Optimal Social Insurance

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Spring, 2013

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 $e =$ fraction in employed state
- Utility function $U\left(e, c^e, c^u\right)$
- Full insurance:

$$MRS = \frac{\frac{\partial U}{\partial c^e}}{\frac{\partial U}{\partial c^u}} = \frac{p^e}{p^u}$$

- Utility $U\left(e, c^e, c^u\right)$ assumed to have a particular structure:

$$eu\left(c^e\right) + \left(1 - e\right) u\left(c^u\right) - \psi\left(e\right)$$

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

Unemployment Insurance

- Consumption has constraints

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

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

where τ are taxes and b are unemployment benefits; A is assets.

- Indirect utility

$$V(\tau, b) = \max_e (1 - e) u(A + b) + eu(A + w - \tau) - \Psi(e)$$

- Budget neutral constraint

$$e\tau = (1 - e) b$$

Unemployment Insurance

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

$$\max_{\tau,b} V(\tau, b) \;\; s.t. \;\; (1-e)\, b \leq e\tau$$

or

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

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

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

So

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

Envelope Theorem

- Envelope theorem implies

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

$$\frac{\partial V}{\partial b} = \left(1-e\right)u'\left(c^u\right)$$

- Combining:

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

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

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

where

$$\epsilon_{e,b} = \frac{d\left(1-e\right)}{db}\frac{b}{\left(1-e\right)}$$

Empirical Quantities

- What is $\epsilon_{1-e,b}$?
  - 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
  - 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"

Estimates of Duration Elasticity

- Early literature used cross-sectional variation in replacement rates
- Problem: comparisons of high and low wage earners confounded by other factors.
- Modern studies use exogenous variation from policy changes (e.g. Meyer 1990)

Estimates of Duration Elasticity

- Define hazard rate $h_t =$ number that find a job at time t divided by number unemployed at time t
    - This is an estimate of the probability of finding a job at time t conditional on being unemployed for at least t weeks
- Standard specification of hazard model: Cox "proportional hazards"

$$h_t = \alpha_t \exp(\beta X)$$

- Here α_t is the non-parametric "baseline" hazard rate in each period t and X is a set of covariates
- Semi-parametric specification – allow hazards to vary freely across weeks and only identify coefficients off of variation across spells

Estimates of Duration Elasticity

- Useful to rewrite expression as:

$$\log h_t = \log \alpha_t + \beta X$$

- Key assumption: effect of covariates proportional across all weeks

$$\frac{d \log h_t}{dX} = \beta = \frac{d \log h_s}{dX} \forall t, s$$

- If a change in a covariate doubles hazard in week 1, it is forced to double hazard in week 2 as well

- Restrictive but a good starting point; can be relaxed by allowing for time varying covariates X_t

Estimates of Duration Elasticity

- Meyer includes log UI benefit level as a covariate:

$$\log h_t = \log \alpha_t + \beta_1 \log b + \beta_2 X$$

- In this specification,

$$\frac{d \log h_t}{d \log b} = \beta_1 = \varepsilon_{h_t,b}$$

- Note:

$$h_t = \frac{\frac{d[1-e]}{db}}{1-e}$$

- So, $\varepsilon_{h_t,b} = -\varepsilon_{e,b} \frac{e}{1-e}$. So,

$$\epsilon_{e,b} \frac{1}{1-e} = \frac{\epsilon_{h_t,b}}{e}$$

- Meyer estimates $\varepsilon_{h_t,b} = -0.9$ using administrative data for UI claimants (and $e \approx 1$).
- Subsequent studies get smaller estimates; consensus: $\varepsilon_{h_t,b} = -0.5$ (Krueger and Meyer 2002)

Value of Insurance Benefits

Harder part: How much do people value insurance?

- Willingness to pay:

$$\frac{u'\left(c^u\right) - u'\left(c^e\right)}{u'\left(c^e\right)}$$

- State independence + Taylor approximation:

$$\frac{u'\left(c^u\right) - u'\left(c^e\right)}{u'\left(c^e\right)} \approx \underbrace{\left(\frac{u''c}{u'}\right)}_{\text{CRRA}} \underbrace{\left(\frac{\Delta c}{c}\right)}_{\text{\%Drop}}$$

Gruber 1997

- Gruber (1997) estimates impact of unemployment benefits on consumption drop

$$\Delta c = a + \beta_i X_i + \beta_2 UI_i + \epsilon_i$$

where X_i are individual characteristics and UI_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?
  - Endogenous take-up (i.e. those with high Δc)?
  - TAKEUP? Why don't people take up the benefits for which they are eligible?
    - General problem in social insurance
- Instruments using state-level UI program definitions
  - UI that you're eligible for given your lagged wages

Do we care about the impact of UI on consumption smoothing?

- Finds significant d
  - Do we care? Envelope theorem?
- Mean consumption drop $\sim$7-10%
  - Suggests WTP $\sim$30% markup if CRRA $= 3$
  - Less than -0.5 elasticity... -> benefits too large!

Chetty 2008

- Chetty 2008 allows one to get around state dependence issues
  - At cost of assuming separable effort function for employment
- Agent chooses e to maximize

$$e \cdot u(A + w - \tau) + (1 - e) \cdot u(A + b)$$

(where the wage is only paid in the high state)

- FOC

$$u\left(A + w - \tau\right) - u\left(A + b\right) = \Psi'\left(e\right)$$

- Consider three comparative statics for effort:
  - Change assets, A, which increases consumption in both state of the world
  - Change high-state wage w
  - Change benefits, b, which increases consumption only when unemployed

Chetty 2008

- Derive WRT A to get $\frac{de}{dA}$

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

$$\Longrightarrow\ \frac{de}{dA}=\left[u'\left(c^{e}\right)-u'\left(c^{u}\right)\right]/\Psi''\left(e\right)<0$$

- Derive WRT w to get $\frac{de}{dw}$

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

$$\Longrightarrow\ \frac{de}{dw}=u'\left(c^{e}\right)/\Psi''\left(e\right)>0$$

- Derive WRT b to get $\frac{de}{db}$

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

$$\Longrightarrow\ \frac{de}{db}=-u'\left(c^{u}\right)/\Psi''\left(e\right)<0$$

Chetty 2008

- Impies

$$\frac{de}{db} = \frac{de}{dA} - \frac{de}{dw}$$

- $\frac{de}{dA}$ is "liquidity effect"–behavioral impact of receving more income accesible in any state
- $\frac{de}{dA}$ is "moral hazard" effect or price effect–behavioral impact
- So $\frac{de}{db}$ is sum of these two
  - Liquidity (and thus benefit) effect is smaller for agents with better consumption smoothing ability
- So:

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

Or

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

- The above implies

$$\frac{\frac{de}{dA}}{\frac{de}{dw}} = \frac{\text{LIQ}}{\text{MH}} = \frac{u'(c^u) - u'(c^e)}{u'(c^e)}$$

- Or, in terms of the benefit response

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

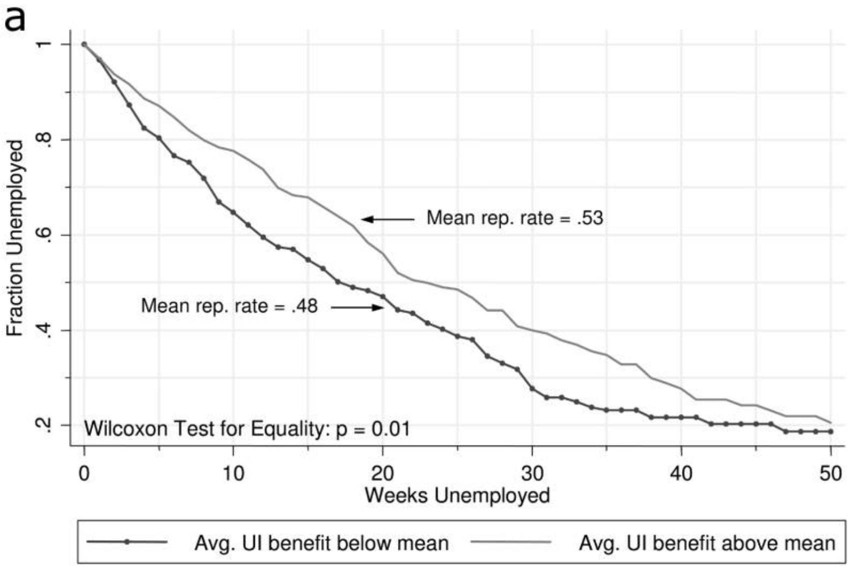
Chetty 2008

Chetty 2008 calculates the ratio

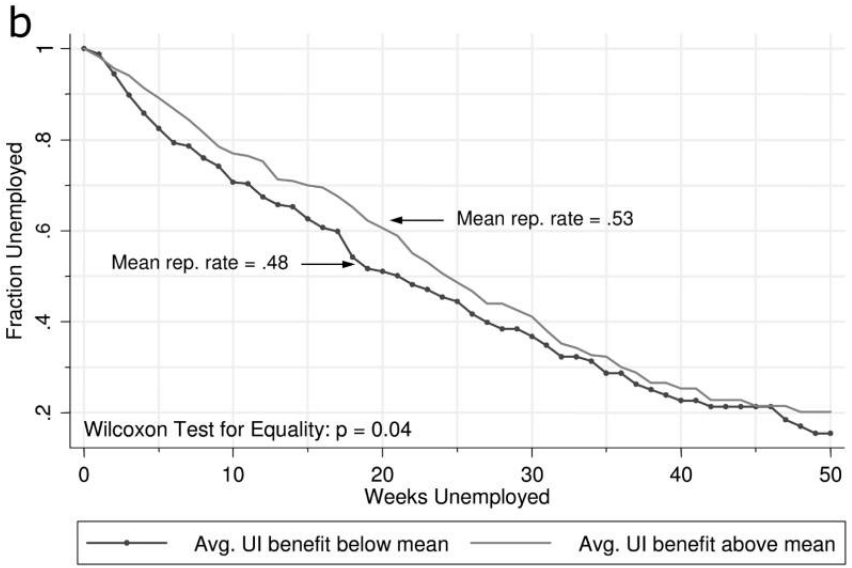
$$R = \frac{\frac{de}{dA}}{\frac{de}{db}} = \frac{\frac{de}{dA}}{\frac{de}{dA} - \frac{de}{dw}}$$

"Fraction of UI duration due to liquidity effect"
Evidence from the SIPP

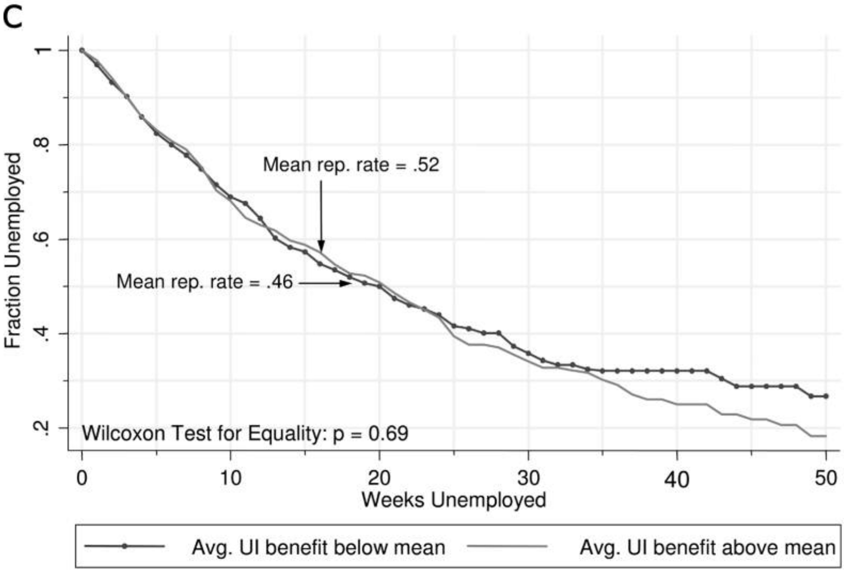
First Quartile of Net Wealth



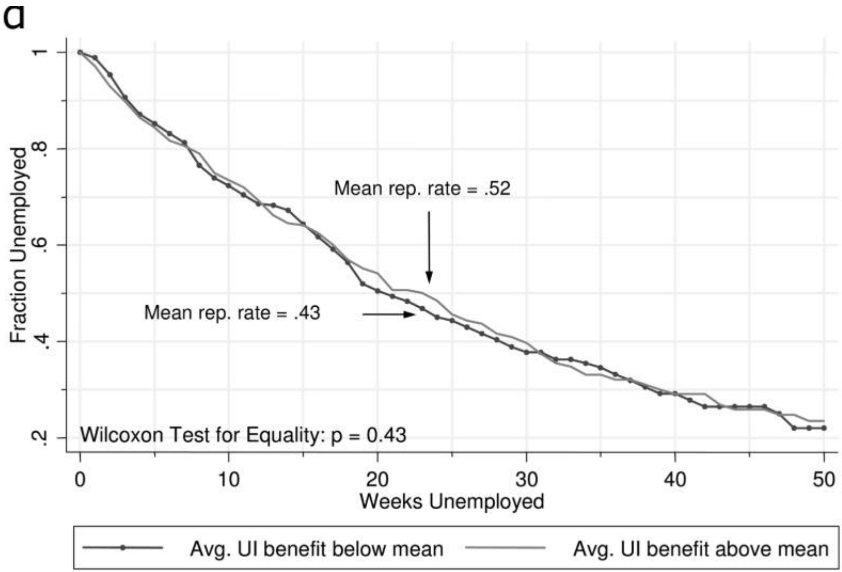
Second Quartile of Net Wealth



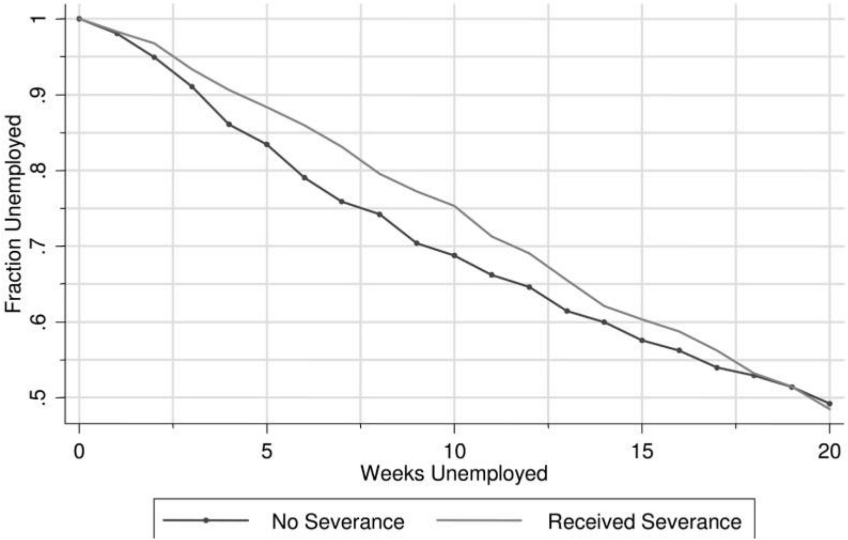
Third Quartile of Net Wealth



Highest Quartile of Net Wealth



Severance



Fraction Unemployed
1
.9
.8
.7
.6
.5
0
5
10
15
20
Weeks Unemployed
No Severance
Received Severance

Calibration

$$R = 0.6$$

So that WTP for insurance is

$$\frac{0.6}{0.4} = 1.5$$

Willing to pay 150% markup for insurance
Gruber 1997: 30% with CRRA = 3

What does the elasticity miss?

- Entry into unemployment?
  - Amazingly little work on this!
- GE Effects
  - e.g. Crepon et al (2012) for job placement assistance
- Risk taking / efficiency effects
  - Acemoglu and Shimer (2007)

Optimal Social Insurance: Other papers

Shimer and Werning

Net or tax reservation wages -> sufficient for both ϵ and $\frac{u'(c^u)-u'(c^e)}{u'(c^e)}$

Dynamic Search Models

Time path of replacement rates (Shimer and Werning)

General implications of under-insurance

- Individual's consume c and earn y after or before observing the state of the world, θ. (e.g. a=consumption or a=labor earnings).
- Face uncertainty about state of the world, θ.
- Maximize utility function $E\left[u\left(c, y; \theta\right)\right]$ s.t. budget constraint $c \leq y + t\left(\theta\right)$ for all θ and $\sum p\left(\theta\right) t\left(\theta\right) \leq 0$
  - Choose c and y, along with financial transfers $t\left(\theta\right)$
- Full insurance -> can move resources across states of the world according to probability ratios
  - $p\left(\theta\right) = Pr\left\{\theta\right\}$

$$\left[t\left(\theta\right)\right] : \lambda\left(\theta\right) = \psi p\left(\theta\right)$$

for all θ

General implications of under-insurance

- Derivate wrt c:

$$u_c Pr\left\{\theta\right\} = \lambda\left(\theta\right) = \psi p\left(\theta\right)$$

- So, $\lambda\left(\theta\right) = Pr\left\{\theta\right\}$ if prices are actuarially fair
- Marginal utilities equated across all states of the world:

$$u_c = \psi = u_y$$

Generally, state dependence is killer...

- With state dependence, can't separate changes in c from θ.
- But, key implication: conditional on state of the world, $\Pr(\theta)$ does not affect behavior!
  - If full insurance, then consumption drop upon unemployment should not vary with the degree to which it is unexpected
  - Anyone ever tested this?

Problems

- Are benefits state independent? Aguiar and Hurst (2005)
  - We measure expenditure
  - Maybe utility is stable only over consumption
  - Time increases when unemployed
- More generally, other things break state independence

Subtle Problem: Timing!

- Suppose there are three periods: 1, 2, 3.
- Suppose you learn about being unemployed in period 1.
- Suppose you observe delta c in period 2 and 3
  - Simply identifying state dependence!
- Stepping back.
- Full insurance implies marginal utilities are equated across states of the world
- Key implication: conditional on the state of the world, actions don't depend on $E[]$.