How are wages determined?

Compensating Wage Differentials
What is the Market?

Market is a mechanism that brings together buyers and sellers.

BUYERS
FIRMS

SELLERS
WORKERS

Labor MARKETS determine Wages and Employment level.

Market is a mechanism that brings together buyers and sellers.
Individual’s LS: # of hours you choose to work

Choose between *work* and *leisure*.

- **Work** = time spent on a paying job
- **Leisure** = unpaid activities (Rest, Education, HH production)

**Substitution effect**

Higher wage $\rightarrow$ higher opportunity cost of leisure $\rightarrow$ work more, substitute work for leisure.

**Income effect**

Higher wage $\rightarrow$ higher *income* $\rightarrow$ work less, enjoy more leisure.
Market LS

- **at higher w:**
  1. Individuals are willing to work more
  2. More individuals enter labor market

**Market labor supply curve** = horizontal summation of $S_L$ curves for all individuals in a labor market.
Labor Demand

- Demand for labor is a **derived demand**.
  - The demand for hamburgers leads to the demand for hamburger workers.

- Lower wage rate – firms want to hire more workers
Competitive Labor Market

- at wage $W_{\text{low}}$: excess demand for labor (shortage)
  - $Q_2 - Q_1$
- at wage $W_{\text{high}}$: excess supply of labor
  - $Q_2 - Q_1$
  - (surplus, unemployment)
- Equilibrium wage rate $W_0$ and level of employment $Q_0$ are at intersection of labor supply and demand.
Competitive Labor Market

- Large number of firms trying to hire an identical type of labor;
- Numerous qualified people independently offering their services;
- Neither firms nor workers have control over the market wage;
- Perfect, costless information and labor mobility.
Noncompetitive Labor Markets

- **Monopsony**
  - a market with one buyer

- **Monopoly**
  - only one seller in the market
Nondiscriminating Monopsonist

\[ MC_E > \omega \]

- \( \pi_{\text{max}}: VMP_E = MC_E \)
- \( \omega_{\text{monopsonic}} = \omega_M < \omega^* \)
- \( E_{\text{monopsonic}} = E_M < E^* \)

This leads to smaller output and lower wage than efficient level.
Monopsony and the Minimum Wage

Cases:

- \( \omega_{\text{min}} \leq \omega_{\text{monopsonic}} \)
- \( \omega_{\text{monopsonic}} < \omega_{\text{min}} \leq \omega^* \)
- \( \omega_{\text{monopsonic}} < \omega^* < \omega_{\text{min}} \)
Noncompetitive Labor Markets: Monopoly

- Firm could influence the price of output it sells
  - $\text{MR} < p$

- $\pi_{\text{max}} : \text{MR} = \text{MC}$

- $q_M < q^*$

- $p_M > p^*$
The Labor Demand Curve of Monopolist

- **Competitive firm:**
  - \( VMP_E = MC_E = \omega \)

- **Monopoly:**
  - \( \pi_{max}: MRP_E = MR \cdot MP_E = \omega \)
  - \( MRP_E < VMP_E \)
    - because \( MR < p \)
  - \( E^* > E_M \)
  - \( \omega^* = \omega_M \)
Work, wages, wage differentials

- Why do similar jobs pay different wages?
- Why do similar workers receive different salaries?
Wage Differentials: Workers are different

- **Human Capital:** Skills, education, experience
- **Theory:**
  - More schooling improves productivity,
  - Lower quit and absentee rates,
  - Less likely to abuse drugs and alcohol.

- **Differences in time preferences**
  - *presented-oriented people acquire less education*
    - not willing to sacrifice present consumption without a large increase in future income, discount future income
  - *future-oriented people acquire more education*
    - willing to sacrifice present consumption for a small increase in future income, value future income
Wage Differentials: Jobs are different

- **Non-competing skills**
  - doctors and computer programmers

- **Compensating wage differentials =**
  - extra pay that an employer must provide a worker for some undesirable job characteristic that does not exist in alternative employment
  - Higher risk of injury or death
  - Lower job status/prestige
  - Job location
  - Less job security
    - Private sector vs government
  - Prospect of wage advancement
    - The *greater* wage advancement, the lower *starting* wages
  - Flexible hours
Wage Differentials: Other Explanations

- **Firm size**
  - large firms pay higher wages (unionized, higher worker productivity)

- **Higher wages to prevent turnover**
  - above-market wages when hiring and training costs are high.

- **Costly to monitor shirking**
  - above-market wages where it is costly to monitor employee performance or the employer’s cost of poor performance is high.

- **Costly job search**
  - information is costly - time

- **Geographic immobilities**
  - costs of moving deters migration to areas with higher wages.

- **Worker’s tastes for nonwage aspects of jobs**
  - job security, location, commute, risk, co-workers.
A Model of Compensating Differentials

Setup:

- The utility function is $U(c, l, Z)$.
  
  $$\frac{\partial U(c, l, Z)}{\partial Z} \geq 0$$

- Firm $A$ offers $(w_A, Z_A)$
- Firm $B$ offers $(w_B, Z_B)$

- $w_A = w_B$
- $Z_A > Z_B$

$\Rightarrow V(w_A, Z_A) > V(w_B, Z_B)$
A Model of Compensating Differentials

- \( V(\omega_A, Z_A) - V(\omega_B, Z_B) > 0 \)

Firm B calculates that it needs to raise wages to equalize utility:
\[ V(\omega_A, Z_A) = V(\omega^N_B, Z_B) \]

- Note: \( \omega_A < \omega^N_B \)
- The difference in the wage offers, \( \omega^N_B - \omega_A \), is the compensating differential for the difference in non-pecuniary characteristics, \( Z_A - Z_B \).
Example: Risky vs. Safe jobs

2 types of jobs:
- Safe ($\rho = 0$),
- Risky ($\rho = 1$).
- Information is complete.

$$U = f(w, \rho)$$
- $\partial U / \partial w > 0$
- $\partial U / \partial \rho < 0$
Market Compensating Differential

- If firms have to pay workers more than they need to make the environment safe, they will hire only for safe-jobs.
Risky jobs & Weird preferences

When the demand for the risky job is high (the labor supply to risky job) compared to the supply of it (demand for the labor), the price goes up (the wage goes down).

- e.g. Space Tourists
Heterogeneity: ICs

- Different workers dislike risk differently

- $\Delta \omega_A > \Delta \omega_B > \Delta \omega_C$
Heterogeneity: Isoprofit curve

- Isoprofit curves are upward sloping (costly to produce safety)
- Concave
- Higher isoprofit curves yield lower profits.
Heterogeneity: Equilibrium

- Hedonic Wage fn
  - shows the relationship between wage and job characteristics

Compensating wage differential model
“marries” workers and firms.
Taking risky jobs: Applications

What is the value of a human life?

There are 2 firms:

1) Firm A offers \((w_A, \rho_A)\),

2) Firm B offers \((w_B, \rho_B)\).

such that \(\rho_B > \rho_A\) and \(w_B > w_A\)

Thus, workers are willing to trade \(w_B - w_A\) dollars for \(\rho_B - \rho_A\) higher risk.
What is the value of a human life?

There 2 firms:

1) Firm A offers \((w_A, \rho_A)\),

2) Firm B offers \((w_B, \rho_B)\).

such that \(\rho_B (= \rho_A + .001) > \rho_A\) and

\[w_B (= w_A + \$7,600) > w_A\]

If 1000 workers hired by firm B,
The value of statistical life is costs \$7,600*1000
Problems with Compensating Differentials

- People must know the actual differences.
- Must control for all other differences.
Compensating wage differentials: Summary

- The idea is proposed by Adam Smith in Wealth of Nations.
- Utility, not wages should be equilized across jobs in a perfectly competitive market.
- Utility is affected by risk of injury, risk of layoff, etc.
- The market compensating wage differential is the dollar amount required to convince the marginal worker (last worker hired) to move to the riskier job.
Homework

- Borjas (5e), Ch 5: Compensating wage differentials
Human Capital
Facts about education, experience, earnings

- More educated people earn more.
- Earnings rise, then fall.
- Earnings of more educated people show more growth and peak later in life.

Source: 2000 Ethiopian Urban Household Survey. Incomes shown for people who reported an income on a monthly basis of between 10 and 1000 Birr and worked at least 25 hours per week. People with no schooling and religious schooling excluded.
The Concept of Human Capital

**Human Capital** is the abilities and skills of any individual, esp those acquired through investment in education and training, that enhance potential income earning.

**Sources of HC:**
- formal schooling,
- on-the-job training,
- experience,
- abilities the individuals are born with.
A Model of HC Investments

Decision to attend college.

HS graduate choices:
1) Immediately start working ($\omega_{HS}$)
2) Attend college (4 years), then work ($\omega_C$)

$\omega_C > \omega_{HS}$
Suppose a person can put her money into a risk free investment that pays $r$ per year per 1 CZK invested.

Thus, it will be

- $(1 + r)$ CZK in one year;
- $(1 + r)^2$ CZK in two years;
- etc.

Present Value calculations can be used to calculate future value of money.
Potential earning streams of HS graduate

- $w_{COL}$: Goes to College
- $w_{HS}$: Quits after High School

Age: 18 to 65
Foregone earnings and college attendance

- Working after school:

\[
PV_{HS} = \omega_{HS} + \delta \omega_{HS} + \delta^2 \omega_{HS} + \ldots + \delta^{T-1} \omega_{HS} \\
= \sum_{t=1:T} \delta^{t-1} \omega_{HS}
\]

- Working after college:

\[
PV_C = 0 + \delta 0 + \delta^2 0 + \delta^3 0 + \delta^4 \omega_{C} + \delta^5 \omega_{C} + \ldots + \delta^{T-1} \omega_{C} \\
= \sum_{t=1:4} \delta 0 + \sum_{t=5:T} \delta^{t-1} \omega_{C}
\]

\[
PV_C > PV_{HS}
\]
Direct cost of schooling (e.g. tuition)

Tuition $D > 0$

$$PV_C = - D - \delta D - \delta^2 D - \delta^3 D + \delta^4 w_C + \delta^5 w_C + \ldots + \delta^{T-1} w_C$$

$$= - \Sigma_{t=1:4} \delta^{t-1} D + \Sigma_{t=5:T} \delta^{t-1} w_C$$
Different discount rates
Different Abilities

- $w_{HS}(A), w_{C}(A),$
- where $\frac{\partial w_{HS}(A)}{\partial A} \geq 0, \frac{\partial w_{C}(A)}{\partial A} \geq 0$

- $PV_{HS}(A) = \sum_{t=1:T} \delta^{t-1} w_{HS}(A)$

- $PV_{C}(A) = -\sum_{t=1:4} \delta^{t-1} D + \sum_{t=5:T} \delta^{t-1} w_{C}(A)$
Why Does Schooling Vary?

- Discount rates are different
- Different abilities
- Credit constraints
- Returns to college are uncertain
Life Cycle and HC Investment

Why people invest to HC throughout their life cycle?

- HC depreciates
- Returns to HC change over time
- People update their preferences
The age-earnings profile implied by HC theory

- Upward-sloping and concave
On-the-job training

Types:
- General HC
- Firm-specific HC

Will firms provide general training to their workers?