Microeconomics, Module 11, "Monopoly" (Chapter 10)

Concepts and Overview

(See the attached PDF file.)

Market power (*monopoly power*) means that the firm's production affects the market price.

A monopolist faces a downward sloping demand curve.

The single seller definition is imprecise because some markets have close substitutes.

Price and Output under Monopoly

Monopoly pricing:

$$MR = \frac{\partial TR}{\partial Q} = \frac{\partial}{\partial Q}(PQ) = P + Q\frac{\partial P}{\partial Q}$$

The marginal revenue curve lies below the demand curve.

Suppose *marginal cost is constant*.

If marginal cost rises
- The competitive price rise = the rise in marginal cost.
- The monopoly price rise is less than the rise in marginal cost.

If marginal cost falls
- The competitive price decline = the decline in marginal cost.
- The monopoly price decline is less than the decline in marginal cost.
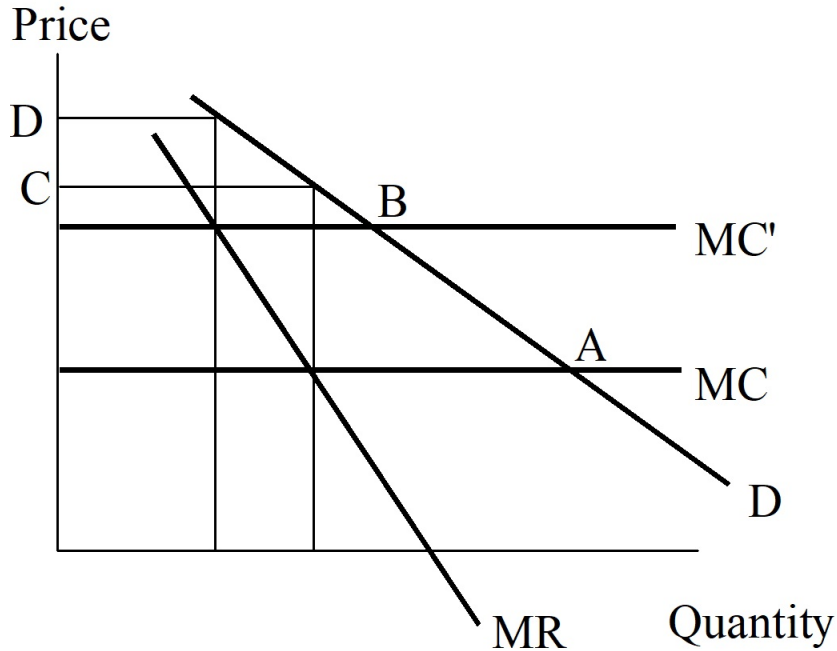
$$MR = P \times \left(1 - \frac{1}{|\eta|}\right)$$

o   *Elastic* demand ⇒ marginal revenue > 0
    Inelastic demand ⇒ marginal revenue < 0.

o   A downward-sloping *linear* demand curve is
        elastic when Q is small
        inelastic when Q is large

o   A monopolist produces where MR = MC and MC > 0
        ⇒ A monopolist produces where MR > 0
        ⇒ The monopolist operates on the *elastic* part of the demand curve.

o   A monopolist has no supply curve, since it does not face a market price.

Exercise 11.1: French Wine

{The homework assignment and the final exam questions are similar to this problem.}

A single firm (a monopolist) sells high quality French wine in the United States. The demand curve for high quality French wine is Q = –100P + 27,000. The monopolist's marginal cost curve is MC = Q/200 + 22.50.

A.   What is the equilibrium price and output?
B.   If the US government imposes a sales tax of $10 per bottle of French wine, what is the new equilibrium price and output?
C.   To avoid taxing US consumers, the government imposes a tariff (like an excise tax) of $10 per bottle of French wine instead of the sales tax. What is the new equilibrium price and output?
D.   What is consumers' surplus before and after the sales tax?
E.   What is producers' surplus before and after the sales tax?
F.   What are the government tax receipts?

G. What is the dead weight loss from the sales tax?

Solution 11.1:

Part A: We equate marginal cost with marginal revenue (MC = MR). To do this, we rewrite the demand curve as P = –Q/100 + 270.

- The total revenue curve is TR = –Q² / 100 + 270 Q.
- The marginal revenue curve is MR = –Q/50 + 270.

We equate marginal revenue with marginal cost:

$$–Q/50 + 270 = Q/200 + 22.5$$
$$\Rrightarrow 5Q / 200 = 270 – 22.5 = 247.5$$
$$\Rrightarrow Q = 247.5 \times 200 / 5 = 9,900$$

From the demand curve we obtain:

$$9,900 = –100P + 27,000$$
$$\Rrightarrow P = (27,000 – 9,900) / 100 = 171$$

Part B: With a $10 sales tax, the full cost of a bottle of wine = the price paid + the sales tax. We rewrite the demand curve to include both the price paid and the sales tax:

$$Q = –100 \times (P + 10) + 27,000 = –100P + 26,000.$$

$\Rrightarrow$ The marginal revenue (MR) = –Q/50 + 260
$\Rrightarrow$ The marginal revenue curve moves down by $10 = amount of tax.

$$MC = MR$$
$$–Q/50 + 260 = Q/200 + 22.5$$
$$Q = 9,500$$

From the demand curve, we obtain:

$$9,500 = –100P + 26,000$$
$$P = 165$$

Part C: A $10 excise tax means the marginal cost increases $10 for each bottle sold:

$$MC = Q/200 + 22.5 + 10 = Q/200 + 32.5$$

$$MC = MR$$
$$–Q/50 + 270 = Q/200 + 32.5$$
$$Q = 9,500$$

From the demand curve, we obtain

$$9,500 = –100P + 27,000 \Rrightarrow P = 175$$

Part D: Consumers' surplus is the area of a triangle: under the demand curve, above the price, and from zero to the equilibrium quantity. Before the tax, these are the points

$$(0, 171), (0, 270), (9,900, 171)$$

The area is ½ × (270 – 171) × 9,900 = $490,050.

After the tax, these are the points (0, 175), (0, 260), (9,500, 175).

The area is ½ × (260 – 175) × 9,500 = $403,750.

Part E: The area for producers' surplus before the tax is bounded by the points

(0, 22.5), (0, 171), (9,900, 72), (9,900, 171).

The point (9,900, 72) is the marginal cost for unit number 9,900: 9,900 / 200 + 22.5 = 72.

This area is a rectangle sitting on top a triangle.

- The rectangle has a width of 9,900 and a height of 171 – 72 = 99. Its area is 9,900 × 99 = $980,100.
- The triangle has a width of 9,900 and a height of 72 – 22.5 = 49.5. Its area is ½ × 9,900 × 49.5 = $245,025

The producers' surplus is $980,100 + $245,025 = $1,225,125.

The area for producers' surplus after the sales tax is bounded by the points

(0, 22.5), (0, 165), (9,500, 70), (9,500, 165).

The area for producers' surplus after the excise tax is bounded by the points

(0, 32.5), (0, 175), (9,500, 80), (9,500, 175).

Compared to the sales tax, the producers' surplus for the excise tax is shifted up by 10 units. The area does not change.

- The marginal cost for unit number 9,500 with the sales tax is 9,500 / 200 + 22.5 = 70.
- The marginal cost for unit number 9,500 with the excise tax is 9,500 / 200 + 32.5 = 80.

This area is a rectangle sitting on top a triangle.

- The rectangle has a width of 9,500 and a height of 165 – 70 = 95. Its area is 9,500 × 95 = $902,500.
- The triangle has a width of 9,500 and a height of 70– 22.5 = 47.5. Its area is ½ × 9,500 × 47.5 = $225,625

The producers' surplus is $902,500 + $225,625 = $1,128,125.

*Part F:* The government's tax receipts are 9,500 × $10 = $95,000.

Part G: The dead weight loss is

($490,050 + $1,225,125) – ($403,750 + $1,128,125 + $95,000) = $88,300.

In a competitive market, we can determine the dead weight loss from the decrease in quantity and the slopes of the supply and demand curves. The dead weight loss is a triangle, whose width is the reduction in quantity and whose height is the difference between the demand curve and the supply curve at the lower quantity. This is the value of the lost production because of the tax. In a monopolistic market, part of the government revenue is the monopoly profit, which is a transfer of wealth from consumers to suppliers, not a gain from trade.

Welfare

Suppose a competitive industry would produce with same industry marginal cost (MC) curve as a monopolist.
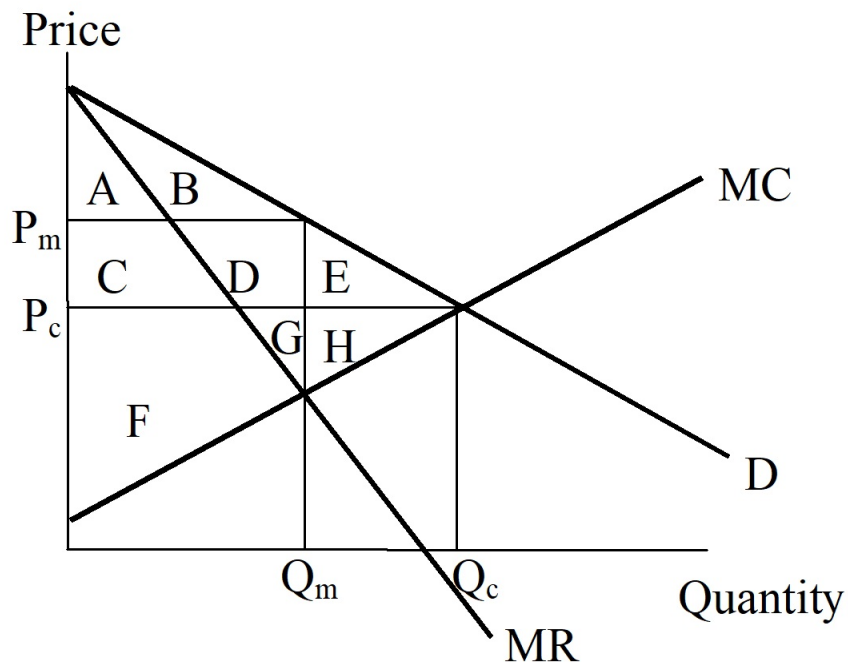
The competitive industry produces Q_c; the monopolist produces Q_m.

	Competition	Monopoly
Consumers' Surplus	A + B + C + D + E	A + B
Producers' Surplus	F + G + H	C + D + F + G
Social Gain	A+B+C+D+E+F+G+H	A+B+C+D+F+G
Wealth Transfer: C → P		C + D
Dead Weight Loss		E + H

Producers' surplus increases (i.e., H < C + D); otherwise, the monopolist would produce at a different level.

Part 2: Sources of Monopoly Power

(A) Natural Monopoly

o   Each firm's average cost curve is decreasing when it crosses the demand curve.

o   Economies of scale can explain monopoly.
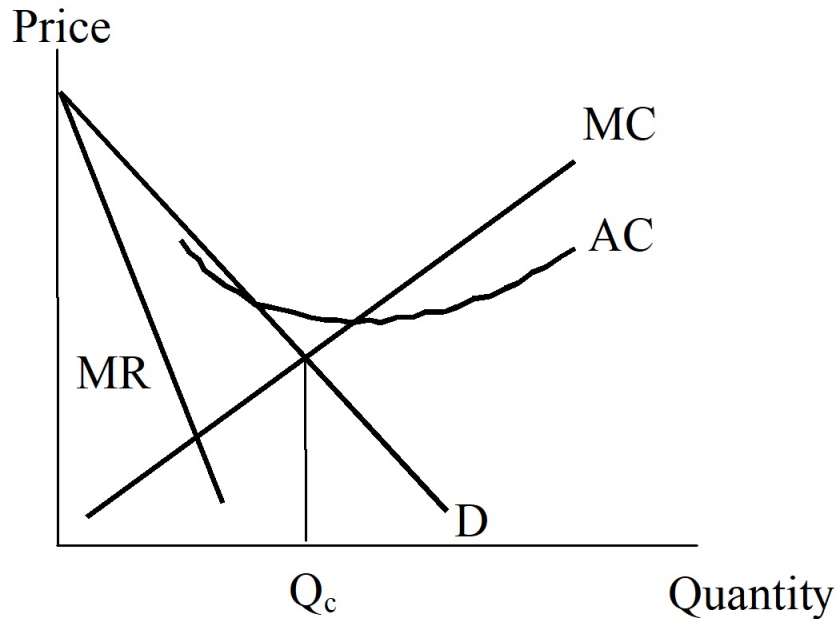
The marginal cost curve (MC) intersects the average cost curve (AC) at the minimum average cost.

⇒ The marginal cost (MC) crosses demand where P < AC.
⇒ The natural monopolist earns negative profit at the competitive price.

It is not proper to compare the social gain from a natural monopoly to the social gain under competition, since the welfare lost by not having competition could never have been created under competition.

(B) Patents

● Patents create an incentive to invest.
● Losses from monopoly production are offset by the gains from more inventive activity.
● Some studies suggest that a 17 year patent period is close to optimal.

(C) Resource Monopolies

A single firm gains control of a vital resource.

(D) Legal Barriers to entry

The competition to get legal barriers consumes resources, without any offsetting gains, adding to the welfare cost of monopoly.