

MONOPOLY

Key points

- ▶ some markets have only one seller.
- ▶ a monopoly determines the quantity to produce or the price to charge, but not both.
- ▶ A monopoly's decisions affect economic well-being.
- ▶ the various public policies aimed at solving the problem of monopoly.
- ▶ why monopolies would like to charge different prices to different customers.

Monopoly

- ▶ While a competitive firm is a *price taker*, a monopoly firm is a *price maker*.
- ▶ A firm is considered a *monopoly* if . . .
 - it is the **sole seller** of its product.
 - its product does **not** have close **substitutes**.

WHY MONOPOLIES ARISE

- ▶ The fundamental cause of monopoly is *barriers to entry*.

WHY MONOPOLIES ARISE

- ▶ Barriers to entry have two main sources:
 - The government gives a single firm the **exclusive right** to produce some good.
 - **Costs** of production make a single producer more efficient than a large number of producers.

Government-Created Monopolies

- ▶ Governments may restrict entry by giving a single firm the exclusive right to sell a particular good in certain markets.

Government–Created Monopolies

- ▶ Patent and copyright laws are two important examples of how government creates a monopoly to serve the public interest.
 - Ex Covid–19 vaccine, software, specific medicine vs generic drug

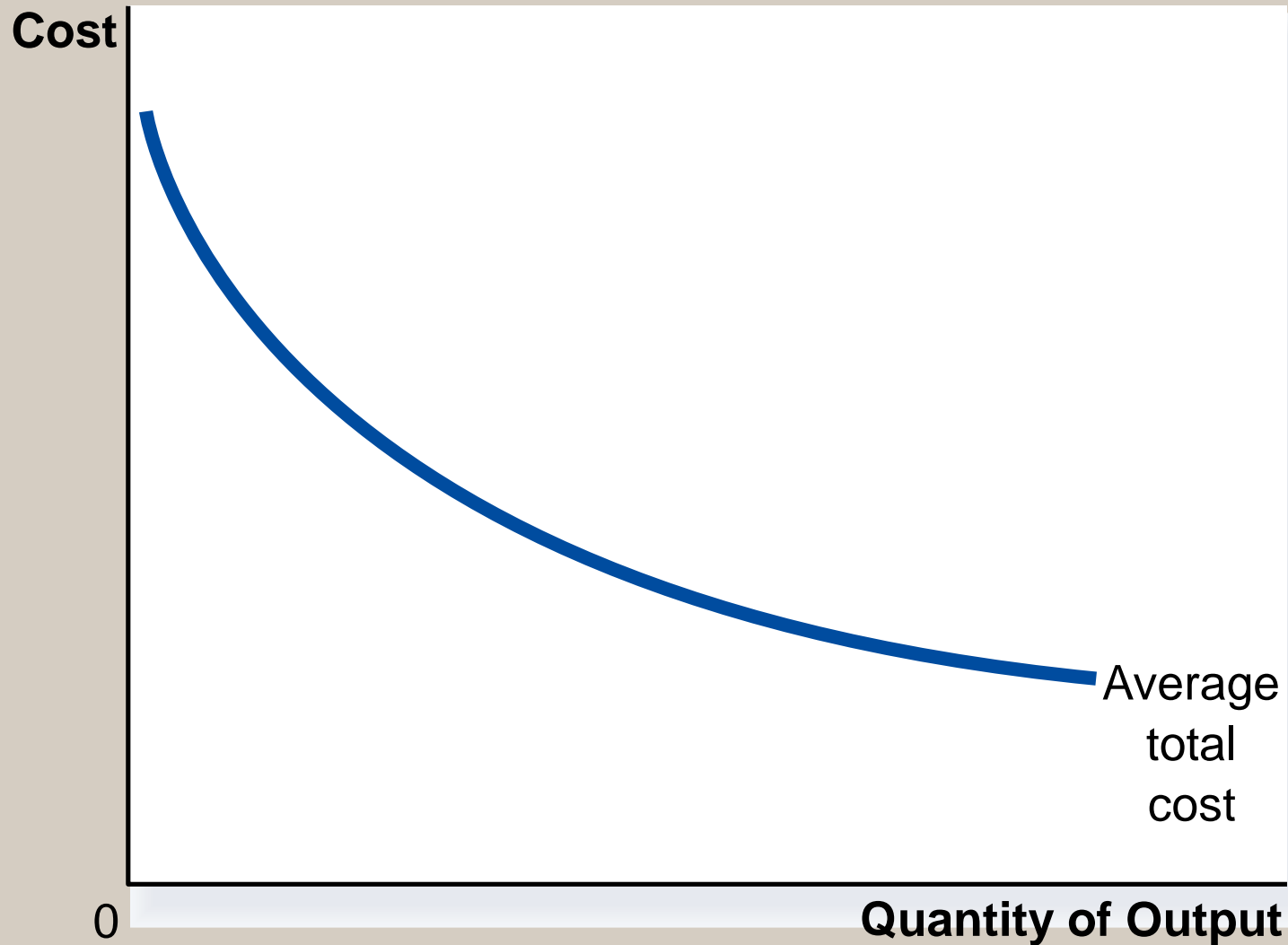
Natural Monopolies

- ▶ An industry is a *natural monopoly* when a single firm can supply a good or service to an entire market at a **smaller cost** than could two or more firms.

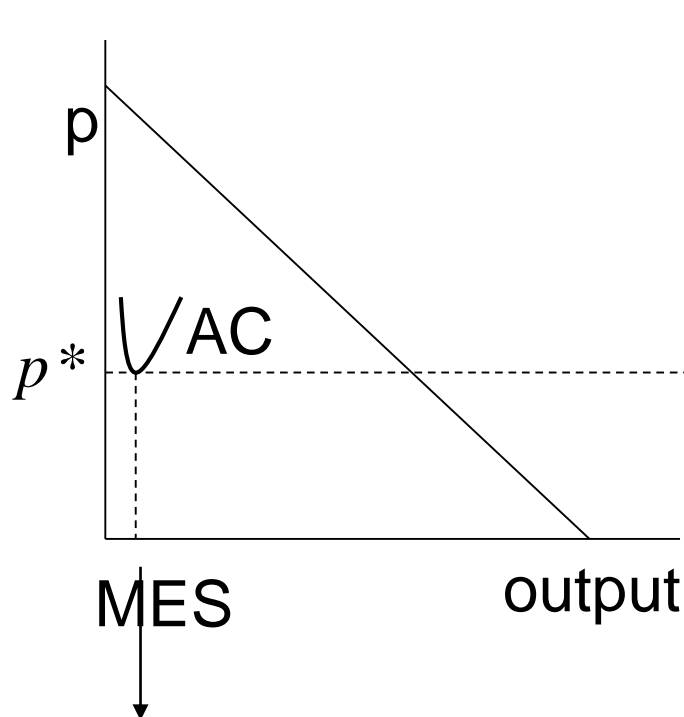
Natural Monopolies

- ▶ A *natural monopoly* arises when there are economies of scale over the relevant range of output.
- ▶ We have NM when fixed cost are higher and marginal cost are lower, then AC is decreasing in the output
 - Gas
 - Telecommunication
 - Public Transport as subway or railway

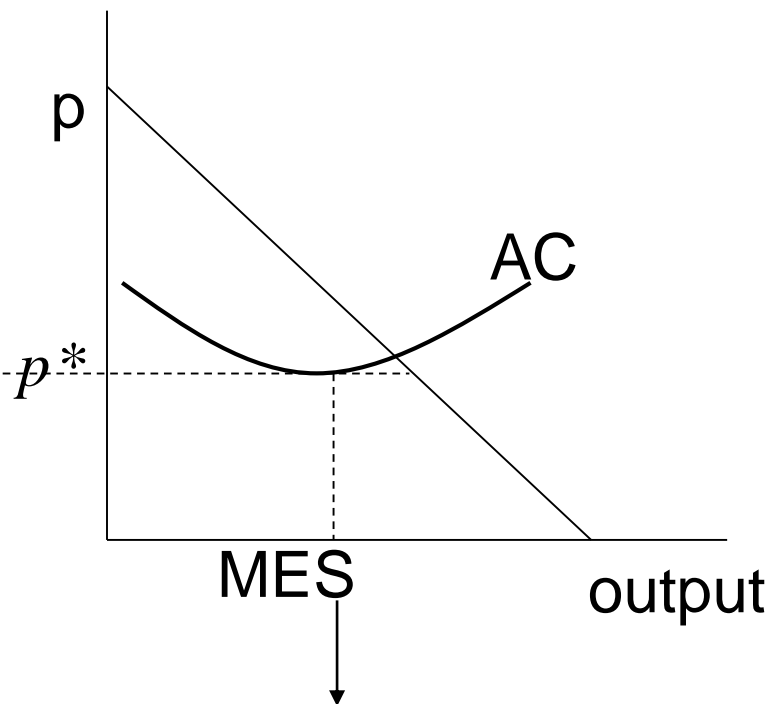
Economies of Scale as a Cause of Monopoly



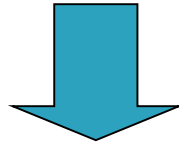
minimum efficient scale (MES): output minimizing the AC



Other firms may enter and produce a quantity equal to the MES and setting p^*

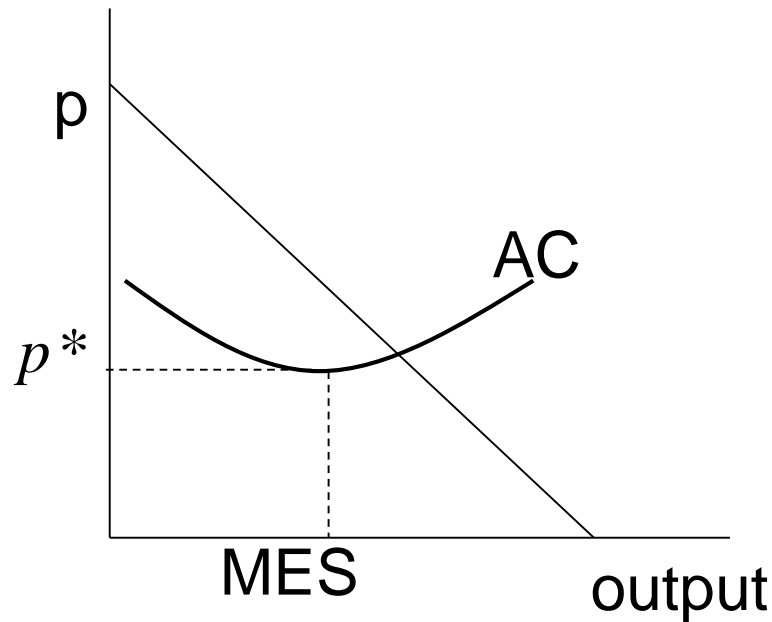


Only one firm can produce the SME and set p^* , other firms entering this market will make negative profit



There exists a **Natural Monopoly** when the *MES* is **high** with respect to the (dimension of) market demand

Only one firm makes non-negative profit at p^*



HOW MONOPOLIES MAKE PRODUCTION AND PRICING DECISIONS

► Monopoly versus Competition

◦ Monopoly

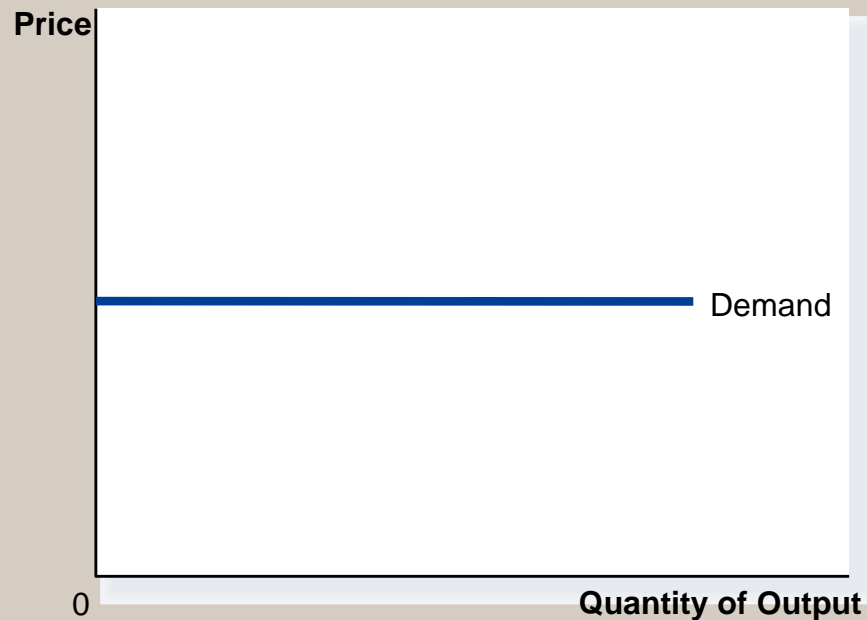
- Is the sole producer
- Faces a downward-sloping demand curve
- Is a price maker
- Reduces price to increase sales

◦ Competitive Firm

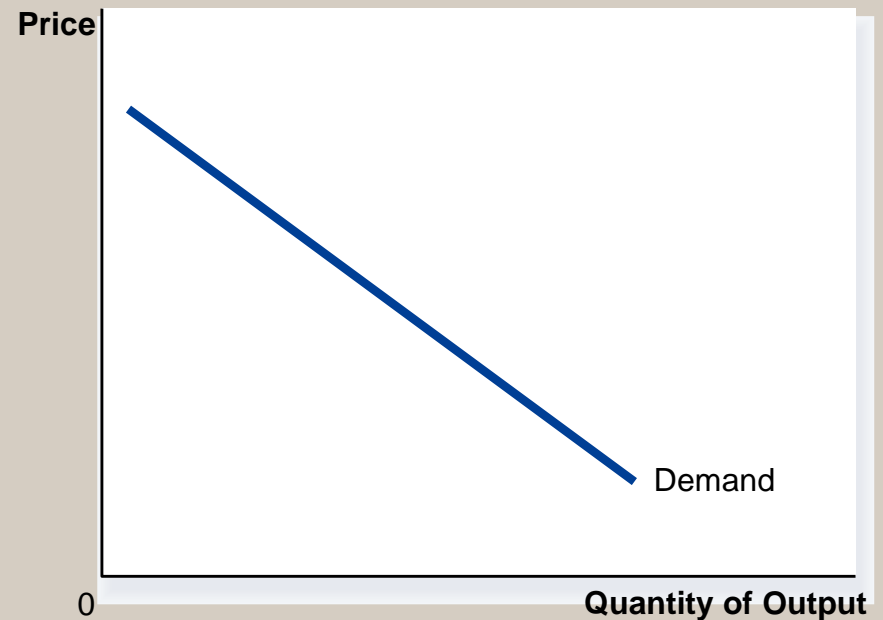
- Is one of many producers
- Faces a horizontal demand curve
- Is a price taker
- Sells as much or as little at same price

Demand Curves for Competitive and Monopoly Firms

(a) A Competitive Firm's Demand Curve



(b) A Monopolist's Demand Curve



A Monopoly's Revenue

- ▶ Total Revenue

$$P \times Q = TR$$

- ▶ Average Revenue

$$TR/Q = AR = P$$

- ▶ Marginal Revenue

$$\Delta TR/\Delta Q = MR$$

Table 1 A Monopoly's Total, Average, and Marginal Revenue

Quantity of Water	Price	Total Revenue	Average Revenue	Marginal Revenue
(Q)	(P)	($TR = P \times Q$)	($AR = TR/Q$)	($MR = \Delta TR/\Delta Q$)
0 gallons	\$11	\$ 0	—	
1	10	10	\$10	\$10
2	9	18	9	8
3	8	24	8	6
4	7	28	7	4
5	6	30	6	2
6	5	30	5	0
7	4	28	4	-2
8	3	24	3	-4

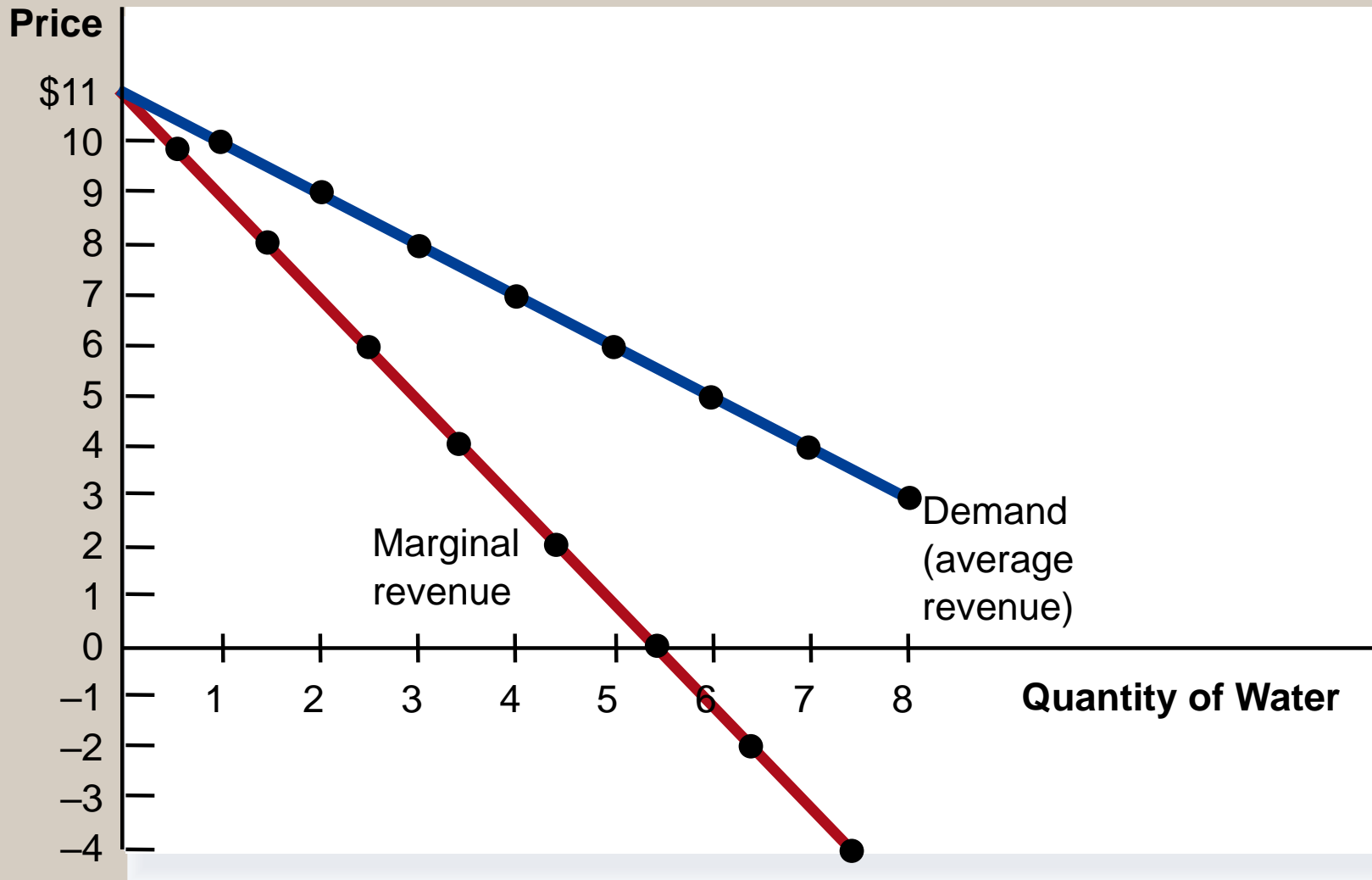
A Monopoly's Revenue

- ▶ A Monopoly's Marginal Revenue
 - A monopolist's marginal revenue is always *less than the price* of its good.
 - The demand curve is downward sloping.
 - When a monopoly drops the price to sell one more unit, the revenue received from the previously sold units also decreases.

A Monopoly's Revenue

- ▶ A Monopoly's Marginal Revenue
 - When a monopoly increases the amount it sells, it has **two effects** on total revenue ($P \times Q$).
 - The output effect—more output is sold, so **Q is higher**.
 - The price effect—price falls, so **P is lower**.

Demand and Marginal-Revenue



Marginal Revenue: a formal analysis

$$\Delta R = P\Delta Q + Q\Delta P + \Delta P\Delta Q$$

For very small values of ΔP and ΔQ we get:

$$\Delta R = P\Delta Q + Q\Delta P$$

$$MR = \frac{\Delta R}{\Delta Q} = P + Q \frac{\Delta P}{\Delta Q} \longrightarrow MR = \frac{\partial R(Q)}{\partial Q} = P + Q \frac{\partial P(Q)}{\partial Q}$$

Then.....marginal revenue can be written as:

$$R'(Q) = P \left[1 + P'(Q) \frac{Q}{P} \right] \rightarrow \frac{1}{\varepsilon} = P'(Q) \frac{Q}{P}$$

$$R'(Q) = P(Q) \left[1 + \frac{1}{\varepsilon(Q)} \right]$$

to avoid problems with the sign of the elasticity there is the absolute value

$$R'(Q) = P(Q) \left[1 - \frac{1}{|\varepsilon(Q)|} \right]$$

- If $|\varepsilon(Q)| = 1$ the marginal revenue is zero

- If demand is inelastic $|\varepsilon(Q)| < 1$ then $1 - \frac{1}{|\varepsilon(Q)|} < 0$

to increase demand it is necessary a **significant reduction** in the **price**, then marginal revenue becomes negative (revenue decreases)

• If demand is elastic $|\varepsilon(Q)| > 1$ then $1 - \frac{1}{|\varepsilon(Q)|} > 0$

Marginal revenue is positive. The **monopolist finds it always profitable producing in the elastic part of the demand** (in the inelastic part MR is negative)

Remark: for $Q=0$ elasticity is infinite, then

$$R'(Q) = P(Q) \left[1 - \frac{1}{\infty} \right] = P$$

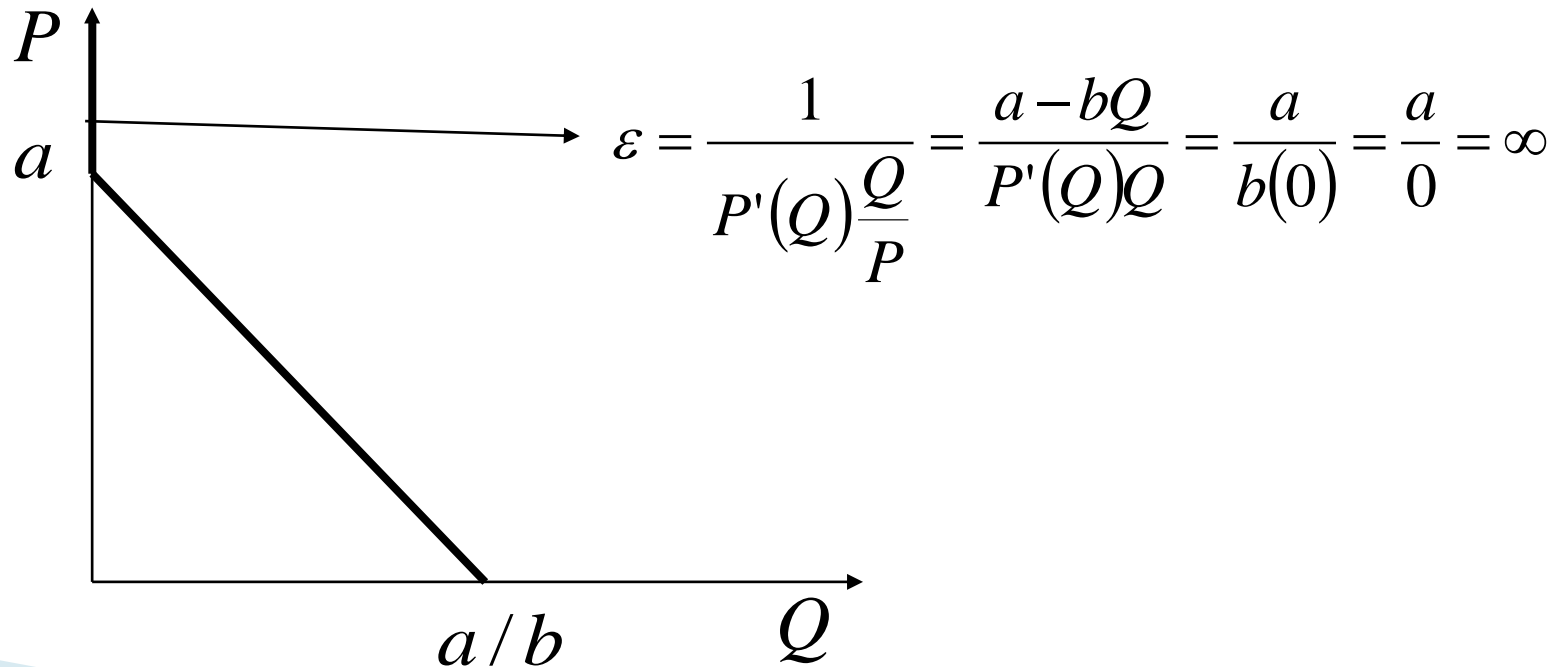
For the first unit sold the marginal revenue is equal to the price

Linear Demand

$$P(Q) = a - bQ$$

The slope of the inverse demand curve is constant: $P'(Q) = -b$

We now set up the marginal revenue curve:



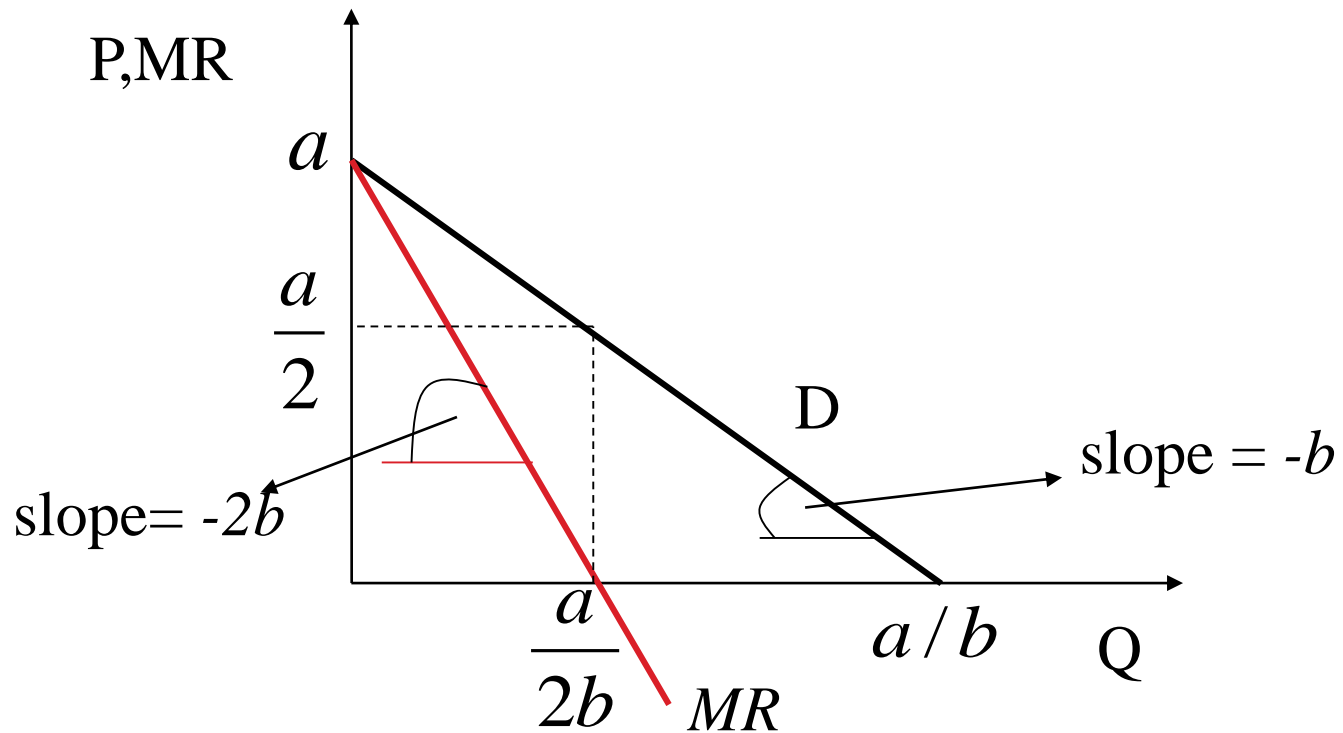
From:
$$\frac{\partial R(Q)}{\partial Q} = P(Q) \left[1 - \frac{1}{|\varepsilon(Q)|} \right]$$

Then:

$$\frac{\partial R(Q)}{\partial Q} = P(Q) + \frac{\partial P(Q)}{\partial Q} Q = P(Q) - bQ = (a - bQ) - bQ = a - 2bQ$$

Marginal Revenue Curve





for $Q > \frac{a}{2b}$ the demand is inelastic, $|\varepsilon| < 1$, then $MR < 0$

A Monopoly's Profit

- ▶ Profit equals total revenue minus total costs.
 - Profit = $TR - TC$
 - Profit = $(TR/Q - TC/Q) \times Q$
 - Profit = $(P - ATC) \times Q$

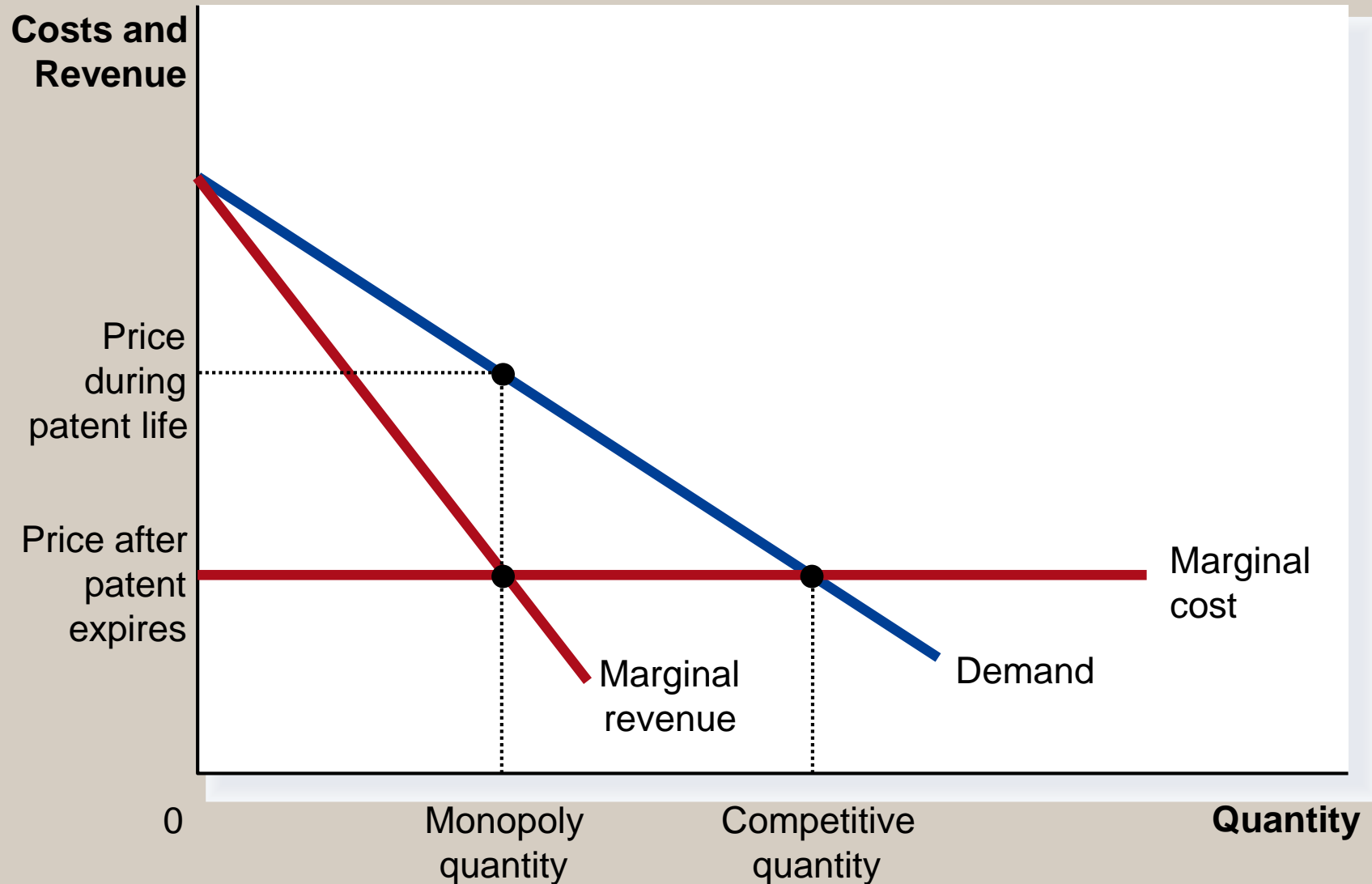
Profit Maximization

- ▶ A monopoly maximizes profit by producing the quantity at which **marginal revenue equals marginal cost**.
- ▶ It then uses the demand curve to find the price that will induce consumers to buy that quantity.

A Monopolist's Profit

- ▶ Note
 - Quantity on the intersection of MC and MR.
 - Price is given by the point on the demand curve on the vertical of this intersection.
- ▶ The monopolist will receive economic profits as long as price is greater than average total cost.

The Market for Drugs



Profit Maximization

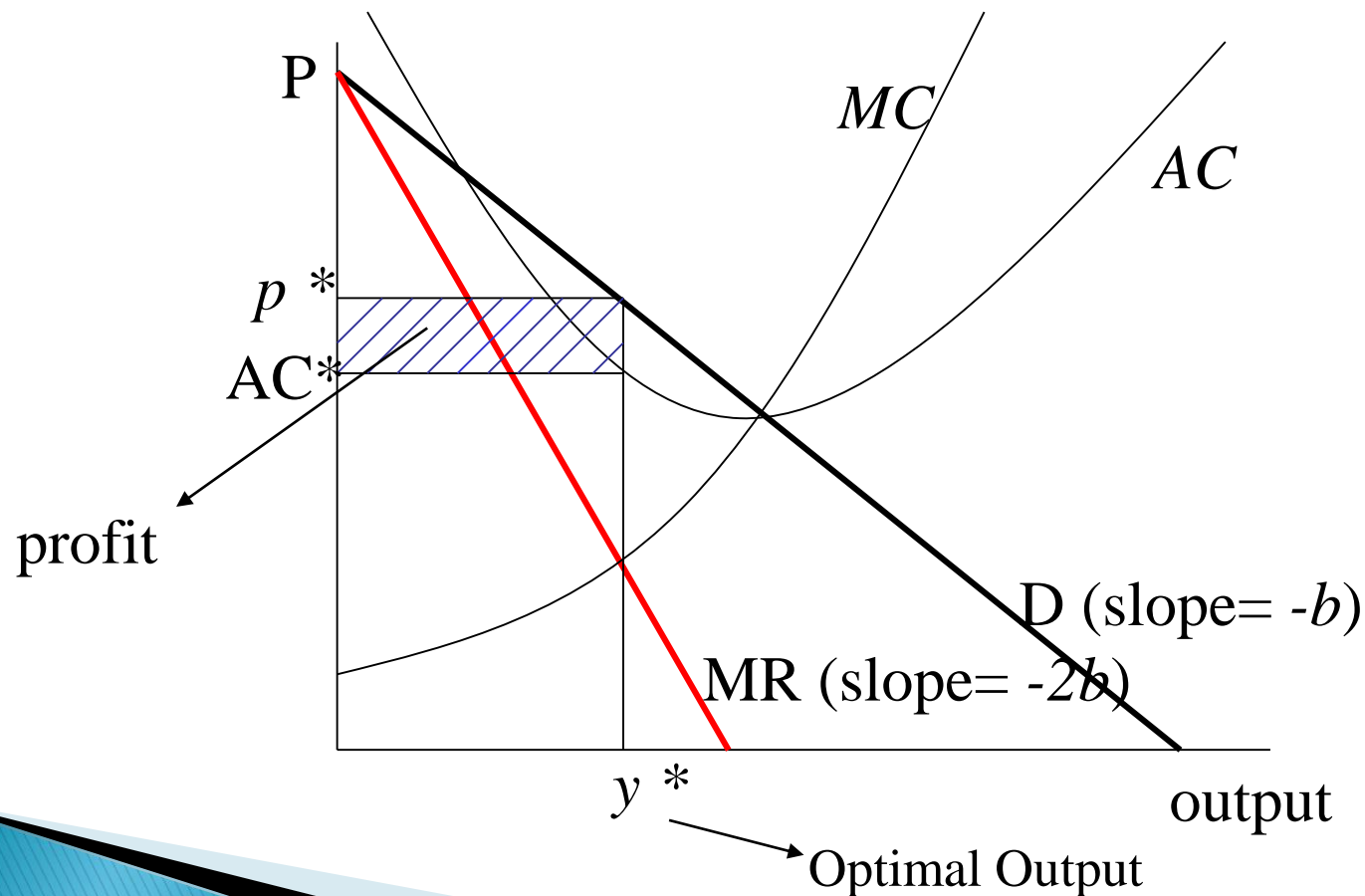
- ▶ Comparing Monopoly and Competition
 - For a competitive firm, price equals marginal cost.
$$P = MR = MC$$
 - For a monopoly firm, price exceeds marginal cost.
$$P > MR = MC$$

Example, still linear demand

$$P(Q) = a - bQ$$

$$R(Q) = P(Q)Q = aQ - bQ^2$$

$$MR(Q) = a - 2bQ$$



Profit maximization: a more formal analysis

$$\Pi = R - c(Q)$$

First order condition:

$$\frac{\partial \Pi}{\partial Q} = \frac{\partial R(Q)}{\partial Q} - \frac{\partial c(Q)}{\partial Q} = 0 \Rightarrow MR = MC$$

Remind : In competitive market the price is given, $MR=P$ and the optimal condition is $P=MR=MC$

The increase in output has a double effect on revenue:

$$\Delta R = P\Delta Q + Q\Delta P$$

Positive effect arisen from selling more

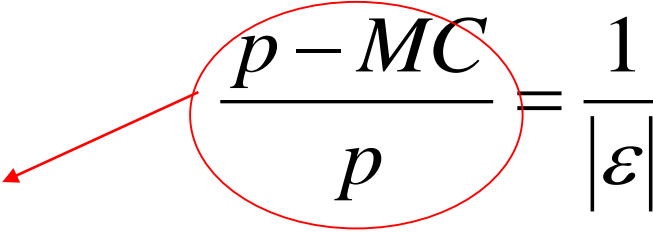
If quantity increases the price needs to decrease and all output is sold at a lower price

But remember!!!! the marginal revenue is equal to:

$$MR = P(Q) \left[1 - \frac{1}{|\varepsilon(Q)|} \right]$$

The first order condition $MR=MC$ becomes:

$$P(Q) \left[1 - \frac{1}{|\varepsilon(Q)|} \right] = MC(Q)$$


$$\frac{p - MC}{p} = \frac{1}{|\varepsilon|}$$

Lerner Index: measures the market power of the monopolist

If $|\varepsilon| < 1$ MR is negative then $MR < MC$



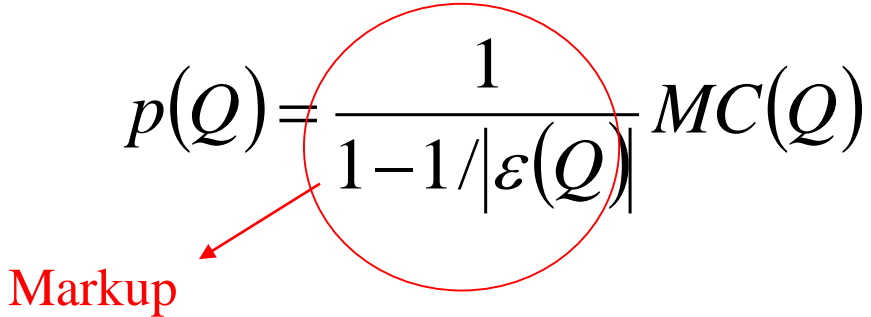
A profit maximizer **Monopolist always produces in the elastic part**

$$|\varepsilon| \geq 1$$

Intuition: if it produced in the inelastic part it could reduce quantity and increase its profit: with inelastic demand a small reduction of Q is obtained by a high increase in P , this means that it was not maximizing.

The optimal price policy of Monopolist is:

$$p(Q) \left[1 - \frac{1}{|\varepsilon(Q)|} \right] = MC(Q)$$

$$p(Q) = \frac{1}{1 - 1/|\varepsilon(Q)|} MC(Q)$$


Markup

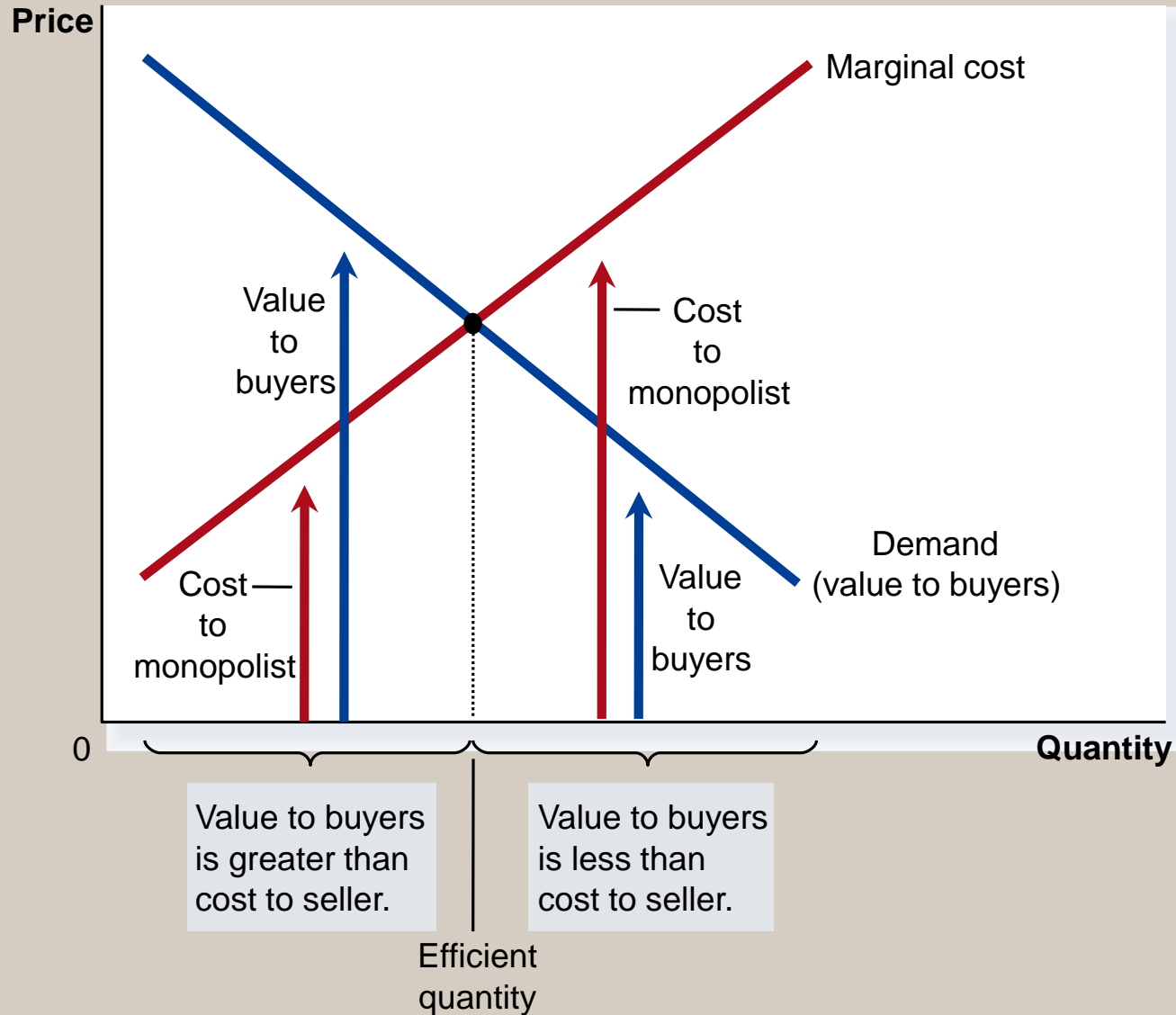
Optimal price implies **a markup on marginal cost.**

Since monopolist produces in the elastic demand $|\varepsilon(Q)| > 1$ then the markup is **positive and higher than 1**, then a profit maximizer monopolist charges a **price higher than the marginal cost.**

THE WELFARE COST OF MONOPOLY

- ▶ In contrast to a competitive firm, the monopoly charges a **price above the marginal cost**.
- ▶ From the standpoint of consumers, this high price makes monopoly undesirable.
- ▶ However, from the standpoint of the owners of the firm, the high price makes monopoly very desirable.

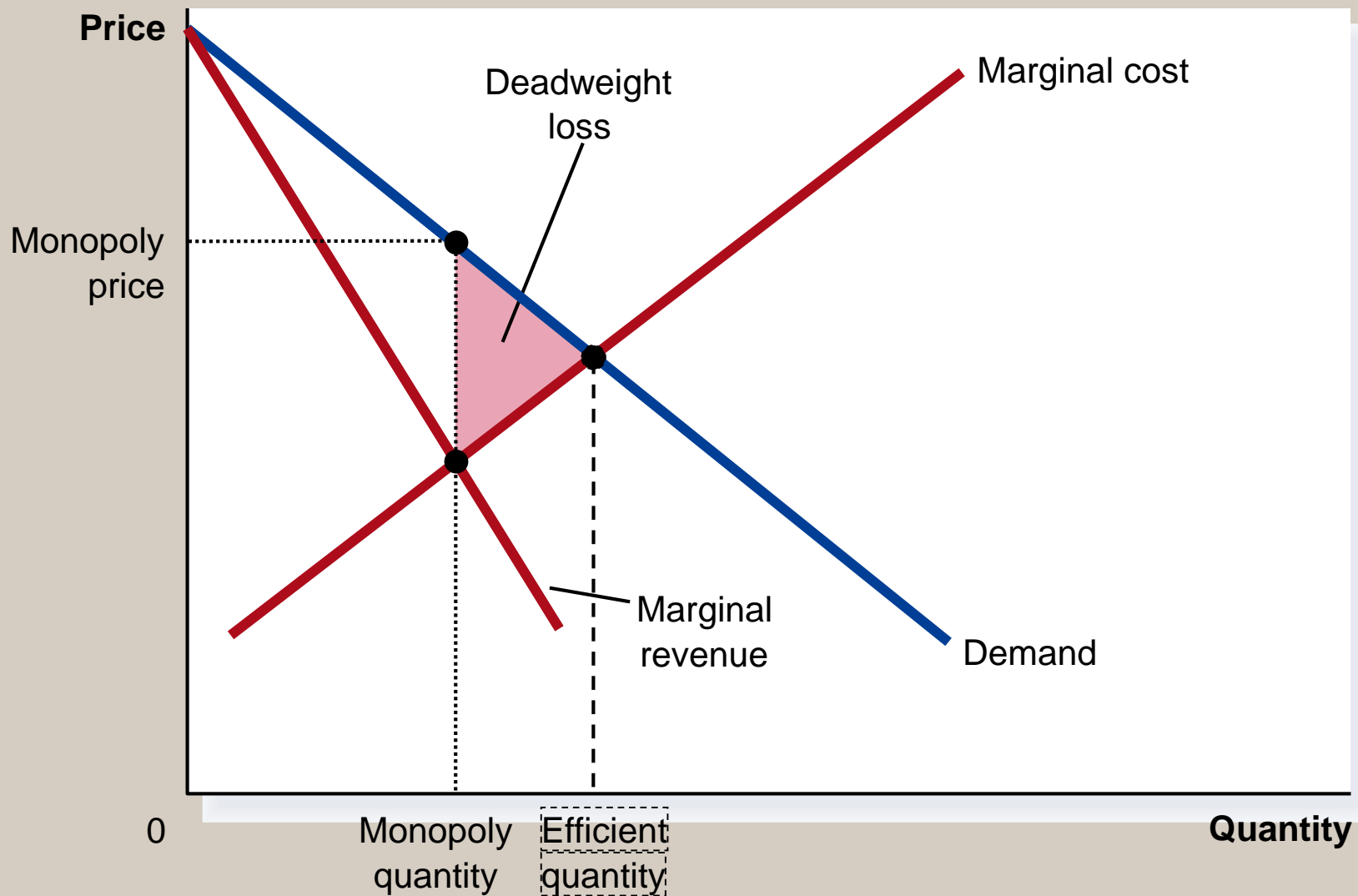
Figure 7 The Efficient Level of Output



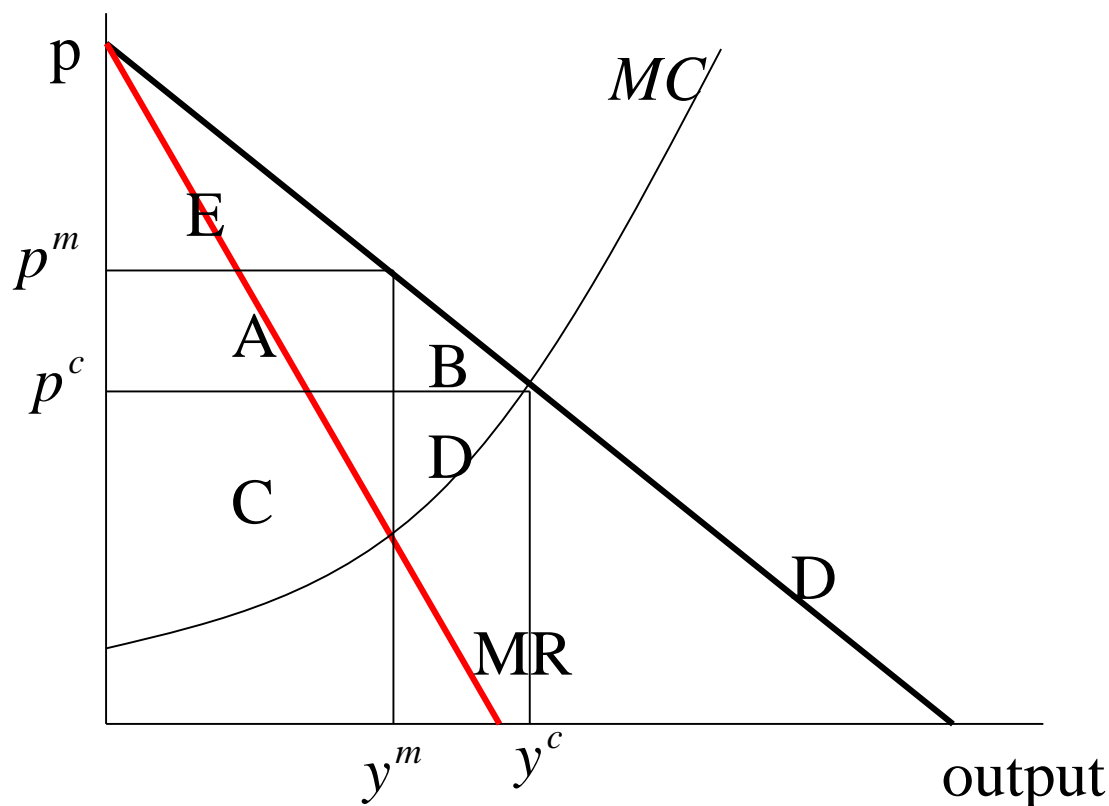
The Deadweight Loss

- ▶ The Inefficiency of Monopoly
 - The monopolist produces *less than* the socially efficient quantity of output.

Figure 8 The Inefficiency of Monopoly



Under monopoly **consumers are worse-off** but the **firm is better-off**: what about social welfare?



- Consumer surplus decreases of $B+A$
- The firm increases its surplus by A but it loses D (output previously sold at a price higher than the marginal cost)

- Total Surplus in monopoly is $SW_m = E + A + C$, while in competition was $SW_c = A + B + C + D + E$, with $SW_m < SW_c$

the reduction in consumer surplus offsets the increase in the producer surplus: **society as a whole is worse-off**

$B + C$ is the **deadweight loss**, B is the lost part of the consumer surplus (not going to the producer), C is the reduction in the producer surplus

social loss: it is not redistributed among groups within same economy (society)

The Deadweight Loss

- ▶ The deadweight loss caused by a **monopoly** is **similar** to the deadweight loss caused by a **tax**.
- ▶ The difference between the two cases is that the government gets the revenue from a tax, whereas a private firm gets the monopoly profit.

PUBLIC POLICY TOWARD MONOPOLIES

- ▶ Government responds to the problem of monopoly in one of four ways.
 - Making monopolized industries **more competitive**.
 - **Regulating** the behavior of monopolies.
 - **Turning** some private monopolies **into public** enterprises.
 - Doing **nothing** at all (**price discrimination**)

Increasing Competition with Antitrust Laws

- ▶ Antitrust laws are a collection of statutes aimed at curbing monopoly power.
- ▶ Antitrust laws give government various ways to promote competition.
 - They allow government to **prevent mergers**.
 - They allow government to **break up companies**.
 - They prevent companies from performing activities that make markets less competitive (**dominant position**)

Increasing Competition with Antitrust Laws

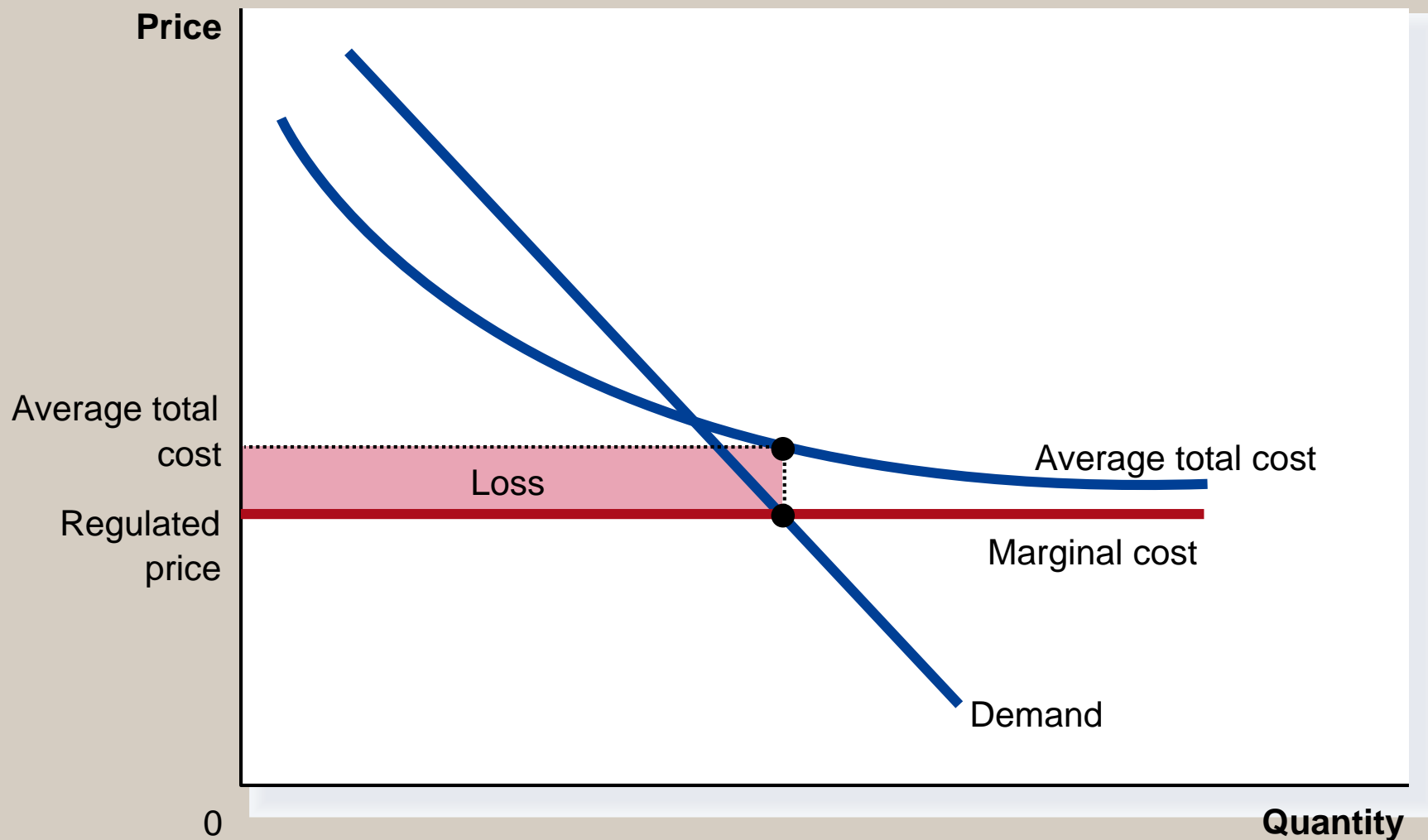
- ▶ Two Important US Antitrust Laws
 - Sherman Antitrust Act (1890)
 - Reduced the market power of the large and powerful “trusts” of that period.
 - Clayton Act (1914)
 - Strengthened the government’s powers and authorized private lawsuits.
- ▶ EU competition commissioner
 - Firms in a **dominant position** may **not abuse** of that position (Article 82 of the EC Treaty).

Regulation

- ▶ Government may regulate the prices that the monopoly charges.
 - The allocation of resources will be **efficient** if **price is set to equal marginal cost**.

Regulating Natural Monopoly

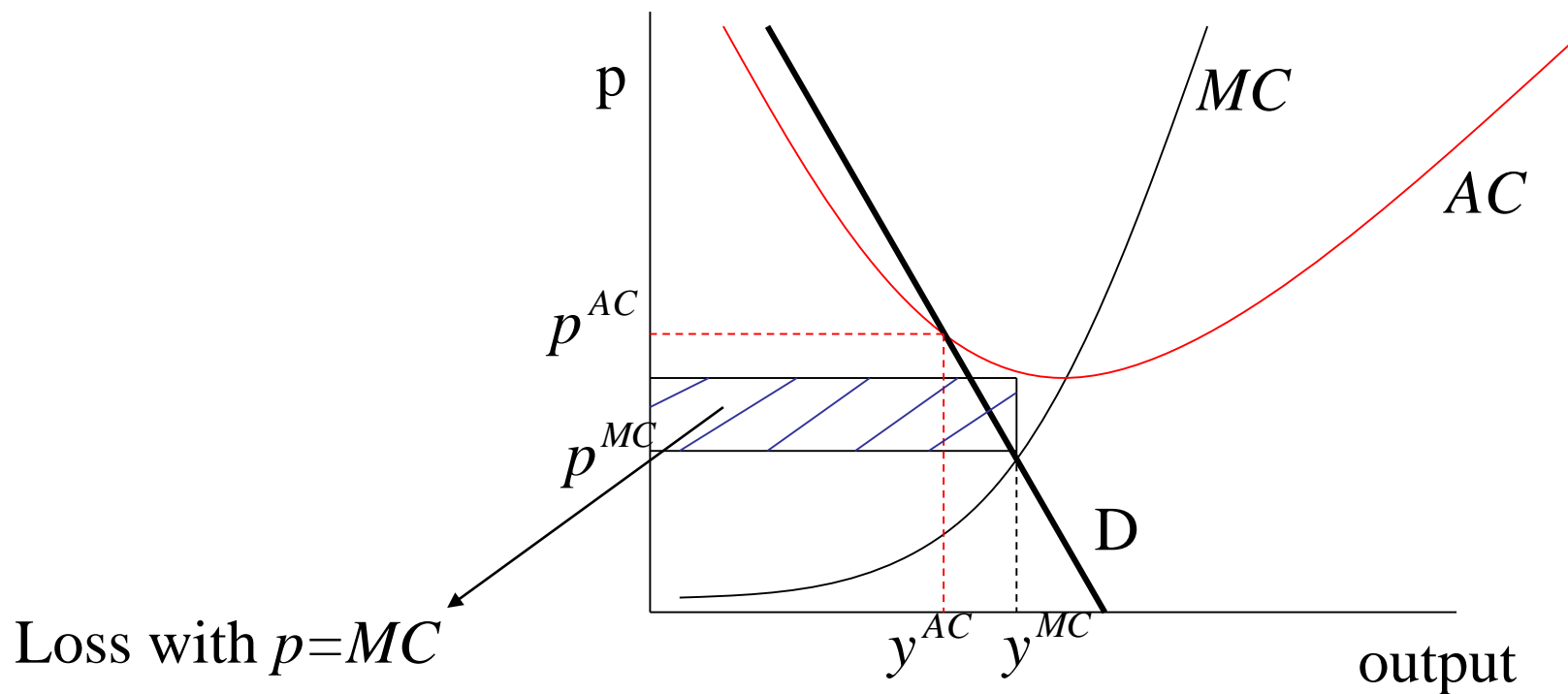
- I. Producing an efficient quantity by charging $P=MC$ would imply a negative profit



Regulation

- ▶ In practice, regulators will allow monopolists to keep some of the benefits from lower costs in the form of higher profit, a practice that requires some **departure from marginal-cost pricing**.

- II. Producing a quantity with $P=AC$ would cover the costs but the quantity is lower than the efficient one.



Then, allowing the monopolist to set its optimal price *is not socially efficient*, but imposing $P = MC$ would induce shutting down, any solutions?

1) sub-optimal pricing (second best) under *private ownership*:

- Regulator accepts that prices must cover costs, $P=AC$ (USA gas, Italy: electricity, telephone services, mail services)
- *ROR system*
- Imposes $P=MC$ and allows a *subsidy* to the firm (subway, public bus)

Public Ownership

- ▶ Rather than regulating a *natural monopoly* that is run by a private firm, the government can run the **monopoly itself**
 - Rare in the United States (Postal Service).
 - In UK very common pre-privatisation;
 - More in continental Europe (i.e. Italy: national railways system (ex Ferrrovie dello Stato), Telecommunication Provider (ex SIP)..)