Session #4

Fundamentals of Microeconomics

PERFECT COMPETITION

November 4, 2019

- Profit maximization - revision
- Perfect competition
- Profit maximization under perfect competition

The goal of each firm (in all market regimes) is to maximize profit

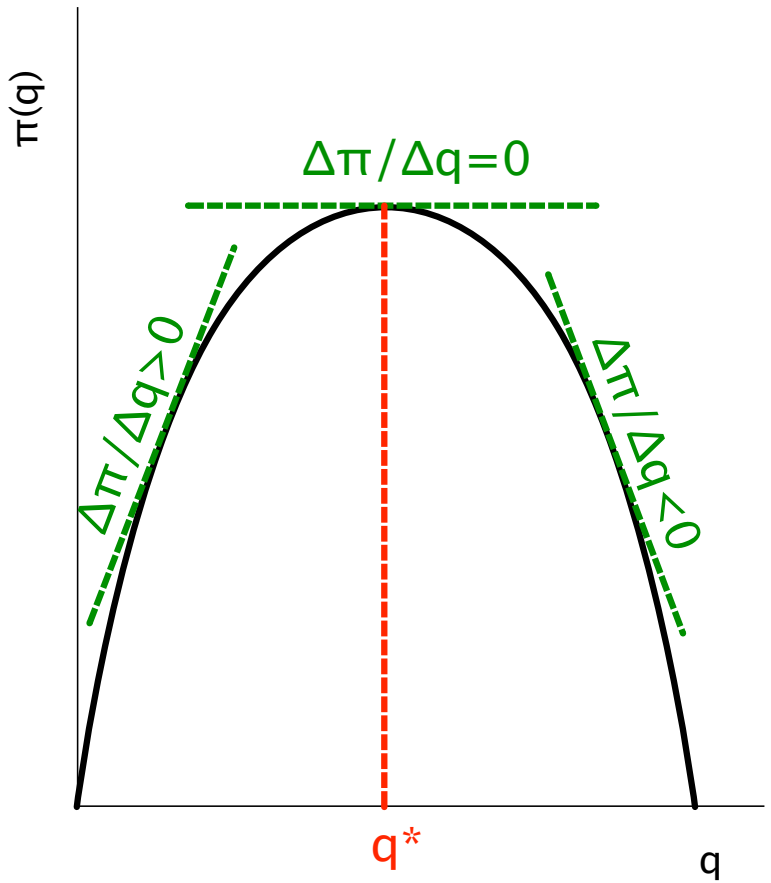
- The profit (π) is defined as the difference between revenues (R) and total costs (C) and depends on the quantity of output produced by the firm (q):

$$\pi(q) = R(q) - C(q) \quad .$$

- The firm decides about its optimal production in two steps:
  1. What level of output q^* maximizes the profit of the firm?
  2. At this level, is it optimal to produce or to interrupt (stop) the production?
- The firm thus maximizes its profit (given market conditions), and if this maximal profit at least lowers the necessary costs, then the firm produces the optimal quantity of output.

At optimal production level, the profit is maximized - marginal profit is equal to zero

- We assume that with increasing quantity produced, the profit first increases and than decreases.
- At the point where the profit stops increasing and starts decreasing, it is maximized, and this point thus corresponds to the optimal production q^*.
- Marginal profit $\frac{\Delta\pi(q)}{\Delta q}$ is equal to zero at this point.



At optimal production level, marginal revenues are equal to marginal costs

- Necessary condition for the production q^* to be optimal:

$$\frac{\Delta \pi(q^*)}{\Delta q} = \frac{\Delta R(q^*)}{\Delta q} - \frac{\Delta C(q^*)}{\Delta q} = 0 \ .$$

- If we denote marginal revenues $MR = \frac{\Delta R}{\Delta q}$ and marginal costs $MC = \frac{\Delta C}{\Delta q}$, we have the condition

$$MR(q^*) = MC(q^*) \ .$$

- This condition tells us that at the optimal production level, the change of costs has to be just compensated by the change of revenues.

The firm produces if revenues in optimum are larger than variable costs

- At the optimal solution q^*, the profit of the firm (generated by production) has to be larger than the loss given by fixed costs (that the firm has to pay even if it does not produce):

$$\pi(q^*) = R(q^*) - C(q^*) \geq -FC \ ,$$

  where FC are necessary fixed costs.

- It holds then:

$$R(q^*) \geq C(q^*) - FC = VC(q^*) \ ,$$

  where $VC(q)$ are variable costs.

- This condition as well as the condition

$$MR(q^*) = MC(q^*)$$

  has to be satisfied in the short run as well as in the long run and under all market regimes.

The optimal level of production depends on the market structure

- Marginal costs are given by the production technology of the firm.
- Marginal revenues depend on the market structure.
- Market structure is defined by the number of firms in the market, conditions under which firms can enter the market and leave it, and the ability of firms to differentiate their products from the products of their competitors.

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Perfect competition regime is characterized by several conditions:

1. There is a large number of firms and consumers in the market.
2. Firms sell identical products.
3. Sellers and buyers have perfect information about prices.
4. Transactions costs (of change of business partner) are low.
5. Firms can enter and leave the market freely.

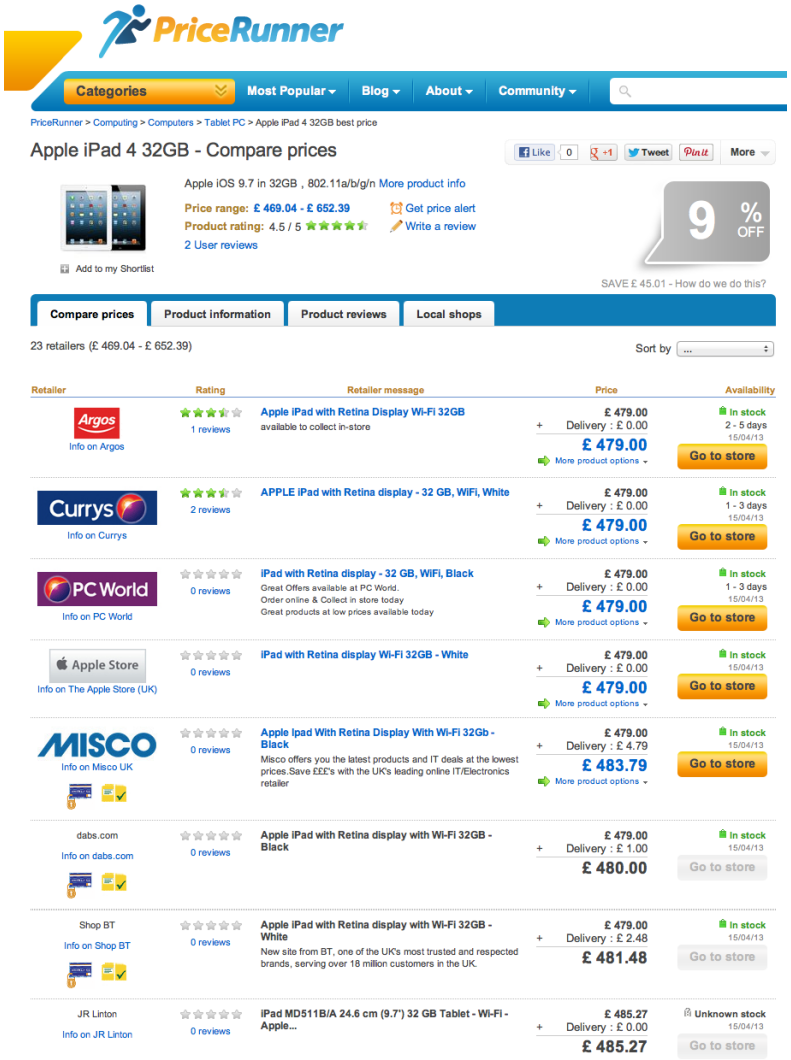
Under perfect competition, a large number of firms is selling identical products

- If there is a large number of producers in the market, and one of them increases the price, customers will switch to another one.
- The more identical the products are, the better the competition is.

Under perfect competition, a large number of firms is selling identical products

- Small number of producers selling differentiated products lowers the competition level.

Under perfect competition, perfect information about prices is available



- If customers can easily compare products and their prices, it is more difficult for the producer to deviate from the market price.
- Information thus leads to market structure with higher competition level.

In perfect competition regime, transaction costs are low

- If it is easy to change the supplier, competition increases.
- If it is costly to change the supplier, the consumer is willing to accept the increase of price by the supplier.

In perfect competition regime, firms can freely enter the market

- If firms can freely enter the market, then existing firms cannot deviate from the market price, because they can be replaced by new competitors.
- For flexible environment with perfect competition, firms have to be allowed to leave the market, if revenues at market price do not cover their costs.

Perfect competition regime is a great baseline to study other market structures

- We can consider many markets to be perfectly competitive (commodity markets, stock markets, retail market, etc.).
- Perfect competition regime maximizes society's welfare.
- This regime thus represents a baseline to which we can compare other market structures.

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Under the regime of perfect competition, the firm is "price taker"

- In economic models, we define perfect competition as the situation in which the firm cannot influence the price of the good it sells and has to accept the price given by the market.

- This situation is conditioned by previously explained assumptions and technically, it occurs when the firm faces perfectly elastic (horizontal) demand.

- This means that:
  - at the given price, the firm can sell as much as it can produce, it has thus no incentive to lower the price;
  - the firm cannot increase the price, because nobody would buy the good.

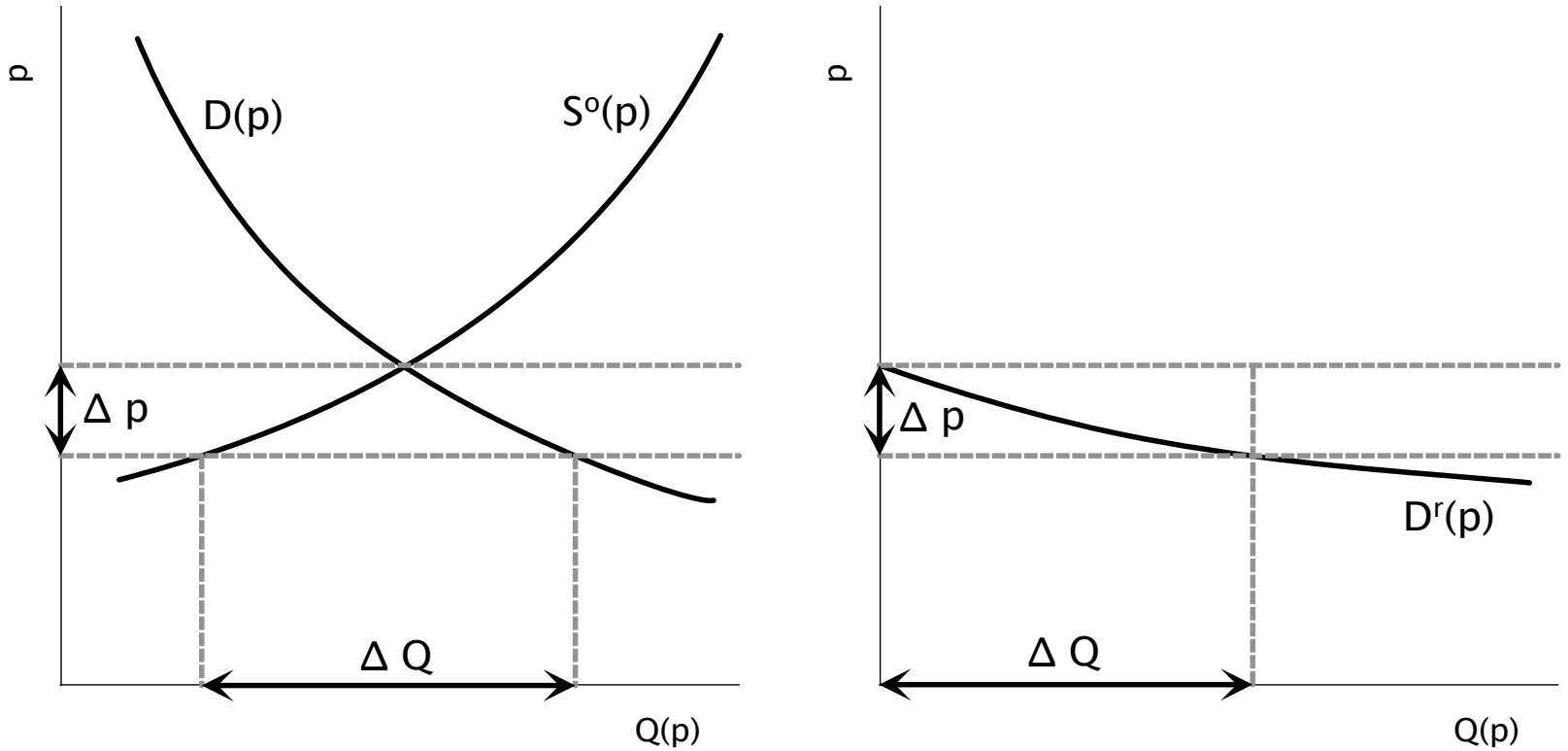
In perfect competition regime, the firm faces perfectly elastic (horizontal) demand

- If there is a large number of firms in the market, each of them covers only a small part of the total demand - the part that is not covered by other firms.
- We talk about "residual demand" $D^r(p)$, equal to the difference between total demand $D(p)$ and the supply by other firms$S^o(p)$:

$$D^r(p) = D(p) - S^o(p)$$

- If the price is so high that the demand by other firms is higher than demand, the residual demand will be zero (the firm will not sell its products and will not produce).
- For lower prices, the firm can cover the positive difference.

Residual demand is more elastic (more flat) than total demand



In perfect competition regime, the firm faces perfectly elastic (horizontal) demand

- If there are n identical firms in the market, than the elasticity of residual demand faced by the n-th firm is equal to

$$\varepsilon^r = n\varepsilon - (n-1)\eta^o \ ,$$

  where ε is the elasticity of total demand and η^o is elasticity of supply by remaining $n-1$ firms.
- We know that $\varepsilon < 0$ and $\eta^o > 0$, and so we see that

$$\lim_{n \to +\infty} \varepsilon^r = -\infty \ .$$

- In perfect competition regime, when there is a large number of firms in the market, the firm faces perfectly elastic and thus horizontal demand - it has to accept the price given by the market.

In perfect competition regime, marginal costs in the optimum are equal to the price

- Revenues of the firm equal to the quantity of production q multiplied by the price p:

$$R(q) = pq$$

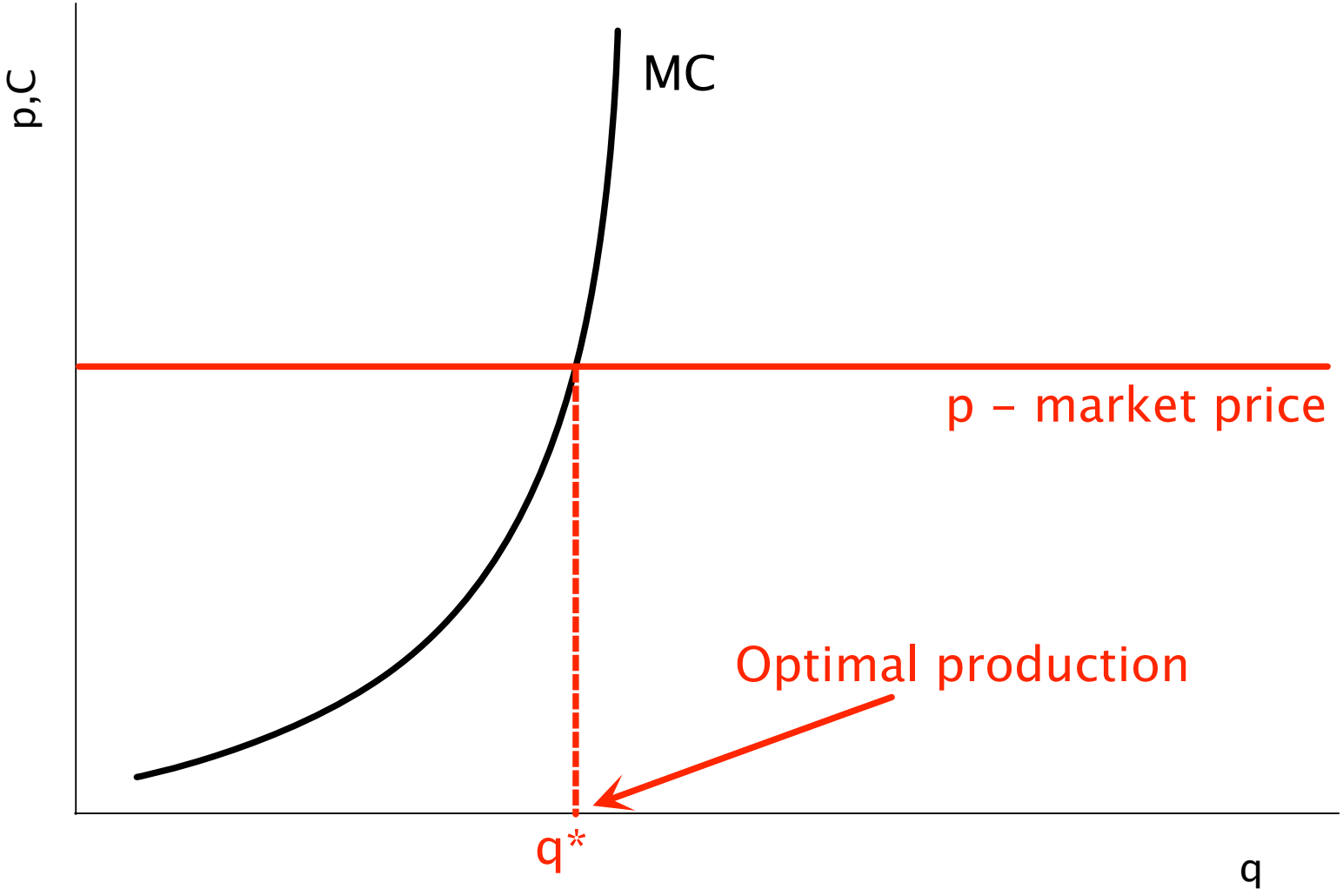
- In perfect competition regime, the firm does not influence by its decision about q the market price p, and therefore p does not depend on q.
- Marginal revenues are thus

$$MR = \frac{\Delta R}{\Delta q} = \frac{p\Delta q}{\Delta q} = p \ .$$

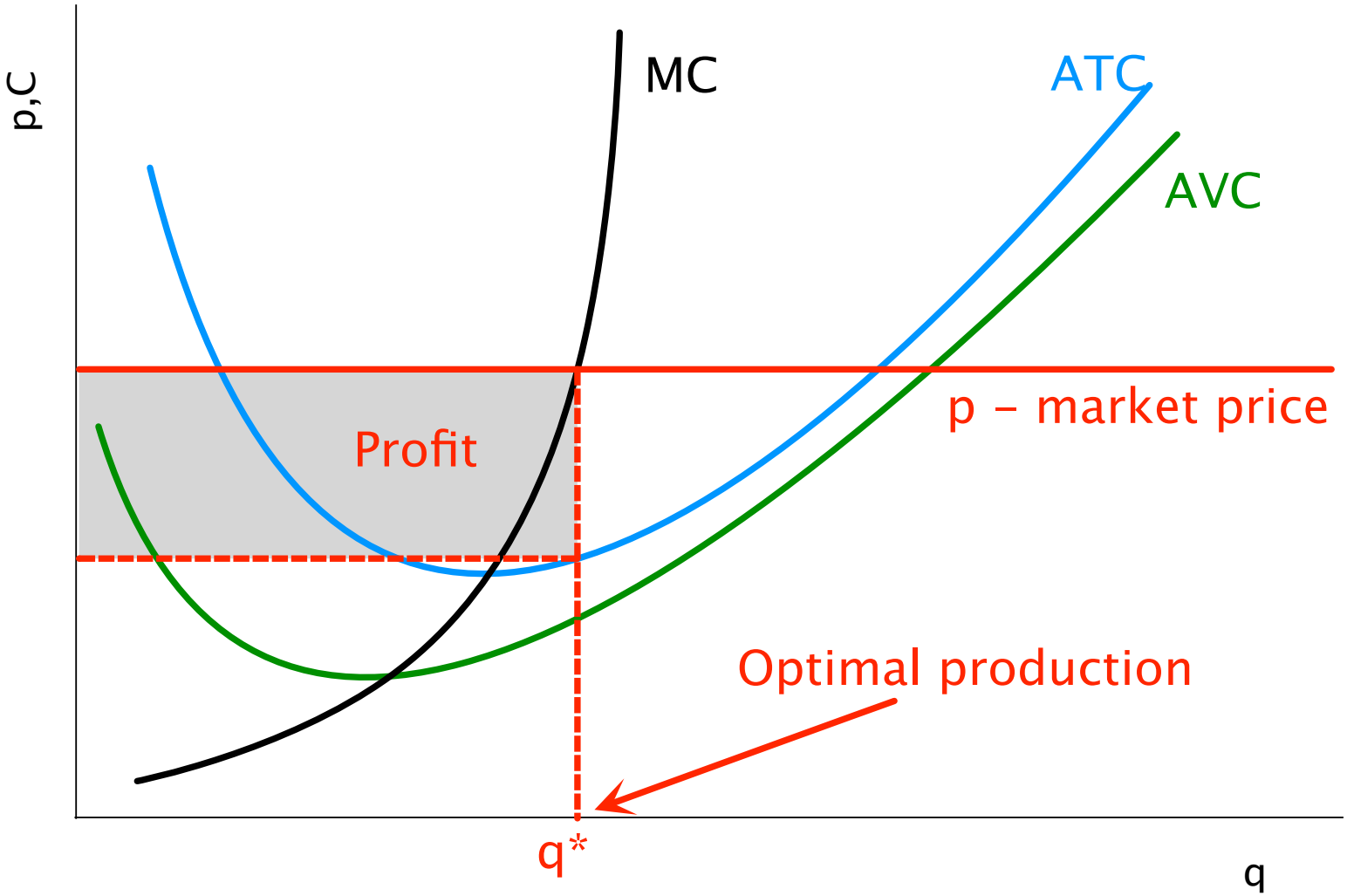
- From the necessary condition for profit maximization, we thus get

$$MR(q^*) = MC(q^*) = p \ .$$

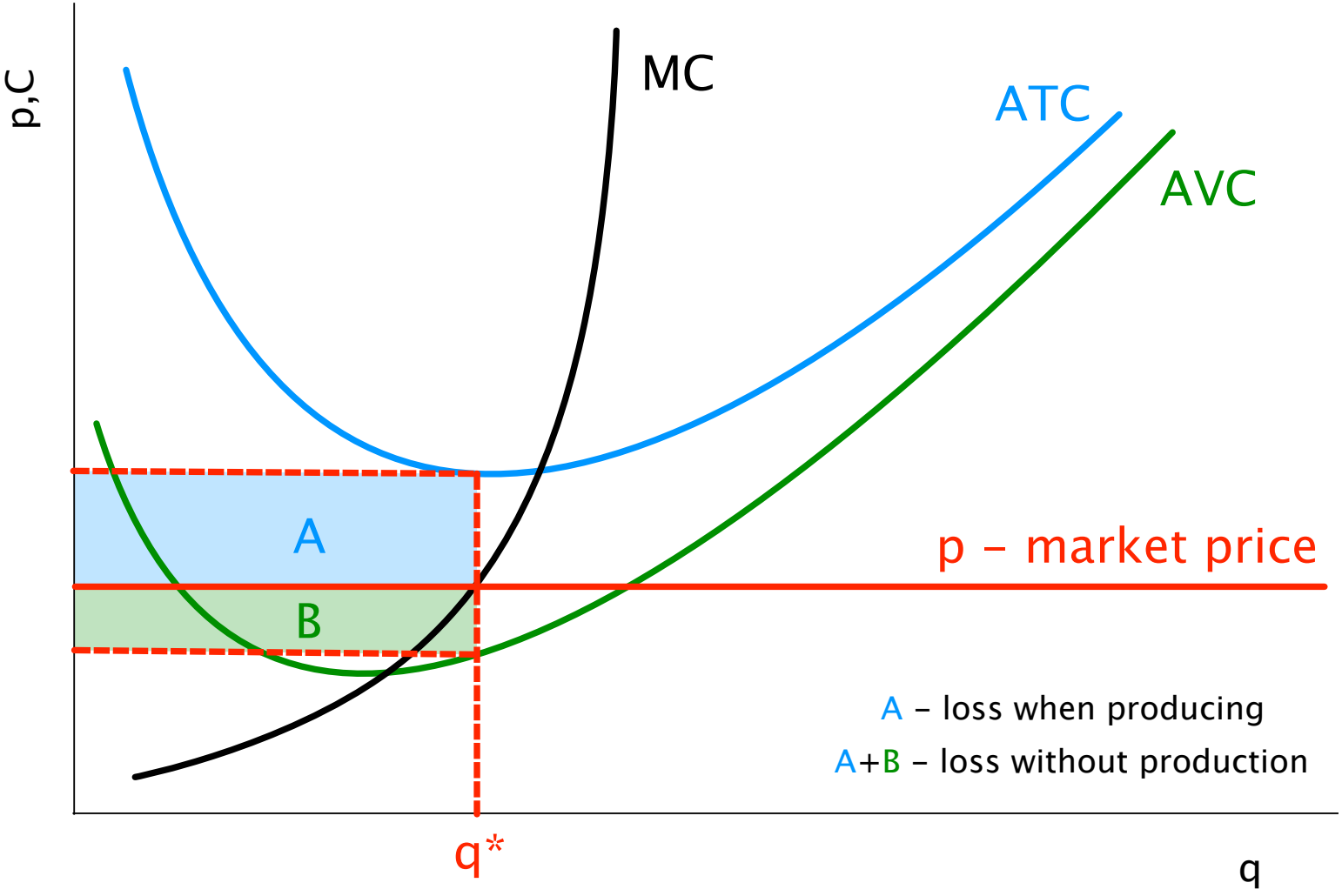
In perfect competition regime, marginal costs in the optimum are equal to the price



We can represent the profit of a competitive firm graphically using cost curves



In short run, firm can make loss, but it has to be smaller than the loss given by fixed costs



EXCERCISE

An industry currently has 100 firms, all of which have fixed costs of $12 and average variable cost as follows:

Quantity	Average variable costs (in USD)
1	1
2	2
3	3
4	4
5	5
6	6

1. Compute marginal cost and average total cost.
2. The price is currently $9. What is the total quantity supplied in the market? Is this market in long-run equilibrium?
3. As this market makes the transition to its long-run equilibrium, will the price rise or fall? Will the quantity demanded rise or fall? Will the quantity supplied by each firm rise or fall?