Perfect competition and pure monopoly

Part III: Pure monopoly

MICRO- AND MACROECONOMICS

Pure monopoly

Part 3

A perfectly competitive firm and a monopolist

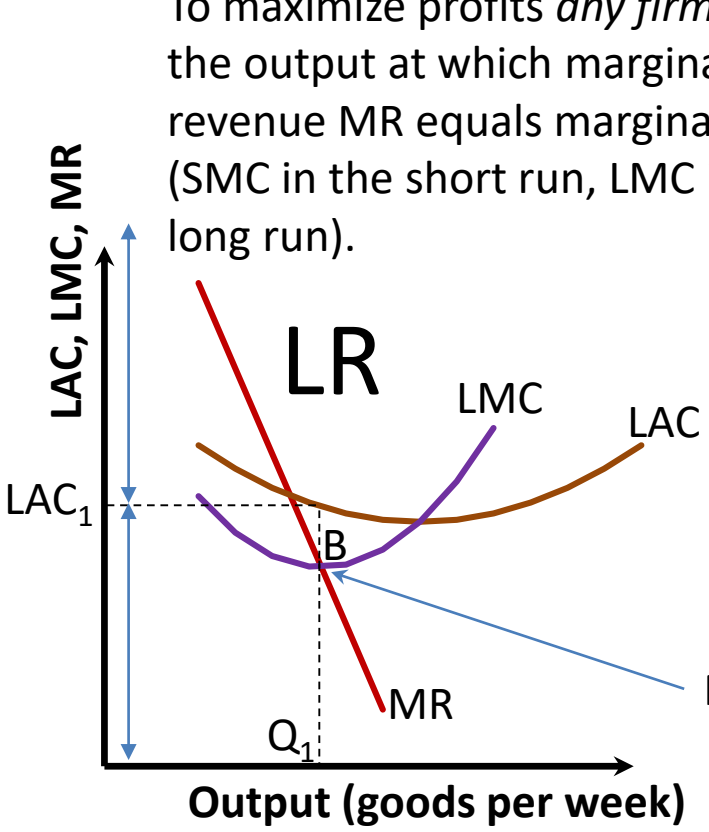
- A **perfectly competitive firm** is too small to worry about any effect of its output decision on industry supply and hence price. It can sell as much as it wants at the market price.
- A **monopolist** is the sole supplier and potential supplier of the industry's product. A real monopolist need not worry about entry even in the long run.

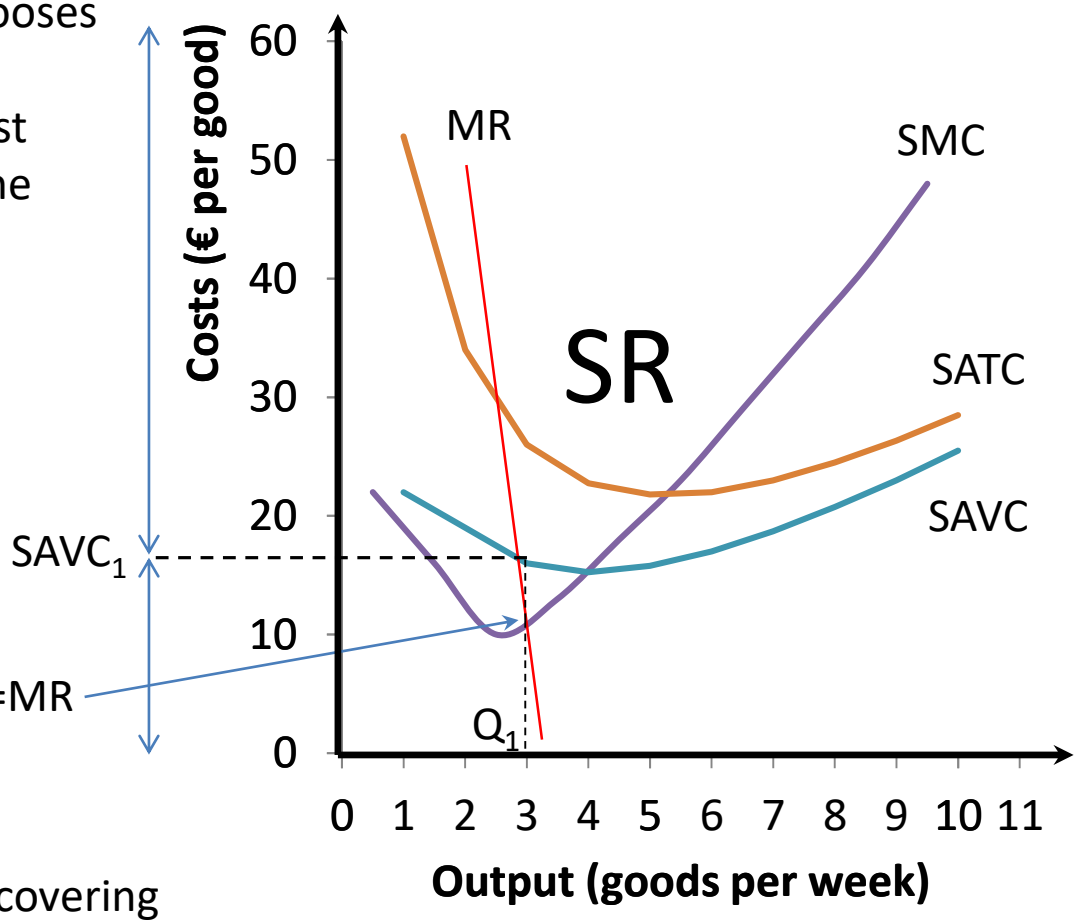
A monopolist and the industry

- The firm and the industry coincide. The sole national supplier may not be a monopolist if the good or service is internationally traded.
- *Royal Mail* (formerly *Consignia*) is the sole supplier of UK stamps and a monopolist in them. *Airbus* is the only large plane-maker in Europe, but is not a monopolist since it faces cut-throat international competition from *Boeing*. Sole suppliers may also face invisible competition from potential entrants. If so, they are not monopolists.

Marginal condition	Average condition	
	Short run	Long run
Produce output Where MR = MC	If P < SAVC shut down temporarily	If P < LAC exit industry

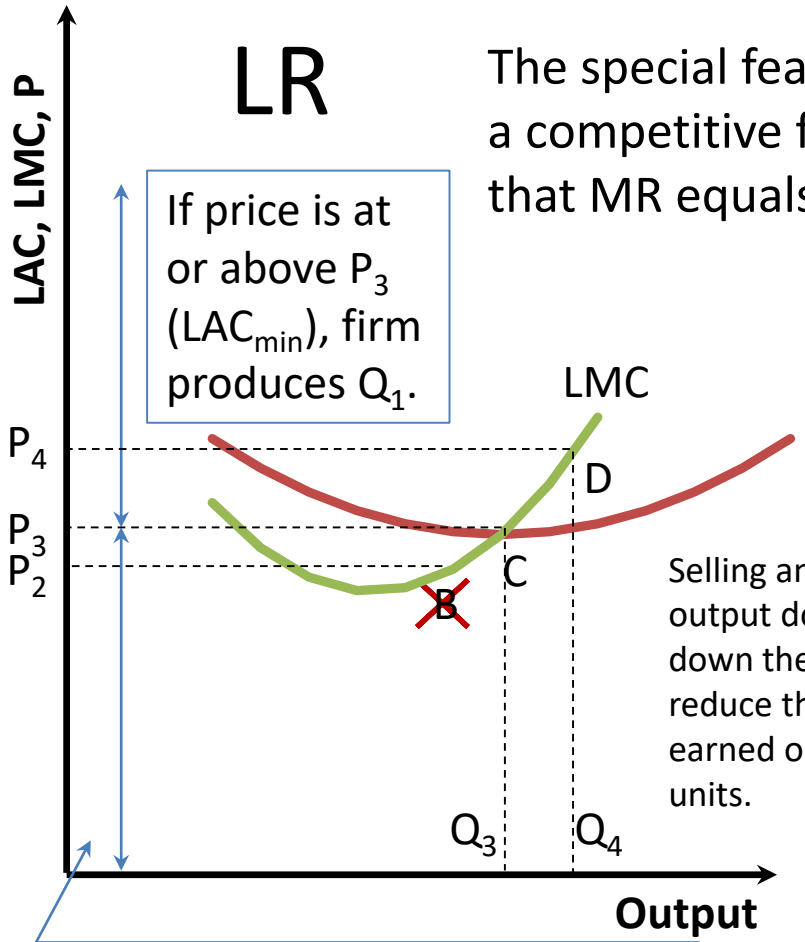
To maximize profits *any firm* chooses the output at which marginal revenue MR equals marginal cost (SMC in the short run, LMC in the long run).





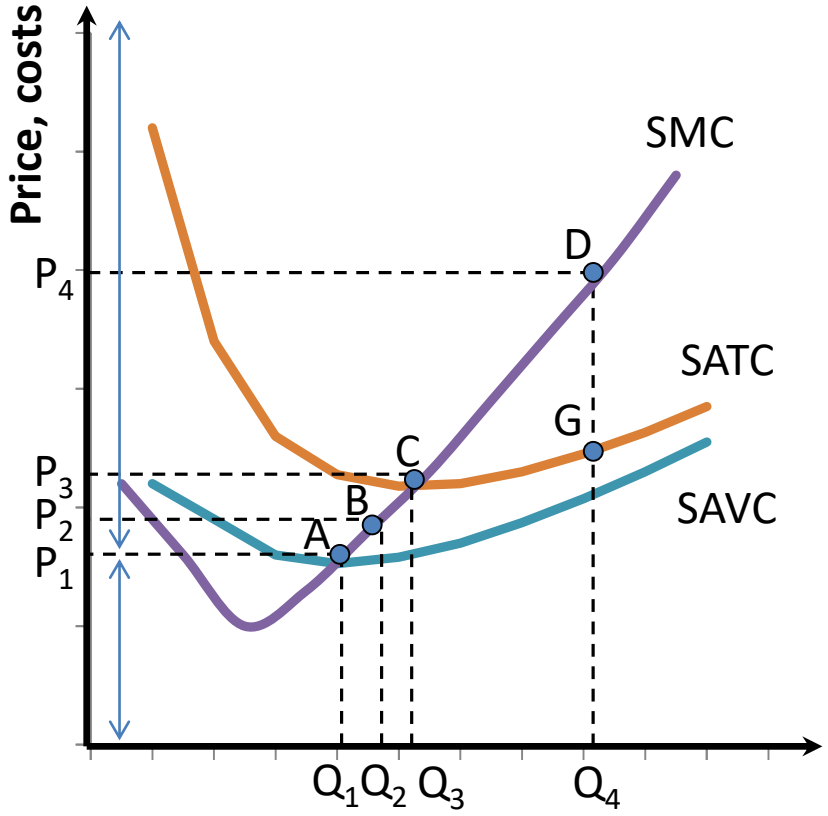
It then checks whether it is covering average costs (SAVC in the short run and LAC in the long run).

Marginal condition	Average condition	
	Short run	Long run
Produce output Where P = MC	If P < SAVC shut down temporarily	If P < LAC exit industry



The special feature of a competitive firm is that MR equals price.

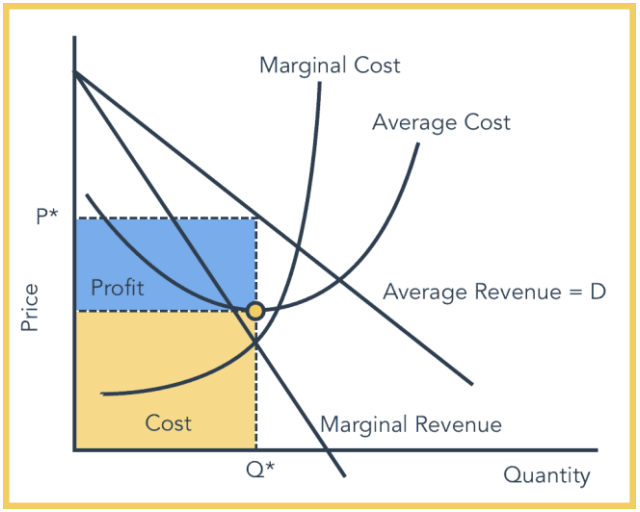
Selling an extra unit of output does not bid down the price and reduce the revenue earned on previous units.

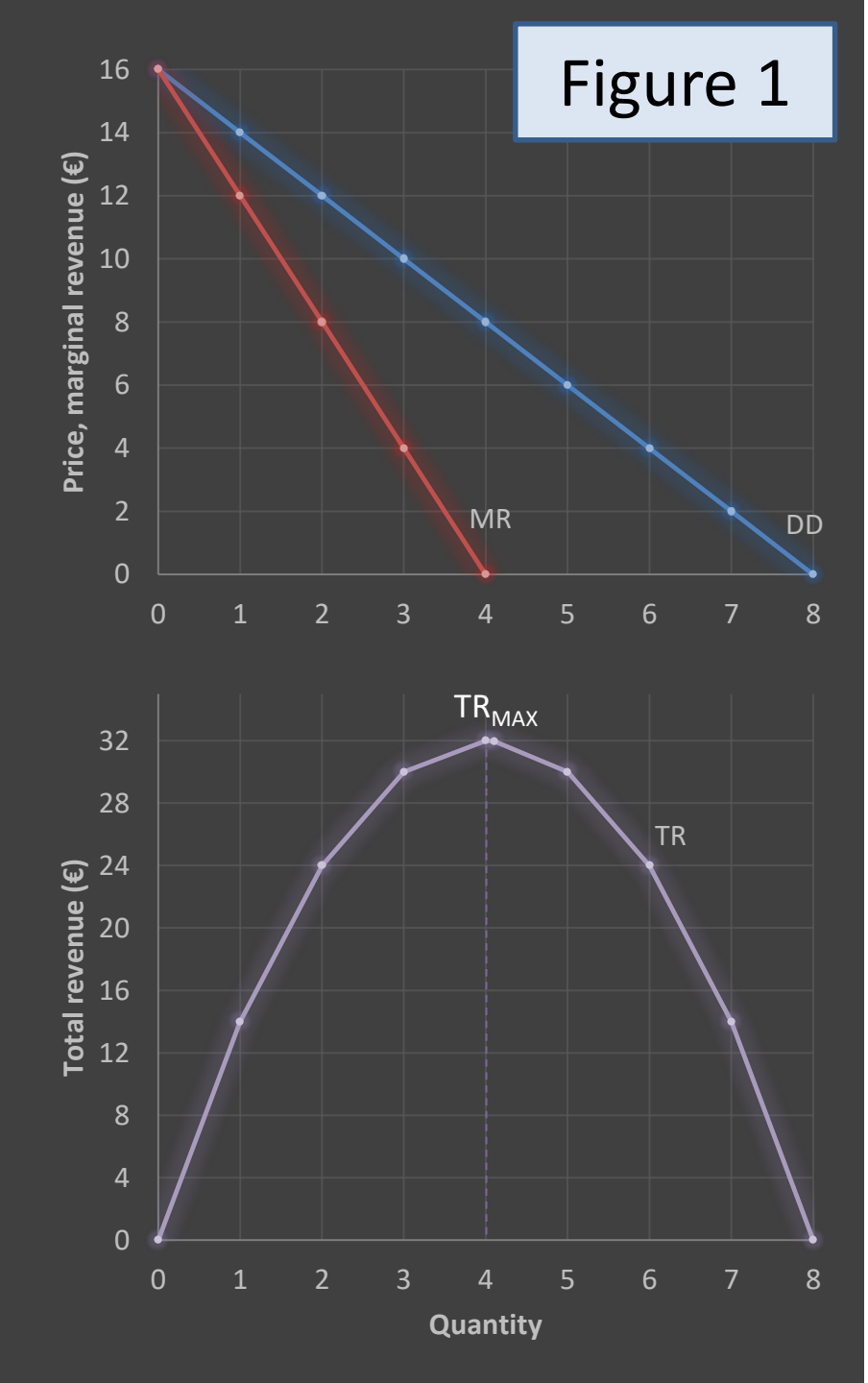


The price at which the extra unit is sold is the change in total revenue.

The monopolist's demand curve

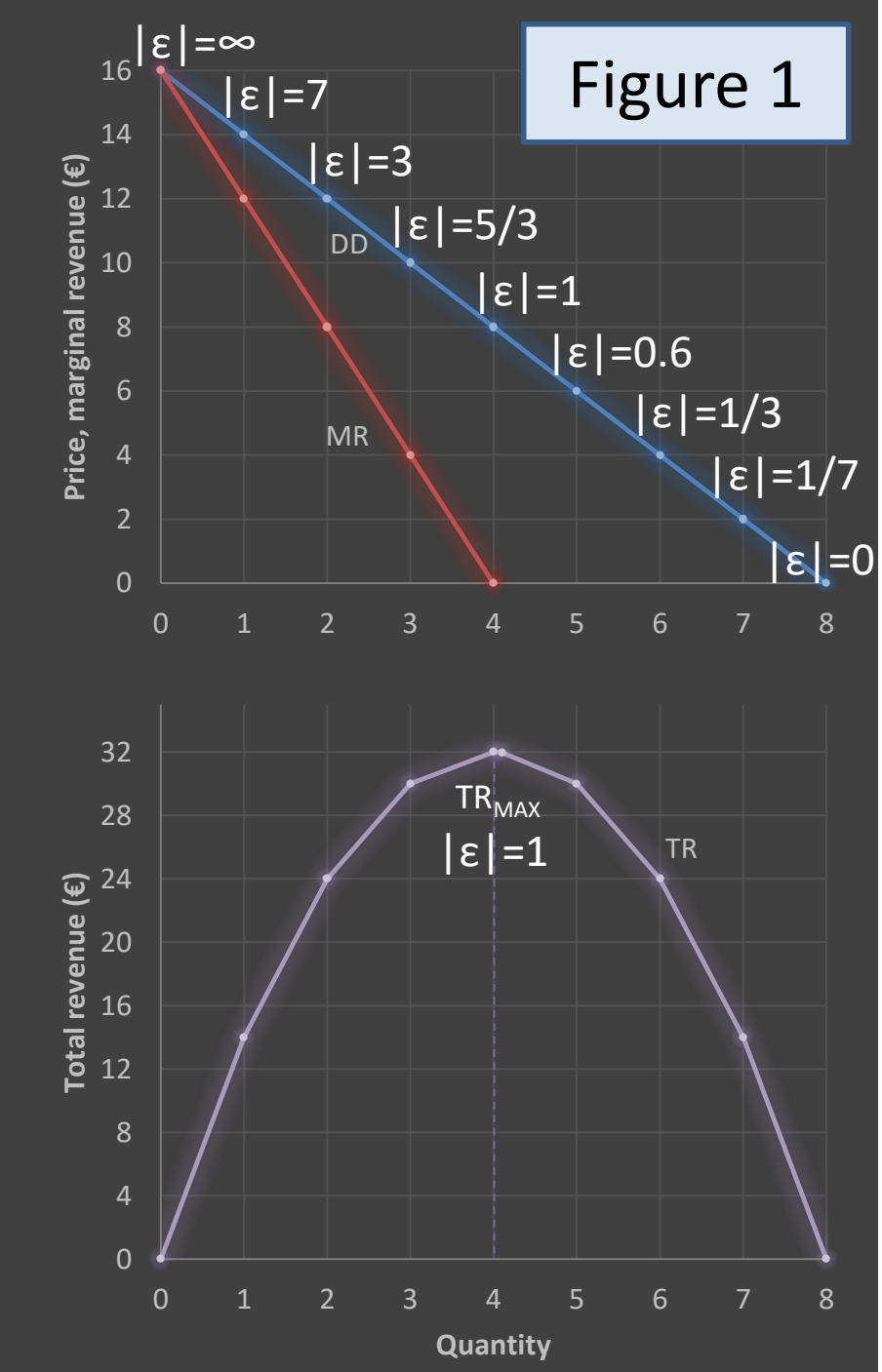
- In contrast, the monopolist's demand curve is the **industry demand curve**, which slopes down.
- Hence, MR is **less** than the price at which the extra output is sold.
- The monopolist knows that **extra output reduces revenue** from existing units. To sell more, the price on all units must be cut.





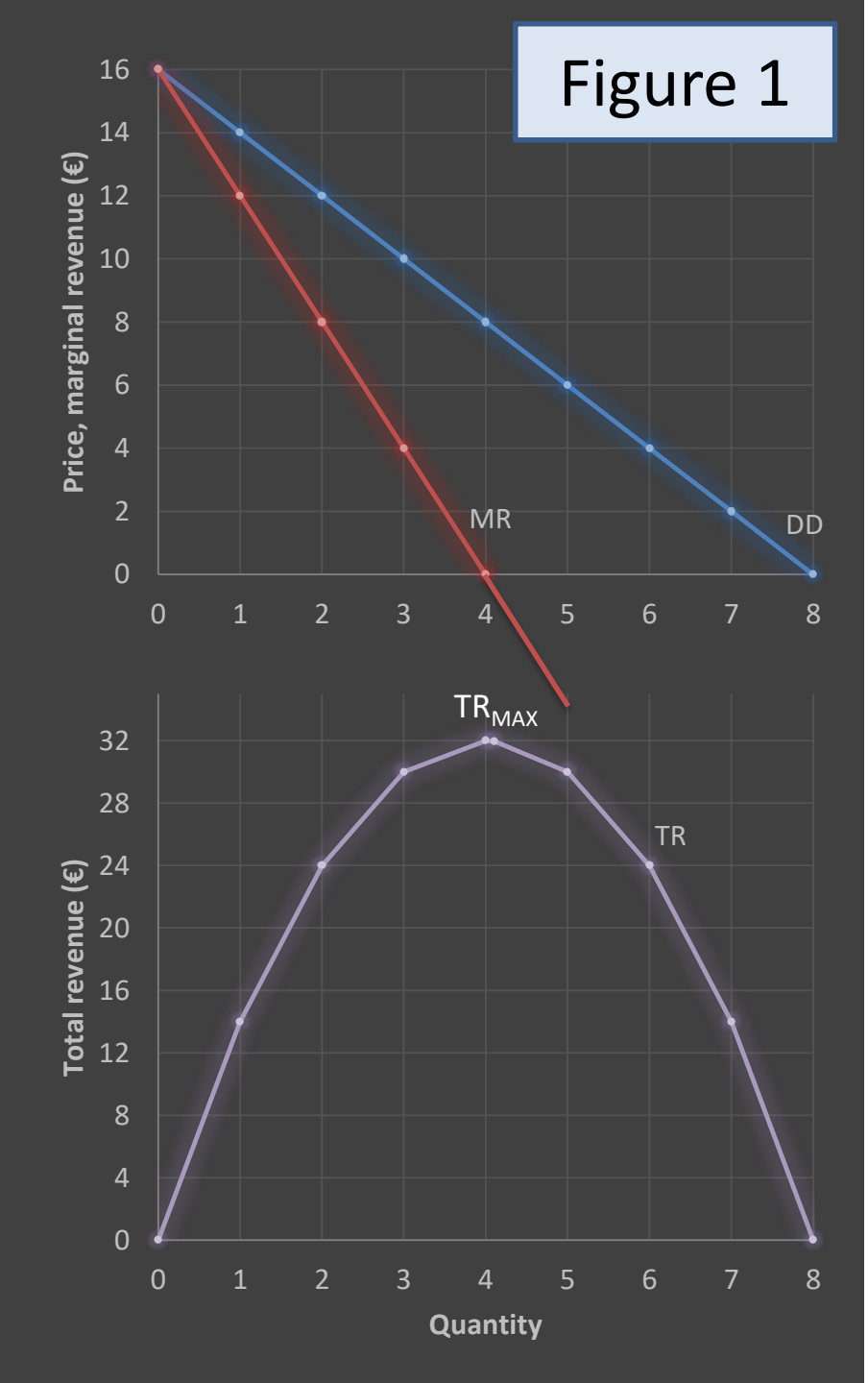
Demand, total revenue and marginal revenue

- Total revenue (TR) equals price times quantity. From the demand curve *DD* we can plot the *TR* curve at each quantity. Maximum *TR* occurs at €32, when 4 units are sold for €8 each.
- Marginal revenue (MR) shows how *TR* changes when quantity is increased a small amount. *MR* lies below the demand curve DD.
- From the price of the extra unit we must subtract the loss in revenue from existing units as the price is bid down.



Price, MR and TR

- The more inelastic the demand curve, the more an extra unit of output bids down the price, reducing revenue from existing units.
- At any output, MR is further below the demand curve the more inelastic is demand.
- Also, the larger the existing output, the larger the revenue loss from existing units when the price is reduced to sell another unit.
- For a given demand curve, MR falls increasingly below price the higher the output from which we begin.



Revenue and cost

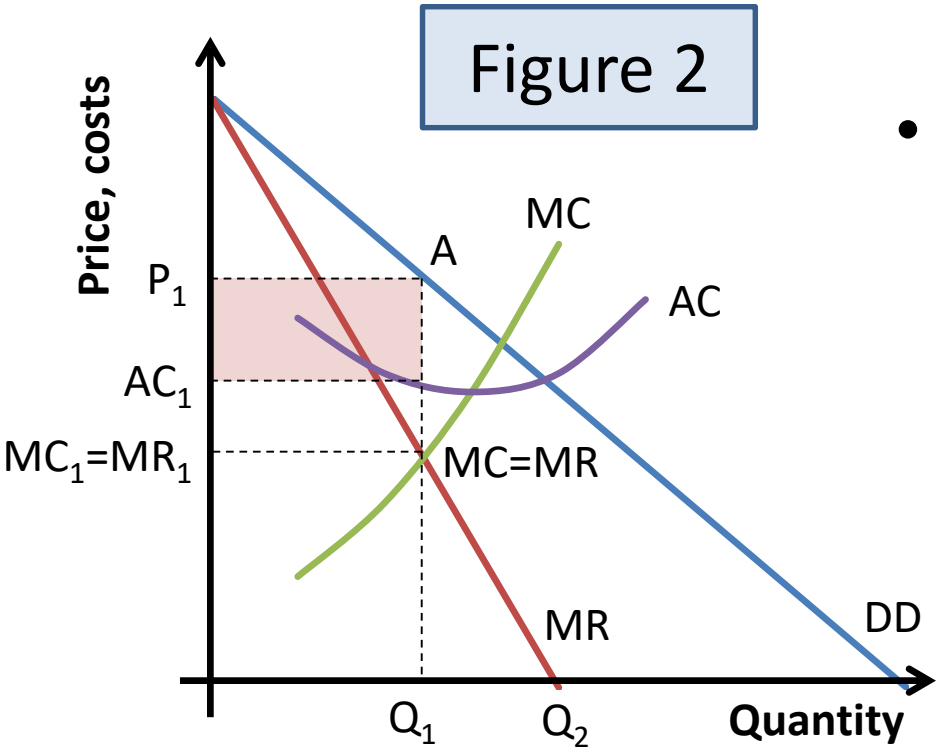
- Beyond a certain output (4 in figure 1), the revenue loss on existing output exceeds the revenue gain from the extra unit itself. Marginal revenue is negative. Further expansion reduces total revenue.
- On the cost side, with only one product, the cost curves of a single firm carry over directly. The monopolist has the usual cost curves, average and marginal, short-run and long-run.
- For simplicity, we discuss only the long-run curves in detail.

Profit-maximizing output

- Setting MR equal to MC leads to the profit-maximizing level of positive output. Then the monopolist must check, whether, at this output, the price (average revenue) covers average variable costs in the short run and average total costs in the long run. If not, the monopolist should shut down in the short run and leave the industry in the long run.

	Marginal condition			**Average condition**			
				Short-run		**Long-run**	
	MR>MC	MR=MC	MR<MC	P>SAVC	P<SAVC	P>LAC	P<LAC
Output decision	Raise	Optimal	Lower	Produce	Shut down	Stay	Exit

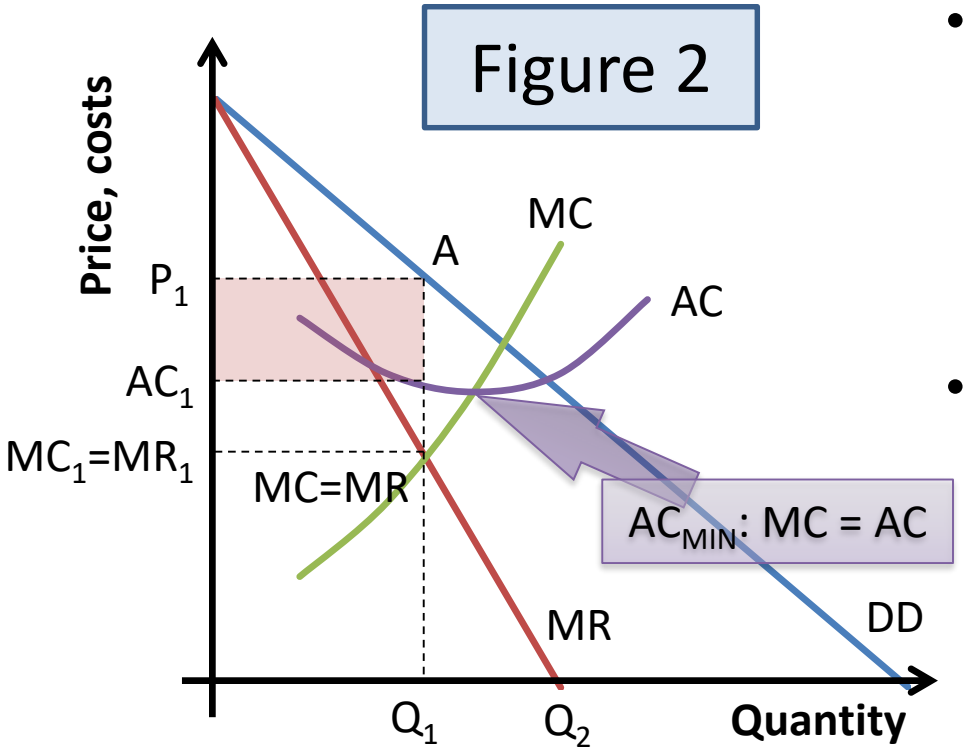
The monopoly equilibrium



- Applying the usual marginal condition, a profit-maximizing monopolist produces output level Q_1 at which marginal cost MC equals marginal revenue MR.

- Then it must check that price covers average cost. In this figure, Q_1 can be sold at price P_1 in excess of average costs AC_1. Monopoly profits are the shaded areas $(P_1 - AC_1) \times Q_1$.

The monopolist's profits



$$\pi(Q) = TR(Q) - TC(Q) = \\ = (P(Q) - AC(Q)) \times Q$$

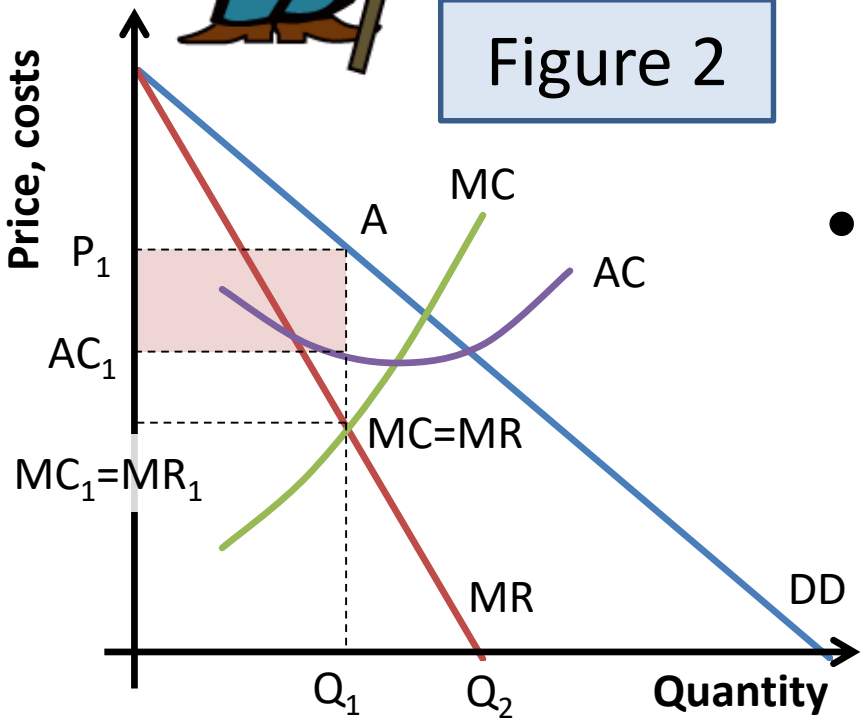
- Figure 2 shows the average cost curve AC with its usual U-shape. The marginal cost curve MC goes through the lowest point on the AC curve.
- Marginal revenue MR lies below the down-sloping demand curve DD. Setting MR = MC, the monopolist chooses the output Q_1. To find the price for which Q_1 is sold we look at the demand curve DD.
- The monopolist sells output Q_1 at a price P_1. Profit per unit is $(P_1 - AC_1)$, and total profit is the shaded area $(P_1 - AC_1) \times Q_1$.

Supernormal (monopoly) profits

- Even in the long run, the monopolist makes *supernormal* profits, sometimes called *monopoly* profits.
- Unlike the competitive industry, supernormal profits of a monopolist are not eliminated by entry of more firms and a fall in the price.
- A monopoly has no fear of possible entry. By ruling out entry, we remove the mechanism by which supernormal profits disappear in the long run.

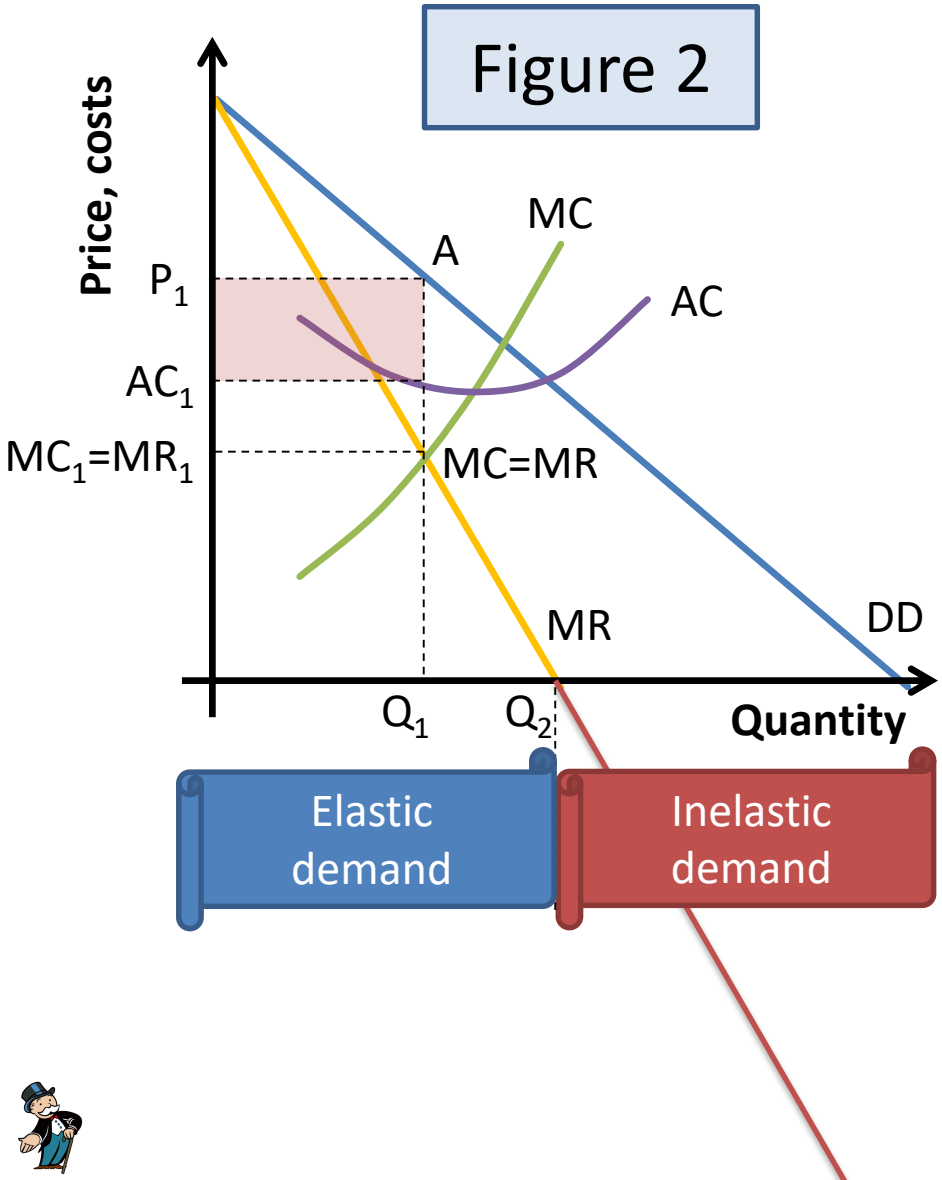
Price-setting

Figure 2



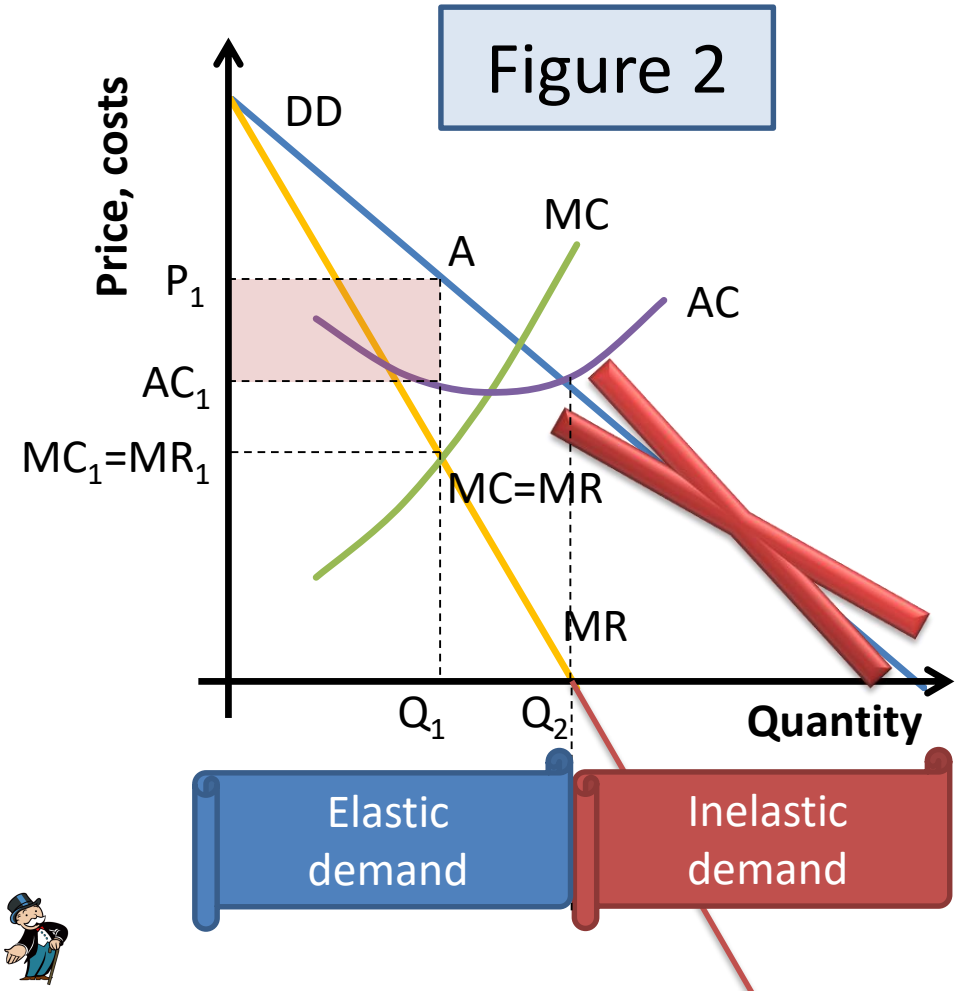
- Whereas a competitive firm is a *price-taker*, a monopolist sets prices and is a *price-setter*.
- Having decided to produce Q_1, in figure 2, the monopolist quotes a price P_1 knowing that customers will then demand the output Q_1.

Elasticity and marginal revenue



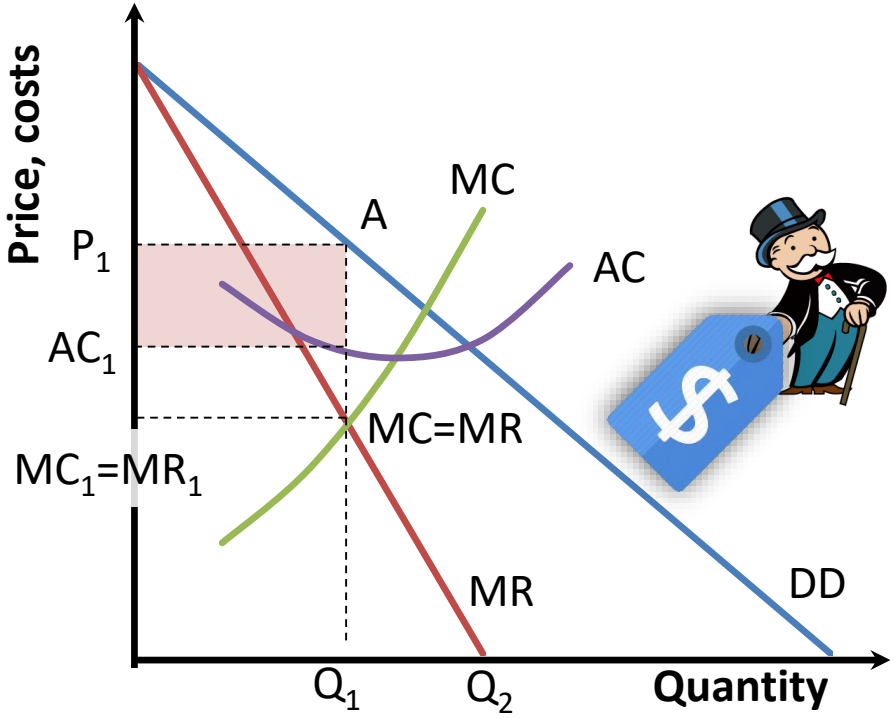
- When the elasticity of demand is between 0 and −1, demand is inelastic and a rise in output reduces total revenue. Marginal revenue is negative. In percentage terms, the fall in the price exceeds the rise in quantity.
- All outputs to the right of Q_2 in figure 2 have negative MR. The demand curve is inelastic at quantities above Q_2.
- At quantities below Q_2 the demand curve is elastic. Higher output leads to higher revenue. Marginal revenue is positive.

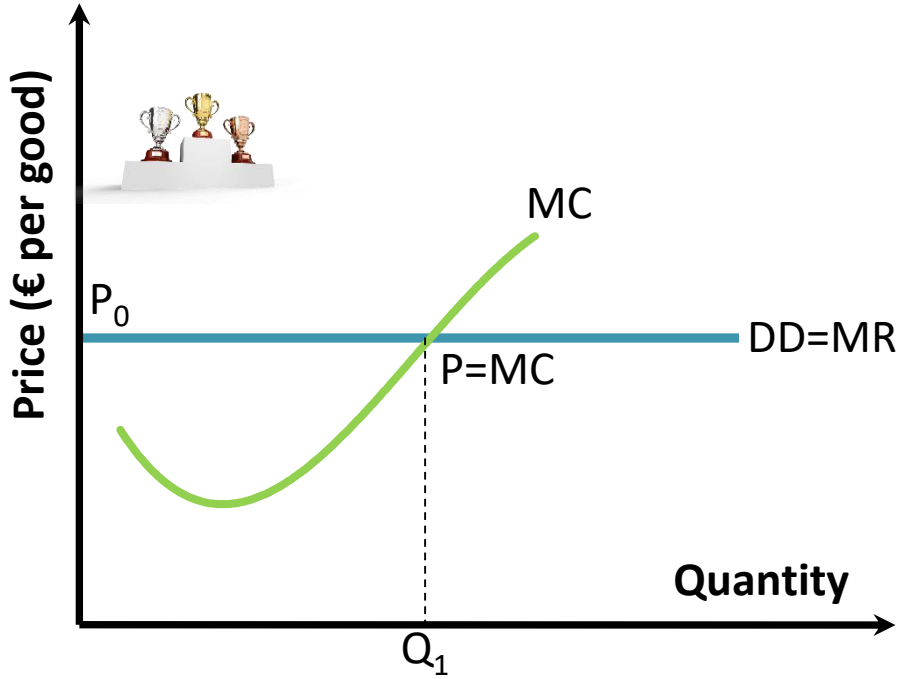
A monopolist never produces on the inelastic part of the demand curve



- The monopolist sets MC = MR.
- Since MC must be positive, so must MR.
- The chosen output must lie to the left of Q_2.
- **A monopolist never produces on the inelastic part of the demand curve**.

Prices and marginal costs





- At any output, price exceeds the monopolist's marginal revenue since the demand curve slopes down.
- Hence, in setting MR = MC the monopolist sets a price that exceeds marginal cost.
- In contrast, a competitive firm always equates price and marginal cost, since its price is also its marginal revenue.

$$LI = \frac{P - MC}{P} = \frac{1}{\varepsilon_d}$$

Monopoly power

- The excess of price over marginal cost is a measure of **monopoly power**.
- A competitive firm cannot raise the price above marginal cost and has no monopoly power.
- The more inelastic the demand curve of the monopolist, the more marginal revenue is below price, the greater is the excess of price over marginal cost, and the more monopoly power it has.

Comparative statics for a monopolist

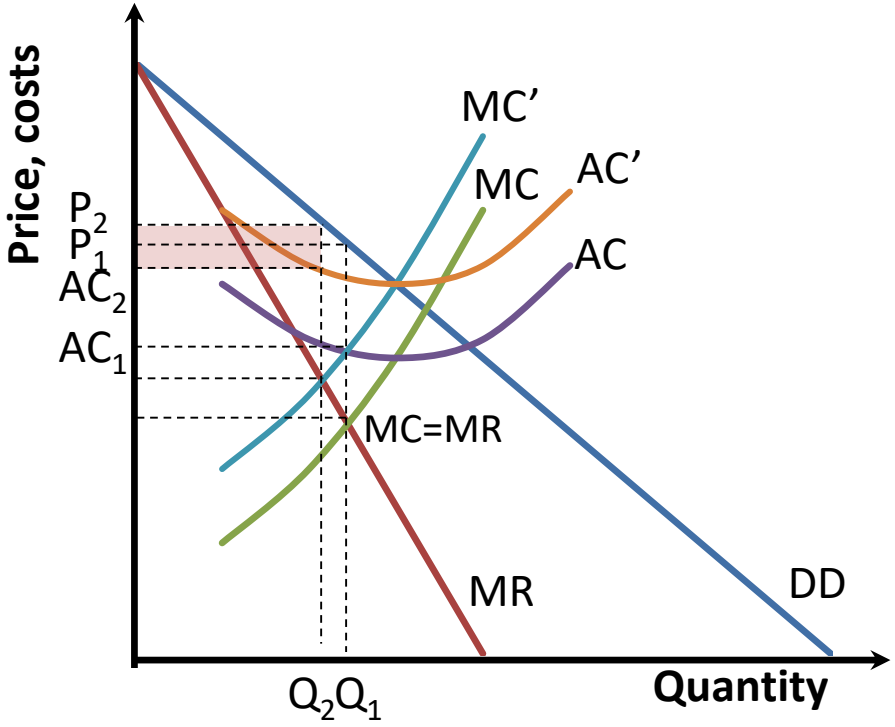


Figure 2 (variant)

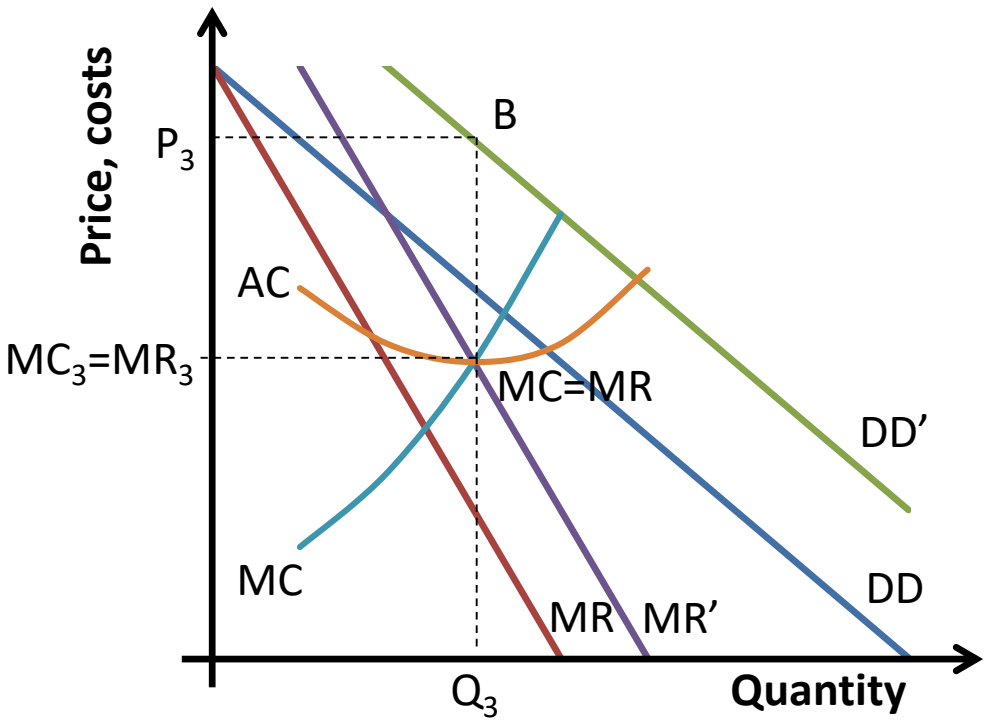
$$MC \uparrow \rightarrow Q \downarrow \rightarrow P \uparrow$$

- Figure 2 may also be used to analyse changes in costs or demand. Suppose a rise in costs shifts the *MC* and *AC* curves upwards.
- The higher *MC* curve must cross the *MR* curve at a lower output. If the monopolist can sell this output at a price that covers average costs, the effect of the cost increase must be to reduce output. Since the demand curve slopes down, lower output means a higher equilibrium price.

Effects of a change in demand

- Similarly, for the original cost curves in figure 2, suppose there is an outward shift in demand and marginal revenue curves.
- *MR* must now cross *MC* at a higher output.
- Thus a rise in demand leads the monopolist to increase output.

Figure 3

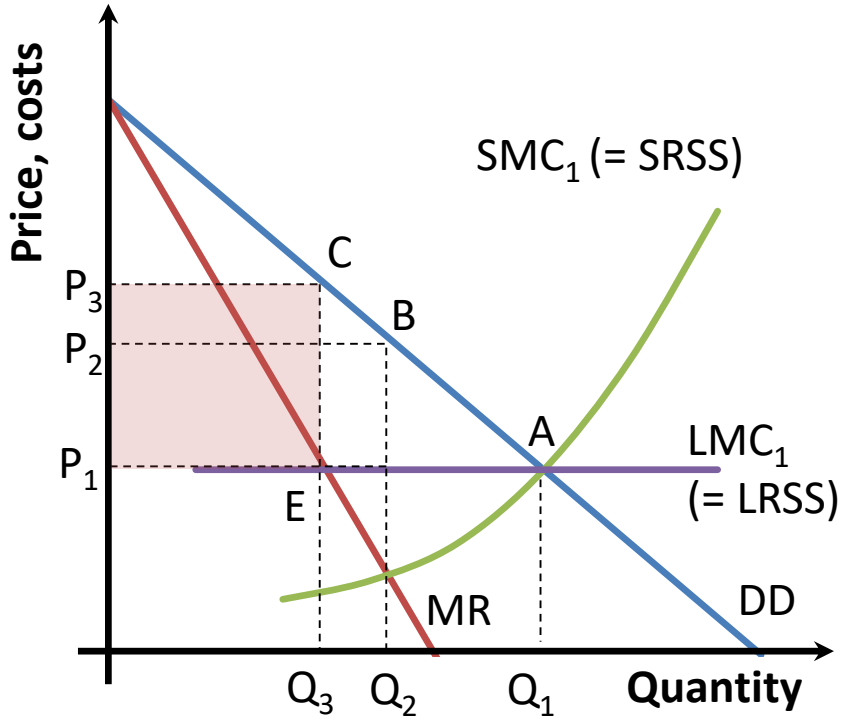


Comparing a perfectly competitive industry with a monopoly

- We now compare a perfectly competitive industry with a monopoly.
- For this comparison to be of interest the two industries must face the same demand and cost conditions. How would the same industry change if it were organized first as a competitive industry then as a monopoly?
- Can the same industry be both competitive and a monopoly? Only in some special cases.

A monopoly produces a lower output at a higher price

Figure 4



Long-run equilibrium in a competitive industry occurs at ***A***. Total output is Q_1 and the price P_1. A monopolist sets *MR* equal to SMC_1, restricting output to Q_2 and increasing the price to P_2.

In the long run, the monopolist sets *MR* equal to LMC_1, reducing output to Q_3 and increasing the price again to P_3. There are no entrants to compete away supernormal profits P_3CEP_1 by increasing the industry output.

Comparing a competitive industry and a multi-plant monopolist

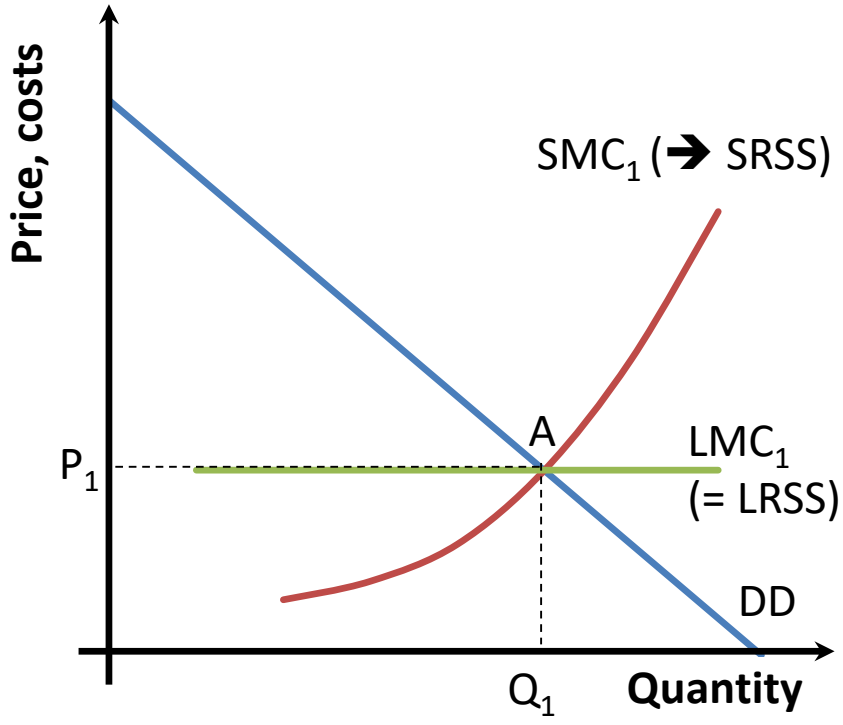
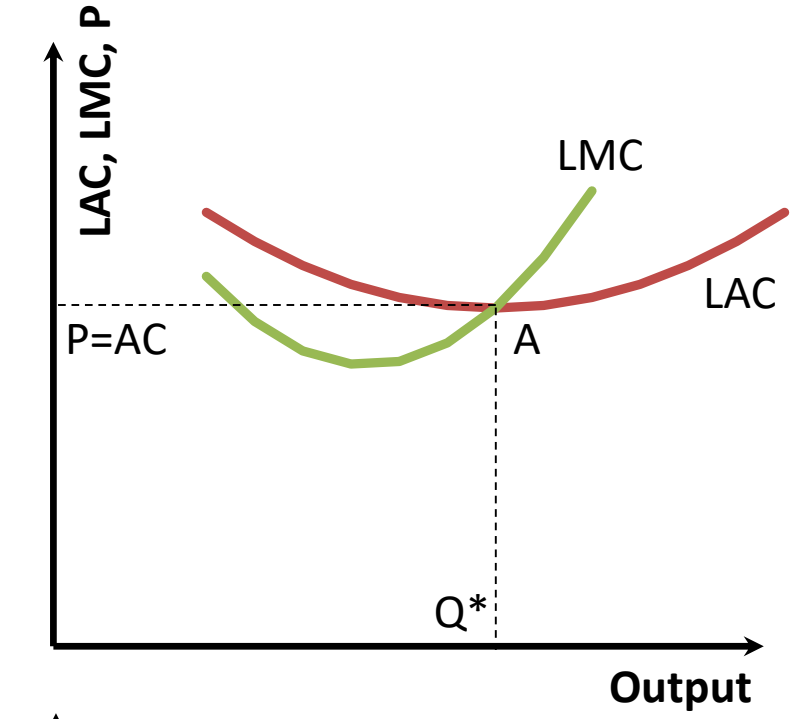
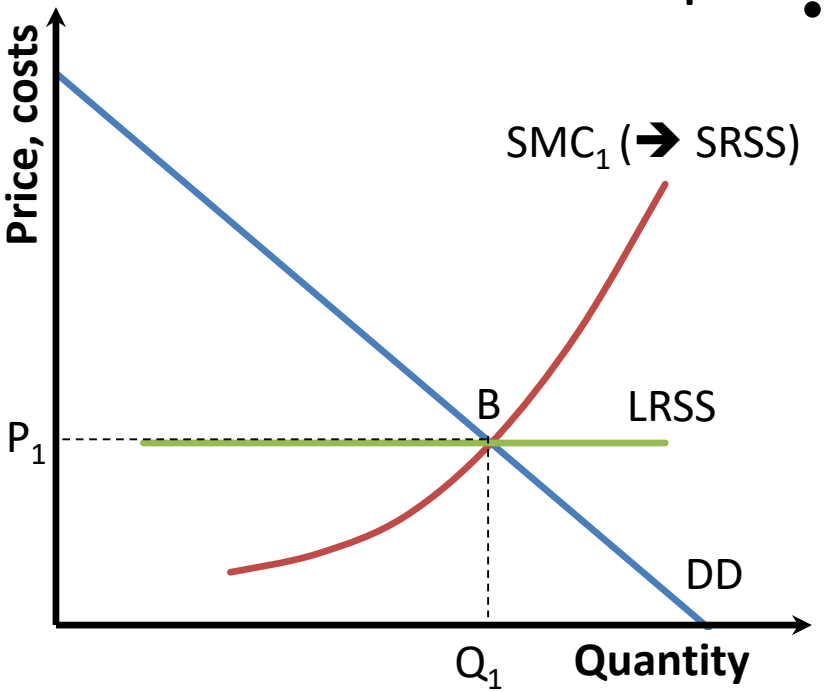


Figure 4

- Consider a competitive industry in which all firms and potential entrants have the same cost curves. The horizontal *LRSS* curve for this competitive industry is shown in figure 4.
- Facing the demand curve *DD*, the industry is in long-run equilibrium at ***A*** at a price P_1 and total output Q_1. The industry *LRSS* curve is horizontal at P_1, the lowest point on the *LAC* curve of each firm.
- Any other price leads eventually to infinite entry or exit from the industry. *LRSS* is the industry's long-run marginal cost curve LMC_1 of expanding output by enticing new firms into the industry.

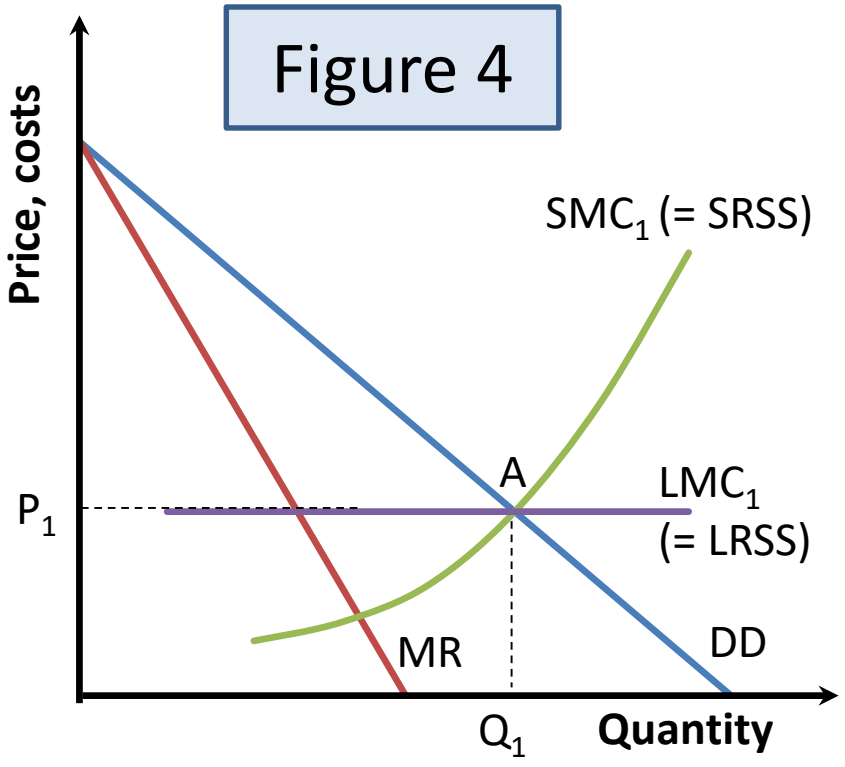
Benchmark: a competitive industry





- In the long run each firm produces at the lowest point on its *LAC* curve, breaking even. Marginal cost curves pass through the point of minimum average costs. Hence, each firm is also on its *SMC* and *LMC* curves.
- Horizontally adding the SMC curves of each firm we get *SRSS*, the short-run industry supply curve. This is the industry's short-run marginal cost curve SMC_1 of expanding output from existing firms with temporarily fixed factors. Since *SRSS* crosses the demand curve at P_1, the industry is both in short-run and long-run equilibrium.

A monopolist takes over…



$$Q \uparrow \rightarrow P \downarrow$$

- Beginning from this position, the competitive industry becomes a monopoly. The monopolist takes over each plant (firm) but makes central pricing and output decisions.
- Overnight, the monopolist still has the same number of factories (ex-firms) as in the competitive industry. Since the firm and the industry now coincide, SMC_1 remains the short-run marginal cost curve for the monopolist taking all plants together.
- However, the monopolist knows that higher total output bids down the price.

The monopolist raises prices and reduces quantity

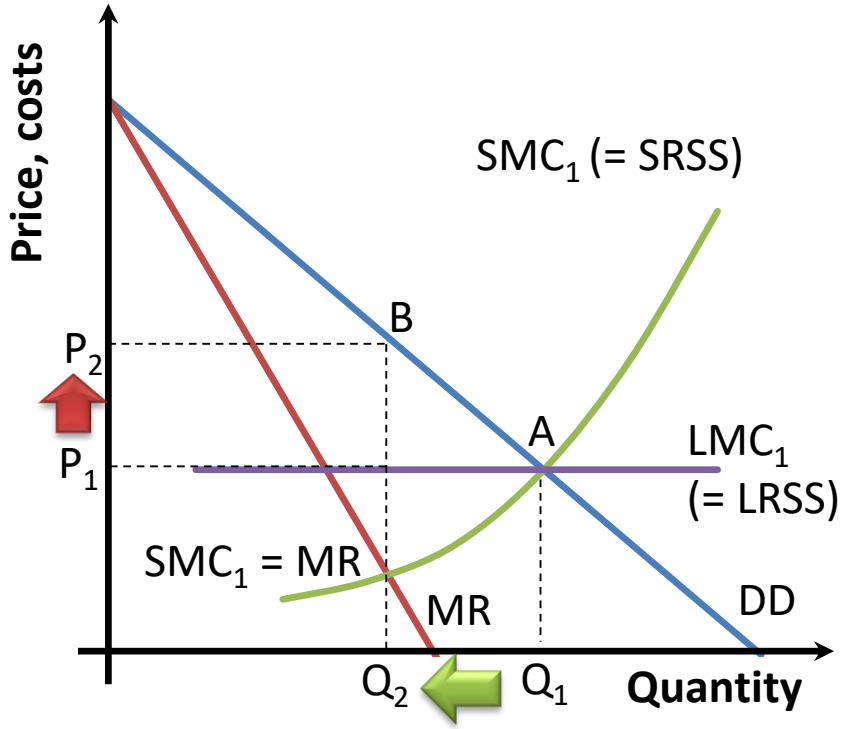


Figure 4

- In the short run the monopolist equates SMC_1 and MR, reaching equilibrium at ***B***.
- Output is Q_2 and the price P_2.
- Relative to competitive equilibrium at ***A***, *the monopolist raises prices and reduces quantity*.

The monopolist's behaviour in the long run

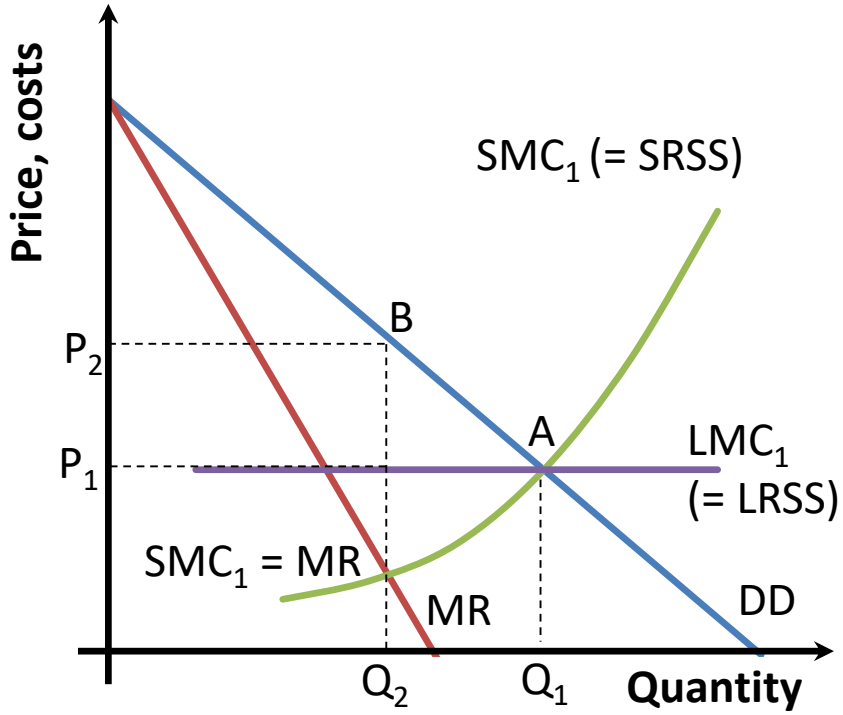
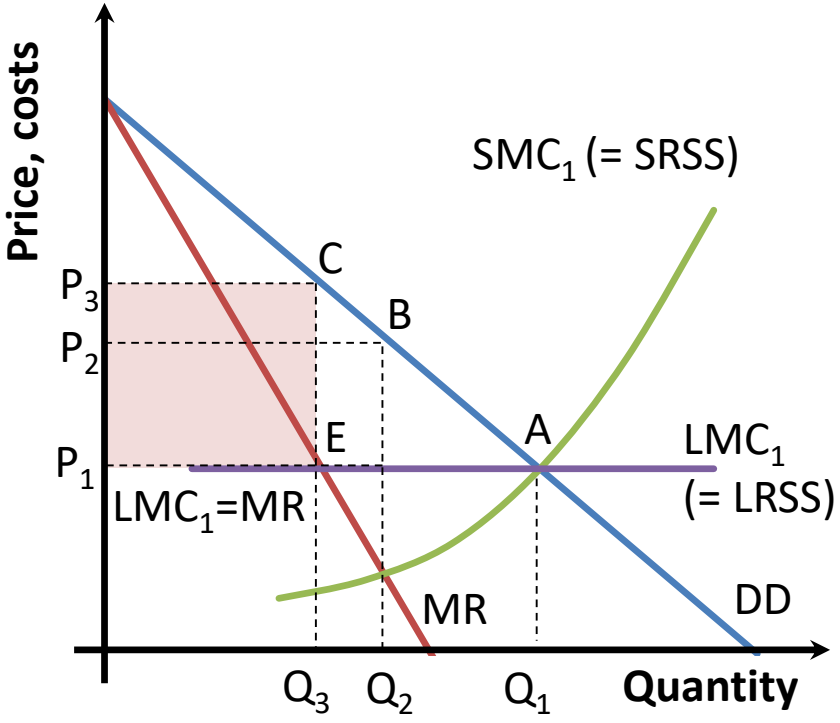
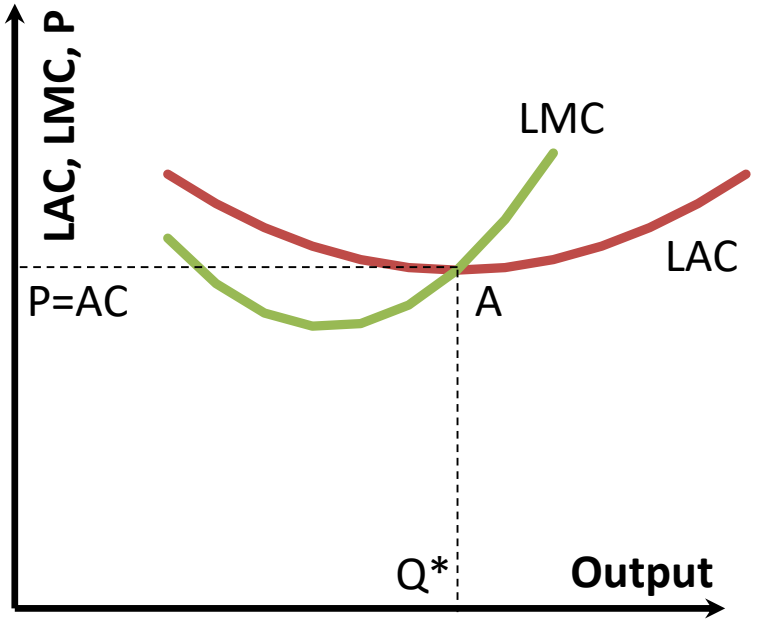


Figure 4

- In the long run, the monopolist can set up new factories ('enter') or close down existing factories ('exit').
- Whether making short-run profits or losses at ***B*** (we need to draw the *SATC* to see which), a monopolist will now 'exit' or retire some factories from the industry in the long run.

A further price rise



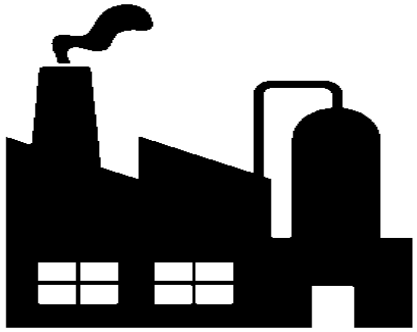


- The monopolist cuts back output to force up the price. In the long run it makes sense to operate each factory at the lowest point on its *LAC* curve. To reduce total output some factories are closed.
- In the long run, the monopolist sets $LMC_1 = MR$ and reaches equilibrium at ***C***. Price has risen yet further to P_3 and output has fallen to Q_3.
- Long-run profits are given by the area P_3CEP_1 since P_1 remains long-run average cost when all plants are at the lowest point of their *LAC* curve.

Absence of entry

- Because *MR* is less than price, a monopolist produces less than a competitive industry and charges a higher price.
- However, in this example, they would have to rely on a legal prohibition on entry by competitors that allows the monopolist to succeed in the long run.
- Otherwise, with identical cost curves, other firms would set up in competition, expand industry output, and compete away these supernormal profits. Absence of entry is intrinsic to the model of monopoly.

A single-plant monopolist



- Instead of a multi-plant monopolist taking over many previously competitive firms, consider a monopolist meeting the entire industry demand from a single plant.

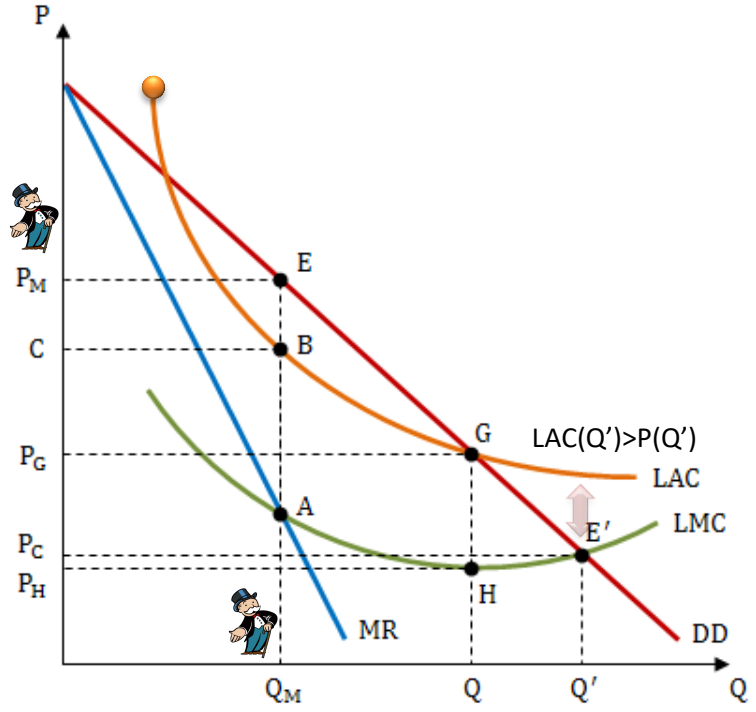
- This is most plausible when scale economies are big. There are huge costs in setting up a national telephone network. Yet the cost of connecting a marginal subscriber is low once the network has been set up.

Natural monopolies

- Monopolies enjoying huge economies of scale – falling LAC curves over the entire range of output – are **natural monopolies**.
- Large-scale economies may explain why there is a sole supplier without fear of entry by others.
- Smaller entrants would be at a prohibitive cost disadvantage.

Figure 5

A natural monopoly with economies of scale

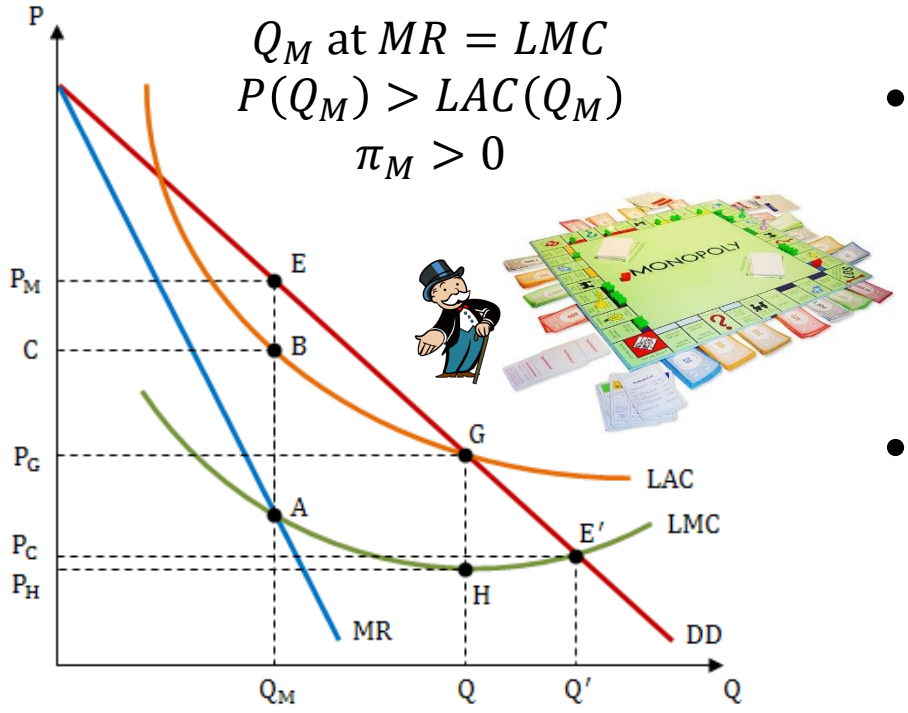


The LAC curve is falling throughout the relevant range of output levels. Economies of scale are large relative to the market size. The monopoly produces Q_M at price P_M and makes profits.

If it tried to behave like a price taking competitive firm, it would produce at E' where price equals LMC and make losses.

By recognizing the effect of output on price the single firm monopoly can do much better. This industry cannot support a lot of small firms. Each would have very high average costs at low output. This cannot be a competitive industry.

Example of a natural monopoly



- Figure 5 illustrates a natural monopoly. In the long run it faces average and marginal cost curves *LAC* and *LMC*.
- Given the position of the demand curve (*DD*), *LAC* is declining over the entire range of outputs that might be sold.

- The monopoly produces at *LMC* equal to *MR*, selling output Q_M for a price P_M. At this output, price exceeds *LAC*. The monopoly makes supernormal profits and is happy to remain in business.

- It makes no sense to compare this equilibrium with how the industry would behave if it were competitive. With such economies of scale there is only one firm in the industry.
- LAC is the cost curve for each possible firm. If a lot of small firms each produced a small fraction of total output, their average costs would be huge. By expanding, a single firm could undercut them and wipe them out.
- This industry must have a sole supplier. This natural monopoly will maximize profits only by recognizing that its marginal revenue is not its price.

A discriminating monopolist

- A **discriminating monopolist** charges different prices to different customers.
- To equate the marginal revenue from different groups, groups with an inelastic demand must pay a higher price.
- Successful price discrimination requires that customers cannot trade the product among themselves.

Monopoly and technical change

- Monopolies may have more internal resources available for research and may have a higher incentive for cost-saving research because the profits from technical advances will not be eroded by entry.
- Although small firms do not undertake much expensive research, it appears that the **patent laws** provide adequate incentives for medium- and larger-sized firms. There is no evidence that an industry has to be a monopoly to undertake cost-saving research.


Thank
you