CHAPTER 4

Intraindustry Trade

"Most students of international trade have long had at least a sneaking suspicion that conventional models of comparative advantage do not give an adequate account of world trade . . . [I]t is hard to reconcile what we see in the manufactures trade with the assumptions of standard trade theory."

Paul Krugman

Introduction

Intraindustry trade international trade that occurs when a country exports and imports goods within the same industry or product group.

Interindustry trade international trade that occurs when a country either exports or imports goods in different industries.

In our analysis of international trade you have learned why countries have a comparative advantage in producing different types of goods. The U.S. has a comparative advantage in machines and India in cloth because the two countries are endowed with different factor proportions. Comparative advantage based on the factor-proportions theory is the foundation of our understanding of the gains from specialization and trade. With this foundation we can determine the impact that trade has on factor prices and a country's distribution of income.

However, a large share of international trade is not based on comparative advantage that results from different factor endowments. Countries also trade essentially the same goods with one another. This is known as **intraindustry trade**. For example, Canada and the U.S. have a large trading relationship based on exporting and importing automobiles and automobile parts to one another. In this chapter, we will explain what intraindustry trade is and how it differs from the **interindustry trade** we considered in the previous two chapters. As we will see, intraindustry trade is determined by different factors than interindustry trade. As

result, a large part of this chapter is dedicated to explaining why intraindustry trade occurs. Finally, we will examine the welfare effects of intraindustry trade and show that it is as beneficial as interindustry trade.

Intraindustry Versus Interindustry Trade

In Chapter 3, you learned that comparative advantage is based on different factor endowments among countries. The empirical tests of the factor-proportions theory raised some questions regarding the empirical validity of the theory but also stimulated the development of new trade theories. More specifically, the factor-proportions theory leaves unexplained a large portion of today's international trade. Up to this point, we have assumed that all international trade is interindustry trade, meaning countries trade different goods with one another. The U.S. imports cloth and exports machines and India imports machines and exports cloth. Because each country has different resource endowments, countries trade very different goods. However, a large portion of international trade consists of a country exporting and importing the same good—intraindustry trade. For example, the U.S. both imports and exports automobiles, beer, and steel. Intraindustry trade is not an isolated event but rather it is a pervasive part of international trade for many countries.

Unfortunately, intraindustry trade between countries coupled with the factor-proportions theory as the basis of trade poses a logical problem. The premise of the factor-proportions theory is that each country exports goods in which it has a comparative advantage. This comparative advantage reflects a country's ability to produce the good at a lower opportunity cost. Countries have different opportunity costs because they have different resource endowments. As a result, the factor-proportions theory provides a basis for interindustry trade but not intraindustry trade.

With intraindustry trade, a country simultaneously imports and exports the same good. This implies that a country simultaneously has a comparative advantage and a comparative disadvantage in the same good. Using the factor-proportions theory as the sole basis for trade, this does not make any sense. Something else must be determining the basis for intraindustry trade. However, explaining intraindustry trade is more complicated than was the case for interindustry trade. We will discuss several theories, each less general than the factor-proportions theory, and each designed to explain intraindustry trade for narrower groups of goods. In order to meaningfully discuss intraindustry trade, we must first define it more carefully.

Defining Intraindustry Trade

Measures of the importance of intraindustry trade vary because measuring intraindustry trade is not nearly as straightforward as measuring interindustry trade. For interindustry trade we can easily determine what goods are imported and exported. We measure interindustry trade by calculating the value of trade in various goods. For example, the U.S. imports $100,000 of cloth from India and exports $100,000 of machines to India.

The problem in measuring intraindustry trade is that it is two-way trade in the same good—a country imports and exports the same good. For example, suppose the U.S. imports $50,000

in food from India and exports $50,000 in food to India. In this case, a numerical measure of the amount of intraindustry trade in the food industry is necessary. The easiest way to measure intraindustry trade is by means of the following formula, called the **intraindustry trade index.**

Intraindustry trade index indicates the amount of intraindustry trade embodied in a country's international trade. The index is expressed as 1 minus the ratio of the absolute value of exports minus imports divided by exports plus imports.

$$\text{Intraindustry Trade Index} = 1 - \frac{|X - M|}{X + M}$$

For a particular industry or product group, X represents the value of exports and M represents the value of imports. The vertical bars in the numerator of the index denote the absolute value of the difference between the amount exported and the amount imported.[1]

In order to evaluate intraindustry trade, we first consider the situation covered in the previous two chapters. For the most part, a country either imported a particular product or exported it. As a starting point, consider the situation that was examined in Chapter 3. Suppose the U.S. only imports $100,000 of cloth from India. In this case, the second term in the expression reduces to 1 by dividing ($100,000/$100,000), and the whole expressions equals 0. This indicates no intraindustry trade in the cloth industry. If the U.S. only exports $100,000 of machines to India, the second term in the expression reduces to 1 by dividing ($100,000/$100,000), and the whole expression equals 0. This indicates no intraindustry trade in machines. In both cases, all trade is interindustry trade.

However, if the U.S. exports $50,000 in food to India and imports $50,000 in food from India, the result is different. The second term in the expression reduces to 0 by dividing (0/$100,000). The whole expression now equals 1. This indicates that 100 percent of the trade in the food industry is intraindustry trade. Using these two extreme cases, the intraindustry trade index ranges from 0 (no intraindustry trade) to 1 (100 percent of the trade is intraindustry trade). The closer the index is to 1, the more intraindustry trade there is relative to interindustry trade. The closer it is to 0, the less intraindustry trade there is relative to interindustry trade in the same good or service.

The major shortcoming of using this index to measure the amount of intraindustry trade is that we get very different values for intraindustry trade depending on how we define the industry or product group. The more broadly we define the industry, the more likely a country will engage in intraindustry trade. For example, suppose the U.S. imports $100,000 of men's pants and exports $100,000 of women's pants. What is the amount of intraindustry trade? If we define the industry to be the pants industry, the second term in the expression reduces to 0 by dividing (0/$200,000), and the whole expression equals 1. This indicates that 100 percent of the trade in this industry is intraindustry trade. But if we define the men's pants industry and the women's pants industry separately, the intraindustry trade indexes for each industry would equal 0, indicating no intraindustry trade. As a result, measuring the importance of intraindustry trade can vary depending on how you define the industry or product group. The general principle is that the more broadly one defines the industry, the higher the intraindustry trade index will be. Conversely, the more narrowly the industry is defined, the lower the index will be. Beyond this definitional issue, there is little doubt that intraindustry trade is now an important part of international trade overall. In the next section, we consider just how important it is and how fast it is growing.

[1] Indexes of intraindustry trade can be traced back to Bela Balassa, "Tariff Reductions and Trade in Manufactures Among the Industrial Countries," *American Economic Review,* June 1966, 56(2), pp. 466–73.

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Intraindustry Trade in U.S. Foreign Trade

The major shortcoming of using the intraindustry trade index to measure the amount of intraindustry trade is that we get very different values for intraindustry trade depending on how we define the industry or product group. The more broadly we define the industry or product group, the more likely a country will engage in intraindustry trade. In Tables 4.1 and 4.2, we examine how intraindustry trade varies across industries. U.S. merchandise trade can be subdivided by a number of different product categories. Table 4.1 shows the amount of U.S. imports and exports for 16 of these broad product categories. The intraindustry trade index varies from 0.985 in medical equipment and 0.961 in electrical apparatus to 0.002 in crude oil. These indexes indicate that intraindustry trade for the U.S. is substantial.

However, the level of intraindustry trade is sensitive to how broadly or narrowly the industry is defined. As we move to more narrowly defined product categories, the measured amount of intraindustry trade frequently falls. Intraindustry trade indexes for more narrowly defined product categories are shown in Table 4.2. Even with these more narrowly defined product categories, the level of intraindustry trade is quite large in some cases. For other product categories the level is relatively low.

Can you determine what causes the difference? The more closely trade approximates the factor-proportions theory of Chapter 3, the less intraindustry trade there is. Products such as clothing and apparel typically now are imported from developing countries. Products such as electrical machinery are more likely to be traded *among* developed countries, where the factor-proportions model works less well.

TABLE 4.1

INTRAINDUSTRY TRADE EXAMPLES: SELECTED U.S. EXPORTS AND IMPORTS, 2003 ($ MILLION)

Category	Exports	Imports	Index of IIT	Category	Exports	Imports	Index of IIT
Telecommunications equipment	$20,748	$24,766	0.912	Machine tools	$21,109	$6,209	0.455
Plastic material	15,407	8,508	0.712	Furniture	2,414	17,985	0.237
Cookware	689	4,834	0.250	Excavating machinery	5,288	4,925	0.964
Pulpwood	4,271	2,603	0.757	Farm machinery	3,791	4,815	0.881
Finished metal shapes	8,951	7,625	0.920	Business machines and equipment	1,925	7,136	0.425
Crude oil	124	99,260	0.002	Medical equipment	15,753	16,228	0.985
Electronic apparatus	21,109	22,804	0.961	Computers	8,664	20,368	0.597
Semiconductors	46,158	24,608	0.695	Civilian aircraft	23,446	12,326	0.689

Source: U.S. Bureau of the Census, *International Trade in Goods and Services, FT 900,* Washington, D.C.: U.S. Government Printing Office, 2004.

TABLE 4.2

INDEXES OF INTRAINDUSTRY TRADE FOR THE U.S., 2003

Industry	Index of IIT	Industry	Index of IIT
Inorganic chemicals	0.999	TV, VCR, etc.	0.236
Generators	0.749	Vehicles	0.552
Industrial machinery	0.926	Iron and steel	0.723
Organic chemicals	0.862	Household appliances	0.580
Apparel and textiles	0.245	Stereo equipment	0.341
Toiletries and cosmetics	0.982		

Source: U.S. Bureau of the Census, *International Trade in Goods and Services, FT 900,* Washington, D.C.: U.S. Government Printing Office, 2004.

The Increasing Importance of Intraindustry Trade

Now that you know how intraindustry trade is measured, we will examine the data in Table 4.3. The table shows the average share of intraindustry trade in manufactured goods for various countries and groups of countries from 1970 to 2000. Manufactured goods in this case do not include trade in agricultural products, raw materials, and other primary products that can be explained by the factor-proportions theory. The combined intraindustry trade for the 22 developed economies was approximately 62 percent of their total trade in manufactured goods in 2000. Among the six largest economies, the lowest was Japan's 41 percent intraindustry trade as a percent of its total trade in manufactured goods. France was the highest with intraindustry trade of 76.7 percent of its total trade in manufactured goods. For the U.S., intraindustry trade accounts for 59.6 percent of total manufactured goods trade. Even for the developing countries, the percentage of intraindustry trade ranged from 28.5 percent to nearly 51.2 percent of total trade.

TABLE 4.3

AVERAGE SHARES OF IIT IN MANUFACTURED GOODS BY COUNTRY GROUP, 1970 AND 2000 (PERCENTAGES), AND CHANGE IN IIT

Economic Group/Country (Number of Countries)	Average Intraindustry Trade Index		Change in Average Intraindustry Trade Index from 1970 to 2000
	1970	2000	
Developed economies (22)	0.351	0.620	0.269
Six major exporters	0.411	0.617	0.206
France	0.519	0.767	0.248
Germany	0.510	0.692	0.182
Italy	0.443	0.581	0.138
Japan	0.177	0.410	0.233
U.K.	0.453	0.736	0.283
U.S.	0.360	0.596	0.236
Other developed economies (16)	0.328	0.628	0.300
Developing countries (25)	0.081	0.465	0.384
Newly industrialized economies (6)	0.139	0.512	0.373
Second-generation newly industrialized economies (9)	0.034	0.408	0.374
Other developing countries (10)	0.089	0.285	0.196

Note: Developed market economies include France, Germany, Italy, Japan, the U.K., the U.S., Australia, Austria, Belgium, Canada, Denmark, Finland, Greece, Ireland, Israel, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, and Switzerland. Developing countries include the newly industrialized economies, the second-generation newly industrialized economies, and the other developing countries. The newly industrialized economies include Argentina, Brazil, Hong Kong, Mexico, Korea, and Singapore; Second-generation newly industrialized economies include Colombia, Indonesia, Malaysia, Peru, Philippines, Sri Lanka, Thailand, Tunisia, and Uruguay; and other developing countries, Chile, Dominican Republic, Egypt, Guatemala, India, Pakistan, Panama, Turkey, Venezuela, and Yugoslavia.

Source: Adapted from Helmut Forstner and Robert Ballance, *Competing in a Global Economy: An Empirical Study on Specialization and Trade in Manufactures,* London: Unwin Hyman, 1990; and authors' calculations.

The third column of Table 4.3 presents the change in the average levels of intraindustry trade in manufactured goods from 1970 to 2000. As the table indicates, intraindustry trade has grown over the period. For most countries or country groups, the average levels of intraindustry trade grew by 13.8 percentage points to 38.4 percentage points over the 30 years from 1970 to 2000. For the developed economies, the average levels of intraindustry increased by 26.9 percentage points over the same time period. For the U.S., intraindustry trade increased by 23.6 percentage points. These data indicate that intraindustry trade has become a larger component of total manufactured trade among countries.[2] In the next section, we consider the reasons that intraindustry trade occurs.

Explanations of Intraindustry Trade in Homogeneous Products

So far, we have assumed that the goods being traded were **homogeneous goods** (identical goods). For example, cloth and machines produced in India are identical to cloth and machines produced in the U.S. The factor-proportions theory explained why there is interindustry trade in homogeneous goods. We now want to explain why there also is intraindustry trade in these goods. Intraindustry trade in homogeneous goods between countries can occur as a result of four possible circumstances.

Homogeneous goods one product is identical to every other product produced within an industry.

First, consider an identical and bulky material such as cement, for which the cost of transportation is high relative to its value. For example, there are several cement plants located on each side of the U.S. and Canadian border. Cement users in both Canada and the U.S. might find it cheaper to buy from a supplier on the other side of the border—that is, a foreign supplier—if that supplier is closer than the nearest domestic supplier. In such cases, exports and imports would show up as intraindustry trade for both Canada and the U.S.

Second, homogeneous services can be the basis of intraindustry trade due to the joint production of the service or peculiar technical conditions. For example, a country both exports and imports banking services, shipping services, and insurance services because these services are produced jointly with another traded product. Exports of automobiles from Germany to the U.S. must be transported and insured. Frequently, a bank is involved in financing goods as they move from the German exporter to the U.S. importer. In addition, a shipment of computers from the U.S. to Germany must also be transported, insured, and financed. The export and import of these goods are interindustry trade, but the export and import of transportation, insurance, and financing services to move these goods would show up as intraindustry trade in services for both Germany and the U.S.

Third, some countries engage in substantial entrepot and re-export trade. With **entrepot trade**, goods are imported into a country and later the same good is exported to another country. The country engaging in entrepot trade is providing storage and distribution facilities for an international firm. For example, IBM may ship computers from the U.S. to a warehouse facility in Singapore. With computers stored in a warehouse in Singapore, IBM can supply other countries in the Far East. Imports and exports of computers by Singapore are classified as entrepot trade. With **re-export trade**, goods are imported into a country and

Entrepot trade goods are imported into a country and sometime later the same goods are exported to another country.

Re-export trade goods are imported into a country and sometime later the same goods are subjected to a small transformation and exported to another country.

[2] The same results seem to hold for broader measures of trade among industrialized countries. Also, intraindustry trade is not a new phenomenon. Even in the 1960s, intraindustry trade was already a large percentage of total trade. For more details, see H. P. Grubel and P. J. Lloyd, *Intra-Industry Trade*, London: MacMillan, 1975.

Differentiated goods features make one good appear different from competing goods in the same market or industry.

Horizontally differentiated goods similarly priced goods that are perceived to be different in some slight way.

then subjected to some small transformation that leaves them essentially unchanged prior to exporting them to another country. For example, Singapore, Hong Kong, China, and the Netherlands collect imports and then sort, repack, and label these goods with the language of the country to which they will ultimately be shipped. Finally, these countries re-export the goods to countries in the region. In the case of entrepot and re-export trade, the country does not actually produce the good but rather transships the good through it. However, this type of trade is included in a country's imports and exports and increases the reported level of intraindustry trade. Fourth, seasonal or other periodic fluctuations in output or demand can lead to intraindustry trade in homogeneous goods. Examples would include international trade in seasonal fruits and vegetables, electricity, and tourist services.[3]

Explanations of Intraindustry Trade in Differentiated Products

Vertically differentiated goods features that make one good appear different from competing goods in the same market based on very different product characteristics and very different prices.

Imperfect competition a market structure in which firms have some degree of monopoly power including monopolistic competition, oligopoly, and monopoly markets.

Monopolistic competition a market structure in which many firms produce slightly differentiated goods but each firm maintains some control over its own price.

Most intraindustry trade is trade in differentiated goods between countries. **Differentiated goods** have features that make them appear different from competing goods in the same market or industry. Goods can be differentiated in one of two ways. **Horizontally differentiated goods** are goods that are different in some slight way, although their prices are similar. For example, candy bars may have the same price but contain very different flavors or ingredients. **Vertically differentiated goods** have very different physical characteristics and different prices.[4] For example, the prices and physical characteristics of new automobiles vary enormously.

In addition, most international trade in differentiated goods occurs under conditions of imperfect competition. A critical distinction between perfect competition and imperfect competition is the number of firms in the marketplace. Under perfect competition, a firm cannot affect the market price because it is only one of many firms that produce virtually identical goods. Under **imperfect competition**, a firm is able to influence the price of the product by changing the quantity of goods offered for sale. When a firm in an imperfectly competitive market can influence the price of the product, this means that the firm has some degree of market power. Imperfect competition can occur under three different market structures—monopolistic competition, oligopoly, and monopoly.

In an industry characterized by **monopolistic competition**, there are many firms and each firm has some market power derived from product differentiation. For example, there may be 30 women's clothing stores in a city. Each store may be able to differentiate itself by offering a different location, atmosphere, style, quality of the material, or quality of the service. However, each firm must compete with other firms offering close substitutes. Coffee bars, banks, radio stations, apparel stores, convenience stores, law firms, and dentists are al

[3] Most of our discussion of intraindustry trade will be limited to international trade in goods. However, from thi section there is obviously a nontrivial amount of international trade in services. Unfortunately, the study of this typ of trade is even less developed than our study of international trade in services in general.

[4] An explanation of intraindustry trade in terms of horizontal product differentiation is contained in Pau R. Krugman, "Scale Economies, Product Differentiation and the Pattern of Trade," *American Economic Revieu* December 1980, 70(5), pp. 950–59. Vertical product differentiation and intraindustry trade is covered in Kelvi J. Lancaster, "Intra-Industry Trade under Perfect Monopolistic Competition," *Journal of International Economic* June 1980, 10(2), pp. 151–75. An analysis of intraindustry trade between the U.S. and Canada is provided in Keit Head and John Ries, "Increasing Returns Versus National Product Differentiation as an Explanation for the Patter of U.S.–Canada Trade," *American Economic Review,* September 2001, 91(4), pp. 858–76.

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Equilibrium with Monopolistic Competition Firms face a high degree of competition when they produce differentiated products that can be distinguished from one another by the consuming public. If competition is great enough in the marketplace, the free entry of firms into the market will drive profits for all firms to zero. In this case, the demand for the product produced by any one firm is characterized by a downward sloping demand curve. As such, the firm is a price searcher in that if the firm raises or lowers its price while the prices of competing products are constant, its sales would dramatically decrease or increase, respectively.

Figure 4.1 illustrates the equilibrium level output for a single firm in this monopolistically competitive market. The demand curve, D, facing the firm is downward sloping, implying that the marginal revenue curve, MR—meaning the change in total revenue as the firm sells 1 more unit—lies below the demand curve. With the firm producing in the range of decreasing costs, the average cost curve, AC, is declining. With average costs declining, the marginal cost curve—the change in total costs as the firm produces 1 more unit—lies below the average cost curve.

The firm in this market seeks to produce an output level at which profits are maximized. This means that the firm will select the output level for which marginal revenue equals marginal cost, Q_M. If new firms are free to enter this market, the resulting maximum profits for any one firm are zero. This is shown in Figure 4.1 by the tangency of the average cost and the demand curves at point M. Output Q_M and price P_M represent the best the firm can achieve, as any other output level results in losses for the firm.

Notice that in this market, the price of the product is greater than the marginal cost of producing the last unit of output. When consumers pay a price above the marginal cost of producing a product, then society as a whole values additional units of that product more than they value alternative products that can be produced with the resources. In addition, imperfectly competitive firms are characterized by excess capacity, which means that they produce somewhat short of the least unit cost level of output. As a result, an imperfectly competitive market tends to have underutilized plants, and consumers are penalized through having to pay higher than perfectly competitive prices to buy the product.

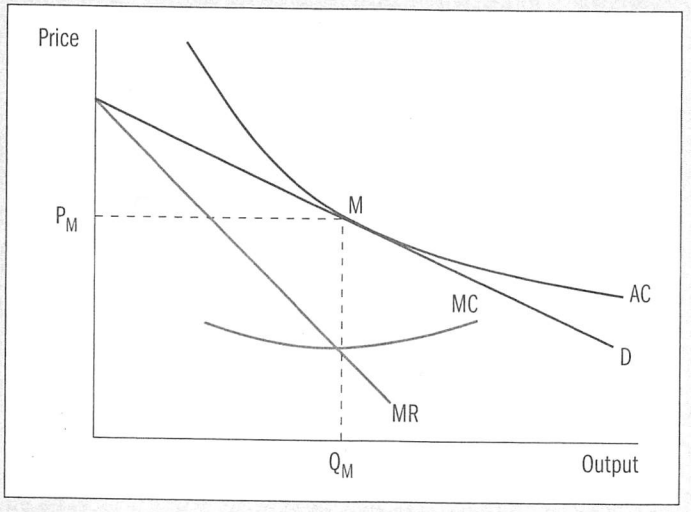


Figure 4.1

Equilibrium with Monopolistic Competition

A firm in a monopolistically competitive market achieves equilibrium by producing output level Q_M, where marginal revenue equals marginal cost. Free entry into the market by other firms creates a situation where profits for the firm are zero at price P_M, which is equal to average costs.

Oligopoly a market structure in which a few firms produce all of the output for an industry, and each firm has some control over its own price.

Monopoly a market structure in which one firm supplies the entire industry for a particular good and maintains considerable control over its own price.

examples of monopolistic competition. In an **oligopoly** there are few firms and each firm has some market power that is derived from the small number of firms in the industry and high barriers to entry. Automobiles, tires, detergents, and TVs are all differentiated products sold in oligopoly markets in which one firm's actions may cause a reaction on the part of the other firms. In a **monopoly**, a firm's market power is derived from being the only firm in the industry that produces a unique product with no close substitutes. Electrical power service, water service, sewer service, natural gas service, cable TV service, and drugs under patent are all examples of monopolies.

What follows are three theories explaining intraindustry trade. Economies of scale, the product cycle, and overlapping demands all are used to explain intraindustry trade in differentiated products. However, these theories are not mutually exclusive. This means that you may be able to apply more than one of these explanations of intraindustry trade to a particular product or industry.[5]

Economies of Scale

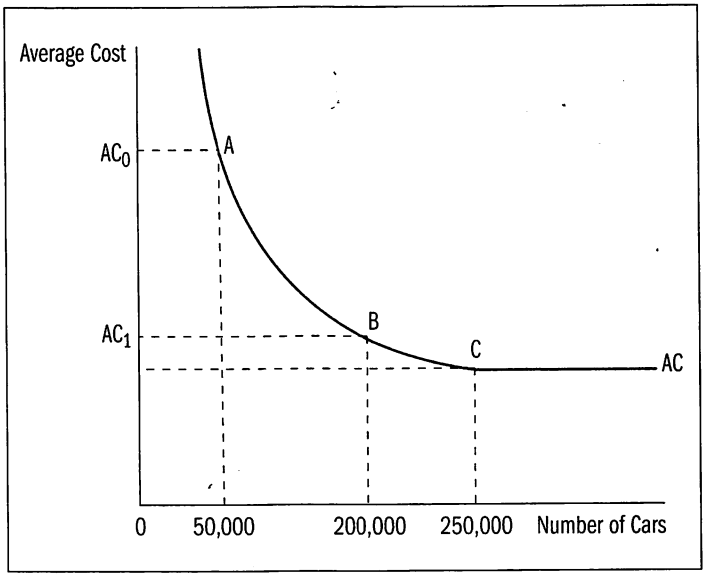
Economies of scale the reduction in average costs that result from increases in the size (scale) of a firm's plant.

Decreasing costs the reduction in average costs that results from increases in a firm's output.

A common explanation of international trade in differentiated products is that this trade is a result of economies of scale—EOS—in the product's production. **Economies of scale** means that as the production of a good increases, the cost per unit falls. This phenomenon also is known as **decreasing costs** or increasing returns to scale.

Figure 4.2 shows the effects of economies of scale on international trade. Assume that a U.S. automobile firm and a German automobile firm have identical cost conditions. This

Figure 4.2
Economies of Scale as a Basis for Trade
By adding to the size of the domestic market, international trade allows a firm to increase its production. This increase in production can lead to greater efficiency and reductions in unit costs.



[5] For an extensive discussion of this problem, see H. Peter Gray, "Intra-Industry Trade: An 'Untidy' Phenomenon," *Weltwirtschaftliches Archiv*, 1988, 124(2), pp. 212–29.

means that the firms have the same long-run average cost curve (AC) for this type of car. As the figure indicates, the economies of scale both firms face result in decreasing unit costs over the first 250,000 cars produced in a year. Past this point, the unit cost of a car remains constant. Point C in the figure is called the minimum efficient scale of plant size. This means that 250,000 units of output are required to minimize per-unit cost.

Now, suppose that the U.S. automobile firm produces and sells 50,000 cars in the U.S. and the German automobile firm produces and sells 50,000 cars in Germany, as indicated by point A. Because cost and price structures are the same, the average costs for both firms are equal at AC_0. At this point, there is no basis for international trade. Now, suppose that rising incomes in the U.S. result in a demand for 200,000 cars, and German demand remains constant. The larger demand allows the U.S. firm to produce more output and take advantage of the economies of scale. As output increases from 50,000 cars to 200,000 cars, unit costs for the firm change from AC_0 at point A to AC_1 at point B. Because the U.S. firm is subject to economies of scale, its unit costs have declined. Compared to the German firm, the U.S. firm now can produce cars at a lower cost. With free trade, the U.S. would now export cars to Germany. As a result, we can use economies of scale to explain interindustry trade when initial comparative costs between countries are equal. However, this example of economies of scale and international trade does not explain the existence of intraindustry trade in automobiles between Germany and the U.S.

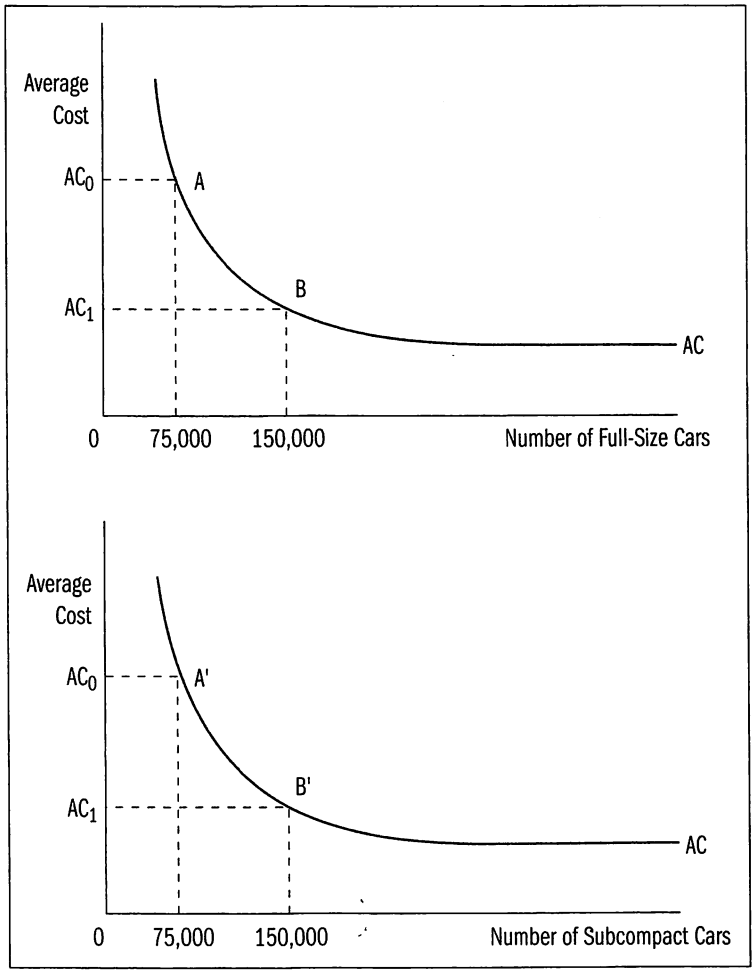
To explain intraindustry trade using economies of scale, consider a situation where both a U.S. automobile firm and a German automobile firm produce full-size cars and subcompact cars. In addition, assume that both firms have identical cost conditions in the production of both types of cars so that they have the same long-run average cost curves (AC). As Figure 4.3 indicates, the economies of scale both firms face result in decreasing unit costs for both full-size and subcompact cars. Assume that the U.S. automobile firm produces and sells 75,000 full-size cars in the U.S. and the German automobile firm produces and sells 75,000 full-size cars in Germany, as indicated by point A. In addition, assume that the U.S. automobile firm produces and sells 75,000 subcompact cars in the U.S. and the German automobile firm produces and sells 75,000 subcompact cars in Germany, as indicated by point A′. Because cost and price structures are the same, there is no basis for trade.

Now, assume that both Germany and the U.S. allow free trade in the automobile market. The total demand for full-size and subcompact cars in the combined German and U.S. markets is 150,000 full-size and 150,000 subcompact cars (75,000 cars in Germany and 75,000 cars in the U.S.). This combined larger demand for full-size cars would allow the U.S. firm to produce more full-size cars and take advantage of economies of scale. As the U.S. firm increases output from 75,000 full-size cars to 150,000 full-size cars, unit costs for the firm change from point A to point B. Because the U.S. firm is subject to economies of scale, its unit costs decline from AC_0 to AC_1. Compared to the German firm, the U.S. firm now can produce full-size cars at a lower cost. In addition, the combined larger demand for subcompact cars would allow the German firm to produce more subcompact cars and likewise take advantage of economies of scale. As the German firm increases output from 75,000 to 150,000 subcompact cars, unit costs for the firm fall from AC_0 to AC_1 (point A′ to point B′). Because the German firm is subject to economies of scale, its unit costs decline. Compared to the U.S. firm, the German firm now can produce subcompact cars at a lower cost. With free trade, the U.S. would now export full-size cars to Germany, and Germany would export subcompact cars to the U.S. As a result, economies of scale also can be used to explain intraindustry trade when initial comparative costs between countries are equal.

Figure 4.3

Economies of Scale as the Basis for Intraindustry Trade

By combining the German and U.S. automobile markets, economies of scale allow the German and U.S. automobile firms to increase production. This increase in production can lead to greater efficiency and reductions in unit costs. As a result, intraindustry trade can occur between the U.S. and Germany in the automobile industry.



Although our example shows that intraindustry trade can occur between countries because of economies of scale, the actual specialization pattern is indeterminate. In the example, the U.S. produces full-size cars and Germany produces subcompact cars. As a practical matter, it does not make any difference which firm or which country produces the full-size or subcompact car. In either case, unit costs decline and intraindustry trade will occur between the two countries. Very often, the determination of which country produces which type of good is a result of historical accident or is based on initial consumer tastes and preferences within the domestic economy. In our example, we assumed that the initial comparative costs and demand conditions between the two countries were identical. With differentiated products, identical costs and demand conditions are not necessary for mutually beneficial trade to occur from economies of scale.

There are two sources of economies of scale. One source is *internal* economies of scale for the firm. Scale economies are internal when the firm's increase in output causes a decline in

In the first stage of the product cycle, manufacturers of a "new" product need to be near a high-income market in order to receive consumer feedback. Generally, firms target the initial small-scale production at a consumer base with substantial income in their domestic market, such as the U.S. At this point, both the product's design and the production process are still evolving. The product may need to be improved or the production process may need to be adjusted to determine the most efficient method of production. These design and production enhancements usually require specialized scientific and engineering inputs that are available only in developed countries. During this stage of the product cycle, both consumption and production of a "new" product are likely to occur in a relatively high-income and high-cost-of-production country. Over time, the firm will perfect the product and the production process. At this point, the product's consumption and production increases. Aside from serving the domestic market, the firm will begin to export the new product to other countries where there is additional demand from high-income consumers.

In the second stage of the product cycle, the product matures as it becomes more standardized in terms of size, features, and the production process. If foreign demand is sufficiently large, the firm may find it more profitable to produce the product in other high-income markets rather than export it. In some circumstances, the country where the product was originally developed may begin importing the product from other high-income countries where production costs are less.

In the third stage of the product cycle, the product and the production process have become so standardized that profit maximization leads firms to produce in the lowest-cost production site. At this point, the standardized production processes can be moved to developing countries where using semiskilled labor in assembly-type operations keeps production costs low. The innovating country now becomes an importer of the product.[12] In the innovating country, attention moves on to a new product at the early stage of its product cycle. Examples of products that have experienced a typical product cycle include radios, TVs, VCRs, and semiconductor chips. The product may have started as a "new" and somewhat unique product in the first phase. In the last stage, the product has become a standardized product so that factor abundance and low production costs determine the pattern of production and trade.

The product cycle can be used to explain some of the intraindustry trade both among developed countries and between developing and developed countries. For example, a country may be exporting a new product and at the same time importing a similar product from another country. The U.S. may be exporting a new sports car to Japan and simultaneously be importing another variety of sports car from Japan. With the constant flood of "new" products being developed in developed countries, intraindustry trade occurs among high-income countries as they exchange these new products with one another. The model also implies that high-income countries will be exporting "newer" versions of the product to developing countries and importing "older" versions of the product from these countries.

Overlapping Demands

The final explanation of intraindustry trade focuses on the importance of demand characteristics in various countries. In the early 1960s, the economist Staffan Linder used the concept

[12] The original article by Vernon, cited in the previous footnote, is quite readable for those with a greater interest in the subject. Some writers use a five-stage process to cover this in more detail. For an excellent discussion of this latter scheme, see Beth V. Yarbrough and Robert M. Yarbrough, *The World Economy*, 3rd edition, New York: Dryden Press, 1994.

its average cost. A firm that has high fixed costs as a percentage of its total costs will have falling average unit costs as output increases. This cost structure generally occurs when firms use a lot of capital to produce a good relative to labor or other variable factors. For example, most firms in the automobile industry are subject to internal economies of scale. Firms such as General Motors or Toyota produce a large number of automobiles at relatively low prices. Smaller firms such as Porsche or Ferrari have much higher production costs per unit. Similar economies of scale occur in industries that produce intermediate products such as steel and chemicals.

Another source of internal economies of scale occurs in high-technology products where there are high fixed costs associated with research and development (R&D). For example, nearly all of the total costs of computer software are development costs. The variable unit cost of producing and distributing the software may be small relative to the total production costs. In the pharmaceutical industry, the development costs of a new drug are quite high and the variable costs of producing and distributing it are low. In many cases, the first producer to successfully develop the product gains almost all of the market as unit costs decline.[6] The result is that internal economies of scale contribute to the existence of intraindustry trade.

When there are *external* economies of scale, a firm's average unit cost falls as the output of the entire industry rises. As the industry expands output, several factors may influence costs for all firms. Because the industry may depend upon the existence of suppliers or a large pool of labor with the skills necessary in that industry, external economies of scale may explain why firms within an industry tend to cluster geographically.[7] Examples include the watch industry in Switzerland, the movie industry in southern California, and the financial services industry in New York City. Economies of scale provide a basis for intraindustry trade.[8] In markets characterized by internal or external economies of scale, international trade makes it possible for consumers to enjoy a greater variety of goods, while paying a lower price to producers whose costs are lower because of large-scale production.

The Product Cycle

Another explanation for the occurrence of intraindustry trade between countries is the **product cycle.** In this case, changes in technology or a new product design can change the pattern of imports and exports.[9] The basic idea behind the product cycle is that developed countries tend to specialize in producing new goods based on technological innovations, whereas the developing countries tend to specialize in the production of already well-established goods. The theory of the product cycle is that as each good moves through its product cycle, there will be changes in the geographical location of where and how the good is produced. The product cycle for a typical good is shown in Figure 4.4.

Product cycle the process where goods are produced and introduced in a developed country requiring heavy R&D expenses and refinement in production, followed by product stabilization in design and production, and finally complete standardization and production in a developing country.

[6] For a firm such as Boeing Aircraft, unit cost declines as output expands due to large physical capital costs and large R&D costs. This firm has a very high market share worldwide in the production of wide-bodied jet aircraft.

[7] An excellent description of these types of effects is contained in Michael Porter, *The Competitive Advantage of Nations,* New York: Free Press, 1990.

[8] An extensive empirical test of economies of scale and intraindustry trade is contained in James Harrigan, "Scale Economies and the Volume of Trade," *Review of Economics and Statistics,* May 1994, 76(2), pp. 321–28.

[9] The original work on the product cycle was published in Raymond Vernon, "International Investment and International Trade in the Product Cycle," *Quarterly Journal of Economics,* May 1966, 80(2), pp. 190–207.

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The Learning Curve Fixed costs and R&D expenses are not the only reason unit costs decline as output expands. For some industries, another reason why costs decline as output expands is the learning curve. Learning curve analysis relates a firm's average cost of production to the total quantity of the product that is produced over time. Early work on learning curves stressed the gains in labor experience over time. Workers were organized more efficiently over time and both teams and individuals learned the production ropes. Later work extended the application of the learning curve to other costs of the firm. For example, machines could be fine-tuned or the distribution network could be improved.

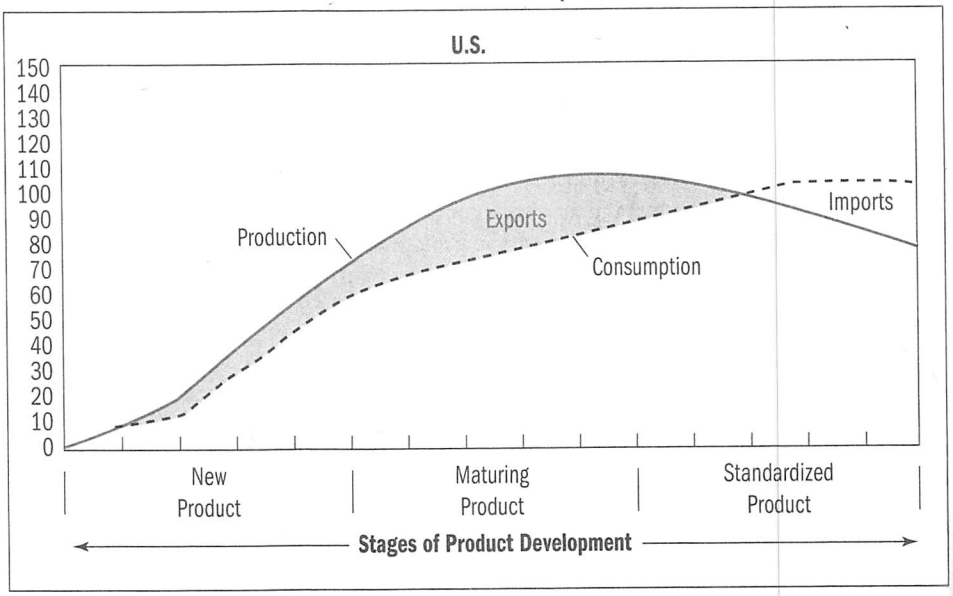
For a typical learning curve, it is assumed that costs decline by a fixed percentage each time output doubles. For example, unit costs decline by 15 percent with each doubling of output. As a result of learning, unit costs decline and a firm's cost curve would look like the average cost curve in Figure 4.2. In a study by Lieberman on the chemical industry, it was estimated that, on average, each doubling of plant scale over time was accompanied by an 11 percent reduction of unit costs.[10] In a study of the semiconductor industry, Irwin and Klenow found an average learning rate of 20 percent for successive generations of dynamic random-access memory chips (DRAMs).[11] These types of results also have been found in other industries such as petrochemicals and electric utilities.

Learning curves have some important implications for international trade. The country that produces the greatest quantity of the products has the lowest costs, not because of different resource endowments, but because it has learned to use its labor and capital more efficiently. In this case, comparative advantage is something that is created. As such, it is not low costs that cause a country to specialize and trade, rather it is specialization that causes the low unit costs.

[10] See M. B. Lieberman, "The Learning Curve and Pricing in the Chemical Processing Industry," *Rand Journal of Economics*, Summer 1984, pp. 213–28.

[11] See D. Irwin and P. Klenow, "Learning-by-Doing Spillovers in the Semiconductor Industry," *Journal of Political Economy*, 102(6), 1994, pp. 1200–27.

Figure 4.4
The Product Cycle
The product cycle suggests that the relationship among domestic production, consumption, exports, and imports of a product varies over the life cycle of the typical manufactured good.



of overlapping demands to suggest that similarities between countries could be the basis of trade, even though factor prices were the same in both countries.[13]

Overlapping demands trade in manufactured goods is likely to be greatest among countries with similar tastes and income levels.

According to the **overlapping demands** hypothesis, trade in manufactured goods is likely to be greatest among countries with similar tastes and income levels. Linder argues that firms within a country are primarily oriented toward producing a specific variety of a good for which there is a large home market. As such, a country's tastes and preferences determine the specific variety of the product its firms will produce and could then export to foreign consumers. The most promising foreign markets for these exports will be found in countries with tastes and income levels similar to those of the country in which the products are produced. Each country will produce products that primarily serve its home market, but part of the output will be exported to other countries where there is a receptive market.

For example, a U.S. automobile firm will produce an automobile that satisfies the tastes and preferences of most U.S. consumers. However, there will be a small number of U.S. consumers that do not prefer the domestic version. In Sweden and Germany, automobile producers will produce an automobile that satisfies the tastes and preferences of most Swedish and German consumers, respectively. However, it is likely that in both countries there will be a small number of consumers that do not prefer the Swedish or German versions. In all three countries there are some consumers who are not able to purchase the variety of automobile that they prefer. The hypothesis of overlapping demands indicates that in this case, U.S. producers could produce for their domestic market and export automobiles to Swedish and German consumers who prefer the U.S. automobile. In addition, Swedish and German producers would be able to export automobiles to U.S. consumers who prefer German and Swedish automobiles. These sorts of overlapping demands can lead to intraindustry trade.

Linder states that within a country, consumers' average income level will determine their general tastes and preferences. Countries with low average incomes will demand lower-quality goods, and countries with high average incomes will demand higher-quality goods. As such, high-income countries are more likely to trade with other high-income countries because there is a greater probability of overlapping demands. For the same reason, low-income countries are more likely to trade with other low-income countries for the same reason.

Overlapping demands implies that intraindustry trade would be more intense among countries with similar incomes.[14] In general, the theory of overlapping demands can explain the large and growing amount of trade in similar but differentiated goods. These conclusions concerning trade patterns between countries are interesting because they are not based on or predicted by the factor-proportions theory. Everything else equal, the theory suggests that trade will be more intense between countries that have similar tastes, preferences, and incomes.

The discussion of intraindustry trade and overlapping demands indicates that countries with similar incomes would tend to have a higher percentage of their trade as intraindustry trade. Going back to Table 4.2, it would appear that, in general, this is the case. However, it was noted in the first part of the chapter that developing countries also engage in a substantial amount of intraindustry trade. Some of this trade can be explained as intraindustry trade with other developing countries at a similar level of income. However, it has been observed that there is also a growing amount of intraindustry trade between developed and developing

[13] Staffan B. Linder, *An Essay on Trade and Transformation*, New York: Wiley, 1961. An empirical test of the hypothesis is contained in Joseph F. Francois and Seth Kaplan, "Aggregate Demand Shifts, Income Distribution, and the Linder Hypothesis," *Review of Economics and Statistics*, May 1996, 78(2), pp. 244–50.

[14] See Rudolf Loertscher and Frank Wolter, "Determinants of Intra-Industry Trade: Among Countries and Across Industries," *Weltwirtschaftliches Archiv*, 1980, 116(2), pp. 280–93.

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The U.S. Automobile Market According to the overlapping demands hypothesis, trade in manufactured goods as opposed to agricultural, raw material, and primary products is likely to be greatest among countries with similar tastes and income levels. Linder argues that firms within a country are primarily oriented toward producing a specific variety of a good for which there is a large home market.

In this chapter, we used the U.S. automobile market as an example of overlapping demands. Table 4.4 illustrates the number of different automobile firms and the number of different types of automobiles for sale in the U.S. automobile market.[15] The list includes 44 manufacturers with 309 different cars, vans, sport utility vehicles, and trucks available within the U.S.

Notice that overlapping demands have resulted in intraindustry trade in the U.S. automobile market.

[15] The data on automobile firms and models for Table 4.4 were obtained from the Internet site www.edmunds.com.

TABLE 4.4

AUTOMOBILE MANUFACTURERS AND PRODUCTS SOLD IN THE U.S.

Automobile Manufacturer	Number of Products Sold in the U.S.	Automobile Manufacturer	Number of Products Sold in the U.S.
Acura	6	Lincoln	4
Audi	6	Maserati	2
Bentley	1	Maybach	2
BMW	8	Mazda	8
Buick	6	Mercedes-Benz	17
Cadillac	9	Mercury	5
Chevrolet	28	Mini	1
Chrysler	8	Mitsubishi	9
Dodge	16	Nissan	11
Ferrari	2	Oldsmobile	3
Ford	21	Panoz	1
GMC	15	Pontiac	8
Honda	8	Porsche	4
Hummer	2	Rolls-Royce	1
Hyundai	6	Saab	2
Infiniti	7	Saturn	3
Isuzu	3	Scion	2
Jaguar	7	Subaru	6
Jeep	3	Suzuki	6
Kia	6	Toyota	16
Land Rover	3	Volkswagen	8
Lexus	9	Volvo	10

countries. At first glance, this would seem to be a bit odd. However, the explanation lies in linking vertical product differentiation with overlapping demands. In a developing country, there may be a substantial number of consumers with incomes similar to those in developed countries. These consumers may be poorly served by the domestic producers who are producing for the majority taste and preference within the country. Satisfying the needs of these high-income consumers may be most profitably accomplished by importing higher-quality versions of products from developed countries. The reverse is true for the developed countries. In these countries, there may be less affluent consumers that desire cheaper varieties of a product. These consumers may not be well served by the domestic producers if the market is too small. The solution may be to import lower-priced versions of the product designed for consumers in low-income countries. The existence of vertical product differentiation and overlapping demands between different groups of consumers in different types of countries helps to explain the growing amount of intraindustry trade between developed and developing countries.[16]

The Welfare Implications of Intraindustry Trade

Recall that interindustry trade covered in earlier chapters was shown to increase world economic output and welfare. Although intraindustry trade results from different associated processes, welfare gains also occur with intraindustry trade. Figure 4.5 shows the different types of intraindustry trade and their respective associated processes we discussed earlier. As the figure indicates, intraindustry trade occurs in homogeneous products and in horizontally or vertically differentiated products.

For intraindustry trade in homogeneous products, the welfare gains for a country are similar to the welfare gains under interindustry trade. These gains occur as the traded goods are provided based on lower opportunity costs in the form of lower transportation, insurance, or financing costs or the provision of low-cost seasonal products.

In the case of horizontally or vertically differentiated products, welfare gains also occur but there are additional factors to consider. First, product differentiation enhances consumers' choices, but the products are produced in a market structure of imperfect competition. In imperfectly competitive markets, the market price of the product is greater than the marginal cost of producing the last unit of output. In this case, consumers value additional units of the product more than they value alternative products that could be produced with the resources. Further, imperfectly competitive firms are characterized by excess capacity. This means that production falls somewhat short of the most efficient or least unit cost level of output because of economies of scale. As a result, an imperfectly competitive market tends to have underutilized plants, and consumers are penalized through having to pay higher than perfectly competitive prices. The introduction of imports into these markets would tend to lower prices. This in turn helps to reduce the social costs associated with markets that are imperfectly competitive.

[16] For a discussion of this type of intraindustry trade and an empirical example, see Robert H. Ballance, Helmut Forstner, and W. Charles Sawyer, "An Empirical Examination of the Role of Vertical Product Differentiation in North–South Trade," *Weltwirtschaftliches Archiv,* 1992, 128(2), pp. 330–38.

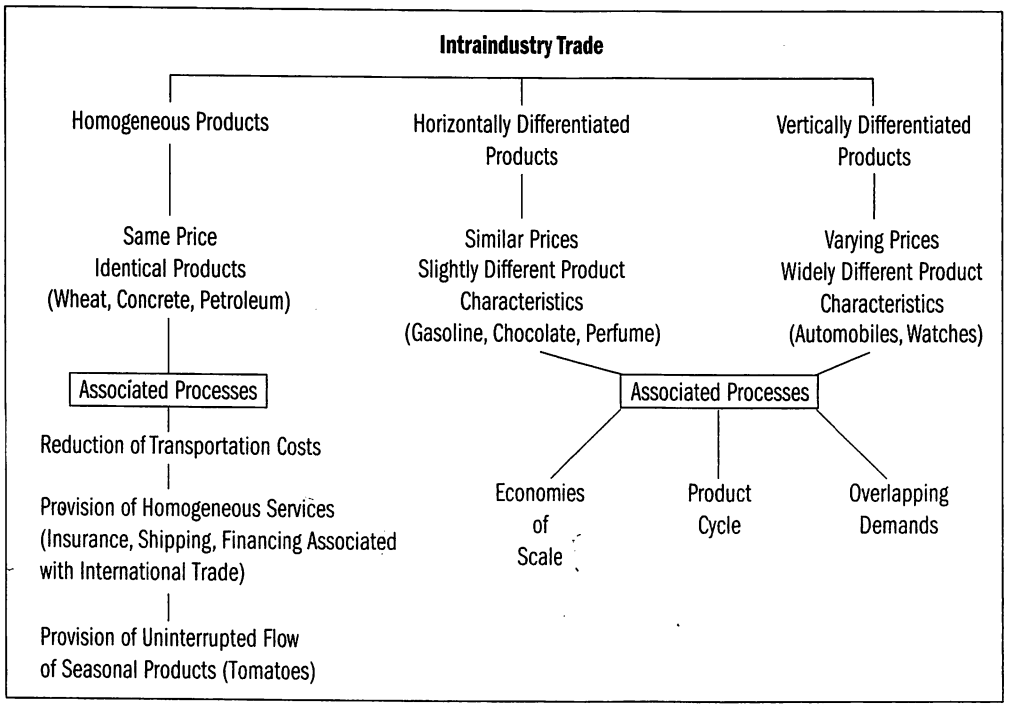

Figure 4.5
Types of Intraindustry Trade and Associated Processes

Second, intraindustry trade in differentiated products improves the general welfare of a country to the extent that domestic consumers have more types of the product available from which to choose. Additional types of the same differentiated product increases competition and generally should result in an improvement in the average quality of the products. Without imports of automobiles from Japan and other countries, U.S.-made automobiles would probably be of lower quality. Third, intraindustry trade is effective at reducing the monopoly power of domestic firms. More open trade among countries has reduced potential antitrust problems—the problems associated with monopoly power—and even eliminated them in a number of industries, such as the U.S. automobile and steel industries. Fourth, intraindustry trade makes it possible for companies to produce at higher levels of output. This increased output means firms can reduce costs due to economies of scale. As a result, prices decline not only in the export market but also in the domestic market.

Fifth, when discussing interindustry trade, we described the adjustment costs of an economy moving toward free trade. For example, when factors of production used to produce cloth are being shifted to and adapted to the production of machines, the shift may be difficult or impossible in the short run. In the case of intraindustry trade, this does not necessarily happen when shifting factors of production. Recall that intraindustry trade is more intense among countries with similar incomes and factor endowments. Therefore, it is easier for resources to reallocate among industries participating in intraindustry trade because those industries have similar factor intensities. Both the contracting industry and the expanding

industry are either capital intensive or skilled labor intensive.[17] In summary, the gains from intraindustry trade may be larger and the adjustment costs lower than in the case of interindustry trade.

Summary

1. Besides interindustry trade, the exchange of goods between countries includes intraindustry trade. Intraindustry trade is two-way trade in similar products. The common measure of intraindustry trade is the intraindustry trade index.
2. Intraindustry trade can occur for both homogeneous and differentiated goods. Intraindustry trade is a large and growing portion of international trade. For the U.S., approximately 60 percent of manufacturing trade is intraindustry trade.
3. Differentiated goods are usually described using the market structures of imperfect competition. The market structures of imperfect competition are monopolistic competition, oligopoly, and monopoly.
4. Products may be horizontally differentiated—meaning that the prices of various types of the goods are similar but the goods differ in their physical characteristics. Products also may be vertically differentiated—meaning the good's physical characteristics and prices are different.
5. Intraindustry trade widens the size of the domestic market, permitting firms to take advantage of economies of scale. Economies of scale translate into lower production costs, and therefore, lower product prices, which improves a firm's or country's comparative advantage.
6. There are internal and external economies of scale. Economies of scale create an incentive for firms to specialize in production, which stimulates intraindustry trade.
7. There are three product stages in the product cycle theory: new product, maturing product, and standardized product. The product cycle theory explains the speed of dissemination of innovation on the basis of changing input requirements over a new product's product cycle and countries' factor endowments.
8. Linder asserted that trade in manufactured goods is best explained by overlapping demand structures between countries. A country would tend to export those manufactured goods to countries with similar per capita incomes for which there is a broad domestic market.
9. Intraindustry trade in differentiated products has two important implications for the gains from trade: (1) consumers gain from having a greater variety of goods to choose from, and (2) unit costs and prices decline because the commodities are produced under increasing returns.

[17] See H. Peter Gray, *Free Trade or Protection: A Pragmatic Analysis*, London: Palgrave, 1985.

Key Concepts and Terms

intraindustry trade p. 86
interindustry trade p. 86
intraindustry trade index p. 88
homogeneous goods p. 91
entrepot trade p. 91
re-export trade p. 91
differentiated goods p. 92
horizontally differentiated goods p. 92
vertically differentiated goods p. 92
imperfect competition p. 92
monopolistic competition p. 92
oligopoly p. 94
monopoly p. 94
economies of scale p. 94
decreasing costs p. 94
product cycle p. 97
overlapping demands p. 100

Problems and Questions for Review

1. Distinguish between interindustry and intraindustry trade.
2. How is intraindustry trade measured?
3. What is the extent of intraindustry trade in the U.S. and in the world economy?
4. Using the formula for the intraindustry trade index, explain why the index can take on a value of 0 for industries with no intraindustry trade and a value of 1 for industries with all of their trade being intraindustry trade.
5. If a country exports $15 million in computers per year and imports $25 million in computers per year, what is the country's intraindustry trade index for computers?
6. What are the major determinants of intraindustry trade in homogeneous products?
7. What is the difference between horizontal and vertical product differentiation? Give examples of each.
8. What is meant by economies of scale? Explain the difference between internal and external economies of scale.
9. How can economies of scale be a basis for trade?
10. State the product cycle theory of trade and identify the various stages of production.
11. What goods might be examples of products that are currently going through or have gone through the various stages of the product cycle?
12. Explain how overlapping demands between countries could lead to trade.
13. What would Linder's theory suggest about the future prospects of developing countries in exporting goods to developed countries?
14. Why is an increase in the number of varieties of a good regarded as a gain from trade?