Macroeconomics

Lecture 6.

An analysis of unemployment:

The Shapiro – Stiglitz model

Let repeat something important about unemployment from the introductory economics

Unemployment can be

-frictional, structural and cyclical;

-voluntary and involuntary;

- *Classical* (because of higher wages) *and Keynesian* (because of lack of aggregate demand)…

Do you remember what is asymmetric information?

?

The Shapiro – Stiglitz model or “shirking” model: the basic idea

- Because of *asymmetric information* firms do not know what the workers do on the job.
- Workers do not like to work; in other words, the efforts generate *disutility* for workers.
- Firms cannot control behavior of the workers, and the latter have opportunities to shirk.
- ***Firms prefer to set higher wages in order to discourage propensity to shirk*** (Shapiro and Stiglitz, 1984).

Some words about “efficiency wage” theory

- This situation is the special case of “**efficiency wage**” theory: *higher wage may increase not only cost but also revenue*…
- *Profit = Revenue **as a function of wages** – Cost as a function of wages*
- The idea of the efficiency wage theory is that increasing wages can lead to increased labor productivity because workers feel more motivated to work with higher pay.
- Therefore, if firms increase wages – some or all of the higher wage costs will be recouped through increased staff retention and higher labor productivity.

The Shapiro – Stiglitz model: the basic assumptions

- An individual worker's utility function is:

$U = w - e$

that is: Utility = Wage minus Efforts

A typical worker enjoys wage but suffers making any efforts.

And he or she faces with the choice:

to shirk [to be shirker] ($e=0$) or not to shirk [to be non-shirker] ($e>0$)

The goal of a employer is to create incentives that provide situation when the utility of a non-shirker is not less than the utility of a shirker.

Please think at home (as part of preparation for The Final Exam)

Are these assumption consistent with:

The Islamic ethic?

The Confucian ethics?

The ethical standards of South Korean and Japanese corporations?

“Lyrical digression”: how can we calculate “benefits” from (financial) assets’ holding?

Present Value of Discounted Cash Flows

$$PV = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} \cdots \frac{CF_n}{(1+r)^n}$$

CF equals cash flow for a period,

r equals the discount rate, and

n equals the number of periods.

The important question

Is your job like an asset?

The essential formulas (Part 1)

The worker selects an effort level to maximize his discounted utility stream. This involves comparison of the utility from shirking with the utility from not shirking, to which we now turn. We define V_E^S as the expected lifetime utility of an employed shirker, V_E^N as the expected lifetime utility of an employed nonshirker, and V_u as the expected lifetime utility of an unemployed individual. The fundamental asset equation for a shirker is given by

$$(1) \qquad rV_E^S = w + (b+q)(V_u - V_E^S),$$

while for a nonshirker, it is

$$(2) \qquad rV_E^N = w - e + b(V_u - V_E^N),$$

Each of these equations is of the form "interest rate times asset value equals flow benefits (dividends) plus expected capital gains

The essential formulas (Part 2)

$$V_E^S = \frac{w + (b+q)V_u}{r+b+q}; \tag{3}$$

$$V_E^N = \frac{(w-e) + bV_u}{r+b}. \tag{4}$$

The worker will choose not to shirk if and only if $V_E^N \geq V_E^S$. We call this the *no-shirking condition* (*NSC*), which, using (3) and (4), can be written as

$$w \geq rV_u + (r+b+q)e/q = \hat{w}. \tag{5}$$

Some important conclusions

Equation (5) has several natural implications. If the firm pays a sufficiently high wage, then the workers will not shirk. The critical wage, $\hat{w}$, is higher

(a) the higher the required effort (e),

(b) the higher the expected utility associated with being unemployed (V_u),

(c) the lower the probability of being detected shirking (q),

(d) the higher the rate of interest (i.e., the relatively more weight is attached to the short-run gains from shirking (until one is caught) compared to the losses incurred when one is eventually caught),

(e) the higher the exogenous quit rate b (if one is going to have to leave the firm anyway, one might as well cheat on the firm).

The essential formulas (Part 3)

The asset equation for V_u, analogous to (1) and (2), is given by

$$rV_u = \bar{w} + a(V_E - V_u), \tag{6}$$

where a is the job acquisition rate and V_E is the expected utility of an employed worker (which equals V_E^N in equilibrium). We can now solve (4) and (6) simultaneously for V_E and V_u to yield

$$rV_E = \frac{(w-e)(a+r)+\bar{w}b}{a+b+r}; \tag{7}$$

$$rV_u = \frac{(w-e)a+\bar{w}(b+r)}{a+b+r}. \tag{8}$$

The essential formulas (Part 4)

Substituting the expression for V_x (i.e., (8)) into the *NSC* (5) yields the *aggregate NSC*

$$(9) \qquad w \geq \bar{w} + e + e(a + b + r)/q.$$

Notice that the critical wage for nonshirking is greater: (a) the smaller the detection probability q; (b) the larger the effort e; (c) the higher the quit rate b; (d) the higher the interest rate r; (e) the higher the unemployment benefit ($\bar{w}$); and (f) the higher the flows out of unemployment a.

The essential formulas (Part 5)

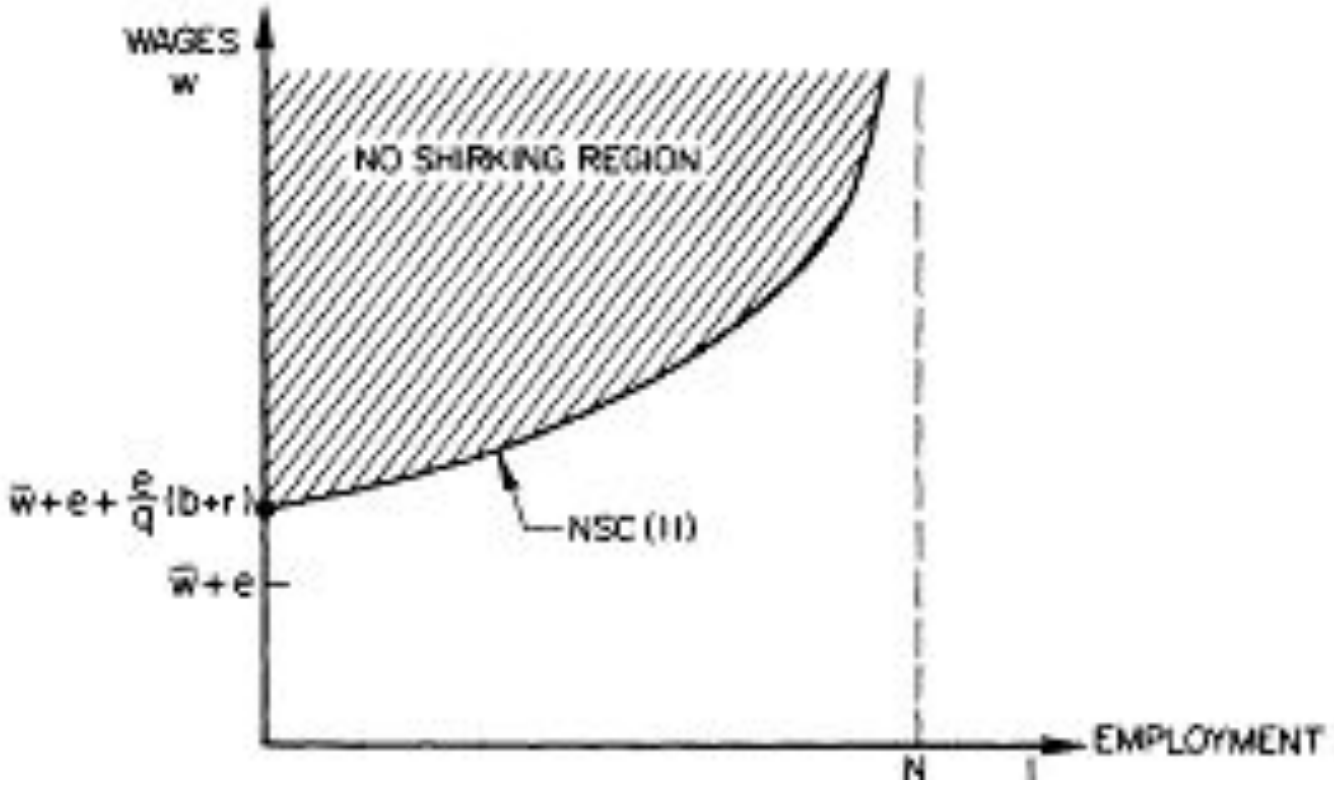
The rate a itself can be related to more fundamental parameters of the model, in a steady-state equilibrium. In steady state the flow *into* the unemployment pool is bL where L is aggregate employment. The flow *out* is $a(N-L)$ (per unit time) where N is the total labor supply. These must be equal, so $bL = a(N-L)$, or

$$a = bL/(N-L). \tag{10}$$

Substituting for a into (9), the aggregate NSC, we have

$$w \geq e + \bar{w} + \frac{e}{q}\left(\frac{bN}{(N-L)} + r\right) \tag{11}$$

The aggregate No-Shirking Constraint or formula (11) graphically



$$u = (N - L)/N$$

The NSC curve: important features/questions

NSC curve is a very special analogue to the labor supply curve…

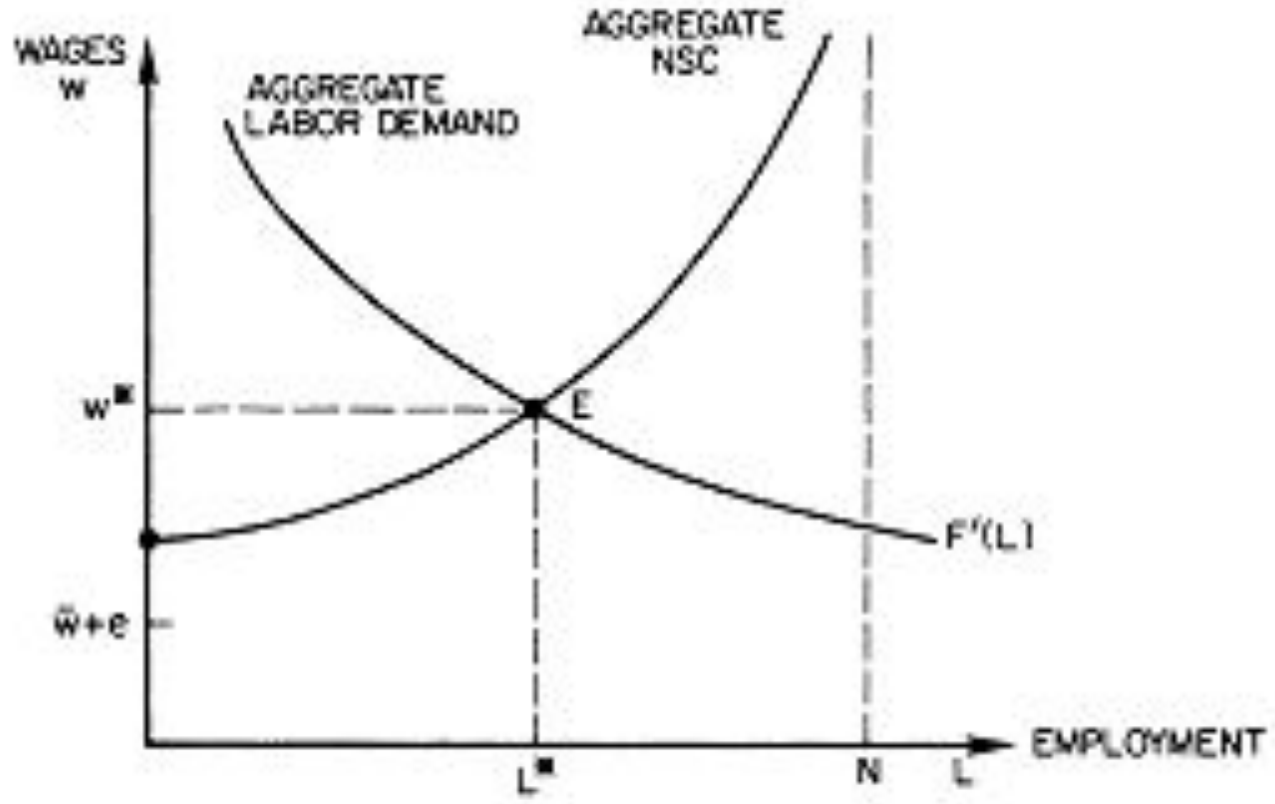
- *Why is the NSC curve positively sloping?*
- *Why is the NSC curve convex?*
- *Is the NSC curve consistent with the guaranteed employment?*
- *What are differences between NSC curve and typical Neoclassical economics-based labor supply curve?*

The algebra of the equilibrium in the Shapiro – Stiglitz model

The equilibrium wage and employment level are now easy to identify. Each (small) firm, taking the aggregate job acquisition rate a as given, finds that it must offer at least the wage $\hat{w}$. The firm's demand for labor then determines how many workers are hired at the wage. Equilibrium occurs where the aggregate demand for labor intersects the aggregate NSC. For $\bar{w} = 0$, equilibrium occurs when

$$F'(L) = e + (e/q)(bN/(N - L) + r).$$

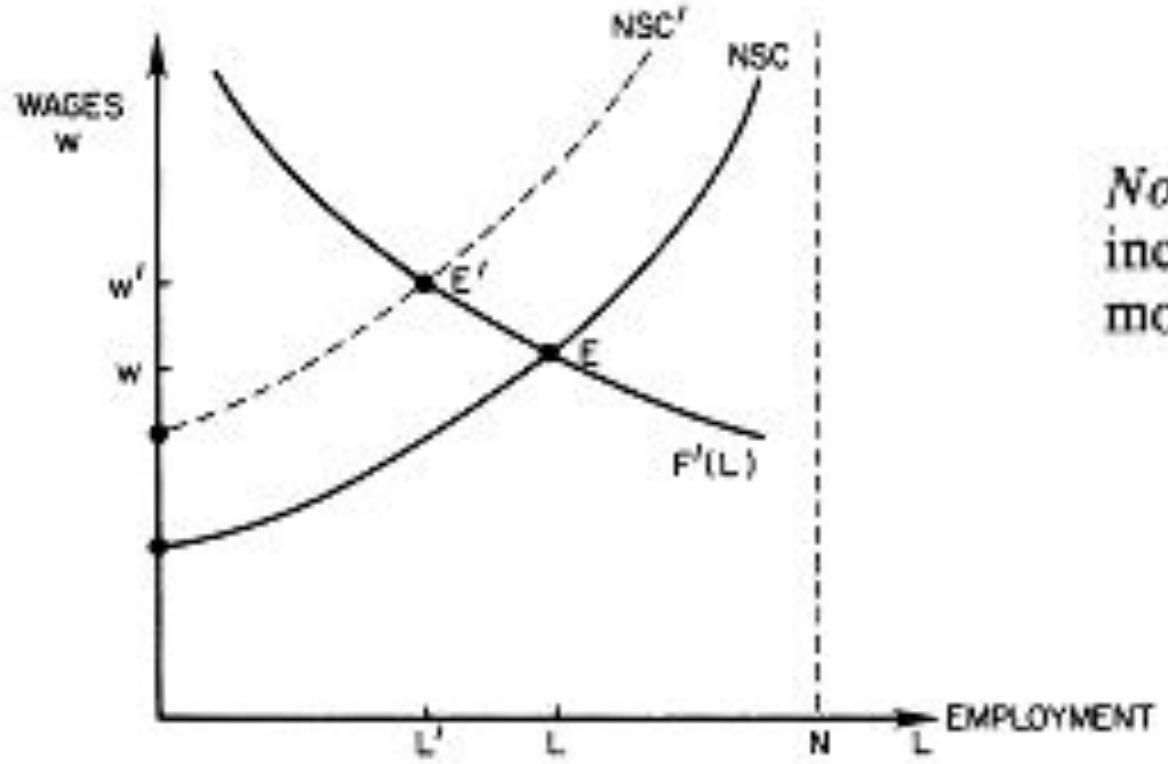
The equilibrium graphically



Involuntary unemployment in the Shapiro – Stiglitz model

From the worker's point of view, *unemployment is involuntary*: those without jobs would be happy to work at w^* or lower, but cannot make a credible promise not to shirk at such wages.

Changes in the equilibrium



Note: A decrease in the monitoring intensity q, or an increase in the quit rate b, leads to higher wages and more unemployment

Some additional conclusions

- The nominal wages in the modern capitalist economy are characterized by downward inflexibility. In other words, it is difficult to decrease nominal wage rate. One of the reasons for it is the employers' aspirations to discourage employees' shirking.
- When the recession starts and aggregate demand falls, the firms (the employers) will react not by decreasing wages but by dismissing workers.

So…

Did you understand why unemployment can be a consequence of the normal operation of the mechanism of a market economy – in the conditions of asymmetric information?

The Shapiro – Stiglitz model-based exercises from InClass Test

- What will happen to both equilibrium real wage rate and equilibrium employment if the employers introduce more effective means of monitoring (for the employees' efforts)? Explain both verbally and graphically by using Shapiro – Stiglitz model.
- What will happen to both equilibrium real wage rate and equilibrium employment if unemployment benefit decreases? Explain both verbally and graphically by using Shapiro – Stiglitz model.
- What will happen to both equilibrium real wage rate and equilibrium employment if exogenous quit rate increases? Explain both verbally and graphically by using Shapiro – Stiglitz model.
- What will happen to both equilibrium real wage rate and equilibrium employment if the "interest rate" (the workers' discount rate) decreases? Explain both verbally and graphically by using Shapiro – Stiglitz model.
- What will happen to both equilibrium real wage rate and equilibrium employment if required level of efforts on the job increases? Explain both verbally and graphically by using Shapiro – Stiglitz model.