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

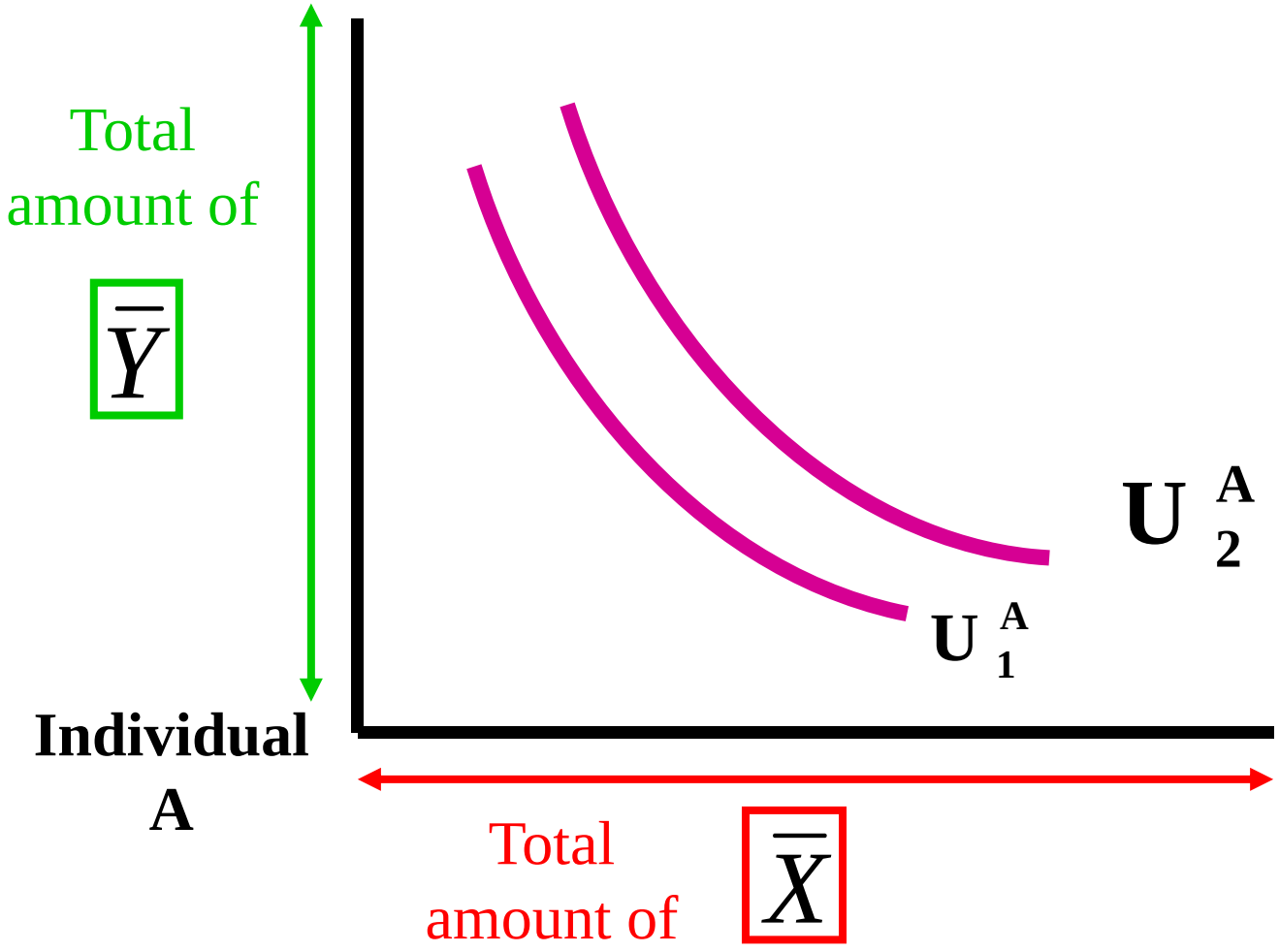
2 Products: $\overline{X}$ and $\overline{Y}$

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

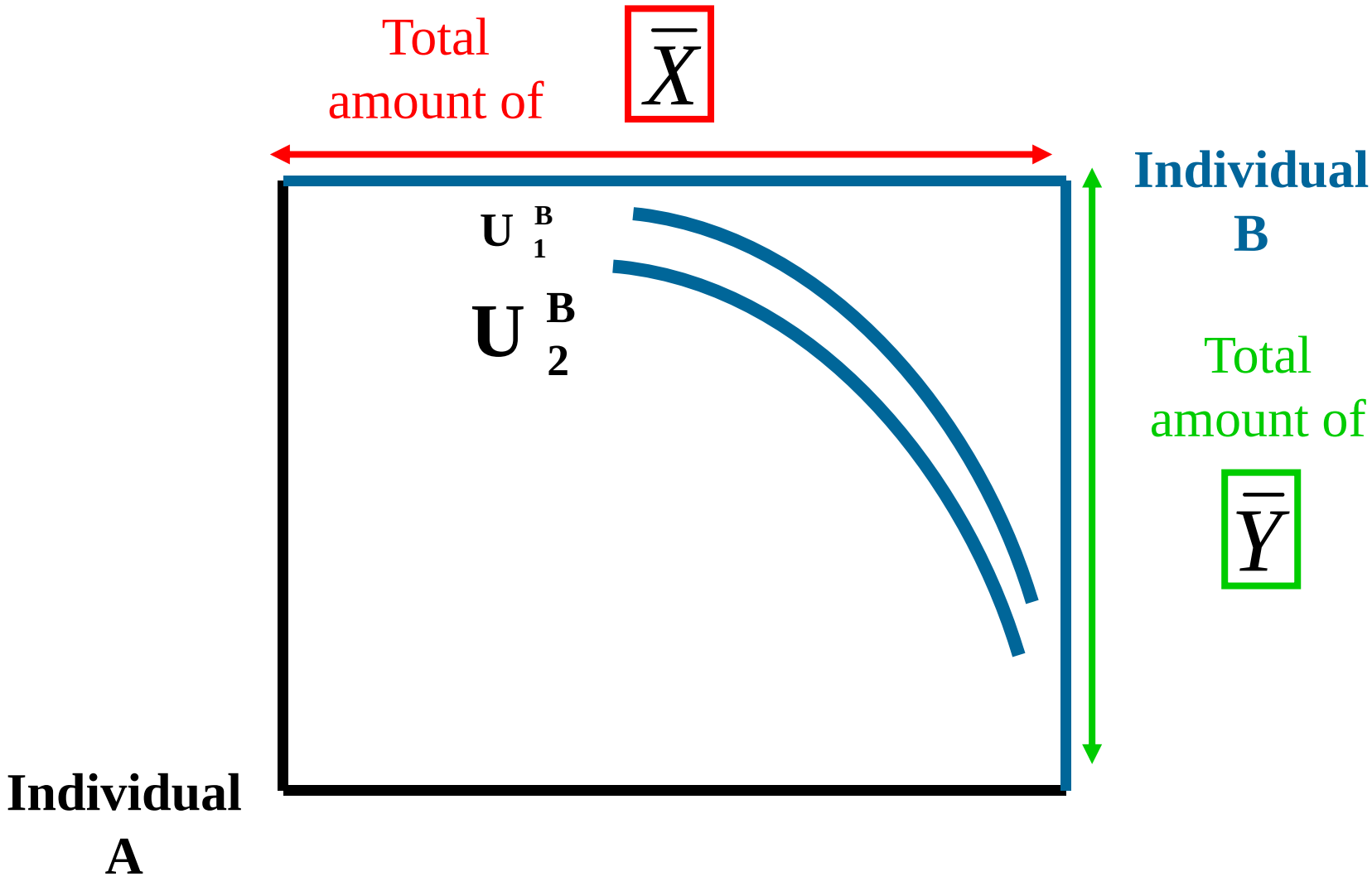
Edgeworth Box

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**

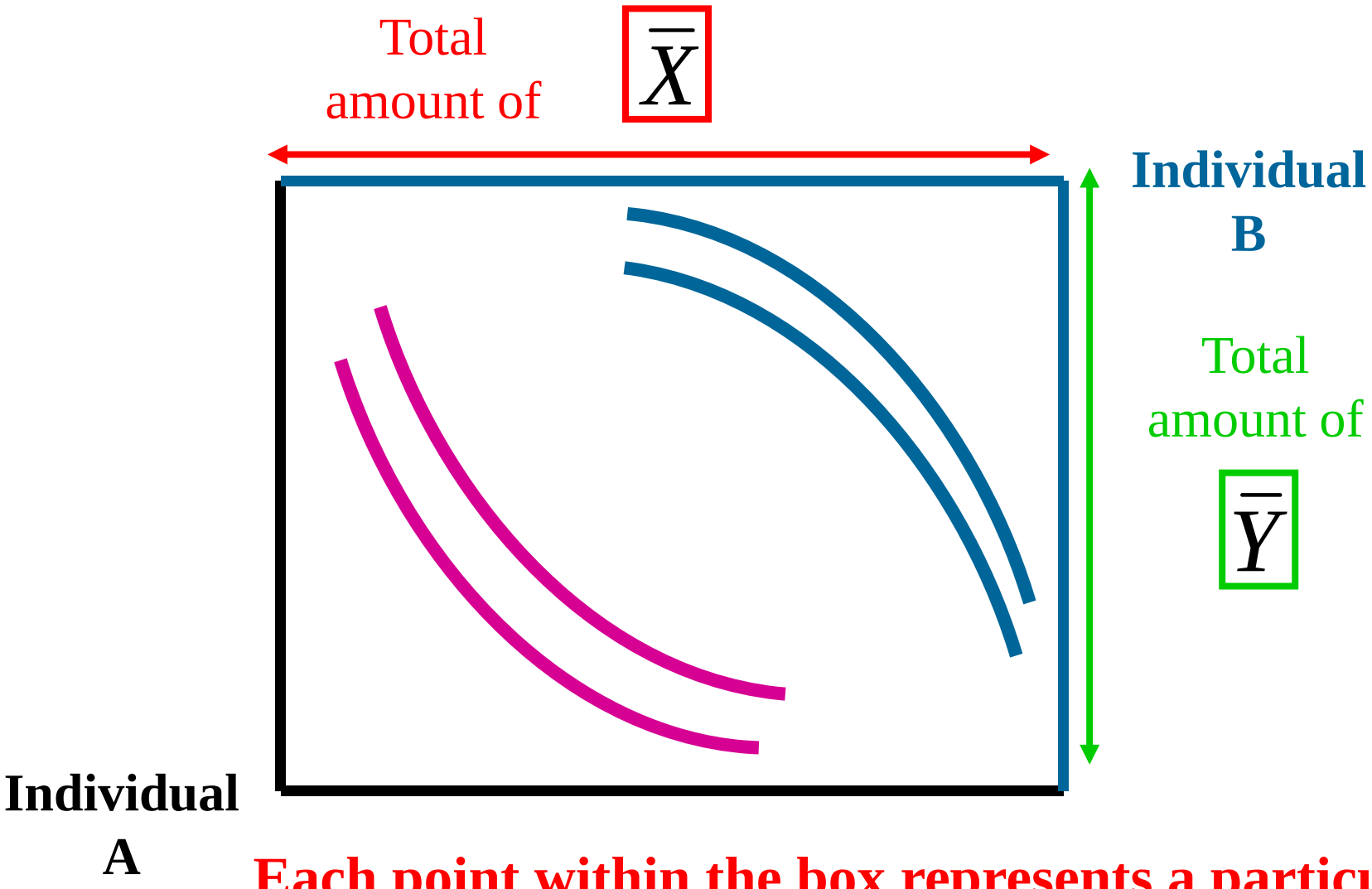
Edgeworth Box



Edgeworth Box



Edgeworth Box

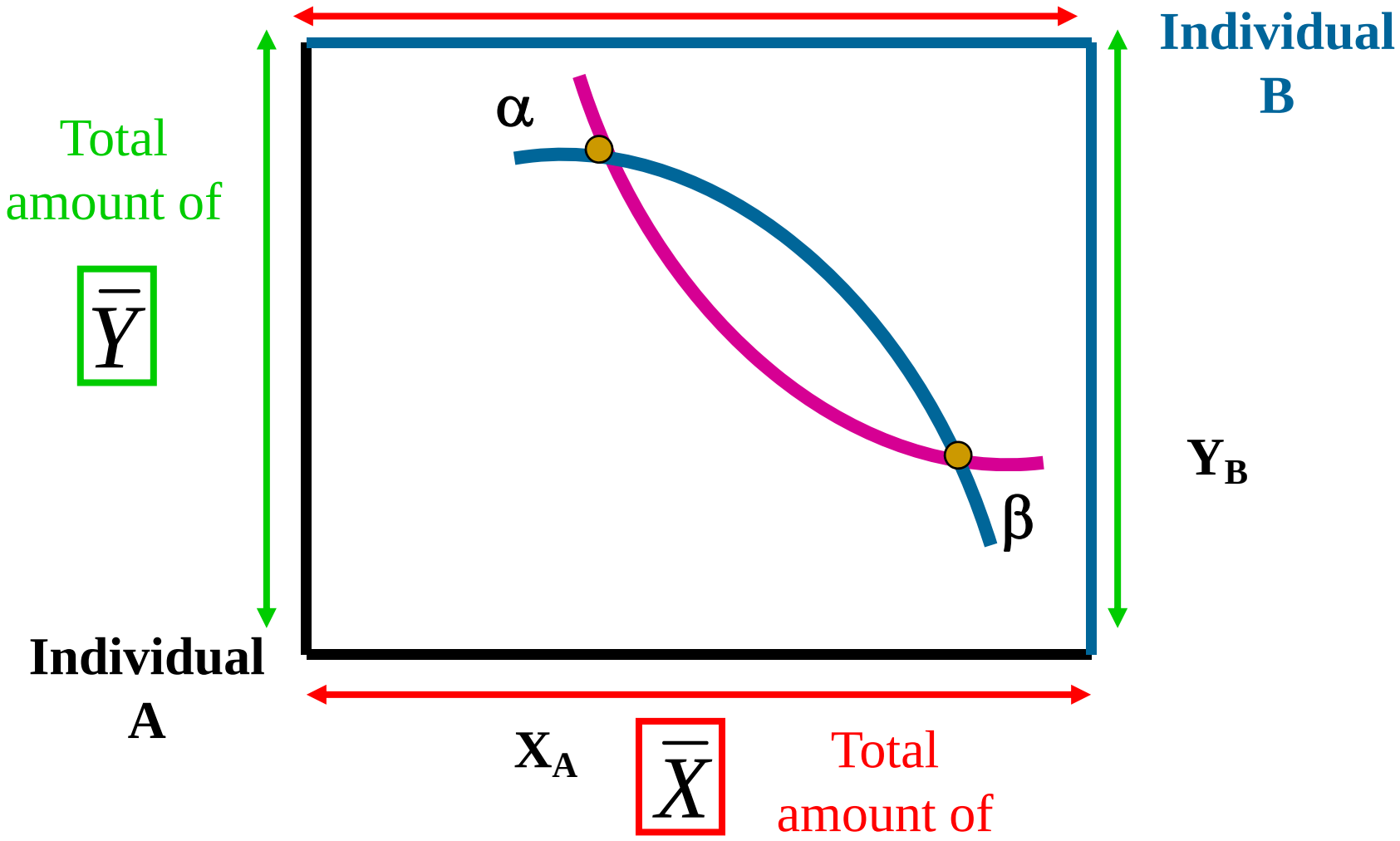


Each point within the box represents a particular allocation of the two products between the two individuals

Pareto Efficient Allocation

- Pareto Efficient Allocation: Each individual is on the highest possible indifference curve, **given the indifference curve of the other individual.**

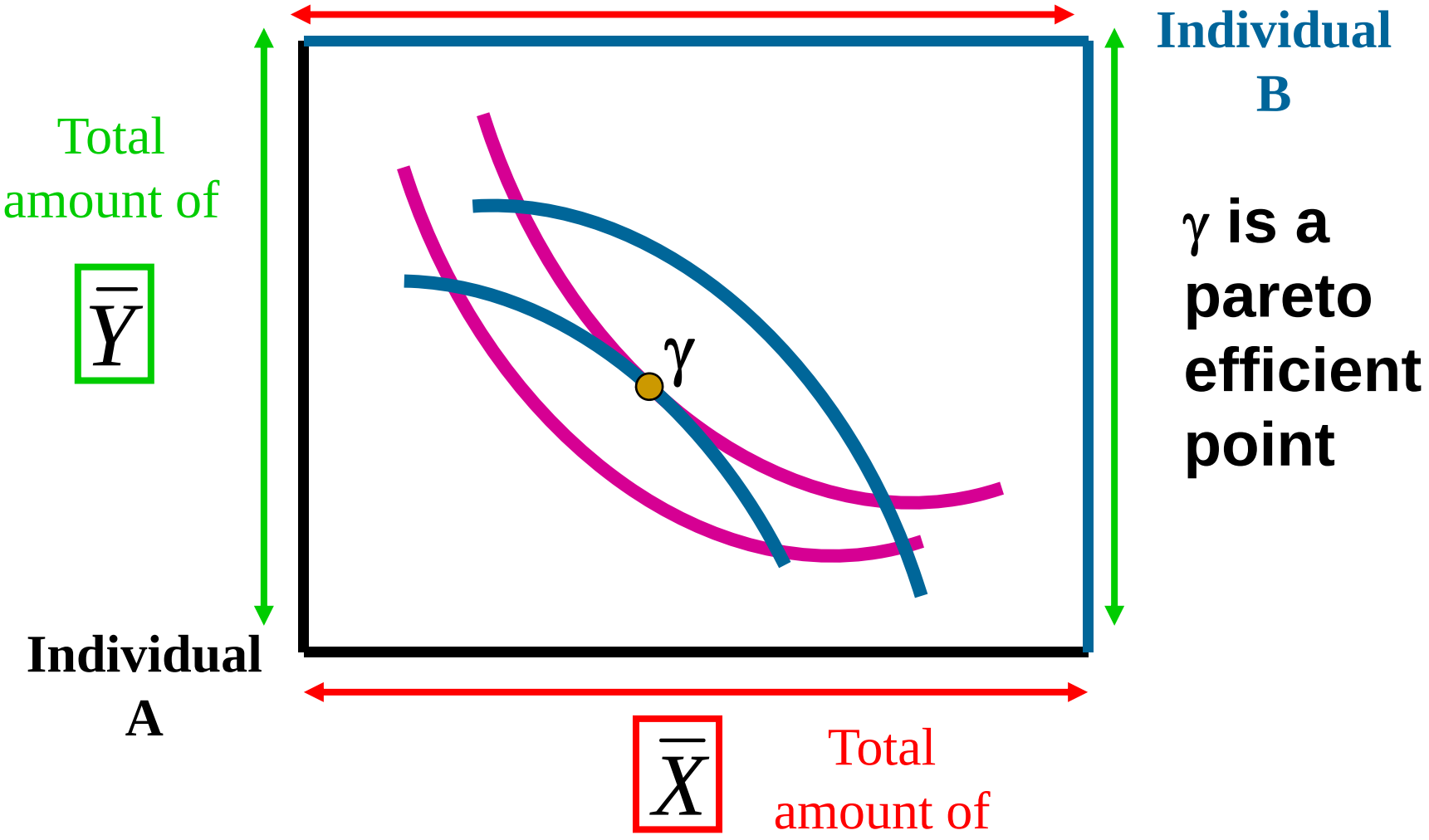
Edgeworth Box



Pareto Inefficient Allocation

- **α and β are Pareto inefficient allocations.**
- **Why? Because there exists changes in allocations, starting from α or β, that would make at least one individual better off without making the other individual worse off.**

Edgeworth Box

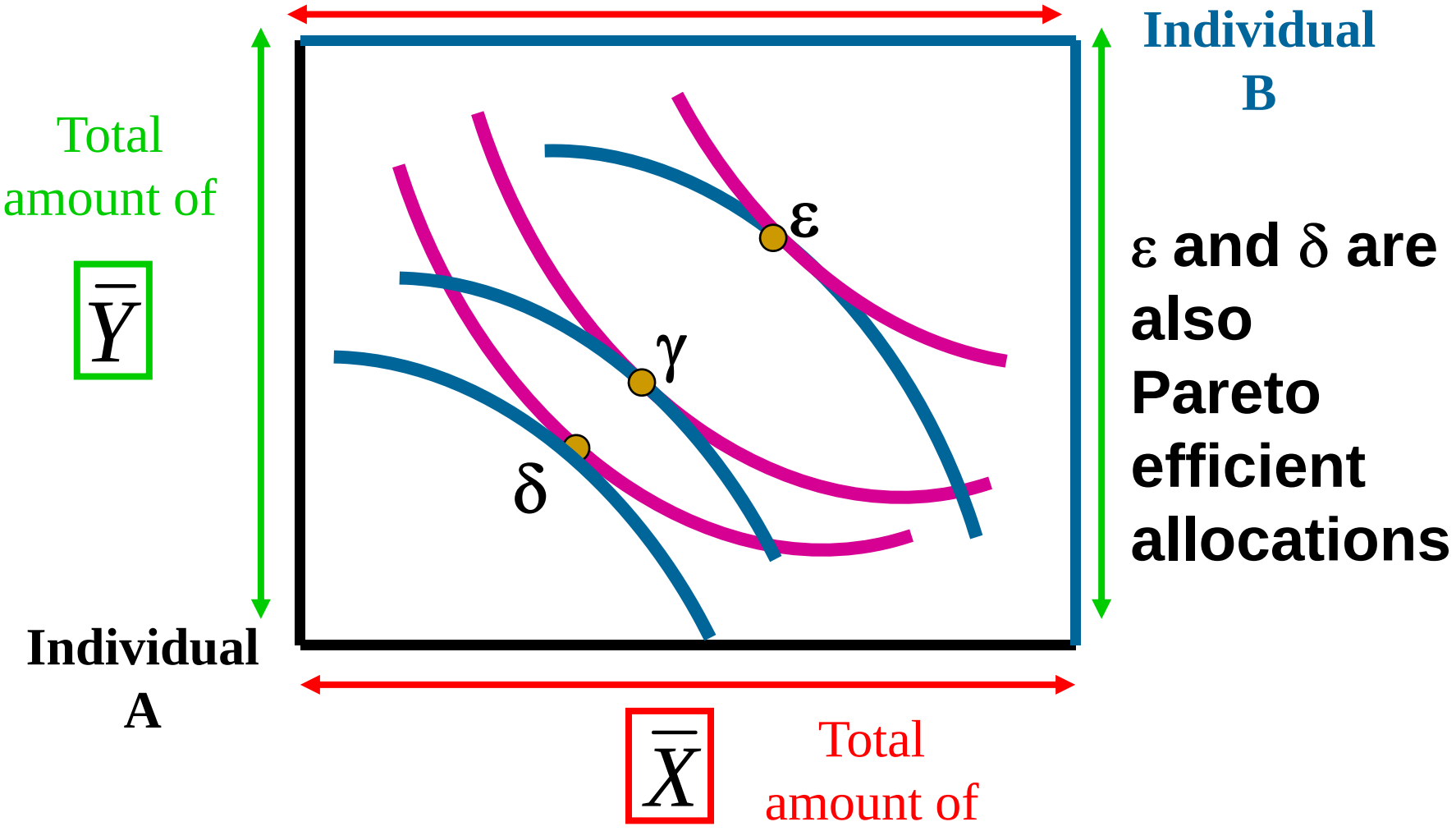


γ is a pareto efficient point

Pareto Efficient Allocation

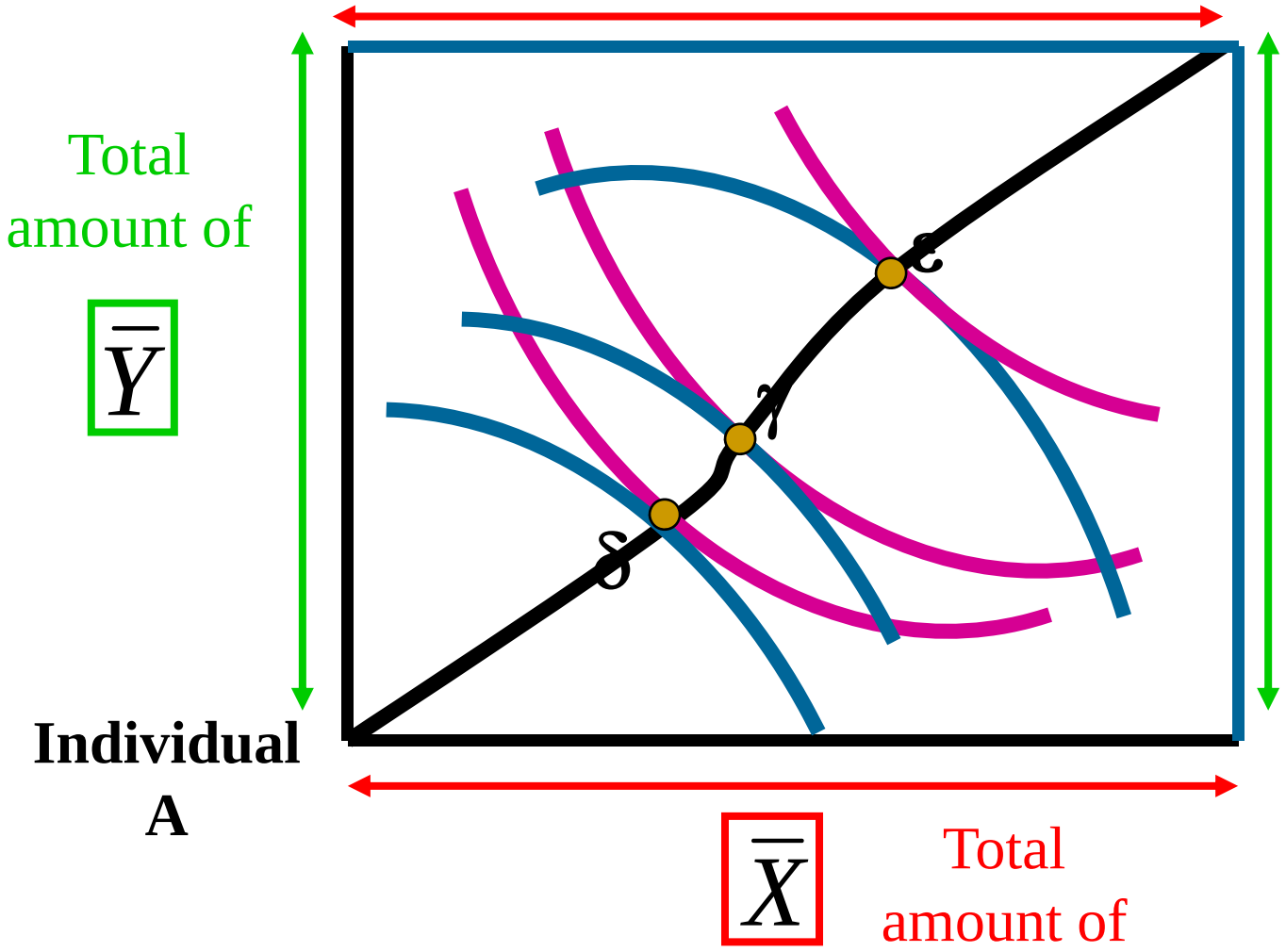
- **At point/allocation γ:**
- **Individual A is on the higher possible indifference curve given B's indifference curve and**
- **Individual B is on the highest possible indifference curve given A's indifference curve.**
- **Therefore, γ is a pareto efficient allocation**
- **Note: The two indifference curves are tangential to each other**

Pareto Efficient Allocations



ε and δ are also Pareto efficient allocations

Contract Curve



Joining up these Pareto efficient points yields the contract curve

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.**

$$MRS^{A}_{xy} = MRS^{B}_{xy}$$

Market Place

An "auctioneer" adjusts the product prices (P_x and P_y) until the following three conditions hold:

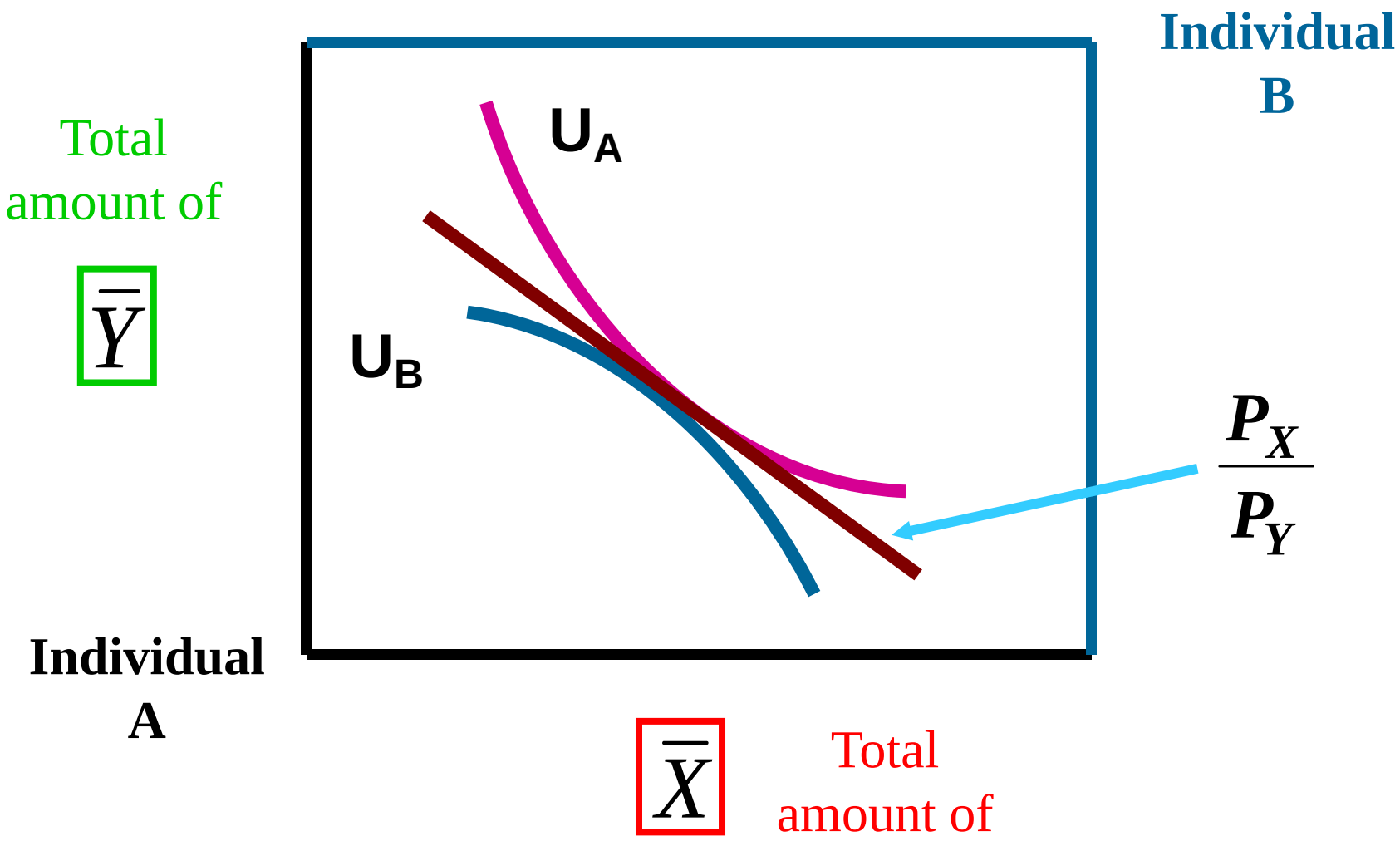
(1) $$MRS^A = \frac{P_X}{P_Y}$$ **(2)** $$MRS^B = \frac{P_X}{P_Y}$$

(3)

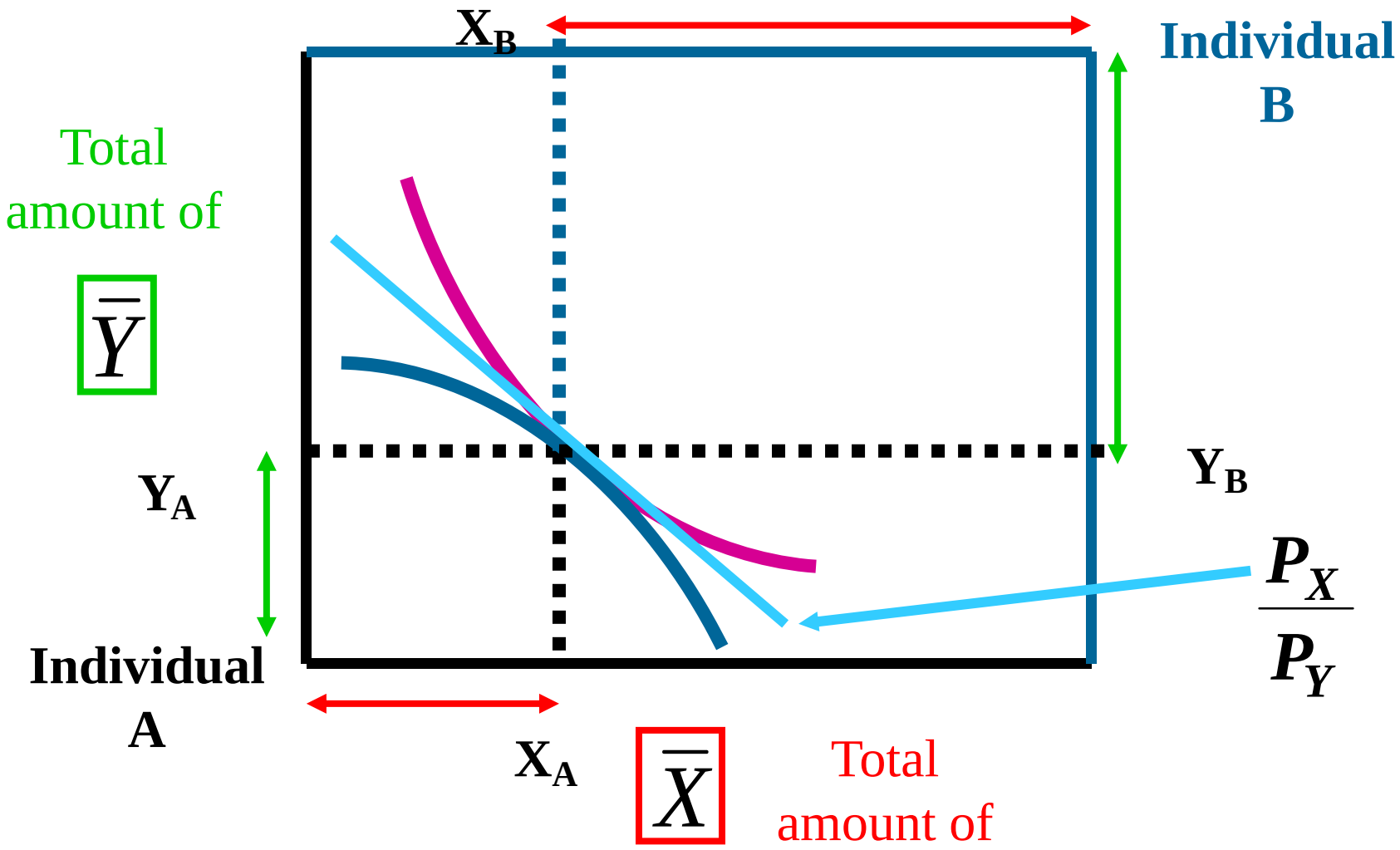
$$\text{Demand for X} = \overline{X}$$

$$\text{Demand for Y} = \overline{Y}$$

Market Place: Exchange Economy Equilibrium



Exchange Edgeworth Box: Summary

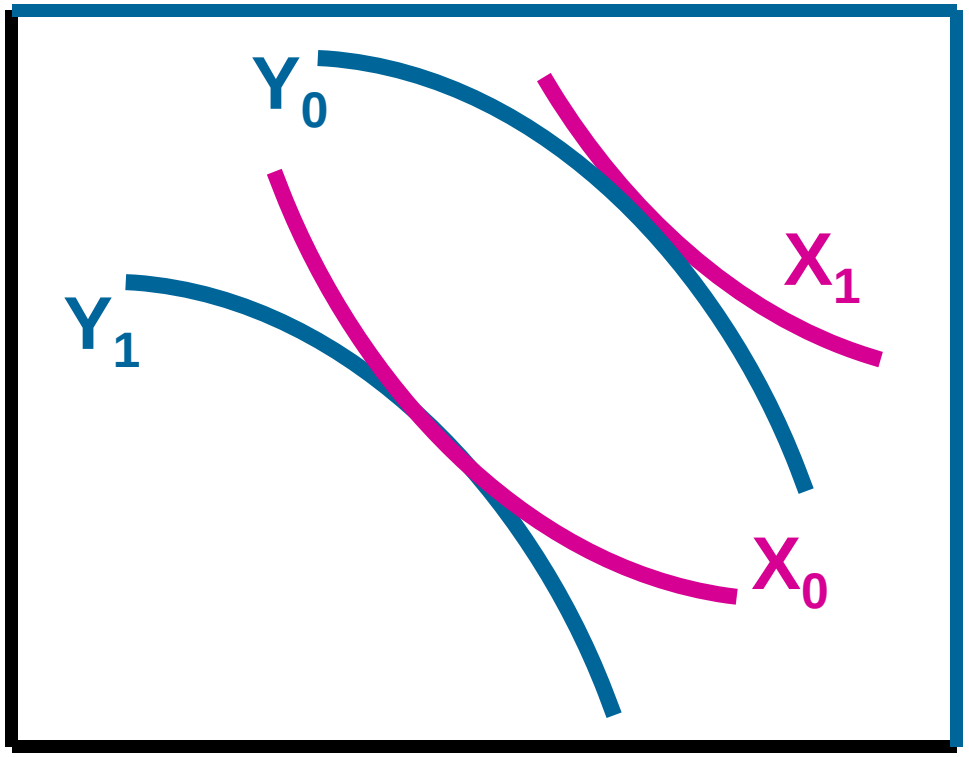


Production Economy

- **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.**

(Production) Edgeworth Box

Total amount of $\bar{K}$



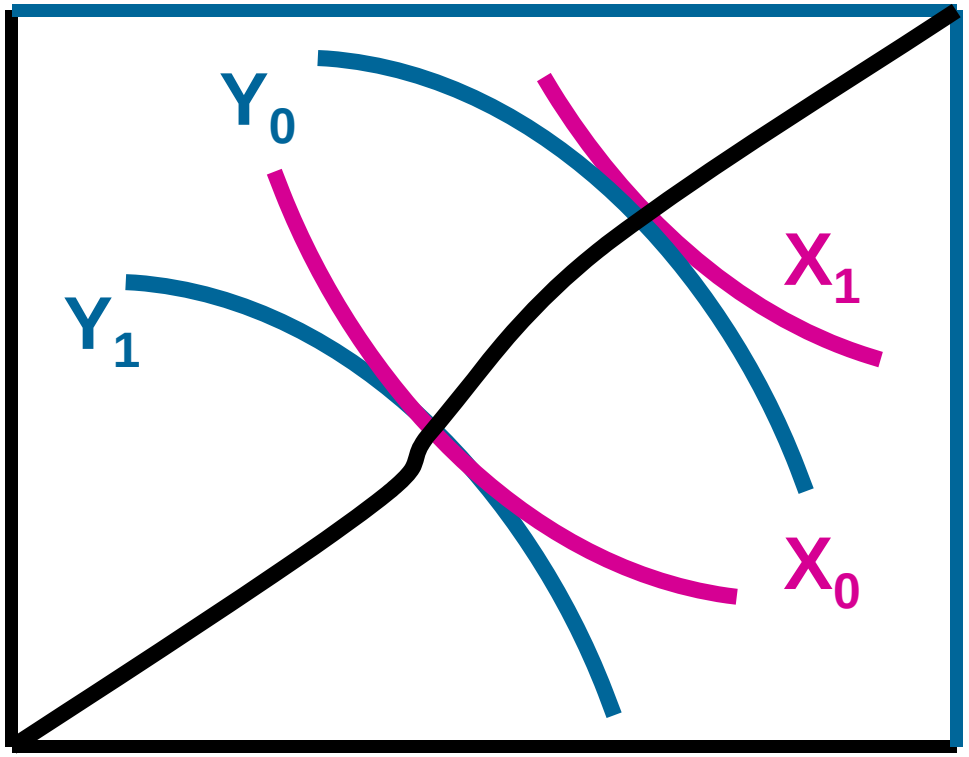
Firm Producing Good Y

At the tangency points: $MRTS^{X}_{LK} = MRTS^{Y}_{LK}$

Firm Producing Good X

$\bar{L}$ Total amount of

(Production) Edgeworth Box



You can join up all these (Pareto) efficient points to form the contract curve.

Market Place: Production Economy Equilibrium

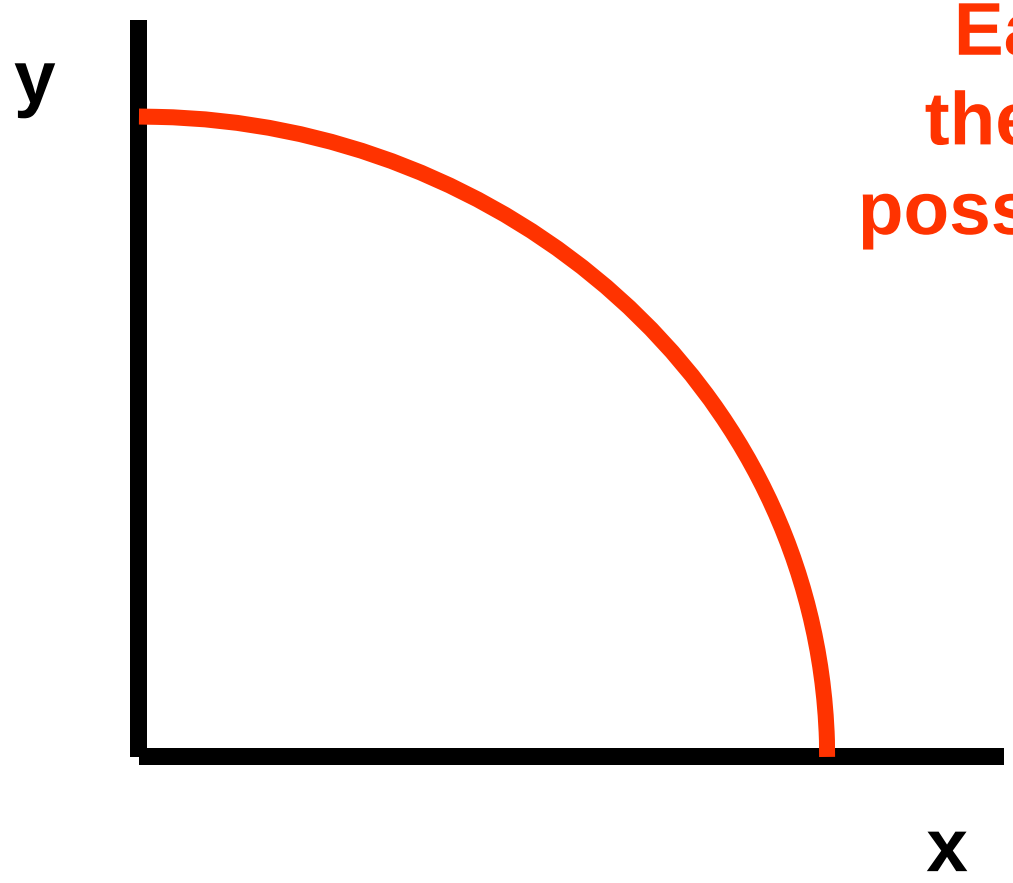
An "auctioneer" adjusts the factor prices ($P_l = w$ and $P_k = r$) until the following three conditions hold:

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

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

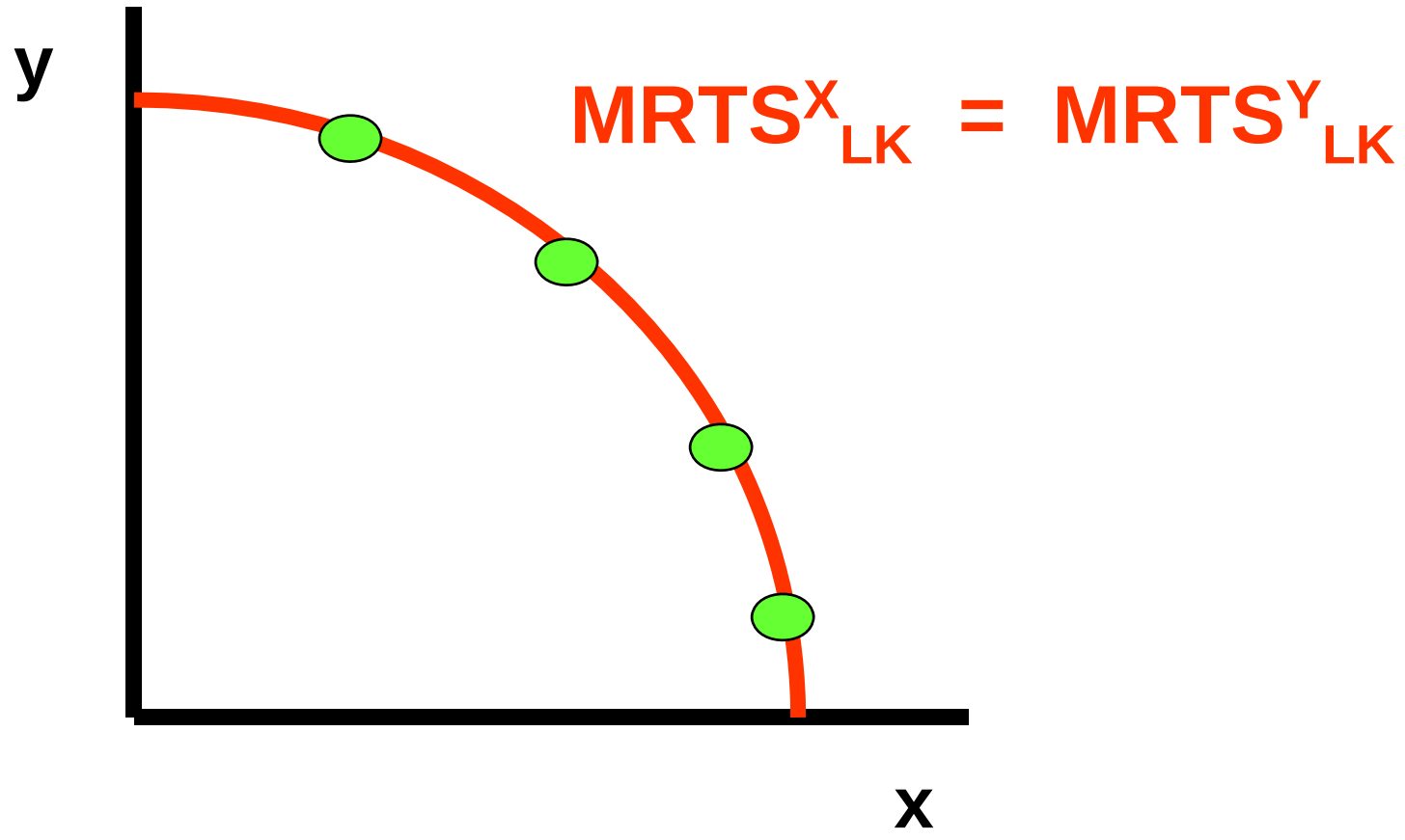
$\text{Demand for K} = \overline{K}$

Production Possibility Curve

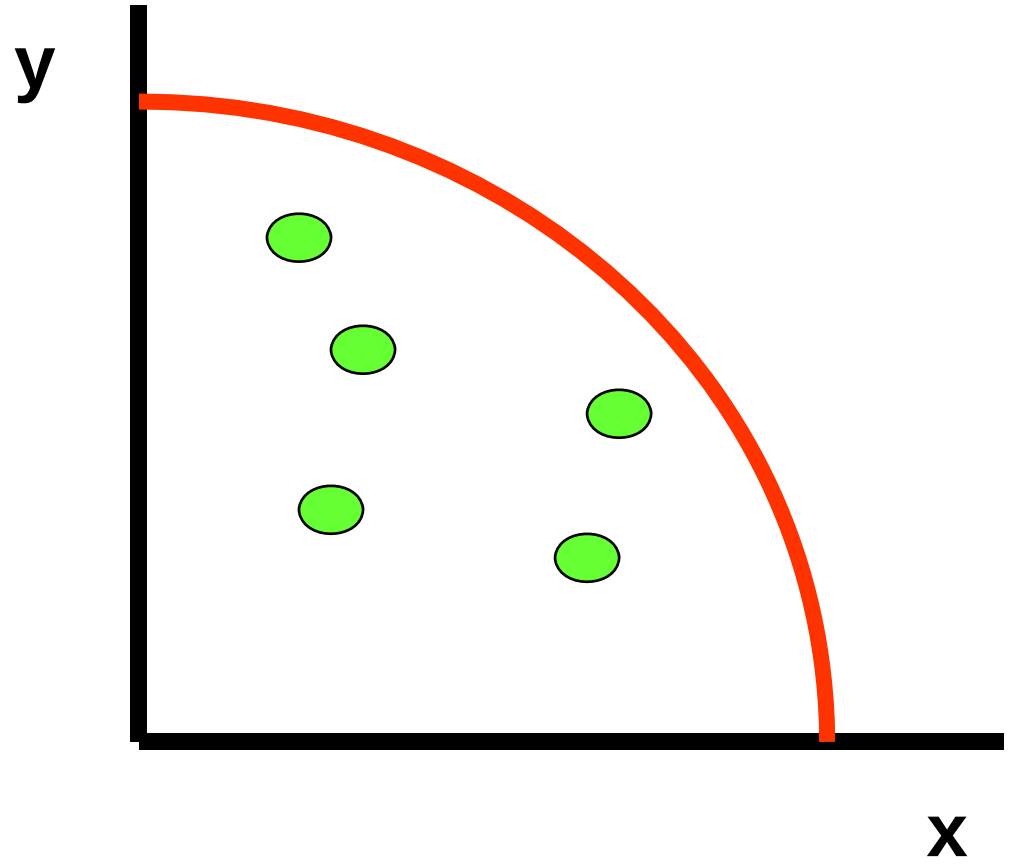


Each point on the production possibility curve is (Pareto) efficient

Production Possibility Curve

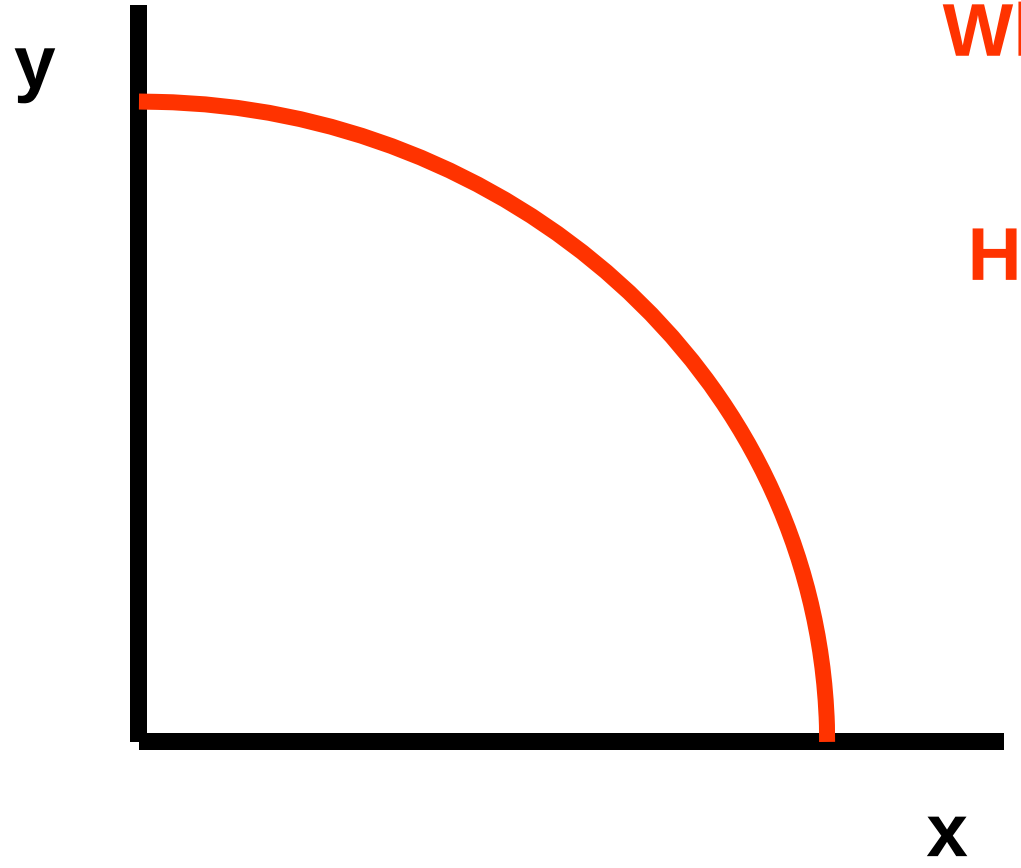


Production Possibility Curve



Points lie inside the curve are (Pareto) inefficient

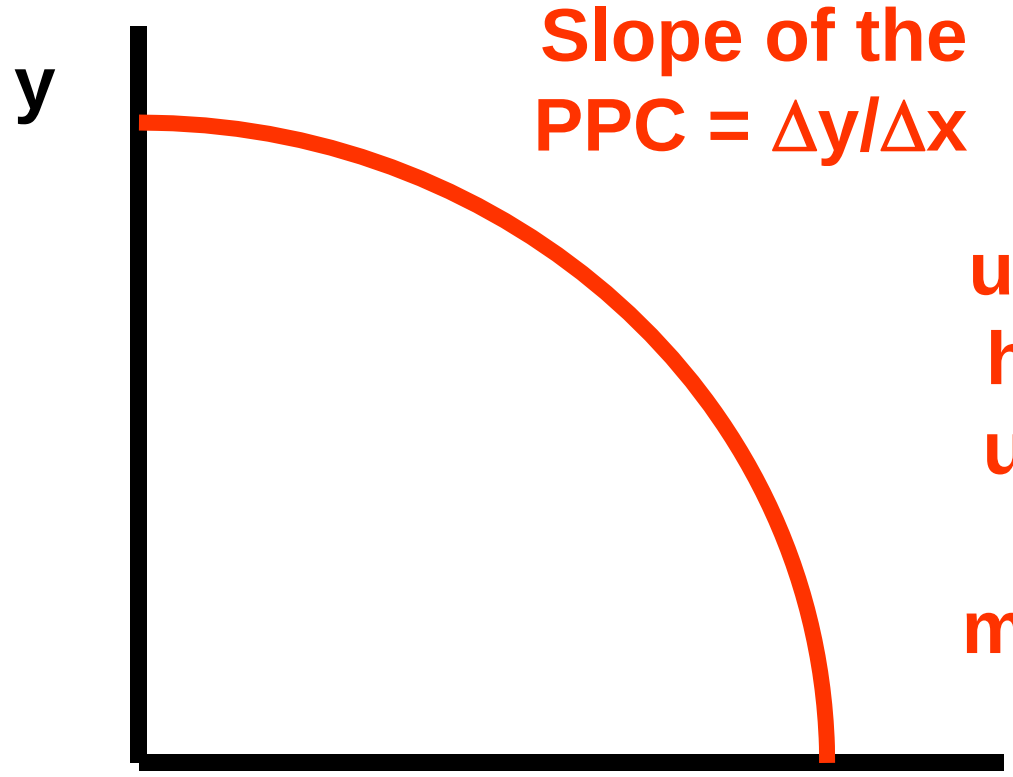
Production Possibility Curve



Where on the PPC?

How much X and how much Y should be produced?

Production Possibility Curve



Slope of the PPC = $\Delta y/\Delta x$

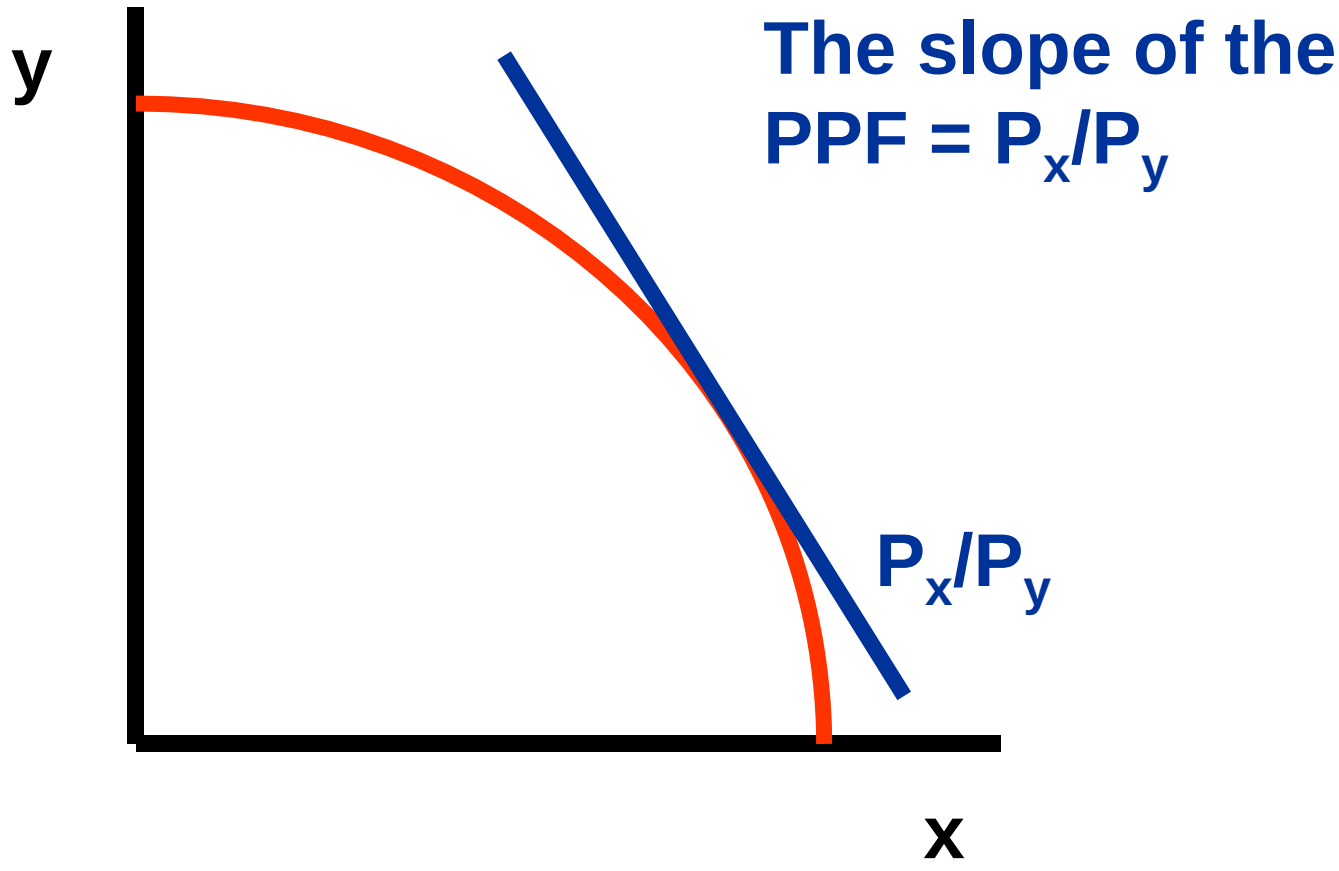
How many units of Y that have to given up in order to produce one more unit of X

Marginal rate of product transformation (MRPT or MRT)

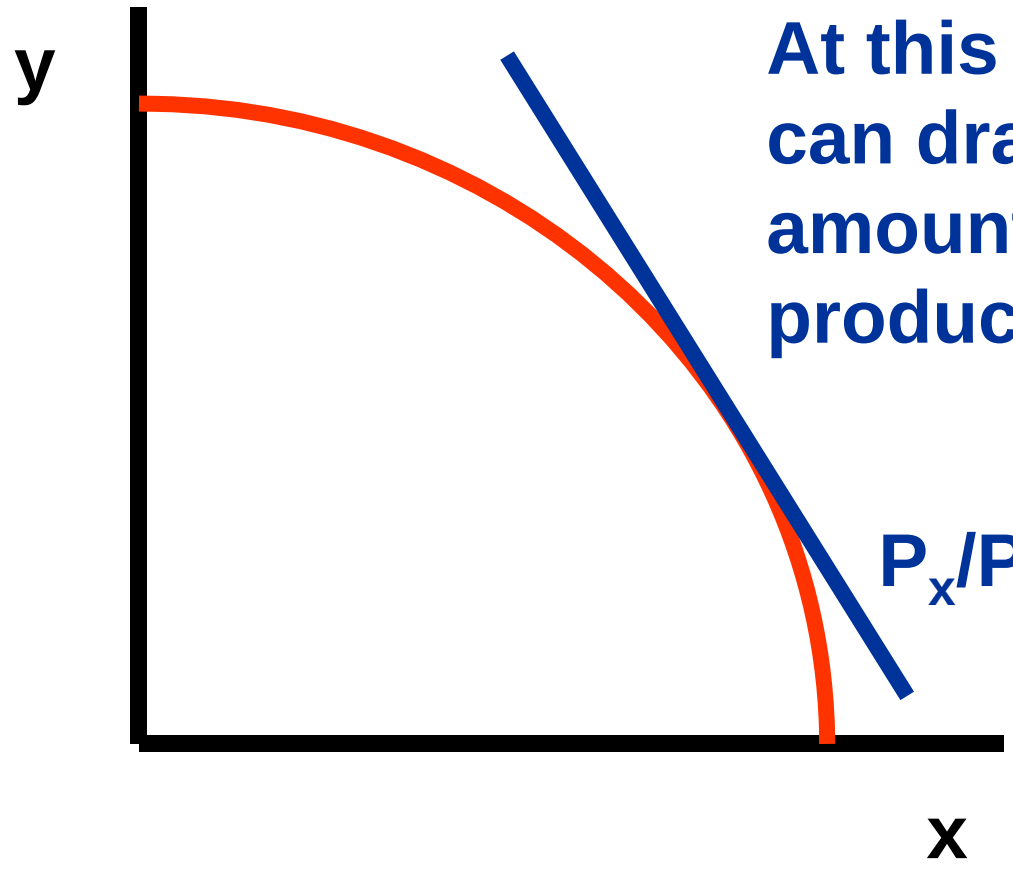
General Equilibrium

- **Claim: In equilibrium, firms will produce at the point on the production possibility curve at which MRPT = P_x/P_y**
- **If MRPT < $P_x/P_y \Rightarrow$ produce more X and less Y**
- **If MRPT > $P_x/P_y \Rightarrow$ produce less X and more Y**
- **[Aside: $MRS_{xy} = P_x/P_y \Rightarrow MRPT_{xy} = MRS_{xy}$]**

General Equilibrium

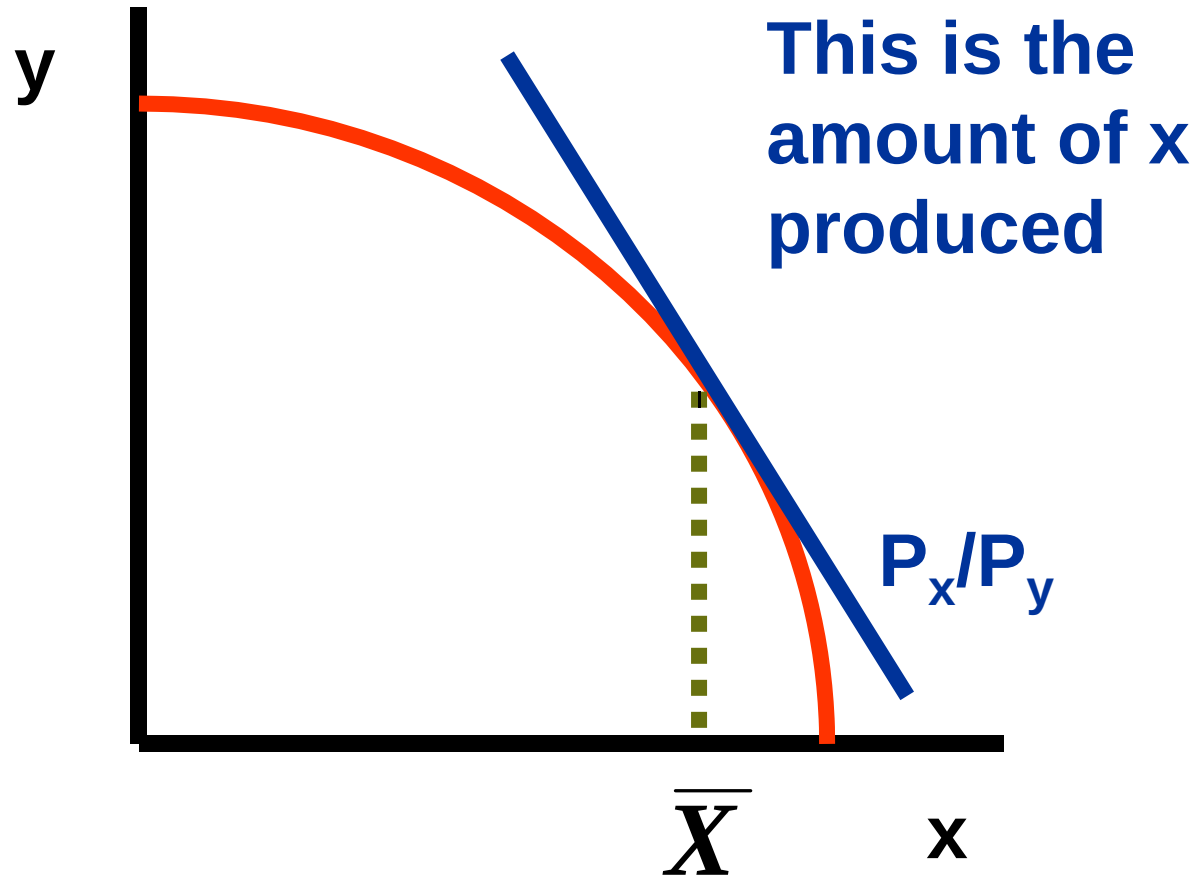


General Equilibrium

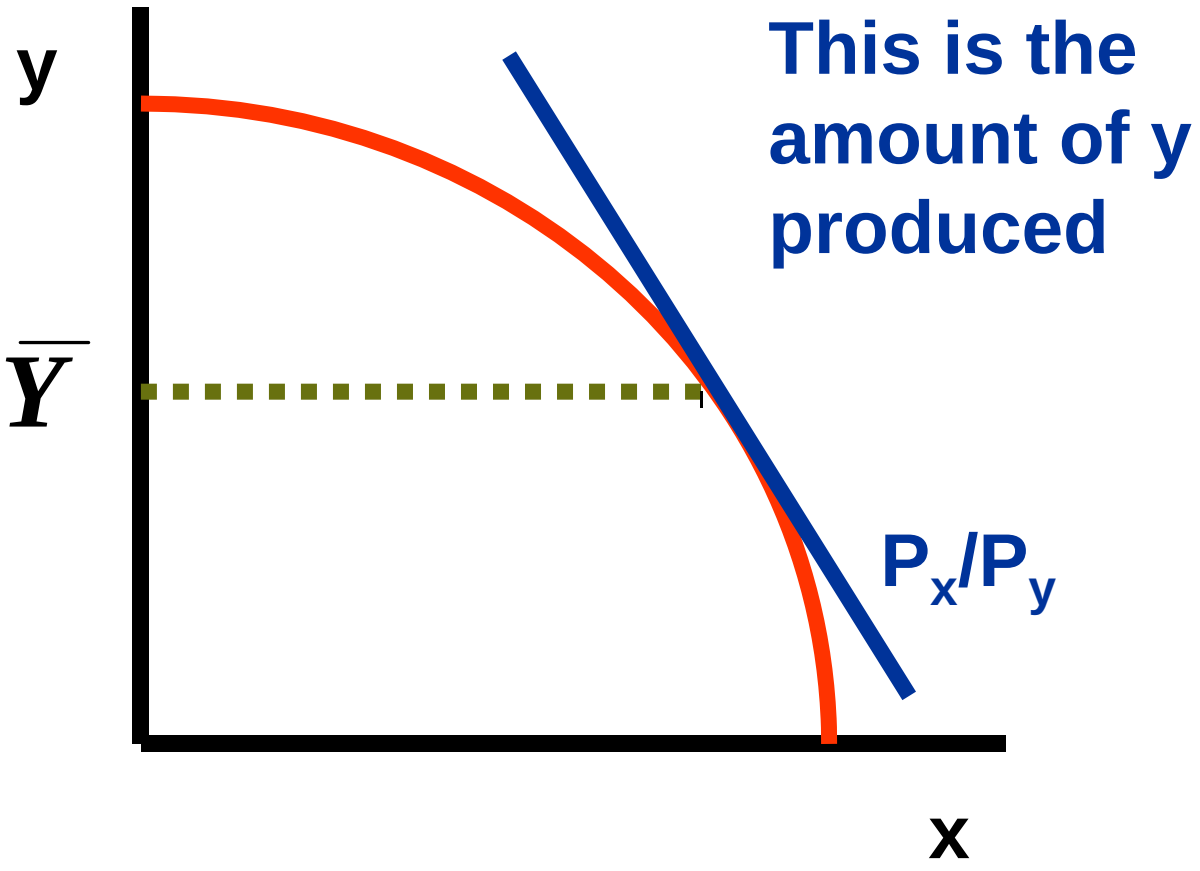


At this point we can draw in the amount of x and y produced

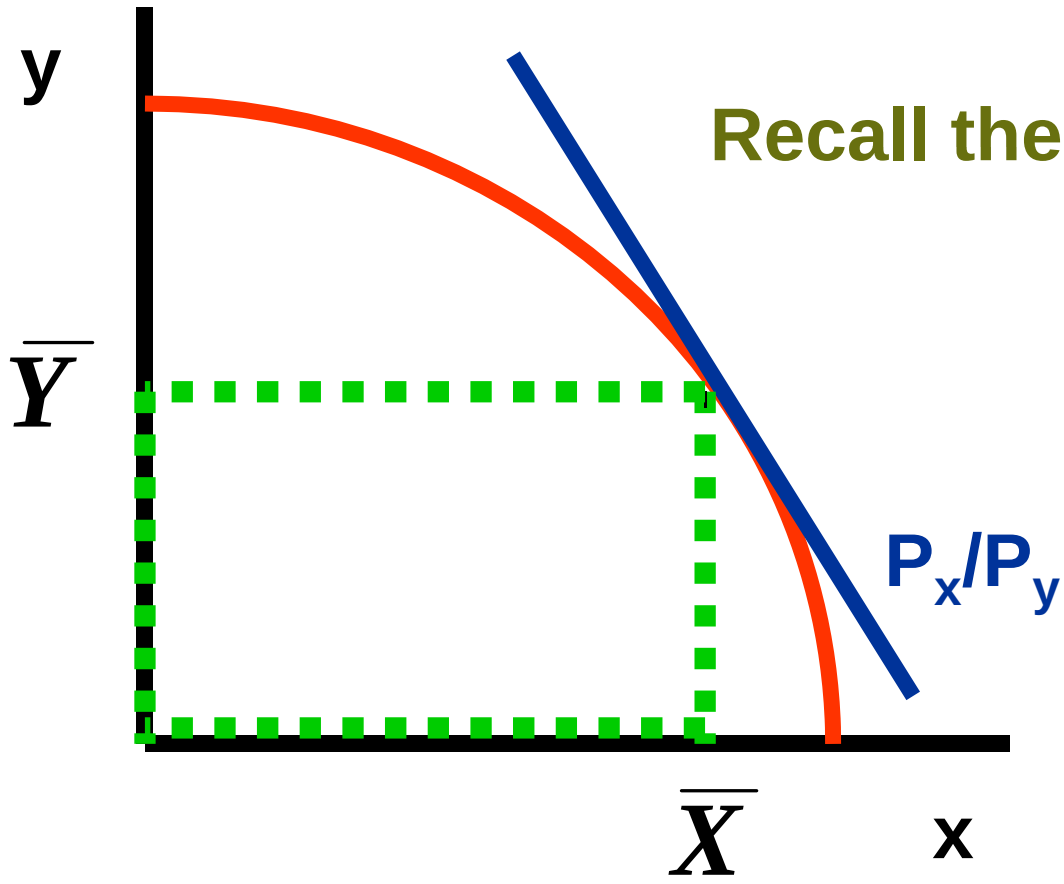
General Equilibrium



General Equilibrium

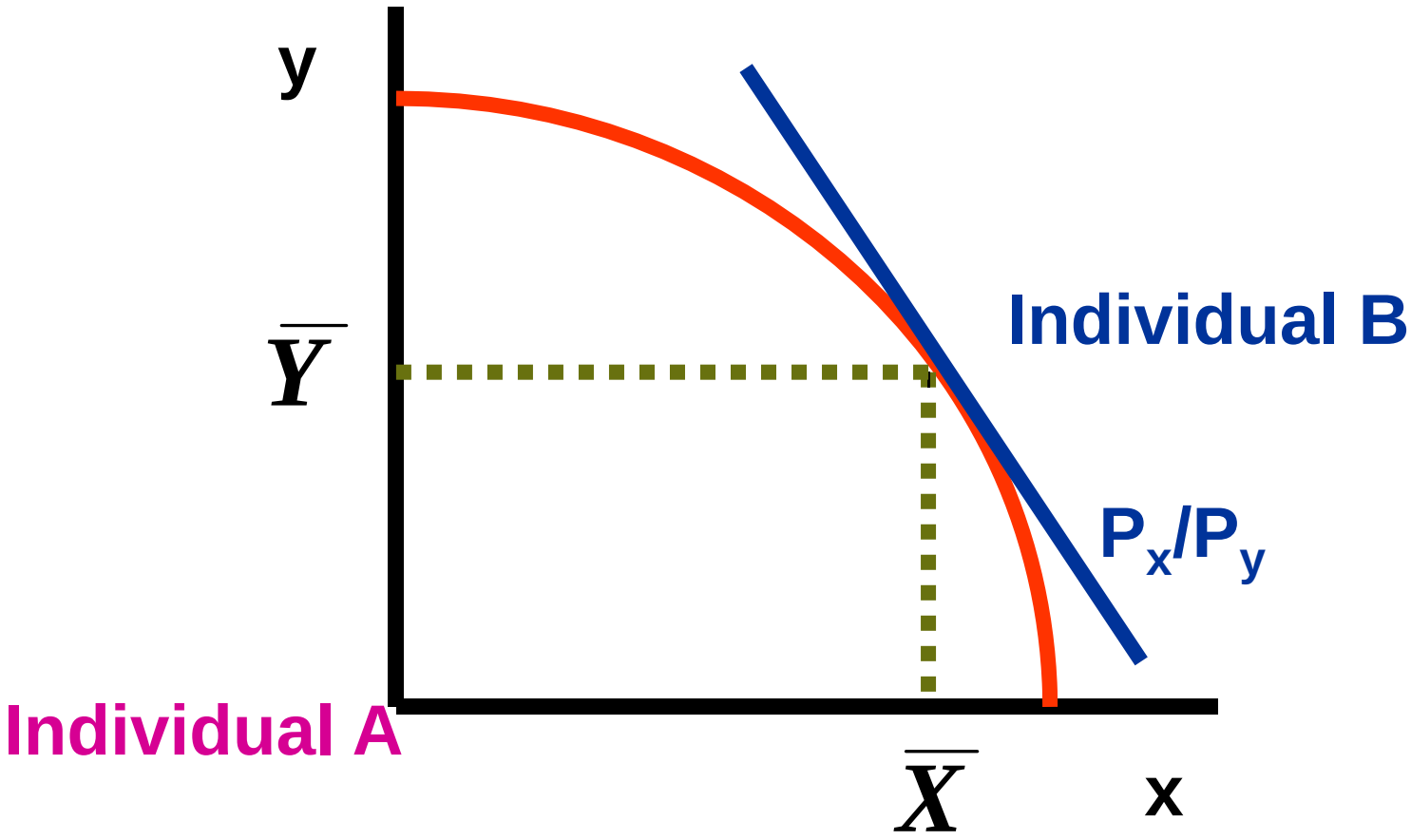


General Equilibrium

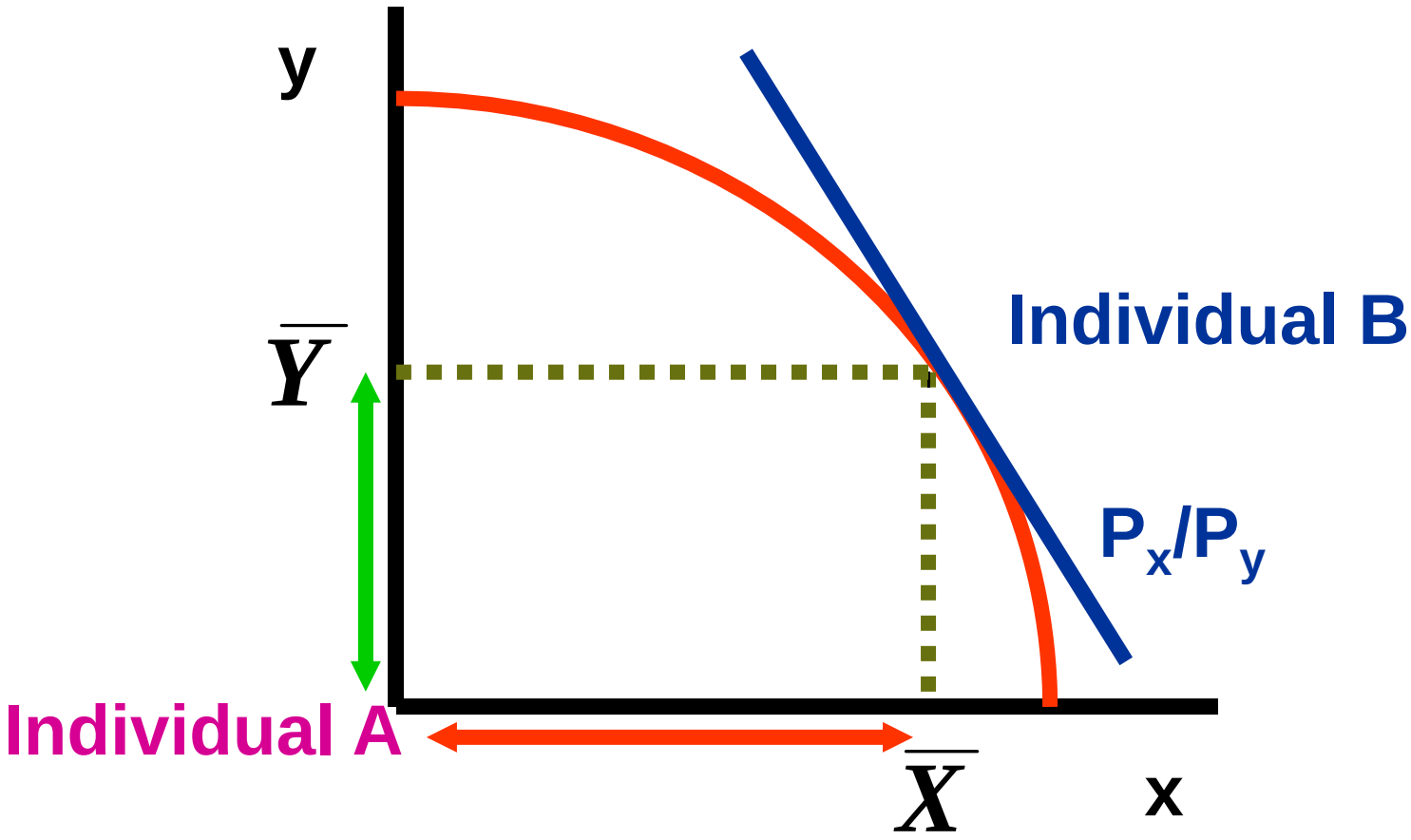


Recall the Edgeworth box

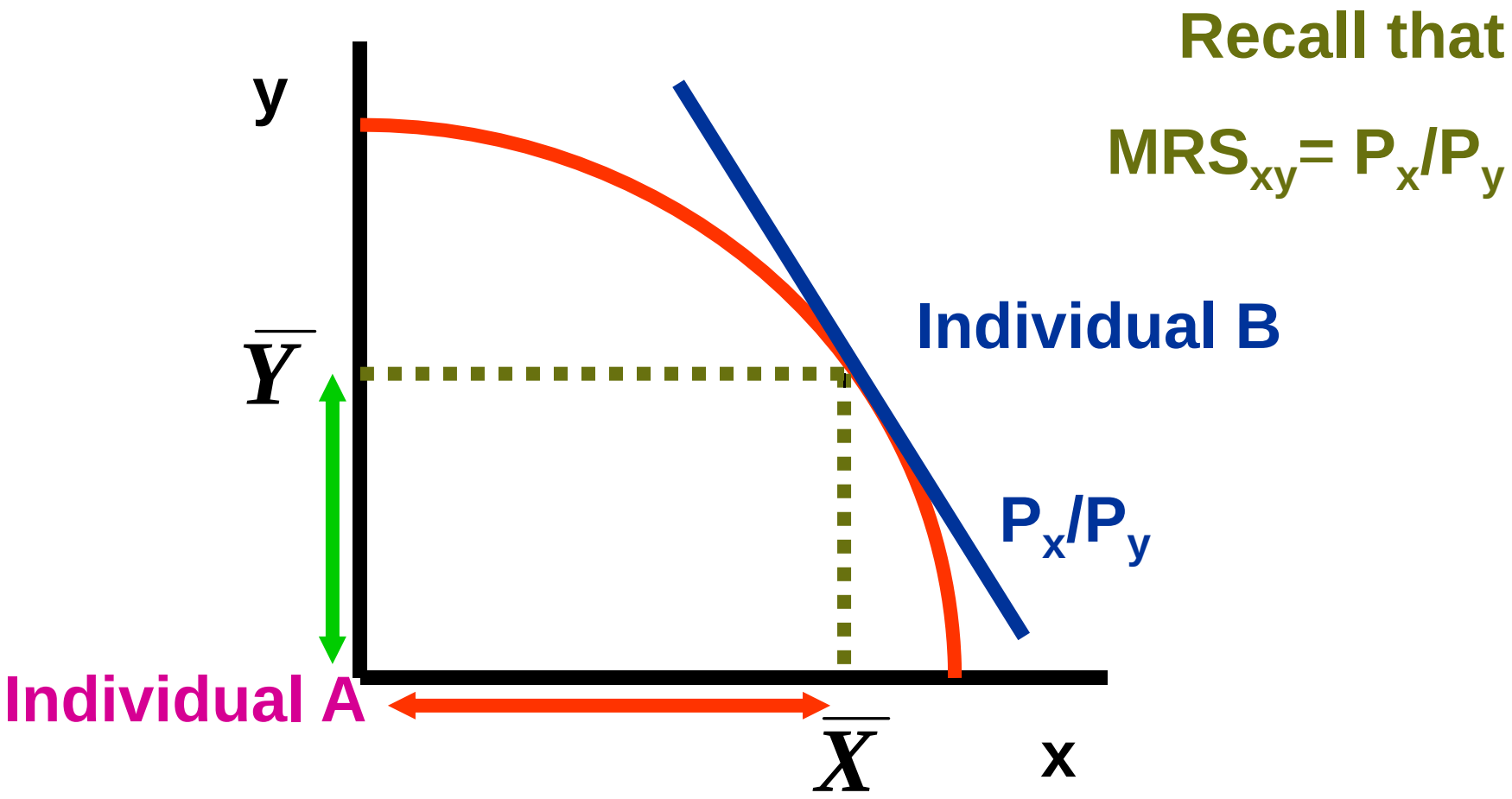
General Equilibrium



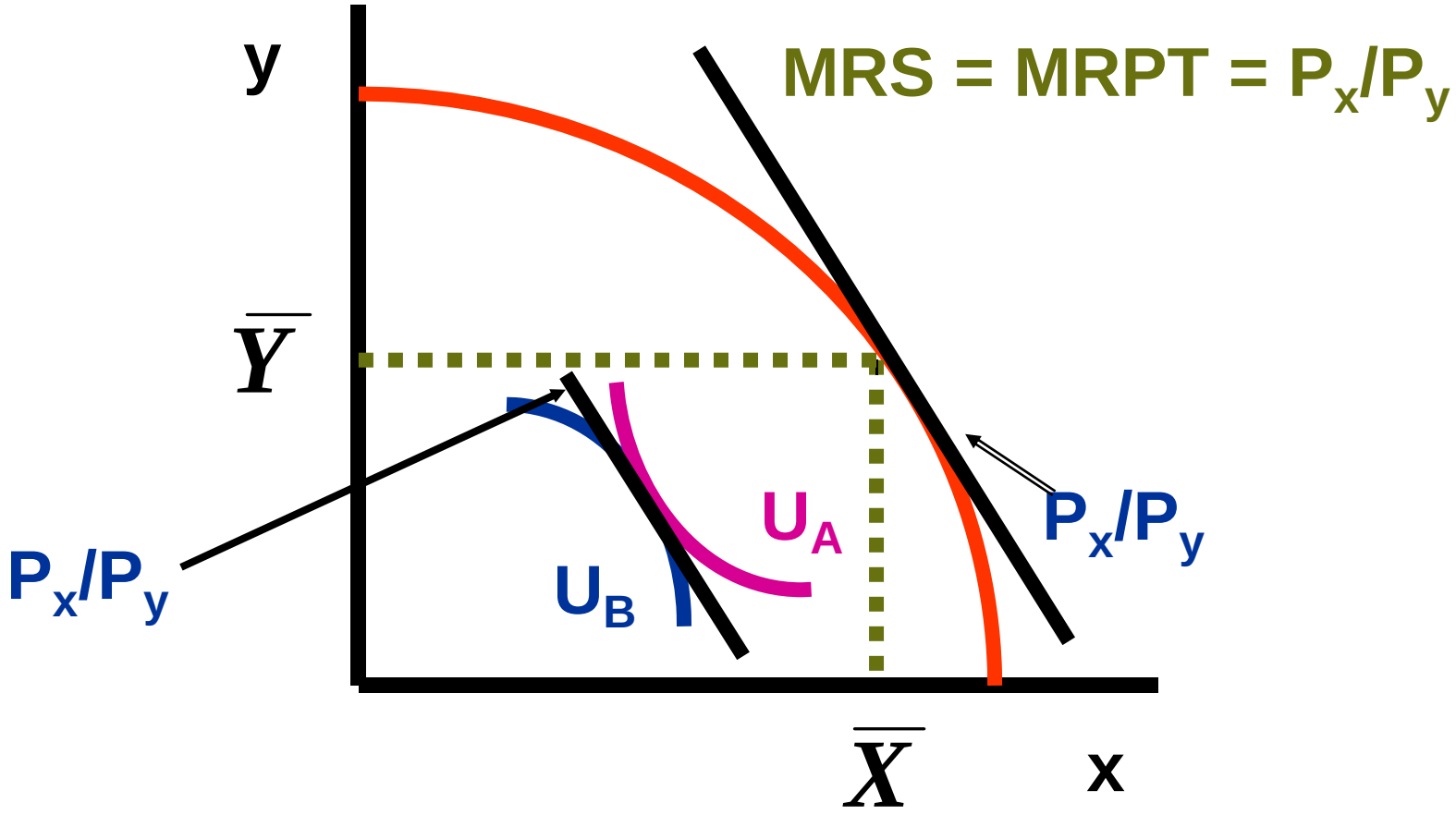
General Equilibrium



General Equilibrium



General Equilibrium



General Equilibrium

Three Conditions for General Equilibrium:

$$\textbf{(1)}\quad \boldsymbol{MRS^{A}_{XY} = MRS^{B}_{XY} = \frac{P_X}{P_Y}}$$

$$(2)\quad MRTS^{X}_{LK} = MRTS^{Y}_{LK} = \frac{P_L}{P_K} = \frac{w}{r}$$

$$\textbf{(3)}\quad \boldsymbol{MRPT_{XY} = \frac{P_X}{P_Y} = MRS_{XY}}$$

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.