How to Reduce Unemployment Without Creating Poverty

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Problem Set 7

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Question 1 (Two-tier unemployment compensation systems)
Basically all OECD countries pay unemployment benefits as a function of duration s in unemployment.[1] While short-term unemployed, individuals receive unemployment insurance (UI) benefits. When long-term unemployed, they receive unemployment assistance (UA) payments. Formally, benefits $b(s)$ are given by

$$b(s) = \left\{ \begin{array}{c} b_{UI} \\ b_{UA} \end{array} \right\} \text{for } s \left\{ \begin{array}{c} \leq \\ > \end{array} \right\} \bar{s}$$

where $\bar{s}$ is the length of entitlement to UI payments. Once employed, the worker earns a constant wage $w > b_{UI} > b_{UA}$.

Consider unemployed individuals whose instantaneous utility depends on their current consumption $c(\tau)$ and their effort $\phi(s)$ they put into finding a job. The preferences of the individual are represented by the intertemporal utility function

$$U(t) = \int_t^\infty e^{-\rho[\tau - t]} u(c(\tau), \phi(s)) ds \tag{1}$$

with the instantaneous utility

$$u(c(\tau), \phi(s)) = \frac{c(\tau)^{1-\sigma} - 1}{1-\sigma} - \phi(s), \quad \sigma > 0. \tag{2}$$

and the time preference rate $\rho > 0$. The agents cannot save or invest, hence

$$c(\tau) = \left\{ \begin{array}{ll} w, & \text{when the agent is employed,} \\ b(s), & \text{when the agent is unemployed.} \end{array} \right.$$

The individual is choosing optimal effort $\phi(s)$ by maximizing (1) joint with (2) subject to the arrival rate of a job that is given by

$$\mu = \mu(\phi(s)), \quad \frac{d\mu(\phi(s))}{d\phi(s)} \geq 0.$$

In words, the rate with which a new job arrives increases in individual search effort. The job separation rate, λ, is constant.

Suppose the optimal programme of an unemployed is defined via the value function $V(b(s), s)$. It has two arguments, the benefits $b(s)$ and the spell argument s itself. The value function of an employed individual is given by $V(w)$.

[1] See Launov and Wälde "Estimating Incentive and Welfare Effects of Non-Stationary Unemployment Benefits" in International Economic Review, 54 (2013): 1159-1198 for details.

a) Explain in words what the Bellman equations for this maximization problem tell us:

$$\rho V(w) = u(w,0) + \lambda\left[V\Big(b_{UI},0\Big) - V(w)\right] \tag{3}$$

$$\rho V(b(s),s) = \max_{\phi(s)}\left\{u(b(s),\phi(s)) + \frac{\partial V(b(s),s)}{\partial s} + \mu(\phi(s))\Big[V(w) - V(b(s),s)\Big]\right\} \tag{4}$$

b) Compute and discuss in words the first-order condition.

c) Derive the first order condition for $\mu = [\phi(s)]^{\alpha}$, where $0 < \alpha < 1$.

d) What does the first-order condition tell us about optimal effort for long-term unemployed workers, i.e. for $b(s) = b_{UA}$?