EC201 Macroeconomics

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Class - 8 -

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This Week: Outline

1. Review Questions – 1 & 2 –
2. Class Questions – 1 –
3. Class Questions – 2 –

1. “From the perspective of a policy-maker, setting unemployment benefits involves a trade-off between proving incentives and providing insurance”. Do you agree with this statement? Explain why or why not.
2. Explain intuitively the role of the matching function in the two-sided search model. Why does the matching function capture the idea of search frictions?

1

“From the perspective of a policy-maker, setting unemployment benefits involves a trade-off between proving incentives and providing insurance”. Do you agree with this statement?

Explain why or why not.

- The statement is correct.
- On one hand, higher unemployment benefits increase the value of being unemployed, and therefore reduce the incentives of the unemployed to accept job offers and search hard for a job; moreover, since higher benefits increase equilibrium wages, they reduce employers' incentives to open vacancies.
- Because of this, higher benefits tend to generate higher unemployment rate.
- On the other hand, unemployment benefits provide insurance, since they allow individuals' consumption not to drop that much when/if they become unemployed.

2

Explain intuitively the role of the matching function in the two-sided search model. Why does the matching function capture the idea of search frictions?

Review Question 2

- The matching function gives the number of successful matches for any given numbers of job seekers on one hand and vacancies on the other.
- It captures the idea of search frictions since it allows for the number of matches to be lower than the number of workers and firms looking for a match.
- This reflects the fact that in practice the "meetings" between job seekers and firms are not instantaneous or costless, and that job seekers and vacancies are heterogeneous and in many cases the fit between the two might not be good enough to lead to a match.

[**One-Sided Search**]. Consider the one-sided search model discussed in the lecture.

(a) Explain intuitively and represent graphically how the value of being employed depends on the wage.
(b) Explain intuitively and represent graphically how the value of being unemployed depends on the wage.
(c) What is a "reservation wage"? Explain intuitively and graphically.
(d) Suppose the probability of receiving an offer increases. What is the effect of this on the reservation wage? Explain intuitively and graphically.
(e) What is the effect on the long-run unemployment rate? Explain graphically and intuitively.

1a

Explain intuitively and represent graphically how the value of being employed depends on the wage.

- The value of being employed is an increasing and concave function of the wage.
- This is because a higher wage affords a higher level of consumption (hence increasing),
- The utility gains associated with higher consumption are decreasing in the level of consumption (hence concave).
- Graphically: see Figure 1.

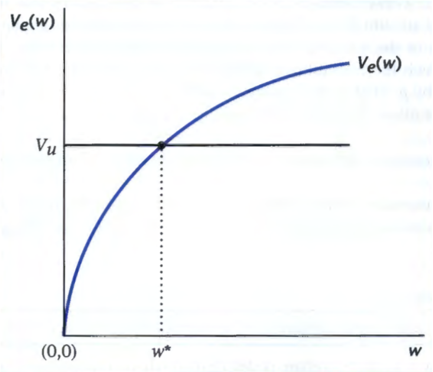


Figure One-Sided Search

1b

Explain intuitively and represent graphically how the value of being unemployed depends on the wage.

- The value of being unemployed does not depend on the offered wage.
- This is because once an offer is rejected, the wage that was offerd becomes irrelevant for the welfare of the unemployed worker (there is no serial correlation in wage offers).
- Graphically: see Figure 2. (the same)

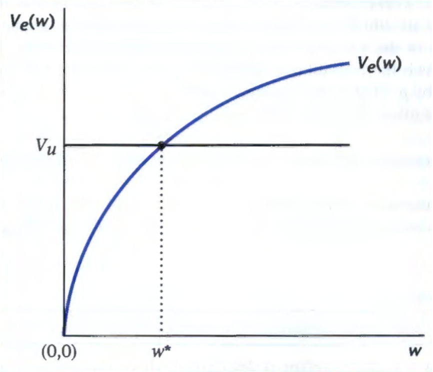


Figure One-Sided Search

1c

What is a “reservation wage”? Explain intuitively and graphically.

- The reservation wage is the lower level of the wage that an unemployed worker would be willing to accept in order to become employed.
- Graphically, it is given by the w^* such that the value of being employed is greater than the value of being unemployed for any $w > w^*$:
- see Figure 3.

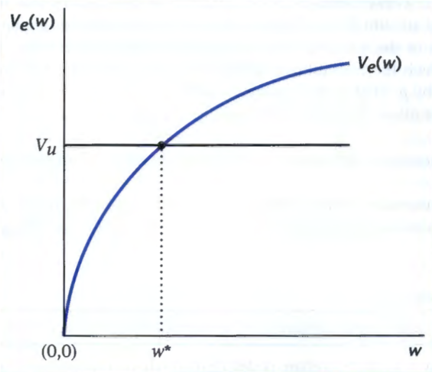


Figure One-Sided Search

1d

Suppose the probability of receiving an offer increases. What is the effect of this on the reservation wage? Explain intuitively and graphically.

- A higher probability of receiving an offer increases the value of staying unemployed, as it becomes easier to find a job in the future.
- As a result, the reservation wage increases: unemployed workers are now picky with job offers,
- Since they know it's more likely the will receive further offers in the future.
- Graphically: see Figure 4

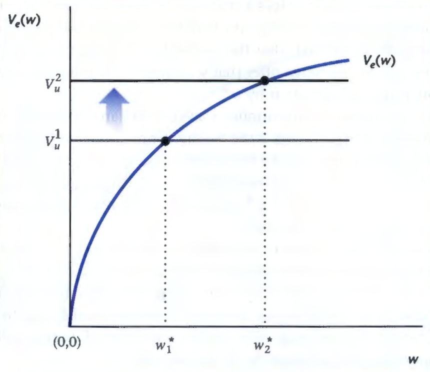


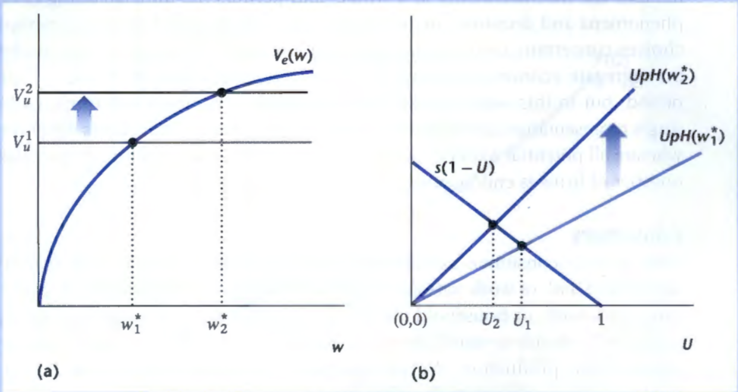
Figure One-Sided Search

1e

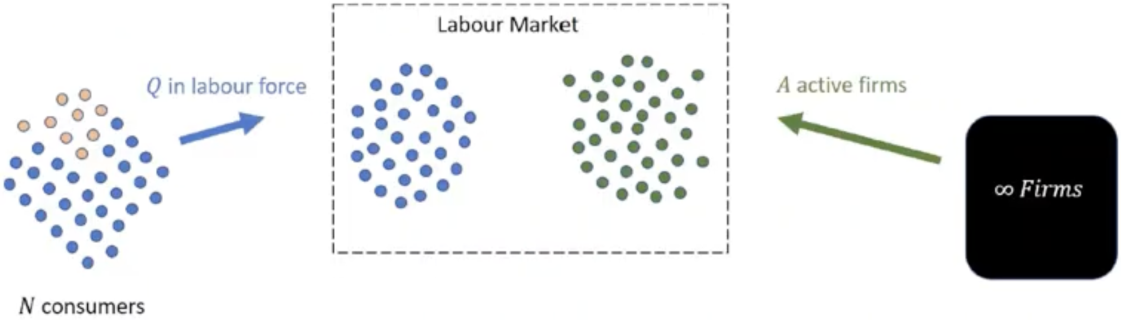
What is the effect on the long-run unemployment rate? Explain graphically and intuitively.

Figure 6.16 An Increase in the Job Offer Rate, *p*

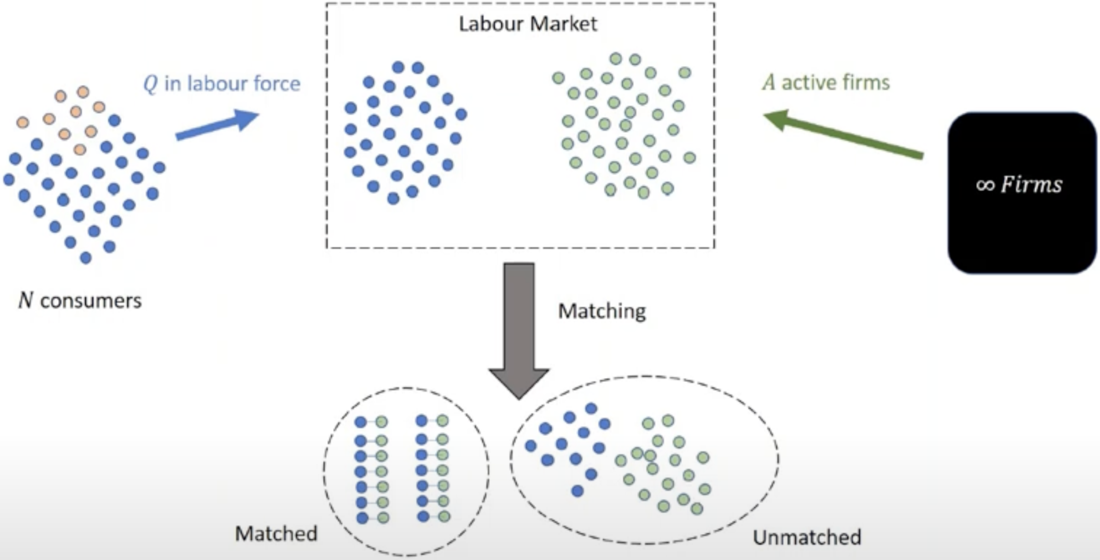
When *p* increases, this increases the welfare of the unemployed, who are now more likely to find work, and the reservation wage increases from w_1^* to w_2^* in panel (a). In panel (b), there are two effects on $UpH(w^*)$, in that *p* has increased, which increases the flow of workers from unemployment to employment, but w^* has increased, which reduces this flow. It is not clear how the unemployment rate is affected, but we show it decreasing in the figure.



Search and Matching

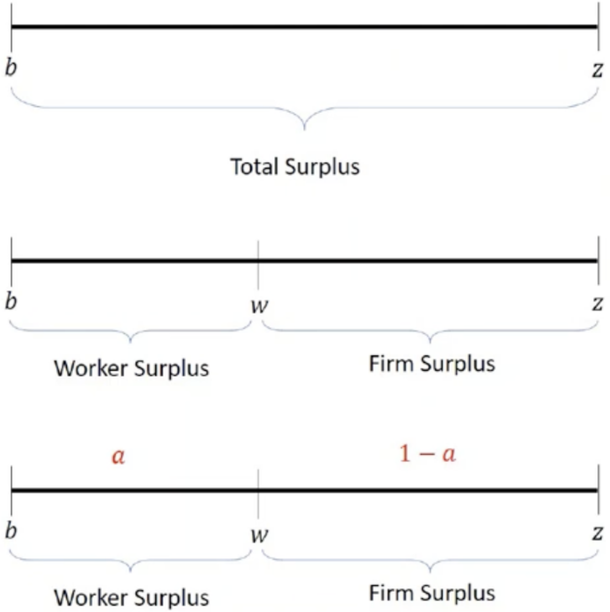


Search and Matching



The Demand Side of the Labor Market: Optimization by Firms

- Posting a vacancy has a cost firms k and posting a vacancy have a probability $p_f = M/A$ of finding a worker,
- Given a successful match with a worker, the firm and worker produce output z,
- So the profit the firm receives from the match is $z - w$, or output minus the wage paid to the worker.
- In this case, the worker will receive a surplus of $w - b$, which is the wage the worker receives minus the employment insurance benefit, where b represents the alternative for the worker if he or she cannot come to an agreement with the firm.



b
z
Total Surplus
b
w
z
Worker Surplus
Firm Surplus
a
1 − a
b
w
z
Worker Surplus
Firm Surplus

Matching Function

- The function m has properties that are very similar to the function F described in the context of production.

1. The function m has constant returns to scale. Recall that this means that

$$\mathrm{em}(x\mathcal{Q}, \mathrm{x}\, A) = \mathrm{xem}(\mathcal{Q}, A) \tag{1}$$

   for any $x > 0$.
   For the matching function, constant returns to scale implies that a large economy is no more efficient at producing matches between workers and firms than a small economy, and vice versa.
2. If there are no consumers searching for work or no firms searching for workers, then there are no matches, or $m(0, A) = m(Q, 0) = 0$.
3. The number of matches M increases when either $\mathcal{Q}$ or A increases.
4. Marginal products are diminishing, in that the increase in matches obtained for a one-unit increase in $\mathcal{Q}$ decreases as $\mathcal{Q}$ increases, and similarly for A.

Equilibrium

- Once we have determined j and Q, we can work backward to determine all other variables of interest.
- First, the number of consumers who do not search for work is $N - Q$, and these are the people who would be counted as not in the labor force.
- Second, since Q is the number of people in the labor force, the unemployment rate is

$$u = \frac{Q\,(1 - p_c)}{Q} = 1 - em(1, j), \tag{2}$$

  using Equation-**??**.
- Similarly, the vacancy rate is the number of vacancies that go unfilled, relative to the number of jobs that were originally posted, so the vacancy rate is

$$v = \frac{A\left(1 - p_f\right)}{A} = 1 - em\left(\frac{1}{j}, 1\right) \tag{3}$$

- Finally, the quantity of aggregate output in this economy is $Y = Mz$, which is the number of matches multiplied by the output produced in each match.
- From Equation- $M = em(Q, A)$, and using the constant-returns-to-scale property of the matching function, we can express aggregate output as

$$Y = em(Q, A)z = Qem(1, j)z. \tag{4}$$

- In Equation-4, aggregate output is then increasing in Q and increasing in j.
- Thus, if there is a larger labor force or a tighter labor market, aggregate output will be higher.

[**Two-Sided Search**]. Consider the two-sided search model discussed in the lecture.

(a) Derive the expression for the equilibrium wage. Based on this expression, explain intuitively which exogenous events would, according to this model, lead to a higher wage.

(b) Derive two equilibrium conditions where Q and j are the only endogenous variables appearing in them, and represent them graphically.

(c) Consider the parameter e in the matching function. Provide one example of a real-world event that would lead to an increase in e, and one of an event that would lead to a decrease in e.

(d) Suppose that e decreases. Illustrate graphically and intuitively the effect of this shock on Q and j.

(e) What are the effects of this shock on the unemployment rate, vacancies and output?

2a

Derive the expression for the equilibrium wage. Based on this expression, explain intuitively which exogenous events would, according to this model, lead to a higher wage.

- When a consumer and a firm meet, they need to negotiate a wage
- The model assumes this bargaining happens according to the Nash bargaining theory, proposed by John Nash
- Key idea: the outcome of the negotiation depends on the bargaining power and on the alternative faced by the two parts
- *Surplus* = what each part gains from an agreement (compared to no agreement)
- Worker's surplus = $w - b$ // Firm's surplus = $z - w$
- Total surplus = $(w - b) + (z - w) = z - b$
- The Nash bargaining theory postulates that each part receives a fraction of the total surplus
- Let a be the share of the total surplus received by the worker, i.e. the worker's *bargaining power* (with $1 - a$ being the firm's bargaining power)

$$w - b = a(z - b)$$

- Then, the bargained wage will be $w = az + (1 - a)b$

2b

Derive two equilibrium conditions where Q and j are the only endogenous variables appearing in them, and represent them graphically.

For a consumer, the probability of finding a job is

$$p_c = \frac{M}{Q} = \frac{em(Q,A)}{Q} = em(1, \frac{A}{Q}) = em(1,j) \tag{5}$$

where $j = A/Q$ is the so-called labour market tightness

- For the third equality above, we used the fact that $m(Q,A)$ has constant returns to scale
- In equilibrium, the expected payoff from searching is

$$P(Q) = p_c w + (1-p_c)b = b + em(1,j)(w-b) \tag{6}$$

where w is the wage

- For a firm, the probability of filling a vacancy is

$$p_f = \frac{M}{A} = \frac{em(Q,A)}{A} = em\left(\frac{Q}{A},1\right) = em\left(\frac{1}{j},1\right) \tag{7}$$

where again we used the fact that $m(Q,A)$ has constant returns to scale

We assume free entry $\rightarrow$ firms will post vacancies until the expected payoff from doing so is 0,

$$p_f(z-w-k)-(1-p_f)k=0 \tag{8}$$

Substituting the expression for p_f and re-arranging

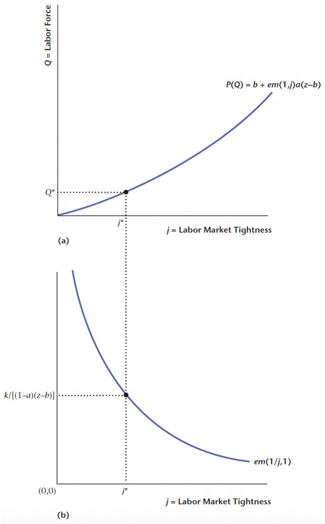
$$em(\frac{1}{j},1)=\frac{k}{z-w} \tag{9}$$

The wage equation can be plugged in the two equilibrium conditions:

$$P(Q)=b+em(1,j)a(z-b) \tag{10}$$

$$em(\frac{1}{j},1)=\frac{k}{(1-a)(z-b)} \tag{11}$$

These are two equations in two unknowns (Q and j). See Figure



Two-Sided Search Model

2c

Consider the parameter e in the matching function. Provide one example of a real-world event that would lead to an increase in e, and one of an event that would lead to a decrease in e.

Examples of events leading to an increase in e:

- new technologies (e.g. online job boards) facilitating matching
- increase in workers' geographical mobility

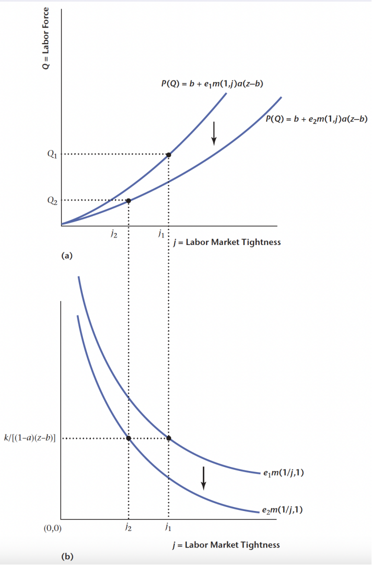
Examples of events leading to a decrease in e:

- sectoral shifts leading to mismatch between workers' skills and required tasks
- decrease in workers' geographical mobility

2d

Suppose that e decreases. Illustrate graphically and intuitively the effect of this shock on Q and j.

- See Figure
- Intuitively, when e decreases firm anticpate that it will be harder to fill a vacancy, and therefore open less vacancies (j decreases).
- Workers anticipate that it will be harder to find a job, and less of them look for one (Q decreases).



2e

What are the effects of this shock on the unemployment rate, vacancies and output?

- The unemployment rate is $1 - em(1, j)$. It increases since both e and j decrease.
- The number of vacancies A decreases, since both $j = \frac{A}{Q}$ and Q decrease.
- Output is given by $Y = Qem(1, j)z$. It decreases since e, Q and j all decrease.

Summary

- A decrease in matching efficiency reduces labor market tightness and the size of the labor force.
- The unemployment rate increases, the vacancy rate does not change, and aggregate output falls.
- Changes in matching efficiency are a potential explanation for the recent behavior of unemployment and vacancies in the United States.

Eqm equations:

$$\begin{cases} P(Q) = b + em(1,j)(w-b) = b + em(1,j)a(z-b) \\ em\left(\frac{1}{j},1\right) = \frac{k}{z-w} = \frac{k}{(1-a)(z-b)} \end{cases}$$

Outcomes of interest:

$$u = 1 - p_c = 1 - em(1,j)$$

$$v = 1 - p_f = 1 - em\left(\frac{1}{j},1\right)$$

$$Y = Q \cdot z \cdot e \cdot m(1,j)$$