CHAPTER 11
Monopoly

CHAPTER OUTLINE

11.1 Monopoly Profit Maximization
   - Marginal Revenue
   - A Monopoly Chooses Price or Quantity
   - Graphical Approach
   - Mathematical Approach
11.2 Market Power
   - Market Power and the Shape of the Demand Curve
   - Lerner Index
   - Causes of Market Power
11.3 Effects of a Shift of the Demand Curve
11.4 Welfare Effects of Monopoly
   - Graphing the Welfare Loss
   - Welfare Effects of Ad Valorem Versus Specific Taxes
11.5 Cost Advantages that Create Monopolies
   - Sources of Cost Advantages
   - Natural Monopoly
11.6 Government Actions That Create Monopolies
   - Barriers to Entry
   - Patents
11.7 Government Actions That Reduce Market Power
   - Regulating Monopolies
   - Increasing Competition
   - Dominant Firm and Competitive Fringe

TEACHING TIPS

Chapter 11 begins the study of monopoly and concentrated markets. Most of the chapter focuses on monopoly, followed by a brief discussion of dominant firm with competitive fringe. You might want to maintain a running connection to the material in Chapters 8 and 9 by comparing the competitive solution or assumption to that of monopoly throughout the early portion of the chapter. This will be helpful in the later stages when evaluating deadweight loss and the comparison of efficient levels to monopoly output and price levels.

Before beginning the material on profit maximization it is worth the time to discuss the concept of market edges. Because monopolies only exist when a product has no close substitutes, the class should see that a monopoly on Ford pick-up trucks is not meaningful. This will provide context for the discussion of elasticity and market power that begins with the relationship among price, marginal revenue and elasticity in equation 11.4, and continues in Section 11.2. The United States Postal Service (which is mentioned in the text) is a great example to discuss, as most students are very familiar with the changes that have occurred in communication technology. Students used to free access to e-mail through the campus network are likely to have highly elastic demand for first class mail.

In the presentation on profit maximization, two points tend to slow students down. The first is the relationship between marginal revenue and price. If you are restricting your demand curves to be linear and are using even basic calculus, the price–marginal revenue relationship is greatly simplified. Although memorization is generally to be discouraged, if students remember the “same intercept, twice the slope” relationship between linear demand curves and their associated marginal revenue curves, it might prevent a silly mistake on an exam. The shut-down point is the other point that occasionally throws students, as it implies that a monopolist might not earn profits. When students think of monopolies, they
usually associate them with high prices and profits, not the need to shut down. It is also worth using a graph to show a comparison to the shutdown rule for the competitive firm.

Section 11.4, which covers the measurement of welfare loss, is extremely important. In order for students to be able to assess monopoly effects at more than the most superficial level (price is higher, output is lower), they must understand the concept of deadweight loss. You might use a current event, such as the introduction of competition to the residential electricity industry, to discuss the relationship among the inelasticity of demand, the magnitude of the welfare loss, and the importance of substitutes. As demand elasticity decreases, loss of consumer surplus increases. Because consumers have historically had no alternatives for commodities such as electricity and local telephone service, demand was highly inelastic. Further, scale economies have made break-ups unwise, with the result that utilities have been heavily regulated to reduce welfare loss. Recent changes in technology have created the opportunity to replace regulation with competition, which would increase the elasticity of demand faced by individual firms, thus creating incentives for lower prices and increased efficiency.

The discussion of entry barriers in the text, with the exception of patents, is limited mostly to exogenous barriers such as cost advantages due to scale economies and government actions such as the postal service or licensing laws. Strategic actions such as advertising, product tie-ins, and raising rival’s costs are discussed in Chapter 14. If you will not have time to cover all of Chapter 14 later in the course, you might want to spend a few minutes discussing how firms can try to create barriers to entry, and give some examples. You may be able to generate a good class discussion on the subject of patents. I present them as the classic example of a double-edged sword—creating the incentive to innovate on the one hand, but at the same time creating a legal monopoly. Students often will give the quick response of “too expensive” if asked about pharmaceuticals. This is likely because they have not considered the alternatives, which are less research and development, and fewer new medicines. The line between too much protection for firm innovations and not enough protection, is difficult to determine. Recent changes in patent law such as the Drug Price Competition and Patent Term Restoration Act in 1984 have moved this line toward more protection in the short run, and increased competition in the long run. This new law reduces the time required to approve generic equivalent drugs, decreasing the time lag between the expiration of a patent and the introduction of substitutes. It also allows for the extension of patents by up to five years to replace time lost in the FDA approval process, increasing the incentive for firms to innovate.

ADDITIONAL APPLICATION

The Creation and Destruction of an Aluminum Monopoly

Cost advantages and government actions allowed the Aluminum Company of America (Alcoa) to maintain a monopoly in aluminum in the United States. Eventually, however, government and judicial action destroyed Alcoa’s monopoly.

In 1893, Alfred Hall invented and patented a new process that allowed his firm, Pittsburgh Reduction (which became Alcoa) to produce aluminum at much lower cost than his competitors. Over time, this firm obtained control of most domestic and many international sources of bauxite ore, which is necessary to produce aluminum. As a result, Alcoa was the only American producer of aluminum. Alcoa did face some competition from foreign producers; however, the United States established high tariffs on aluminum imports, which reduced this threat to Alcoa’s market power.

During World War I, when foreign competitors were unable to effectively produce and sell in other countries, Alcoa became an exporter. It continued to export after the war. Between the two world wars, Alcoa remained the only aluminum smelter (producer) in the United States due to its technological advantages and economies of scale. The demand for aluminum increased substantially with the start of World War II. Aluminum was used to produce planes and other manufactured products for military use. Because of its

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important role in the production of military products, the government financed new plants during World War II that were built and run by Alcoa, and encouraged the development of other aluminum producers.

In 1945, the U.S. Supreme Court ruled that Alcoa should be broken up because it had a monopoly, which is a violation of U.S. law under the Sherman Anti-trust Act (1890). With the end of the war, the Supreme Court decision was enforced by the sale of government financed Alcoa plants at low prices to Reynolds metals company, and Permanente Metals Corporation, owned by Henry Kaiser. By 1950, these government sales created an oligopoly, where Alcoa made 50.9% of all sales, Reynolds, 30.9%, and Kaiser Aluminum and Chemical Corporation (the renamed Permanente Metals) 18.2%.

1. Based on your knowledge of general equilibrium from Chapter 10, what other markets do you believe were affected by the Alcoa monopoly?
2. Are consumers necessarily better off with three producers rather than one? Why, or why not?

DISCUSSION QUESTIONS

1. Is it feasible to prohibit monopolies in all markets?
2. Patents provide an incentive to invest. The government could provide other incentives such as government grants or prizes for major discoveries. Why do you think patents are more commonly used than these other approaches, even though patents lead to monopoly problems?
3. How many monopolies can you list? List them and identify which markets they serve.
4. How many of the monopolies identified in question #3 are unregulated?
5. Which of the monopolies identified in question #3 are likely to be natural monopolies?
6. If the government regulates the price a monopoly may charge, how will that affect a firm’s Lerner index? When should we distinguish between an actual Lerner index and a potential Lerner index?
7. Sometimes a local convenience store is said to have “local monopoly power.” What is meant by this phrase?
8. Would you expect monopolies to be more common in small countries or large ones? Why?

ADDITIONAL QUESTIONS AND MATH PROBLEMS

1. Use equation 11.4 to prove that a monopolist would never choose to price in the inelastic range of demand.

2. Assume a monopolist faces a market demand curve \( P = 100 - 2Q \), and has the short-run total cost function \( C = 640 + 20Q \). What is the profit-maximizing level of output? What are profits? Graph the marginal revenue, marginal cost, and demand curves, and show the area that represents deadweight loss on the graph.

3. In question #2 above, what would price and output be if the firm priced at socially efficient (competitive) levels? What is the magnitude of the deadweight loss caused by monopoly pricing?

4. Show that if a firm is a natural monopoly, a government policy that forces marginal cost pricing will result in losses for the firm.

5. Suppose a change in technology available to fringe firms increases their elasticity of supply, altering the total fringe supply curve from \( p = 5 + Q \), to \( p = 5 + 2Q \). If market demand is \( Q = 20 - p \), show the change in the residual demand curve using a graph. Is the dominant firm better off or worse off after the change?

6. If a monopolist has constant marginal cost \( MC = 20 \), and faces demand \( p = 80 - Q \), what is the effect on consumer surplus of a $5 per unit tax on sellers? Is the tax revenue collected less than, equal to, or greater than the consumer surplus loss plus the reduction in profits?
7. Suppose a legislator introduced a bill that would decrease patent life for new drugs from 17 years to 10 years, based on the argument that it would reduce deadweight loss through lower prices. What argument could you make against such a change?

8. Suppose a monopoly is for sale. What specifically must be purchased by the buyer in order to retain its market position? How much would it be worth?

9. Suppose a monopolist faces a market demand curve $Q = 50 - p$. If marginal cost is constant and equal to zero, what is the magnitude of the welfare loss? If marginal cost increases to $MC = 10$, does welfare loss increase or decrease? Use a graph to explain your answer.

**ANSWERS TO ADDITIONAL QUESTIONS AND MATH PROBLEMS**

1. In equation 11.4, whenever demand is inelastic, $MR$ is negative, indicating that the last unit sold decreased total revenue. By increasing prices, the monopolist will reach the elastic portion of the demand curve, at which point $MR$ becomes positive.

2. First, derive the $MR$ and $MC$ functions; then set $MC = MR$ and solve. See Figure 11.1. Deadweight loss is equal to area $abc$.

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\begin{align*}
P &= 100 - 2Q \\
R &= 100Q - 2Q^2 \\
MR &= \frac{dR}{dQ} = 100 - 4Q \\
MC &= 20 \\
100 - 4Q &= 20 \\
Q^* &= 20 \\
p^* &= 60 \\
\pi &= 1,200 - 1,040 = 160
\end{align*}
\]

Figure 11.1

3. To solve for the competitive price and output, set $MC = p$. 

![Figure 11.1](image-url)
\[20 = 100 - 2Q\]
\[Q^*_c = 40\]
\[p^*_c = 20\]

The magnitude of the deadweight loss is $400, which is the area of triangle \(abc\) in Figure 11.1.

4. See Figure 11.2. If the firm is a natural monopoly, \(AC\) falls throughout the range of demand. When \(AC\) is falling, \(MC\) is below \(AC\). By forcing the firm to price at marginal cost, revenue would be less than cost, and the firm would incur losses equal to area \(abcd\).

Figure 11.2
5. See Figure 11.3. The change in technology reduces the slope of the fringe firm supply curve, allowing them to supply more of the total demand at all prices above $5, making the dominant firm worse off.

![Figure 11.3](image)

6. The $5 tax increases $MC$ to $25. Quantity falls from 30 to 27.5, and price increases from $50 to $52.50. Consumer surplus falls by $71.875 (from $450 to $378.125). Profits fall by $143.75 (from $900 to $756.25). Tax revenue collected is $137.50 ($5 x 27.5). See Figure 11.4.

![Figure 11.4](image)
7. In order for the legislation to have a net positive effect, any social cost must be more than offset by the lower prices when the patent expires. Firms would engage in less research and development. If a firm believed that a project could only become profitable in the 11th through 17th year of the patent, it would not be funded, or may be funded at a less than efficient level. The reduction in health that occurs as a result represents the social cost of the policy.

8. The buyer would have to purchase whatever the source is of the monopolist’s barrier to entry. For example a patent, or the control of a resource needed for production. The value of a barrier to entry is the discounted stream of profits that a monopolist could expect to earn from that monopoly. In the case of a patent it would be the discounted stream of profits that could be earned in the remaining years before the patent expires.

9. See Figure 11.5. When marginal cost is zero, the firm sells 25 units of output for $25 per unit. The welfare loss is equal to the area of triangle abc, or $312.50. When marginal cost increases to $10, the firm reduces output to 20, and the new welfare loss is def, or $250.00.

Figure 11.5