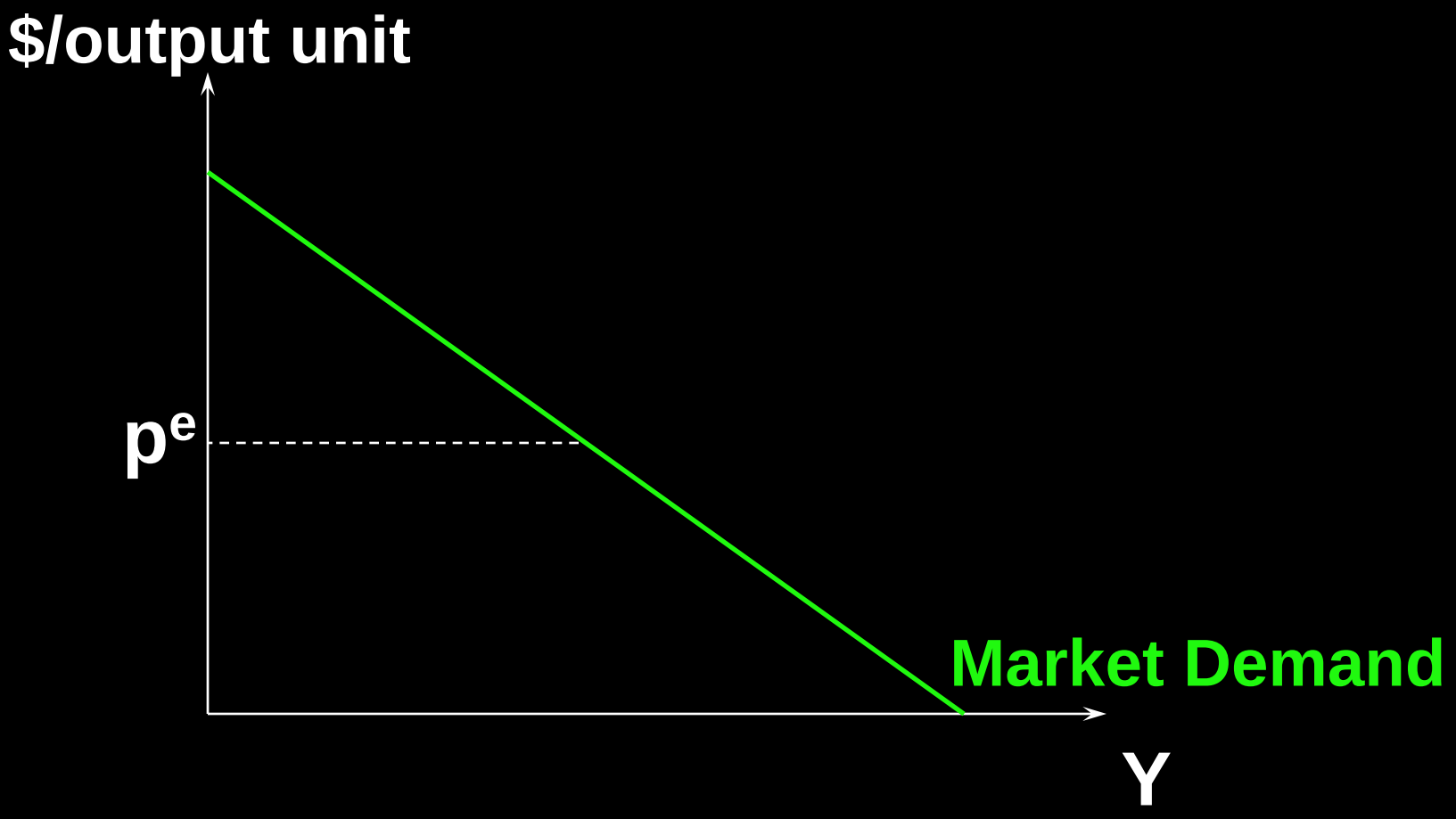
These slides are by courtesy of Prof. 李稻葵 and Prof. 郑捷.

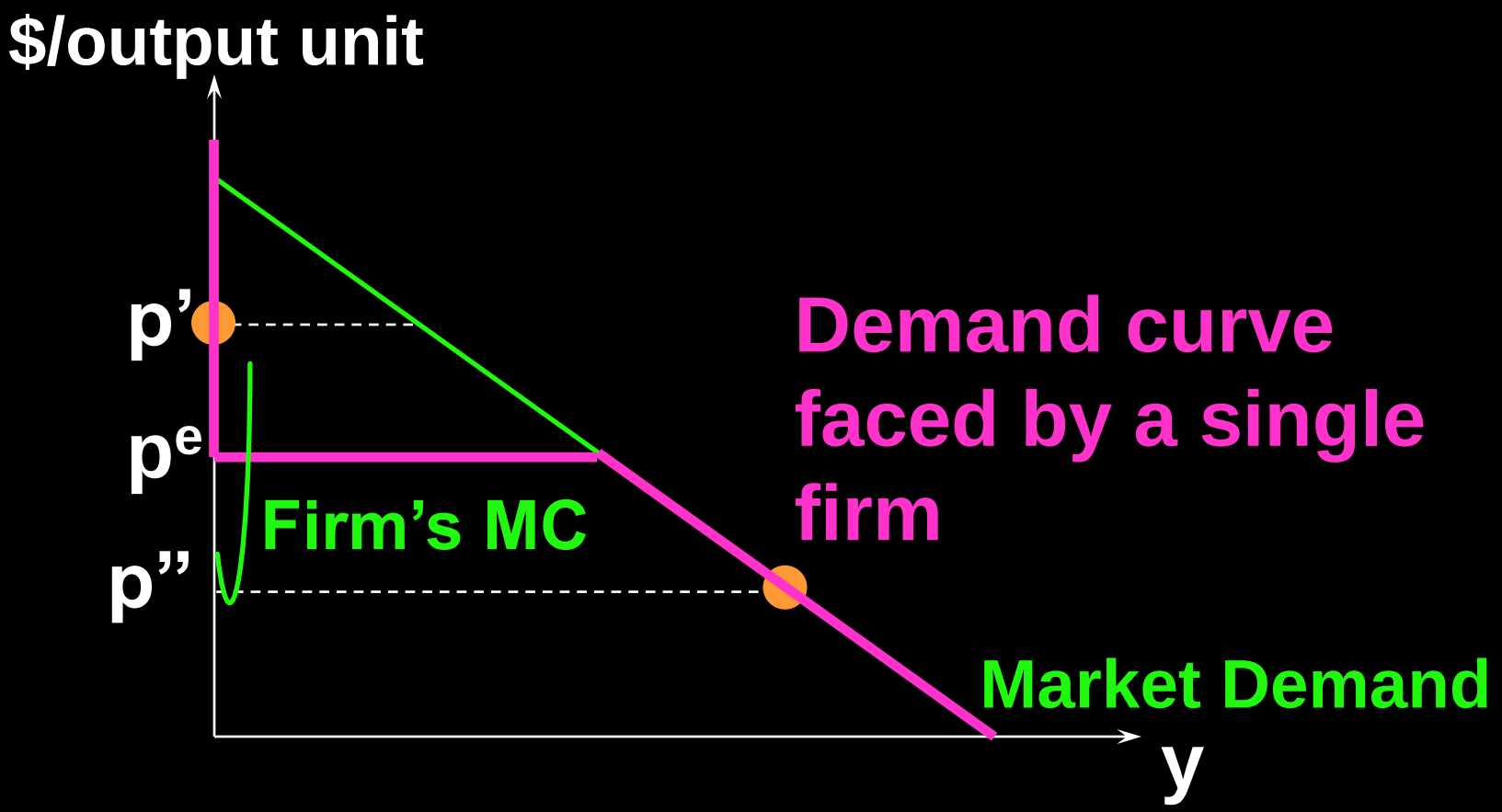
Chapter Twenty-Three

Firm Supply

Assume Competition



Firm as a Price Taker



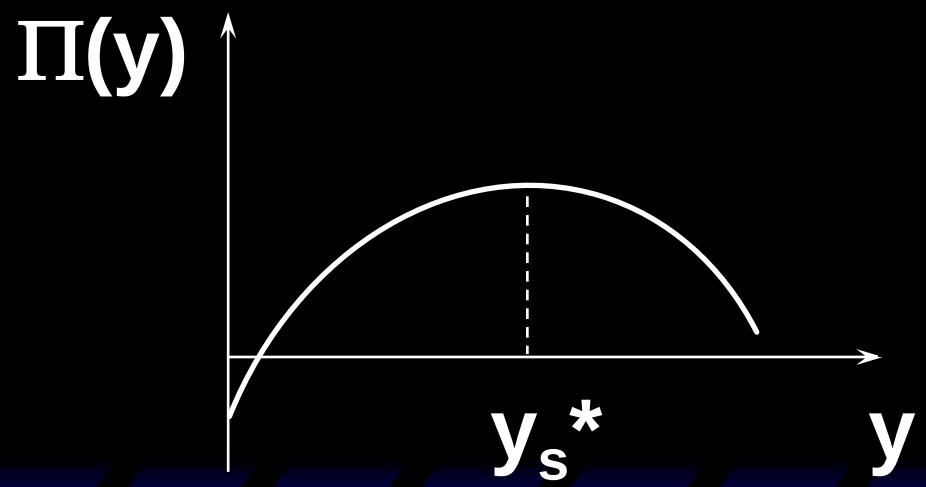
The firm only finds the flat part of the single-firm demand curve potentially profitable.

The Firm's Short-Run Supply Decision

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

Case (a) $y_s^* > 0$:

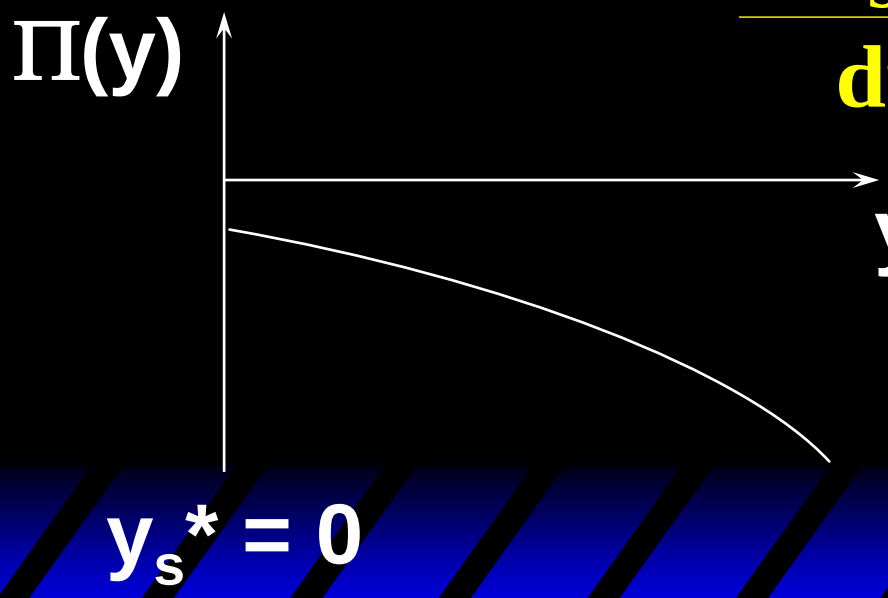
$$\frac{d\Pi_s(y)}{dy} = p - MC_s(y) = 0$$



The Firm's Short-Run Supply Decision

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

Case (b) $y_s^* = 0$:



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

$$\text{at } y = y_s^* = 0.$$

The profit is:
$p*0 - c_s(0) = -FC.$

When will case (a) happen?

- Assuming no quasi-fixed cost
- Since y=0 is always a feasible choice, if the optimal y > 0, it must be

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

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

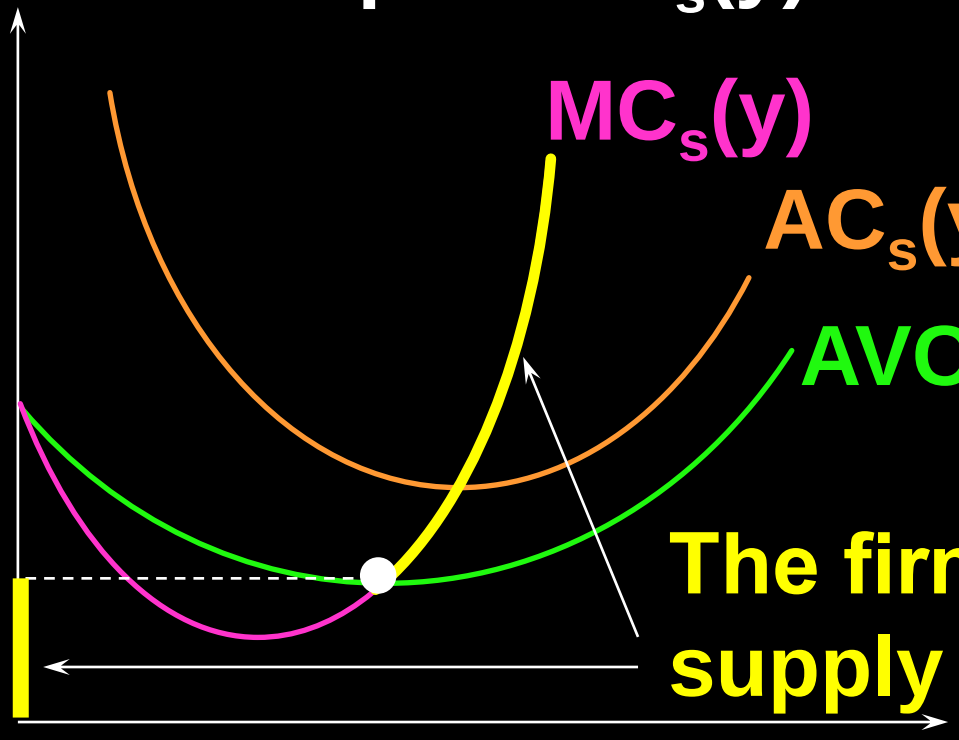
- I.e.,

- Equivalently, $p \geq \dfrac{c_v(y)}{y} = AVC_s(y).$

The Firm's Short-Run Supply Decision

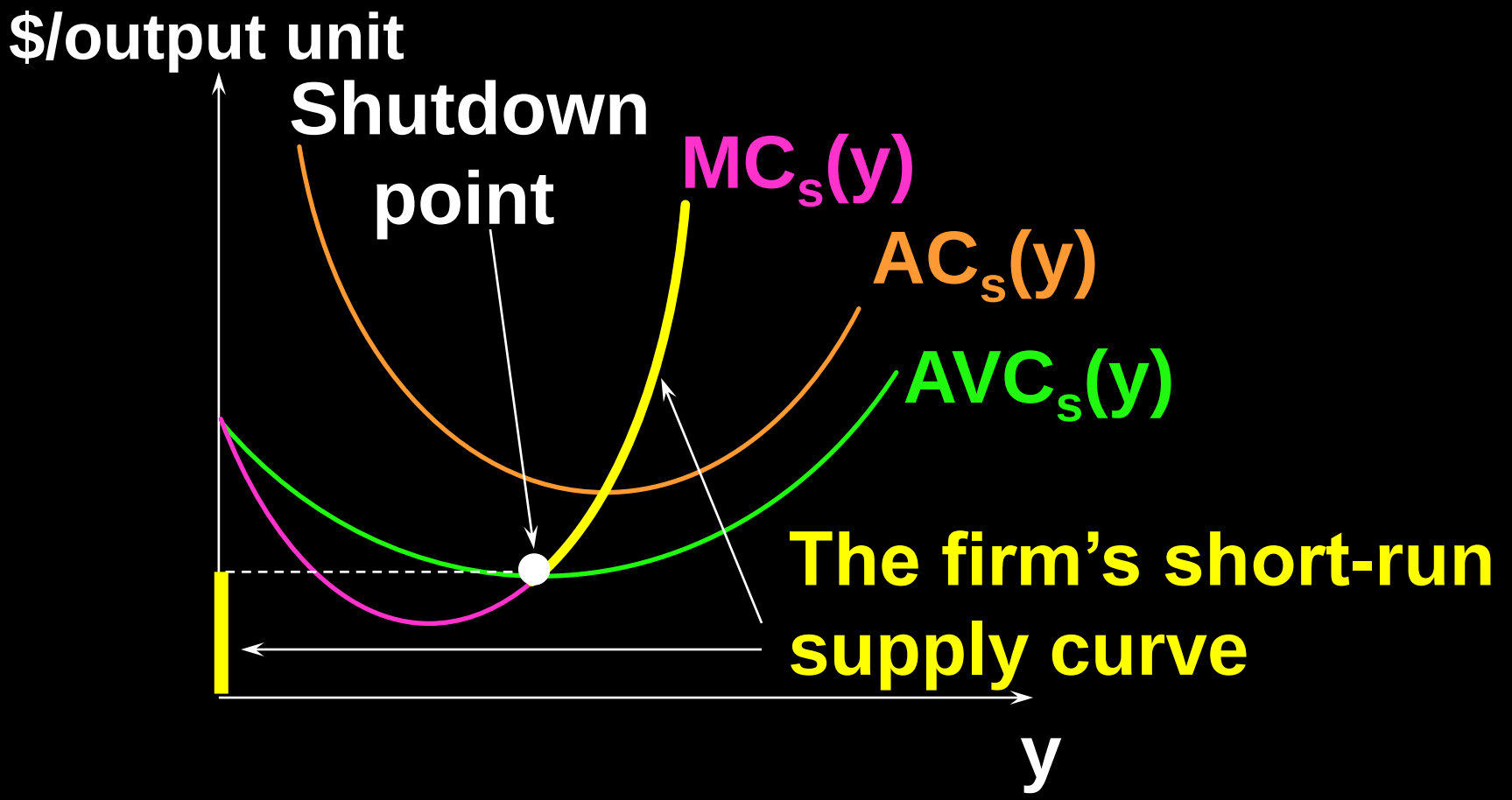
$/output unit

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



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

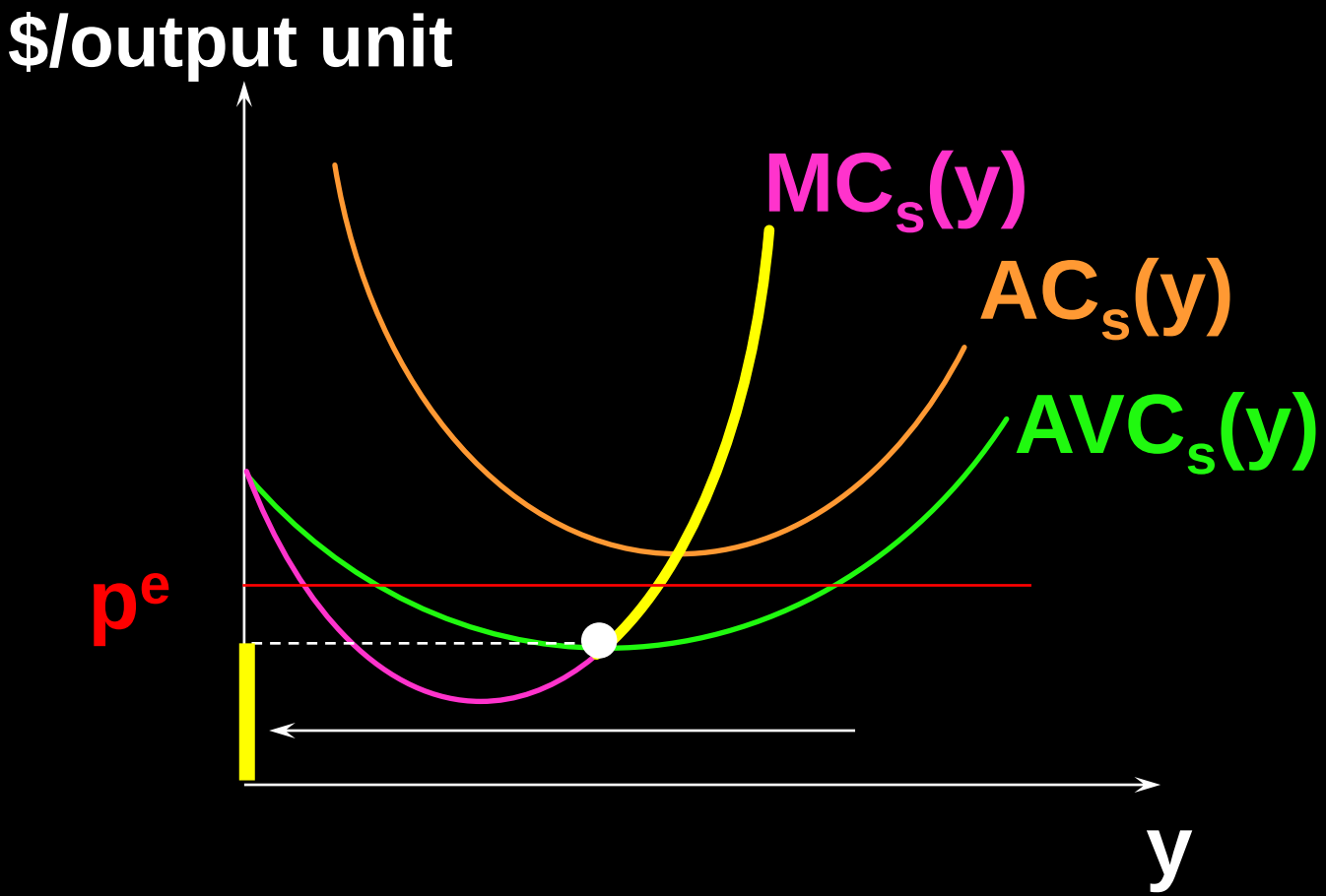
The Firm's Short-Run Supply Decision



Shutdown in the Short-Run

- **Shutting-down means producing no output, i.e. y=0.**
- **But the firm still must pay for the fixed inputs in the short run.**
- **The firm may run with negative profit in the short run, since fixed cost is sunk in the short run.**

The Firm's Short-Run Supply Decision



At price p^e, the firm will operate with a negative profit.

Long-Run Supply

- With competition, the firm's long-run profit function is

$$\Pi(y) = py - c(y).$$

- c(y): long-run cost

The Firm's Long-Run Supply Decision

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

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

- **FOC: p = MC(y)**

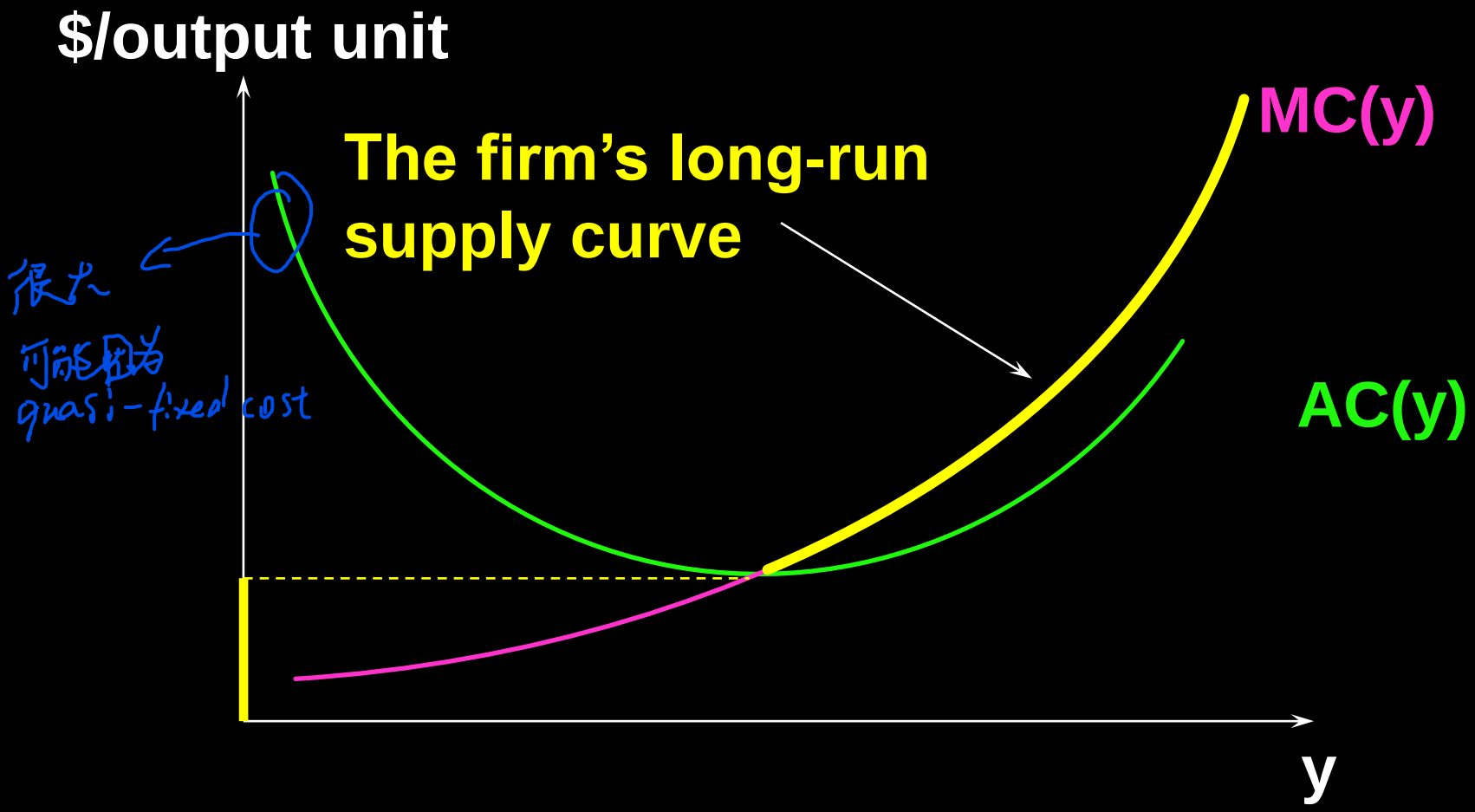
The Firm's Long-Run Supply Decision

- To see whether we have an interior solution (y>0) or corner solution (y = 0), it is again helpful to compare p and AC.
- If y>0 is an interior solution, we must have

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

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

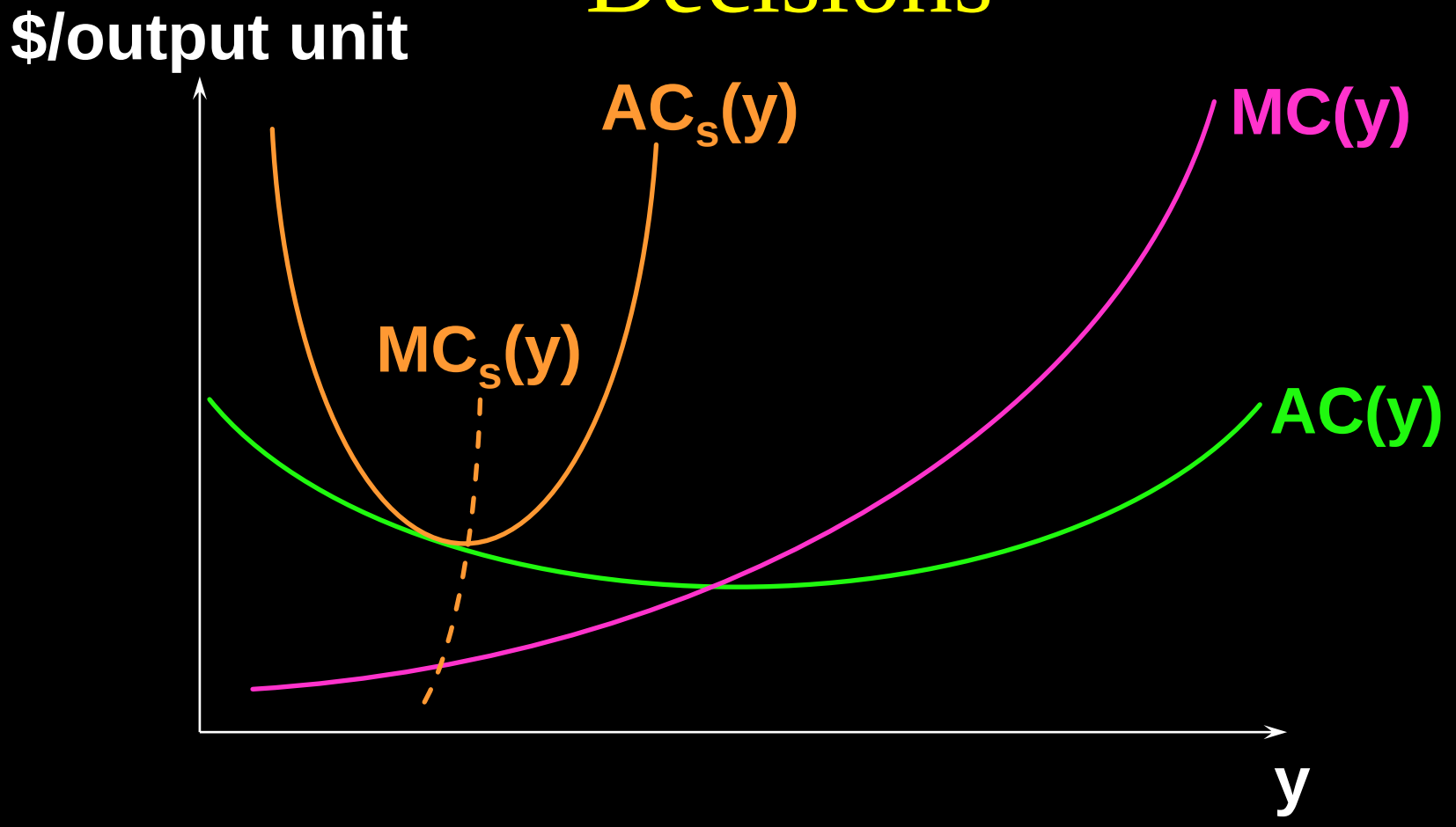
The Firm's Long-Run Supply Decision



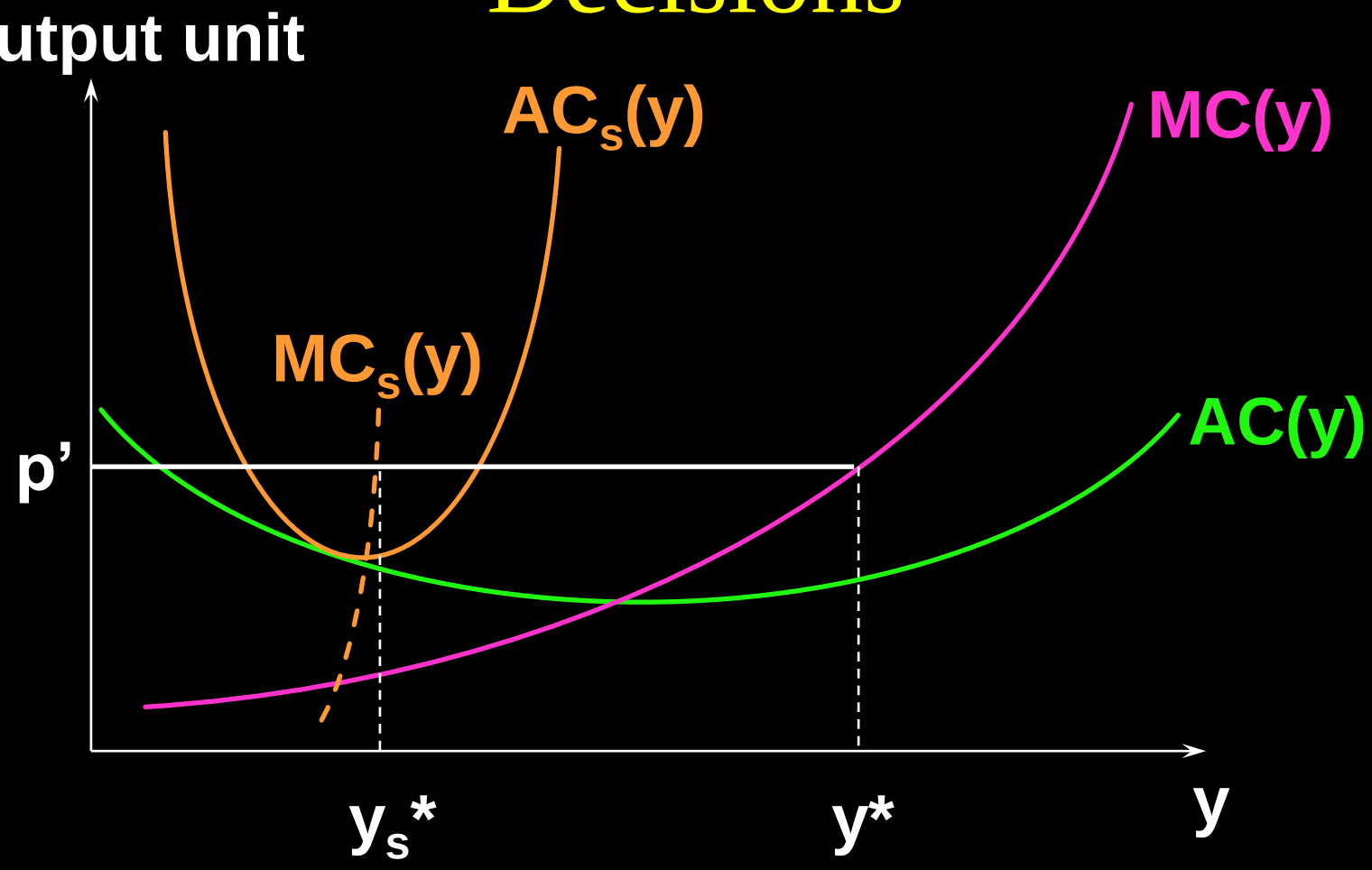
Long Run vs. Short Run

- **How is the firm's long-run supply curve related to its short-run supply curves?**

The Firm's Long & Short-Run Supply Decisions

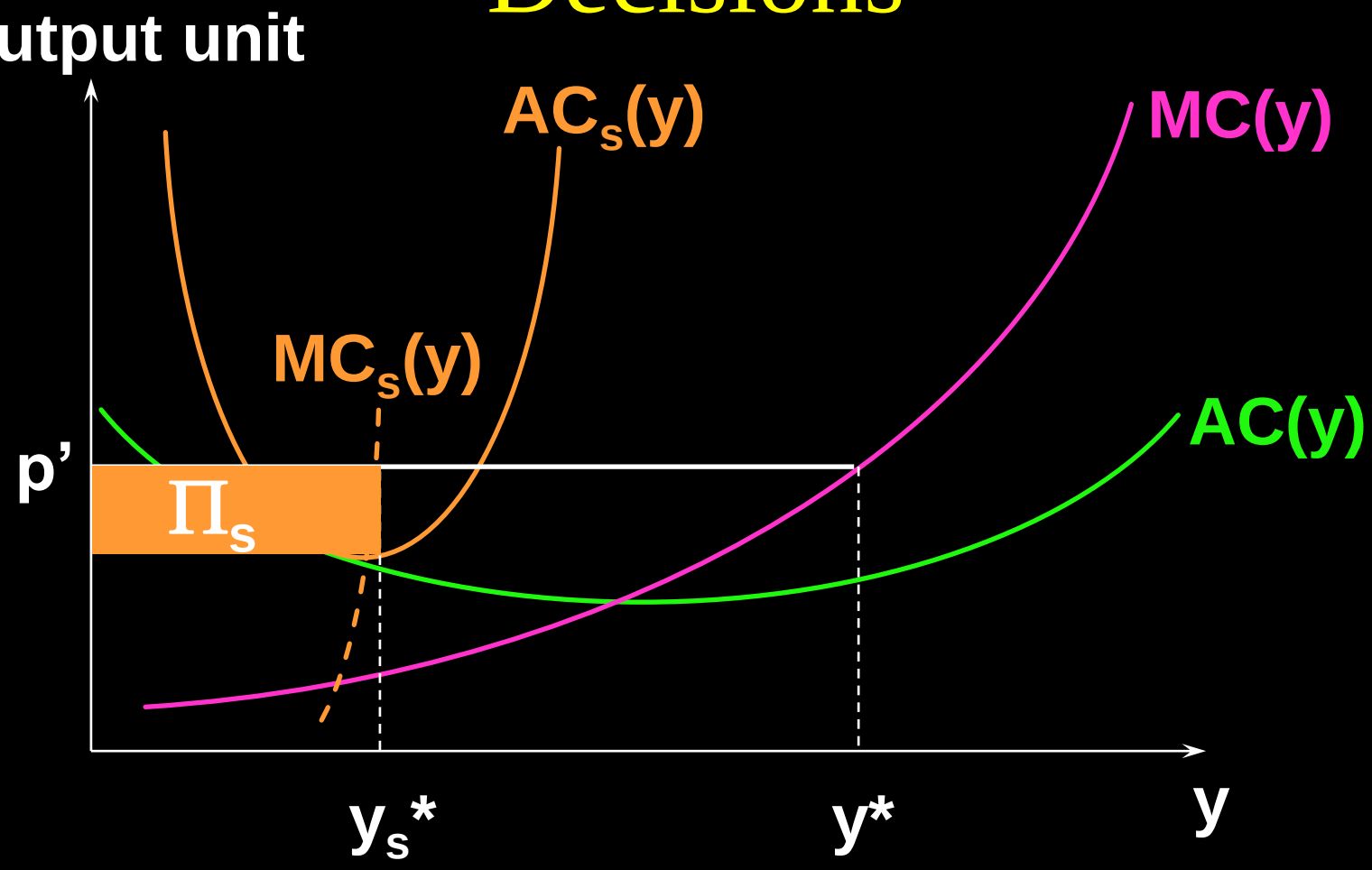


The Firm's Long & Short-Run Supply Decisions



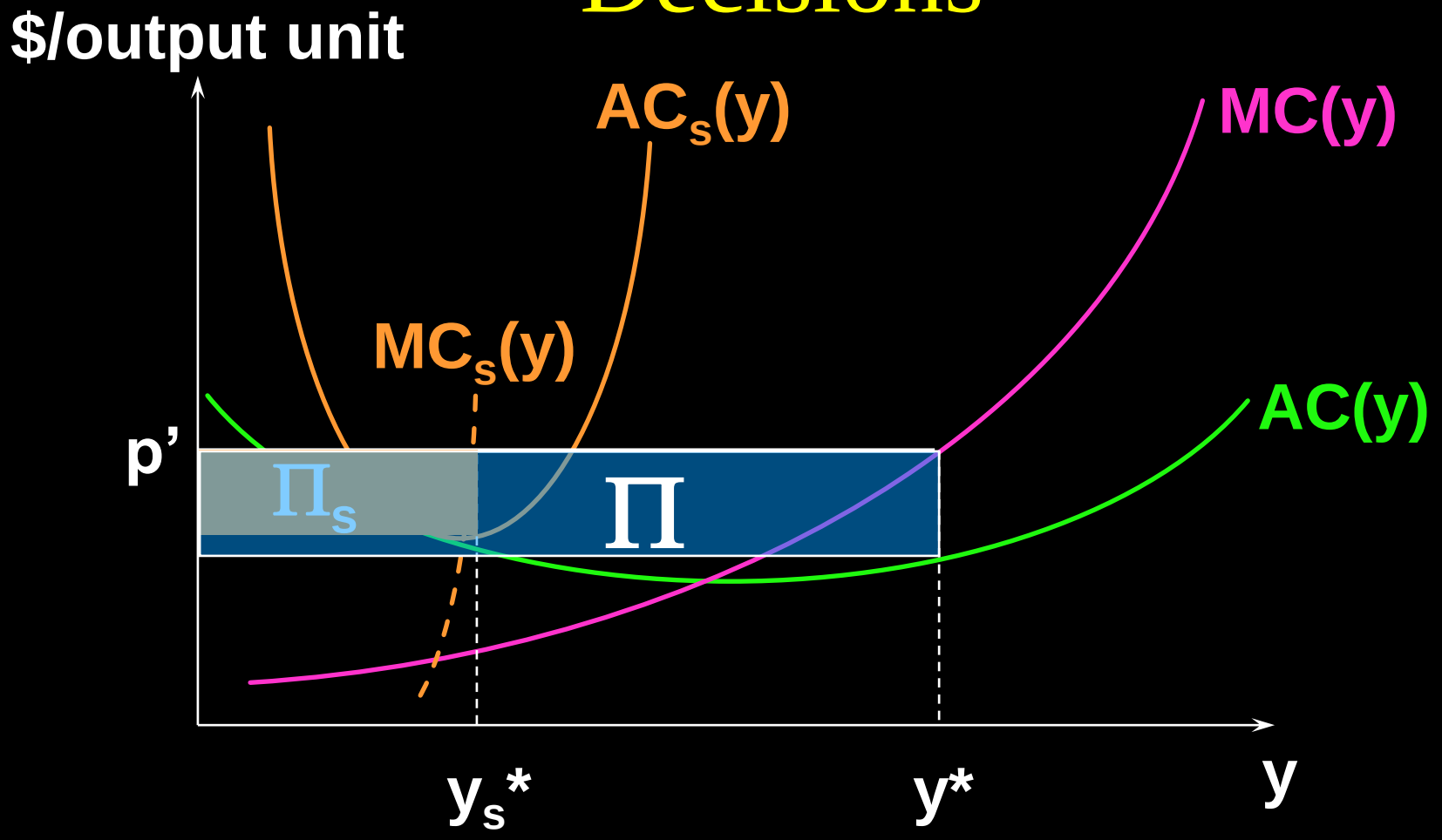
y_s^* is profit-maximizing in this short-run.

The Firm's Long & Short-Run Supply Decisions



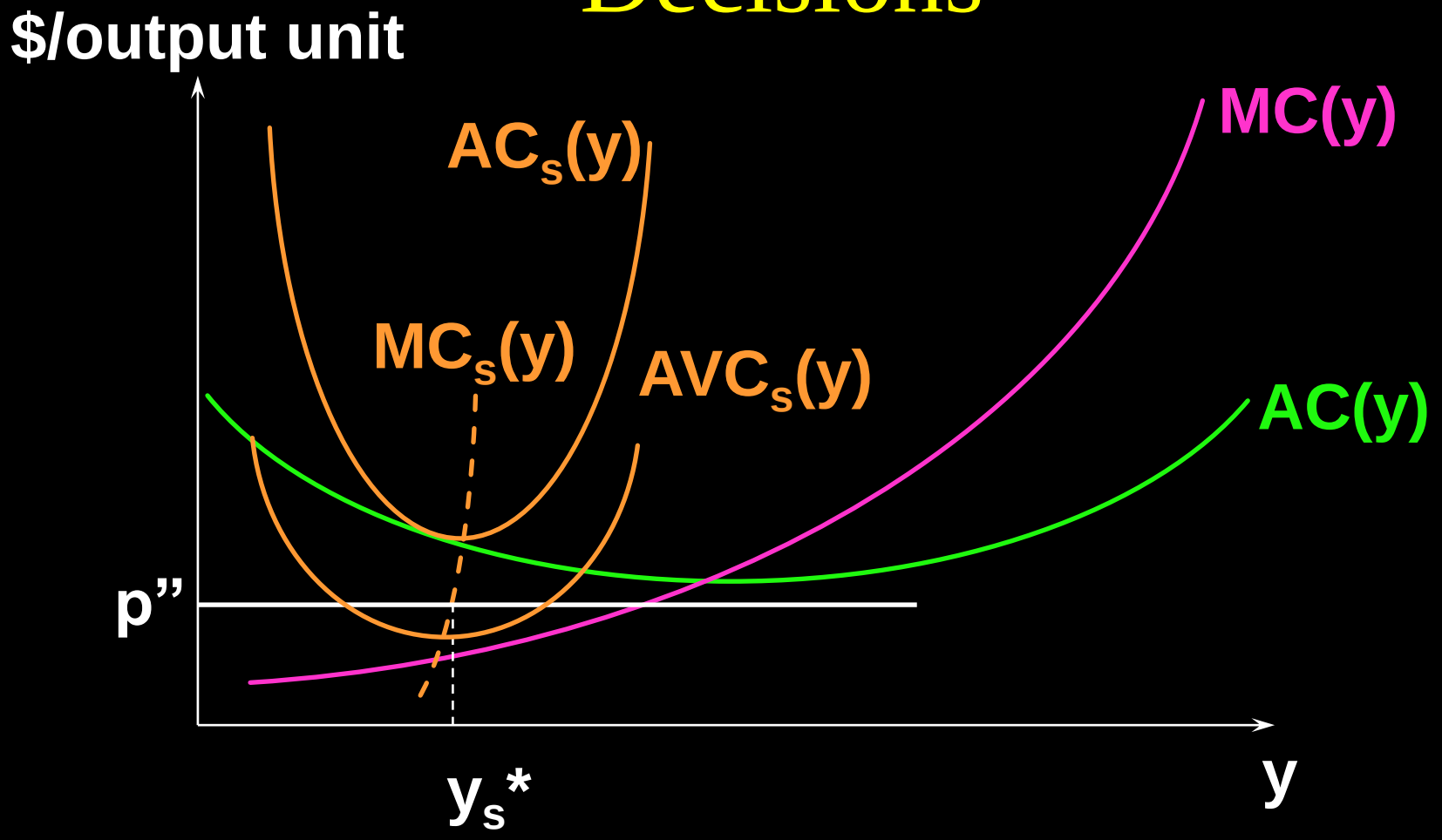
y_s^* is profit-maximizing in this short-run.

The Firm's Long & Short-Run Supply Decisions



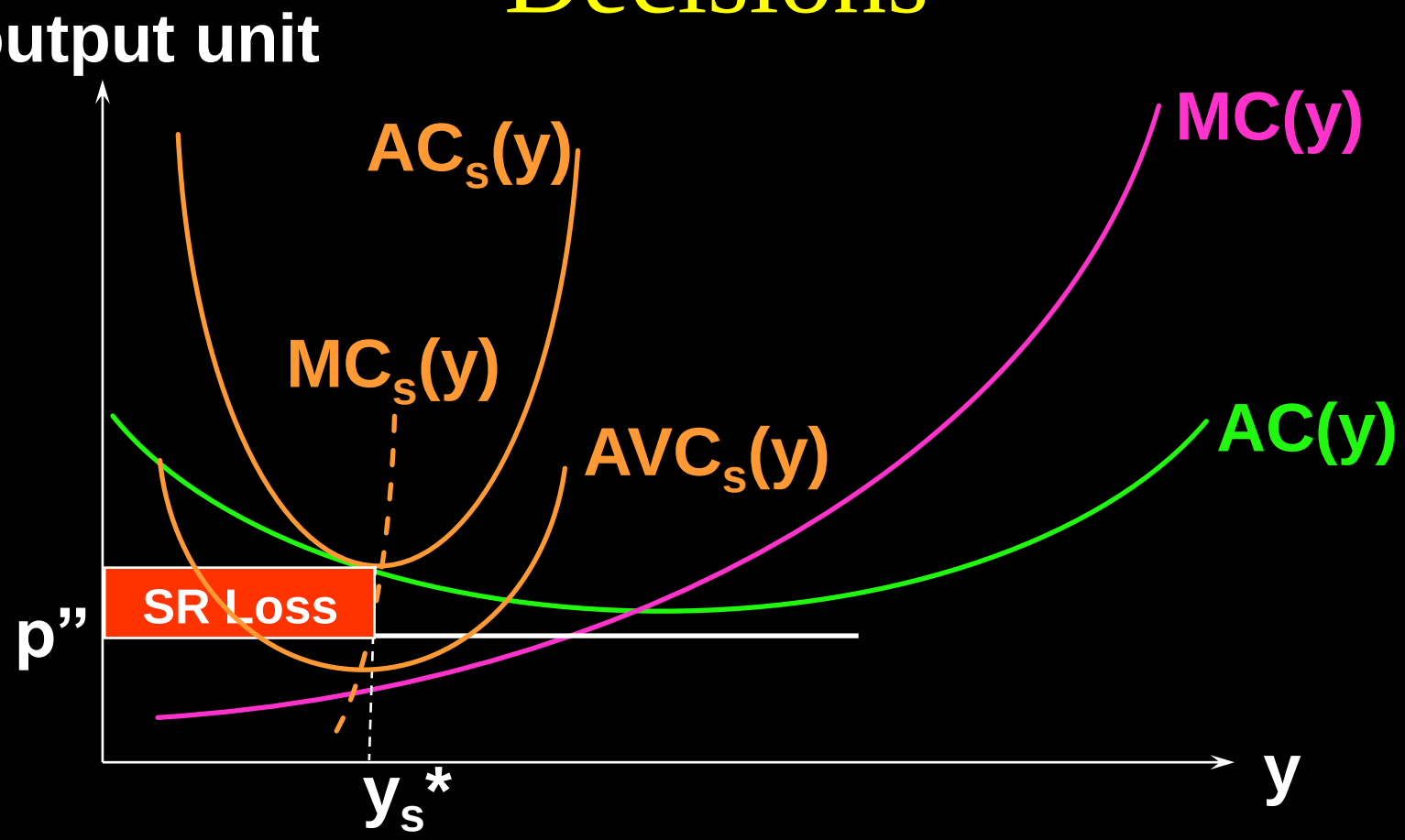
y* is profit-maximizing in the long run.

The Firm's Long & Short-Run Supply Decisions



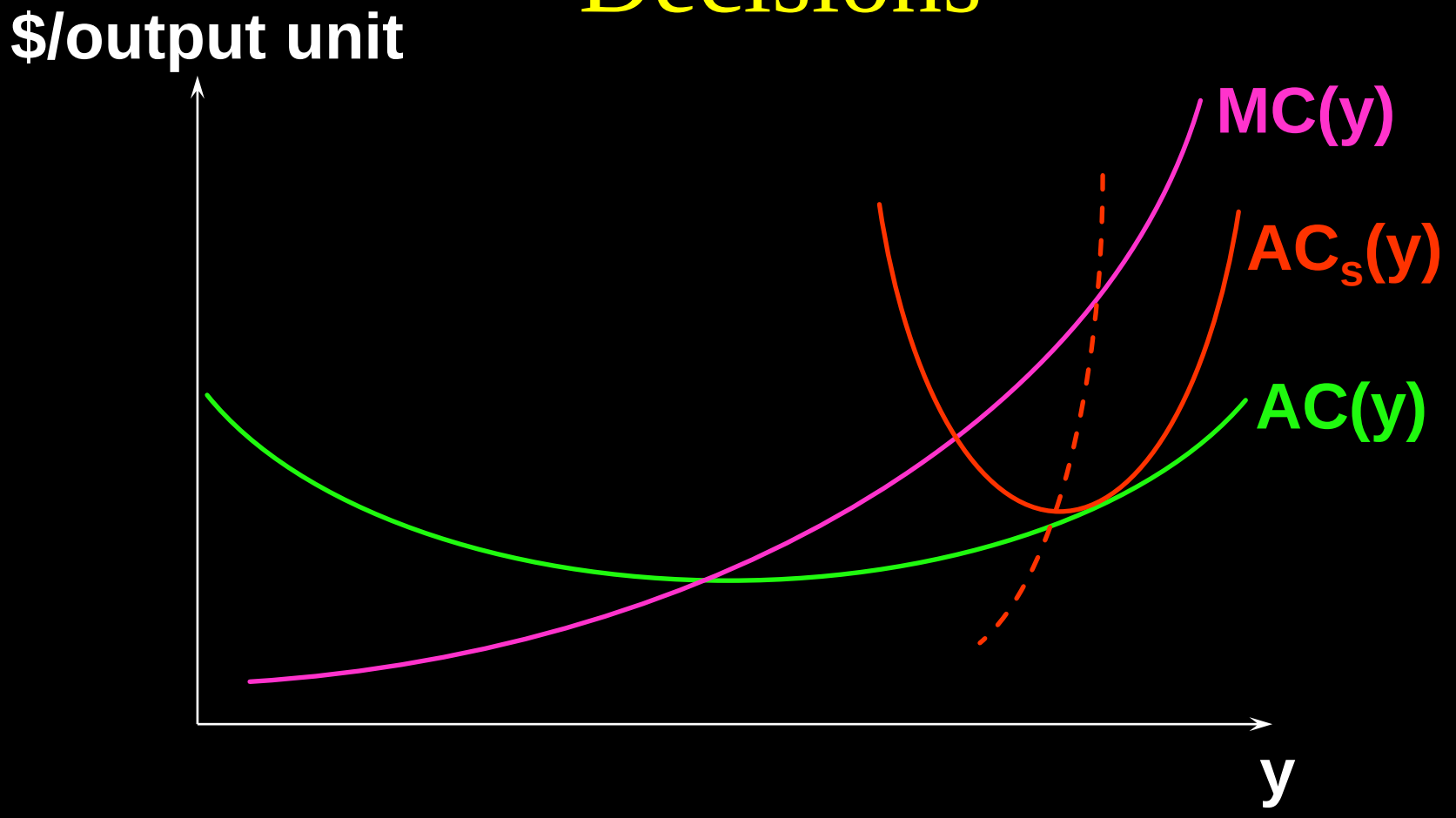
y_s^* is loss-minimizing in this short-run.

The Firm's Long & Short-Run Supply Decisions

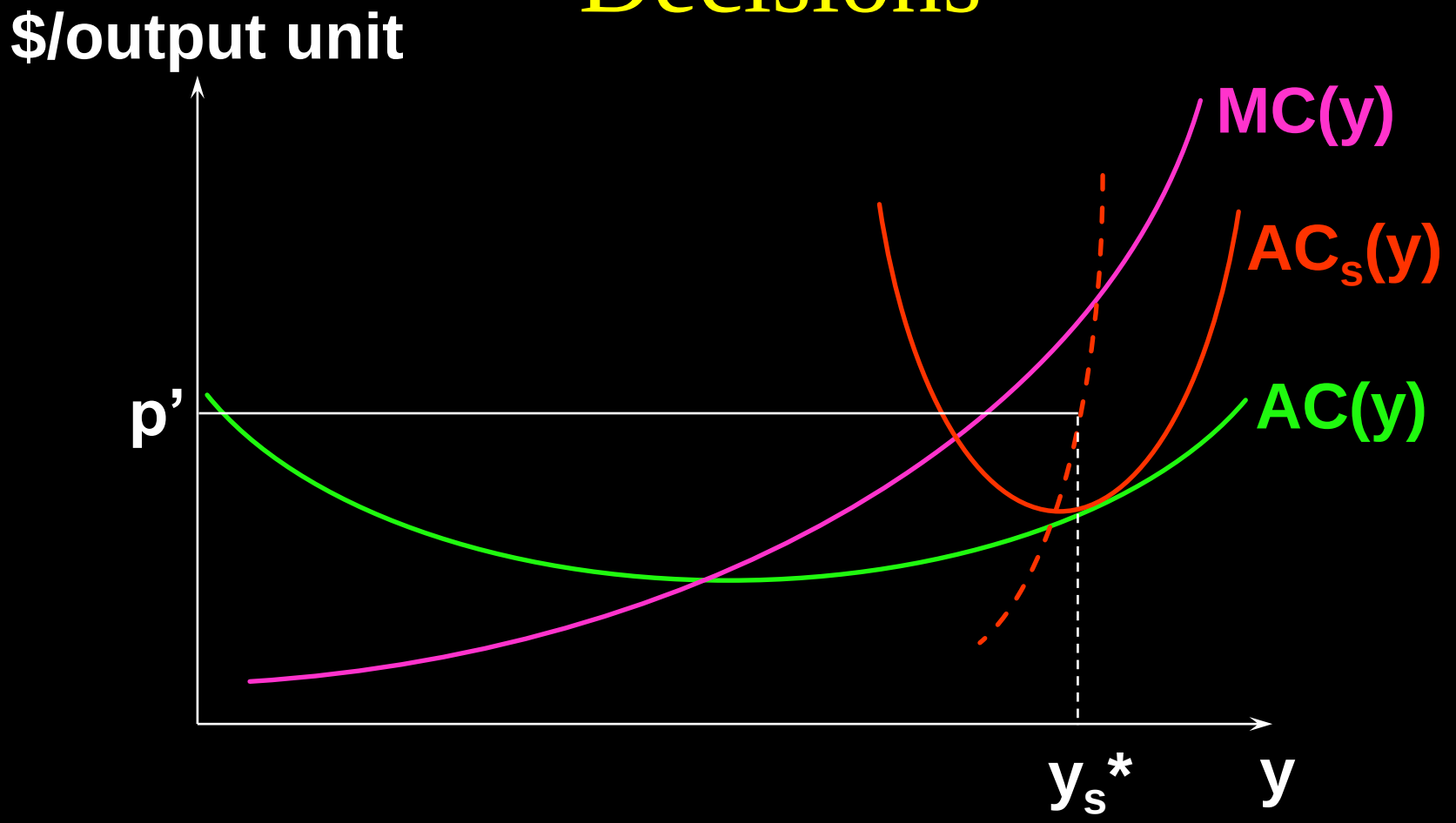


In the short run, profit<0. But in the long run, the firm will exit the market (y=0) and profit = 0.

The Firm's Long & Short-Run Supply Decisions

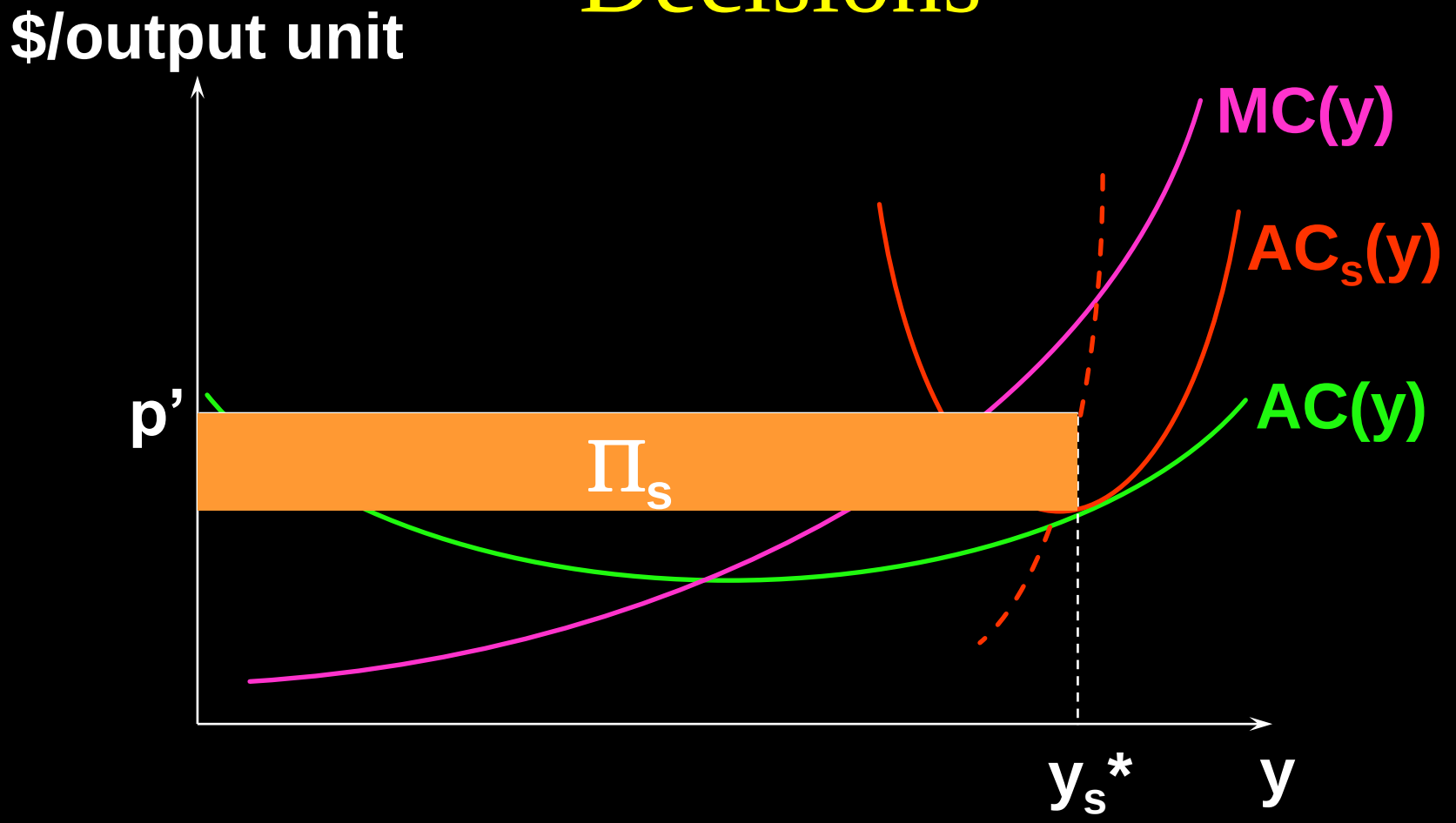


The Firm's Long & Short-Run Supply Decisions



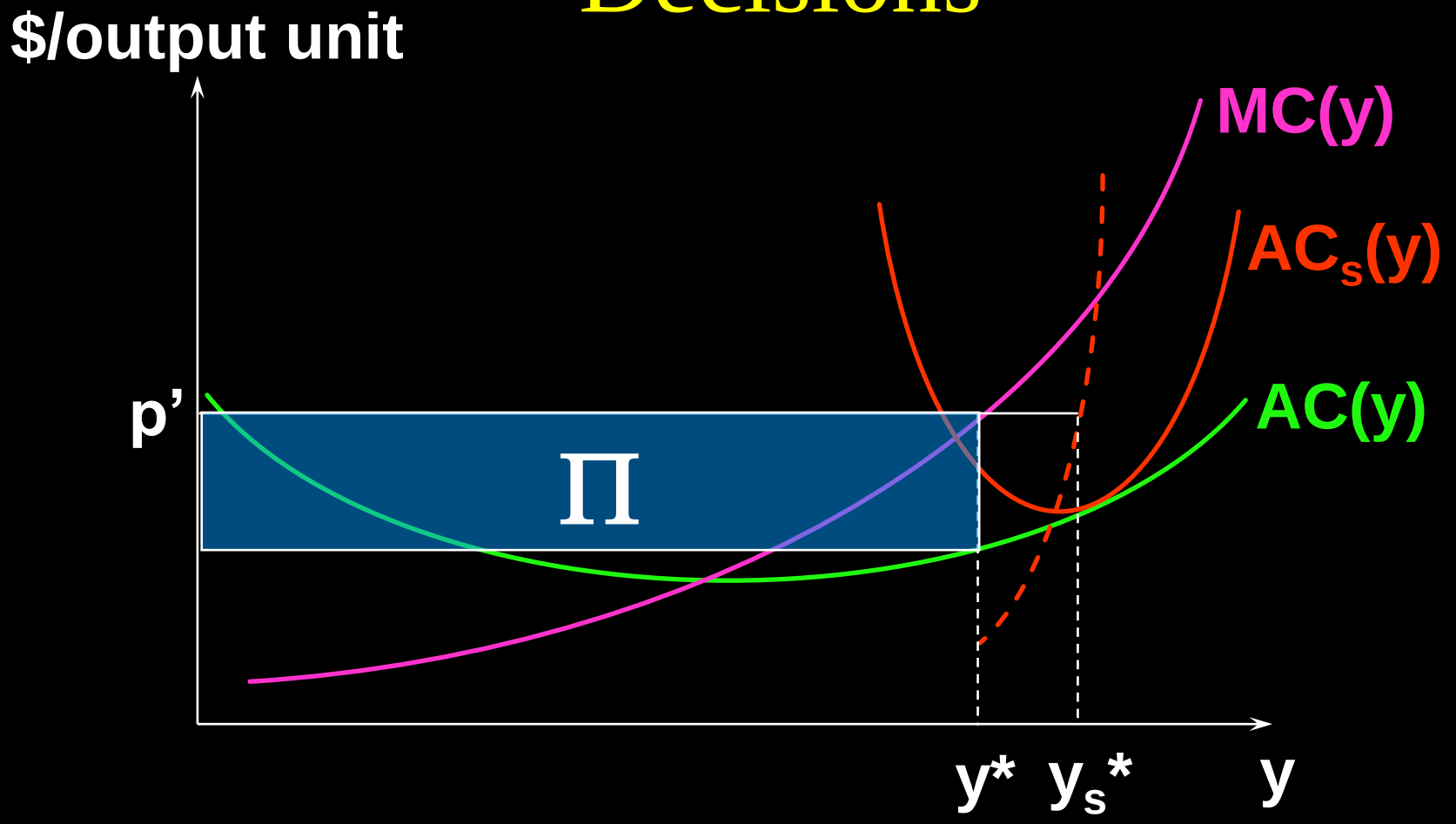
y_s^* is profit-maximizing in this short-run.

The Firm's Long & Short-Run Supply Decisions



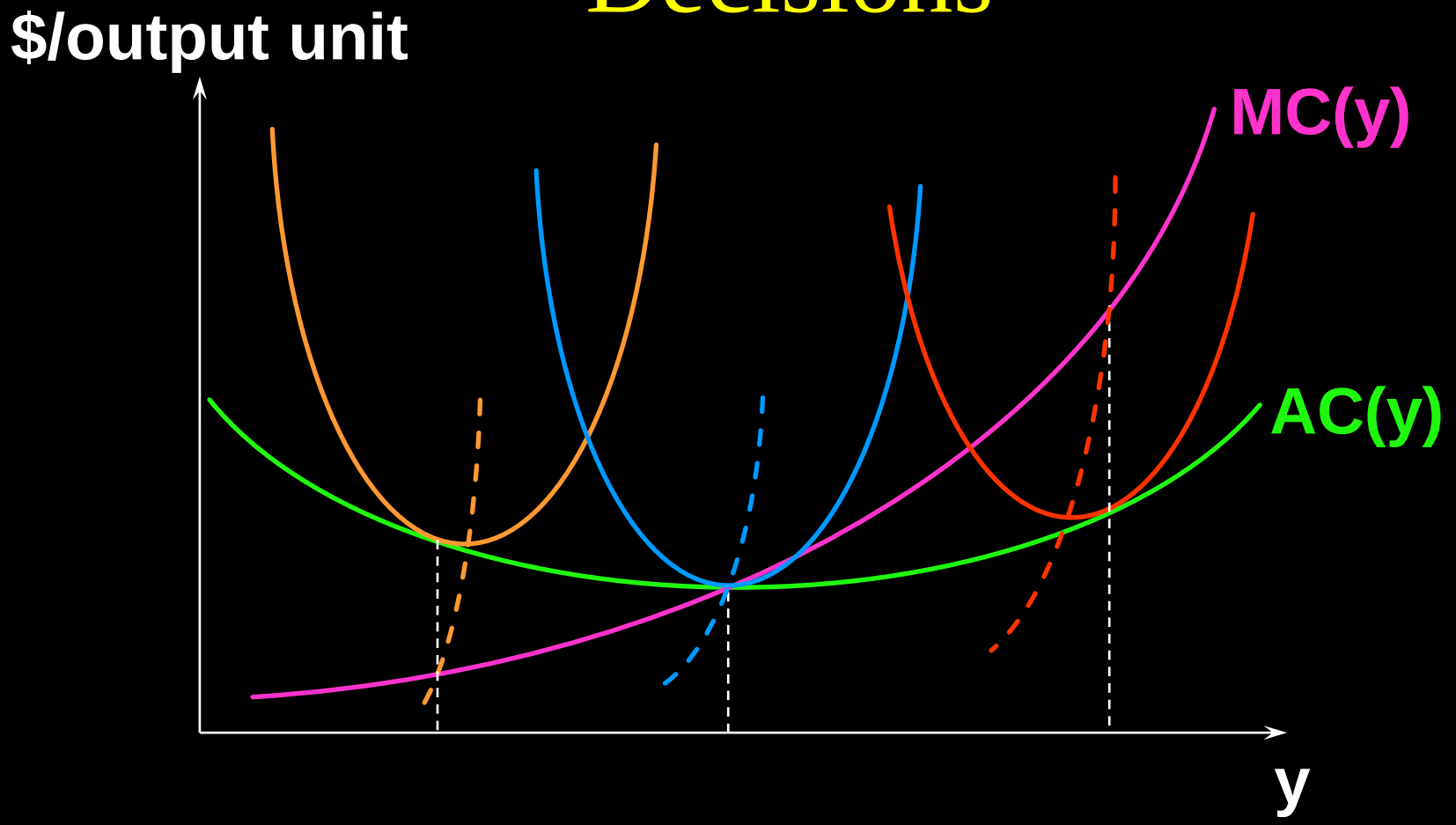
y_s* is profit-maximizing in this short-run.

The Firm's Long & Short-Run Supply Decisions

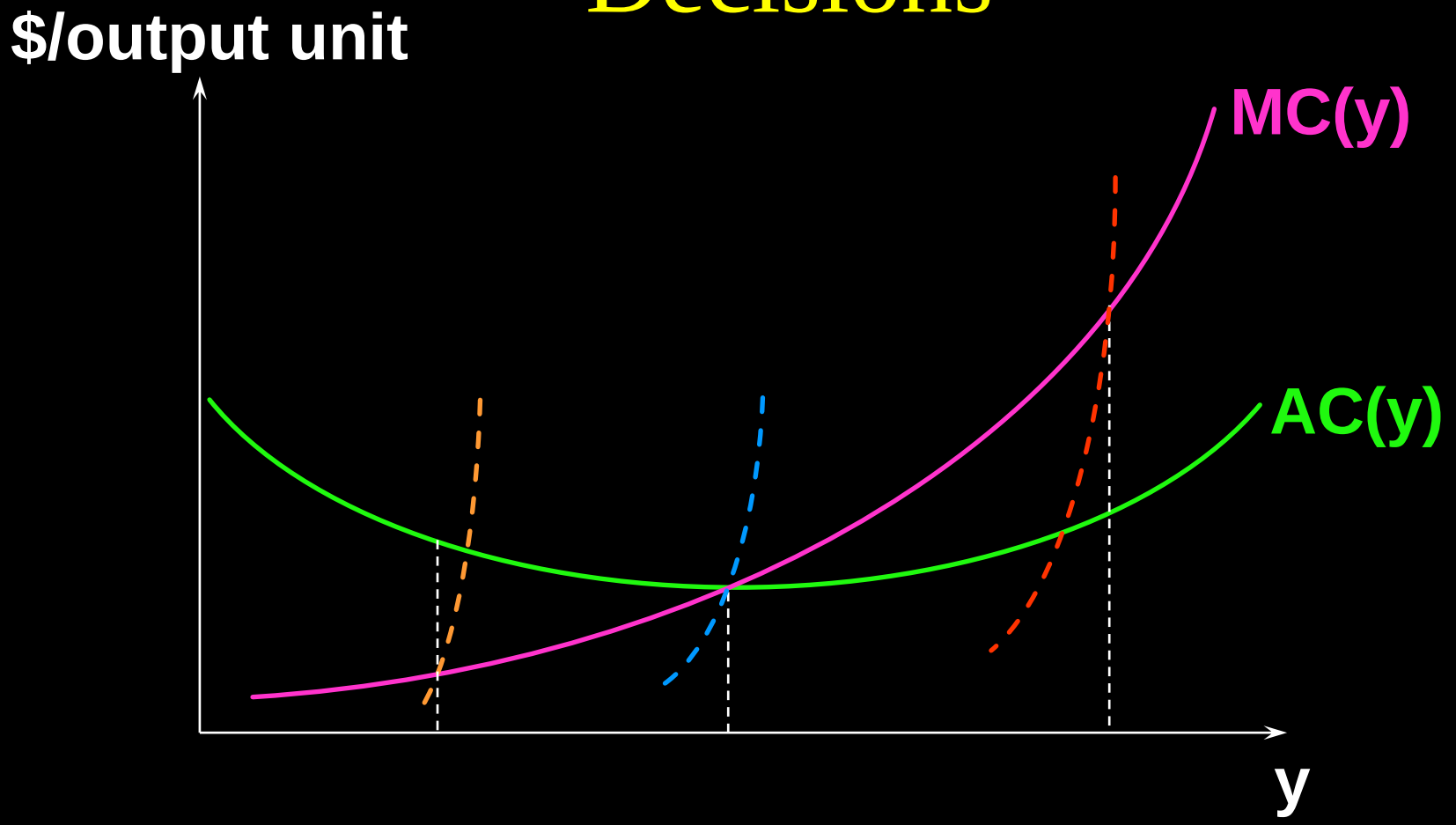


y$_s$* is profit-maximizing in this short-run.
y* is profit-maximizing in the long-run.

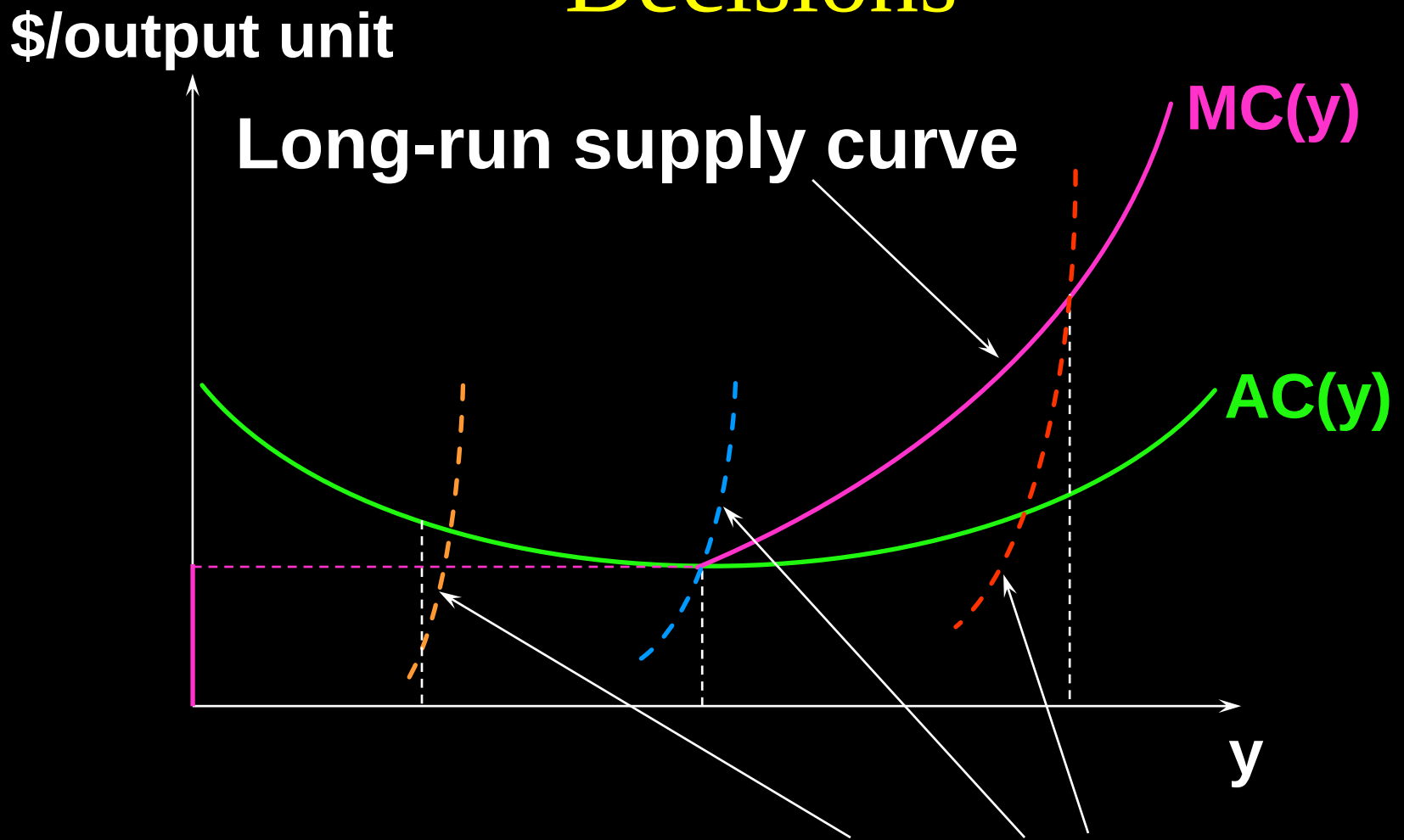
The Firm's Long & Short-Run Supply Decisions



The Firm's Long & Short-Run Supply Decisions

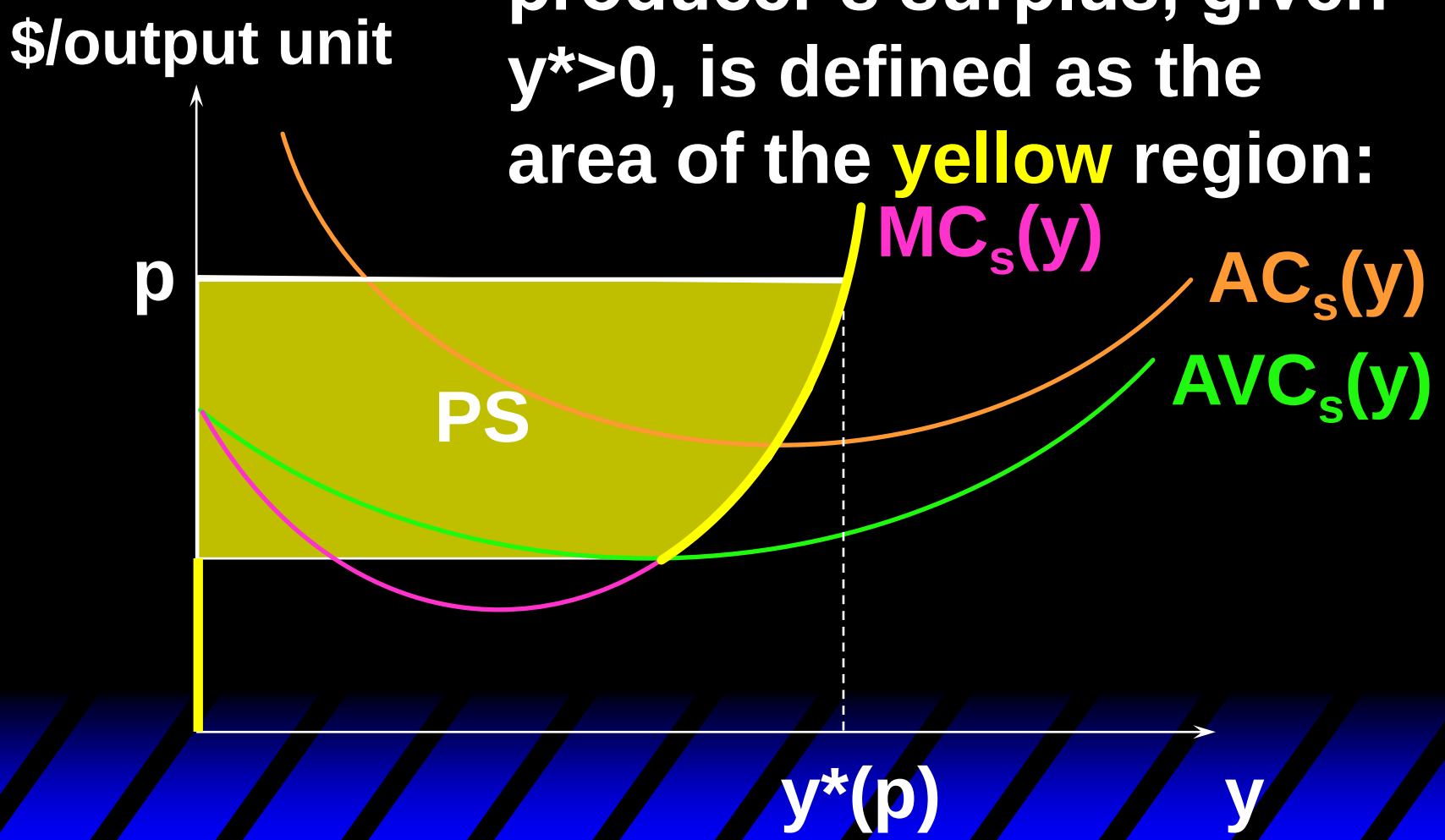


The Firm's Long & Short-Run Supply Decisions



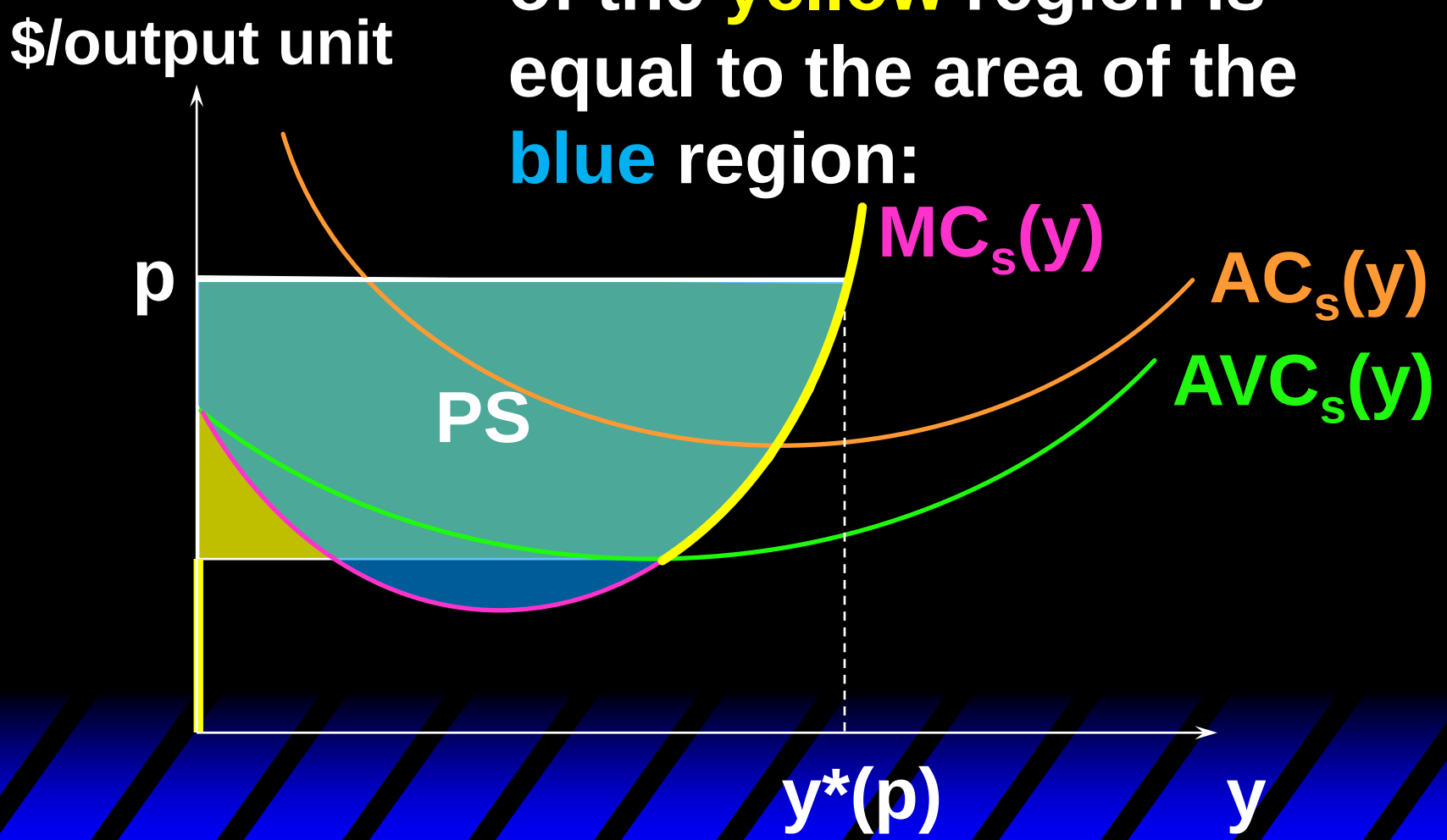
Producer's Surplus in Short Run

- In the short run, the firm's producer's surplus, given y*>0, is defined as the area of the yellow region:



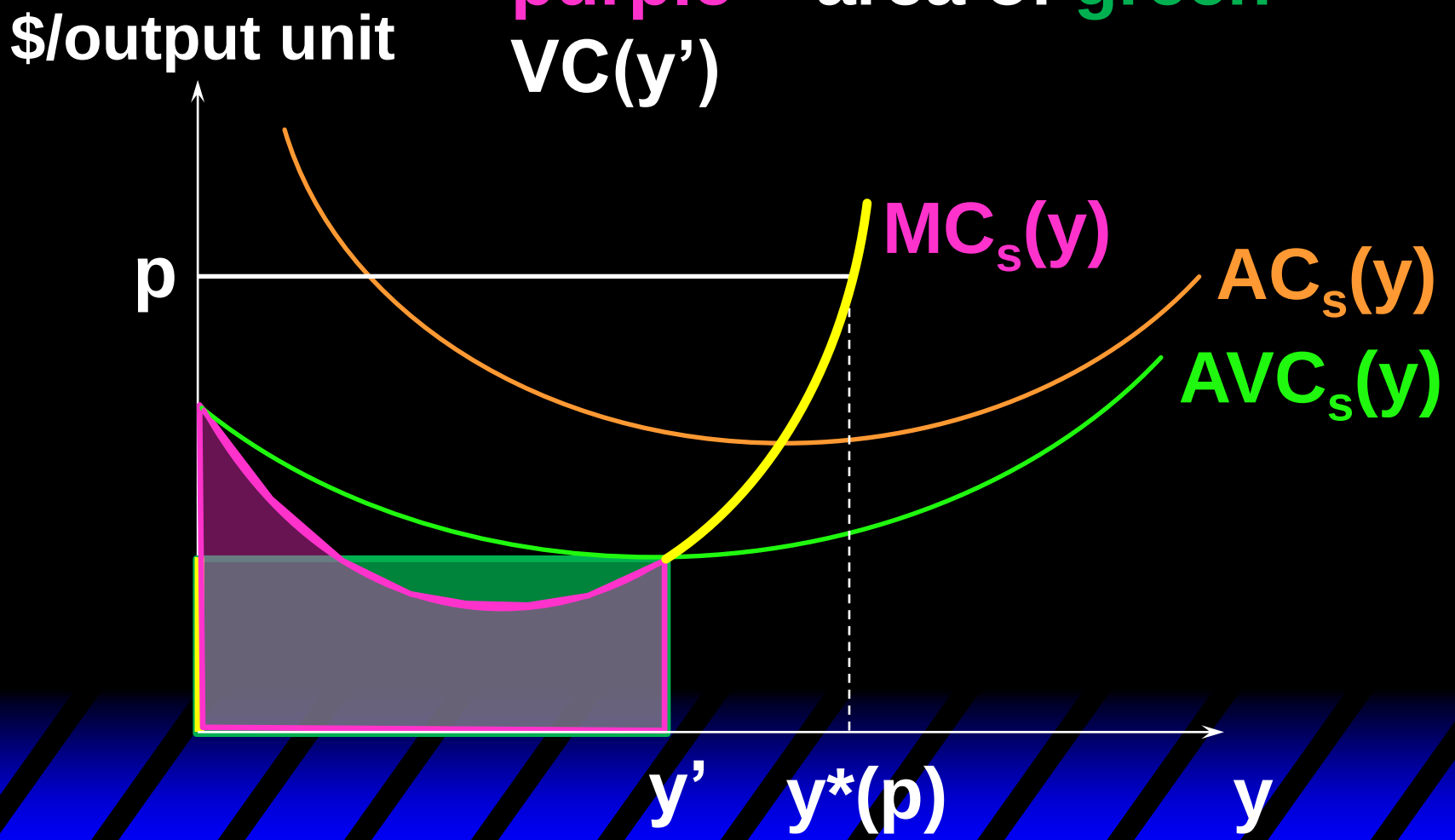
Producer's Surplus in Short Run

- We can show that the area of the yellow region is equal to the area of the blue region:



Producer's Surplus in Short Run

- This is because area of purple = area of green = VC(y')



Producer's Surplus in Short Run

- **Therefore PS can be calculated as the area of the blue region:**

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

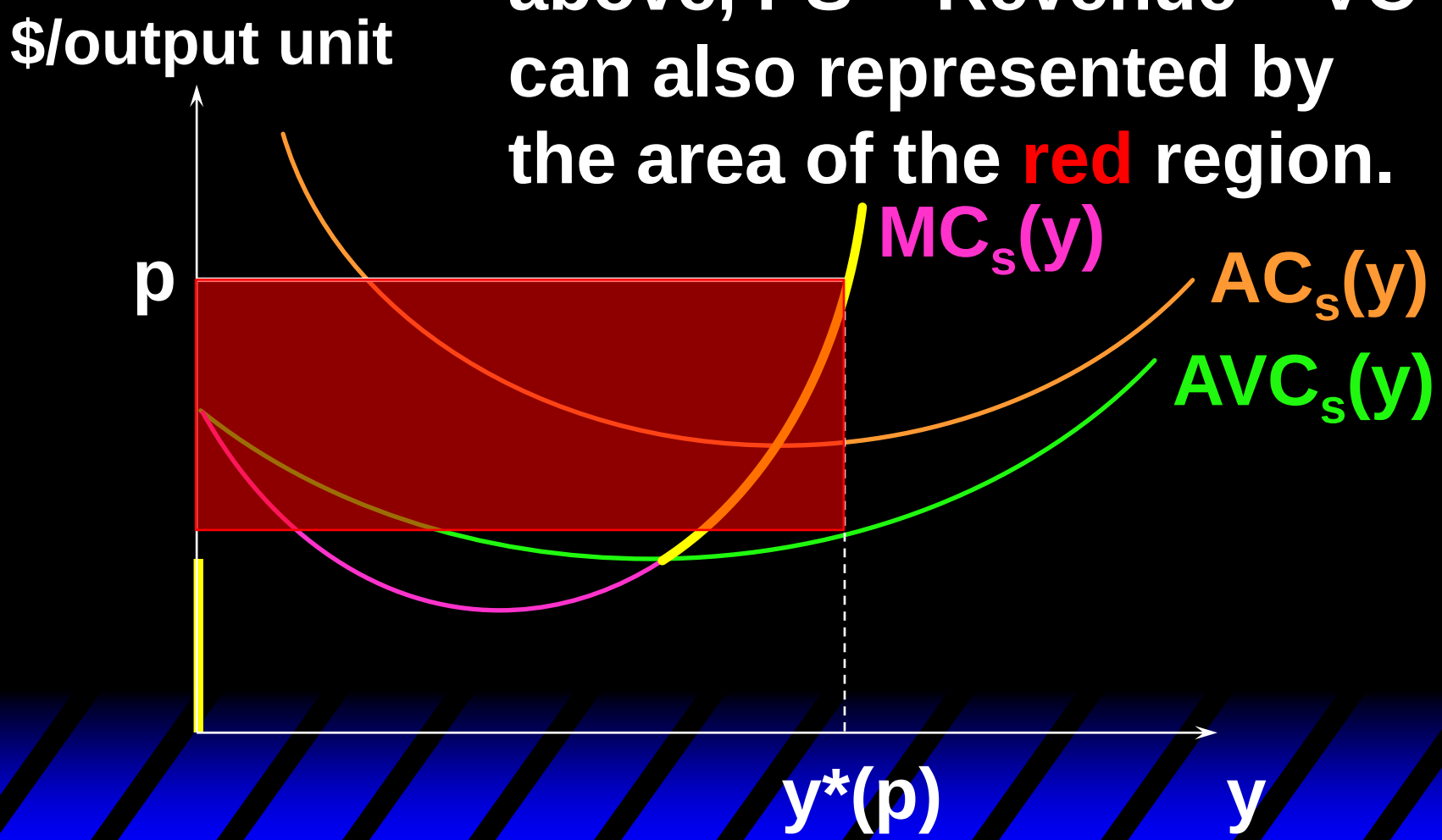
$$= py^*(p) - \int_0^{y^*(p)} MC_s(z)\,d(z)$$

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

= Profit + F

Producer's Surplus in Short Run

- From the calculation above, PS = Revenue – VC can also represented by the area of the red region.



Producer's Surplus in Long Run

- In the long run, the same argument goes through with the short-run cost functions replaced by the long-run ones.
- We still obtain PS = Profit + F, where F only contains the quasi-fixed cost since there is no fixed cost in the long run.

Summary: Two Key Issues

- **Short-run supply function:**
  -- Note the shut-down condition;
- **Long-run supply function**
  -- Note the exiting condition.