Industry supply
Ch 22+(Ch 23, only 23.1-23.5)

…**Perfect Competition** (*repetita iuvant*):

1-*price taker firm*

2-*high number of firms*

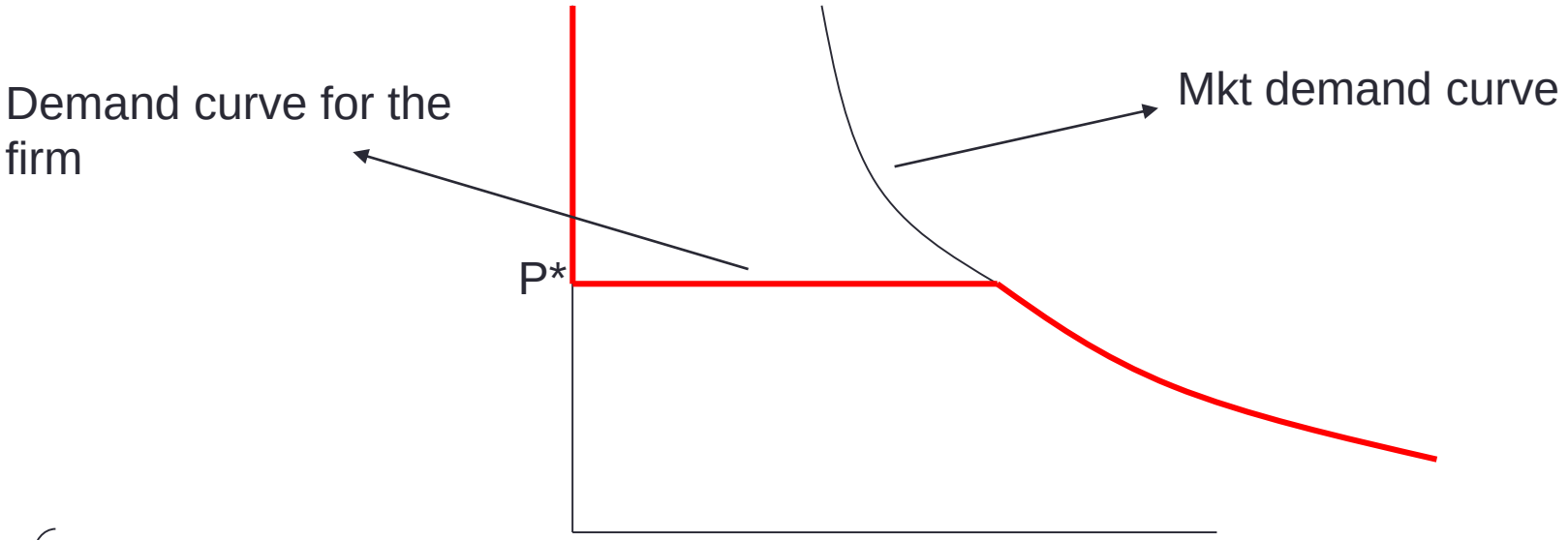
3-omogenous good

4-Free entry:

5-Perfet factors mobility: ex. K,L free to move within/among sectors (industries)

6-Perfect information: prices/quality/ location are public knowledge.

Demand curve for the firm is infinitely elastic (at a price equal to the market price)



0 *if* P>P*: firms sell nothing

If P=P* firm can sell any quantity

If P<P* firm covers the entire mkt

Firm's problem:

$$\max_{y} \; py - c(y)$$

Firm sets only y

$$MR = \frac{\partial(py)}{\partial y} = p \longrightarrow \textbf{Marginal revenue}.$$

FOC $\quad p = c'(y)$

Firm (optimally) sets a level of production such that the marginal revenue is equal to the marginal cost

!!!!! In perfect competition **MR=P**

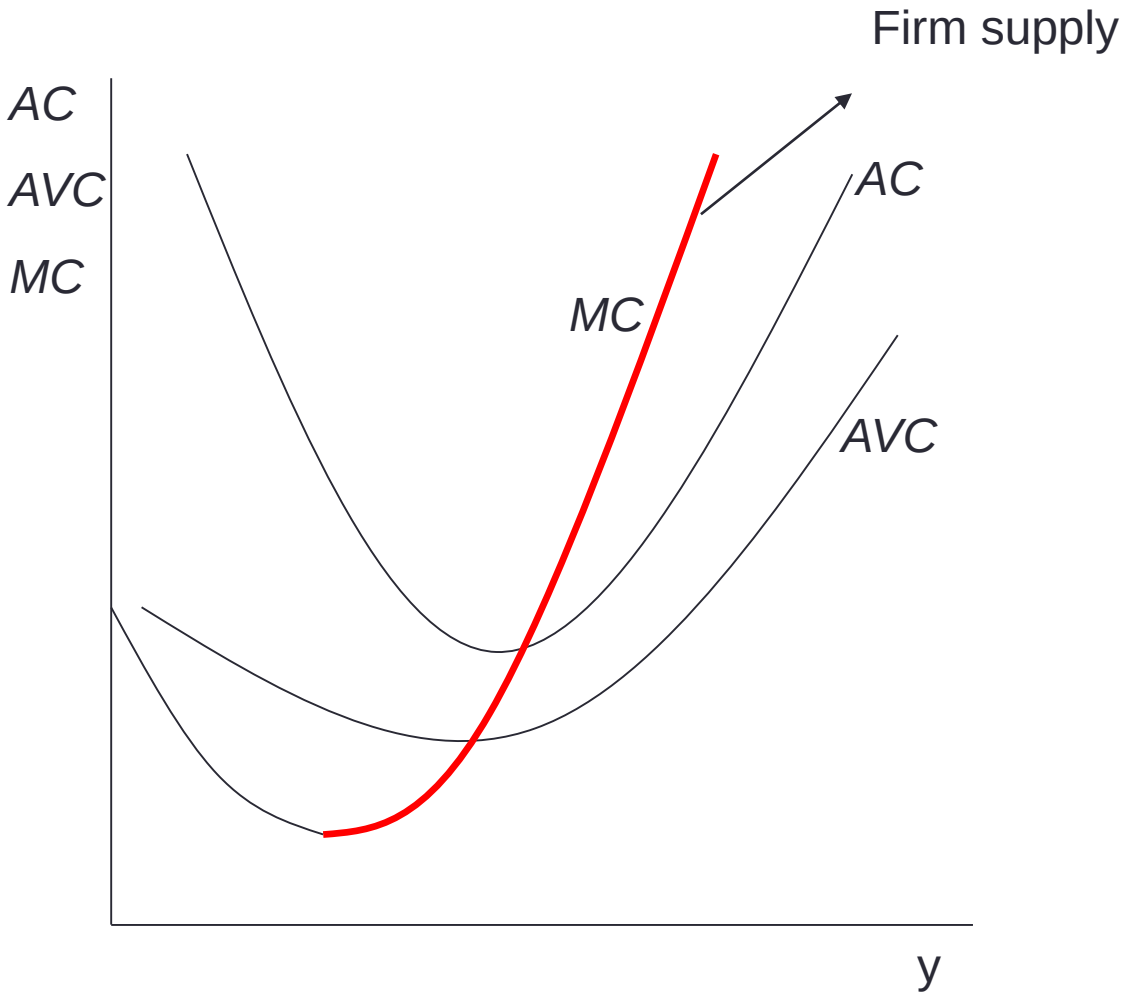
$p > MC(y)$ ⟶ It is possible to increase profit by producing more

$p < MC(y)$ ⟶ It is possible to increase profit by producing less

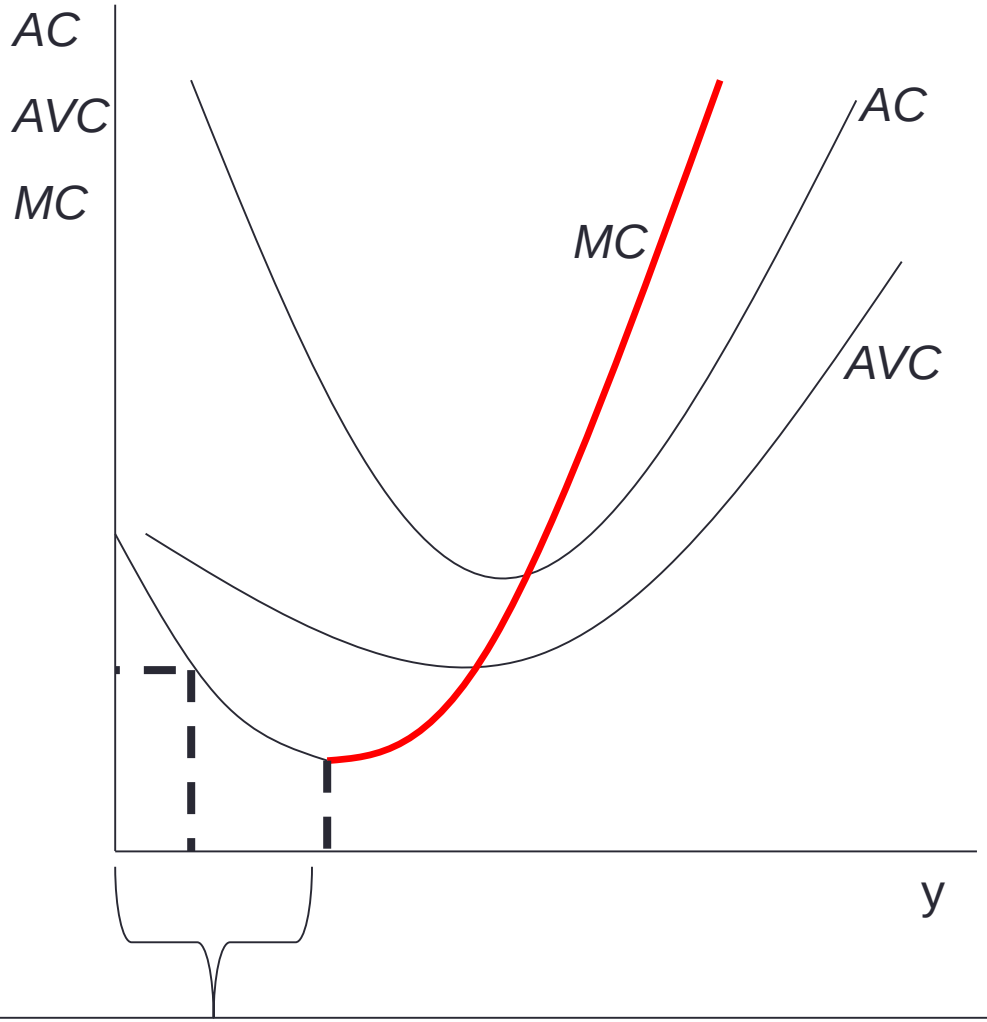
Since firm produces at *p=MC* then the marginal cost curve *coincides with its supply curve*

BUT..

! Not the all marginal cost curve coincides with the supply curve of the firm in competition



1- <u>the decreasing part of the *MC* curve DOES NOT represent firm supply</u>



In the part of decreasing MC we formally have p=MR>MC!!!! Firm can always increase profit by increasing output

p=MC *necessary condition (not sufficient)* for the profit maximization:

2- In the short-run the supply curve coincides ONLY with the MC curve above the AVC

Short-run profit with zero production:

$$\pi = -F$$

Short-run profit with positive production:

$$\pi = py - c_v(y) - F$$

Firm produces only if:

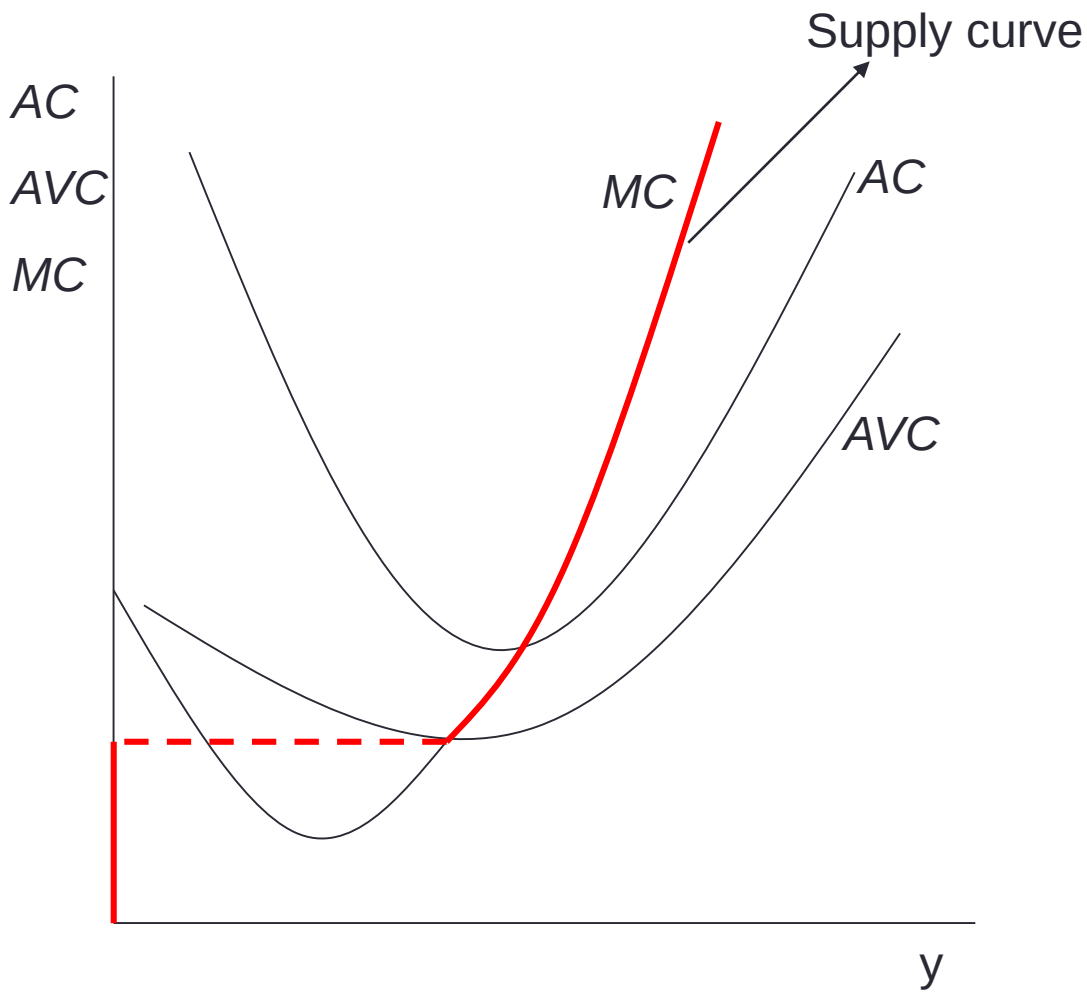
$$py - c_v(y) - F > -F$$

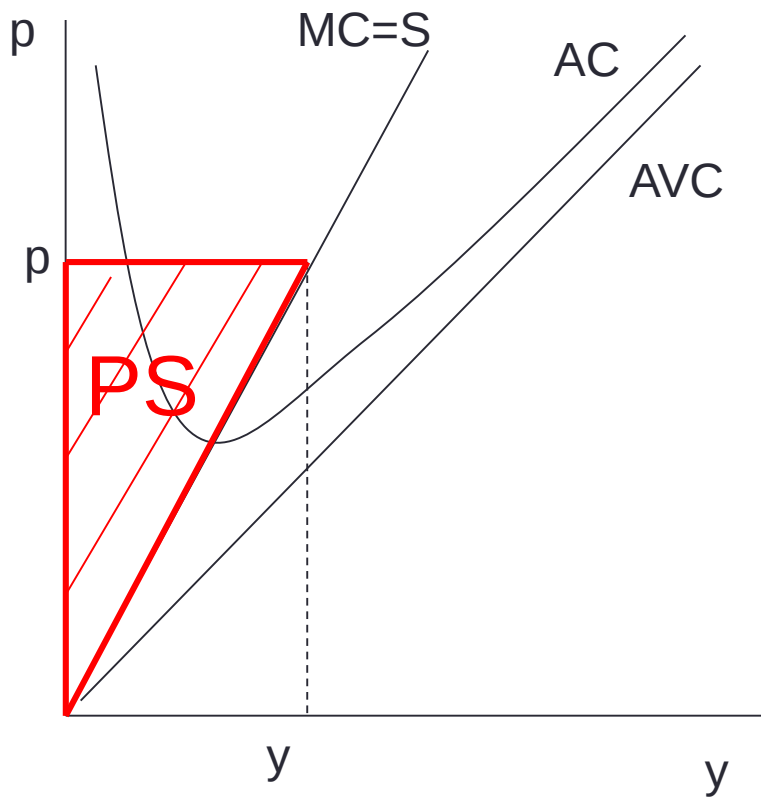
$$AVC(y) = \frac{c_v(y)}{y} < p$$

⇒ Firm produces ONLY if *P>AVC*

⇓

Short-run supply curve coincides only with the increasing *MC curve* above the *AVC*


Supply curve
AC
AVC
MC
MC
AC
AVC
y


p
MC=S
AC
AVC
p
PS
y
y

The minimum price the firm is willing to accept is equal to the variable cost of the additional quantity

↓

!!!!! Variable costs: area below the MC curve

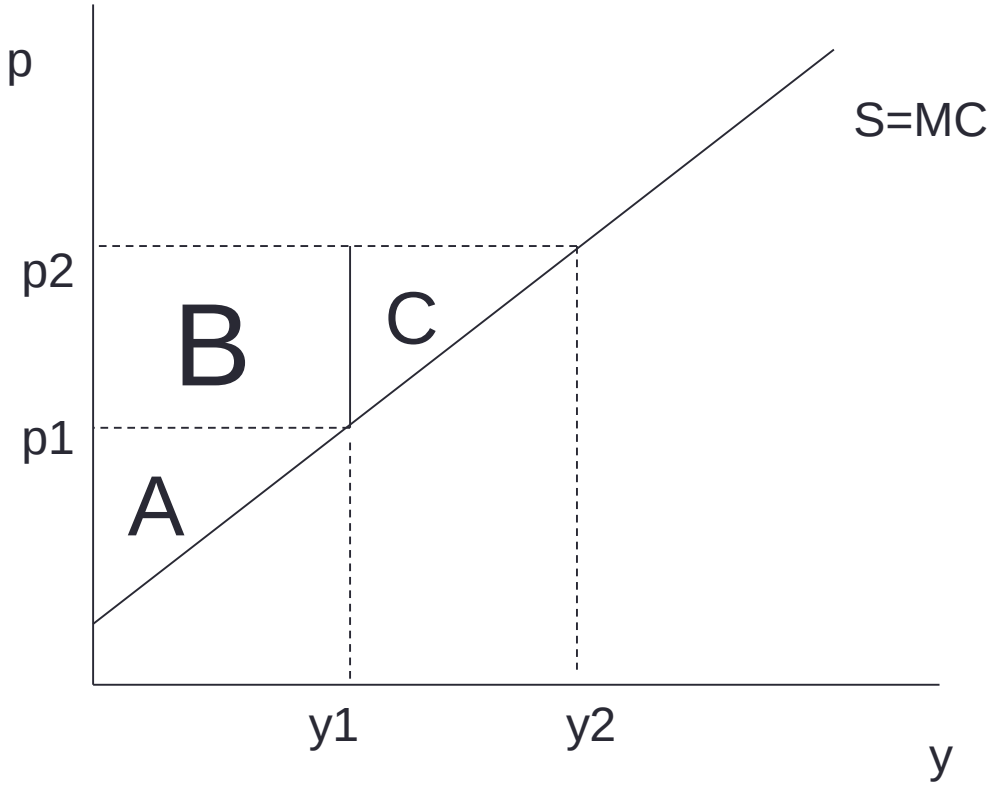
↓

Producer surplus= difference between revenue and variable costs (or marginal costs)

$$\mathrm{PS} = py - c_v(y)$$

$$\mathrm{PS} = \pi + F = py - c_v(y) - F + F$$

Price variation….



B = benefit from selling the same units at higher price (than p1)

C = benefit from selling more at p2

$$c(y) = y^2 + 1$$

From the FOC *p=MC:*

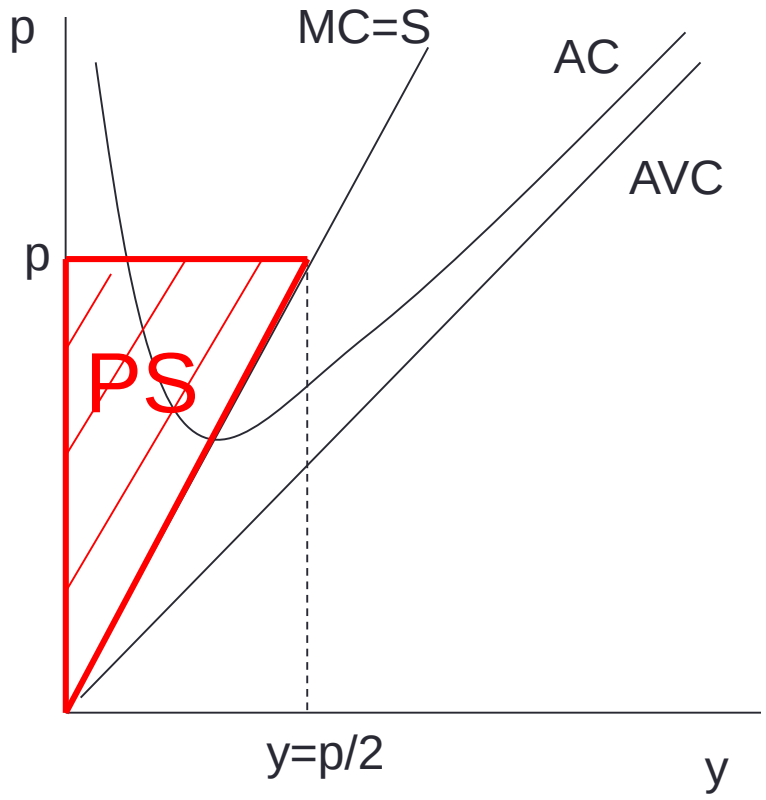
$$p = 2y$$

$$S(p) = y = \frac{p}{2}$$

Then….

$$\pi(p) = py - c(y) = p\frac{p}{2} - \left(\frac{p}{2}\right)^2 - 1$$

$$\pi(p) = \frac{p^2}{4} - 1$$



$$SP = \frac{1}{2}\left(\frac{p}{2}\right)p = \frac{p^2}{4}$$

Then *PS=profit + fixed costs*

Short and long-run Supply curves

Long-run supply function

$$p = MC_l(y) = MC(y, k(y))$$

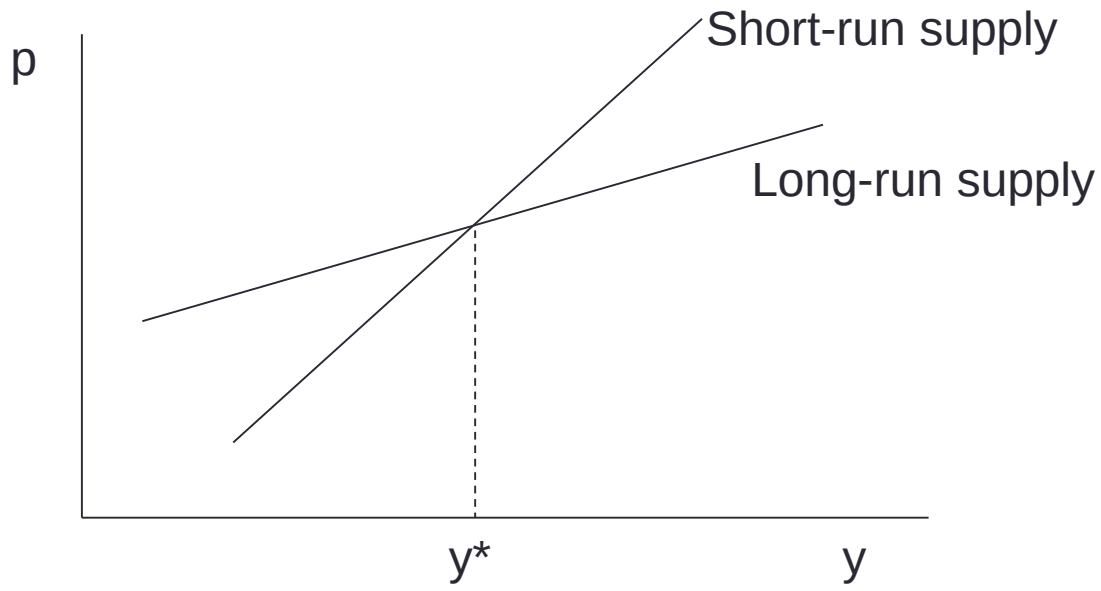
k(y) depending on *y*

Short-run supply function:

$$p = MC_S(y, k)$$

Where *k* is fixed

As the MC curves supply functions coincide at the output *y* * produced by using the optimal level of the fixed factor…then



Long-run supply is more elastic : firm is free to change its choices according to the price variation

In the long-run shutting down with zero profit is one option:

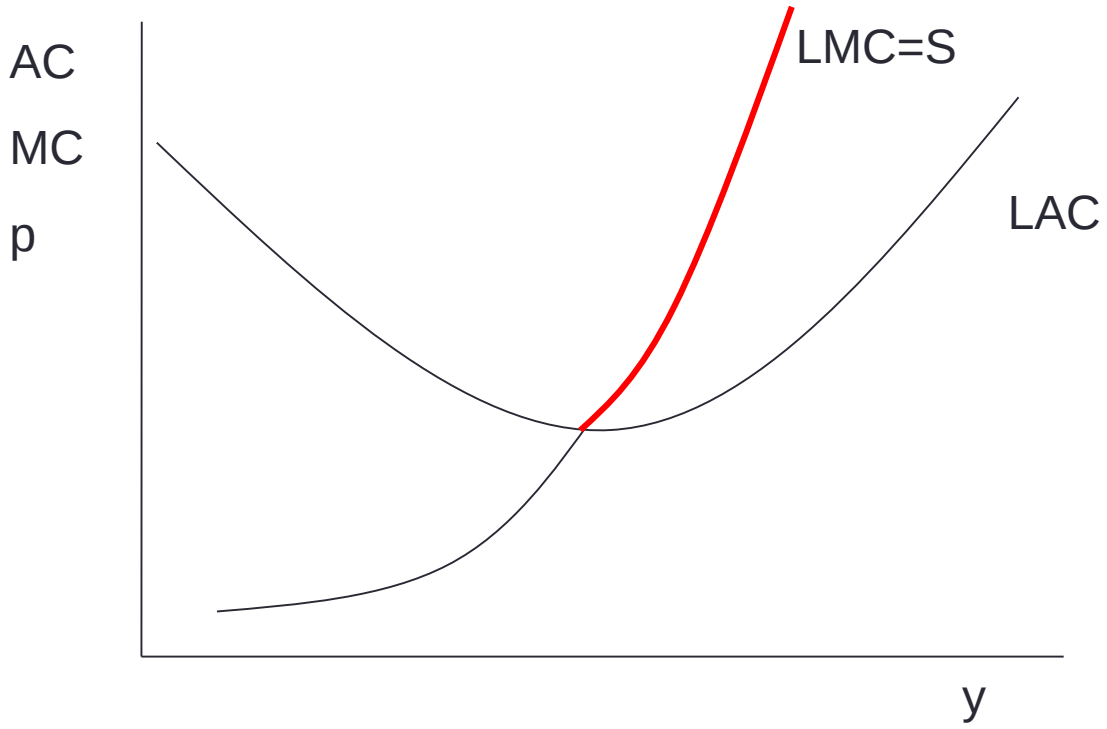
Supply still $p = MC_l(y)$

Firm remains in the market if

$$py - c(y) \geq 0$$

$$p \geq \frac{c(y)}{y} = AC(y)$$

Long-run supply curve is the increasing part of the MC curve ABOVE the average cost

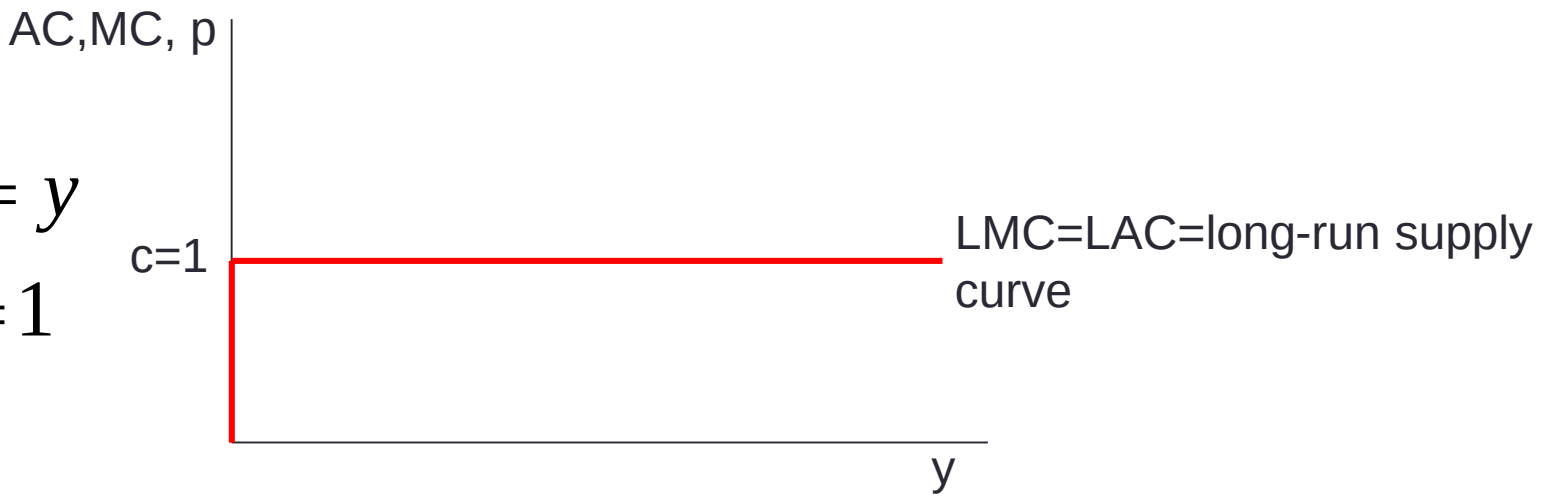

AC
MC
p
LMC=S
LAC
y

Particular case: with ConstRetSc the long run supply curve coincides with the long run average cost curve and is flat

Ex

$$c_L(y) = y$$

$$LAC = 1$$



Finding (formally) the supply curve

$$\max_{y} \; py - c(y)$$

$$py - c(y) \geq 0$$

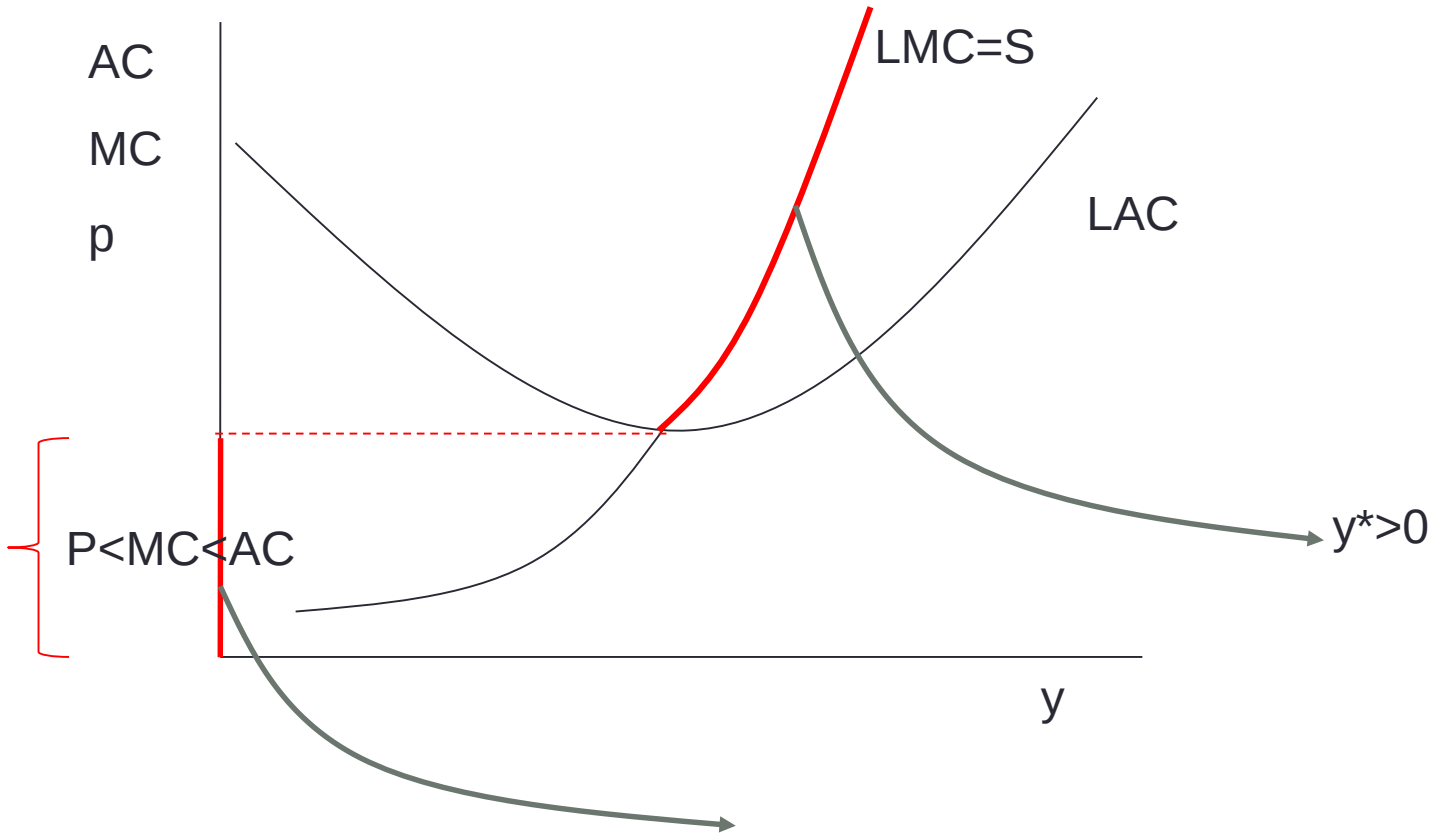
$$y \geq 0$$

Optimal solutions y* must satisfy (FOC) y*≥0 and $p \leq C'(y^*)$

The (interior) solution with y*>0 satisfies:

$$p = c'(y^*) \quad \text{and (SOC):} \quad c''(y^*) \geq 0$$

SOC implies *increasing marginal cost* *(as we have seen)*



We have a solution such that y*=0, p<MC, p<AC therefore firm finds it optimal to <u>produce zero</u>

(advanced mathematics: formally application of the non-negativity constraint on *y*)

Industry Supply

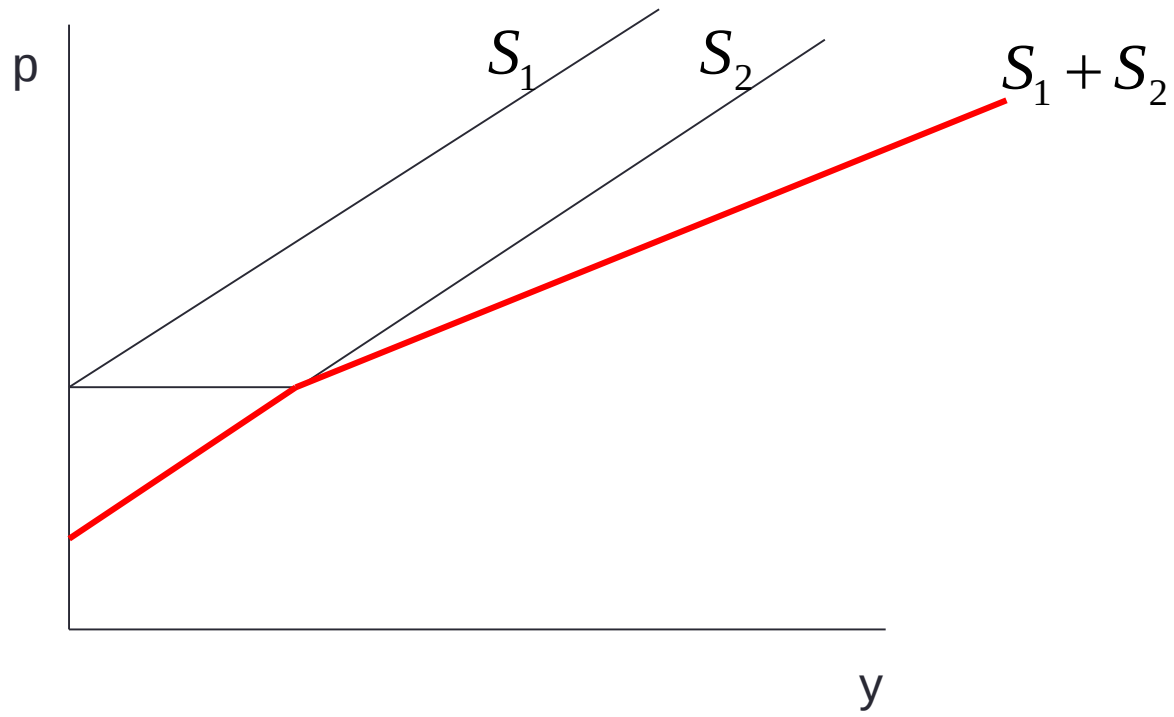
Assume a fixed number of firms, *n.*

Supply curve of *firm i:*

$$S_i(p)$$

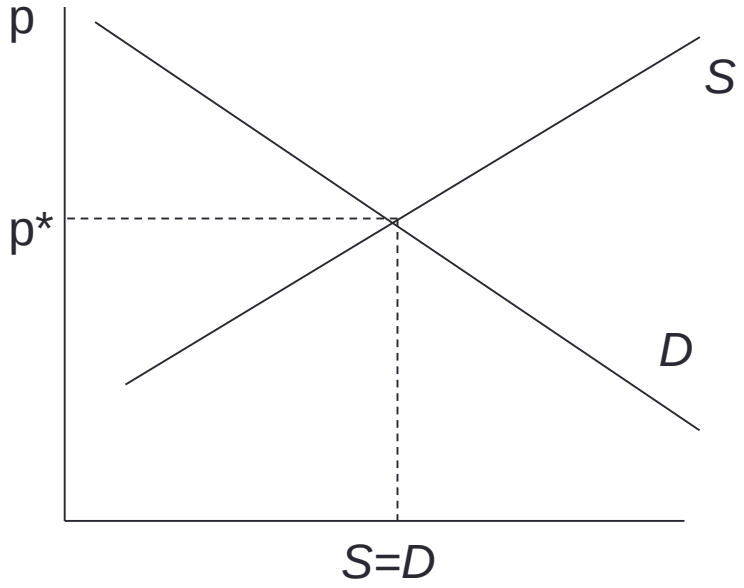
Industry supply:

$$S(p) = \sum_{i=1}^{n} S_i(p)$$

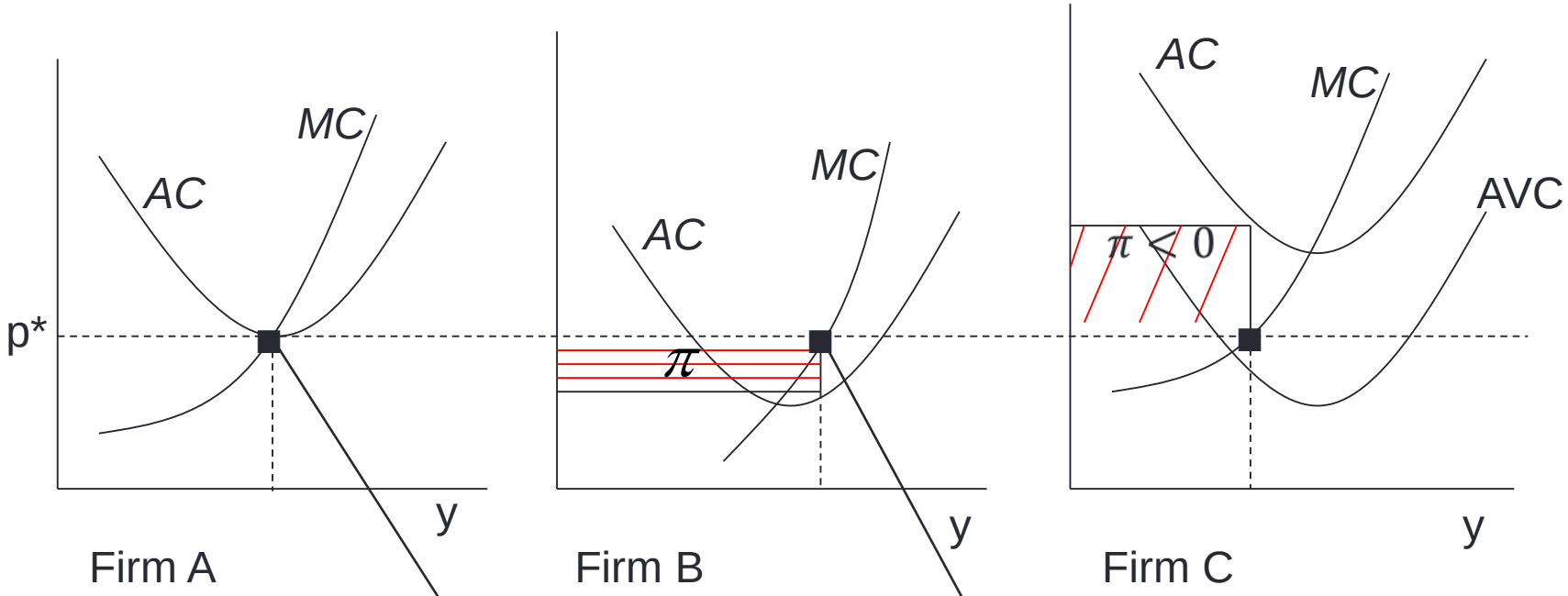


Horizontal sum of each single firm supply curve

short-run industry equilibrium



$n=3$



$$p = \frac{c(y)}{c} \rightarrow py - c(y) = 0 \qquad p > \frac{c(y)}{c} \rightarrow py > c(y)$$

Firm B produces at $p^* > AC$;

$$p > \frac{c(y)}{y} \Rightarrow \pi_B = py - c(y) > 0$$

Firm C produces at $p^* < AC$;

$$p < \frac{c(y)}{c} \rightarrow py - c(y) < 0$$

Negative profit in the short-run but since $p^* > AVC$ it would make a lower loss by remaining in the business than by producing zero

Long-run Industry equilibrium

No firm remains in the market with negative profit

Remind: free entry..

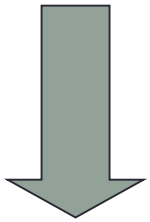
- If firms are doing positive profit, they remain and other firms enter
- Firms making negative profits exit the market

→ With zero profit no firm enters/no firm exits, market is in equilibrium

- when all firms make zero profit the industry stops expanding

→ The number of active firms in the market is given by the all firms having zero profit at the equilibrium price

Since profit is zero…



Equilibrium price in the Long-Run is:

$$p = MC = AC_{\min}$$