Microeconomics

Chapter 14
Monopoly

Fall 2025

Beside building on Ch 14 of the 3rd Edition of Microeconomic Analysis (Varian), these slides also use figures and examples from Principle of Microeconomics, available here.

Perfect Competition Reminder

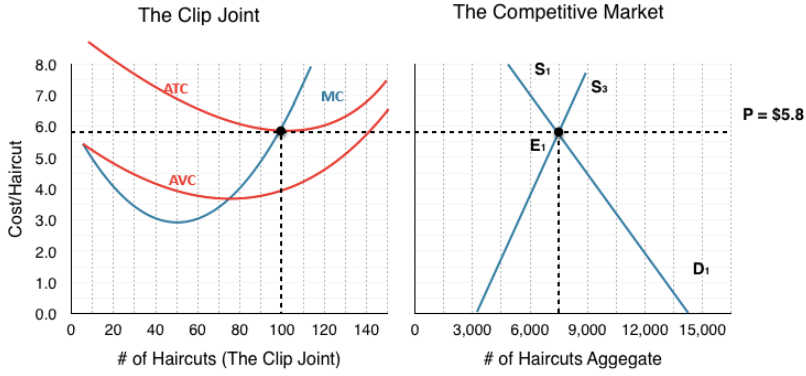


Figure 7.3a Reproduced

For the individual competitive firm, the demand is perfectly elastic. If they charge p higher than market price, they will sell no units. If they lower p, they will have lower profits because they are producing at $p = MC$.

Monopoly

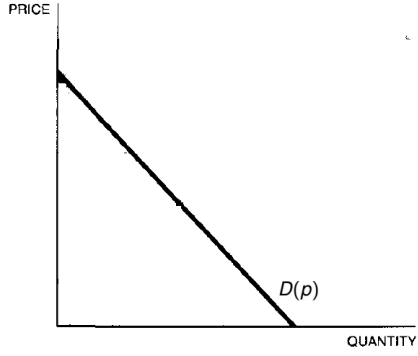
A **monopolistic market** has one main characteristic:

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

No product is a close substitute. 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 (Law of Demand, Chapter 8).

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,

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

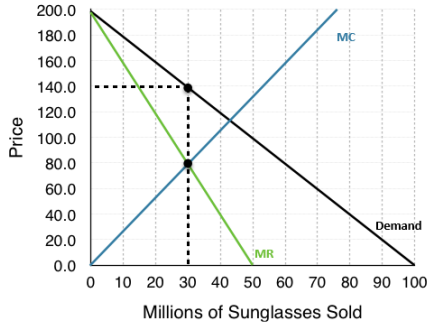
Which can be written as,

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

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 $p_m = 140$ is such that the whole quantity $y_m = 30$ can be sold.

At 30 million sunglasses sold, consumers are willing to pay \$140 per pair, not just \$80. Monopolist will charge \$140 as it considers the demand function in its profit maximization problem.

Marginal revenue

Let's 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:

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

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

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

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

Marginal revenue

The marginal revenue of a monopolist can be written as:

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

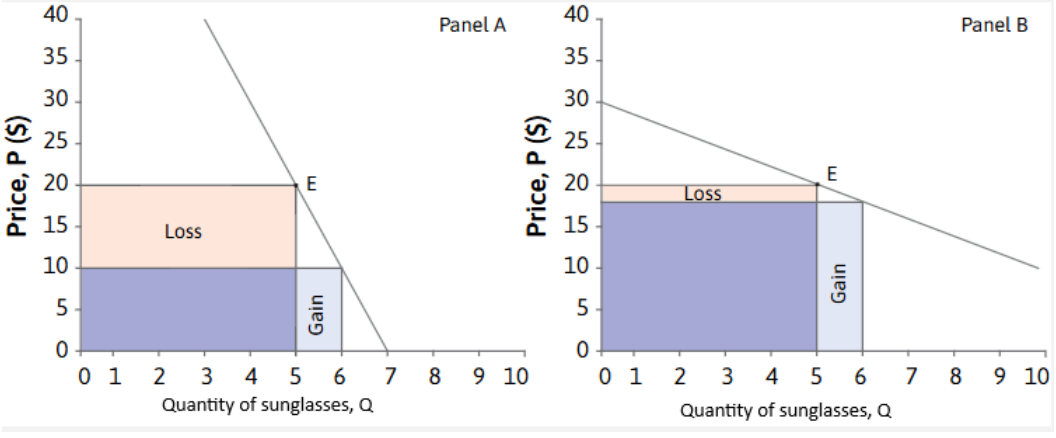
Hence, the marginal revenue of the monopolist depends on the elasticity of demand. Consider three scenarios:

(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.

Elasticity and revenues



Panel A: demand is inelastic ($|\epsilon| < 1$), Panel B: demand is elastic ($|\epsilon| > 1$) (Source: Core 2.0)

Elasticity (example)

The graph below uses the absolute value of elasticity. This is usually the convention as it makes interpretation easier.

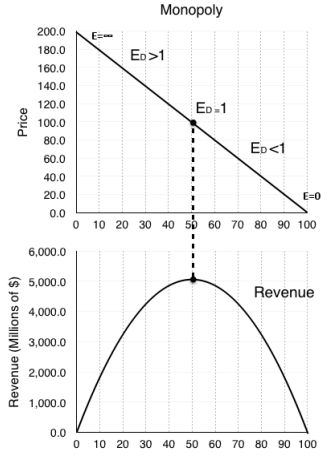


Figure 8.1d

Demand is inelastic ($|\epsilon| > 1$), demand is perfectly elastic ($|\epsilon| = 1$), demand is elastic ($|\epsilon| < 1$).

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 **markup** $= p - MC$.

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?

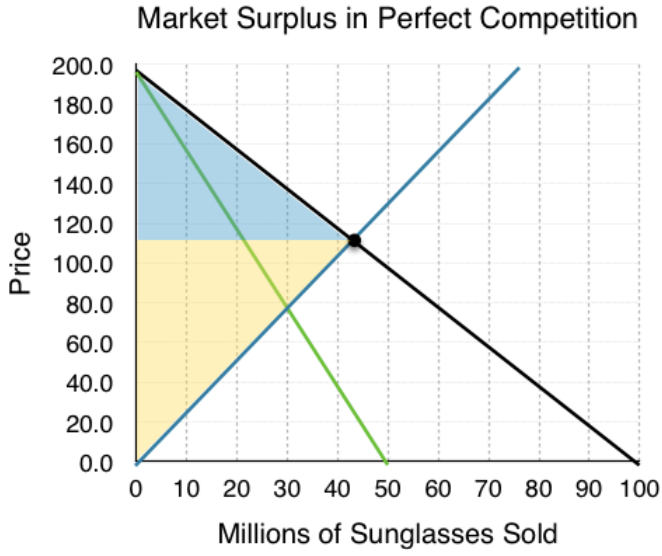
3. This monopolist can charge a markup. Carefully explain whether a monopolist can always charge a markup.

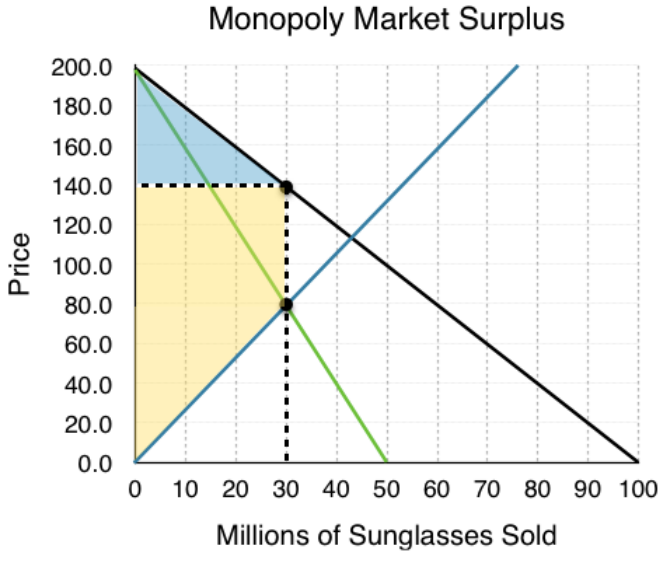
4. Explain why the markup may be used as a measure of market power.

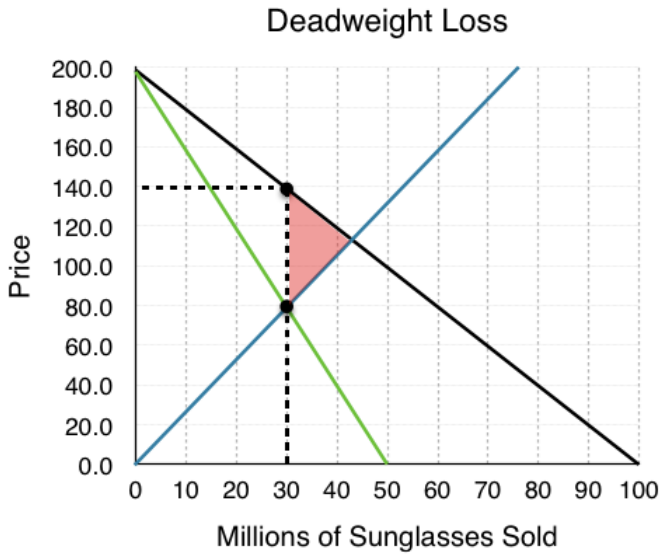
5. A monopolist's elasticity of demand is 3 and its marginal costs are equal to 10. Calculate the mark-up.

Homework exercises

Exercise on the slides. Slide 17–19 are not relevant for the exam.


Market Surplus in Perfect Competition
Price
200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
0
10
20
30
40
50
60
70
80
90
100
Millions of Sunglasses Sold


Monopoly Market Surplus
Price
200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
0
10
20
30
40
50
60
70
80
90
100
Millions of Sunglasses Sold


Deadweight Loss
200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Price
0
10
20
30
40
50
60
70
80
90
100
Millions of Sunglasses Sold