# Heckscher and Ohlin Theorem (H-O):

- "Each country benefits by exporting the good that uses its relatively abundant factor of production more intensively."
- **Comparative advantage** arises in the sector that uses the relatively abundant factor of production more intensively.
- **The Model:**
  - 2 countries
  - 2 goods
  - 2 factors of production (inputs)

# 2x2x2 model: Hypotheses

- **Two countries** (I and II)
- **Two goods** (A and B)
- **Two factors of production** (capital K and labour L)
- **Main assumptions:**
- Free international trade (no tariffs, quotas, or transport costs)
- Both countries have the same production functions and technology for each good
- Countries differ only in the **relative abundance of factors of production**
- Suppose A is the labor-intensive good and
- B is the capital-intensive good.

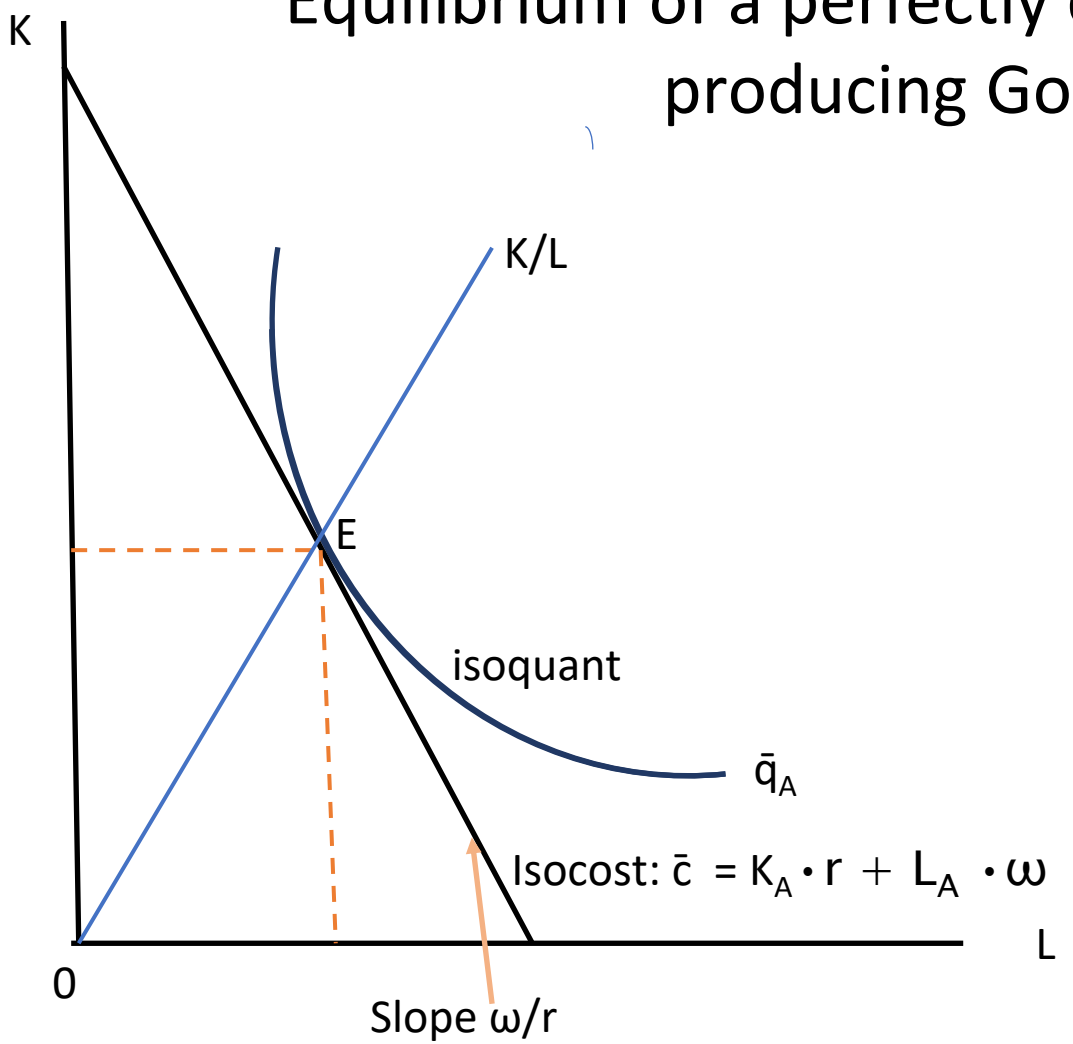
# How do we define the labour-intensive good? How do we define the capital-intensive good?

- Let
- ω: price of labor (wage)
- r: price of capital (rent)
- If for any ratio, ω/r
  the inequality
- $(K/L)^B > (K/L)^A$ holds, $\Rightarrow$
- Good B is the capital-intensive good and
- A is the labour-intensive good

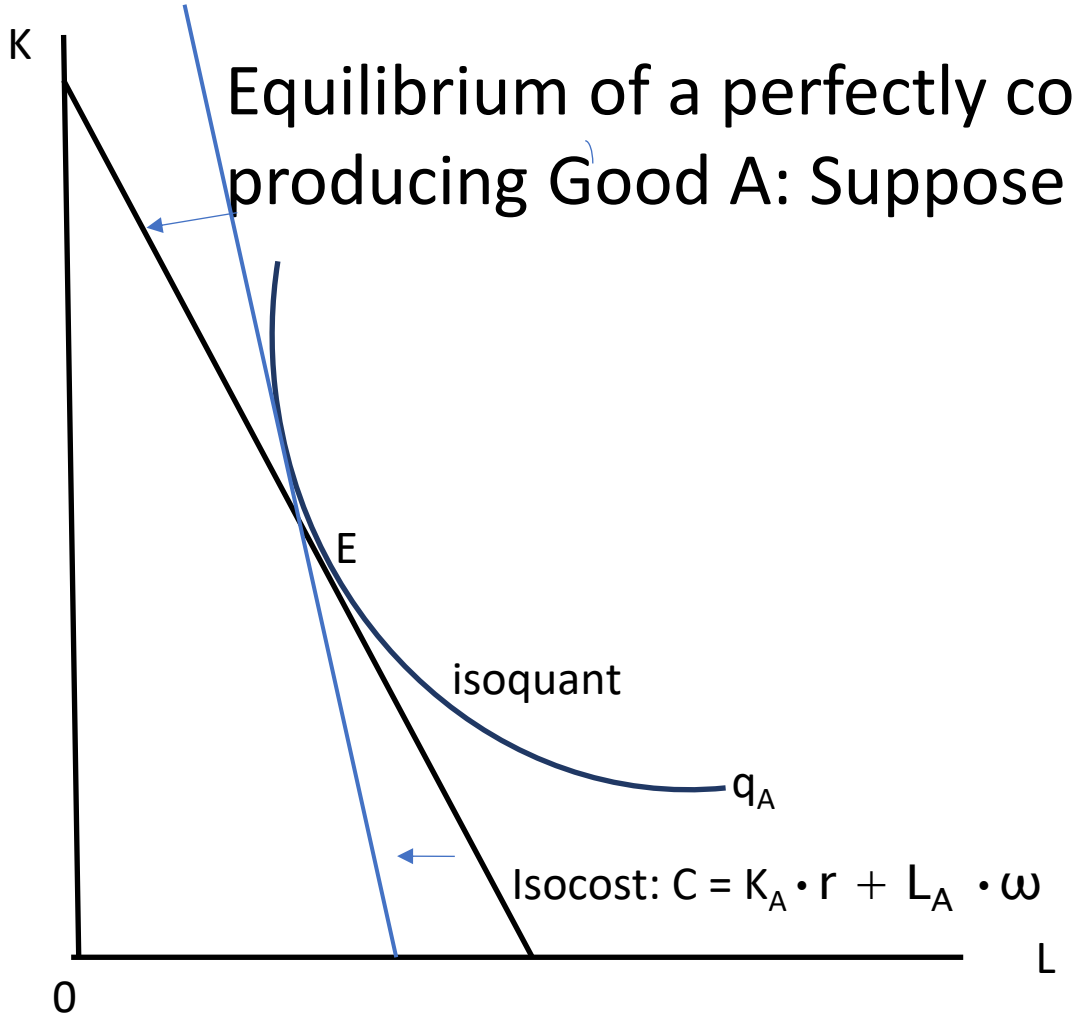
# The relation between K/L και ω/r

- There is a **positive relationship** between K/L and ω/r in production.
- As ω/r rises, production becomes more **capital-intensive.**
  When a good becomes more capital-intensive, **labour is substituted by capital**, which has now become **relatively cheaper.**

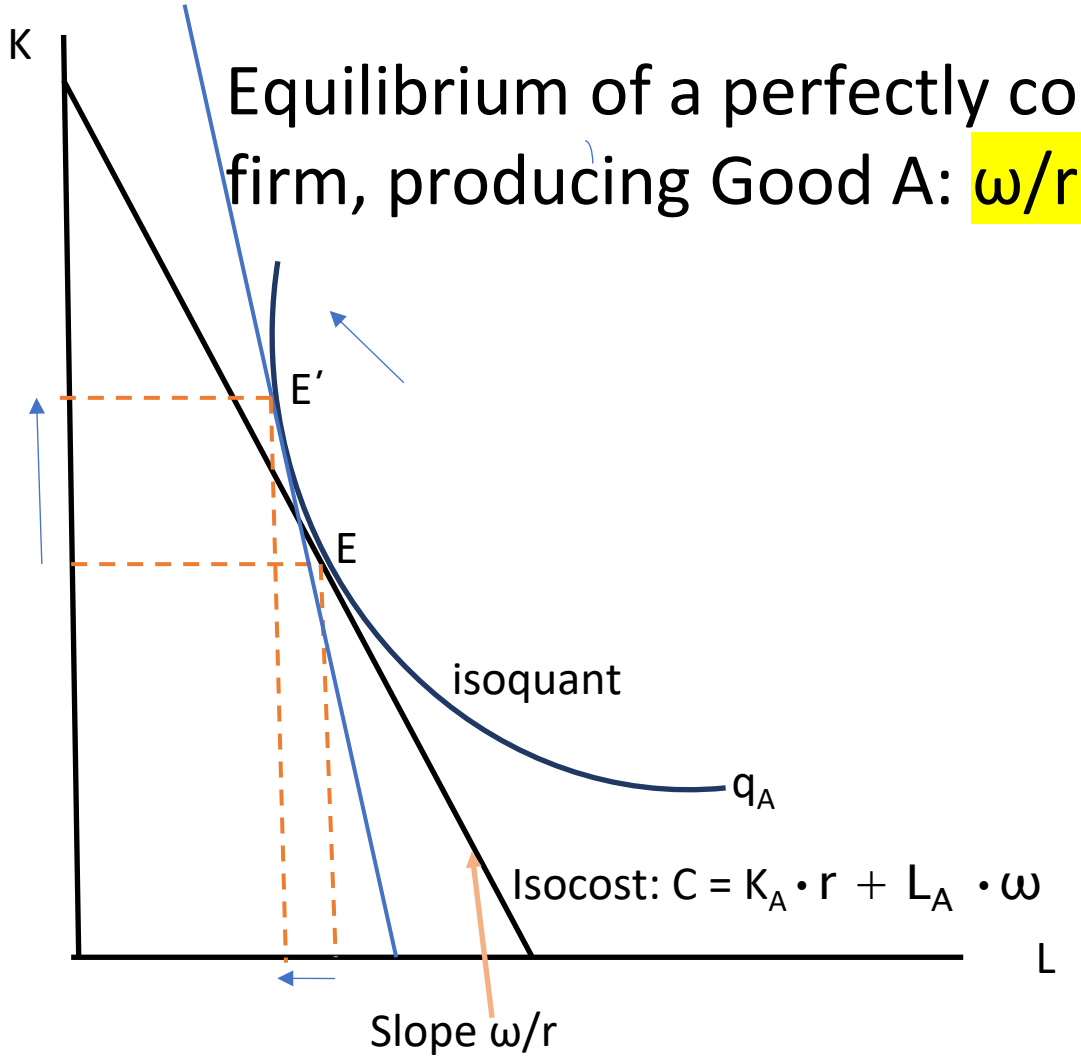
# Equilibrium of a perfectly competitive firm, producing Good A



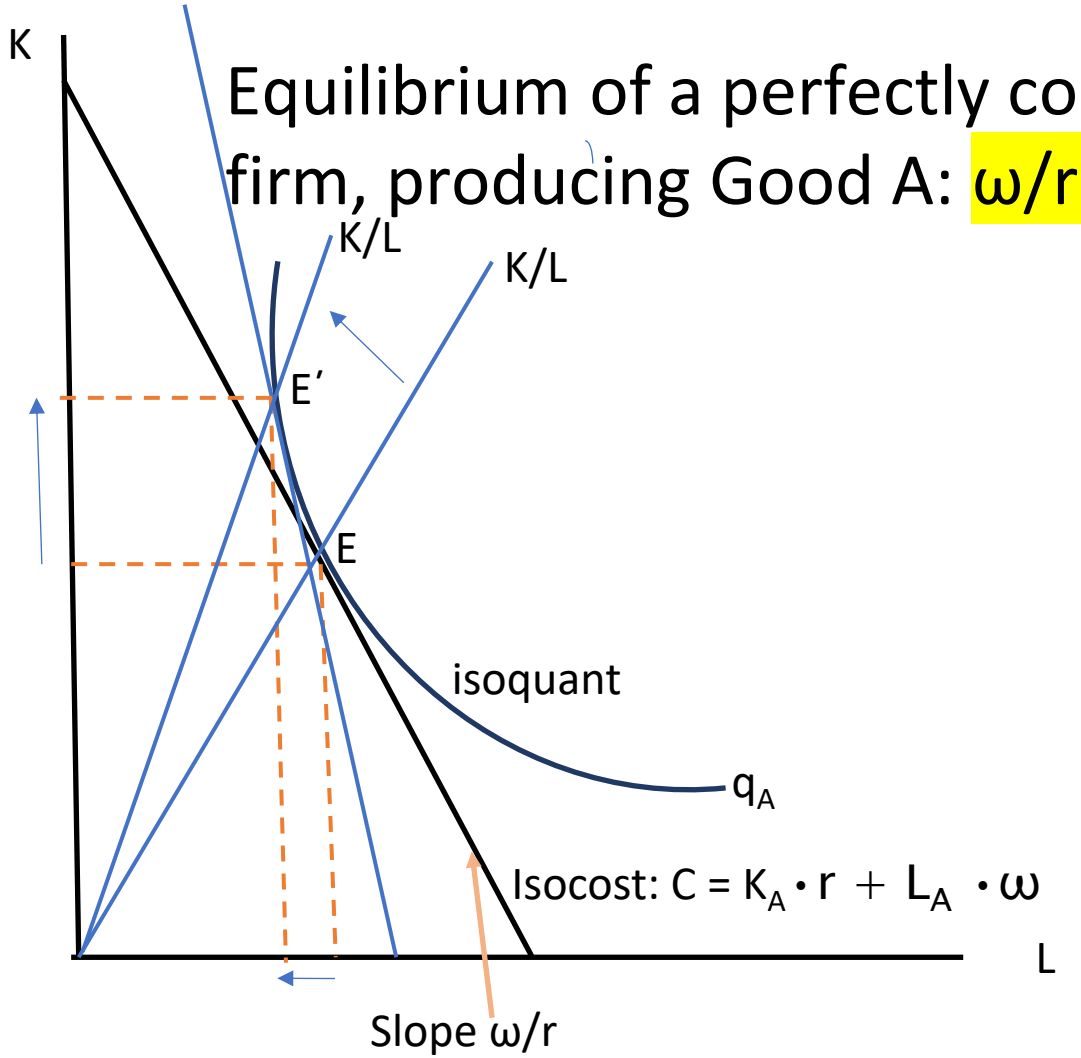
# Equilibrium of a perfectly competitive firm, producing Good A: Suppose that ω/r rises



# Equilibrium of a perfectly competitive firm, producing Good A: ω/r rises

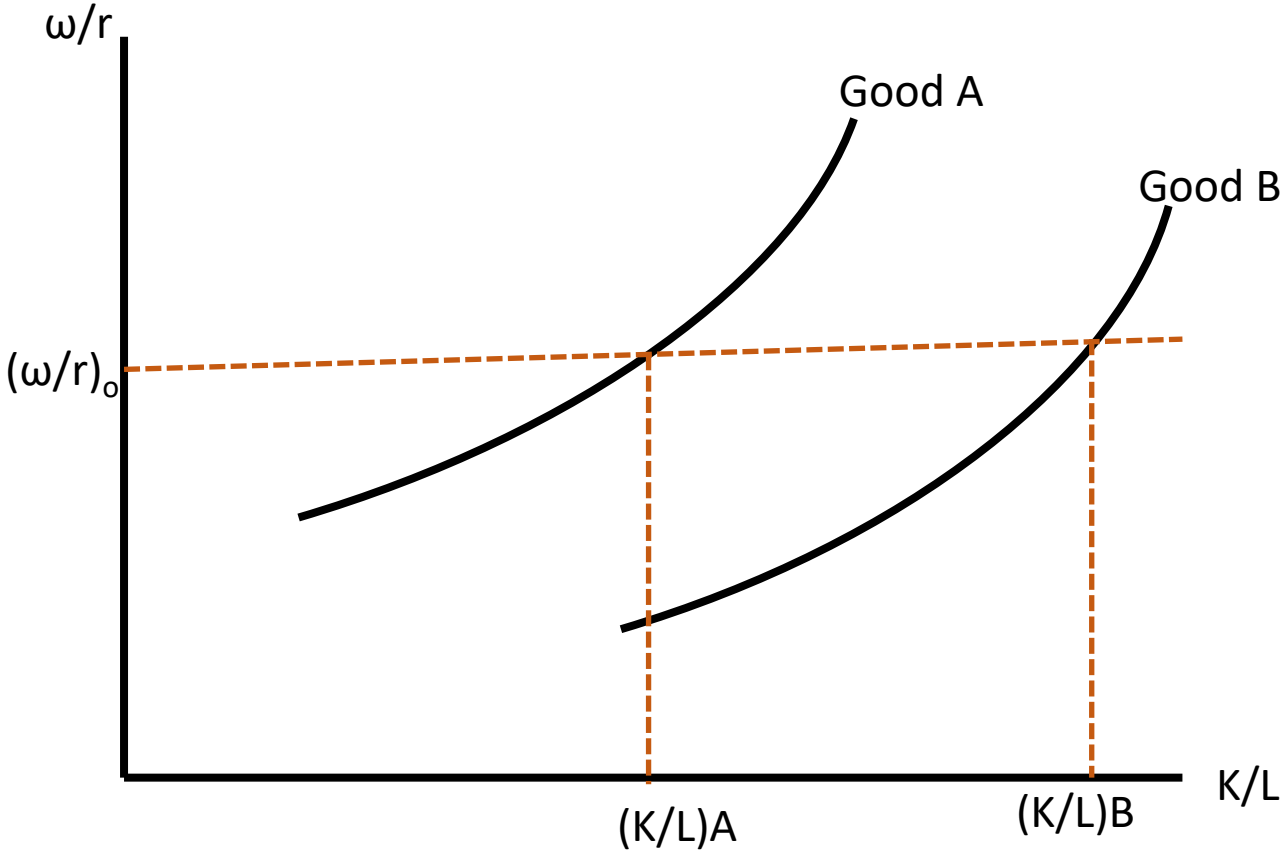


# Equilibrium of a perfectly competitive firm, producing Good A: ω/r rises




→ Positive relation between (ω/r) and (K/L)

Given the wage/rent ratio, **Good A** is always the labour-intensive good and **Good B** is the capital-intensive good (assumption)



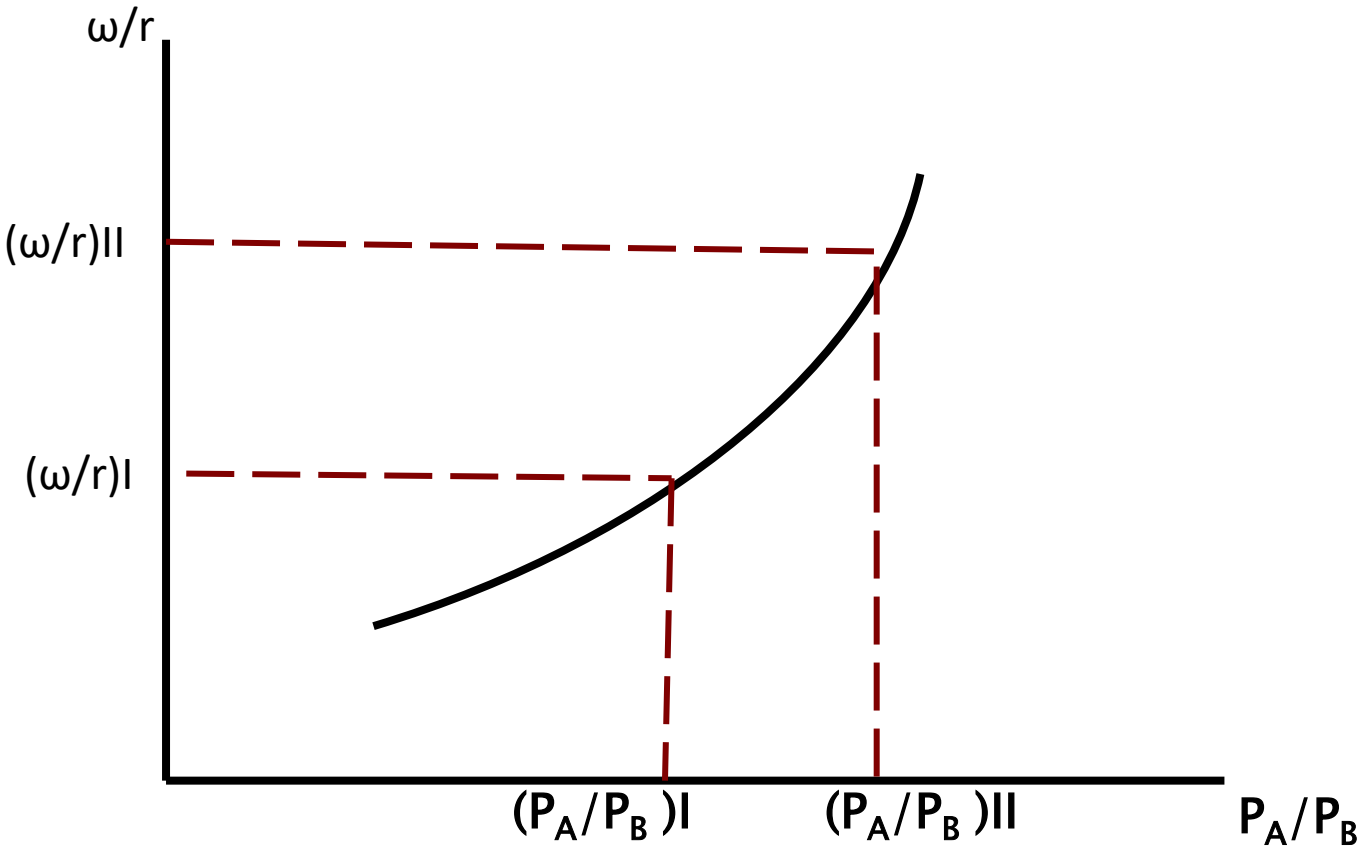
# Relative Abundance of Factors

- How do we define the relative abundance of factors of production?
- Two equivalent definitions:
- **1. In terms of factor prices:**
  If $(\omega/r)I < (\omega/r)II \rightarrow$ Country I is labour-abundant, Country II is capital-abundant.
- **2. In terms of factor quantities:**
  If $(L/K)I > (L/K)II \rightarrow$ Country I is labour-abundant, Country II is capital-abundant.
- Usually, the two definitions coincide.

# Comparative advantage

- What is the meaning of comparative advantage according to the Heckscher-Ohlin theorem?
- If Country I is **labour-abundant, Good A (labour-intensive**) will be **relatively cheaper** in Country I.
  This is because ω/r and PA/PB are positively related:
  as ω/r increases, PA/PB also increases.
- → **Country I exports Good A**, which uses its abundant factor (labour) more intensively.
- Next, we will discuss the relation between ω/r and PA/PB.

# Unique positive relation between $\omega/r$ and $P_A/P_B$



# In country I, good A is the relatively cheaper good (before trade)

- ⇒ **sector A has the comparative advantage.**
- Country, I, exports good A, which uses its relatively abundant factor (labor) more intensively in production.

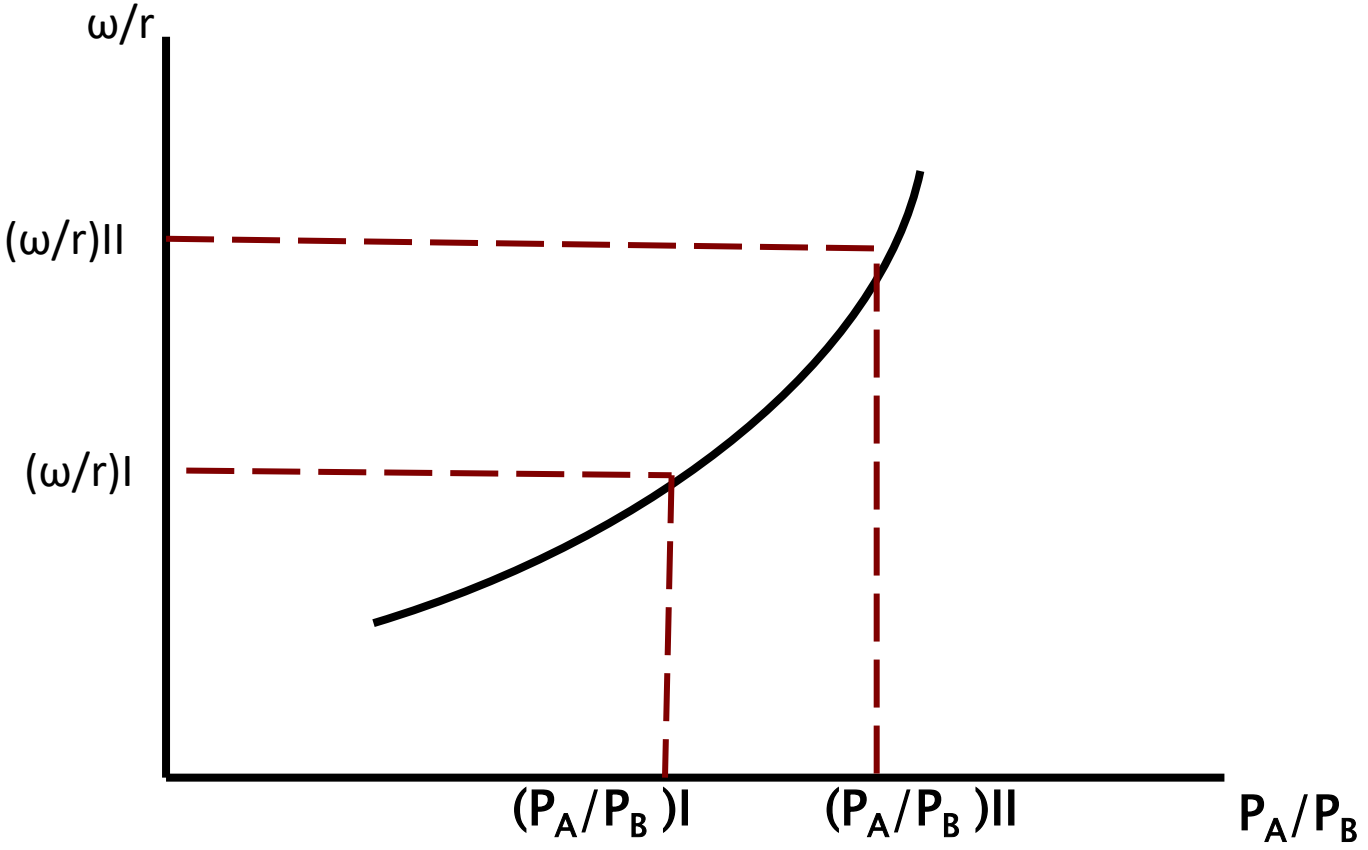
# Impact of international trade on relative prices:

- 1. The convergence of relative prices of commodities between countries occurs when international trade starts:
- In country I, $P_A/P_B$ increases.
- In country II, $P_A/P_B$ falls.
- Also,
- 2. convergence of relative prices of the factors of production, between countries:
- In country I, $\omega/r$ increases.
- In country II, $(\omega/r)$ falls.

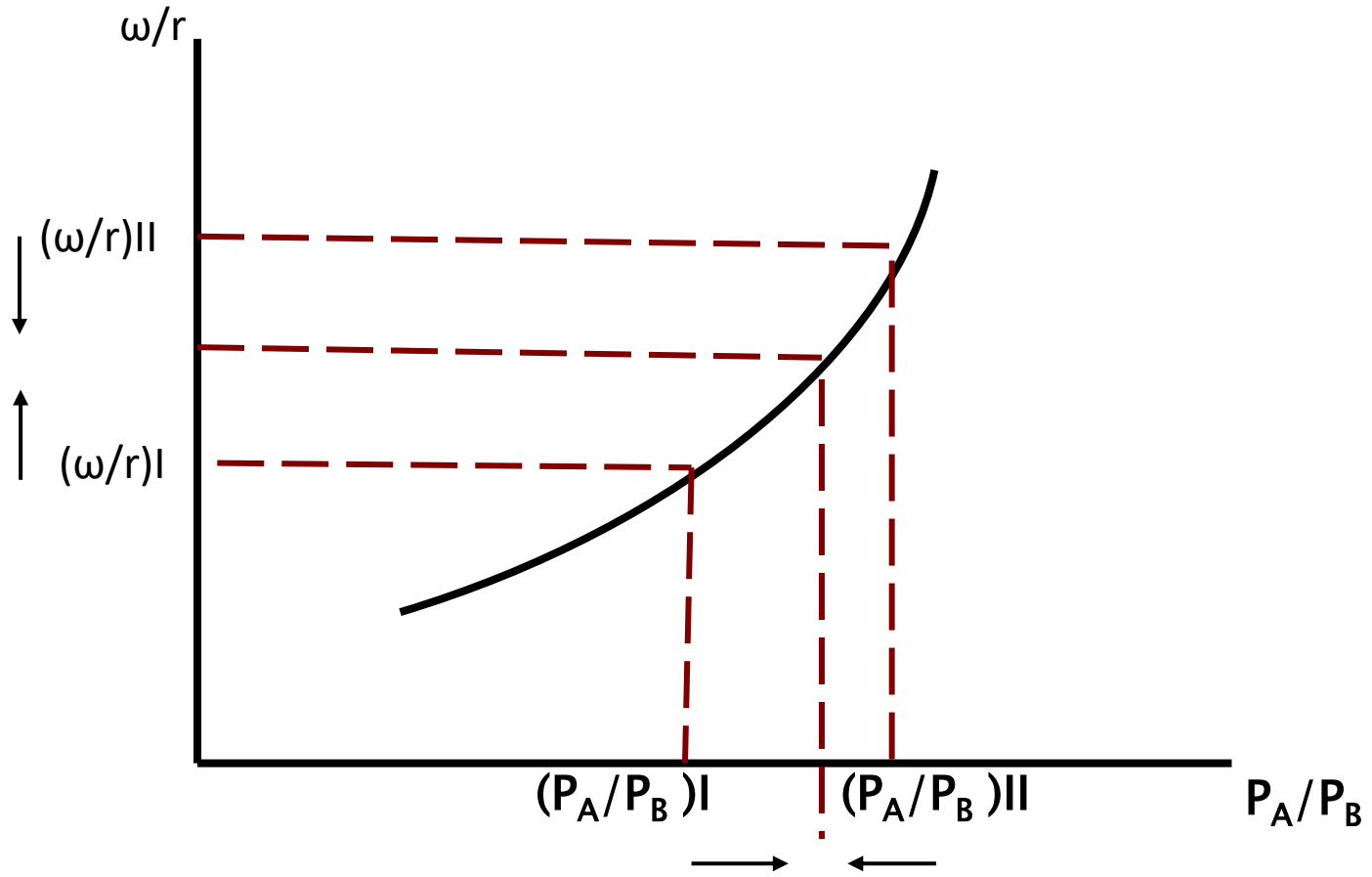
# Impact of international trade on the relative prices of goods and factors of production:

- **Before trade has started:**
- $(P_A/P_B)^I < (P_A/P_B)^{II}$
- **After trade:**
- $(P_A/P_B)^I \uparrow < (P_A/P_B)^{International} < (P_A/P_B)^{II} \downarrow$
- **Before trade has started:**
- $(\omega/r)^I < (\omega/r)^{II}$
- **After trade :**
- $(\omega/r)^I \uparrow < (\omega/r)^{International} < (\omega/r)^{II} \downarrow$

# $\omega/r$ and $P_A/P_B$ in the two countries, before international trade



# Convergence of $\omega/r$ and $P_A/P_B$ after international trade



# Redistribution of income after international trade:

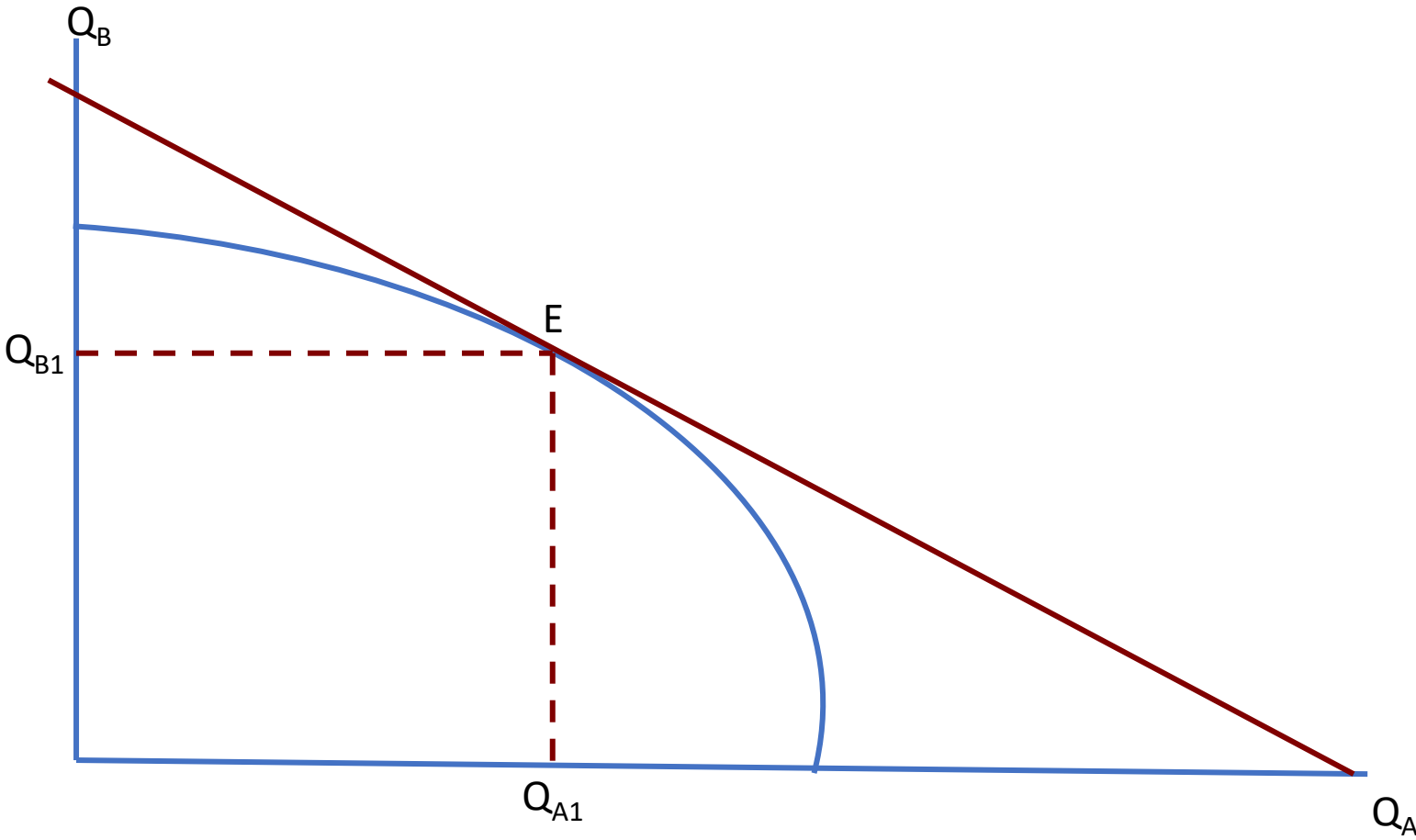
- In each country, the relatively affluent factor of production benefits.

- That is, the factor of production that is used in the exporting sector more intensively benefits from international trade.

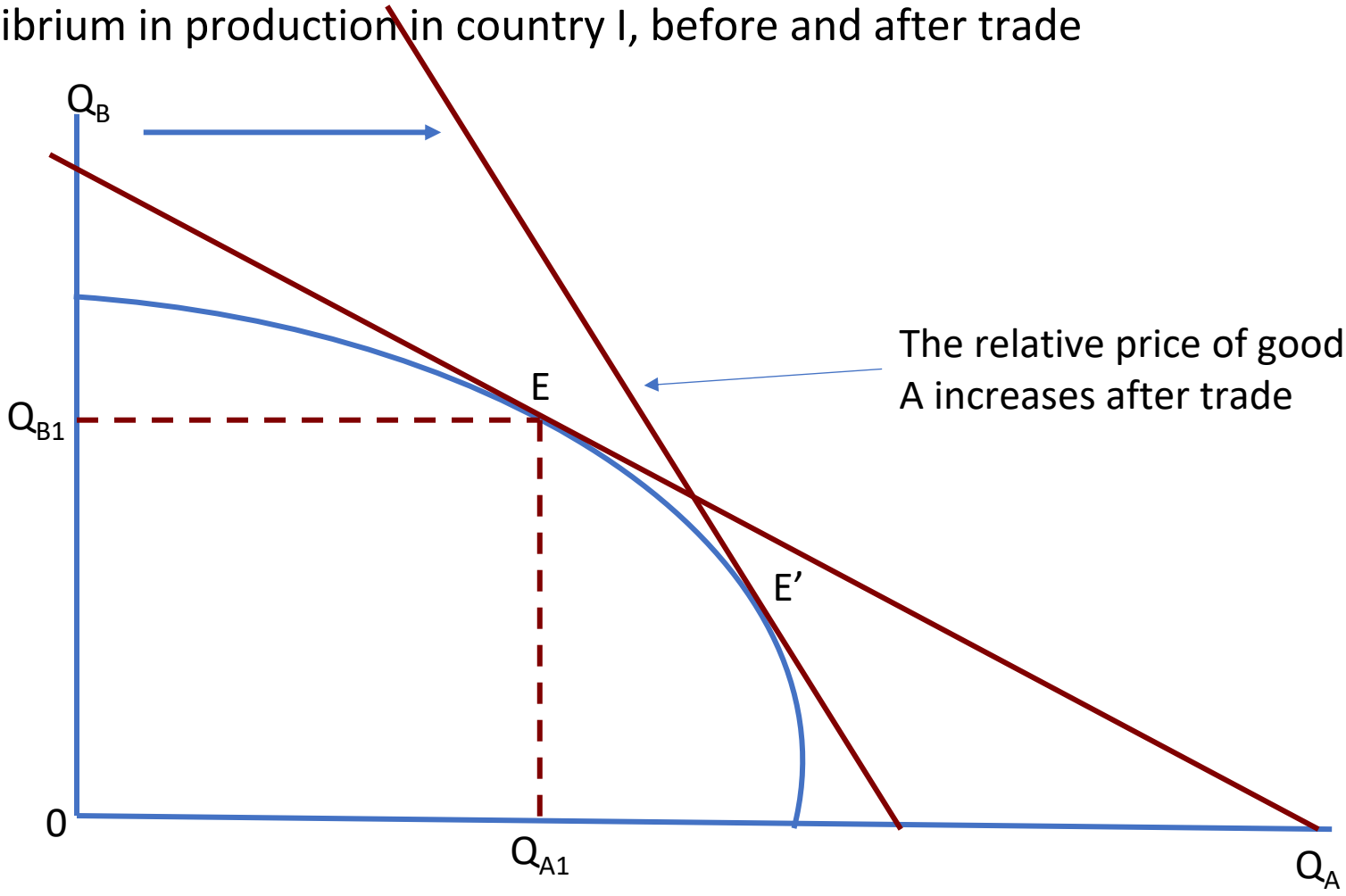
# To summarize: after international trade

- The relative price of the relatively abundant rises.
- In each country, the sector that produces the exporting good grows, at the expense of the other sector. (specialization occurs…but not complete)
- Relative prices of goods are equalized.
- Relative prices of factors of production are equalized.
- In each sector, the same technology (K/L), is used in both countries.

Equilibrium in country I, in a state of closed economy



Equilibrium in production in country I, before and after trade



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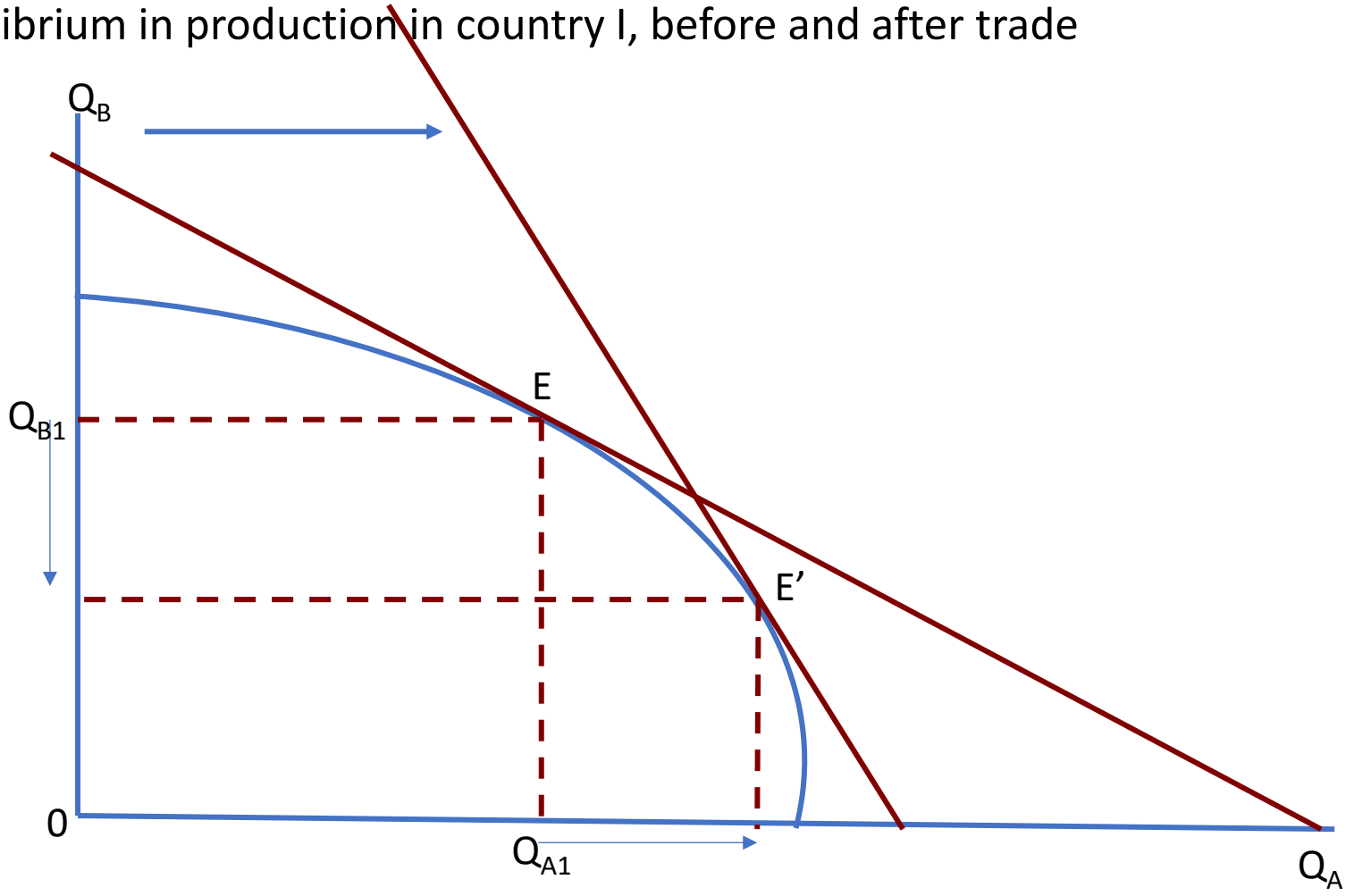

# H-O: The convergence of remuneration for factors of production across countries through international trade.

- After international trade begins between two countries, the relative prices of factors production equalize.
- Absolute prices of the factors of production are equalized when the absolute prices of goods are equalized.
- (This can occur only under the assumption of constant returns to scale.)

# International trade: indirect way of exchanging factors of production

- Although factors do not move freely between countries, trade in goods helps equalize their returns.
- However, in the real world:
- Technologies differ across countries.
- Barriers to trade exist.
- Equal pay across countries does **not** occur.

# Real-World Observation

- In the USA and other developed countries, **wage inequality** between skilled and unskilled workers increased between 1970 and 1990.
  Question:
- Is this increase due to free international trade?
- If developed countries export goods that use skilled labour more intensively,
  Then, after trade, we expect $\omega^s/\omega^{ns}$ (wages of skilled/unskilled) to increase in developed countries.
  However, data show mixed evidence — the ratio did **not** always increase.

- Relative prices of skilled intensive goods, Ps/Pns, did not increase in the 1970s-90s.
- In countries with affluency of unskilled labour (China, S. Korea ,…) : the share of labour in GDP has remained constant.
- the relative USA wage of skilled/unskilled labor did not increase.
- **(on the contrary) $\omega^s/\omega^{ns} \downarrow$**
- **Possible explanation:**
- In the data, the rise in **wage inequality** observed in developed countries
  is largely explained by **skill-biased technological change**, rather than by international trade alone.
- **International trade is a small share of US GDP. (In Europe, however, international trade has a larger share in GDP.)**

# Therefore, According to Heckscher–Ohlin theorem,

- Trade should raise skilled workers' wages in rich countries and unskilled workers' wages in poor countries.

- But the real-world evidence from the 1970s–90s doesn't fully support this.

- Instead, **technology — not trade — seems to explain most of the rise in wage inequality.**

# Empirical testing of the Heckscher-Ohlin theorem

- **1. Leontief Paradox (1953)**
  Leontief found that U.S. exports were **more labor-intensive** than imports — the opposite of what the H–O model predicted for a capital-abundant country.
- **Possible explanations:**
- U.S. labour is more productive (skilled).
- U.S. imports are intensive in raw materials.
- Technologies differ between countries.
- Product life-cycle theory may explain trade better.
- Human capital plays a key role.

- **2. Bowen, Leamer, Sveikauskas (1987)**
- Confirmed that trade in goods is an **indirect exchange of factors but** also found deviations due to technology and measurement issues.
- Each country will export, along with its products, its relatively affluent factor of production.
- They extended the H-O model to include

  27 countries, 12 factors of production.
- They compare the share of the income of the factor of production to the country's income, to the global share of this factor in global income**.**

# Main points to remember:

- Countries export goods that use their **abundant factors** relatively more intensively.
- Trade leads to relative **price convergence** and to **income redistribution.**
- The relatively abundant factor gains, the scarce factor loses.
- Real-world results are mixed due to technology, productivity, and policy differences.