

Chapter 6

Economies of Scale, Imperfect Competition, and International Trade

With revisions for ANU

Econ
3103/3013/8015

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Slides prepared by Thomas Bishop

Preview

- Types of economies of scale
- Types of imperfect competition
 - ◆ Oligopoly and monopoly
 - ◆ Monopolistic competition
- Monopolistic competition and trade
- Inter-industry trade and intra-industry trade
- Dumping
- External economies of scale and trade

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Introduction

- When defining comparative advantage, the Ricardian model and the Heckscher-Ohlin model both assume **constant returns to scale**:
 - ◆ If all factors of production are doubled then output will also double.
- But a firm or industry may have **increasing returns to scale** or **economies of scale**:
 - ◆ If all factors of production are doubled, then output will more than double.
 - ◆ Larger is more efficient: the cost per unit of output falls as a firm or industry increases output.

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Introduction (cont.)

- The Ricardian and Heckscher-Ohlin models also rely on competition to predict that there is no “excess” or economic (monopoly) profits exist.
- But when economies of scale exist, large firms may be more efficient than small firms, and the industry may consist of a monopoly or an oligopoly.
 - ♦ Production may be imperfectly competitive in the sense that economic profits are captured by the large firms.

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Types of Economies of Scale

- Economies of scale could mean either that larger firms or that a larger industry (one comprising more firms) is more efficient.
- **External economies of scale** occur when cost per unit of output depends on the *size of the industry*.
- **Internal economies of scale** occur when the cost per unit of output depends on the *size of a firm*.

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Types of Economies of Scale (cont.)

- *External* economies of scale may result if a larger industry allows for more efficient provision of services or equipment to firms in the industry.
 - ♦ Many small firms that are competitive may comprise a large industry and benefit from services or equipment efficiently provided to the large group of firms.
- Internal economies of scale result when large firms have a cost advantage over small firms. This leads to an imperfectly competitive market.

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A Review of Monopoly

- A **monopoly** is an industry with only one firm.
- An **oligopoly** is an industry with only a few firms.
- A characteristic of a monopoly (and to some degree an oligopoly) is that its marginal revenue generated from selling an additional unit of output is lower than the price of output.
 - ♦ The marginal revenue curve lies below the demand curve (which determines the price of units sold).

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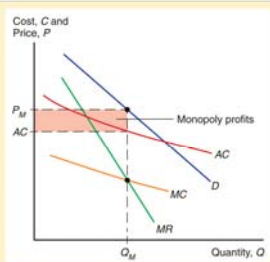
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A Review of Monopoly (cont.)

Figure 6-1

Monopolistic Pricing and Production Decisions

A monopolistic firm chooses an output at which marginal revenue, the increase in revenue from selling an additional unit, equals marginal cost, the cost of producing an additional unit. This profit-maximizing output is shown as Q_M , the price at which this output is demanded is P_M . The marginal revenue curve MR lies below the demand curve D , because, for a monopoly, marginal revenue is always less than the price. The monopoly's profits are equal to the area of the shaded rectangle, the difference between price and average cost times Q_M .



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A Review of Monopoly (cont.)

- **Average cost** is the cost of production (C) divided by the total quantity of output produced (Q) at a time.
 - ♦ $AC = C/Q$
- **Marginal cost** is the cost of producing an additional unit of output.
- Consider the **special case** of a firm with constant marginal cost: $MC = c$.

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A Review of Monopoly (cont.)

- Suppose that costs are measured by
$$C = F + cQ,$$
 - ◆ where F represents fixed costs, independent of the level of output.
$$AC = F/Q + c$$
- A larger firm is more efficient because average cost decreases as output Q increases: **internal** economies of scale.

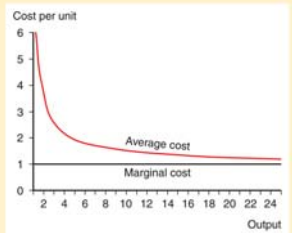
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A Review of Monopoly (cont.)

Figure 6-2
Average Versus Marginal Cost

This figure illustrates the average and marginal costs corresponding to the total cost function $C = 5 + x$. Marginal cost is always 1; average cost declines as output rises.



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Monopolistic Competition

- **Monopolistic competition** is a model of an imperfectly competitive industry which assumes that
 1. Each firm can differentiate its product from the product of competitors.
 2. Each firm ignores the impact that changes in its own price will have on the prices competitors set: even though each firm faces competition it behaves as if it were a monopolist.

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Monopolistic Competition (cont.)

- A firm in a monopolistically competitive industry is expected:
 - ♦ to sell more the larger the total sales of the industry (demand) and the higher the prices charged by its rivals.
 - ♦ to sell less the larger the number of firms in the industry and the higher its own price.
- These concepts can be, most simply, be represented by the mathematical relationship:

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Monopolistic Competition: pricing

$$Q = S[1/n - b(P - \bar{P})]$$

- ♦ Q is an individual firm's sales
- ♦ S is the total sales of the **industry**
- ♦ n is the number of firms in the industry
- ♦ b is a constant term representing the responsiveness of a firm's sales to its price
- ♦ P is the price charged by the firm itself
- ♦ \bar{P} is the average price charged by its competitors

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Monopolistic Competition: Pricing

- Firms choose Q to maximise profits:

$$\pi = R - cQ - F = P(S) \cdot Q - cQ - F$$

- The optimum can be found by seeking a turning point in profits as a function of Q :

$$\frac{d\pi}{dQ} = 0 = \frac{dR}{dQ} - c = MR - c$$

- This confirms that firms set marginal revenue equal to marginal cost.

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Monopolistic Competition: Pricing

- Now do this using the monopolistic competition pricing relation

$$Q = S \left[\frac{1}{n} - b(P - \bar{P}) \right] = \left(\frac{S}{n} + bS\bar{P} \right) - bSP$$

So that, expressed as an "inverse demand function" we have:

$$P = \left(\frac{1}{bn} + \bar{P} \right) - \frac{1}{bS}Q$$

We can now write the equation for revenue and calculate marginal revenue in terms of the output, Q, that the firm chooses:

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Monopolistic Competition: Pricing

$$R = PQ = \left(\frac{1}{bn} + \bar{P} \right) Q - \frac{1}{bS}Q^2$$

Marginal revenue is then:

$$MR = \frac{dP(Q)Q}{dQ} = \left(\frac{1}{bn} + \bar{P} \right) - \frac{2}{bS}Q$$

Setting marginal revenue equal to marginal cost yields:

$$MR = c = \frac{1}{bn} + \bar{P} - \frac{2}{bS}Q$$

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Monopolistic Competition: Pricing

- Imagine, now, that all firms have identical demand functions and cost functions. Thus, in equilibrium

- ♦ $P = P$, all firms charge the same price

- ♦ $Q = S/n$, output is share equally

Then the pricing relationship becomes:

$$P = c + \frac{1}{bn}$$

The prices firms set then are inversely proportional to the number of firms.

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Monopolistic Competition: Av cost

$$AC = F(n/S) + c$$

- The larger the number of firms n in the industry, the higher the average cost for each firm because the less each firm produces.
- The larger the total sales S of the industry, the lower the average cost for each firm because the more that each firm produces.

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Monopolistic Competition

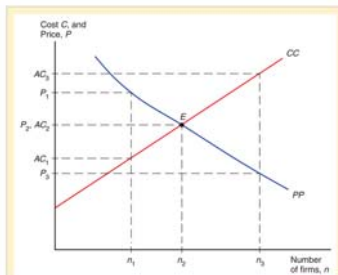


Figure 6-3

Equilibrium in a Monopolistically Competitive Market

The number of firms in a monopolistically competitive market, and the prices they charge, are determined by two relationships. On one side, the more firms there are, the more intensely they compete, and hence the lower is the industry price. This relationship is represented by PP . On the other side, the more firms there are, the less each firm sells and therefore the higher is its average cost. This relationship is represented by CC . If price exceeds average cost (if the PP curve is above the CC curve), the industry will be making profits and additional firms will enter the industry; if price is less than average cost, the industry will be incurring losses and firms will leave the industry. The equilibrium price and number of firms occurs when price equals average cost, at the intersection of PP and CC .

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Monopolistic Competition: Equilibrium

- At some number of firms, the price that firms charge (which decreases in n) matches the average cost that firms pay (which increases in n).
- This number of firms is the number at which each firm has *zero profits*: price matches average cost.
- This number is the equilibrium number of firms.

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Monopolistic Competition (cont.)

- If the number of firms is greater or less, then in industry is not in equilibrium in the sense that firms have an incentive to exit or enter the industry.
 - ◆ Firms have an incentive to enter the industry when profits are greater than zero (price > average cost).
 - ◆ Firms have an incentive to exit the industry when profits are less than zero (price < average cost).

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Monopolistic Competition and Trade

- Because trade increases market size, trade is predicted to decrease average cost in an industry described by monopolistic competition.
 - ◆ Industry sales increase ($S \uparrow$) with trade leading to decreased average costs: $AC = F(n/S) + c$
- Because trade opening to trade increases market size, it raises the number of firms in equilibrium
 - ◆ The number of varieties of goods that consumers can buy increases, raising the welfare of consumers.

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Monopolistic Competition and Trade (cont.)

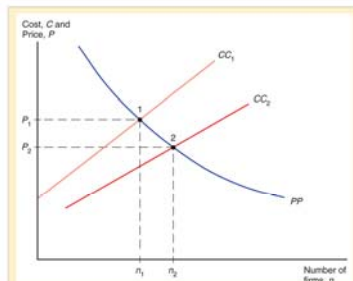


Figure 6-4

Effects of a Larger Market

An increase in the size of the market allows each firm, other things equal, to produce more and thus have lower average cost. This is represented by a downward shift from CC_1 to CC_2 . The result is a simultaneous increase in the number of firms (and hence in the variety of goods available) and fall in the price of each.

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Intra-industry Trade

- Suppose now that the global cloth industry is described by the monopolistic competition model.
- Because of product differentiation, suppose that each country produces different types of cloth.
- Because of economies of scale, large markets are desirable: the foreign country exports some cloth and the domestic country exports some cloth.
 - ♦ Trade occurs *within* the cloth industry: **intra-industry trade**

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Intra-industry Trade (cont.)

- If the home country is capital abundant, it still has a comparative advantage in cloth.
 - ♦ It should therefore export more cloth than it imports.
- Suppose that the trade in the food industry continues to be determined by comparative advantage only
 - ♦ Say because food commodities are homogeneous (not differentiated into varieties).

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Intra-industry Trade (cont.)

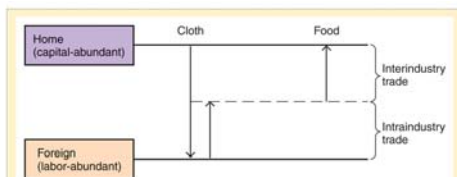


Figure 6-7

Trade with Increasing Returns and Monopolistic Competition

If cloth is a monopolistically competitive industry, Home and Foreign will produce differentiated products. As a result, even if Home is a net exporter of cloth goods, it will import as well as export cloth, giving rise to intraindustry trade.

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Inter-industry and Intra-industry Trade

1. Gains from inter-industry trade reflect comparative advantage.
2. Gains from intra-industry trade reflect economies of scale (lower costs) and product differentiation (hence wider consumer choices).
3. The monopolistic competition model does not predict in which country firms locate, but a comparative advantage in producing the differentiated good will likely cause a country to export more of that good than it imports.

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Inter-industry and Intra-industry Trade (cont.)

4. The relative importance of intra-industry trade depends on how similar countries are.
 - ◆ Countries with *similar* relative amounts of factors of production are predicted to have *intra-industry trade*.
 - ◆ Countries with *different* relative amounts of factors of production are predicted to have *inter-industry trade*.
5. Unlike inter-industry trade in the Heckscher-Ohlin model, income distribution effects are not predicted to occur with intra-industry trade.
 - ◆ Industries with two-way trade have similar productivity and factor proportions.

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Inter-industry and Intra-industry Trade (cont.)

- About 25% of world trade is intra-industry trade according to standard industrial classifications.
 - ◆ But some industries have more intra-industry trade than others: those industries requiring relatively large amounts of skilled labor, technology and physical capital exhibit intra-industry trade for the US.
 - ◆ Countries with similar relative amounts of skilled labor, technology and physical capital engage in a large amount of intra-industry trade with the US.

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Inter-industry and Intra-industry Trade (cont.)

TABLE 6-3 Indexes of Intraindustry Trade for U.S. Industries, 1993

Inorganic chemicals	0.99
Power-generating machinery	0.97
Electrical machinery	0.96
Organic chemicals	0.91
Medical and pharmaceutical	0.86
Office machinery	0.81
Telecommunications equipment	0.69
Road vehicles	0.65
Iron and steel	0.43
Clothing and apparel	0.27
Footwear	0.00

Note: an index of 1 means that all trade is intra-industry trade.
An index of 0 means that all trade is inter-industry trade.

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Dumping

- **Dumping** is the practice of charging a lower price for exported goods than for goods sold domestically.
- Dumping is an example of **price discrimination**: the practice of charging different customers different prices.
- Price discrimination and dumping may occur only if
 - ◆ *imperfect competition* exists: firms are able to influence market prices.
 - ◆ *markets are segmented* so that goods are not easily bought in one market and resold in another.

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Dumping (cont.)

- Dumping may be a profit maximizing strategy because of differences in foreign and domestic markets.
- One difference is that domestic firms usually have a larger share of the domestic market than they do of foreign markets.
 - ◆ Because of less market dominance and more competition in foreign markets, foreign sales are usually more responsive to price changes than domestic sales (more price-elastic).
 - ◆ Domestic firms may be able to charge a high price in the domestic market but must charge a low price on exports if foreign consumers are more responsive to price changes (more price-elastic).

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Dumping (cont.)

- We draw a diagram of how dumping occurs when a firm is a monopolist in the domestic market but a small competitive firm in foreign markets.
 - ◆ Because the firm is a monopolist in the domestic market, the domestic market demand curve is downward sloping, and the marginal revenue curve lies below that demand curve.
 - ◆ Because the firm is a small competitive firm in foreign markets, the foreign market demand curve is horizontal, representing the fact that exports are very responsive to small price changes.

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Dumping (cont.)

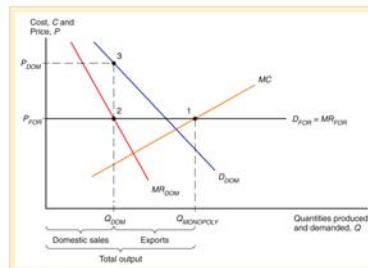


Figure 6-8

Dumping

The figure shows a monopolist that faces a demand curve Q_{DOM} for domestic sales, but which can also sell as much as it likes at the export price P_{FOR} . Since an additional unit can always be sold at P_{FOR} , the firm increases output until the marginal cost equals P_{FOR} ; this profit-maximizing output is shown as $Q_{MONOPOLY}$. Since the firm's marginal cost at $Q_{MONOPOLY}$ is P_{DOM} , it sells output on the domestic market up to the point where marginal revenue equals P_{DOM} ; the profit-maximizing level of domestic sales is shown as Q_{DOM} . The rest of its output, $Q_{MONOPOLY} - Q_{DOM}$, is exported. The price at which domestic consumers demand Q_{DOM} is P_{DOM} . Since $P_{DOM} > P_{FOR}$, the firm sells exports at a lower price than it charges domestic consumers.

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Dumping (cont.)

- To maximize profits, the firm will sell a low amount in the domestic market at a high price P_{DOM} , but sell in foreign markets at a low price P_{FOR} .
 - ◆ Since an additional unit can always be sold at P_{FOR} , the firm will sell its products at a high price in the domestic market until marginal revenue there falls to P_{FOR} .
 - ◆ Thereafter, it will sell exports at P_{FOR} until marginal costs exceed this price.
- In this case, dumping is a profit-maximizing strategy.

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Protectionism and Dumping

- Dumping (as well as price discrimination in domestic markets) is widely regarded as unfair.
- A US firm may appeal to the Commerce Department to investigate if dumping by foreign firms has injured the US firm.
 - ◆ The Commerce Department may impose an “anti-dumping duty”, or tax, as a precaution against possible injury.
 - ◆ This tax equals the difference between the actual and “fair” price of imports, where “fair” means “price the product is normally sold at in the manufacturer’s domestic market”.

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Protectionism and Dumping (cont.)

- Next the International Trade Commission (ITC) determines if injury to the US firm has actually occurred or is likely to occur.
- If the ITC determines that injury has occurred or is likely to occur, the anti-dumping duty remains in place.
 - ◆ See http://www.itds.treas.gov/ADD_CVD.htm

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External Economies of Scale

- If external economies exist, a country that has a large industry will have low costs of producing that industry’s good or service.
- External economies may exist for a few reasons:

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External Economies of Scale (cont.)

1. **Specialized equipment or services** may be needed for the industry, but are only supplied by other firms if the industry is large and concentrated.
 - ◆ For example, Silicon Valley in California has a large concentration silicon chip companies, which are serviced by companies that make special machines for manufacturing silicon chips.
 - ◆ These machines are cheaper and more easily available for Silicon Valley firms than for firms elsewhere.

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External Economies of Scale (cont.)

2. **Labor pooling:** a large and concentrated industry may attract a pool of workers, reducing employee search and hiring costs for each firm.
3. **Knowledge spillovers:** workers from different firms may more easily share ideas that benefit each firm when a large and concentrated industry exists.

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External Economies of Scale and Trade

- If external economies exist, the pattern of trade may be due to historical accidents:
 - ◆ countries that start out as large producers in certain industries tend to remain large producers even if some other country could potentially produce the goods more cheaply.

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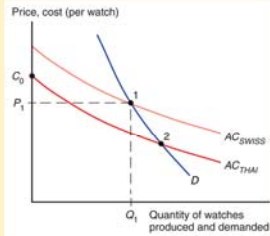
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External Economies of Scale and Trade (cont.)

Figure 6-9

External Economies and Specialization

The average cost curve for Thailand, AC_{THAI} , lies below the average cost curve for Switzerland, AC_{SWISS} . Thus Thailand could potentially supply the world market more cheaply than Switzerland. If the Swiss industry gets established first, however, it may be able to sell watches at the price P_1 , which is below the cost C_0 that an individual Thai firm would face if it began production on its own. So a pattern of specialization established by historical accident may persist even when new producers could potentially have lower costs.



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External Economies of Scale and Trade (cont.)

- Trade based on external economies has an ambiguous effect on national welfare.
 - ◆ There may be gains to the *world* economy by concentrating production of industries with external economies.
 - ◆ But there is no guarantee that the right country will produce a good subject to external economies.
 - ◆ It is even possible that a country is worse off with trade than it would have been without trade: a country may be better off if it produces everything for its domestic market rather than pay for imports.

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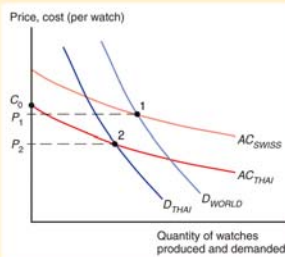
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External Economies of Scale and Trade (cont.)

Figure 6-10

External Economies and Losses from Trade

When there are external economies, trade can potentially leave a country worse off than it would be in the absence of trade. In this example, Thailand imports watches from Switzerland, which is able to supply the world market (D_{WORLD}) at a price (P_1) low enough to block entry by Thai producers who must initially produce the watches at cost C_0 . Yet if Thailand were to block all trade in watches, it would be able to supply its domestic market (D_{THAI}) at the lower price P_2 .



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External Economies of Scale and Trade (cont.)

- We have considered cases where external economies depend on the amount of *current output* at a point in time.
- But external economies may also depend on the amount of *cumulative output over time*.
- **Dynamic external economies of scale** (dynamic increasing returns to scale) exist if average costs fall as cumulative output over time rises.

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External Economies of Scale and Trade (cont.)

- Dynamic increasing returns to scale could arise if the cost of production depends on the accumulation of knowledge and experience, which depend on the production process over time.
- A graphical representation of dynamic increasing returns to scale is called a **learning curve**.

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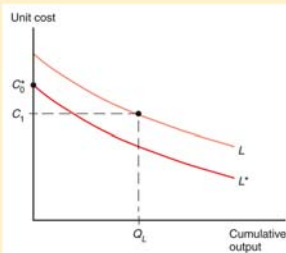
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External Economies of Scale and Trade (cont.)

Figure 6-11

The Learning Curve

The learning curve shows that unit cost is lower the greater the cumulative output of a country's industry to date. A country that has extensive experience in an industry (L) may have lower unit cost than another country with little or no experience, even if the second country's learning curve (L^*) is lower, for example, because of lower wages.



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External Economies of Scale and Trade (cont.)

- Like external economies of scale at a point in time, dynamic increasing returns to scale can lock in an initial advantage or head start in an industry.
- Like external economies of scale at a point in time, dynamic increasing returns to scale can be used to justify protectionism.
 - ◆ Temporary protection of industries enables them to gain experience: infant industry argument.
 - ◆ But temporary is often for a long time, and it is hard to identify when external economies of scale really exist.

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Summary

1. Economies of scale imply that more output at the firm or industry level causes average cost to fall.
 - ◆ External economies of scale refer to the amount of output by an industry.
 - ◆ Internal economies of scale refer to the amount of output by a firm.
2. With monopolistic competition, each firm has some monopoly power due to product differentiation but must compete with other firms whose prices are believed to be unaffected by each firm's actions.

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Summary (cont.)

3. Monopolistic competition allows for gains from trade through lower costs and prices, as well as through wider consumer choice.
4. Monopolistic competition predicts intra-industry trade, and does not predict changes in income distribution within a country.
5. Location of firms under monopolistic competition is unpredictable, but countries with similar relative factors are predicted to engage in intra-industry trade.

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Summary (cont.)

- Dumping may be a profitable strategy when a firm faces little competition in its domestic market and faces heavy competition in foreign markets.
- Trade based on external economies of scale may increase or decrease national welfare, and countries may benefit from temporary protectionism if their industries exhibit external economies of scale either at a point in time or over time.

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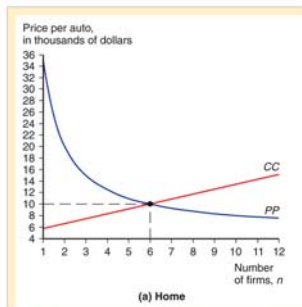


Figure 8.5
Equilibrium in the Automobile Market
In the Home market, with a market size of 300,000 automobiles, Home's equilibrium, determined by the intersection of the PP and CC curves, occurs with six firms and an industry price of \$10,000 per auto. In the Foreign market, with a market size of 1.8 million automobiles, Foreign's equilibrium occurs with eight firms and an industry price of \$8,750 per car. In the combined market (treating the two markets as one), the market supports ten firms, and the

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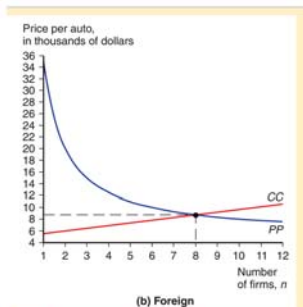


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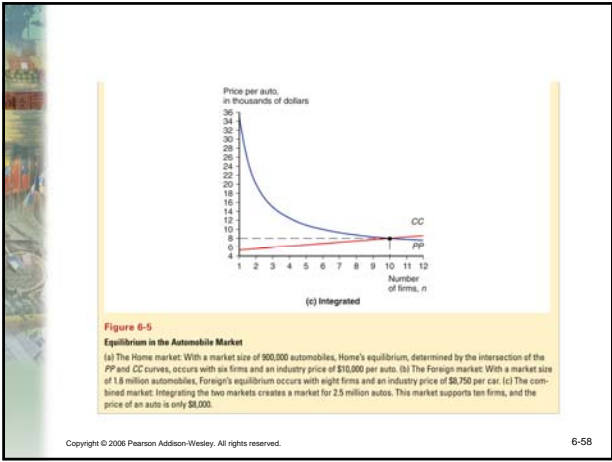


TABLE 6-1 Relationship of Input to Output for a Hypothetical Industry

Output	Total Labor Input	Average Labor Input
5	10	2
10	15	1.5
15	20	1.333333
20	25	1.25
25	30	1.2
30	35	1.166667

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TABLE 6-2 Hypothetical Example of Gains from Market Integration

	Home Market, Before Trade	Foreign Market, Before Trade	Integrated Market, After Trade
Total sales of autos	900,000	1,600,000	2,500,000
Number of firms	6	8	10
Sales per firm	150,000	200,000	250,000
Average cost	10,000	8,750	8,000
Price	10,000	8,750	8,000

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