CHAPTER 7

Imperfect Competition, Increasing Returns, and Product Variety

The preceding chapters have developed three different models dealing with production and international trade. Whereas the Ricardian model emphasized the possibility that countries might differ in their effective technological knowledge, including the skills of productive factors and asymmetries in climate, the Specific-Factors model and the Heckscher-Ohlin model both emphasized the role of countries possessing relatively different endowments of productive factors. Although different in these respects, all three scenarios shared something in common: Commodity markets were assumed to display purely competitive conditions in that all firms are assumed to be price-takers and entry into any activity was open so competition would drive prices down to the level of unit costs. Constant returns to scale characterized all productive activity. That is, there were assumed to be no *scale* effects wherein large firms could develop a cost advantage over smaller firms.

Not all commodity markets exhibit purely competitive behavior, and not all production processes are characterized by constant returns to scale. The development of international trade theory based on imperfectly competitive behavior has made great strides in recent years, and such work has developed along two different lines. First has been the analysis focused on international competition between large firms, say monopolists in each country or oligopoly behavior wherein entrance by new firms is made difficult and firms make profits in equilibrium. The role of governments is important in that they may champion their local firm, trying to pass on a strategic advantage in their competition with the national champions of other countries for profits that could be made in international markets. Issues arising from such a setting are discussed in later chapters in which a nation's commercial policy (tariffs, subsidies, and other ways in which countries interfere with free trade) is appraised.

The second line of investigation, discussed in the present chapter, stems from an observation that some real trade patterns seemed not to be well captured by the purely competitive models, namely, that a high fraction of international exchange is of the form of intra-industry trade, wherein countries often export and import commodities that are part of the same industrial classification. We start by describing the importance of such trade and then turn to a type of imperfect market behavior, that of *monopolistic competition*, that has been put forth to explain such behavior. A natural role is found in

this model for the importance of scale effects as providing an explanation for international trade patterns that is additional to the relevance of asymmetries in technologies and relative factor endowments we previously examined.

7.1 The Prevalence of Intra-Industry Trade

The traditional theories of a nation's comparative advantage in international trade imply that a traded good is either imported or exported, but not both. However, economists have come to realize that many very similar commodities are both exported from and imported into most industrial countries. This phenomenon was first noticed empirically among the European countries as they eliminated trade restrictions among themselves to form the European Common Market (now European Union). It soon became clear that two-way trade is a fairly general phenomenon.

The simplest way to measure intra-industry trade is by means of the following formula, where X indicates exports of some class of goods and M indicates imports of items in this same class:

$$1 - (|X - M|)/(X + M)$$

If a country only exports or only imports an item in this class, the second term reduces to X/X (or M/M) $= 1$, and the whole expression equals zero. If X equals M, the second term equals zero and the whole expression equals one. Thus the index ranges from zero, where no intra-industry trade occurs, to one (or 100, if expressed as a percentage) when exports and imports are balanced and intra-industry trade is at its maximum. Table 7.1 illustrates the amount of intra-industry trade that takes place. It was calcu-

TABLE 7.1

Average Levels of Intra-Industry Trade, All Commodities, Selected Countries, 1964–1985 (percentages)

Country	1964	1967	1973	1979	1985
Canada	37	49	57	56	68[a]
United States	48	52	48	52	72[a]
Japan	23	22	24	21	24
Belgium/Luxembourg	62	66	69	73	74
Netherlands	65	66	63	65	67
Germany	44	51	60	60	65
France	64	67	70	70	72
Italy	49	45	54	48	55
United Kingdom	46	55	71	80	76
Australia	18	17	29	22	25
Mean of above countries	46	49	55	55	60

[a]These unusually high values probably reflect the enormous volume of trade in automobiles and parts between the United States and Canada under a special free-trade arrangement for this sector.

Source: Organization for Economic Cooperation and Development, Structural Adjustment and Economic Performance (Paris: OECD, 1987), p. 273.

lated by applying a version of the formula to each standard statistical classification of commodities and then averaging the values over all classes for each country (and year). The amount of intra-industry trade evidently rose by approximately a third over the years 1964 to 1985. It is over half for all the countries shown except Japan and Australia, which differ from the others in having very sharply distinguished comparative advantages or disadvantages in wide ranges of commodities.

The extent of intra-industry trade varies a good deal from industry to industry. Casual examination of intra-industry trade ratios for U.S. industries suggests that they are low for simple, undifferentiated products in which the country has either a strong comparative advantage (corn) or disadvantage (crude petroleum). They are high for nearly all complex, differentiated goods (photographic equipment), whatever the apparent state of our comparative advantage. They are also high for some simple goods (fertilizers, inorganic chemicals) for which the country seems to neither have a strong advantage nor disadvantage.

7.2 Consumer Behavior and the Demand for Product Variety

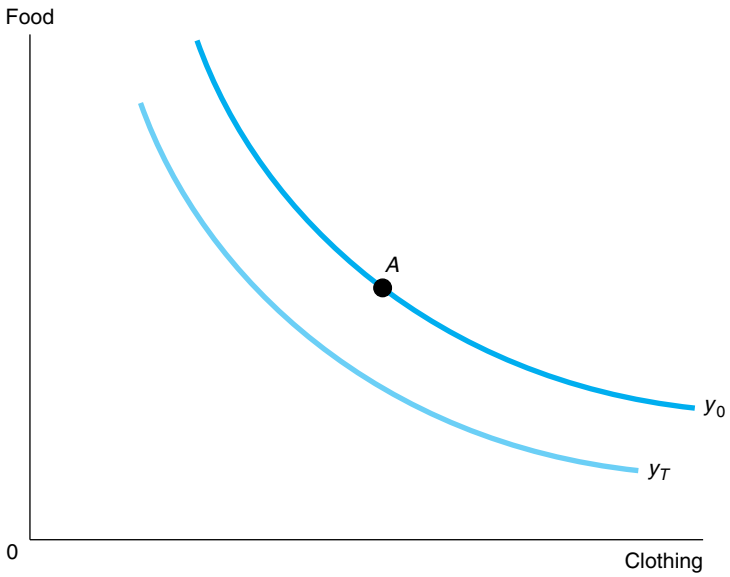
Many commodity groups contain a number of varieties. Consumers differ in the varieties they most prefer. Some men have a preference for suits and ties, whereas others would rather have a more casual look in clothing; some consumers prefer brie to cheddar and others the reverse. A nation could well be populated by consumers with a wide range of preferences in clothing (or cheese), so that if some types are produced at home and others abroad, the country would have to be both an exporter and an importer of each class of commodity to satisfy such a spectrum of demand. Such trade is referred to as *intra-industry*. Other individuals may exhibit a love for variety—sometimes with an appetite for Chinese cooking, other times for an Italian pasta dish. To the extent that both types of individuals are found within the nation's borders, a basis is provided for healthy intra-industry trade, even if endowment differences suggest, say, that overall the home country is a *net* exporter of clothing and the foreign country a *net* exporter of food. Gross trade flows encompass both intra-industry exchanges for commodities in similar categories as well as inter-industry trade of different products.

Return to our earlier discussion of trade in two commodities, clothing and food. There we *assumed* the type of food or clothing available in one country was identical in the two countries. This certainly makes the discussion and the diagrams simpler. But suppose, now, that each country's variety is distinct from that in the other country, so that international trade allows consumers in each country to have variety introduced into their consumption possibilities. That is, in each country, consumption of four distinct varieties (two in each industry) instead of two is made possible in the move from autarky to free trade. Assume varieties in each commodity group can be added up (more on this later). Then, as Figure 7.1 reveals, if indifference curve y_0 for the home country (say) expresses a given level of satisfaction at home for all the consumption bundles along the curve when there is autarky at home, this *same* level of satisfaction can be achieved by the indifference curve, y_T, when free trade between countries allows a wider selection of varieties. Some consumers at home may now just consume

FIGURE 7.1

Trade and Welfare

Point A on indifference curve y_0 before trade yields the same level of utility as any point on indifference curve y_T if after trade the variety of clothing and/or food available for consumption increases.



the foreign variety (say of food), if that comes closer to their ideal; others, exercising their love of variety, demand both the home and foreign offerings. The aggregate bundle, A, on indifference curve, y_0, would yield a higher level of satisfaction if after trade it were available in either (or both) of each country's variety.

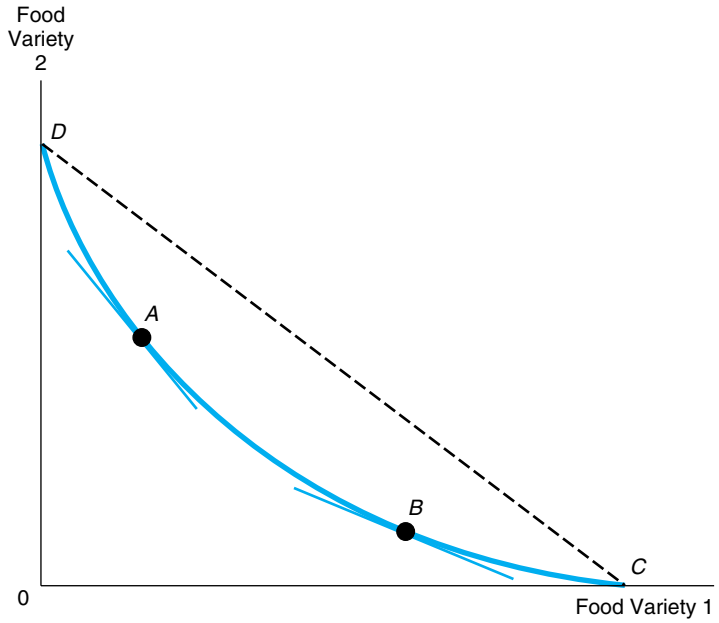
Those individuals who prefer variety to consuming only one type of commodity can have their preferences illustrated by the indifference curve for food drawn in Figure 7.2. Note how such an indifference curve (for a given consumption of clothing) is drawn such that it hits each axis. This is necessary, for it allows the individual to survive with consumption of only one variety or to select some of both. If restricted to consuming only one variety and if the relative price of the first variety is higher than illustrated by the slope of the dashed line, the individual would consume only the second variety. But note that in this event the individual could attain the same level of satisfaction at a lower cost if allowed to consume a combination of the two varieties of food (say at point A in Figure 7.2). Similarly, if the relative price of the first variety were lower than illustrated by the dashed line, the individual would prefer to consume only the first variety if only one could be consumed, but a love of variety is revealed by the fact that a point such as B achieves the same level of satisfaction at a lower overall cost.

The addition of variety increases the gains from trade already possible by exchanging food for clothing. Indeed, if two countries had identical endowments of food and clothing, intra-industry trade could improve real incomes even in the absence of any inter-industry trade. Furthermore, there need be no losers with trade—everyone benefits by having a wider selection of each type of commodity from which to choose or blend.

FIGURE 7.2

Love of Variety

Individuals consume a given amount of clothing and have available two varieties of food. The indifference curve for these two varieties hits the axes, showing that individuals can survive consuming only quantity *C* of the first variety or only quantity *D* of the second variety. However, for given prices of the two varieties, a mixture of varieties shown by *A* or by *B* could be obtained more cheaply and yield the same level of utility.



7.3 Increasing Returns in Production

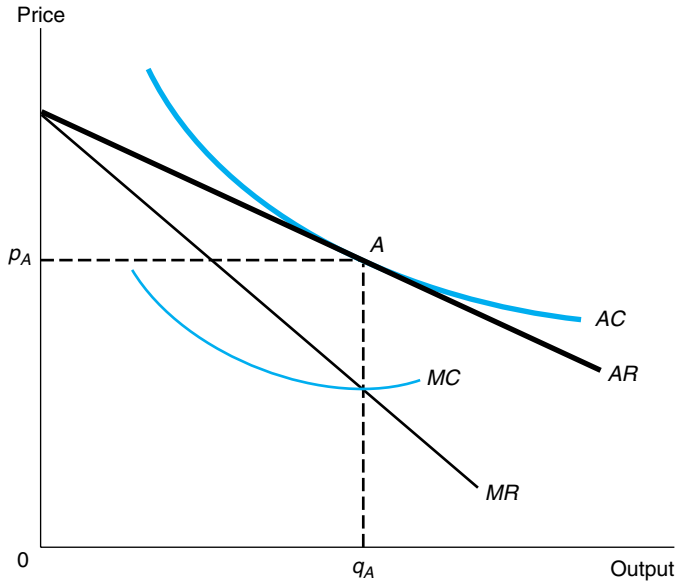
Very little has been said about production in the preceding account or, for that matter, about the nature of competition. If firms in each country produce only a single variety, one that differs from country to country, and if outputs are held fixed, as in Figure 2.4(a) in Chapter 2, intra-industry trade can take place between countries without increasing returns in production and with purely competitive behavior.

Suppose, now, that in one industry, clothing, production exhibits increasing returns to scale in the sense that if all inputs were to increase in the same proportion, output would expand by a greater relative amount. In such a case a large firm would have a scale advantage over a smaller one, and it is easy to imagine that the resulting market would consist of a single large monopolistic supplier. However, suppose that in the clothing sector, individual tastes range over a wide variety of types of clothing. Furthermore, assume that each variety entails two different types of costs: a fixed-cost element (such as the costs of styling as well as capital) plus constant marginal production costs so that total *variable* production costs increase in proportion to output. The consequence: to produce each variety of clothing the average costs of production decline as output expands. From a cost point of view, it would be cheaper just to produce a single variety, but this would neglect the value that consumers place on being able to select from a wide menu of types of clothing. The type of market that results when there is an interplay between declining costs to produce each variety and a demand for variety is called *monopolistic competition.*

FIGURE 7.3

Monopolistic Competition

A firm in a monopolistically competitive equilibrium produces at q_A, with marginal revenue equal to marginal cost. Free entry wipes out all positive profits at price p_A, equal to average costs.



Monopolistic Competition

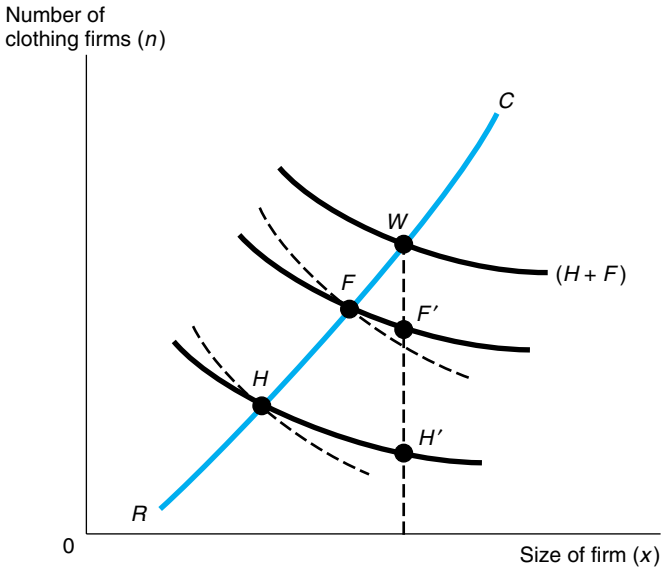
Figure 7.3 illustrates the type of market equilibrium that would emerge for each firm in monopolistic competition. Two cost curves are drawn: the marginal cost curve showing the extra costs involved in producing an extra unit of output, and the higher average cost curve, which is declining because it includes, for each unit of output, not only marginal costs but also that output's share of fixed costs. Demand conditions have been illustrated as well: a downward sloping demand curve for this variety, the AR curve (for average revenue, which is price). Such a demand curve facing any single firm is assumed to be quite elastic because there are large numbers of firms (each with its own variety), but not to exhibit the strictly horizontal shape that typifies a firm in a competitive environment in which all firms produce identical commodities. A critical feature of monopolistic competition is that new firms are assumed to be able to enter the market in case existing firms are making profits. These new firms will position themselves so as to produce new varieties instead of adding to the output of existing varieties. Such entry causes demand curves for each existing variety to shift to the left until equilibrium is obtained when entry squeezes out all profits. Point A depicts such an equilibrium: Each firm is maximizing profits when marginal costs equal marginal revenue, but such profits are reduced to zero when entry forces average revenue down to the level of average costs—at the tangency point between the two average curves.

To keep the analysis simple, strong assumptions have been made: Each firm produces a separate variety in which the cost structure is the same for all firms. In addition, the configuration of demand is identical for all varieties. The resulting equilibrium price and quantity for each firm is the same, as illustrated by p_A and q_A in Figure 7.3.

FIGURE 7.4

Size and Number of Firms

The *RC* curve shows how in each country sharing a common technology, larger firm size goes hand in hand with the production of a greater number of varieties. In autarky, the smaller home market is served by firms (at *H*) that are fewer in number and smaller in size than in the larger foreign market (*F*). With trade, if the same resources are devoted to clothing as in autarky, producers concentrate (at *H′* and *F′*), all firms are the same (larger) size, and a larger number of varieties is available for consumers (at *W*).



Firm Size and Product Variety in Autarky

The equilibrium illustrated in Figure 7.3 could represent the situation in the home country in autarky. How might such an equilibrium differ in the foreign country when it also must rely only on its own production to satisfy demand in autarky?

Suppose the technology required to produce any variety is not only the same for each variety at home but also is shared by firms abroad. Similarly, suppose demand conditions are the same in both countries. If the foreign country is larger and devotes more resources to the clothing sector, its firms in autarky will not resemble exactly the firms at home. Figure 7.4 helps identify the differences. The horizontal axis measures the size (x) of a firm in the clothing sector, whereas the vertical axis measures the number of clothing firms (n), each producing a distinct variety. The upward-sloping *RC* curve is assumed to be common to both countries.[1] In autarky the home country is positioned at *H* and the foreign country at *F*. The total size of the market is larger for points farther out along the *RC* curve, which suggests that any one firm will face stiffer competition as more brands are introduced. Assuming demand becomes more elastic and profits once again are squeezed out by the entry of new firms, as in the tangency solution of Figure 7.3, the size of a typical firm also expands. (That is, the tangency point in Figure 7.3 slides farther down the average cost curve.) As a consequence, the number of varieties changes positively with the size of the representative firm. With the expansion in market size, any one brand faces closer substitutes and firms become

[1]A discussion of this curve is found in Elhanan Helpman and Paul Krugman, *Market Structure and Foreign Trade* (Cambridge, MA: MIT Press, 1985), pp. 153–157.

larger. If the two countries share a common technology, in autarky the smaller market will be served by a smaller number of firms, each similar in size to any other firm in that country but smaller in size relative to firms in the larger foreign market. Thus differences in country size are reflected in differences in firm size.

Differentiated Products in a World Market

A common theme running through all the previous chapters is that the possibility of trading in world markets frees local consumers from a lockstep dependence on the output of national firms. Such a theme is especially relevant to countries producing differentiated products once the countries move from autarky to engage in world markets. The composition of trade depends on cost conditions and tastes for both the clothing and food sectors at home and abroad. Postpone for the moment a full analysis of free-trade patterns by considering only how each country's consumers and producers of clothing respond to the possibilities of international trade *if* each country makes the same commitment of total resources to the clothing industry as it did in autarky. (It will then be asked how this allocation of resources can be altered by trade.)

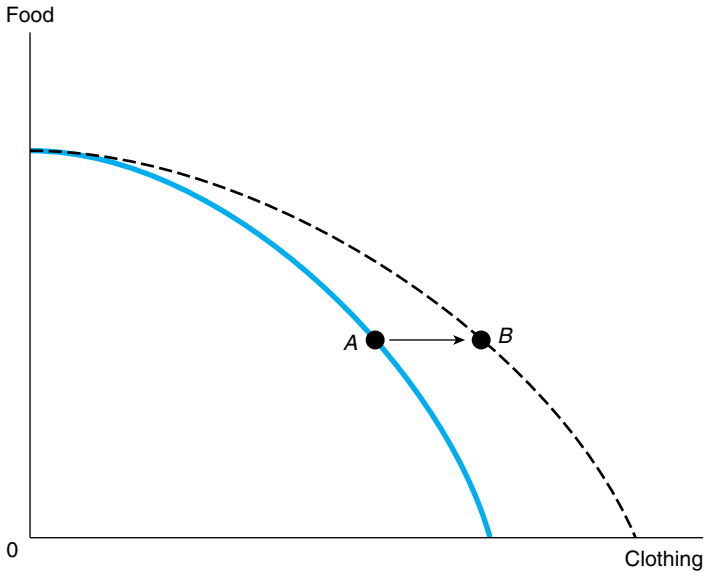
In Figure 7.4 the curves HH' and FF' show, for home and foreign country, respectively, a given allocation of resources to the clothing sector—the same level as in autarky positions H and F. A move toward the southeast represents, for each country, a cutback in the number of varieties produced but an increase in the scale of operations for each variety. Now add these curves vertically to obtain the $(H + F)$ locus, which cuts the RC curve at W. Consider the consequences of trade for consumers and producers in each country: (1) For consumers, opening up trade with the other country establishes a larger market in which more varieties are made available. As discussed earlier, the possibility of widening the number of varieties from which to choose (singly or in combination) raises the utility gained from purchase of any aggregate bundle of clothing. (2) As for producers of clothing, in each country firms now face greater competition. As a consequence of the change to a single, larger, world market, elasticities of demand increase and, for the assumed given allocation of resources to clothing in each country, the number of firms in each is reduced, with each firm becoming larger. Indeed, in the run-up to the Canadian national elections in 1988, where the possibility of a Free-Trade Agreement with the United States (followed five years later by the inclusion of Mexico in NAFTA) was the burning issue, pro-agreement forces in Canada emphasized the gains to be had by Canadian firms having longer production runs with freer access to American consumers. In Figure 7.4 we illustrate that free international trade allows both home and foreign firms to produce for the same larger world market, thus increasing the size of foreign firms from F to F' and home firms by a larger amount, from H to H'.

This type of reaction of producers in a setting of monopolistic competition suggests that our earlier discussion in Chapter 2 of the gains to be had when a country moves from autarky to free trade can be widened. (Already discussed is the downward shift in indifference curves shown in Figure 7.1, in the case in which both the clothing and food sectors contain a number of varieties). Each country's transforma-

FIGURE 7.5

Trade and the Shift in the Transformation Schedule

If clothing is available in autarky for a given number of varieties, a certain allocation of resources can support production at point *A*. If the same allocation of resources after trade is made to the entire clothing sector, production point *B* is attainable if clothing varieties exhibit increasing returns to scale. The reason is that fewer varieties will be produced locally, and thus have longer production runs and lower average costs.



tion schedule shifts outward, in a manner captured in Figure 7.5. Consider an arbitrary assignment of resources to the two industries represented by point *A* for the home country in autarky. After trade, the same total output of food would be produced from the same set of inputs into food production.[2] But a greater aggregate output of clothing is achieved (at point *B* in Figure 7.5). The reason? The greater competitive forces in the larger world market for clothing with trade force a reduction in the number of firms producing clothing at home, with each surviving firm producing a greater output with the same fixed costs. In Figure 7.4 a dotted curve is drawn through point *H* (and one through foreign point *F* as well). This curve is a rectangular hyperbola (the fancy mathematical name), a curve along which the number of firms, (n), times the output size of the firm, (x), is a constant. That is, total home clothing output would be a constant along such a curve. The clothing output at H' exceeds that at *H* because of the increasing returns found in clothing firms. Note there is an asymmetry in the effect of trade on firms in the two countries: In autarky foreign firms are larger than home firms because of the assumed larger foreign market. Such a distinction gets obliterated with the creation of a single world free-trade market, and firm size between countries becomes the same. This, of course, assumes away transportation costs or human-made obstacles that would persist to keep foreign firms larger than those at home.

[2]Recall that here we assume food is a homogeneous product and the food market is perfectly competitive. For the development of a model in which one sector is monopolistically competitive, and the other is purely competitive, see especially Elhanan Helpman, "International Trade in the Presence of Product Differentiation, Economies of Scale, and Monopolistic Competition: A Chamberlin-Heckscher-Ohlin Approach," *Journal of International Economics* 11 (1981), pp. 305–340.

The Combination of Intra-Industry Trade and Inter-Industry Trade

There is no reason why the resources allocated to the clothing sector in each country in autarky should still indicate resource use after trade has been opened up. Although we have assumed that all varieties of clothing in each country are produced in the same way (and that consumer demand is such that all have the same price and thus can be aggregated into an industry total), we retain the assumption that food is produced differently, by capital-intensive techniques compared with clothing. Therefore the bias in production imparted by countries possessing different relative factor endowments carries over to indicate the extent of *inter-industry* trade, of net clothing exports from the relatively labor-abundant home country. As the figures in Table 7.1 indicate, intra-industry trade is indeed important but so also is inter-industry trade. The causes of trade explored in the preceding chapters, namely, technology differences and/or differences in factor proportions, often serve well to indicate the pattern of inter-industry trade, but two-way trade in varieties within an industry classification takes place as well, and this kind of trade is encouraged by the increasing returns to scale found in markets characterized by monopolistic competition.

Quality Differences and Intra-Industry Trade

Does this kind of model setting, with the emphasis on increasing returns in production and imperfect competition, rule out the importance of factor endowments and factor intensities in determining the nature of intra-industry trading patterns? The answer would have to be in the affirmative if we literally stick with the assumption that the capital/labor ratios used in producing any variety of clothing is the same as for any other variety, for then there is no opening for factor endowments to make a difference. What, then, does determine which varieties of clothing get produced at home and which abroad? The theory is silent on this point or argues that the pattern makes no difference because this is *horizontal* intra-industry trade. But it is also possible that two-way trade takes place in varieties that differ in quality, a kind of *vertical* intra-industry trade.[3] Japan or Germany may produce automobiles that are of higher quality than South Korea or Spain. If higher quality varieties are produced, say, with more capital-intensive techniques than are lower quality varieties, we might expect the higher quality varieties to be produced by more capital-abundant countries.

There is, however, an added effect stemming from asymmetry between countries in relative capital abundance. Per capita incomes tend to be higher in more capital-abundant countries, and such income differentials may find expression in the difference in the quality of varieties demanded in such countries. Factor endowments have an influence both on the supply side and the demand side. It may be the case that relatively capital-abundant countries tend to export capital intensive commodities in inter-industry trade. However, if a labor-abundant country produces a number of varieties of

[3]See especially the article by Rod Falvey and Henryk Kierzkowski, "Product Quality, Intra-industry Trade, and (Im)perfect Competition," in H. Kierzkowski, ed., *Protection and Competition in International Trade* (Oxford: Blackwell, 1987), pp. 143–161.

a commodity, differing in quality, the varieties that get exported to capital-rich countries may well be more capital intensive than those varieties consumed at home.[4] In the United States in discussions leading up to the NAFTA treaty with Mexico and Canada, American tomato producers were concerned with the fact that Mexico often exports its quality tomatoes, well packaged, to the American market.

7.4 Summary

Industries in which consumers' tastes support a wide variety of qualities are often characterized by monopolistic competition. The demand curve facing the producer of any given variety is slightly downward sloping; in equilibrium such a firm will produce in the range where average costs are declining (increasing returns to scale in the technology). If differences in technology among varieties is ignored, and if it is further supposed that demand is evenly balanced over all varieties produced, it is possible to model both autarky and free-trade positions in a Heckscher-Ohlin framework. Conclusions that emerge include:

1. In autarky larger countries tend to produce more varieties of products than do smaller countries, and firms tend to be larger.
2. With free trade and a commonly shared technology, each country may produce a range of different product types, as well as a homogeneous product that differs in its required capital/labor ratio from that adopted by other firms in an industry of differentiated products.
3. Firm size in each country will be larger with trade than under autarky and will be comparable among countries. Consumers everywhere enjoy a larger menu of varieties in a world market than with autarky. Producers, however, face stiffer competition, which encourages longer production runs and a more limited range of varieties produced.
4. Factor endowments affect the pattern of trade in Heckscher-Ohlin fashion. The relatively labor-abundant country, with output levels relatively higher in the labor-intensive industry, will tend to be a net exporter of that industry's output. If the industry is characterized by differentiated products, such a net export position reflects an underlying mutual interpenetration by each firm of the other country's markets.
5. Gross trade exceeds net trade. In situations where some products are differentiated and some are homogeneous, both comparative advantage (as imparted by relative factor endowments) and increasing returns help explain nations' trading patterns.

[4]This possibility, that a labor-abundant country may be an exporter of labor-intensive commodities in inter-industry trade but an exporter of more capital-intensive items in intra-industry trade, is discussed in R. Jones, H. Beladi, and S. Marjit, "The Three Faces of Factor Intensities," *Journal of International Economics*, 48 (1999): 413–420.

CHAPTER PROBLEMS

1. Suppose that in autarky the decomposition of food and clothing aggregates reveals that ten varieties of each are produced, with each variety requiring 200 units of resources for setup costs, regardless of scale of output. In addition, each unit of food of any variety produced requires one unit of resources, and each unit of clothing requires two units of resources. The autarky output levels are 400 units of each variety of clothing and 200 units of each variety of food. With trade, competition from the world market narrows the number of varieties produced in each industry (food, clothing) to four. If resources are allocated to food and clothing industries exactly as in autarky, by how much has trade allowed each industry aggregate to expand? Why did the number of varieties produced not get cut back to four in each industry before trade?
2. In Figure 7.4 points H' and F' show each country devoting the same resources to the differentiated clothing sector as it did in autarky. Suppose that the home country is relatively labor abundant and clothing is labor intensive relative to food. How would this alter the number of firms devoted to clothing in each country? Could the home country produce a wider variety of clothing with trade than the (larger) foreign country?

SUGGESTIONS FOR FURTHER READING

Helpman, Elhanan, and P. Krugman. *Market Structure and Foreign Trade* (Cambridge, MA: MIT Press, 1985). A more advanced monograph; Chapter 7 describes trade in a setting of monopolistic competition.

Krugman, Paul R. "Increasing Returns, Monopolistic Competition, and International Trade," *Journal of International Economics,* 9, 4 (November 1979): 469–479. An early discussion of trade with monopolistic competition and increasing returns.

Lloyd, Peter, and Hyun-Hoon Lee (eds.). *Frontiers of Research in Intra-Industry Trade* (New York: Palgrave, Macmillan, 2002). Chapters 1 and 2 especially review the development of intra-industry trade theory.

Smith, Alasdair. "Imperfect Competition and International Trade," Chapter 3 in David Greenaway and L. Alan Winters (eds.), *Surveys in International Trade* (Oxford: Blackwell, 1994). A survey both of monopolistic competition in trade theory and monopoly, duopoly, and other variants of imperfect competition.