Chapter 4

Resources,
Comparative
Advantage,
and Income
Distribution

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INTERNATIONAL
Theory & Policy
ECONOMICS

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PEARSON
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Preview

- Production possibilities
- Relationship among output prices, input (factor) prices, and levels of inputs
- Relationship among output prices, input prices, levels of inputs, and levels of output.
- Trade in the Heckscher-Ohlin model
- Factor price equalization
- Income distribution and income inequality
- Empirical evidence

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Introduction

- While trade is partly explained by differences in labor productivity, it also can be explained by differences in resources across countries.
- The Heckscher-Ohlin theory argues that differences in labor, labor skills, physical capital, land or other factors of production across countries create productive differences that explain why trade occurs.
  - ♦ Countries have a *relative abundance* of factors of production.
  - ♦ Production processes use factors of production with *relative intensity.*

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Two Factor Heckscher-Ohlin Model

1. Labor services and land are the resources important for production.
2. The amount of labor services and land varies across countries, and this variation influences productivity.
3. The supply of labor services and land in each country is constant.
4. Only two goods are important for production and consumption: cloth and food.
5. Competition allows factors of production to be paid a "competitive" wage, a function of their productivities and the price of the good that they produce, and allows factors to be used in the industry that pays the most.
6. Only two countries are modeled: domestic and foreign

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HO model

HO theorem

Rybczinsky theorem

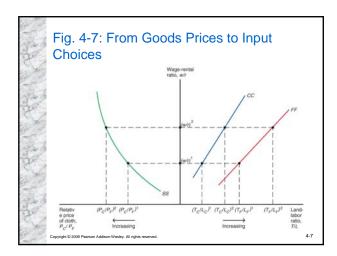Stolper-Samuelson theorem

Factor price equalization theorem

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Factor Prices, Output Prices, and Levels of Factors (cont.)

- We have a relationship among input (factor) prices and output prices and the levels of factors used in production:
- **Stolper-Samuelson theorem**: if the relative price of a good increases, then the real wage or real lending/ renting rate of the factor used intensively in the production of that good increases, while the real wage or real lending/renting rate of the other factor decreases.
  - ♦ Under competition, the real wage/rate is equal to the marginal productivity of the factor.
  - ♦ The marginal productivity of a factor typically decreases as the level of that factor used in production increases.

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Fig. 4-7: From Goods Prices to Input Choices

Wage-rental ratio, w/r

CC

FF

$(w/r)^2$

$(w/r)^1$

SS

Relative price of cloth, P_C/P_F

$(P_C/P_F)^2$ $(P_C/P_F)^1$

← Increasing

$(T_C/L_C)^1$ $(T_C/L_C)^2$ $(T_F/L_F)^1$ $(T_F/L_F)^2$

Increasing →

Land-labor ratio, T/L

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Factor Prices, Output Prices, and Levels of Factors (cont.)

- We have a theory that predicts changes in the distribution of income when the relative price of goods changes, say because of trade.
- An increase in the relative price of cloth, P_C/P_F, is predicted to:
  - ♦ raise income of workers relative to that of landowners, *w/r*.
  - ♦ raise the ratio of land to labor services, *T/L*, used in both industries and raise the marginal productivity of labor in both industries and lower the marginal productivity of land in both industries.
  - ♦ raise the real income of workers and *lower the real income of land owners.*

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Factor Prices, Output Prices, Levels of Factors, and Levels of Output

- The allocation of factors used in production determine the maximum level of output (on the PPF).
- We represent the amount of factors used in the production of different goods using the following diagram:

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Trade in the Heckscher-Ohlin Model

- Suppose that the domestic country has an abundant amount of labor services relative to land.
  - ♦ The domestic country is **abundant** in labor services and the foreign country is **abundant** in land: $L/T > L^*/T^*$
  - ♦ Likewise, the domestic country is **scarce** in land and the foreign country is **scarce** in labor services.
  - ♦ However, the countries are assumed to have the same technology and same consumer tastes.
- Because the domestic country is *abundant in labor services*, it will be relatively efficient at producing cloth because cloth is *labor intensive*.
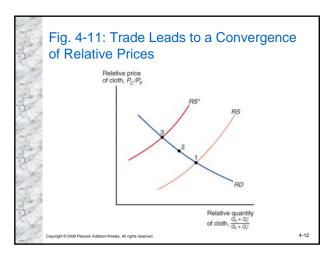
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Trade in the Heckscher-Ohlin Model (cont.)

- Since cloth is a labor intensive good, the domestic country's PPF will allow a higher ratio of cloth to food relative to the foreign county's PPF.
- At each relative price, the domestic country will produce a higher ratio of cloth to food than the foreign country.
  - ♦ The domestic country will have a higher relative supply of cloth than the foreign country.

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Fig. 4-11: Trade Leads to a Convergence of Relative Prices

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Trade in the Heckscher-Ohlin Model (cont.)

- Like the Ricardian model, the Heckscher-Ohlin model predicts a convergence of relative prices with trade.
- With trade, the relative price of cloth is predicted to rise in the labor abundant (domestic) country and fall in the labor scarce (foreign) country.
    - In the domestic country, the rise in the relative price of cloth leads to a rise in the relative production of cloth and a fall in relative consumption of cloth; the domestic country becomes an exporter of cloth and an importer of food.
    - The decline in the relative price of cloth in the foreign country leads it to become an importer of cloth and an exporter of food.

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Trade in the Heckscher-Ohlin Model (cont.)

- An economy is predicted to be relatively efficient at (have a comparative advantage in) producing goods that are intensive in its abundant factors of production.
- An economy is predicted to export goods that are intensive in its abundant factors of production and import goods that are intensive in its scarce factors of production.
    - This proposition is called the Heckscher-Ohlin theorem

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Factor Price Equalization

- Unlike the Ricardian model, the Heckscher-Ohlin model predicts that input (factor) prices will be equalized among countries that trade.
- Because relative output prices are equalized and because of the direct relationship between output prices and factor prices, factor prices are also equalized.
- Trade increases the demand of goods produced by abundant factors, indirectly increasing the demand of the abundant factors themselves, raising the prices of the abundant factors across countries.

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Factor Price Equalization (cont.)

- But factor prices are not really equal across countries.
- The model assumes that trading countries produce the same goods, so that prices for those goods will equalize, but countries may produce different goods.
- The model also assumes that trading countries have the same technology, but different technologies could affect the productivities of factors and therefore the wages/rates paid to these factors.

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Factor Price Equalization (cont.)

- The model also ignores trade barriers and transportation costs, which may prevent output prices and factor prices from equalizing.

- The model predicts outcomes for the long run, but after an economy liberalizes trade, factors of production may not quickly move to the industries that intensively use abundant factors.
  - ♦ In the short run, the productivity of factors will be determined by their use in their current industry, so that their wage/rate may vary across countries.

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Does Trade Increase Income Inequality?

- Over the last 40 years, countries like South Korea, Mexico, and China have exported to the U.S. goods intensive in unskilled labor (ex., clothing, shoes, toys, assembled goods).

- At the same time, income inequality has increased in the U.S., as wages of unskilled workers have grown slowly compared to those of skilled workers.

- Did the former trend cause the latter trend?

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Does Trade Increase Income Inequality? (cont.)

- The Heckscher-Ohlin model predicts that owners of abundant factors will gain from trade and owners of scarce factors will lose from trade.
- But little evidence supporting this prediction exists.
1. According to the model, a change in the distribution of income occurs through changes in output prices, but there is no evidence of a change in the prices of skill-intensive goods relative to prices of unskilled-intensive goods.

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Does Trade Increase Income Inequality? (cont.)

2. According to the model, wages of unskilled workers should increase in unskilled labor abundant countries relative to wages of skilled labor, but in some cases the reverse has occurred:
   - Wages of skilled labor have increased more rapidly in Mexico than wages of unskilled labor.
     - But compared to the U.S. and Canada, Mexico is supposed to be abundant in unskilled workers.
3. Even if the model were exactly correct, trade is a small fraction of the U.S. economy, so its effects on U.S. prices and wages prices should be small.

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Trade and Income Distribution

- Changes in income distribution occur with every economic change, not only international trade.
  - Changes in technology, changes in consumer preferences, exhaustion of resources and discovery of new ones all affect income distribution.
  - Economists put most of the blame on technological change and the resulting premium paid on education as the major cause of increasing income inequality in the US.
- It would be better to compensate the losers from trade (or any economic change) than prohibit trade.
  - The economy as a whole does benefit from trade.

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Trade and Income Distribution (cont.)

- There is a political bias in trade politics: potential losers from trade are better politically organized than the winners from trade.
  - ◆ Losses are usually concentrated among a few, but gains are usually dispersed among many.
  - ◆ Each of you pays about $8/year to restrict imports of sugar, and the total cost of this policy is about $2 billion/year.
  - ◆ The benefits of this program total about $1 billion, but this amount goes to relatively few sugar producers.

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Empirical Evidence of the Heckscher-Ohlin Model

- Tests on US data
  - ◆ Leontief found that U.S. exports were less capital-intensive than U.S. imports, even though the U.S. is the most capital-abundant country in the world: **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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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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Table 4-3: Testing the Heckscher-Ohlin Model

Factor of Production	Predictive Success[*]
Capital	0.52
Labor	0.67
Professional workers	0.78
Managerial workers	0.22
Clerical workers	0.59
Sales workers	0.67
Service workers	0.67
Agricultural workers	0.63
Production workers	0.70
Arable land	0.70
Pasture land	0.52
Forest	0.70

[*] Fraction of countries for which net exports of factor runs in predicted direction.

Source: Harry P. Bowen, Edward E. Leamer, and Leo Sveikauskas, "Multicountry, Multifactor Tests of the Factor Abundance Theory," *American Economic Review* 77 (December 1987), pp. 791–809.

4-25

Table 4-4: Estimated Technological Efficiency, 1983 (United States = 1)

Country	
Bangladesh	0.03
Thailand	0.17
Hong Kong	0.40
Japan	0.70
West Germany	0.78

Source: Daniel Trefler, *American Economic Review* (December 1995), p. 1037.

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Empirical Evidence of the Heckscher-Ohlin Model (cont.)

- Because the Heckscher-Ohlin model predicts that factor prices will be equalized across trading countries, it also predicts that factors of production will produce and export a certain quantity goods until factor prices are equalized.
  - ♦ In other words, a predicted value of services from factors of production will be *embodied* in a predicted volume of trade between countries.

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Empirical Evidence of the Heckscher-Ohlin Model (cont.)

- But because factor prices are not equalized across countries, the predicted volume of trade is much larger than actually occurs.
  - A result of "missing trade" discovered by Daniel Trefler.
- The reason for this "missing trade" appears to be the assumption of identical technology among countries.
  - Technology affects the productivity of workers and therefore the value of labor services.
  - A country with high technology and a high value of labor services would not necessarily import a lot from a country with low technology and a low value of labor services.

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Summary

1. Substitution of factors used in the production process is represented by a curved PPF.
   - When an economy produces a low quantity of a good, the opportunity cost of producing that good is low and the marginal productivity of resources used to produce that good is high.
   - When an economy produces a high quantity of a good, the opportunity cost of producing that good is high and the marginal productivity of resources used to produce that good is low.
2. When an economy produces the most it can from its resources, the opportunity cost of producing a good equals the relative price of that good in markets.

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Summary (cont.)

3. If the relative price of a good increases, then the real wage or real lending/renting rate of the factor used intensively in the production of that good is predicted to increase,
   - while the real wage and real lending/renting rates of other factors of production are predicted to decrease.
4. If output prices remain constant as the amount of a factor of production increases, then the supply of the good that uses this factor intensively is predicted to increase, and the supply of other goods is predicted to decrease.

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Summary (cont.)

5. An economy is predicted to export goods that are intensive in its abundant factors of production and import goods that are intensive in its scarce factors of production.

6. The Heckscher-Ohlin model predicts that relative output prices and factor prices will equalize, neither of which occurs in the real world.

7. The model predicts that owners of abundant factors gain, but owners of scarce factors lose with trade.

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Summary (cont.)

8. A country as a whole is predicted to be better off with trade, even though owners of scarce factors are predicted to be worse off without compensation.

9. Empirical support of the Heckscher-Ohlin model is weak except for cases involving trade between high income countries and low/middle income countries.

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