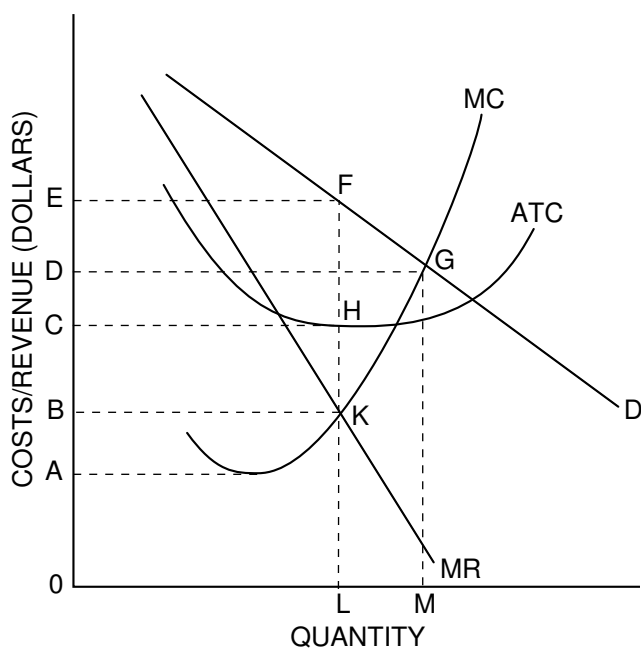## Monopolistic Competition

✳ Figure 40.1
Monopolistically Competitive Firm in the Short Run

1. Use Figure 40.1 to answer these questions.

   (A) At what level of output will this firm operate? _____

   (B) What is marginal revenue at this level of output? _____

   (C) What price will this firm charge for its product? _____

   (D) The area of which rectangle is equal to total revenue? _____

   (E) What is the firm's average total cost? _____

   (F) The area of which rectangle is equal to the firm's total cost? _____

   (G) Is the firm making profits or incurring losses? _____

   (H) The area of which rectangle is equal to profits or losses? _____

2. Would the demand curve for a monopolistic competitor be more or less elastic than the demand curve for a monopolist? Justify your answer.

3. What are the characteristics of a monopolistically competitive market? In what sense is there competition and in what sense is there monopoly in this type of market structure?

4. What are three examples of monopolistically competitive markets?

5. True, false or uncertain, and why? "Monopolistic competition is just another form of pure monopoly."

6. True, false or uncertain, and why? "Monopolistic competition is even better than perfect competition."

7. True, false or uncertain, and why? "In the long run, monopolistic competitors produce at their most efficient point."

Game Theory

Strategic thinking is the art of outdoing an adversary, knowing that the adversary is trying to do the same to you.   Di it and Nalebuff

Game theory is used to e plain how two or more players make decisions or choose actions when their actions (or strategies) affect each participant. Each player determines his or her best response to the possible actions of every other player. According to game theory, a player's choice of strategy depends on the strategy the player thinks other players will choose. In some cases, these strategies reinforce each other, but in other cases, they do not. When the chosen strategies reinforce each other, the game achieves what is called a *Nash Equilibrium*. The Nash Equilibrium is named after John F. Nash, Jr., who was co winner of the 1994 Nobel Prize in Economics for his work in this area and the sub ect of the 001 movie *A Beautiful Mind*.

Game theory provides insights into how business and government decisions are made and has numerous real world applications. For e ample, game theory has helped economists analyze antitrust policy, tariff wars and auctioning behavior. This lesson is an introduction to the basic elements of game theory. As you do the math, think about the implications of the results.

Part A
The Basic Elements of Game Theory

The three basic elements of a game are

  (A) the players,

  (B) the strategies available to each player,

  (C) the payoffs each player receives.

These three elements are summarized in a table called a *payoff matrix*. A payoff matri describes the payoffs to each player for combinations of given strategies. Here is an e ample of a payoff matri :

		Coke	
		Advertise	Don't Advertise
Pepsi	Advertise	80, 80	120, 45
	Don't Advertise	45, 120	100, 100

The first number in each square refers to the payoff for the row (horizontal) player, here Pepsi. The second number in each square refers to the payoff for the column (vertical) player, here Coke. The numbers represent the profit for Pepsi and Coke.

In this game:

  (A) The players are Pepsi and Coke.

  (B) The strategies available to each player:

      Pepsi, as the row player, can choose either Advertise or Don't Advertise.

      Coke, as the column player, can choose either Advertise or Don't Advertise.

(C) The payoffs each player receives:

> If Pepsi chooses Advertise and Coke chooses Advertise, Pepsi earns 80 and Coke earns 80.
>
> If Pepsi chooses Advertise and Coke chooses Don't Advertise, Pepsi earns 1 0 and Coke earns 45.
>
> If Pepsi chooses Don't Advertise and Coke chooses Advertise, Pepsi earns 45 and Coke earns 1 0.
>
> If Pepsi chooses Don't Advertise and Coke chooses Don't Advertise, Pepsi earns 100 and Coke earns 100.

Each player gains a lot from advertising when the other player does not advertise because the advertiser gains a larger share of the market. If both advertise, the gain is less than if both don't advertise because advertising costs money.

In some games, one player will have a *dominant strategy*. A dominant strategy is the best strategy for one player regardless of the strategy the other player follows. In the game with Pepsi and Coke, the dominant strategy for Pepsi is to choose Advertise. This is because Pepsi earns more regardless of which strategy Coke chooses.

> If Coke chooses Advertise, Pepsi earns 80 choosing Advertise, which is greater than earning 45 from choosing Don't Advertise.
>
> If Coke chooses Don't Advertise, Pepsi earns 1 0 choosing Advertise, which is greater than earning 100 from choosing Don't Advertise.

The dominant strategy for Coke is to choose Advertise. This is because Coke earns more regardless of what Pepsi chooses.

> If Pepsi chooses Advertise, Coke earns 80 choosing Advertise, which is greater than earning 45 from choosing Don't Advertise.
>
> If Pepsi chooses Don't Advertise, Coke earns 1 0 choosing Advertise, which is greater than earning 100 from choosing Don't Advertise.

A *dominated strategy* yields a lower payoff than at least one other strategy. In this game, the domi nated strategy for Pepsi is Don't Advertise; it is dominated by Advertise. Regardless of the strategy selected by Coke, Pepsi gains more by choosing Advertise. If Pepsi chooses Don't Advertise, the payoff is 45, while a strategy of Advertise has a payoff of 80. Since 45 is less than 80, the dominated strategy is Don't Advertise.

The dominated strategy for Coke is Don't Advertise; it is dominated by Advertise. If Coke chooses Don't Advertise, Coke receives 45 if Pepsi chooses Advertise and 100 if Pepsi chooses Don't Advertise. Since 45 is less than 100, the dominated strategy for Coke is Don't Advertise.

A Nash Equilibrium is a combination of strategies for each player, such that each chooses his or her best response to the other's strategy choice. In this game, the Nash Equilibrium is Pepsi choosing Advertise and Coke choosing Advertise. Although in this e ample both Coke and Pepsi select the same strategy, in a Nash Equilibrium the players do not have to select the same strategy.

If Coke chooses Advertise, Pepsi is better off choosing Advertise (80 compared with 45). If Coke chooses Don't Advertise, Pepsi is better off choosing Advertise (1 0 compared with 100). So whatever

strategy Coke chooses, Pepsi is always better off choosing Advertise. Note that Pepsi has no incentive to choose any strategy other than Advertise.

Likewise if Pepsi chooses Advertise, then Coke is always better off choosing Advertise (80 compared with 45). If Pepsi chooses Don't Advertise, Coke is always better off choosing Advertise (1 0 compared with 100). So whatever strategy Pepsi chooses, Coke is always better off choosing Advertise. Note that Coke has no incentive to choose any strategy other than Advertise.

A Nash Equilibrium is similar to a market equilibrium in that there is no incentive for producers and consumers to change from the equilibrium price. Thus a Nash Equilibrium is an enforceable equilibrium because the firms do not have an incentive to cheat as they might in a cartel.

Other economic e amples of game theory applications are decisions by firms about what price to charge, whether to enter a market, where to locate and what kind of product or quality level to pro duce; decisions by a central bank on monetary policy actions and decisions by a nation on the opti mal tariff policy.

Part B
The Prisoner's Dilemma Game

One classic type of game is the *prisoner's dilemma game.* Prisoner's dilemma games are games in which each player has a dominant strategy; and when both players play the dominant strategy, the payoffs are smaller than if each player played the dominated strategy. The dilemma is how to avoid this bad outcome.

The basics of the prisoner's dilemma game are as follows: Two prisoners have the option to confess or not confess to a crime they committed. The prosecutor has only enough information to convict both criminals of a minor offense and is, therefore, relying on a confession. The minor offense carries one year in ail. The prisoners are questioned in different cells, without the ability to communicate. They are told that if one prisoner confesses while the other remains silent, the prisoner confessing will go free and the prisoner remaining silent will serve 0 years in ail. If both prisoners confess, both prisoners will serve three years in ail.

If a player goes free, the payoff is 0. If a player serves one year in ail, the payoff is –1. If a player spends 0 years in ail, the payoff is – 0. Use these numbers in your payoff matri . Note that the neg ative numbers come from losing years of freedom.

1. Determine the three basic elements of the game.

    (A) The players:

    (B) The strategies for each player:

    (C) The payoffs for each player:

 . Create a payoff matri for the prisoner's dilemma game.

 . Identify any dominant strategies.

4. Identify any dominated strategies.

5. Find the Nash Equilibrium.

Part C

Variation of the Prisoner's Dilemma Game

You are in a class with one other student. It is the end of the semester, and final e ams are in a week. Your teacher has said the final e am will be graded so that anyone who scores the class average on the final e am will receive a B in the class. Anyone who scores above the average will receive an A in the class, and anyone who scores below the average will fail the class. You would certainly score higher on the e am than the other student. You and the other student have made an agreement not to take the final e am so that the class average is zero and you both receive B grades.

. Determine the three basic elements of the game.

(A) The players:

(B) The strategies for each player:

(C) The payoffs for each player:

. Create a payoff matri for this game.

8. What is your dominant strategy? (Underline the correct answer)
   Take the Exam or *Not Take the Exam*

9. Using a four point scale (A = 4, B = , C =   and D = 1), which choice results in the highest class GPA?

    If you finished Parts B and C correctly, you will realize that when each player chooses his or her dominant strategy, the result is unattractive to the group.

    The key to avoiding the prisoner's dilemma outcome of lower payoffs for both players is to find a way for players to credibly commit to playing a dominated strategy. Merely having both prisoners agree to Not Confess or both students to Not Take the E am will not work. This results because it is always optimal for Prisoner 1 (or Prisoner) to still play the Confess strategy, and it is always optimal

for the better student to play the Take the Exam strategy. One possible way to have credible commitment in the prisoner's dilemma game would be to have both prisoners reveal another past crime they committed, thus ensuring that if they confess to this crime, the other prisoner will have additional information to punish the prisoner who cheats on an agreement to not confess.

One way to do this is to form a *cartel*. A cartel is a coalition of firms that coordinate their decisions to reach a more optimal solution for all members of the group by finding ways to credibly commit players to play their dominated strategies. Cartels, however, are not always successful in maintaining their agreements because there may be an incentive for a member to cheat on the cartel.

Part D
Questions

10. Is the Coke and Pepsi advertising game a prisoner's dilemma game? Explain why or why not.

11. Interpret standing at a concert in terms of the prisoner's dilemma game.

12. Explain at least one way the optimal outcome for players, which would be for all players to play the dominated strategy, can be reached in Question 11. What are the possible commitment problems?

13. A rivalry exists between the U.S. jet producer Boeing and the European jet producer Airbus. Each government has the opportunity to subsidize its jet producer to give it a competitive edge in the global market. Using game theory, explain what you would expect to observe in practice.

Market Structure and Business Decision Making

Answer the questions and briefly e plain your answers. Please use diagrams to illustrate your point.

1. True, false or uncertain, and e plain why? Monopolies always charge the highest possible price.

. True, false or uncertain, and e plain why? To find a monopoly, look for bigness. For e ample,
   monopoly is more likely to be found in the oil business than in the dry cleaning business.

. True, false or uncertain, and e plain why? If all the firms in an industry raise their prices at the
   same time, one can be pretty sure that there is collusion or monopoly behavior in this industry.

4. After several losing seasons, a college is considering dropping football. The college has concluded it
   needs an athletic director for other sports. To what e tent should the college's decision makers con
   sider the following budget items? (Hint: Consider variable and fi ed costs.)

   (A) Tuition scholarships

   (B) Payments on the stadium's mortgage

   (C) Free tickets to the games for students

   (D) Salary of the athletic director

   (E) Salary of the football coach and assistant coaches

5. True, false or uncertain, and e plain why? The marginal cost curve for a perfectly competitive firm is the same thing as its supply curve.

. True, false or uncertain, and e plain why? If marginal cost equals marginal revenue, a firm must be breaking even because costs and revenue are equal.

. The Crazy Toy Company produces yo yos. Figure 4 .1 gives the total revenue and total cost associated with the production of a certain number of yo yos. Fi ed costs are $1, 00.

Figure 4 .1
Crazy Toy Company Yo-Yo Schedule

Number of Yo-Yos Produced	Total Revenue	Marginal Revenue	Total Cost	Marginal Cost
0	$0	—	$1,200	—
1	150	$150	1,300	$100
2	275	125	1,350	50
3	375	100	1,425	75
4	460	85	1,505	80
5	540	80	1,595	90
6	600	60	1,700	105
7	640	40	1,820	120
8	670	30	1,960	140

(A) What are the fi ed and variable costs associated with each level of output?

(B) What is the optimal production level for the firm?

(C) In the short run, should the firm shut down? E plain your answer.

8. Why do airlines charge a discounted fare to passengers who stay over on a Saturday night? (Hint: Consider price discrimination.)

9. Assume your economics teacher got a scholarship to study in Europe this summer. Therefore, the teacher's family wants to rent its house for the summer. They figure if no one rents it, it will still cost them $ 00 a month in principal, interest and property insurance. It will cost them an addi tional $ 00 a month to maintain it if someone occupies it.

   (A) How much rent must they charge to cover all costs? _____

   (B) What is the minimum rent they should be willing to accept before they would leave the house unoccupied? _____ Why?

10. True, false or uncertain, and e plain why? Without government regulations most firms in a capi talist market system would be monopolies.

11. Draw a graph illustrating a monopoly market. Include the demand curve, the marginal revenue curve and the marginal cost curve.

(A) Indicate the equilibrium quantity for the monopolist, and label it Q.

(B) Indicate the equilibrium price, and label it P.

(C) Shade the area of consumer surplus for the monopolist market.

(D) Indicate the equilibrium price and quantity, if your diagram indicates conditions of perfect competition, and label them respectively P_1 and Q_1.

(E) Using diagonal lines, indicate the area of consumer surplus if the monopoly were actually a perfectly competitive industry.

(F) Does the monopoly model e hibit allocative efficiency? Why or why not?

(G) Does a perfectly competitive industry e hibit allocative efficiency? Why or why not?

1 . Why is game theory important to an oligopolist?