General Equilibrium
(Welfare Economics)
General Equilibrium

- Partial Equilibrium: Neglects the way in which changes in one market affect other (product/factor) markets.
- General Equilibrium: Analyses the way in which the choices of economic agents are co-ordinated across all product and factor markets.
Agenda

- Exchange Economy
  - 2 individuals/consumers (A and B)
  - 2 products (X and Y)

- Production Economy
  - 2 products (X and Y)
  - 2 factors (L and K)

- General Equilibrium
  - 2 individuals/consumers (A and B)
  - 2 products (X and Y)
  - 2 factors (L and K)
Exchange Economy

2 Individuals: A and B

2 Products: $\overline{X}$ and $\overline{Y}$

Assume a world with no production and with fixed endowments of X and Y (hence the line on top of X and Y).
Edgeworth Box

1. Look at the world from Individual A’s perspective
2. Look at the world from Individual B’s perspective
3. Combine A and B’s worlds to form an Edgeworth box
Edgeworth Box

Total amount of $\bar{Y}$

Individual $A$

$U_1^A$

$U_2^A$

Total amount of $\bar{X}$
Edgeworth Box

Total amount of $X$

Individual B

Total amount of $Y$

Individual A

$U_B^1$

$U_B^2$
Each point within the box represents a particular allocation of the two products between the two individuals.
Pareto Efficient Allocation: Each individual is on the highest possible indifference curve, given the indifference curve of the other individual.
Edgeworth Box

Individual A

Total amount of $X_A$

Individual B

Total amount of $Y_B$

$\alpha$

$\beta$
Pareto Inefficient Allocation

- $\alpha$ and $\beta$ are Pareto inefficient allocations.

- Why? Because there exists changes in allocations, starting from $\alpha$ or $\beta$, that would make at least one individual better off without making the other individual worse off.
Edgeworth Box

\[ \gamma \text{ is a pareto efficient point} \]
Pareto Efficient Allocation

• At point/allocation $\gamma$:
  • Individual A is on the higher possible indifference curve given B’s indifference curve and
  • Individual B is on the highest possible indifference curve given A’s indifference curve.

• Therefore, $\gamma$ is a pareto efficient allocation

• Note: The two indifference curves are tangential to each other
Pareto Efficient Allocations

\[ \text{Total amount of } \bar{Y} \]

Individual A

\[ \text{Total amount of } \bar{X} \]

Individual B

\[ \varepsilon \text{ and } \delta \text{ are also Pareto efficient allocations} \]
Contract Curve

Joining up these Pareto efficient points yields the contract curve.
The curve connecting all Pareto efficient allocations is known as the contract curve.

At each point on the contract curve, the MRS’s for A and B are equal, i.e.

\[ \text{MRS}^A_{xy} = \text{MRS}^B_{xy} \]
An “auctioneer” adjusts the product prices \((P_x \text{ and } P_y)\) until the following three conditions hold:

(1) \[ MRS^A = \frac{P_x}{P_y} \]

(2) \[ MRS^B = \frac{P_x}{P_y} \]

(3) Demand for \(X = \bar{X}\)

Demand for \(Y = \bar{Y}\)
Market Place: Exchange Economy Equilibrium

Individual A

Total amount of $Y$

Individual B

$\frac{P_X}{P_Y}$

Total amount of $X$
Exchange Edgeworth Box: Summary

Total amount of $\bar{Y}$

Individual A

Individual B

$\bar{X}$

Total amount of $\bar{X}$

$X_A$ $X_B$

$Y_A$ $Y_B$

$P_X$ $P_Y$
Production Economy

- Two firms produce two products (X and Y)
- The firms use two factors of production, capital (K) and labour (L)
- Assume fixed endowments of K and L.
At the tangency points: \( \text{MRTS}_L^X = \text{MRTS}_L^Y \)
(Production) Edgeworth Box

You can join up all these (Pareto) efficient points to form the contract curve.
Market Place: Production Economy Equilibrium

An “auctioneer” adjusts the factor prices ($P_l = w$ and $P_k = r$) until the following three conditions hold:

$$MRTS^X = \frac{w}{r} \quad (1) \quad MRTS^Y = \frac{w}{r} \quad (2)$$

(3) Demand for $L = \overline{L}$

Demand for $K = \overline{K}$
Production Possibility Curve

Each point on the production possibility curve is (Pareto) efficient.
Production Possibility Curve

\[ \text{MRTS}^x_{LK} = \text{MRTS}^y_{LK} \]

Diagram showing the relationship between the marginal rates of technical substitution (MRTS) in the production of goods X and Y, with the curve indicating equal MRTS at various points on the curve.
Production Possibility Curve

Points lie inside the curve are (Pareto) inefficient.
Production Possibility Curve

Where on the PPC?
How much X and how much Y should be produced?
Production Possibility Curve

Slope of the PPC = \( \frac{\Delta y}{\Delta x} \)

How many units of Y that have to given up in order to produce one more unit of X

Marginal rate of product transformation (MRPT or MRT)
General Equilibrium

- Claim: In equilibrium, firms will produce at the point on the production possibility curve at which MRPT = \( \frac{P_x}{P_y} \)
- If MRPT < \( \frac{P_x}{P_y} \) ⇒ produce more X and less Y
- If MRPT > \( \frac{P_x}{P_y} \) ⇒ produce less X and more Y
- [Aside: \( MRS_{xy} = \frac{P_x}{P_y} \) ⇒ MRPT\(_{xy}\) = MRS\(_{xy}\)]
General Equilibrium

The slope of the PPF = $P_x / P_y$
At this point we can draw in the amount of $x$ and $y$ produced.
General Equilibrium

This is the amount of x produced

$P_x/P_y$
This is the amount of $y$ produced.
Recall the Edgeworth box.
General Equilibrium

Individual A

Individual B

$\frac{P_x}{P_y}$
Recall that
\[ MRS_{xy} = \frac{P_x}{P_y} \]
General Equilibrium

\[ MRS = MRPT = \frac{P_x}{P_y} \]
General Equilibrium

Three Conditions for General Equilibrium:

1. \( MRS^A_{XY} = MRS^B_{XY} = \frac{P_X}{P_Y} \)

2. \( MRTS^X_{LK} = MRTS^Y_{LK} = \frac{P_L}{P_K} = \frac{w}{r} \)

3. \( MRPT_{XY} = \frac{P_X}{P_Y} = MRS_{XY} \)
Welfare Economics

1st Fundamental Theorem of Welfare Economics:
If all markets are perfectly competitive, the allocation of resources will be Pareto efficient.

2nd Fundamental Theorem of Welfare Economics:
Any Pareto efficient allocation can be obtained as the outcome of competitive market processes, provided that the economy's initial endowment of resources can be redistributed, via lump sum taxes and subsidies, among agents.