CHAPTER 5

Factor Endowments and the Heckscher- Ohlin Theory

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Lecture Overview

1. Assumptions
2. Factor intensity - Factor abundance
3. Factor Endowment and H-O theory
4. Factor – Price Equalization and Income Distribution

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Eli Heckscher and Bertin Ohlin

http://homepage.newschool.edu/het//alphabet.htm

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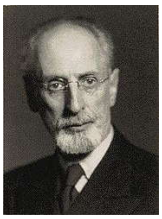
Eli Heckscher



- 1879 - 1952
- Swedish political economist and economic historian.
- Article "The effect of Foreign Trade on the Distribution of Income" (1919).
- Best known for H-O model

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Bertin Ohlin

- (1899-1979)
- Swedish economist
- 1930s: Contribution for International Economics: H-O model
- Nobel prize in Economic Science in 1977

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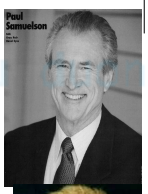
Paul Samuelson

- Paul A. Samuelson (1915 -)
- American economist
- Nobel Prize in Economic Science in 1970.
- Contribution for International Economics: Designer of H-O-S Model (the factor- price equalization theorem)



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Assumptions of H-O Theory

- Two nations (N1 and N2), two commodities (X and Y), two factors of production (L and K)
- The same technology in production
- X is labor intensive, Y is capital intensive
- Constant returns to scale
- Incomplete specialization in production in both nations
  - What is implications about the shape of PPF?

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Assumptions of H-O Theory (cont.)

- Equal tastes in both nations
- Perfect competition in both commodities and factor markets
- Perfect factor mobility within each nation but no international factor mobility
- Free trade
- All resources are fully employed in both nations
- International trade in balance

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FACTOR INTENSITY – FACTOR ABUNDANT

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Basis for trade

- H-O:
  - comparative advantage
  - Compare with David Ricardo?
- Sources of comparative advantage
  - H-O: factor endowment
  - David Ricardo: productivity

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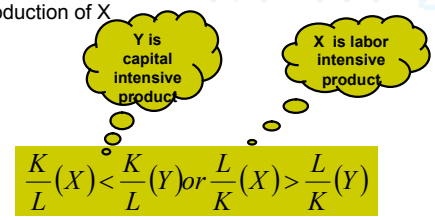
Factor intensity

- Two commodities (X and Y) and two factors (L and K)
- Y is capital intensive if **capital-labor ratio (K/L)** used in production of Y is greater than K/L used in production of X



$$\frac{K}{L}(X) < \frac{K}{L}(Y) \text{ or } \frac{L}{K}(X) > \frac{L}{K}(Y)$$

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Factor intensity

- E.g: 2K and 2L to produce one unit of Y
  1K and 4L to produce one unit of X
  - Identify which product is labor intensive?
    - X: Labor intensive

    => Y: Capital intensive
- Note: it is not the *absolute* amount of capital and labor used but ratio of K and L determines factor intensity
  - *E.g:* 2K and 2L to produce one unit of Y
    3K and 12L to produce one unit of X
    - Identify which product is capital intensitve?
      - Y: Capital intensive
      - X: Labor intensive

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Factor abundance

- Two ways: physical units and relative factor price.
- In term of physical units:
  - N2 is capital abundant if the ratio of the total amount of capital to the total amount of labor (TK/TL) available in N2 is greater than that in N1

$$\frac{TK}{TL}(N_2) > \frac{TK}{TL}(N_1)$$

  - E.g: N1 has 10 million L and 100 million K
    N2 has 20 million L and 800 million K
  - Identify which country is abundant in K and which country in L?
    - N1: abundant in L
    - N2: abundant in K
  - Note: Not the absolute amount of K and L is important.

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Factor abundance (cont.)

- In term of factor prices:
  - Price of labor time (P_L): w
  - Rental price of capital (P_K): r
  - N2 is capital abundant if the ratio of the rental price of capital to the price of labor time (PK/PL) is lower in N2 than in N1 (Why lower???)

$$\frac{P_K}{P_L}(N_2) < \frac{P_K}{P_L}(N_1) \qquad \frac{r}{w}(N_2) < \frac{r}{w}(N_1)$$

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Summary

$\frac{TL}{TK}(N1) > \frac{TL}{TK}(N2)$ ⇒ **N1-labor abundant**

N2-capital abundant ⇐ $\frac{TK}{TL}(N1) < \frac{TK}{TL}(N2)$

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Summary (cont.)

$$\frac{P_L}{P_K}(N1) = \frac{w}{r}(N1) < \frac{P_L}{P_K}(N2) = \frac{w}{r}(N2)$$ → **N1-labor abundant**

N2-capital abundant ← $$\frac{P_K}{P_L}(N2) = \frac{r}{w}(N2) < \frac{P_K}{P_L}(N1) = \frac{r}{w}(N1)$$

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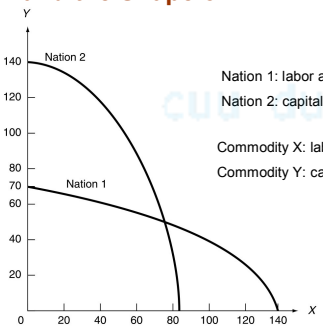
Factor abundance – Factor intensity and the Shape of PPF



Nation 1: labor abundant
Nation 2: capital abundant

Commodity X: labor intensive
Commodity Y: capital intensive

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FACTOR ENDOWMENT AND H-O THEORY

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H-O Theory

H-O theorem deals with the pattern of trade

H-O-S theorem deals with the factor prices

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H-O Theorem

- H-O Theorem:
  - A Nation
    - Export the commodity whose production requires the intensive use of the nation's relatively abundant and cheap factor
    - Import the commodity whose production requires the intensive use of the nation's relatively scarce and expensive factor.
  - E.g: vietnam and China, the US, Australia

Nation 1: Labor abundant → X: labor intensive → Nation 1 exports X and imports Y

Nation 2: Capital abundant → Y: capital intensive → Nation 2 exports Y, imports X

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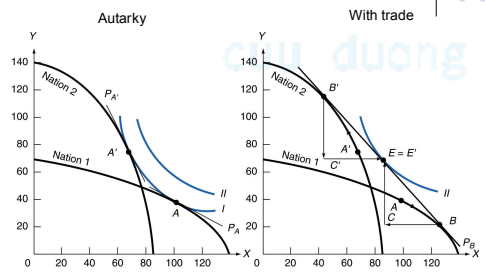
Illustration of H-O theorem



Equilibrium point in isolation of each country?

Identify comparative advantage?

Why do two nations have the same ICs?

What is the pattern of trade?

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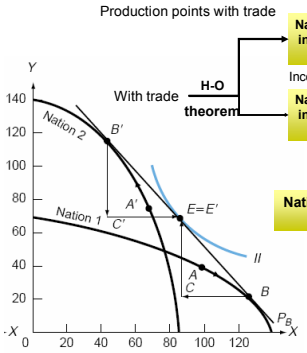
Illustration of H-O theorem (cont.)

Production points with trade



With trade — H-O theorem

- Nation 1 specializes in X, exports X and imports Y
- Nation 2 specializes in Y, exports Y and imports X

Incomplete specialization → Relative prices are equal

- Nation 1 produces at point B
- Nation 2 produces at point B'

$P_B = P_{B'}$ = the slope of common tangent of 2 PPFs

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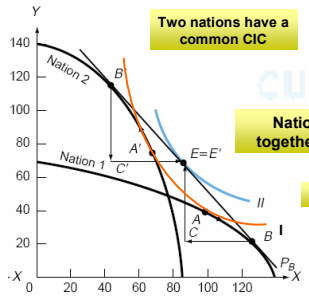
Illustration of H-O theorem (cont.)

Consumption points with trade



Two nations have a common CIC

The common tangent of two PPFs is tangent to CIC on E = E'

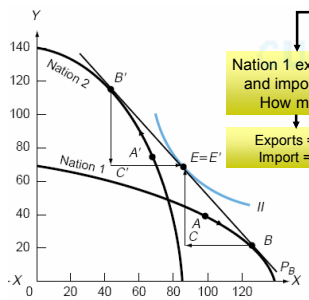
Nation 1 và Nation 2 will together consume at point E

CIC_{II} is higher than CIC_I

Both nations are better off

Illustration of H-O theorem (cont.)

Import and export of each country



In the presence of trade

- Nation 1 exports X and imports Y? How much
  - Exports = BC
  - Import = EC
- Nation 2 exports Y and imports X? How much?
  - Export = B'C'
  - Import = C'E

B'C' = CE

BC = C'E

Import of N1 = Export of N2 and vice versa

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H-O-S Theorem

- H-O-S theorem (The **Factor-Price** Equalization)
  - International trade will bring about equalization in the relative and absolute return to homogeneous factors across nations.
    - International trade will cause the wages of homogenous labor to be the same in all trading nations.
    - International trade will cause the homogenous capital to be the same in all trading nations.
    - International trade will make w and r the same in both nations.

    => **Both relative and absolute factor prices will be equalized.**

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Illustration of H-O-S theorem

Nation 1 : abundant in L and Nation 2 abundant in K

Good X : L intensive
Good Y: K intensive

$\frac{P_x}{P_y}(N1) < \frac{P_x}{P_y}(N2)$

In the absence of trade

In the presence of trade

Nation 1 specializes in X and decreases Y

- Relative demand for L increases -> w increases
- Relative demand for K decreases -> r Decreases

Nation 2 specializes in Y and decrease X

- Relative demand for L decreases -> w Decreases
- Relative demand for K increases -> r increases

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Illustration of H-O-S theorem (cont.)

Nation 1 : abundant in L and Nation 2 abundant in K ⇒ Nation 1 will have relatively lower w and Nation 2 will have relatively lower r

With trade

- W decreases in nation 1 and increases in nation 2
- r increases in nation 2 and decreases in nation 1

⇒ International trade makes w and r equal in two nations

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Illustration of H-O-S theorem (cont.)

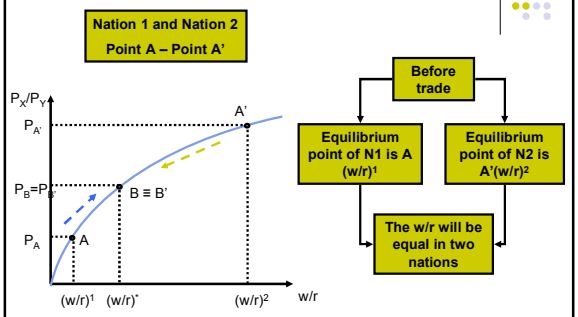

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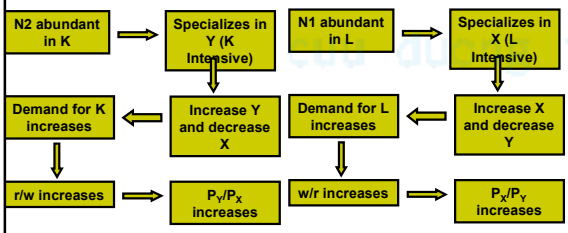
Illustration of H-O-S theorem (cont.)



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Income distribution

- In Nation 1, who benefits and who losses?
  - w/r increases
  - Labor: benefits
  - Capital owners: loss
- In Nation 2: who benefits and who losses?
  - w/r decreases
  - Labor: loss
  - Capital owners: benefits

  => In developed countries: labor unions favor trade restriction.

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The Leontief Paradox

- Tests on US data
  - The US is the most capital-abundant country
  - US exports were less capital-intensive than US imports, **Leontief paradox**.
- Tests on global data
  - Bowen, Leamer, and Sveikauskas tested the Heckscher-Ohlin model on data from 27 countries and confirmed the Leontief paradox on an international level.
- Tests on manufacturing data between low/middle income countries and high income countries.
  - This data lends more support to the theory.

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The Leontief Paradox (cont.)

TABLE 4-2 Factor Content of U.S. Exports and Imports for 1962

	Imports	Exports
Capital per million dollars	$2,132,000	$1,876,000
Labor (person-years) per million dollars	119	131
Capital-labor ratio (dollars per worker)	$17,916	$14,321
Average years of education per worker	9.9	10.1
Proportion of engineers and scientists in work force	0.0189	0.0255

Source: Robert Baldwin, "Determinants of the Commodity Structure of U.S. Trade," *American Economic Review* 61 (March 1971), pp. 126–145.

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The Leontief Paradox (cont.)

- Possible explanations for these findings include
  - that the U.S. has a special advantage in producing new products made with innovative technologies
  - differences in technology

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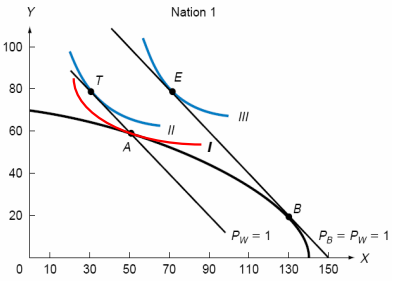
Gains from trade



Any comments?

- **Total gains: movement from A to E.**
- **Movement from A to T in consumption measures the gains from exchange.**
- **The movement from T to E in consumption measures the gains from specialization**

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Key words

- Same technology
- Perfect competition
- Internal factor mobility
- International factor mobility
- Labor – intensive commodity
- Capital – intensive commodity
- Factor abundance
- Relative factor prices
- H-O theory
- H-O theorem
- Factor – price equalization theorem
- Leontief Paradox

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- END OF CHAPTER
  - THANK YOU

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