Topic 1: Policy Design: Unemployment Insurance and Moral Hazard

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Lecture Notes for Ec426
Topics & Question in Public Economics

- Classical division in Public Economics:
  - Taxation: How does and should government raise revenues?
  - Spending: How does and should government spend revenues?

- Same fundamental questions for both topics:
  - When and how should the government intervene?
  - How do government policies affect economic behavior?
Focus on Social Insurance

- Definition of Social Insurance?
  - Social Insurance = government transfers based on events which cause a loss of income
  - Examples are unemployment, disability, health, retirement, ...
  - Welfare = means-tested transfers such as poverty alleviation, housing benefits.

- SI is the biggest and most rapidly growing part of Government Expenditures
  - GE have increased as a percentage of national income throughout the 20th century. Now close to 50 percent of national income in OECD countries.
  - GE have shifted towards social security and health insurance in particular
  - expected increase in GE causes worries about future solvability

- Generosity of SI (i.e. replacement of lost income) differs significantly among countries.
Distribution of UK Government Spending

Figure: Source: IFS 2008-2009.

- Up-to-date rule-of-thumb: 20% on Pensions, 20% on Health, 20% on Welfare, 15% on Education
Social Security Spending as a Share of National Income, 1949 to 2011

NHS Spending as a Share of National Income, 1949 to 2011

Change in Distribution of US Gov. spending, 1960 vs. 2014

Source: Gruber’s Textbook
International Comparison of Social Expenditures
Share of GDP, 2007 vs. peak vs. 2014

Source: OECD
Why have social insurance?

- General motivation for insurance: pool risks of \textit{risk-averse} individuals
  - Unemployment: loss of earnings due to involuntary unemployment
  - Health: risk of health shocks/expenses
  - Social security: loss of earnings at old age

- But why is \textbf{government} intervention needed to provide this insurance?
  - First and Second Welfare Theorem optimal insurance allocation could be decentralized
  - So why care about individuals not having health insurance in the US?
Why have social insurance?

- Typical answer is market failure due to asymmetric information
  - private information about actions leads to moral hazard; increase in coverage increases the probability that the risk occurs
  - private information about risks leads to adverse selection; higher risk types are more likely to buy insurance

- Does this provide a rational for government intervention?
  - in case of adverse selection it does; government has advantage over private insurers that it can mandate insurance
  - if governments intervene for other reasons, understanding how interventions affect selection and incentives is essential for optimal design
What else can explain government interventions?

- Other Market Failures
  - externalities, aggregate risks, redistribution, imperfect competition,...

- Behavioral failures
  - people make mistakes, do not internalize the true impact of their actions on themselves

- Trade-off between costs and benefits of government intervention
  1. information: how does government aggregate information on preferences and technology to choose optimal production and allocation?
  2. politicians not necessarily a benevolent planner in reality; face incentive constraints themselves
  3. why does govt. know better what’s desirable for you (e.g. wearing a seatbelt, not smoking, saving more)
Outline

**Lecture 1-2** Unemployment Insurance & Moral Hazard

**Lecture 2-3** Health Insurance & Adverse Selection

**Lecture 4** Social Security

**Lecture 5** Education

**Lecture 6** Externalities

**Lecture 7** Behavioural Public Economics
Approach

- Integration of theory with empirical evidence to derive quantitative predictions about policy
  - theoretical analysis of core issues
  - empirical analysis of direct and indirect effects
  - institutional framework (incomplete)

- Behavioral public economics: focus on non-standard decision makers where relevant

- Critical about question; why government?
Logistics

- Slides and reading list posted in advance on Frank’s website

- Background textbooks:
  - Public Finance and Public Policy by Gruber
  - Handbook of Public Economics (recent Vol. 5 in particular)

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This Lecture: UI & Moral Hazard

1. Moral Hazard: Insurance vs. Incentives
2. Optimal level of UI benefits [Baily-Chetty model]
   1. Model of Moral Hazard - generalizes for other applications
   2. Sufficient Statistics Approach - use of envelope conditions
3. Empirical estimation to test for optimality of program
Unemployment Insurance: Basic Trade-off

- Insurance against unemployment
  - loss of current (and potentially future) earnings
  - uninsured unemployed experience drop in consumption

- If fully insured, unemployed has no (monetary) incentive to keep/get a job
  - moral hazard on the job and during unemployment

- Central trade-off: insurance vs. incentives \(\Rightarrow\) optimal generosity
Static Generosity: Replacement Rate

- Common measure of program’s size is its “replacement rate”

\[ r = \frac{(\text{net}) \text{ benefit}}{(\text{net}) \text{ wage}} \]

- UI reduces agents’ effective wage rate to \( w(1 - r) \)

- Typical profile:

![Unemployment Benefits in Michigan, 2005](image)
Dynamic Generosity: Duration of Eligibility

Net Replacement Rates Over a Five-Year Period
For a One-Earner Couple With Two Children

Source: Gruber's book
Baily-Chetty model

- Canonical analysis of optimal level of UI benefits: Baily (1978)

- Shows that the optimal benefit level can be expressed as a function of a small set of parameters in a static model

- Once viewed as being of limited practical relevance because of strong assumptions

- Chetty (2006) shows formula actually applies with arbitrary choice variables and constraints

- Parameters identified by Baily are “sufficient statistics” for welfare analysis ⇒ robust yet simple guide for optimal policy
Baily-Chetty model: Setup

- Static model with two states: an agent is either
  - employed and earns wage \( w \)
  - or unemployed and has no income

- Agent is initially unemployed. Controls probability of remaining unemployed by exerting search effort

- If the agent searches at cost \( e \), the probability of finding a job equals \( \pi (e) \) with \( \pi' > 0, \pi'' < 0 \)
Baily-Chetty model: Setup

- UI system that pays constant benefit $b$ to unemployed agents
- Benefits financed by lump sum tax $\tau$ paid by the employed agents
- Govt’s balanced budget constraint:
  \[ \pi(e) \cdot \tau - (1 - \pi(e)) \cdot b = 0 \]
- Agent’s expected utility, with $u(c)$ utility over consumption, is:
  \[ \pi(e) u(w - \tau) + (1 - \pi(e)) u(b) - e \]
Baily-Chetty model: First Best Solution

- In first best, there is no moral hazard problem

- Government chooses $b$ and $e$ (determining $\tau$) to maximize agent’s welfare:

$$\max_{b,e} \pi(e) u \left( w - \frac{1 - \pi(e)}{\pi(e)} b \right) + (1 - \pi(e)) u(b) - e$$

- Solution to this problem is

$$FOC_b : \quad u'(c_e) = u'(c_u) \implies \text{full insurance}$$
$$FOC_e : \quad \pi'(e) [u(c_e) - u(c_u)] - 1 + \frac{\pi'(e)}{\pi(e)} bu'(c_e) = 0$$
Baily-Chetty model: Second Best Solution

- In second best, effort is unobserved by govt. ⇒ moral hazard

- Problem: agents only consider *private* marginal benefits and cost when choosing $e$

  - agent does not internalize the effect on the govt's budget constraint

$$
e^I (b, \tau) : \quad \pi' (e) [u(c_e) - u(c_u)] - 1 = 0
$$

$$
e^S (b, \tau) : \quad \pi' (e) [u(c_e) - u(c_u)] - 1 + \frac{\pi'(e)}{\pi(e)} bu'(c_e) = 0
$$

- hence, agent searches too little from a social perspective ⇒ source of inefficiency
Baily-Chetty model: Second Best Solution

- Government’s problem is to maximize agent’s expected utility, taking into account agent’s behavioral responses:

\[
\max_{b,\tau,e} \pi(e)u(w-\tau) + (1-\pi(e))u(b) - e
\]

such that

\[
BC : \quad \pi(e)\tau - (1-\pi(e))b = 0
\]
\[
IC : \quad \pi'(e)\left[u(w-\tau) - u(b)\right] - 1 = 0
\]

- Denote by \(e(b)\) and \(\tau(b)\), the functions satisfying \(BC\) and \(IC\)

- The (unconstrained) problem of the government is

\[
\max_b V(b) = \pi(e(b))u(w-\tau(b)) + (1-\pi(e(b)))u(b) - e(b)
\]
Two Approaches to Optimal Policy Problems

Focus in public finance is on deriving an *empirically implementable* solution to this problem:

1. **Structural**: specify complete models of economic behavior and estimate the primitives
   - identify $b^*$ as a fn. of deep parameters: returns and cost of job search, discount rates, nature of borrowing constraints, informal ins. arrangements.
   - challenge: difficult to identify all primitive parameters in an empirically compelling manner

2. **Sufficient Statistics**: derive formulas for $b^*$ as a fn. of high-level elasticities
   - these elasticities can be estimated using *reduced-form* methods
   - estimate statistical relationships using research designs that exploit quasi-experimental exogenous variation.
   - Baily-Chetty model is an example of this approach
Baily-Chetty model: Second Best Solution

At an interior optimum, \( \frac{dV}{db}(b^*) = 0 \)

\[
\Leftrightarrow (1 - \pi(e))u'(b) - \pi(e)u'(w - \tau)\frac{d\tau}{db} + \{\pi'(e)[u(w - \tau) - u(b)] - 1\}\frac{de}{db} = 0
\]

Since the expected utility has been optimized over \( e \), the Envelope Thm implies:

\[
(1 - \pi(e))u'(c_u) - \pi(e)u'(c_e)\frac{d\tau}{db} = 0
\]

Key here is that we can neglect the \( \frac{de}{db} \) term

- given the agent’s optimization, the impact on expected utility through effort is of second order
- this holds for any optimal behavior by the agent, e.g. endogenous consumption (Chetty 2006)
Baily-Chetty model: Second Best Solution

- The change in effort does have a first order effect on the government’s UI budget

- With $\tau(b) = \frac{(1-\pi(e(b)))}{\pi(e(b))} b$, we find

$$\frac{d\tau}{db} = \frac{1 - \pi(e)}{\pi(e)} - \frac{\pi'(e)}{\pi(e)^2} \frac{de}{db} b$$

$$= \frac{1 - \pi(e)}{\pi(e)} \left( 1 + \frac{\varepsilon_{1-\pi(e),b}}{\pi(e)} \right)$$

$$\Rightarrow$$

$$\frac{dV(b)}{db} = (1 - \pi(e)) \left\{ u'(c_u) - (1 + \frac{\varepsilon_{1-\pi(e),b}}{\pi(e)}) u'(c_e) \right\}$$
Baily-Chetty model: Second Best Solution

- This yields the optimality condition

\[
\frac{u'(c_u) - u'(c_e)}{u'(c_e)} = \frac{\varepsilon_1 - \pi(e)b}{\pi(e)}
\]

- LHS is marginal social benefit of UI
  - benefit of transferring $1 from high to low state due to increased insurance
  - \( MB \) is decreasing in insurance coverage

- RHS is marginal social cost of UI
  - cost of transferring $1 due to decreased search effort
  - \( MC \) is constant (or decreasing less) with insurance coverage

- Comparative statics; ceteris paribus,
  - if \( MC \) is higher, optimal UI benefits should be lower
  - if \( MB \) is higher, optimal UI benefits should be higher
Implementation: Consumption-Based Formula

- Can we identify sufficient statistics to test for the optimality of the current system?

- Write marginal utility gap using a Taylor expansion:
  \[ u'(c_u) - u'(c_e) \approx u''(c_e)(c_u - c_e) \]

- Defining coefficient of relative risk aversion \( \gamma = \frac{-u''(c)c}{u'(c)} \), we can write
  \[
  \frac{u'(c_u) - u'(c_e)}{u'(c_e)} \approx -\frac{u''}{u'} c_e \frac{\Delta c}{c} \\
  = \gamma \frac{\Delta c}{c}
  \]

- Gap in marginal utilities is a function of curvature of utility (risk aversion) and consumption drop from high to low states.
Implementation: Consumption-Based Formula

Theorem

The optimal unemployment benefit level $b^*$ satisfies

$$\gamma \frac{\Delta c}{c} (b^*) \approx \frac{\varepsilon_{1-\pi(e),b}}{\pi(e)}$$

where

$$\Delta c = \frac{c_e - c_u}{c_e} = \text{consumption drop during unemployment}$$

$$\gamma = -\frac{u''(c_e)}{u'(c_e)}c_e = \text{coefficient of relative risk aversion}$$

$$\varepsilon = \frac{d \log 1 - \pi(e)}{d \log b} = \text{unemployment elasticity}$$
Estimating the Moral Hazard Cost

- Lots of empirical work on labor supply effect of social insurance. Overview by Krueger and Meyer (2002)

- Early literature used cross-sectional variation in replacement rates. Problem: this implies a comparison of high and low wage earners, whose employment prospects may be very different!

- This gave way in late 80s/early 90s to modern methods using more exogenous variation/quasi-experiments
  - difference in UI generosity across states, across time, across group...
  - state experiments with UI bonuses (Meyer 1995)

- Evidence suggests elasticity of around 0.5.
Difference-in-Differences Estimates

- Compare a group affected by a change in the unemployment policy ($T$) to a group for which the unemployment policy is unchanged ($C$). Let $B$ and $A$ denote before and after the reform.

- The effect on the exit probability can be estimated by the difference-in-differences

$$
\Delta \pi^T - \Delta \pi^C = \left[ \pi_A^T - \pi_B^T \right] - \left[ \pi_A^C - \pi_B^C \right].
$$

- before-after estimator $\left[ \pi_A^T - \pi_B^T \right]$ is biased by time effects
- a group comparison $\left[ \pi_A^T - \pi_A^C \right]$ is biased by group effects

- The dif-in-dif removes (group-invariant) time effects and (time-invariant) group effects. The identification assumption is that groups follow parallel trends over time, absent the policy change.
“Spike” in hazard rate

- Most striking evidence for moral hazard effect of unemployment insurance: “spike” in hazard rate at benefit exhaustion.

Source: Schmieder et al. QJE 2011
Estimating the Consumption Smoothing Benefits

- The smoothing benefits can be estimated as well, but we should take into account that UI crowds out self-insurance
  - some people use their savings when unemployed
  - some people borrow from banks of family

\[
\begin{align*}
  c_u &= b + \text{savings} \\
  c_e &= w - \tau - \text{savings}
\end{align*}
\]

- however, many unemployed have no savings and face borrowing constraints

- Gruber analyzes drop in food consumption \( \frac{c_e - c_u}{c_e} \) and estimates how this is affected by a change in the benefit ratio \( \frac{b}{w} \).
Simulated Instruments

- Same problem: the difference in consumption drop for individuals with high and low replacement rates is not only due to the replacement rate differential.

- Alternative solution: Simulated Instruments
  - take a representative subsample of individuals $S_{sub}$
  - for each individual $i$ in state $j$ at year $t$ in the original sample
    - calculate the subsample’s average replacement rate if all individuals of the subsample had lived in state $j$ at year $t$
    
    $\left( \frac{b}{w} \right)_{j,t}^{\text{simulated}} = \sum_{s \in S_{sub}} \frac{b_{s,j,t}^{\text{simulated}}}{w_s}$
    
    - use $\left( \frac{b}{w} \right)_{j,t}^{\text{simulated}}$ as an instrument for $\left( \frac{b}{w} \right)_{i,j,t}$

- The approach exploits only variation in the generosity of the state UI system over time ($\sim$ difference-in-difference). Underlying the identification is a similar parallel-trends assumption.
Estimating the Insurance Value

- Gruber runs IV regression

\[
\left( \frac{c_e - c_u}{c_e} \right)_{i,j,t} = \beta_1 + \beta_2 \left( \frac{b}{w} \right)_{i,j,t} + \beta_3 \delta_j + \beta_4 \tau_t + \epsilon_i
\]

and finds:

- \( \beta_1 = 0.24, \beta_2 = -0.28 \)
- without UI, cons drop would be about 24%
- a 10 pp increase in UI replacement rate causes 2.8 pp reduction in cons. drop.
- with current replacement rate \((b/w = 0.5)\), cons drop is about 10%

- Is current level optimal?

\[ \gamma \times 10\% \overset{?}{=} 0.5 \]
Calibrating the Model

• We can find the optimal level using our estimates

\[ \frac{\Delta c}{c} \approx \frac{\varepsilon}{\pi} \]

\[ \gamma \left( \beta_1 + \beta_2 \frac{b^*}{w} \right) \approx \varepsilon \]

• Results: \( \frac{b^*}{w} \) varies considerably with \( \gamma \)

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<th>( \gamma )</th>
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• Consumption smoothing benefits seem small relative to the moral hazard cost of unemployment insurance?
Summary

- Policy maker faces trade-off between the provision of insurance and the provision of incentives.

- Simple model with search efforts can capture this trade-off. Model generalizes for other behavioral responses like saving, moral hazard on the job, quality of job matches,...
  
  - if behavior is optimal, change in behavior has second-order effect on welfare
  - only the effect on the government’s budget constraint is important and this is captured by the unemployment probability

- Empirical evidence suggests that job seekers are quite responsive to monetary incentives, implying that consumption benefits need to be large to justify generous unemployment benefits