1. Explain how price and quantity are determined in monopolistic competition.
2. Explain why selling costs are high in monopolistic competition.
3. Explain the dilemma faced by firms in oligopoly.
4. Use game theory to explain how price and quantity are determined in oligopoly.

Monopolistic competition is a market structure in which:
- A large number of independent firms compete.
- Each firm produces a differentiated product.
- Firms compete on product quality, price, and marketing.
- Firms are free to enter an exit.
14.1 MONOPOLISTIC COMPETITION

- **Large Number of Firms**
  
  Like perfect competition, the market has a large number of firms. Three implications are:
  
  - Small market share
  - No market dominance
  - Collusion impossible

- **Product Differentiation**
  
  Product differentiation is making a product that is slightly different from the products of competing firms. A differentiated product has close substitutes but it does not have perfect substitutes.
  
  When the price of one firm’s product rises, the quantity demanded of it decreases.

- **Competing on Quality, Price, and Marketing**
  
  - **Quality**
    
    Design, reliability, service, ease of access to the product.
  
  - **Price**
    
    A downward sloping demand curve.
  
  - **Marketing**
    
    Advertising and packaging

- **Entry and Exit**
  
  No barriers to entry. A firm cannot make economic profit in the long run.
14.1 MONOPOLISTIC COMPETITION

Identifying Monopolistic Competition
Two indexes:
- The four-firm concentration ratio
- The Herfindahl-Hirschman Index

The four-firm concentration ratio
The percentage of the value of sales accounted for by the four largest firms in the industry.
The range of concentration ratio is from almost zero for perfect competition to 100 percent for monopoly.
- A ratio that exceeds 40 percent: indication of oligopoly.
- A ratio of less than 40 percent: indication of monopolistic competition.

The Herfindahl-Hirschman Index (HHI)
The square of the percentage market share of each firm summed over the largest 50 firms in a market.
Example, four firms with market shares as 50 percent, 25 percent, 15 percent, and 10 percent.
$$\text{HHI} = 50^2 + 25^2 + 15^2 + 10^2 = 3,450$$
A market with an HHI less than 1,000 is regarded as competitive.
An HHI between 1,000 and 1,800 is moderately competitive.

Output and Price in Monopolistic Competition
How, given its costs and the demand for jeans, does Tommy Hilfiger decide the quantity of jeans to produce and the price at which to sell them?

The Firm’s Profit-Maximizing Decision
The firm in monopolistic competition makes its output and price decision just like a monopoly firm does. Figure 14.1 on the next slide illustrates this decision.
14.1 MONOPOLISTIC COMPETITION

Profit is maximized when MC = MR

1. The profit-maximizing output is 150 pairs of Tommy jeans per day.
2. The profit-maximizing price is $70 per pair. ATC is $20 per pair, so
3. The firm makes an economic profit of $7,500 a day.

---

Long Run: Zero Economic Profit

Because there is no restriction on entry, economic profit induces entry, just as it does in perfect competition.

The demand for the product of each firm decreases as more firms share the market.

Eventually, economic profit is competed away and the firms earn normal profit.

Figure 14.2 on the next slide illustrates long-run equilibrium.

---

Initially, the firm earns an economic profit, which induces entry.

Demand for the firm’s product decreases to $D'$ and marginal revenue decreases to $MR'$.

1. The output that maximizes profit is 50 pairs of Tommy jeans a day.
2. The price is $30 per pair. Average total cost is also $30 per pair.
3. Economic profit is zero.
14.1 MONOPOLISTIC COMPETITION

Monopolistic Competition and Efficiency

Efficiency requires that the marginal benefit (price) of the consumer equal the marginal cost of the producer. In monopolistic competition, price exceeds marginal cost, which is an indicator of inefficiency. Inefficiency arises from product differentiation. So the inefficiency brings a gain for consumers by offering greater product variety.

Excess Capacity

Capacity Output

The output at which average total cost is a minimum—the output at the bottom of the U-shaped ATC curve. A firm in monopolistic competition always operates with excess capacity in long-run equilibrium. Figure 14.3 on the next slide illustrates excess capacity.

1. The firm produces 50 pairs of jeans a day. Long-run equilibrium occurs where the demand curve just touches the ATC curve. Because the demand curve is downward sloping, output occurs on the downward sloping part of the ATC curve.

2. The firm’s capacity output is the output at which average total cost is a minimum—125 pairs a day.

3. In long-run equilibrium, the firm operates with excess capacity.
Innovation and Product Development
Wherever economic profits are earned, imitators emerge.
To maintain economic profit, a firm must seek out new products.
Cost Versus Benefit of Product Innovation
The firm must balance the cost and benefit at the margin.

Efficiency and Product Innovation
Regardless of whether a product improvement is real or imagined, its value to the consumer is its marginal benefit, which equals the amount the consumer is willing to pay.
The marginal benefit to the producer is the marginal revenue, which in equilibrium equals marginal cost.
Because price exceeds marginal cost, product improvement is not pushed to its efficient level.

Marketing
Advertising
Packaging
Marketing Expenditures
A large proportion of the prices that we pay cover the cost of selling a good.
Figure 14.4 on the next slide shows some estimates of marketing expenditures for some familiar markets.
Selling Costs and Total Costs
Advertising expenditures increase the costs of a monopolistically competitive firm above those of a perfectly competitive firm or a monopoly. Advertising costs are fixed costs. Advertising costs per unit decrease as production increases. Figure 14.5 on the next slide illustrates the effects of selling costs on total cost.

1. When advertising costs are added to...
2. ... the average total cost of production, ...
3. ... average total cost increases by a greater amount at small outputs than at large outputs.

Selling Costs and Demand
If advertising enables a firm to survive, it might increase the number of firms in the market. To the extent that it increases the number of firms, it decreases the demand faced by any one firm.

Efficiency: The Bottom Line
The bottom line is ambiguous.
14.3 OLIGOPOLY

Another market type that stands between perfect competition and monopoly.
Oligopoly is a market type in which:
• A small number of firms compete.
• Natural or legal barriers prevent the entry of new firms.

Collusion
Cartel
A group of firms acting together to limit output, raise price, and increase economic profit
Duopoly
A market in which there are only two producers.

Duopoly In Airplanes
Competitive Outcome
Price equals marginal cost.
Monopoly Outcome
The firm would be a single-price monopoly.
Range of Possible Oligopoly Outcomes
The extremes of perfect competition and monopoly provide the maximum range within which the oligopoly outcome might lie.
14.3 OLIGOPOLY

The Duopolists’ Dilemma

By limiting production to the monopoly quantity, the firms can maximize joint profits.

By increasing production, one firm might be able to make an even larger profit and force a smaller profit on to the other firm.

Joint profits can be $72 million if the firms produce the monopoly output.

<table>
<thead>
<tr>
<th>Quantity (Airplanes a week)</th>
<th>Boeing</th>
<th>Airbus</th>
<th>Market total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price ($ million per airplane)</td>
<td>13</td>
<td>13</td>
<td>26</td>
</tr>
<tr>
<td>Total revenue ($ million)</td>
<td>39</td>
<td>39</td>
<td>78</td>
</tr>
<tr>
<td>Total cost ($ million)</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Economic profit ($ million)</td>
<td>36</td>
<td>36</td>
<td>72</td>
</tr>
</tbody>
</table>

Boeing Increases Output to 4 Airplanes a Week

Boeing can increase its economic profit by $4 million and cause the economic profit of Airbus to fall by $6 million.

<table>
<thead>
<tr>
<th>Quantity (Airplanes a week)</th>
<th>Boeing</th>
<th>Airbus</th>
<th>Market total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price ($ million per airplane)</td>
<td>11</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>Total revenue ($ million)</td>
<td>44</td>
<td>33</td>
<td>77</td>
</tr>
<tr>
<td>Total cost ($ million)</td>
<td>4</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Economic profit ($ million)</td>
<td>40</td>
<td>30</td>
<td>70</td>
</tr>
</tbody>
</table>

Airbus Increases Output to 4 Airplanes a Week

For Airbus this outcome is an improvement on the previous one by $2 million a week.

For Boeing, the outcome is worse than the previous one by $8 million a week.

<table>
<thead>
<tr>
<th>Quantity (Airplanes a week)</th>
<th>Boeing</th>
<th>Airbus</th>
<th>Market total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price ($ million per airplane)</td>
<td>9</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>Total revenue ($ million)</td>
<td>24</td>
<td>24</td>
<td>48</td>
</tr>
<tr>
<td>Total cost ($ million)</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Economic profit ($ million)</td>
<td>32</td>
<td>32</td>
<td>64</td>
</tr>
</tbody>
</table>
Boeing Increases Output to 5 Airplanes a Week

If Boeing Increases output to 5 Airplanes a week, its economic profit falls.

Similarly, if Airbus Increases output to 5 Airplanes a week, its economic profit falls.

<table>
<thead>
<tr>
<th>Quantity (Airplanes per week)</th>
<th>Boeing</th>
<th>Airbus</th>
<th>Market total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price ($ million) per airplane</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Total revenue ($ million)</td>
<td>35</td>
<td>38</td>
<td>73</td>
</tr>
<tr>
<td>Total cost ($ million)</td>
<td>5</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Economic profit ($ million)</td>
<td>30</td>
<td>24</td>
<td>54</td>
</tr>
</tbody>
</table>

A dilemma:

- If both firms stick to the monopoly output, they both produce 3 airplanes and make $36 million.
- If they both increase production to 4 airplanes a week, they both make $32 million.
- If only one increases production to 4 airplanes a week, that firm makes $40 million.
- What do they do?
- Game theory provides an answer.

Game theory

The tool used to analyze strategic behavior—behavior that recognizes mutual interdependence and takes account of the expected behavior of others.
14.4 GAME THEORY

- The Prisoners’ Dilemma

Art and Bob been caught stealing a car: sentence is 2 years in jail.
DA wants to convict them of a big bank robbery: sentence is 10 years in jail.
DA has no evidence and to get the conviction, he makes the prisoners play a game.

Rules
Players cannot communicate with the other.
- If both confess to the larger crime, each will receive a sentence of 3 years for both crimes.
- If one confesses and the accomplice does not, the one who confesses will receive a sentence of 1 year, while the accomplice receives a 10-year sentence.
- If neither confesses, both receive a 2-year sentence.

Strategies
The strategies of a game are all the possible outcomes of each player.
The strategies in the prisoners’ dilemma are:
- Confess to the bank robbery
- Deny the bank robbery

Payoffs
Four outcomes:
- Both confess.
- Both deny.
- Art confesses and Bob denies.
- Bob confesses and Art denies.
A payoff matrix is a table that shows the payoffs for every possible action by each player given every possible action by the other player.
Table 14.5 shows the prisoners' dilemma payoff matrix for Art and Bob.

<table>
<thead>
<tr>
<th>Art's strategy</th>
<th>Confess</th>
<th>Deny</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bob's strategies</td>
<td>3 years</td>
<td>3 years</td>
</tr>
<tr>
<td></td>
<td>1 year</td>
<td>1 year</td>
</tr>
<tr>
<td></td>
<td>2 years</td>
<td>2 years</td>
</tr>
</tbody>
</table>

Equilibrium
Occurs when each player takes the best possible action given the action of the other player.

Nash equilibrium
An equilibrium in which each player takes the best possible action given the action of the other player.

The Nash equilibrium for Art and Bob is to confess.

Not the Best Outcome
The equilibrium of the prisoners' dilemma is not the best outcome.

The Duopolists' Dilemma as a Game
Each firm has two strategies. It can produce airplanes at the rate of:
- 3 a week
- 4 a week
Because each firm has two strategies, there are four possible combinations of actions:

- Both firms produce 3 a week (monopoly outcome).
- Both firms produce 4 a week.
- Airbus produces 3 a week and Boeing produces 4 a week.
- Boeing produces 3 a week and Airbus produces 4 a week.

The Payoff Matrix
Table 14.6 shows the payoff matrix as the economic profits for each firm in each possible outcome.

Equilibrium of the Duopolists’ Dilemma
Both firms produce 4 a week.
Like the prisoners, the duopolists fail to cooperate and get a worse outcome than the one that cooperation would deliver.

Repeated Games
Most real-world games get played repeatedly.
Repeated games have a larger number of strategies because a player can be punished for not cooperating.
This suggests that real-world duopolists might find a way of learning to cooperate so they can enjoy monopoly profit.
The larger the number of players, the harder it is to maintain the monopoly outcome.
The End

Chapter 14

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