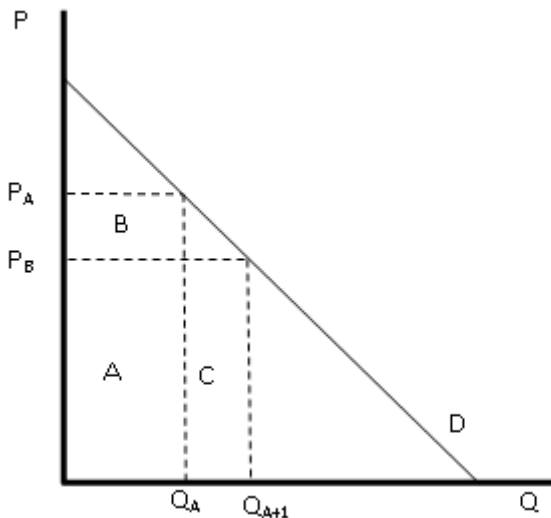


# Lecture # 18 – Monopoly

## I. Marginal Revenue for a Monopolist

- We now begin to look at what happens if our assumptions about perfect competition are not satisfied. Our first example is monopoly.
- Monopoly -- An industry that has only one seller of the product, for which there are no close substitutes.
- Because the monopolist is the market, a monopolist has control over price.
  - Compare to a firm in perfect competition, in which each individual firm is a price taker.
- To increase quantity sold, a monopolist must lower its price on each unit sold. This has two effects:
  - The monopolist makes money on the additional quantity sold.
  - The monopolist loses money on the goods that it was already selling, as these are now sold at a lower price.
- This can be seen on the graph below

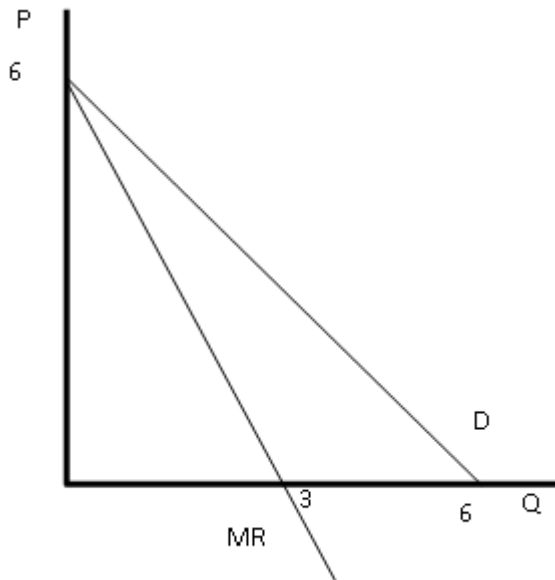


- Initially, at a price of  $P_A$ , the monopolist sells  $Q_A$  of the good.
  - Revenue equals areas  $A + B$
- To sell one more unit of the good, the monopolist must lower the price to  $P_B$ .
  - Revenue equals areas  $A + C$ 
    - The monopolist gains area  $C$ , but loses  $B$
    - $B$  represents the money no longer earned because the price is lower than before.
- Thus, marginal revenue =  $C - B$ 
  - Note that area  $C$  equals  $P_B$ , since the difference between  $Q_A$  and  $Q_{A+1}$  equals 1.
    - Thus, *MR at the new quantity must be less than  $P_B$ .*
  - Area  $B$  is the change in price  $\times$  initial quantity
- Thus, for a monopolist, marginal revenue is less than price.

- The table below illustrates.
  - It uses the following demand curve:  $P = 6 - Q$ .
  - Note that, as the monopolist sells more, it must lower the price.
    - For instance, total revenue at  $Q = 1$  is \$5.
    - If the monopolist wants to sell two units, it will charge a price of \$4. This price holds for each unit sold.
      - This brings in one new sale, and thus \$4 of revenue (area C on the previous graph).
      - But the monopolist loses \$1 (area B on the previous graph) on the first unit, which could have sold for \$5.
      - Thus marginal revenue is \$3 (= C – B on the previous graph)

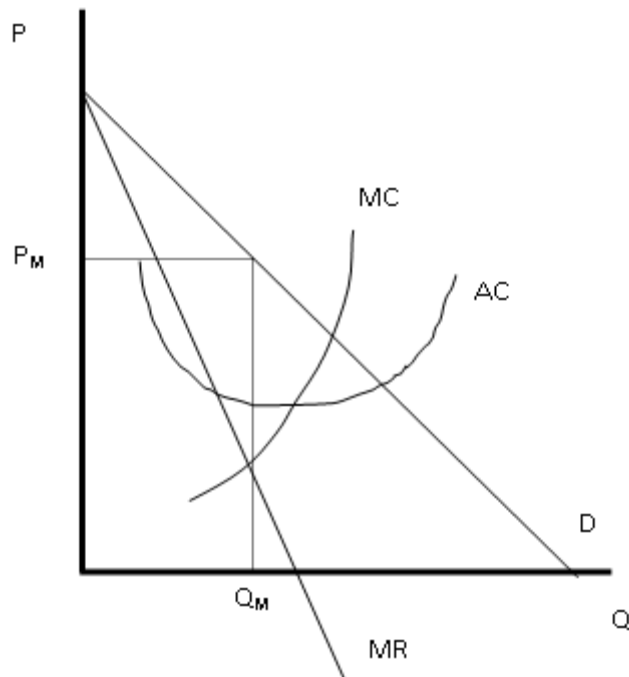
<b>P</b>	<b>Q</b>	<b>TR</b>	<b>MR</b>	<b>AR</b>
6	0	0	--	--
5	1	5	5	5
4	2	8	3	4
3	3	9	1	3
2	4	8	-1	2
1	5	5	-3	1
0	6	0	-5	0

- Bisection rule:
  - For a linear demand curve, the marginal revenue curve bisects the demand curve.
  - E.g.: If  $P = a - bQ$ ,  $MR = a - 2bQ$ .
    - In the example below, demand is  $P = 6 - Q$ .
    - Thus,  $MR = 6 - 2Q$ .
      - Note that the marginal revenue curve goes through the x-axis at a quantity of 3, compared to a quantity of 6 for the demand curve. Thus, it cuts this distance in half. That is why this is called the bisection rule.

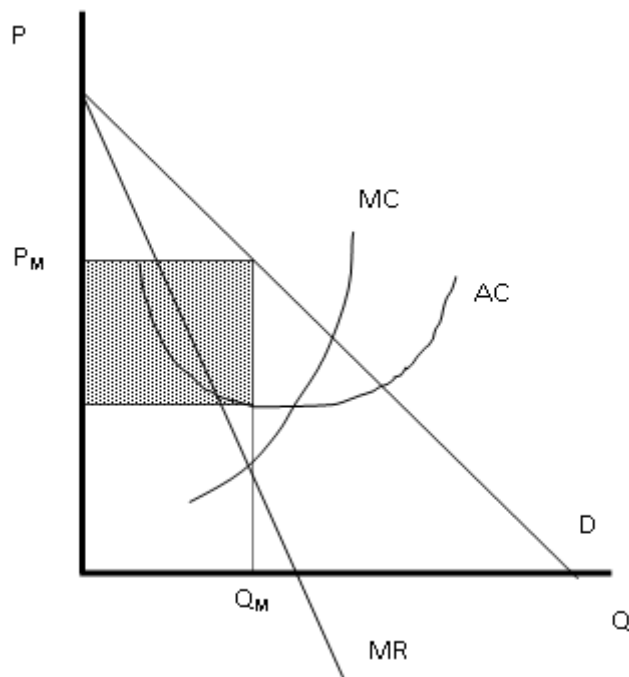


## II. Profit Maximization for a Monopolist

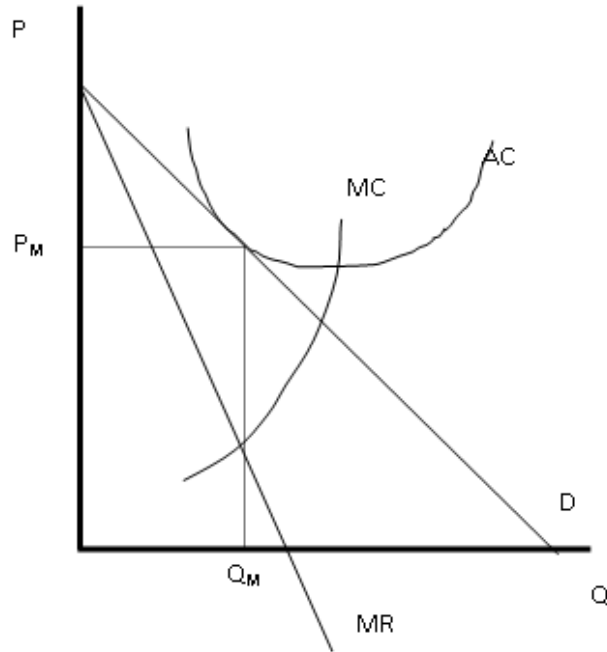
1. As before, we find the optimal quantity by setting  $MR = MC$ .
  - However, note that  $P$  does not equal  $MR$  for a monopolist!
2. Since  $P$  does not equal  $MR$ , we get  $P$  by plugging  $Q^*$  into the demand curve.



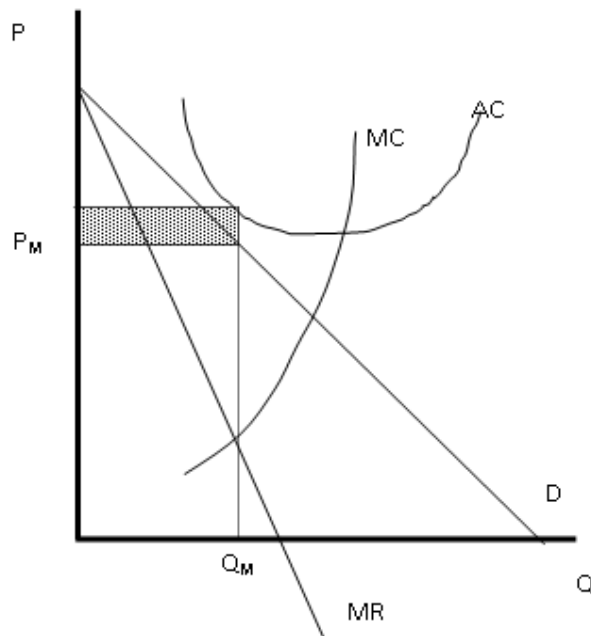
3. Profits can be calculated in the same way as in perfect competition.



- As in perfect competition, the position of the AC curve determines profits.
  - Here is a case where the monopolist earns zero economic profits



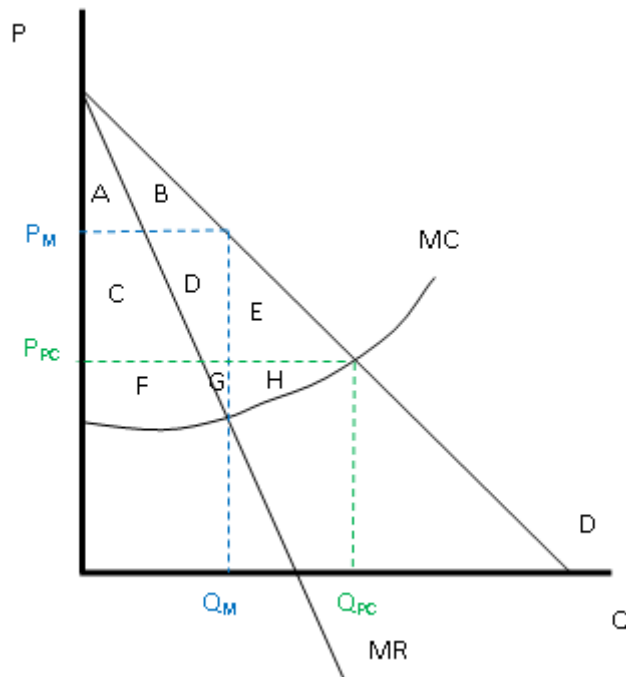
- Here is a case where the AC is always above the demand curve, so that the monopolist loses money



- AC is always greater than price.
- In such a case, for-profit firms will not want to produce this good or service. Government provision will be needed.

### III. Monopoly vs. Perfect Competition

- In perfect competition,  $P = MR = MC$ , whereas in monopoly,  $P > MR = MC$ .
  - Thus, price is greater than marginal cost in a monopoly, so it no longer reflects the scarcity of the good.
- Quantity is lower with a monopoly, and price is higher.
- Also, there is deadweight loss with a monopoly, since some potentially beneficial trades do not take place.



- In the illustration above, the monopolist finds where  $MR = MC$ . It chooses  $Q_M$  and  $P_M$  (shown in blue).
- If, instead, the industry consisted of several small firms, so that we had perfect competition, the MC curve would be the supply curve. The market would operate where  $MC = D$ , ending up with  $Q_{PC}$  and  $P_{PC}$  (shown in green).
- Note how consumer and producer surplus changes between perfect competition and monopoly.
  - Perfect competition:
    - Consumer surplus:  $A + B + C + D + E$
    - Producer surplus:  $F + G + H$
  - Monopoly:
    - Consumer surplus:  $A + B$
    - Producer surplus:  $C + D + F + G$
    - Deadweight loss:  $E + H$

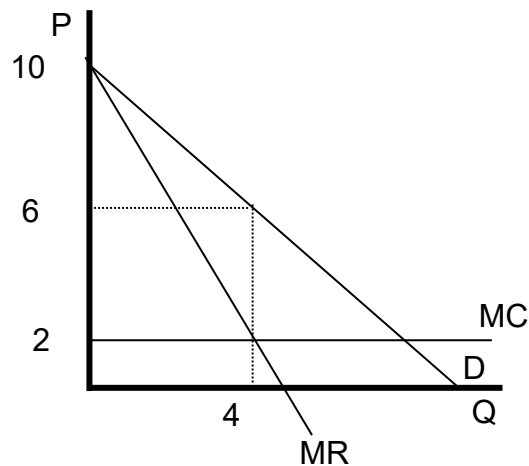
- Note how this relates to the equations for efficiency in perfect competition. In a monopoly,  $P > MR$ . Thus:
  - $MU_X/MU_Y = P_X/P_Y > MR_X/MR_Y = MC_X/MC_Y$
  - In this case, the marginal utility from the last unit of good X, for example, is greater than the marginal cost. There will be a deadweight loss.
- Unlike perfect competition, there is no entry when monopolies make profits (due to barriers to entry). Therefore, profits persist in the long run.
- Numerical example
  - Assumptions:
    - Demand:  $P = 10 - Q$
    - $MC = 2$
    - $FC = 0$
  - Maximizing profits for a monopolist
    - Profits are maximized where  $MR = MC$ . We use the bisection rule to find the MR curve, which is  $MR = 10 - 2Q$ .

$$\begin{aligned}
 MR = 10 - 2Q &= 2 = MC \\
 8 &= 2Q \\
 Q &= 8/2 = 4
 \end{aligned}$$

- To get the price, we need to look at the demand curve, to see how much consumers are willing to pay for 4 units. We get:

$$P = 10 - Q = 10 - 4 = \mathbf{\$6}$$

- The graph for this market is shown below.



- Calculate profits:

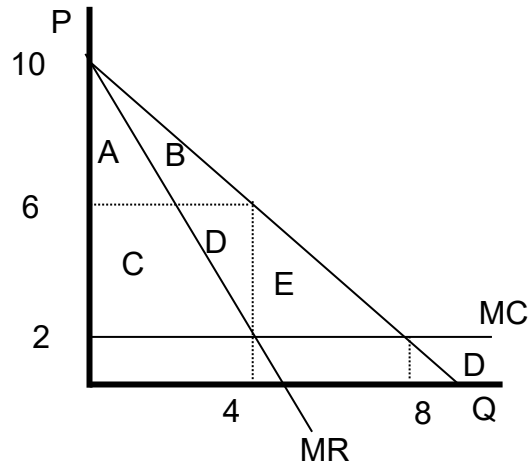
$$\begin{aligned}
 \text{profit} &= TR - TC \\
 \text{profit} &= P \times Q - TC \\
 \text{profit} &= (6)(4) - 2(4) \\
 \text{profit} &= 24 - 8 = \mathbf{\$16}
 \end{aligned}$$

- Compare to perfect competition
  - MC becomes the supply curve in perfect competition, so we set MC = Demand

$$P = 10 - Q = 2 = MC$$

$$Q = 8$$

- The price will equal the MC, which is \$2
  - Profits = TR – TC = (2)(8) – (2)(8) = 0.
- Compare welfare under perfect competition and monopoly



- Perfect competition
  - Consumer surplus = ABCDE =  $0.5(8)(8) = \$32$
  - Producer surplus = \$0
- Monopoly:
  - Consumer surplus = A + B =  $0.5(4)(4) = \$8$
  - Producer surplus = CD =  $(4)(4) = \$16$
- Compare
  - CS has fallen by \$24.
  - PS increases by only \$16.
  - Thus, \$8 of welfare has disappeared. This is the deadweight loss.
    - Graphically, this is area E =  $0.5(4)(4) = \$8$ .