Microeconomic Theory I

Firm Supply and Industry Supply

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<#>

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Hal R. Varian

ΜΙΚΡΟΟΙΚΟΝΟΜΙΚΗ
Μια σύγχρονη προσέγγιση
3η έκδοση
Επιμέλεια: Γιάννης Καραγιάννης

Μαθαίνω
Ψηφιακά

εκδόσεις ΚΡΙΤΙΚΗ

Firm Supply

- **How does a firm decide how much product to supply? This depends upon the firm's**
  - **technology**
  - **market environment**
  - **goals**
  - **competitors' behaviors**

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?

Market Environments

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

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

Market Environments

- **Dominant Firm: Many firms, but one much larger than the rest. The large firm's decisions affect the payoffs of each small firm. Decisions by any one small firm do not noticeably affect the payoffs of any other firm.**

Market Environments

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

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

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.**

Pure Competition

- **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 quantity-demanded.**

Pure Competition

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

Pure Competition

$/output unit

p^e

Market Supply

Market Demand

Y

Pure Competition

$/output unit

Market Supply

p'

p^e

At a price of p', zero is demanded from the firm.

Market Demand

y
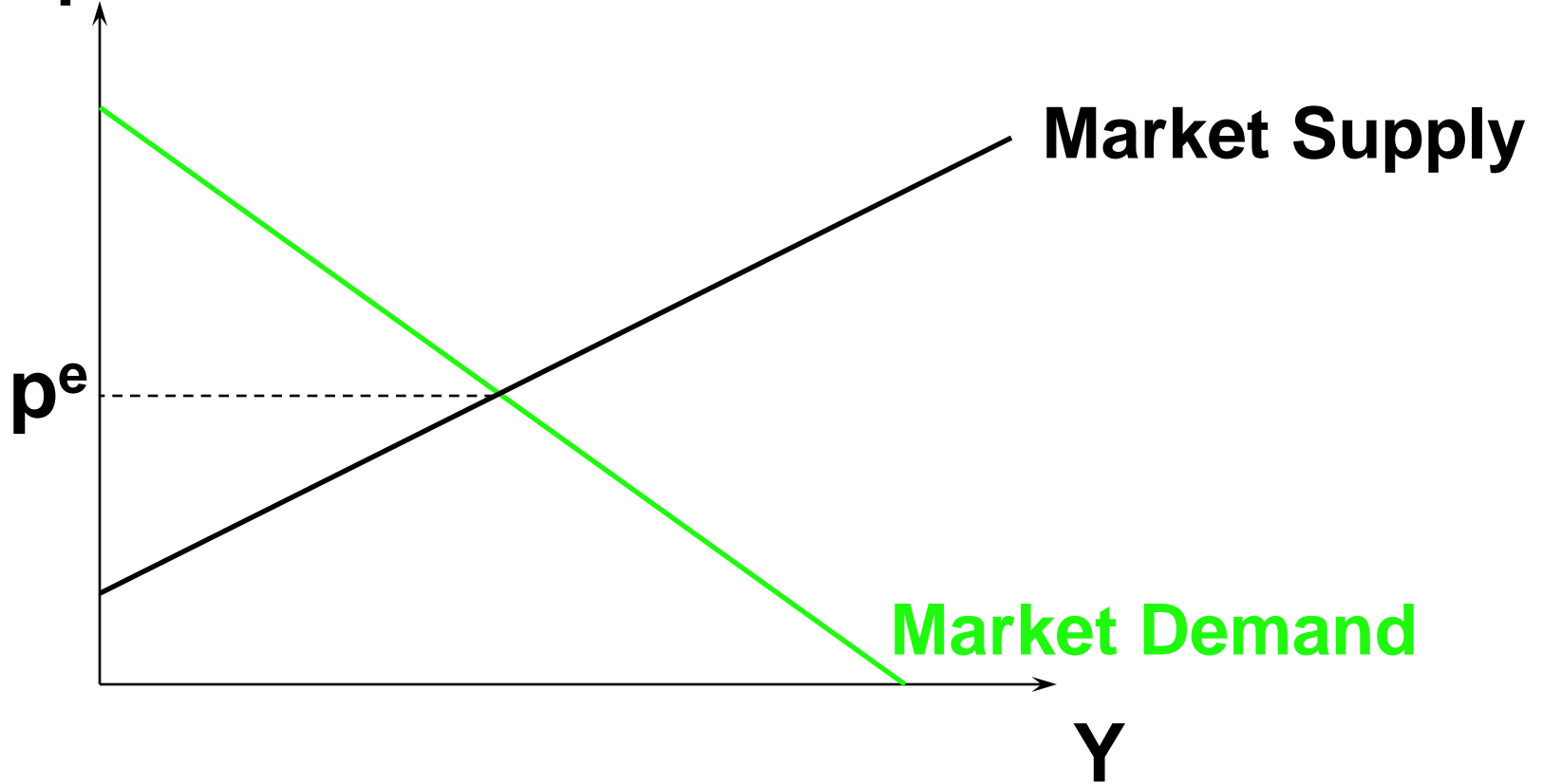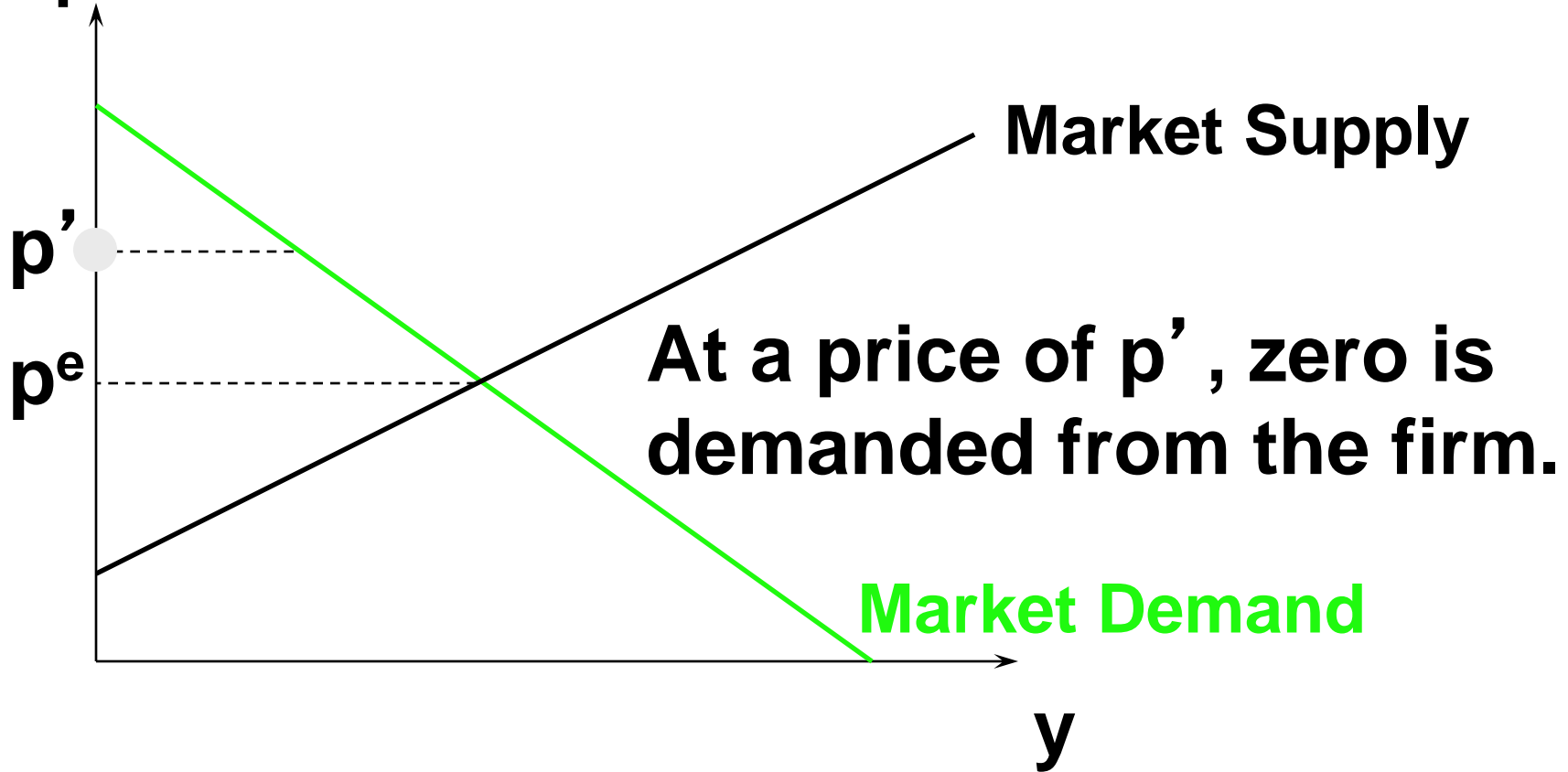
Pure Competition

$/output unit

At a price of p', zero is demanded from the firm.

Market Supply

Market Demand

p'

p^e

p"

y
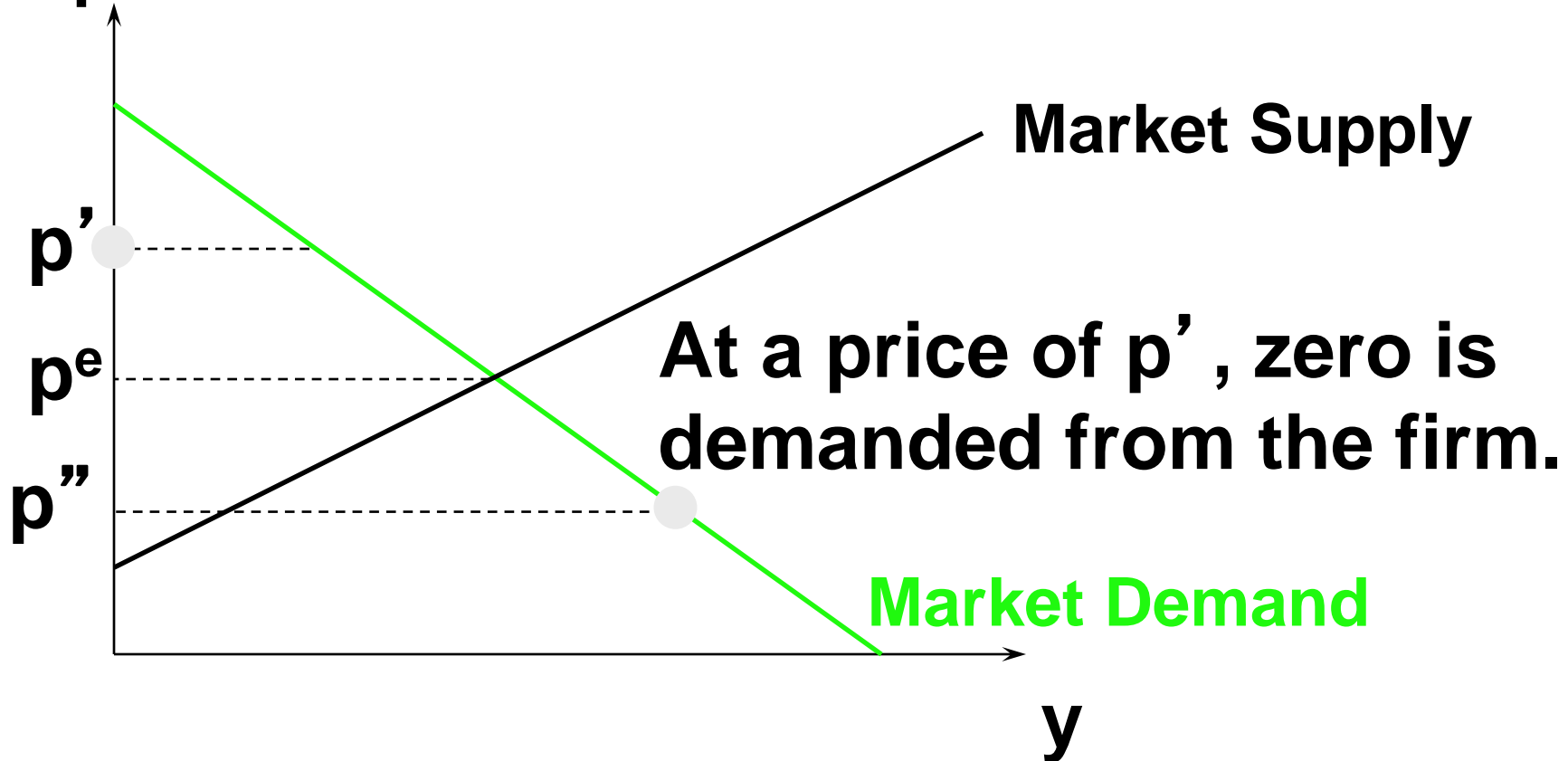
At a price of p" the firm faces the entire market demand.

Pure Competition

☐ **So the demand curve faced by the individual firm is ...**

Pure Competition
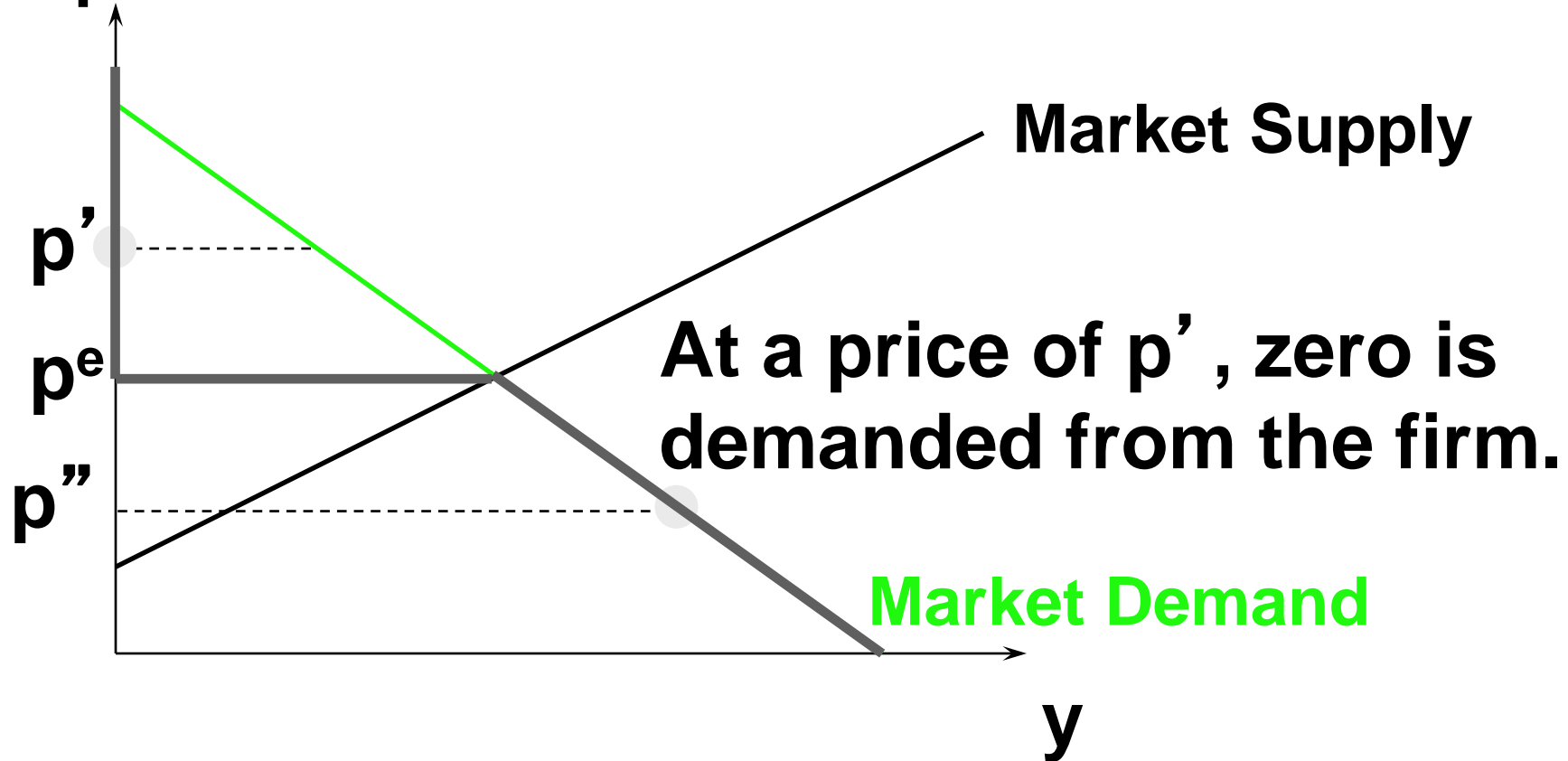
$/output unit

Market Supply

p'

pᵉ

p"

At a price of p', zero is demanded from the firm.

Market Demand

y

At a price of p" the firm faces the entire market demand.

Pure Competition

$/output unit

p'

p^e

p"

Market Demand

Y
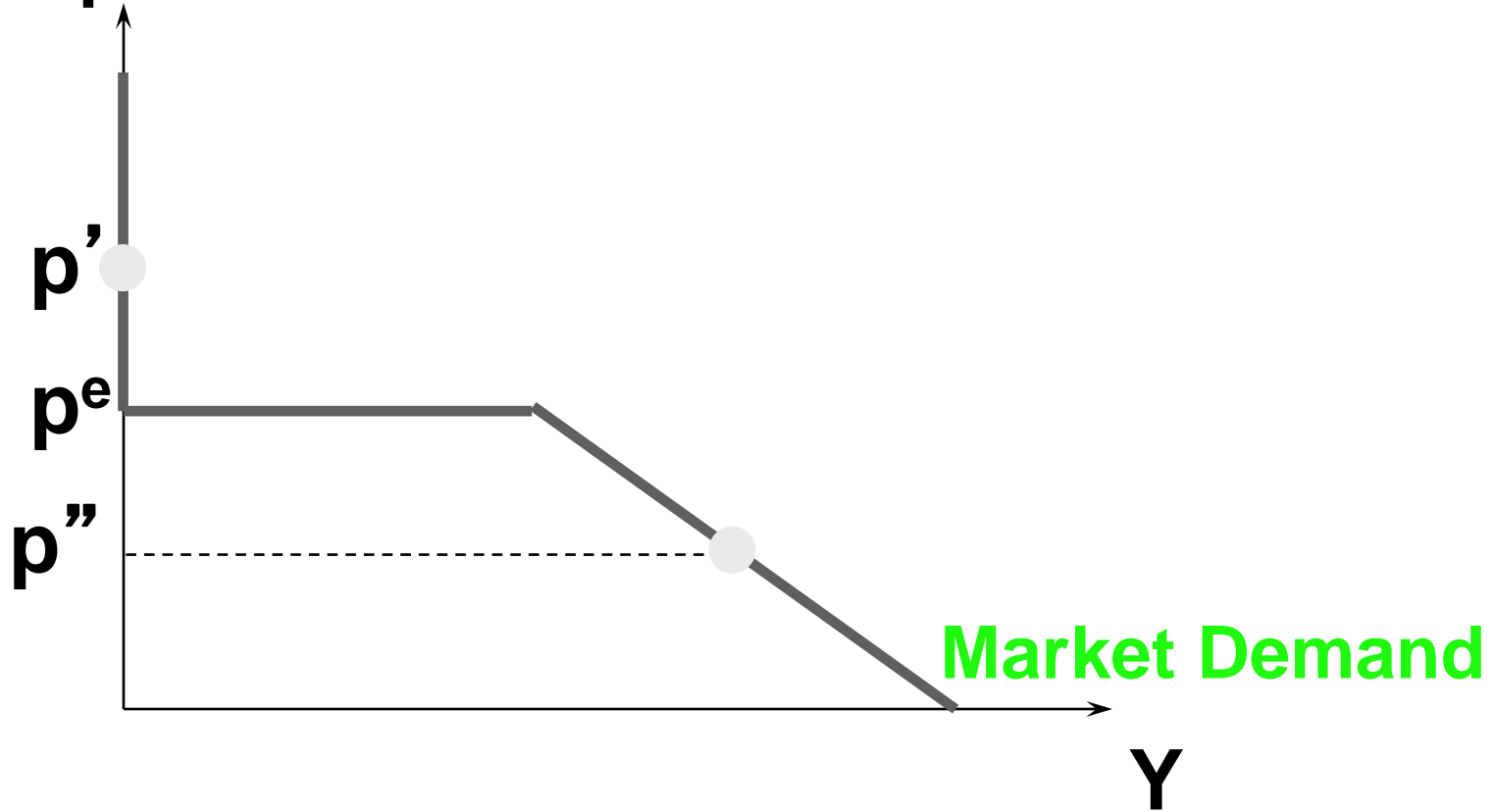
Smallness

- **What does it mean to say that an individual firm is "small relative to the industry"?**

Smallness

$/output unit

Firm's MC

p^e

Firm's demand curve

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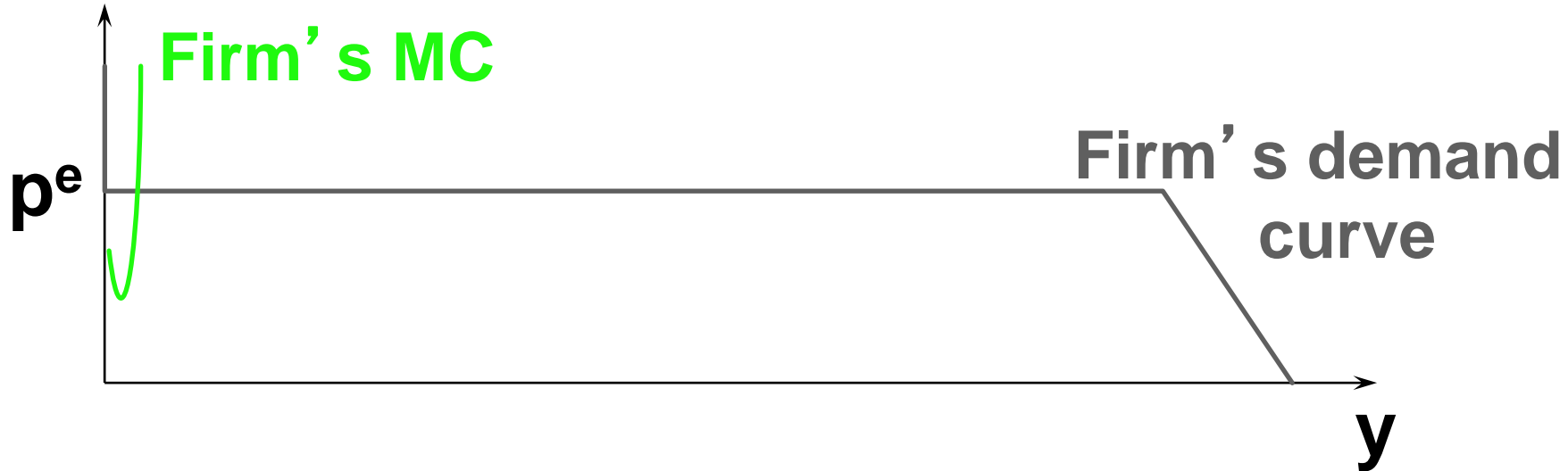
The individual firm's technology causes it always to supply only a small part of the total quantity demanded at the market price.

The Firm's Short-Run Supply Decision

- Each firm is a profit-maximizer and in a short-run.

- Q: How does each firm choose its output level?

The Firm's Short-Run Supply Decision

- **Each firm is a profit-maximizer and in a short-run.**

- **Q: How does each firm choose its output level?**

- **A: By solving**
$$\max_{y \geq 0} \Pi_S(y) = py - c_S(y).$$

The Firm's Short-Run Supply Decision

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

What can the solution y_s^* look like?

The Firm's Short-Run Supply Decision

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

What can the solution y_s* look like?

(a) y_s* > 0:

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

$\Pi(y)$

$$\text{(ii) } \frac{d^2\Pi_s(y)}{dy^2} < 0 \text{ at } y = y_s^*.$$

y_s*

y

The Firm's Short-Run Supply Decision

$$\max_{y \geq 0} \mathsf{P}_s(y) = py - c_s(y).$$
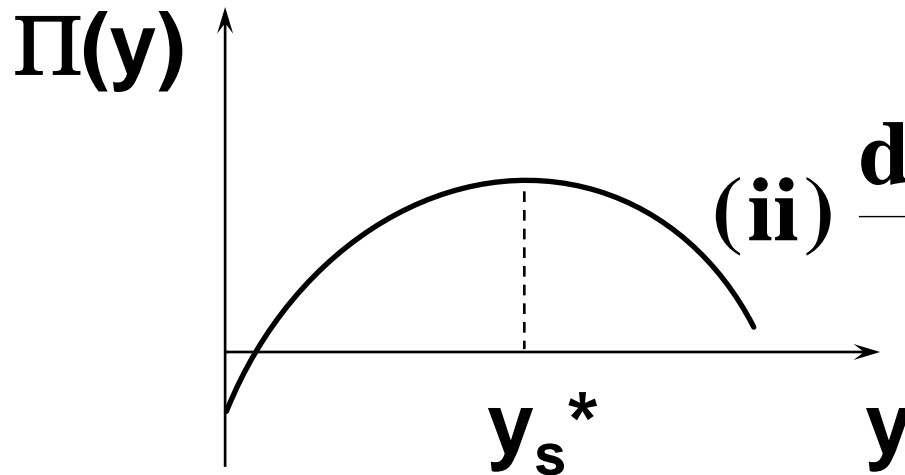
What can the solution y* look like?

(b) $y_s{}^* = 0$:
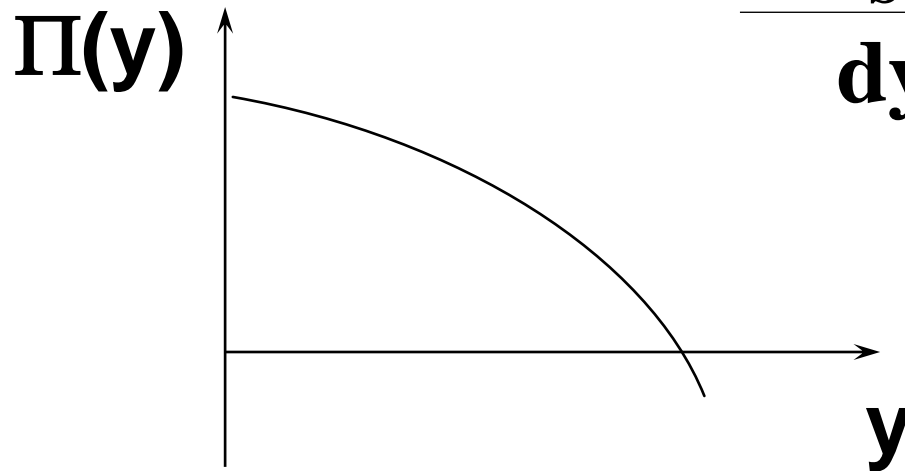
$$\frac{d\Pi_s(y)}{dy} = p - MC_s(y) \leq 0$$

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

$\Pi(y)$

y

$y_s{}^* = 0$

The Firm's Short-Run Supply Decision

For the interior case of y$_s$* > 0, the first-order maximum profit condition is

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

That is, $p = MC_s(y_s^*).$

So at a profit maximum with y$_s$* > 0, the market price p equals the marginal cost of production at y = y$_s$*.

The Firm's Short-Run Supply Decision

For the interior case of $y_s* > 0$, the second-order maximum profit condition is

$$\frac{d^2\Pi_s(y)}{dy^2} = \frac{d}{dy}\left(p - MC_s(y)\right) = -\frac{dMC_s(y)}{dy} < 0.$$

That is, $\dfrac{dMC_s(y_s^*)}{dy} > 0.$

So at a profit maximum with $y_s* > 0$, the firm's MC curve must be upward-sloping.

The Firm's Short-Run Supply Decision
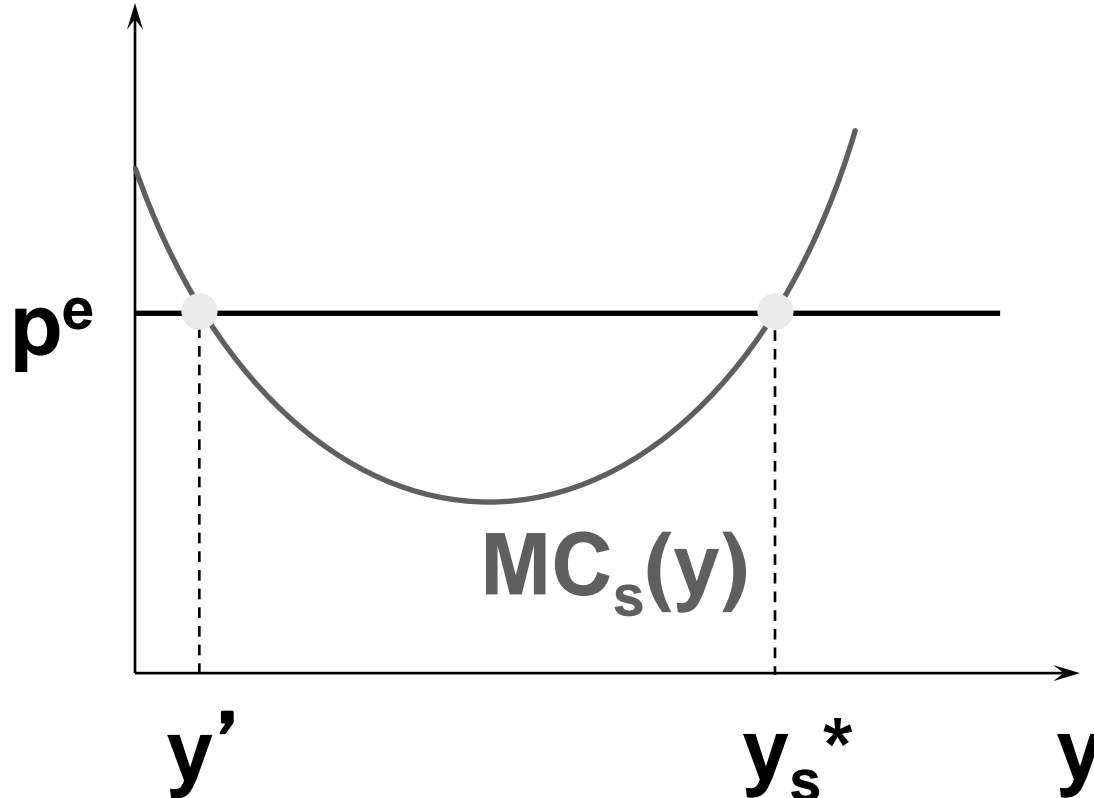
$/output unit

p^e

$MC_s(y)$

y' y_s^* y

The Firm's Short-Run Supply Decision

$/output unit

At y = y_s^*, p = MC and MC slopes upwards. y = y_s^* is profit-maximizing.

p^e

$MC_s(y)$

y' y_s^* y

The Firm's Short-Run Supply Decision

$/output unit

At $y = y_s^*$, p = MC and MC slopes upwards. $y = y_s^*$ is profit-maximizing.

p^e

$MC_s(y)$

y'   **y_s^***   **y**
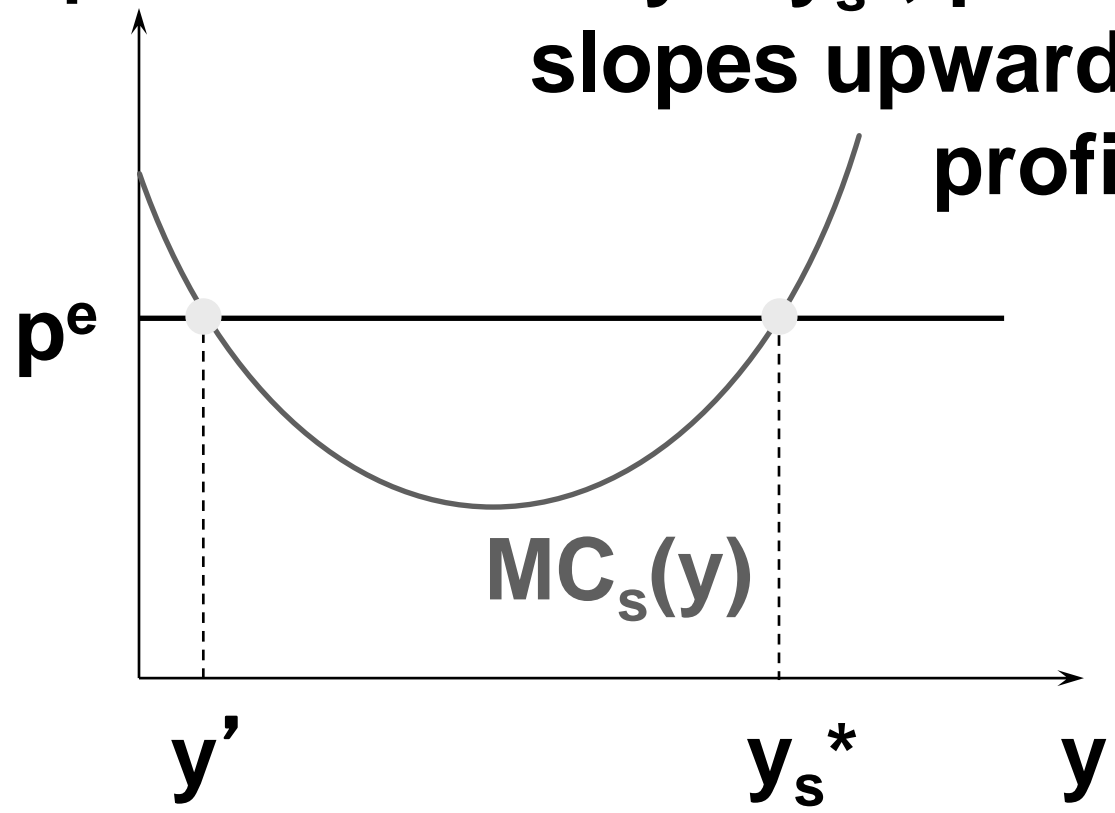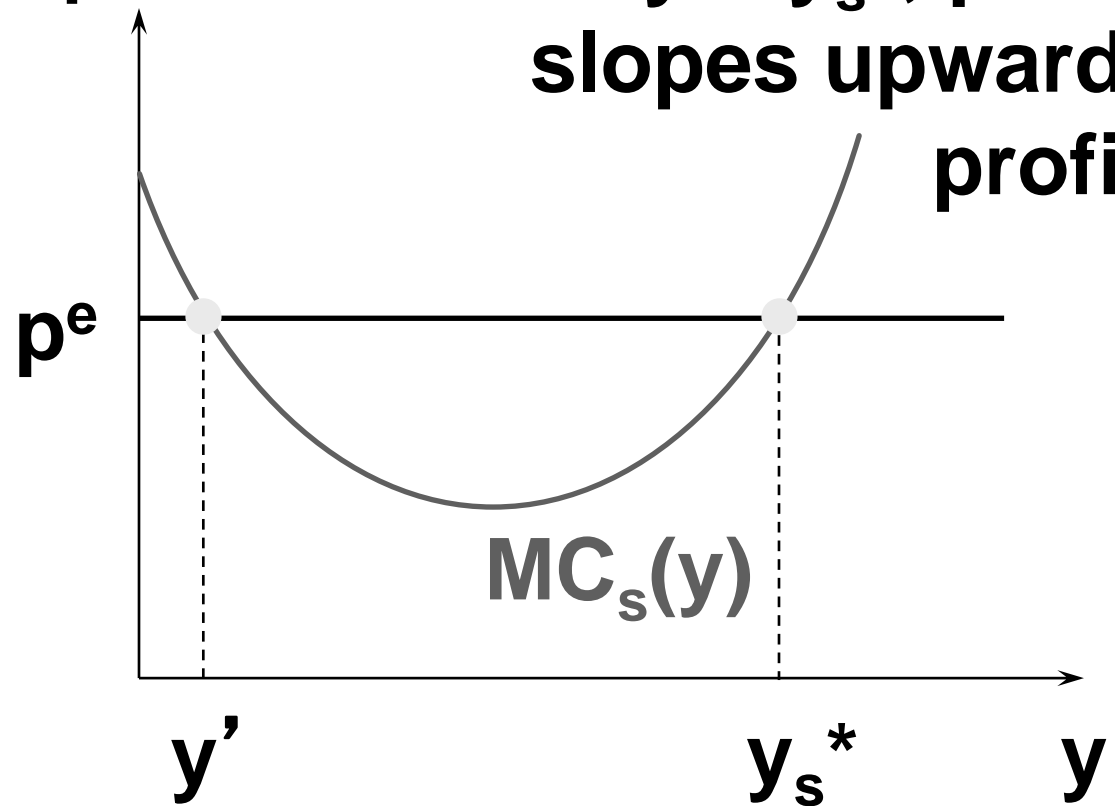
At $y = y'$, p = MC and MC slopes downwards. $y = y'$ is profit-minimizing.

The Firm's Short-Run Supply Decision

$/output unit

At $y = y_s^*$, $p = MC$ and MC slopes upwards. $y = y_s^*$ is profit-maximizing.

So a profit-max. supply level can lie only on the upwards sloping part of the firm's MC curve.
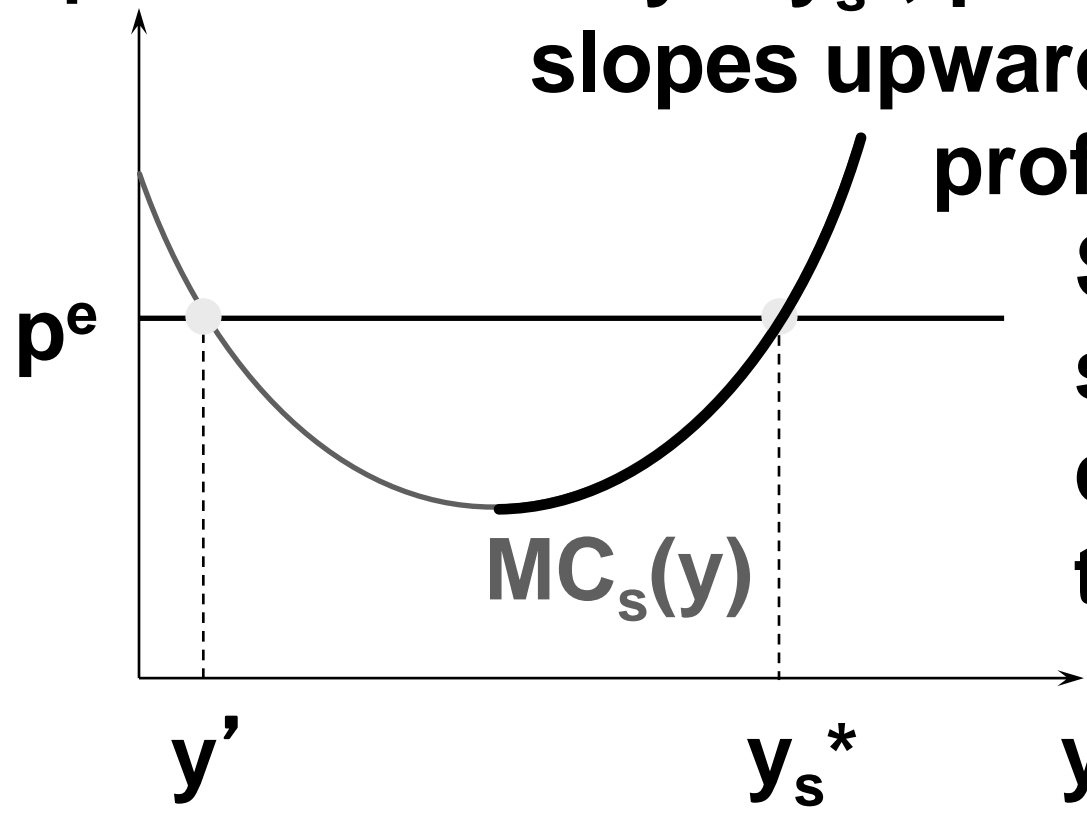
p^e

$MC_s(y)$

y' y_s^* y

The Firm's Short-Run Supply Decision

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

The Firm's Short-Run Supply Decision

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

- **The firm's profit function is**
$$\Pi_S(y) = py - c_S(y) = py - F - c_V(y).$$

- **If the firm chooses y = 0 then its profit is**
$$\Pi_S(y) = 0 - F - c_V(0) = -F.$$

The Firm's Short-Run Supply Decision

- **So the firm will choose an output level y > 0 only if**
$$\Pi_S(y) = py - F - c_v(y) \geq -F.$$

The Firm's Short-Run Supply Decision

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

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

- **I.e., only if**

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

Equivalently, only if

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

The Firm's Short-Run Supply Decision
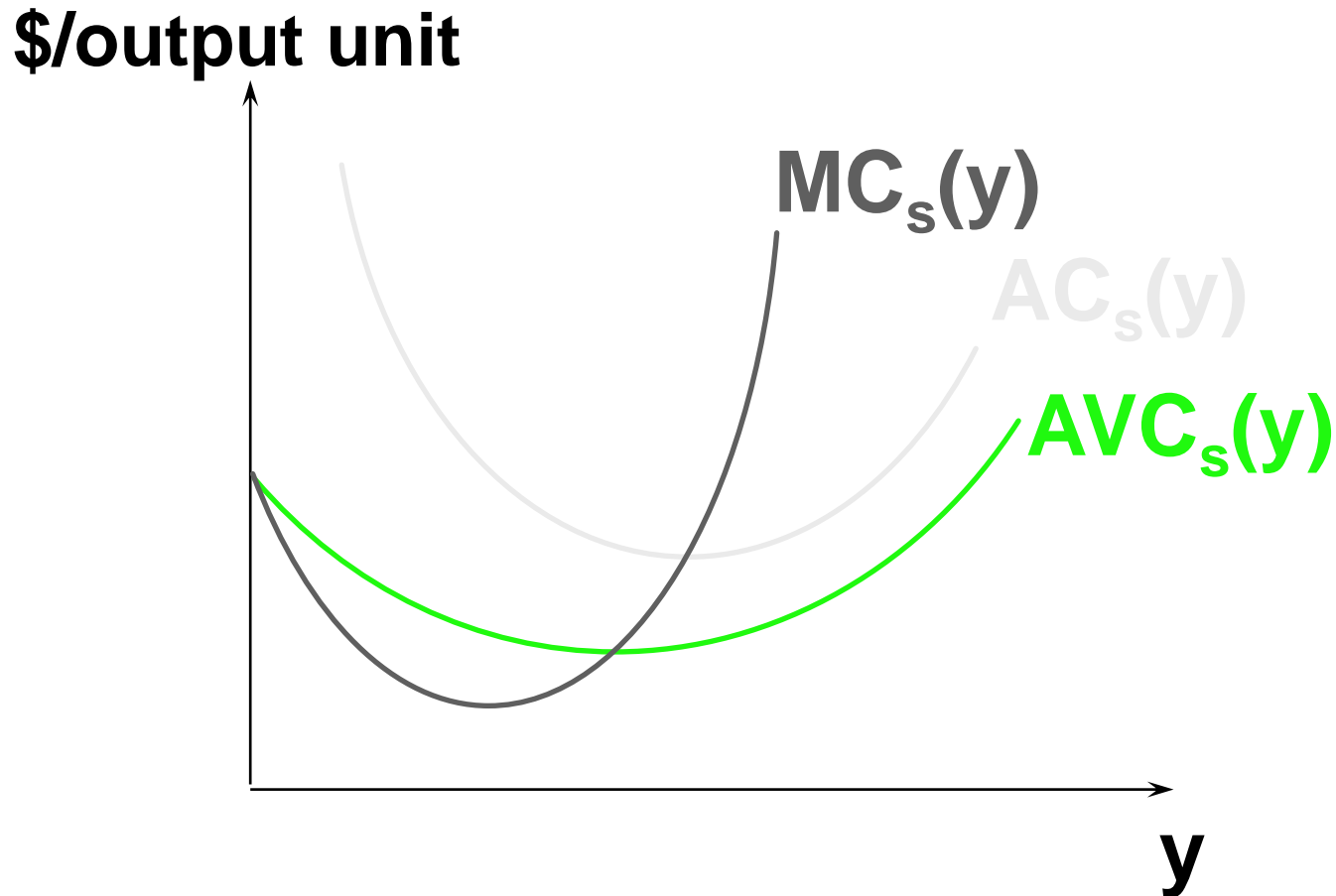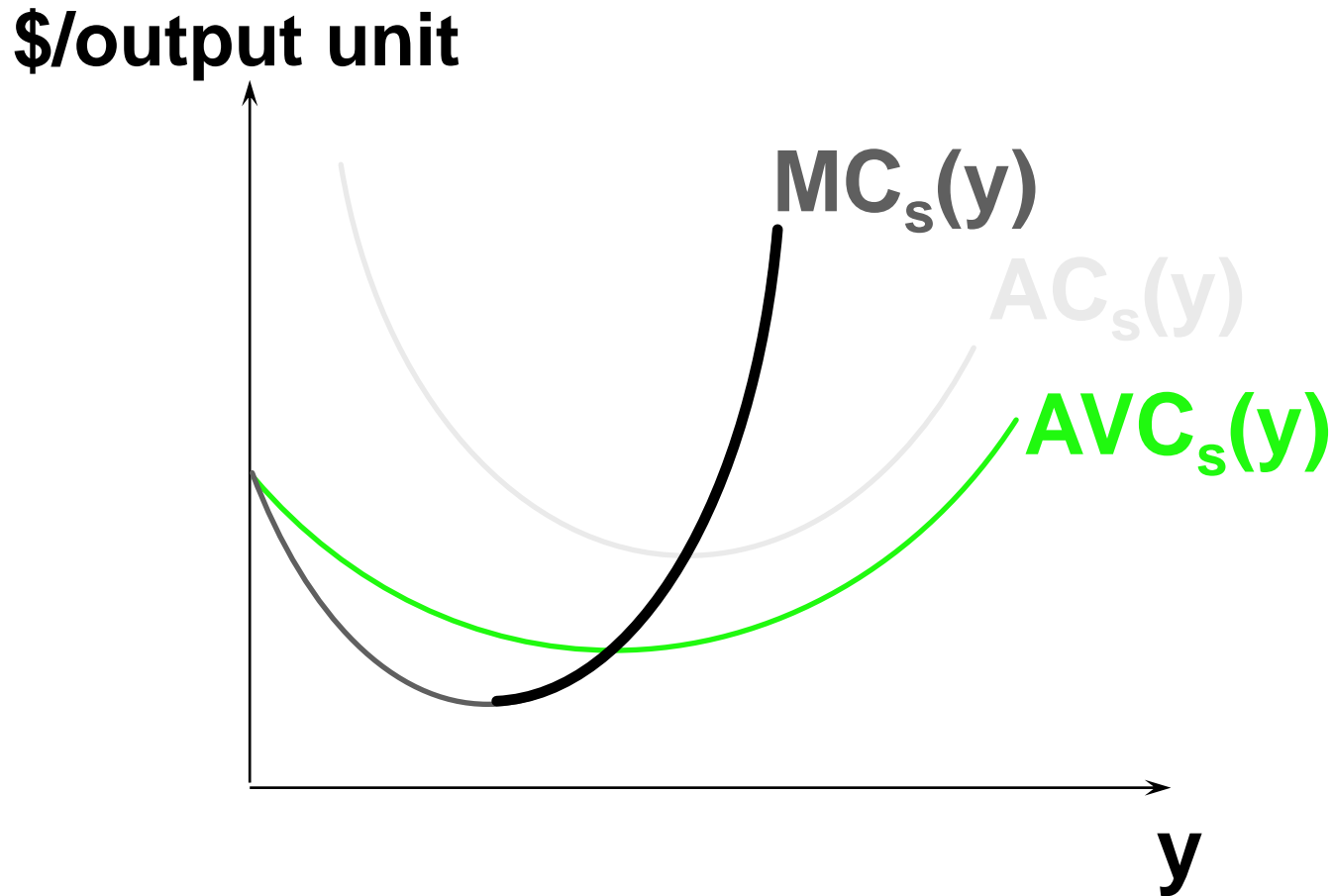
$/output unit

$MC_s(y)$

$AC_s(y)$

$AVC_s(y)$

y

The Firm's Short-Run Supply Decision

$/output unit

$MC_s(y)$

$AC_s(y)$

$AVC_s(y)$

y

The Firm's Short-Run Supply Decision

$/output unit $p > AVC_s(y)$

MC$_s$(y)

AC$_s$(y)

AVC$_s$(y)

y

The Firm's Short-Run Supply Decision

$/output unit   **p > AVC$_s$(y)**   ⟹   **y$_s$* > 0.**

MC$_s$(y)

AC$_s$(y)

AVC$_s$(y)

y

The Firm's Short-Run Supply Decision

$/output unit $p > AVC_s(y)$ $\Longrightarrow$ $y_s^* > 0.$

$MC_s(y)$

$AC_s(y)$

$AVC_s(y)$

y

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

The Firm's Short-Run Supply Decision

$/output unit $p > AVC_s(y)$ $\Longrightarrow$ $y_s^* > 0.$

$MC_s(y)$

$AC_s(y)$

$AVC_s(y)$

The firm's short-run supply curve

y

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

The Firm's Short-Run Supply Decision

$/output unit

Shutdown point

$MC_s(y)$

$AC_s(y)$

$AVC_s(y)$

The firm's short-run supply curve

y
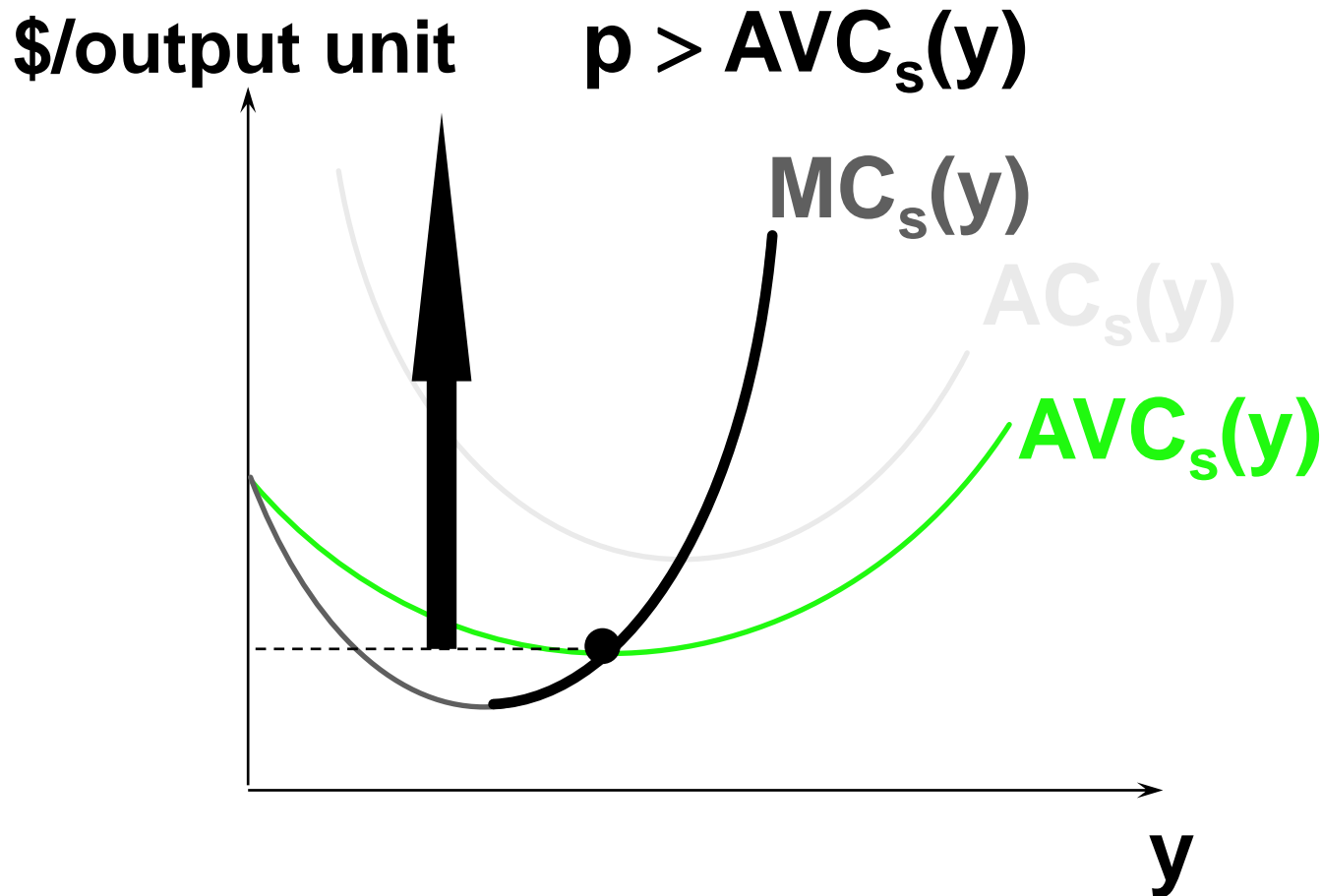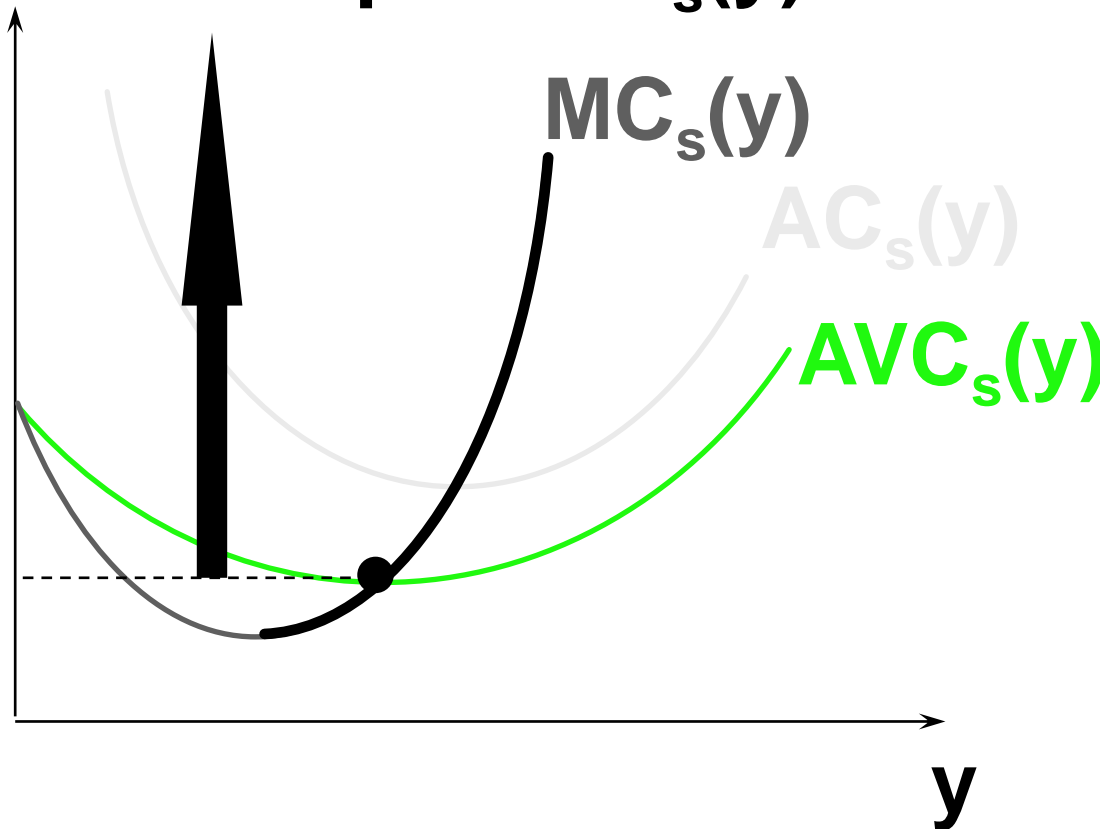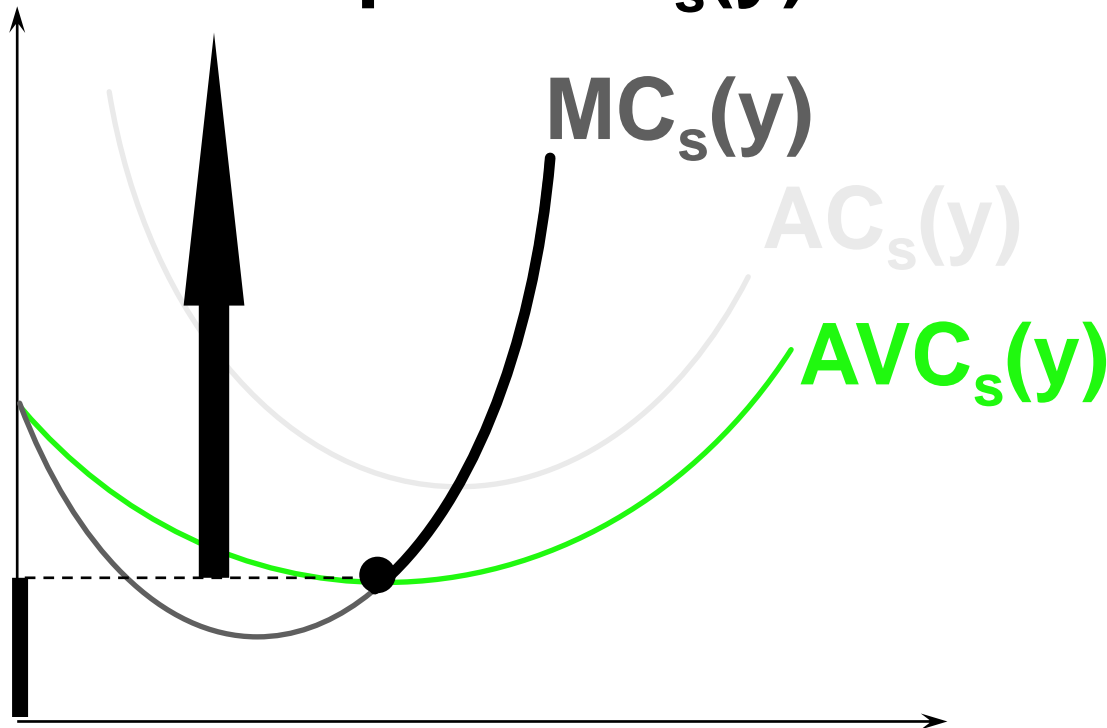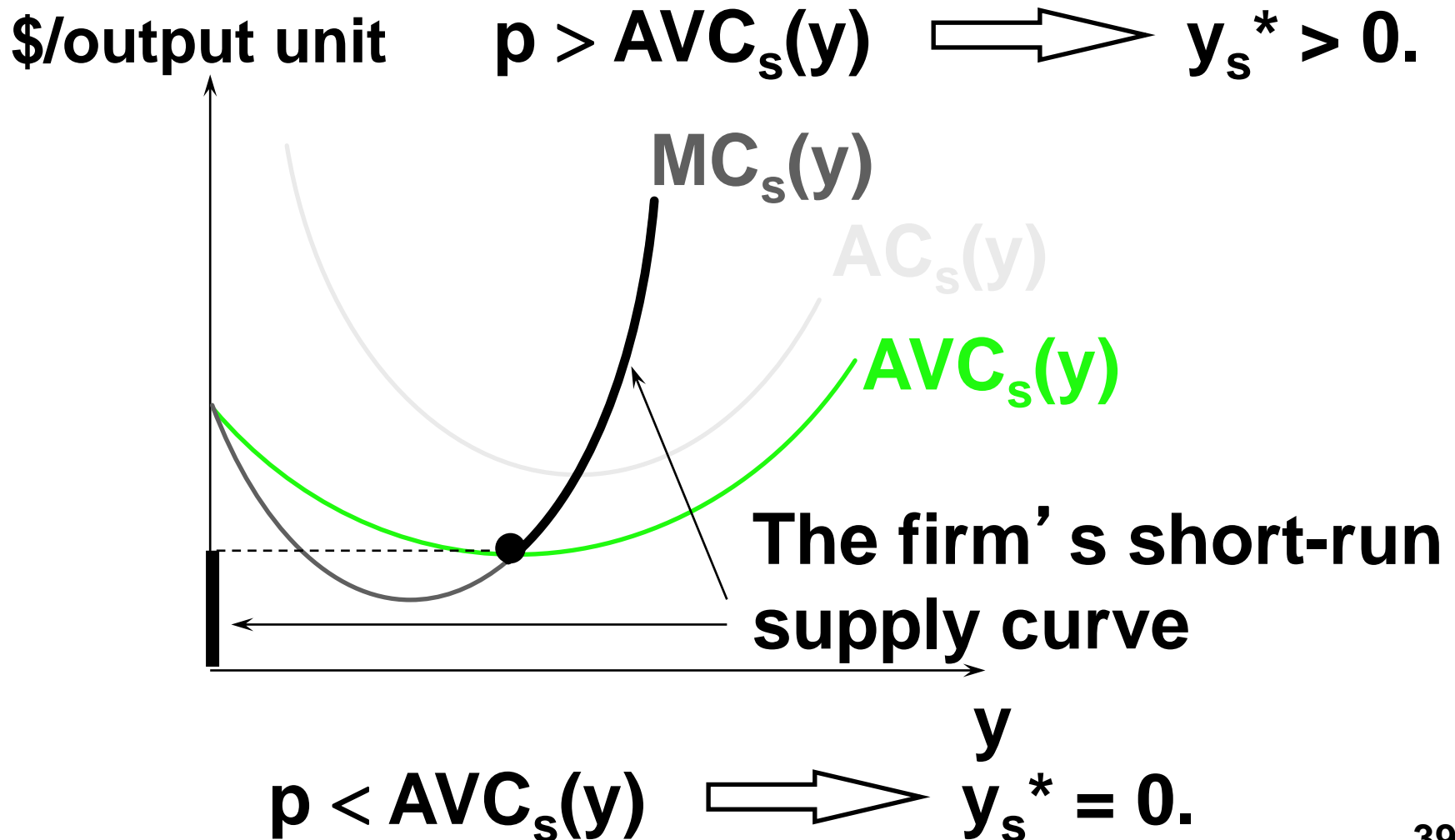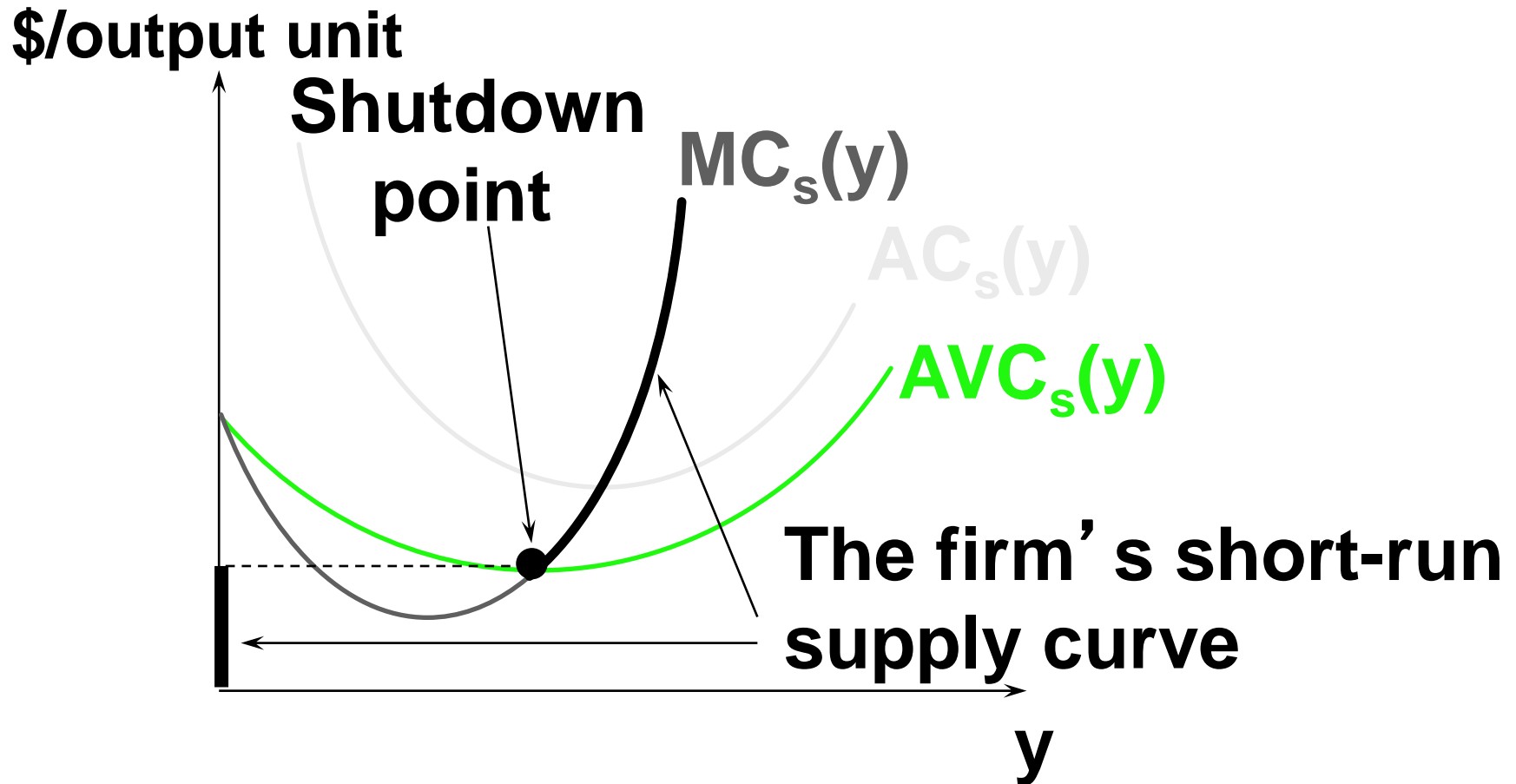
The Firm's Short-Run Supply Decision

- 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 long-run is the circumstance in which the firm can choose amongst all of its short-run circumstances.**

- **How does the firm's long-run supply decision compare to its short-run supply decisions?**

The Firm's Long-Run Supply Decision

- **A competitive firm's long-run profit function is**

$$\Pi(\mathbf{y}) = \mathbf{py} - \mathbf{c}(\mathbf{y}).$$

- **The long-run cost c(y) of producing y units of output consists only of variable costs since all inputs are variable in the long-run.**

The Firm's Long-Run Supply Decision

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

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

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

$$p = MC(y) \text{ and}$$

$$\frac{dMC(y)}{dy} > 0.$$

The Firm's Long-Run Supply Decision

□ **Additionally, the firm's economic profit level must not be negative since then the firm would exit the industry. So,**

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

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

The Firm's Long-Run Supply Decision

$/output unit

MC(y)

AC(y)

y

The Firm's Long-Run Supply Decision

$/output unit

p > AC(y)

MC(y)

AC(y)

y

The Firm's Long-Run Supply Decision

$/output unit

MC(y)

p > AC(y)

AC(y)

y

The Firm's Long-Run Supply Decision

$/output unit

The firm's long-run supply curve

MC(y)

AC(y)

y

The Firm's Long-Run Supply Decision

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

The Firm's Long & Short-Run Supply Decisions

$/output unit

$AC_s(y)$

MC(y)

$MC_s(y)$

AC(y)

y

The Firm's Long & Short-Run Supply Decisions

$/output unit

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

The Firm's Long & Short-Run Supply Decisions

$/output unit

AC$_s$(y)

MC(y)

MC$_s$(y)

AC(y)

p'

Π_s

y$_s$*   y*   y

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

The Firm's Long & Short-Run Supply Decisions

$/output unit

$AC_s(y)$

$MC(y)$

$MC_s(y)$

$AC(y)$

p'

Π_s

Π

y_s^*

y^*

y

The firm can increase profit by increasing x_2 and producing y^* output units.

The Firm's Long & Short-Run Supply Decisions
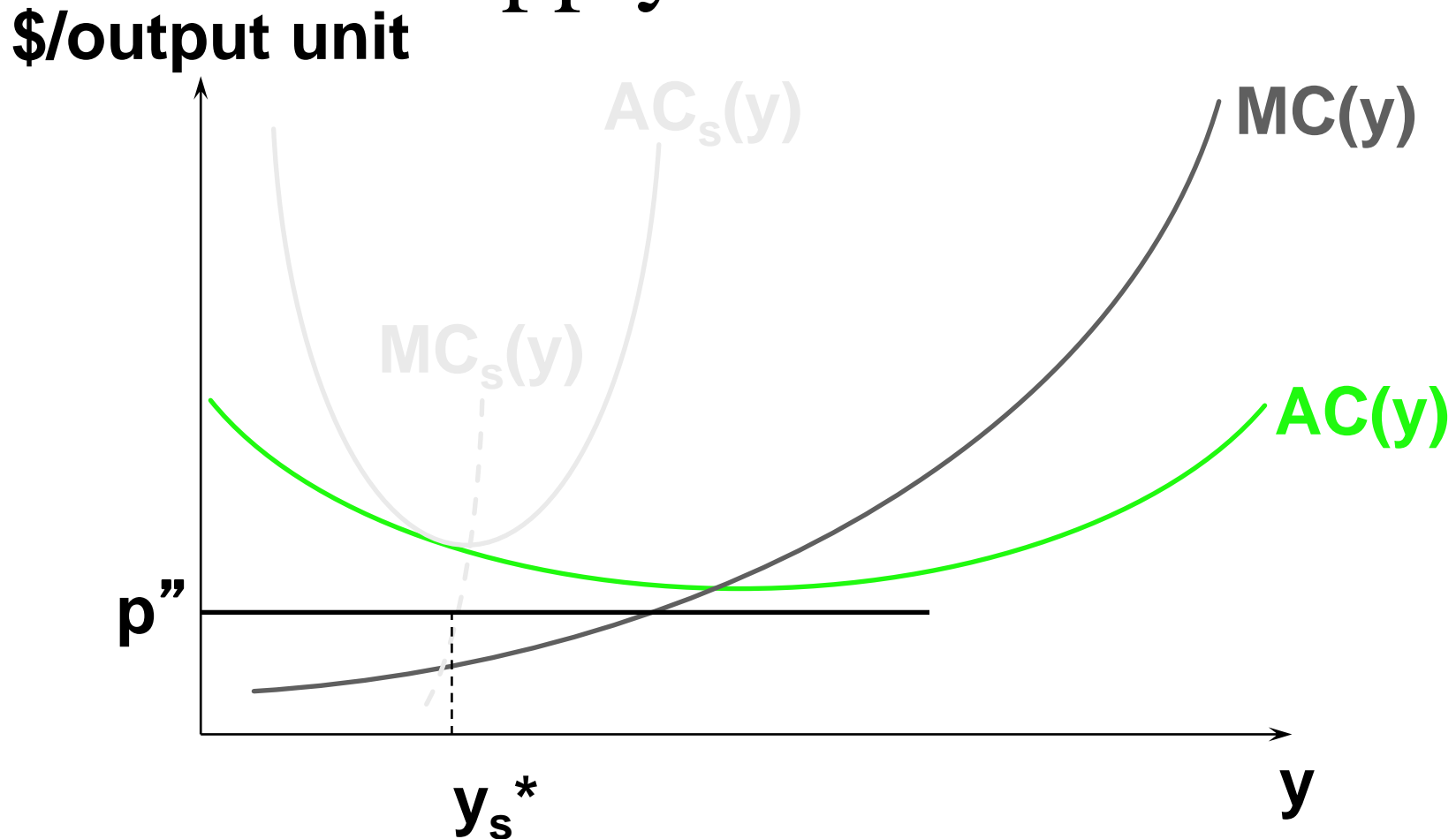
$/output unit

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

The Firm's Long & Short-Run Supply Decisions

$/output unit

$AC_s(y)$

$MC(y)$

$MC_s(y)$

$AC(y)$

Loss

p"

y_s*

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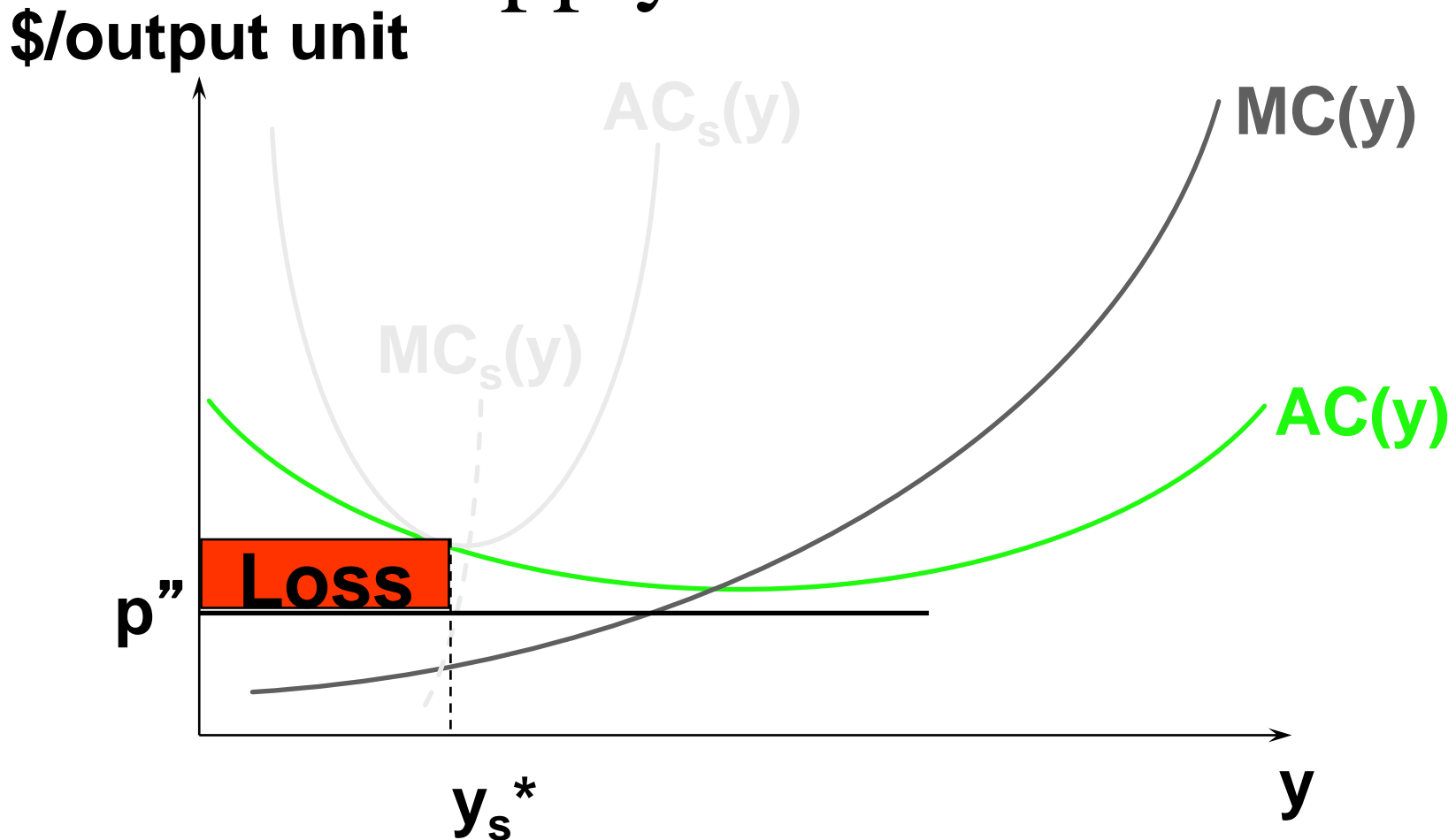
y_s* is loss-minimizing in this short-run.

The Firm's Long & Short-Run Supply Decisions
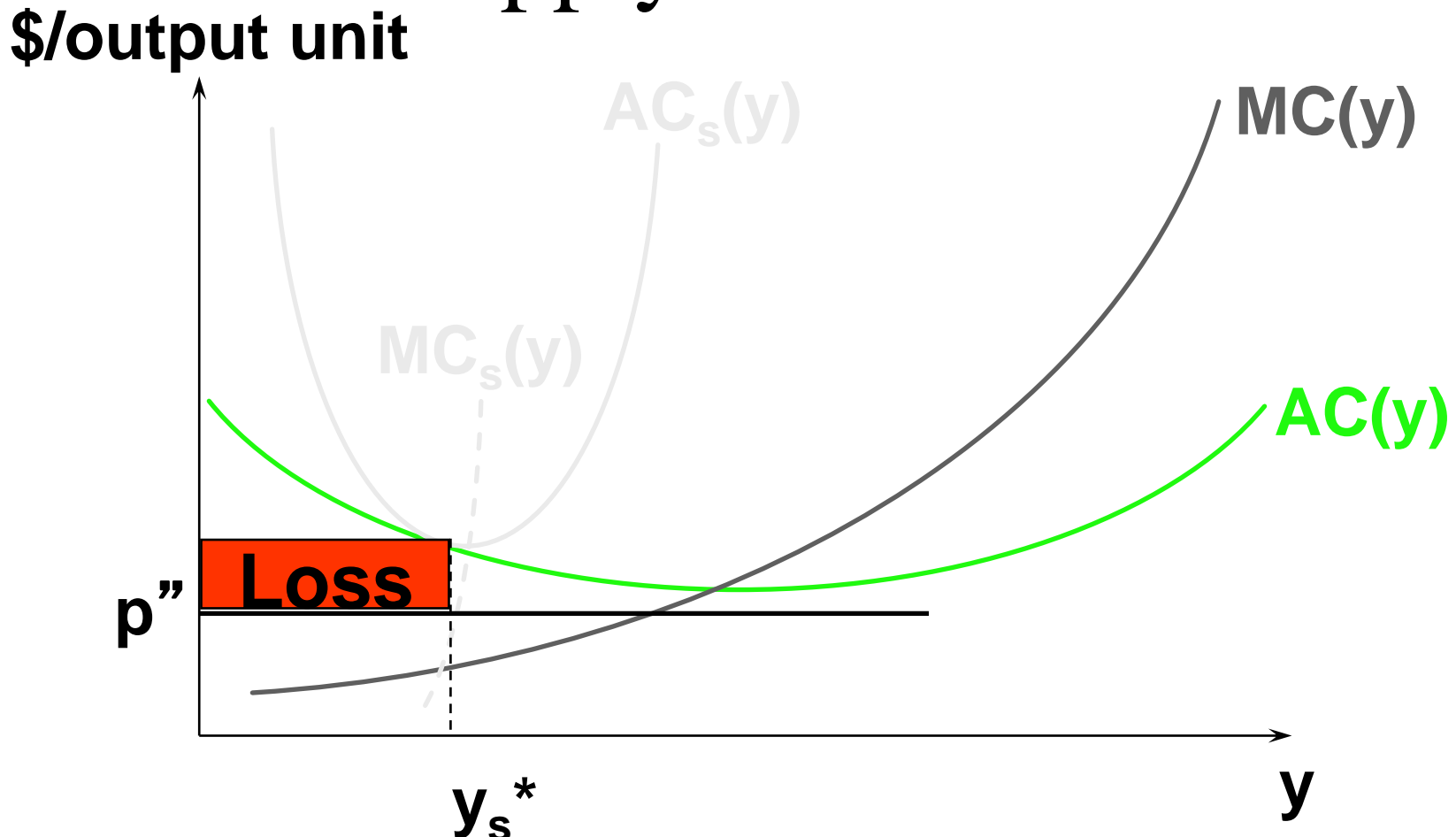
$/output unit

This loss can be eliminated in the long run by the firm exiting the industry.

The Firm's Long & Short-Run Supply Decisions
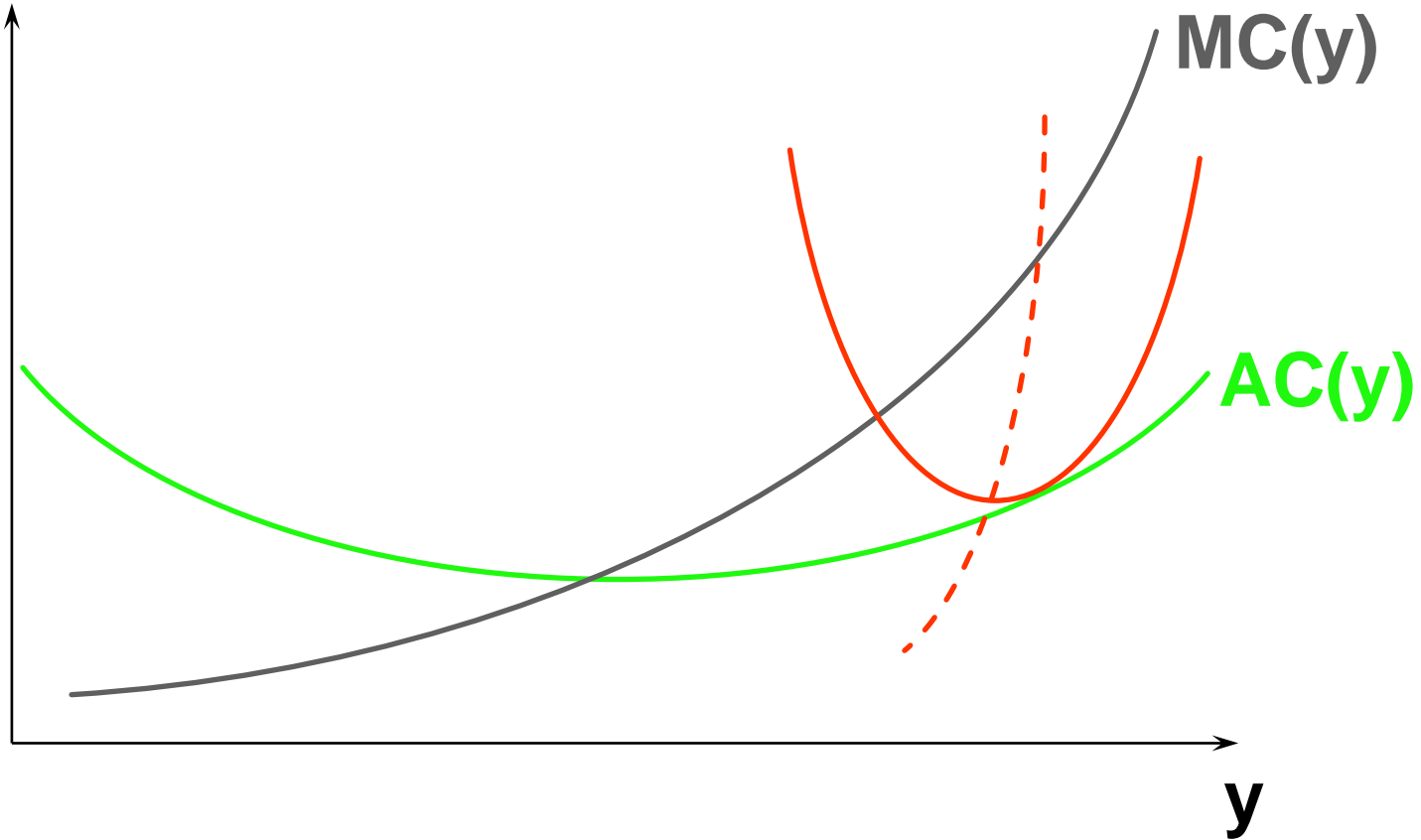
$/output unit

MC(y)

AC(y)

y

The Firm's Long & Short-Run Supply Decisions

$/output unit

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

The Firm's Long & Short-Run Supply Decisions

$/output unit

MC(y)

p'

Π_s

AC(y)

y_s^* **y**

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

The Firm's Long & Short-Run Supply Decisions

$/output unit

MC(y)

AC(y)

p'

y* y$_s$* y

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

$/output unit

$MC(y)$

p'

Π

$AC(y)$

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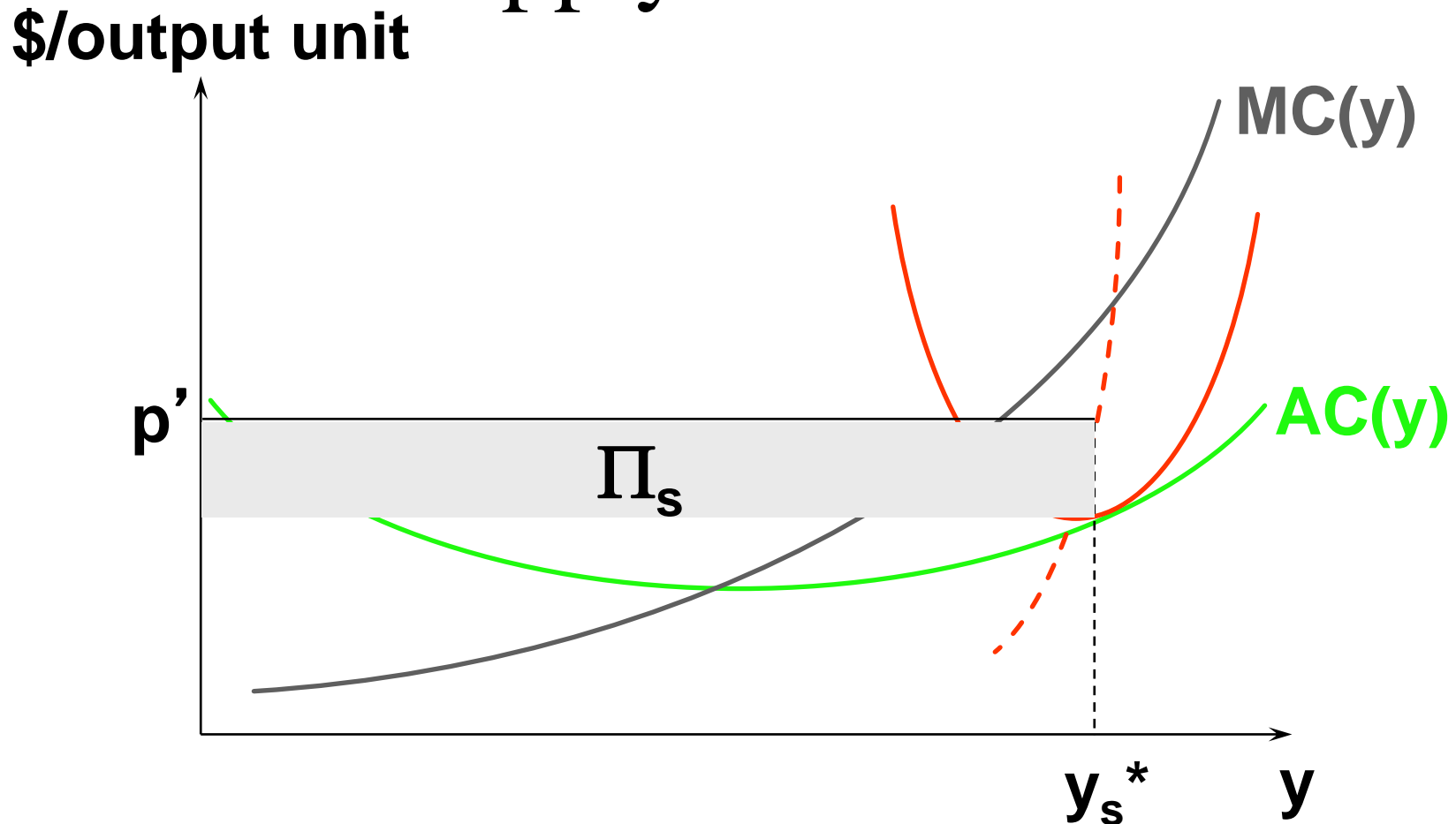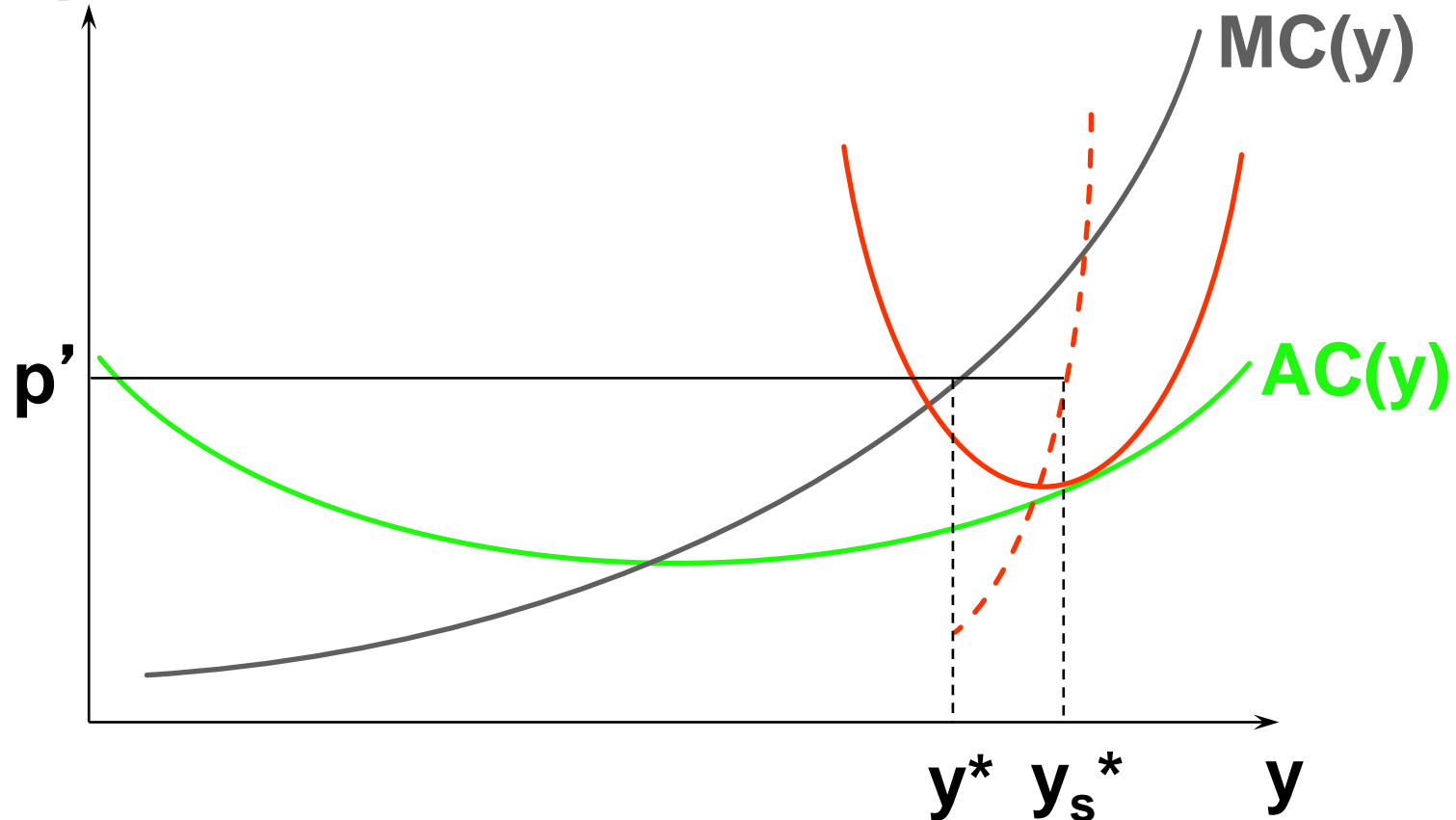
y_s^* **is profit-maximizing in this short-run.**
y^* **is profit-maximizing in the long-run.**

The Firm's Long & Short-Run Supply Decisions
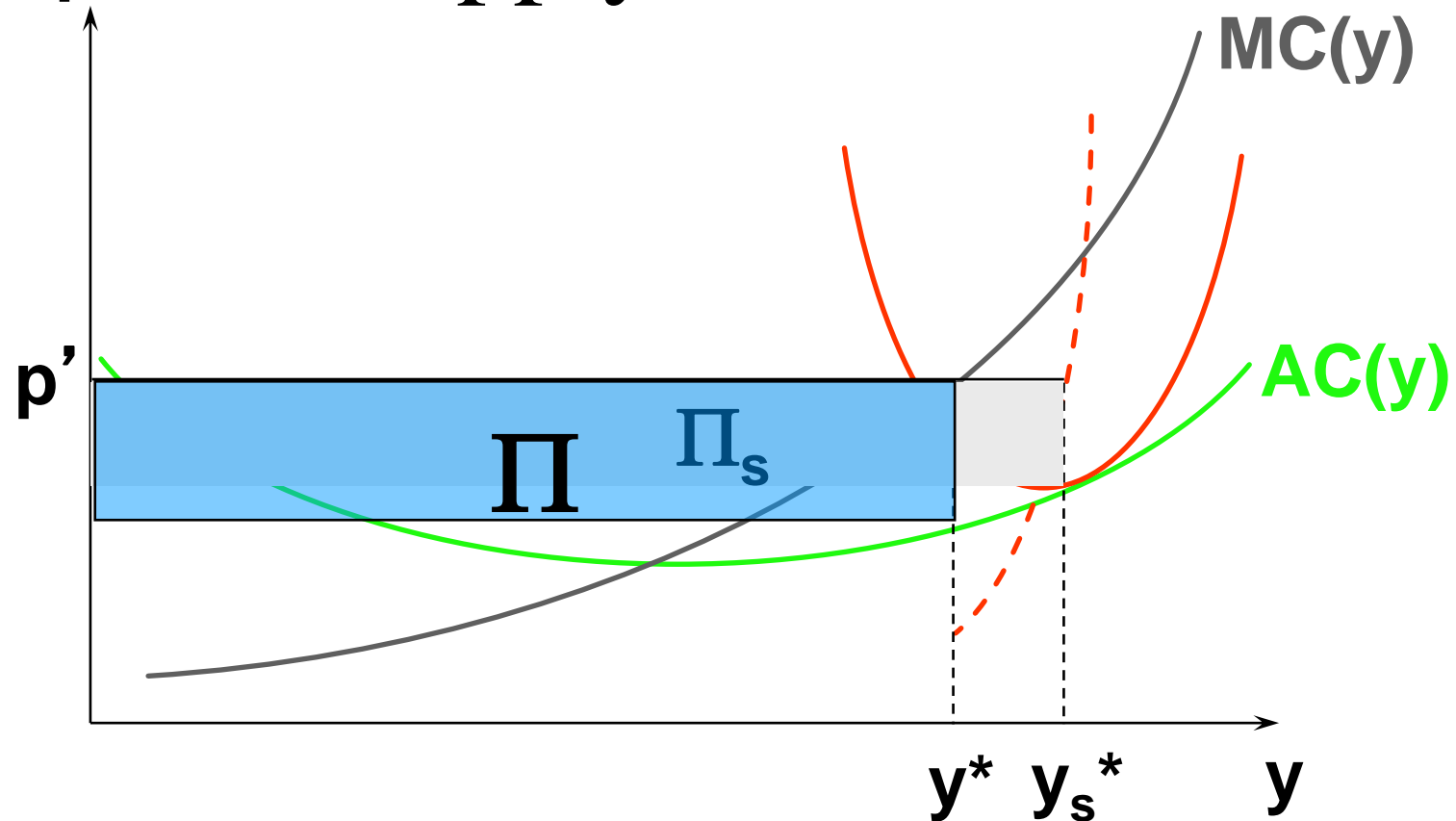
$/output unit

The firm can increase profit by reducing x_2 and producing y* units of output.

The Firm's Long & Short-Run Supply Decisions
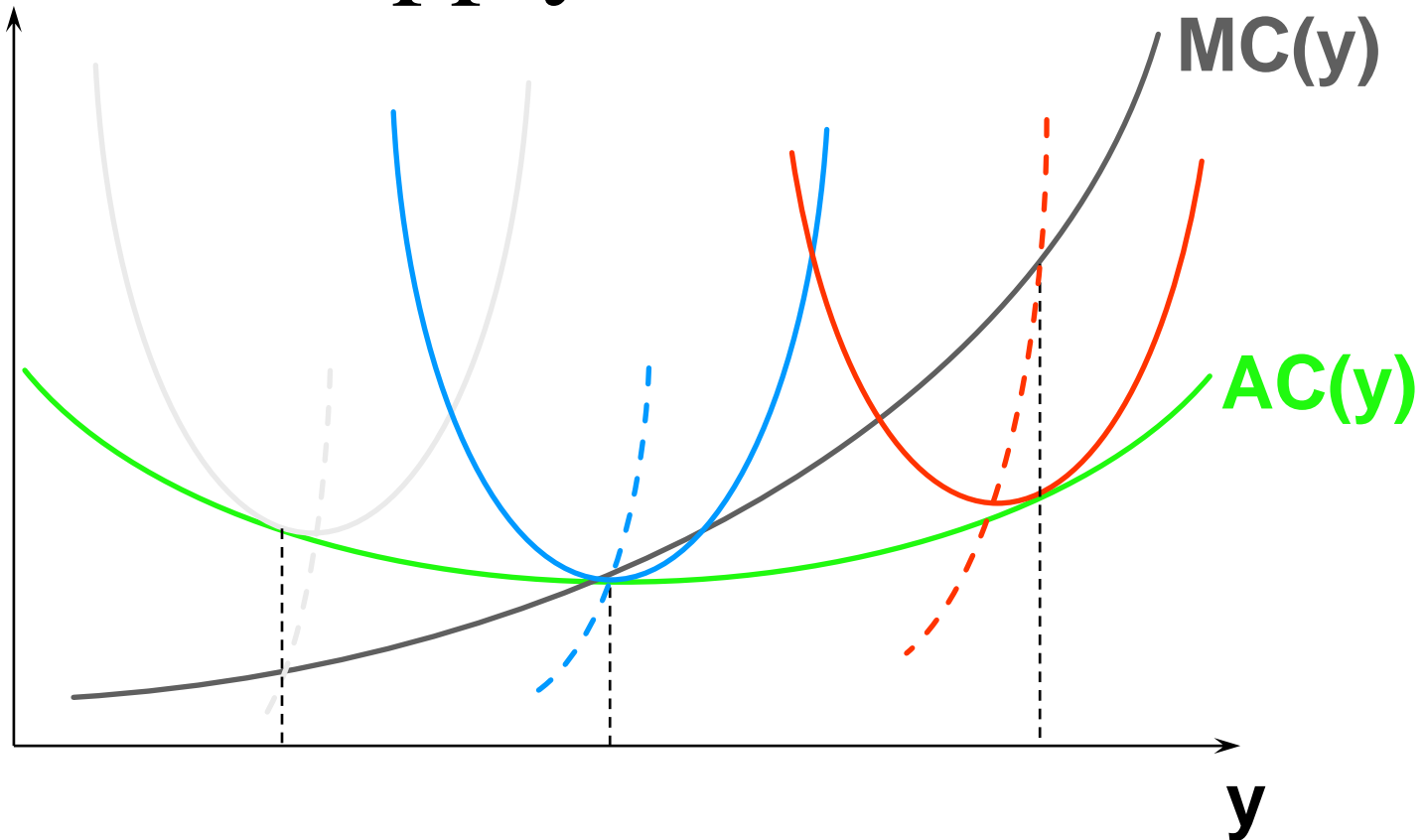
$/output unit

MC(y)

AC(y)

y

The Firm's Long & Short-Run Supply Decisions

$/output unit

MC(y)

AC(y)

y

The Firm's Long & Short-Run Supply Decisions

$/output unit

MC(y)

AC(y)

y

The Firm's Long & Short-Run Supply Decisions

$/output unit

Long-run supply curve

MC(y)

AC(y)

Short-run supply curves

y
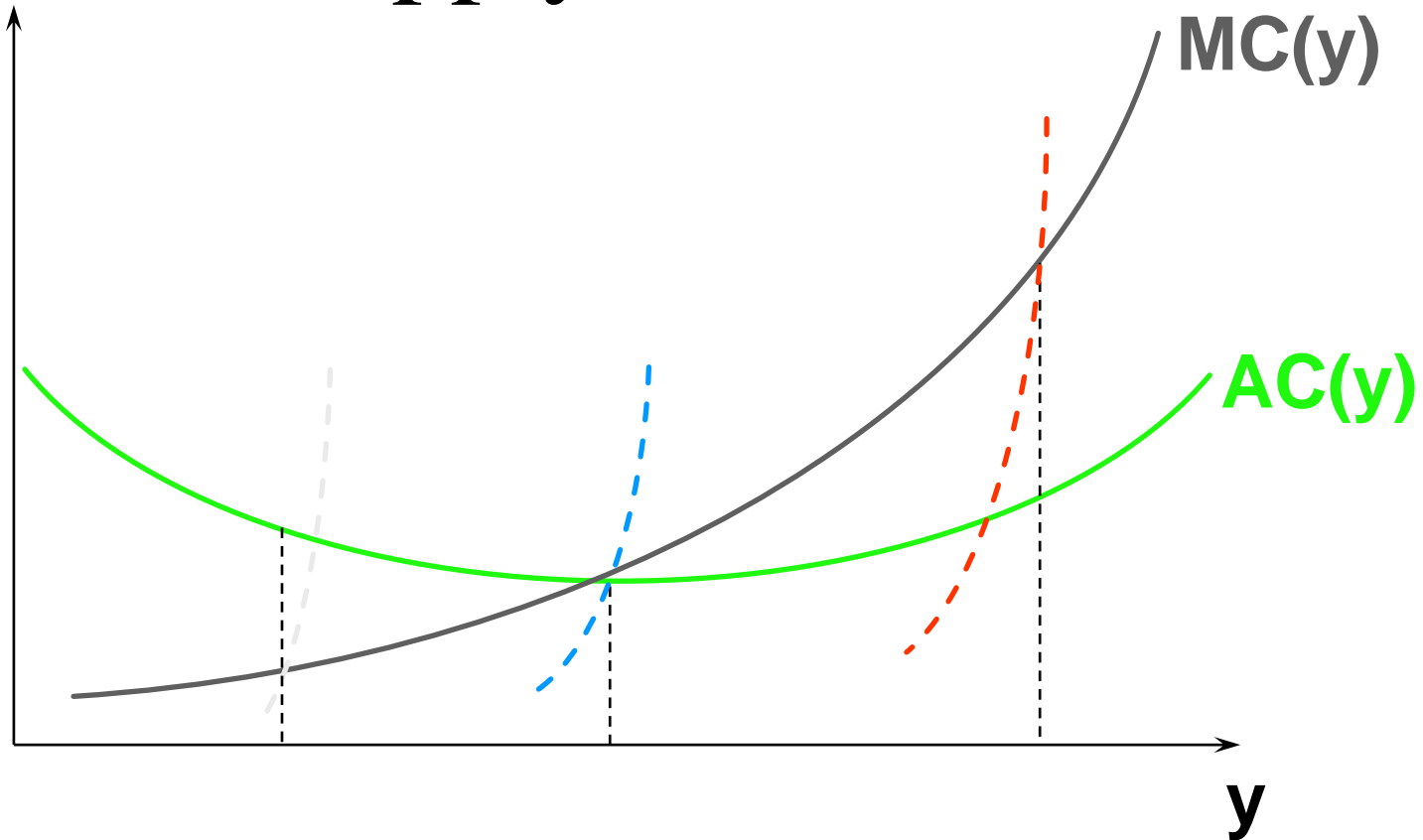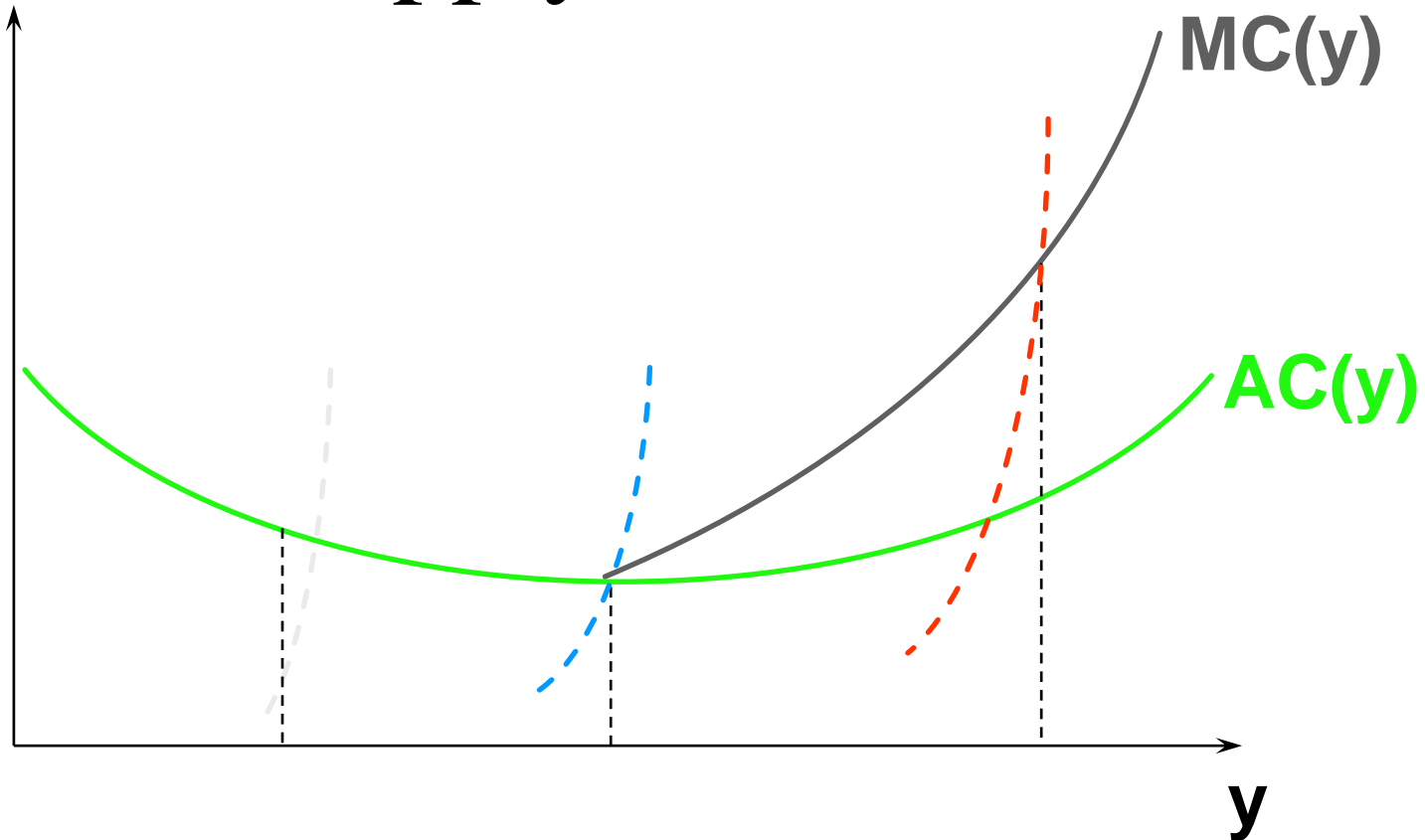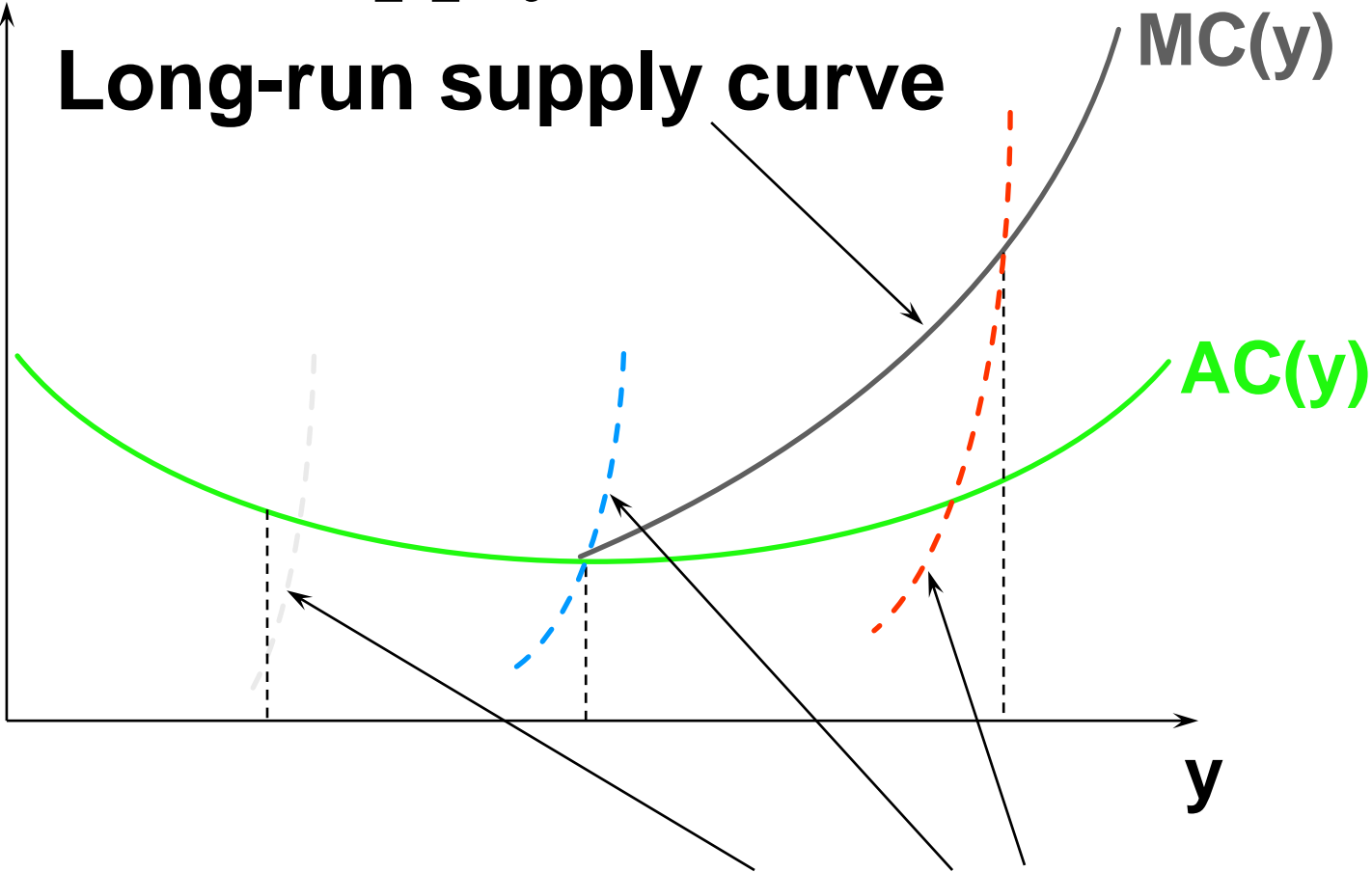
Producer's Surplus Revisited

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

- **How is producer's surplus related profit?**

Producer's Surplus Revisited
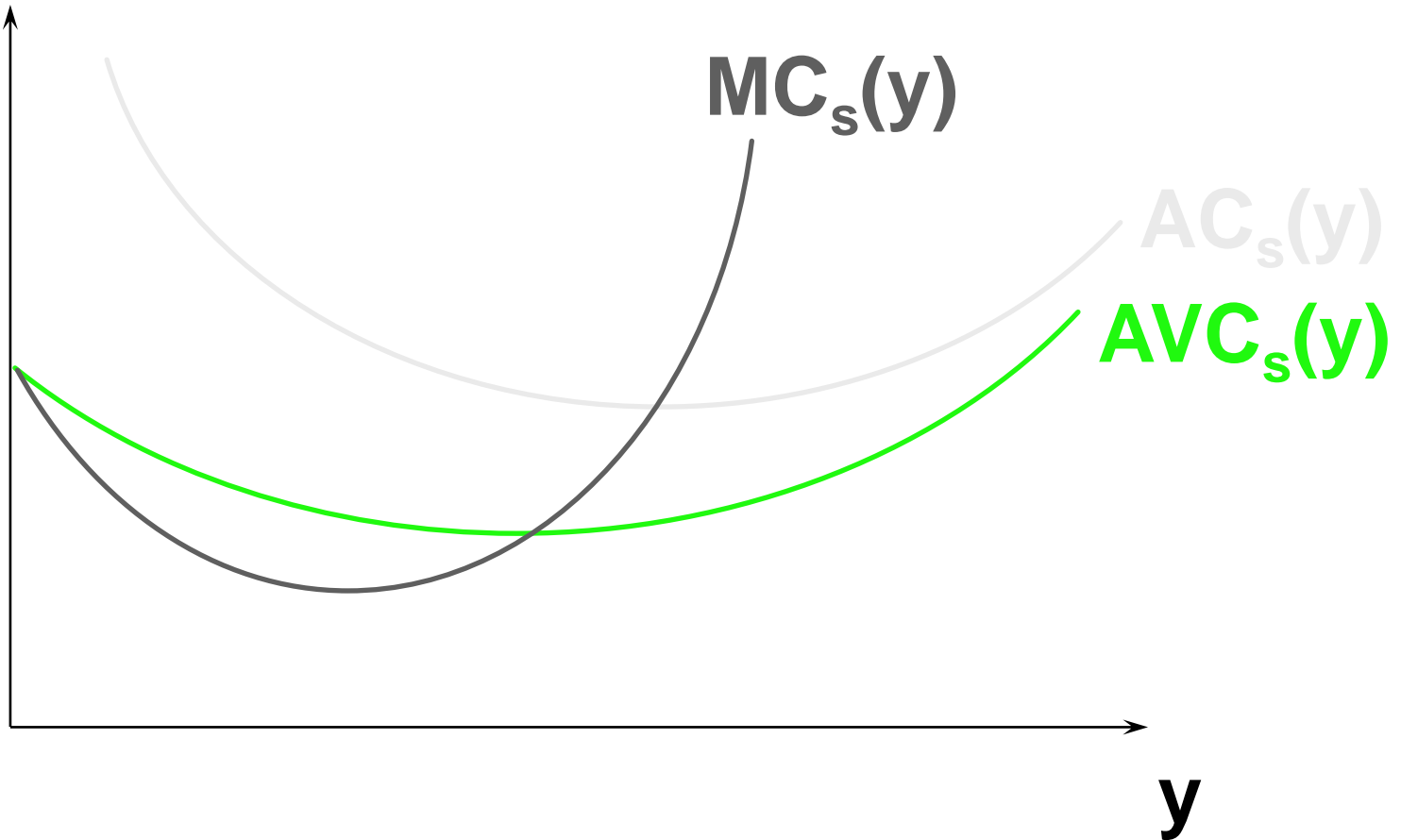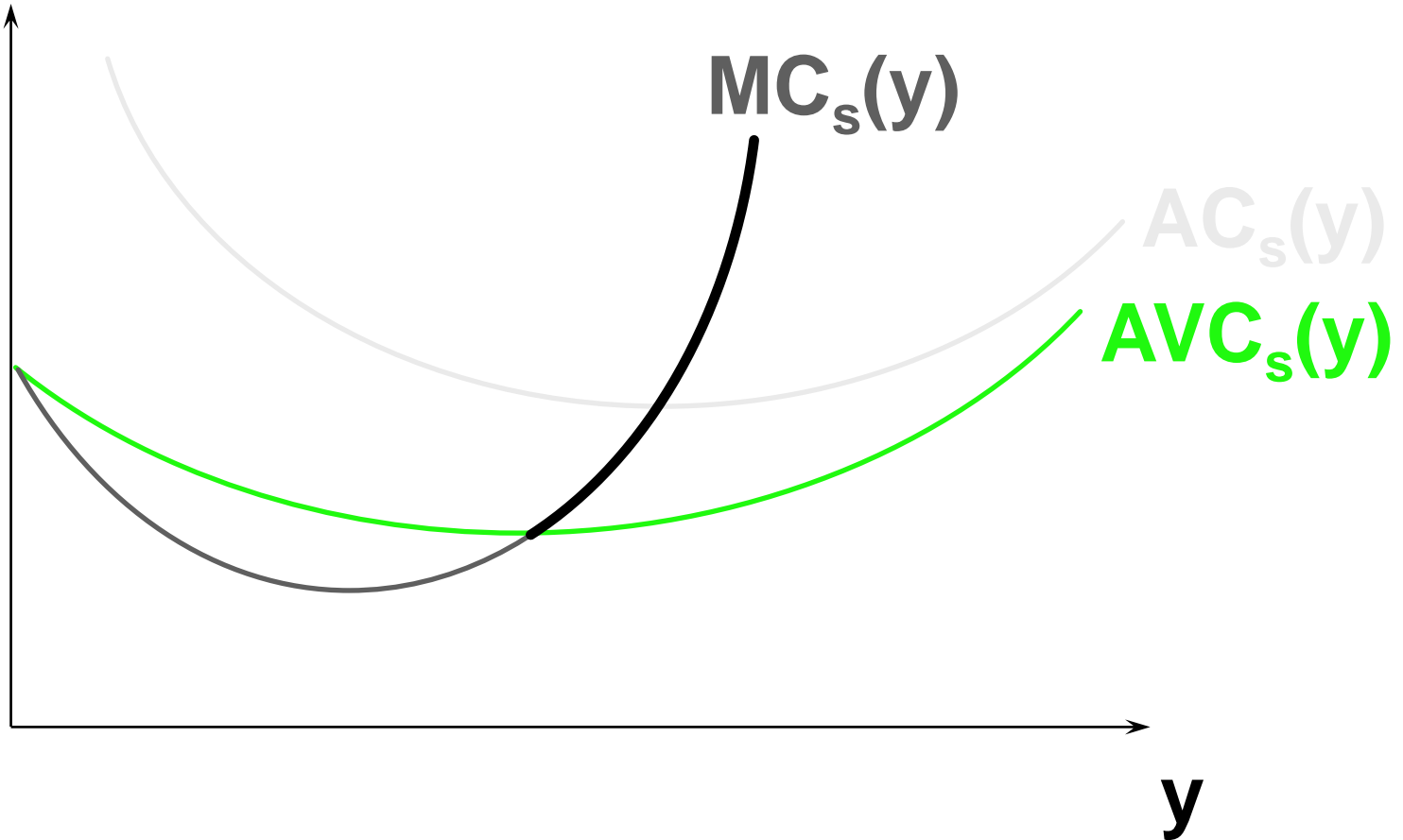
$/output unit

$MC_s(y)$

$AC_s(y)$

$AVC_s(y)$

y

Producer's Surplus Revisited

$/output unit

$MC_s(y)$

$AC_s(y)$

$AVC_s(y)$

y

Producer's Surplus Revisited

$/output unit

$MC_s(y)$

$AC_s(y)$

$AVC_s(y)$

p

y*(p)

y

Producer's Surplus Revisited

$/output unit

$MC_s(y)$

$AC_s(y)$

$AVC_s(y)$

p

PS

y*(p)

y
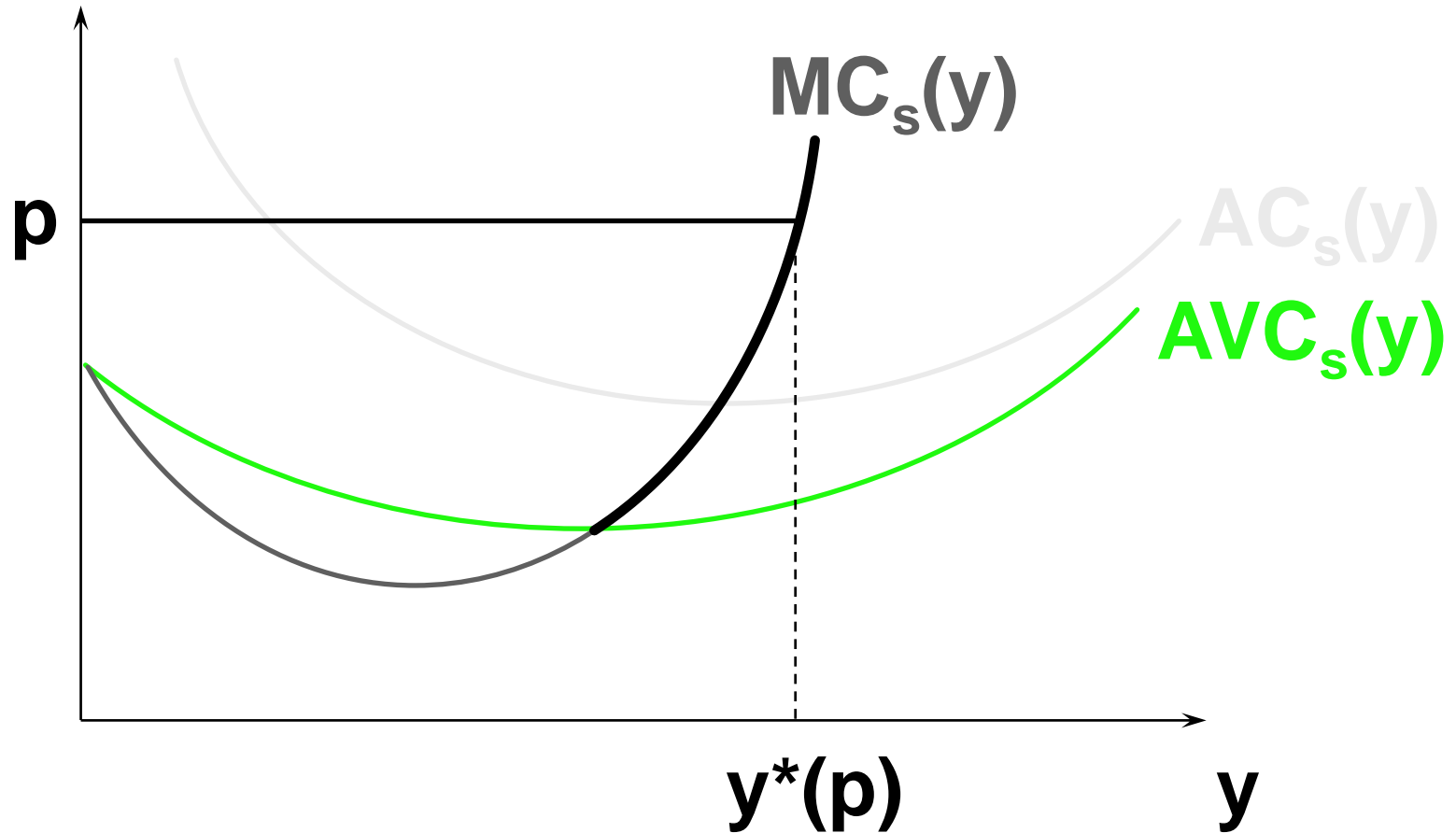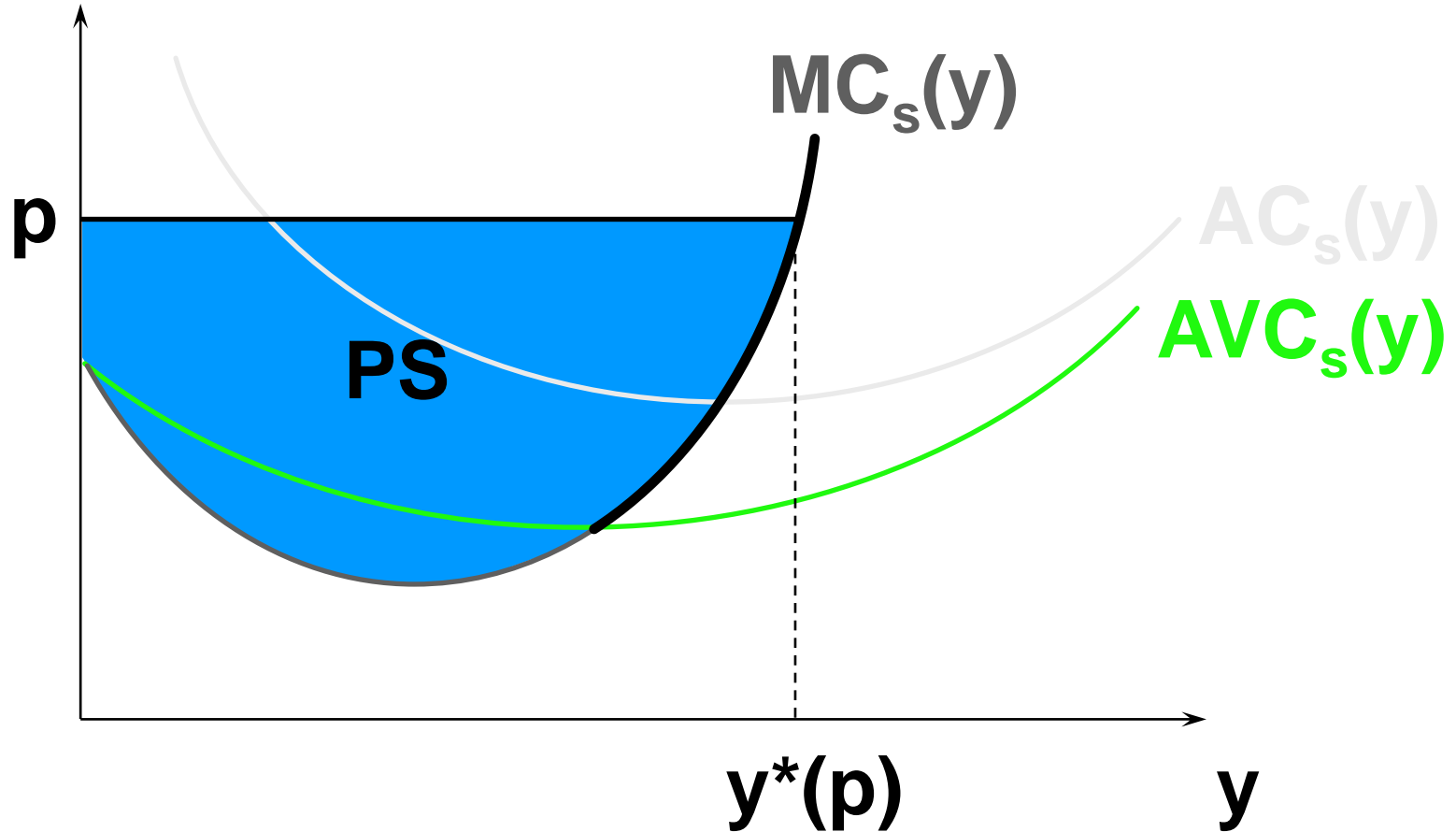
Producer's Surplus Revisited

So the firm's producer's surplus is

$$PS(p) = \int_0^{y^*(p)} \left[p - MC_S(z)\right] d(z)$$

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

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

That is, PS = Revenue - Variable Cost.

Producer's Surplus Revisited
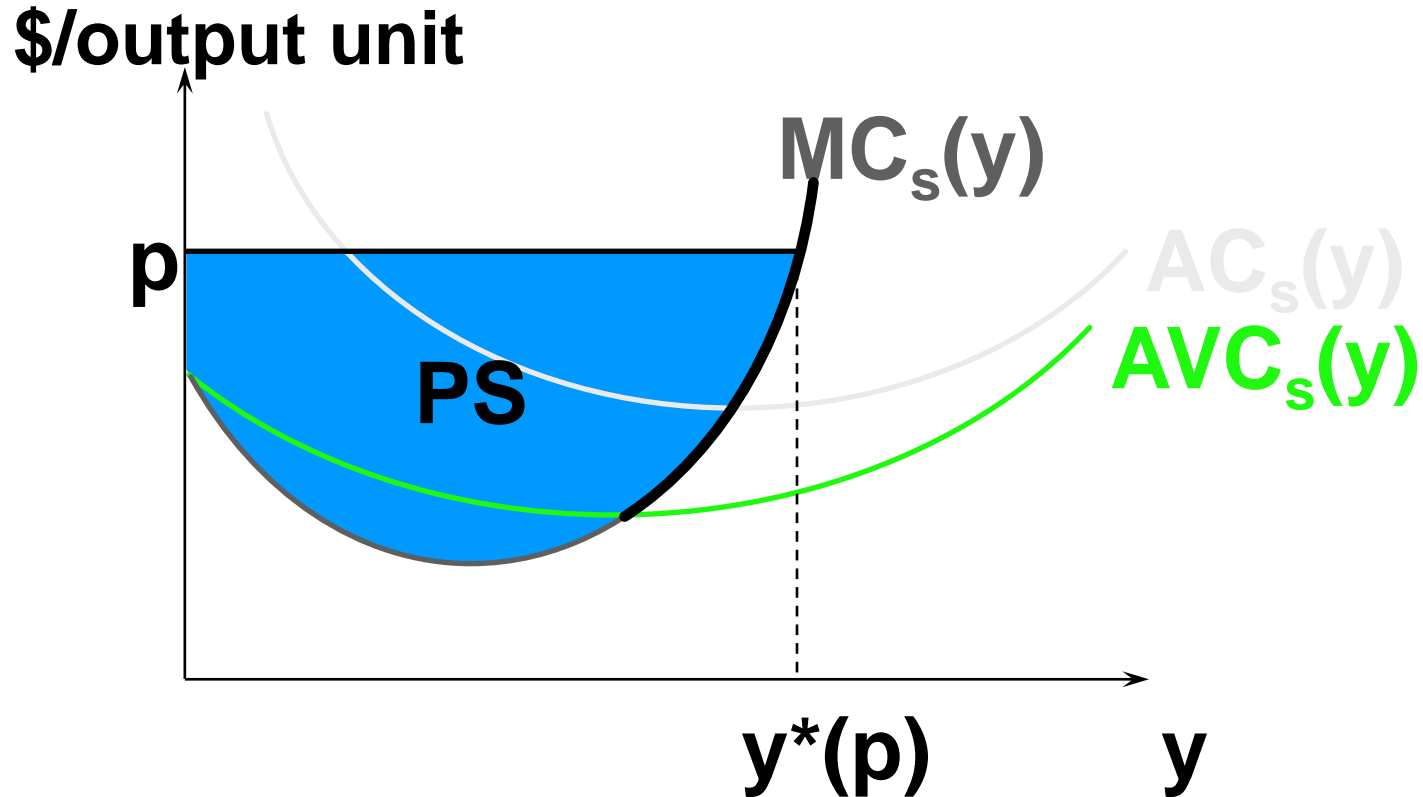
Producer's Surplus Revisited
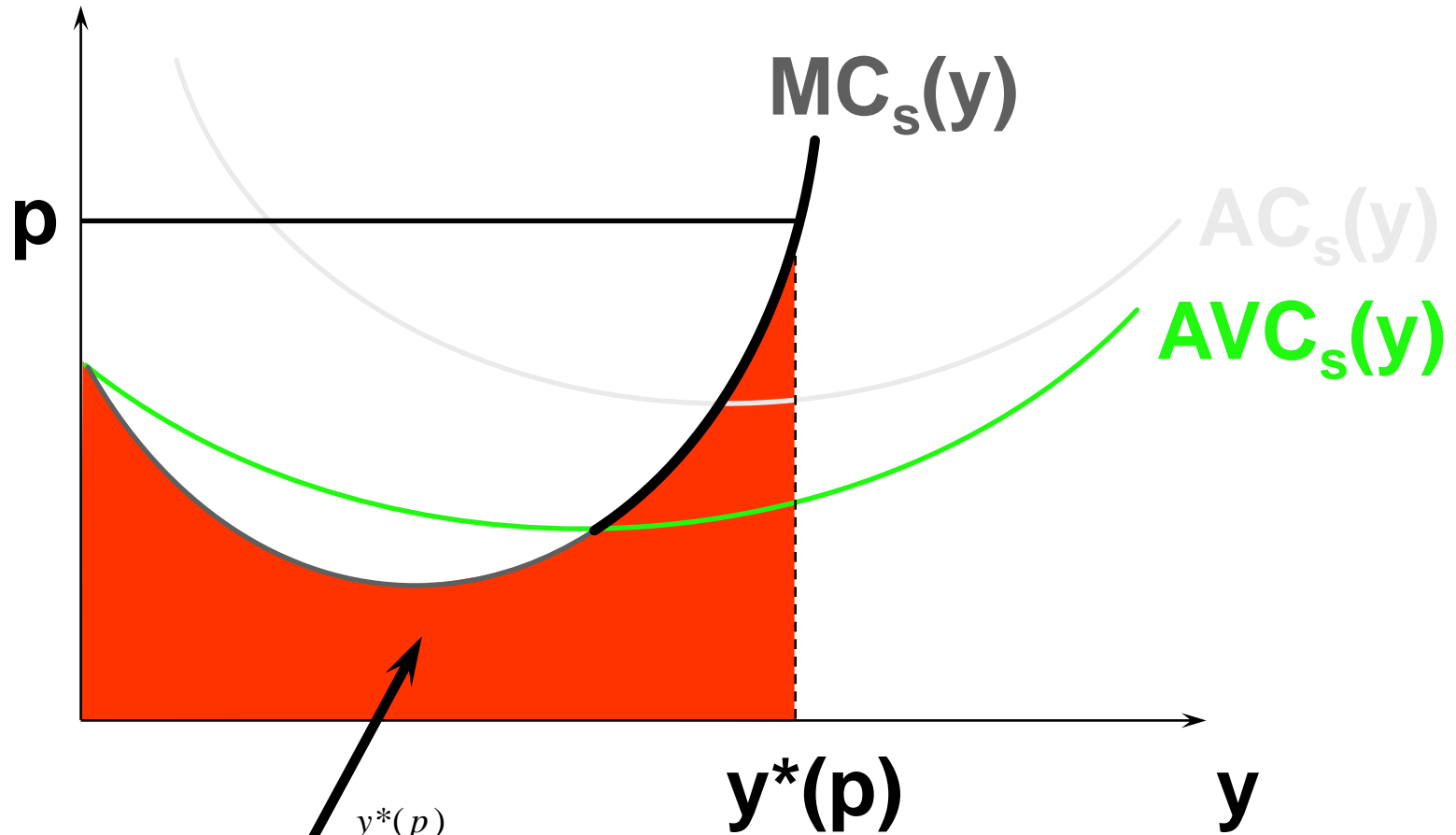
$/output unit

$$c_v(y*(p)) = \int_0^{y*(p)} MC_s(z)d(z)$$
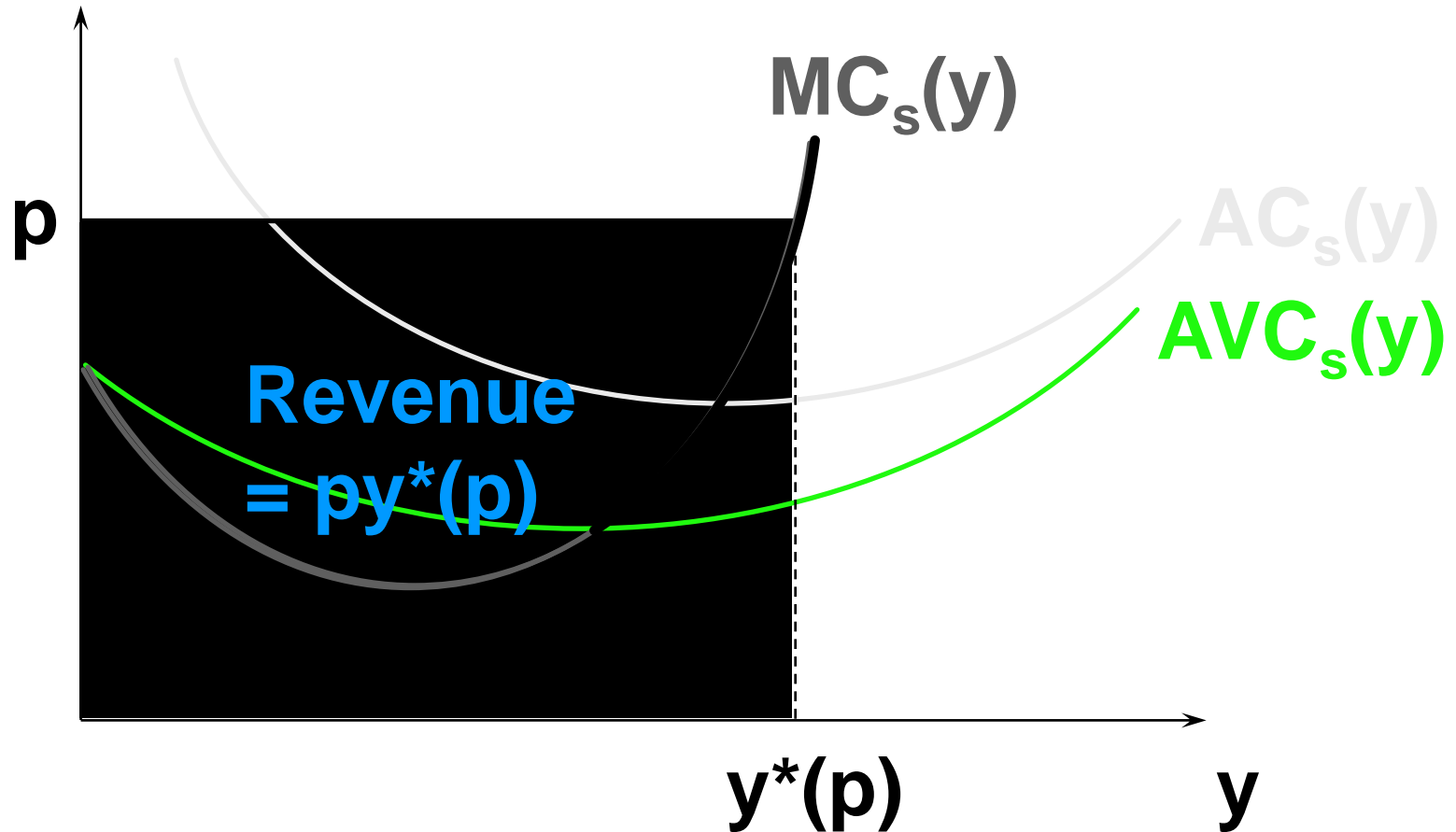
75

Producer's Surplus Revisited

$/output unit

$MC_s(y)$

$AC_s(y)$

$AVC_s(y)$

p

Revenue
= py*(p)

y*(p)

y

Producer's Surplus Revisited

$/output unit

MC$_s$(y)

p

AC$_s$(y)

AVC$_s$(y)

Revenue = py*(p)

c$_v$(y*(p))

y*(p)

y

Producer's Surplus Revisited

$/output unit

$MC_s(y)$

$AC_s(y)$

$AVC_s(y)$

p

PS

y*(p)

y
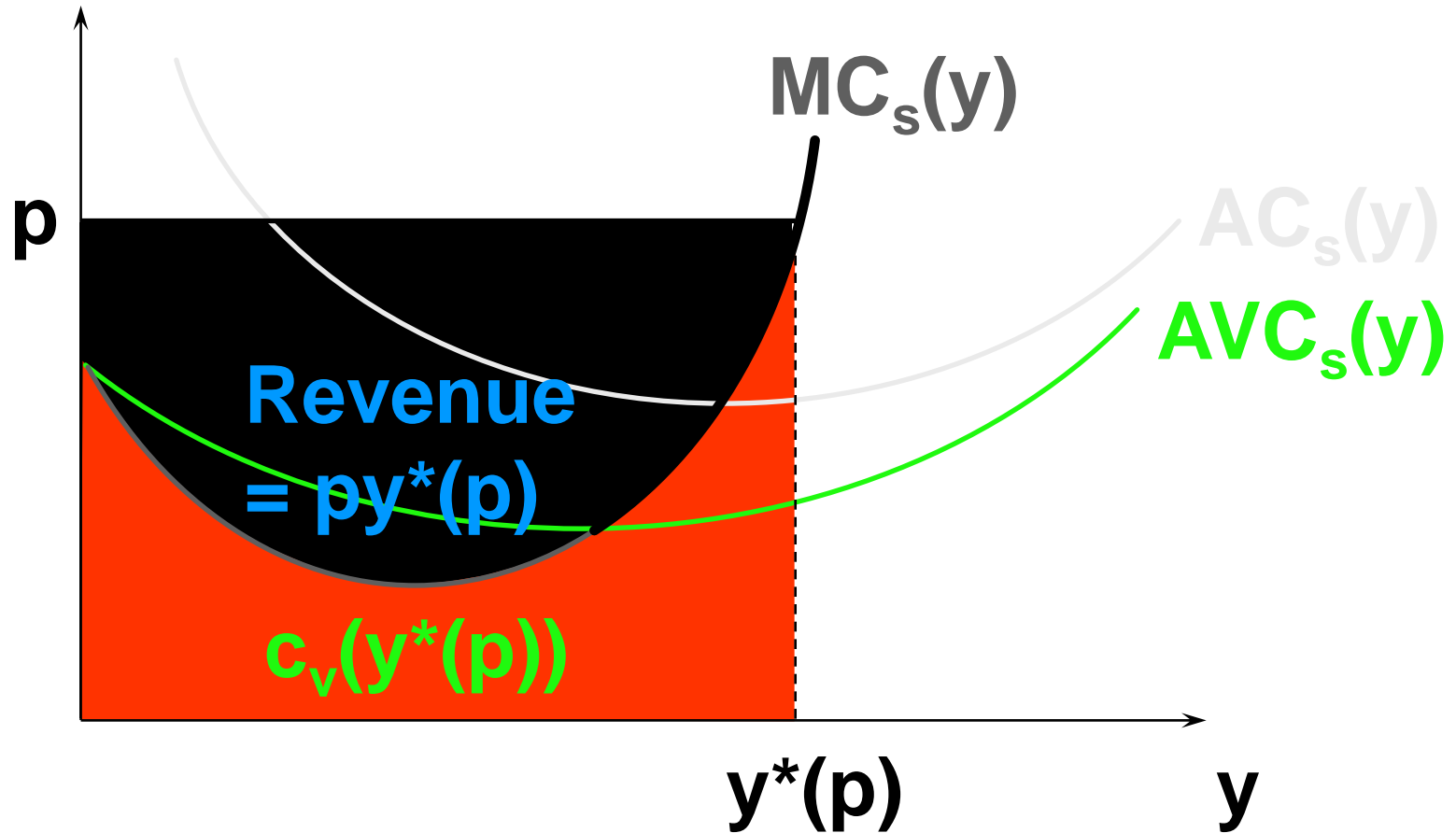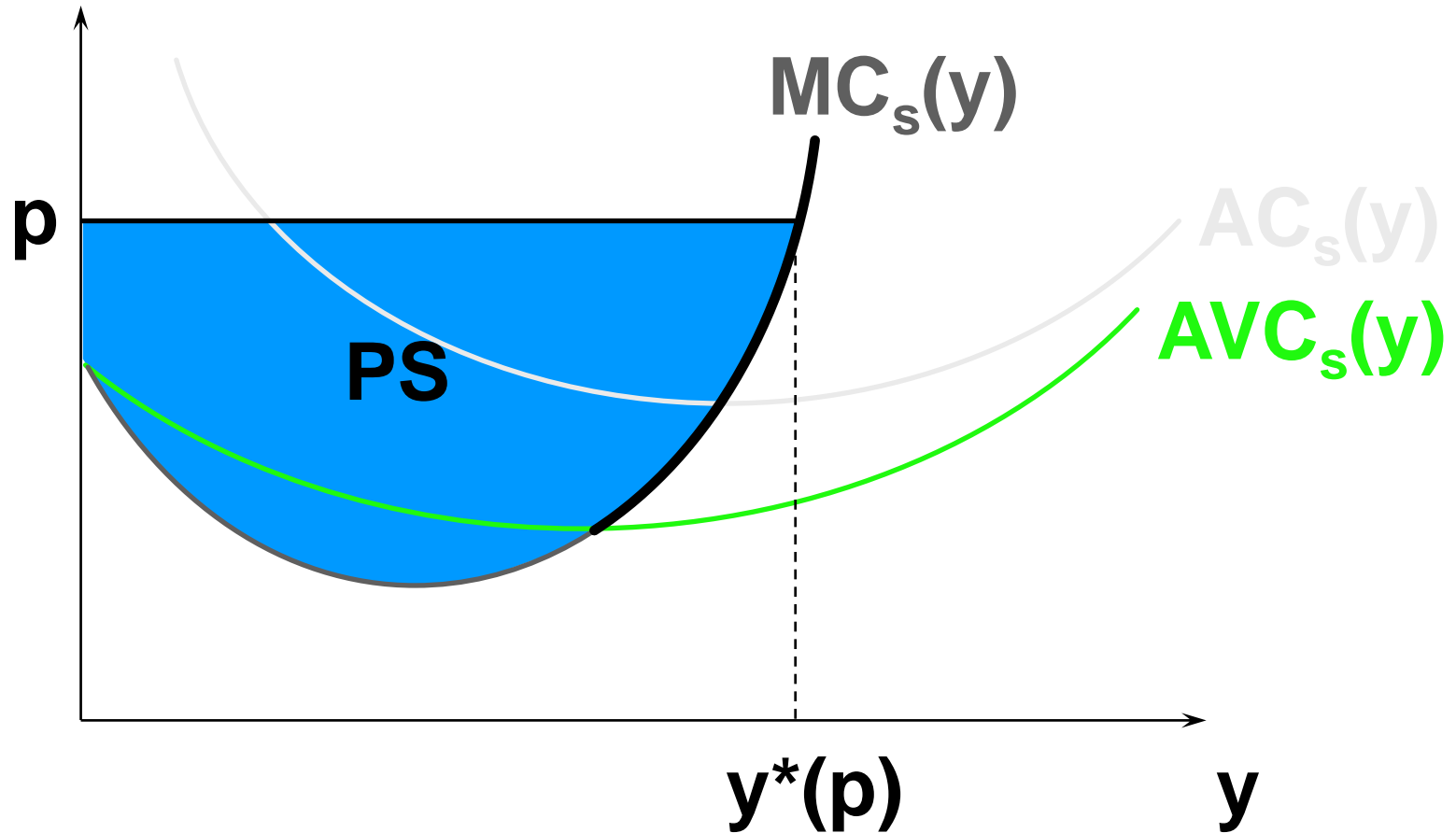
Producer's Surplus Revisited

- **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.**

Supply From A Competitive Industry

☐ **How are the supply decisions of the many individual firms in a competitive industry to be combined to discover the market supply curve for the entire industry?**

Supply From A Competitive Industry

- **Since every firm in the industry is a price-taker, total quantity supplied at a given price is the sum of quantities supplied at that price by the individual firms.**

Short-Run Supply

- **In a short-run the number of firms in the industry is, temporarily, fixed.**
- **Let n be the number of firms;**
  i = 1, … ,n.
- **$S_i(p)$ is firm i's supply function.**

Short-Run Supply

- **In a short-run the number of firms in the industry is, temporarily, fixed.**
- **Let n be the number of firms; i = 1, … ,n.**
- **$S_i(p)$ is firm i's supply function.**
- **The industry's short-run supply function is**

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

Supply From A Competitive Industry

Firm 1's Supply

p

$S_1(p)$

Firm 2's Supply

p

$S_2(p)$

Supply From A Competitive Industry

Firm 1's Supply   **Firm 2's Supply**

$S_1(p')$ $S_1(p)$ $S_2(p)$

$S_1(p')$ $S(p) = S_1(p) + S_2(p)$

Industry's Supply

Supply From A Competitive Industry
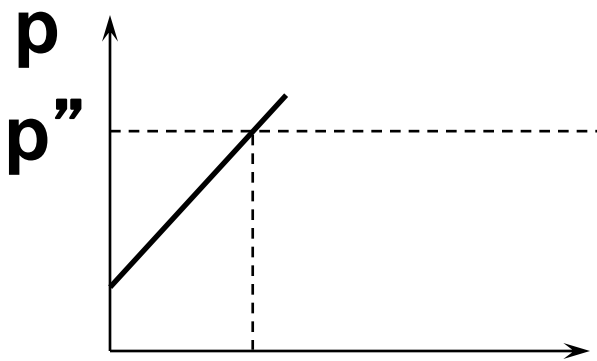
Firm 1's Supply
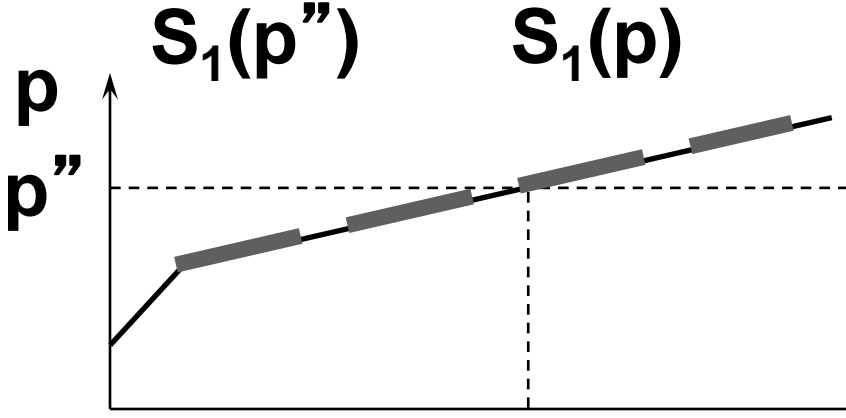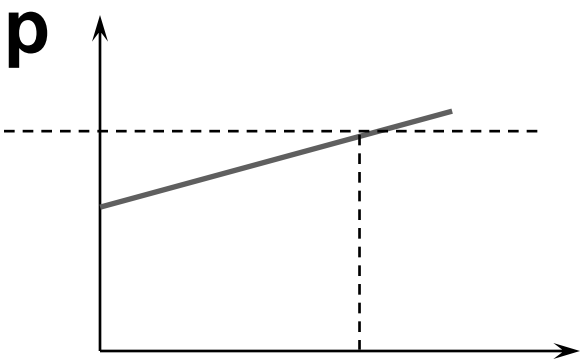
Firm 2's Supply

$$S_1(p'') \qquad S_1(p)$$

$$S_2(p'') \quad S_2(p)$$

$$S_1(p'')+S_2(p'') \qquad S(p) = S_1(p) + S_2(p)$$

Industry's Supply

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Supply From A Competitive Industry

Firm 1's Supply

Firm 2's Supply

p

p

$S_1(p)$

$S_2(p)$

p

$S(p) = S_1(p) + S_2(p)$
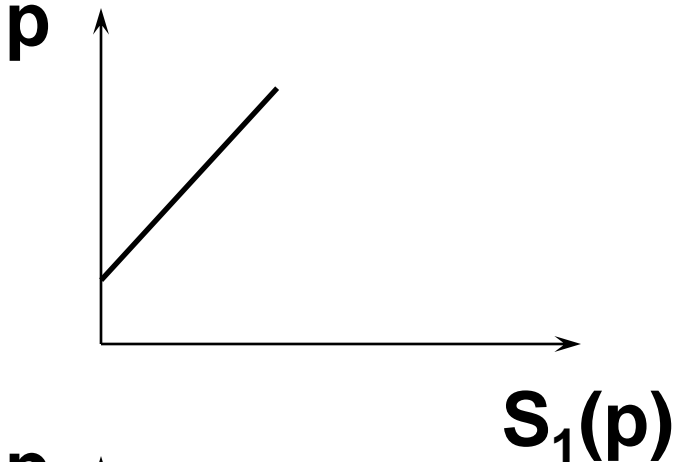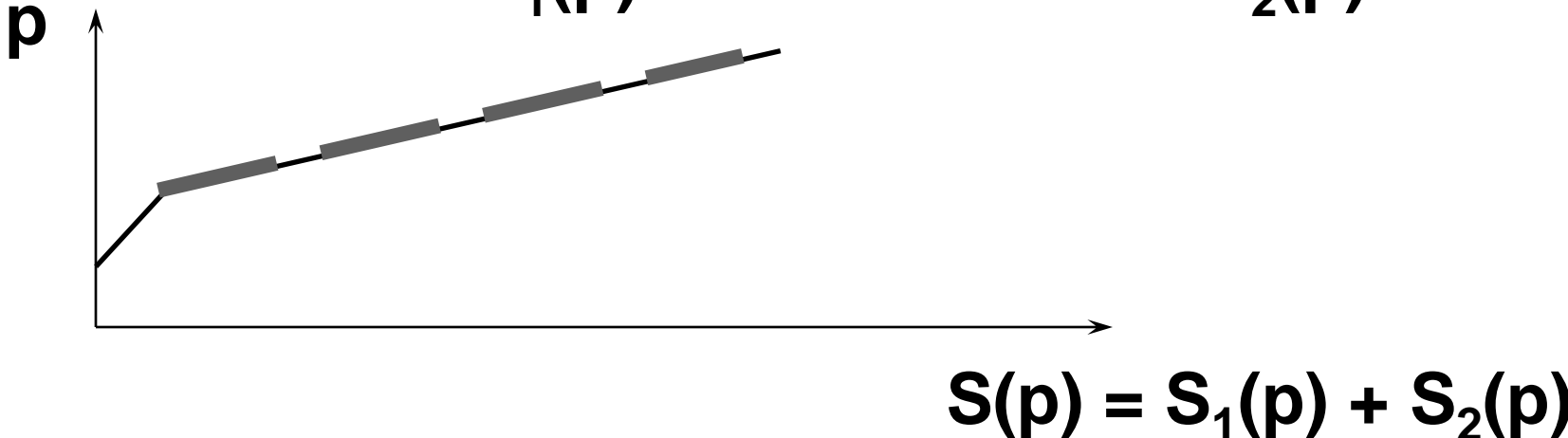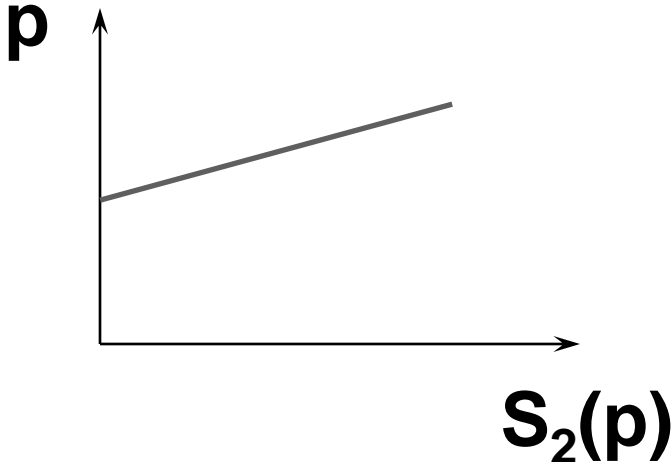
Industry's Supply

Short-Run Industry Equilibrium

☐ **In a short-run, neither entry nor exit can occur.**

☐ **Consequently, in a short-run equilibrium, some firms may earn positive economics profits, others may suffer economic losses, and still others may earn zero economic profit.**

Short-Run Industry Equilibrium
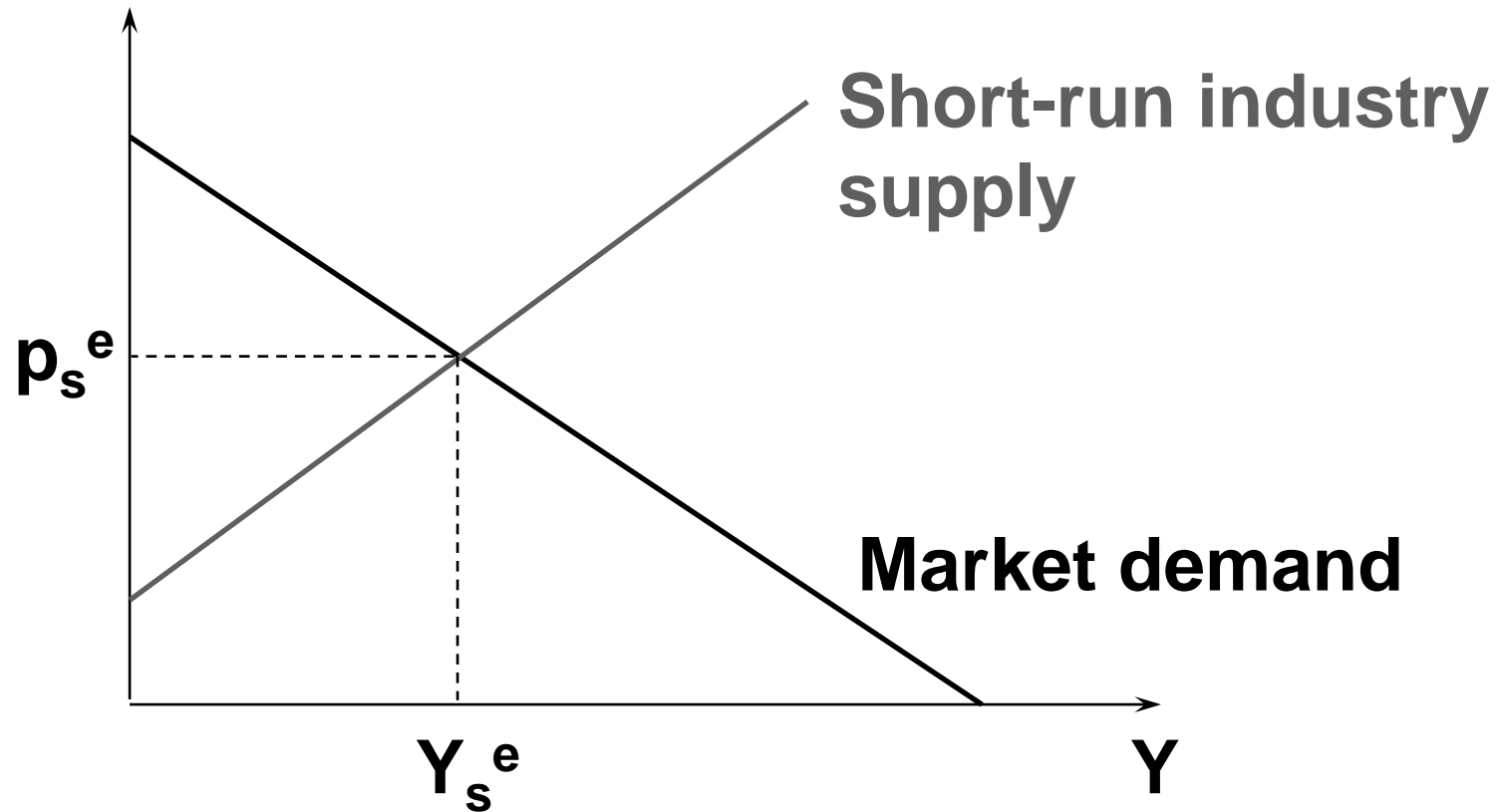
Short-run equilibrium price clears the market and is taken as given by each firm.

Short-Run Industry Equilibrium
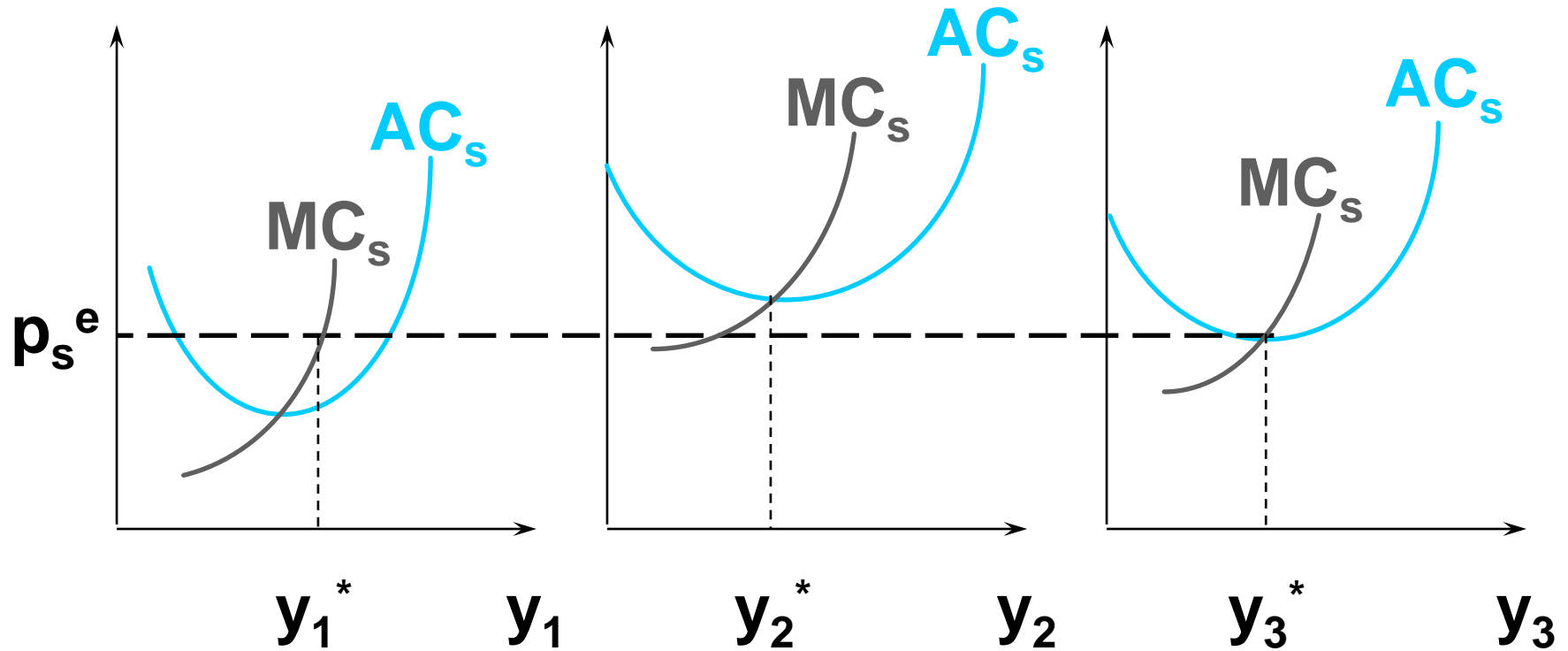
Firm 1 **Firm 2** **Firm 3**

AC_s

MC_s

p_s^e

AC_s

MC_s

AC_s

MC_s

y_1^* y_1 y_2^* y_2 y_3^* y_3

Short-Run Industry Equilibrium

Firm 1   **Firm 2**   **Firm 3**

AC_s

MC_s

AC_s

MC_s

AC_s

MC_s

p_s^e

$\Pi_1 > 0$ $\Pi_2 < 0$ $\Pi_3 = 0$

y_1^* y_1 y_2^* y_2 y_3^* y_3

Short-Run Industry Equilibrium

Firm 1   **Firm 2**   **Firm 3**

p_s^e

AC_s MC_s AC_s MC_s AC_s

$\Pi_1 > 0$ $\Pi_2 < 0$ $\Pi_3 = 0$
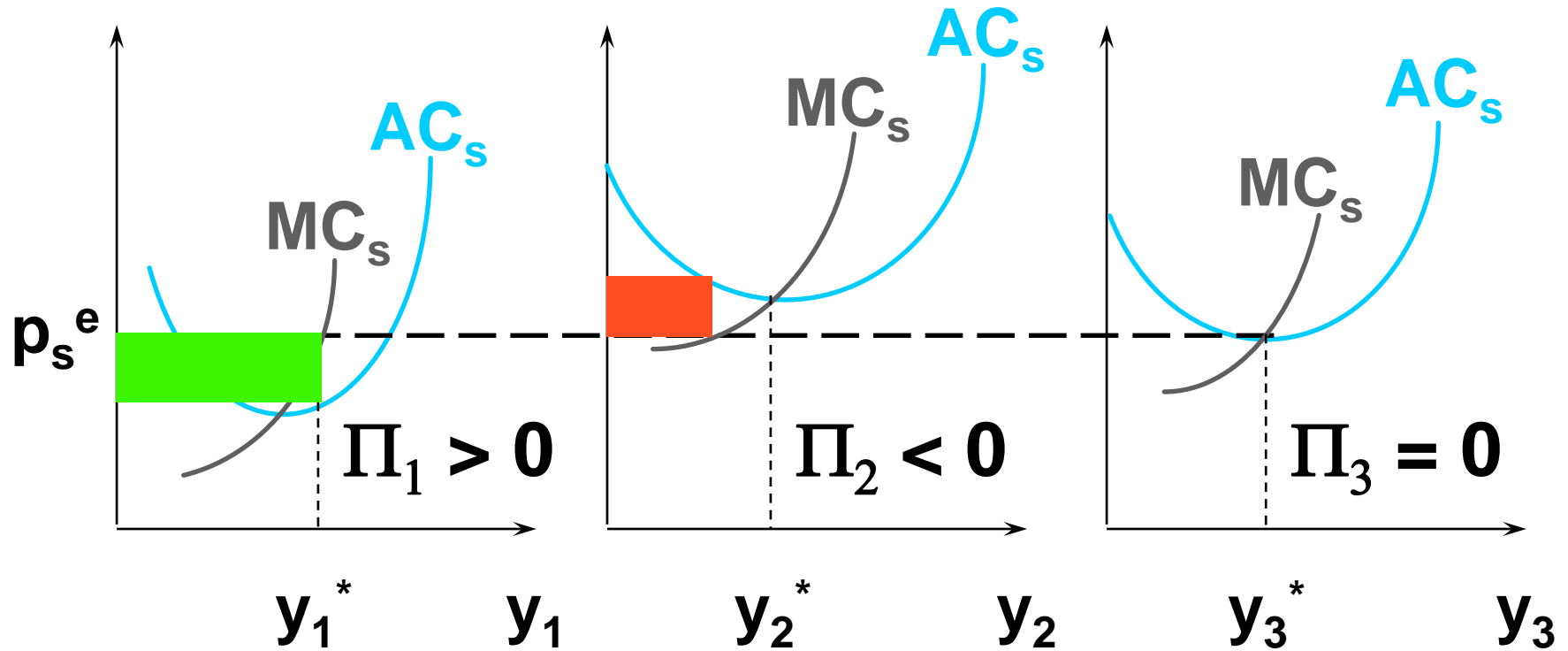
y_1^* y_1 y_2^* y_2 y_3^* y_3
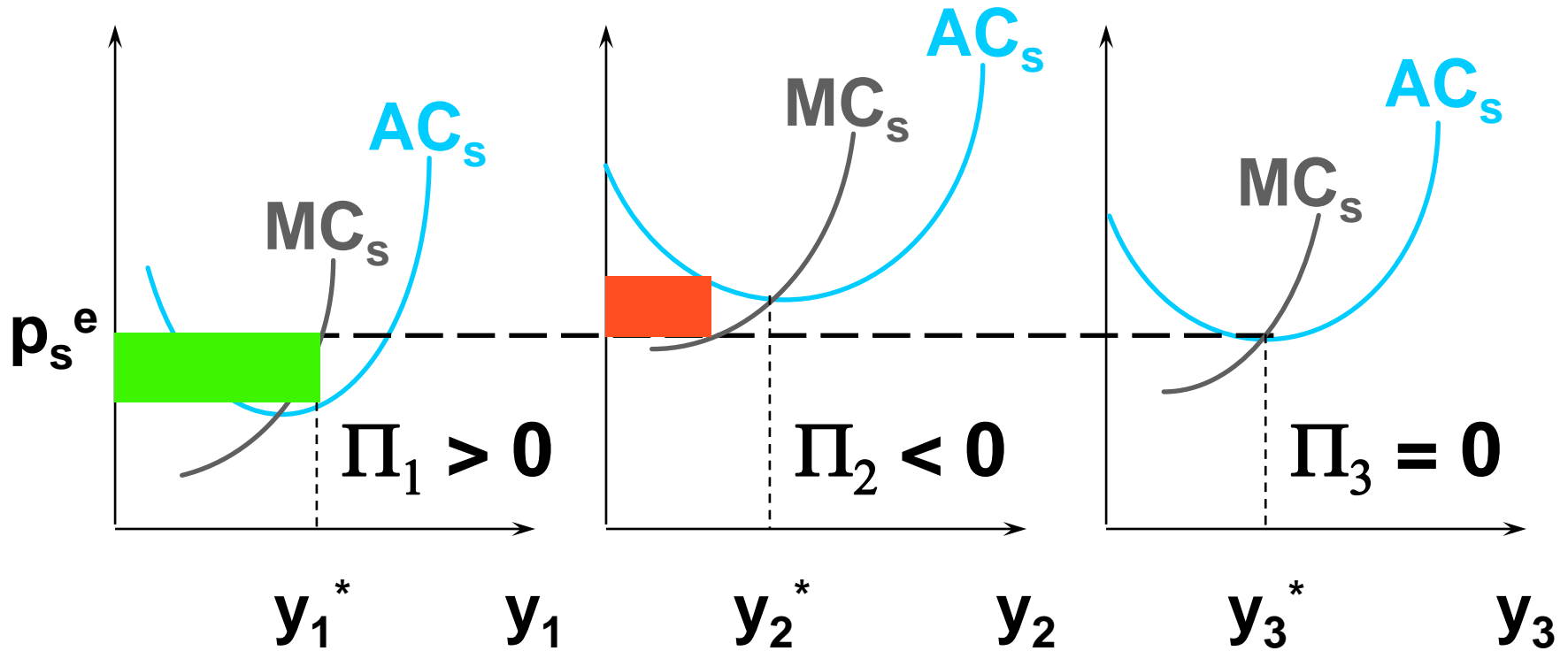
Firm 1 wishes to remain in the industry.

Firm 2 wishes to exit from the industry.

Firm 3 is indifferent.

Long-Run Industry Supply

- **In the long-run every firm now in the industry is free to exit and firms now outside the industry are free to enter.**

- **The industry's long-run supply function must account for entry and exit as well as for the supply choices of firms that choose to be in the industry.**

- **How is this done?**

Long-Run Industry Supply

- **Positive economic profit induces entry.**
- **Economic profit is positive when the market price p_s^e is higher than a firm's minimum av. total cost; $p_s^e > \min AC(y)$.**
- **Entry increases industry supply, causing p_s^e to fall.**
- **When does entry cease?**

Long-Run Industry Supply

The Market   **A "Typical" Firm**

Mkt. Demand

$S^2(p)$

Mkt. Supply

MC(y)   **AC(y)**
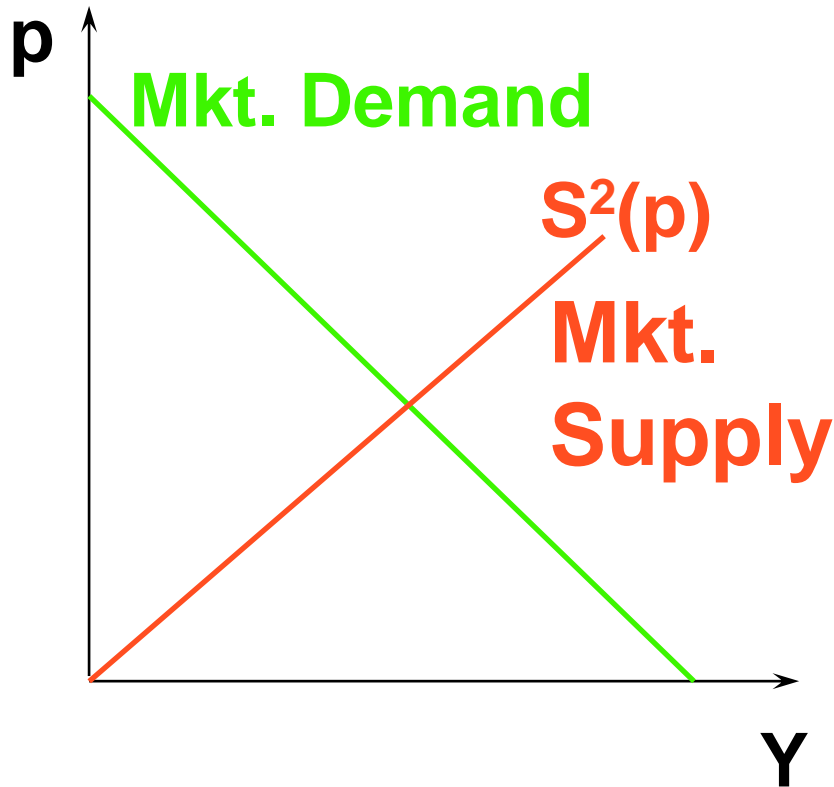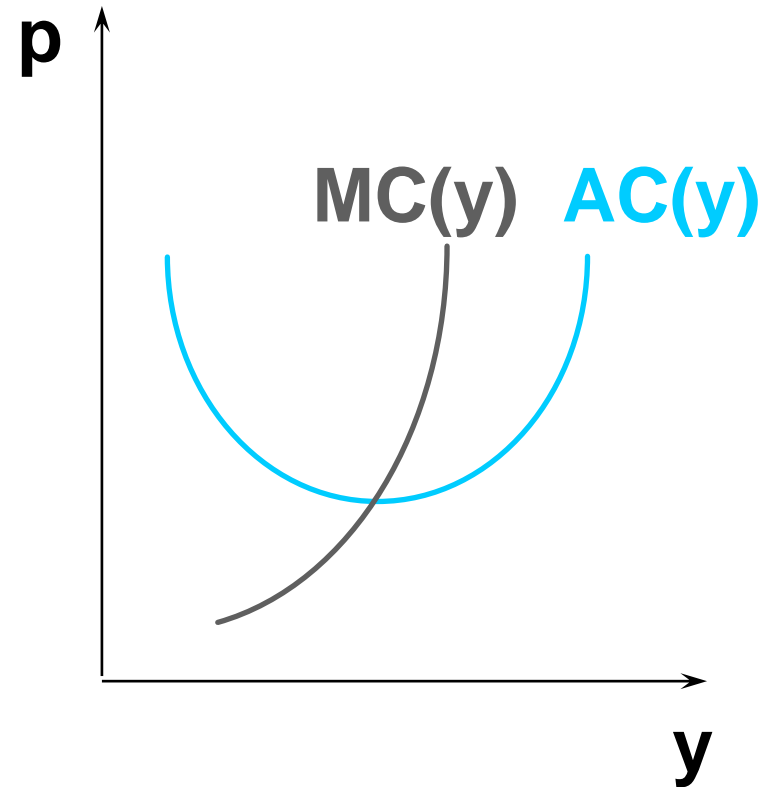
Suppose the industry initially contains only two firms.

Long-Run Industry Supply
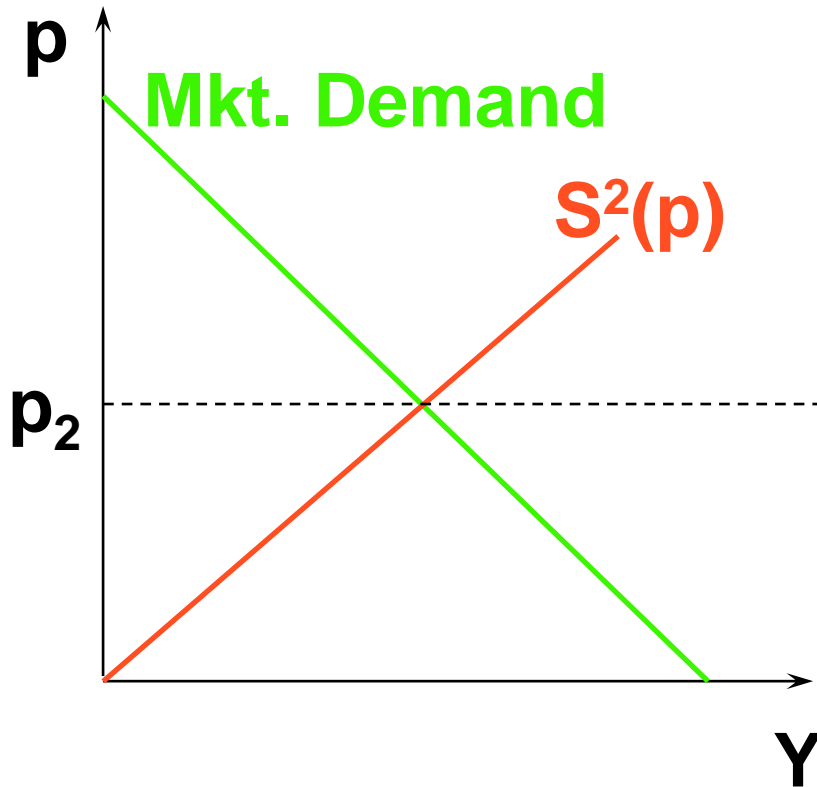
The Market   **A "Typical" Firm**
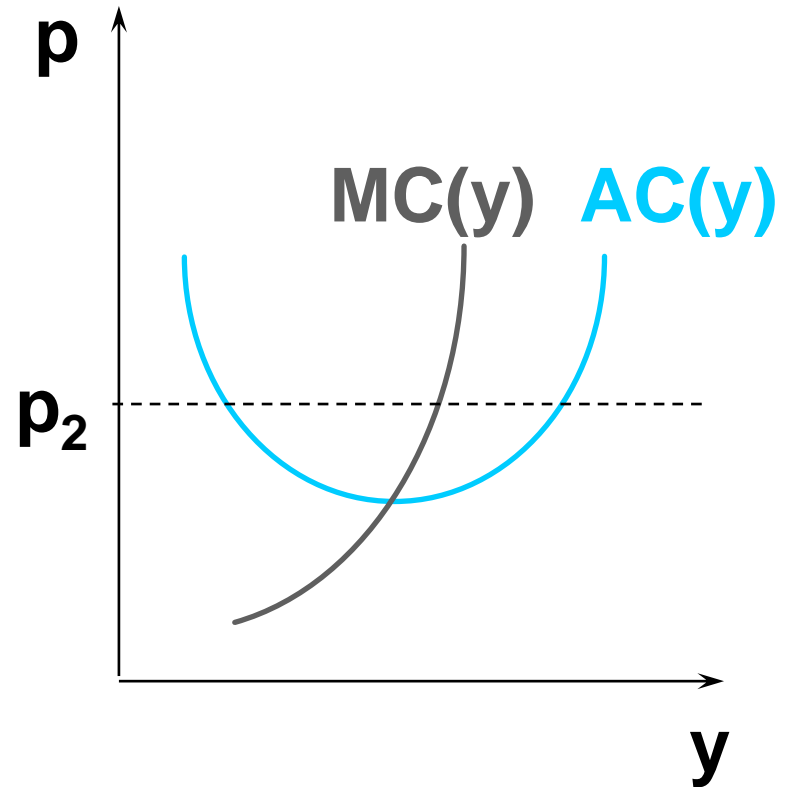
Then the market-clearing price is p_2.

Long-Run Industry Supply
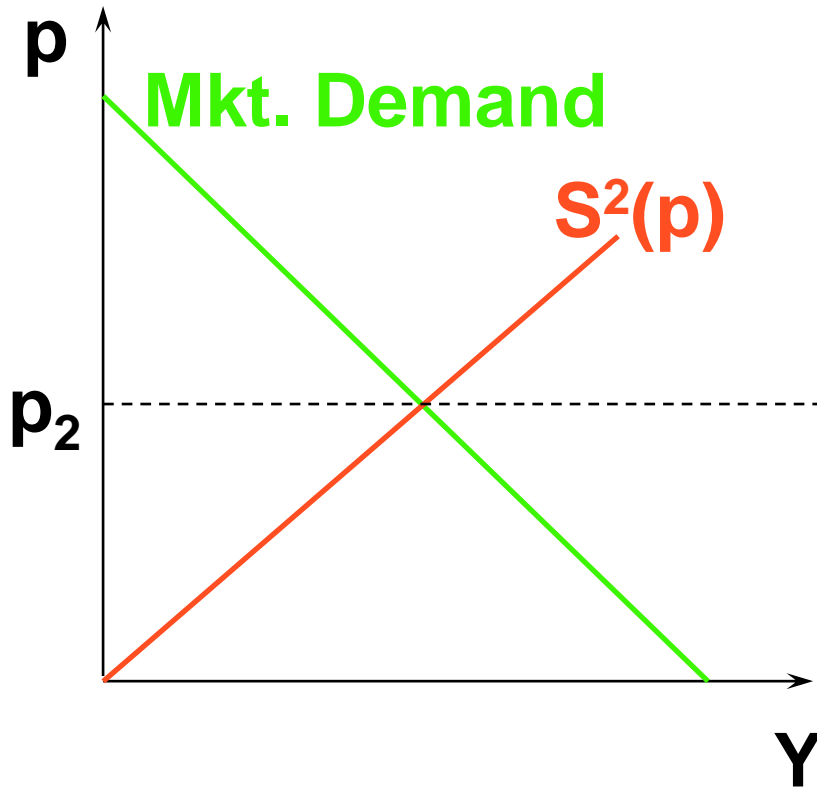
The Market   **A "Typical" Firm**
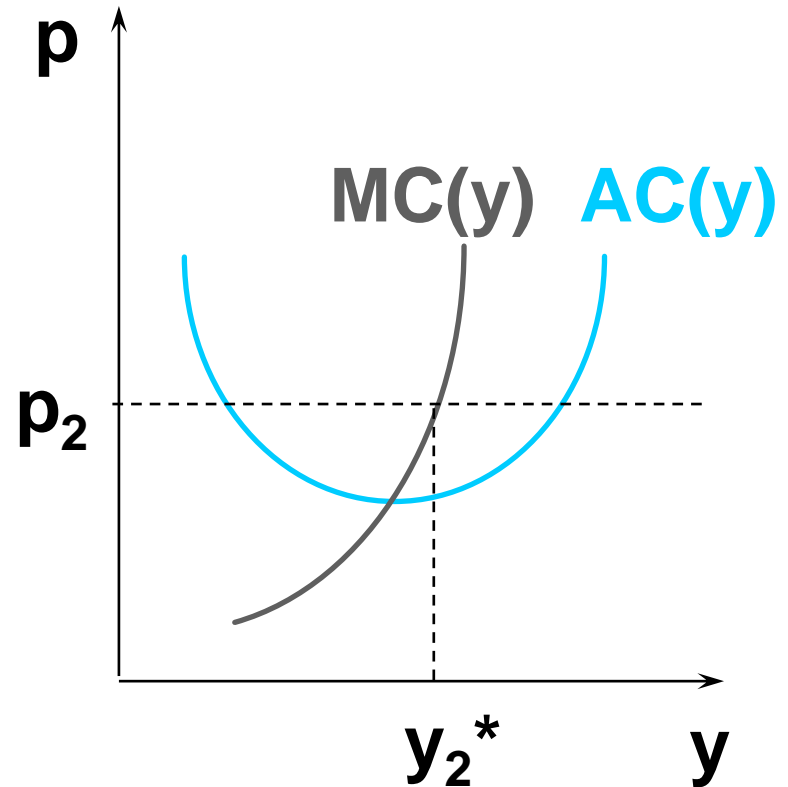
**Then the market-clearing price is p_2.
Each firm produces y_2^* units of output.**

Long-Run Industry Supply
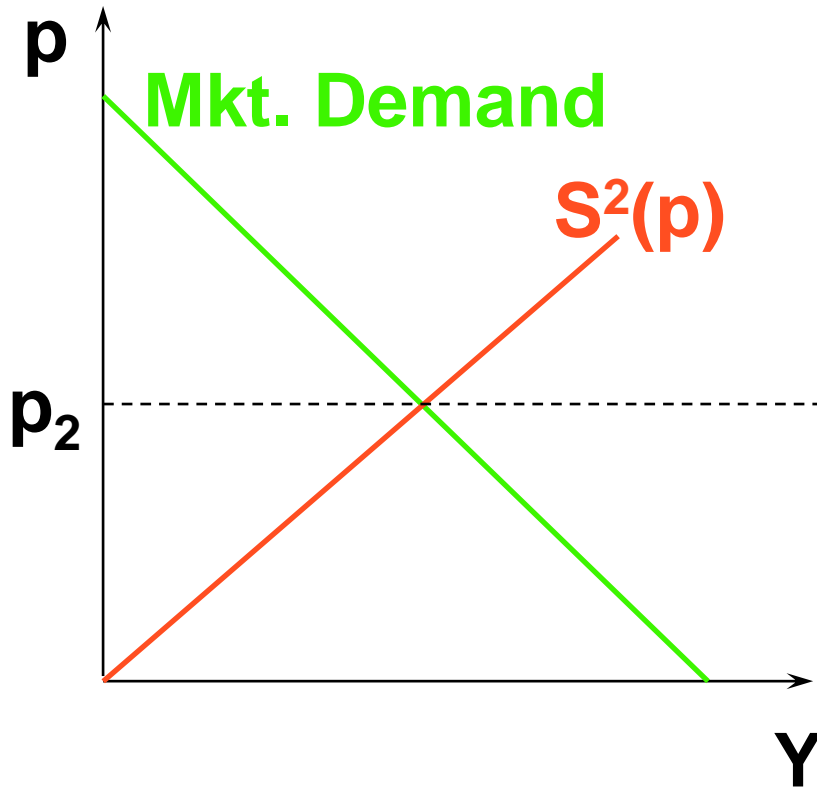
The Market   **A "Typical" Firm**
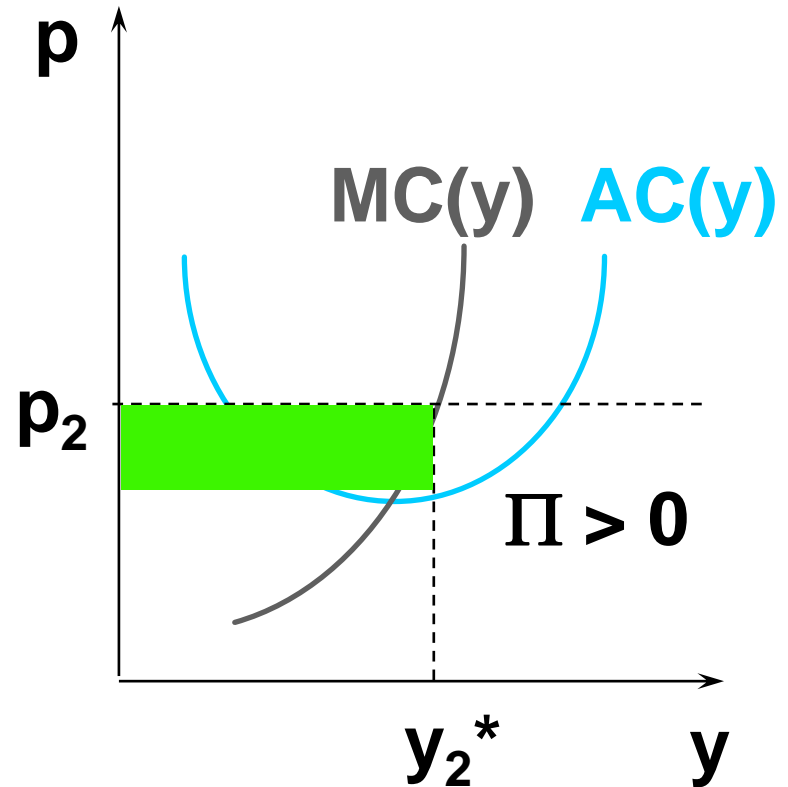
Each firm makes a positive economic profit, inducing entry by another firm.

Long-Run Industry Supply

The Market   **A "Typical" Firm**

Mkt. Demand

$S^2(p)$

$S^3(p)$

p_2

Y

MC(y)   **AC(y)**

p_2

y_2^* y
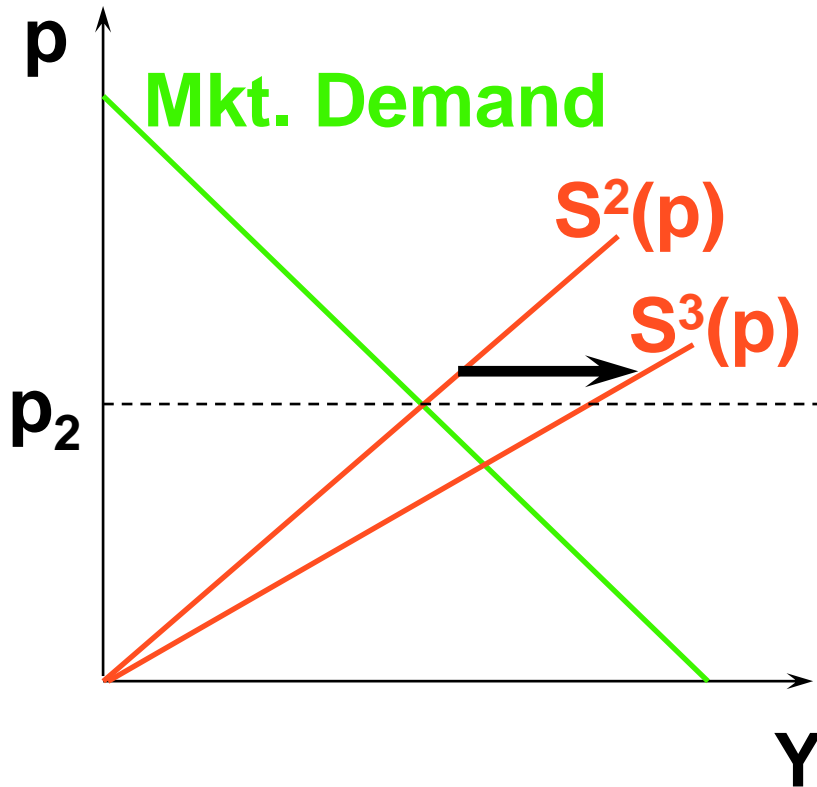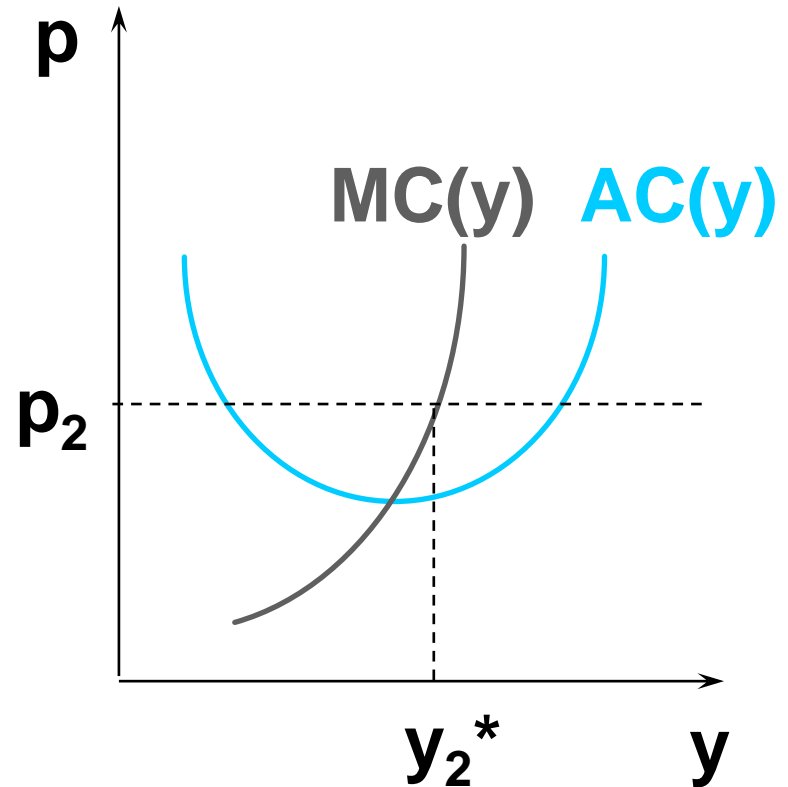
Market supply shifts outwards.

Long-Run Industry Supply

The Market   **A "Typical" Firm**

Mkt. Demand

$S^2(p)$

$S^3(p)$

p_2

MC(y)   **AC(y)**

p_2

Y

y_2^* y
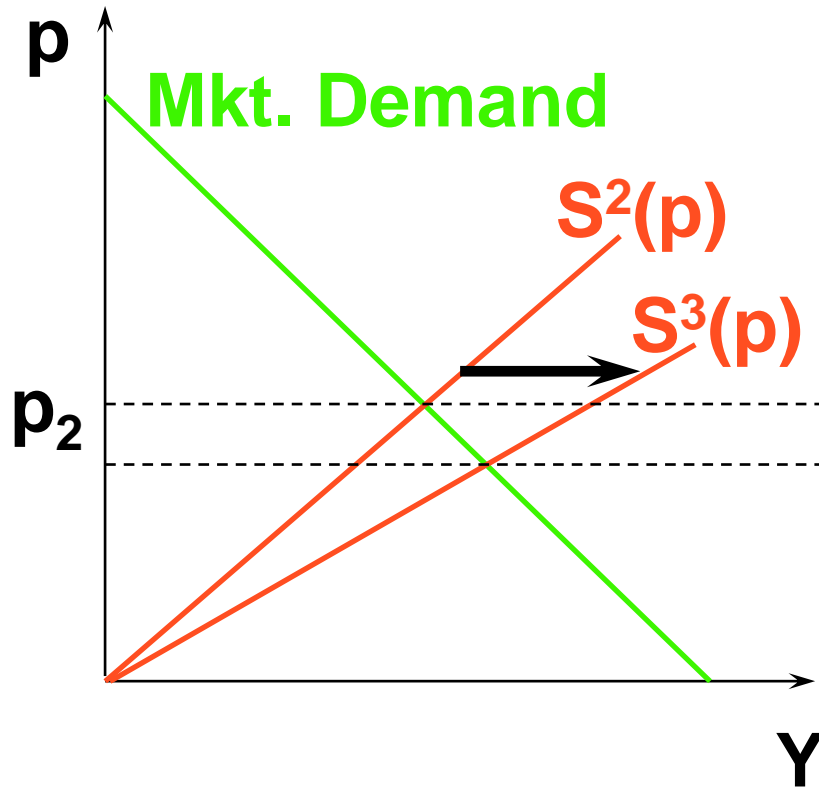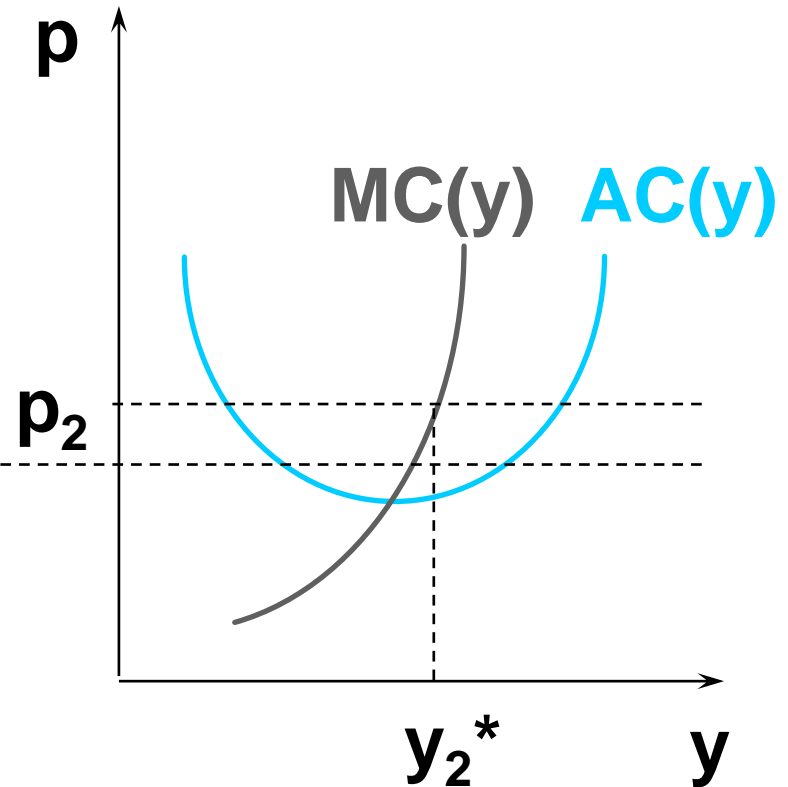
Market supply shifts outwards.
Market price falls.

Long-Run Industry Supply

The Market

Mkt. Demand

$S^2(p)$

$S^3(p)$

p_3

Y

A "Typical" Firm

MC(y)   AC(y)

p_3

y_3^* y
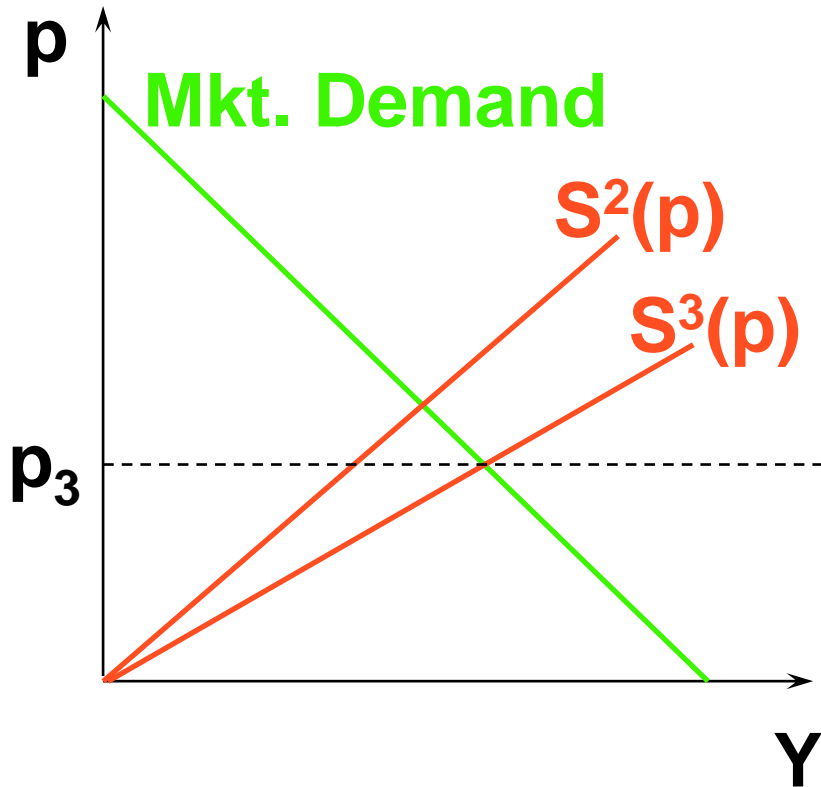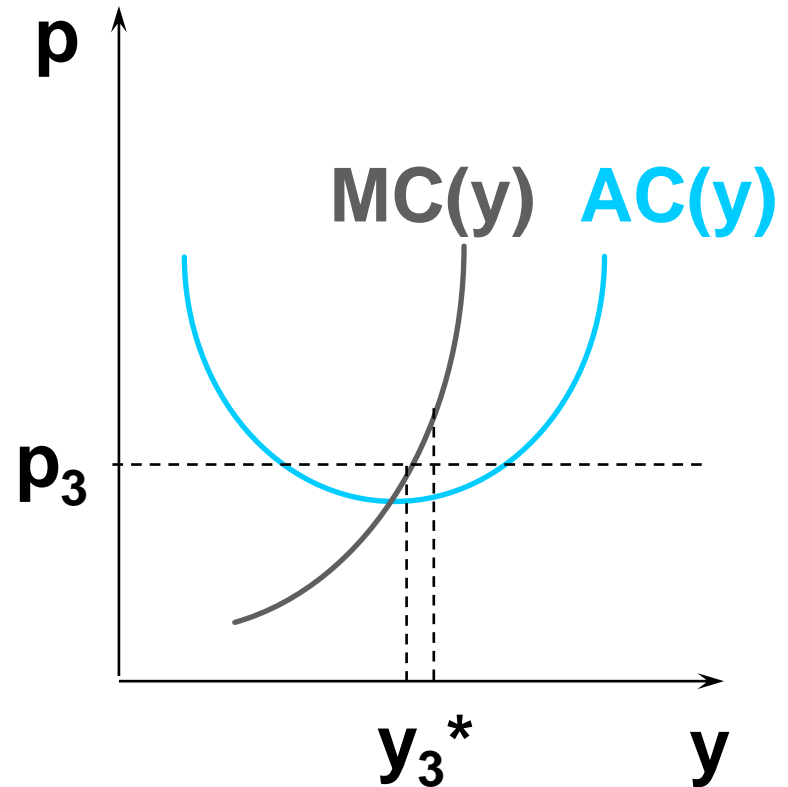
Each firm produces less.

Long-Run Industry Supply

The Market   **A "Typical" Firm**

Mkt. Demand

$S^2(p)$

$S^3(p)$

p_3

Y

MC(y)   **AC(y)**

p_3

$\Pi > 0$

$y_3{}^*$ y
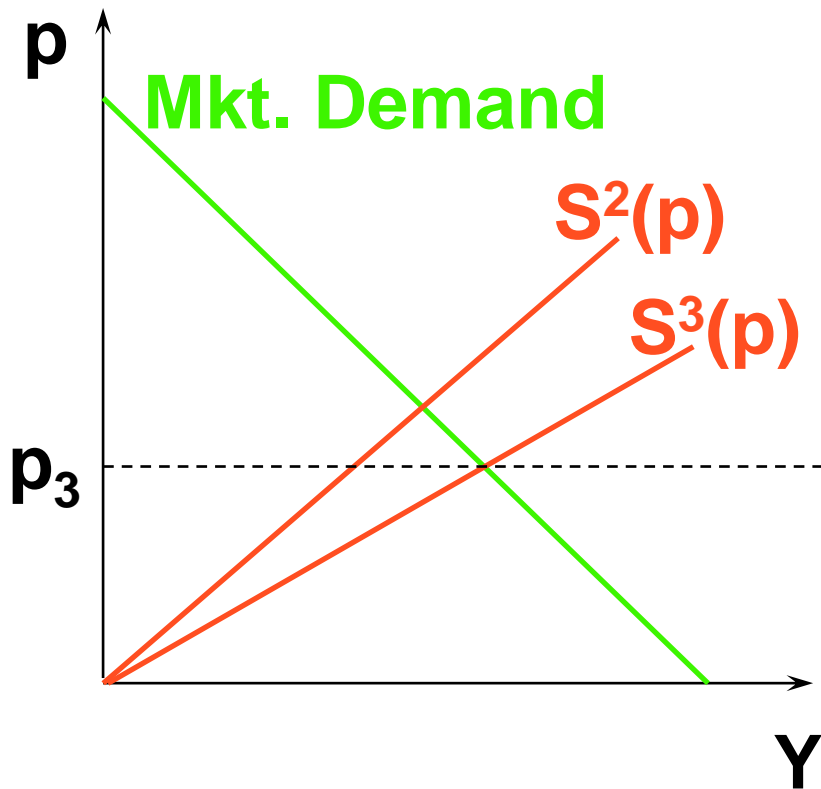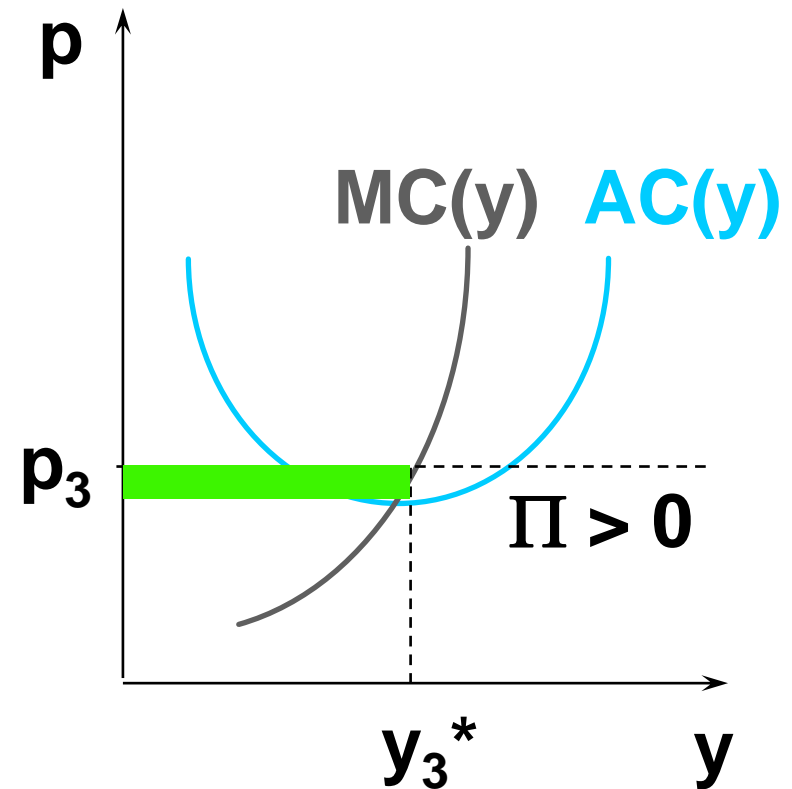
Each firm produces less.
Each firm's economic profit is reduced.

Long-Run Industry Supply
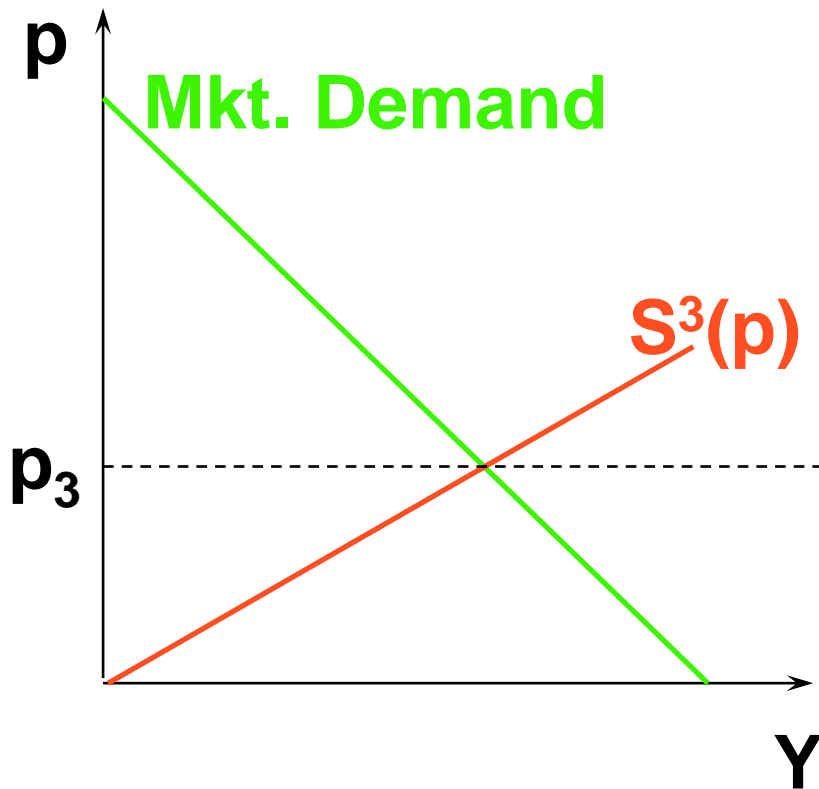
The Market
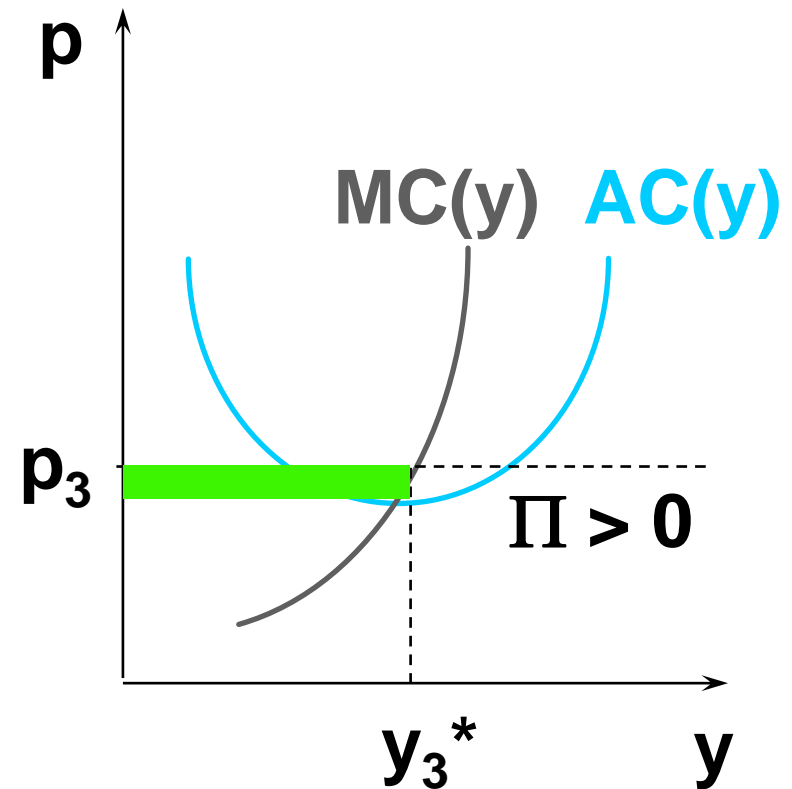
A "Typical" Firm

Each firm's economic profit is positive. Will another firm enter?

Long-Run Industry Supply
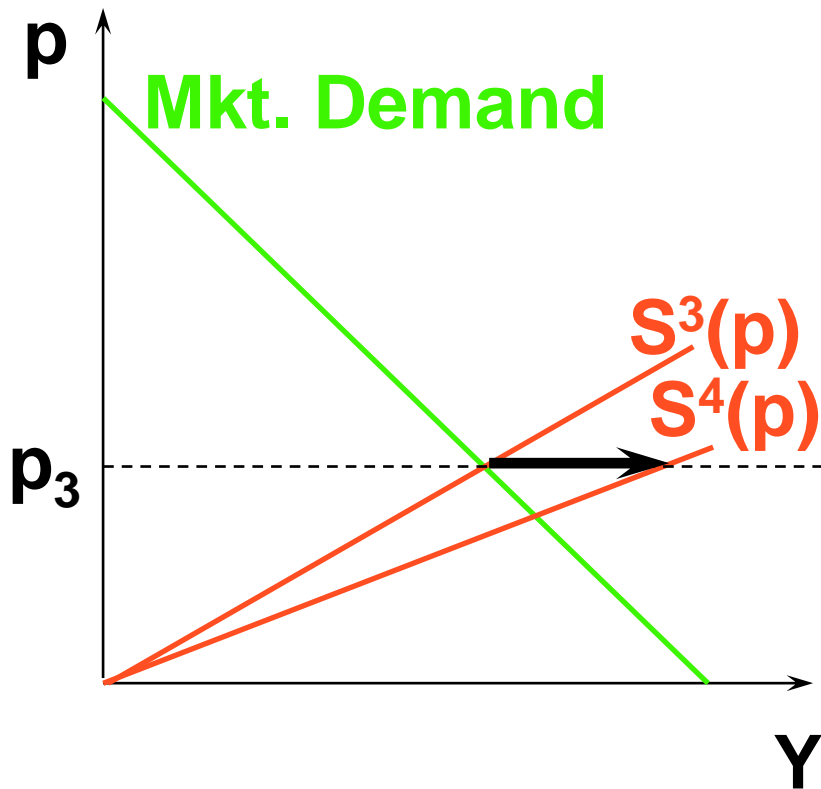
The Market   **A "Typical" Firm**
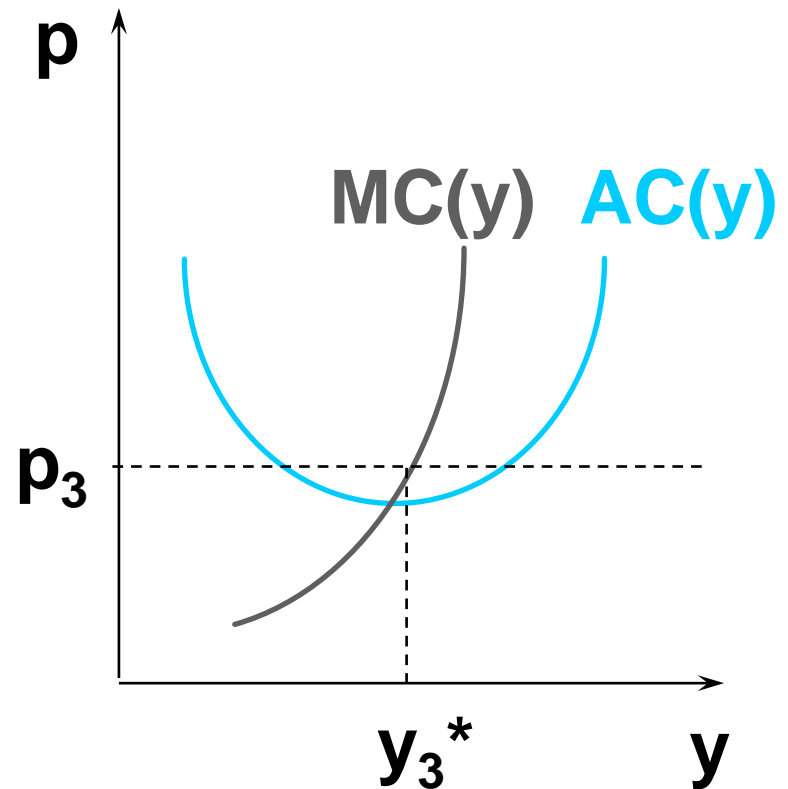
Market supply would shift outwards again.

Long-Run Industry Supply
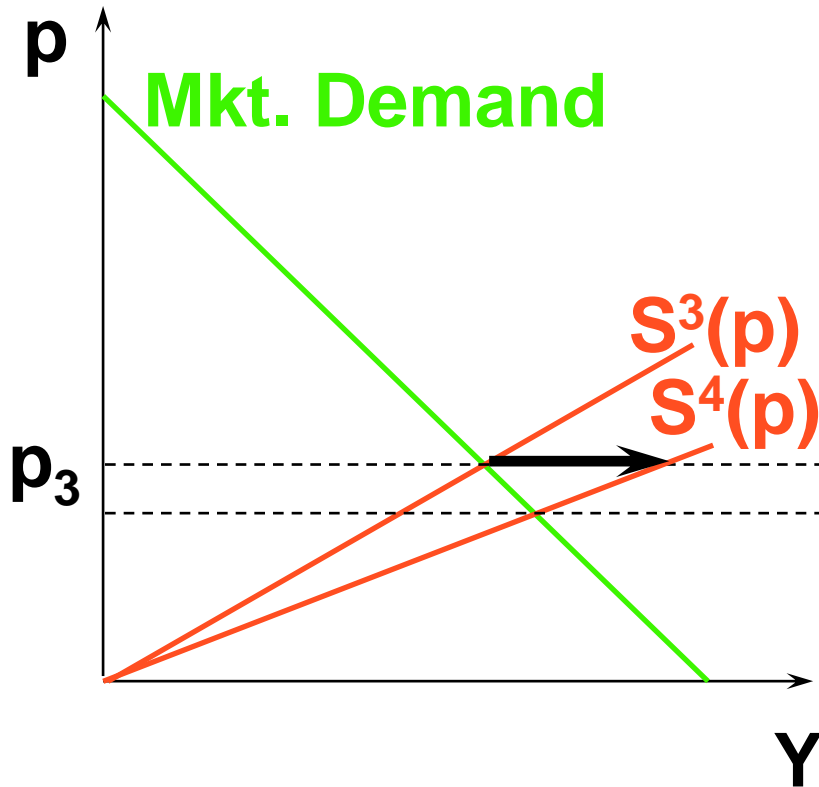
The Market
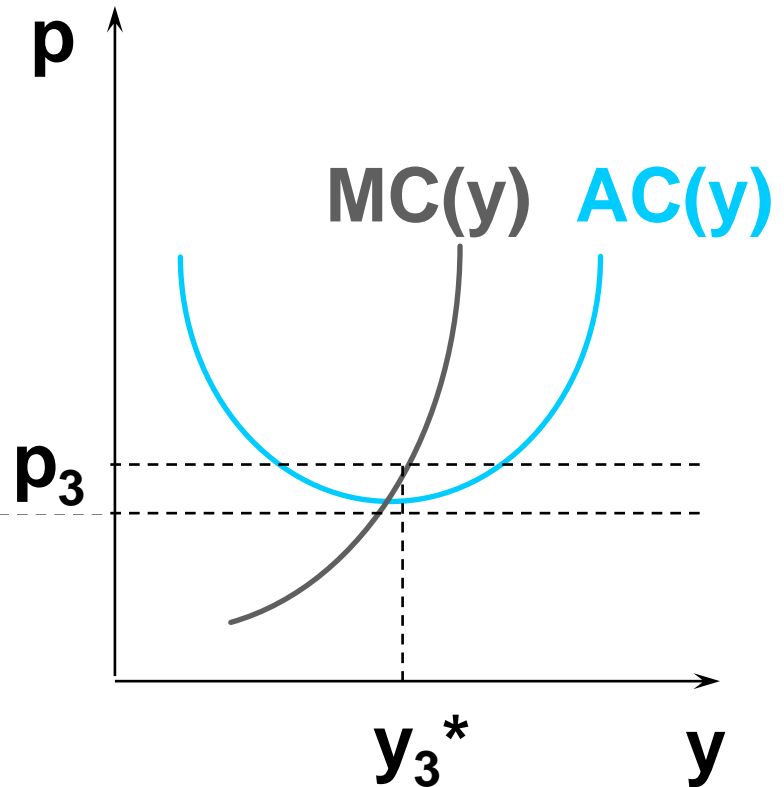
A "Typical" Firm

Market supply would shift outwards again.
Market price would fall again.

Long-Run Industry Supply
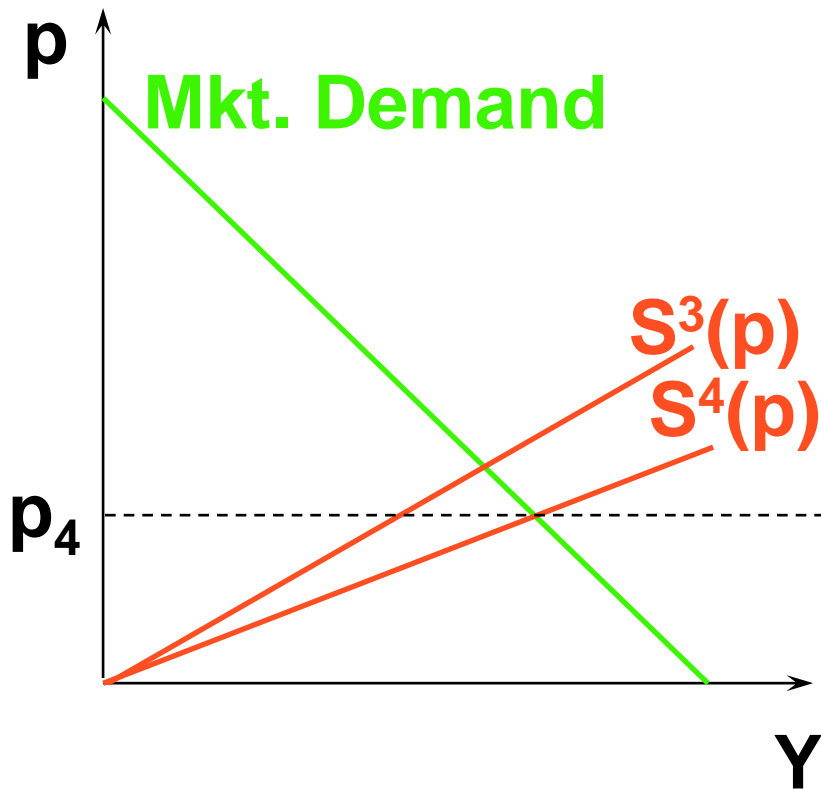
The Market   **A "Typical" Firm**
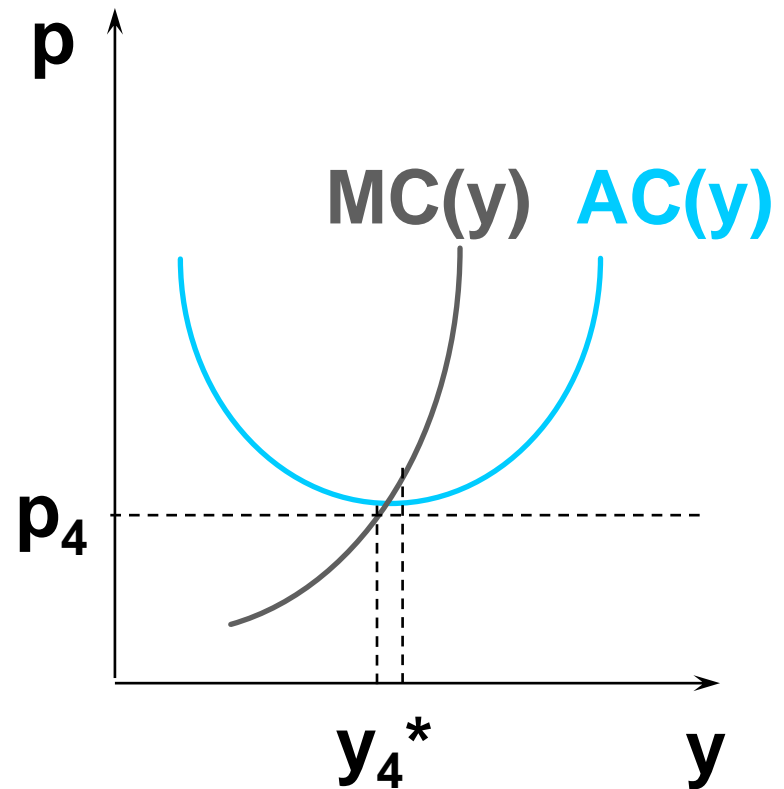
Each firm would produce less again.

Long-Run Industry Supply
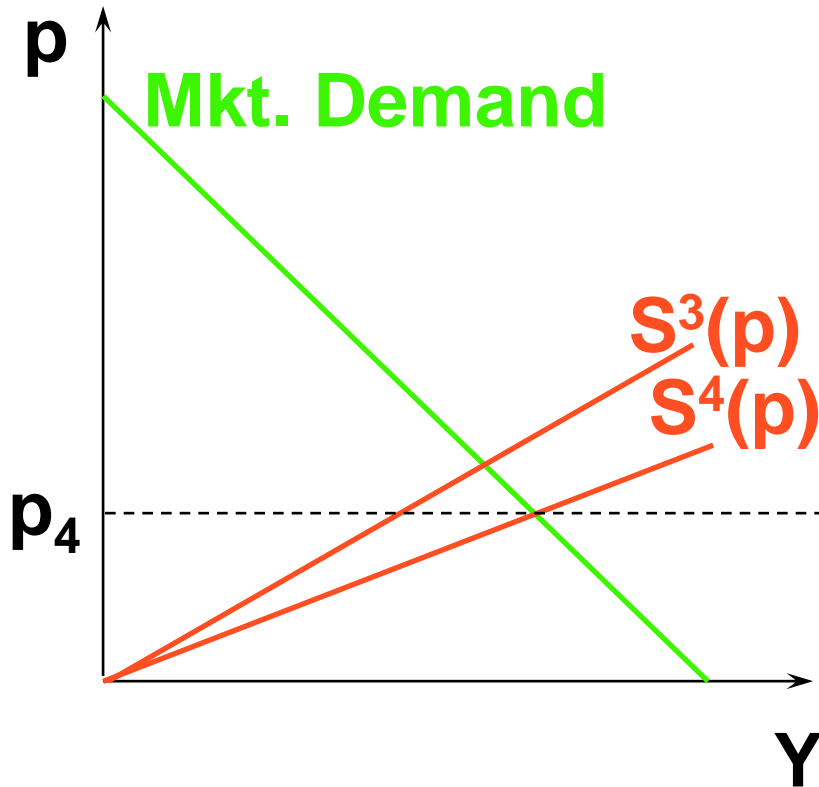
The Market

A "Typical" Firm

Mkt. Demand

$S^3(p)$

$S^4(p)$

p_4

MC(y)   **AC(y)**

p_4

$\Pi < 0$

y_4^*

Y

y
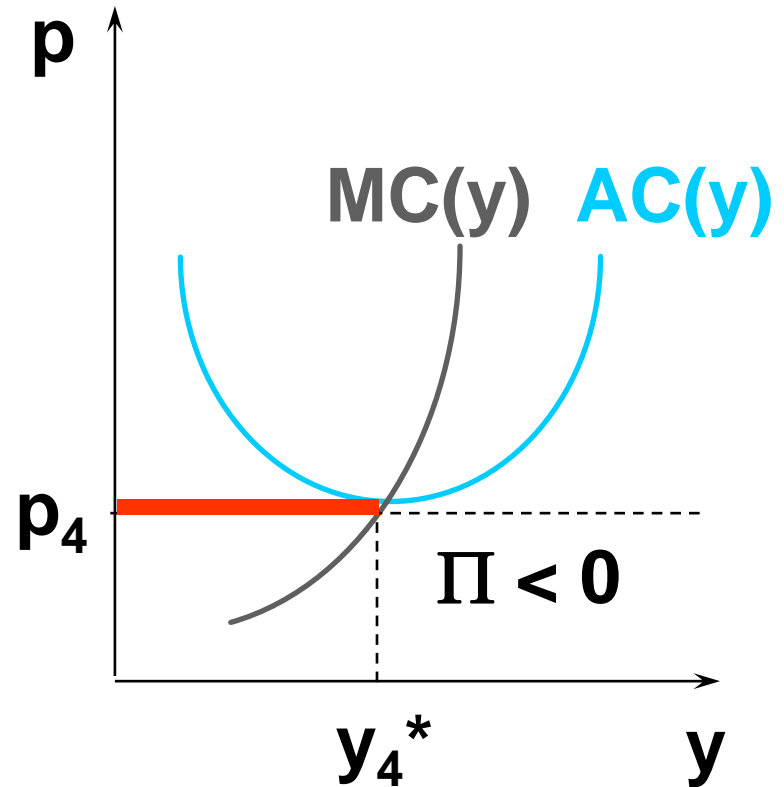
Each firm would produce less again. Each firm's economic profit would be negative.

Long-Run Industry Supply
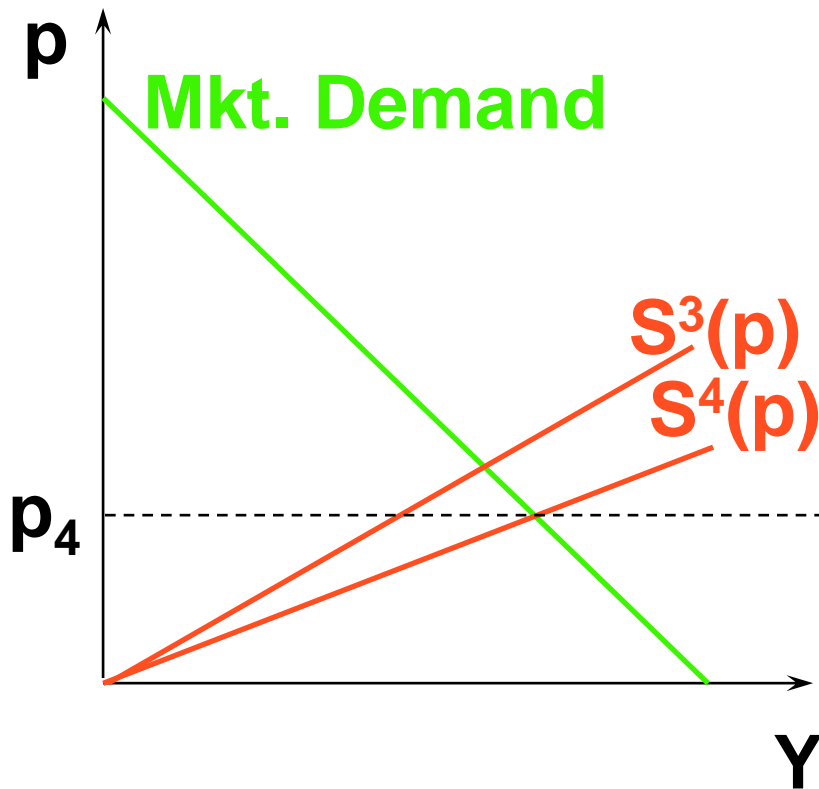
The Market   **A "Typical" Firm**
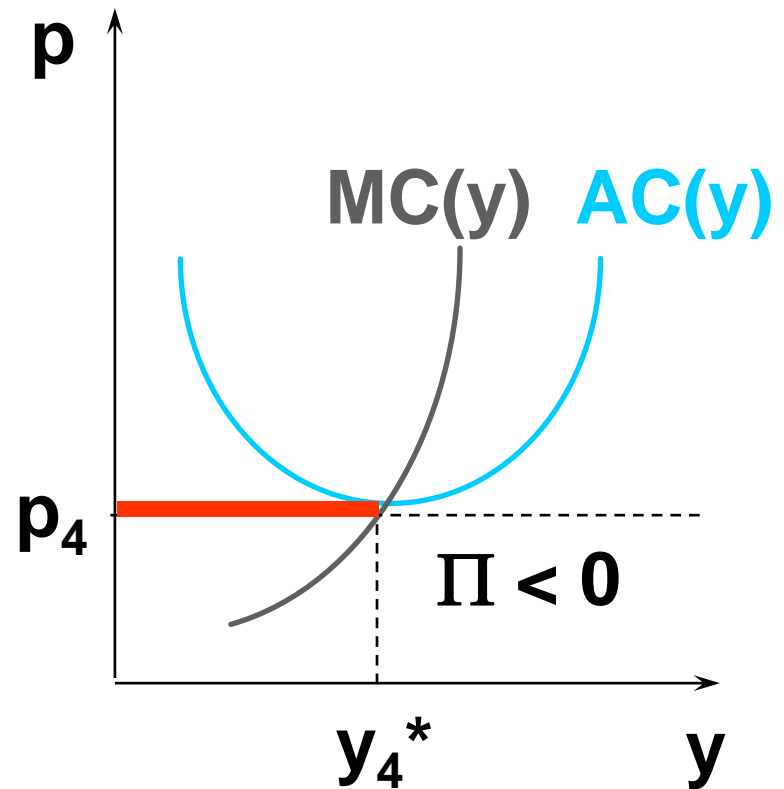
Each firm would produce less again. Each firm's economic profit would be negative. So the fourth firm would not enter.

Long-Run Industry Supply

☐ **The long-run number of firms in the industry is the largest number for which the market price is at least as large as min AC(y).**

☐ **Now we can construct the industry's long-run supply curve.**

Long-Run Industry Supply

 Suppose that market demand is large enough to sustain only two firms in the industry.

Long-Run Industry Supply
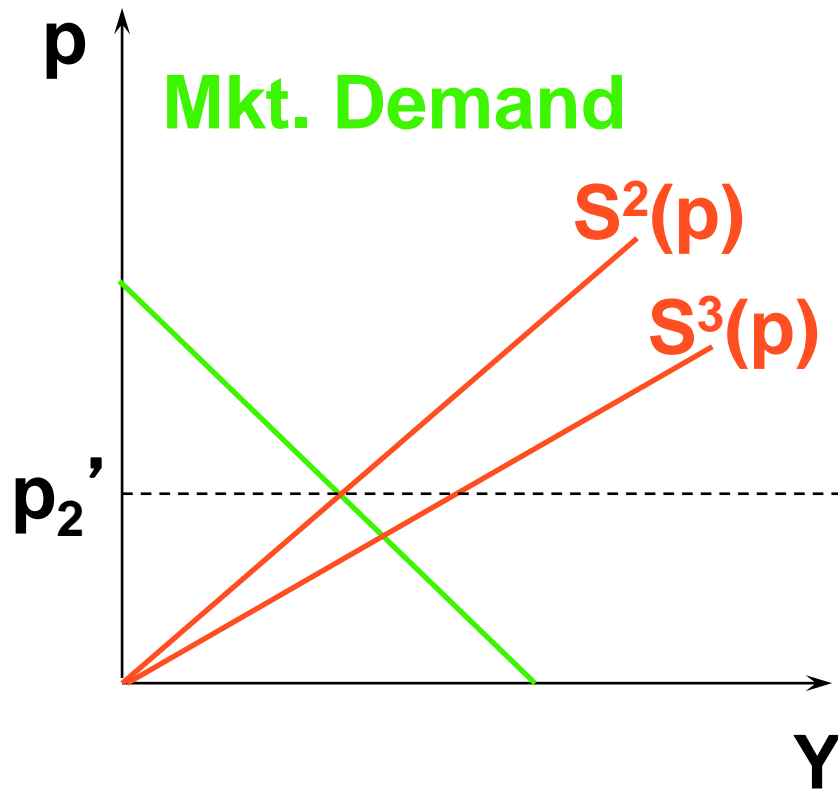
The Market

A "Typical" Firm
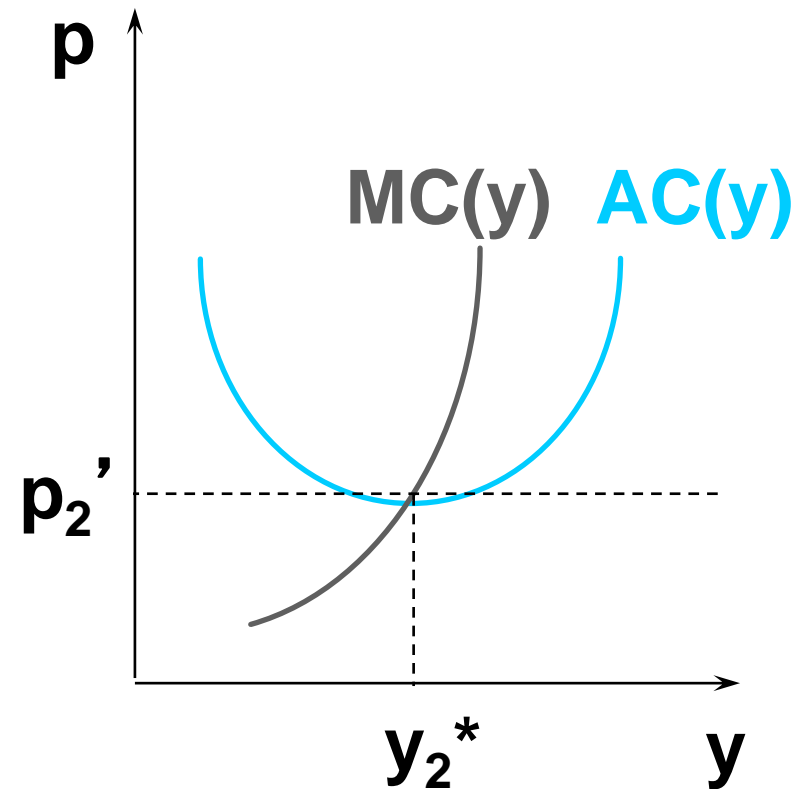
Long-Run Industry Supply

- **Suppose that market demand is large enough to sustain only two firms in the industry.**

- **Then market demand increases, the market price rises, each firm produces more, and earns a higher economic profit.**
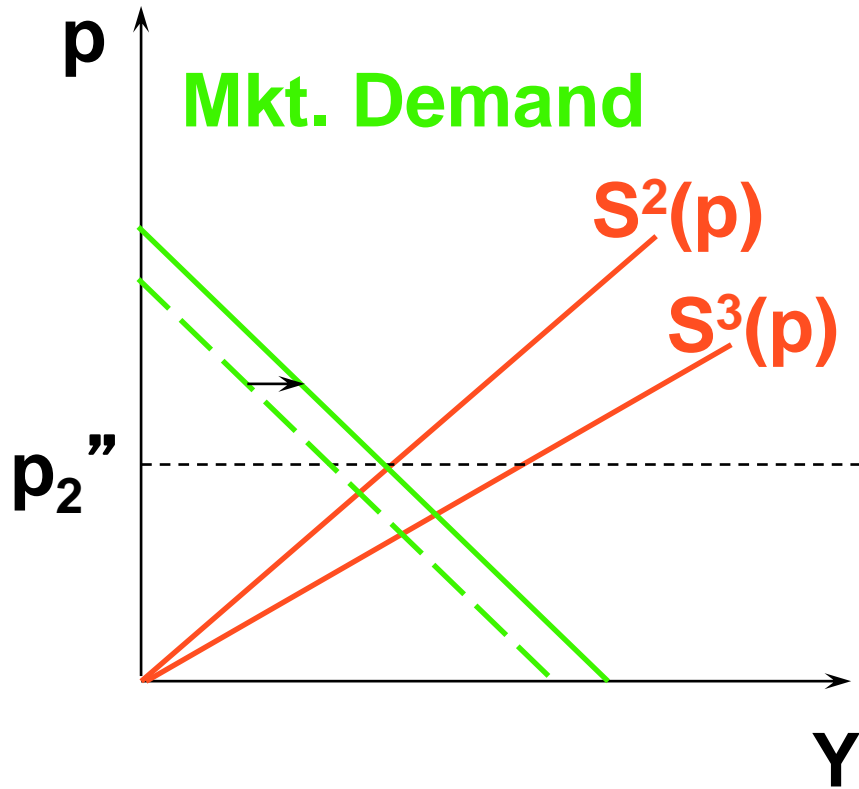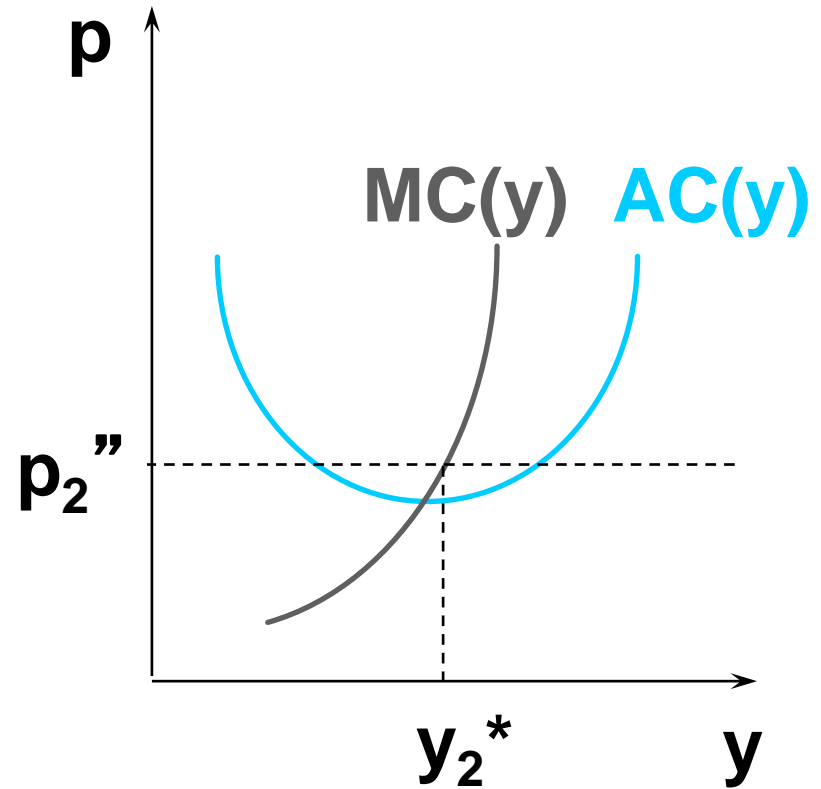
Long-Run Industry Supply
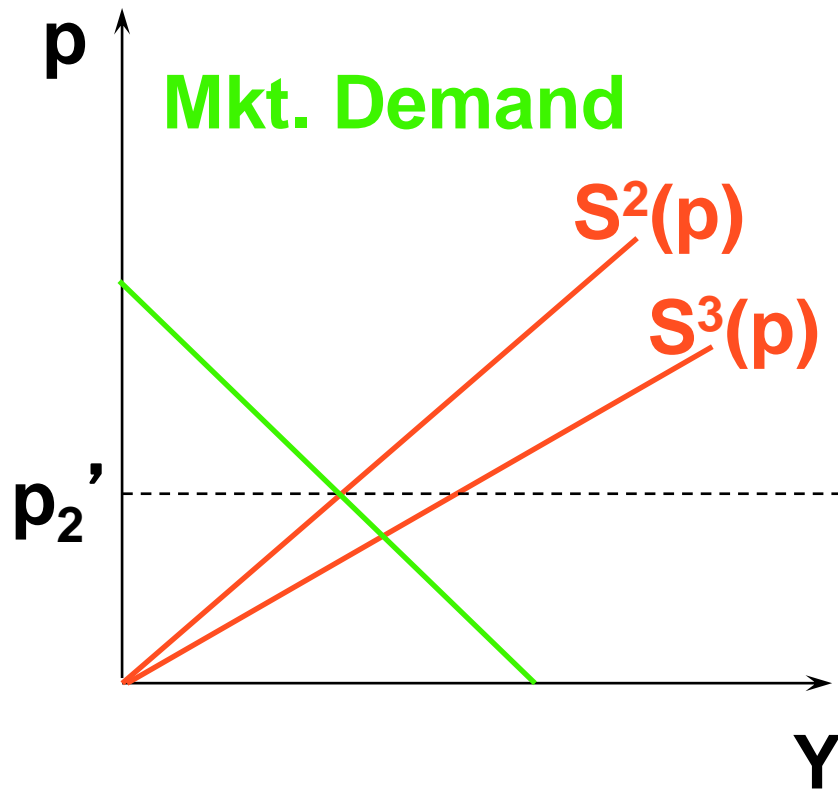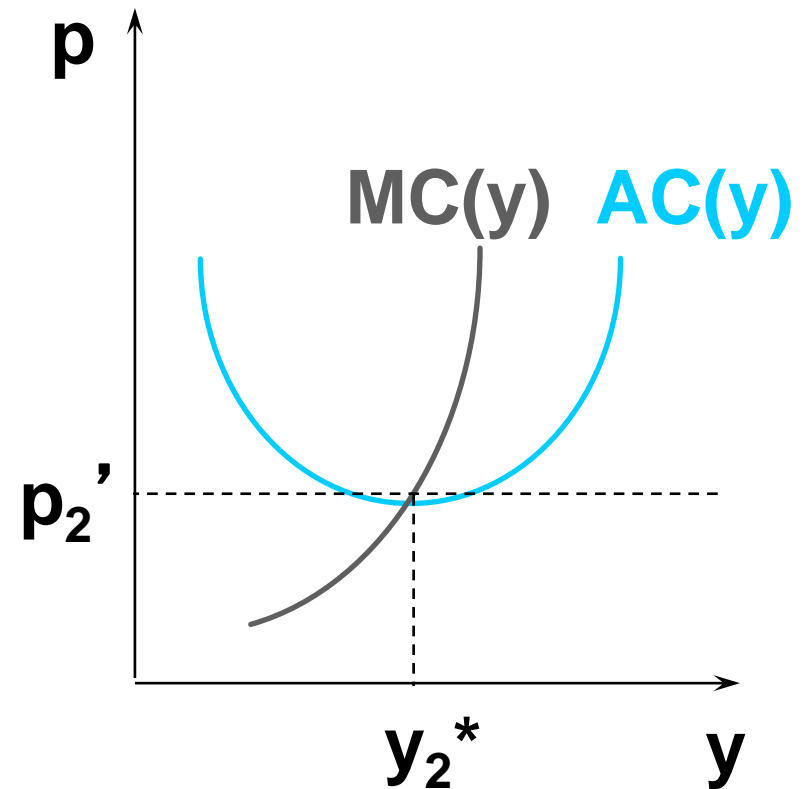
The Market

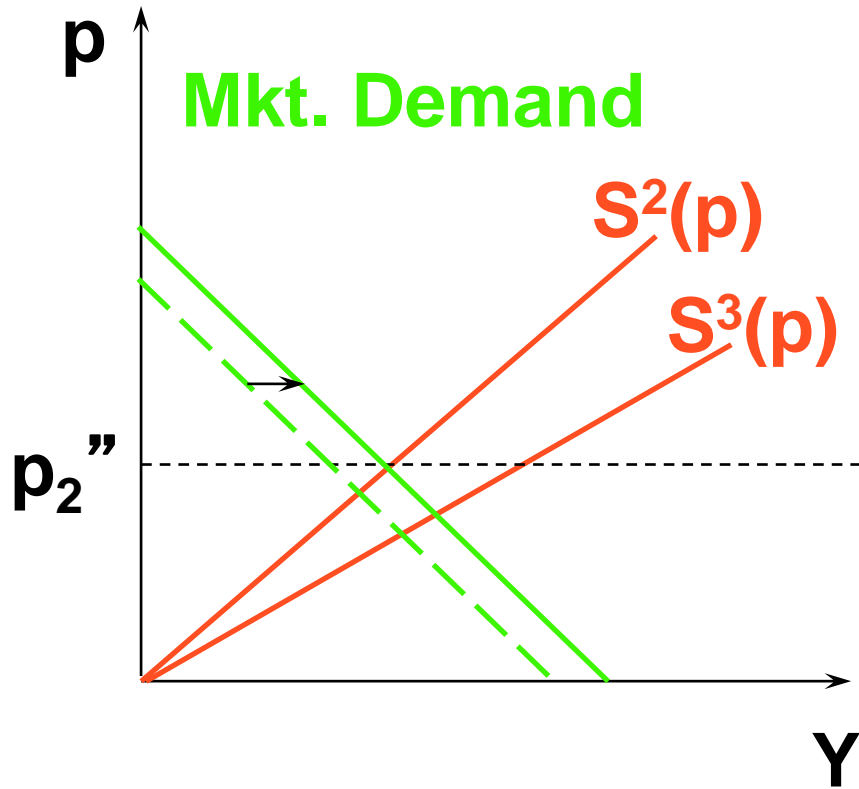**A "Typical" Firm**

Long-Run Industry Supply

The Market

A "Typical" Firm

Long-Run Industry Supply
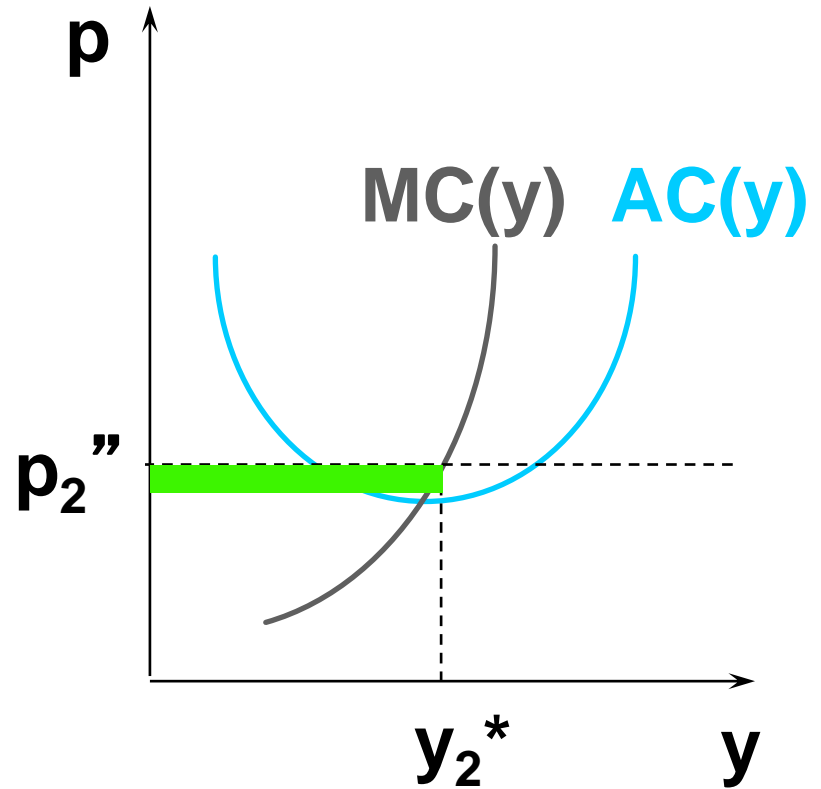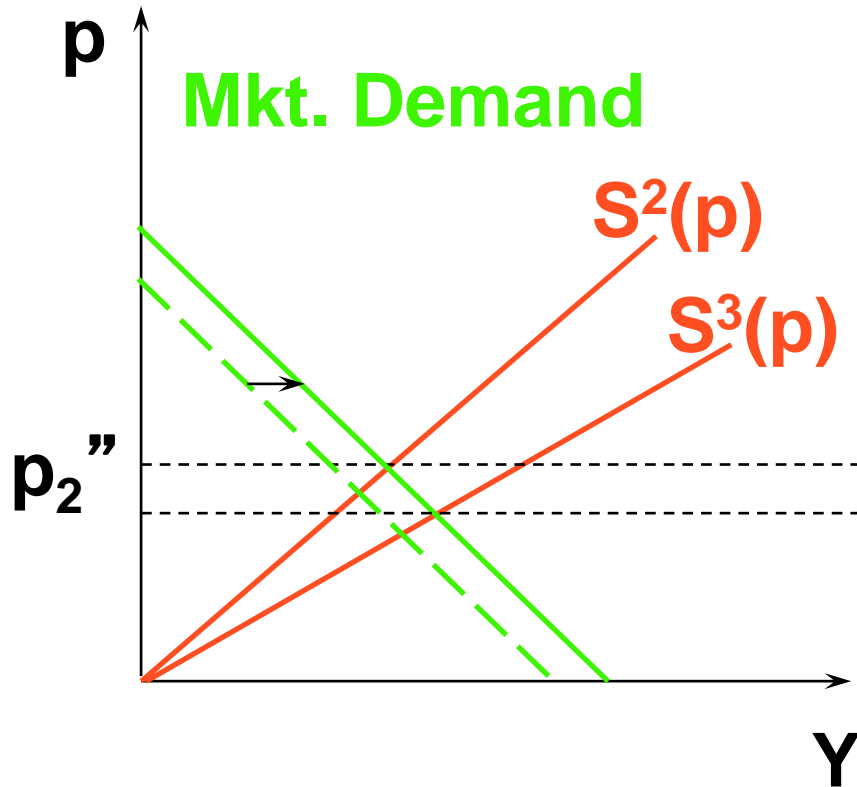
The Market

A "Typical" Firm

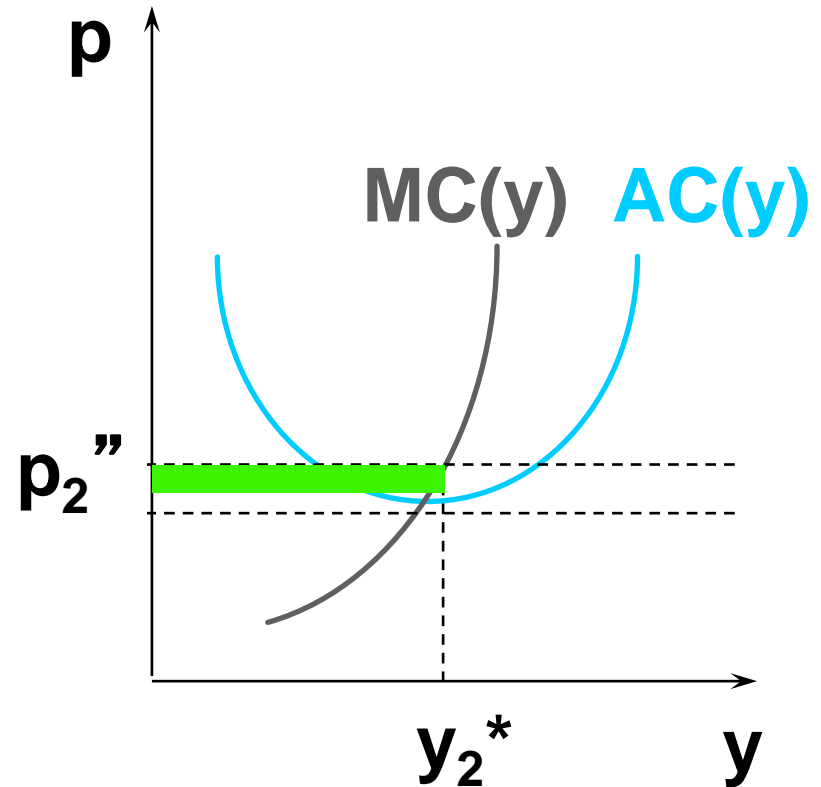# Long-Run Industry Supply
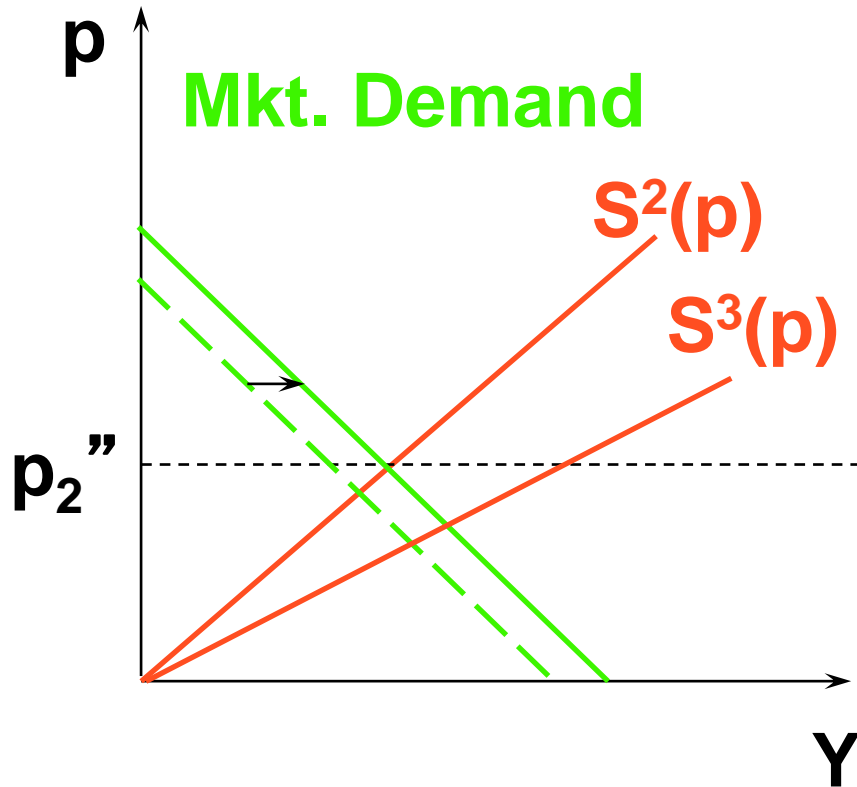
The Market

A "Typical" Firm

Notice that a 3rd firm will not enter since it would earn negative economic profits.
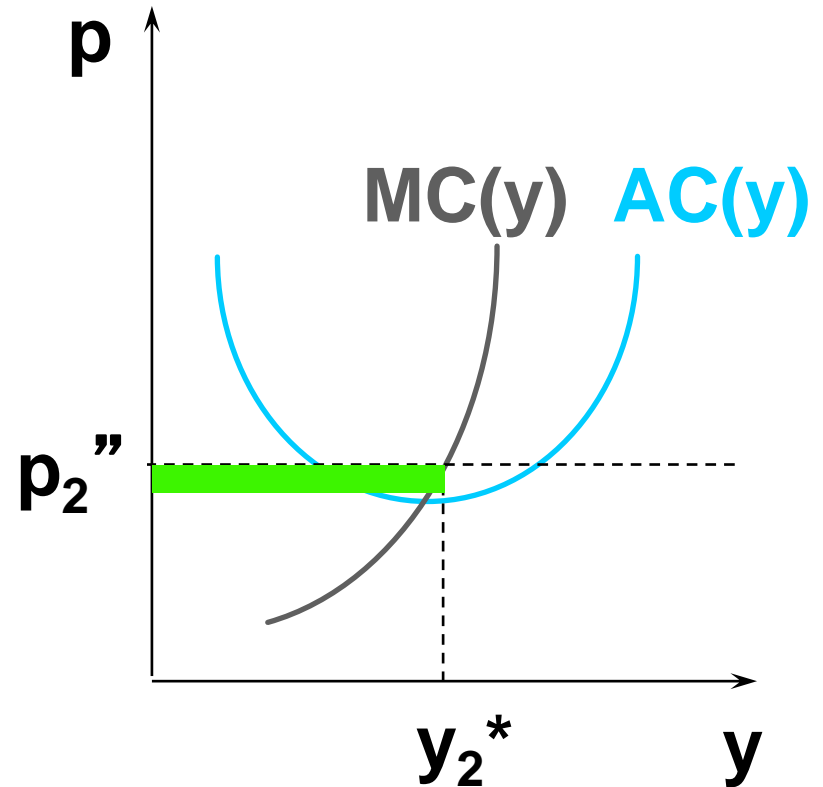
Long-Run Industry Supply

- **As market demand increases further, the market price rises further, the two incumbent firms each produce more and earn still higher economic profits -- until a 3rd firm becomes indifferent between entering and staying out.**

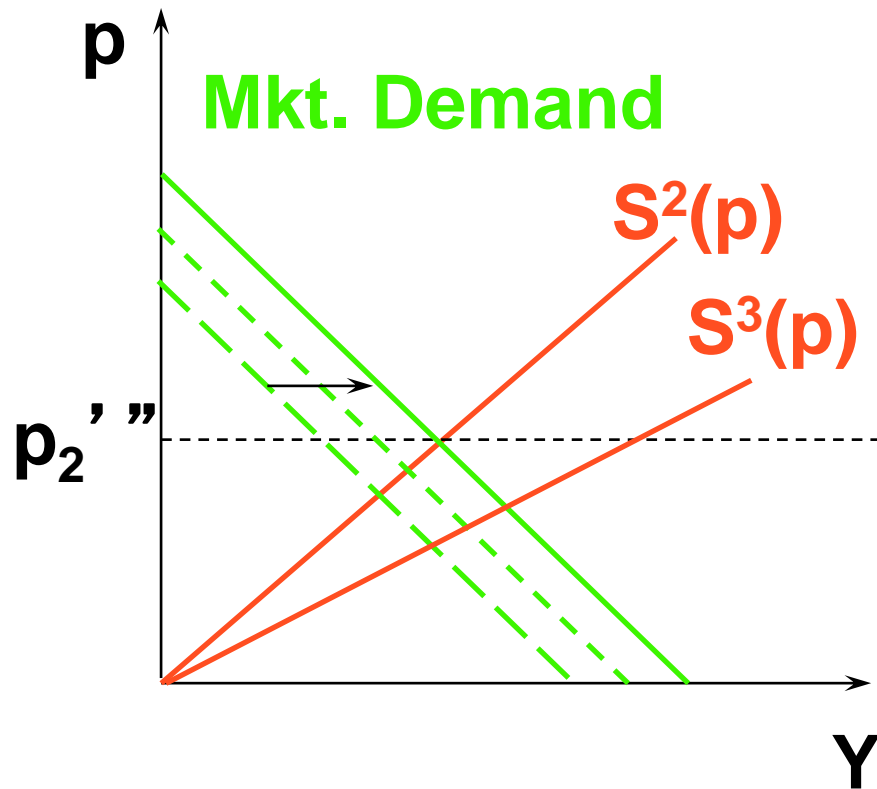# Long-Run Industry Supply
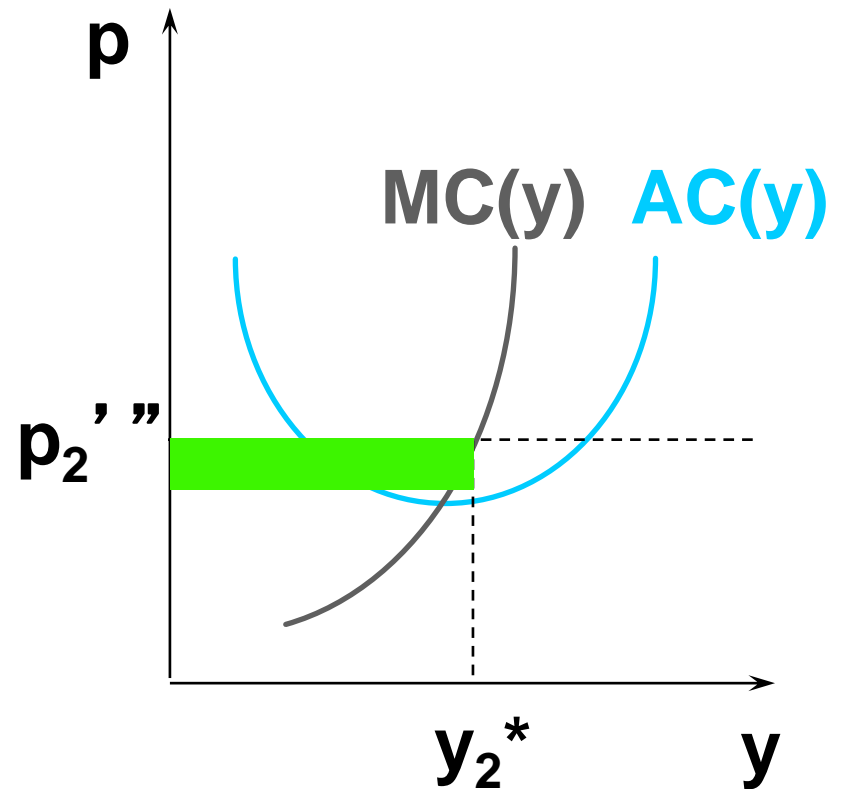
The Market

A "Typical" Firm

p

Mkt. Demand

$S^2(p)$

$S^3(p)$

p_2"

Y

p

MC(y)   **AC(y)**

p_2"

y_2*

y

Long-Run Industry Supply
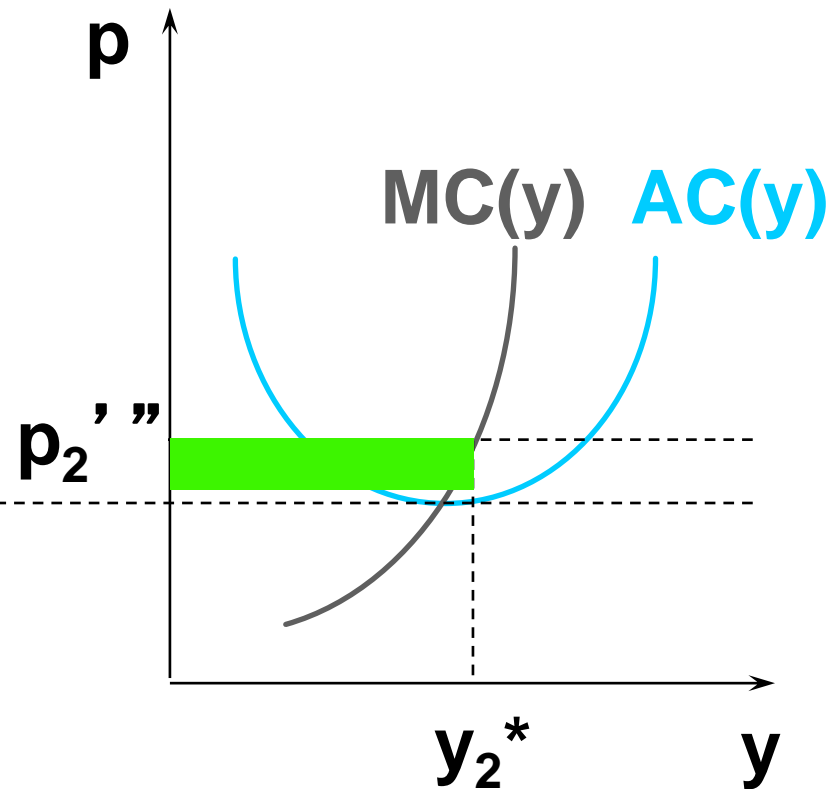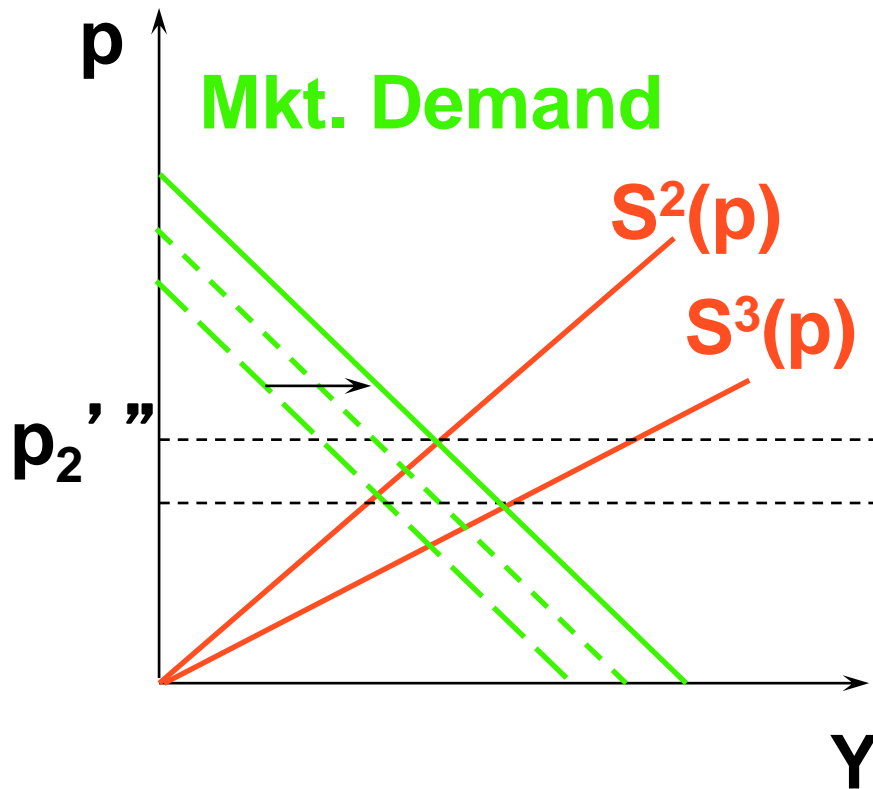
The Market

A "Typical" Firm

Long-Run Industry Supply

The Market   **A "Typical" Firm**

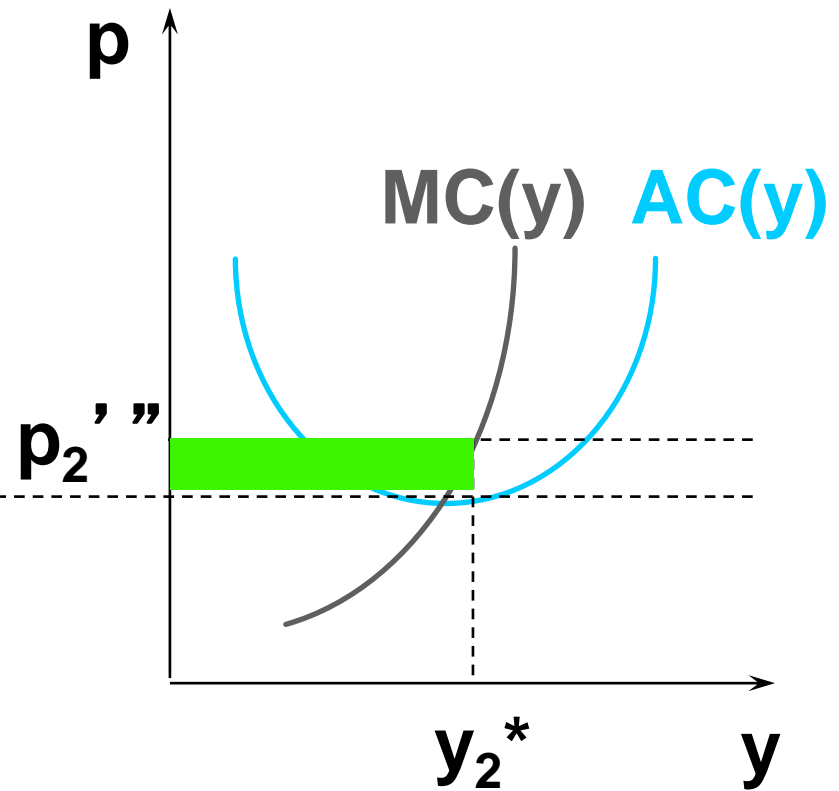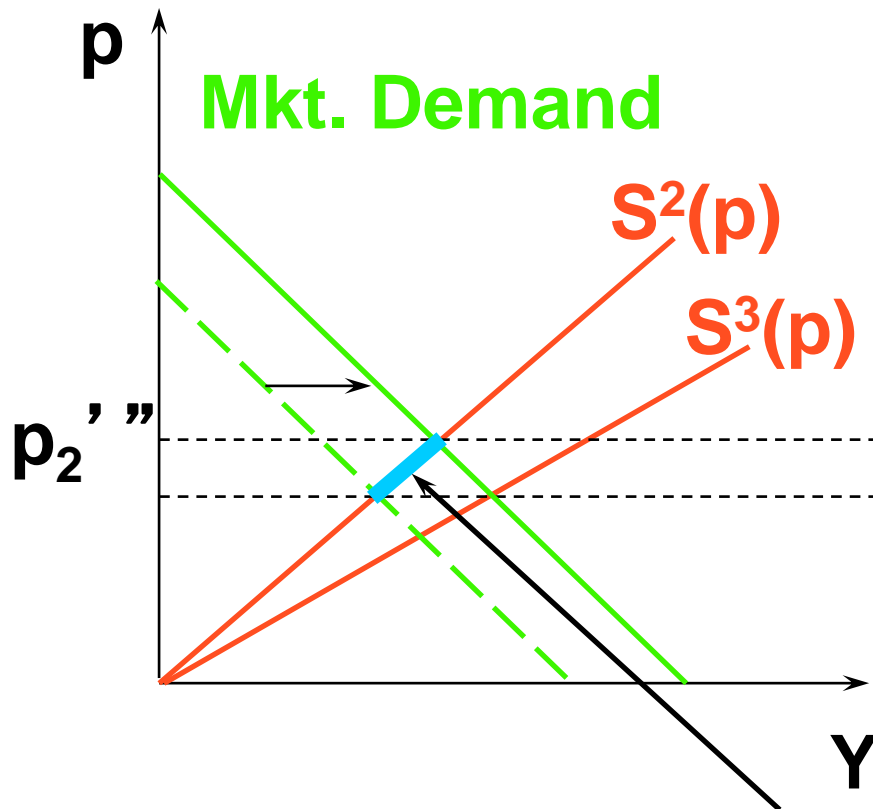**A third firm can now enter, causing all firms to earn zero economic profits.**

Long-Run Industry Supply

- **So any further increase in market demand will cause the number of firms in the industry to rise to three.**

Long-Run Industry Supply

The Market   **A "Typical" Firm**

Mkt. Demand

$S^2(p)$

$S^3(p)$

p_2' "

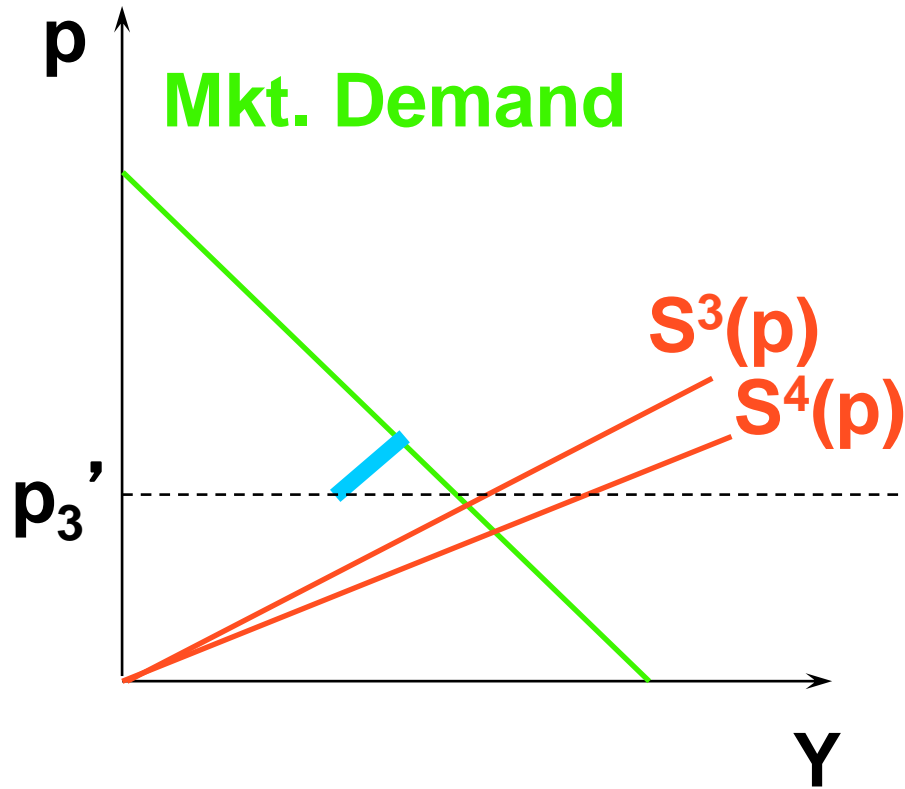MC(y)   AC(y)

p_2' "

Y

y_2^* y

The only relevant part of the short-run supply curve for n = 2 firms in the industry.
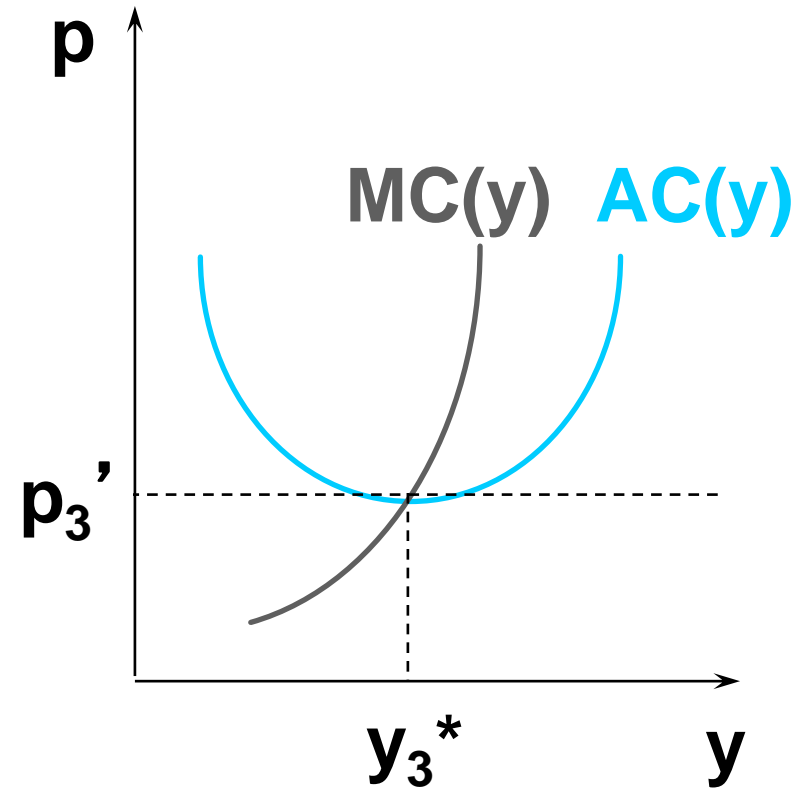
Long-Run Industry Supply

☐ **How much further can market demand increase before a fourth firm enters the industry?**
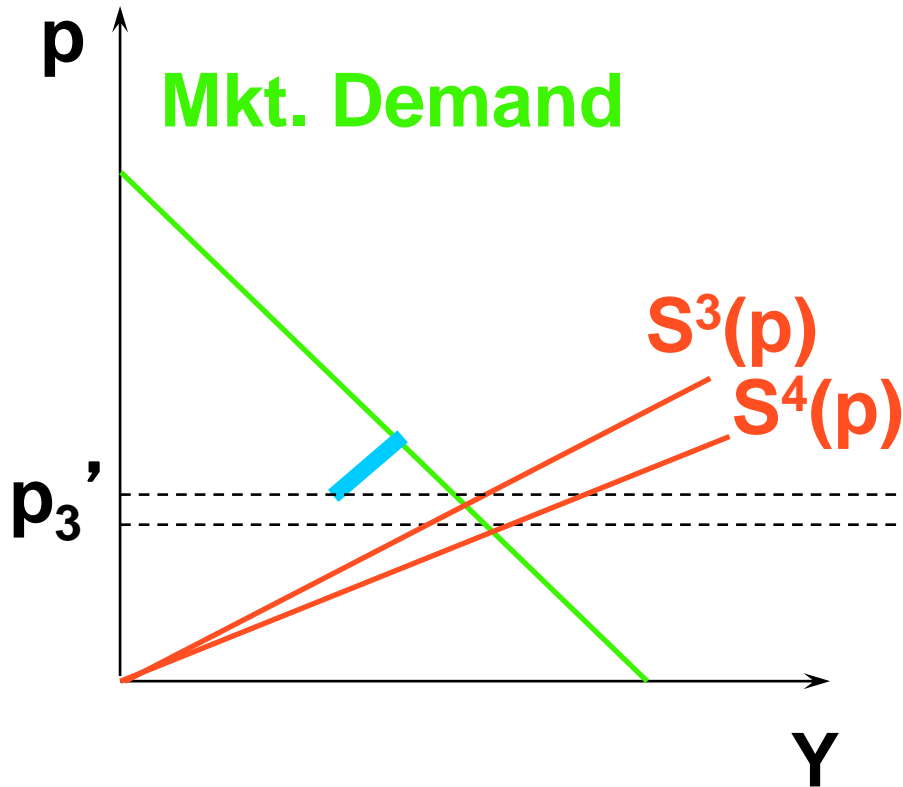
Long-Run Industry Supply
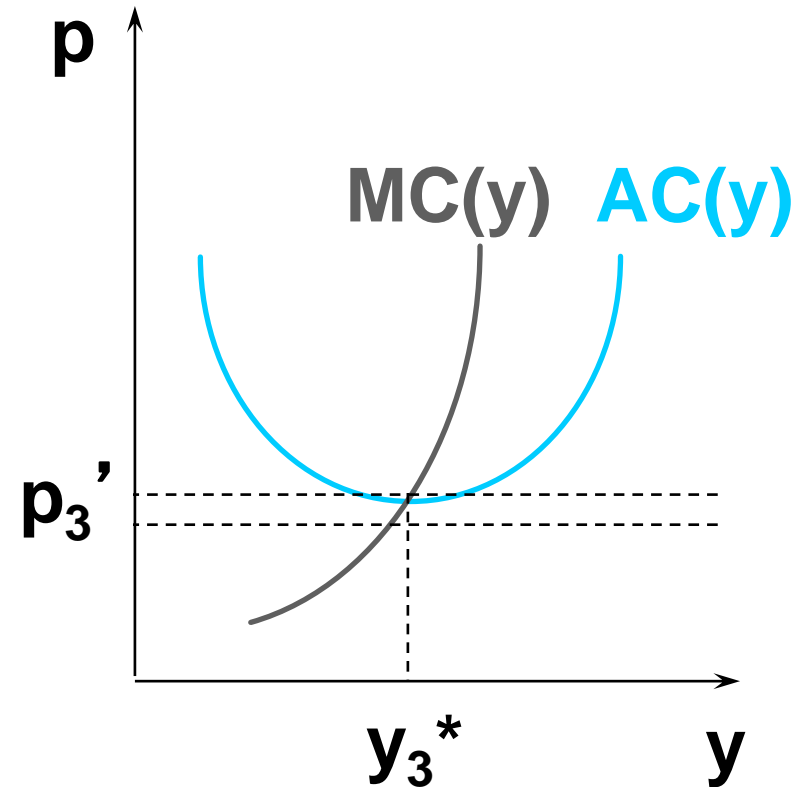
The Market

A "Typical" Firm

Long-Run Industry Supply

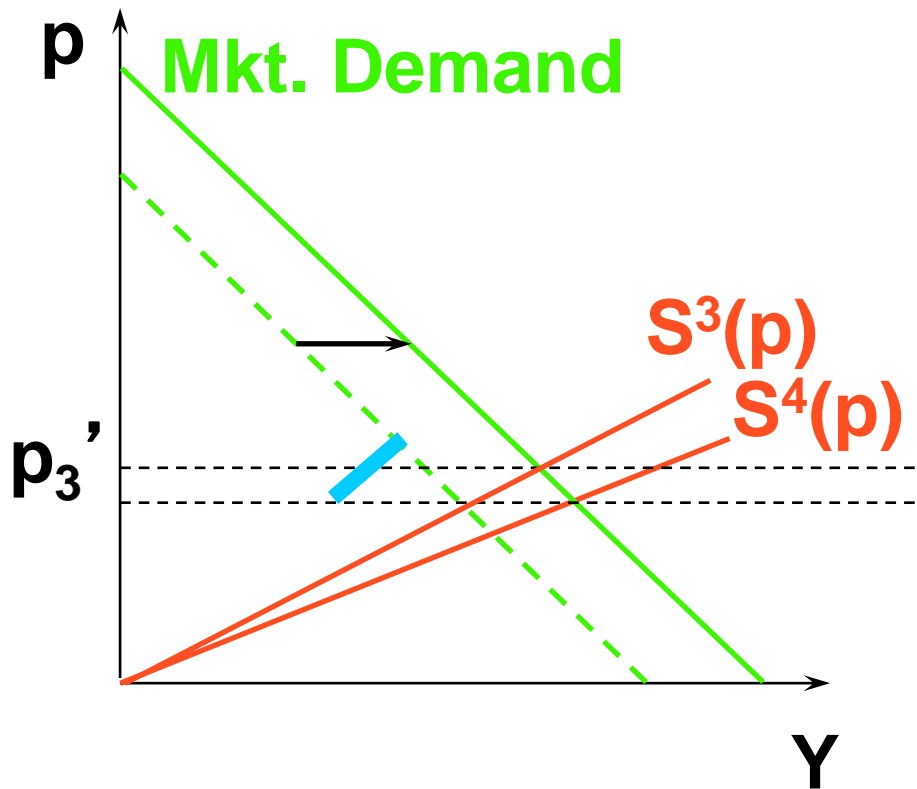**The Market**   **A "Typical" Firm**

A 4th firm would now earn negative economic profits if it entered the industry.

Long-Run Industry Supply

The Market   **A "Typical" Firm**

Mkt. Demand

$S^3(p)$

$S^4(p)$

p_3'

MC(y)   AC(y)

p_3'

Y

y_3^* y
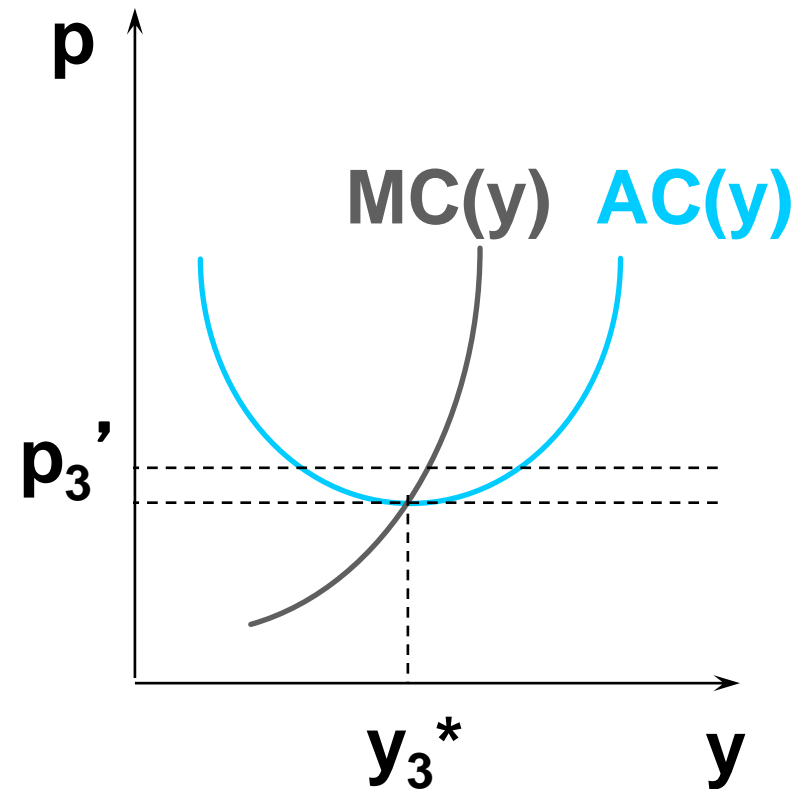
But now a 4th firm would earn zero economic profit if it entered the industry.

Long-Run Industry Supply
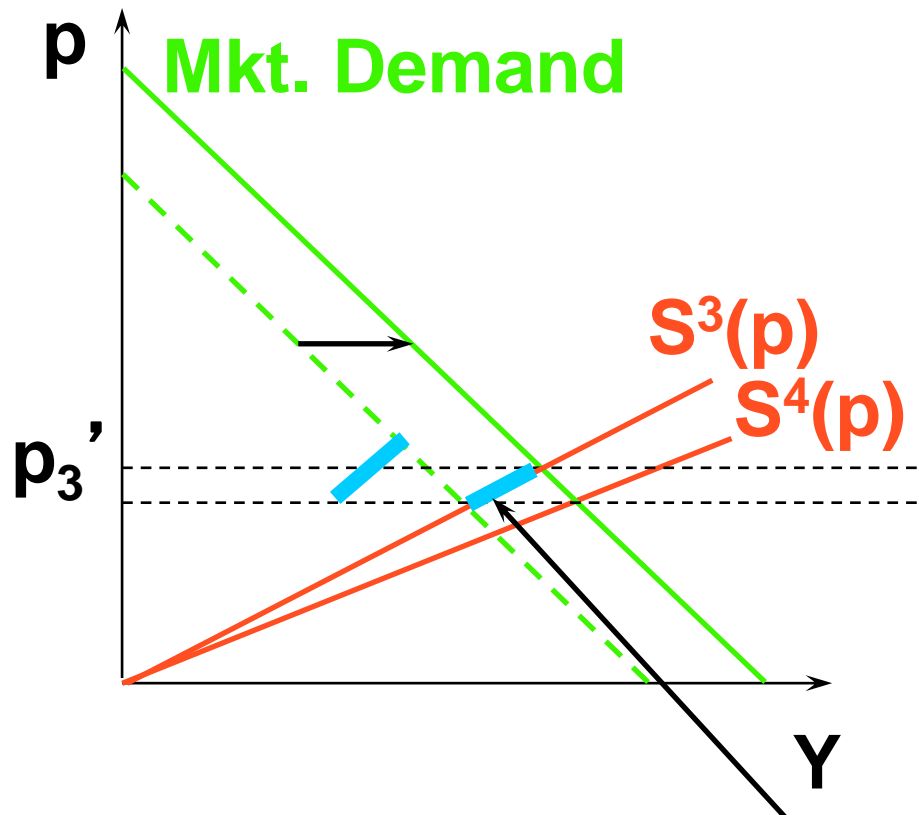
The Market   **A "Typical" Firm**
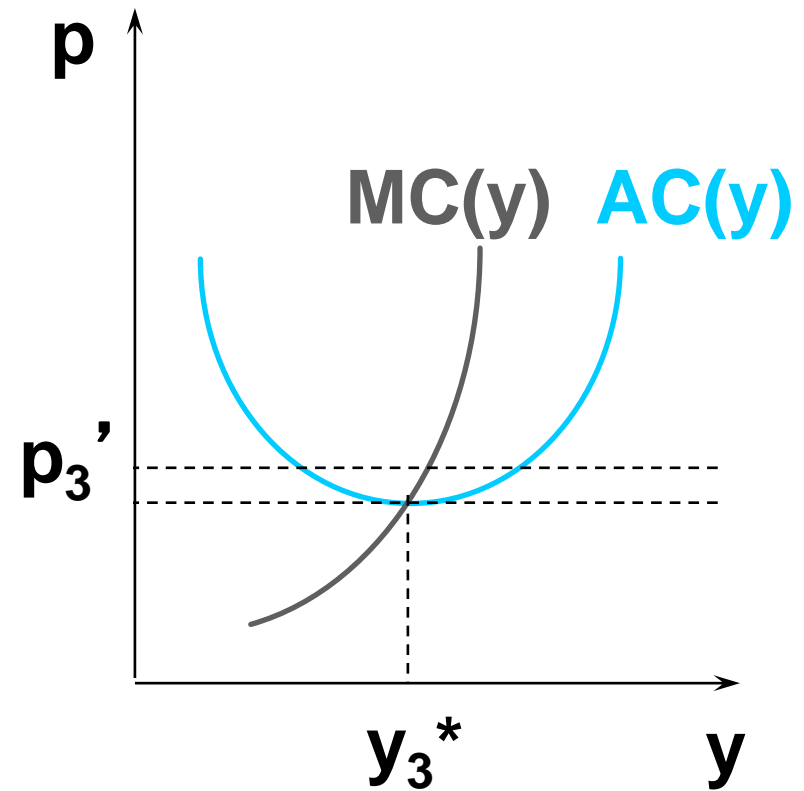
The only relevant part of the short-run supply curve for n = 3 firms in the industry.

Long-Run Industry Supply

* **Continuing in this manner builds the industry's long-run supply curve, one section at-a-time from successive short-run industry supply curves.**

Long-Run Industry Supply
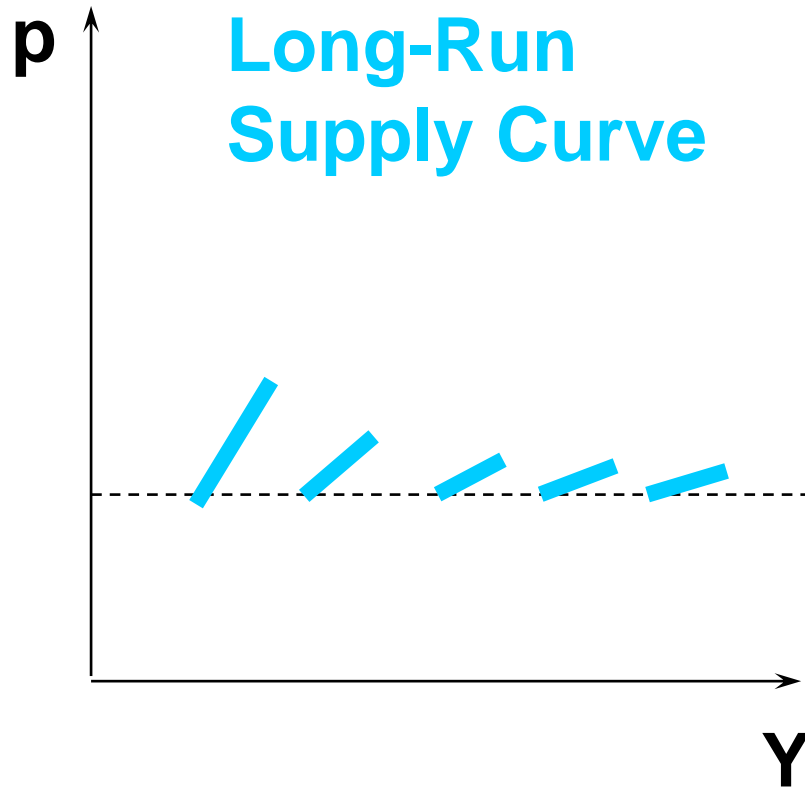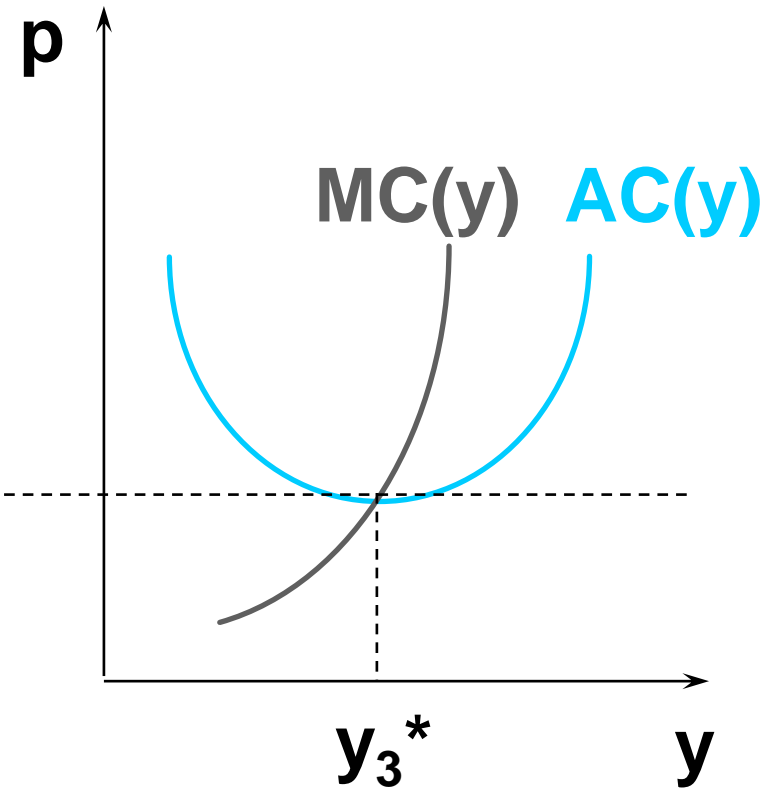
The Market Long-Run Supply Curve

A "Typical" Firm

MC(y) AC(y)

y_3^*

Long-Run Industry Supply

The Market Long-Run Supply Curve

A "Typical" Firm

Notice that the bottom of each segment of the supply curve is min AC(y).

Long-Run Industry Supply

☐ **As each firm gets "smaller" relative to the industry, the long-run industry supply curve approaches a horizontal line at the height of min AC(y).**

Long-Run Industry Supply

The Market Long-Run Supply Curve
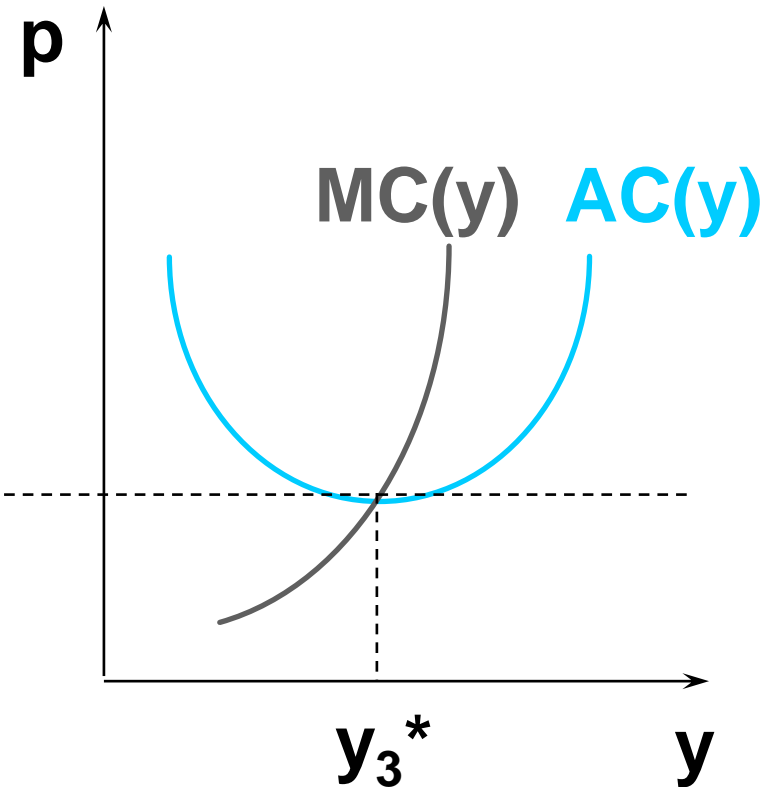
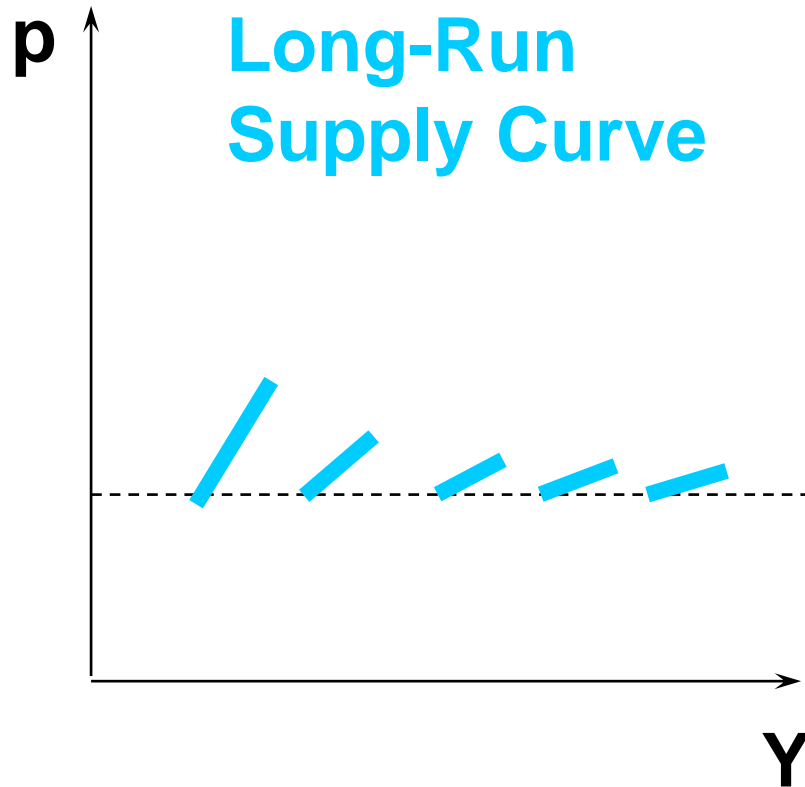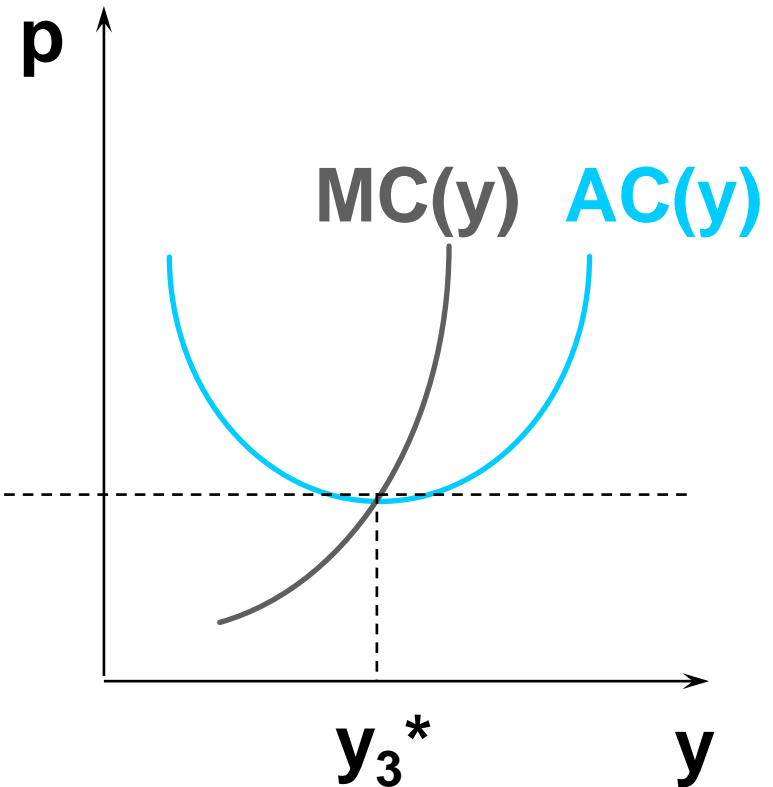**A "Typical" Firm**

Notice that the bottom of each segment of the supply curve is min AC(y).

Long-Run Industry Supply

The Market Long-Run Supply Curve
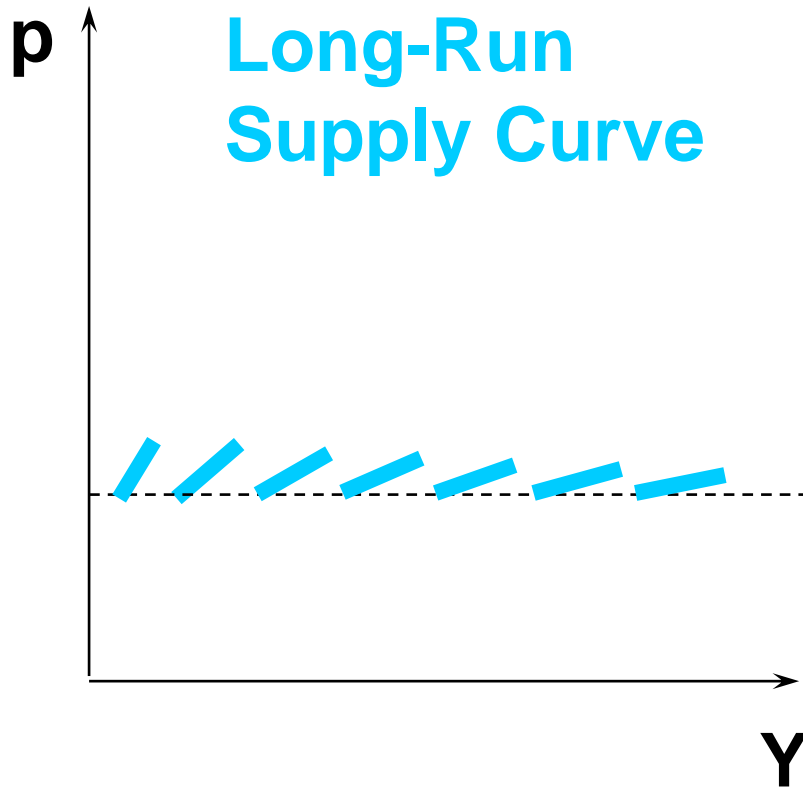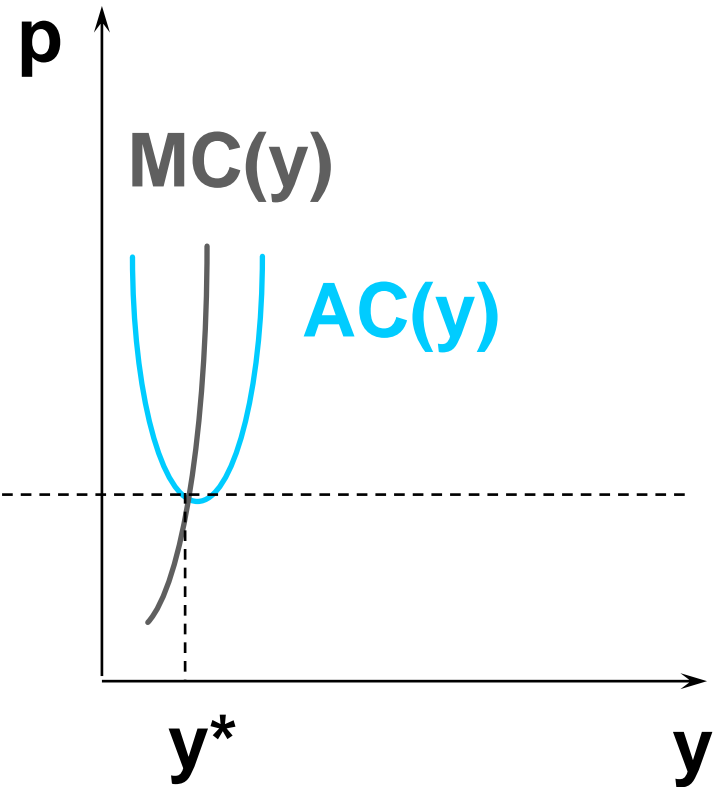
A "Typical" Firm

The bottom of each segment of the supply curve is min AC(y). As firms get "smaller" the segments get shorter.
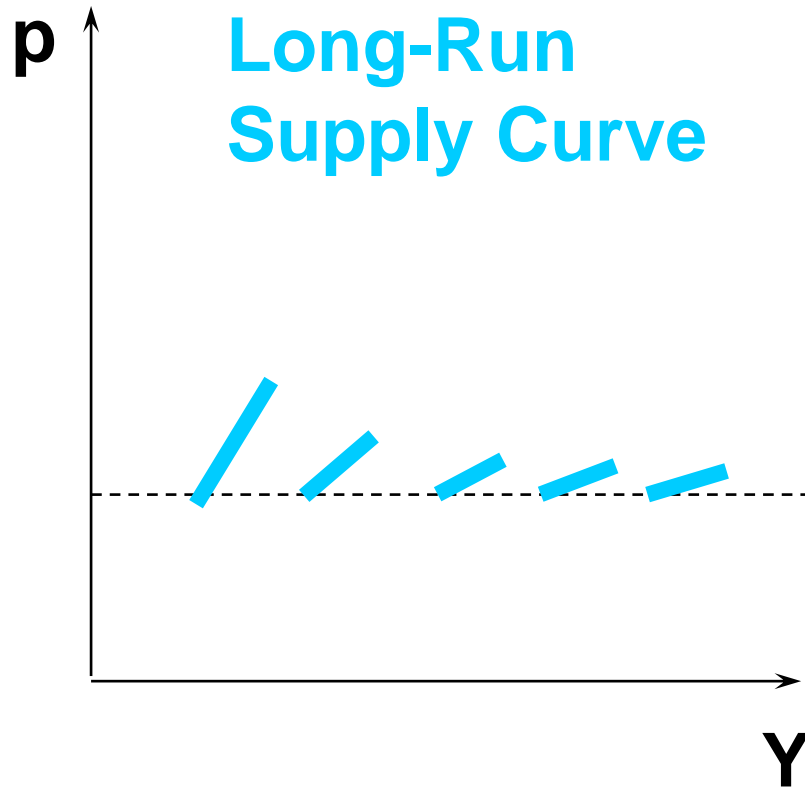
Long-Run Industry Supply

The Market Long-Run Supply Curve

A "Typical" Firm
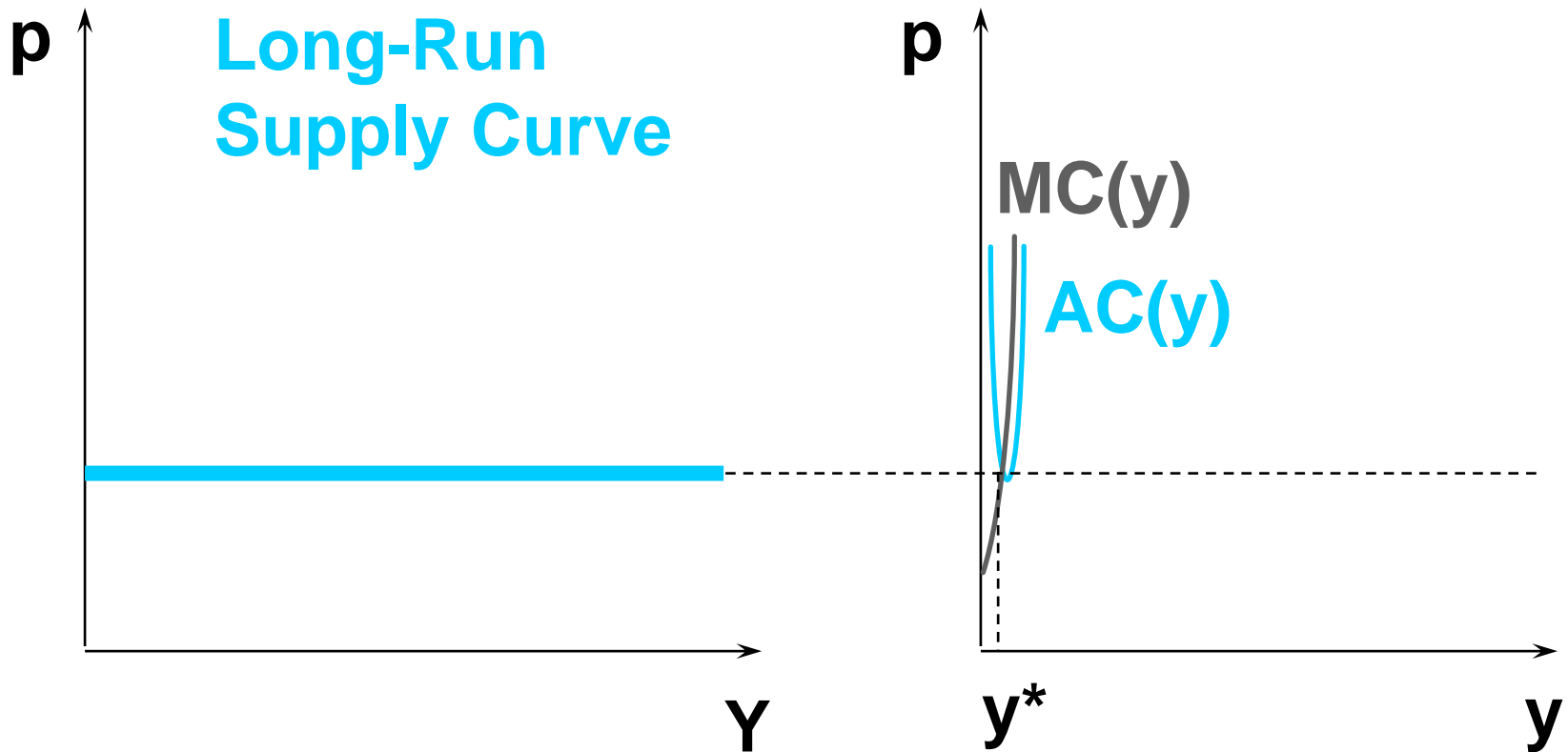
In the limit, as firms become infinitesimally small, the industry's long-run supply curve is horizontal at min AC(y).

Long-Run Market Equilibrium Price

☐ **In the long-run market equilibrium, the market price is determined solely by the long-run minimum average production cost.**

Long-run market price is

$$\mathbf{p^e = \min_{y>0} AC(y).}$$

Long-Run Implications for Taxation

○ **In a short-run equilibrium, the burden of a sales or an excise tax is typically shared by both buyers and sellers, tax incidence of the tax depending upon the own-price elasticities of demand and supply.**

○ **Q: Is this true in a long-run market equilibrium?**

Long-Run Implications for Taxation

p

Mkt. demand

p^e

LR supply (no tax)

Q^e

X,Y

Long-Run Implications for Taxation

p

Mkt. demand

$p_b = p^e + t$

$p_s = p^e$

LR supply (with tax)

t

LR supply (no tax)

Q^t Q^e **X,Y**
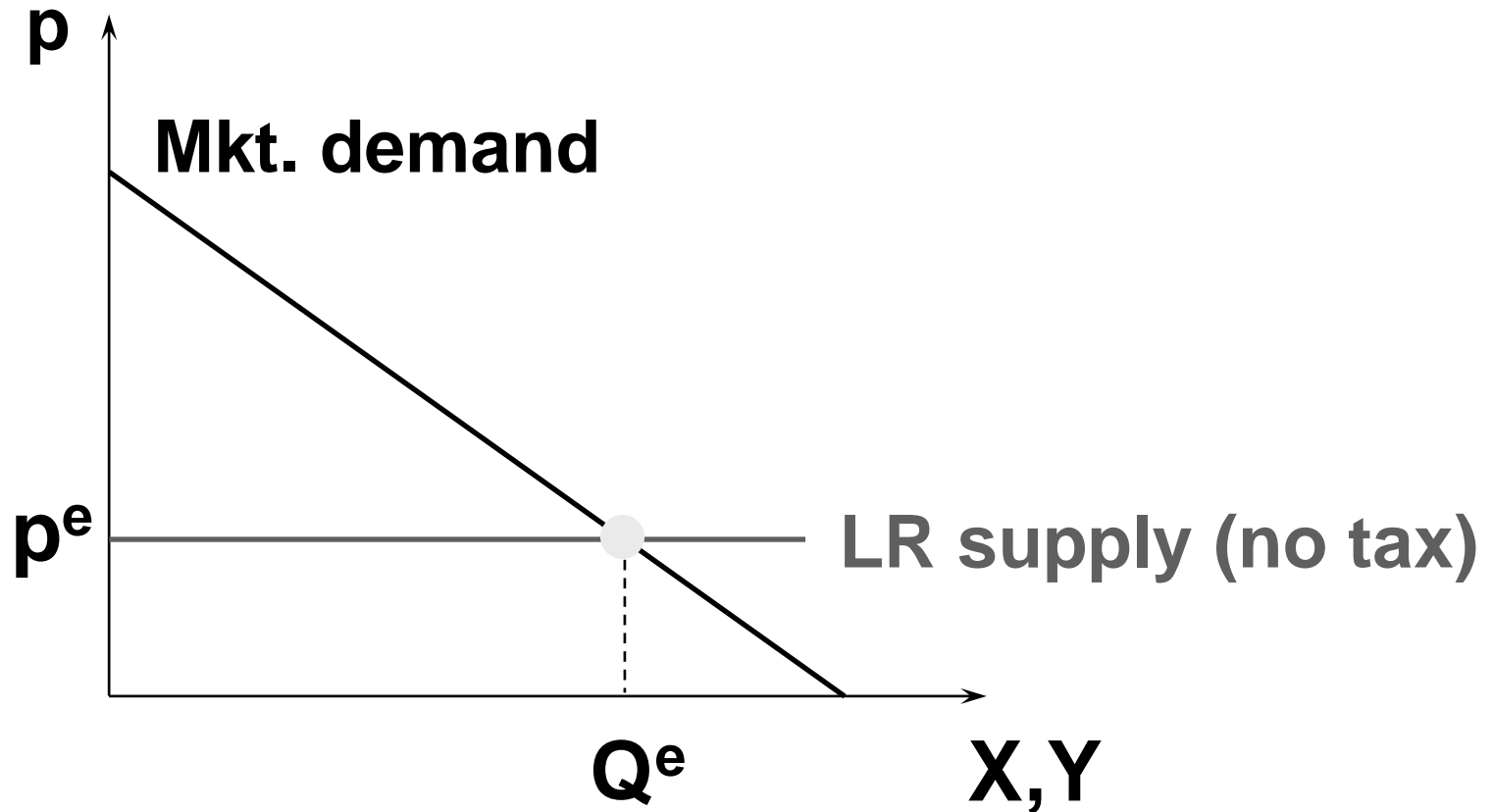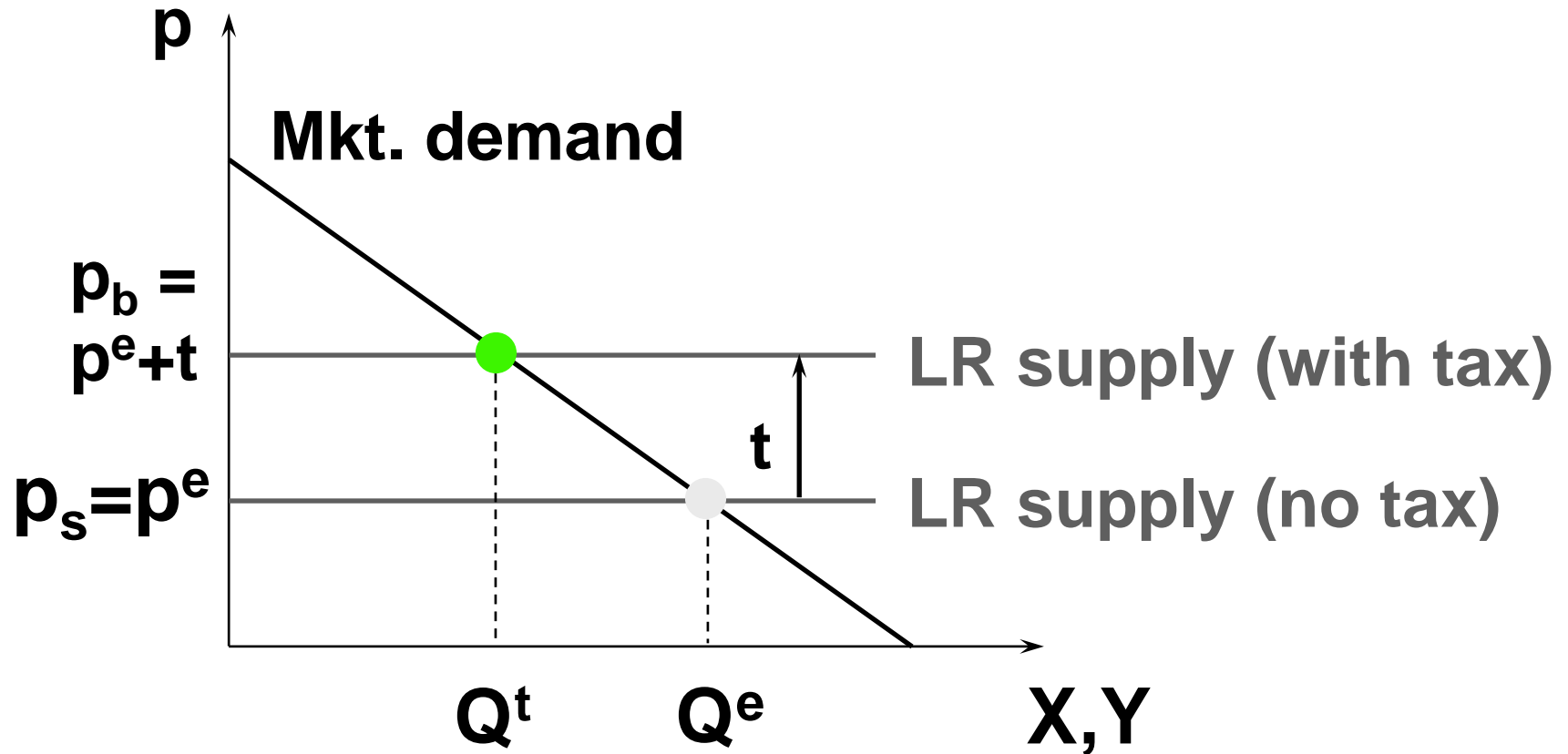
Long-Run Implications for Taxation

In the long-run the buyers pay all of a sales or an excise tax.

p

Mkt. demand

$p_b = p^e+t$

LR supply (with tax)

t

$p_s=p^e$

LR supply (no tax)

Q^t Q^e **X,Y**
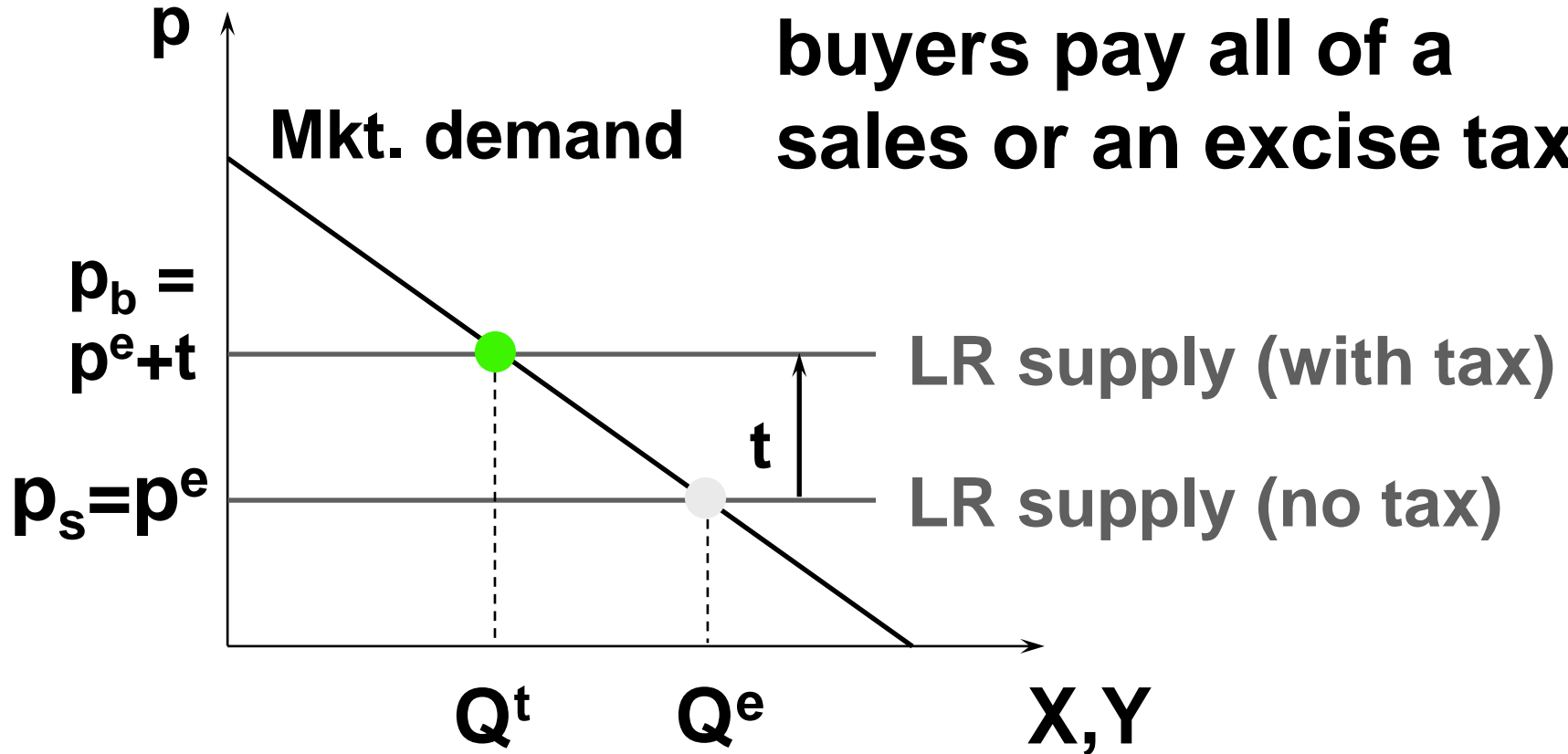
Fixed Inputs and Economic Rent

- What if there is a barriers to entry or exit?

- E.g., the taxi-cab industry has a barrier to entry even though there are lots of cabs competing with each other.

- Liquor licensing is a barrier to entry into a competitive industry.

Fixed Inputs and Economic Rent

 Q: When there is a barrier to entry, will not the firms already in the industry make positive economic profits?

Fixed Inputs and Economic Rent

- **Q: When there is a barrier to entry, will not the firms already in the industry make positive economic profits?**

- **A: No. Each firm in the industry makes a zero economic profit. Why?**

Fixed Inputs and Economic Rent

- An input (e.g. an operating license) that is fixed in the long-run causes a long-run fixed cost, F.

- Long-run total cost, $c(y) = F + c_v(y)$.

- And long-run average total cost,
$$AC(y) = AFC(y) + AVC(y).$$

- In the long-run equilibrium, what will be the value of F?
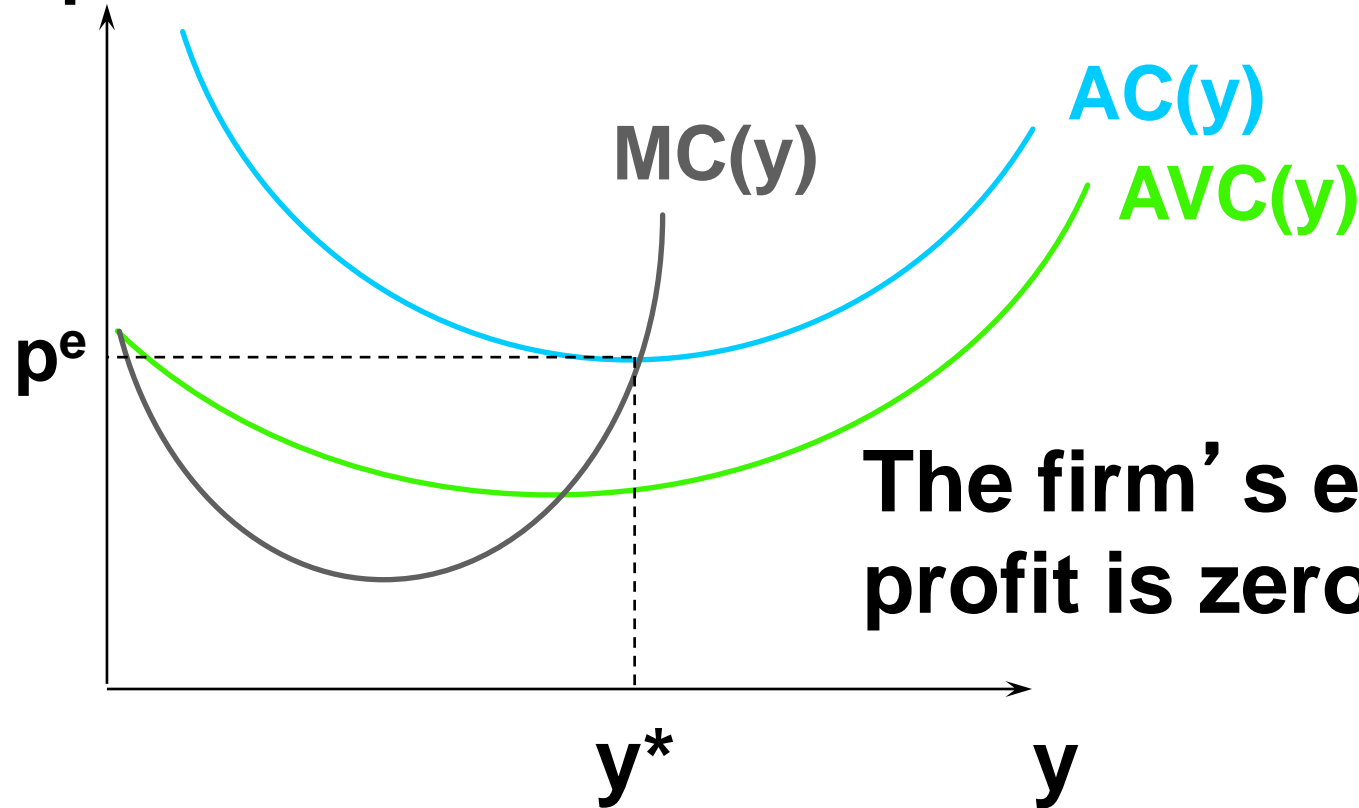
Fixed Inputs and Economic Rent

- **Think of a firm that needs an operating license -- the license is a fixed input that is rented but not owned by the firm.**

- **If the firm makes a positive economic profit then another firm can offer the license owner a higher price for it. In this way, all firms' economic profits are competed away, to zero.**

Fixed Inputs and Economic Rent

☐ **So in the long-run equilibrium, each firm makes a zero economic profit and each firm's fixed cost is its payment for its operating license.**
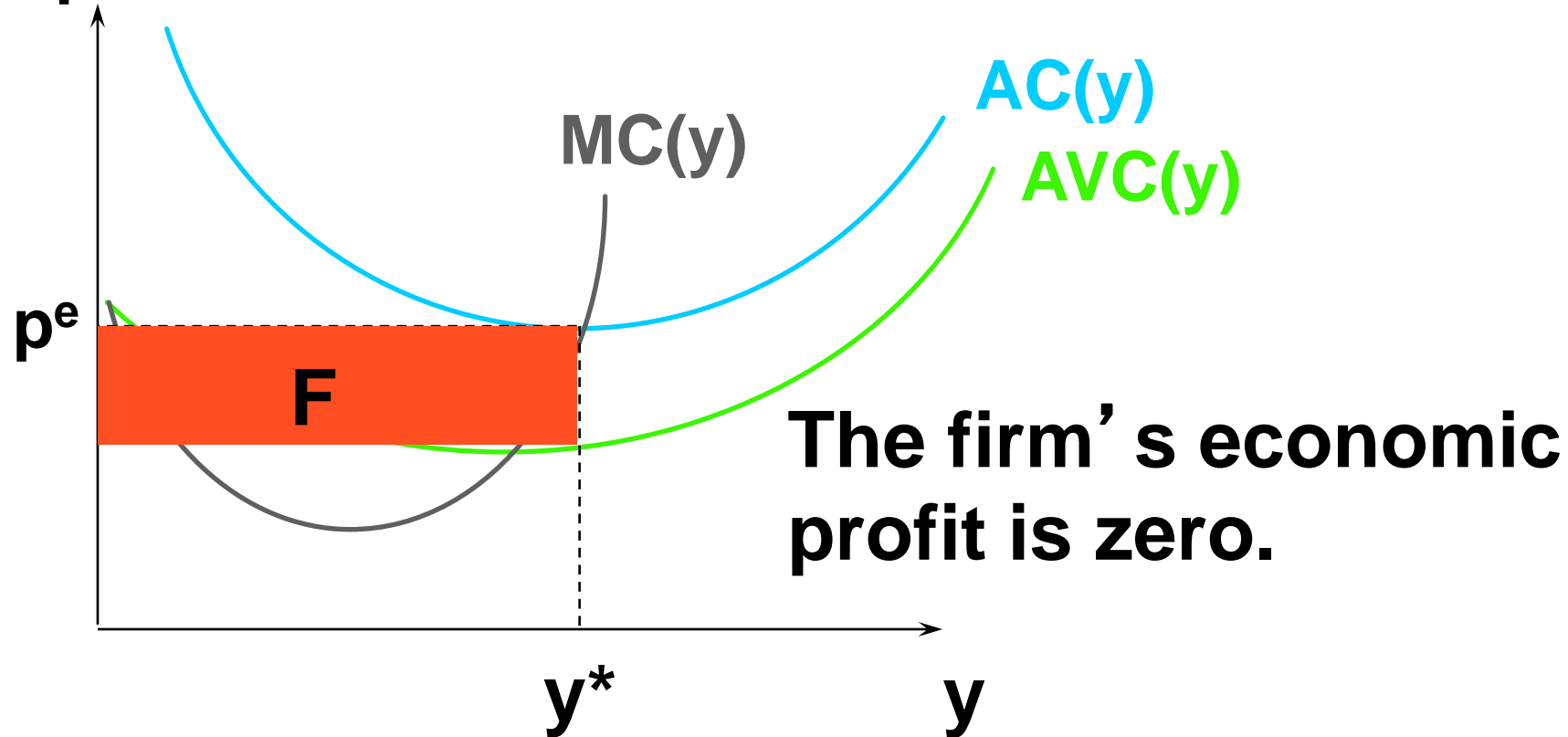
Fixed Inputs and Economic Rent

$/output unit

MC(y)

AC(y)

AVC(y)

p^e

The firm's economic profit is zero.

y*

y

Fixed Inputs and Economic Rent

$/output unit

**The firm's economic profit is zero.**

F is the payment to the owner of the fixed input (the license).

Fixed Inputs and Economic Rent

☐ **Economic rent is the payment for an input that is in excess of the minimum payment required to have that input supplied.**

☐ **Each license essentially costs zero to supply, so the long-run economic rent paid to the license owner is the firm's long-run fixed cost.**

Fixed Inputs and Economic Rent

$/output unit

MC(y)

AC(y)

AVC(y)

p^e

F

The firm's economic profit is zero.

y*

y
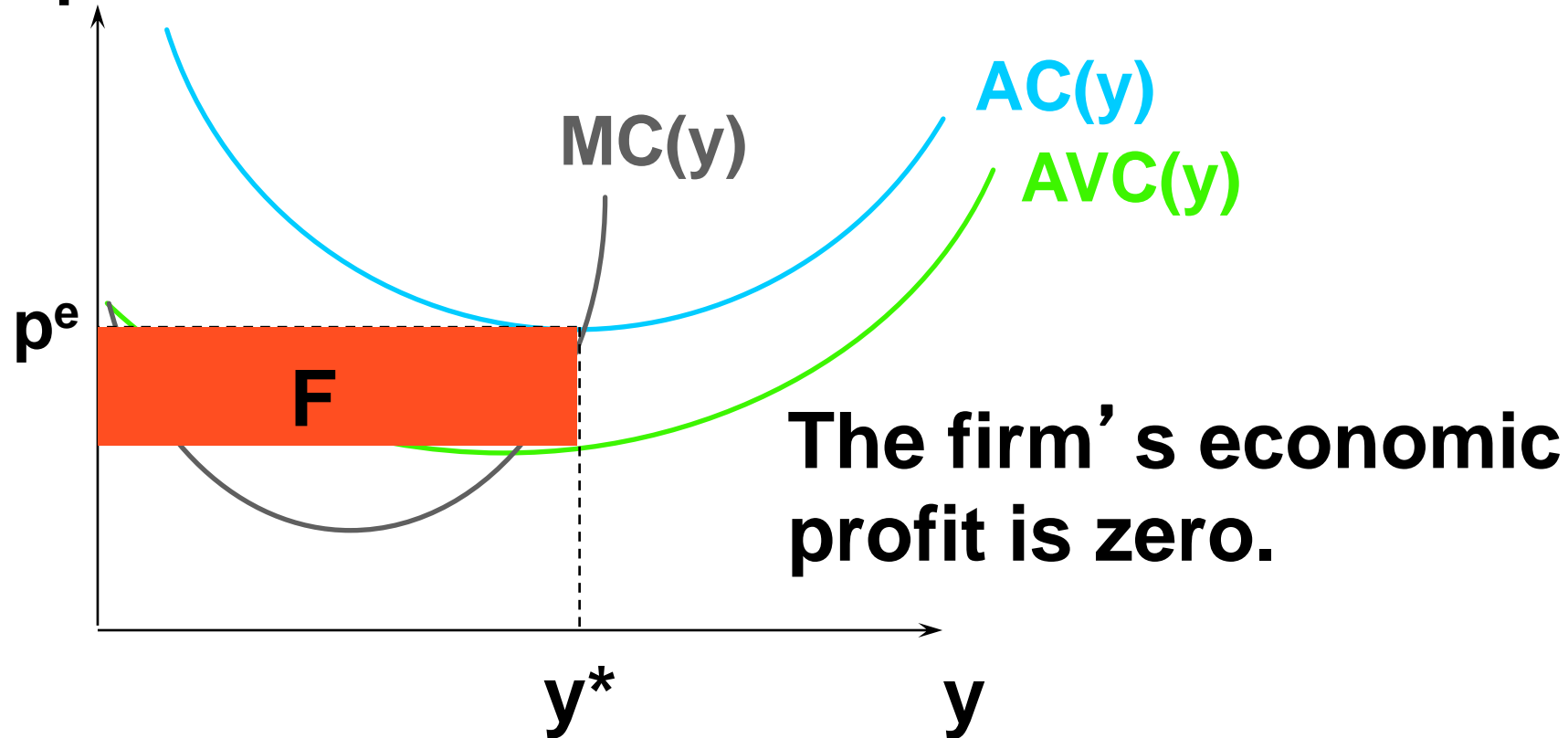
F is the payment to the owner of the fixed input (the license); F = economic rent.