14 Unemployment

Why unemployment?

- So far we have studied models where labor market clears.

- Is that a good assumption?

- Why is unemployment important?
  1. Reduces income
  2. Increases inequality.

- How can we think about unemployment in an equilibrium model?
Concepts and Facts from the Labor Market

- The labor force is the number of people, 16 or older, that are either employed or unemployed but actively looking for a job. We denote the labor force at time \( t \) by \( P_t \).

- Note that actively looking for a job is an ambiguous term.

- Let \( WP_t \) denote the total number of people in the economy that are of working age (16 - 65) at date \( t \). The labor force participation rate \( f_t \) is defined as the fraction of the population in working age that is in the labor force, i.e. \( f_t = \frac{P_t}{WP_t} \).
• The number of unemployed people are all people that don't have a job. We denote this number by $U_t$. Similarly we denote the total number of people with a job by $N_t$. Obviously $P_t = N_t + U_t$. We define the unemployment rate $u_t$ by

$$u_t = \frac{U_t}{P_t} = \frac{U_t}{N_t + U_t}$$

• The job losing rate $s_t$ is the fraction of the people with a job which is laid off during a particular time, period, say one month (it is crucial for this definition to state the time horizon).

• The job finding rate $e_t$ is the fraction of unemployed people in a month that find a new job.
Basic Facts

- U.S. Labor Force in Feb 2002: 142 million people

- U.S. working age population in 1994: 212 million people

- Labor force participation rate of about 67.0%.

- Between 1967 and 1993 the average job losing rate was 2.7% per month

- Average job finding rate was 43%.

- Average unemployment rate during this time period was about 6.2%
Job Creation and Destruction

- The gross job creation $Cr_t$ between period $t - 1$ and $t$ equals the employment gain summed over all plants that expand or start up between period $t - 1$ and $t$.

- The gross job destruction $Dr_t$ between period $t - 1$ and $t$ equals the employment loss summed over all plants that contract or shut down between period $t - 1$ and $t$.

- The net job creation $Nc_t$ between period $t - 1$ and $t$ equals $Cr_t - Dr_t$.

- The gross job reallocation $Ra_t$ between period $t - 1$ and $t$ equals $Cr_t + Dr_t$. 
Main Findings of Davis, Haltiwanger and Schuh (1996)

- Data from all manufacturing plants in the US with 5 or more employees from 1963 to 1987. In the years they have data available, there were between 300,000 and 400,000 plants.

- Gross job creation $Cr_t$ and job destruction $Dr_t$ are remarkably large. In a typical year 1 out of every ten jobs in manufacturing is destroyed and a comparable number of jobs is created at different plants.

- Most of the job creation and destruction reflects highly persistent plant-level employment changes. Most jobs that vanish at a particular plant fail to reopen at the same location within the next two years.
• Job creation and destruction are concentrated at plants that experience large percentage employment changes. Two-thirds of job creation and destruction takes place at plants that expand or contract by 25% or more within a twelve-month period. About one quarter of job destruction takes place at plants that shut down.

• Job destruction exhibits greater cyclical variation than job creation. In particular, recessions are characterized by a sharp increase in job destruction accompanied by a mild slowdown in job creation.
Unemployment and the Business Cycle

- Gross job creation is relatively stable over the business cycle, whereas gross job destruction moves strongly countercyclically: it is high in recessions and low in booms.

- In severe recessions such as the 74-75 recession or the 80-82 back to back recessions up to 25% of all manufacturing jobs are destroyed within one year, whereas in booms the number is below 5%.

- Time a worker spends being unemployed also varies over the business cycle, with unemployment spells being longer on average in recession years than in years before a recession.
• Length of unemployment spells:

<table>
<thead>
<tr>
<th>Unemployment Spell</th>
<th>1989</th>
<th>1992</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5 weeks</td>
<td>49%</td>
<td>35%</td>
</tr>
<tr>
<td>5 - 14 weeks</td>
<td>30%</td>
<td>29%</td>
</tr>
<tr>
<td>15 - 26 weeks</td>
<td>11%</td>
<td>15%</td>
</tr>
<tr>
<td>&gt; 26 weeks</td>
<td>10%</td>
<td>21%</td>
</tr>
</tbody>
</table>

• Other countries: in Germany, France or the Netherlands about two thirds of all unemployed workers in 1989 were unemployed for longer than six months!!
The Evolution of the Unemployment Rate

- \( U_t \) = Number of unemployed at \( t \)
- \( P_t \) = Labor Force in \( t \)
- \( N_t = P_t - U_t \) = Number of employed in \( t \)
- \( u_t = \frac{U_t}{P_t} \) = unemployment rate
- \( s \) = job losing rate
- \( e \) = job finding rate
- Assume that \( P_t = (1 + n)P_{t-1} \)
Then we have

\[ U_t = (1 - e)U_{t-1} + sN_{t-1} + (P_t - P_{t-1}) \]

\[ = (1 - e)U_{t-1} + s(P_{t-1} - U_{t-1}) + (P_t - P_{t-1}) \]

Dividing both sides by \( P_t = (1 + n)P_{t-1} \) yields

\[ u_t = \frac{U_t}{P_t} = \frac{(1 - e)U_{t-1}}{(1 + n)P_{t-1}} + \frac{s(P_{t-1} - U_{t-1}) + (P_t - P_{t-1})}{(1 + n)P_{t-1}} \]

\[ = \frac{1 - e - s}{1 + n}u_{t-1} + \frac{s + n}{1 + n} \]
Steady State Rate of Unemployment

- In theory: steady state unemployment rate, absent changes in \( n, s, e \)

- Some people call it “Natural Rate”:

- Solve for \( u^* = u_{t-1} = u_t \)

\[
\begin{align*}
  u^* &= \frac{1 - e - s}{1 + n} u^* + \frac{s + n}{1 + n} \\
  \frac{n + e + s}{1 + n} u^* &= \frac{s + n}{1 + n} \\
  u^* &= \frac{s + n}{n + e + s}
\end{align*}
\]

- From data \( s = 2.7\%, e = 43\%, n = 0.09\% \).
Determinants of the Rate of Unemployment

- We just presented an accounting exercise.

- There was no theory on it.

- We want to have a model to think about the different elements of the model \((b, e, \text{ etc.})\).

- There are several Models of Unemployment. We will look at one: SEARCH MODEL. Matching is costly (think about getting a date). We can bring our intuition to the job market.
A Basic Search Model

- Two period model. In the second period an employed worker gets whatever its wage is $w$.

- In the second period, with probability $p$ an unemployed worker gets a job offer. If she does not get it she gets $b$ (includes the value of leisure and unemployment insurance).

- If she gets a job offer, she draws a wage from a distribution characterized by function $H$, where $H(\hat{w})$ is the probability that the wage offer obtained is higher or equal than $\hat{w}$. 
• Note that she takes the job in the second period if and only if the wage obtained is higher than $b$.

• While an employed worker starts the second period knowing that she will get $w$ that was the job she accepted in the first period. The unemployed worker’s expected utility is given by

$$U_u = (1 - p) b + p [1 - H(b)]b + p \int_{b}^{\infty} w H(dw)$$

the first term recognizes that she may not get an offer and has to settle for $b$, in the second term she may get a job offer too bad to accept (so she gets $b$), and the third term is the expected wage conditional on being good enough to take it.
We can rewrite this expression as

$$ U_u = b \left[ (1 - p) + p \left( 1 - H(b) \right) \right] + p \ H(b) \ E[w | w \geq b] $$

- What to do in the first period?

- A person that does not get an offer obtains

  $$ b + \beta U_u $$

- A person that rejects an offer gets

  $$ b + \beta U_u $$

- A person that accepts an offer $w$ gets

  $$ w + \beta w $$
- The worker will accept an offer the first period, when

\[ w + \beta w \geq b + \beta U_u \]

\[ w + \beta w \geq b + \beta \{b \left[(1 - p) + p (1 - H(b))\right] + p \ H(b) \ E[w|w \geq b]\} \]

where \( w^* \) that makes her indifferent \( w^* + \beta w^* = b + \beta U_u \).
To compare $w^*$ and $b$, note that $E[w|w \geq b] > b$.

$$b < \{b [(1 - p) + p (1 - H(b))] + p \ H(b) \ E[w|w \geq b]\}$$

$$b + \beta b < b + \beta\{b [(1 - p) + p (1 - H(b))]$$

$$+ p \ H(b) \ E[w|w \geq b]\} = w^* + \beta w^*$$

And then that $w^* > b$. So the option of a new draw makes workers more picky in the first period than in the second and then makes employment lower in the first period.
What does affect unemployment?

• $p$

• Unemployment insurance, $b$.

• Minimum wage. It is illegal to have $w < \bar{w}$. If $b < \bar{w}$ then minimum wage is binding.