

Chapter Summaries

Chapter 9: Decreasing Cost Services - the Natural Monopolies

Chapter 9 discusses the natural monopoly, the most extreme case of decreasing cost production. The chapter begins by describing the features of a natural monopoly.

1. Natural monopolies are services whose production is characterized by relatively high set-up costs to be able to provide any service at all coupled with relatively low operating costs. The result is that average cost (AC) declines all the way to market demand. Also, since AC is decreasing, marginal cost (MC) is less than AC.
2. It is natural to have one firm provide the service under these cost conditions to save on total resource costs. A monopoly can supply the market demand more cheaply than can many competitive firms each supplying an output high up on their AC curves.
3. Examples of natural monopolies include: the public utilities (electricity, water, and sewage), recreational facilities (parks and beaches), many forms of transportation (highways, bridges and tunnels, mass rail transit), broadcasting and telecommunications, and software.

The chapter then considers the *pricing decision* for these services.

4. The standard Pareto optimal condition for any private good has to hold for the efficient provision of a natural monopoly's service: $MRS = MRT$ (relative to a reference good whose price and marginal cost equal one). This requires that price equals marginal cost. Therefore, the efficient output and price are at the intersection of the market demand (D) and MC curves, such that $P = MC$.
5. Marginal cost pricing implies that the firm makes a loss. Therefore, the owners have to be subsidized so that they cover their full costs. The subsidy is the difference between AC and MC at the efficient output: $(AC - MC) \cdot Q_{\text{efficient}}$, or $(AC - P) \cdot Q_{\text{efficient}}$. To

maintain efficiency, the subsidy must be lump sum, and any lump-sum payment will do. The distribution branch presumably corrects any unwanted distributional implications of the subsidy when it taxes and transfers to satisfy the interpersonal equity condition for a social welfare maximum.

6. The price most often set for the natural monopolies in the U.S. is the *average cost price*, at the intersection of the market demand and average cost curve. The preference for average cost pricing is that it is fully consistent with the *benefits-received principle*: Users pay for the service, nonusers do not pay, and users pay the entire cost of the service.
7. The U.S. rejects the efficient marginal cost price because the subsidy needed to cover the resulting losses breaks the link between use and payment.

The chapter then considers the *investment decision* related to the natural monopoly, which has an all-or-none feature that is typically absent for private firms: Operate the service at the efficient output with marginal cost pricing or do not operate the service at all. Profitability is not a direct test in answering the all-or-none question because the service operates at a loss if price equals marginal cost. Two cases are identified, the easy case and the hard case.

8. *The easy case* is if the market demand curve either lies above some portion of the AC curve or is tangent to the AC curve, such that the monopolist could set a price that makes an economic profit or at least breaks even. Although the service is operated at a loss at the marginal cost price, the possibility of making a profit or breaking even is sufficient for determining that the service is worthwhile and it should be provided.
9. *The hard case* is if the market demand curve lies everywhere below the market demand curve, such that there is no one price at which the service could at least break even. In this case the service may or may not be worthwhile.
10. The test in this case relies on the compensated demand curve for the service, which is the demand curve obtained by lowering the price to a consumer and having the consumer sacrifice income such that he stays on the same indifference curve. Because income is being sacrificed, the compensated demand curve lies to the left of the actual demand curve.
11. The prices on both the actual and compensated demand curves reflect the consumer's MRS between the service and a reference good whose price is one, but only the MRSs along the compensated demand curve are comparable because they keep the consumer on the same indifference curve (at the same utility level).
12. The area behind the compensated demand curve to the price axis from the point that the demand curve intersects the vertical axis to the actual marginal cost price gives the willingness to pay for being able to consume the service at the marginal cost price. The amount the consumer has to pay is the lump-sum subsidy. If the area

behind the compensated demand curve exceeds the lump-sum subsidy to cover the loss, then the service is worthwhile. If the area behind the compensated demand curve is less than the lump-sum subsidy to cover the loss, then the service is not worthwhile.

13. Since average cost pricing is not possible in the hard case, there is a temptation to try to *minimize the deficit* generated by the service. Minimizing the deficit is the same as maximizing profit. Therefore, the output is selected for which marginal revenue equals marginal cost, with the price given by the market demand curve at that output. Minimizing the deficit runs the risk that the output is so low that the service does not pass the all-or-none test, whereas it would pass the test if price were set equal to marginal cost.

The label “public good” is commonly applied to goods that are nonrival in consumption, meaning that consumption by any one person in no way limits the consumption of any other person. Both nonexclusive goods and decreasing cost services for which marginal cost is zero are nonrival and therefore referred to as public goods. The next section of the chapter shows that they are very different goods, however, and expresses a preference for reserving the label “public good” for the nonexclusive good.

14. Even if the marginal cost of a nonexclusive good were zero, and consumers had the same demands for that good and a zero-marginal-cost decreasing cost service, the efficient quantities of the two goods would differ. The market demand curve for the nonexclusive good is obtained from the vertical summation of the individual demand curves and the efficient quantity is at the intersection of the market demand curve and the horizontal axis. The market demand curve for the zero-marginal-cost decreasing cost service is obtained from the horizontal summation of the individual demand curves and the efficient quantity is at the intersection of the market demand curve and the horizontal axis.

The *natural monopoly model* has recently become much more important because computer software has the characteristics of an easy case, *zero-marginal-cost* decreasing cost service that is truly global in scope. The chapter concludes with a discussion of some interesting pricing issues associated with software.

15. The efficient price of software is zero since marginal cost is zero up to market demand. All the costs associated with software are in creating and testing the programs. Once software programs are ready for market, they can be distributed at zero marginal cost to 2 or 2 billion consumers by downloading them from the Internet.
16. Software firms mostly sell their programs on discs and set prices well above average cost to make a profit. Their pricing and distribution are not efficient. But they could

establish the efficient price of zero by making all-or-none offers to consumers, the same kind of offers that libraries make: Consumers can have access to all of a firm's software, and upgrades, free of charge by paying an annual fee. Otherwise, they cannot use any of the firm's software. All-or-none offers greatly increase the firm's profit because in the limit they can transfer the total value consumers receive from the software to the firm, an amount that is much larger than the total revenue received even with the monopoly price.

17. There is a pressing need to maintain competition for software so that no one firm is capable of making effective all-or-none offers to consumers.