Microeconomics

Chapter 14
Monopoly

Fall 2023

Monopoly

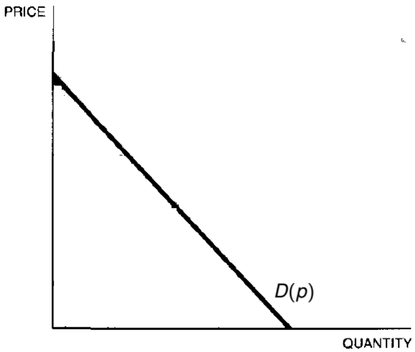
A monopolistic market has one main characteristic:

(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.

Typical demand curve



The typical **demand curve** for a monopolist is downwards sloping: if price goes up then demand goes down. Strictly speaking, the graph shows the **inverse demand curve**: price as a function of quantity. One can also graph the **demand curve**: quantity as a function of price.

Profit maximization

Profit maximization for a monopolist is more complicated than for a perfectly competitive firm: The monopolist chooses both the price p and output y to maximize profits $\pi(y) = py - c(y)$,

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

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

However, we can simplify this profit maximization problem. Recall that the monopolist has a **demand curve**:

$$y = D(p).$$

We can take the inverse of this function to obtain **inverse demand function**: $p(y)$ gives for each quantity y the price p consumers would be willing to pay. We can substitute $p(y)$ for p in the profit function,

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

Profit maximization

The firm can now solve the profit maximization problem by only choosing y, as we made explicit that choosing y also means choosing p,

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

Recall that the FOC for profit maximization was to set the first derivative to zero:

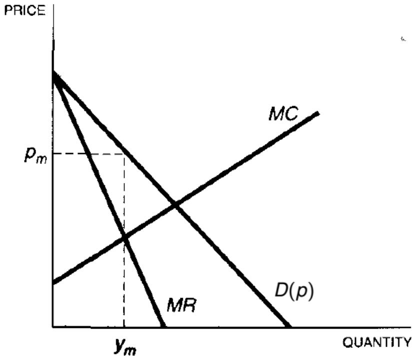
$$\frac{\partial \pi(y)}{\partial y} = p(y) + \frac{\partial p(y)}{\partial y} y - \frac{\partial c(y)}{\partial y} = 0.$$

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.

Profit maximization in a graph



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 $MR = p$. However, for a monopolist we have that:

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

$$\neq p(y)$$

The **quantity effect** reflects that selling one additional y gives the firm $p(y)$ additional revenue.

The **price effect** reflects that 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

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

The markup

The FOC showed that the monopolist produces y until MR equals MC. Note that this is simply the **market equilibrium** of a monopolist.

We can rewrite this FOC by swapping sides of $MC(y) = \frac{\partial c(y)}{\partial y}$ and $\frac{\partial p(y)}{\partial y} y$, and by dividing both sides by $p(y)$,

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

Note that $\epsilon(y) = \frac{\partial y(p)}{\partial p} \frac{p}{y(p)}$ is the **elasticity of demand**, which is the percentage change in demand divided by the percentage change in the price:

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

Substituting for $\epsilon(y)$ we can write the FOC as,

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

The markup

We can write the FOC of the monopolist as:

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

Define $(p - MC) \geq 0$ as the **markup**. Note that $\epsilon < 0$ as the demand curve is typically downwards sloping.

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

(1) **Demand is completely elastic** with $\epsilon \to -\infty$, then $p = MC$. If demand is completely elastic then its as if the "price is given". Hence, the monopolist behaves like a perfect competitor.

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

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Chapter 16
Oligopoly

Not part of the exam

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Syllabus

The syllabus on Fenix contains an up-to-date overview of the program. All chapters in that overview are part of the exam, except Chapter 16.

Homework exercises

Exercises: exercises on the slides and the practice exam