

## *Chapter 8*

# TRADE, GROWTH, AND PRODUCT VARIETY

In the previous chapter, we studied the standard 2x2x2 Heckscher-Ohlin model and derived the trade pattern from differences in factor endowments (the Heckscher-Ohlin Theorem). This chapter maintains the view that countries have access to the same technology and that the trade pattern, therefore, reflects differences in factor endowments. The chapter differs by investigating a world with many commodities and many countries.

One way of expanding the number of traded commodities is to assume that different varieties of a good are produced. In the exchange model in Chapter 2 we saw that the consumer can have preferences for different varieties of the same good. This chapter presents a model of monopolistic competition in production, in which each variety is produced by only one firm with a downward-sloping average cost curve. In this situation, a remarkable result can be derived: two countries, identical in *all* respects, can gain from trading with each other. The source of the gain is that average costs fall worldwide as each country cuts in half the number of varieties it produces. Such intra-industry trade constitutes a large component of the volume of trade between industrialized countries. These trade patterns also help to explain why trade liberalizations such as the U.S.-Canada free-trade agreement require less reallocation of labor across sectors than the standard model with homogeneous goods would suggest.

An alternative approach to multi-commodity trade is to consider a world in which many countries produce many homogeneous goods with increasing costs. In such a world, it is impossible to explain *bilateral* trade flows as functions of differences in factor endowments. The Heckscher-Ohlin Theorem still holds in a weaker sense, however. Countries tend to specialize in the subset of goods to which their factor endowments are best suited. A country's *overall* export bundle does reflect its factor endowment. A capital-rich country, for example, will tend to export more capital-intensive goods than a capital-poor one.

## SHORT-ANSWER QUESTIONS

1. Section 8.1's discussion of the determinants of the trade pattern focuses on endowments, prices, and technology. Which ingredient is left out?
2. What happens to the unit isoquant for color television sets if their price doubles? What happens to the unit-*value* isoquant?
3. If all countries have identical technologies, is Figure 8.2 in the textbook consistent with a trading equilibrium?

4. True or False:

In a multi-commodity world a country with a high endowment of capital relative to labor will import all of the goods produced with a higher capital/labor ratio and export all the goods with a lower capital/labor ratio.

5. In the context of Heckscher-Ohlin theory, define:

- (a) short run
- (b) long run

6. True or false:

Factor prices are necessarily equalized if two countries have the same technology and identical tastes.

7. Brazil produces coffee for exports and imports luxury cars from Europe. It also produces non-traded housing services. What happens to the price of non-traded housing if foreign demand for coffee increases?

8. Which characteristics does a firm in a monopolistically competitive industry have in common with:

- (a) a competitive firm?
- (b) a monopoly?

9. Which of these pairs of assumptions of symmetry is made in the standard model of monopolistic competition?

- (a) Firms are of the same size whether producing varieties or homogeneous products and countries have the same number of firms.
- (b) Cost functions are the same for all varieties, and consumers' preferences are identical over all varieties.
- (c) Cost functions are the same for all varieties, and consumers have identical incomes across all countries.

10. True or false:

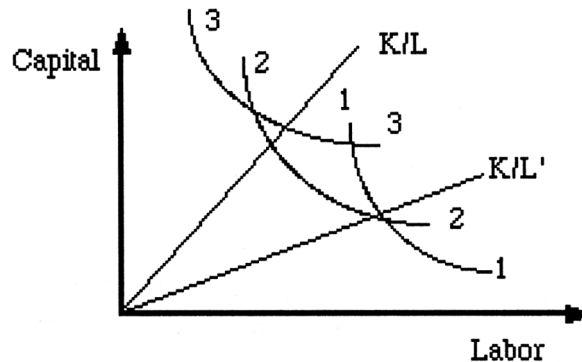
If there are increasing returns to scale in the production of steel and if consumers have no preference for variety in their consumption of steel, then, in the long run, there will be a single firm producing steel.

## PROBLEMS

1. Unit-Value Isoquants, Production Pattern, and Factor Prices:

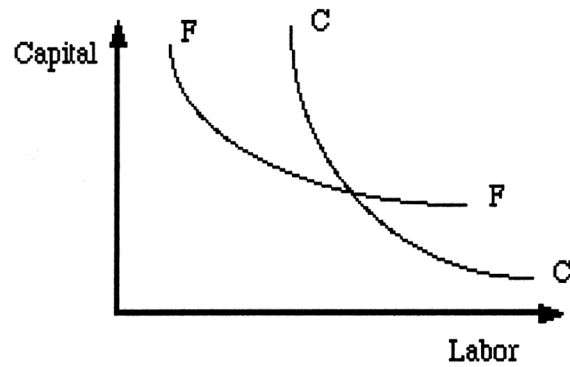
The isoquants drawn on the next page show the amount of capital and labor required to produce one dollar's worth of each of the three goods.

- (a) Suppose the endowment of this economy is shown by the  $K/L$  ray. What good(s) will be produced?
- (b) Suppose there is an influx of workers and the capital/labor ratio falls to  $K/L'$ . Now what will be produced?
- (c) What happened to the wage/rental ratio as the capital/labor ratio fell?
- (d) What happens to the wage/rental ratio as compared to (c) if the price of good 1 doubles?



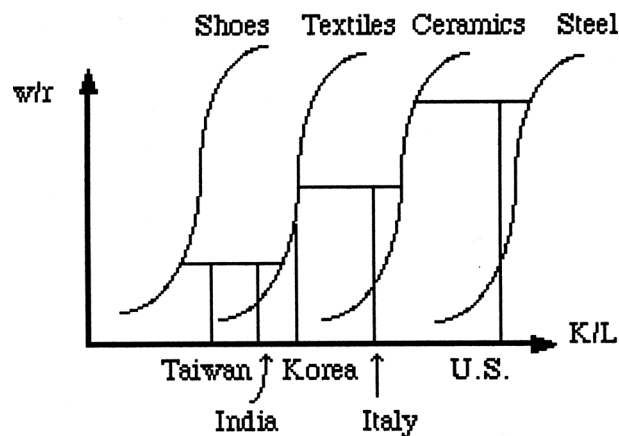
2. The Factor Price Equalization Theorem Once Again:

Consider a two-country world, where both countries have the same technology for producing clothing and food as illustrated by the following unit-value isoquants:



- (a) What is the range of factor endowment ratios that will yield factor price equalization? Indicate this range in the diagram.
  - (b) Does this range depend upon commodity prices?
3. Factor Endowments and Factor Prices With Many Goods:

Suppose that Taiwan, Korea, Italy, and the United States all have the same technology for producing shoes, textiles, ceramics, and steel but have different endowments of capital and labor. Use the diagram below to answer the following questions:



- (a) Identify the goods produced by each country.
- (b) Between which countries will factor prices be equalized?
- (c) Suppose Korea begins to accumulate capital as its income rises. What happens to the Korean wage/rental ratio?

4. Explaining Trade Flows:

Relative Factor Supplies	United States	Europe	Asia
Ample	Land	Capital	Labor
Moderate	Capital	Land	Land
Scarce	Labor	Labor	Capital

The relative factor supplies of Europe, the United States, and Asia are shown in the table above. Using your knowledge of Heckscher-Ohlin trade theory, what trade pattern do you predict?

5. Comparative Advantage and Intra-Industry Trade:

Suppose that the home country has the technology to produce food and automobiles. There are several varieties of automobiles, each requiring capital-intensive techniques relative to food production and there are increasing returns to scale in specializing in a particular variety of automobile. The foreign country has the same technology and preferences, but has a relatively larger endowment of labor than the home country. These countries now begin to trade with each other.

- (a) Which country exports food?
- (b) What happens to the size of the firms producing automobiles in the two countries?
- (c) What happens to the volume of automobile production in the home country?
- (d) If you collected trade statistics on the goods exported and imported by these two countries, what would you expect to see?

6. Love of Variety versus Indifference toward Variety:

The home and foreign countries each possess the same technology for producing blue and red schmoo. Production of a single schmoo (blue or red) requires 30 units of capital and 30 units of labor, while the second schmoo requires only an additional 10 units of capital and 10 units of labor. The third schmoo requires 5 units of capital and 5 units of labor extra. Each additional schmoo requires only one extra unit of capital and one extra unit of labor to be produced. If the first schmoo is red the other schmoo produced must also be red to capture the increasing returns to scale.

- (a) Each country is endowed with 60 units of capital and 60 units of labor. Suppose consumers in each country demand blue and red schmoo in equal proportions. What will each country produce in autarky?
- (b) If consumers are indifferent about the color of schmoo, what does each country produce in autarky?
- (c) Now suppose the two countries begin to trade and that consumers care about the color of the schmoo. What will each country produce in a trade equilibrium? What happens to the number of schmoo produced in each country relative to your answer to part (b)? What is the number of firms in each country?

7. The Competitive Firm versus the Monopolistically Competitive Firm:

- (a) Draw the “demand curve” and long-run cost curves for a firm in a perfectly competitive industry.
- (b) Do the same for a firm in a monopolistically competitive industry.
- (c) What is a natural criterion by which to define the size of a firm?
- (d) Can the size of the monopolistically competitive firm be determined?
- (e) If the firm in the competitive industry has constant returns to scale technology, can its size be determined?

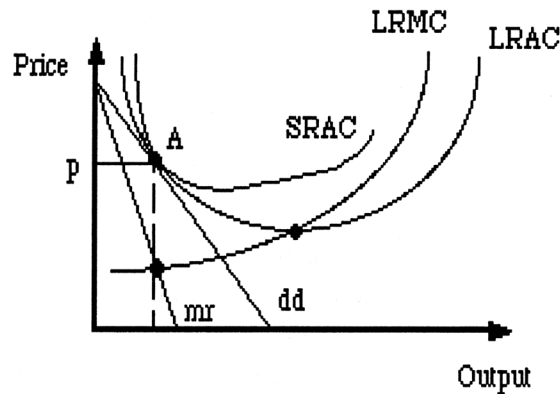
8. Monopolistic Competition and the Firm's Equilibrium:

- (a) What is the relationship between marginal cost and marginal revenue in equilibrium?
- (b) From which assumption about the firm does it follow?
- (c) What is the relationship between average cost and average revenue (which equals price) in equilibrium?
- (d) From which assumption about the industry does it follow?
- (e) If we were considering a short-run equilibrium as opposed to a long-run equilibrium would (a) be violated? Would (c) be likely to be violated?

9. Monopolistic Competition and Entry and Exit:

In the following diagram  $dd$  is the demand curve perceived by a monopolistically competitive firm and  $mr$  is the corresponding marginal revenue curve.  $SRAC$  is the short-run average cost curve of this firm determined by its exogenously given plant size, and  $SRMC$  (not drawn) is the corresponding short-run marginal cost curve. Finally,  $LRAC$  is the firm's long-run average cost curve (the envelope of all the  $SRAC$  curves, one  $SRAC$  curve for each possible plant size), and  $LRMC$  is the corresponding long-run marginal cost curve.

- Is this firm in short-run equilibrium at point A?
- Is this industry in long-run equilibrium at A?
- Overnight, the demand for each variety of the good goes up. What happens to  $dd$  and  $mr$ ?
- How does this firm respond in the short run?
- Is this situation consistent with a long-run equilibrium for the industry?
- Through which mechanism does this industry approach long-run equilibrium?



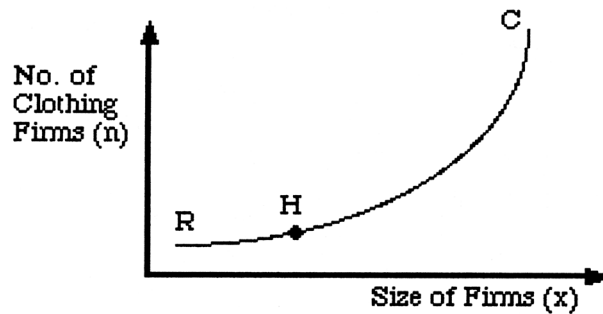
An industry is defined to be one of *increasing costs* if larger industry output causes unit costs to increase. An industry is defined to be one of *decreasing costs* if larger industry output reduces unit costs. Finally, a *constant costs* industry leaves unit costs immune from industry size.

- Suppose the industry we are considering is one of increasing costs. As new firms enter to compete away the profits,  $dd$  and  $LRAC$  both shift. Why? Shift all the other loci accordingly, and illustrate the new industry equilibrium.
- As compared to the initial situation described in (a), what has happened to:
  - the number of varieties produced?
  - the number of firms in the industry?
  - the size of the firm in the industry?
- Which of the loci in Figure 8.5 can you derive from (h)?

10. Adding the Demand Side to Determine the Number of Varieties in General Equilibrium:

From the previous question you can draw the RC curve in figure 8.2 of the textbook. To determine the number of firms (varieties) and the size of each in equilibrium, we need a locus capturing the demand side of the problem.

Under the assumptions of identical technologies and identical effects on costs, the RC curve is the same in both countries. Suppose that RC is upward sloping (it could be horizontal or even downward sloping), and consider point H illustrating the home country's autarky equilibrium.



- (a) Draw through H a locus that satisfies the equation:

$$nx = \text{constant}$$

What is the interpretation of such a locus?

- (b) Draw through H a locus that satisfies the condition that the same amount of resources is allocated to clothing production. At point H, will this locus cut the locus you drew in (a) from above or from below? (Hint: Suppose one clothing firm shut down. By how much would remaining firms have to expand output to employ the released factors?)
- (c) Is the locus a straight line, or is it convex or concave toward the origin?
- (d) In the textbook, point F, which depicts the autarky equilibrium in the foreign country's monopolistically competitive industry, lies to the northeast of point H. Which difference between the home and foreign country does this location of F reflect? Draw through F the analogous loci to those you drew through H.
- (e) Derive the free trade equilibrium number of firms and the size of each firm.
- (f) Suppose demand for all varieties falls as consumers' preferences suddenly shift toward the homogeneous good. Illustrate this in your diagram.