

# Chapter 4

## Resources, Comparative Advantage, and Income Distribution

### ■ Chapter Organization

A Model of a Two-Factor Economy

Prices and Production

Choosing the Mix of Inputs

Factor Prices and Goods Prices

Resources and Output

Effects of International Trade Between Two-Factor Economies

Relative Prices and the Pattern of Trade

Trade and the Distribution of Income

Factor-Price Equalization

Trade and Income Distribution in the Short Run

*Case Study: North–South Trade and Income Inequality*

The Political Economy of Trade: A Preliminary View

The Gains from Trade, Revisited

Optimal Trade Policy

Income Distribution and Trade Politics

Empirical Evidence on the Heckscher-Ohlin Model

*Box: Income Distribution and the Beginnings of Trade Theory*

Testing the Heckscher-Ohlin Model

Implications of the Tests

Summary

APPENDIX TO CHAPTER 4: Factor Prices, Goods Prices, and Input Choices

Choice of Technique

Goods Prices and Factor Prices

## ■ Key Themes

In Chapter 3, trade between nations was motivated by differences internationally in the relative productivity of workers when producing a range of products. In Chapter 4, this analysis goes a step further by introducing the Heckscher-Ohlin theory.

The Heckscher-Ohlin theory considers the pattern of production and trade that will arise when countries have different endowments of factors of production, such as labor, capital, and land. The basic point is that countries tend to export goods that are intensive in the factors with which they are abundantly supplied. Trade has strong effects on the relative earnings of resources, and tends to lead to equalization across countries of prices of the factors of production. These theoretical results and related empirical findings are presented in this chapter.

The chapter begins by developing a general equilibrium model of an economy with two goods, which are each produced using two factors according to fixed coefficient production functions. The assumption of fixed coefficient production functions provides an unambiguous ranking of goods in terms of factor intensities. (The appendix develops the model when the production functions have variable coefficients.) Two important results are derived using this model. The first is known as the *Rybczynski effect*. Increasing the relative supply of one factor, holding relative goods prices constant, leads to a biased expansion of production possibilities favoring the relative supply of the good which uses that factor intensively.

The second key result is known as the *Stolper-Samuelson effect*. Increasing the relative price of a good, holding factor supplies constant, increases the return to the factor used intensively in the production of that good by more than the price increase, while lowering the return to the other factor. This result has important income distribution implications.

It can be quite instructive to think of the effects of demographic/labor force changes on the supply of different products. For example, how might the pattern of production during the productive years of the “Baby Boom” generation differ from the pattern of production for post-Baby Boom generations. What does this imply for returns to factors and relative price behavior?

The central message concerning trade patterns of the Heckscher-Ohlin theory is that countries tend to export goods whose production is intensive in factors with which they are relatively abundantly endowed. This is demonstrated by showing that, using the relative supply and relative demand analysis, the country relatively abundantly endowed with a certain factor will produce that factor more cheaply than the other country. International trade leads to a convergence of goods prices. Thus, the results from the *Stolper-Samuelson theory* demonstrate that owners of a country’s abundant factors gain from trade but owners of a country’s scarce factors lose. The extension of this result is the important *Factor Price Equalization theorem*, which states that trade in (and thus price equalization of) goods leads to an equalization in the rewards to factors across countries. The political implications of factor price equalization should be interesting to students.

The chapter also introduces some political economy considerations. First, it briefly notes that many of the results regarding trade and income distribution assume full and swift adjustment in the economy. In the short run, though, labor and capital that are currently in a particular industry may have sector specific skills or knowledge and being forced to move to another sector, and this involves costs. Thus, even if a shift in relative prices were to improve the lot of labor, for those laborers who must change jobs, there is a short run cost.

The core of the political economy discussion focuses on the fact that when opening to trade, some may benefit and some may lose, but the expansion of economic opportunity should allow society to redistribute some of the gains towards those who lose, making sure everyone benefits on net. In practice, though, those who lose are often more concentrated and hence have more incentive to try to affect policy. Thus, trade policy is not always welfare maximizing, but may simply reflect the preferences of the loudest and best organized in society.

Empirical results concerning the Heckscher-Ohlin theory, beginning with the Leontief paradox and extending to current research, do not support its predictions concerning resource endowments explaining overall patterns of trade, though some patterns do match the broad outlines of its theory (for example the United States imports more low skill products from Bangladesh and more high skill products from Germany). This observation has motivated many economists to consider motives for trade between nations that are not exclusively based on differences across countries. These concepts will be explored in later chapters. Despite these shortcomings, important and relevant results concerning income distribution are obtained from the Heckscher-Ohlin theory.

## ■ Key Terms

Define the following key terms:

1. Factor Intensity \_\_\_\_\_  
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2. Biased Expansion of Production Possibilities \_\_\_\_\_  
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3. Magnified Effect of Goods Prices on Factor Prices (Stolper-Samuelson Effect)  
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4. Equalization of Factor Prices \_\_\_\_\_  
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5. Specific Factors \_\_\_\_\_  
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6. Leontief Paradox \_\_\_\_\_  
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■ **Review Questions**

1. Suppose that a country produces wine (W) and cheese (C) using its supply of 400 units of labor (man-hours) (L) and 600 units of land (acres) (T). To produce a gallon of wine requires 10 units of labor and 5 units of land. A pound of cheese requires 4 units of labor and 8 units of land.

a. Which inputs are used intensively in the production of cheese? Which inputs are used intensively in the production of wine?

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\_\_\_\_\_  
\_\_\_\_\_.

b. Is it possible for this country to produce 90 gallons of wine and 50 gallons of cheese with the resources available? Explain your answer.

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\_\_\_\_\_.

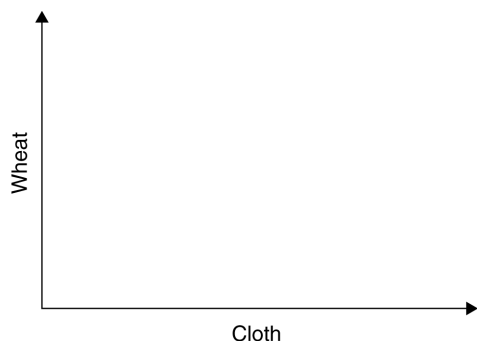
c. Graph the land and labor constraints on production in this economy.



d. How are these constraints affected by an increase in the supply of labor by 100 workers? Show this graphically in the diagram above.

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\_\_\_\_\_.

2. Production of a bushel of wheat requires 9 units of land and 3 units of labor. Production of a yard of cloth requires 6 units of labor and only 1 unit of land. Suppose an economy is endowed with 120 units of labor and 180 units of land.
- a. Draw the production possibilities frontier of this economy on the axis provided below.



- b. If the supply of land increases by 90 units, how does the production possibilities frontier change? What is the implication of this result?

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3. Television production is relatively labor-intensive, requiring 20 units of labor and 4 units of land. Televisions sell for \$60 each. Rice, on the other hand, is a relatively land-intensive product, requiring 1 unit of labor and 4 units of land for every pound of rice produced. Rice sells for \$4 per pound.

- a. If Home has 120 million workers and 200 million acres, while Foreign has 40 million workers and 50 million acres, what is the pattern of trade between these countries that will be predicted by the factor proportions (Heckscher-Ohlin) theory?

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- b. Under what conditions in the real world would the predictions of the factor proportions theory be contradicted? [*Hint*: Think of some of the notable empirical tests of the Heckscher-Ohlin theory.]

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- c. Given the prices described above, graph the lines along which price equals production costs for rice and for television.



4. Suppose that production of wine requires 10 units of labor and 5 units of land per gallon, while the production of cheese requires 4 units of labor and 8 units of land per pound.
- a. If the unit prices of wine and cheese are \$30 and \$16, respectively, show that unit wages and rent *cannot* be 2 and 3, respectively, in a competitive economy.

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- b. If the unit prices of wine and cheese are \$30 and \$16, respectively, graph the lines along which price equals marginal cost for each of these two goods.



- c. Using your graph, determine the factor prices of land and labor.
- d. If the price of cheese increases to \$24 per pound, what happens to factor prices?

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- e. How will the purchasing power of workers and landowners be affected by an increase in the price of cheese? Discuss your result.

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5. Say there are two industries in a country (clothing and cars) where clothing uses more labor and cars more capital. If a country is capital rich, consider what happens if it starts trading with a labor rich country.

- a. What is the pattern of trade?

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- b. Assume factors do not move quickly from one industry to another (specific factors). How will the following groups real income be affected by the opening of trade in the short run and long run?

Group	Short Run Impact	Long Run Impact
Car company labor		
Car company capital		
Clothing company labor		
Clothing company capital		

## ■ Answers to Odd-Numbered Textbook Problems

1. The definition of cattle growing as land intensive depends on the ratio of land to labor used in production, not on the ratio of land or labor to output. The ratio of land to labor in cattle exceeds the ratio in wheat in the United States, implying cattle is land intensive in the United States. Cattle is land intensive in other countries too *if* the ratio of land to labor in cattle production exceeds the ratio in wheat production in *that* country. Comparisons between another country and the United States is less relevant for this purpose.
3. This question is similar to an issue discussed in Chapter 3. What matters is not the absolute abundance of factors, but their relative abundance. Poor countries have an abundance of labor relative to capital when compared to more developed countries.

5. Specific programmers may face wage cuts due to the competition from India, but this is not inconsistent with skilled labor wages rising. By making programming more efficient in general, this development may have increased wages for others in the software industry or lowered the prices of the goods overall. In the short run, though, it has clearly hurt those with sector specific skills who will face transition costs. There are many reasons to not block the imports of computer programming services (or outsourcing of these jobs). First, by allowing programming to be done more cheaply, it expands the production possibilities frontier of the United States, making the entire country better off on average. Necessary redistribution can be done, but we should not stop trade which is making the nation as a whole better off. In addition, no one trade policy action exists in a vacuum and if the United States blocked the programming imports, it could lead to broader trade restrictions in other countries.
  
7. If the efficiency of the factors of production differ internationally, the lessons of the Heckscher-Ohlin theory would be applied to “effective factors,” which adjust for the differences in technology or worker skills or land quality (for example). The adjusted model has been found to be more successful than the unadjusted model at explaining the pattern of trade between countries. Factor-price equalization concepts would apply to the effective factors. A worker with more skills or in a country with better technology could be considered to be equal to two workers in another country. Thus, the single person would be 2 effective units of labor. The one high-skilled worker could earn twice what lower skilled workers do and the price of 1 effective unit of labor would still be equalized.