Lecture: Labour markets and unemployment

Macroeconomic II
Winter 2020/2021 - SGH

Jacek Suda
Labour market, employment, and unemployment

- In the growth model we implicitly assumed that number of workers = number of people
  - it doesn’t have to be like that

- In the labour market households, who supply hours of labour, meet firms, who demand hours of labour for production

- Unemployment arises when individuals seeking paid work do not find it

- Formally:
  - Unemployment rate = number of unemployed workers divided by the labour force
  - labour force = individuals working + individuals actively looking for a job

- Employment and unemployment are important for economic growth, business cycles and welfare
  - Labour is an important factor of production
  - Unemployment is highly countercyclical
Registered unemployment rate in Poland (1990-2017)

Red line: unemployment rate (%)  Black line: unemployment rate (s.a.%)

Source: GUS

Lecture: Labour markets
Unemployment rate in the US

Unemployment rate in the USA, 1900-2000

![Unemployment rate graph](image)

Source: Mankiw, Macroeconomics, (2001)

1. Introduction

Source: Mankiw (2011)

Lecture: Labour markets
Labour supply - Microfoundation

- To consume goods and services, individuals need income
  earned through paid work

- Consumption-leisure trade off
  - households value both consumption and leisure
  - working implies giving up free time (leisure)

- Households preferences regarding consumption (of goods and services) and leisure can be represented with indifference curves
  - it presents a combination of consumption and leisure yielding the same utility
  - the rate at which a household is willing to give up consumption for leisure is called marginal rate of substitution of consumption for leisure
Household preferences
Indifference curve

Houshold Preferences:
A Household Indifference Curve

More leisure = less work

Gain

Pain

Utility held constant
Household Preferences: Economic Interpretation

- **Slope**: $(< 0)$ Substitution of leisure for consumption

- **Curve**: Marginal rate of substitution is not constant
  The less leisure you have, the less leisure you are willing to sacrifice for one more unit of consumption (holding utility constant)

- **Shift**: Level of economic welfare (utility)
Indifference curve

Household Preferences

Higher utility

Lower utility

Fig. 4.1 (c) Leisure

Lecture: Labour markets
Household choice

- Households choose the highest attainable indifference curve
- **Budget constraint** determines what household can afford

\[
\bar{l}w = lw + C
\]
\[
(\bar{l}W = lW + PC)
\]

- \(\bar{l}\) - total possible work time (40h or 168h a week)
- \(C\) - spending on consumption
- \(w = W/P\) - **real wage** = nominal wage (\(W\))/price index (\(P\))

or

\[
(\bar{l} - l) w = C
\]

- Real wage is a **relative price** of leisure in terms of consumption
- At optimum indifference curve is tangent to the budget line
Budget Line and Choice: the Household Budget
(Zero Non-Labour Income)

\[ \ell \cdot w = \ell \cdot w + C \]

- \( \ell \cdot w \): earnings if we work all day
- We "buy back" our leisure time
- We rest on goods
- \( (\ell - \ell) \cdot w = C \): actual earnings

slope = \(-w\)

Fig. 4.2 (a)

Leisure
Budget Line and Choice: Tangency Condition

Highest attainable indifference curve is tangent to this budget constraint for those who work.

Nice but we can’t afford it!

We can do better than this!

Consumption

Leisure
Budget Line and Choice: Optimal Choice

\[ \text{consumption} = -w \text{slope} \]

Lecture: Labour markets
The effect of change of $w$ on individual supply of labour is ambiguous

- **substitution effect** $\Rightarrow$ more work (higher supply)
  - wage increase makes leisure less attractive, induces more work and more consumption
- **income effect** $\Rightarrow$ less work (lower supply)
  - higher wage increases income leading to increase in consumption (of goods) and (of) leisure

If the substitution effect dominates, an increase in wages leads to increase in working hours and (as a result) to upward-sloping*

*household labour supply
  - the slope of labour supply curve can change
Optimal choice

- Assumptions about household reaction

\[ w \uparrow \Rightarrow C \uparrow \text{ and } (\bar{l} - l) \uparrow \]

- both consumption and leisure are normal goods
- substitution effect for labour supply is greater than the income effect
Aggregate labour supply is the sum of individual decisions and individual labour supplies.

It is measured in person-hours i.e. total number of hours supplied by all workers in the economy during the same period.

If $w$ increases, even if working individuals may not increase their labour supply (strong income effect), some who had preferred not to work before may join the labour force.

Aggregate labour supply is upward-sloping and flatter than individual (household/worker) level labour supply curve.
Individual and Aggregate Labour Supply

The graph shows the relationship between real wage and labour, with two curves: one for individual labour supply and another for aggregate labour supply. As the real wage increases, both curves indicate an increase in the amount of labour supplied.
### Annual Total Hours Worked and Average Wages, 1870–2014

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>2945</td>
<td>2588</td>
<td>1848</td>
<td>1771</td>
<td>1542</td>
<td>1517</td>
<td>1473</td>
</tr>
<tr>
<td>Germany</td>
<td>2941</td>
<td>2584</td>
<td>2316</td>
<td>1804</td>
<td>1563</td>
<td>1469</td>
<td>1371</td>
</tr>
<tr>
<td>UK</td>
<td>2984</td>
<td>2624</td>
<td>2267</td>
<td>1688</td>
<td>1491</td>
<td>1491</td>
<td>1677</td>
</tr>
<tr>
<td>USA</td>
<td>2964</td>
<td>2605</td>
<td>2062</td>
<td>1717</td>
<td>1589</td>
<td>1660</td>
<td>1789</td>
</tr>
<tr>
<td>Sweden</td>
<td>2945</td>
<td>2588</td>
<td>2204</td>
<td>1571</td>
<td>1515</td>
<td>1588</td>
<td>1609</td>
</tr>
</tbody>
</table>

### Real wage (index: 1870 = 100)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>100</td>
<td>205</td>
<td>335</td>
<td>1048</td>
<td>1417</td>
<td>1434</td>
<td>1668</td>
</tr>
<tr>
<td>Germany</td>
<td>100</td>
<td>185</td>
<td>285</td>
<td>944</td>
<td>1178</td>
<td>1222</td>
<td>1318</td>
</tr>
<tr>
<td>UK</td>
<td>100</td>
<td>157</td>
<td>256</td>
<td>439</td>
<td>640</td>
<td>733</td>
<td>790</td>
</tr>
<tr>
<td>USA</td>
<td>100</td>
<td>189</td>
<td>325</td>
<td>596</td>
<td>659</td>
<td>737</td>
<td>826</td>
</tr>
<tr>
<td>Sweden</td>
<td>100</td>
<td>270</td>
<td>521</td>
<td>1228</td>
<td>1493</td>
<td>1727</td>
<td>2135</td>
</tr>
</tbody>
</table>

Source: see text, p. 96
Labour Demand

- Firms use capital and labour to produce goods and services
- Firms maximize profits by setting labour

\[ \Pi = PF(K, L) - WL \]

- assuming that capital stock is constant in the short-run

- Firm continues higher workers until

\[ PF_L(K, L) = W \iff F_L = \frac{W}{P} = w \]

- \( F_L(K, L) = MPL \), czyli marginal productivity of labour = real wage
- MPL is a slope of production function (wrt to labour)

- Schedule of points \((w, L)\) consistent with the firm’s optimal behaviour
  - firm is labour demand curve
The Production Function and the Labour Demand Curve: Wage $W_1$

The firm has a production function and pays the real wage $w_1$.
The Production Function and the Labour Demand Curve: Wage Costs

Wage costs increase with employment

Output (Y)

Real wage

Labour

$R_1$ (slope = $w_1$)
Labour Demand

The Production Function and the Labour Demand Curve: Labour Demand $L_1$

Determine $L_1$ so that $MPL_1 = w_1$

Lecture: Labour markets
The Production Function and the Labour Demand Curve: Lower Wage $W_2$

Now determine $L$ for a lower wage $w_2$
The Production Function and the Labour Demand Curve: Labour Demand $L_2$

Find $L_2$ so that $MPL_2=w_2$
The Production Function and the Labour Demand Curve

Connect the dots to derive the demand for labour
The Production Function and the Labour Demand Curve: Interpretation of the Geometry

- **Slope.** Negative because $MPL$ falls as we move to the right along the production function.

- **Curve.** Here there is no reason to expect curvature one way or the other. Note that an absolutely linear demand for labour implies a quadratic form of the production function.

- **Shift.** Capital accumulation or productivity change. (Figure 4.6)
Shift in Labour Demand

- If wage \((w)\) changes firm’s demand for labour changes as well

- Firm always chooses employment level \(L\) such that \(MPL = w\)
  - Demand for labour is a diminishing marginal productivity of labour

- The demand for labour curve is drawn for a \textit{given} labour productivity (or capital level)

- Changes in the capital stock \((K)\) and technology \((A)\) have an effect on MPL and change the labour demand
  - an increase in capital stock of total factor productivity \(\Rightarrow\) increase in MPL
    \(\Rightarrow\) labour demand curve shifts out (up)
  - a decrease of labour productivity \(\Rightarrow\) fall in MPL \(\Rightarrow\) labour demand curve shifts down
An Increase in Labour Productivity: Shift in Labour Demand

Output ($Y$)

Real wage

Lecture: Labour markets
Equilibrium in the Labour Market

- In the equilibrium labour supply equals labour demand
  - at wage $w$ the demand for labour matches with the labour offered

- Both real wage and employment/hours are determined endogenously in the labour market

- Equilibrium is given by the intersection of labour supply curve with labour demand curve
Equilibrium in the Labour Market: Supply

Equilibrium in the Labour Market: Supply

Real wage

Supply

Labour hours

0

consumption

leisure

Fig. 4.7 (a)
Equilibrium in the Labour Market: Supply

Equilibrium in the Labour Market: Demand

Graph:
- **Real wage** vs. **Labour hours**
- **Demand** curve

Figure 4.7 (b)

Lecture: Labour markets
Equilibrium in the Labour Market

If \( N \) is working age population, total labour endowment is given by \( N \ell \).

Equilibrium in the Labour Market

Real wage

\( w \)

Labour hours

\( 0 \)

\( L \)

\( N \ell \)

Supply

Demand

\( A \)
Shifting Labour Demand

**MPL** increases because of increase in $A$ or $K$

$w$ and $L$ increase

**Diagram:**
- **Supply**
- **Demand**
- **Labour hours**
- **Real wage**

Equilibrium in the Labour Market: Shifting Labour Demand

Lecture: Labour markets
Shifting Labour Supply

- Labour supply increases e.g. through immigrants
- \( w \) falls, \( L \) rises
Voluntary unemployment

- In the equilibrium considered so far, supply = demand: anyone who wants to work can work.
  - We only observe voluntary unemployment that reflects the decision of individuals to enjoy ‘leisure’ and not to work.

Equilibrium in the Labour Market: Voluntary Unemployment

Voluntary Unemployment: \( N \bar{\ell} - L \)

Lecture: Labour markets
Involuntary unemployment

- Labour force ($L^s$) includes both employed ($L$) and unemployed ($U$): individuals who are actively looking for a job and are ready to work

$$L^s = L + U$$

- Unemployment rate is the fraction of the labour force which is out of work

$$u = \frac{U}{L^s} = \frac{U}{U + L}$$

(in our picture $u = 0$)

- **Involuntary unemployment** occurs when labour is willing and able to work at the market wage $w$ but cannot find employment

- In our model unemployment occurs when the wage is higher than the level which equates supply and demand
Involuntary unemployment

Involuntary Unemployment: Wage Fixed above Market-Clearing Level

It's a free market, so the short-side determines actual employment.

Lecture: Labour markets
Involuntary unemployment

- If wages can adjust the “over” supply of labour will lead to decrease if wages from \( \bar{w} \) to \( w \) and the equilibrium will move from \( B \) to \( A \).

- The reason for involuntary unemployment is real wage rigidity.

- Wages can be rigid due to:
  - Collective bargaining, e.g. by labour union
  - Wage regulation, e.g. minimal wage
  - “Efficiency wage”
Collective bargaining

- Very often wages are not negotiated by individuals and employers, but by labour unions and employers’ associations
  - Labour unions: associations of employees advocating the interests of workers: worker’s rights, working conditions, safety, wages
- From an economic point of view, a union has two primary objectives: higher wages and more jobs
- Preferences of a union over labour and wages can be represented by indifference curves

- slope of the indifference curve depicts the union’s willingness to trade employment for wage
Unions’ indifference curves

Trade Unions’ Indifference Curves

Real wage vs Employment

(a) Average
(b) Hard-line
(c) Jobs-first

Lecture: Labour markets
Union preferences

- The union tries to obtain the highest possible utility (the highest indifference curve) given its constraint

- Constraint of unions is given by labour demand by firm

- Equilibrium: point of tangency between labour demand and union indifference curve

- Labour demand shifts:
  - increase in labour demand yields new equilibrium point with higher wages and higher employment
  - decrease in labour demand brings lower wages and lower employment

- Set of points in which unions’ indifference curve is tangent to changing demand for labour yields collective labour supply curve
The Collective Labour Supply Curve

[Graph showing the relationships between real wage, collective labour supply, and employment.]

Lecture: Labour markets
Labour Market Equilibrium with a Trade Union

Real wage vs. Labour

Collective labour supply
Household labour supply
Labour demand

0

Labour

L

L

L^s

Union-voluntary, individual-involuntary unemployment

Fig. 4.12 (a)

Lecture: Labour markets
Collective negotiation and employment

- If the collective labour supply is above the individual supply then wage that is determined by collective negotiation is above equilibrium wage ⇒ unemployment

- Union members (and union leaders) are usually employed, i.e. they are insiders, and they prefer higher wages

- Unemployed (outsiders) are not organized and do not have big influence on (or even participate in) bargaining

- Since unions “fight” for higher wages collective labour supply curve is above individual labour supply curve
## Standardized Unemployment Rates (% of labour force)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>9,7</td>
<td>8,4</td>
<td>9,9</td>
<td>10,1</td>
</tr>
<tr>
<td>Spain</td>
<td>18,0</td>
<td>11,2</td>
<td>23,1</td>
<td>19,6</td>
</tr>
<tr>
<td>Germany</td>
<td>8,1</td>
<td>8,9</td>
<td>5,5</td>
<td>4,1</td>
</tr>
<tr>
<td>Sweden</td>
<td>7,2</td>
<td>6,7</td>
<td>8,0</td>
<td>6,9</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>8,0</td>
<td>5,4</td>
<td>7,1</td>
<td>4,8</td>
</tr>
<tr>
<td>Japan</td>
<td>3,1</td>
<td>4,7</td>
<td>4,2</td>
<td>3,1</td>
</tr>
<tr>
<td>United States</td>
<td>5,8</td>
<td>5,5</td>
<td>7,6</td>
<td>4,9</td>
</tr>
<tr>
<td>Poland (registered)</td>
<td>12,0</td>
<td>15,7</td>
<td>12,3</td>
<td>7,3 (2017)</td>
</tr>
<tr>
<td>Poland (BAEL)</td>
<td>11,5</td>
<td>15,0</td>
<td>9,4</td>
<td>4,9 (2017)</td>
</tr>
</tbody>
</table>

**Source:** OECD, GUS

- **Unemployment Rate in Poland September 2020:**
  - registered: 6,1%
  - BAEL: 3,2% (II qtr)
# European Trade Unions: Membership and Coverage, 1950-2013

<table>
<thead>
<tr>
<th>Country</th>
<th>Structure</th>
<th>Union Membership (%)</th>
<th>Collective Bargaining Coverage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>Umbrella (ILO, TCO, SAGO)</td>
<td>72.1</td>
<td>67.7</td>
</tr>
<tr>
<td>Finland</td>
<td>Umbrella (SAK, STTK, AKAVA)</td>
<td>31.9</td>
<td>51.3</td>
</tr>
<tr>
<td>Denmark</td>
<td>Umbrella (LO, HK, FTF)</td>
<td>56.9</td>
<td>60.3</td>
</tr>
<tr>
<td>Norway</td>
<td>Umbrella (LO, AF, YS)</td>
<td>60.0</td>
<td>56.8</td>
</tr>
<tr>
<td>Belgium</td>
<td>Party, religious (ACV/CSC, ABVV/FGTB, ACLVB/CGSLB)</td>
<td>39.3</td>
<td>39.9</td>
</tr>
<tr>
<td>Ireland</td>
<td>Mostly crafts in ICTU, fragmented</td>
<td>43.1</td>
<td>50.6</td>
</tr>
<tr>
<td>Austria</td>
<td>Umbrella/industrial (OGB)</td>
<td>67.9</td>
<td>62.8</td>
</tr>
<tr>
<td>Italy</td>
<td>Party, religious (CGIL, CISL, UIL)</td>
<td>24.7</td>
<td>37.0</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Mostly crafts in ICTU, fragmented</td>
<td>38.8</td>
<td>43.0</td>
</tr>
<tr>
<td>Germany</td>
<td>Umbrella/industrial (DGGB, IG Metall, Verdi)</td>
<td>34.7</td>
<td>32.0</td>
</tr>
<tr>
<td>Portugal</td>
<td>Party, religious/umbrella (CGTP, UGT)</td>
<td>54.8</td>
<td>18.1</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Party, religious (FNV, CNV, MHP)</td>
<td>41.7</td>
<td>36.5</td>
</tr>
<tr>
<td>Greece</td>
<td>Occupational/sectoral (GSEE, ADEDY)</td>
<td>39.0</td>
<td>20.8</td>
</tr>
<tr>
<td>Spain</td>
<td>Industrial, company level (CCOO, UGT, ELA, CIGA)</td>
<td>13.5</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>Party, religious (CGT, CFDT, CGTFO, CFTC, CFET-CGC)</td>
<td>19.6</td>
<td>21.7</td>
</tr>
<tr>
<td>United States</td>
<td>Mostly local plant-level (AFL-CIO)</td>
<td>30.9</td>
<td>27.4</td>
</tr>
</tbody>
</table>

Source: [www.eurofound.europa.eu/eiro/country_index.htm](https://www.eurofound.europa.eu/eiro/country_index.htm)

Lecture: Labour markets
Wage regulations by the government is also an important source of wage rigidity.

**Minimum wage** is a legally binding lower bound on wages:
- It can curb market power of employers (vs employees)
- Reference point for many social security programs

Minimum wage matters only if it is higher than the wage negotiated by collective negotiation and the equilibrium wage:
- Minimum wage can discourage employers to hire workers with lower productivity (low marginal productivity of labour)
Minimum Wages

Fig. 4.13

Lecture: Labour markets
Equilibrium Wage

(a) No Unions, No Minimum Wage

Fig. 4.13 (a)
“Union” Wage

(b) Unions, No Minimum Wage

Real wage

Collective labour supply

Household labour supply

Labour demand

Labour

0

Union-voluntary, individual-involuntary unemployment

L

L

L

L

Labour markets
Minimum Wage above Union Wage

- Real wage
- Household labour supply
- Collective labour supply
- Labour demand
- Unemployment under a minimum wage
Efficiency Wages

- Sometimes employers themselves choose to pay higher wages: efficiency wages

- Paying higher wages attracts workers with higher (unobservable) productivity (positive self-selection)

- Higher wage increase incentives to higher (unobservable) effort and, as a result, more productive work as getting fired becomes costly (in terms of future condition) (reduction of moral hazard)

- Additionally, higher wages imply
  - better nutrition and better health
  - reduction in labour turn-over $\implies$ lower cost of job training and hiring
Inflows and Outflows of Unemployment

- Unemployment is a dynamic phenomenon
  - Unemployment rates change from month to month
  - In recessions unemployment rate is higher than in periods of growth when unemployment is very low

- Individuals move in and out of unemployment
  - Employed individuals lose or quit jobs and become unemployed (layoffs/separations)
  - Unemployed individuals find new jobs
  - New individuals enter in the labour force
  - Other individuals retire and drop out of the labour force
Three States

All Working Age People Are in One of the Following Three States:

Employed

Unemployed

Not in labour force
Gross Flows Starting from State of Employment:

- Employed
- Unemployed
- Not in labour force

Quits to unemployment
Layoffs
Retirements
Quits to other jobs
Gross Flows from State of Unemployment:

- Employed
- Unemployed
- Not in labour force
- Job finds
- Layoffs
- Quits to unemployment
- Discouraged
- Retirements
- Quits to other jobs

Fig. 4.14 (c)
Gross Flows from out of the Labour Force:

- Employed
- Unemployed
- Not in labour force
- Job finds
- Layoffs
- Quits to unemployment
- Discouraged
- New entries
- Unsuccessful new entries
- Quits to other jobs
- Retirements

Lecture: Labour markets
Frictional Unemployment

- Changes in unemployment can be written as
  \[ \Delta U = sL - fU \]
  changes in unemployment inflow to unemployment outflow of employment

  gdzie
  - \( s \) to separation rate
  - \( f \) to job finding rate

- Interpretation of dynamic equilibrium in the labour markets assumes that \( \Delta U = 0 \) and, since \( L^s = L + U \),
  \[ u^f = \frac{s}{s + f}, \]
  where \( u^f \) denotes frictional unemployment that results from specificity of labour market
The equilibrium rate of unemployment is the rate of unemployment toward which the economy gravitates in the long run (steady state).

natural unemployment = frictional unemployment + structural unemployment

- **Frictional unemployment** - unemployment resulting from labour turnover: finding a proper worker takes time and effort.

- **Structural unemployment** - involuntary unemployment, due to wage rigidities as well as due to the fundamental mismatch at the labour market.
## Estimates of the Equilibrium Unemployment Rate (in %)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Spain</td>
<td>5.8</td>
<td>11.0</td>
<td>14.4</td>
<td>13.9</td>
<td>15.9</td>
</tr>
<tr>
<td>Germany</td>
<td>b.d.</td>
<td>b.d.</td>
<td>7.3</td>
<td>8.5</td>
<td>5.7</td>
</tr>
<tr>
<td>Italy</td>
<td>5.5</td>
<td>7.4</td>
<td>9.3</td>
<td>8.4</td>
<td>8.6</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>5.3</td>
<td>9.3</td>
<td>8.0</td>
<td>5.8</td>
<td>6.0</td>
</tr>
<tr>
<td>Japan</td>
<td>1.7</td>
<td>2.4</td>
<td>2.9</td>
<td>4.1</td>
<td>3.8</td>
</tr>
<tr>
<td>United States</td>
<td>5.9</td>
<td>6.6</td>
<td>5.7</td>
<td>5.2</td>
<td>5.1</td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td>12.2</td>
<td>12.3</td>
<td>8.4</td>
</tr>
</tbody>
</table>

*Sources: OECD Stat; Economic Outlook Database*
Actual Unemployment

Equilibrium Employment and Unemployment

Real wage

Collective labour supply

Individual labour supply

Labour demand

$L^s - \bar{L}$

Labour

$L^s$

$\bar{L}$

$w$
Equilibrium Employment and Unemployment

Actual employment when real wage is not equal to the equilibrium real wage

Real wage

Collective labour supply

Individual labour supply

Labour demand

Labour

Fig. 4.17 (b)
Actual Unemployment

Equilibrium Employment and Unemployment

Actual unemployment when real wage is not equal to the equilibrium real wage

Real wage

Wage offer curve

Individual labour supply

Labour demand

Lecture: Labour markets