14.461 Lecture 20
Unemployment Insurance

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1 Unemployment Insurance

Shavell and Weiss (1979) and Hopenhayn and Nicolini (1997).

My lecture is based on the treatment in Ljunquist and Sargent. Workers have preferences

$$E \sum_{t=0}^{\infty} \beta^t \left[u\left(c_t \right) - a_t \right]$$

where $c_t \geq 0$ is consumption at time t, and $a_t \geq 0$ is the search effort at time t of an unemployed worker, u is strictly increasing, twice differentiable and strictly concave, and $u(0)$ is well defined. An unemployed worker who searches with effort a_t at time t, finds a permanent job at the beginning of time $t+1$ with probability $p(a_t)$, with p increasing, twice differentiable, and strictly concave, with $p(a_t) \in [0, 1]$ for $a_t \geq 0$ and $p(0) = 0$. Once, a worker finds a job, he is behind the grasp of the unemployment insurance agency and does not search anymore. All jobs are the same and pay w each period. Moreover, the consumption good is not storable and unemployed workers cannot borrow or lend.

1.1 Autarky

First, let us consider an economy with no insurance agency.

Employment is an absorbing state because jobs are permanent. Hence the value of being employed is equal to

$$V = \frac{u\left(w \right)}{1 - \beta}. \tag{1}$$

The value of being unemployed who chooses optimally (c, a) each period is

$$U = \max_{a \geq 0} \left\{ u(0) - a + \beta \left[p(a) V + (1 - p(a)) U \right] \right\}.$$

The foc is

$$\beta p'(a)(V - U) \leq 1,$$

with equality if $a > 0$. Given that there is no state variable, the value function is a constant U^A and has an associated constant effort a.

1.2 Full information

Now, imagine there is a planner who can observe and control consumption and effort and wants to design an unemployment insurance that gives to the unemployed utility $U > U^A$. The planner wants to give U to the unemployed in the more efficient way, that is, in order to minimize the costs. Define $C(U)$ the expected discounted cost for the planner to give U to the unemployed. It must be that C is a strictly convex function because a higher U implies a lower marginal utility of the worker and hence additional utils can be given to the workers only at an increasing marginal cost in terms of consumption goods. The planner solves the following problem:

$$C(U) = \min_{c, a, U'} \left\{ c + \beta (1 - p(a)) C(U') \right\}$$

subject to the promise-keeping constraint

$$U = u(c) - a + \beta \left[p(a) V + (1 - p(a)) U' \right]$$

where V is given by equation (1). Let λ be the multiplier attached to the constraint, then the foc are

$$\lambda = \frac{1}{u'(c)} \tag{2}$$

$$C(U') = \lambda \left[\frac{1}{\beta p'(a)} - (V - U') \right] \tag{3}$$

$$C'(U') = \lambda \tag{4}$$

The Envelope condition is $C'(U) = \lambda$ and hence, given strict convexity of C, (4) implies $U' = U$! This means that under full information, the unemployed workers will get the

same expected utility over time, which also mean that c and a are constant over time. This implies that workers fully smooth consumption during unemployment, while the smooth consumption across states only if $U = V$.

1.3 Moral Hazard

Imagine that the planner cannot observe or control the workers' search effort a. Hence, he announces c and then the workers privately choose a.

The issue is that the planner could give higher utility to the unemployed workers than in autarky by increasing their consumption c and decreasing search effort a. However, the search effort prescribed was higher than if the worker was choosing by himself! From conditions (2) and (4) and the fact that $C(U') > 0$ we have that

$$\frac{1}{\beta p'(a)} - (V - U') = C(U') u'(c) > 0,$$

while in autarky we know that if $a > 0$ then

$$\frac{1}{\beta p'(a)} - (V - U') = 0, \tag{5}$$

which imply that a is chosen differently in the two economies. Hence, if the planner was promising U' to the unemployed worker but leave him choose a, then the worker would like to decrease a in order to satisfy (5). If the equality is established for $a > 0$ then this would be the search effort, otherwise $a = 0$. Given that the worker does not internalize the social cost of the insurance scheme, he would choose an effort that is below the socially optimal level.

The planner problem, under moral hazard, is the same as before with the additional constraint

$$\frac{1}{\beta p'(a)} - (V - U') \geq 0,$$

with complementarity slackness $a \geq 0$. Given that the two constraints are not linear and generally do not define a convex set, it is difficult to derive the conditions under which $C(U)$ is a convex function, however from now on we assume that $C(U)$ is strictly convex to characterize the solution.

Let η be the Lagrangian multiplier associated to this constraint and λ the one associated to the promise-keeping one, guess that $a > 0$, then the foc are

$$1 = \lambda u'(c) \tag{6}$$

$$C(U') = -\eta \frac{p''(a)}{p'(a)}(V - U') \tag{7}$$

$$C'(U') = \lambda - \eta \frac{p'(a)}{1 - p(a)} \tag{8}$$

where (7) uses the fact that the constraint is binding. As long as the insurance scheme is associated with costs, that is, $C(U') > 0$, this implies that $\eta > 0$. Given that the Envelope condition is still $C'(U) = \lambda$, condition (8) implies that

$$C'(U') = C'(U) - \eta \frac{p'(a)}{1 - p(a)},$$

and hence $C'(U') < C'(U)$. Convexity of C implies that $U' < U$. Also, condition (6) together with the Envelope gives that

$$u'(c) = \frac{1}{C'(U)},$$

and hence it must be that consumption decrease with the length of the unemployment spell. The intuition is that to give the right incentives to the unemployed to search intensively enough, their consumption must decrease over time. The moral hazard constraint also implies that a increases with the duration of unemployment because the value of staying unemployed decreases.

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