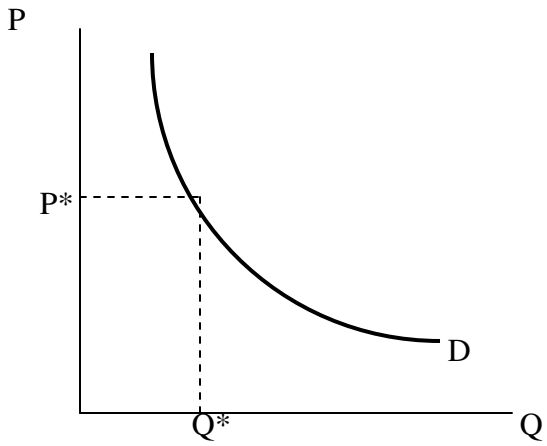
Chapter 10: Monopoly

In this chapter, we move away from perfect competition and consider another extreme market structure: monopoly. We use the term monopoly to refer to a market in which there is only one seller. As we will see, though, any firm that faces a downward-sloping demand curve (as opposed to a PC firm's horizontal demand curve) will have some market power and could be modeled as a monopolist.

While competitive firms are price takers, a monopolist is a "price maker." Since the monopolist is the only firm in the market, it gets to choose its own price. However, the monopolist is still constrained by the market demand curve. Phizer is a monopolist in the market for Allegra, but it cannot charge $250 per pill because nobody would buy at that price. When the monopolist chooses its price, it implicitly chooses its output based on the market demand curve. Conversely, if the monopolist chooses its output, the price it can charge is dictated by market demand. Thus, we can think of the monopolist choosing Q and selecting a particular point on its demand curve, as follows:



Once this monopolist decides on P*, it is committing itself to Q*. Likewise, if it chooses Q*, it is committing itself to P*. There is only one real "choice variable" here – the other is dictated by that initial choice. We will analyze the monopolist as choosing Q.

The one other constraint we put on the monopolist is that it sells all of its output at the same price. In other words, if Phizer sells Allegra for $10 per dose, it sells *all* of its stock for that price. It does not sell to me at one price and you at another price.

With this constraint in mind, the monopolist's average and marginal revenue curves are going to look different from those of a PC firm. Suppose the monopolist faces the following demand curve:

Price	Quantity	TR	MR	AR
6	0	0	--	--
5	1	5	5	5
4	2	8	3	4
3	3	9	1	3
2	4	8	-1	2
1	5	5	-3	1

(Table given in book). As the firm increases Q, it must lower its price. This leads to a "hill-shaped" TR function. Note that AR = TR/Q = PQ/P = P, and that this is just the same as demand.

For marginal revenue, note a couple of things:

1) MR falls as Q rises. In order to sell one more unit of output, the firm must lower its price. Thus, unit Q+1 must bring in less additional revenue than unit Q since if the firm stopped production at Q units, the last unit would fetch a higher price than unit Q+1.

2) MR lies below demand (AR). Remember that the monopolist sells all of its output at the same price. Thus, when it lowers its price to sell one more unit, not only does it lower its price on the last unit, but it also lowers its price on ALL other units as well. In other words,

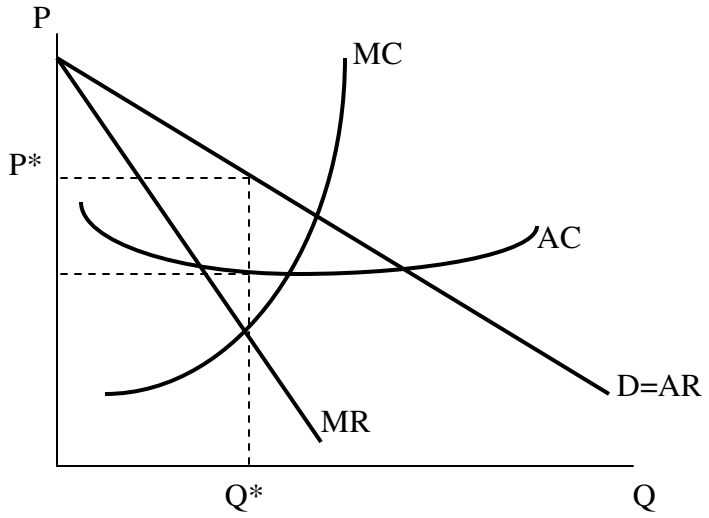
$$MR = \Delta TR = \Delta(PQ) = P(\Delta Q) + Q(\Delta P)$$

The first term shows the additional revenue gained from selling one more unit of output. The second term shows the revenue lost from lowering output on all other units of output (if the firm is lowering its price, ΔP will be negative). Thus, $MR < P$.

The cost structure of the firm will be exactly the same as a PC firm. The only thing that has changed is the firm's market structure, not its cost. Also, when the firm chooses its optimal production level, profit is still maximized by setting MR equal to MC, since

$$\pi = R(Q) - C(Q) \qquad \text{so} \qquad \partial\pi/\partial Q = R'(Q) - C'(Q) = 0$$
$$\Rightarrow \quad R'(Q) = C'(Q)$$
$$\Rightarrow \quad MR = MC$$

We can express all of this graphically as follows:



Here the monopolist chooses the Q that equates MC and MR. It then chooses the highest possible price at which consumers will buy Q* units (given by demand). We can see that the monopolist is earning profits given by (P*-AC)Q*, the rectangle formed by Q*, AC and P*.

Notice that the monopolist does not have a "supply curve" in any normal sense of the word. The monopolist is choosing a point on the demand curve, and that is all. We cannot simply trace out MC or anything else to get a price-quantity relationship like we did for PC firms.

This is also pretty easy to do mathematically.

Example: Suppose that a monopolist faces $P(Q) = 100 - Q$ and $C(Q) = 100 + Q^2$. Then

$$\pi = Q(100 - Q) - 100 - Q^2 = 100Q - 2Q^2 - 100$$

$$\partial\pi/\partial Q = 100 - 4Q = 0 \qquad \Rightarrow Q^* = 25$$
$$P = 75$$
$$\pi = 1150$$

Rule of Thumb for Pricing

As P&R show, we can translate our normal MR = MC profit-maximization condition into a condition based on the elasticity of demand.

$$MR = \partial TR/\partial Q = \partial(PQ)/\partial Q$$
$$\Rightarrow MR = P + Q(\partial P/\partial Q) \qquad \text{(product rule)}$$
$$\Rightarrow MR = P + P(Q/P)(\partial P/\partial Q) \qquad \text{(multiplying by P/P)}$$

but $E_P = (P/Q)(\partial Q/\partial P)$, so $(Q/P)(\partial P/\partial Q) = 1/E_P$, so

$$MR = P + P/E_P$$

But remember that if the firm is maximizing profits, MR = MC, so

$$MC = P + P/E_P = P(1 + 1/E_P)$$

so

$$P = \frac{MC}{1 + \left(1 / E_P \right)}$$

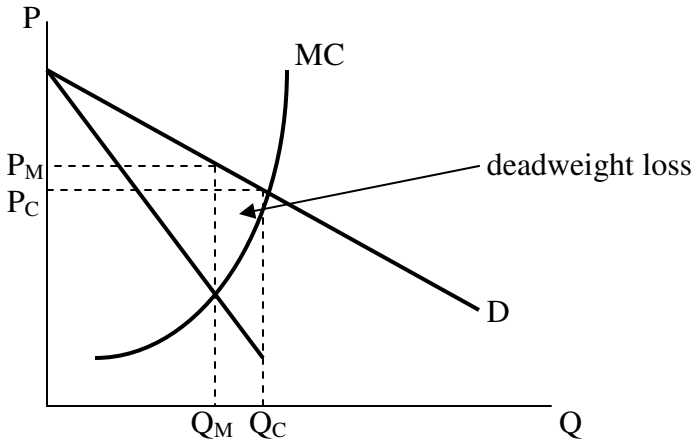
or, stated differently,

$$\frac{P - MC}{P} = -\frac{1}{E_P}$$

The first expression gives the firm's profit-maximizing price as a function of its MC and price elasticity of demand. The second expression gives the firm's "mark-up" over MC as a function of E_P. Notice that as demand becomes less elastic (E_P becomes smaller in absolute value), P rises, as does the mark-up over MC.

Monopoly is Inefficient

If the market dominated by a monopolist were instead perfectly competitive, we would see P = MC. (We would use the MC as the perfectly competitive supply curve). Instead, the monopolist chooses P > MC. How does this affect social welfare?



The monopolist produces less output and charges a higher price that what we would see in a perfectly competitive market. Notice that this must reduce consumer surplus. The decline in CS can be seen in the trapezoid formed by P_M, P_C, Q_C and demand.

Of course, we would expect for producer surplus to rise, since the monopolist has the ability to choose its own price. Indeed, the monopolist loses the "triangle" formed by Q_C, Q_M and P_C, but gains the rectangle formed by P_M, P_C and Q_M. This should be a gain for the monopolist, otherwise it would just set the competitive price. Also note that this increase in PS comes directly at the expense of consumers, since the rectangle formed by P_M, P_C and Q_M was initially part of CS.

Overall, total surplus falls. We can see the deadweight loss as the triangle formed by Q_M, Q_C and P_M.

Because the monopolist produces at a point where P > MC, somebody would be willing to buy one more unit from the monopolist (paying P) and the monopolist would normally be happy to produce and sell that unit, netting profit P – MC. The reason why this mutually-beneficial exchange doesn't happen is that that if the monopolist sells to that consumer, it must lower its price on all other output, driving down its profit. Because a mutually-beneficial exchange could be made but isn't (because of the one-price constraint), we know that monopoly is socially inefficient. This is the main reason why economists like perfect competition so much while disliking monopoly.

Market Power

There are many markets in which there are a few firms. Such a market is called an oligopoly. We will say more later on about how oligopolists might behave, but suffice it to say that while they are not monopolists, they certainly face downward-sloping demand because there are not enough firms to cause the oligopolist's sales to drop to zero if it raises its price. When a firm faces a downward sloping demand curve, we say that it has market power even if it is not a pure monopoly.

The monopolist faces the market demand curve. An oligopolist faces a residual demand curve that should be downward sloping. Thus, we could analyze oligopoly in the same way that we analyze monopoly, except that the "demand curve" in the profit-maximization diagram is not really market demand, but just the demand curve facing the individual firm.

Remember that a PC firm faces a perfectly horizontal demand curve. The monopolist faces market demand. It makes sense, then, that an oligopolist will face a demand curve that is downward sloping but more elastic than market demand (since the presence of competitors gives consumers a greater number of substitutes for the *particular firm's* good than for the good itself).

So is there any way we can say how much market power a particular firm has? Sure. Remember that a PC sets P = MC, while a monopolist sets P above MC. We can indicate the amount of market power the firm has by measuring the markup over MC. We saw before that this markup will be:

$$\frac{P - MC}{P} = -\frac{1}{E_P}$$

So that, not surprisingly, the firm's market power depends on the elasticity of demand. The RHS of this expression is sometimes called the Lerner Index of market power.

$$L = -(1/E_P)$$

If the firm is perfectly competitive, $E_P \rightarrow -\infty$ so $L = 0$ (no market power).

If the firm has any market power, E_P will be some finite value. As the firm's demand curve becomes less elastic, it is able to mark up price over MC more, so that its Lerner Index value rises (more market power).

Sources of Market Power

In order to raise price above MC and keep it there, the firm must be protected from other firms entering the market (they will be drawn, in the long run, by the super-normal profits earned by the monopolist). Thus, there must be a barrier to entry for the monopolist to maintain its monopoly status. Possible barriers include:

1) Legal barriers.

2) Control over essential inputs.

3) Economies of scale.