

Unit 6.2 (Oligopoly)
Chapter 15

1.
 - a. If BASF produces 10 tons more, it now produces 50 tons and the price would fall to \$3 per ton. That is, on each of the 40 tons it was already producing, it would lose \$1. So the price effect is $40 \times (-\$1) = \-40 . Since BASF produces an additional 10 tons and sells them at \$3, the quantity effect is $10 \times \$3 = \30 . So BASF gains \$30 revenue from producing 10 additional tons, but it loses \$40 revenue from producing those 10 additional tons. Since the marginal cost is zero, additional production does not change BASF's cost. Since BASF loses revenue, it has no incentive to produce the 10 additional tons.
 - b. If BASF produces 10 tons more, the total produced is now 50 tons and the price would fall to \$3. That is, on each of the 20 tons it was already producing, it would lose \$1. So the price effect is $20 \times (-\$1) = \-20 . Since BASF produces an additional 10 tons and sells them at \$3, the quantity effect is $10 \times \$3 = \30 . So BASF gains \$30 revenue from producing 10 additional tons, and it loses only \$20 revenue, resulting in an overall increase in revenue of \$10. Since the marginal cost is zero, there is no change to BASF's cost. Since producing the 10 additional tons raises BASF's revenue by \$10, BASF does have an incentive to produce 10 additional tons.
3.
 - a. The accompanying table calculates total revenue and marginal revenue for the cartel. The cartel maximizes profit by producing whenever marginal revenue is greater than marginal cost (which here is €2). That is, the cartel produces a quantity of 4 liters at a price of €6 per liter. If the firms divide production equally, each produces 2 liters and has revenue of $2 \times €6 = €12$. Since the fixed cost is €1, and each liter's marginal cost is €2, each firm has profit of $€12 - €1 - €(2 \times 2) = €7$.

Price of bottled water (per liter)	Quantity of bottled water demanded (liters)	Total revenue	Marginal revenue
€10	0	€0	
9	1	9	€9
8	2	16	7
7	3	21	5
6	4	24	3
5	5	25	1
4	6	24	-1
3	7	21	-3
2	8	16	-5
1	9	9	-7

- b. If Perrier increases production by 1 liter, the total produced now is 5 liters, and the price is €5. Perrier now produces 3 liters and so has profit of $(3 \times €5) - €1 - (3 \times €2) = €8$. Evian's profit, however, falls to $(2 \times €5) - €1 - (2 \times €2) = €5$.
- c. If Perrier increases production by 3 liters, the total produced is 7 liters and the price is €3. Perrier produces 5 liters and so has profit of $(5 \times €3) - €1 - (5 \times €2) = €4$. This profit is lower than in part b. This implies that while Perrier has an incentive to increase production slightly, it does not have an incentive to increase production dramatically.
- d. Any firm that can undercut its rival stands to make considerable profits at the expense of the other firm. The likelihood of cheating on a cartel agreement is therefore high.

5.

- a. If the European Union has only one fleet, the United States will have a higher profit if it sends out two fleets (\$12,000 rather than \$10,000). If the EU sends out two fleets, the United States will have a higher profit if it also sends out two fleets (\$7,500 rather than \$4,000). The same reasoning will persuade the EU that its best strategy is also to send out two fleets whether the United States sends out one or two. Both parties will send out two fleets, each earning only \$7,500 each instead of the \$10,000 they would each have earned if they had each limited themselves to one fleet.
- b. If both play a “tit for tat” strategy, they each will begin by sending out one fleet. The week after that, each does what the other one did the week before—that is, each again sends out one fleet, and so on. As a result, each week the United States and the EU will each have a profit of \$10,000 every week.

6.

- a. This is a prisoners’ dilemma situation. Whatever Air ‘R’ Us does, it is best for Untied to charge the low price; whatever Untied does, it is best for Air ‘R’ Us to charge the low price. So the Nash (noncooperative) equilibrium is for both airlines to charge the low price.
- b. These are Untied’s payoffs:
 - i. Both airlines charge the low price in both periods, so Untied’s payoffs are \$20 in the first period and \$20 in the second period, for a total of $\$20 + \$20 = \$40$.
 - ii. In the first period, Untied charges the low price and Air ‘R’ Us charges the high price for a payoff to Untied of \$50. In the second period, Untied and Air ‘R’ Us both charge the low price for a payoff to Untied of \$20. Untied’s payoffs are therefore $\$50 + \$20 = \$70$.
 - iii. In the first period, Untied charges the high price and Air ‘R’ Us charges the low price for a payoff to Untied of \$0. In the second period, both airlines charge the low price for a payoff to Untied of \$20. Untied’s total payoff is therefore $\$0 + \$20 = \$20$.
 - iv. Both airlines charge the high price in both periods, so Untied’s payoffs are \$40 in both periods, for a total of $\$40 + \$40 = \$80$.

8.

- a. See the accompanying payoff matrix.

		R.J. Reynolds	
		Advertise	Do not advertise
Phillip Morris	Advertise	\$1.5 million profit \$1.5 million profit	\$2.8 million profit \$1 million profit
	Do not advertise	\$2.8 million profit \$1 million profit	\$2 million profit \$2 million profit

- b. Each firm should not advertise, since this would maximize joint profits. Each firm then earns a profit of \$2 million.
- c. Each firm will consider what its best action is depending on the action of the other firm. If R.J. Reynolds advertises, Philip Morris should as well, since it will earn \$1.5 million instead of \$1 million. If R.J. Reynolds does not advertise, Philip Morris should advertise, since \$2.8 million is better than \$2 million. So no matter what R.J. Reynolds does, the best action for Philip Morris is to advertise. The same logic applies to R.J. Reynolds. As a result, each firm will advertise, yielding profit of \$1.5 million for each firm. This is a prisoners' dilemma situation.