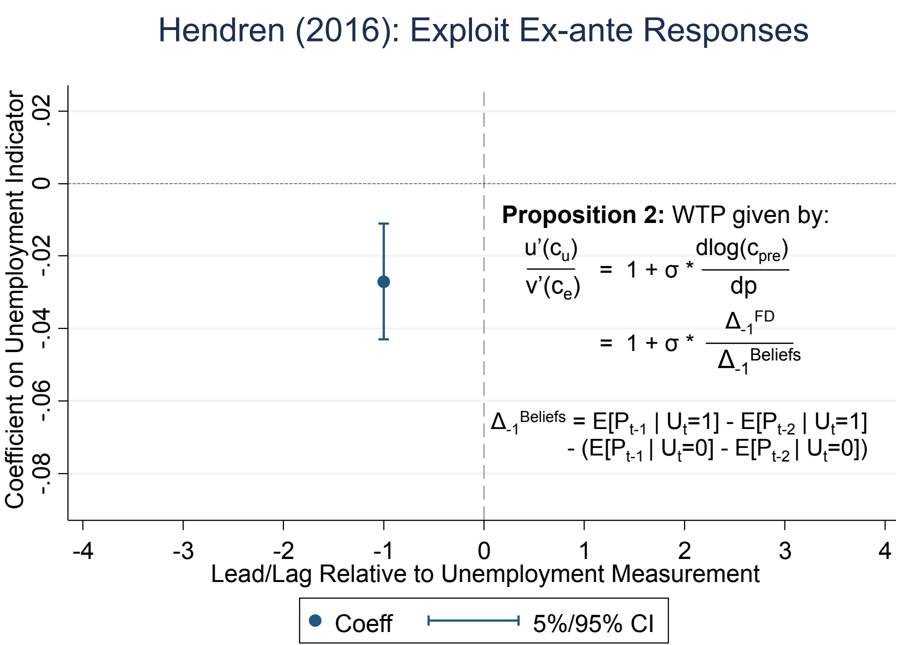
$$v'\left(c_{today}\left(p\right)\right) = pu'\left(c_u\right) + \left(1-p\right)v'\left(c_e\right)$$

Implies

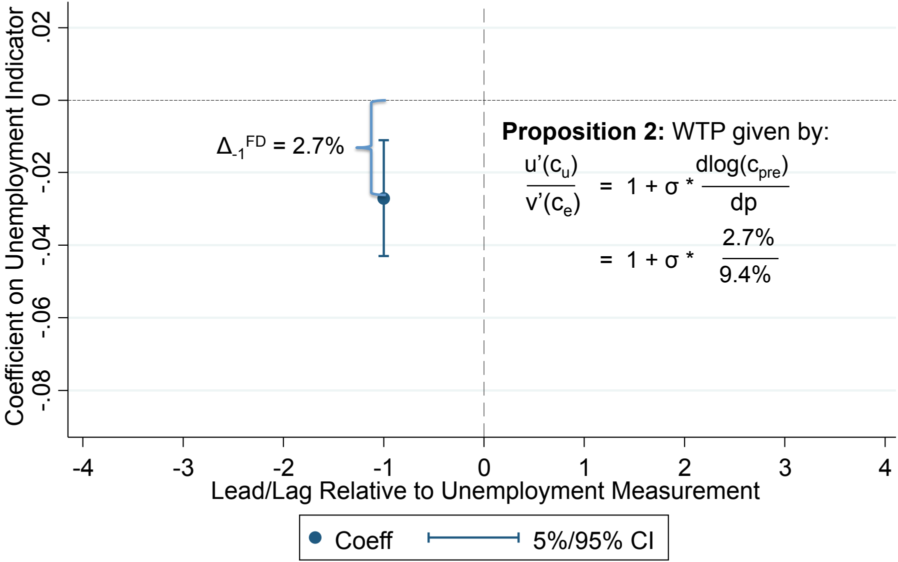
$$\underbrace{\left(c_{today}\frac{v''}{v'}\right)}_{\sigma}\underbrace{\frac{1}{c_{today}}\frac{dc_{today}}{dp}}_{\frac{\Delta c_{today}}{c_{today}}} = \frac{u'\left(c_u\right) - v'\left(c_e\right)}{v'}$$


Hendren (2016): Exploit Ex-ante Responses
Coefficient on Unemployment Indicator
.02
0
-.02
-.04
-.06
-.08
-4
-3
-2
-1
0
1
2
3
4
Lead/Lag Relative to Unemployment Measurement
Coeff
5%/95% CI

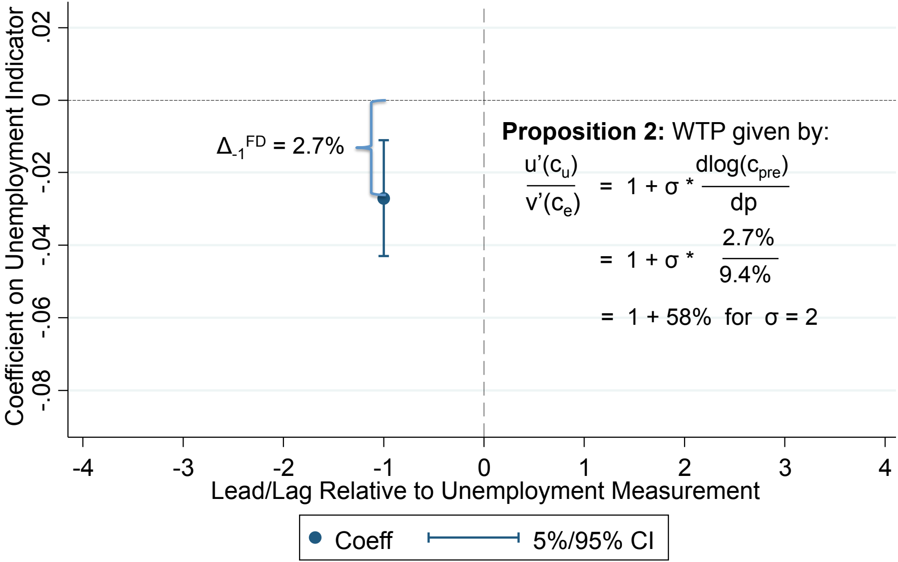

Hendren (2016): Exploit Ex-ante Responses
Proposition 2: WTP given by:
$\frac{u'(c_u)}{v'(c_e)} = 1 + \sigma * \frac{d\log(c_{pre})}{dp}$
Coefficient on Unemployment Indicator
.02
0
-.02
-.04
-.06
-.08
-4
-3
-2
-1
0
1
2
3
4
Lead/Lag Relative to Unemployment Measurement
Coeff
5%/95% CI


Hendren (2016): Exploit Ex-ante Responses
Coefficient on Unemployment Indicator
.02
0
-.02
-.04
-.06
-.08
-4
-3
-2
-1
0
1
2
3
4
Lead/Lag Relative to Unemployment Measurement
Proposition 2: WTP given by:
$\frac{u'(c_u)}{v'(c_e)} = 1 + \sigma * \frac{d\log(c_{pre})}{dp}$
$= 1 + \sigma * \frac{\Delta_{-1}^{FD}}{\Delta_{-1}^{Beliefs}}$
$\Delta_{-1}^{Beliefs} = E[P_{t-1} \mid U_t=1] - E[P_{t-2} \mid U_t=1] - (E[P_{t-1} \mid U_t=0] - E[P_{t-2} \mid U_t=0])$
Coeff
5%/95% CI

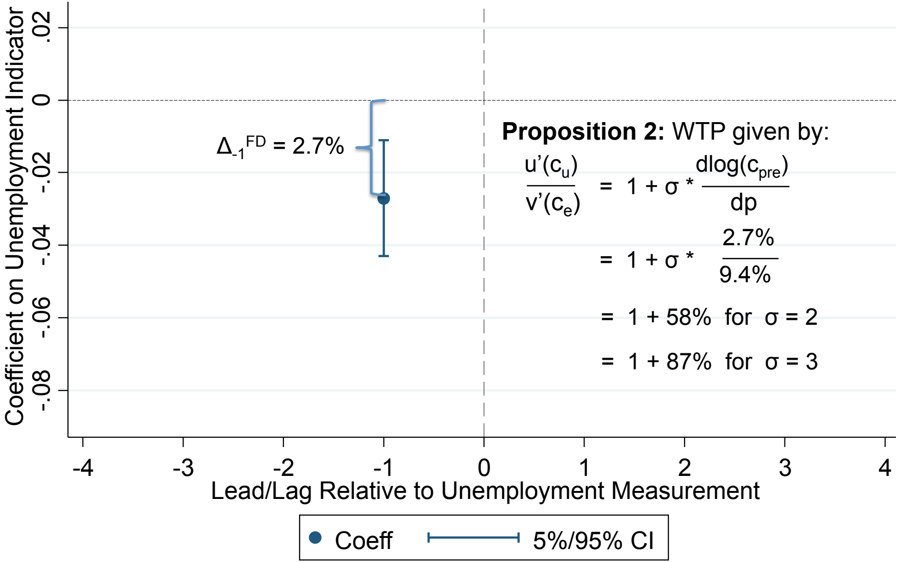
# Hendren (2016): Exploit Ex-ante Responses



# Hendren (2016): Exploit Ex-ante Responses



# Hendren (2016): Exploit Ex-ante Responses



# Spousal Labor Supply

- Hendren (2017): Can also use spousal labor supply
- Assume disutility of labor additively separable:

$$\frac{u'\left(c_u\right)}{v'\left(c_e\right)} \approx 1 + \frac{1}{\epsilon^{semi}} \frac{d\left[LFP^{Spouse}\right]}{dp}$$

  - Scale labor supply responses by semi-elasticity of spousal labor supply to wages

# Spousal Labor Supply

- Hendren (2017): Can also use spousal labor supply
- Assume disutility of labor additively separable:

$$\frac{u'(c_u)}{v'(c_e)} \approx 1 + \frac{1}{\epsilon^{semi}} \frac{d\left[LFP^{Spouse}\right]}{dp}$$

  - Scale labor supply responses by semi-elasticity of spousal labor supply to wages
- Need to estimate $\frac{dLFP^{Spouse}}{dp}$
  - Recall: $\frac{dLFP}{dZ} = 0.025$
  - Scale by signal-to-noise ratio, $\frac{var(Z)}{var(P)} = \frac{var(Z)}{cov(U,Z)} = 11$
    - Roughly 10% of variance is signal
  - Suggests WTP of 60% for semi-elasticity of 0.5.

# Approach #3: Chetty 2008

- Chetty 2008 provides another method to get around state dependence issues
  - Assume separable effort function for employment
- Implies FOC

$$v\left(c^{e}\right)-u\left(c^{u}\right)=\Psi'\left(e\right)$$

  where $e=1-p$ (sorry for the notation change! If only papers were consistent :-) ).
- Note that the difference in levels of utility between employed and unemployed states is equated to the marginal disutility of effort
  - Relates levels of utility to 1st derivative of utility
- Key idea: take another derivative and relate 1st derivatives (WTP) to 2nd derivatives (elasticities)

# Chetty 2008

- Consider two comparative statics:
  - Change assets, $A$, which increases consumption in both state of the world
  - Change benefits, $b$, which increases consumption only when unemployed
- FOC for Assets

$$\left[u'\left(c^{e}\right)-u'\left(c^{u}\right)\right]=\Psi''\left(e\right)\frac{de}{dA}$$

- FOC for benefits

$$-u'\left(c^{u}\right)=\Psi''\left(e\right)\frac{de}{db}$$

- So:

$$u'\left(c^{e}\right)=\Psi''\left(e\right)\left[\frac{de}{dA}-\frac{de}{db}\right]$$

Or

$$\frac{u'\left(c^{u}\right)-u'\left(c^{e}\right)}{u'\left(c^{e}\right)}=\frac{\frac{de}{dA}}{\frac{de}{dA}-\frac{de}{db}}$$

# Chetty 2008

- So:

$$u'\left(c^{e}\right)=\Psi''\left(e\right)\left[\frac{de}{dA}-\frac{de}{db}\right]$$

- Therefore, WTP For UI is given by:

$$\frac{u'\left(c^{u}\right)-u'\left(c^{e}\right)}{u'\left(c^{e}\right)}=\frac{\frac{de}{dA}}{\frac{de}{dA}-\frac{de}{db}}=\frac{-R}{R-1}$$

where

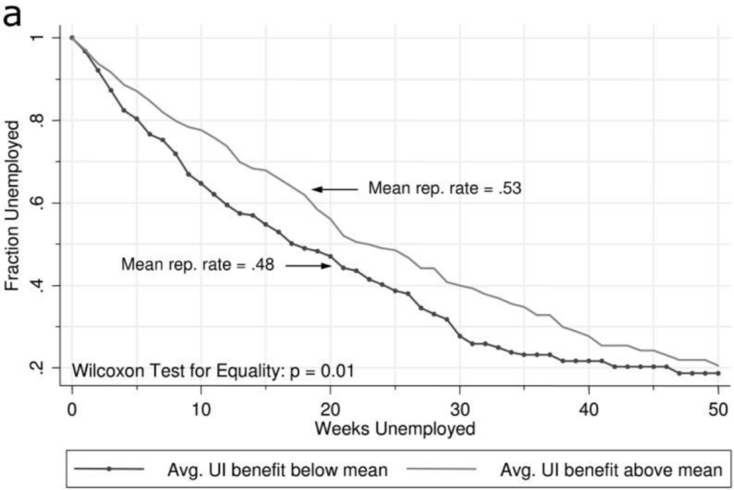
$$R=\frac{\frac{de}{dA}}{\frac{de}{db}}$$

is the "fraction of the moral hazard effect, $\frac{de}{db}$, that is due to a liquidity effect, $\frac{de}{dA}$"

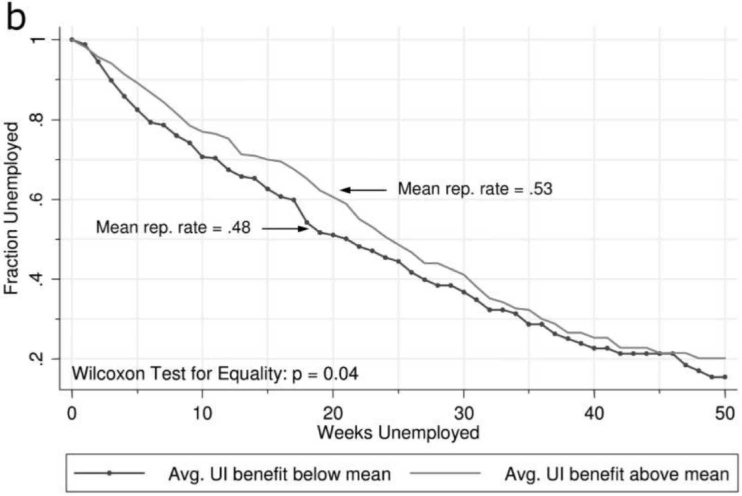
# Chetty 2008

- Chetty (2008) provides evidence from the SIPP that most of the duration response to benefits is driven by those who are liquidity constrained
    - Evidence from the SIPP

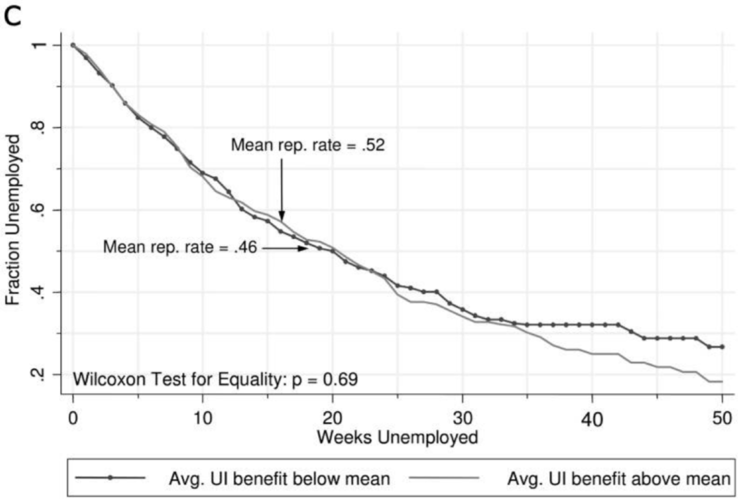
# First Quartile of Net Wealth (Chetty 2008)



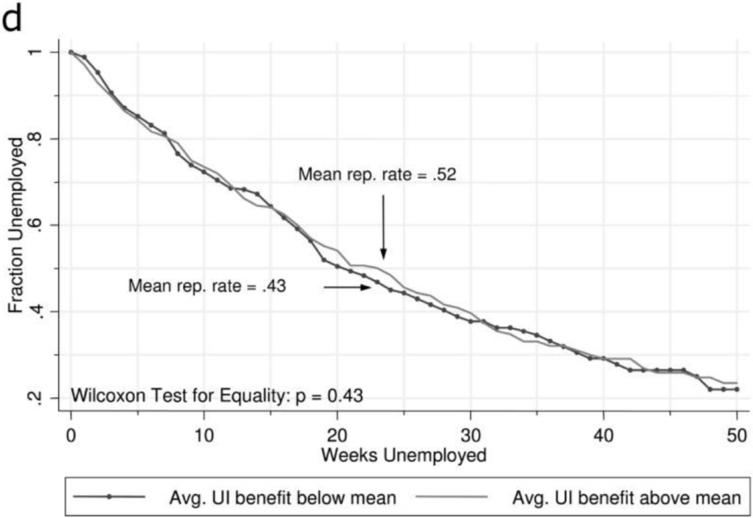
# Second Quartile of Net Wealth (Chetty 2008)



# Third Quartile of Net Wealth (Chetty 2008)



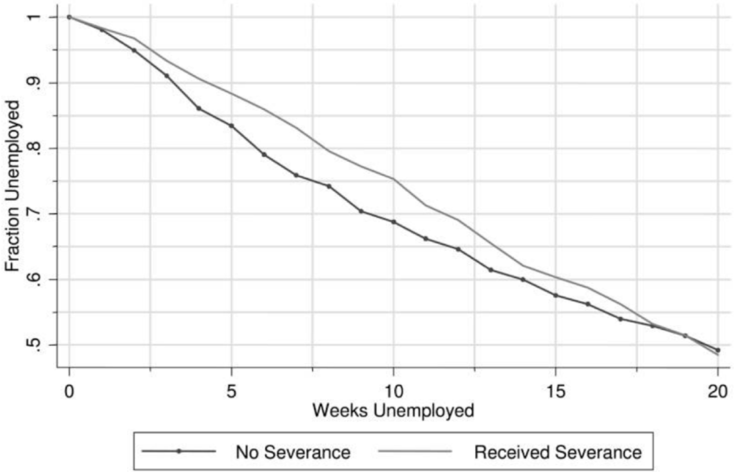
# Highest Quartile of Net Wealth (Chetty 2008)



# Chetty 2008

- This suggests that $\frac{de}{db}$ is higher for those with low assets (i.e. $\frac{d}{dA}\frac{de}{db} > 0$)
- But, it doesn't provide an estimate of $\frac{de}{dA}$!
- For this, look at impact of severance payments
    - Causes increase in unemployment duration
    - Despite the fact that benefits are paid regardless of duration

# Severance (Chetty 2008)



# Calibration

- Calibrating $\frac{de}{dA}$, finds that:
$$R = 0.6$$
- Suggests that
$$\frac{u'\left(c^{u}\right) - u'\left(c^{e}\right)}{u'\left(c^{e}\right)} = \frac{0.6}{0.4} = 1.5$$
- Suggests individuals are willing to pay a 150% markup for UI
- Problems?
  - Separability assumption valid?
- Nathan's take: relies heavily on additive separability
  - Not a general result of being able to turn behavioral responses (2nd derivatives) into willingness to pay estimates (1st derivatives)

# Schmeider and Von Wachter Annual Review (2018)

Table 3: Estimates of Consumption Loss at Unemployment and Ratio of Liquidity to Moral Hazard Effect of UI

| Study | Range of Years | Country | Data Source | Consumption Loss at Unemployment | Implied Welfare Effect, CRRA coefficient $\gamma = 2$ | Implied Welfare Effect, CRRA coefficient $\gamma = 5$ |
|---|---|---|---|---|---|---|
| **Panel A: Consumption Loss Estimates** | | | | | | |
| Cochrane, 1991 | 1980-1983 | USA | PSID | 24-27% | 0.51 | 1.275 |
| Gruber, 1997 | 1968-1987 | USA | PSID, Food only | 6.8% | 0.136 | 0.34 |
| Browning and Crossley, 2001 | 1995 | Canada | COEP Canada | 14.0% | 0.28 | 0.7 |
| Stephens, 2001 | 1968-1992 | USA | PSID | 9.0% | 0.18 | 0.45 |
| Chetty and Looney, 2006 | 1980-1993 | USA | PSID | 10.6% | 0.212 | 0.53 |
| Chetty and Szeidl, 2006 | 1968-1997 | USA | PSID | 10-15% | 0.25 | 0.625 |
| Rothstein and Valletta, 2014 | 2001 panel | USA | SIPP | 10.0% | 0.2 | 0.5 |
| | 2008 panel | USA | SIPP | 20.0% | 0.4 | 1 |
| Kroft and Notowididgo, 2015 | 1968-1997 | USA | PSID | 6.9% | 0.138 | 0.345 |
| Ganong, 2015 | 2012-2015 | USA | JPMCI Checking account data | 6.1% | 0.122 | 0.305 |
| Kolsrud et al., 2015 | 1999-2007 | Sweden | Tax Records | 19.0% | 0.38 | 0.95 |
| **Panel B: Estimates of Liquidity to Moral Hazard Ratio** | | | | | | |
| | | | | Design to Estimate Liquidity / Moral Hazard Effect | | Liquidity to Moral Hazard |
| Card, Chetty, Weber, 2007 | 1981-2001 | Austria | Social Security Registry | Response to Severance Pay, RD | | 1.4 |
| Chetty, 2008 | 1985 - 2000 | USA | SIPP | Response to Severance Pay, OLS | | 1.5 |
| Landais, 2015 | 1970s to 1984 | USA | CWBH (5 States) | Regression Kink Design | | 0.88 |

**Notes:** The implied welfare effect is calculated by multiplying the consumption loss at unemployment by the CRRA coefficient, see text. To calculate implied welfare effect for studies giving range of estimates the midpoint of the interval is taken.

# Approach #4: Reservation Wages

- Large empirical literature documenting how UI increases reservation wages
  - Often interpreted as "moral hazard"
  - People don't take jobs because they have UI
- Shimer and Werning (2006) deliver a surprising result:
  - Optimal UI should maximize after-tax reservation wages
- Logic is quite straightforward (but math is not...)

# Shimer and Werning (2006)

- Utility given by

$$E \int_0^\infty e^{-\rho t} U\left(c\left(t\right)\right) dt$$

  where $\rho$ is a discount rate and $c\left(t\right)$ is consumption at time $t$
    - Note: no disutility of search or effort – utility is fully summarized by consumption
    - Employed worker obtains wages $w$ and pays tax $t$.
    - Unemployed worker obtains benefits $b$ and receives job offers at Poisson arrival rate with wages drawn from distribution $F\left(w\right)$
        - If accepted, she becomes employed; otherwise waits for next offer
- Define $V_u$ to be the expected future lifetime utility for an unemployed worker
    - Main Result:

$$V_u \propto U\left(\bar{w} - \tau\right)$$

    where $\bar{w} - \tau$ is the after-tax reservation wage.

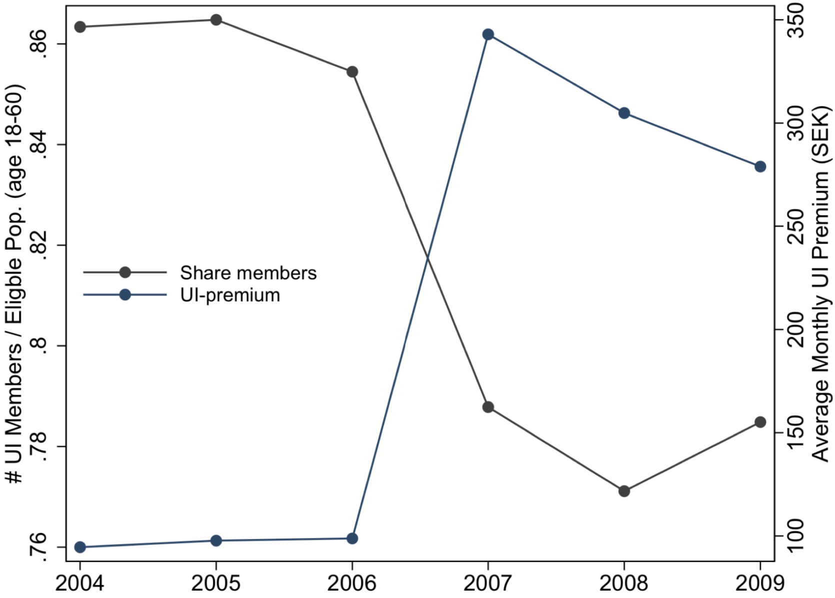
# Shimer and Werning (2006)

- Maximizing after tax reservation wage is equivalent to maximizing welfare
- If benefits cause people to forego good jobs, this is:
  - Good because they can get even better future jobs
  - Bad because it might increase taxes
- After-tax reservation wage is the right balance between these two forces
- Issues:
  - No disutility of effort
  - Jobs are more than wages
  - Little data on reservation wages

# Approach #5: Measure WTP Directly

- Sweden has option to purchase UI through one's union
- Exploited by A. Nekoei, Peter Nilsson, David Seim, & Johannes Spinnewijn
  - "Risk-based Selection in Unemployment Insurance: Evidence and Implications"
- 2007 reform changed prices

# 2007 Reform in Sweden



# Approach #5: Measure WTP Directly

- Use estimates to back-out implied WTP
- Find large UI subsidies are optimal
- But full mandate is not optimal
  - Some people don't want insurance and no need to force them to buy
- Very nice paper because it speaks to optimal social insurance using choice variation

# Approach #6: Heterogeneity in MPCs

- Landais and Spinnewijn (2021 RESTUD)
- Provide formula for WTP for UI using difference in MPCs in employed vs. unemployed state
- Suggests large WTP for UI

# Summary

- Six approaches yield different estimates
- e.g. Approach #1 suggests smaller WTP than other approaches
- Potential explanations:
  - Correlated shocks
  - $u \neq v$
  - Others?
- Suggests higher benefits increase welfare if willing to pay 55% markup for UI
  - But still haven't solved for optimal benefits

# Gruber 1997

- UI papers often go one step further: what is the optimal benefit level, $b^*$?
- Write:

$$\sigma \frac{\Delta c}{c}\left(b^*\right) = \frac{\epsilon_{p,b}}{1-p}$$

  - Assume $\epsilon$ is constant with respect to $b$ (good assumption)
  - Need to estimate $\frac{\Delta c}{c}(b)$: how does consumption impact vary with benefit level?

$$\frac{\Delta c}{c}(b) = \beta_1 + \beta_2 b$$

  - Implies

$$\sigma\left[\beta_1 + \beta_2 b\right] = \frac{\epsilon_{p,b}}{1-p}$$

or

$$b^* = \frac{\beta_1 + \frac{1}{\sigma}\frac{\epsilon_{p,b}}{1-p}}{\beta_2}$$

# Gruber 1997

- Gruber (1997) uses simulated instruments to generate variation in benefit levels, $b$
  - Isolate variation in benefits due to policy variation across states
- Estimates:

$$\Delta c = a + \gamma X_i + \beta_1 Unemp + \beta_2 * b_i * Unemp + \epsilon_i$$

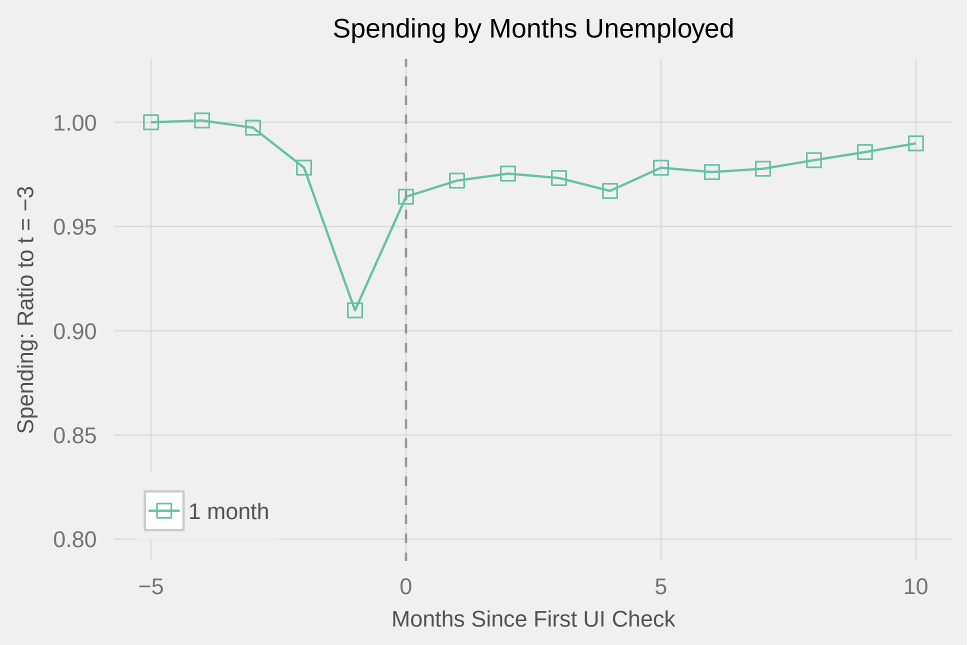
  where $X_i$ are individual characteristics and $b_i$ is the replacement rate (benefits / wages) for which an individual is ELIGIBLE
  - 67% of people take up UI (Blank and Card 1991)
  - Why not use observed UI replacement rate = benefits received / wage?
- Finds $\beta_3 > 0$ so that UI reduces impact of unemployment on expenditure
  - But suggests optimal $b^* = 0$ (problematic with $\epsilon$ constant?)

# Optimal UI Design

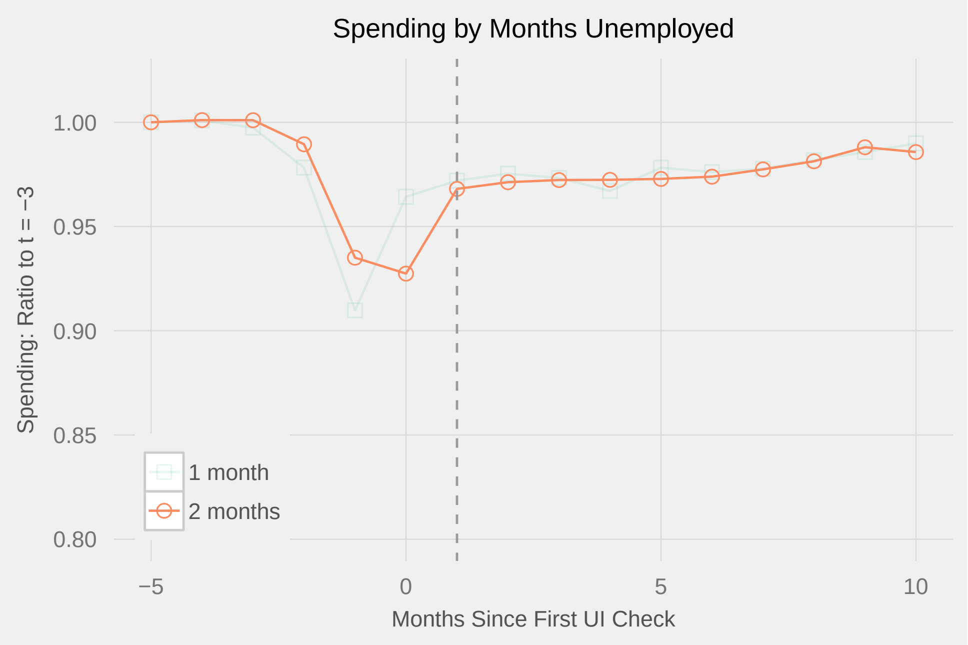
- So far, talked about "benefits"
- But, benefits has multiple dimensions:
  - Duration of UI
  - Generosity / replacement rate of UI
- Key ingredients: need to know
  - Differential behavioral response to changes in these two dimensions
  - WTP for changing these two margins

# Ganong and Noel (2016)

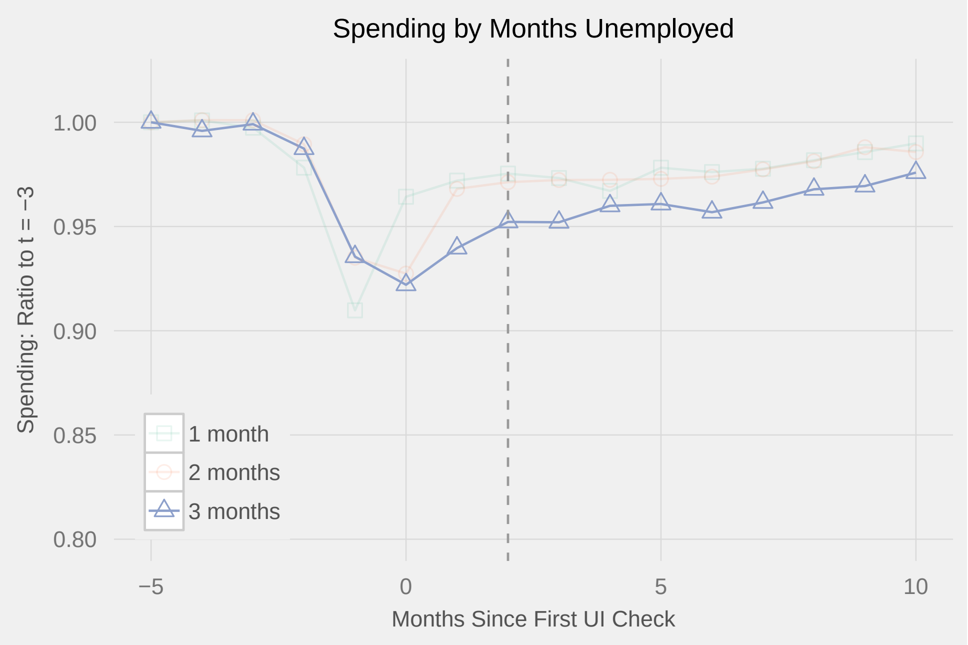
- Ganong and Noel (2016) estimates consumption path throughout UI spell
- Use data from linked account information from major US financial institution
- Define spell from UI deposits
  - Concerns?
- Plot time path of expenditures through UI spell
  - Look at both onset of unemployment and impact of benefit exhaustion



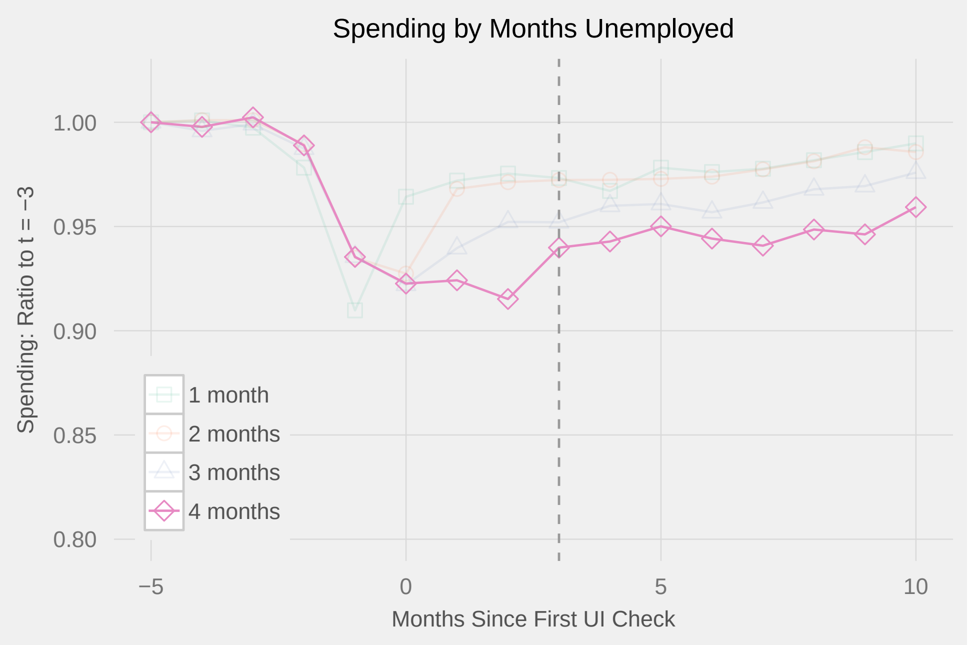

- Source: Ganong and Noel (2016)



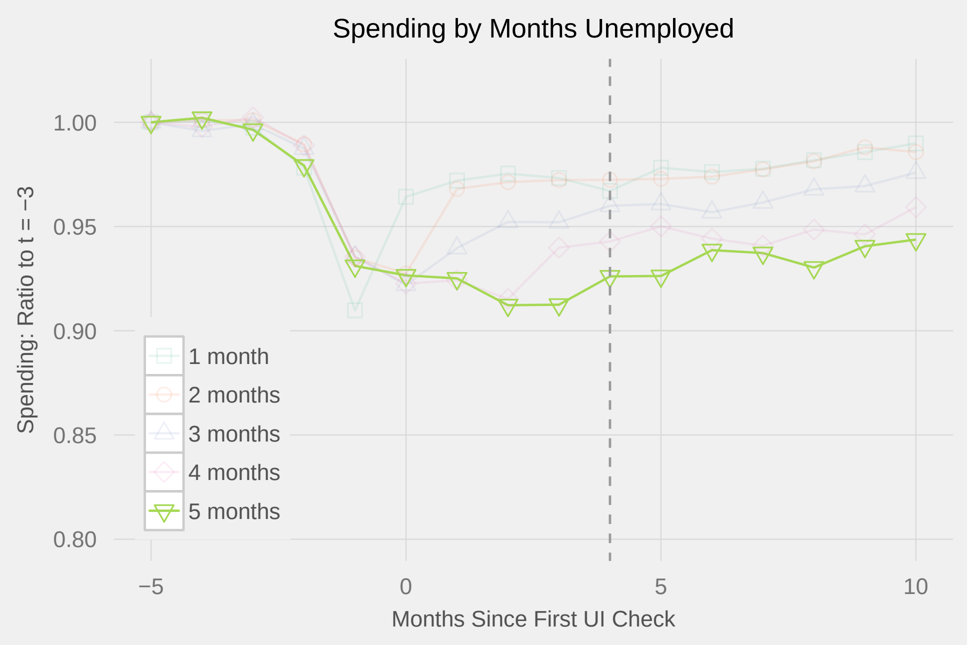

- Source: Ganong and Noel (2016)



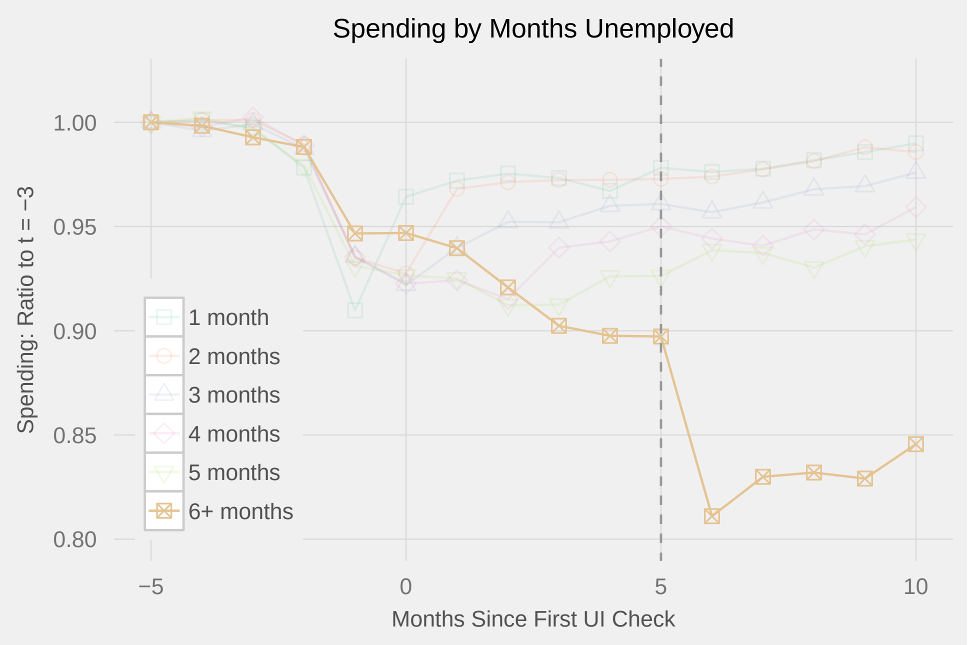

- Source: Ganong and Noel (2016)




- Source: Ganong and Noel (2016)



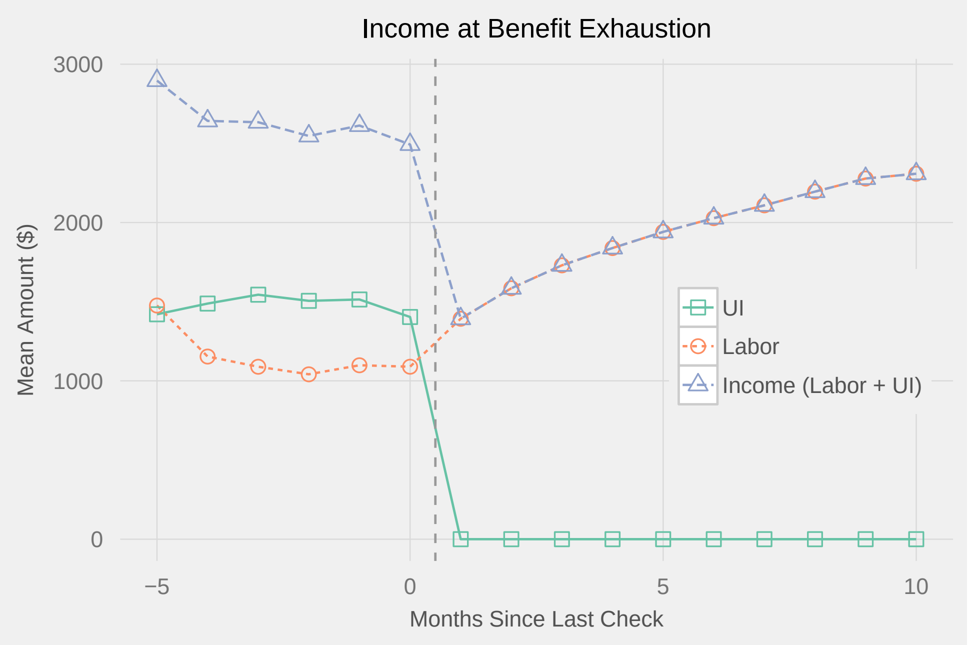

- Source: Ganong and Noel (2016)



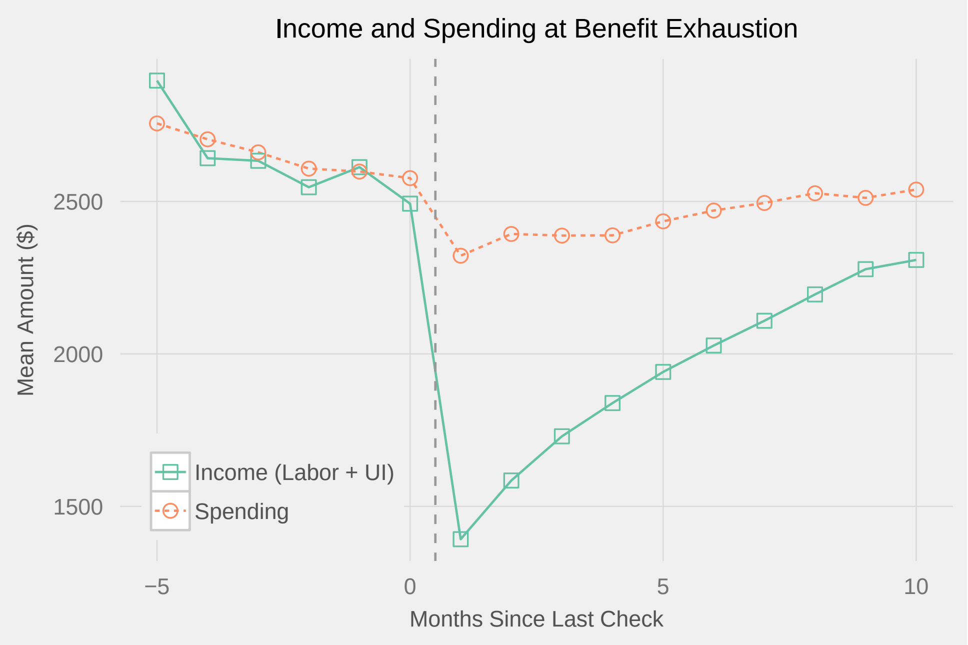

- Source: Ganong and Noel (2016)

# Ganong and Noel (2016)

- Expenditure patterns follow duration of unemployment spell
- Strong evidence though of consumption impact at benefit exhaustion




- Source: Ganong and Noel (2016)



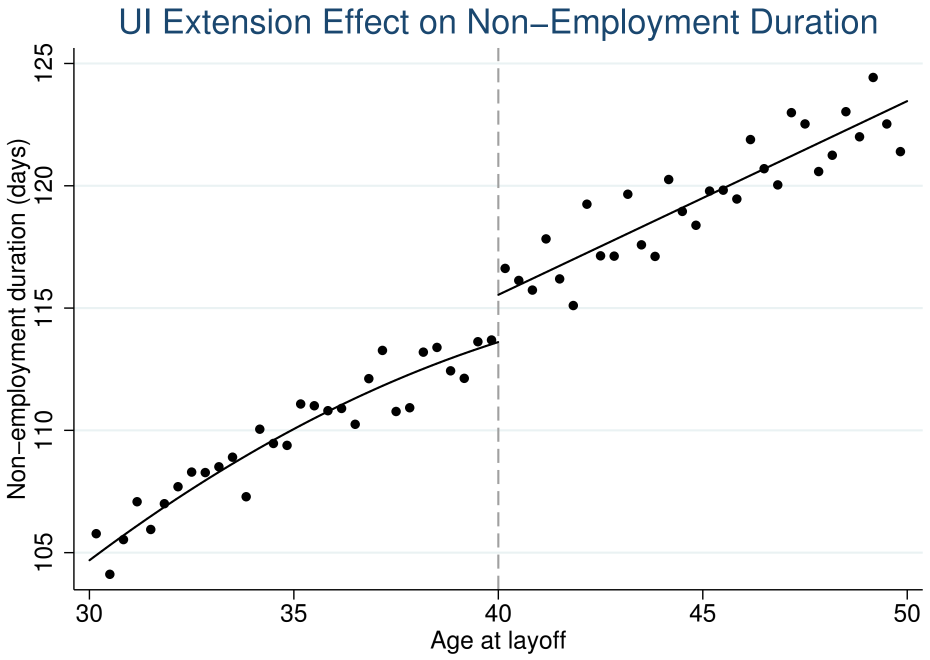

- Source: Ganong and Noel (2016)

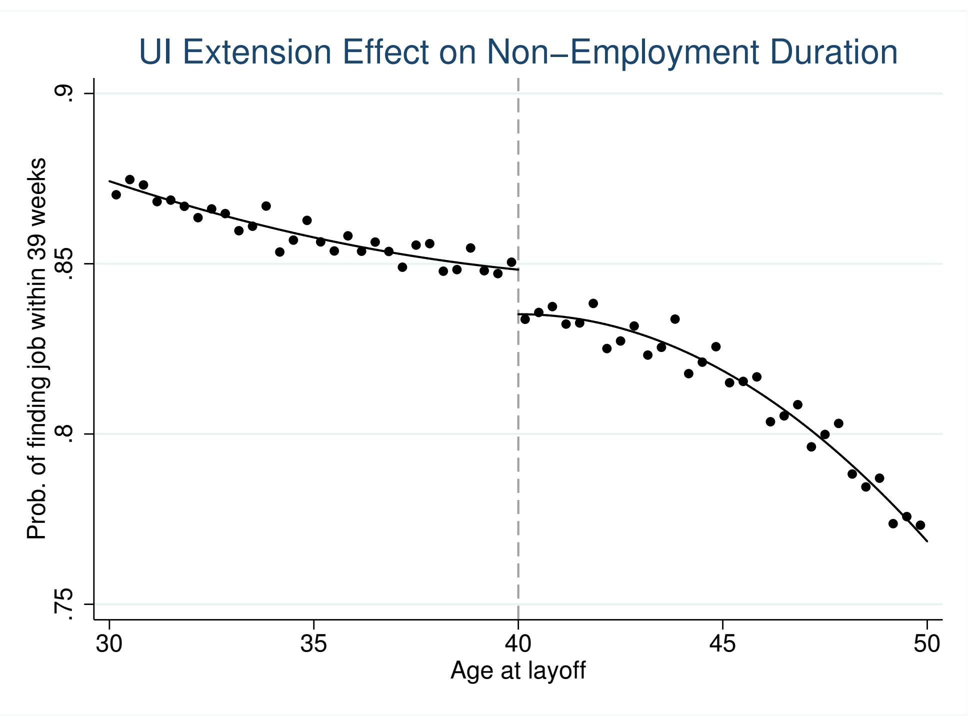
# Ganong and Noel (2016)

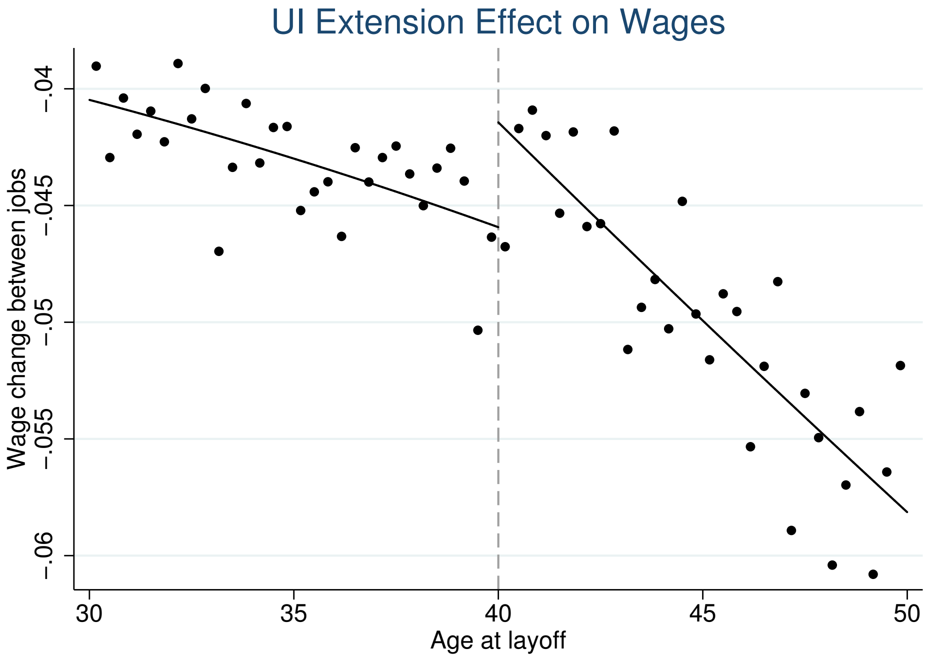
- Consumption drops 11% at benefit exhaustion
    - Should be a known!
- Paper goes on to show traditional models do not do a good job of fitting the data
    - Permanent income model would suggest no drop at exhaustion
    - Hand-to-mouth consumption would suggest greater consumption fluctuations
    - Buffer-stock model doesn't fit because people should accumulate more assets to help smooth the shock
- Question: does consumption drop at exhaustion suggest greater welfare benefit of extending benefits versus higher replacement rate?

# Nekoei and Weber (2017, AER)

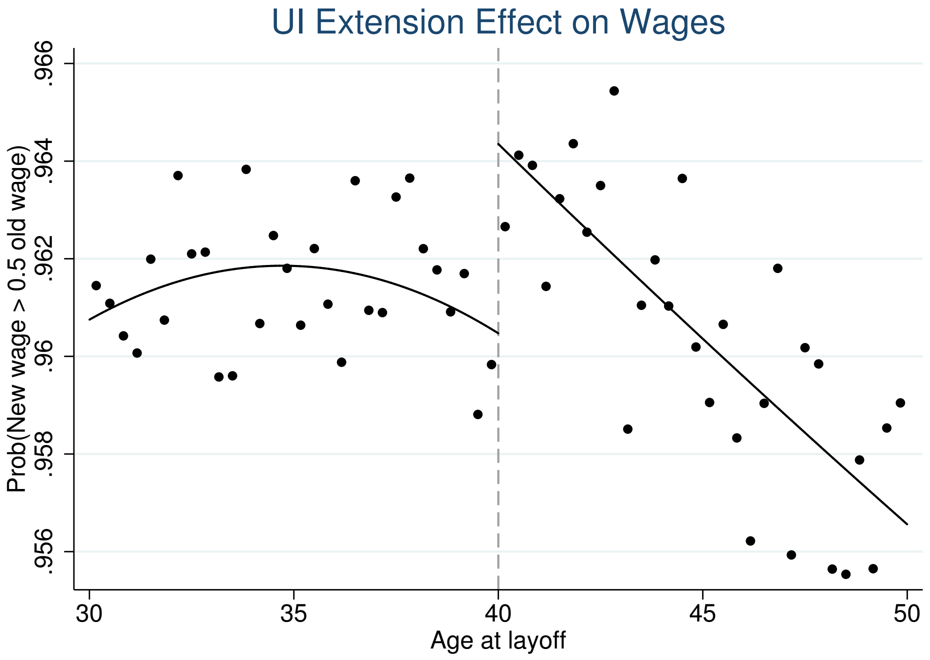
- Nekoei and Weber study impact of UI duration on job quality
- Exploit age-based discontinuity in UI rules in Austria
- Identification: Discontinuity at age 40
- Laid-off workers eligible for 39 instead of 30 weeks of UI as age crosses from 40 to 41
    - Implemented on August 1, 1989


UI Extension Effect on Non−Employment Duration
Non−employment duration (days)
105
110
115
120
125
30
35
40
45
50
Age at layoff


UI Extension Effect on Non−Employment Duration
Prob. of finding job within 39 weeks
.75
.8
.85
.9
30
35
40
45
50
Age at layoff



UI Extension Effect on Wages
Wage change between jobs
−.04
−.045
−.05
−.055
−.06
30
35
40
45
50
Age at layoff



UI Extension Effect on Wages
Prob(New wage > 0.5 old wage)
.966
.964
.962
.96
.958
.956
30
35
40
45
50
Age at layoff

# Effect of UI Extension from 30 to 39 Weeks

## Discontinuity at age 40

| | Dependent variable | | | |
|---|---|---|---|---|
| | Non-employment duration | Find job within 39 weeks | Wage change between jobs | New wage > UI benefit |
| Covariates | (1) | (2) | (3) | (4) |
| No | 1.932*** | -0.0131*** | 0.00449*** | 0.00388*** |
| | (0.526) | (0.00164) | (0.00170) | (0.00105) |
| Yes | 1.898*** | -0.0119*** | 0.00459*** | 0.00386*** |
| | (0.466) | (0.00146) | (0.00146) | (0.00102) |
| Mean dep. var. | 114.7 | 0.842 | -0.0440 | 0.962 |
| Observations | 1,589,178 | 1,738,787 | 1,187,476 | 1,187,476 |

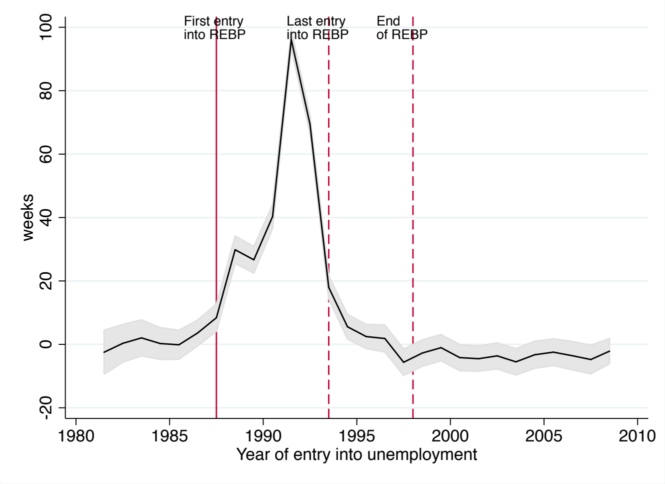
# Nekoei and Weber (Forthcoming, AER)

- Additional UI duration causes significant increase in future wages
  - One of only papers finding that UI helps job match quality
  - Nice use of regression discontinuity design
- Two implications:
  - Benefits of UI?
  - Costs of UI?
    - Significantly changes the FE associated with UI?

# Macro versus Micro

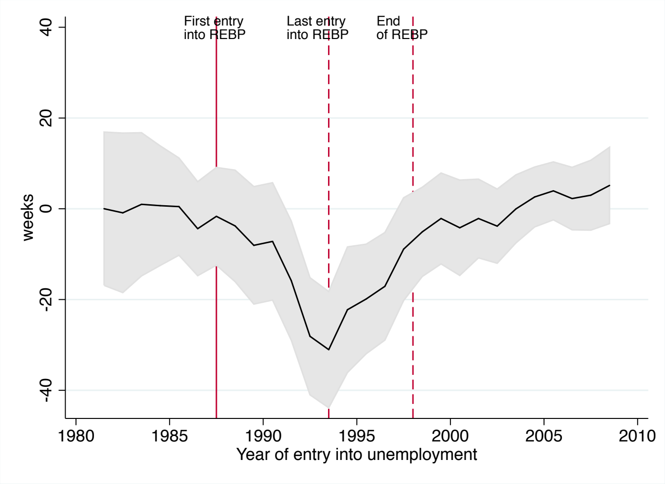
- Literature generally focused on micro impact of UI on durations
- But, UI can generate search externalities
  - Allowing some workers to remain unemployed helps other workers find jobs
- Lalive, Landais, and Zweimuller (2013) exploit large UI expansion in Austria
  - Provided 209 weeks instead of 52 weeks as long as:
    - Age above 50
    - At least 15 years of continuous work history in past 25 years
    - Reside in particular subsets of regions
    - Unemployment spell began between June 1988 and Aug 1993

Figure 5 : **Difference in U duration between REBP and non REBP regions**: male 50-54 with **<u>more</u>** than 15 years of experience



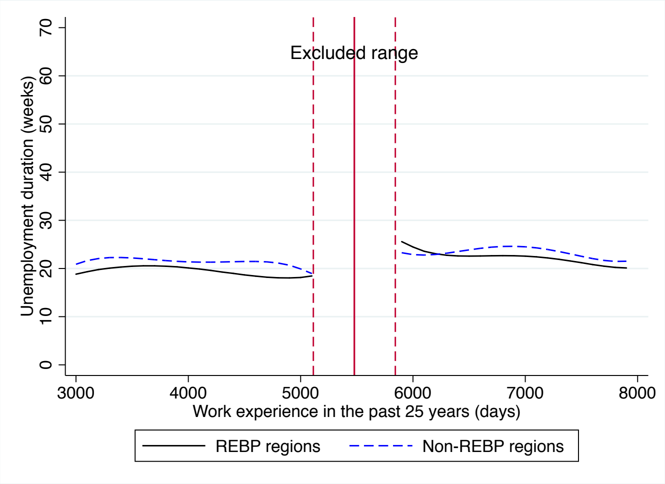

- Lalive, Landais, and Zweimuller (2013)

Figure 6 : **Difference in U duration between REBP and non REBP regions**: male 50-54 with **less** than 15 years of experience



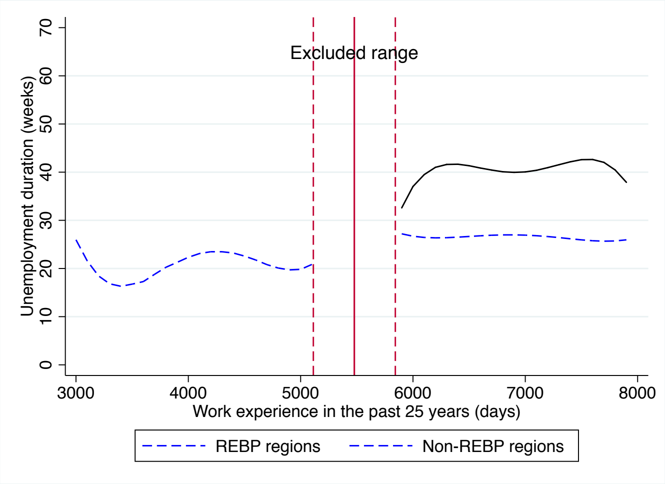

- Lalive, Landais, and Zweimuller (2013)

Figure 7 : Relationship between previous work experience and unemployment duration: male 50-54, **Before and after REBP**



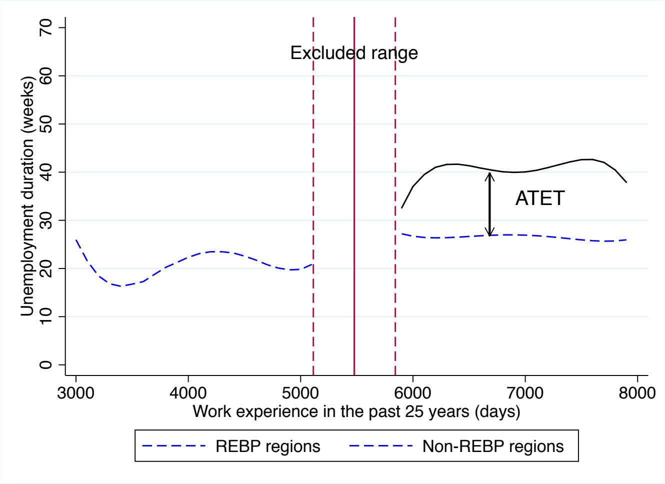

- Lalive, Landais, and Zweimuller (2013)

Figure 7 : Relationship between previous work experience and unemployment duration: male 50-54, **during REBP**



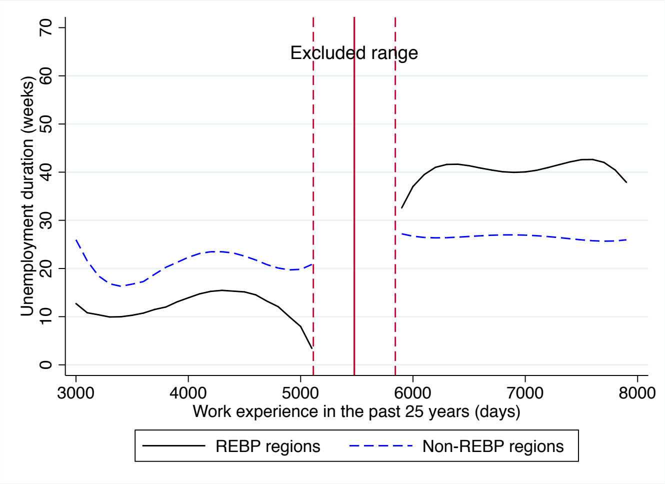

- Lalive, Landais, and Zweimuller (2013)

Figure 7 : Relationship between previous work experience and unemployment duration: male 50-54, **during REBP**



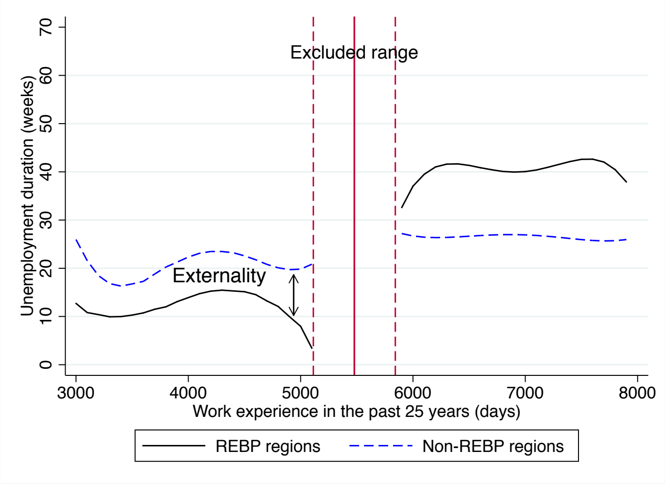

- Lalive, Landais, and Zweimuller (2013)

Figure 7 : Relationship between previous work experience and unemployment duration: male 50-54, **during REBP**




- Lalive, Landais, and Zweimuller (2013)

Figure 7 : Relationship between previous work experience and unemployment duration: male 50-54, **during REBP**




- Lalive, Landais, and Zweimuller (2013)

# Macro versus Micro

- Macro effects provide additional rationale for UI
- UI affects non-beneficiaries through search externalities
- Affects optimal UI calculations

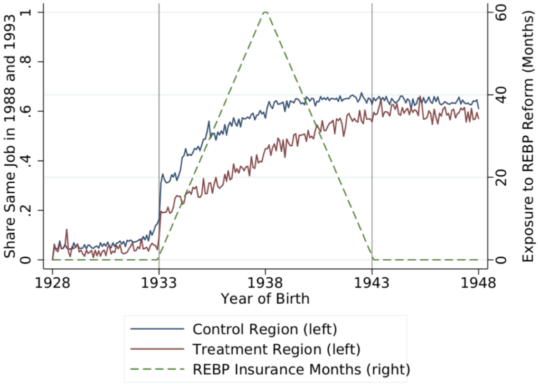
# Does Unemployment Insurance Cause Layoffs/Quits?

- Until recently, very limited evidence on this (see Feldstein 1976)
- Jager, Shoefer, and Zweimuller (2020 QJE) exploit variation REBP context to look at worker separations
- Are workers who have higher UI benefits less likely to stay at their firm?

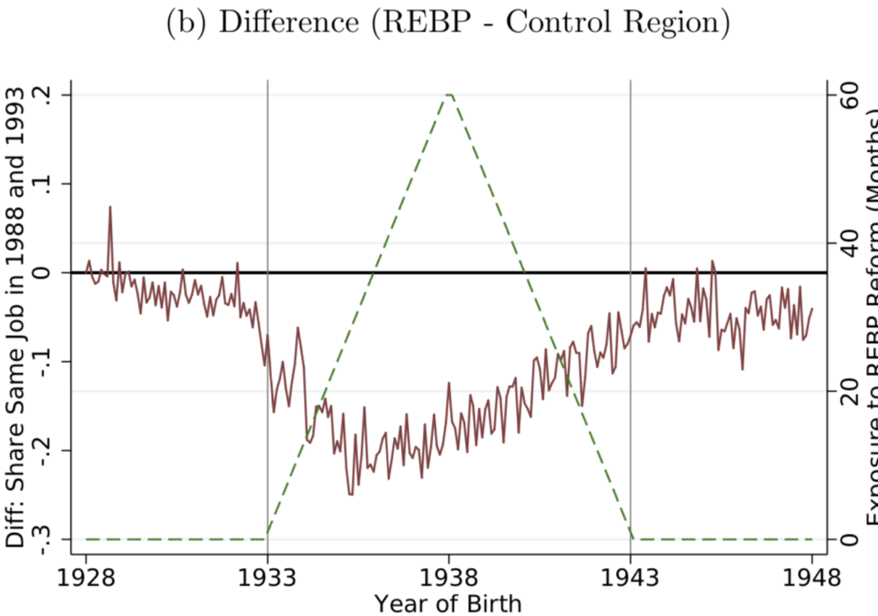
# Jager, Shoefer, and Zweimuller (2018)

Figure 4: Benefit Extensions and Separations – Share of Workers With Same Job in 1988 ar
1993

(a) REBP and Control Region



# Jager, Shoefer, and Zweimuller (2018)



# Summary

- Large literature studying optimal UI
- Development of "sufficient statistic" approach for welfare analysis
  - Compare costs to benefits
- Evidence suggests
  - consumption expenditure drops upon unemployment (permanently)
  - UI increases duration of unemployment
- Open questions:
  - Role of UI versus curvature in income tax schedule
    - UI for uber drivers?
    - **Verifiability** of unemployment
  - Others?