Microeconomics

Chapter 14
Monopoly

Fall 2024

Monopoly

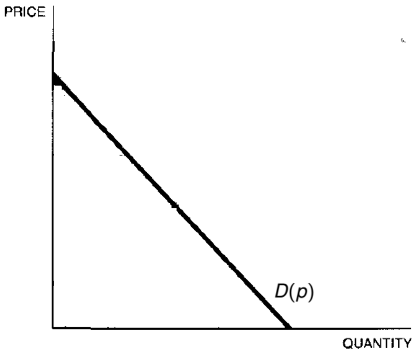
A **monopolistic market** has one main characteristic:

(1) a single firm that sells to the whole market

This ensures that a **monopolist** is a **price maker**. The demand curve of a monopolist $D(p)$ is simply the market demand curve $X(p)$ for that good. This demand curve is typically downwards sloping

There are at least three reasons for the existence of monopolists: patents, superior technology, and control over limited natural resources.

Demand curve



The typical **demand curve** for a monopolist is downwards sloping: if price goes up then demand goes down.

Note that the graph shows the **inverse demand curve**: price as a function of quantity. Instead the **demand curve** is: quantity as a function of price.

Profit maximization

The monopolist's **demand function** can be written as:

$$y = D(p).$$

We can take the inverse of this function to obtain the **inverse demand function**:

$$p = D^{-1}(y) = p(y).$$

Hence, profit maximization for a monopolist is more complicated than for a perfectly competitive firm: The monopolist **chooses output** y as to maximize profits while y also affects the price $p(y)$,

$$\max_{y} p(y)y - c(y).$$

Note that $c(y)$ is a cost function as discussed in Chapter 4.

Profit maximization

The FOC for profit maximization sets the first derivative to zero,

$$\frac{\partial \pi(y)}{\partial y} = p(y) + \frac{\partial p(y)}{\partial y} y - \frac{\partial c(y)}{\partial y} = 0.$$

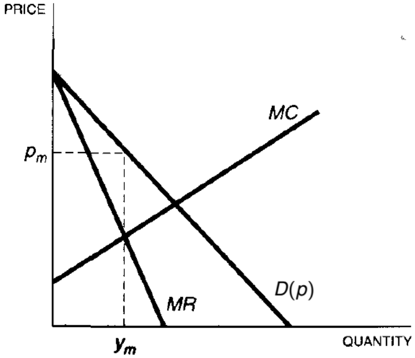
Which can be written as,

$$\underbrace{p(y) + \frac{\partial p(y)}{\partial y} y}_{MR(y)} = \underbrace{\frac{\partial c(y)}{\partial y}}_{MC(y)}$$

The monopolist produces y until MR equals MC. Intuitively, if $MR > MC$ than the firm should produce more, and if $MR < MC$ it should produce less.

Note that this is simply the **market equilibrium** of a monopolist.

Profit maximization



The figure visualizes the FOC: the monopolist will choose quantity y_m such that $MR = MC$. The price p_m is such that the whole quantity y_m can be sold.

Marginal revenue

Lets analyze MR in greater detail. Recall that for a perfectly competitive firm we had that $MR = p$. For a monopolist we have that:

$$MR(y) = \underbrace{p(y)}_{\text{quantity effect}} + \underbrace{\frac{\partial p(y)}{\partial y} y}_{\text{price effect}}$$

$$\neq p(y)$$

Quantity effect: selling one additional y gives the firm $p(y)$ additional revenue.

Price effect: to sell one additional y the firm needs to change (typically lower) the price by $\frac{\partial p(y)}{\partial y}$, and this lower price applies to all units y it is selling.

Hence, a monopolist's MR is lower than the price if the demand function is downwards sloping, since then the price effect is negative. If $\frac{\partial p(y)}{\partial y} < 0$, then

$$MR(y) < p(y).$$

Marginal revenue

We can also express MR in terms of the **elasticity of demand**, which is the percentage change in demand divided by the percentage change in the price:

$$\left(\frac{\Delta y}{y}\right) / \left(\frac{\Delta p}{p}\right) = \frac{\Delta y}{\Delta p}\frac{p}{y} \approx \frac{\partial y(p)}{\partial p}\frac{p}{y(p)} = \epsilon(y).$$

Note that $\epsilon(y) < 0$ if the demand curve is downwards sloping with $\frac{\partial y(p)}{\partial p} < 0$.

Lets rewrite MR by dividing and multiplying the second term (the price effect) with $p(y)$ and factor out $p(y)$ to obtain:

$$\begin{aligned} MR(y) =& \left(1 + \frac{\partial p(y)}{\partial y}\frac{y}{p(y)}\right)p(y) \\ =& \left(1 + \frac{1}{\epsilon(y)}\right)p(y). \end{aligned}$$

Marginal revenue

The marginal revenue of a monopolist can be written as:

$$MR(y) = \left(1 + \frac{1}{\epsilon(y)}\right) p(y).$$

Hence, the marginal revenue of the monopolist depends on the elasticity of demand. Consider three scenarios:

(1) **Demand is completely elastic** with $\epsilon \to -\infty$, then $MR = p$. If demand is completely elastic then the price is given as with perfect competition.

(2) **Demand is elastic** with $-\infty < \epsilon < -1$, then $0 < MR < p$. Increasing y generates additional revenue, but you also need to lower the price.

(3) **Demand is inelastic** with $-1 < \epsilon \leq 0$ then $MR < 0$. Increasing y decreases revenue, as you need to lower the price too much.

The markup

We can now also write the FOC of the monopolist that $MR = MC$ as:

$$\frac{p(y) - MC(y)}{p(y)} = -\frac{1}{\epsilon(y)}.$$

Define $(p - MC)$ as the **markup**.

Whether the monopolist charges a markup depends upon the elasticity of demand. Consider again the three scenarios:

(1) **Demand is completely elastic** with $\epsilon \to -\infty$, then $p = MC$. If demand is completely elastic then the price is given, the monopolist behaves like a perfect competitor and does not ask a markup.

(2) **Demand is elastic** with $-\infty < \epsilon < -1$, then $p > MC$. The monopolist asks a markup, which increases if demand becomes less elastic.

(3) **Demand is inelastic** with $-1 < \epsilon \leq 0$ then $\frac{p-MC}{p} > 1$. This cannot happen since $MC > 0$. Hence, the monopolist will never choose to produce at a point where demand is inelastic.

Exercise

A monopolist faces a demand curve of $D(p) = 11 - p$, has constant marginal costs that are equal to 1, and has fixed costs that are equal to 0.

1. What is the profit-maximizing level of output?
2. What is the accompanying profit?
3. This monopolist can charge a markup. Carefully explain whether a monopolist can always charge a markup.

Homework exercises

Exercises: exercises on the slides

Microeconomics

Chapter 16
Oligopoly

Not part of the exam

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