Microeconomics: Principles, Applications, and Tools

NINTH EDITION

Chapter 12

Oligopoly and Strategic Behavior

In an oligopoly, defined as a market with just a few firms, each firm has an incentive to act strategically, anticipating the possible actions and reactions of its fellow oligopolists.

Pearson

Learning Objectives

12.1 Explain why a price-fixing cartel is difficult to maintain.

12.2 Explain the effects of a low-price guarantee on the price.

12.3 Describe the prisoners' dilemma.

12.4 Explain the behavior of an insecure monopolist.

12.5 Explain two advertisers' dilemmas.

Oligopoly and Strategic Behavior

- **Oligopoly**
  A market served by a few firms.
- **Game theory**
  The study of decision making in strategic situations.

WHAT IS AN OLIGOPOLY?

- **Concentration ratio**
  The percentage of the market output produced by the largest firms.

An alternative measure of market concentration is the *Herfindahl-Hirschman Index* (*HHI*). It is calculated by squaring the market share of each firm in the market and then summing the resulting numbers.

An oligopoly—a market with just a few firms—occurs for three reasons:

1. *Government barriers to entry*.
2. *Economies of scale in production*.
3. *Advertising campaigns*.

WHAT IS AN OLIGOPOLY?

TABLE 12.1 Concentration Ratios in Selected Manufacturing Industries

Industry	Four-Firm Concentration Ratio (%)	Eight-Firm Concentration Ratio (%)
Primary copper smelting	99	Not available
House slippers	97	99
Guided missiles and space vehicles	96	99
Cigarettes	95	99
Soybean processing	95	99
Household laundry equipment	93	Not available
Breweries	91	94
Electric lamp bulbs	89	90
Military vehicles	88	93
Primary battery manufacturing	87	99
Beet sugar processing	85	98
Household refrigerators and freezers	85	95
Small arms (weapons)	84	90
Breakfast cereals	82	93
Motor vehicles and car bodies	81	91
Flavoring syrup	Not available	89

SOURCE: U.S. Bureau of the Census, 2002 Economic Census, Manufacturing, *Concentration Ratios: 2002* (Washington, D.C.: U.S. Government Printing Office, 2006).

12.1 CARTEL PRICING AND THE DUOPOLISTS' DILEMMA

- **Duopoly**
  A market with two firms.
- **Cartel**
  A group of firms that act in unison, coordinating their price and quantity decisions.

12.1 CARTEL PRICING AND THE DUOPOLISTS' DILEMMA

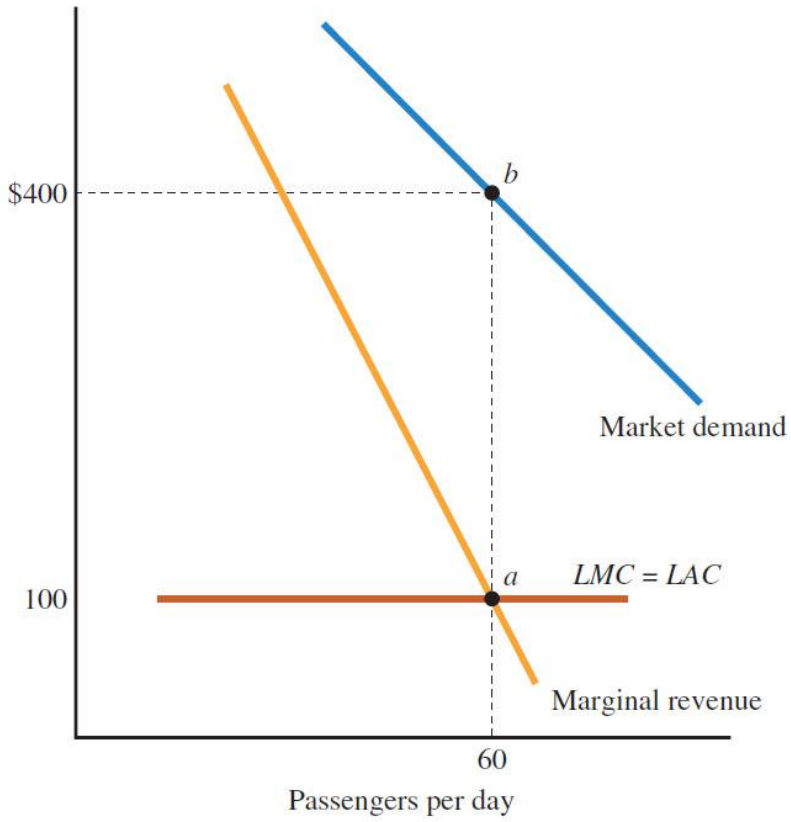
Profit = (price − average cost) × quantity per firm

The monopoly outcome is shown by point a, where marginal revenue equals marginal cost.

The monopoly quantity is 60 passengers and the price is $400. If the firms form a cartel, the price is $400 and each firm has 30 passengers (half the monopoly quantity).

The profit per passenger is $300 (equal to the $400 price minus the $100 average cost), so the profit per firm is $9,000.

- **Price-fixing**
  An arrangement in which firms conspire to fix prices.



▲ FIGURE 12.1 A Cartel Picks the Monopoly Quantity and Price

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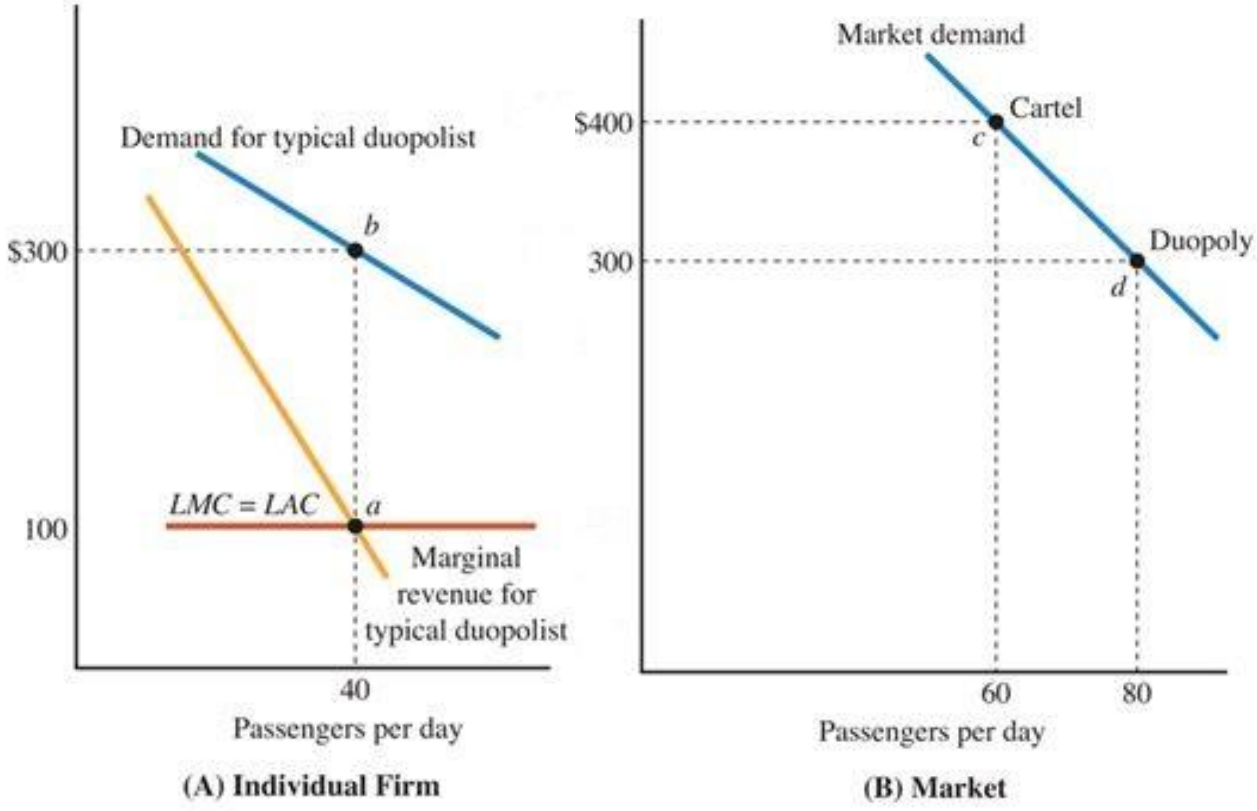
12.1 CARTEL PRICING AND THE DUOPOLISTS' DILEMMA

(A) The typical firm maximizes profit at point a, where marginal revenue equals marginal cost. The firm has 40 passengers.

(B) At the market level, the duopoly outcome is shown by point *d*, with a price of $300 and 80 passengers. The cartel outcome, shown by point *c*, has a higher price and a smaller total quantity.



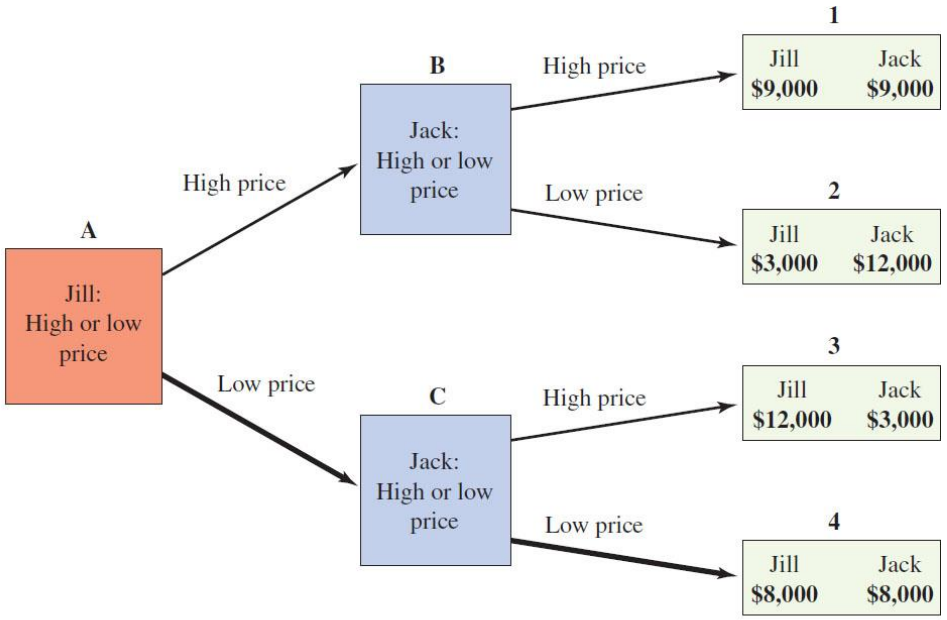
12.1 CARTEL PRICING AND THE DUOPOLISTS' DILEMMA

Price-Fixing and the Game Tree

- **Game tree**
  A graphical representation of the consequences of different actions in a strategic setting.

The equilibrium path of the game is square A to square C to rectangle 4: Each firm picks the low price and earns a profit of $8,000.

The duopolists' dilemma is that each firm would make more profit if both picked the high price, but both firms pick the low price.



▲ FIGURE 12.3 Game Tree for the Price-Fixing Game

12.1 CARTEL PRICING AND THE DUOPOLISTS' DILEMMA

Price-Fixing and the Game Tree

TABLE 12.2 Duopolists' Profits When They Choose Different Prices

	Jill: High Price	Jack: Low Price
Price	$ 400	$ 300
Average cost	$ 100	$ 100
Profit per passenger	$ 300	$ 200
Number of passengers	10	60
Profit	$3,000	$12,000

12.1 CARTEL PRICING AND THE DUOPOLISTS' DILEMMA

Equilibrium of the Price-Fixing Game

- **Dominant strategy**

  An action that is the best choice for a player, no matter what the other player does.

- **Duopolists' dilemma**

  A situation in which both firms in a market would be better off if both chose the high price, but each chooses the low price.

12.1 CARTEL PRICING AND THE DUOPOLISTS' DILEMMA

Nash Equilibrium

- **Nash equilibrium**

  An outcome of a game in which each player is doing the best he or she can, given the action of the other players.

APPLICATION 1

FAILURE OF THE SALT CARTEL

APPLYING THE CONCEPTS #1: Why do cartels sometimes fail to keep price high?

- At the beginning of the 19th Century, high overland transportation costs protected salt producers from competition with one another, generating local salt monopolies. Over the course of the 19th Century, decreases in overland transportation costs increased competition between salt producers and decreased prices.
- In response to the increased competition, salt producers in a particular state colluded by forming a salt pool, enterprises that set a uniform price and distributed the salt of all participating producers. Some pools established output quotas or paid firms not to produce salt for a year, a practice known as “dead-renting” a salt furnace.
- Every pool arrangement broke down, usually within a year or two of its formation. In some cases, individual firms cheated on the cartel by selling salt outside the cartel. In other cases the artificially high price caused new firms to enter the market and underprice the salt pool.

12.2 OVERCOMING THE DUOPOLISTS' DILEMMA

Low-Price Guarantees

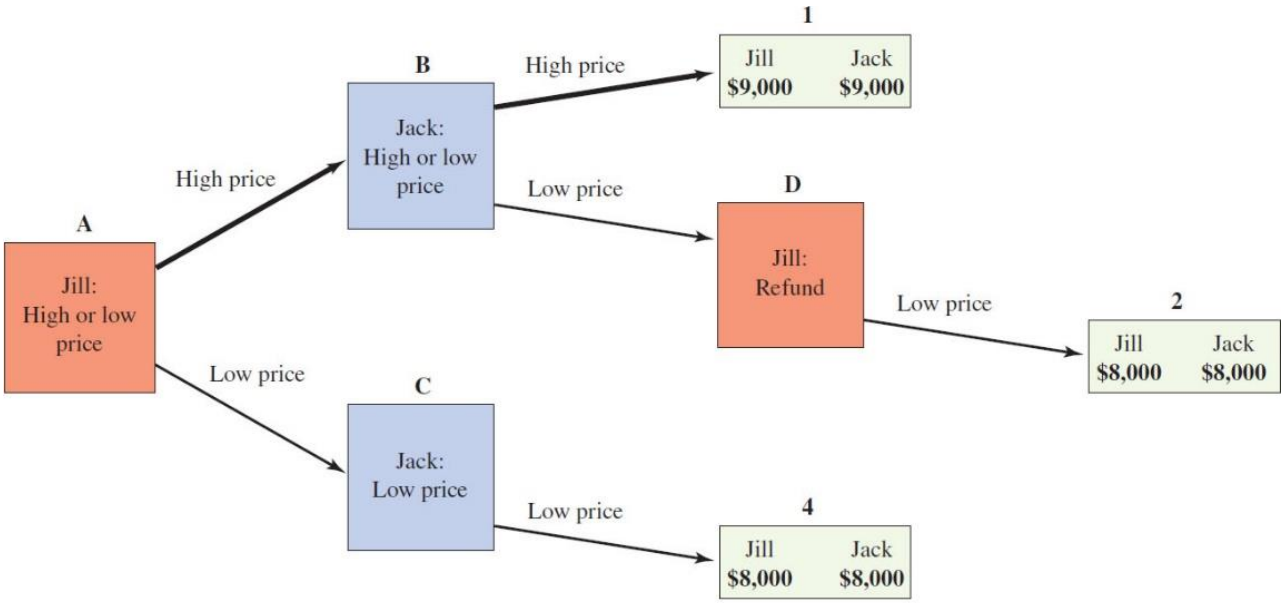
- **Low-price guarantee**
  A promise to match a lower price of a competitor.

12.2 OVERCOMING THE DUOPOLISTS' DILEMMA

Low-Price Guarantees

When both firms have a low-price guarantee, it is impossible for one firm to underprice the other. The only possible outcomes are a pair of high prices (rectangle 1) or a pair of low prices (rectangles 2 or 4).

The equilibrium path of the game is square A to square B to rectangle 1. Each firm picks the high price and earns a profit of $9,000.



▲ FIGURE 12.4 Low-Price Guarantees Increase Prices

12.2 OVERCOMING THE DUOPOLISTS' DILEMMA

Repeated Pricing Games with Retaliation for Underpricing

Repetition makes price-fixing more likely because firms can punish a firm that cheats on a price-fixing agreement, whether it's formal or informal:

1 *A duopoly pricing strategy.*
Choosing the lower price for life.

2 *A grim-trigger strategy*.

- **Grim-trigger strategy**
  A strategy where a firm responds to underpricing by choosing a price so low that each firm makes zero economic profit.

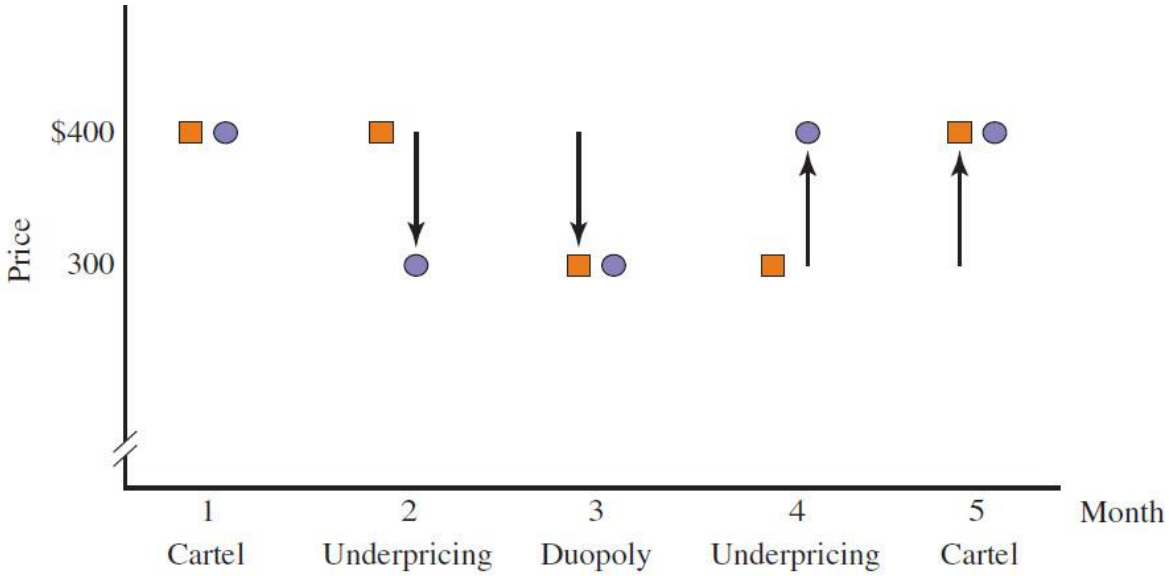
3 *A tit-for-tat strategy.*

- **Tit-for-tat**
  A strategy where one firm chooses whatever price the other firm chose in the preceding period.

12.2 OVERCOMING THE DUOPOLISTS' DILEMMA

Repeated Pricing Games with Retaliation for Underpricing

Under tit-for-tat retaliation, the first firm (Jill, the square) chooses whatever price the second firm (Jack, the circle) chose the preceding month.



▲ FIGURE 12.5 A Tit-for-Tat Pricing Strategy

12.2 OVERCOMING THE DUOPOLISTS' DILEMMA

Price-Fixing and the Law

- Under the Sherman Antitrust Act of 1890 and subsequent legislation, explicit price-fixing is illegal. It is illegal for firms to discuss pricing strategies or methods of punishing a firm that underprices other firms.

12.2 OVERCOMING THE DUOPOLISTS' DILEMMA

Price Leadership

- **Price leadership**

  A system under which one firm in an oligopoly takes the lead in setting prices.

The problem with an implicit pricing agreement is that it relies on indirect signals that are often garbled and misinterpreted. When one firm suddenly drops its price, the other firm could interpret the price cut in one of two ways:

- *A change in market conditions.*
- *Underpricing.*

APPLICATION 2

LOW-PRICE GUARANTEE INCREASES TIRE PRICES

APPLYING THE CONCEPTS #2: Do low price guarantees generate higher or lower prices?

- In two successive months (November and December), a Florida tire retailer listed prices for 35 types of tires in newspaper advertisements. In November the average price was $45, and in December the average price was $55.
- The December advertisement was different in another way: it included a low-price guarantee under which the retailer agreed to match any lower advertised price (and also pay the customer some percentage of the price gap). In fact, for each of the 35 types of tires, the December price was the same or higher than the November price. In this case, a low-price guarantee generated higher prices.
- Is the relationship between low-price guarantees and prices apparent or real? A careful study of the retail tire market suggests that prices are generally higher in markets where firms offer low-price guarantees. On average, the presence of a low-price guarantee increases prices by a modest $4 per tire, or about 10 percent of the price.

12.3 SIMULTANEOUS DECISION MAKING AND THE PAYOFF MATRIX

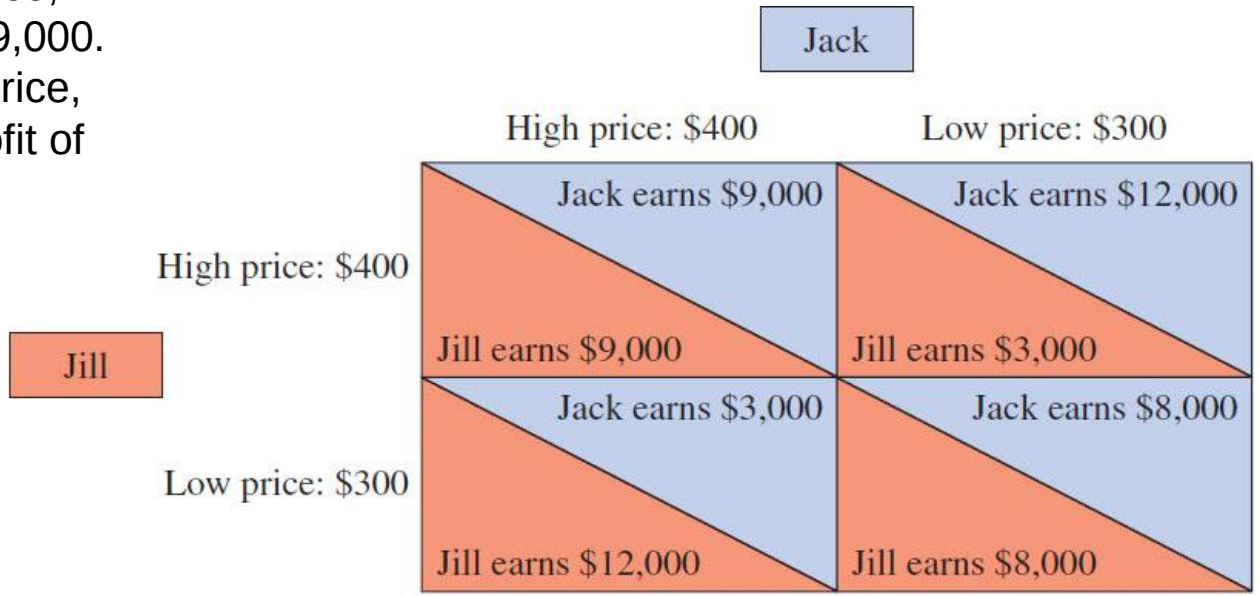
- **Payoff matrix**
  A matrix or table that shows, for each possible outcome of a game, the consequences for each player.

12.3 SIMULTANEOUS DECISION MAKING AND THE PAYOFF MATRIX

Simultaneous Price-Fixing Game

Jill's profit is in red, and Jack's profit is in blue.

If both firms pick the high price, each firm earns a profit of $9,000. Both firms will pick the low price, and each firm will earn a profit of only $8,000.



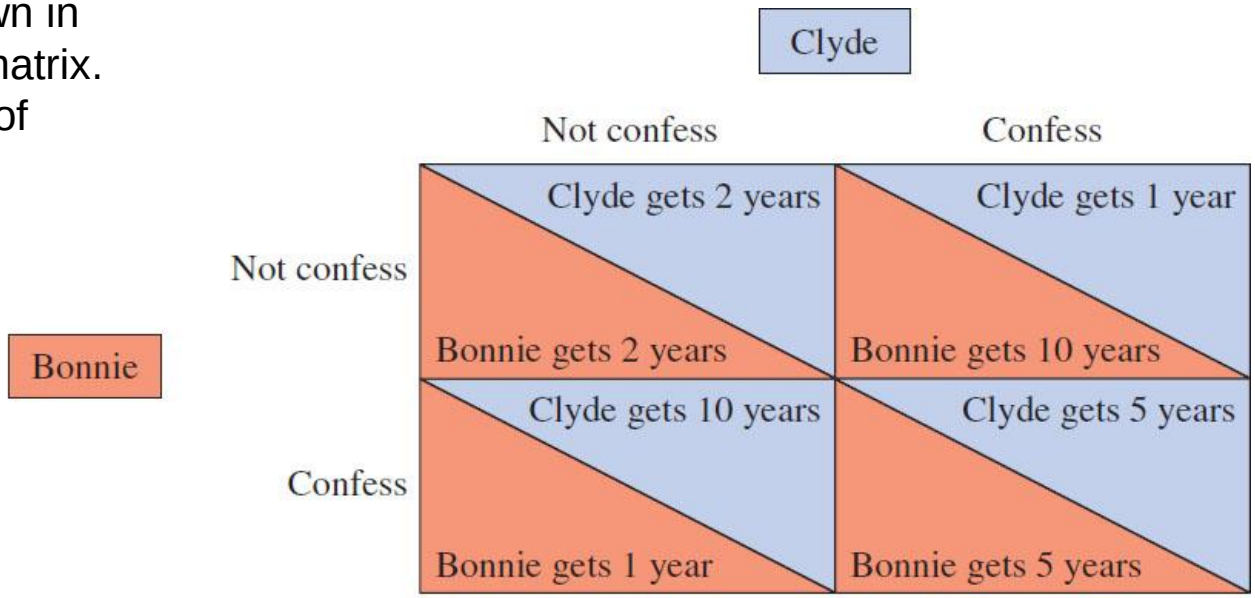
▲ FIGURE 12.6 Payoff Matrix for the Price-Fixing Game

12.3 SIMULTANEOUS DECISION MAKING AND THE PAYOFF MATRIX

The Prisoners' Dilemma

The prisoners' dilemma is that each prisoner would be better off if neither confessed, but both people confess.

The Nash equilibrium is shown in the southeast corner of the matrix. Each person gets five years of prison time.



▲ FIGURE 12.7 Payoff Matrix for the Prisoners' Dilemma

APPLICATION 3

CHEATING ON THE FINAL EXAM: THE CHEATERS' DILEMMA

APPLYING THE CONCEPTS #3: When does cooperation break down?

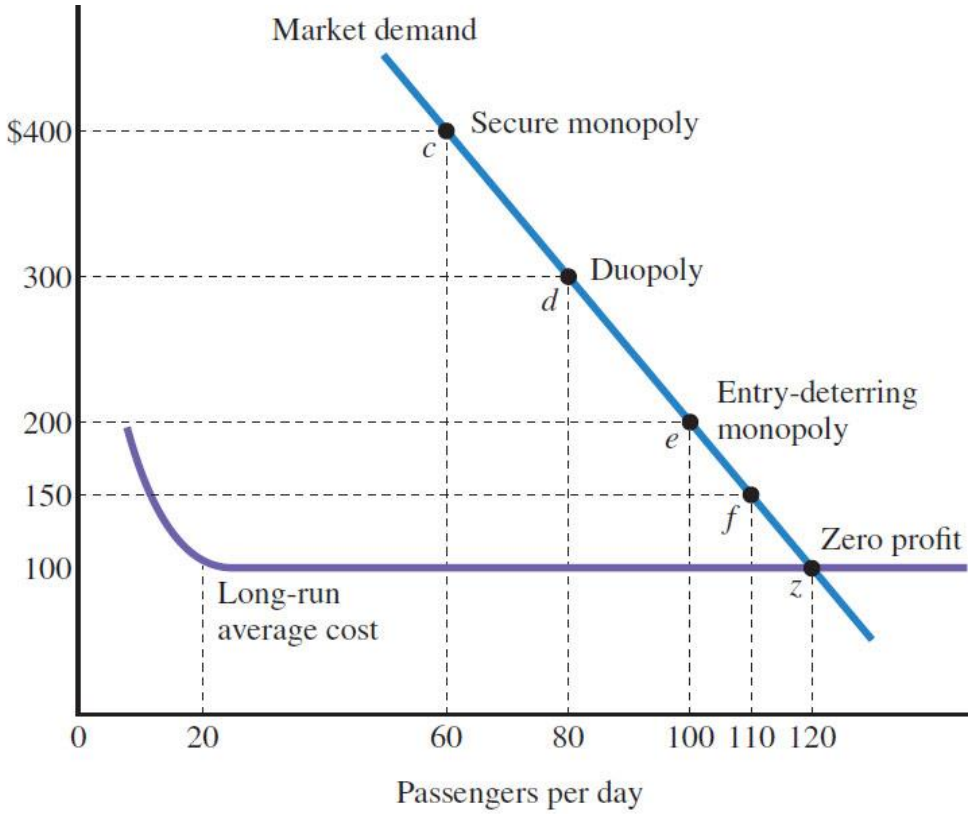
- An economics professor discovered three students cheating on the final.
- Speaking to them individually, he gave each student two options
- If the student confessed, he or she would receive a zero on the exam, but suffer no other consequences.
- If they did not confess, he or she would go before the Office of Student Judicial Affairs, and any confessions by the other two students would be used as evidence.
- Is this a prisoner's dilemma?
- What is the likely outcome?

12.4 THE INSECURE MONOPOLIST AND ENTRY DETERRENCE

Point *c* shows a secure monopoly, point *d* shows a duopoly, and point *z* shows the zero-profit outcome.

The minimum entry quantity is 20 passengers, so the entry-deterring quantity is 100 (equal to 120 – 20), as shown by point *e*.

The limit price is $200.



▲ FIGURE 12.8 Deterring Entry with Limit Pricing

12.4 THE INSECURE MONOPOLIST AND ENTRY DETERRENCE

Entry Deterrence and Limit Pricing

The quantity required to prevent the entry of the second firm is computed as follows:

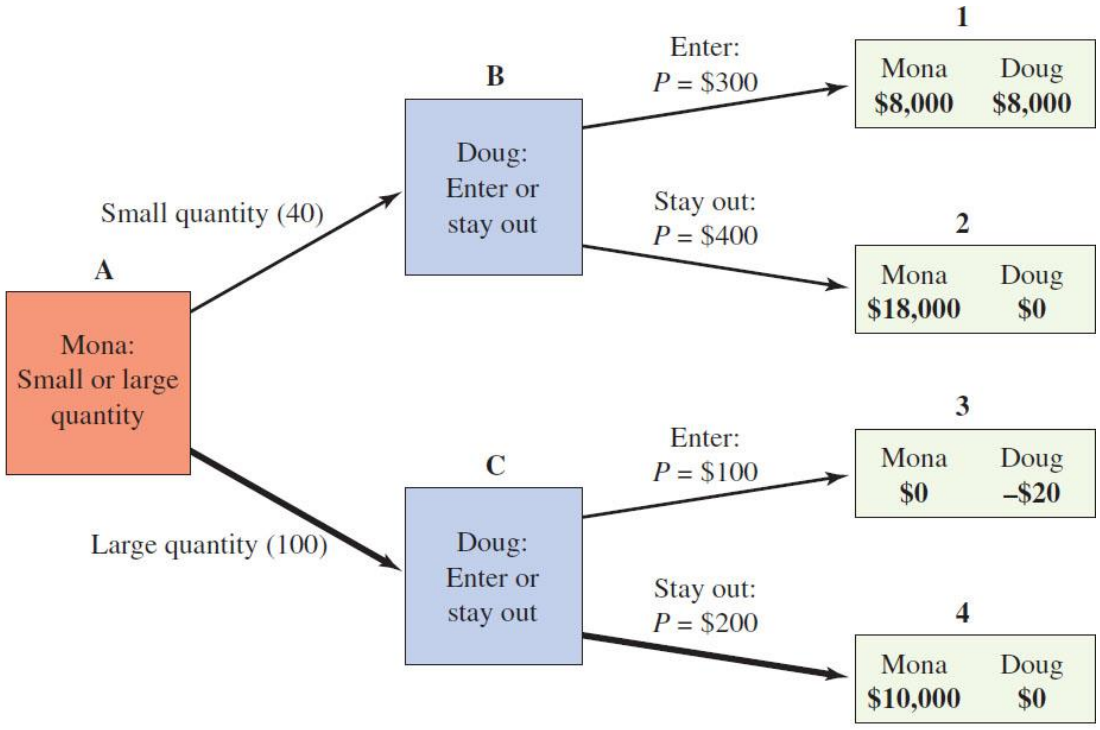
deterring quantity = zero profit quantity − minimum entry quantity

12.4 THE INSECURE MONOPOLIST AND ENTRY DETERRENCE

Entry Deterrence and Limit Pricing

The path of the game is square A to square C to rectangle 4. Mona commits to the entry-deterring quantity of 100, so Doug stays out of the market.

Mona's profit of $10,000 is less than the monopoly profit but more than the duopoly profit of $8,000.



▲ FIGURE 12.9 Game Tree for the Entry-Deterrence Game

12.4 THE INSECURE MONOPOLIST AND ENTRY DETERRENCE

Entry Deterrence and Limit Pricing

- **Limit pricing**

  The strategy of reducing the price to deter entry.

- **Limit price**

  The price that is just low enough to deter entry.

12.4 THE INSECURE MONOPOLIST AND ENTRY DETERRENCE

Examples: Aluminum and Campus Bookstores

- Alcoa maintained a relatively low price and large quantity between 1893 and 1940 to deter entrance of other firms.
- If your campus bookstore suddenly feels insecure about its monopoly position, it could cut its prices to prevent online booksellers from capturing too many of its customers.

Entry Deterrence and Contestable Markets

- **Contestable market**

  A market with low entry and exit costs.

When Is the Passive Approach Better?

- Entry deterrence is not the best strategy for all insecure monopolists.
- Sharing a duopoly can be more profitable than increasing output and cutting the price to keep the other firm out.

APPLICATION 4

MICROSOFT AS AN INSECURE MONOPOLIST

APPLYING THE CONCEPTS #4: How does a monopolist respond to the threat of entry?

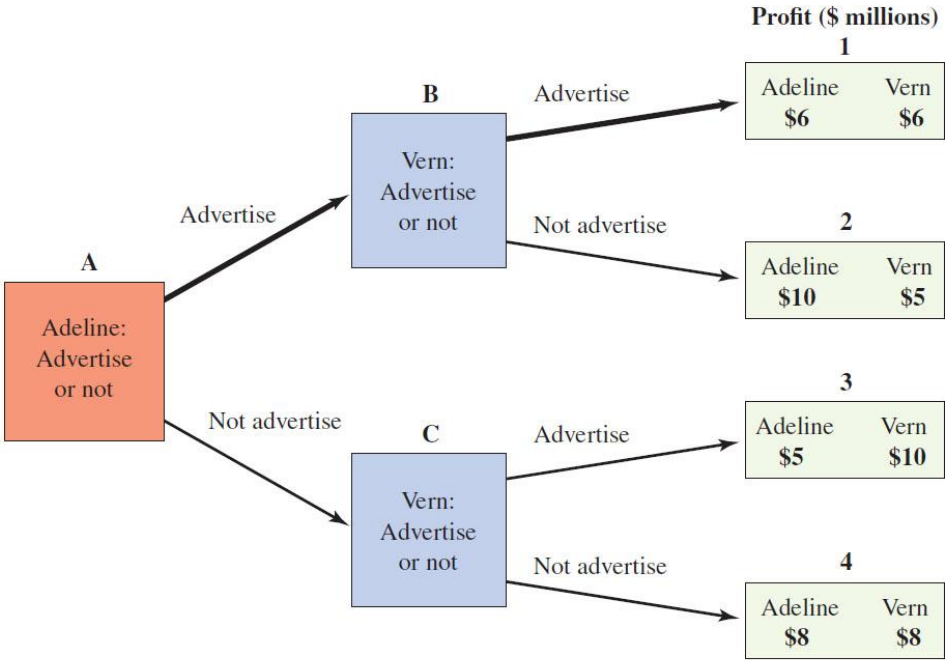
- Microsoft has a virtual monopoly in the market for personal-computer operating systems and business software. But there is a constant threat that another firm will launch competing products, so Microsoft engages in limit pricing to deter entry into its key markets. A recent study computes some of the numbers behind the insecure monopoly.
  1. The pure monopoly price for a software bundle of the Windows operating system and the Office Suite of business tools is about $354, but the actual price (the limit price) is about $143. The estimated cost for a second firm to develop, maintain, and market an alternative software bundle is about $38 billion, and Microsoft's actual price is just low enough to make such an investment unprofitable.
  2. The pure monopoly profit would be about $191 billion, while the profit under Microsoft's limit pricing is about $153 billion. Although the profit under the entry-deterrence strategy is less than the pure monopoly profit, it is greater than the profit Microsoft would earn if it allowed a second firm to enter the market ($148 billion). In other words, entry deterrence is the best strategy.

12.5 THE ADVERTISERS' DILEMMA

Adeline moves first, choosing to advertise or not. Vern's best response is to advertise no matter what Adeline does.

Knowing this, Adeline realizes that the only possible outcomes are shown by rectangles 1 and 3.

From Adeline's perspective, rectangle 1 ($6 million) is better than rectangle 3 ($5 million), so her best response is to advertise. Both Adeline and Vern advertise, and each earns a profit of $6 million.



▲ FIGURE 12.10 Game Tree for the Advertisers' Dilemma

TABLE 12.3 Advertising and Profit

	Neither Advertises		Both Advertise		Adeline Advertises	
	Adeline	Vern	Adeline	Vern	Adeline	Vern
Net revenue from sales ($ million)	$8	$8	$13	$13	$17	$5
Cost of advertising ($ million)	0	0	7	7	7	0
Profit ($ million)	8	8	6	6	10	5

APPLICATION 5

GOT MILK?

APPLYING THE CONCEPTS #5: What is the rationale for generic advertising?

- Milk is advertised by the National Fluid Milk Producers, and industry group. The milk producers pool their resources and fund the campaign with a tax. Why?
- The is a standardized good, so advertising by one producer increases demand for all producers.
  - The Got Milk campaign increases demand about 6 percent.
  - If a single firm advertised, it would incur all the expense, but only a fraction of the benefit.
  - The solution is to share costs and benefits.

Learning Objectives

12.1 Explain why a price-fixing cartel is difficult to maintain.

12.2 Explain the effects of a low-price guarantee on the price.

12.3 Describe the prisoners' dilemma.

12.4 Explain the behavior of an insecure monopolist.

12.5 Explain two advertisers' dilemmas.

KEY TERMS

Cartel
Concentration ratio
Contestable market
Dominant strategy
Duopolists' dilemma
Duopoly
Game theory
Game tree
Grim-trigger strategy
Kinked demand curve model
Low-price guarantee
Limit price
Limit pricing
Nash equilibrium
Oligopoly
Payoff matrix
Price-fixing
Price leadership
Tit-for-tat

Questions?

Homework:
Ch11, pp 251-253
1.1, 2.2, 2.3, 3.3, 3.4, 4.7
Ch12, pp 276-
1.5, 2.1, 3.2, 5.1,

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