CHAPTER 7

Monopoly

By the end of this chapter you will be able to:

- Specify the conditions that may permit the development of a "single-seller" monopoly and, using the two broad types of barriers to entry, identify two types of monopoly.
- Explain why the monopolist's marginal revenue decreases as output increases.
- Draw and interpret a diagram representing the price and output choices of a profit-maximizing monopolist.
- Draw a diagram to compare a monopolist's performance relative to that of a perfectly competitive firm in terms of price, output, and the effect on income distribution.
- Identify the long-run welfare loss caused by the presence of an "-artificial" monopoly and show it graphically.
- Explain what is meant by price discrimination and discuss its effects.
- Distinguish a natural monopoly from other forms of monopoly.
- Identify the two broad policy stances taken by the government with regard to an industry that exhibits monopoly characteristics and the two government organizations charged with combating anticompetitive practices.

Lipitor, the cholesterol-reducing drug, has been the world's best-selling branded medication in pharmaceutical history, topping the sales performance lists since the late 1990s. Pfizer, its developer, has enjoyed a lucrative monopoly, protected by patent law. In May 2012, generic drug makers became able to market their competing versions but it's a safe bet that Lipitor will continue to earn profits for Pfizer, supported by name-brand recognition and advertising. This situation—one seller of a -patent-protected product with name-brand recognition—is far from perfect competitive model we have explored in the two previous chapters but it is one that has been created and sustained by our legal system. In this chapter, we consider why.

Chapter Preview: In Chapters 5 and 6 we examined the consequences of having production organized through perfectly competitive industries and discovered that perfect competition gave society generally beneficial results, through the operation of what Adam Smith termed the "invisible hand" of self-interest. However, perfect competition is a rare beast in the real world and, in this chapter, we turn our attention to the other end of the competitive spectrum—monopoly, the market structure in which one firm dominates the industry.

Brain Teaser: Monopoly has frequently received a bad press and, certainly, our conclusions in Chapter 6 would seem to argue that perfect competition bestows beneficial results in terms of productive efficiency and allocative efficiency. Can you think of any examples or circumstances where we would prefer to have a single producer instead of perfect -competition?

The Making and Maintenance of a Monopoly: Is One the Loneliest Number?

Characteristics of a Monopoly

A **pure monopoly** arises when there is a single firm in an industry producing a good or service with no close substitutes and where there are significant barriers to the entry of competitors. Clearly, the trick is to define what comprises the relevant market. There is a market for Budweiser beer, but Budweiser is not a monopoly because there are other brands of beer available that, for most buyers, are sufficiently similar. However, Microsoft's bundling its own browser and other products with its Windows operating system was found by the courts to be the practice of an "abusive" monopoly. Note that a monopoly need not be a large nationwide firm—your local water and sewage provider is likely to be a mono-polist, as is your local cable TV provider.

Whereas the perfectly competitive firm is a "price taker" (having no independent control over the price of his product), the monopolist is said to be a "price maker." The monopolist *is* the industry and can choose to set any price he desires, although we continue to assume his actions are guided by the goal of profit-maximization. It is because of this power to dictate price that many monopolies are subject to government regulation.

Initially, we assume that the firm sets the same price for all -customers, but, in many instances, monopolists practice**price discrimination**—setting different prices for different classes of customer. We look at the implications of price discrimination later in this chapter.

Circumstances may create a situation where there is only one seller of a good—a tornado rips through town, destroying all the stores but one—but usually we think of a monopoly as having more staying power than this. For a monopoly to develop and endure, there must exist some sort of restriction that prevents competitors from entering and competing with the monopolist. These restrictions are known as **barriers to entry**.

Barriers to Entry

Artificial Barriers to Entry

Barriers to entry may be "artificial" or "natural." An **artificial barrier to entry**, which often is legal in nature, imposes an artificial restriction on competition—"artificial" in the sense that the barrier exists simply because society has chosen to impose it. For example, patent laws bestow monopoly power on firms—Pfizer's right to be the sole producer of Lipitor is due to patent laws; if these laws were modified, then the legal basis for such monopolists would vanish.

Other artificial barriers to entry include government licenses, franchise agreements, ownership or control of key resources, and overpowering advertising budgets or name identification with a class of product.

THINK IT THROUGH. Can you think of real-world examples of monopolies (or near-monopolies) sustained by each of these barriers? Cable TV companies have monopoly power due to government licenses; marketing of foreign products can be encouraged through franchise agreements; Alcoa once had a stranglehold on aluminum -production because of itsownership of bauxite mines; and Coke, Kleenex, and Xerox all have had advantages over would-be rivals because of name recognition.

There may be good economic reasons for the establishment of an "artificial" monopoly. Having only one firm operating in an area may prevent wasteful duplication of service or underemployment of resources—it makes little sense to have two or more sets of water lines in a neighborhood, for example. The profit-earning attraction of a new process or product may stimulate creativity if the innovation can be protected by patent while exclusive marketing rights may encourage the provision of a new good or service that might otherwise not be offered to customers. After all, why go to the expense of researching and developing a new product, then educating consumers about its advantages, if a low-cost competitor is then allowed to come into the market and undercut the original developer's price?

Natural Barriers to Entry

A **natural barrier to entry** is one that occurs through the nature of the market itself and results in the development of a **natural monopoly**. The most obvious example of this type of barrier is the presence of substantial economies of scale. As we saw in Chapter 6, as a firm expands its scale of operations, economies of scale drive down the per-unit cost of -production.

Suppose we have 20 companies in competition, with each firm producing 100 units of output at an average cost of $10. Total industry production is 2000 units. The long-run average cost (LRAC) curve for each firm is identical and shown in Figure 7-1.

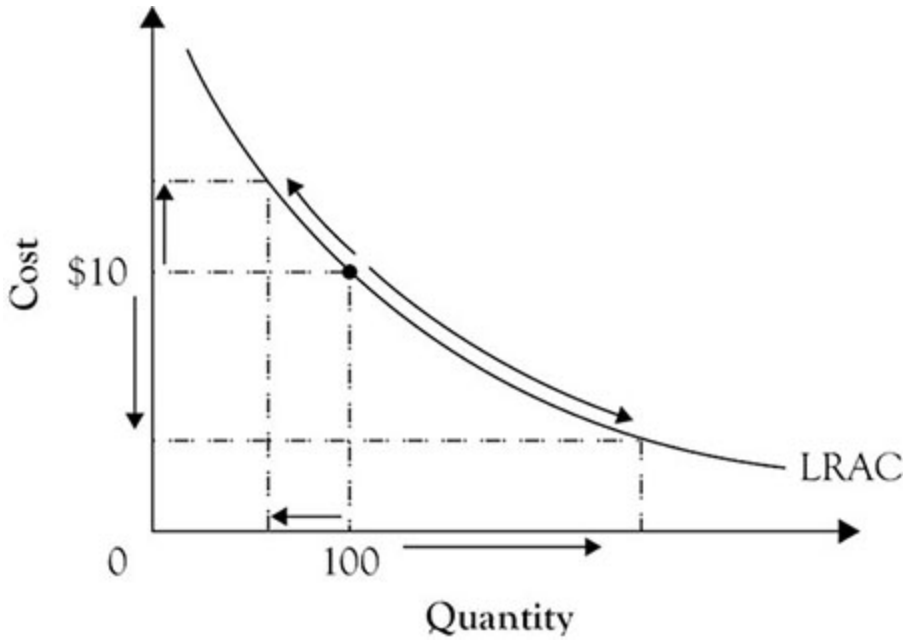

Figure 7-1. Economies of scale creating a monopoly.

The continually downward-sloping appearance of the LRAC curve tells us that ongoing economies of scale are present. This is a potentially unstable situation because if one firm (Firm A) attracts a few customers from each of its rivals, then the market will evolve into a monopoly. As Firm A's output expands, its average costs decrease and it will be able to reduce its price, whereas Firm A's rivals will service fewer customers and, with lower output and rising average costs, will increase price. Firm A's relatively cheaper price will attract more customers to switch from its rivals—its output will expand further and its price will decrease more, while the output of its rivals will contract further, forcing them to raise prices again. Assuming that Firm A's economies of scale are sufficiently sustained to service the entire market, the culmination of the process will be a monopoly—a natural monopoly.

Note that there is no mechanism present to encourage renewed competition. Any new firm entering the market, with a small scale of production and the associated high costs, would be forced out by low-cost, low-price Firm A.

We would expect to see a natural monopoly in an industry with substantial economies of scale, or in one that has high set-up costs (electricity generation, for example).

Other situations where it is "natural" to have a single firm will be dealt with more fully in the section on natural monopolies.

Monopoly in the Short Run: Stellio's Pizzeria

In this section we consider the behavior of the "artificial" monopolist in the short run and, in the following section, the long-run implications. After that, we turn to the special aspects of natural monopoly.

Monopolies need not be large national firms—many monopolies thrive in local markets. The benign country store in the small rural town may, in many respects, be a monopolist and, in our example, so is Stellio's Pizzeria and Fish Restaurant. Stellio runs his pizzeria in a small, fairly isolated town and his is the only restaurant for many miles. If you crave a restaurant meal, then it has to be served at Stellio's. Stellio's monopoly is sustained not by a legal barrier to entry but, in fact, by an illegal one. He has Mafia connections and restaurateurs who have set up in opposition to Stellio in the past have had a nasty history of unfortunate "accidents."

The Monopolist's Revenue Picture

We can set up a demand schedule for Stellio's pizzas. The law of demand would have us expect that higher prices would lead to fewer pizzas being demanded each hour and this pattern is shown in Table 7-1.

Table 7-1. Revenue Information for Stellio's Pizzeria

Price of a Pizza	Quantity of -Pizzas Demanded	Total -Revenue	Marginal -Revenue
$13	0	0	
$12	1	$12	$12
$11	2	$22	$10
$10	3	$30	$8
$9	4	$36	$6
$8	5	$40	$4
$7	6	$42	$2

If Stellio increases the price of his pizzas, then quantity demanded will decrease—the law of demand holds true just as firmly in the monopoly market as it does in perfect competition.

Total revenue (TR) or total spending was introduced in Chapter 4, and defined as price times quantity demanded (P × q). This definition also holds for the monopolist and we use it to complete the "total -revenue" column in the table.

THINK IT THROUGH: Table 7-1 has no column for average revenue, but do we need a separate column for average revenue? Average revenue (AR) was defined in Chapter 5 as total revenue divided by quantity and, we saw at that time, it is simply another name for price. When price is $9, total revenue is $36, quantity is 4, and average revenue is $9 (the same as price).

Marginal revenue (MR) was defined in Chapter 5 as how much total revenue changes as an extra unit is sold.

MR = DTR/ Dq

Again, we can apply that definition to determine the extra revenue brought in from each additional pizza sold. If Stellio charges $11 per pizza, then his total revenue is $22. If he cuts his price to $10, then he sells another pizza and his total revenue increases to $30.

MR = DTR/Dq = +$8/+1 = $8

We can complete the "marginal revenue" column in Table 7-1.

THINK IT THROUGH: Note that marginal revenue is positive decreasing as additional pizzas are sold. Can marginal revenue fall so low that it becomes zero, or even negative? Yes, marginal revenue can become zero or negative. This is related to the Total Revenue Test of elasticity in Chapter 4. When price decreases, we know that quantity demanded increases—in terms of the marginal revenue formula, Dq is positive. However, the effect on the numerator of the formula (DTR) depends on elasticity. If demand is elastic, then a price decrease will cause total revenue to increase (DTR is positive), and marginal revenue will be a positive value. If, however, demand is inelastic, then a price decrease will cause total revenue to decrease (D TR is negative), and marginal revenue will be a negative value. Finally, if demand is unit-elastic, then a price decrease will have no effect on total revenue (DTR is zero), and marginal revenue will be zero.

When we looked at the perfectly competitive firm, we derived its "revenue picture" and found that it was a single horizontal line. The monopolist's revenue picture is a bit more complicated. Stellio's revenue picture is shown in Figure 7-2.

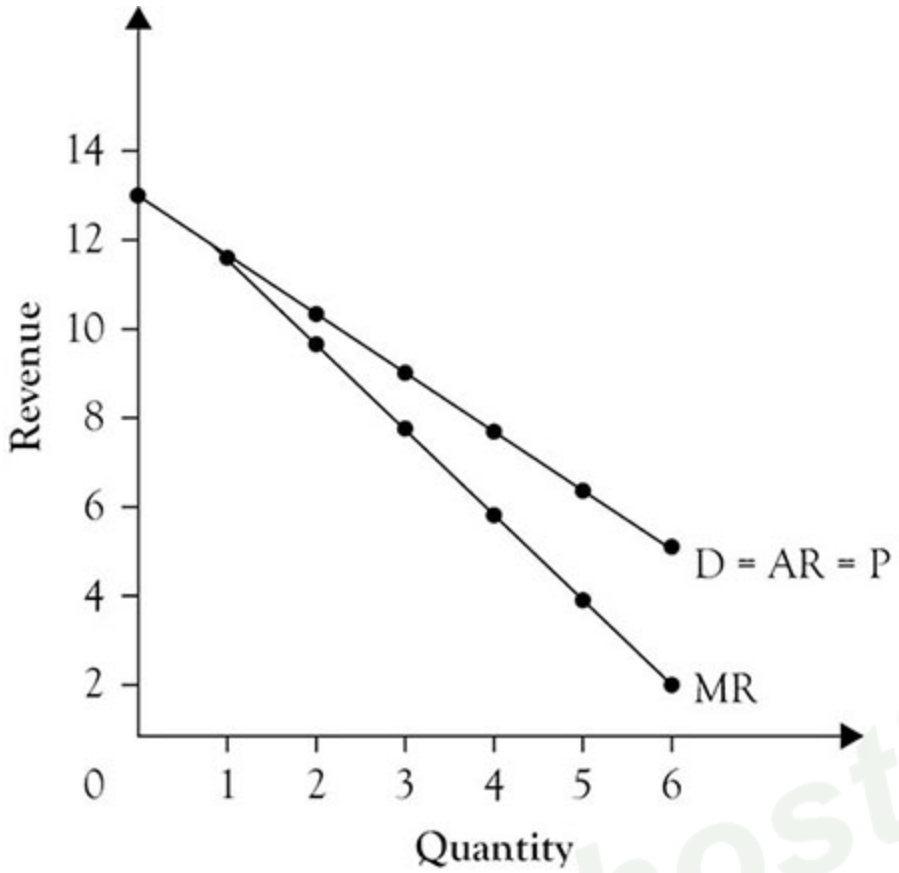

Figure 7-2. The monopolist's revenue picture.

The revenue picture for a monopolist features a downward-sloping industry demand curve—which also represents price (P), average revenue (AR), and marginal benefit (MB)—and a downward-sloping marginal revenue (MR) curve.

THINK IT THROUGH: The relationship between these two curves harks back to the "average-marginal rule" that we developed in Chapter 5. First, we know that marginal revenue must lie below average revenue. Why? Because average revenue is decreasing. We also know that the two curves must start at the same point—for the first observation, the average and marginal values are equal. We saw this same phenomenon when we looked at the relationship between average product and marginal product and, again, when we looked at the relationship between average variable cost and marginal cost. If you're unsure about the previous statements, go back now and revisit the average-marginal rule.

Comment for the mathematically minded reader: The MR curve is twice as steep as the AR curve.

The Monopolist's Short-Run Cost Picture

Just as we have developed a revenue picture for the firm, so we can derive its short-run cost picture. In fact, there is no new work to be done here because the cost picture for the monopolist is identical to that of the perfectly competitive firm. Why? Because the monopolist is just as closely governed by the law of diminishing marginal productivity and the interplay of the specialization effect and the congestion effect as the perfectly competitive firm. To be sure, the number of units the monopolist produces may be much larger than that for the perfectly competitive firm, but the principles and the relationship developed in Chapter 5 are the same—nothing new to learn.

Table 7-2 shows Stellio's short-run costs.

Table 7-2. Short-Run Cost Information for Stellio's Pizzeria

Quantity of Pizzas Produced	Total Cost	Marginal Cost
0	$9	
1	$11	$2
2	$14	$3
3	$18	$4
4	$24	$6
5	$32	$8
6	$43	$11

In the short run, the firm has some fixed resource and, therefore, some fixed costs that it incurs even when output is zero—Stellio's total fixed cost (TFC) is $9. Total variable cost (TVC) is zero when no pizzas are produced, but will increase, as will total cost (TC), as pizza production is stepped up, as shown in the table—for instance, when 4 pizzas are produced, total cost is $24, total fixed cost is (still) $9, and total variable cost is $15.

THINK IT THROUGH: What might these fixed resources be? What are Stellio's variable resources?

We are familiar with marginal cost (MC) from Chapter 5. Marginal cost is defined as

$$MC = DTC/Dq$$

For instance, as output expands from 4 pizzas to 5 pizzas, total cost increases from $24 to $32, and the marginal cost of the fifth pizza is $8.

The firm's short-run cost picture shown in Figure 7-3, and the production and cost relationships it represents, is indistinguishable from the one derived for perfect competition, that is, Figure 5-11.

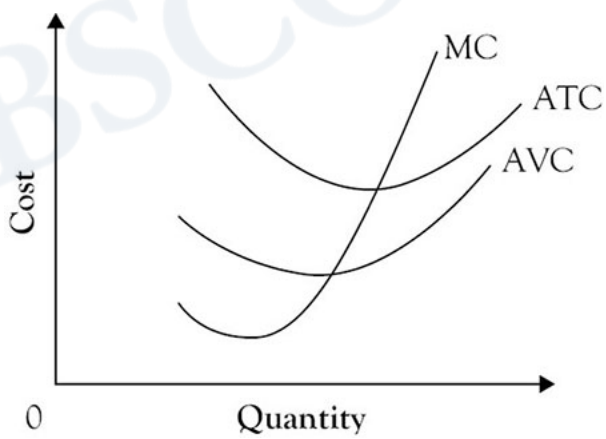

Figure 7-3. The monopolist's short-run cost picture.

Profit Maximization

The monopolist follows the same principles as the perfectly competitive firm when seeking to maximize his profit. As we saw in Figure 5-15 of Chapter 5, there are three possible relationships between price (average revenue) and average total cost (ATC)—the demand curve can intersect, be tangent to, or entirely miss the ATC curve. These relationships are shown in Figure 7-4.

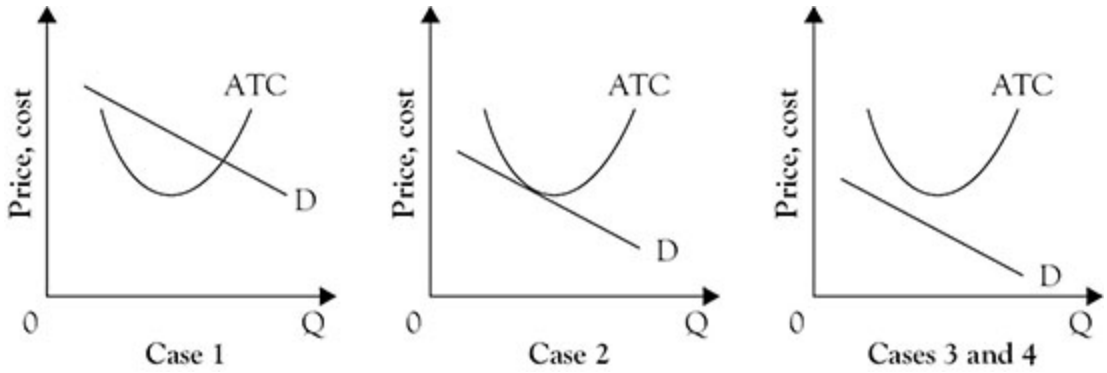

Figure 7-4. Relationships between price and average total cost.

In Case 1, the firm can earn a positive economic profit because, at least at some output levels, its average revenue exceeds its average cost. In Case 2 (the break-even case), the best the firm can manage is zero economic profit—a normal profit is earned. In Cases 3 and 4, the firm will earn a negative economic profit and must decide whether to produce (Case 3) or shut down (Case 4).

We look at each of these cases in turn but the important point to keep in mind is that, although the diagrams may appear more complex, the principles involved for the monopolist are exactly the same as those we developed in Chapter 5 for the perfectly competitive firm.

Comment: Before proceeding, you may wish to review the sections in Chapter 5 on the "Four Short-run Cases" and the "General Procedure for Short-Run Profit Maximization," both of which are highly pertinent here.

Case 1: Positive Economic Profit

When the product's price exceeds average total cost, the firm can earn a positive economic profit. To maximize profit, the firm should produce at the output level (q*) where MR = MC. At this output level, the difference between price and average total cost (P – ATC) represents the economic profit per unit. Multiplying by the number of units gives us the total economic profit.

Table 7-3 provides information for Stellio's Pizzeria.

Table 7-3. Stellio's Pizzeria and Profit Maximization

Quantity of Pizzas	Price	Total Revenue	Total Cost	Marginal Revenue	Marginal Cost	Economic Profit
0	$13	$0	$9		0	–$9
1	$12	$12	$11	$12	$2	$1
2	$11	$22	$14	$10	$3	$8
3	$10	$30	$18	$8	$4	$12
4	$9	$36	$24	$6	$6	$12
5	$8	$40	$32	$4	$8	$8
6	$7	$42	$43	$2	$11	–$1

Comparing the marginal revenue and marginal cost columns, marginal revenue equals marginal cost when 4 pizzas are produced each hour. Accordingly, Stellio should set his price to $9 per pizza to attract the profit-maximizing number of orders. Comparing total revenue ($36) and total cost ($24), we see that his total economic profit is $12 per hour.

We could arrive at the same result using the following alternative method:

Total economic profit = (P ATC)q*
= ($9.00 $6.00) 4
= $12.00

We can depict the same conclusion with Figure 7-5.

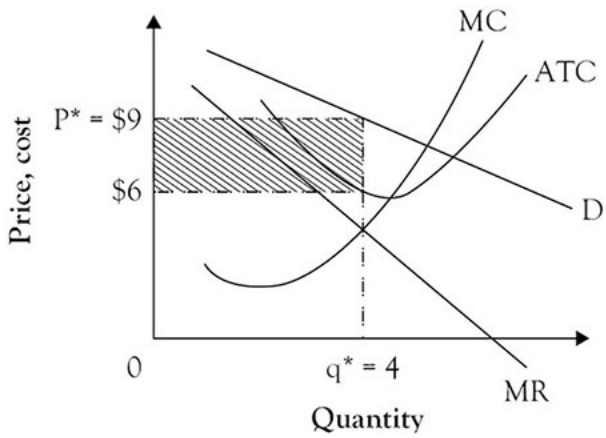

Figure 7-5. Case 1: positive economic profit.

If, as is the case in this example, the demand curve intersects the average total cost curve, then a positive economic profit can be earned. To interpret the diagram, recall that the firm's first interest is to determine this profit-maximizing output level (q*). This occurs where marginal revenue and marginal cost are equal (at 4 pizzas). The price associated with this output level is determined by the *demand* curve. Total economic profit is represented by the shaded area in Figure 7-5.

Comment: Many students find it tempting to go to the vertical axis directly from the intersection between marginal revenue and marginal cost. This is wrong, but understandable. In perfect competition, marginal revenue and price were the same value but, in monopoly, a bit more caution is called for.

The remaining three short-run cases are presented briefly—the principles involved are no different from those developed in Chapter 5 for the perfectly competitive firm.

Case 2: Zero Economic Profit—The Break-Even Case

If the demand curve touches the ATC curve at only one point, then this output level must be the profit-maximizing output level (q*)—at every other level of output, an economic loss must be incurred because price (average revenue) is less than average total cost. Accordingly, q* must be the output level at which marginal revenue and marginal cost are equal. The profit-maximizing price is P*. See Figure 7-6.

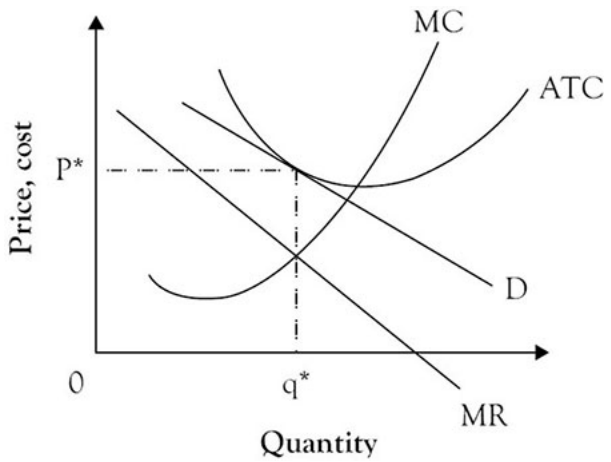

Figure 7-6. Case 2: zero economic profit.

Comment: In all other cases, the downward-sloping marginal revenue curve can be drawn in the short-run monopoly diagram without much caution—as long as the MR curve is drawn below the demand curve then a reasonable diagram should ensue. However, in this case, care must be taken to ensure that the diagram is consistent. The intersection of the MR curve and the MC curve determines the profit-maximizing output level (q*) and this output level *must* be the one at which the demand curve is tangent to the ATC curve. If the diagram is drawn otherwise, then it is inconsistent—you can't have two "best" output levels!

As we saw in perfect competition, the firm earning zero -economic profit will continue to produce—the entrepreneur is earning a -normal profit (a reasonable rate of return equivalent to his opportunity costs).

Case 3: Negative Economic Profit but Continuing to Produce

When the demand curve lies below the ATC curve at every output level, then the firm must earn a negative economic profit. As with the perfect competitor, the monopolist must decide whether or not to produce. Fortunately, the rule we created when looking at perfect competition is equally applicable for a monopolist—if, at the profit-maximizing (that is, loss-minimizing) output level, the firm's price equals or exceeds its average variable cost, then it should produce, but, if its price is less than its average variable cost, then it should shut down. Figure 7-7 depicts the former case while Figure 7-8 depicts the latter.

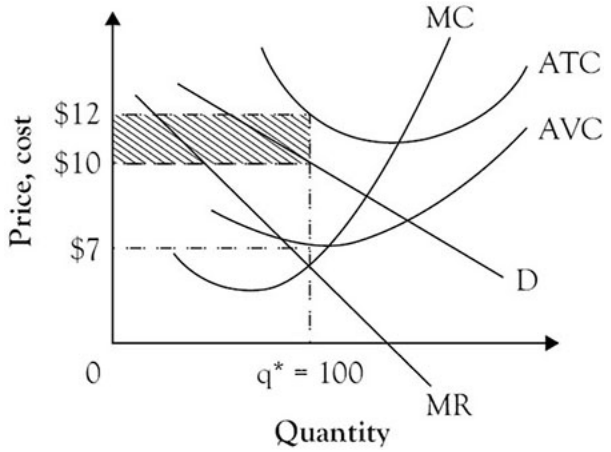

Figure 7-7. Case 3: negative economic profit but continuing to produce.

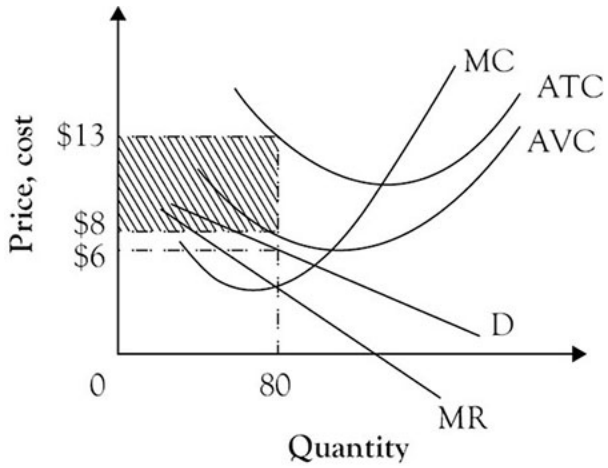

Figure 7-8. Case 4: negative economic profit—the shut-down case.

If this firm should produce at all, then it should produce at q*, where MR = MC. This requires q* to be 100 units of output. At this output, the demand curve dictates a price of $10, but average total cost is greater—say, $12. The firm will suffer a total economic loss of $200.

Total economic profit = (P ATC)q*
= ($10.00 $12.00) 100
= $200.00

Total economic profit (a loss in this case) is represented by the shaded area in Figure 7-7.

Can this firm do better by shutting down? If it does shut down, then its total revenue will be zero and its total cost will be limited to its total fixed cost as the firm can divest itself of its variable resources. Its total economic loss, therefore, will equal its total fixed cost. We can determine the firm's total fixed cost—it is $500.

At q*, ATC is $12. We can see that AVC is $7, meaning that AFC must be $5. Total fixed costs (AFC × q) must therefore be $500.

By producing, the firm loses $200; by not producing, it loses more—it's better for the firm to suffer the smaller loss and continue to operate.

THINK IT THROUGH: As long as AVC is less than price, then it must be true that the total fixed cost will exceed total economic loss and, therefore, the better option is to stay in business instead of shutting down.

Case 4: Negative Economic Profit—The Shut-Down Case

When the firm's price is so low that it can find no level of production at which it can cover its variable costs, then the firm's best interests are served by shutting down. We can see this in the following example, as shown in Figure 7-8.

In this case, the profit-maximizing output level (if the firm opts to produce) is 80 units. This is where MR = MC. On the basis of the demand curve, the price is $6 but the average total cost is $13. If it goes ahead, then the firm will lose $7 on each unit produced, or $560.

If however, the firm shuts down, then its total revenue will be zero and its total cost will be limited to its total fixed cost. Total fixed cost is average fixed cost times the number of units and is constant at all output levels. At 80 units of output, because ATC is $13 and AVC is $8, then AFC must be $5. Total fixed cost must be $400. If the firm shuts down then its loss will be lower than if it produces.

As we saw with perfect competition, the distinction between Case 3 and Case 4 lies in the relationship between price and average variable cost. At any price equal to or above the minimum value for average variable cost, production should proceed

because the producer can fully pay the variable resources and may have additional revenues that can defray some of the fixed expenses. If, however, the product's price is less than average variable cost, the firm should cease operations. There is no point hiring resources that can't pay their way.

Profit-Maximizing for the Monopolist

What this sequence of examples has shown is that the short-run profit-maximizing technique for the monopolist is indistinguishable from that of the perfectly competitive firm. Propelled by their own self-interest, they think, and act, alike.

The Monopolist's (Missing) Short-Run Supply Curve

You may recall from Chapter 5 that, after considering the "four short-run cases," we derived the perfectly competitive firm's short-run supply curve and may have an expectation that we will now do the same for the monopolist. However, it is not possible for us to derive a unique "price–quantity supplied" relationship for the monopolist. Figure 7-9 shows the problem.

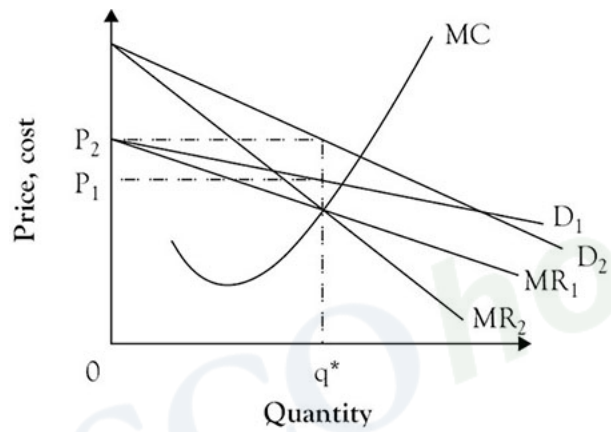

Figure 7-9. The non-unique "price–quantity" relationship.

A supply curve depicts a unique, one-to-one relationship between price and quantity supplied and, in perfect competition, we found that that relationship was governed by marginal cost. No such unique -relationship can be derived for the monopolist because demand-side conditions are unpredictable. Let us suppose that the monopolist's demand curve is D_1. Its profit-maximizing output level is q* (where MR_1 = MC). -However, if the monopolist's demand curve is D_2 then its profit-maximizing output level is still q* (where MR_2 = MC). Two prices (P_1 and P_2) but one output level—there is no unique monopoly supply curve.

Monopoly in the Long Run: Long-Run Equilibrium Outcomes in Artificial Monopoly

We are now ready to turn our attention to the behavior of the "artificial" monopoly in the long run and, more particularly, in long-run equilibrium. In a natural monopoly, long-run average cost (LRAC) continues to decline because of substantial economies of scale. This is not true for the artificial monopoly—the LRAC curve is U-shaped.

In Chapter 6, we saw that, in long-run equilibrium, the typical perfectly competitive firm will be driven, by the entry and exit of rivals, to a situation where only a normal profit will be earned. However, in monopoly, there are no rivals and economic profits can be preserved, even in long-run equilibrium.

There are two possible cases. The first, unlikely, but possible, case is that the firm will earn only a normal profit. This outcome *could* occur, but it is important to realize that there is no mechanism in monopoly that would compel it to occur—it just would be the accidental alignment of the demand-side and supply-side conditions. The second, and more likely, case is

that the firm will earn economic profits.

Case 1: Long-Run Equilibrium with Zero Economic Profits

We consider the less likely case first, as shown in Figure 7-10.

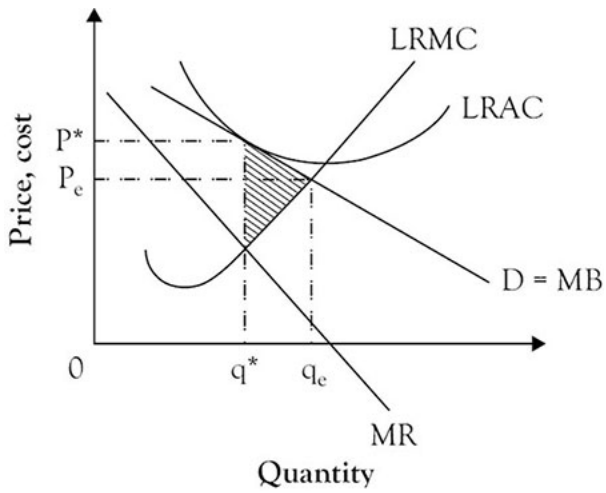

Figure 7-10. Long-run equilibrium with zero economic profits.

At first glance, this diagram looks similar to Figure 7-6 and, in one respect, they tell the same story, that the firm is earning only normal -profits. Profit maximization occurs at the output level (q*) where the demand curve is tangent to the LRAC curve (and where MR = MC). The firm will charge a price of P*. The important difference is that the current context is long run whereas in Figure 7-6 the context was short run. There is nothing inherent in this market that will cause change—firms cannot enter (and, given that only normal profits are being earned, none will wish to enter) and the firm will remain in business as it is earning a reasonable rate of return.

Performance Criteria—A Review

In Chapter 6, we developed three performance criteria for a firm in long-run equilibrium—that the firm earn only a normal profit; that the firm be productively efficient (producing at the output level where long-run average costs are minimized); and that the firm be allocatively efficient (producing at the output level where price (marginal benefit) equals long-run marginal cost). Perfect competition fulfilled these criteria well—but what about monopoly?

The Monopolist's Performance

We can relate what we learned about economic performance in Chapter 6 to the situation as depicted in Figure 7-10. The monopolist is earning only a normal profit (Criterion 1). However, the monopolist fails the other two tests—the firm is neither productively efficient nor allocatively efficient. The firm is not productively efficient because, at its chosen output level (q*), long-run average costs are still decreasing—it should expand its output. The firm is not allocatively efficient because, at q*, the price that consumers are willing to pay exceeds the long-run marginal cost of production. Again, the firm should expand output, in this instance, to q_e.

Left to its own devices, however, the firm will not expand output—it has achieved its preferred output level at q* and preferred price at P*. If the monopolist were to expand output to the allocatively efficient level, q_e, then, to attract the additional customers, the price of the product would have to decrease to P_e. We can conclude, then, that the profit-maximizing monopolist's self-interest leads him to restrict output to a level that is less than the socially optimal level (q_e), and sets a price

to be higher than the socially optimal price (P_e). The monopolist imposes a deadweight welfare loss on society equal to the "gap" between marginal benefit (MB) and marginal cost in the range of output denied society from q* to q_e, as shown by the shaded area in Figure 7-10.

Case 2: Long-Run Equilibrium with Positive Economic Profits

The more likely situation is that the monopolist will earn positive -economic profits, and this case is shown inFigure 7-11.

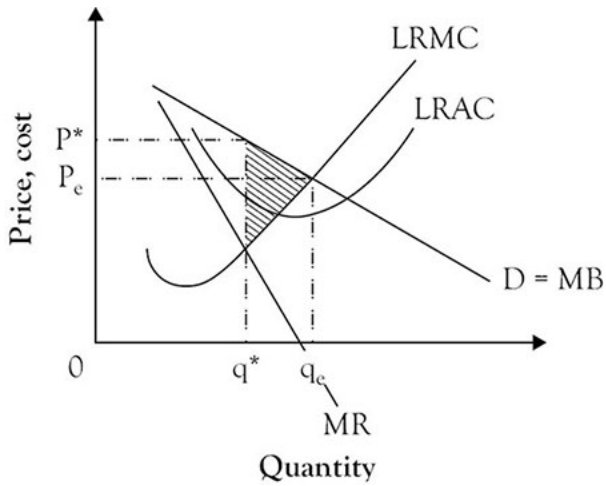

Figure 7-11. Long-run equilibrium with positive economic profits.

The Monopolist's Performance

The story is similar to the previous case. The monopolist will produce q*, where MR = MC, setting a price of P*. Because the price exceeds long-run average cost, the monopolist is earning an economic profit—he fails Criterion 1. The monopolist also fails the other criteria. The firm is not productively efficient (Criterion 2) because, at its chosen output level (q*), long-run average costs are not minimized. The firm is not allocatively efficient (Criterion 3) because, at q*, marginal benefit exceeds marginal cost—the firm should expand output to q_e. Society incurs a deadweight welfare loss equal to the "gap" between marginal benefit (MB) and marginal cost, as shown by the shaded area in Figure 7-11.

THINK IT THROUGH: In fact, the firm *could* be productively efficient, but it would be a fluke. If demand conditions were such that the marginal revenue curve passed through the minimum point on the LRAC curve then the monopolist would choose to produce at the productively efficient output level. Draw it and confirm this!

THINK IT THROUGH MORE: It is impossible for the monopolist to maximize profits and also achieve allocative efficiency. Profit maximization requires that MR = MC. Allocative efficiency requires that MB = MC. To accomplish both goals would require that MR = MB and, with a downward-sloping demand curve, we know that marginal revenue will be less than marginal benefit.

The profit-maximizing monopolist generally fails on each of the three performance criteria. In contrast, perfectly competitive industries perform well. The monopolist overprices and underproduces, denies consumers the socially optimal output level, squanders resources, and, in the case of the firm earning economic profits, forces a redistribution of spending power away from the customers and to the owners of the monopoly. This unflattering scorecard has been the theoretical justification for over a century of antitrust legislation and regulation of monopoly.

The Case of an Industry where there are no Economies of Scale

In Chapter 6 we determined that the U-shape of the LRAC curve was due to the presence of economies and diseconomies of scale. Are our conclusions regarding the relative merits of perfect competition and monopoly affected by the presence or absence of such factors?

Consider Figure 7-12, in which the LRAC curve is horizontal, implying that there are no economies or diseconomies of scale.

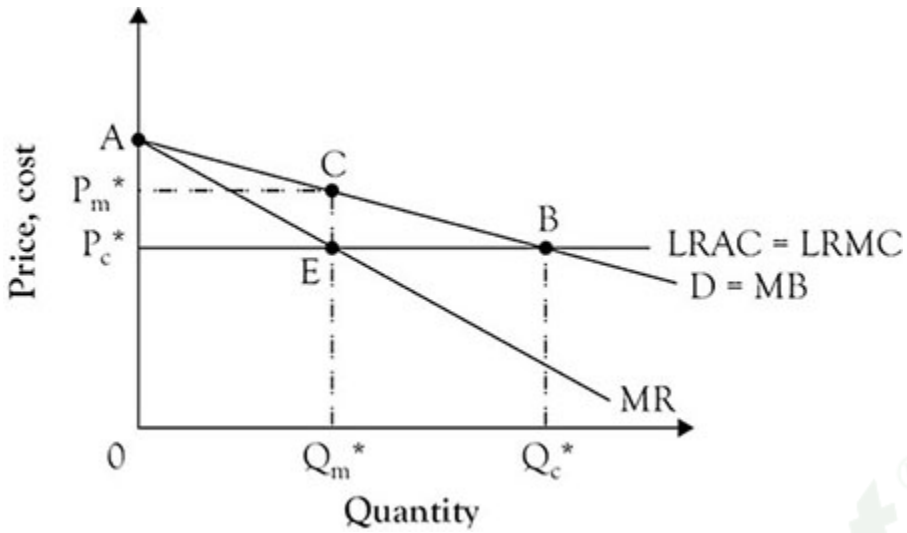

Figure 7-12. Graphical comparison of perfect competition and monopoly.

Initially, let us suppose that we have an industry composed of many perfectly competitive firms. Given that the LRAC curve is horizontal, the average-marginal rule should convince us that the single line also represents long-run marginal cost (LRMC). We have established that, under perfect competition, the industry will expand production until price (or marginal benefit) equals marginal cost. Long-run output is at Q_c* and the market price is P_c*. The consumer surplus is P_c*AB—the area between the marginal benefit curve and the marginal cost curve.

THINK IT THROUGH: Verify that, at Q_c*, the perfectly competitive industry is meeting each of the three performance criteria.

What will be the effects if the firms are consolidated into one monopoly organization? First, because the firm is now a price maker, we must consider the marginal revenue curve. The profit-maximizing monopolist will set price at P_m* and output at Q_m*.

A comment on notation: Throughout this chapter, we have viewed the monopoly as a firm and used lower-case letters in diagrams (e.g., q*) to be consistent with previous chapters. In this example, because we're making an industry comparison, upper-case letters are being used.

The presence of the monopoly has increased price and decreased output. Productive and allocative efficiency have suffered. The consumer surplus that was being received under perfect competition has shrunk to P_m*AC—consumers have lost ground. Part of the original consumer surplus has been appropriated by the monopolist as economic profits. Recalling that P_c* represents the firm's average cost and P_m represents its price, the monopoly is earning an economic profit shown by the area P_c* P_m*CE—income distribution has shifted in favor of the owners of the monopoly. The remaining portion of P_c*AB—the triangle CEB—represents the deadweight welfare loss caused to society by the presence of the monopolist.

Because of the deleterious effects of monopolies (and other forms of imperfect competition), the government may choose to intervene to improve the allocation of society's resources. There are two apparently conflicting government positions—first, promotion of competition and restriction of market power through trust-busting legislation and, second, restriction of

competition by regulation of industries. Antitrust actions are meant to promote competition; regulation intends to restrict competition. Both policies are intended to promote allocative efficiency.

Antitrust actions prevent monopolies from forming or, if they have formed, break them up or inject additional competitive elements into the market. In banking, for instance, economies of scale favor larger banks and, therefore, regulations have been established to enhance the viability of smaller banks. A similar statement could be made about family farms. The Antitrust Division of the Department of Justice enforces antitrust laws and must approve mergers between firms and it may refuse if the merger is felt not to be in the public interest. The Federal Trade Commission was also created to investigate unfair competition. The courts can impose civil and criminal penalties and can specifically forbid illegal actions in the future.

The Sherman Act of 1890 made monopoly and trade restraints illegal. Subsequent legislation has made it clear that the key issue is not whether a firm is a monopoly but whether its actions to establish and secure its position represent "unreasonable conduct."

Think about an opposite case: Currently, there are 18 alcoholic beverage control (ABC) states. Although the particular controls vary from state to state, the common feature is that the sale of liquor is regulated by a monopoly organization run by the state government. We can predict the effect of such a monopoly presence in the market—the price of alcohol will be higher and sales will be lower. Indeed, ABC regulations were frequently promoted by temperance organizations that wished for precisely such an outcome!

Price Discrimination

So far, we have assumed that the firm charges all customers the same price but the monopolist may be able to practice price discrimination, where the same product is sold at different prices to different consumers. For price discrimination to be effective, the firm must be able to identify who will be willing to pay the higher price and must be able to prevent resale.

THINK IT THROUGH: Price discrimination surrounds us, although usually it's expressed as special discounted prices for select customers, not -special high prices for some customers. Senior citizen or student discounts, frequent flier bonuses, and differential rates for children in movies or restaurants are all examples, as are quantity discounts such as "buy one, get one free." The friendly car saleswoman is intently trying to assess her customer's willingness to pay for the new car he's interested in buying. In recent years, soft drinks machines have adjusted prices according to the temperature—higher temperature, higher price. Airlines offering the same seat to different customers, or hotels offering the same room to different guests, but charging different prices are practicing price discrimination. A student receiving financial aid, or one who pays "in-state" tuition, is deriving benefits from price discrimination whereas nonrecipients and out-of-state students are penalized.

Perfect price discrimination occurs when the firm is able to charge each customer the maximum amount that that customer is willing to pay. The price charged equals the customer's marginal benefit and the entire consumer surplus is appropriated by the producer. In such a situation, the extra revenue derived from the sale of an additional unit of output is equal to the price charged to the customer. In other words, marginal revenue and price are equal. Graphically, the firm's demand curve is also its marginal revenue curve.

Armed with this new information, let's revisit Figure 7-12. If the firm is able to price discriminate perfectly, then the original marginal revenue disappears and the demand curve represents marginal revenue. The profit-maximizing monopolist will produce at the output level where marginal revenue equals marginal cost, namely Q_c*, the allocatively efficient output level. Price discrimination can correct a misallocation of resources.

THINK IT THROUGH: The entire area P_c*AB will be taken over as profits by the monopolist! Can you see why?

Natural Monopoly: Regulation of Monopoly

As we have seen, some monopolies are the natural product of market forces. Such "natural" monopolies are often due to the existence of substantial economies of scale or extremely high set-up costs. The presence of network externalities is another reason why a single firm might be the most desirable market structure. Network externalities arise when the value of a good or

service to a customer increases as the number of users increase—having one firm such as eBay is more beneficial for customers than spreading auctions over many small firms.

THINK IT THROUGH: It makes sense to have one social media provider—Facebook has thrived while MySpace has withered. One service location adds value for the customer. Similarly, software and Internet services, including interactive video games, are more valuable for all users the more subscribers are added into the system. My purchase of a cell phone bestows benefits not only for me but also for those who wish to phone me.

THINK IT THROUGH: Before the events of 9/11, airport security was provided by privately contracted firms. Following 9/11, many of these firms were felt to be inadequate and the Transportation Security Administration (TSA) was set up. The belief was that an integrated government monopoly would perform more effectively than a patchwork of private firms. One option, then, is that the government can wholly take over and manage an industry, such as airport security or the post office, but this course of action is infrequently pursued in the United States.

When a natural monopoly is present, we would wish to preserve the benefits bestowed by the monopoly, but to regulate it. We can see the theory underlying regulation in Figure 7-13. Let us assume that the firm is an electric company—Sparx.

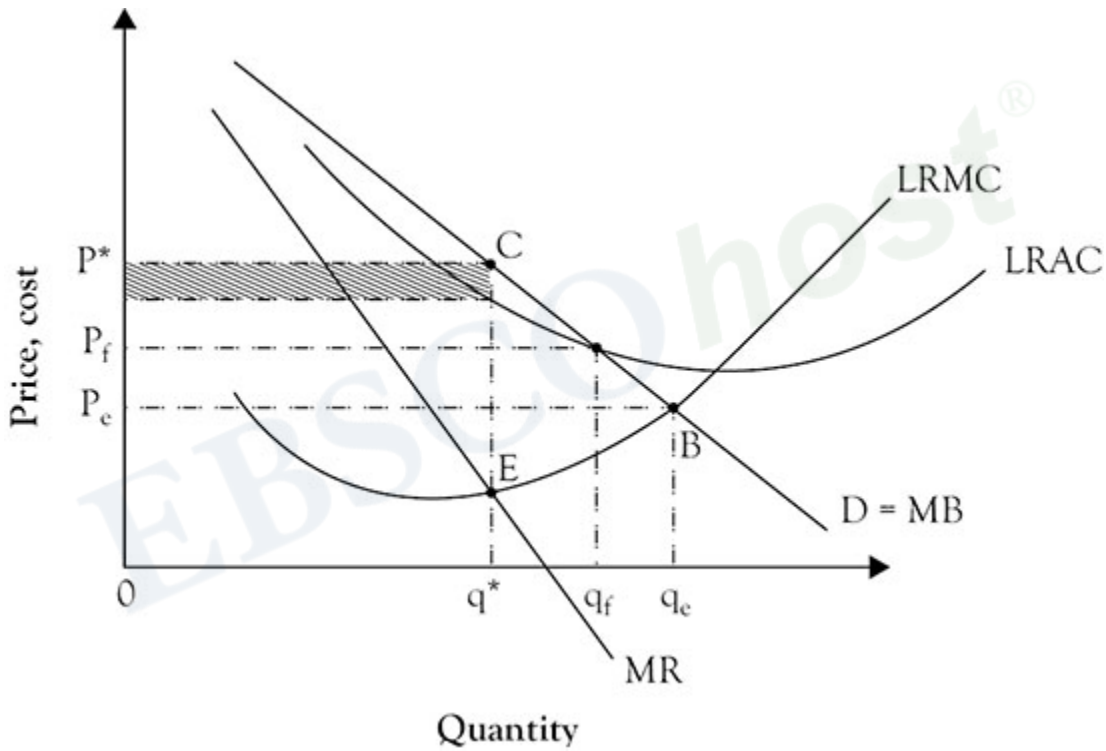

Figure 7-13. Natural monopoly and regulation.

The diagram signals that Sparx is a natural monopoly because the LRAC curve is continually downward-sloping. Left to itself, the profit-maximizing firm will set price (P*) and output (q*) based on the intersection of marginal revenue and marginal cost. The firm is earning an economic profit and failing to produce electricity at the allocatively -efficient output level (q_e) where marginal benefit equals marginal cost. The deadweight welfare loss created by the monopolist is the area CEB.

Society, through government action, has a range of options. It can let things be and accept the situation; it can break up the monopoly (losing all of the cost-saving advantages of economies of scale) and allow the entry of several small competitors ("baby" Sparxs); or it can regulate the existing monopoly. If it chooses regulation, society still must make choices. Ought it require the firm to generate electricity at the allocatively efficient output level or, if not at that level, where?

Socially Optimal Output Level (P = LRMC)

One option is that the monopolist is regulated in order to achieve the socially optimal output level (q_e). To do this, the firm would be required to produce level q_e units of output, where marginal benefit equals marginal cost. However, in order to drum up sufficient demand to absorb this amount of production, the firm's price would have to be reduced to P_e.

This strategy poses a problem—at P_e, the price is lower than average cost and the firm will earn a negative economic profit. The owners of this firm will not tolerate this—remember that this is a long-run situation—and will quit the industry in search of a fair return on their investment elsewhere. Society, then, will have no electricity!

Sparx's loss per unit of electricity generated is equal to the vertical gap between P_e and LRAC at q_e. Society could "fill the gap" by offering the company a subsidy that fully compensates for the loss. Economically, this might be feasible, but, politically, may be imprudent.

THINK IT THROUGH: Sparx, a long-term monopoly that has been extracting economic profits from its customers for years by withholding output and charging high prices is now seen by tax-paying voters to be receiving subsidies, financed by tax hikes. The higher taxes may be borne by those same long-suffering customers or, if not, there is an income redistribution away from taxpayers and to the monopoly's customers. Either way, despite lower prices and improved service, there is a political risk that voters will rebel. Some students may feel they see connections between this scenario and President Obama's managed health care system.

Fair Return Output Level (P = LRAC)

A compromise option that is frequently employed in regulation is to control the firm's output and price in such a way that the original deadweight welfare loss (CEB) is reduced, but not eradicated. "Fair return" (or average cost) pricing sets the firm's price so that the firm breaks even. If the price is set at P_f, where it equals average cost, then, on average, the firm will earn zero economic profit. By earning a reasonable rate of return (a normal profit) for its owners, Sparx will continue to operate without requiring a subsidy from taxpayers. Output will be higher than q* and price will be lower than P*.

Problems With Regulation

Controlling a natural monopoly presents particular problems. If a fair return is guaranteed, then there is little incentive to be diligent in cutting costs, boosting productivity, or innovating. Cost-saving initiatives translate into lower future rates. Reversing this point, regulated industries display the **Averch–Johnson effect**, which is the tendency for regulated firms to accumulate an overabundance of capital. If the firm's rate of return is based on the quantity of its capital, then there is an incentive to increase investment. Although this may be rationalized as a desire to provide a high-quality service—in the case of an electric firm, for example, fewer outages because of the additional generating capacity—the consequence is that the firm is driven away from the socially optimal level. Efficiency is sacrificed to profit.

Regulatory capture suggests that, because of close association over time, the role of a regulatory agency may shift from being a watchdog for the interests of customers to being a lapdog for the interests of the industry, with inefficient or undesirable practices being supported or, at least, ignored.

THINK IT THROUGH: There are frequent claims of regulators being "in bed" with the executives of large firms—perhaps the most notable recent example is the series of "lapses" in scrutiny that led to the meltdown on Wall Street in 2007–2008 and the subsequent Great Recession. The Food and Drug Administration has been accused of promoting the interests of agribusiness over that of consumer health, for example, in the continued use by milk producers of the growth hormone rBGH, which has been linked to cancer and has been banned in the European Union, Canada, and Australia.

The Interstate Commerce Commission was accused by its critics of sympathetically setting railroad freight rates and trucking rates at high levels and of acting to exclude competition through restrictive practices. The ICC was scrapped in 1995—subsequently, railroad freight rates and trucking rates have fallen by about 50 percent.

Applications: Cable TV, NFL Logos, and Electricity Generation

This section considers three examples of industries or firms whose practices have attracted the scrutiny of regulators.

Cable TV

It is frequently claimed that the cable TV industry is an example of a natural monopoly. With expensive cable to be laid, there are high initial costs to set up the system but relatively low variable costs once the system is in operation. This implies that the average cost decreases as the number of subscribers increases—a hallmark of a natural monopoly. Given that cable TV in a local region is a natural monopoly, and during most of its history it has been treated as such, then why is it beneficial to prevent competition in this case?

The argument goes that having more than one cable provider competing in a market would lead to wasteful duplication of service, economies of scale would be reduced and average costs of production would increase.

Cable TV rates were deregulated in 1984 when price caps were removed. This policy change had several effects—prices for cable TV subscribers increased but, because more channels and better quality programming was made available, the number of subscribers increased. Cable was re-regulated in 1992, but only partially. Pricing on basic packages was controlled, to ensure that viewers could afford television access, but premium channels were not subject to regulation. The result was -predictable—cable companies provided mediocre "basic" packages and tried to tempt subscribers to the far more attractive premium packages. Currently, only "basic tier" cable TV is regulated.

Cable TV has so far been successful in bundling channels together—to get a particular channel such as HBO the customer must also subscribe to channels that they do not wish to have. The *à la carte* alternative, in which subscribers can pick and pay for only those channels they wish to have, has been resisted as requiring very expensive technology.

Is Bundling Desirable? Bundling, the practice where the firm offers a take-it-or-leave-it choice of channels, is economically sensible from the viewpoint of the provider—given that providing additional channels involves a low marginal cost.

Suppose Cabal Cable has two subscribers, Lionel and Nancy. Lionel values ESPN at $4.00 per month and MTV at $3.00 per month whereas Nancy values ESPN at $3.00 per month and MTV at $4.00 per month. With *à la carte* pricing, Cabal's revenues would be maximized if each channel cost $3.00 per month because each individual would buy ESPN and MTV, spending $6.00 each. Cabal's total revenue would be $12.00.

THINK IT THROUGH: If Cabal raised the price per channel to more than $3.00 per month, then Lionel would not wish to subscribe to MTV and Nancy would not wish to subscribe to ESPN.

The two-channel bundle is worth $7.00 per month to Lionel and is worth $7.00 per month to Nancy. If Cabal offers the bundle at $7.00 per month, then both viewers will subscribe, increasing Cabal's revenue to $14.00. If the cost of adding a subscriber to an established channel is zero (or negligible) then offering the bundle increases Cabal's profitability.

Bundling may also benefit the subscriber. Instead of paying two charges to receive two desired but separate *à la carte* channels, one lower fee may secure both desired channels. If Cabal offers its bundle at a rate of $6.50 per month, Lionel and Nancy will each receive a consumer surplus of 50 cents per month.

NFL and Apparel Logos

In 2010, there was an antitrust case concerning the NFL's practice of having an exclusive licensing agreement and negotiating as a single unit with apparel companies that wished to market NFL team logos. The NFL's position was that significant competition existed between NFL teams and also that there was significant competition between the NFL and other forms of entertainment. The court rejected this argument, however, finding that team logos were not good substitutes for one another (would a Giants fan really wish to buy a Carolina Panthers t-shirt?) and that the NFL's exclusive licensing agreement, in which teams operated collectively, violated antitrust rules because the collective action had the consequence of driving up licensing revenues.

Electricity Generation and Deregulation

Enthusiasm for regulation swings like a pendulum. Following the financial missteps revealed by the meltdown on Wall Street in 2008 and the bursting of the housing bubble, calls for more stringent regulation have increased in volume. In earlier decades, deregulation was more favored. Deregulation in the airline industry reduced fares by about one-third, and telephone service became cheaper.

Deregulation can go seriously wrong, however, as the following case demonstrates and, when it does, it can swing the pendulum in the opposite direction. In 1998, California deregulated its wholesale electricity prices and prices began to rise. This was due to an extraordinary and unforeseeable alignment of supply and demand factors—aging generating capacity, and declines in water to power hydroelectric plants on the supply side, and an economic boom, rising population, and hot summer weather boosting demand.

Electricity generating firms were quick to realize that, if supply were curtailed, then the price of electricity would rise sharply, given an inelastic demand. Demand for electricity is inelastic because there are few substitutes and it is highly costly to store for later use.

THINK IT THROUGH: In Chapter 4, we discussed the Total Revenue Test as a method of determining whether the demand for a product was inelastic or not. We concluded that, if demand were inelastic, then an increase in price would cause total revenue to increase. Clearly, the electricity producers had some economics majors on their payroll because they realized that, by cutting supply, the price of their product would increase and their total revenue would also increase.

In order to reduce supply and drive up prices and revenue, many plants were closed down for "maintenance" during periods of peak demand, widespread blackouts occurred and wholesale electricity prices increased, sometimes by tenfold. California's governor initiated a state of emergency that lasted for more than two years.

Unfortunately, the transmission and distribution of electricity for retail customers had not been deregulated so companies such as Pacific Gas and Electric were being forced to buy electricity at high unregulated prices and sell to customers at low regulated prices. Pacific Gas and Electric filed for bankruptcy in 2001. It was only with the bankruptcy of Enron, an energy-trader and major player in the manipulation of the wholesale electricity market, that the situation began to stabilize.

Because of California's experience, several states have reversed their moves toward electricity deregulation, while California now requires electricity distributors to acquire their own generating capacity, in order to prevent reliance on independent electricity-generating firms.

Review: In general, monopoly misallocates society's scarce resources but this need not always be true—perfect price discrimination may result in an allocatively efficient result, and natural monopoly's cost-saving -economies may trump perfect competition. Further, in the case of a regulated monopoly, the cure may be almost as injurious to efficiency as the cause.