## Chapter 6

**Chapter 6**

Economies of
Scale, Imperfect
Competition, and
International Trade

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## 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 and Heckscher-Ohlin models assume that production processes have **constant returns to scale**:
  - ♦ When factors of production change at a certain rate, output increases at the same rate.
  - ♦ For example, 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**:
  - ♦ When factors of production change at a certain rate, output increases at a faster rate.
  - ♦ A larger scale 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 all income from production is paid to owners of factors of production: no "excess" or 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 a few large firms.
  - ♦ Production may be imperfectly competitive in the sense that excess or monopoly profits are captured by large firms.

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## Types of Economies of Scale

- Economies of scale could mean either that larger firms or a larger industry 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 when services or equipment can be efficiently provided to all firms in the industry.
- Internal economies of scale result when large firms have a cost advantage over small firms, causing the industry to become uncompetitive.
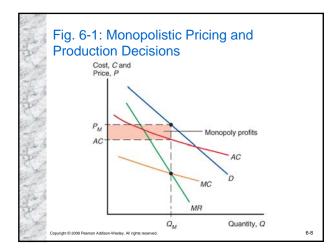
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## A Review of Monopoly

- A **monopoly** is an industry with only one firm.
- An **oligopoly** is an industry with only a few firms.
- In these industries, the marginal revenue generated from selling more products is less than the uniform price charged for each product.
    - ♦ To sell more, a firm must plan to lower the price of additional units as well as of existing units, when it can not price discriminate.
    - ♦ The marginal revenue function therefore lies below the demand function (which determines the price that customers are willing to pay).

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## Fig. 6-1: Monopolistic Pricing and Production Decisions



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## A Review of Monopoly (cont.)

- **Average cost** is the cost of production ($C$) divided by the total quantity of production ($Q$).
    - ♦ $AC = C/Q$
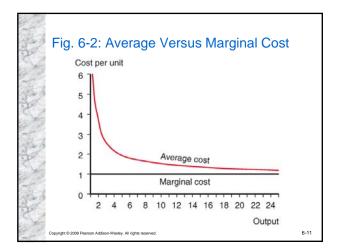- **Marginal cost** is the cost of producing an additional unit of output.

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## A Review of Monopoly (cont.)

- Suppose that costs are represented by $C = F + cQ$,
  - ♦ where $F$ represents fixed costs, those independent of the level of output.
  - ♦ $c$ represents a constant marginal cost: a constant cost of producing an additional quantity of production $Q$.
- $AC = F/Q + c$
- A larger firm is more efficient because average cost decreases as output $Q$ increases: internal economies of scale.

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## Fig. 6-2: Average Versus Marginal Cost



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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 price will have on the prices that 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 as total sales in the industry increase and as prices charged by rivals increase.
  - ♦ to sell less as the number of firms in the industry decreases and as its price increases.
- These concepts are represented by the function:

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## Monopolistic Competition (cont.)

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

- ♦ $Q$ 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
- ♦ $\overline{P}$ is the average price charged by its competitors

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## Monopolistic Competition (cont.)

- To make the model easier to understand, we assume that all firms face the same demand functions and have the same cost functions:
  - ♦ Thus in equilibrium, all firms should charge the same price: $P = \overline{P}$
- In equilibrium,
  - ♦ $Q = S/n + 0$
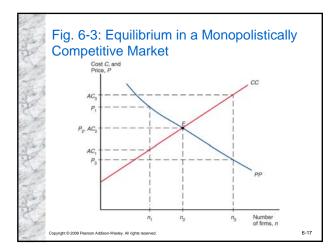  - ♦ $AC = C/Q = F/Q + c = F(n/S) + c$

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## Monopolistic Competition (cont.)

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

- As the number of firms $n$ in the industry increases, the average cost increases for each firm because each produces less.

- As total sales $S$ of the industry increase, the average cost decreases for each firm because each produces more.

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## Fig. 6-3: Equilibrium in a Monopolistically Competitive Market



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## Monopolistic Competition (cont.)

- If monopolistic firms have linear demand functions,
  - then the relationship between price and quantity may be represented as:

$$Q = A - B \times P$$

  - where $A$ and $B$ are constants
  - and marginal revenue may be represented as

$$MR = P - Q/B$$

- When firms maximize profits, they should produce until marginal revenue is no greater than or no less than marginal cost:

$$MR = P - Q/B = c$$

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## Monopolistic Competition (cont.)

$$Q = S[1/n - b(P - \bar{P})]$$
$$Q = S/n - Sb(P - \bar{P})$$
$$Q = S/n + Sb\bar{P} - SbP$$
$$Q = A - B\mathrm{x}P$$

- Let $A \equiv S/n + Sb\bar{P}$ and $B \equiv Sb$

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## Monopolistic Competition (cont.)

$$MR = P - Q/B = c$$
$$MR = P - Q/Sb = c$$
$$P = c + Q/Sb$$
$$P = c + (S/n)/Sb$$
$$P = c + 1/(n\mathrm{x}b)$$

- As the number of firms $n$ in the industry increases, the price that each firm charges decreases because of increased competition.

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## Monopolistic Competition (cont.)

- At some number of firms, the price that firms charge (which decreases in $n$) matches the average cost that firms pay (which increases in $n$).

- When the industry has this number of firms, each firm will earn revenue that exactly offsets all costs (including opportunity costs): price will match average cost.
    - ◆ This number is the equilibrium number of firms in the industry because firms have no incentive or tendency to enter or exit the industry.

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## Monopolistic Competition (cont.)

- If the number of firms is greater than or less than the equilibrium number, then firms have an incentive to exit or enter the industry.
  - ♦ Firms have an incentive to enter the industry when revenues exceed all costs (price > average cost).
  - ♦ Firms have an incentive to exit the industry when revenues are less all costs (price < average cost).
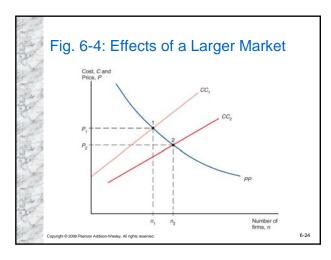
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## Monopolistic Competition and Trade

- Because trade increases market size, trade is predicted to decrease average cost in an industry described by monopolistic competition.
  - ♦ Industry sales increase with trade leading to decreased average costs: $AC = F(n/S) + c$
- Because trade increases the variety of goods that consumers can buy under monopolistic competition, it increases the welfare of consumers.
  - ♦ And because average costs decrease, consumers can also benefit from a decreased price.

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## Fig. 6-4: Effects of a Larger Market



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## Monopolistic Competition and Trade (cont.)

- As a result of trade, the number of firms in a new international industry is predicted to increase relative to each national market.
  - But it is unclear if firms will locate in the domestic country or foreign countries.

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## Monopolistic Competition and Trade (cont.)

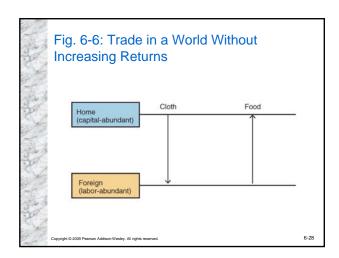| Hypothetical example of gains from trade in an industry with monopolistic competition | | | |
|---|---|---|---|
| | Domestic market before trade | Foreign market before trade | Integrated market after trade |
| Industry sales | 900,000 | 1,600,000 | 2,500,000 |
| Number of firms | 6 | 8 | 10 |
| Sales 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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## Inter-industry Trade

- According to the Heckscher-Ohlin model or Ricardian model, countries specialize in production.
  - Trade occurs only *between* industries: **inter-industry trade**
- In a Heckscher-Ohlin model suppose that:
  - The capital abundant domestic economy specializes in the production of capital intensive cloth, which is imported by the foreign economy.
  - The labor abundant foreign economy specializes in the production of labor intensive food, which is imported by the domestic economy.

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## Fig. 6-6: Trade in a World Without Increasing Returns



Home (capital-abundant) ⟶ Cloth ⟶ Foreign (labor-abundant)
Foreign (labor-abundant) ⟶ Food ⟶ Home (capital-abundant)

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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**
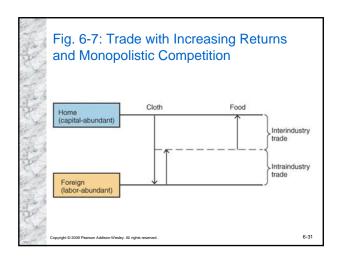
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## Intra-industry Trade (cont.)

- If domestic 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.

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## Fig. 6-7: Trade with Increasing Returns and Monopolistic Competition

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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 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.

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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 U.S.
  - ♦ Countries with similar relative amounts of skilled labor, technology, and physical capital engage in a large amount of intra-industry trade with the U.S.

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## 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.
  - ♦ 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.

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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 must compete in foreign markets.
  - ♦ Because the firm is a monopolist in the domestic market, the demand function that it faces in the domestic market is downward sloping, and marginal revenue from additional output is always less than a uniform price for all units of output.
  - ♦ Because the firm competes in foreign markets, the demand function that it faces in foreign markets is horizontal, representing the fact that exports are very responsive to small price changes.

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## Fig. 6-8: Dumping



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## Dumping (cont.)

- To maximize profits, the firm should sell a limited amount in the domestic market at a high price $P_{DOM}$, but sell in foreign markets at a low price $P_{FOR}$.
    - Since more can always be sold at $P_{FOR}$, the firm should sell its products at a high price in the domestic market until marginal revenue there falls to $P_{FOR}$.
    - Thereafter, it should 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 U.S. firm has 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.usitc.gov/trade_remedy/731_ad_701_cvd/index.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.
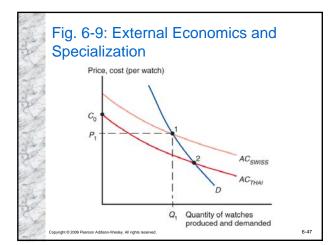
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## External Economies of Scale and Trade

- If external economies exist, the pattern of trade may be due to historical accidents:
  - ♦ countries that start as large producers in certain industries tend to remain large producers even if another country could potentially produce more cheaply.
- So, external economies don't cause international trade. They lock-in old pattern of trade.

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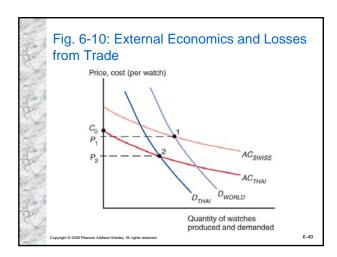## Fig. 6-9: External Economics and Specialization



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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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## Fig. 6-10: External Economics and Losses from Trade

Price, cost (per watch)



Quantity of watches produced and demanded

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## External Economies of Scale and Trade (cont.)

- External economies may also be important for **interregional trade** within a country
  - Many movie producers are located in Los Angeles which produce movies for consumers throughout the U.S.
  - Many financial firms are located in New York which provide financial services for consumers throughout the U.S.
- If external economies exist, the pattern of trade may be due to historical accidents:
  - regions that start as large producers in certain industries tend to remain large producers even if another region could potentially produce more cheaply.

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## External Economies of Scale and Trade (cont.)

- More broadly, **economic geography** refers to the study of international trade, interregional trade and the organization of economic activity in metropolitan and rural areas.
  - Economic geography studies how humans transact with each other across space.
    - Communication changes such as the internet, e-mail, text mail, video conferencing, mobile phones (as well as modern transportation) are changing how humans transact with each other across space.

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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 increasing returns to scale** exist if average costs fall as cumulative output over time rises.
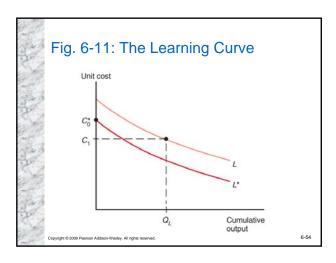    - ♦ Dynamic increasing returns to scale imply dynamic external economies of scale.

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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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## Fig. 6-11: The Learning Curve



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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 a 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 production at the firm or industry level causes average cost to fall.
   - ♦ External economies of scale refer to the amount of production by an industry.
   - ♦ Internal economies of scale refer to the amount of production by a firm.
2. With monopolistic competition, each firm can raise prices somewhat above those on competing products due to product differentiation but must compete with other firms whose prices are believed to be unaffected by each firm's actions.
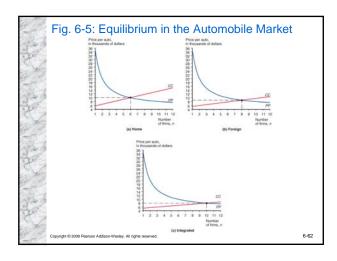
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## Summary (cont.)

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.
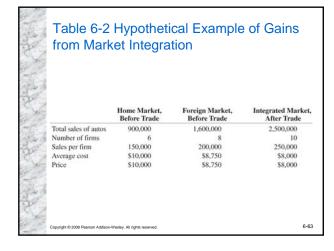
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## Summary (cont.)

6. Dumping may be a profitable strategy when a firm faces little competition in its domestic market and faces heavy competition in foreign markets.

7. Economic geography refers to how humans transact with each other across space, including through international trade and interregional trade.

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## Summary (cont.)

8. 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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### Additional Chapter Art

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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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## Fig. 6-5: Equilibrium in the Automobile Market

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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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## Table 6-4 Some Examples of Tradable and Nontradable Industries

| Tradable industries | Nontradable industries |
| --- | --- |
| Motion pictures | Newspaper publishers |
| Securities, commodities, etc. | Savings institutions |
| Scientific research | Veterinary services |

**Source:** J. Bradford Jensen and Lori. G. Kletzer, "Tradable Services: Understanding the Scope and Impact of Services Outsourcing," Peterson Institute of International Economics Working Paper WP 05-9, September 2005.

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