Firm Supply - Pure Competition

(Reading: Varian Chap 23)

How does a firm decide how much to supply?

- technology (we already discussed …)
- Goals (objective ….)
- market environment
- competitors' behaviours
- …….

Market Environments

- Are there many other firms, or just a few?
- Do other firms' decisions affect our firm's payoffs?
- Is trading anonymous, in a market? Or are trades arranged with separate buyers by middlemen?
- Can the firm negotiate?
- Does the supply depend on the outcome of Tender/ auction?

…..

Monopoly: Just one seller who determines the quantity supplied and the market-clearing price.

Oligopoly: A few firms, the decisions of each influencing the payoffs of the others.

Dominant Firm: Many firms, but one is larger than the rest.

- The large firm's decisions affect the payoffs of small firms.
- Decisions by any one small firm do not noticeably affect the payoffs of any other firm.

Monopolistic Competition: Many firms each making a slightly different product. Each firm's output level is small relative to the total.

Eg: …..

Pure Competition: Many firms, all making the same product. Each firm's output level is small relative to the total.

Monopoly, oligopoly, and the dominant firm will be explored later. This chapter explores only pure competition.

Pure Competition

- A firm in a perfectly competitive market knows it has no influence over the market price for its product.

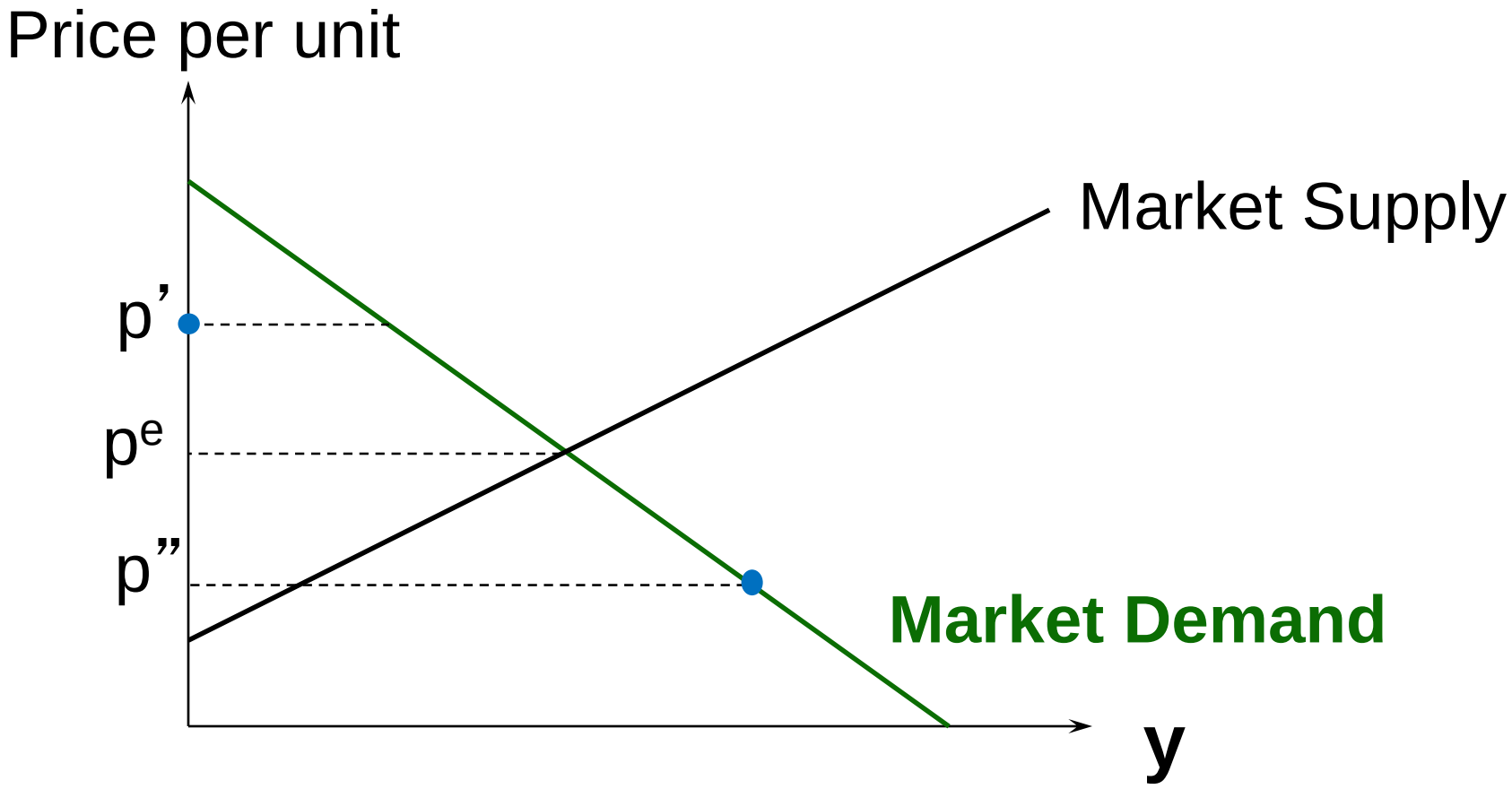
  The firm is a market price-taker.

- The firm is free to vary its own price, ofcourse.

- If the firm sets its own price above the market price then the quantity demanded from the firm is zero.

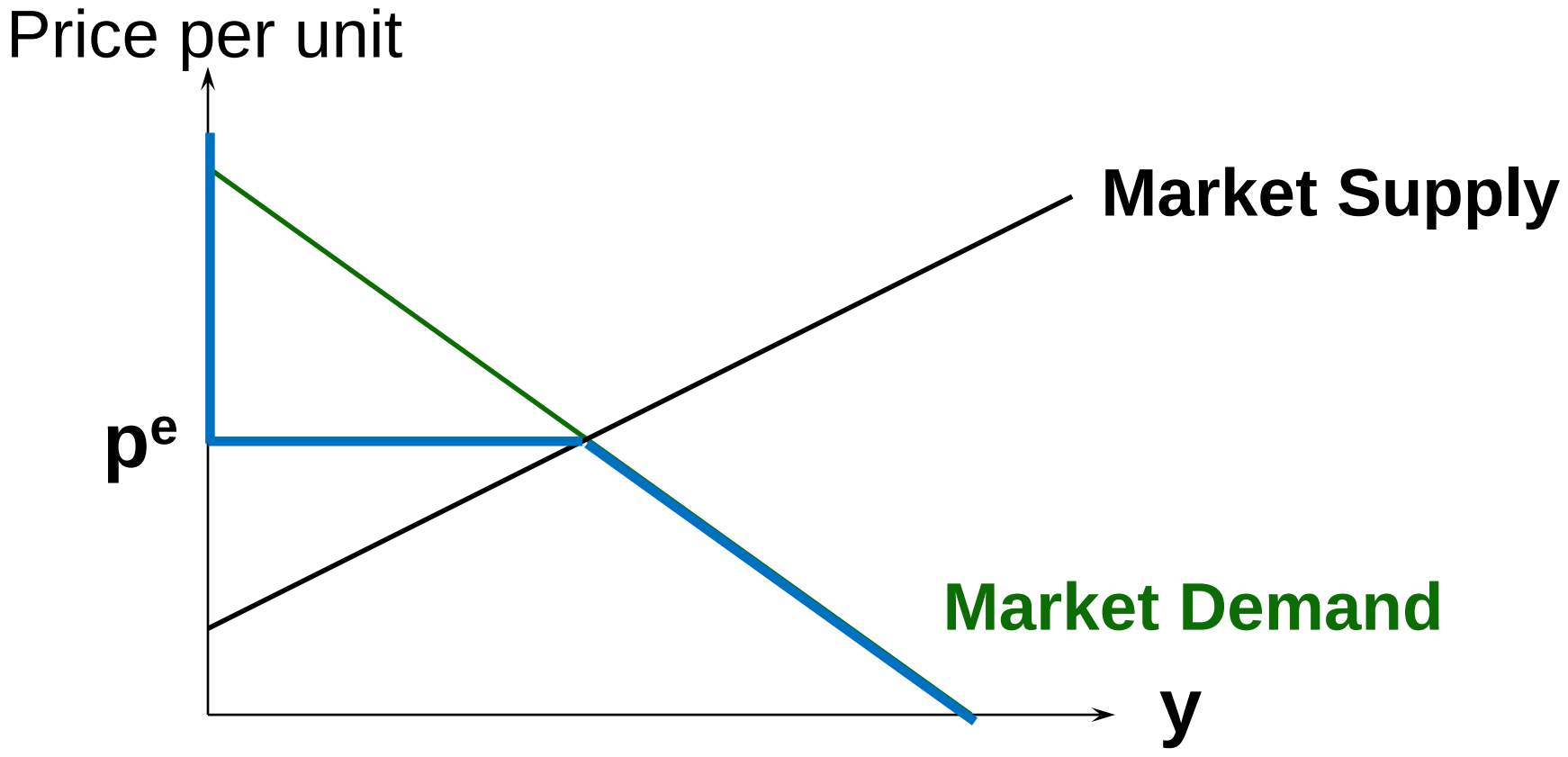
- If the firm sets its own price below the market price, then the quantity demanded from the firm is the entire market.

So what is the demand curve faced by the individual firm?



- At a price of $p' > p^e$, zero is demanded from the firm.
- At a price of $p'' < p^e$, the firm faces the entire market demand

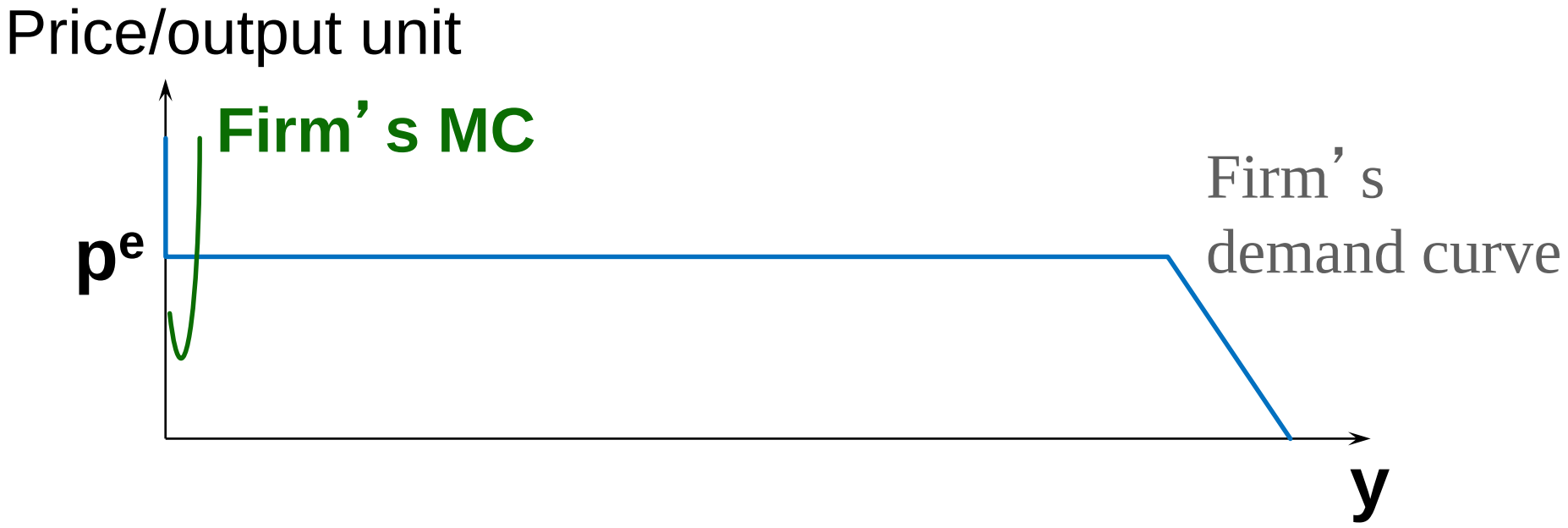
So the demand curve faced by the individual firm operating in a pure competitive market:



- At a price of $p > p^e$, zero is demanded from the firm.
- At a price of $p < p^e$, the firm faces the entire market demand

Smallness

An individual firm's technology causes it to supply only a small part of the total quantity demanded at the market price.

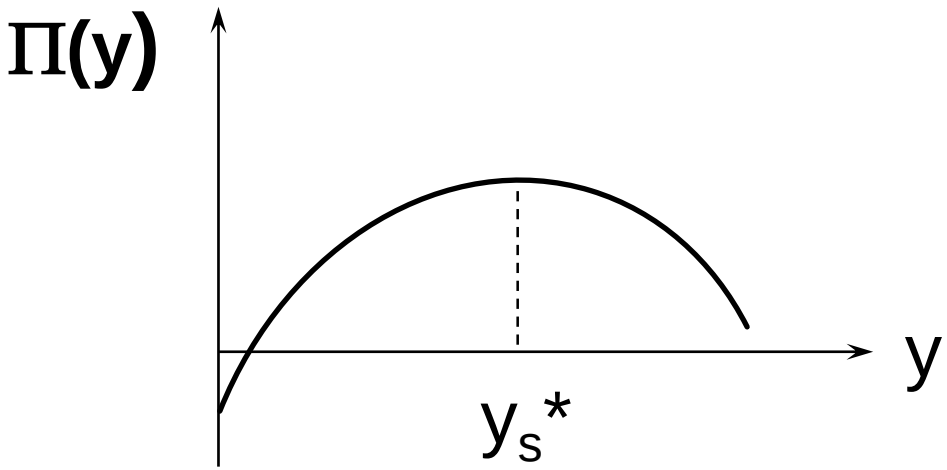


The Firm's Short-Run Supply Decision

The objective of a profit maximizing firm in the short-run:

$$\max_{y \geq 0} \Pi_s(y) = py - c_s(y).$$

$$F.O.C: \frac{d\Pi_s(y)}{dy} = p - MC_s(y) = 0$$



$$\boxed{p = MC_s(y_s^*).}$$

$$\Pi_s(y) = py - c_s(y).$$

When profit maximizing $y_s^* > 0$,

$$\frac{d\Pi_s(y)}{dy} = p - MC_s(y) = 0$$

$$\frac{d^2\Pi_s(y)}{dy^2} = -\frac{dMC_s(y)}{dy}$$

$$S.O.C \text{ for interior maximising condition : } \frac{d^2\Pi_s(y)}{dy^2} < 0 \ \ at y = y_s^*.$$

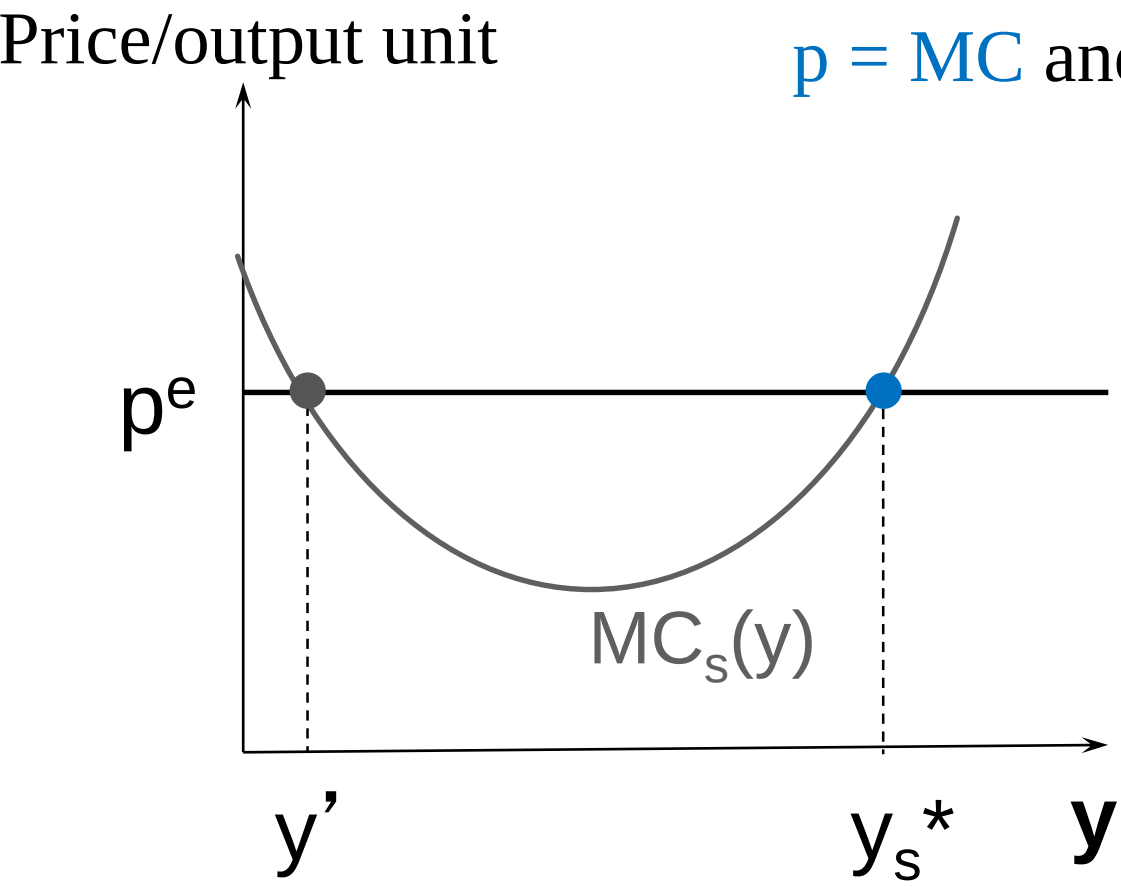
$$Therefore, \frac{dMC_s(y_s^*)}{dy} > 0.$$

So at a profit maximum with $y_s^* > 0$, the firm's

MC curve must be upward-sloping.

At profit maximising point $y = y_s^*$,

p = MC and MC slopes upwards.



Profit-maximizing supply level can lie only on the upwards sloping part of the firm's MC curve.

At y = y', p = MC but MC slopes downwards.

So, at y = y' firm is profit-minimizing.

But not every point on the upward-sloping part of the firm's MC curve represents a profit-maximum.

Recall the firm's profit function:

$$\Pi_s(y) = py - c_s(y) = py - F - c_v(y).$$

If the firm chooses y = 0 then its profit is

$$\Pi_s(y) = 0 - F - c_v(0) = -F.$$

So the **firm will choose an output level y > 0** only if

$$\Pi_s(y) = py - F - c_v(y) \geq -F.$$

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

$$p \geq \frac{c_v(y)}{y} = AVC_s(y).$$

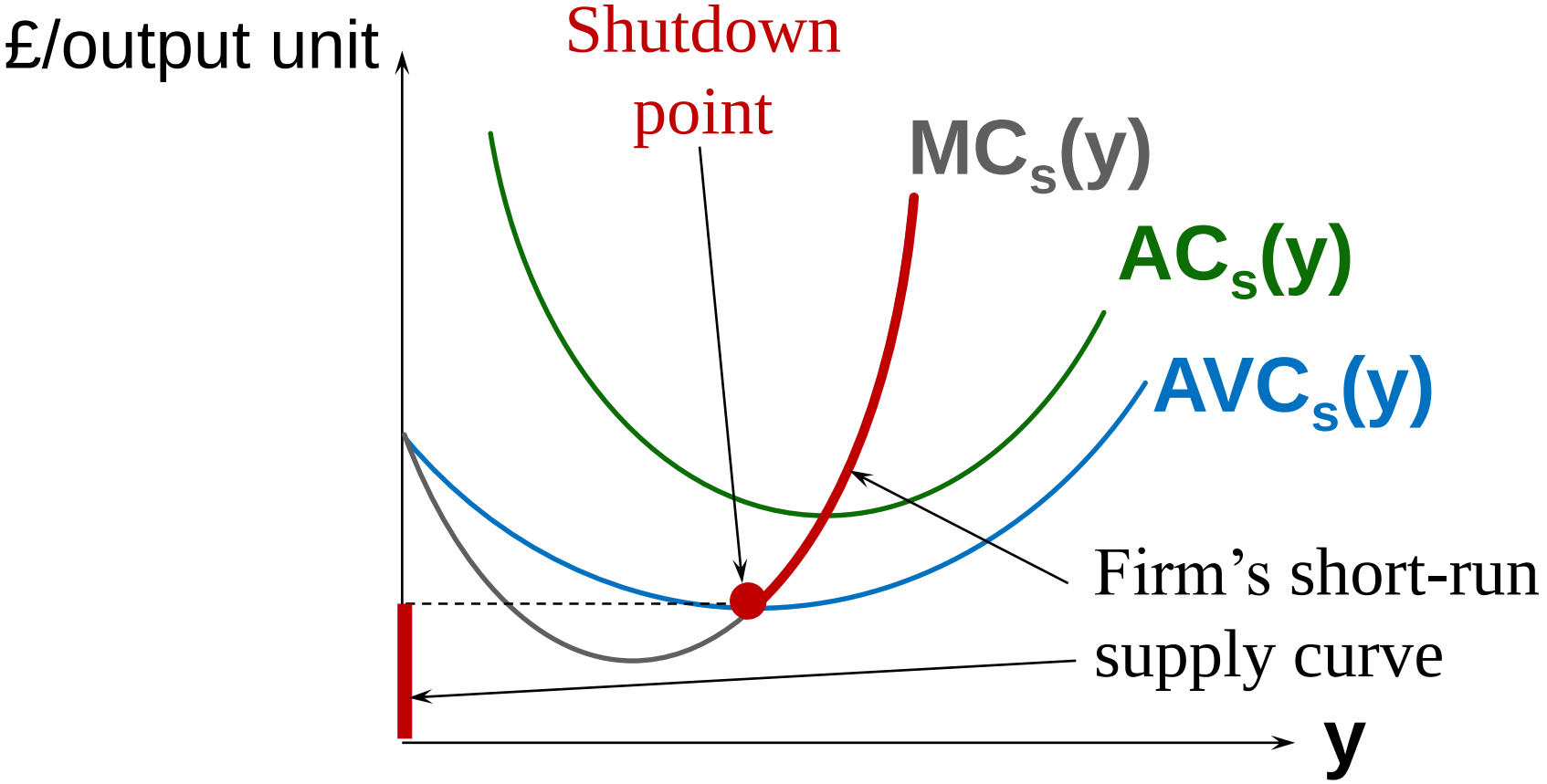
Firm's short-run supply curve

At profit maximising point $y = y_s^*$,

p = MC and MC slopes upwards.

$p > AVC_s(y)$, $y_s^* > 0$.

$p < AVC_s(y)$, $y_s^* = 0$.



Shut-down is not the same as exit.

- Shutting-down means producing no output (but the firm is still in the industry and suffers its fixed cost).
- Exiting means leaving the industry, which the firm can do only in the long-run.

The Firm's Long-Run Supply Decision

The firm can choose the best of its short-run circumstances.

The firm's long-run supply level decision is to

$$\max_{y \geq 0} \Pi(y) = py - c(y).$$

The 1st and 2nd-order maximization conditions for $y^* > 0$ are,

$$p = MC(y) \text{ and } \frac{dMC(y)}{dy} > 0.$$

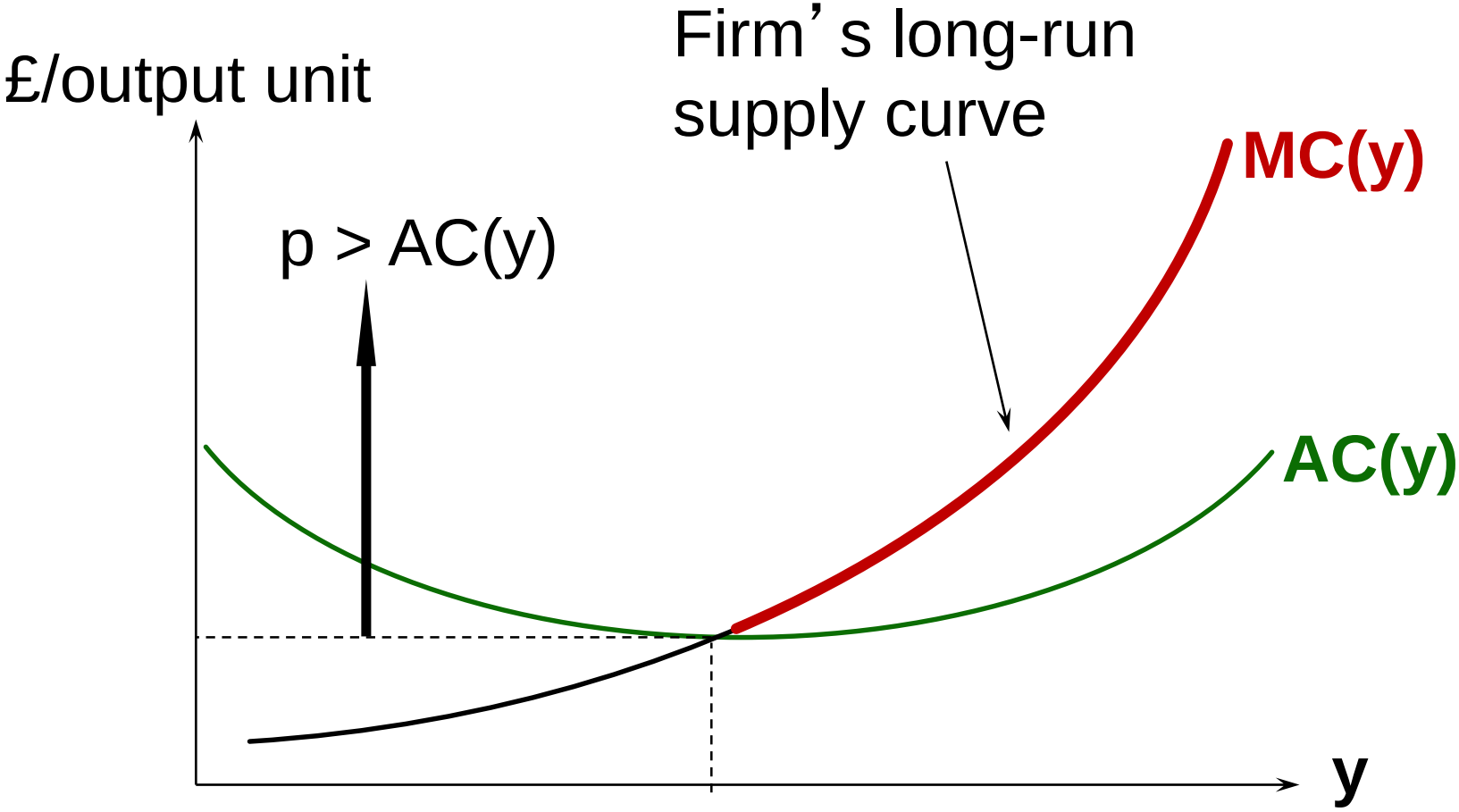
Moreover, the firm's economic profit level must be positive for the firm not to exit the industry.

$$\Pi(y) = py - c(y) \geq 0 \Rightarrow \boxed{p \geq \frac{c(y)}{y} = AC(y).}$$

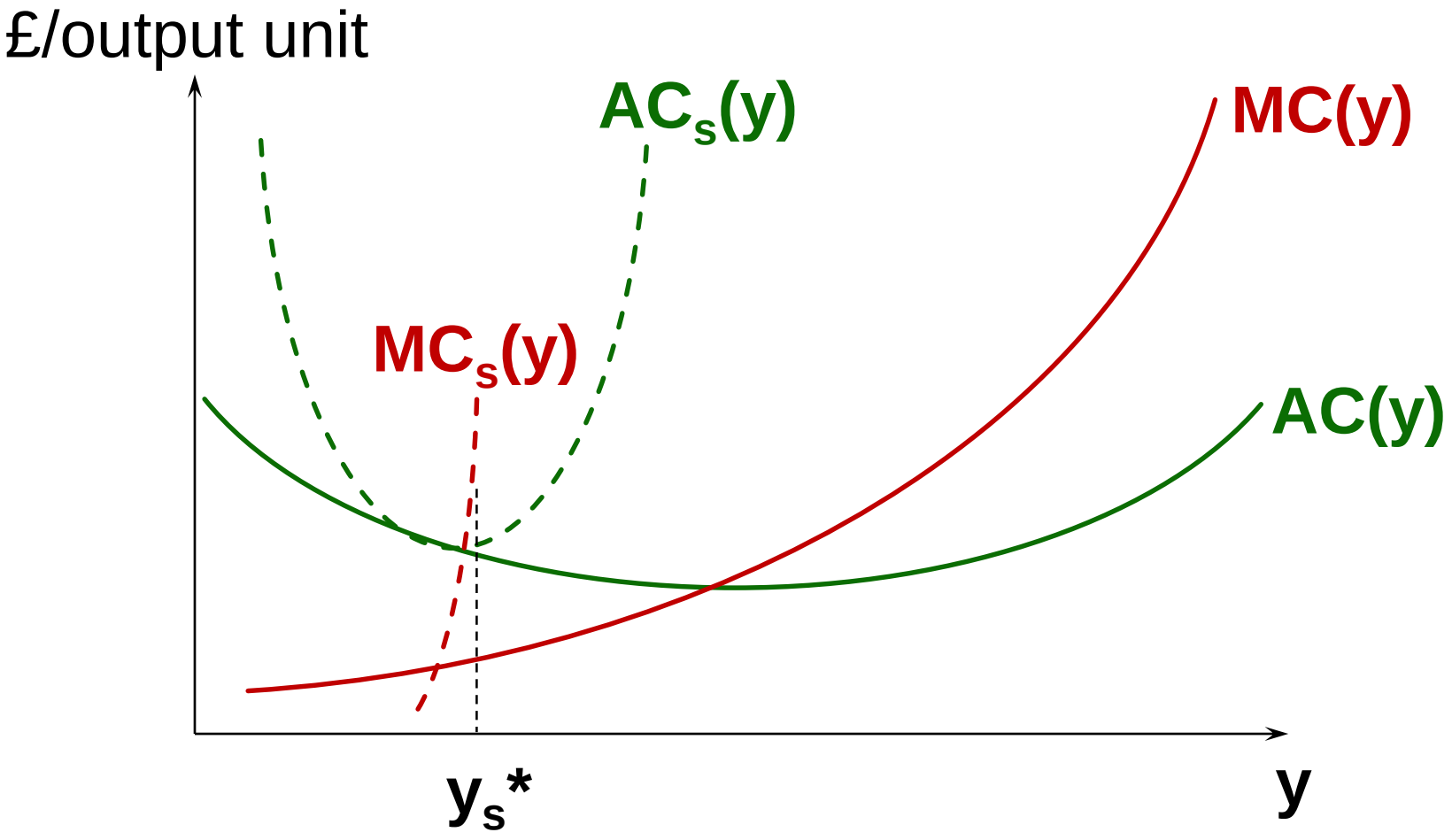
The firm's long-run supply curve

$$p = MC\ (y)\ \ and\ \ \frac{dMC\ (y)}{dy} > 0.$$

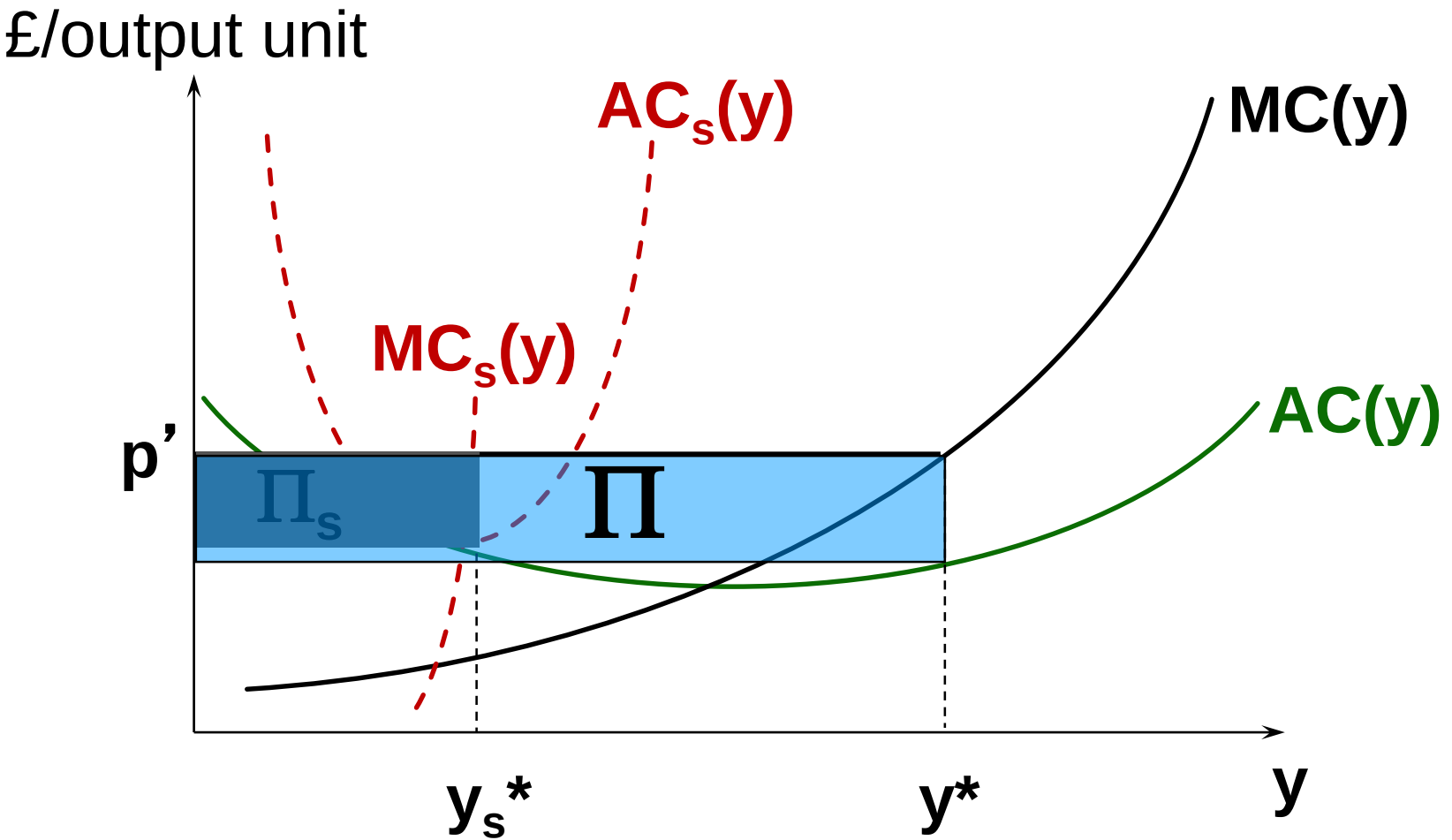
$$p \geq \frac{c(y)}{y} = AC(y).$$

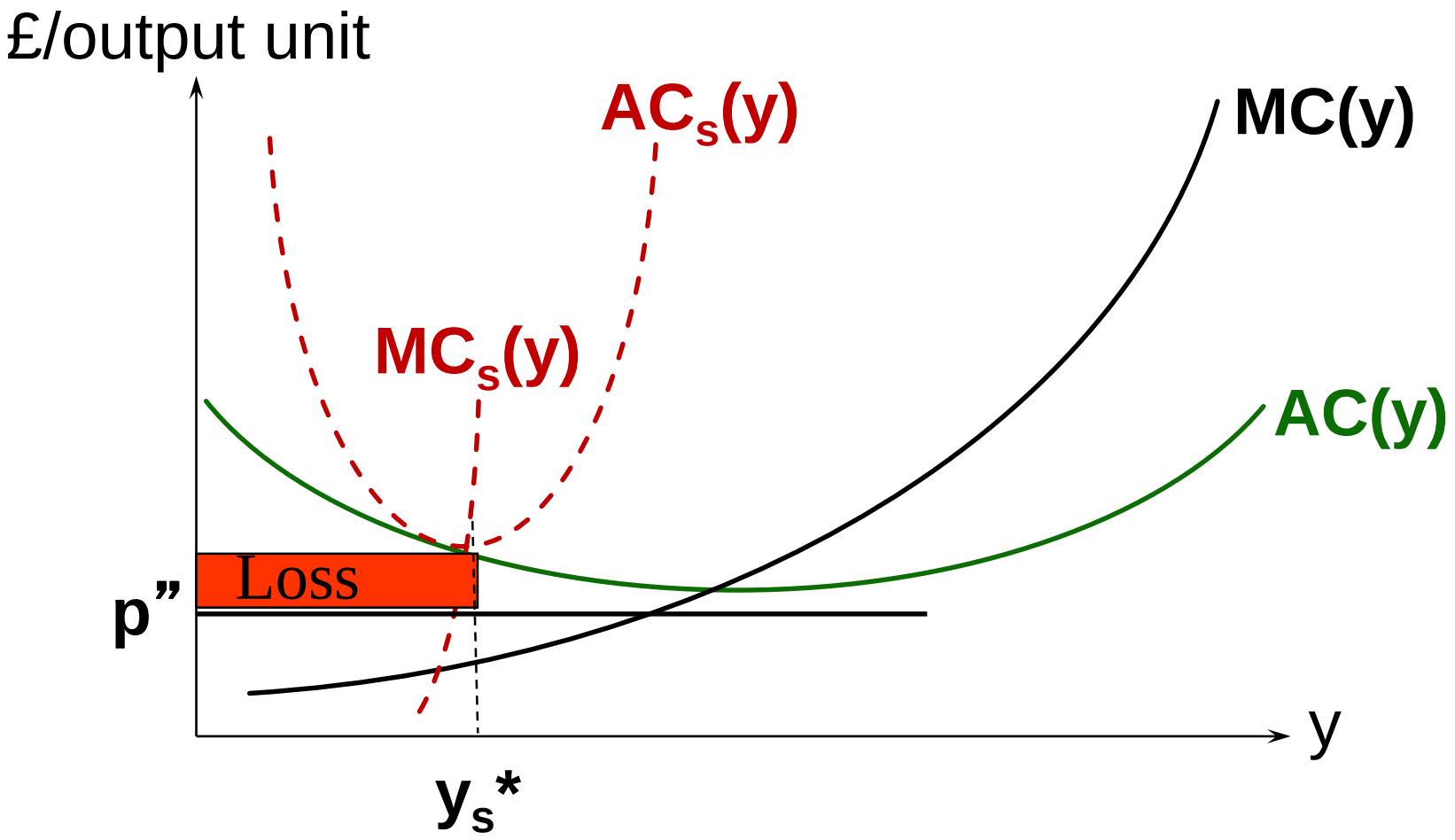


y_s^* is profit-maximizing in this short-run.

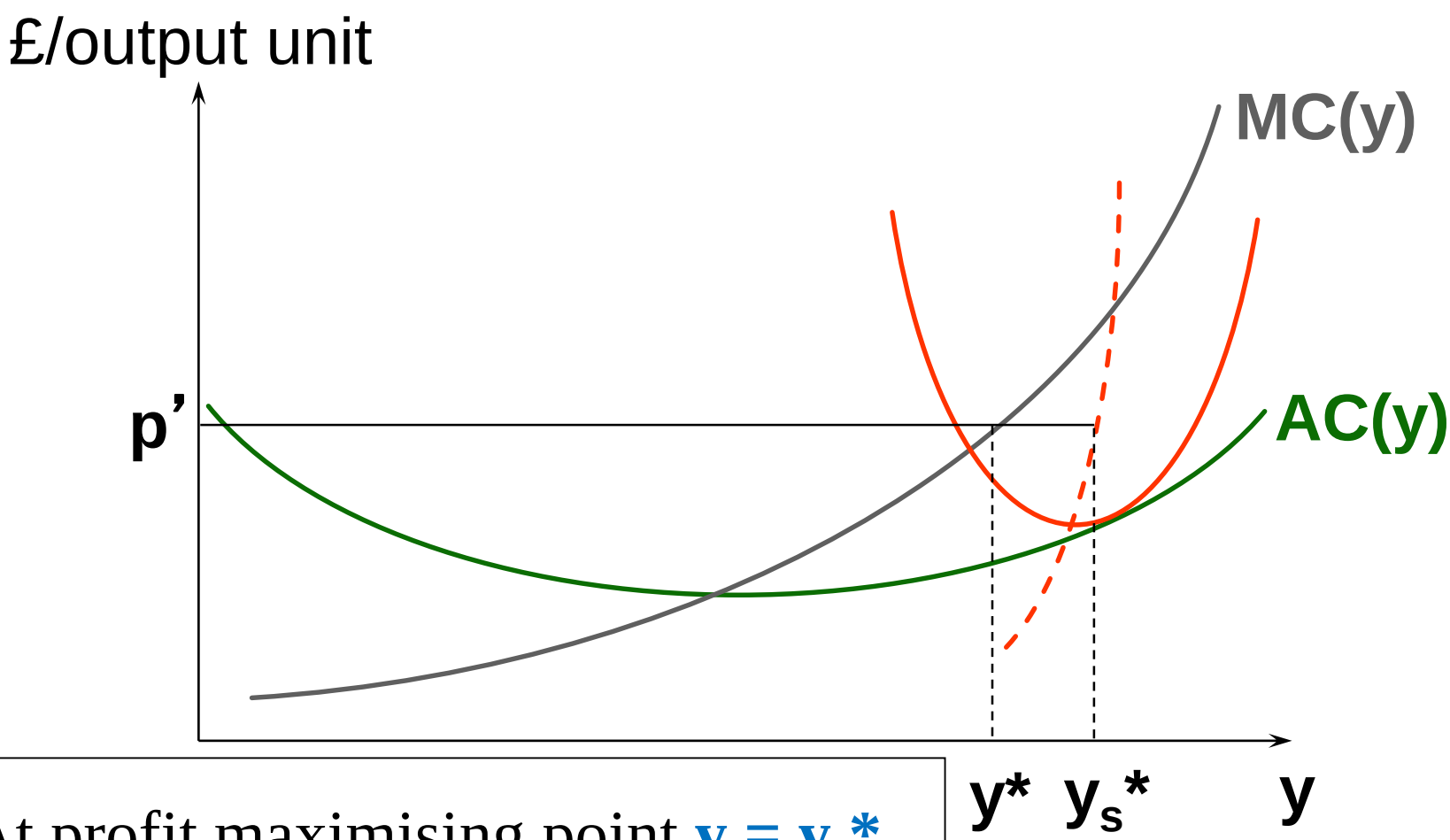


In the long run, the firm can increase profit by increasing x_2 (fixed input) and producing y^*.





y_s^* is loss-minimizing in this short-run. This loss can be eliminated in the long run by the firm exiting the industry.

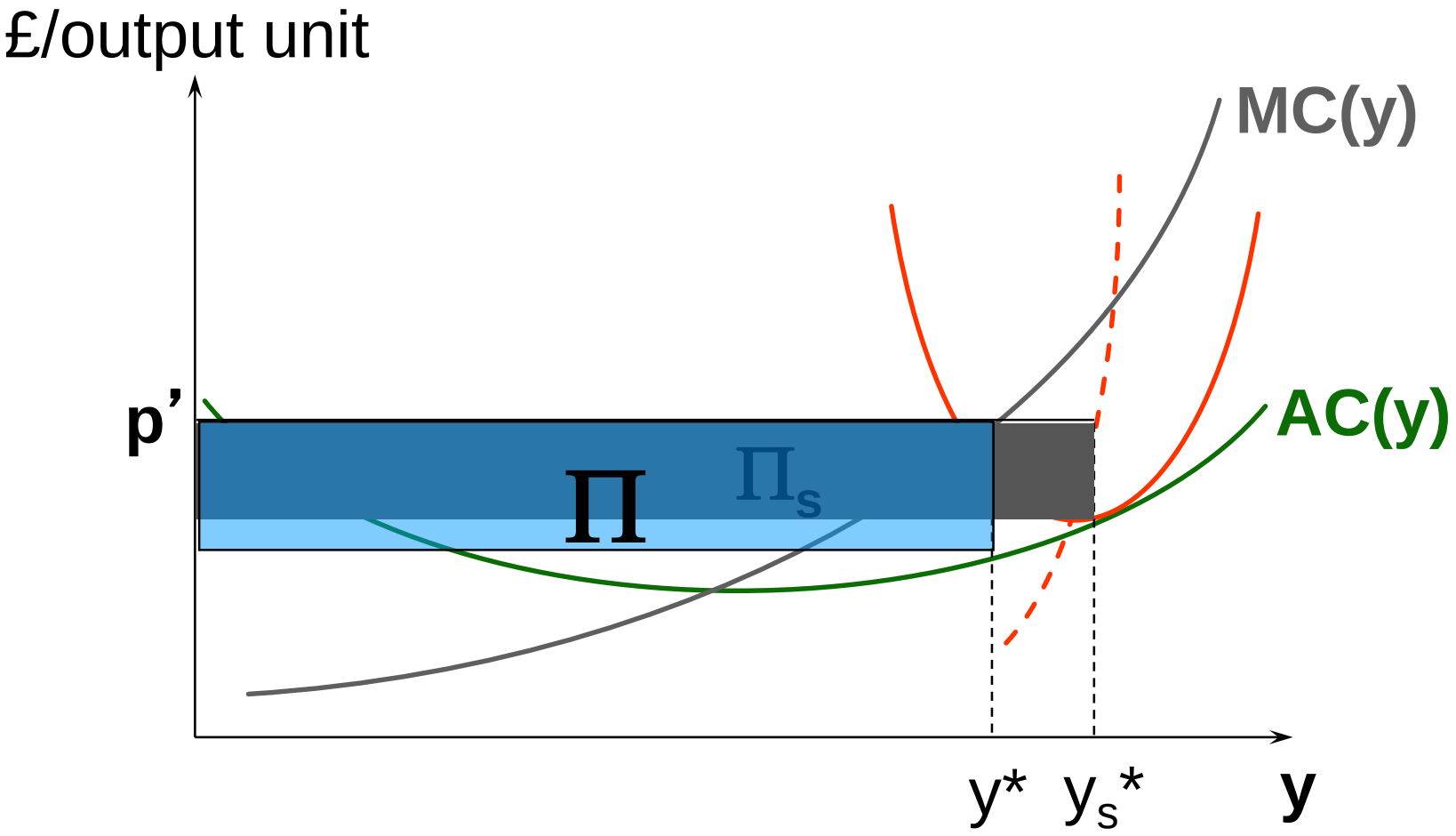


At profit maximising point $y = y_s^*$,

p = MC and MC slopes upwards.

y_s^* is profit-maximizing in this short-run.

y^* is profit-maximizing in the long-run.



y_s^* is profit-maximizing in this short-run.

The firm can increase profit by reducing x_2 and producing y^*.

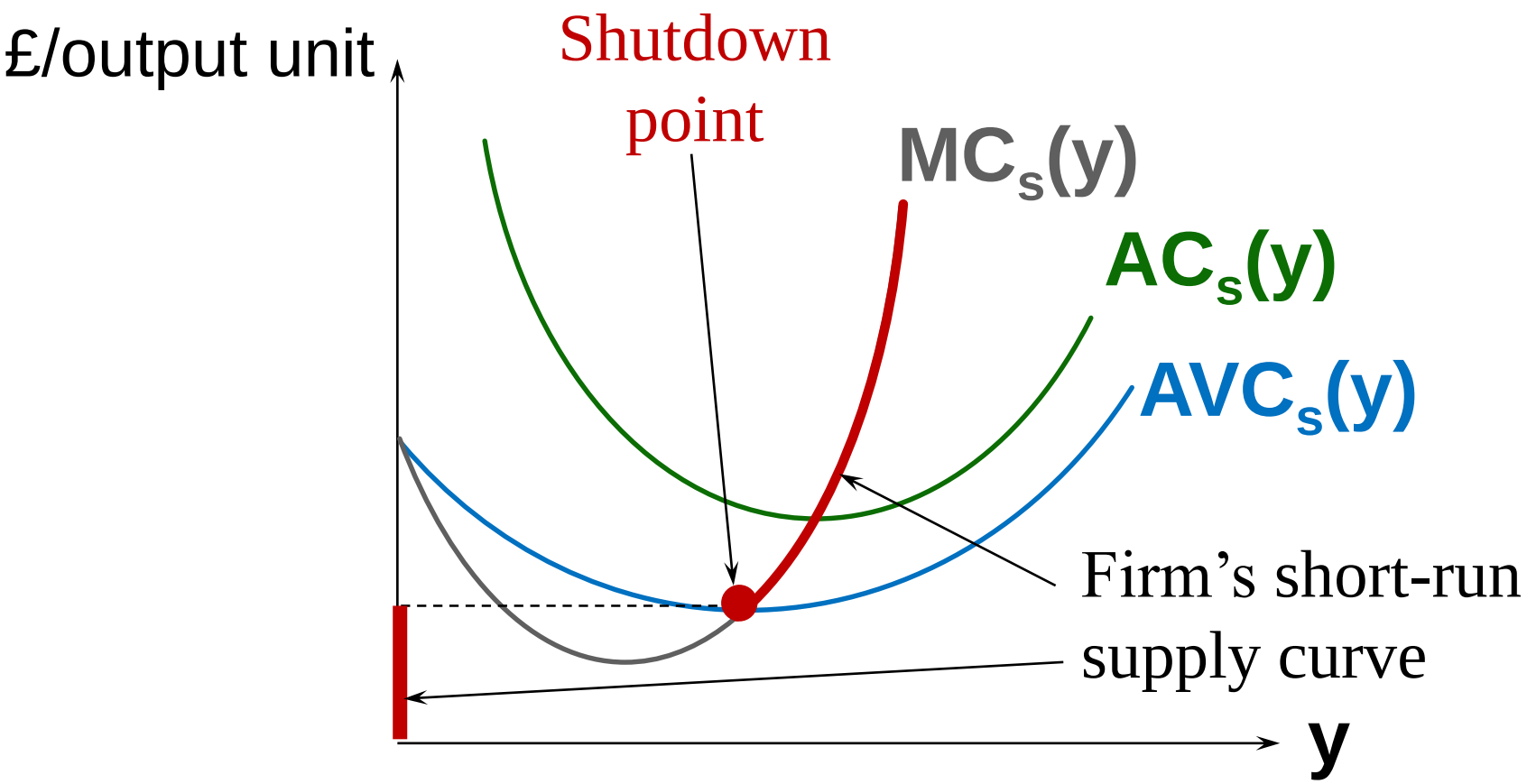
Recall the **Firm's short-run supply curve**

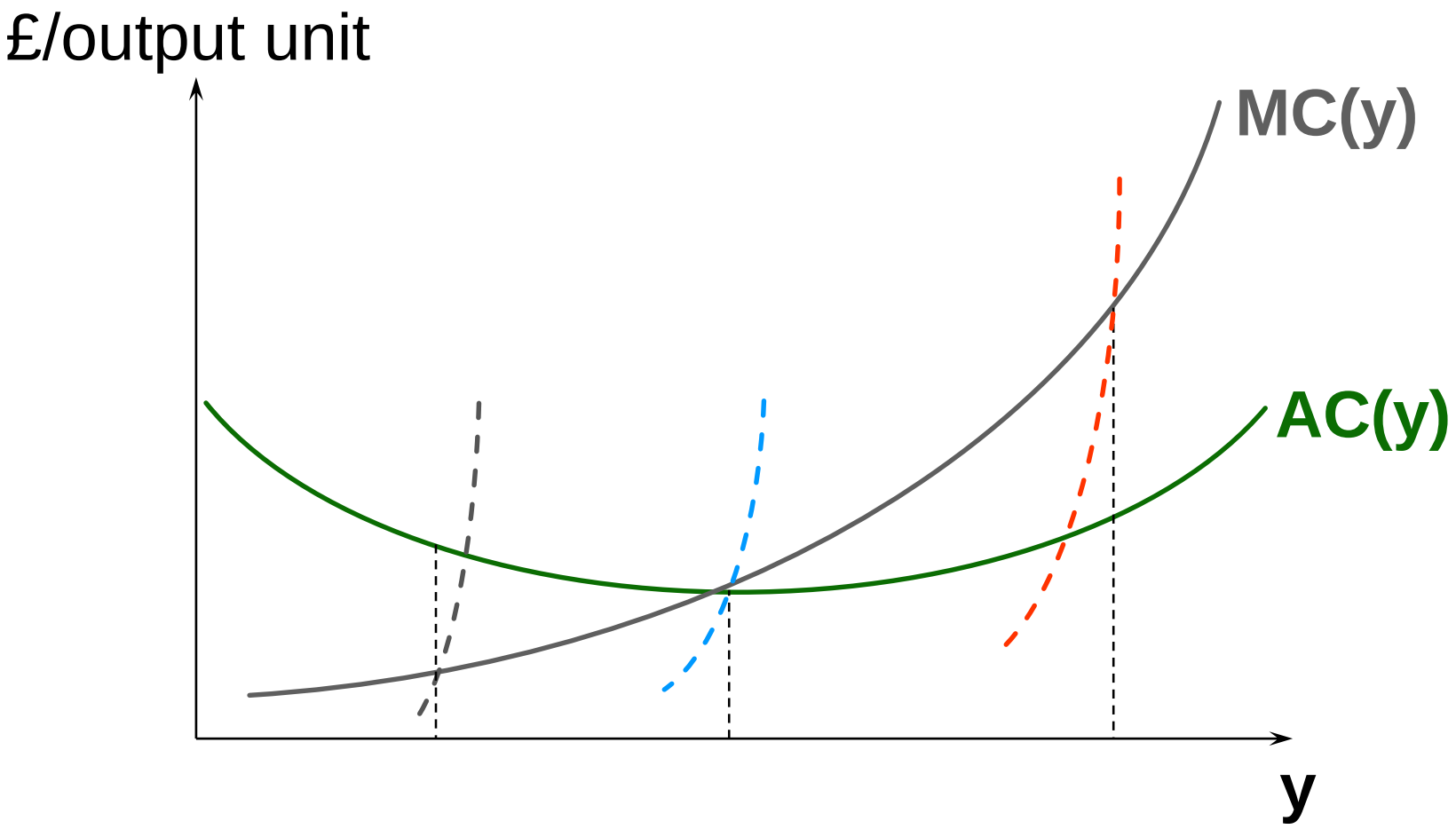
At profit maximising point $y = y_s^*$,

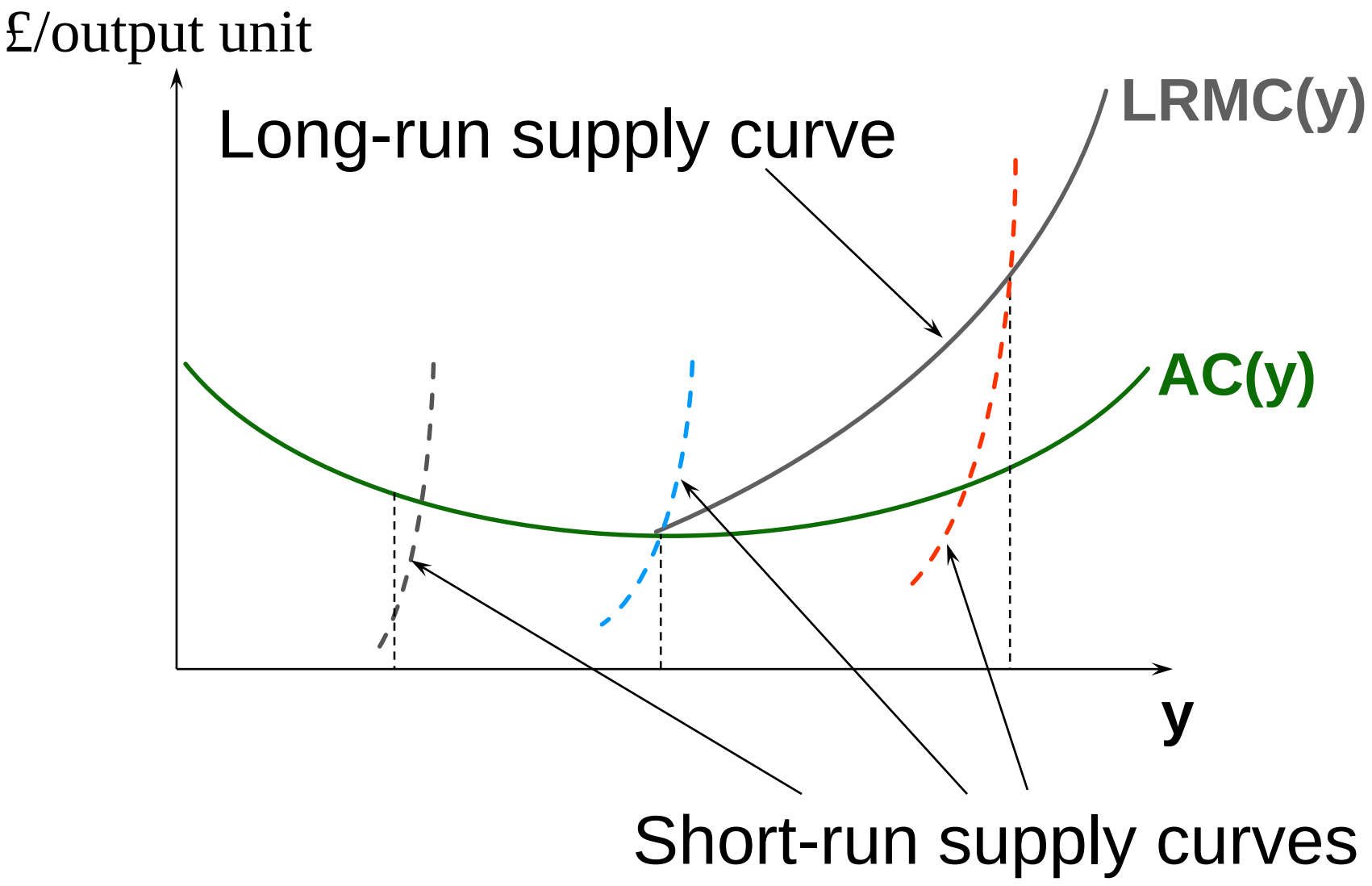
p = MC and MC slopes upwards.

$p > AVC_s(y)$, $y_s^* > 0$.

$p < AVC_s(y)$, $y_s^* = 0$.

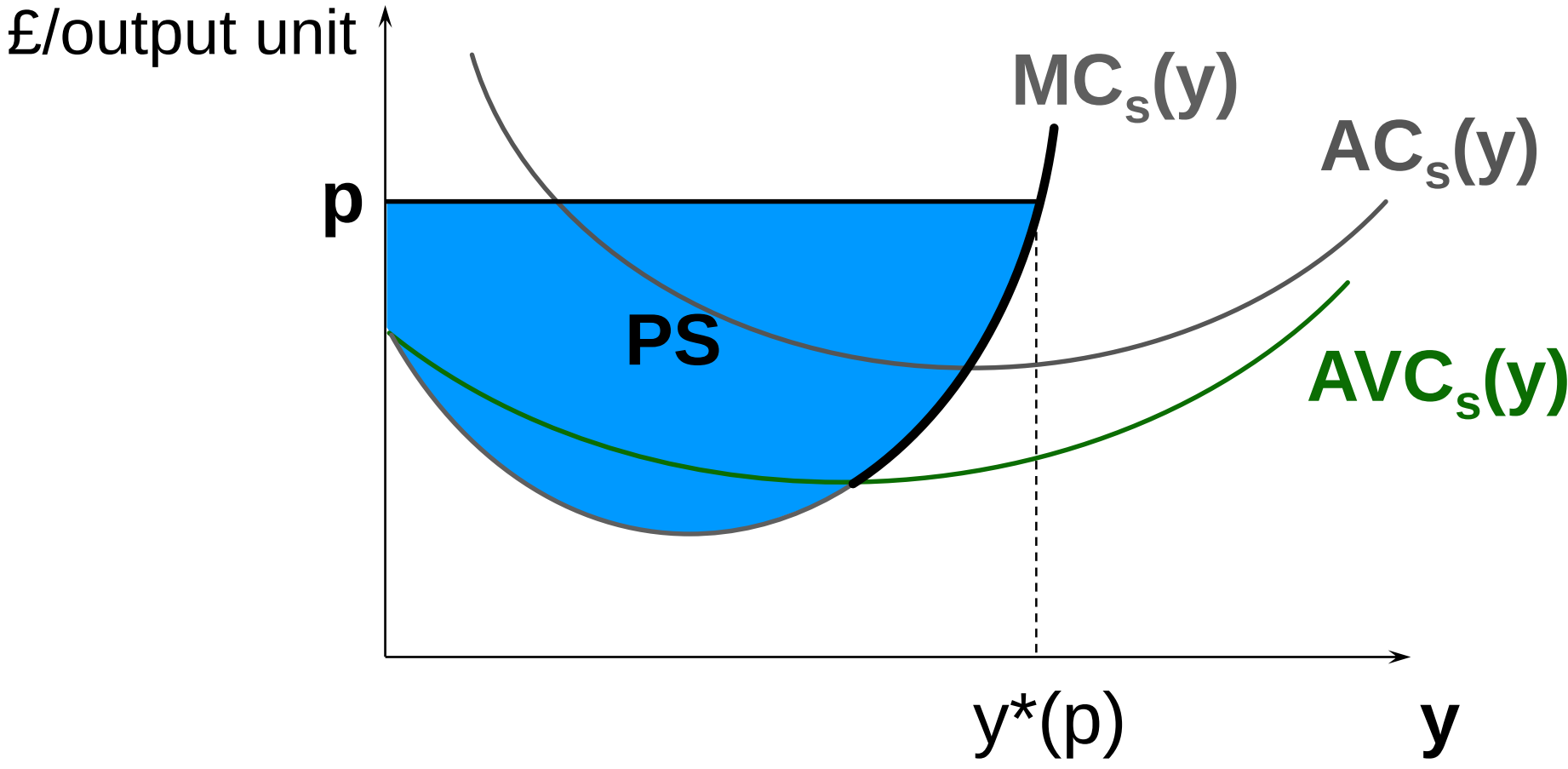


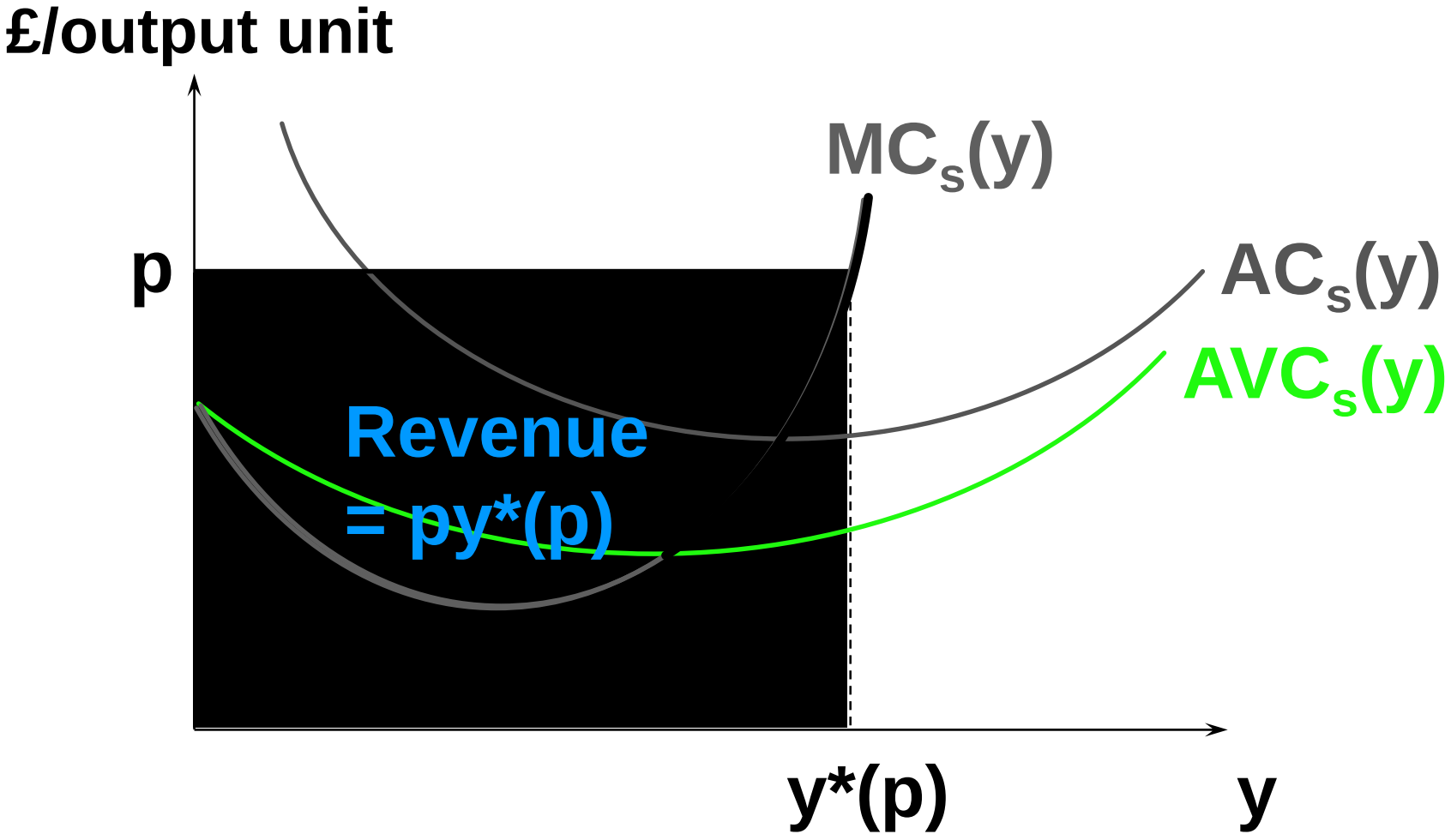

£/output unit
MC(y)
AC(y)
y

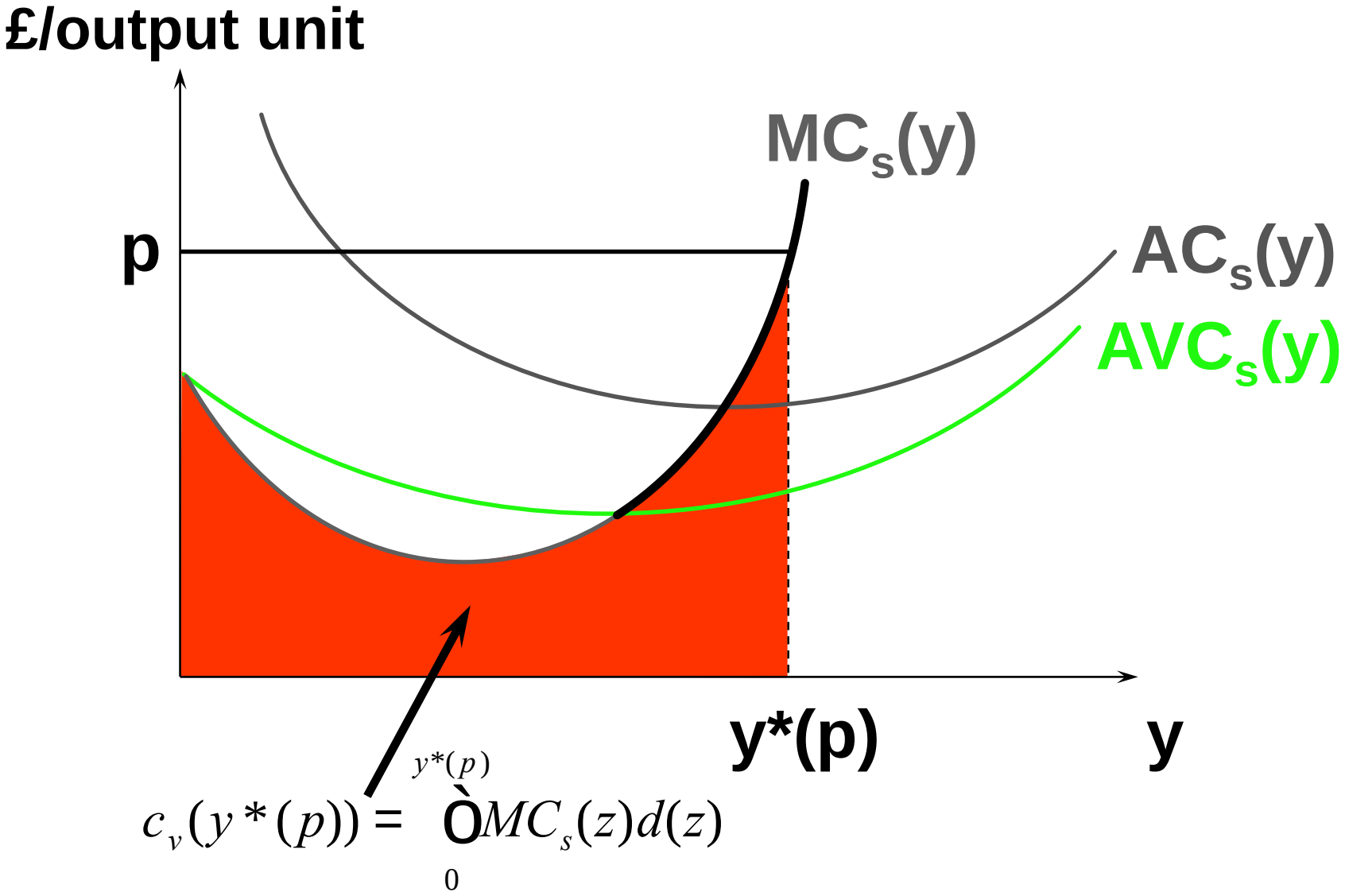

£/output unit
Long-run supply curve
LRMC(y)
AC(y)
y
Short-run supply curves

Producer's Surplus Revisited

The firm's producer surplus is the accumulation, unit by extra unit of output, of extra revenue less the extra production cost.




£/output unit
p
MC$_s$(y)
AC$_s$(y)
AVC$_s$(y)
Revenue
= py*(p)
y*(p)
y


£/output unit
MC_s(y)
AC_s(y)
AVC_s(y)
p
y*(p)
y
c_v(y*(p)) = ∫_0^{y*(p)} MC_s(z)d(z)

So the firm's producer's surplus is

$$PS(p) = py^*(p) - \int_0^{y^*(p)} MC_s(z)d(z)$$

$$= py^*(p) - c_v\left(y^*(p)\right).$$

That is, PS = Revenue –Variable Cost.

Producer surplus vs Profit

- PS = Revenue - Variable Cost.
- Profit = Revenue - Total Cost

  = Revenue - Fixed Cost - Variable Cost.
- So, PS = Profit + Fixed Cost.
- Only if fixed cost is zero (the long-run) are PS and profit the same.