

7 The Optimum of Monopoly, Price Discrimination

7.1 Monopoly

Up to now we have analyzed the behavior of a competitive industry, a market structure that is most likely when there are a large number of small firms. In that case all firms took price as given. In this chapter we turn to the opposite extreme and consider an industry structure when there is only one firm in the industry—a monopoly. A monopolist does not take the price as given. The monopolist will choose the price to maximize the profit.

Profit maximization:

Recall, that in case of perfect competition the optimality condition is $MR = MC$. In case of perfect competition marginal revenue is equal to price and hence in the optimum price equals marginal cost ($p = MC$). This holds because in perfect competition firms take price as given and hence the price is not function of output y . However, in case of monopoly the price is a function of output (the higher the price the lower the demand and vice versa) and hence the term for marginal revenue is a little more complicated.

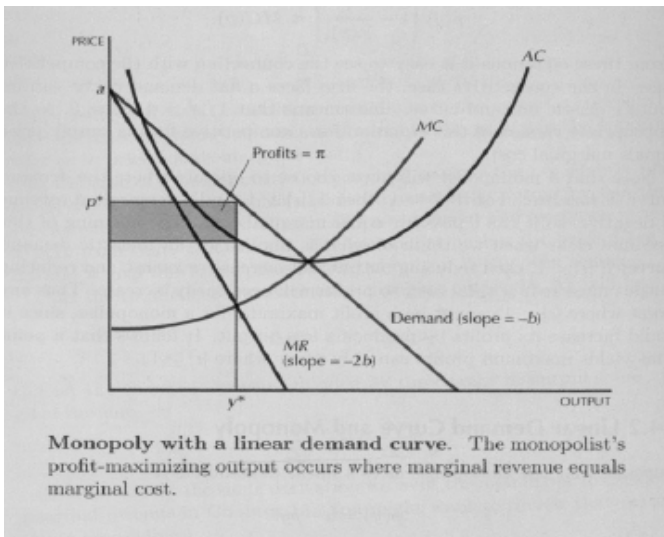
Let's use $p(y)$ to denote the market inverse demand curve and $c(y)$ to denote the cost function. Let $r(y) = p(y)y$ denote the revenue function of the monopolist. The monopolist's profit-maximization problem then takes the form

$$\max_y r(y) - c(y) = \max_y p(y)y - c(y)$$

Optimality condition: at the optimal choice of output we must have marginal revenue equal to marginal cost ($MR = MC$ or $p'(y)y + p(y) = c'(y)$). If marginal revenue were less than marginal cost it would pay the firm to decrease output, since the savings in cost would more than make up for the loss in revenue. If the marginal revenue were greater than the marginal cost, it would pay the firm to increase output. The only point where the firm has no incentive to change output is where marginal revenue equals marginal cost.

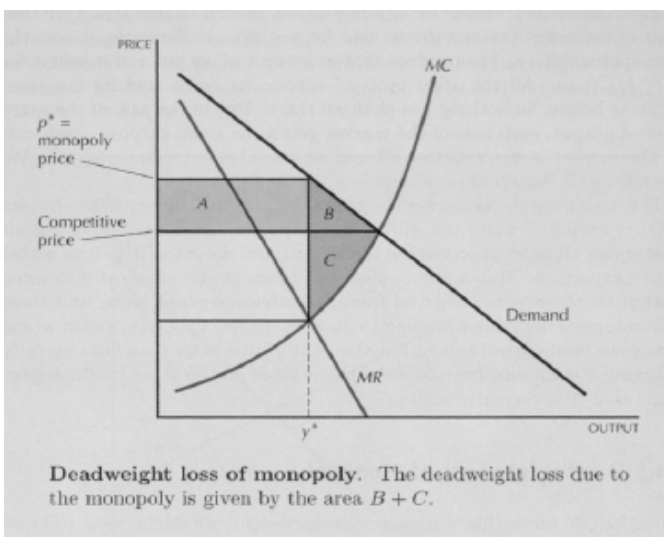
Another way to think about this is to think of the monopolist as choosing its output and price simultaneously. If the monopolist wants to sell more output it has to lower its price. But this lower price will mean a lower price for all of the units it is selling, not just the new units. In the competitive case, a firm that could lower its price below the price charged by other firms would immediately capture the entire market from its competitors. But in the monopolistic case, the monopoly already has the entire market; when it lowers its price, it has to take into account the effect of the price reduction on all the units it sells.

The optimal choice of output and price is depicted on the picture below. The optimal output y^* is where the marginal revenue curve intersects the marginal cost curve. The monopolist will charge the maximal possible price for this level of output. This gives the monopolist a revenue $p(y^*)y^*$ from which we subtract the total cost $c(y^*) = AC(y^*)y^*$ to get the profit (shaded area on the picture below).



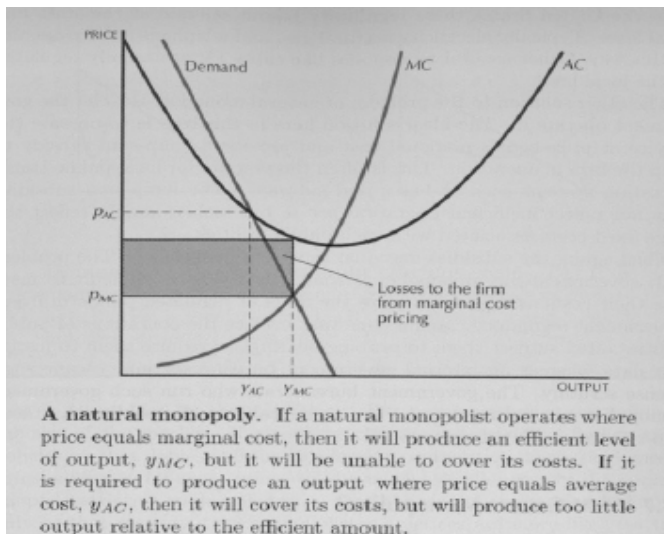
On this picture we have a case of linear demand function of a form $p(y) = a - by$. In this case the revenue function is given by $r(y) = p(y)y = (a - by)y = a - by^2$. And hence marginal revenue is $MR = r'(y) = a - 2by$. Hence it is also a straight line, it has the same vertical intercept and the slope is twice the slope of demand function.

A competitive industry operates at a point where price equals marginal cost. A monopolized industry operates where price is greater than marginal cost. Thus in general the price will be higher and the output lower. For this reason, consumers will typically be worse off in an industry organized as a monopoly than in one organized competitively. The price and output choice of monopolist is not efficient. This pricing also creates an inefficiency on the market. The inefficiency is caused by the following fact: there are people that would be willing to pay some additional units for price higher than marginal cost. But monopoly will not supply these because by selling an additional unit of product would decrease the price of all units sold and overall revenue would decrease.



The deadweight loss due to monopoly, like deadweight loss due to tax, measures the value of output that is lost by valuing each unit at the price that people are willing to pay for it.

Now we know that efficient output is where price is equal to marginal cost. Monopolist produces where marginal revenue is equal to marginal cost and thus produces too little output. It seems that regulation authority could restore efficiency by setting the price equal to marginal cost. However, in some cases this could mean that the monopolist is making negative profit and prefers to leave the market. This situation is illustrated on the picture below.

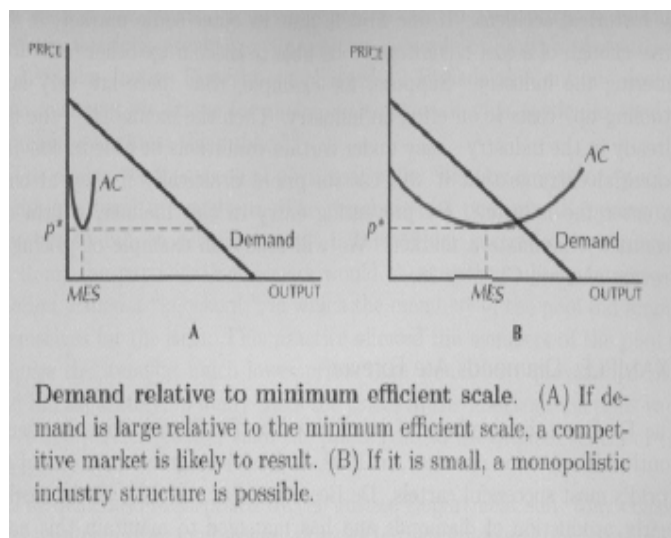


The minimum point of the average cost curve is to the right of the demand curve, and the intersection of demand and marginal cost lies underneath the average cost curve. Even though the level of output Y_{MC} is efficient, it is not profitable. If a regulator set this level of output, the monopolist would prefer to go out of business. This situation often arises when fixed cost of production is very large and marginal cost relatively small (gas company, telephone company, etc.). This situation is referred to as natural **natural monopoly**.

This situation is solved differently in different countries. Sometimes this type of business is run by government sometimes it is run by private firms and regulated by government. In this case the price has to be such that the firm does not make negative profit (it must operate on or above the average cost curve) and also it has to provide service to all who are willing to pay for it (it has to operate on the demand curve). So the natural solution for the firm is to charge price P_{AC} and produce quantity Y_{AC} . This is the usual price set by government regulators. Note: sometimes it might be difficult to estimate the true cost of the firm.

The other solution to the problem of natural monopoly is to let the government operate it. The ideal solution here in this case is to operate the service at price equals marginal cost and provide a lump-sum subsidy to keep the firm in operation. This is often the practice for local public transportation systems such as buses and subways. The lump-sum subsidies may not reflect inefficient operation per se but rather, simply reflect the large fixed costs associated with such public utilities.

Cause of monopoly: Given information on costs and demand, when would we predict that an industry would be competitive and when would we predict that it would be monopolized? In general the answer depends on the relationship between the average cost curve and the demand curve. The crucial factor is the size of the minimum efficient scale (MES), the level of output that minimizes average cost, relative to the size of demand.



Thus the shape of the average cost curve, which in turn is determined by the underlying technology, is one important aspect that determines whether a market will operate competitively or monopolistically. If the minimum efficient scale of production—the level of output that minimizes average costs—is small relative to the size of the market, we might expect that competitive conditions will prevail.

A second reason why monopoly might occur is that several different firms in an industry might be able to collude and restrict output in order to raise prices and thereby increase their profits. When firms collude in this way and attempt to reduce output and increase price, we say the industry is organized as a cartel. Cartels are illegal and firms engaged in this behavior have to pay heavy fines.

7.2 Price Discrimination

We have argued earlier that a monopoly operates at an inefficient level of output since it restricts output to a point where people are willing to pay more for extra output than it costs to produce it. The monopolist doesn't want to produce this extra output, because it would force down the price that it would be able to get for all of its output. But if the monopolist could sell different units of output at different prices, then we have another story. Selling different units of output at different prices is called price discrimination. Economists generally consider the following three kinds of price discrimination:

- **First-degree price discrimination** means that the monopolist sells different units of output for different prices and these prices may differ from person to person. This is sometimes known as the case of perfect price discrimination.
- **Second-degree price discrimination** means that the monopolist sells different units of output for different prices, but every individual who buys the same amount of the good pays

the same price. Thus prices differ across the units of the good, but not across people. The most common example of this is bulk discounts.

- **Third-degree price discrimination** occurs when the monopolist sells output to different people for different prices, but every unit of output sold to a given person sells for the same price. This is the most common form of price discrimination, and examples include senior citizens' discounts, student discounts, and so on.

Price discrimination transfers some of this surplus from the consumer to the producer/marketer. Strictly, a consumer surplus need not exist, for example where price discrimination is necessary merely to pay the costs of production. An example is a high-speed internet connection shared by two consumers in a single building; if one is willing to pay less than half the cost, and the other willing to make up the rest but not to pay the entire cost, then price discrimination is necessary for the purchase to take place.

Examples of price discrimination: Airlines (business class, economy class), employees discount, segmentation by age group, premium pricing (company charges two different prices for low quality and premium product - tesco products), bundling.