Chapter 7: Unemployment
Natural rate of unemployment

- **Natural rate of unemployment**: The average rate of unemployment around which the economy fluctuates.

- In a recession, the actual unemployment rate rises above the natural rate.

- In a boom, the actual unemployment rate falls below the natural rate.
Actual and natural rates of unemployment, U.S., 1960-2010

Percent of labor force

Unemployment rate

Natural rate of unemployment
Actual and natural rates of unemployment, Turkey, 1960-2010
A first model of the natural rate

Notation:

\( L \) = # of workers in labor force

\( E \) = # of employed workers

\( U \) = # of unemployed

\( U/L \) = unemployment rate
Assumptions:

1. \( L \) is exogenously fixed.

2. During any given month,

\[ s = \text{rate of job separations}, \]
the fraction of employed workers
that become separated from their jobs

\[ f = \text{rate of job finding}, \]
fraction of unemployed workers
that find jobs

\( s \) and \( f \) are exogenous
The transitions between employment and unemployment

Employed \[ s \times E \]

Unemployed \[ f \times U \]
The steady state condition

- **Definition:** The labor market is in **steady state**, or long-run equilibrium, if the unemployment rate is constant.

- The steady-state condition is:

\[ s \times E = f \times U \]

- # of employed people who lose or leave their jobs
- # of unemployed people who find jobs
Finding the “equilibrium” $U$ rate

$$f \times U = s \times E$$

$$= s \times (L - U)$$

$$= s \times L - s \times U$$

Solve for $\frac{U}{L}$:

$$(f + s) \times U = s \times L$$

so,

$$\frac{U}{L} = \frac{s}{s + f}$$
Example:

- Each month,
  - 1% of employed workers lose their jobs ($s = 0.01$)
  - 19% of unemployed workers find jobs ($f = 0.19$)
- Find the natural rate of unemployment:

$$\frac{U}{L} = \frac{s}{s + f} = \frac{0.01}{0.01 + 0.19} = 0.05, \text{ or } 5\%$$
Policy implication

- A policy will reduce the natural rate of unemployment only if it lowers $s$ or increases $f$. 
Why is there unemployment?

- If job finding were instantaneous \((f = 1)\), then all spells of unemployment would be brief, and the natural rate would be near zero.

- There are two reasons why \(f < 1\):  
  1. job search  
  2. wage rigidity
Job search & frictional unemployment

- **frictional unemployment**: caused by the time it takes workers to search for a job

- occurs even when wages are flexible and there are enough jobs to go around

- occurs because
  - workers have different abilities, preferences
  - jobs have different skill requirements
  - geographic mobility of workers not instantaneous
  - flow of information about vacancies and job candidates is imperfect
Sectoral shifts

- **def:** Changes in the composition of demand among industries or regions.

- **example:** *Technological change*
  more jobs repairing computers, fewer jobs repairing typewriters

- **example:** *A new international trade agreement*
  labor demand increases in export sectors, decreases in import-competing sectors

- These scenarios result in frictional unemployment
CASE STUDY: Structural change over the long run

1960

- Agriculture: 57.9%
- Manufacturing: 9.9%
- Other industry: 4.2%
- Services: 28.0%

2006

- Agriculture: 76.5%
- Manufacturing: 13.9%
- Other industry: 8.5%
- Services: 1.1%

Lecture Notes
Public policy and job search

Govt programs affecting unemployment include:

- **Govt employment agencies**
  disseminate info about job openings to better match workers & jobs.

- **Public job training programs**
  help workers displaced from declining industries get skills needed for jobs in growing industries.
Unemployment insurance (UI)

- UI pays part of a worker’s former wages for a limited time after losing his/her job.
- UI increases search unemployment, because it reduces
  - the opportunity cost of being unemployed
  - the urgency of finding work
  - $f$
- Studies: The longer a worker is eligible for UI, the longer the duration of the average spell of unemployment.
Benefits of UI

- By allowing workers more time to search, UI may lead to better matches between jobs and workers, which would lead to greater productivity and higher incomes.
Why is there unemployment?

The natural rate of unemployment: \[ \frac{U}{L} = \frac{s}{s + f} \]

- Two reasons why \( f < 1 \):
  - 1. job search
  - 2. wage rigidity
Unemployment from real wage rigidity

If real wage is stuck above its eq’m level, then there aren’t enough jobs to go around.
Unemployment from real wage rigidity

If real wage is stuck above its eq’m level, then there aren’t enough jobs to go around.

Then, firms must ration the scarce jobs among workers.

**Structural unemployment:** The unemployment resulting from real wage rigidity and job rationing.
Reasons for wage rigidity

1. Minimum wage laws
2. Labor unions
3. Efficiency wages
I. The minimum wage

- The min. wage may exceed the eq’m wage of unskilled workers, especially teenagers.
- Studies: a 10% increase in min. wage reduces teen employment by 1-3%
- But, the min. wage cannot explain the majority of the natural rate of unemployment, as most workers’ wages are well above the min. wage.
2. Labor unions

- Unions exercise monopoly power to secure higher wages for their members.

- When the union wage exceeds the eq’m wage, unemployment results.

- **Insiders**: Employed union workers whose interest is to keep wages high.

- **Outsiders**: Unemployed non-union workers who prefer eq’m wages, so there would be enough jobs for them.
### Union membership and wage ratios by industry, 2008

<table>
<thead>
<tr>
<th>Industry</th>
<th># employed (1000s)</th>
<th>U % of total</th>
<th>Wage ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private sector (total)</td>
<td>108,073</td>
<td>7.6%</td>
<td>123.2</td>
</tr>
<tr>
<td>Government (total)</td>
<td>21,305</td>
<td>36.8</td>
<td>120.5</td>
</tr>
<tr>
<td>Construction</td>
<td>7,652</td>
<td>15.6</td>
<td>151.8</td>
</tr>
<tr>
<td>Mining</td>
<td>776</td>
<td>6.9</td>
<td>102.1</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>15,131</td>
<td>11.4</td>
<td>108.6</td>
</tr>
<tr>
<td>Retail trade</td>
<td>14,987</td>
<td>5.2</td>
<td>106.6</td>
</tr>
<tr>
<td>Transportation</td>
<td>4,639</td>
<td>21.3</td>
<td>126.3</td>
</tr>
<tr>
<td>Finance, insurance</td>
<td>6,536</td>
<td>1.3</td>
<td>88.7</td>
</tr>
<tr>
<td>Professional services</td>
<td>11,967</td>
<td>2.1</td>
<td>97.4</td>
</tr>
<tr>
<td>Education</td>
<td>3,657</td>
<td>13.8</td>
<td>117.1</td>
</tr>
<tr>
<td>Health care</td>
<td>15,184</td>
<td>8.0</td>
<td>116.0</td>
</tr>
</tbody>
</table>

**Lecture Notes**

\[ \text{wage ratio} = 100 \times \frac{\text{union wage}}{\text{nonunion wage}} \]
3. Efficiency wage theory

- Theories in which higher wages increase worker productivity by:
  - attracting higher quality job applicants
  - increasing worker effort, reducing “shirking”
  - reducing turnover, which is costly to firms
  - improving health of workers
    *(in developing countries)*

- Firms willingly pay above-equilibrium wages to raise productivity.

- Result: structural unemployment.
Efficiency wages: Shapiro-Stiglitz Model

- One representative firm, many workers
- Each day workers decide on: work or shirk
- Firm cannot perfectly monitor workers’ effort
- Either way, payment is $W$
- The cost of working is $E$. Hence:
  - Worker’s payoff is $(W - E)$ if s/he works
  - Worker’s payoff is $(W)$ if s/he shirks
Efficiency wages: Shapiro-Stiglitz Model

- Suppose that the technology of the firm is such that

\[ W^m > E \]

\( W^m \): Market-clearing wage

![Graph showing Efficiency wages with market-clearing wage](image)
Efficiency wages: Shapiro-Stiglitz Model

- On a given day there is some given probability $p$ that a worker is separated for his job (e.g. retirement)
- If the worker shirks there is an extra probability $q$ for job separation (i.e. worker is fired)

Worker’s reasoning:
- Given the wage rate $W$, what is the value of my job to me if I work vs. if I shirk?
- If the probability of separation is $p$, then I expect to work
  - $1/p$ days (no shirking)
  - $1/(p+q)$ days (shirking)
Efficiency wages: Shapiro-Stiglitz Model

Then the worker compares the following:

- **Value of actually working:**
  \[ V^w = \frac{1}{p} \times (W - E) = \frac{W - E}{p} \]

- **Value of shirking:**
  \[ V^s = \frac{1}{p+q} \times W = \frac{W}{p+q} \]

- Implicit assumption: once a worker is fired, he/she does not find a job again
Efficiency wages: Shapiro-Stiglitz Model

- Since the firm can figure all this out, the firm wants to make sure

\[ V^w \geq V^s \]

“No – Shirking Condition” (NSC)

- Solve \((W - E)/p \geq W/(p+q)\) for \(W\):

\[ W \geq [(p + q)/q]E = E + (p/q)E \]

*Firm would pay the minimum: \(W^* = E + (p/q)E\)*
Efficiency wages: Shapiro-Stiglitz Model

- Efficiency wage level $W^*$ is $W^* > E$
  - Note: If $W^* \leq W^m$ then (no implication for unemployment)

- As $p$ increases or $q$ decreases (e.g. because the firm is unable to monitor), efficiency wage and unemployment increase

<table>
<thead>
<tr>
<th># of weeks unemployed</th>
<th># of unemployed persons in group (% of all unemployed persons)</th>
<th>time spent unemployed by this group (% of time spent unemployed by all groups)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>42%</td>
<td>8.1%</td>
</tr>
<tr>
<td>5-14</td>
<td>30%</td>
<td>21.5%</td>
</tr>
<tr>
<td>15 or more</td>
<td>27%</td>
<td>70.4%</td>
</tr>
</tbody>
</table>
The duration of unemployment

- The data:
  - More spells of unemployment are short-term than medium-term or long-term.
  - Yet, most of the total time spent unemployed is attributable to the long-term unemployed.

- This long-term unemployment is probably structural and/or due to sectoral shifts among vastly different industries.

- Knowing this is important because it can help us craft policies that are more likely to work.
TREND: The natural rate rises over 1960-84, then falls over 1985-2005
EXPLAINING THE TREND:
The minimum wage

The real minimum wage and natural u-rate have similar trends.
**EXPLAINING THE TREND: Union membership**

<table>
<thead>
<tr>
<th>Union membership</th>
<th>selected years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>year</strong></td>
<td><strong>percent of labor force</strong></td>
</tr>
<tr>
<td>1930</td>
<td>12%</td>
</tr>
<tr>
<td>1945</td>
<td>35%</td>
</tr>
<tr>
<td>1954</td>
<td>35%</td>
</tr>
<tr>
<td>1970</td>
<td>27%</td>
</tr>
<tr>
<td>1983</td>
<td>20.1%</td>
</tr>
<tr>
<td>2008</td>
<td>12.3%</td>
</tr>
</tbody>
</table>

Since early 1980s, the natural rate and union membership have both fallen.

But, from 1950s to about 1980, the natural rate rose while union membership fell.
Unemployment in Europe, 1960-2009

The graph below illustrates the unemployment rates of France, Germany, Italy, and the United Kingdom from 1960 to 2009. The x-axis represents the years from 1970 to 2010, while the y-axis shows the percent of labor force unemployed. The graph uses different colors to distinguish the countries, with France represented in red, Germany in yellow, Italy in green, and the United Kingdom in blue. The data shows variations in unemployment rates across different countries and years.
Why unemployment rose in Europe but not the U.S.

Shock  
Technological progress has shifted labor demand from unskilled to skilled workers in recent decades.

Effect in United States  
An increase in the “skill premium” – the wage gap between skilled and unskilled workers.

Effect in Europe  
Higher unemployment, due to generous govt benefits for unemployed workers and strong union presence.
Percent of workers covered by collective bargaining, selected countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Percent</th>
</tr>
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<tbody>
<tr>
<td>United States</td>
<td>18%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>47</td>
</tr>
<tr>
<td>Switzerland</td>
<td>53</td>
</tr>
<tr>
<td>Spain</td>
<td>68</td>
</tr>
<tr>
<td>Sweden</td>
<td>83</td>
</tr>
<tr>
<td>Germany</td>
<td>90</td>
</tr>
<tr>
<td>France</td>
<td>92</td>
</tr>
<tr>
<td>Austria</td>
<td>98</td>
</tr>
</tbody>
</table>
Chapter Summary

1. The natural rate of unemployment
   - definition: the long-run average or “steady state” rate of unemployment
   - depends on the rates of job separation and job finding

2. Frictional unemployment
   - due to the time it takes to match workers with jobs
   - may be increased by unemployment insurance
3. Structural unemployment

- results from wage rigidity: the real wage remains above the equilibrium level
- caused by: minimum wage, unions, efficiency wages
4. Behavior of the natural rate in the U.S.
   - rose from 1960 to early 1980s, then fell
   - possible explanations:
     trends in real minimum wage,
     union membership, prevalence of sectoral shifts
5. European unemployment
   - has risen sharply since 1970
   - probably due to generous unemployment benefits, strong union presence, and a technology-driven shift in demand away from unskilled workers