

How to Study for Chapter 19 Cases on Monopoly

Chapter 19 involves analysis using the case of pure monopoly. It introduces price discrimination and natural monopolies and builds on the reasoning of Chapter 18.

1. Begin by looking over the Objectives listed below. This will tell you the main points you should be looking for as you read the chapter.
2. New words or definitions and certain key points are highlighted in italics and in red color. Other key points are highlighted in bold type and in blue color.
3. You will be given an In Class Assignment and a Homework assignment to illustrate the main concepts of this chapter.
4. There are a few new words in this chapter. Be sure to spend time on the various definitions. There are also some graphs. Go over each carefully.
5. The teacher will focus on the main technical parts of this chapter. You are responsible for the cases and the ways by which each case illustrates a main principle.
6. When you have finished the text, the Test Your Understanding questions, and the assignments, go back to the Objectives. See if you can answer the questions without looking back at the text. If not, go back and re-read that part of the text. When you are ready, take the Practice Quiz for Chapter 19

Objectives for Chapter 19 Cases on Monopoly

At the end of Chapter 19, you will be able to answer the following:

1. Explain what is meant by "**price discrimination**"? Explain why is it practiced? Give some examples of price discrimination.
2. State what conditions are necessary to be able to practice price discrimination?
3. Explain, if price discrimination occurs, which segment of the market gets the higher price? Why?
4. Explain what a "**natural monopoly**" is and why it exists?
5. In the production of information goods, why are **fixed costs high**?
6. In the production of information goods, why are **marginal costs low and don't rise**?
7. What is meant by "**sunk costs**"?
8. Explain why the combination of high fixed costs & low marginal costs leads to **monopoly**.
9. Why do producers of information goods practice **price discrimination**?
10. What is meant by "**network externalities**" or "**positive feedback**". Give some examples of products for which they exist.
11. Explain why network externalities increase the likelihood of monopoly.
12. What is meant by a "**first mover advantage**"?
13. What is the difference between an "**open standard**" and a "**proprietary standard**"?
14. What is meant by "**path dependence**"? Give some examples.
15. What is meant by "**lock-in**"? Why does it enhance the possibility of monopoly?
16. What is meant by "**contestable market**"? Why might companies producing information goods be in a contestable market?
17. Explain how natural monopolies have been regulated? Who regulates them?
18. Explain what is meant by "**average cost pricing**" (also called "**rate of return regulation**")?
19. What is meant by the "**rate base**"?
20. Using SDG&E as an example, state what problems result from average cost pricing for public utilities?
21. Name some changes that have been occurring recently in the regulation of public utilities? Why have they been occurring?

Chapter 19 Cases on Monopoly (latest revision July 2004)

Case 1: Price Discrimination

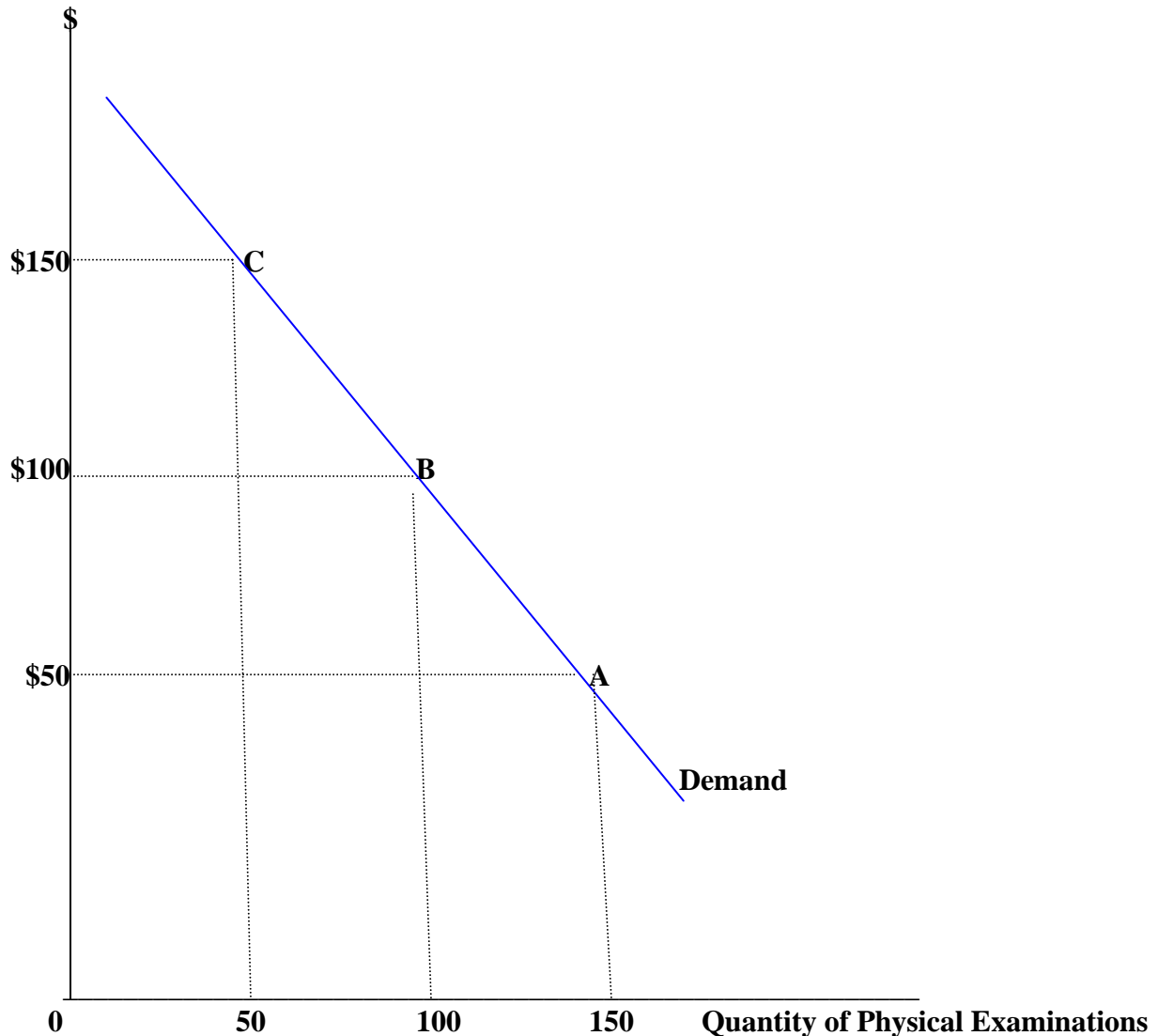
One behavior that tells us that there is monopoly power is price discrimination. Notice that the phrase “*monopoly power*” is used here. The company is not literally a monopoly --- that is, it is not the only seller. But the company does have the ability to affect the price in a way similar to what it would have if it were indeed the only company.

What is price discrimination? The term means that the company sells exactly the same product to different buyers for different prices. Examples of this practice are familiar to many of you. For example, magazines and newspapers advertise on campus that they will sell their magazines or newspapers to students at a price below that charged to others. You get exactly the same magazine or newspaper as anyone else; however, you pay a lower price. The same practice occurs at the movies. As a student or as a senior citizen, you get to see the movie for a lower price than others have to pay. You do not have to go at unusual times or sit in undesirable seats to get this lower price. There are many other examples. When you pay a bill by mail, you pay the first class rate of 37 cents. But when a company sends you junk mail advertising, it pays the much lower fourth class rate. San Diego Gas and Electric charges lower rates to business users of electricity than to household users. However, long-distance companies charge higher prices to business users (who call between 8 A.M. and 5 P.M. on weekdays) than to household users (who call at other times). Notice that, for there to be price discrimination, the one paying the lower price gets exactly the same product as the others.

Why does price discrimination occur? And what determines who will pay the higher price? To answer these questions, let us turn to a different example of price discrimination --- that practiced by doctors. Refer to the demand curve on the next page. Assume that this represents the demand for physical examinations. **The important point is that this is a downward-sloping demand curve.** If the doctor raises the price, the quantity demanded falls, but not to zero. The supply curve is not shown here. If it were shown, the equilibrium price would be \$100. At this price, the doctor would provide 100 physical examinations per year. The doctor would earn \$10,000 (100 @ \$100) from physical examinations.

Notice point A. If the price were \$150, there are 50 people who still want physical examinations. These 50 people are willing to pay \$150 for a physical examination. But the market price is only \$100. Therefore, each of these people has a consumer surplus of \$50 (*remember from Chapter 13 that the consumer surplus is the difference between the*

Price Discrimination



maximum one is willing to pay and the amount one must pay for the product.) Now notice point B. Since we know that 100 people would have physical examinations at the price of \$100, there must be 50 people who are willing to pay \$100 for a physical examination but are not willing to pay \$150. Finally, notice point C. If the price is \$50, there are 150 people who desire a physical examination. Therefore, there must be 50 people who are willing to pay \$50 but are not willing to pay \$100 or more. At the market price of \$100, these people would not have a physical examination.

Now assume that the doctor practices price discrimination. Assume that the doctor can easily determine which patients are in group A, which patients are in group B, and which patients are in group C. Since each of the 50 people in group A is willing to pay \$150, the doctor charges each person this amount. Since each of the 50 people in group B is willing to pay only \$100, the

doctor charges each person this amount. And finally, since each of the 50 people in group C is willing to pay only \$50, the doctor charges each person this amount. Notice that there are 150 people having physical examinations. However, they are paying different prices for the same physical examination. Why would the doctor do this? *The answer is that the revenue received by the doctor rises.* Instead of \$10,000 from physical examinations, the doctor now earns \$15,000 ($50 \times \$150 + 50 \times \$100 + 50 \times \50). Doctors commonly undertake this practice. To them, it is called the “*sliding scale*”.

How does the doctor know which patient is in which group? There are two answers to this question. First, the doctor ascertains whether the patient has health insurance. On one’s first visit to a doctor, the doctor’s staff will take your insurance card and then call the insurance company to find out what will be paid. If the insurance company will pay most of the bill, the patient is in group A. A person with no health insurance will be in group C. The second answer is to determine the patient’s income. A person with a high income would be in group A. One with a low income would be in group C. Of course, it would be crude for the doctor to ask one’s income. But this is not necessary. All the doctor needs to ask is your place of residence, your occupation, and your place of employment. All doctors ask these questions. If a person lives in Beverly Hills and is the Chief Executive Officer of a large corporation, the person is in group A. One who is homeless and unemployed would be in group C.

The practice of price discrimination provides much of the explanation as to why Medicare came to cost so much more than expected. Medicare provides health insurance coverage for people age 65 and up. Prior to 1965, there was no Medicare. Most elderly people had low incomes. When they went to doctors, they would be in a group such as C. After 1965, they were covered by insurance. The government does not have a low income. Therefore, doctors could now bill for the elderly at the rate for group A. In the example above, a physical examination would be billed for \$150. The government would pay 80% (\$120). The patient would have to pay the rest (\$30). The patient is better off than paying the entire bill of \$50. But the doctor is even better-off. The irony is that, while doctors opposed the passage of the law creating Medicare, it became a source of great financial benefit to them.

While access to health insurance and income explain which person is in group A, B, or C for physical examinations, they do not do so for magazines. **And yet, when you subscribe to a magazine, you will pay a lower price than when you renew your subscription.** Since you get the same magazine, this is a form of price discrimination. Why do you have to pay a higher price when it is time to renew? The answer is that you have come to enjoy the magazine. You look forward to its arrival each week. You would be very disappointed if you no longer received it. In the language of Economics, when you subscribe to a magazine, your demand for it is relatively elastic. There are many substitutes since you know little about the magazine. But when you renew, your demand is more inelastic. Since you know and like the magazine, the substitutes are just not as good. *In general, the portion of the market for which demand is more inelastic (elastic) will pay the higher (lower) price. Demand is likely to be more inelastic if there are few substitutes or if the price is low in relation to income.* For higher income people, the demand for physical examinations was more inelastic; therefore, they are charged the higher price.

Another example of price discrimination involves California agriculture. Several products, including lemons, oranges, raisins, and almonds, operate with what is called a **Marketing Order**. Government mandates that a group of growers control the supply so as to raise the price of the product. In each of the above cases, the group of growers divides the market into a domestic market and an export market. In the case of citrus, they also divide the market into a fresh market and a processing market. The price elasticity of demand is much lower (more inelastic) in the domestic market (and also in the fresh market). In these markets, the supply is strictly limited in order to keep prices high. Any extra production is sold in the foreign (or processing) markets at much lower prices because the demand is more elastic there.

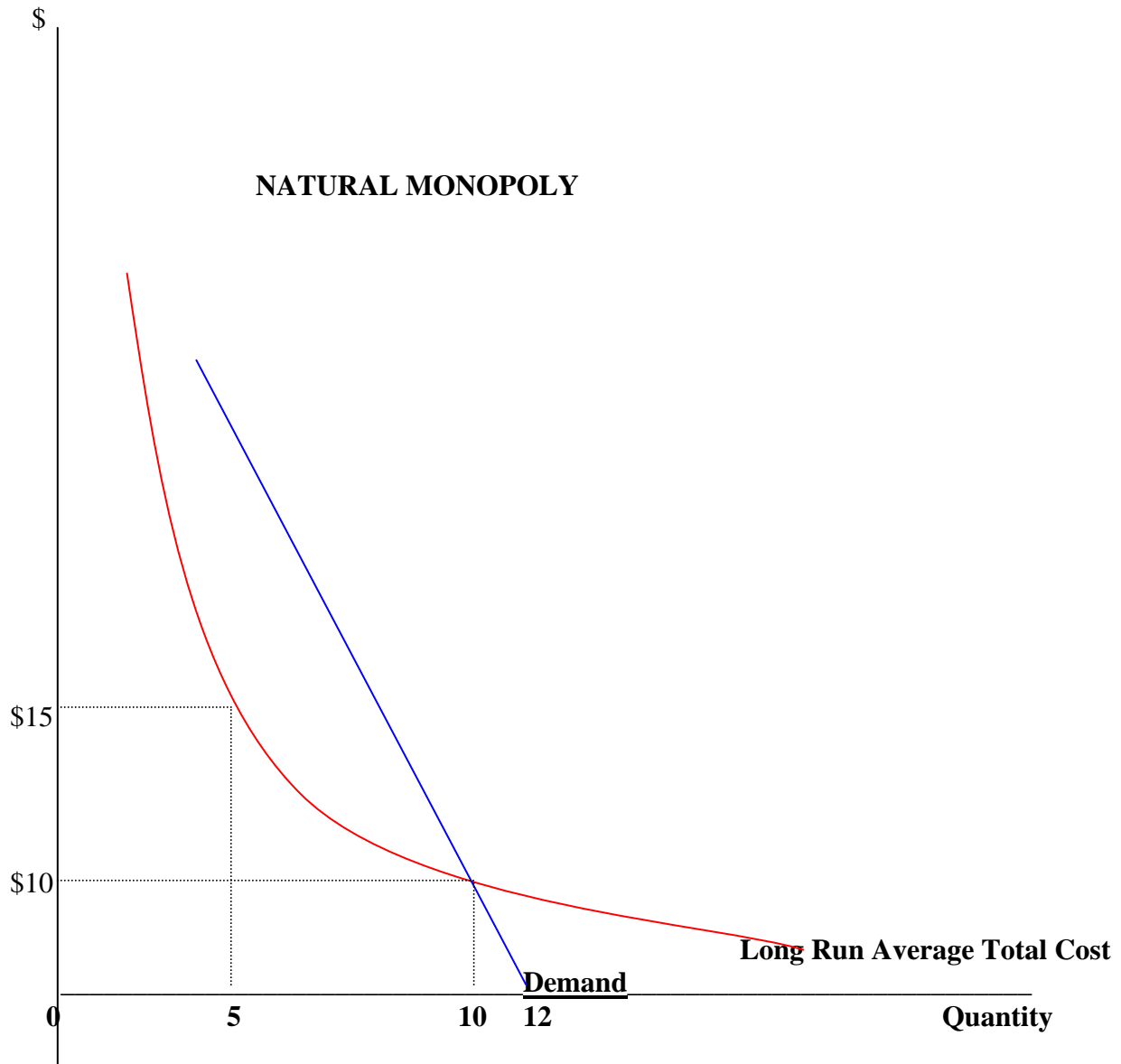
Perhaps the best example of price discrimination is that done by universities. Take the example of Money U. People apply to Money U. It will admit those it desires most to have as students. It will choose people who have a high likelihood of succeeding at the university and who will create the type of student body it believes is best. Having decided whom to admit, Money U asks in effect “what is the most we can charge this person and still have the person attend?”. This question can be answered based on the financial information provided when one applies for financial aid. With this information, there are formulas telling the university the maximum one would be willing and able to pay. If the university wants the person to attend, the difference between the full charge and this maximum is given to the person as **financial aid**. So, for example, Mary comes from a rich family. She will be charged the full \$30,000 per year to attend. The university knows that, because this is a small part of her family’s income, her demand is relatively inelastic. On the other hand, Linda comes from a middle class family. Based on the formulas, it is determined that she can be charged \$10,000 and she will still choose to attend. Linda then gets financial aid of \$20,000. The financial aid is a form of price discrimination. It is possible that every student at Money U is paying a different price to attend.

Test Your Understanding

1. It is a surprise to many people that a Mercedes Benz, produced in Germany, is more expensive in Germany than the **same car** sold in the United States. This is true despite the added costs of shipping the car to the United States. **Use the principles of price discrimination to explain why this would be so.** Ignore differences in taxes.
2. **Use the principles of price discrimination** to explain the following:
 - a. Why do students and the elderly pay a lower price for movies than others
 - b. Why does SDG&E charge a lower price to business users than to household users?
 - c. Why do long-distance companies charge a higher price to business users than to household users?

Case 2: Natural Monopoly

Occasionally, there are situations in which there can be **only one seller**. Since there can be only one seller, this situation is called a **“natural monopoly”**. **The main condition that leads to this result is economies of scale over the entire market. This means that larger companies can continually produce at a lower cost per unit than smaller companies.** There is, of course, some limit to the cost advantage that large companies will have. But this limit occurs at a quantity greater than the entire market. The situation is shown in the graph on the next page. **Notice that the long-run average cost reaches its minimum at some quantity larger than 12 whereas the maximum size of the market is 12** (if the price were zero, 12 would be demanded)



Economies of scale are so great because a very high portion of the total cost of production is fixed (this means that a very high portion of the total cost is the cost of the capital goods).

Industries generating a natural monopoly situation typically produce with large amounts of capital and small amounts of labor. (In most companies, perhaps 1/3 of the total cost is the cost of capital goods. In the industries we are considering here, perhaps 2/3 of the total cost is the cost of capital goods.)

Imagine that there were two such companies in this industry, each selling half of the total sales. *Each company would have considerable excess capacity. This means that each company would have a considerable part of its capital goods that are not being used. Therefore, each company would find that it could lower its costs of production considerably if it could sell more.* (That is, if 5 units are sold, each company would have a cost per unit of \$15. By increasing production from 5 to 10 units, the cost per unit could be lowered to \$10. This

occurs because the capital goods have already been paid for. If the company increases its production from 5 units to 10 units, the cost of the capital goods is simply spread over more units.) Company 1 would decide to attract more customers in order to lower its average total cost (that is, to get better use of its capital goods). It would do this by lowering its price. This takes buyers away from Company 2. Company 2 therefore would respond by lowering its price. Each is back where it began. Company 1 therefore lowers its price yet again. **A price war occurs.** Typically, one company is financially stronger and is able to survive the lower prices. The other company fails and is bought out by the survivor. The surviving company emerges as a monopoly.

One recent illustration of this occurred with airlines. Most of the costs of production of an airline company are the costs of capital goods --- especially, the cost of the plane itself. With many airlines, each had excess capacity. This was seen as empty seats. Each airline realized that filling the empty seats would bring in revenue while adding little to costs (since most of the costs are fixed). To fill these seats, one airline lowered its price. The others followed. The first responded by lowering its price again. A price war occurred. Not only were there lower prices, but there was intense competition over frequent flyer miles, paying for hotels and food, and so forth. Some of the airlines (Eastern, Braniff, etc.) were driven out of business. When the price war ended, there were fewer airlines. However, because the market for airline travel is so large, more than one company survived. In a small market, the number of companies would be reduced to only one. Therefore, **a second condition for a natural monopoly to result is that the market size be relatively small.**

Let us examine another example: a baseball team. Suppose you want to start a team to compete with the baseball team in your city. Assume that you can get the money, the dates at the stadium, and the teams to play against you. Is it possible that two teams could be profitable? The answer is "probably not" (except in New York and perhaps Chicago). To get just enough revenue to cover the costs, the team would need attendance of at least 2 1/2 million people. Most teams have a hard time doing this. The market is just too small to support more than one baseball team! (Question: Since there is only one baseball team in the area, would this be considered pure monopoly or monopolistic competition? Why?)

Below we will examine yet another example: **high technology.** High technology companies have two characteristics that make them similar to the case of airlines. One is that **a high portion of the total cost of production for a high technology company is a fixed cost.** But whereas for the airlines, this was represented by the cost of the airplane (capital), for high technology companies, it is represented by the costs of research and development (R&D). (Question: explain why research and development costs are fixed and not variable.) A second characteristic is that, **in high technology companies, learning by doing is much more important than for most other businesses.** New products are developed with great frequency. Development of a new product then requires development of the means to produce it. The production method is then refined over and over as the company accumulates experience with it. It should not be surprising that companies in industries that are considered high technology (computers, semiconductors, aerospace, pharmaceutical drugs, electronics, and so forth) are characterized by a small number of very large companies. This case is analyzed below.

In the case of airline companies and high technology companies, there will be few large companies in the industry. But the market is large enough to support more than one company.

When the market is very small, as noted above, the number of companies will be reduced to one. This is a natural monopoly. If the demand for the product is relatively elastic, there is no great problem caused by this natural monopoly. If the company raised its prices too greatly, people would just buy something else. **But if the demand is relatively inelastic, there is a major problem. The company will be a pure monopoly and, if it raises its prices, buyers can only reduce their demand very little.** Since there is great potential for these companies to exploit buyers, they are regulated as *public utilities*. (In many countries, they are government owned.) Companies that have been regulated as natural monopolies with relatively inelastic demand include San Diego Gas and Electric, Pacific Bell, the various Cable Television Companies, bus companies, taxi companies, and so forth. These are analyzed below.

Test Your Understanding

In this section, the reasons for the phenomenon of natural monopolies were described. The bus system in North County is a natural monopoly while the airline industry is not. Using the reasons discussed in this section, explain why this is so.

Case 3: Information Technology Companies: The Tendency to Monopoly

One way that markets for information goods (goods that involve information technology) are different from other types of markets is that *competition in the production of information goods generates a winner-take-all result*. One company typically emerges as a monopoly, with all of the problems for society that result from monopoly. Let us see why monopoly may be the inevitable result in these kinds of industries.

High Fixed Costs with Low Marginal Costs

Most information goods, especially software, have an unusual cost structure. *First, the fixed costs of production are very high.* The fixed costs are called “*first copy costs*”. *This means that a great amount of money needs to be spent to develop software products.* A large number of programmers and testers must be paid high salaries to develop these products. And there are also promotion and selling costs. Besides being fixed, these costs are also what are called “*sunk costs*”. *This means that, once these costs are incurred, the money spent cannot be recovered.* (If I buy some land and it turns out to be a mistake, I can perhaps sell it and get some or all of my money back. But if I produce a book, a film, or a software product, and it is a bad product, I cannot recover my money at all.). Sunk costs are paid before production begins.

In Chapter 14 on the Costs of Production, we developed the important point that the cost of producing a good or service rises as we produce more of it (increasing marginal cost). This resulted from the law of diminishing marginal returns and is certainly true for most products. However, once a software product is produced and the fixed costs have been incurred, *the variable costs of production, and therefore the marginal cost, are very low.* Reproducing a new disk, publishing a new copy of a book, or printing a new copy of a film can usually be done for just a few dollars. For example, Microsoft spent millions of dollars developing its operating system, Windows NT, which contains over 16 million lines of code. Yet, a copy of Windows NT can be reproduced for less than a dollar. *Not only are the variable costs low, but the marginal cost of producing another copy usually does not increase as more is produced.* If you can produce one copy for \$1.00, you can produce the 1 millionth copy for the same \$1.00. **So, for software products, the law of diminishing marginal returns seems to no longer exist.**

The situation for software producers resembles that of *natural monopolies*. The combination of high fixed costs of production and low variable costs of production means that the long-run average total cost is falling. *There are very extensive economies of scale*. Producers will find that they can lower the average total cost of producing if they can produce in very large quantities. In fact, given the nature of the technology, there may be no other way that they can lower their costs of production. When such a situation exists, *we cannot expect such an industry to resemble perfect competition. Only one company may survive. This occurs because, in the nature of the technology, there are no limits as to how many units of a particular product can be produced. One company can produce the entire amount produced without experiencing much of an increase in its costs.* (We considered the question as to whether Microsoft is a monopoly in Chapter 10. But Microsoft has gained an average gross profit margin of 92% on its products. And it is no surprise that three of the five wealthiest individuals in the world are Microsoft executives.)

There is one result of monopoly that we don't see in the case of software producers --- high prices. Because of the substantial economies of scale, the company that is producing the software product has a major incentive to increase sales. Higher quantity produced means a lower average total cost of production. The way to increase sales is to lower the price. Since the marginal cost is very low, a low price will still add to profits. *So one would expect to see producers continually lowering prices in these types of industries.* This, of course, is unusual behavior for companies with monopoly power.

More consistent with the behavior of companies with monopoly power, as we also saw in Chapter 19, is the practice of *price discrimination*. This means that the producers sell to different buyers for different prices. *Price discrimination is a common practice for producers whose major product is information.* For example, it is not unusual for a "deluxe" version of a software program to be sold to some buyers for hundreds of dollars while a slightly less powerful version is sold to other buyers for perhaps \$20.

Network Externalities

For most goods or services, the value in the market (the price) falls if more of the good or service is produced. This is the law of diminishing marginal utility. But for many information goods, this may not be true. For these goods, as more is produced, the good becomes even more valuable. *These high technology goods have what are called "demand-side externalities" or "network externalities". This means that the value of a product to a consumer depends on the number of other people already using it.* An E-mail account is of little value if E-mail accounts are relatively scarce. As more and more people have E-mail accounts, having an E-mail account becomes more valuable. A telephone is worthless if no one else has one and is not worth much if only a few people have one. The same is true for a fax machine. Or consider the battle for dominance in computers between the Mac and the PC (typically with an Intel microchip and Windows from Microsoft). When I first bought a computer in 1989, there was no doubt that the Mac was the better computer. Yet like most people, I bought a PC. I did so because so many more people used PCs. Because PCs had so many more users, the people who create software applications had created more applications for the PC than for the Mac. If I wished to share files with someone else, it would have been much harder to do so with a Mac than with a PC. If I needed help (and I certainly did), it would be easier to find people with experience with the PC than with the Mac. *This phenomenon is known as "positive feedback". The more people who*

use a product the more likely it is that other people will also use the product. According to **Metcalf's Law** (named for Bob Metcalfe, the founder of 3 Com), **the value of a network increases exponentially with its size.** So, a network that becomes ten times larger in size may be 100 times more valuable.

Combining network externalities with economies of scale (from the previous section) leads to an enormous drive for growth. Indeed, for producers of information goods, growth is essential for a company's survival. **First, as noted above, if a company can produce in greater volume, it can produce the product at a lower average total cost. Second, the greater volume also enhances the value of the product to the consumer.** This generates a virtuous circle. By making it cheaper and also more desirable, growth begets more growth which begets more growth. The company that is first to start growing may become a monopoly (or at least the dominant company in an oligopoly). In an earlier chapter, this was called a *“first mover advantage”*.

When companies compete in a market in which there is positive feedback, only one of the companies may emerge as the winner. Economists call such a market *“tippy”*, because it can tip in favor of one company or the other. The strong become even stronger while the weak become even weaker. In such a market, a single company may conquer all of the others. There are many examples of this phenomenon of positive feedback. In 1985, Nintendo entered the market for home video games. At the time, the market was dominated by Atari. Nintendo was very popular. As more people bought it, more people wanted it. This led game developers to create more games for the Nintendo system, making Nintendo even more popular. Nintendo was able to get an agreement that the game developers would not make their games available to competitors for two years. Nintendo came to dominate home video games. In the early 1980s, the dominant spreadsheet was VisiCalc. As computers became better and faster, Lotus 1-2-3 came out with a better product. As more people bought Lotus 1-2-3, they could share files. This made it more desirable for others to also buy Lotus 1-2-3. The spreadsheet market grew tremendously. But VisiCalc faded into history. Then, Microsoft Excel replaced Lotus 1-2-3 in the same manner. Positive feedback is also responsible for the dominance of Microsoft operating system, Windows over OS/2 and the Microsoft word processor, Word over Word Perfect.

Because the value of the product is enhanced as more people use it, it is important that there be *a common standard*. I want to be able to read computer files written by others. And I may want others to read computer files that I have written. There needs to be a standard technology that allows us to communicate. Film producers would not produce videos if there were not a common way for people to be able to view them. And so forth. But who is to determine the standard that will be used? In some cases, governments determine the standards. So, for example, fax machines communicate with each other by means of an international standard that is not owned by any company. In some cases, companies create a standard but make it available to everyone. This is called an *“open standard”*. But in other cases, the standard is what is called *“proprietary”*. This means that the standard is owned by the company that created the technology. Microsoft has been famous (notorious?) for having proprietary standards. If the standard is successful, it may be propelled forward by positive feedback. This phenomenon has been called *“path dependence”*. Where positive feedback is important, the particular path chosen may depend only on who happened to develop the technology first. The technology that becomes the standard may or may not be the best one.

Let us examine some **examples of path dependence** where the standard chosen may not have been the best one. One example that has been commonly mentioned is the case of the typewriter. You are all familiar with **the QWERTY keyboard**, named for the first six letters in the upper row. This keyboard was designed around the time of the Civil War. Given the way typewriters were built at that time, typists could type faster than the keys could strike, causing the keys to constantly jam. The QWERTY keyboard was designed to cause typists to type slower. Since that time, the problem of keys jamming has, of course, been resolved. So why has the QWERTY keyboard persisted for so many years? The answer is that people who learn to type learn on the QWERTY keyboard. They do so because all companies at which they might be asked to type use typewriters with the QWERTY keyboard. There is no reason to learn any other keyboard, even if it might be faster. And the companies buy typewriters with the QWERTY keyboard because all typists they might hire know how to use it. Many years ago, Dvorak developed a keyboard from which one can type faster. Virtually no one knows about it. A similar example is the case of the **videocassette**. Sony pioneered the videocassette with its Beta system. According to at least some people, Beta was the technologically superior system (although this is disputed). But Sony kept the technology to itself (proprietary). The company that developed the VHS system, Matsushita, made its technology open to others. As a result, companies built machines for the VHS system. Filmmakers produced videocassettes using the VHS system. VHS became the standard and Beta has ceased to be used.

All of the concepts mentioned here --- network externalities, positive feedback, and path dependence, reinforce the tendency of companies producing information goods to be in industries with very limited amounts of competition.

The Lock-In Effect

For many information goods for which there is positive feedback and for which standards are important, *once a consumer has purchased the product, the cost of switching to a different product can be very high*. The consumer becomes *“locked in”* to a given product or a given technology. The cost of switching may involve a new purchase that must be made, typically of both a new product and new complementary products. But more likely, the cost of switching involves a considerable amount of learning time. Typists may be locked into the QWERTY keyboard because the cost in time of learning another keyboard would be very high. The same is true for many software applications. It took me, a computer novice, much time and effort to learn how to use Windows. Now, I can work with Windows fairly well. It would take me much more time and effort to learn a different system. I would only make that effort if the new system were enormously better than the one I know.

Test Your Understanding

Think about the costs of switching in each of the following situations: (1) switching from America Online to another company, such as Earthlink; (2) switching from SBC to another local telephone provider; (3) switching from San Diego Gas and Electric to another gas and electricity company; or (4) from the compact disc to DVD or from analog television to high-definition television. Why, in some of these cases, are the switching costs low while in others, the switching costs are high?

Potential for Collusion

The existence of network externalities and positive feedback changes the nature of competition between companies that produce information goods. On the one hand, there is the competitive drive to be the “first mover”, to have one’s technology become the industry standard. On the other hand, because a network depends on the compatibility of many different parts, **there is a necessity to cooperate with other companies**. For example, Microsoft and Netscape, who have been strong competitors, cooperated in agreeing to a common standard, the Virtual Reality Modeling Language, which allows 3-D viewing on the Internet. Visa and Master Card, also competitors, cooperated in the creation of the Secure Electronic Transactions standard, a method of protecting the security of electronic payments.

Conclusion for Case 3

What can we conclude? *The main conclusion is that for certain information goods -- those for which fixed costs are high while marginal costs are low, for which there are strong network externalities (positive feedback), and for which switching costs are high enough to generate the phenomenon of “lock-in” – production of the good may become dominated by one company (or possibly just a few companies).* Perfect competition will not even closely approximate the situation for these types of products.

Some economists are greatly concerned about the possibility of monopoly while others are more sanguine. Those who are less concerned argue that the companies who come to dominate certain software products act as though they are in what is called a *“contestable market”*. *This means that, even though there is little actual competition, there is a great amount of potential competition (no barriers to entry).* It is argued that, if a potential competitor can make a better product, it would be able to win a large share of the market. The dominant company must continually innovate if it wishes to succeed (or even survive). In addition, as we saw above, the company that dominates the market will not charge a high monopoly price. Indeed, its prices may be as low as would exist if perfect competition were possible.

Test Your Understanding

Write an essay explaining why Microsoft Windows is on over 90% of all computers in the world. Use all of the points made in this section of the text in your answer.

Case 4: Public Utility Regulation

Public utilities were defined on Page 8 above. In the United States, most public utilities are privately owned companies. Let us take the case of familiar companies such as San Diego Gas and Electric (SDG&E) and SBC. SDG&E is now part of Sempra Energy, and is owned by shareholders. Before it became part of Sempra, SDG&E had about 115,000 shareholders, mostly from San Diego County. SBC is also owned by shareholders. But even though these are private companies, they have been heavily regulated by an agency known as the *Public Utilities Commission (PUC)*. The PUC operates at the state level of government. It has five members, each of whom is appointed by the Governor of California and confirmed by the State Senate for a four-year term. These five people regulate the most important activities of about 1,264 telecommunications, energy, and water companies as well as 3,300 transportation companies.

There has been considerable dispute as to what the Public Utilities Commission ought to do.

In theory, it is to try to achieve the results that would occur if there were perfect competition, even though the companies are actually natural monopolies. Of course, as we saw, there are many results from perfect competition. The one that is chosen here is profits. *The basic regulatory principle is that these companies should earn the same profits as would be earned if there were perfect competition. This means zero economic profits --- the shareholders should earn a return that is equal to what they would earn in alternative investments of equal risk. This is known as Average Cost Pricing (if the price is equal to the average total cost of production, the economic profit must be zero).* The price is set equal to the average total cost. On the graph on Page 6, this means that the price is to be \$10. The company sets its prices so that it earns the profits it is allowed to earn. If, for some reason, the prices are too high and the company earns more than it is allowed, it must give the excess back to the customers as a rebate. If conditions change and the company is earning less profit than it is allowed, the company must apply to the PUC for an increase in its prices (the prices are known as “rates”). The PUC may be slow to grant the approval, a phenomenon known as “regulatory lag”. For most businesses, profits are calculated as a percent of the owner’s investment. For example, if you bought a stock for \$100 and you received a dividend of \$5, you would say that your return was 5%. But, for public utilities, the situation was different. *Here, profits were calculated as a percent of the value of the capital goods. The value of the capital goods is called the “rate base”.*

Problems with Regulation of Public Utilities

Over the years, there were many problems from the way by which public utilities were regulated. Some of these problems acted to hurt the companies. **First, there was the “regulatory lag”**, as noted above. In the past, the PUC could take up to two years to act on a proposal to allow an increase in the rates. During this time, the companies would earn an economic profit that was less than zero.

Second, there were problems with the calculation of the rate base. The capital goods are valued at historical cost minus depreciation. Some of the large buildings and other equipment were purchased many years ago, when the price paid was much lower than today. In the decade of the 1970s, prices of all goods and services (including capital goods) rose rapidly. For buildings and equipment bought before this time, the value on the books may have been much less than the true value in the market today. **This means that the companies’ profits were, in reality, too low.** The company could apply for an increase in rates, but often had to wait for a considerable time for approval. This scenario describes much of what happened to SDG&E during the 1970s and 1980s. (As an analogy, let us say that you bought a house in 1975. You would have paid about \$65,000 for the average house. Today, it would be partly depreciated. By conventional accounting methods, your house would be worth perhaps \$35,000 to \$40,000. If your profits were based on this, you would not earn much. In reality, your house today might be actually worth \$500,000 in the market. The same principle applies to the buildings and equipment bought by the public utility companies.)

On the other hand, most of the problems involved procedures that either hurt consumers or were economically inefficient. *One problem involved the decision to base the profits on the value of the capital goods. This gave the companies the incentive to expand the amount of capital goods – perhaps beyond the amount that would be best.* More capital goods would not mean a higher profit rate, but would mean more dollars of profit. These dollars could be spent

by the management (review the material concerning bureaucracies and their behaviors). The public utility companies often requested an expansion of the amount of their capital goods. While these requests must be approved by the PUC, this was typically done (often with considerable controversy). Three requests for expansion of capital goods from San Diego Gas and Electric (SDG&E) in the 1970s were especially controversial. In 1970, SDG&E issued a report stating that the demand for electricity would triple by 1982. On the basis of this report, the Public Utilities Commission approved these requests. One was to be part-owner of a coal-fired power plant in Utah. A second was for a coal-fired power plant in Sycamore Canyon (east of Poway). And a third was to be part-owner of a nuclear power plant near Blythe (not far from Yuma Arizona). Considerable funds were spent on all three projects. Yet, none of these three ever produced electricity. All were stopped for environmental reasons. The question then became “who is to pay for the funds that were spent on these projects?” Should it be the owners of the company or the ratepayers? The Commission decided that the ratepayers should pay. The amount spent was included in the rate base for SDG&E. (One should not exaggerate the effect of this. The amount paid represented only a small portion of a typical family’s bill.) The 1970 report on which the requests were based turned out to be erroneous. Instead of tripling, as SDG&E had predicted, the demand for electricity rose only about 50%. Is this an honest error, given the difficulty of predicting into the future? Or was the report biased by the fact that the company would gain dollars if the projects were approved?

Another problem involved the definition of “cost”. Since cost is a reduction from profits, we normally assume that, if a company decides to incur a cost, it must be necessary. But when the profit rate is set, there is no reason for such an assumption. ***Companies whose profit rates were set, such as public utilities, had little incentives to hold down costs.*** For example, one controversial cost is lobbying. San Diego Gas and Electric maintained a paid lobbyist. Would it do so if the cost of this lobbyist reduced the company’s profits? Should ratepayers have to pay for a lobbyist who may be advocating policies that ratepayers oppose? Another controversial cost is advertising. And a third controversial cost involves the salaries of the executives. When one recent Chief Executive Officer of SDG&E took over in the early 1980s, the salary was approximately \$160,000. Most people believe that he did a very good job. Before he retired in 1995, the same person received a salary of \$528,615 plus bonuses of \$253,000. Is this a legitimate salary for such a position or not? Would the owners have agreed to pay this much if doing so had come from their profits?

A third problem involved the perverse incentives from any effort to achieve conservation. San Diego Gas and Electric was ordered by the PUC to create conservation programs to reduce the use of gas and electricity. And the water District undertook programs to help people use less water. In both cases, the demand falls. This would reduce the company’s profits. In order to prevent this, after some time, the rates must be raised. ***The reward for conserving electricity or water is that one must pay higher rates.***

A final problem involved the allocation of society’s resources. Recall that the price is set equal to the average total cost of production. Since this is a natural monopoly, the average total cost must be falling. When the average total cost is falling, the marginal cost must be below the average total cost. As a result, we know that ***the price must be greater than the marginal cost.*** In Chapter 17, we saw that, ***if the price is greater than the marginal cost, too little of the product is being produced from the point of view of the society (allocative inefficiency).*** Society would be better off if more of its resources were allocated to the production of this product.

Test Your Understanding

This section has described the reasons for the phenomenon of natural monopolies. Yet, at this time, natural monopolies seem to be ending in many public utilities. We say that **“the public utilities are being deregulated”**. As of now, you are able to buy your natural gas and electricity through SDG&E from any of a large number of companies. You can also buy local telephone services from any of a large number of companies, just as you have been able to do for long-distance for many years. Based on the principles that generated natural monopolies, **why do you think these changes have been occurring at this time?**

Appendix: Electricity Deregulation in California

In the year 2000, electricity became the hottest political issue in California. Electricity rates soared beyond anything that had been seen before. The state experienced rolling blackouts. The public was mad --- mad at the electric utility companies, mad at the state government, mad at the electricity generating companies. A popular governor saw his popularity with the public plunge. In other states, California was a subject for derision. For late night comedians, California was an infinite source of jokes. Let us examine what happened, beginning with the decision to abandon the system of public utility regulation described above

In 1994, California began the process of restructuring of its electricity system. This decision had been motivated by the relatively high prices of electricity faced by California consumers and businesses, especially compared to neighboring states. **These relatively high prices existed partially because of the decision to build the amount of capital needed to produce the amount of electricity generated at the peak of the day.** For the rest of the day, this capital lay idle. **The high electricity prices had also been the result of costly mistakes that had been made by the investor-owned utilities, with the approval of the Public Utilities Commission.** The investor-owned utilities had built nuclear power plants that had turned out to be much more expensive than had originally been expected. They also had signed long-term contracts with small electricity generators that had committed them to pay very high wholesale prices for electricity.¹ The three large investor-owned utilities in the state (Pacific Gas & Electric, Southern California Edison, and SDG&E) are powerful political forces. So when the restructuring law was finally passed in 1996, they used their influence to assure that the law permitted them to fully recover the costs of these mistakes (these were known as **“stranded costs”**).

To do this, the 1996 restructuring law created a **Competition Transition Charge**. This fixed the retail price for electricity at about six cents per kilowatt-hour (= \$60 per megawatt hour). Since the wholesale price of electricity was expected to be lower than six cents, the utilities would use the difference between six cents and the actual wholesale price to “recover their stranded costs”. (**“Wholesale prices”** are paid by the utility company to buy electricity from the generating company. So, for example, SDG&E pays the wholesale price when it buys electricity from Duke Energy, which owns the generating plant in Carlsbad. **“Retail prices”** are paid by households and businesses to buy electricity from utilities such as SDG&E.) That is, if the wholesale price were four cents, then two cents for each kilowatt-hour would go to the utilities to allow them to pay the costs of their nuclear power plants and the long-term contract wholesale purchases. The lower the wholesale prices of electricity, the faster the utilities would recover their stranded costs. Once a utility had recovered all of its stranded costs, the consumer would pay a rate based only on the wholesale price of electricity (as had been the case under regulation

as described above). As this occurred, it was expected that retail prices would decrease.

SDG&E was the first company to recover its stranded costs. It did so in 1999. As described below, in 2000, the wholesale prices soared. SDG&E passed these higher wholesale prices on to consumers, as it was now allowed to do. The public protested vigorously. Because of the outcry, the California legislature decided to freeze the retail prices SDG&E could charge. The other two investor-owned utilities (Pacific Gas and Electric and Southern California Edison) had not yet recovered their stranded costs, so they still had to sell electricity at six cents per kilowatt-hour that was costing them ten cents per kilowatt-hour to buy.

The 1996 restructuring law also created the *California Power Exchange (PX), a non-profit corporation*. The Power Exchange ran a market for the next day's electricity (called a "*day-ahead market*"). All producers were to sell their power through the Power Exchange. All retailers were to buy their power through the Power Exchange. The price was determined by demand and supply. As of 1998, the three investor-owned utilities were producing most of their own electricity. **But from then through the end of 1999, they were required to sell nearly all of their natural gas powered plants** presumably in order to increase competition. (The utilities did keep ownership of their nuclear, hydroelectric, and geothermal plants.) **These natural gas powered electricity generation plants were bought by five companies (Duke, AES/Williams, Reliant, Dynergy, and Southern)**. Each of these five companies came to own about 6% to 8% of the state's capacity to produce electricity, presumably not enough to affect market prices. SDG&E has sold all of its production plants and has become mainly a regulated distributor of electricity. (The distribution of electricity to your home or business has not been restructured and is still a regulated public utility monopoly.) *So there were seven suppliers of electricity in California. And the demanders – the companies who were to buy electricity on the Power Exchange --- were mainly the three investor-owned utilities.*

The restructuring law also created the *Independent System Operator (ISO), also a non-profit corporation*. The job of the Independent System Operator was to manage the electricity grid in the state. It was to adjust the supply of electricity to equal the demand in all parts of the state. It also was to adjust the prices to reflect the difference between supply and demand.

In June of 2000, the wholesale prices of electricity increased greatly. The total cost of wholesale electricity rose from \$7.4 billion in 1999 to \$27 billion in 2000. In September of 2001, average wholesale prices averaged 20-23 cents per kilowatt-hour, compared to 3.3 cents in 1999. The wholesale prices increased for several reasons. **First, the year 2000 was dryer than normal**, reducing hydroelectric production, both in California and in the Pacific Northwest. The summer of 2000 was also hotter than normal, raising the demand for electricity to use for air conditioning. **Second, there had been considerable economic growth in California, especially in the high technology industries.** High technology industries are large users of electricity. **Third, there were large increases in the costs of producing electricity as natural gas prices more than doubled and the cost of pollution permits for nitrous oxide rose from \$4,000 per ton to over \$45,000 per ton – adding about \$45 per megawatt hour to the cost of electricity** (review the section on pollution permits from Chapter 10).² **Fourth, the high demand for electricity forced the producers to use the least efficient plants.** On a hot summer afternoon, 97% of all generators must be running in order to meet demand. The least efficient plants are about half as efficient at converting natural gas to electricity and are also high

polluters. Their costs were more than \$100 per megawatt hour greater than those of the most efficient plants. The wholesale price of electricity had to increase enough to make it profitable for these less efficient plants to produce. **Fifth, no new generating capacity had been added in California in the 1990s. Sixth, there is considerable market power by electricity producers when supplies are tight.** One study estimated that one-third of the wholesale price increase could be attributed to market power. Possibly as an example of this market power, an unusually large amount (up to 35%) of generating capacity was out-of-service between November 2000 and May 2001.³ There are charges being brought against certain energy traders at the present time for manipulating the market for electricity so as to increase prices. Enron has collapsed. Thirty one of its executives are under indictment at the present time for manipulation of the electricity market in California.

One result of the high wholesale prices was the financial decline of the investor-owned utilities. **Pacific Gas & Electric and Southern California Edison were paying wholesale prices for electricity that far exceeded the retail prices they were allowed to charge.** (Pacific Gas & Electric declared bankruptcy in 2001.) By December 2000, these two investor-owned utilities were paying almost \$400 per megawatt hour for wholesale electricity and then reselling it at the fixed price of \$65 per megawatt hour, losing about \$50 million each day. Because it had already recovered its stranded costs, SDG&E was allowed to raise its retail price; for some people in San Diego, the monthly electricity bill tripled between May and June of 2000. Then, as noted above, there was public outcry and the rates for SDG&E were frozen by the state legislature at \$65 per megawatt hour. These three utility companies borrowed over \$15 billion to be able to buy the electricity at the high wholesale prices. The credit rating of these companies fell greatly until eventually no more credit was forthcoming.⁴ (Review price ceilings from Chapter 8.)

The period saw more than a large increase in wholesale prices. It also saw **“rolling blackouts”** --- periods of time during which the electricity was turned off at various places. These resulted from the particular characteristics of the electricity industry, characteristics that differentiate it from other industries. **First, the demand for electricity is very inelastic with respect to the price in the short-run.** This is especially so as there is no mechanism at present to raise prices at times of high demand and lower them at times of low demand (as exists, for example, for long-distance telephone service or airlines). However, the demand for electricity is not perfectly inelastic. A study of San Diego in 2000 indicated that a doubling of the retail price of electricity would cause a decline in demand of 2.2% to 7.6%, depending on the time of day.

Second, the supply of electricity is also very inelastic with respect to the price for three reasons. First, storage of electricity is extremely expensive. Second, increasing production beyond the normal capacity of a plant cannot be done for very long without risking significant damage. Under the old system of regulation described in the chapter, the investor-owned utilities were assured of covering their costs and making a profit (so that economic profits equaled zero). As mentioned earlier, in this regulatory system, they built capacity great enough to cover the peak demand. The state did not suffer from shortages. **Except at rare times of very high demand, the investor-owned utilities had excess capacity.** The cost of this excess capacity was included in the rates paid by consumers. (Remember that the profits of the investor owned utilities were based on the **rate base** --- the value of the capital goods they owned.) In the new system of restructuring, it would be very expensive for companies to have excess capacity that

could be used to expand production quickly. *And third, it takes several years to build a new electricity generation plant.* So the ability to increase production in a short time as a result of a rise in the price is very limited.

Third, all studies of the matter indicate that companies that produce electricity have some degree of market power, especially in those periods during which demand is high. This is a surprising result given the small share of the market held by each producer. But it does seem to hold. When the demand rose and the costs of production rose, there was very little ability for either buyers or sellers to change their behaviors significantly in a short time. Because of these characteristics, even if there had been no ceiling on the price, the rise in demand and the rise in costs would have resulted in a shortage. In California, that shortage manifested itself as rolling blackouts.

In response to the electricity crisis, the Power Exchange crumbled in January 2001. *The state of California, through the California Department of Water Resources, took over the purchase of electricity.* The state then sold this power to the investor-owned utilities to sell to customers. The state had to take over the purchase of electricity because of the poor financial condition of the utilities. The state sold bonds to raise the money to buy this electricity. The bonds are to be paid off over 15 years by raising rates on ratepayers. (Because of their poor financial condition, the utility companies could not sell bonds that people would want to buy.) Another new agency, the **California Consumer Power and Conservation Authority**, was created to acquire generating capacity and sell it to the Department of Water Resources.

The state believed that the practice of requiring the utilities to buy electricity on the day-ahead market had been a mistake. So when it took over the purchase of electricity, *the state government purchased perhaps \$60 billion worth of electricity under long-term contracts from electricity generators and marketers.* Using long-term contracts was designed to protect the state from a situation in which the wholesale prices would rise further. *However, beginning in the summer of 2001, after the long-term contracts were negotiated, wholesale prices of electricity began to fall. Wholesale electricity prices fell first because of a significant decline in demand, partly as a result of a successful conservation effort. Electricity wholesale prices also fell because of a decline in natural gas prices, because of price controls put in place by the Federal Energy Regulatory Commission (FERC), because of the opening of three new power plants in 2001 (the licensing process has been speeded up), because of the return to service of much of the generating capacity that had been off-line, and because of a reduction in the market power of electricity producers.* Therefore, the state is paying more for electricity than it would be paying if it had not negotiated the long-term contracts. (As of January 2002, the state was paying about \$100 per megawatt-hour for electricity that can be bought in the day-after market for perhaps \$30.) Re-negotiating these long-term contracts is one of the current goals of Governor Schwarzenegger..

Several other issues remain from the electricity crisis. The state of California is seeking a refund of \$9 billion from the electricity producers due to “overcharges”. A determination of these refunds was made by the Federal Energy Regulatory Commission. California government officials and the members of the Federal Energy Regulatory Commission have been quite hostile toward each other in the recent past. California was not happy with the settlement arranged by the Commission. So California is suing for more. **The state of California is also suing Pacific**

Gas & Electric. The state argued that Pacific Gas & Electric transferred funds from its public utility to other parts of its corporation and then had the utility declare bankruptcy. This case could take many years to resolve.

There are two solutions to the problem of high electricity prices and/or electricity shortages. **One is that there are dozens of new electricity generation plants under construction in California.** (Remember that it takes several years to complete an electricity generation plant.) **The other solution is that Californians have begun to conserve electricity much more than before.** In July 2001, Californians were using 11% less electricity than they had been using in July of 2000. Small technological changes are very feasible and are currently under development; cumulatively these could have a large effect in reducing electricity use. Examples include the following: (1) more lighting fixtures made especially for the energy-saving compact fluorescent bulbs, (2) improved gaskets, joints, and seals in heating and air conditioning ducts to prevent air leaks, (3) water heaters that draw heat from the surrounding air to reduce energy use in heating the water by up to 60%, (4) washing machines that can adjust water and temperature levels after they figure out how big and soiled a load is, (5) dishwashers that shorten or lengthen cycles depending on how dirty the water is as it re-circulates, (6) new technologies to reduce the need for standby power for VCRs, stereos, televisions, etc. when they are off (standby power accounts for 4% to 7% of residential energy use), (7) greater use of photovoltaic solar energy, geothermal energy, and fuel cells; and so forth. The combination of greater production and greater conservation will ultimately solve the electricity crisis.

Footnotes

1. The Public Utility Regulatory Policy Act, passed in 1978, had required utilities to purchase electric power from certain qualifying cogeneration and small power producers who use renewable fuels. California had required the utilities to purchase electric power from such facilities under long-term contracts at high prices, in order to encourage cogeneration and use of renewable fuels. In the late 1980s and early 1990s, so much of this type of generating capacity began operating that there was significant excess capacity. These high priced contracts helped to drive up retail prices.
2. At that time, natural gas prices were as much as five times higher in California than in other parts of the country. This difference no longer exists.
3. The companies argued that the generating capacity was out-of-service because they had to run the machines so hard that they had broken down. California government officials believe that this was done as a way to raise prices artificially.
4. The restructuring law allowed people to buy electricity directly from new electricity service providers. These new providers were to have access to the transmission and distribution networks of the investor-owned utilities at prices set by the PUC. It had been expected that a large portion of electricity users would switch from the investor-owned utilities to these new electricity service providers. In fact, only 3% of electricity consumers did so. By law, the utilities are obligated to provide electricity to all customers who wish it. They ended up having more customers than they had expected.

Assignments

1. California is now often cited as an example of “how not to do deregulation”. Write a short essay describing to someone unfamiliar with Economics exactly what went wrong with California’s deregulation. (In essence, you are writing a brief summary of this Appendix.)
2. Most of this Appendix was written in January 2002. Go to the Internet. Find whatever articles you need. Write a brief essay explaining what has occurred with regard to the electricity crisis since January 2002.

3. Go to the site: <http://www.ucan.org> UCAN is a consumers group that involves itself with issues relating to utilities. Peruse the site. Then write a brief (one page) essay summarizing some of UCAN's positions regarding the electricity crisis in California and their reasons for these positions.
4. A **Municipal Utility District (MUD)** is a public utility that is government owned instead of investor owned. There is one in Sacramento (SMUD), in Los Angeles (Department of Water and Power), and in Seattle (Seattle Light). In 2001, San Francisco defeated an attempt to create one. Go to the Internet. Get the information you need to answer the following (you might go to the arguments surrounding the San Francisco vote in November, 2001): what are the advantages and what are the disadvantages of a Municipal Utility District as compared to an investor-owned utility?

Practice Quiz on Chapter 19

1. Which of the following best defines **price discrimination**?
 - a. selling a certain product of given quality and cost at different prices to different buyers
 - b. charging different prices on the basis of race
 - c. charging different prices for goods with different costs of production
 - d. charging different prices based on cost-of-service differences
2. To be able to practice **price discrimination**, which of the following is/are needed?
 - a. monopoly power
 - b. ability to separate the market
 - c. ability to prevent reselling
 - d. all of the above
3. In price discrimination, the **higher price** goes to that section of the market where:
 - a. cost per unit is lower
 - b. demand is more elastic
 - c. demand is lower
 - d. demand is more inelastic
4. Which of the following is necessary for a **natural monopoly**?
 - a. economies of scale
 - b. a high proportion of the total cost is the cost of capital
 - c. the market is very small
 - d. all of the above
5. In California, natural monopolies have been private companies regulated by the
 - a. Federal Reserve
 - b. Governor
 - c. PUC
 - d. FBI
6. **Average cost pricing** means that the
 - a. economic profits are zero
 - b. average total cost equals the marginal revenue
 - c. average total cost equals the marginal cost
 - d. all of the above
7. The **rate base** was the
 - a. amount borrowed by the company
 - b. amount invested by the owners
 - c. value of the capital goods
 - d. profits earned by the company
8. Which of the following resulted from the way by which SDG&E was regulated by the PUC?
 - a. when demand fell, the price would fall
 - b. there were incentives to produce as efficiently as possible
 - c. there were incentives to buy more capital goods than would be bought by an unregulated company
 - d. the price was set equal to the marginal cost
 - e. all of the above
9. Which of the following is true about companies producing **information goods**?
 - a. fixed costs are high, marginal costs are low
 - b. fixed costs are low, marginal costs are high
 - c. fixed costs and marginal costs are both high
 - d. fixed costs and marginal costs are both low
10. Industries producing information goods are likely to become:
 - a. perfectly competitive
 - b. monopolistic
 - c. regulated by the government

11. If the value of a product increases as the number of people using it increases, there is/are:
a. a contestable market b. an experience good c. network externalities d. a public good
12. If an industry has one or a few companies, but there are no barriers to entry, the industry is:
a. a contestable market b. an experience good c. a proprietary standard d. a public good
13. The **QWERTY keyboard** has been used to illustrate which of the following:
a. path dependence b. positive feedback c. lock-in d. all of the above
14. A standard that is controlled by the company that developed it is called
a. open b. proprietary c. common

Answers: 1. A 2. D 3. D 4. D 5. C 6. A 7. C 8. C 9. A 10. B 11.C 12. A 13. A 14. B