

Chapter 2

Review of the Economist's Arsenal

■ Solutions to Back-of-Chapter Problems

2.1 Show, using a graph with attendance on the horizontal axis, the effect on the NHL of the following changes:

- An increase in the quality of play due to increased use of international players.
- A tax on each ticket sold.
- A decrease in consumer income.
- The start-up of a rival league.

Answers: In each case, the student should show a supply and demand graph, with the appropriate shift of the correct curve.

- Demand shifts right, price increases, equilibrium quantity increases.
- This can either be shown as a leftward shift of the demand curve or a leftward shift of the supply curve. In either case, if a fixed (per unit) tax is placed on tickets the vertical distance between the new and old curves should equal the tax.
- Demand shifts left, price decreases, equilibrium quantity decreases.
- Demand shifts left, price decreases, equilibrium quantity decreases.

2.2 Suppose the market demand for tickets to a University of Tennessee basketball game is $Q^d = 40,000 - 1,000p$ and the supply is $Q^s = 20,000$. What is the equilibrium price of a ticket to the game? What would be the effect of an increase in consumer income on equilibrium price and quantity.

Answer: Set $Q^d = Q^s$, so $40,000 - 1,000p = 20,000$. Solving for p , $p = 20$. Assuming basketball tickets are a normal good, an increase in consumer income will raise demand for tickets. *Ceteris paribus*, an increase in demand increases price and equilibrium quantity. In this particular example, since supply is fixed at 20,000, an increase in demand would not raise the equilibrium quantity but would only raise the price.

2.3 In Problem 2.2, what would be the effect on the market of a price ceiling set at \$10? What about a ceiling set at \$30.

Answer: To determine the effect of ceiling set at \$10, simply plug \$10 into the demand equation. Demand for tickets would be $40,000 - 1,000(10) = 30,000$ while only 20,000 tickets would be available for sale leading to an excess demand (or shortage) of 10,000 tickets. A price ceiling of \$30 would be above the market clearing price, so the price ceiling would have no effect on ticket sales or the equilibrium price. This is known as a “non-binding constraint.” The quantity demanded would increase to 30,000, but because the quantity supplied is fixed at 20,000, the equilibrium quantity would remain unchanged. Because output remains unchanged, there is no deadweight loss. See Figure 2.1 below. If the ceiling were set at \$30, there would be no change in either quantity or price as the ceiling is above the equilibrium price.

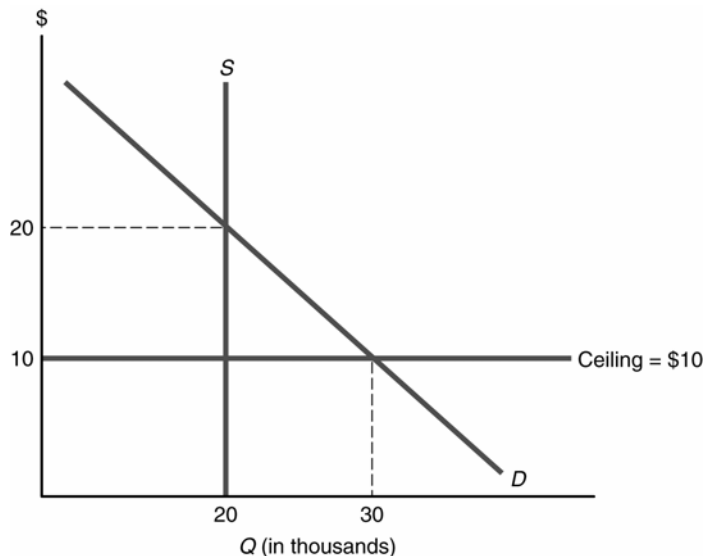


Figure 2.1

- 2.4 Suppose the Jets raise ticket prices from \$30 to \$40 per set and experience a 10-percent decline in tickets sold. What is the elasticity of demand for tickets?

Answer: $\epsilon = \% \Delta Q / \% \Delta p = -.1 / (10/30) = -0.30$. Demand is inelastic since $|\epsilon| < 1$. Alternatively, if a price increase of 33.3% leads to a 10% decline in ticket sales, the elasticity is $-10/33.3$ or -0.30 . Since the law of demand states that an increase in price always leads to a decrease in the quantity demanded, it is common practice to drop the negative sign when discussing a good's own-price elasticity of demand.

- 2.5 A fan called a talk show and exclaimed, "I've had it with professional sports. The building is always sold out, and the tickets are too expensive!" Use supply and demand analysis, including graphs, to show that these claims cannot both be true simultaneously.

Answer: The problem is that, from the standpoint of positive economic analysis, these two statements cannot hold simultaneously. If the building is always sold out, then it must be the case that there are enough consumers willing and able to pay the current price. Thus "too expensive" may be true for the individual, but from the team's perspective, if anything, the tickets are not expensive enough. See Figure 2.2.

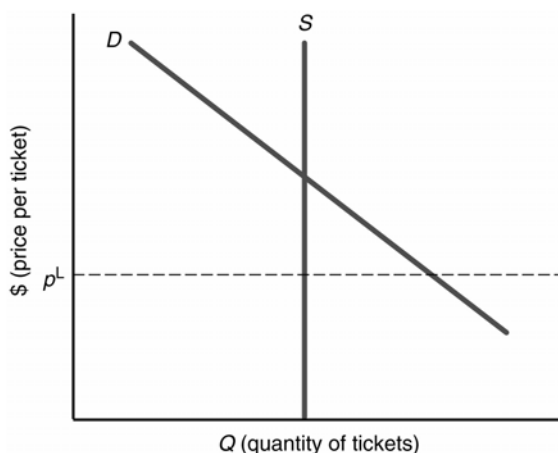


Figure 2.2

At any price below the equilibrium price, such as p^L , excess Demand will drive the price of tickets back up.

- 2.6 Suppose a monopoly team faces demand for a sporting event of $Q = 100 - p$. The associated marginal revenue function is $MR = 100 - 2Q$. If marginal cost is zero, what are the optimal quantity (of tickets) and price per ticket? If fixed costs are \$500, what would the level of profit be?

Answer: Students should follow the profit maximizing rule, $MC = MR$. If marginal cost is zero, then the firm maximizes profits by setting marginal revenue equal to zero.

$$100 - 2Q = 0$$

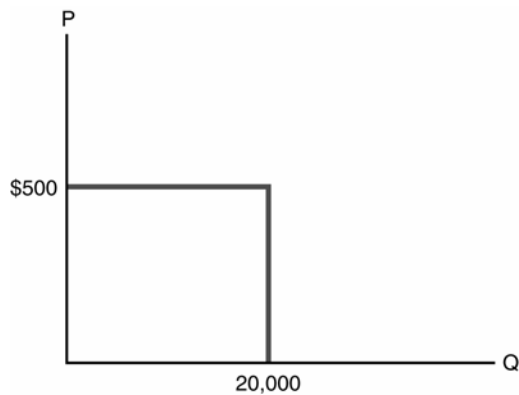
$$Q^* = 50$$

$$p^* = 50$$

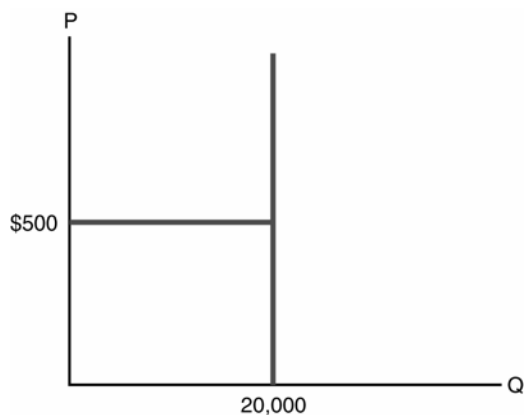
Total cost is equal to the fixed cost of \$500. Total revenue is \$2,500. Thus, profits are \$2,000.

- 2.7 Suppose the Lakers did a study that showed that the demand for tickets was perfectly inelastic at the capacity of building up to a price of \$500 per ticket, at which point it becomes perfectly elastic. Draw a supply and demand diagram assuming a building capacity of 20,000. What would this imply about their best pricing strategy?

Answer: When the Demand curve is perfectly inelastic, it is a vertical line. When it is perfectly elastic, it is a horizontal line. Hence, it looks like this:



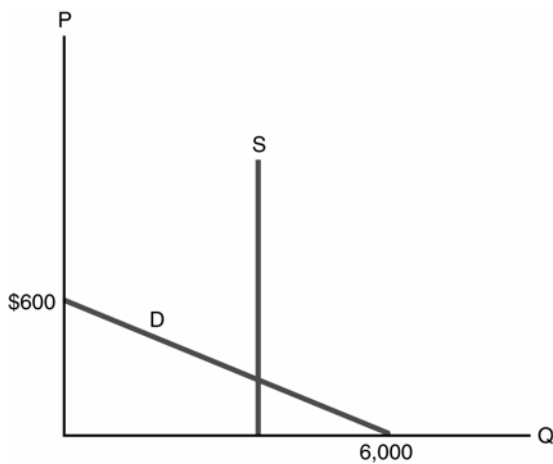
Assuming that the supply curve is a vertical line at the capacity of the arena (20,000), the supply and demand picture looks like this:



where the heavy black segment is the intersection of the supply and demand curves. This implies that the Lakers can sell 20,000 seats at any price up to \$500. At any price above \$500, they cannot sell any seats. The best strategy is thus to sell tickets for \$500 each.

- 2.8 Suppose that the demand curve for seats at a minor league baseball stadium in Trenton, N.J., is $Q^d = 6,000 - 10p$.
- How many fans would attend if ticket were free?
 - At what price would no fans attend the game?
 - If the building capacity (supply) is fixed at 4,000, what price would maximize revenue while ensuring a sellout?

Answers: The demand equation implies that the demand curve is a straight line with a vertical intercept of 600 and a slope of -0.10 . It looks like the demand curve drawn below:



- If tickets were free, plug 0 in for price. Then the demand equation implies that $6,000 - 10(0) = 6,000$ tickets would be sold.
 - Plug in 0 for Q^d . The demand equation then implies $6,000 - 10p = 0$. Solving for p , $6,000 = 10p$, so $p = 600$.
 - If the capacity of the arena was 4,000, then the supply curve is the vertical line in the diagram. The firm can sell out the stadium at any price below the price that ensures sales of 4,000. Set demand = supply so $6,000 - 10p = 4,000$. Solving, $10p = 6,000 - 4,000$, so $10p = 2,000$, or $p = \$200$.
- 2.9 Suppose the Chicago White Sox charge \$10 for bleacher seats and sell 250,000 of them over the course of the season. The next season they raise the price to \$12 and sell 200,000 tickets. What is the price elasticity of demand for bleacher tickets? Assuming the marginal cost of providing tickets is zero, is the price increase a good strategy?

Answer: The price elasticity of demand for tickets to see the White Sox

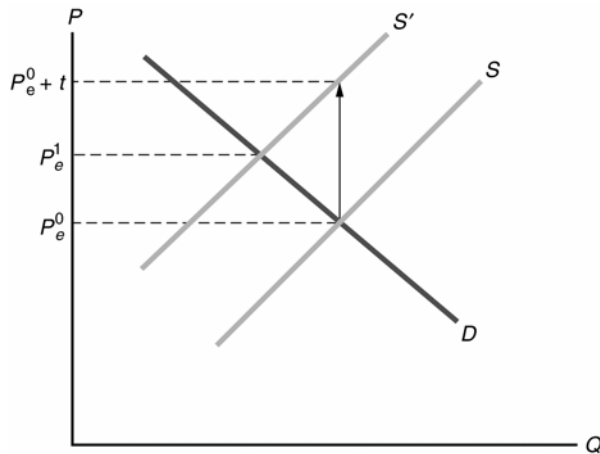
$$\text{is: } \frac{(250,000 - 200,000) / 250,000}{(10 - 12) / 10} = \frac{50,000 / 250,000}{-2 / 10} = \frac{1/5}{-1/5} = -1$$

Since demand is unitary, a small percentage change in price results in an equal but opposite percentage change in quantity sold. A small increase in ticket prices will thus be offset by a small decrease in attendance, so the price change would have no effect.

This, however, points out the weakness of this measure of elasticity, as changes of 20 percent in price and quantity are hardly small changes. In fact the increase in price is not a good idea. To see why, note that total revenue before the price increase is $\$10(250,000) = \$2,500,000$ while after the price increase total revenue falls to $\$12(200,000) = \$4,800,000$.

2.10 Suppose the city of Anaheim places a tax on tickets to see the Mighty Ducks play. Use supply and demand curves to show that the fans and the team share the burden of the tax.

Answer: For simplicity, suppose the sales tax is a fixed tax of $\$t$ per ticket. This tax pushes the supply curve up by the amount $\$t$. At the price $P_e^0 + t$, however, there is excess supply. This causes the price to fall to the new equilibrium price, P_e^1 .



Because the price of tickets rises, the fans pay some of the tax. Because the price rises by less than $\$t$, the Mighty Ducks receive less than price P_e^0 for each ticket they sell. As a result, they pay part of the tax. This concept is known as “tax incidence.” The incidence of any tax is almost always split between the consumer and the producer with side with the most inelastic supply or demand bearing the majority of the tax burden.

Chapter 3

Sports Franchises as Profit Maximizing Firms

■ Solutions to Back-of-Chapter Problems

- 3.1 Suppose that you were the owner of a professional baseball team in a major city. If the league decided to allow a second team in your city, as long as you were compensated for this infringement, on what basis could the appropriate compensation be determined?

Answer: Another team's locating in your city would dilute your monopoly power. Compensation should be based on the magnitude of the loss of expected profits. If the payment is a lump sum, then the present discounted value of the future stream of profits that you will lose as a result of the infringement is the appropriate charge. If the payment occurs annually, each payment should represent the difference between actual profits and the profits that you would have received if you were still a monopolist.

- 3.2 Draw a graph that shows the demand for seats at an NFL stadium. Show how each demand would be affected if:
- The prices of parking and food at the games increase.
 - Televised games switch from free TV to pay-per-view only.
 - A new league forms with a team that plays nearby.
 - The quality of the team decreases dramatically.
 - The length of the season increases.

Answers:

- Increase in the price of a complement; demand shifts leftward.
 - Increase in the price of a substitute; demand shifts rightward.
 - Decrease in the price of a substitute (as the new league decreases the cost of viewing an alternative game); demand shifts leftward.
 - The quality of the good falls, and fans' taste for seeing the team declines. Demand shifts leftward.
 - The availability of possible games increases, creating more substitutes for each individual game; demand shifts leftward.
- 3.3 True or false; explain your answer: "If all teams are of equal quality, it doesn't matter whether they share gate receipts or not – revenue will remain unchanged."
- Answer:** False. Revenue for each team is determined by more than simply team quality. For example, teams with the biggest venues will receive more revenue from home games if they do not share gate receipts than if they do. Conversely, small venue teams will benefit from revenue sharing, as they stand to gain a share of the larger gate receipts enjoyed by other teams. The same holds true for market size. Large market teams that have high average attendance figures will be net losers under revenue sharing.
- 3.4 Some researchers argue that revenue sharing is like socialism in that it removes the incentive to outperform rivals. Do you agree with this statement or not?

Answer: Students should be able to apply the concepts presented in this chapter to formulate their response. For example, there may be limits as to how much better an owner may want his or her team to be relative to its rivals if the existence of a single “super team” causes attendance around the league to fall due to a perceived lack of competition. This is especially true if to build the team would require significantly higher payroll costs, as in the Rangers/Islanders example. On the other hand, leagues are stable only when the teams that belong to that league are also financially stable. Thus, a certain level of revenue sharing may be necessary for the financial health of the league (and also the long term profitability of each member).

- 3.5 Suppose that each team in a league has a demand curve for generic advertising (a league-wide nonteam-specific campaign) equal to $Q = 1,000 - 5p$. If there are 20 teams in the league, and ads cost \$175 each, how many ads will the teams want to purchase as a group?

Answer: Because league wide marketing campaigns are non-rival in consumption, we add the demand curves vertically (the intercept is multiplied by 20).

Each team’s demand function is

$$p = 200 - .2Q$$

Thus, the market demand curve is

$$p = 4,000 - 0.2Q$$

When $p = 1,000$, the equilibrium quantity of ads purchased is

$$1,000 = 4,000 - .2Q$$

$$Q = 15,000$$

- 3.6 Use the marginal revenue and marginal cost curve from the theory of clubs to explain why the NFL has 32 teams while the Bundesliga-1, the top German soccer league, has only 20 teams.

Answer: Because Germany is a smaller country than the U.S., the marginal revenue from adding new teams into the league is less than in the U.S. Therefore, the optimal number of firm (clubs) is lower in Germany than in the U.S.

- 3.7 True or False; explain your answer. “The fact that the Los Angeles Dodgers’ profits have risen so dramatically in recent years shows that Frank McCourt is a much better businessman than Rupert Murdoch.

Answer: This statement may be true, or baseball may be experiencing rapid profit growth leaguewide, or there may be an element of luck involved. One important factor, however, is the fact that under Murdoch, the Dodgers were owned by Fox Sports. In order to reduce revenue sharing with other teams, to plead poverty in dealings with players and fans, and to generate sympathy in attempting to receive taxpayer subsidies, it is likely that Murdoch used accounting tricks to artificially lower the Dodgers’ profits while increasing the profits of Fox Sports. McCourt does not have the same ability to shift profits around in this manner, so current profits simply better reflect the actual financial situation of the club.

- 3.8 Suppose an owner pays \$500 million to purchase a hockey team that earns operating profits of \$50 million per year. The new owner claims that \$200 million of this price is for the players, which he can depreciate using straight-line depreciation in five years. If the team pays corporate profit taxes of 40 percent, how much does the depreciation of the players save the owner?

Answer: The owner can claim a depreciation expense of \$40 million per year ($\$200 \text{ million}/5$). The reduction of profits by \$40 million, which would have been taxed at a rate of 40 percent saves the owner \$16 million per year, or \$80 million over the five year period.

- 3.9 The Florida Marlins of MLB recently shed most of their best players. In 2006, their payroll was less than one-tenth that of the New York Yankees. Would a team in England's Premier League follow such a policy? Why or why not?

Answer: The Marlins can afford to severely cut payroll because no matter how poorly they perform, they will still remain in MLB. A team in the Premier League would not engage in such a drastic slash in their payroll as a poor performance on the field during the season would relegate them to the minor leagues.

- 3.10 What are the primary risks of the MLS business model of single-entity ownership?

Answer: The first issue facing the league is whether the single-entity structure would satisfy antitrust laws. This question was answered by the courts in *Frasier v. MLS* (2003) which determined that the clubs in a single-entity league like MLS could collude with one another to reduce player salaries without running afoul of antitrust laws. The real concern here is with on-field competition. For sports to be successful, it is necessary that the impression of intense on-field competition is maintained. This feeling may be lost when all teams are owned by the same company. This is especially a concern late in the season when playoff positions are on the line. Would MLS "cheat" on behalf of its clubs in bigger cities?

Chapter 4

Monopoly and Antitrust

■ Solutions to Back-of-Chapter Problems

4.1 An athletic director was once quoted as saying that he felt his school spent too much on athletics but that it could not afford to stop. Use game theory to model his dilemma.

Answer:

This is an example of the prisoners' dilemma. If all schools either spend a lot or spend a little, they compete evenly. The problem arises because no school wants to suffer the consequences of being outspent by others. Thus, high spending is the dominant strategy. See the matrix below.

		School A	
		High Spending	Low Spending
School B	High Spending	Even cCompetition wWith hHigh cCosts	B dominates. B's additional revenues exceed the higher spending. A loses revenue.B dominates
	Low Spending	A dominates. A's additional revenues exceed the higher spending. B loses revenue.	Even cCompetition wWith lLow cCosts

4.2 You are the commissioner of the National Hockey League. You have been called to testify at an antitrust case against the NHL. Argue that:

- a. The NHL is not a monopoly.
- b. Even if it is a monopoly, it is a natural monopoly.

Answers: a. 2. To argue that the NHL is not a monopoly requires that the NHL have many substitutes. For example, college hockey, minor league hockey, other sports, even non-sports forms of entertainment might compete for the same consumer expenditures on entertainment.

b. To argue that the NHL is a natural monopoly requires that one consider the high fixed costs associated with the start up and maintenance of a team that, when combined with the low marginal costs of operating a franchise, would make it inefficient to have multiple teams operating in the same market, similar to the Detroit Lions example in the text.

4.3 Why can't a Premier League team like Arsenal exert as much monopoly power as the NFL's Chicago Bears?

Answer: First of all, London is home to Arsenal as well as 5 or 6 other English Premier League soccer teams. If Arsenal charges too much for tickets or provides a poor product on the field, soccer fans can simply go across town to Tottenham Hotspurs, Charlton Athletic, Chelsea, or Fulham.

More importantly, however, is the fact that the NFL can restrict entry into the Chicago market, while the EPL is a promotion and relegation league. If Arsenal was making highly monopoly profits, this would give the incentive for other people to start football clubs in London. If the market could support multiple clubs, it is likely that the high revenues earned by the start-up clubs would allow them to spend sufficiently on payroll such that the team would eventually earn promotion to the Premier League and become a full competitor to Arsenal. In fact, most of England's largest cities, including Birmingham, Liverpool, Manchester, and London, generally have more than one team in the EPL in any given season.

4.4 How did the rise of privately owned cable TV networks affect the revenue structure of European soccer teams?

Answer: Most importantly, cable TV contracts resulted in a huge increase in the revenues accruing to sports teams in general. This revenue, however, was largely skewed towards the top teams and the top leagues resulting in more revenue disparity between the "haves" and the "have nots" than had previously been the case.

4.5 Suppose that the demand curve for tickets to see a football team is given by $Q = 100,000 - 100p$ and marginal cost = 0.

- How many tickets would the team be able to sell (ignoring capacity constraints) if it behaved competitively and set $p = MC$?
- How many tickets would it sell – and what price would it charge – if it behaved like a monopoly. (Hint: In this case the marginal revenue curve is given by $MR = 1,000 - .02Q$.)

Answer: If the team sets prices at competitive levels, $p = MC$, with $MC = 0$. Plug $p = 0$ into the demand equation $Q = 100,000 - 100p$ and $Q = 100,000$.

If it acts like a monopoly, it will set $MC = MR$.

$$MR = 1,000 - .02Q = 0 = MC$$

$$Q^* = 50,000$$

$$p^* = \$500$$

4.6 Why was the limited exemption from antitrust laws so crucial to the development of the NFL?

Answer: The limited exemption allowed the NFL to act as a monopolist over one of its most important sources of revenue—broadcast rights. The monopoly position granted by the limited exemption meant that teams would not undercut one another in negotiations with television networks. The agreement also had the effect of galvanizing the owners into a unified group rather than a loose collection of teams that competed both on and off the field. The off-field cooperation brought about by the joint television contracts and the sharing of resulting revenues significantly strengthened the league.

- 4.7 Suppose the typical Buffalo Bills fan has the following demand curve for Bills football games: $P = 120 - 10G$ where G is the number of games the fans attends.
- If the Bills want to sell the fan a ticket to all eight home games, what price must they charge? What are their revenues?
 - Suppose the Bills have the chance to offer a season ticket that is good for all eight home games, a partial season ticket that is good for four home games, and tickets to individual games. What price should they charge? What is their revenue?

Answer:

If the Bills want to sell tickets to all 8 games by selling eight individual tickets, they have to set the price :

$$P = 120 - 10 * (8) = 120 - 80 = \$40.$$

This yields revenue of $\$40(* 8) = \320 from each fan.

(b)b. If the Bills practice 2nd degree price discrimination, they can effectively charge $P = 120 - 10 * (1) = 120 - 10 = \110 for singlethe first games,

$P = 110 + 100 + 90 + 80 = \380
 $20 - 10 * (4) = 120 - 40 = = \95 80/ticket for a 4-game package games 2–4, and

$P = 120 + 110 + 100 + 90 + 80 + 70 + 60 + 50 = \$680 = \$85$ /ticket – $10 * (8) = 120 - 80 = \$40$ ffor an 8-game packagegames 5–8.

Revenues are clearly much higher for the price discriminating example than one where the team wishes to sell as many as 8 tickets to some fans but must sell tickets individually.

This yields revenue of: $\$110 + 3 * (\$80) + 4 * (\$40) = \$110 + \$240 + \160 Or $\$510$ for the season ticket rather than $\$320$. The firm can thus increase its profits by appropriating some (but not all) of the consumer surplus. Note: this example is actually too simplistic to capture the true benefits of second degree price discrimination. The classic example of profit maximization using second degree price discrimination has the team selling to both high demand and low demand consumers which the team cannot tell apart. The team implicitly differentiates the two groups by offering a season ticket package at a price that will attract the high demand consumers while making slightly higher priced single-game tickets available that attract the lower demand consumers.

- 4.8. The Cardinals can, in effect, charge:

$$P = \$120 - 15 * (1) = \$105 \text{ for 1the first game,}$$

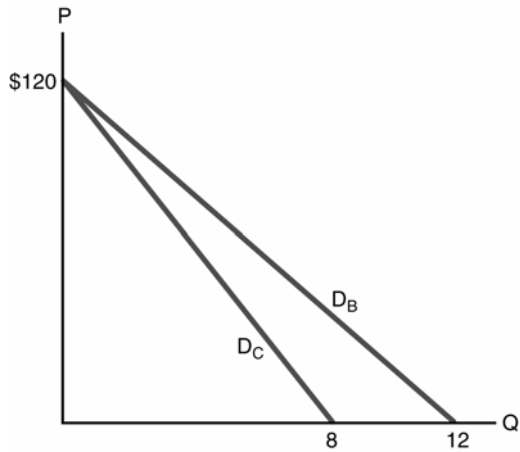
$$P = \$105 + 90 + 75 + 60 = \$230$$

 $120 - 15 * (4) = \$60$ for a 4-game package, and games 2–4, and

$$P = \$105 + 90 + 75 + 60 + 45 + 30 + 15 + 0 = \$420$$

 $20 - 15 * (8) = \$0$ for and 8-game packagegames 5–8

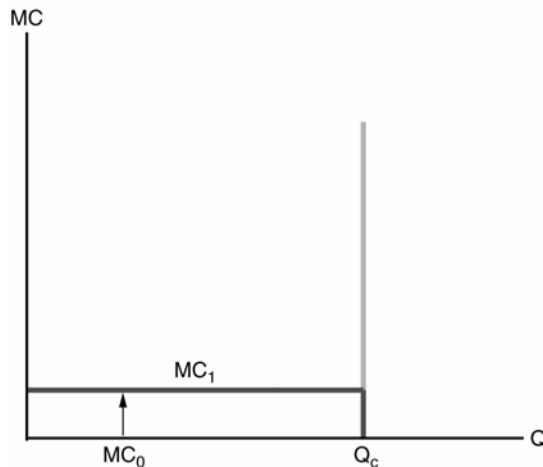
This yields revenue of: $\$105 + \$180 + \$0 = \285 . The Cardinals make less revenue by price discriminating than the Bills do because their demand curve lies within the demand curve, as shown below.



When the Bills lower their price from, the quantity of tickets that they can sell rises by more than when the Cardinals do. Hence, they can sell 1 ticket by charging their price to \$110, while the Cardinals must charge \$105. They can sell 4 tickets by lowering their price to \$80, while the Cardinals must lower their price to \$60.

- 4.9. Suppose that, in order to protect David Beckham from his adoring fans, soccer teams that host the L.A. Galaxy must hire extra security, and security costs go up as the number of fans at the game goes up. When a team such as the Chicago Fire hosts the L.A. Galaxy, how do these extra costs affect the price of a ticket for that game compared with the price of a ticket when they host any other team? Is this price discrimination by Arsenal? Why or why not?

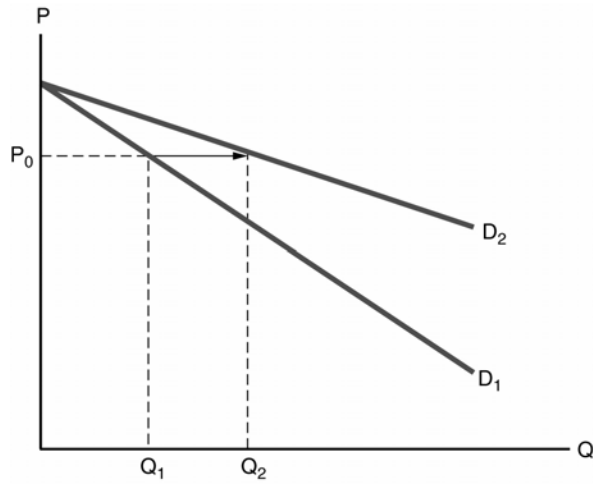
Answer: The cost of security rises when the number of tickets sold rises. This makes the cost of security a variable cost. If, for example, the security cost per fan is \$1, then the marginal cost of admitting a fan rises by \$1. Assuming that the marginal cost without security guards is zero, then the marginal cost curve rises as shown below:



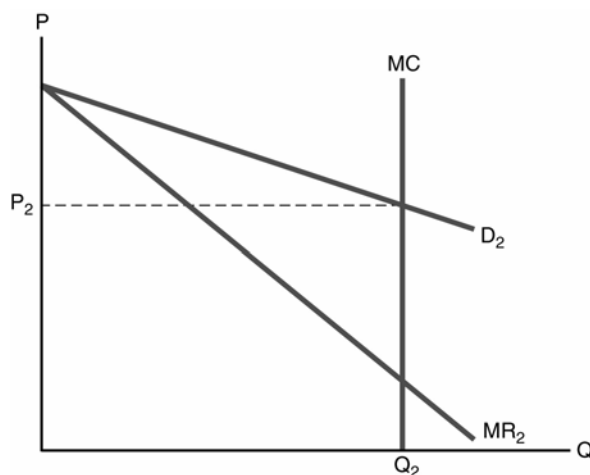
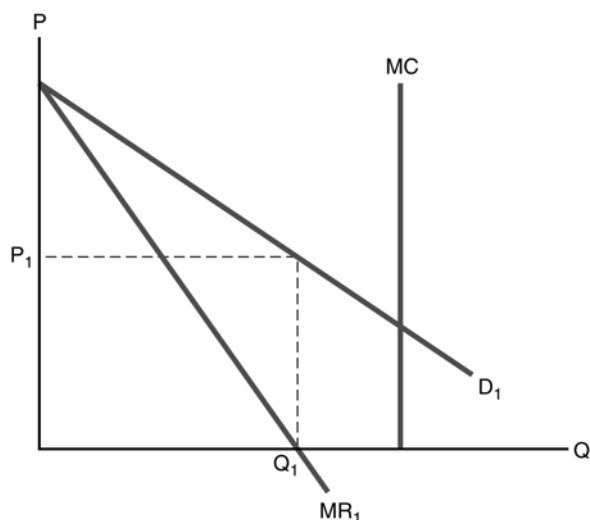
Without security guards, the marginal cost, MC_0 , fits our standard assumption of being zero until reaching the capacity of the facility (Q_c), at which point it becomes vertical. With the guards, the marginal cost rises to \$1 until it, too, becomes vertical at Q_c . Because the cost of providing admission to the game is higher with security guards, the difference in price could reflect higher costs rather than price discrimination.

- 4.10. If having more fans at the game improves a team's chances of winning, should the team reduce ticket prices to increase attendance? (Hint: does it matter what the team is trying to maximize?)

Answer: First of all, in all cases it must be assumed that the profit maximizing quantity is below capacity. If the team always fills its stadium, it makes no sense to lower ticket prices since quantity cannot increase. That consideration aside, suppose first that the team wishes to maximize profit. If having more fans increases its chances of winning, then reducing price has two effects on the quantity of tickets demanded. First, additional fans attend because they respond to the lower price. Second, additional fans attend because the team wins more games. This makes the demand for tickets more price elastic, as shown below:



At the price P_0 , the quantity demanded rises to Q_1 when fans respond only to changes in price. The quantity rises to Q_2 when the added fans bring more wins, thereby attracting still more fans. As shown below, the team actually charges higher prices with D_2 .



Thus, even if the team is concerned solely with profit, it will sell more tickets. Its price, however, will be higher than if having more fans does not affect a team's record.

If the team wishes to maximize wins, then the impact of attendance on wins increases the marginal benefit of selling more tickets. This means that $MB > MC$ at the original optimum. The team will, therefore, want to sell more tickets than before, and it will want to lower its price further than if attendance did not affect wins.

Chapter 5

Competitive Balance

■ Solutions to Back-of-Chapter Problems

- 5.1 Suppose, as an owner you could leave the highly competitive league (in terms of closeness of contests) that you currently play in and enter a league that assure your team would never lose again. Would you want to do so? Why or why not?

Answer: Studies show that, while fans want their hometown team to win, they do not want their team to win all the time. If a team wins all its games, attendance will decline, as the contest becomes too predictable. The team should choose to stay in the competitive league.

- 5.2 Explain how the law of diminishing returns provides a natural tendency towards competitive balance.

Answer: The law of diminishing marginal returns means that adding good players will eventually add less and less to a team's performance on the field and at the box office. Adding an All Star goalie will not bring many more wins if a hockey team already has an All Star goalie. Thus, the marginal benefit of the second goalie is probably less than the marginal cost of hiring him. As a result, even the wealthiest teams do not have an incentive to sign all the best players. Diminishing returns thus add to competitive balance.

- 5.3 Suppose in a six-team league, the winning percentages were as follows at the end of the season: Team A, .750; Team B, .600; Team C, .500; Team D, .500; Team E, .400; Team F, .250. Compute the standard deviation of win percentage.

Answer: The standard deviation is given by the equation $\sigma_w = \sqrt{\frac{\sum (WPCT_i - .500)^2}{N}}$, where $WPCT_i$ is team i 's winning percentage, and N is the number of teams in the league. In the case of sports leagues, the mean winning percentage is always 0.5 because one team's win must be another team's loss. Using the numbers given, the standard deviation is roughly 0.156.

- 5.4 In question 5.3, suppose each team plays a 50-game schedule. Compute the "ideal" benchmark standard deviation of winning percentage based on equal playing strength, and the ratio of the actual to the ideal.

Answer: The "ideal" standard deviation for a league in which all teams are equally likely to win is given by the equation $\sigma_I = \frac{0.5}{\sqrt{G}}$, where G is the number of games played. The ideal standard deviation in a league that plays 50 games is roughly 0.071. The ratio of the actual standard deviation to the ideal standard deviation is $\frac{0.156}{0.071} \approx 2.20$.

- 5.5 If the NFL increased its schedule from 16 games to 30, what would the new benchmark ideal standard deviation be (assuming equal playing strength)?

Answer: The “ideal” standard deviation for a league in which all teams are equally likely to win is given by the equation $\sigma_I = \frac{0.5}{\sqrt{G}}$, where G is the number of games played. Under a sixteen game season, the ideal standard deviation is $\sigma_I = \frac{0.5}{\sqrt{16}} = 0.125$. Under a thirty game season, the ideal standard deviation is $\sigma_I = \frac{0.5}{\sqrt{30}} = 0.091$.

5.6 What is the main prediction of the Coase Theorem with respect to free agency and competitive balance?

Answer: According to the Coase Theorem, resources flow to their most valued use as long as there are well-defined property rights, regardless of who holds those rights. In the case of professional sports, free agency has transferred the rights to players’ services from the team owners to the players. The Coase Theorem predicts that the distribution of talent—and hence competitive balance—will be no different under free agency than it was when players were bound to teams. The change in property rights affects only who is compensated for the move. The Yankees paid the owner of the Red Sox to obtain Ruth’s services. To obtain a free agent like Jason Giambi, they pay only the player.

5.7 Which move would be more effective for increasing the level of competitive balance in baseball, a hard salary cap or a 50-50 gate revenue-sharing plan?

Answer: First of all, gate revenues are only a small portion of total revenues collected in professional sports, so even complete sharing of gate revenues will leave some teams with significantly higher revenues. Even if all revenues are shared equally, however, players still flow to the same teams they would have gone to if there were no revenue sharing. When teams evenly split revenue they effectively put all their revenue in a pile in the middle of the room and then divide the pile equally among themselves. If teams maximize profits, they want to make the pile as large as possible. If a star player is more valuable in Los Angeles than in Cleveland, then the pile in the middle of the room is larger—and the revenue for Los Angeles *and* Cleveland—will be greater if the player moves to Los Angeles. Thus, even a 50–50 revenue split may have little impact on the distribution of talent or competitive balance.

A hard salary cap limits what a team can pay its players. Even if a player is worth more in Los Angeles than in Cleveland, Los Angeles may not be able to lure him away if it is already spending close to its limit on its other players. This limit evens out what teams can spend for players and has the potential for evening out the distribution of talent.

5.8 Suppose over five seasons, the order of finish for five teams in the West League and the East League is as follows. Use the HHI to determine which league has better competitive balance across seasons.

<i>West League Season</i>					<i>East League Season</i>				
1	2	3	4	5	1	2	3	4	5
A	A	A	E	E	A	B	C	D	E
B	B	D	D	D	E	A	A	A	A
C	C	C	C	C	C	B	D	E	D
D	D	B	B	B	B	D	B	B	B
E	E	E	A	A	D	E	E	C	C

Answer: In the West League, Team A finished first 3 times, Team E finished first twice, and no other team finished first. In the East League, each team finished first once. The HHI index is given by the equation $HHI = \frac{\sum f_i^2}{T}$, where f is the number of first-place finishes, and T is the number of seasons. Here, f_i is 3 for Team A and 2 for Team B in the Western League and is 1 for each team in the Eastern League. T equals 5 for both leagues. Inserting these values yields $HHI = 2.6$ for the Western League and $HHI = 1.0$ for the Eastern League. Because HHI is lower for leagues with greater competitive balance, the HHI shows that the Eastern League is more balanced than the Western League. These two leagues can be compared using the HHI only because they have the same number of teams. As noted previously, one would expect teams in the Big Ten (with its paradoxical eleven teams) to win championships more frequently than teams in the 32-team NFL.

- 5.9 If you were a fan of team A, which set of distributions shown in the previous question (West or East) would you prefer? Why?

Answer: The fans of any one team will want their team to win more often than it loses. Fans of Team A may prefer the less balanced results of the West League since they are the champions most often. Of course, the downside for fans of team A in the West League is that when their team is down, it is really down. In the East league, fans of Team A get 4 second place finishes to go along with their single championship. If teams earn playoff appearances or tournament bids by finishing either first or second in the league, fans of team A would likely prefer the East League. In general, while the more equal distribution of championships in the East League may seem more fair, its desirability depends on factors like the size of the cities in the league and the intensity of their fans.

- 5.10 If, as commissioner of professional baseball, you could make one change in the current league rules with the goal of increasing competitive balance as much as possible, what change would you make and why?

Answer: This question has many possible answers, no one of which is necessarily right or wrong. Possible answers include a salary cap, a luxury tax on high payrolls, and revenue sharing based on factors such as city size. Alternatively, saying that nothing should be done because baseball is not so badly unbalanced is also an acceptable answer.

- 5.11 Go to the official MLB website (<http://www.mlb.com>) and check the order of finish in the American League East for the 1997-2003 seasons. What is the between-season variation for this league over this time span?

Answer: The order of finish was unchanged between 1998 and 2003. (1997 was a misprint)