# Heckscher-Ohlin Theory

## International Trade

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Lecture Slides

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# Outline

1. Overview
2. Important propositions
3. The rigid technology model
4. Further issues

# Overview

**The model**

i. Two sectors of production, $X$ and $Y$.
ii. Two perfectly mobile factors of production, K and L.
iii. Two countries
iv. Identical technology across countries.

**Factor abundance:**

The countries differ in their endowments of the production factors. E.g., country A is said to be capital abundant if:

$$\left(\frac{K}{L}\right)_A > \left(\frac{K}{L}\right)_B$$

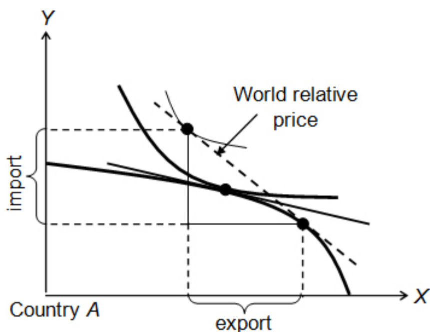
**Factor intensity:**

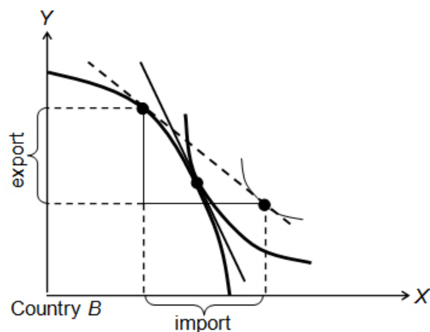
The crucial feature that distinguishes the production of $X$ from that of $Y$ is the factor intensity that each requires. $X$ is said to be capital intensive if (see Figure HO Production Isoquants):

$$\left(\frac{K}{L}\right)_X > \left(\frac{K}{L}\right)_Y$$

## Heckscher-Ohlin Theorem (trade pattern):

A country exports the good that uses intensively the factor that is in abundance in that country.



Country A has been assumed to be capital abundant. Since the production of $X$ is capital intensive, A's PPF willbe"biased" towards $X$. The opposite is the case for country B.

As can be seen, the relative price $\left(\frac{p_X}{p_Y}\right)$ under autarky is lower in country A (assuming identical preferences).

With trade, the prices equalize. The capital abundant country A exports the capital intensive good $X$ (its cheap good) and the labor abundant country B exports the labor intensive good $Y$.

# Important propositions

1. *Factor price equalization:* International trade is a perfect substitute for international factor movements.

   Caveat: Similar factor endowments. See Figure: HO Endowments, intensities and S-S caveat

2. Trade and the pattern of production *(Rybczynski-Theorem)*:

   An increase in a country's endowment of a factor will cause an increase in output of the good which uses that factor intensively, and a decrease in the output of the other good (magnification effects).

3. Trade and the distribution of income *(Stolper-Samuelson)*:

   An increase in the relative price of good $X$, $\left(\frac{p_X}{p_Y}\right)$, will raise the real return to the factor used intensively in the $X$-sector ($r$), and lower the real return of the factor used intensively in the other sector ($w$).

# The rigid technology model

$$\alpha_{LX}X + \alpha_{LY}Y = L \quad \Rightarrow \quad Y = -\frac{\alpha_{LX}}{\alpha_{LY}}X + \frac{L}{\alpha_{LY}}$$

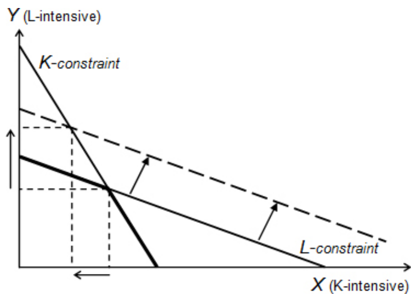
$$\alpha_{KX}X + \alpha_{KY}Y = K \quad \Rightarrow \quad Y = -\frac{\alpha_{KX}}{\alpha_{KY}}X + \frac{K}{\alpha_{KY}}$$

$$\alpha_{LX}w + \alpha_{KX}r = p_X \quad \Rightarrow \quad w = -\frac{\alpha_{KX}}{\alpha_{LX}}r + \frac{p_X}{\alpha_{LX}}$$

$$\alpha_{LY}w + \alpha_{KY}r = p_Y \quad \Rightarrow \quad w = -\frac{\alpha_{KY}}{\alpha_{LY}}r + \frac{p_Y}{\alpha_{LY}}$$

Let $X$ be capital intensive, so:

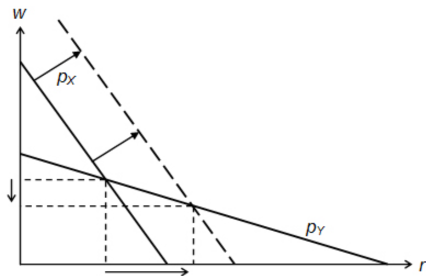
$$\frac{\alpha_{KX}}{\alpha_{LX}} > \frac{\alpha_{KY}}{\alpha_{LY}} \quad \Leftrightarrow \quad \frac{\alpha_{KX}}{\alpha_{KY}} > \frac{\alpha_{LX}}{\alpha_{LY}}$$




$$L \uparrow \Rightarrow X \downarrow,\ Y \uparrow$$

$$\hat{Y} > \hat{L} > \hat{K} = 0 > \hat{X}$$

(*Rybczynski*)




$$p_X \uparrow \Rightarrow w \downarrow,\ r \uparrow$$

$$\hat{r} > \hat{p}_X > \hat{p}_Y = 0 > \hat{w}$$

(*Stolper-Samuelson*)

# Further issues

**The H-O Theory** as the long run version of the specific factors model.
See Figure: HO Trade and Wages: Short vs Long Term

**Multi-good, multi-country extension:**

Countries will on average be a net exporter of the services of its least expensive factors and a net importer of the services of its more expensive factors.

**Key predictions:**

Coalitions based on factor ownership (rather than industry affiliation)

(a) Each factor will favor either free trade or protection but not both

(b) A factor's position does not depend on its industry affiliation (importable vs. exportable)

Finding: These predictions are empirically rejected

Tests of the H-O Theory:

Leontieff paradox: Rejection of the H-O theory

US exports less capital intensive than US imports

Possible explanations of failure:

1. Effectiveness of US labor
2. Labor skills and human capital
3. Product cycle
4. R&D
5. Natural resources
6. Tariffs

**Re-specification of the H-O theory:**

Factor abundance:
Factor $i$ is abundant relative to $j$ if the country's world share of factor $i$ is greater than its world share of $j$. Factor $i$ is abundant if a country's share of the world supply of that factor exceeds its world income share.

Trade in goods is indirectly trade in services of the factors of production.
Leamer: A country will be a net exporter of the services of its abundant factor

Finding: The pattern of trade is broadly consistent with this proposition. But many problems remain.

Summary: The key concept of factor endowments-intensities

- The relative national supplies of factors of production coupled with the "preference" for certain factor by certain industries determine the pattern of trade
- International trade has dramatic implications for the composition of production and the internal distribution of income
- Trade tends to equalize wages internationally even in the absence of international labor mobility
- Free trade reduces the incentives for factor migration
- Political implications: Class struggle

# Figures

Factor Intensities and Factor Endowments

If the capital/labor endowment ratio at home is $k$, the wage/rental ratio must lie in the range $BC$. If the capital-abundant foreign country has the endowment ratio $k^*$, there is an overlap of possible wage/rental ratios in the two countries, $DC$. Free trade *may* equalize factor prices. Should the foreign endowment ratio be at the higher value $k^{**}$, the relative wage rate abroad *must* be higher than at home.

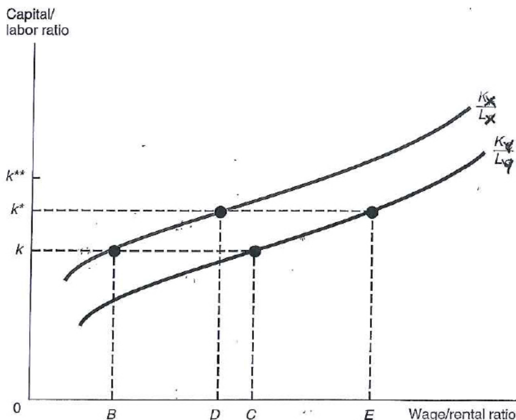



Figure: Optional material: HO Endowments, intensities and S-S caveat

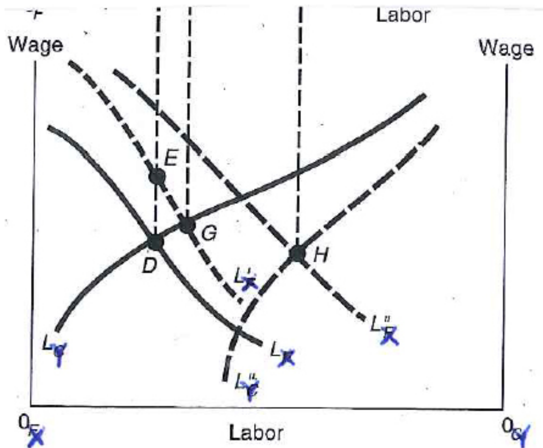



Figure: Optional material: HO Trade and Wages: Short vs Long Term

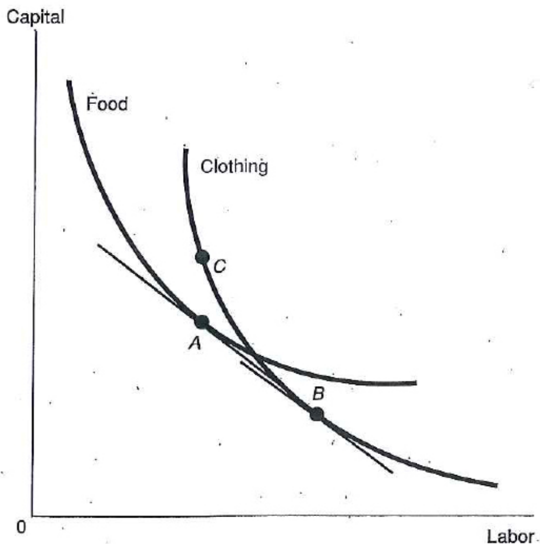



Figure: HO Production Isoquants