



Chapter Twenty-Three

Industry Supply



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;
 $i = 1, \dots, n$.
- ◆ $S_i(p)$ is firm i 's supply function.

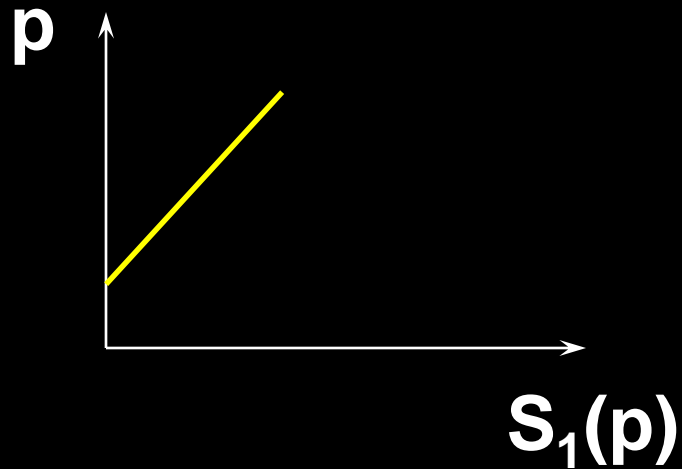
Short-Run Supply

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

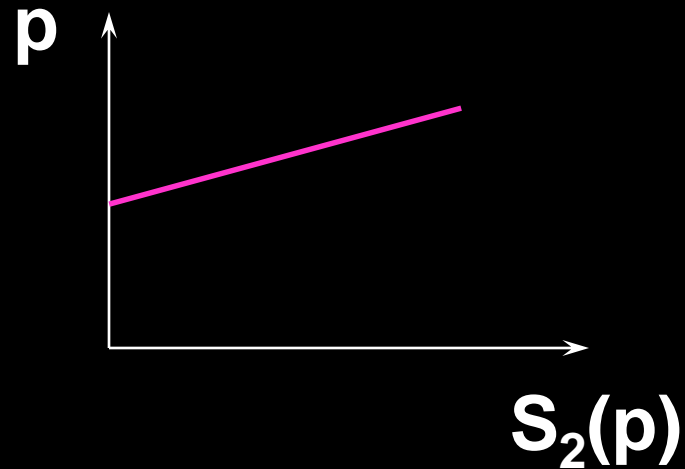
$$S(p) = \sum_{i=1}^n S_i(p).$$

Supply From A Competitive Industry

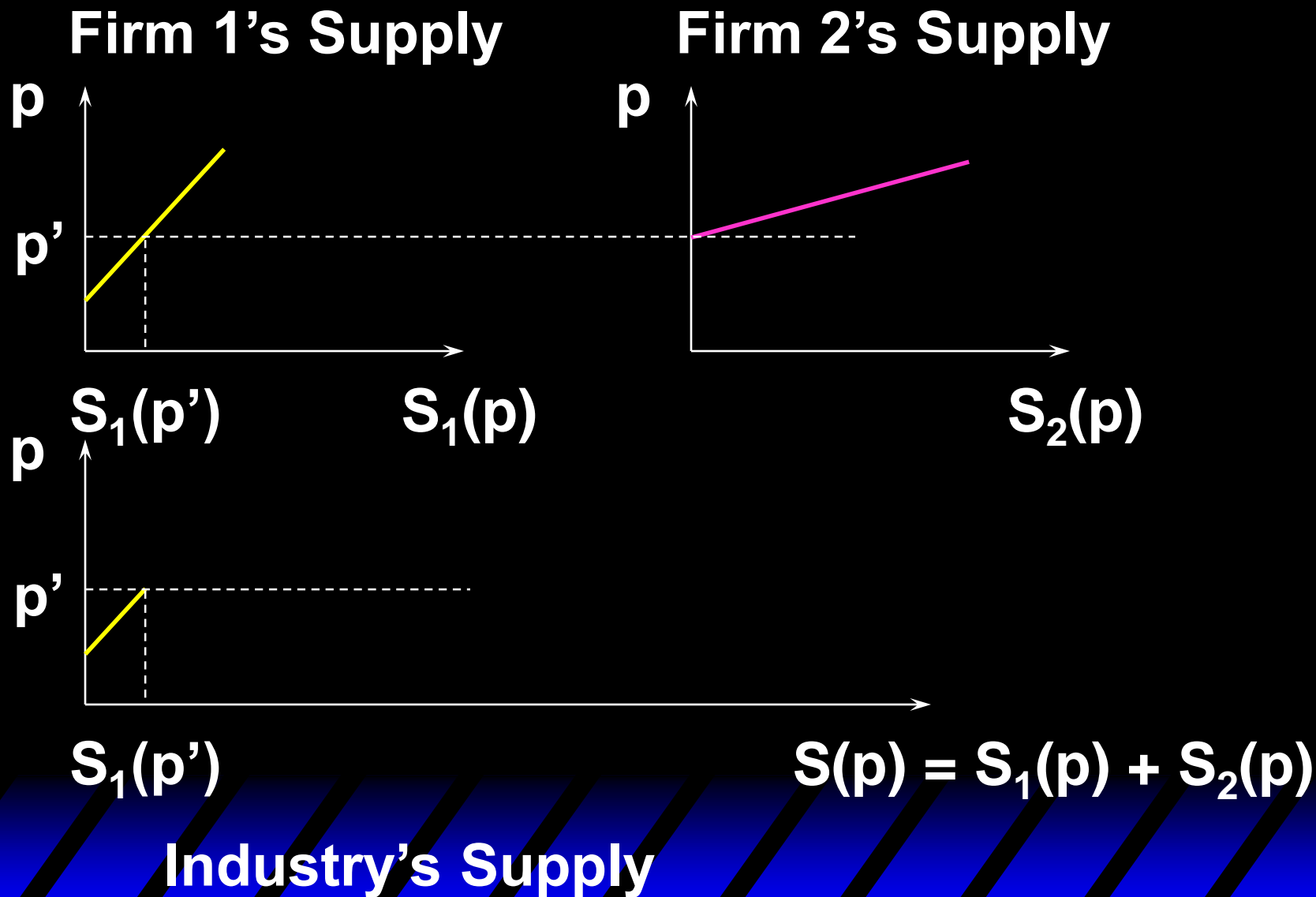
Firm 1's Supply



Firm 2's Supply

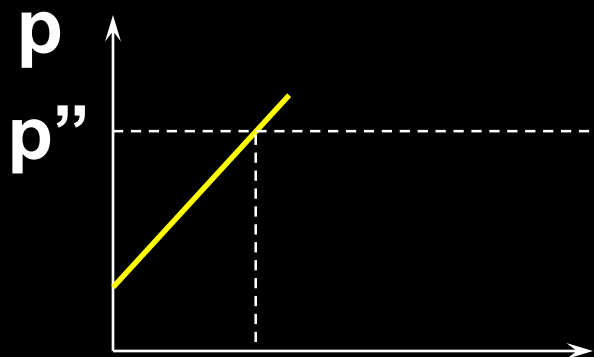


Supply From A Competitive Industry

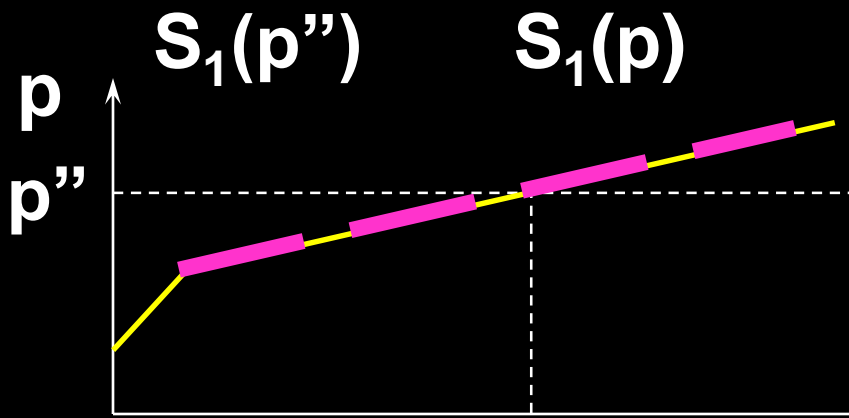
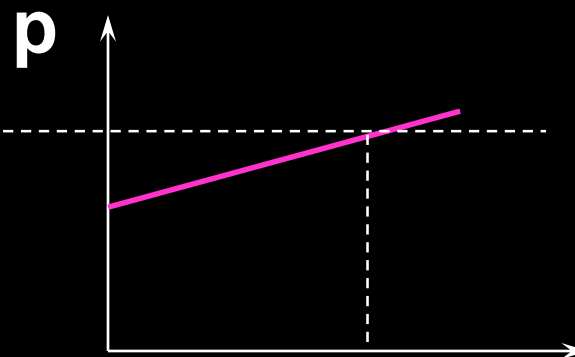


Supply From A Competitive Industry

Firm 1's Supply



Firm 2's Supply



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

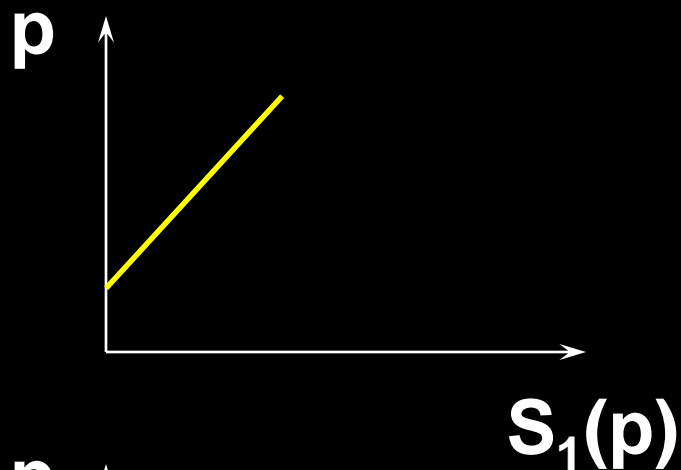
$S_1(p'') + S_2(p'')$

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

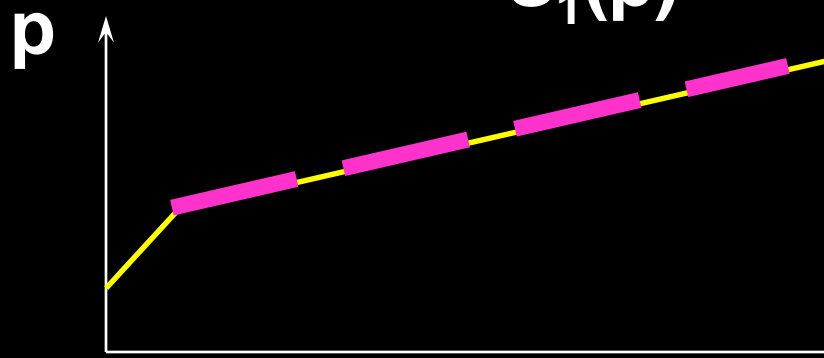
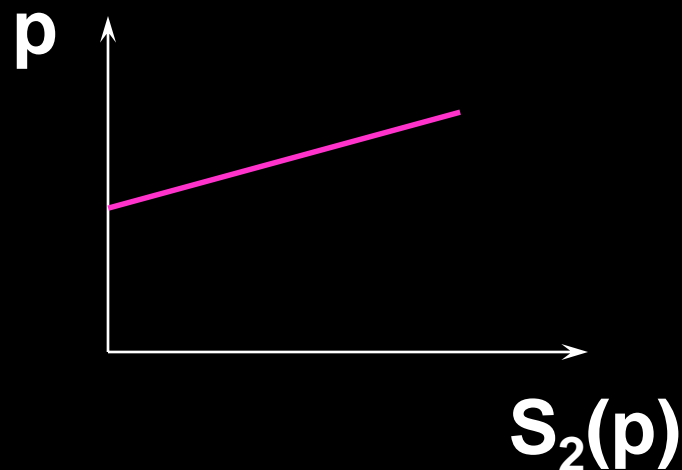
Industry's Supply

Supply From A Competitive Industry

Firm 1's Supply



Firm 2's Supply



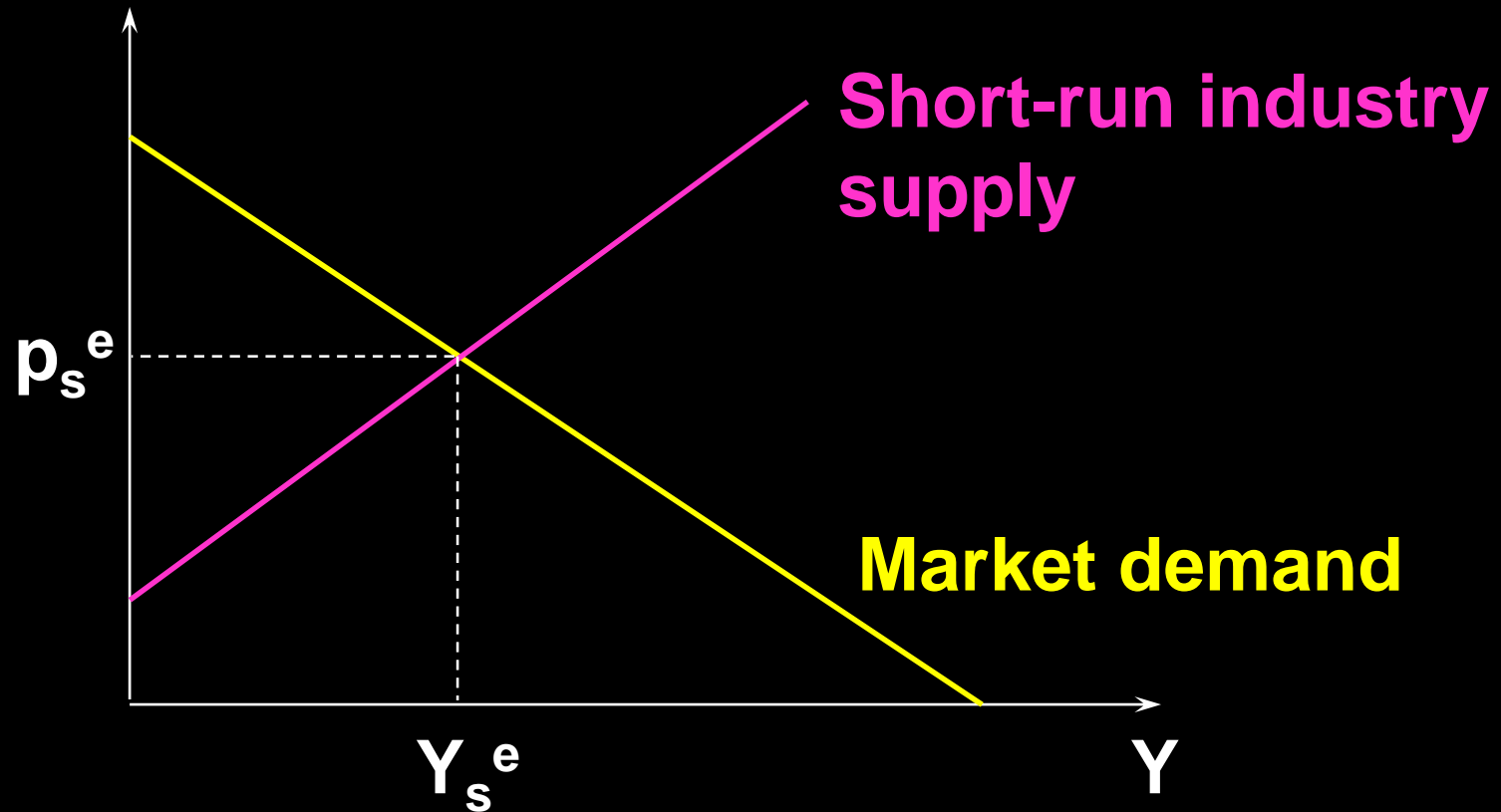
$$S(p) = S_1(p) + S_2(p)$$

Industry's Supply

Short-Run Industry Equilibrium

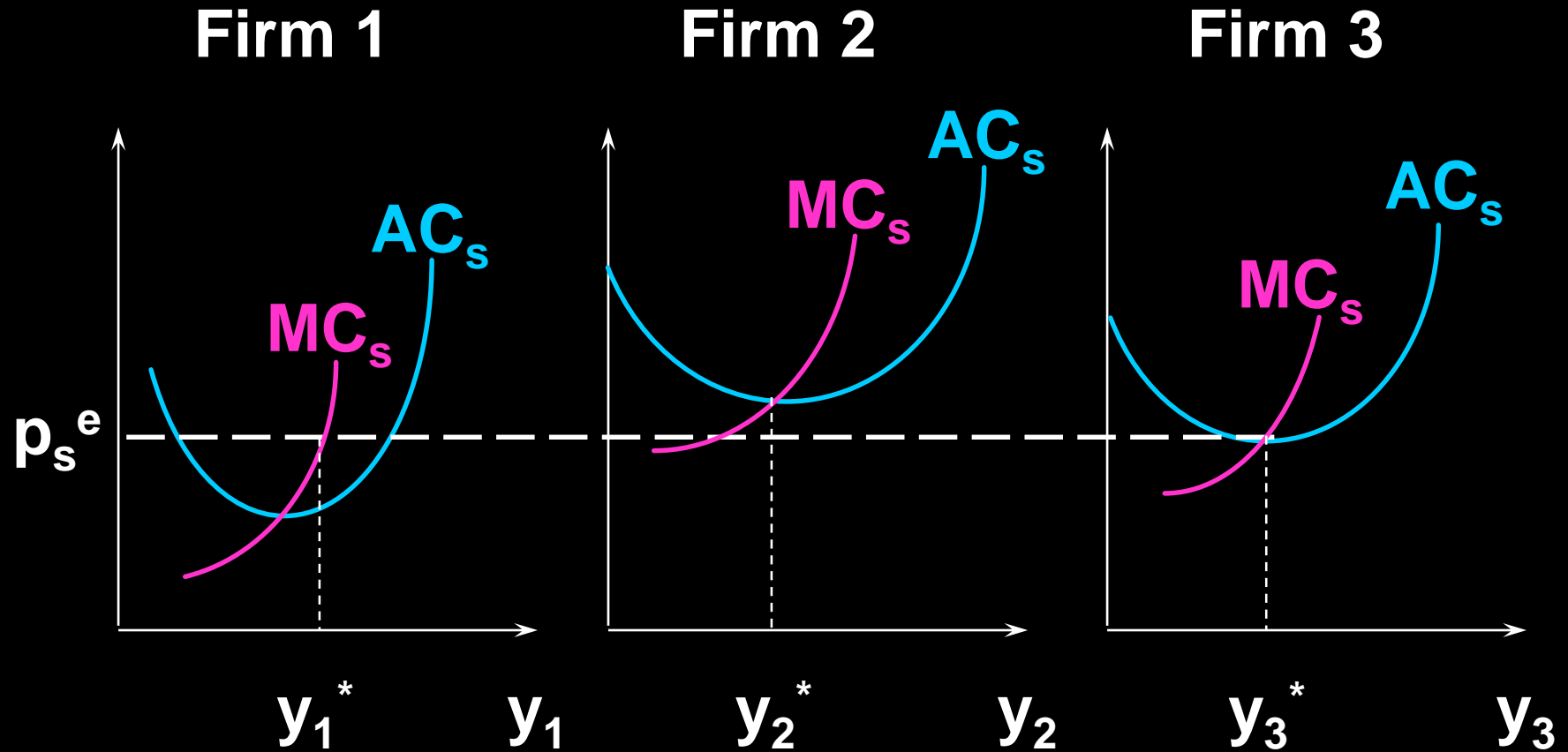
- ◆ In a short-run, neither entry nor exit can occur.
- ◆ Consequently, in a short-run equilibrium, some firms may earn positive economics profits, others may suffer economic losses, and still others may earn zero economic profit.

Short-Run Industry Equilibrium

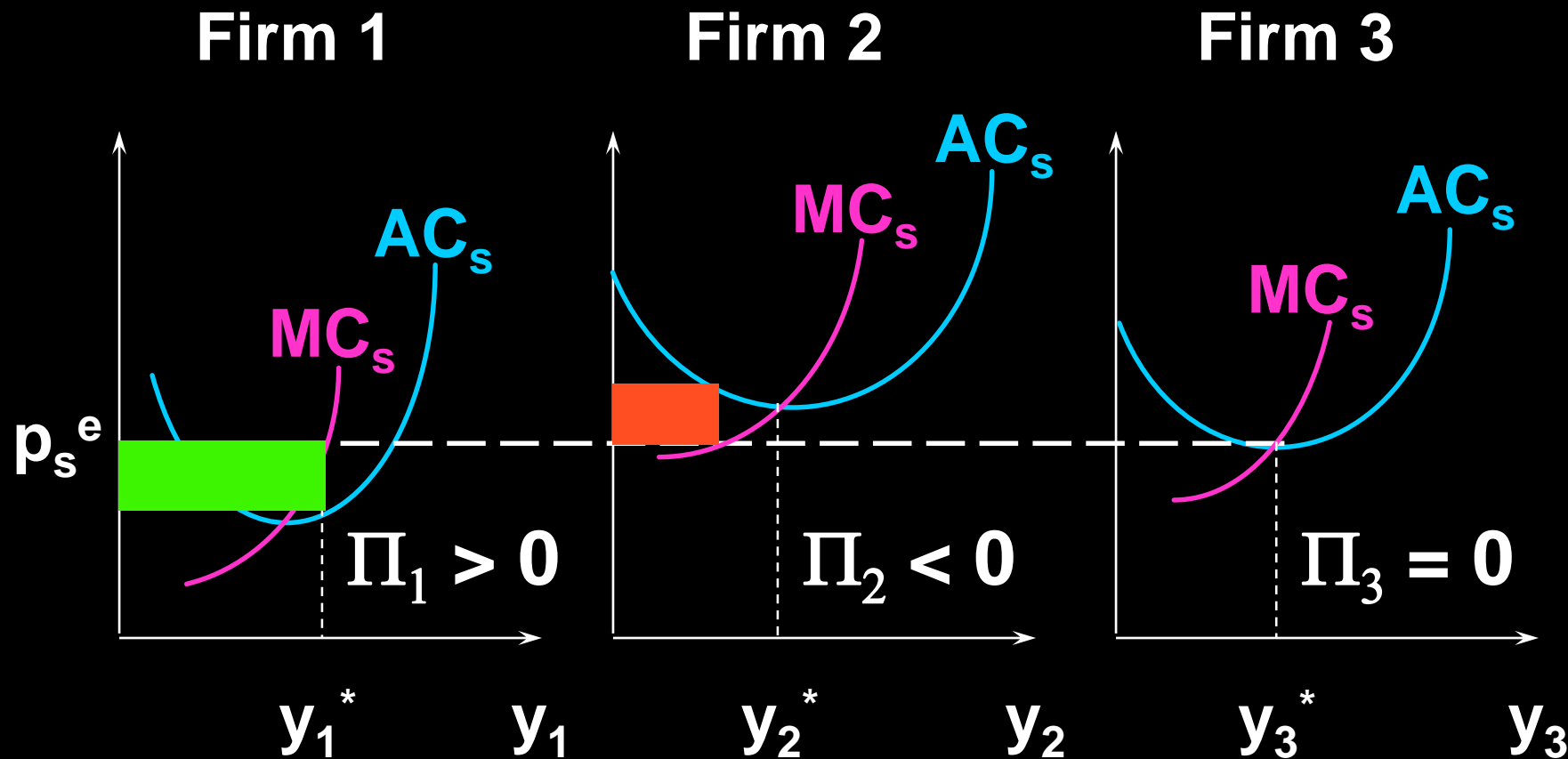


Short-run equilibrium price clears the market and is taken as given by each firm.

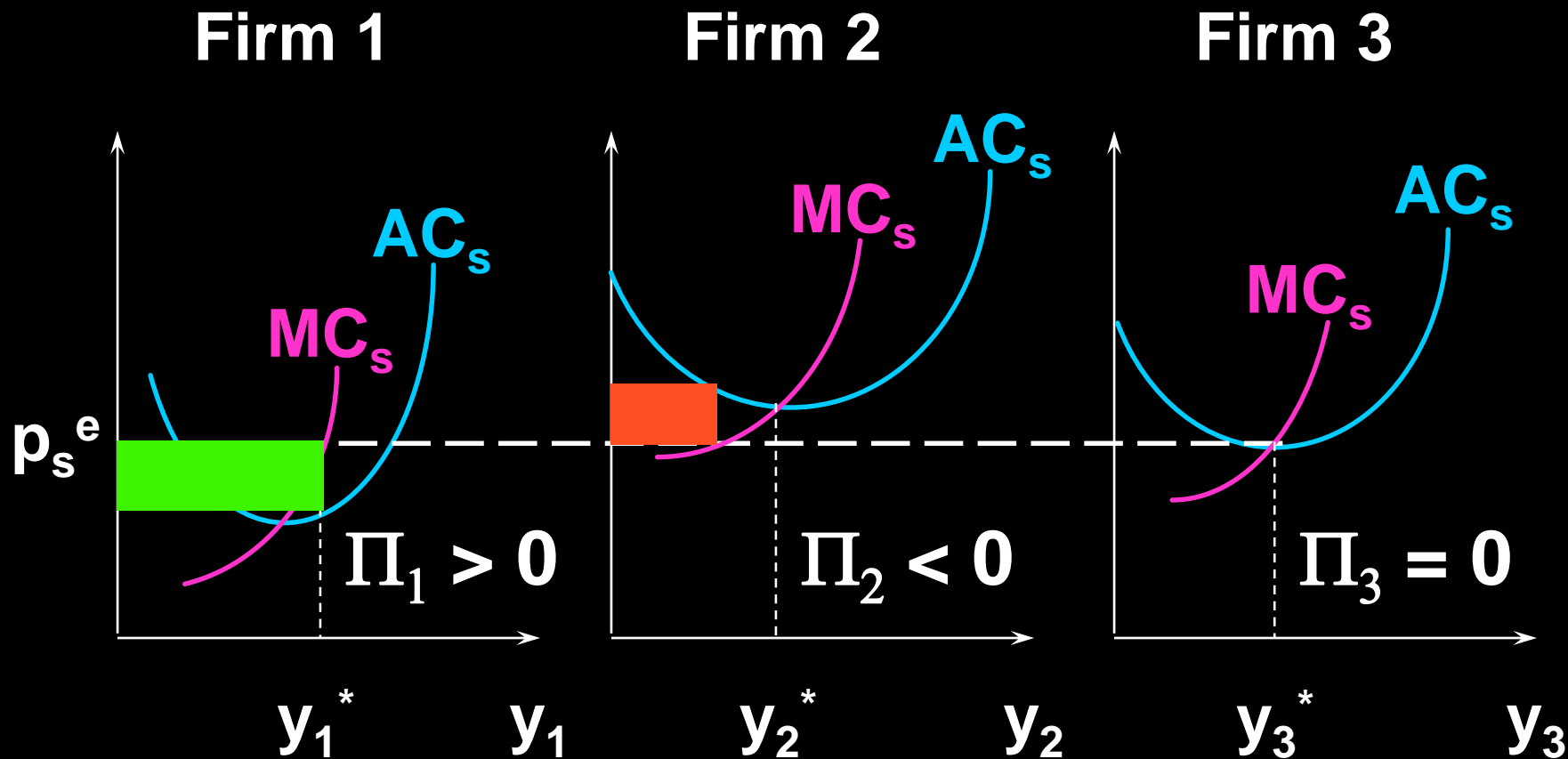
Short-Run Industry Equilibrium



Short-Run Industry Equilibrium



Short-Run Industry Equilibrium



**Firm 1 wishes
to remain in
the industry.**

**Firm 2 wishes
to exit from
the industry.**

**Firm 3 is
indifferent.**

Long-Run Industry Supply

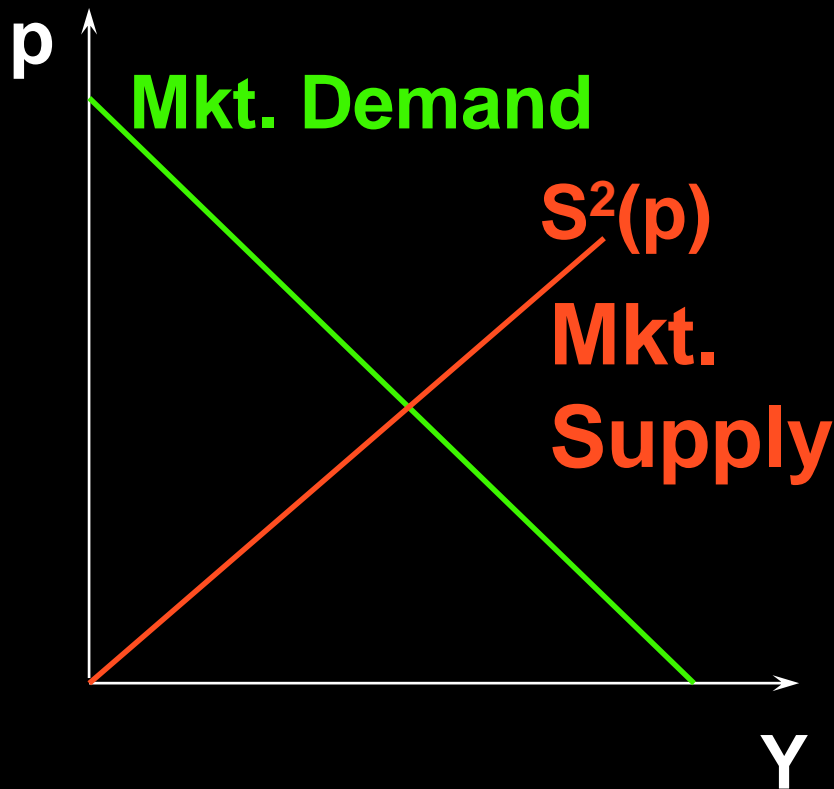
- ◆ In the long-run every firm now in the industry is free to exit and firms now outside the industry are free to enter.
- ◆ The industry's long-run supply function must account for entry and exit as well as for the supply choices of firms that choose to be in the industry.
- ◆ How is this done?

Long-Run Industry Supply

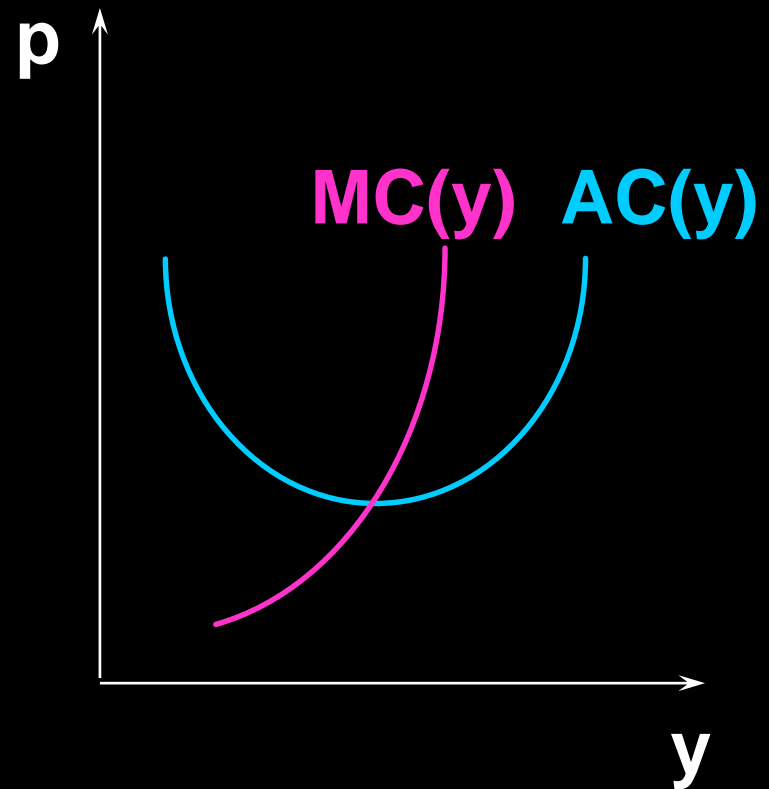
- ◆ Positive economic profit induces entry.
- ◆ Economic profit is positive when the market price p_s^e is higher than a firm's minimum av. total cost;
 $p_s^e > \min AC(y)$.
- ◆ Entry increases industry supply, causing p_s^e to fall.
- ◆ When does entry cease?

Long-Run Industry Supply

The Market



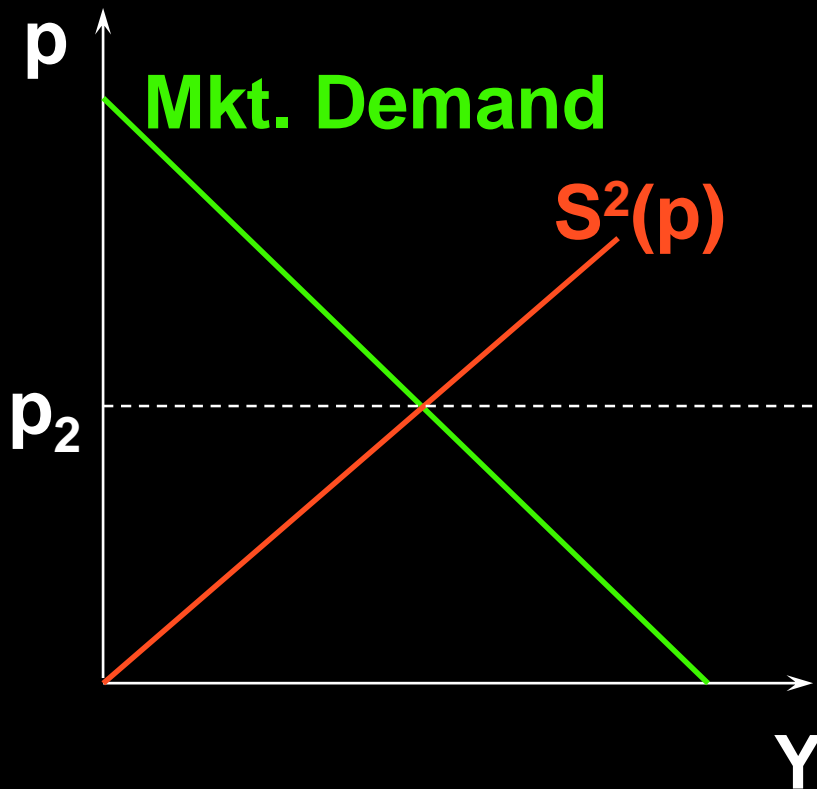
A "Typical" Firm



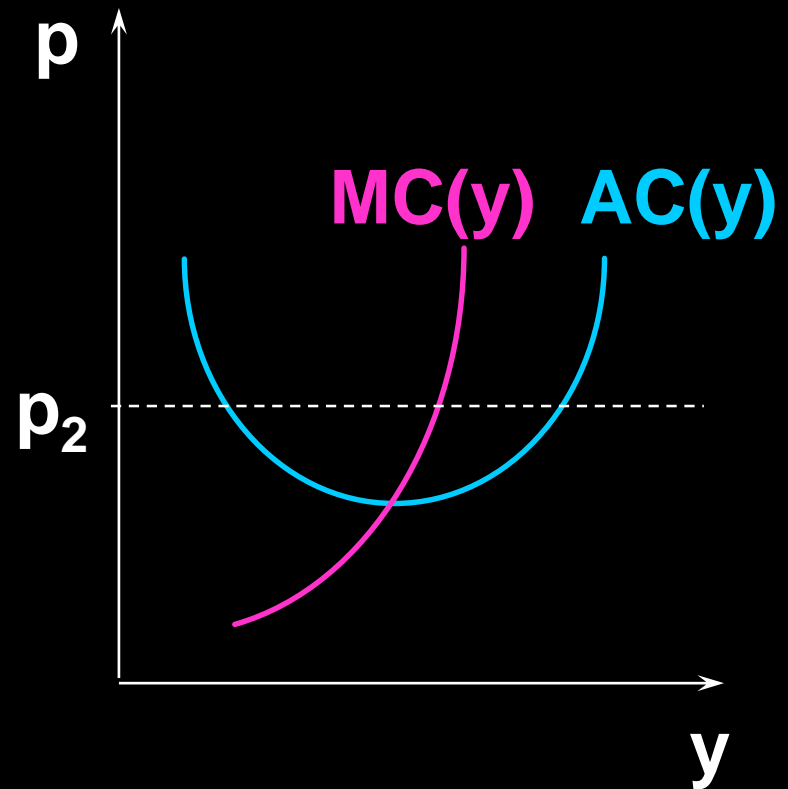
Suppose the industry initially contains only two firms.

Long-Run Industry Supply

The Market



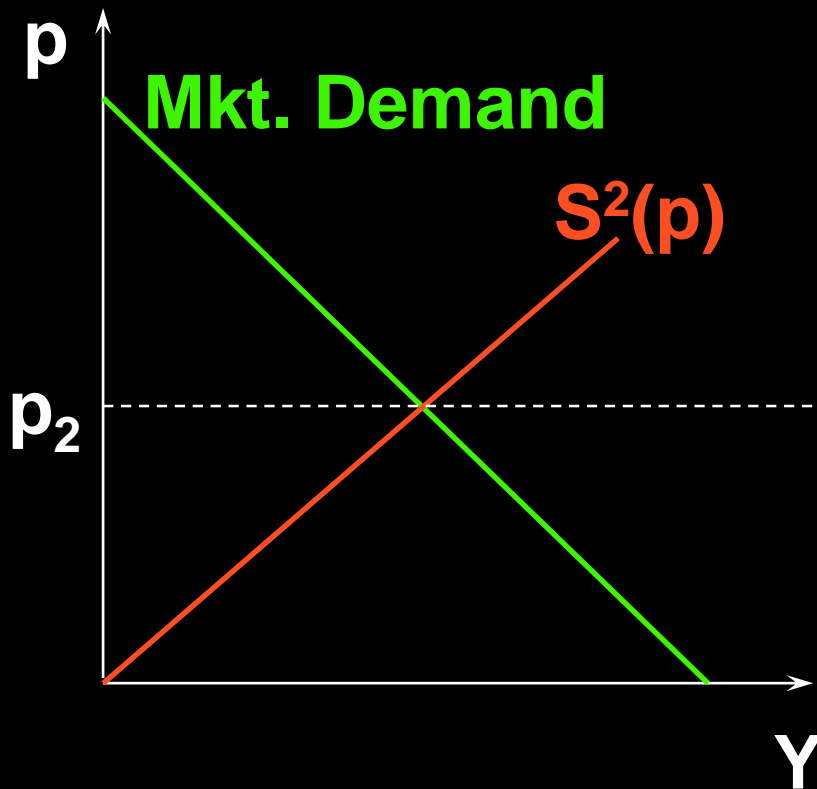
A "Typical" Firm



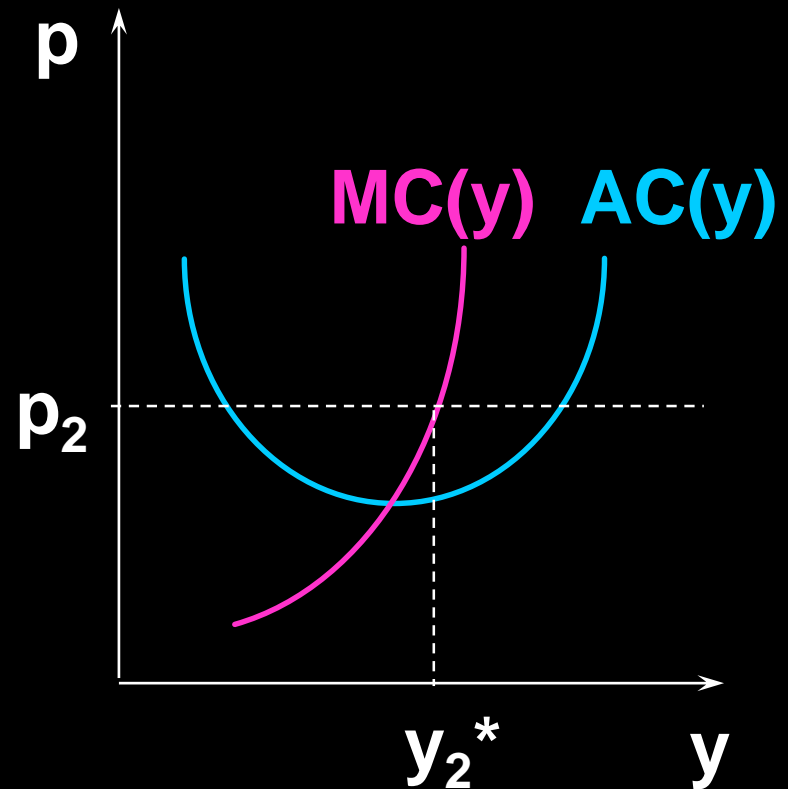
Then the market-clearing price is p_2 .

Long-Run Industry Supply

The Market



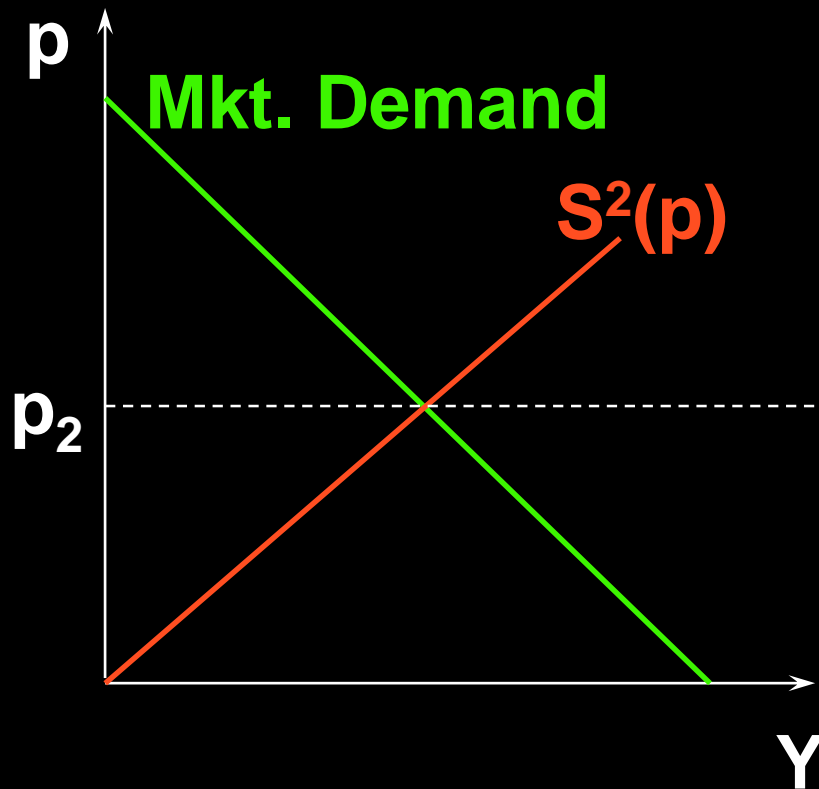
A "Typical" Firm



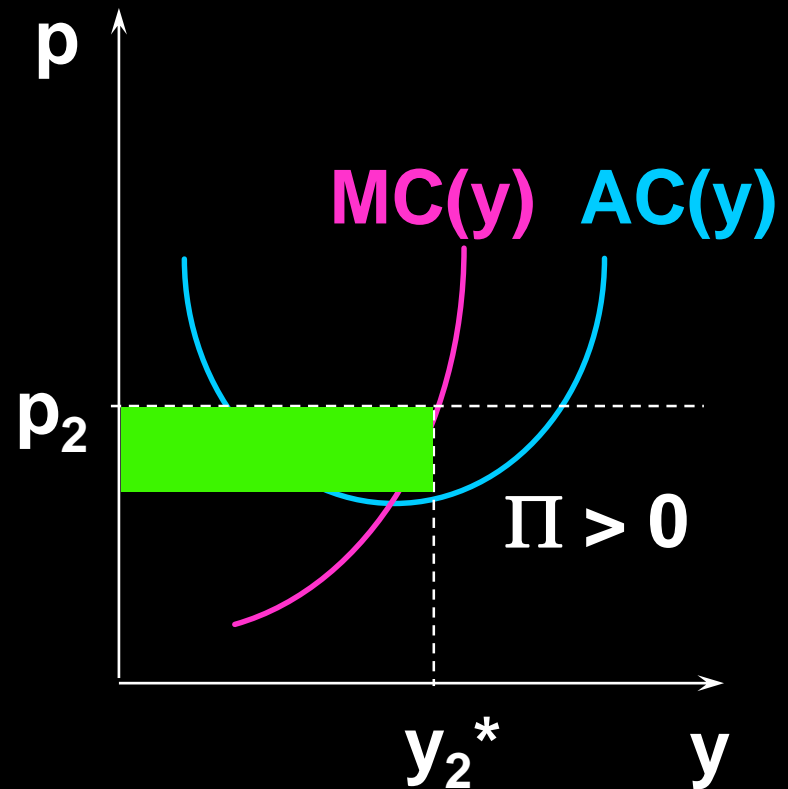
Then the market-clearing price is p_2 .
Each firm produces y_2^* units of output.

Long-Run Industry Supply

The Market



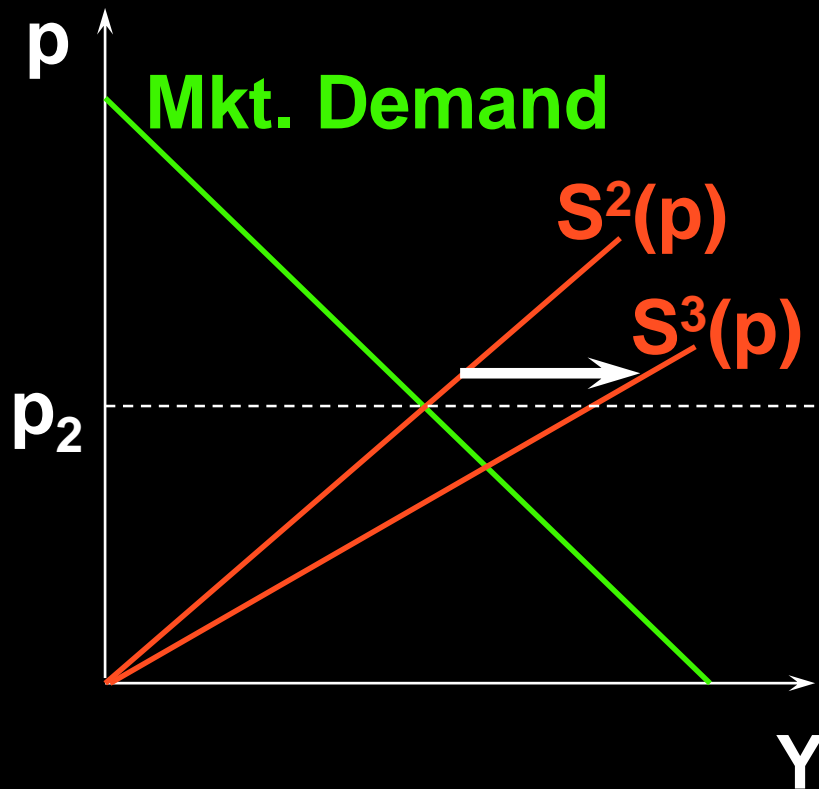
A "Typical" Firm



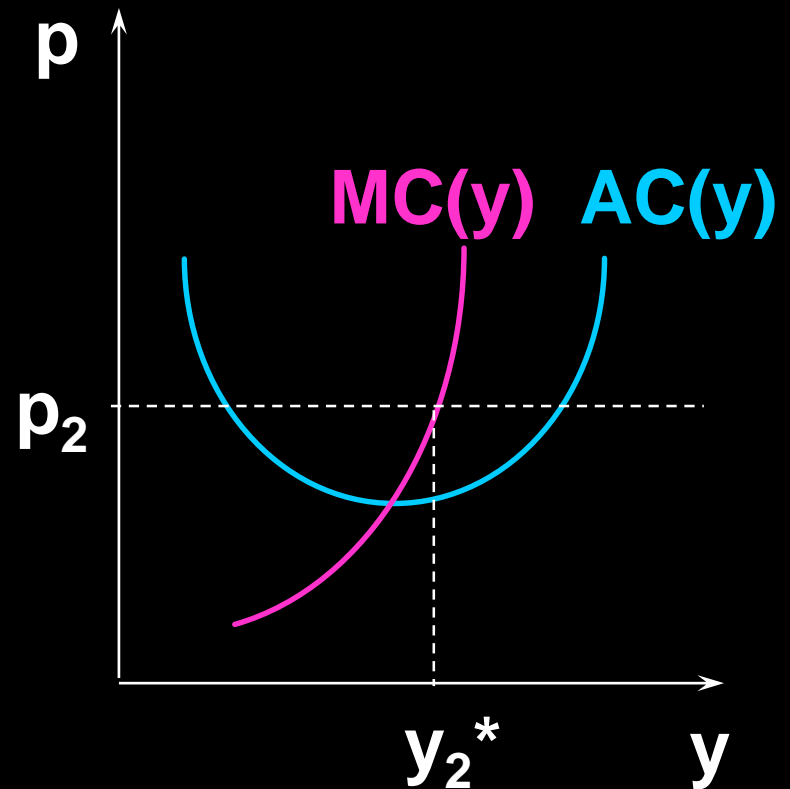
Each firm makes a positive economic profit, inducing entry by another firm.

Long-Run Industry Supply

The Market



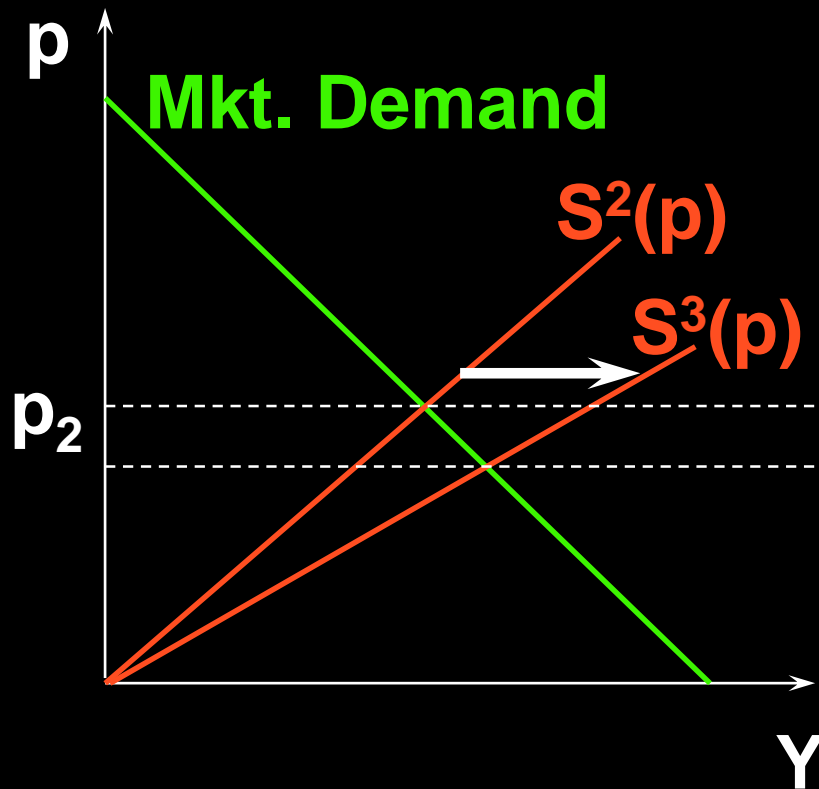
A "Typical" Firm



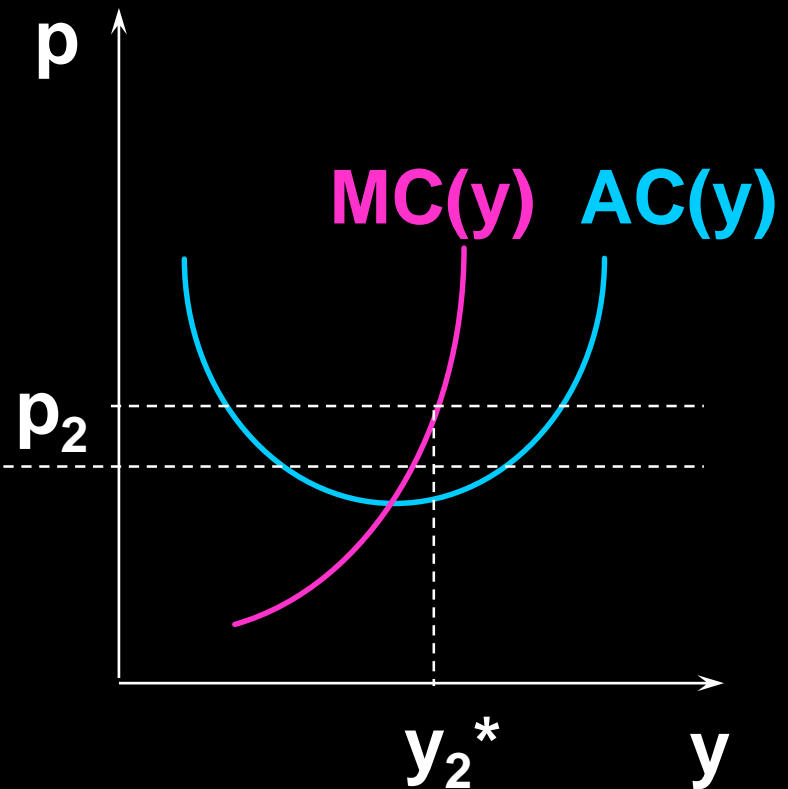
Market supply shifts outwards.

Long-Run Industry Supply

The Market



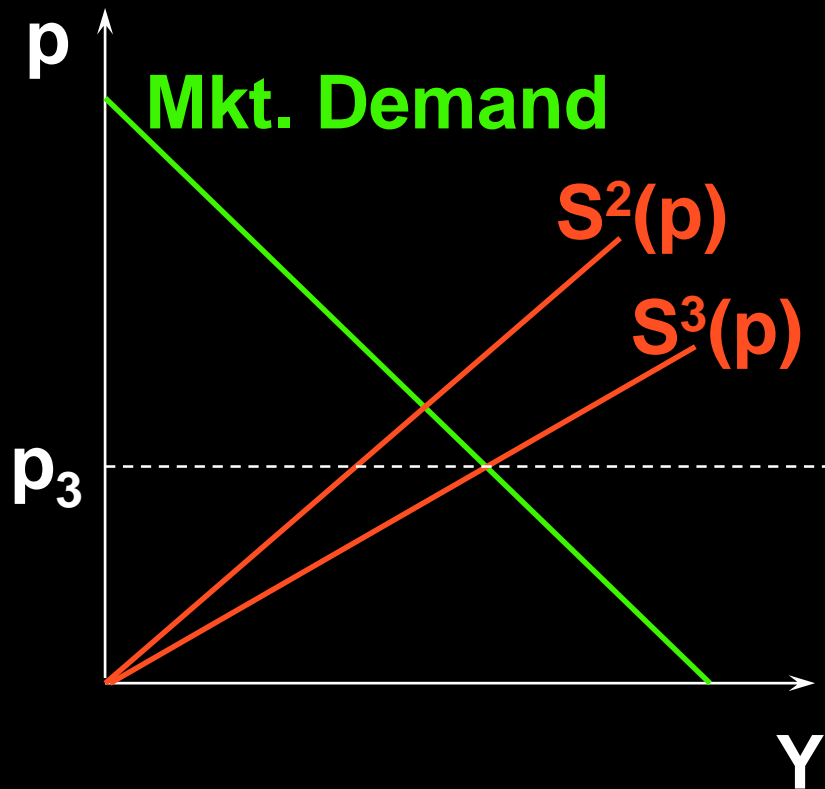
A "Typical" Firm



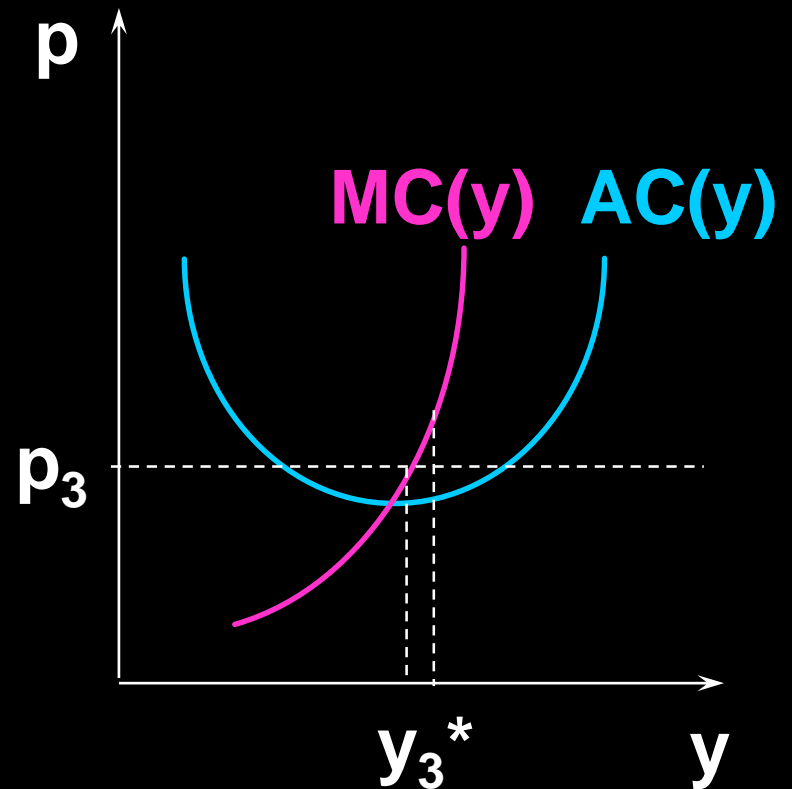
Market supply shifts outwards.
Market price falls.

Long-Run Industry Supply

The Market



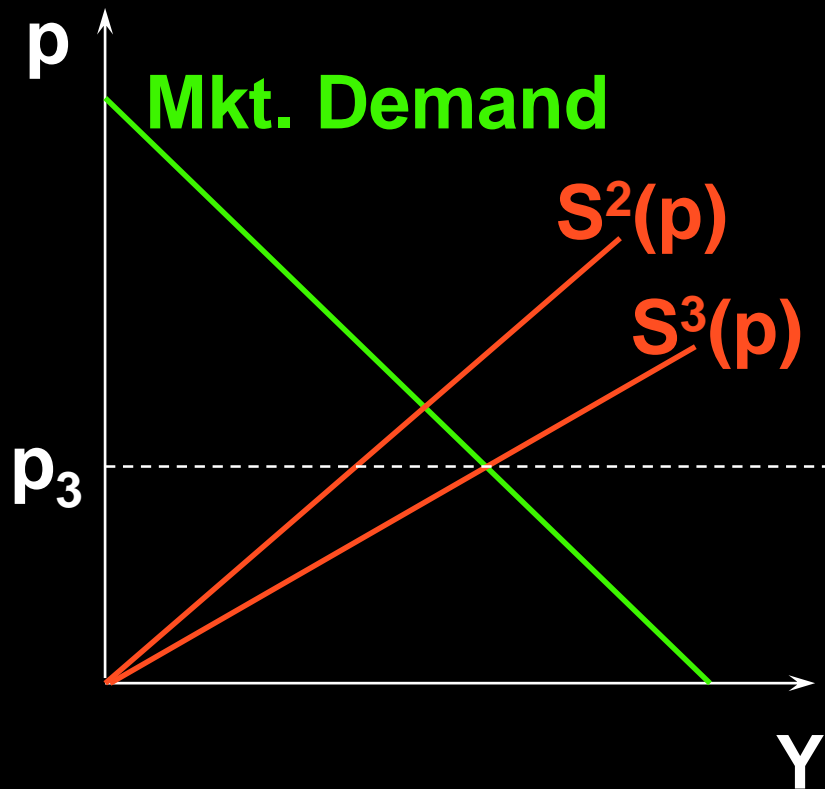
A "Typical" Firm



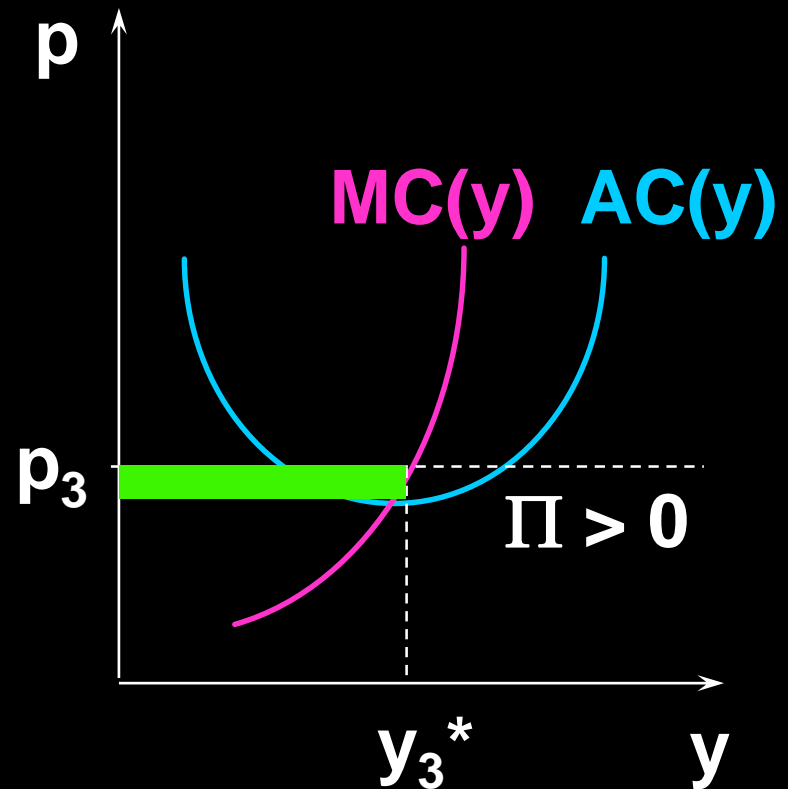
Each firm produces less.

Long-Run Industry Supply

The Market



A "Typical" Firm

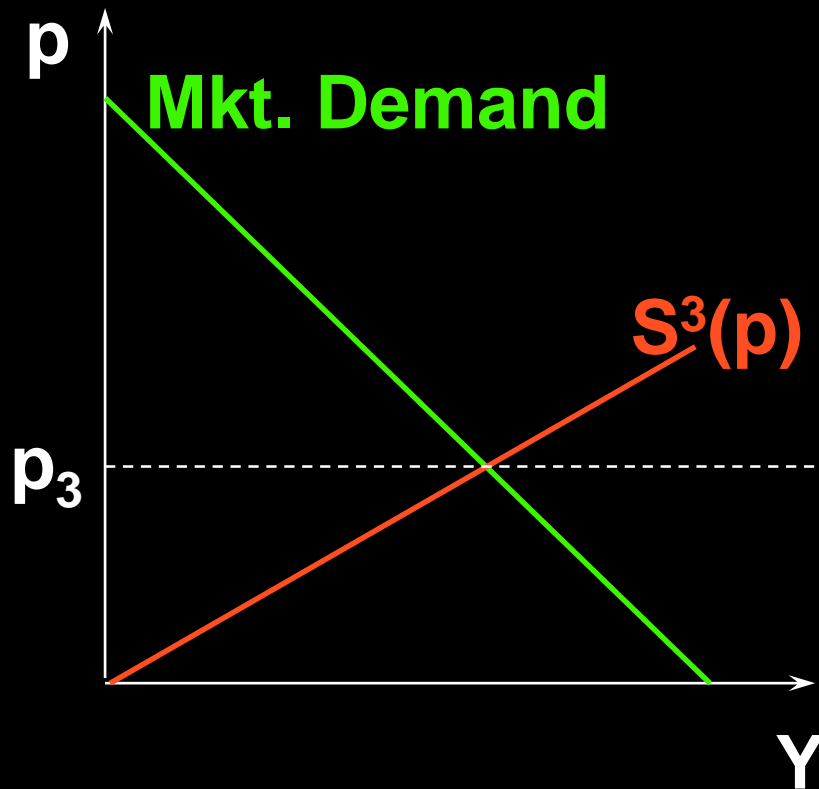


Each firm produces less.

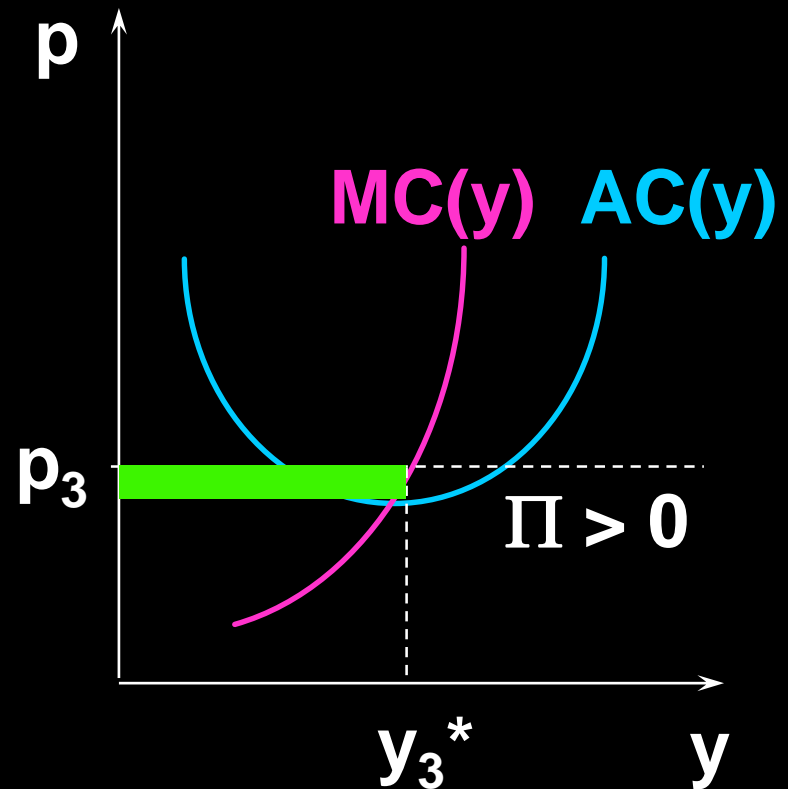
Each firm's economic profit is reduced.

Long-Run Industry Supply

The Market



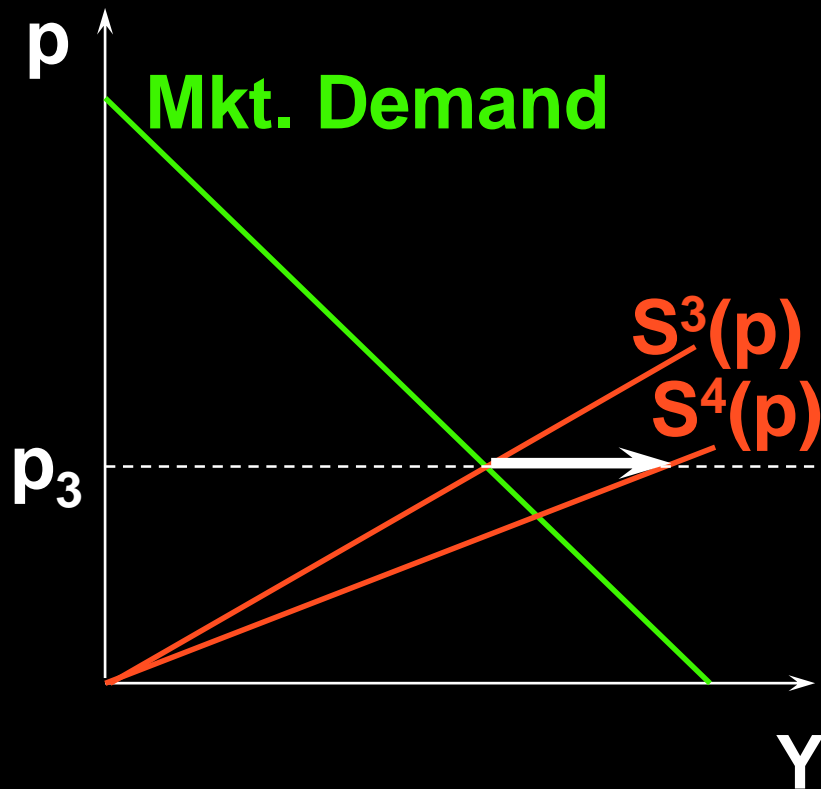
A "Typical" Firm



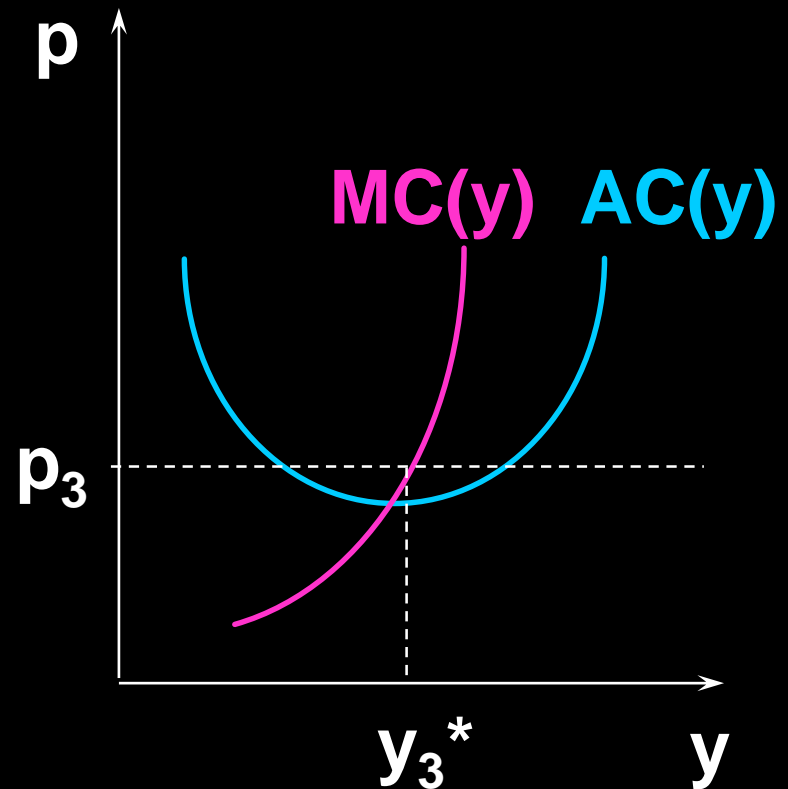
Each firm's economic profit is positive.
Will another firm enter?

Long-Run Industry Supply

The Market



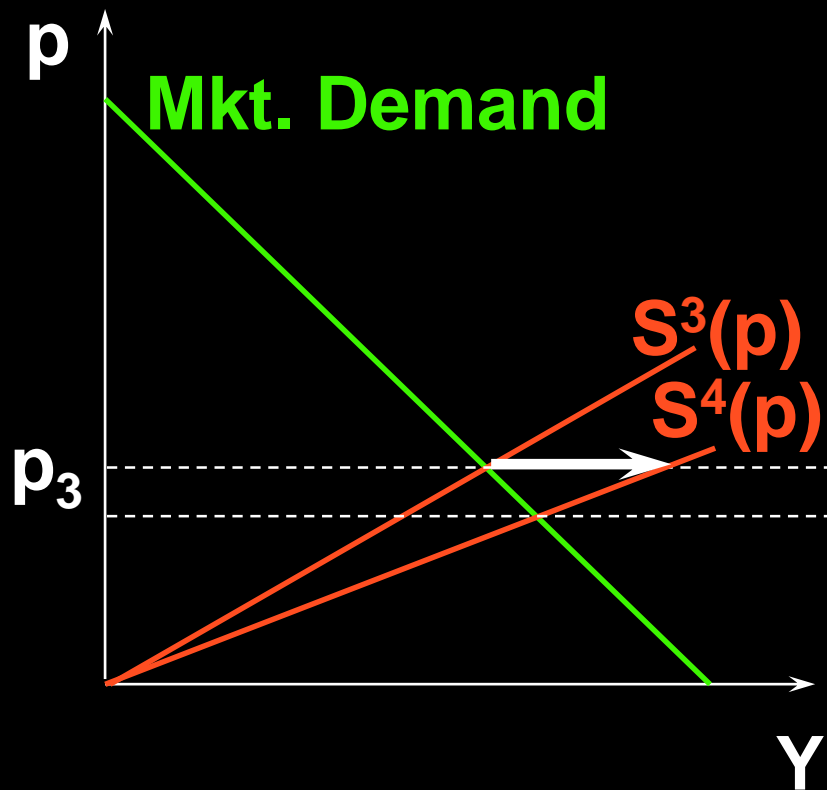
A "Typical" Firm



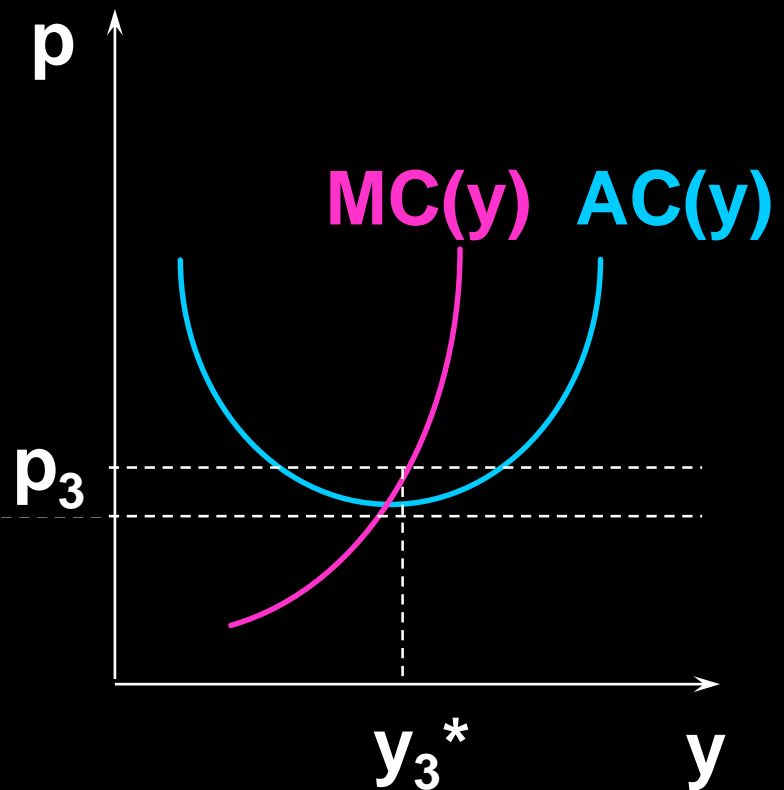
Market supply would shift outwards again.

Long-Run Industry Supply

The Market



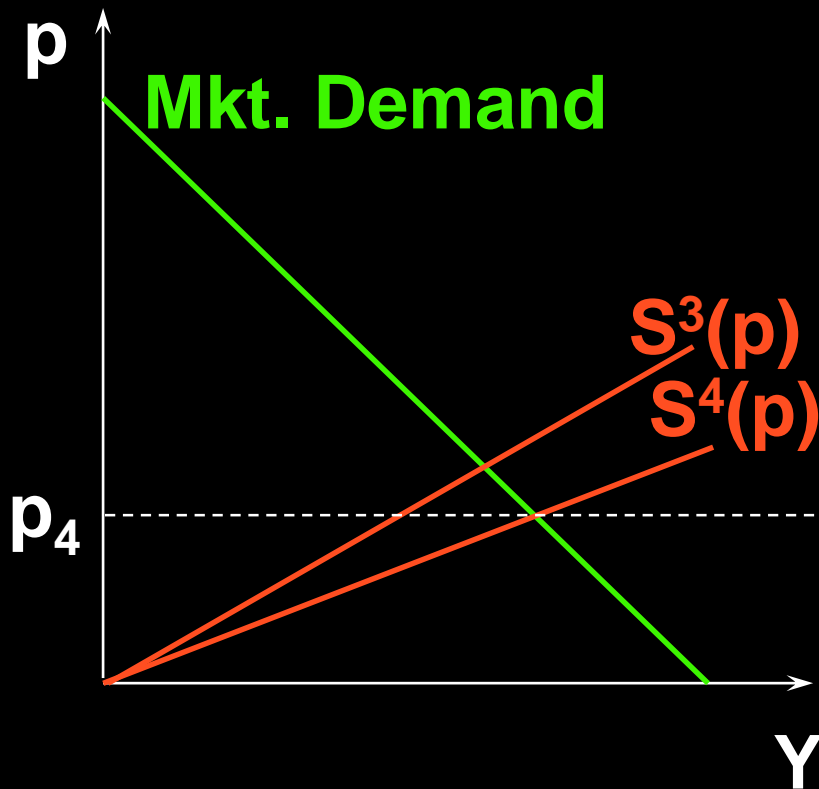
A "Typical" Firm



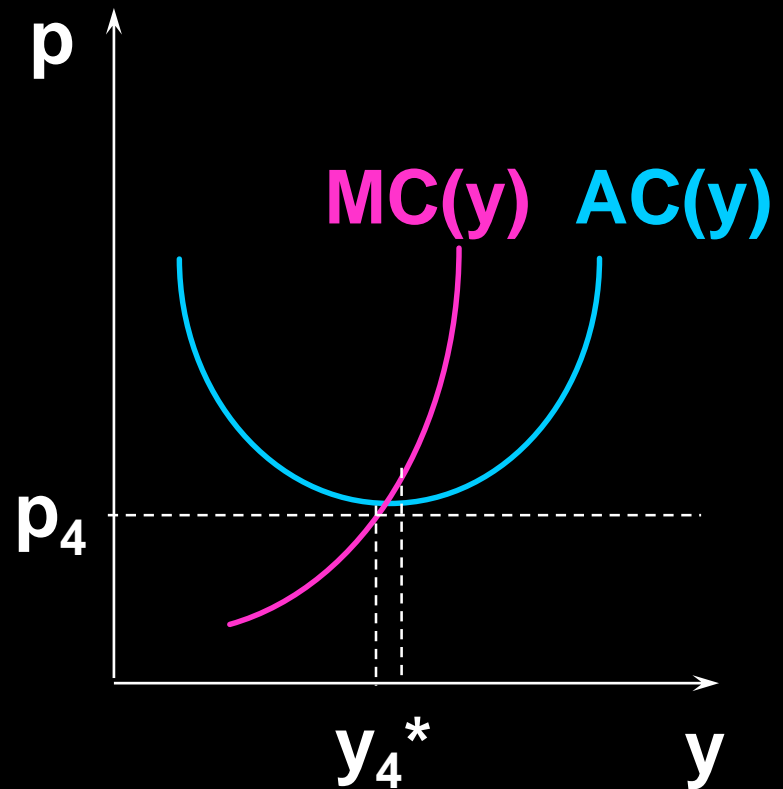
Market supply would shift outwards again.
Market price would fall again.

Long-Run Industry Supply

The Market



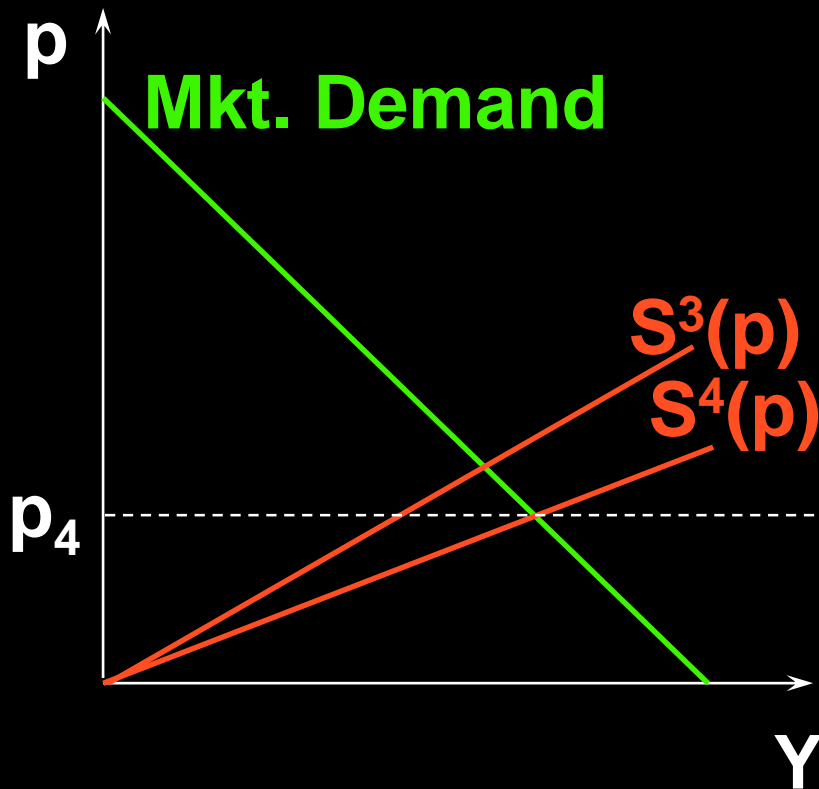
A "Typical" Firm



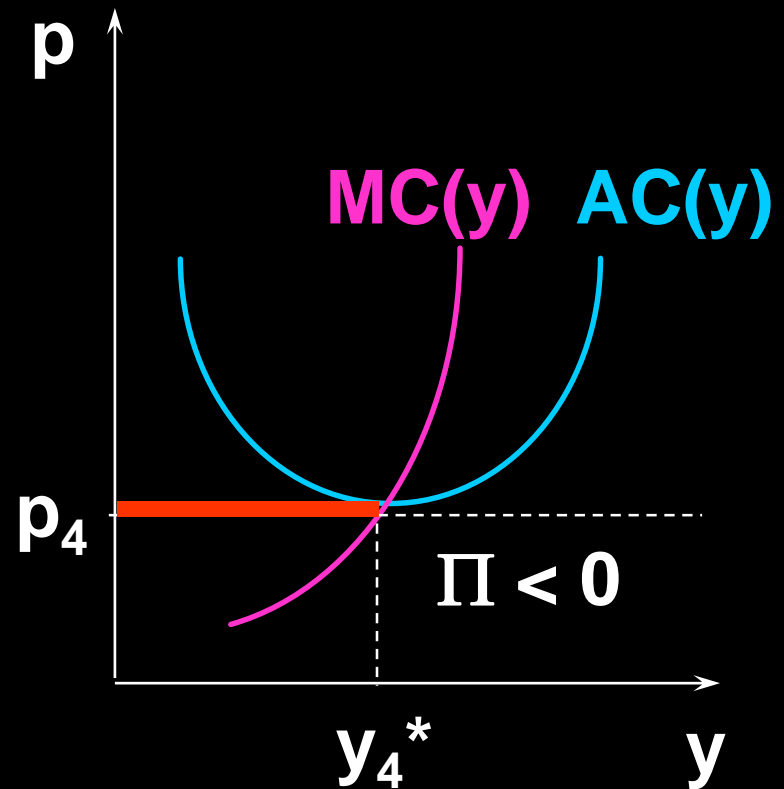
Each firm would produce less again.

Long-Run Industry Supply

The Market



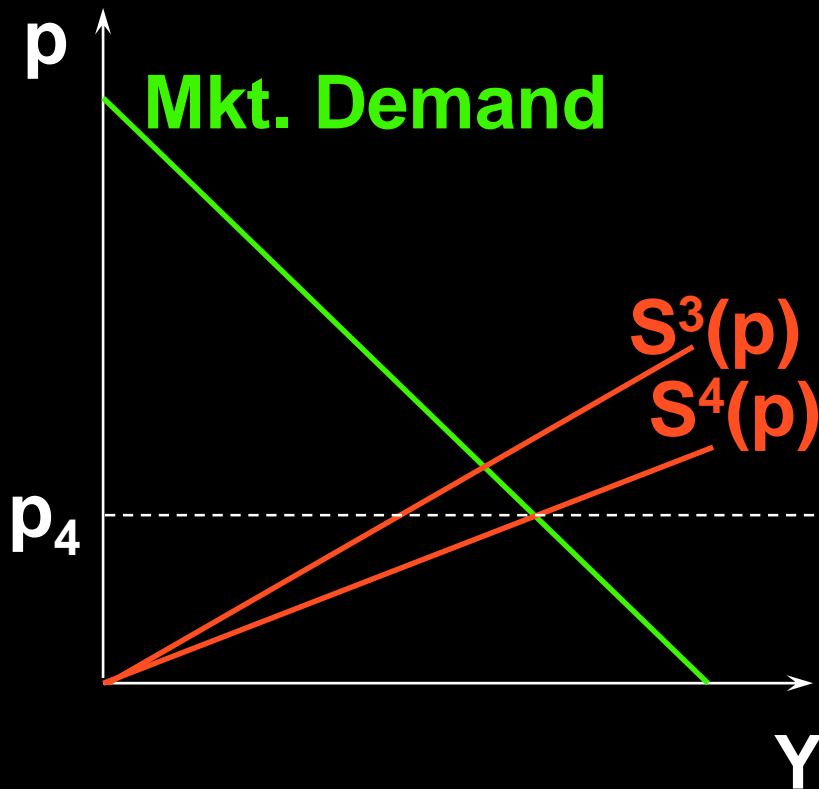
A "Typical" Firm



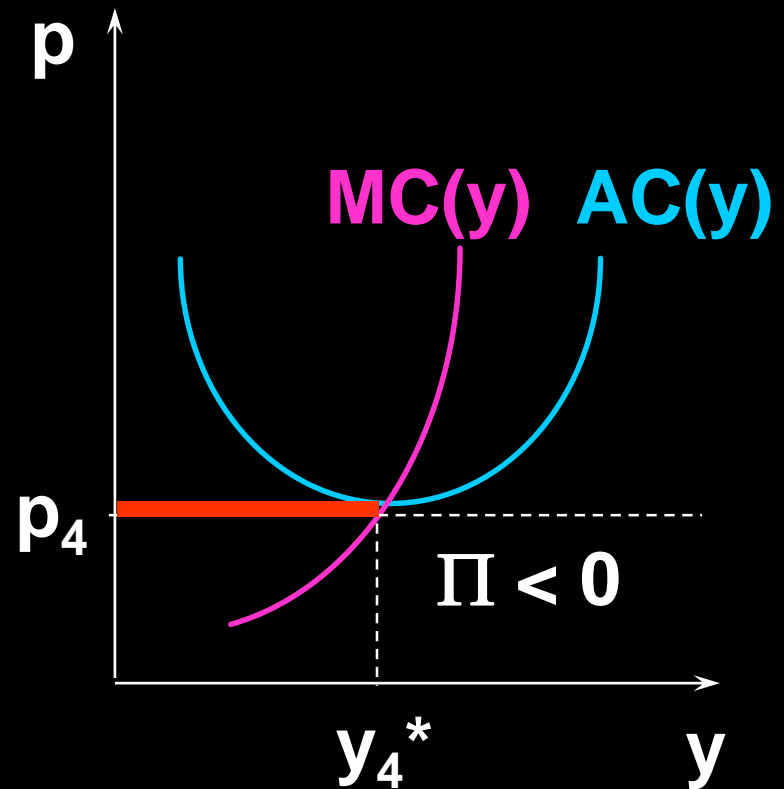
Each firm would produce less again. Each firm's economic profit would be negative.

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

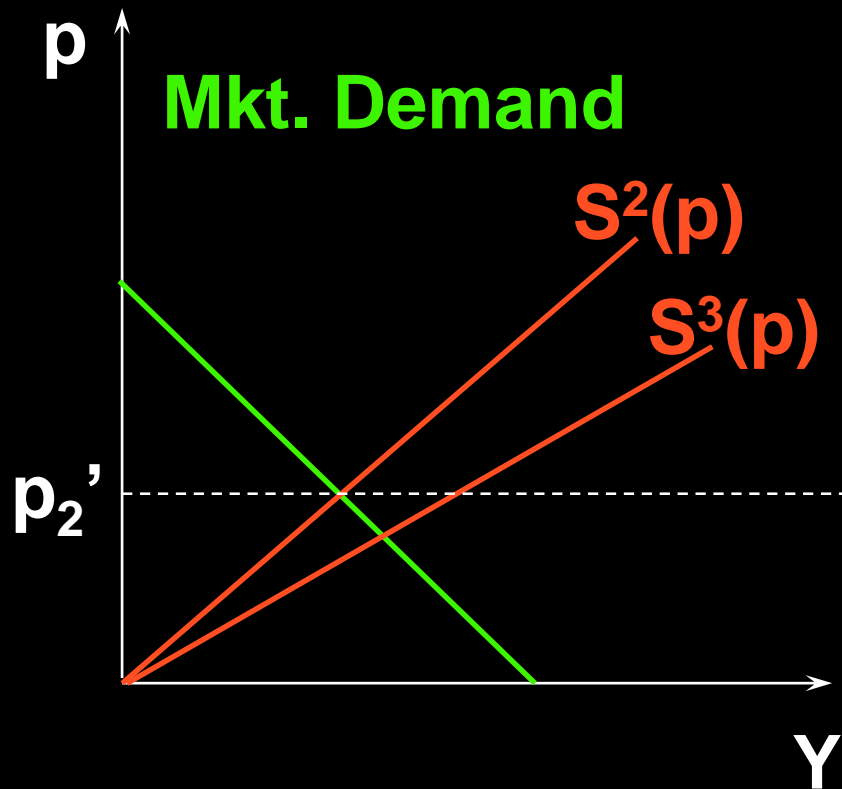
- ◆ The long-run number of firms in the industry is the largest number for which the market price is at least as large as $\min AC(y)$.
- ◆ Now we can construct the industry's long-run supply curve.

Long-Run Industry Supply

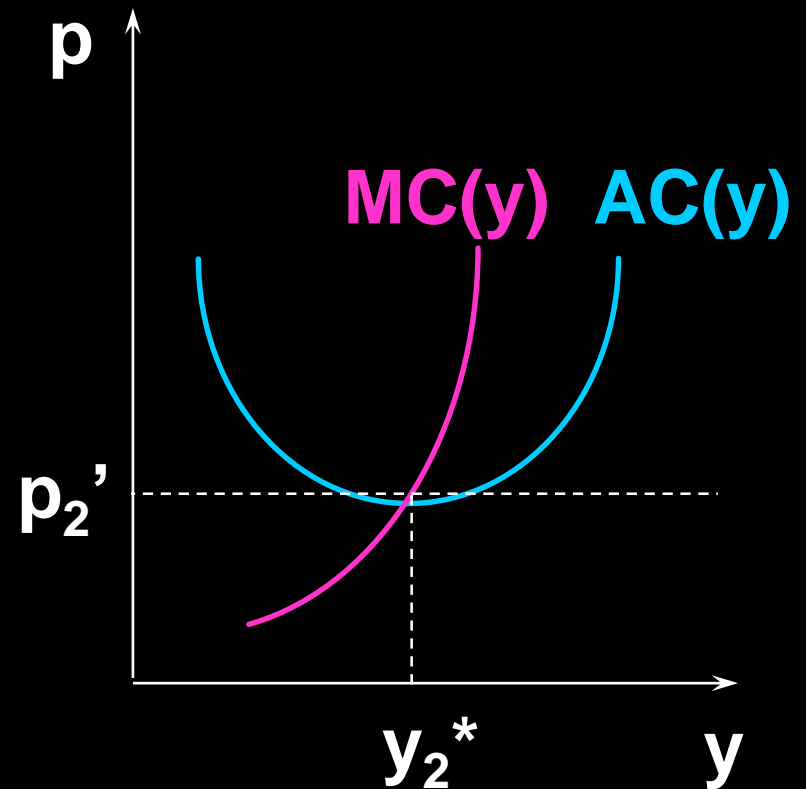
- ◆ Suppose that market demand is only large enough to sustain only two firms in the industry.

Long-Run Industry Supply

The Market



A "Typical" Firm

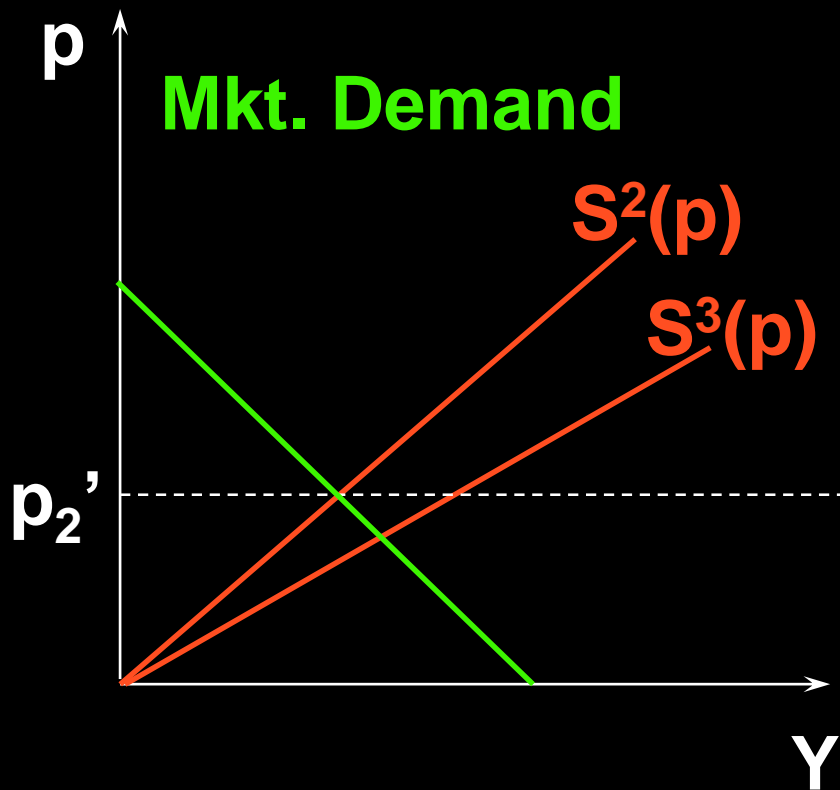


Long-Run Industry Supply

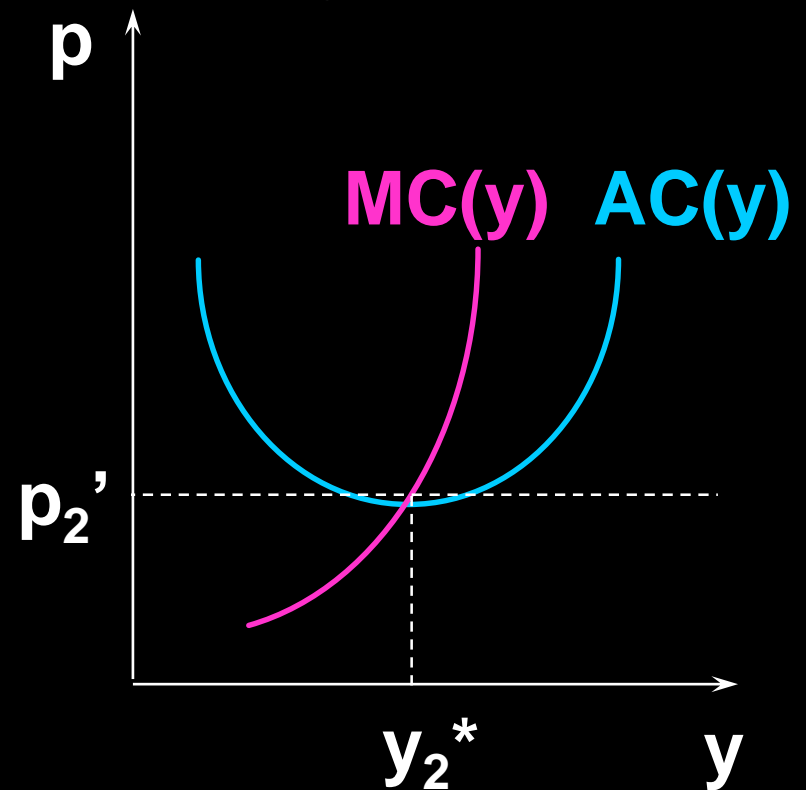
- ◆ Suppose that market demand is only large enough to sustain only two firms in the industry.
- ◆ Next, the market demand increases, the market price rises, each firm produces more, and earns a higher economic profit.

Long-Run Industry Supply

The Market

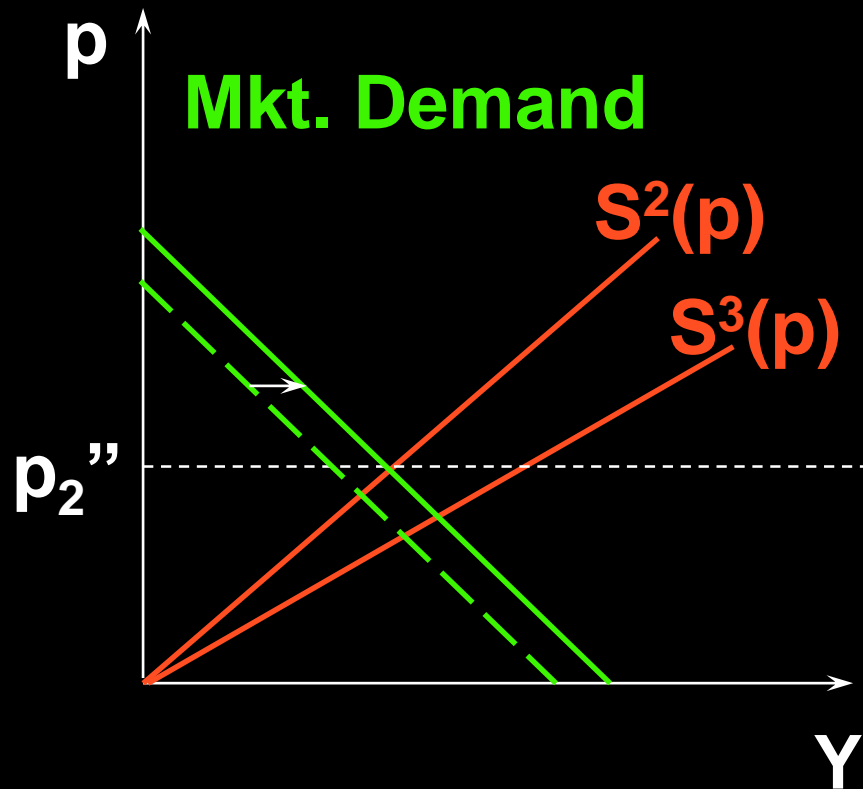


A "Typical" Firm

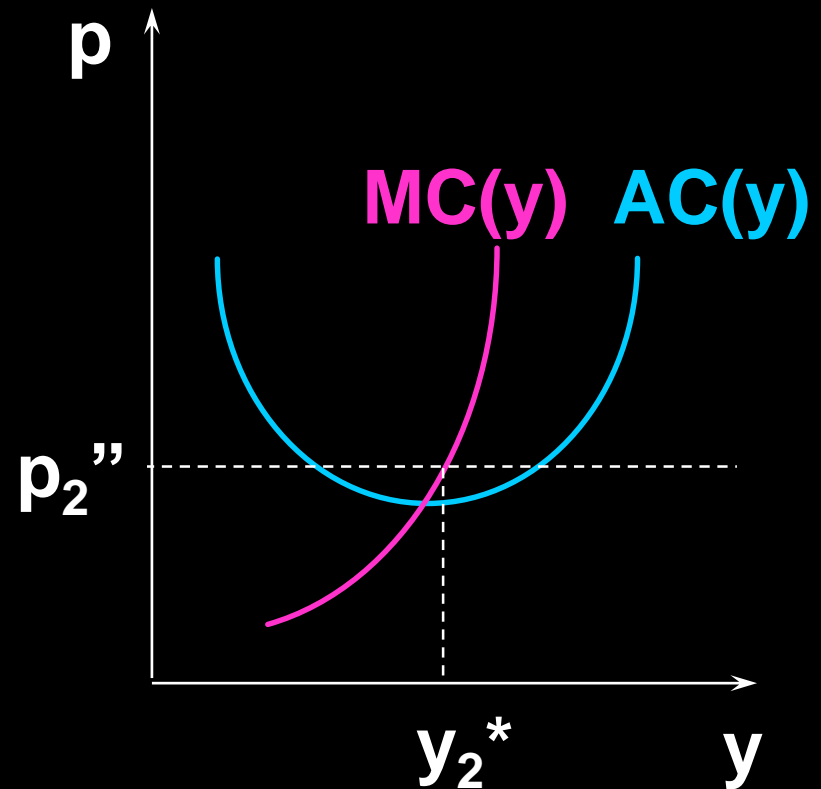


Long-Run Industry Supply

The Market

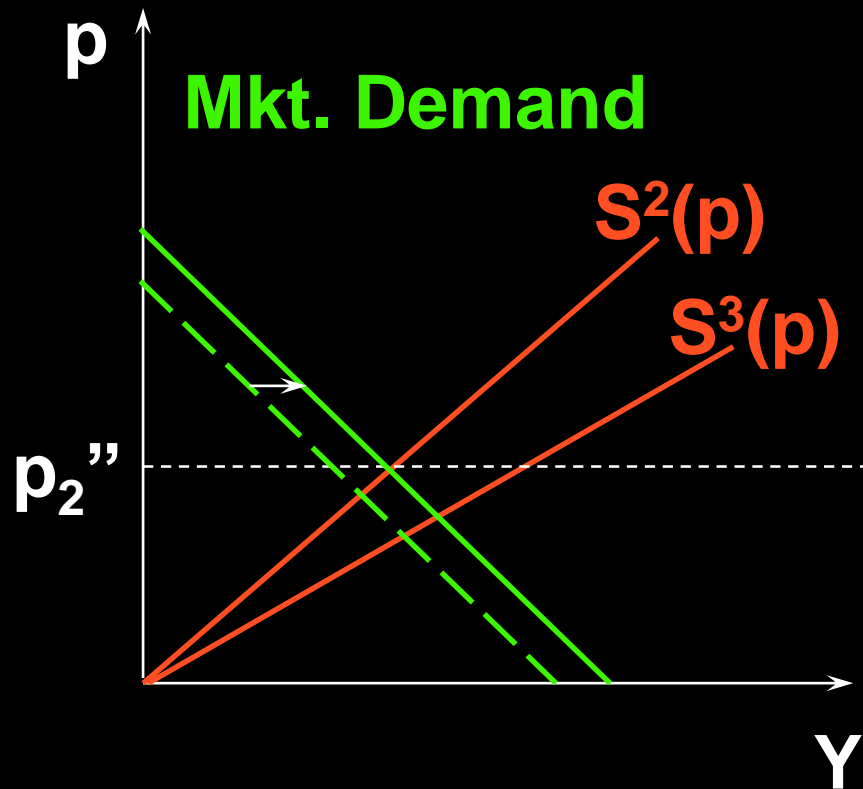


A "Typical" Firm

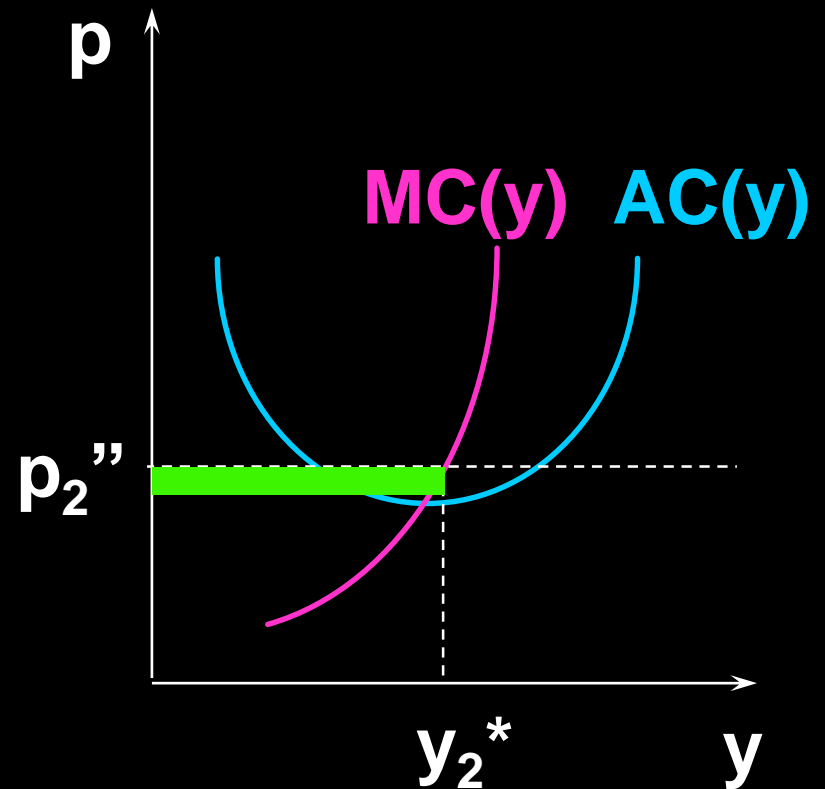


Long-Run Industry Supply

The Market

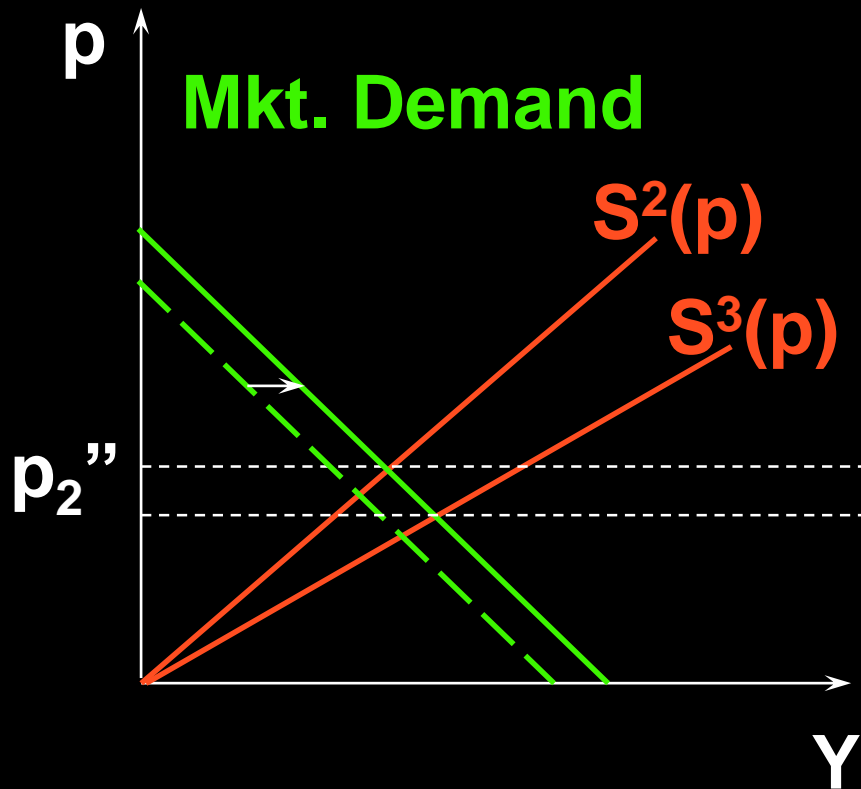


A "Typical" Firm

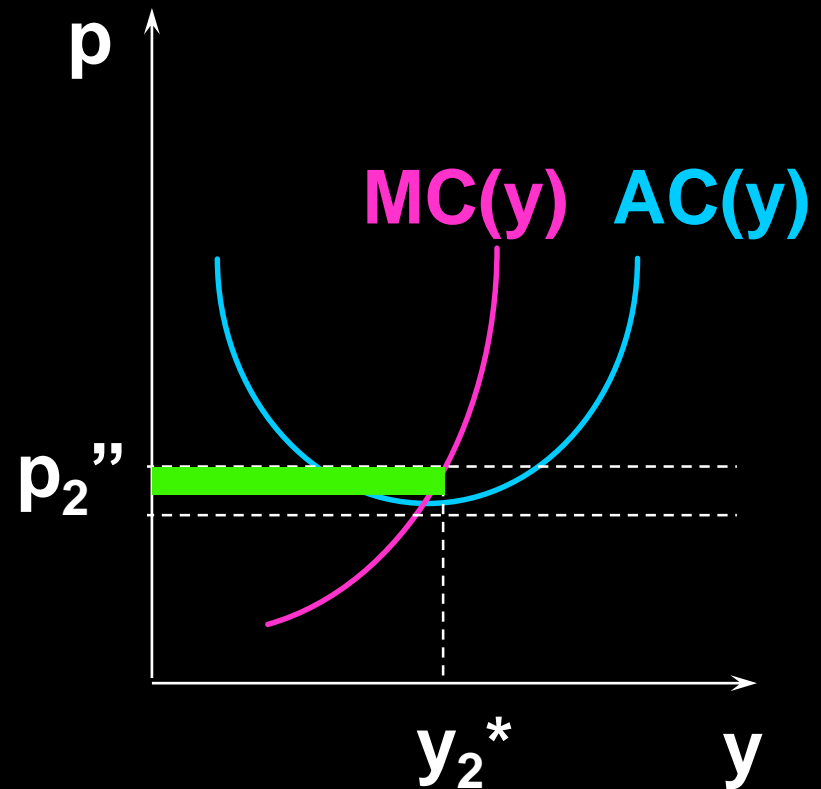


Long-Run Industry Supply

The Market



A "Typical" Firm



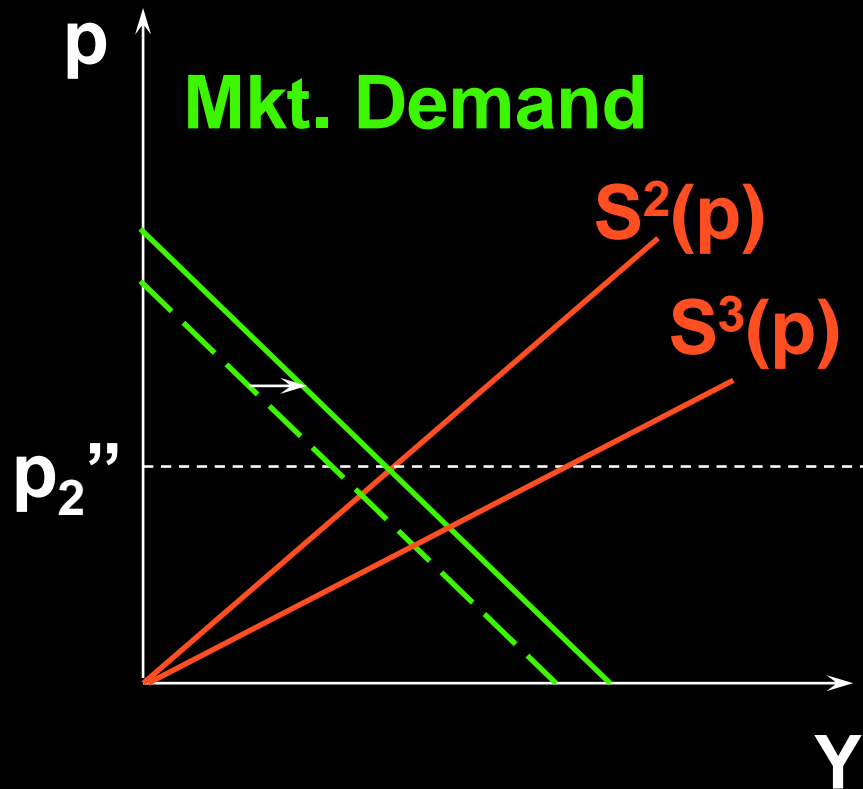
Notice that a 3rd firm will not enter since it would earn negative economic profits.

Long-Run Industry Supply

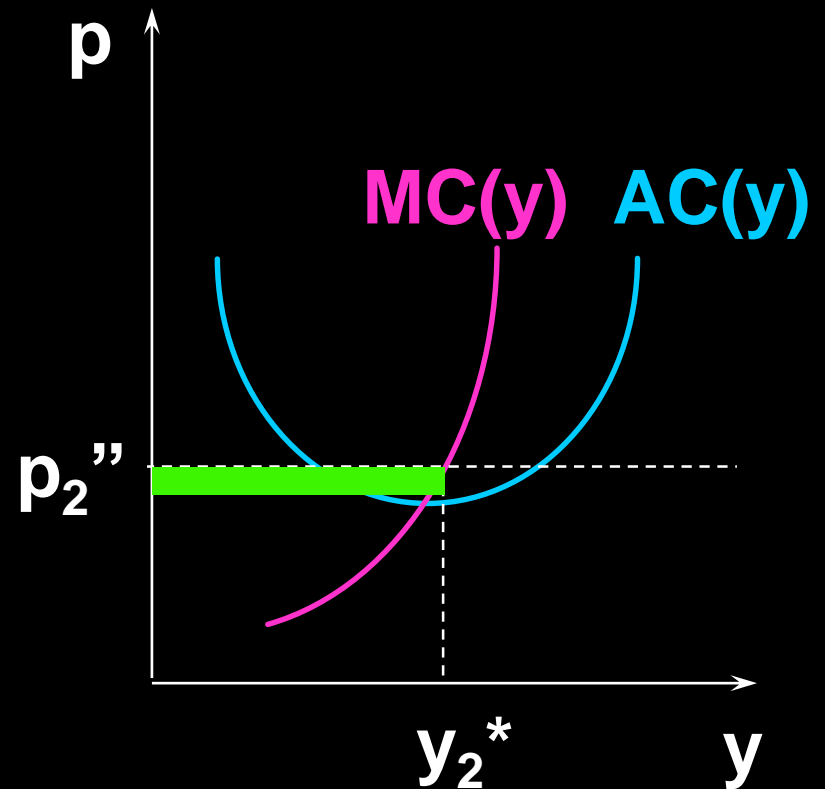
- ◆ **As market demand increases further, the market price rises further, the two incumbent firms each produce more and earn still higher economic profits -- until a 3rd firm becomes indifferent between entering and staying out.**

Long-Run Industry Supply

The Market

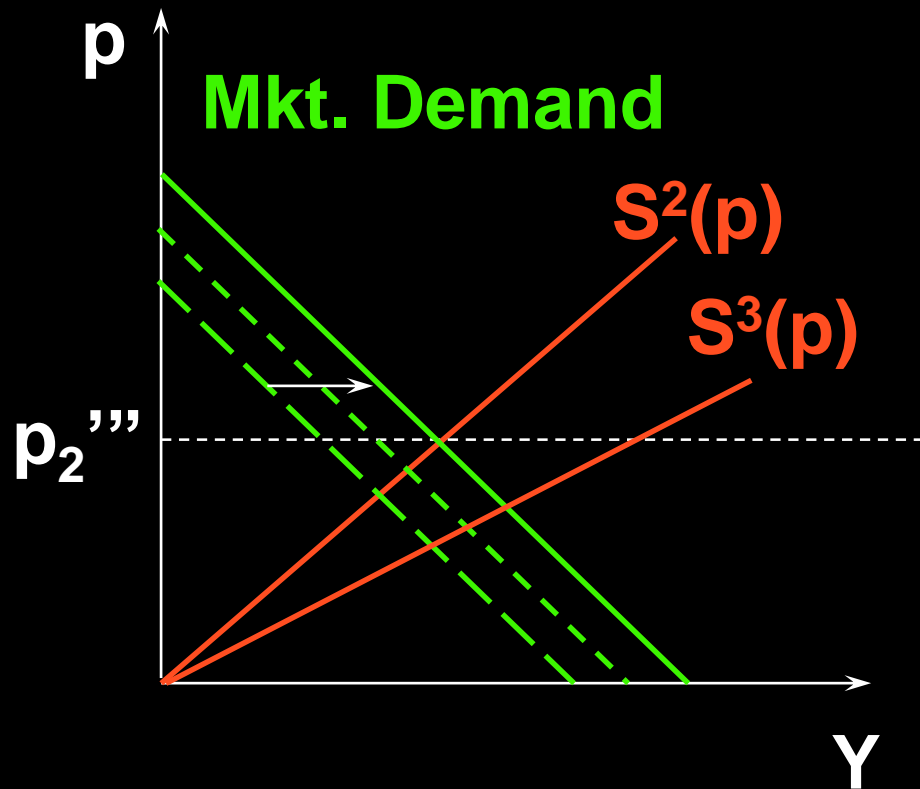


A "Typical" Firm

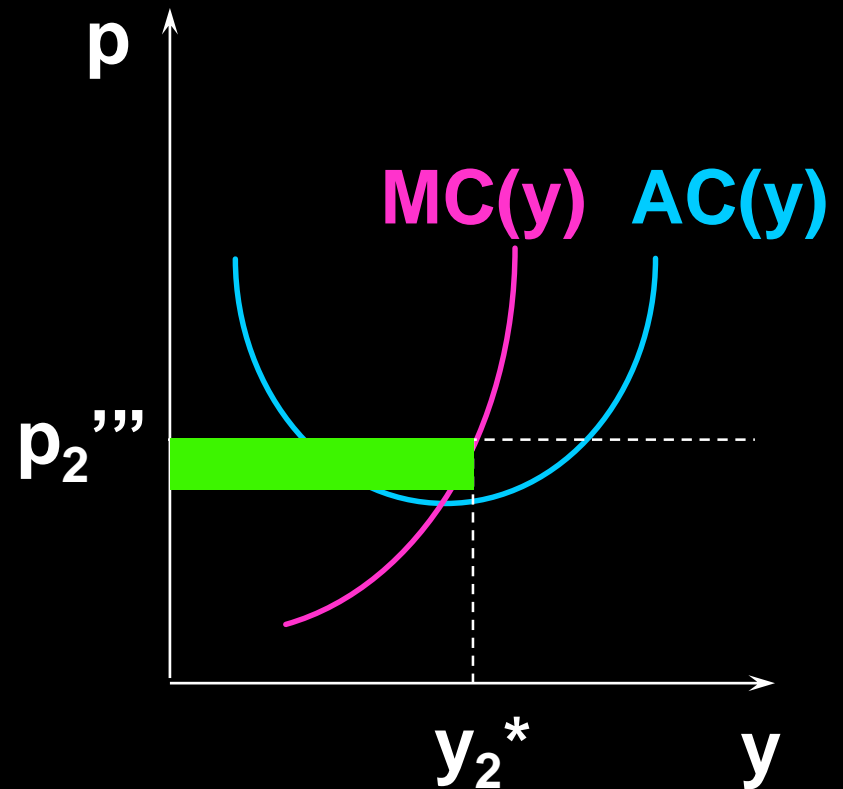


Long-Run Industry Supply

The Market

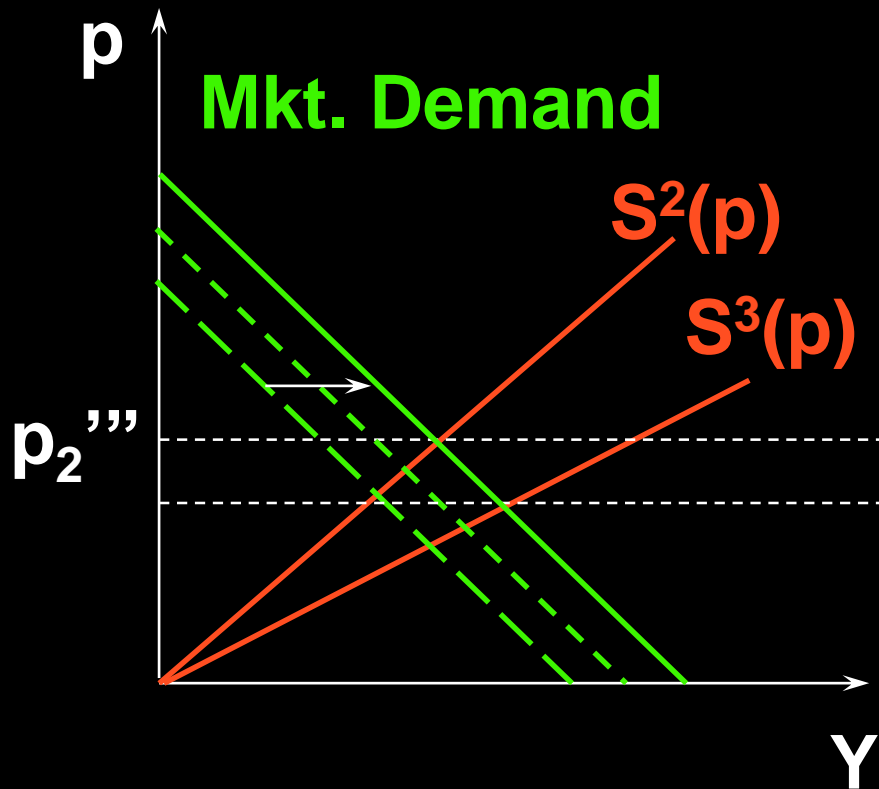


A "Typical" Firm

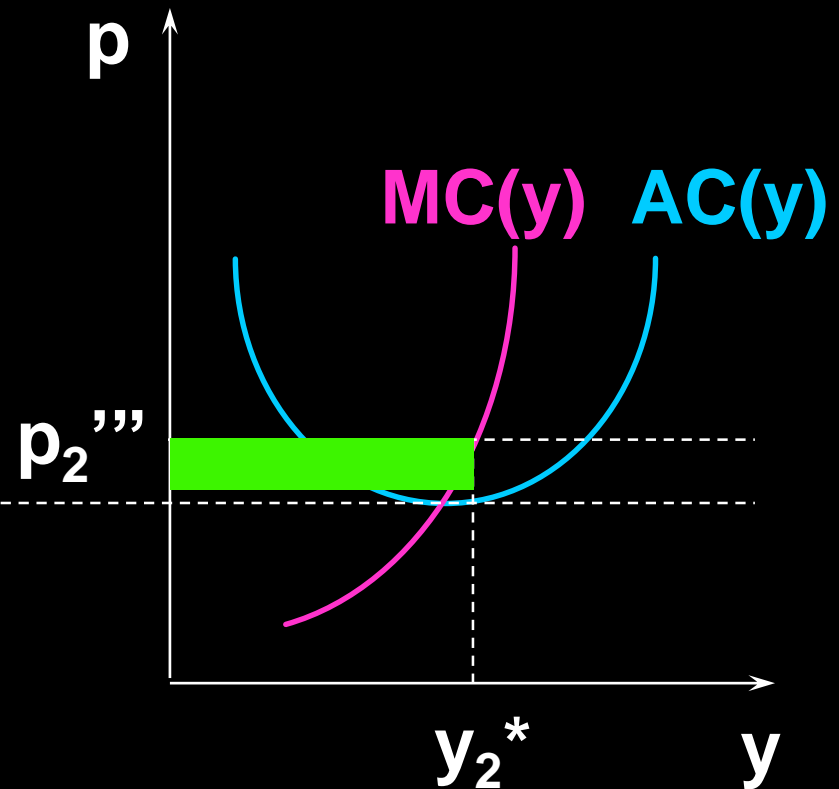


Long-Run Industry Supply

The Market



A "Typical" Firm



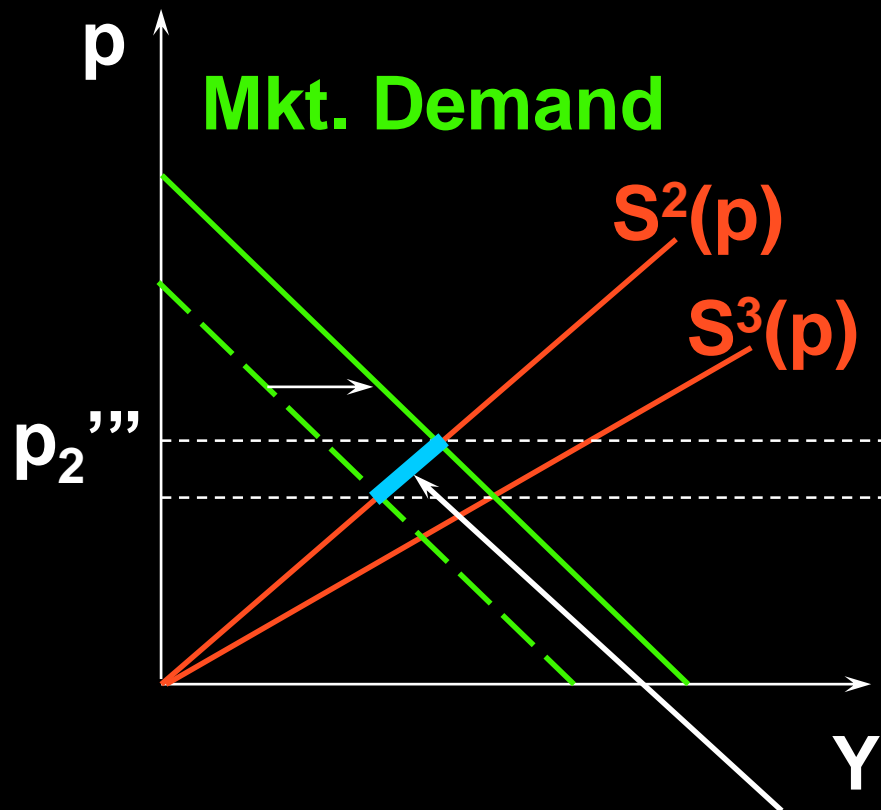
A third firm can now enter, causing all firms to earn zero economic profits.

Long-Run Industry Supply

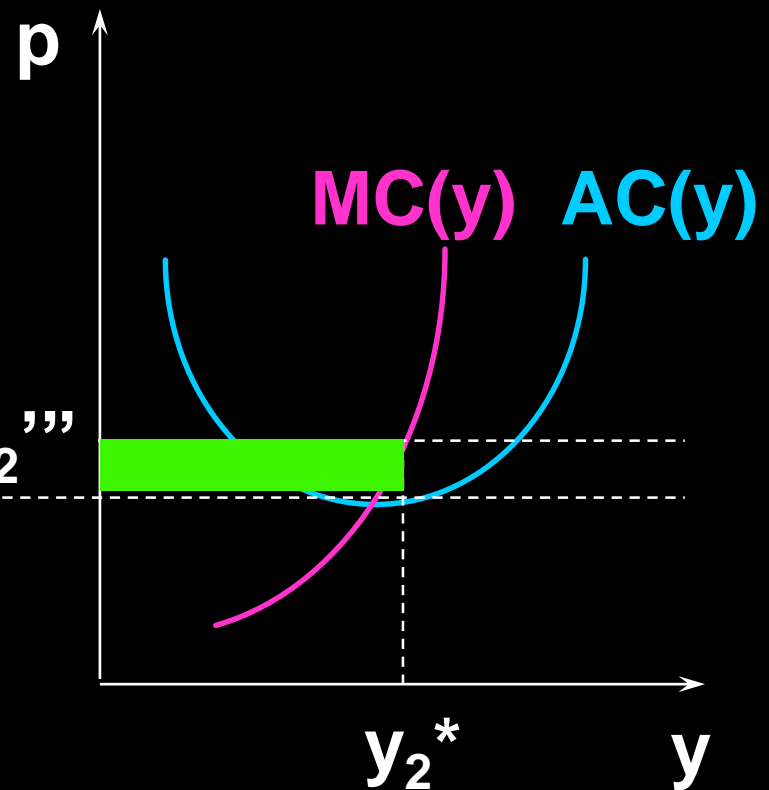
- ◆ So any further increase in market demand will cause the number of firms in the industry to rise to three.

Long-Run Industry Supply

The Market



A "Typical" Firm



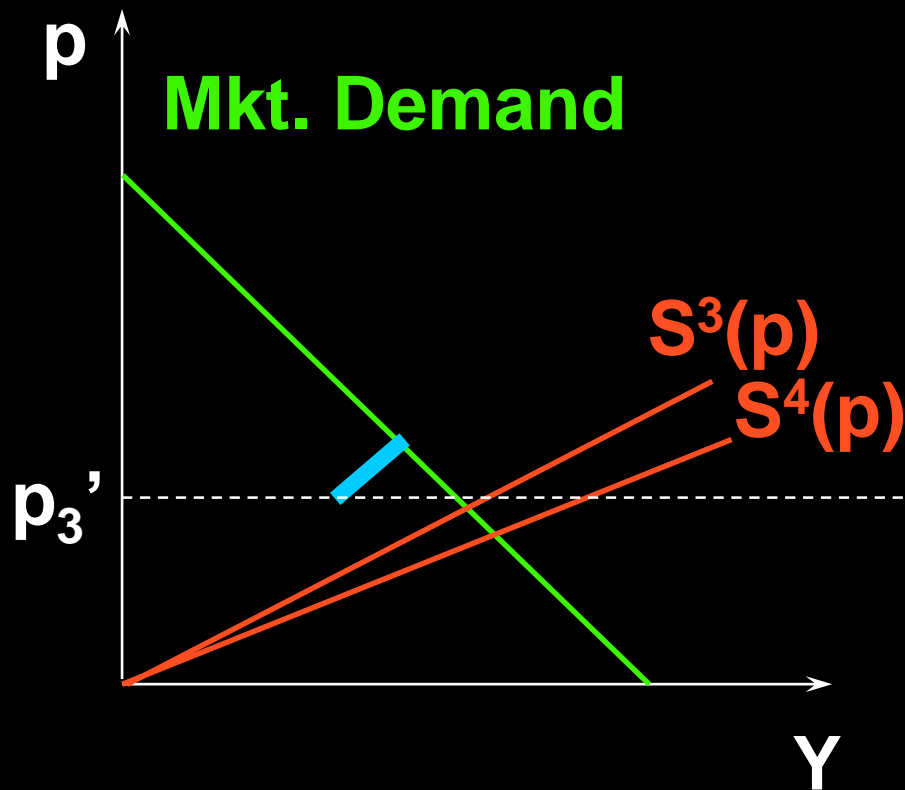
The only relevant part of the short-run supply curve for $n = 2$ firms in the industry.

Long-Run Industry Supply

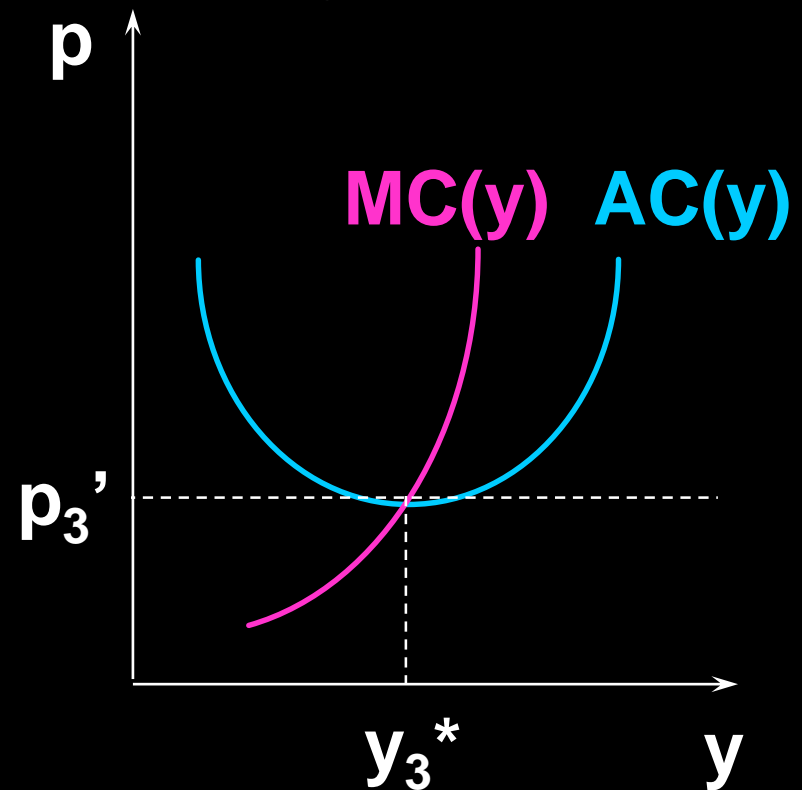
- ◆ How much further can market demand increase before a fourth firm enters the industry?

Long-Run Industry Supply

The Market

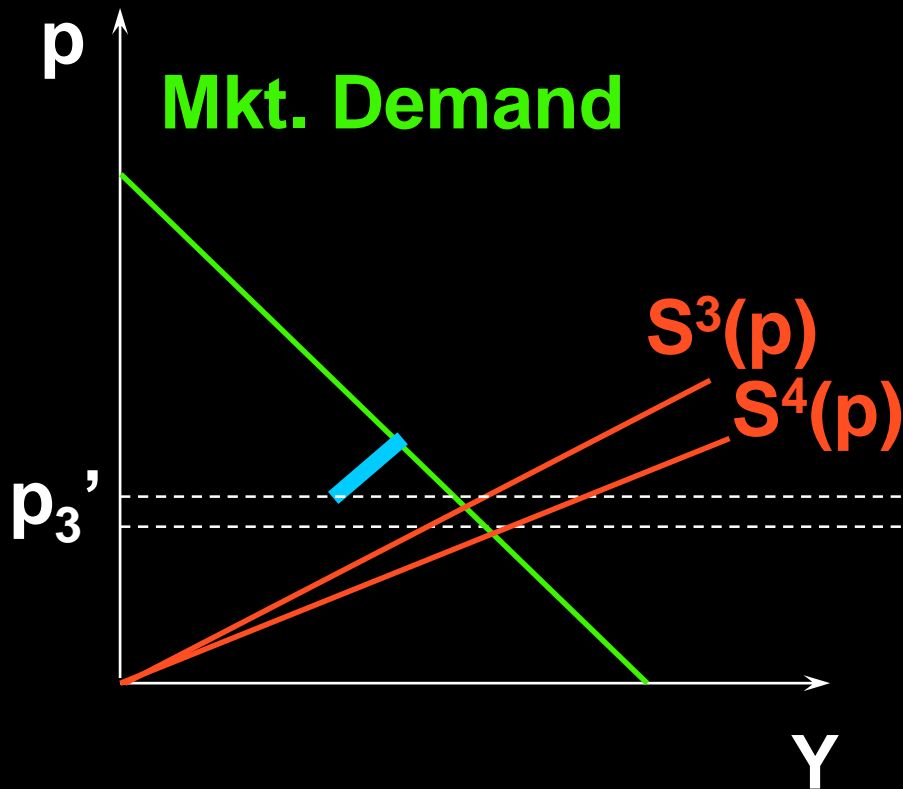


A "Typical" Firm

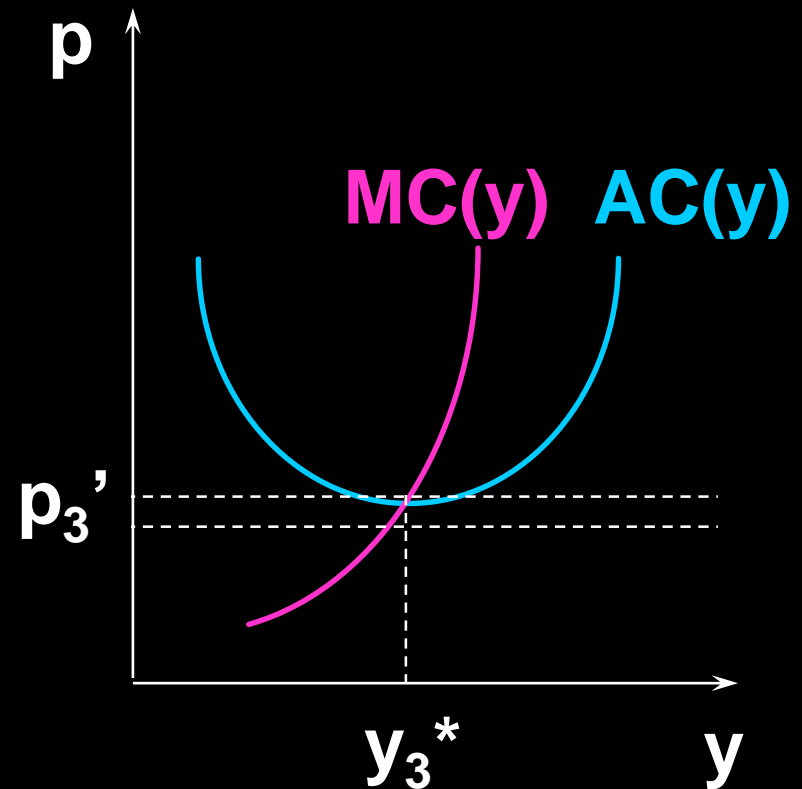


Long-Run Industry Supply

The Market



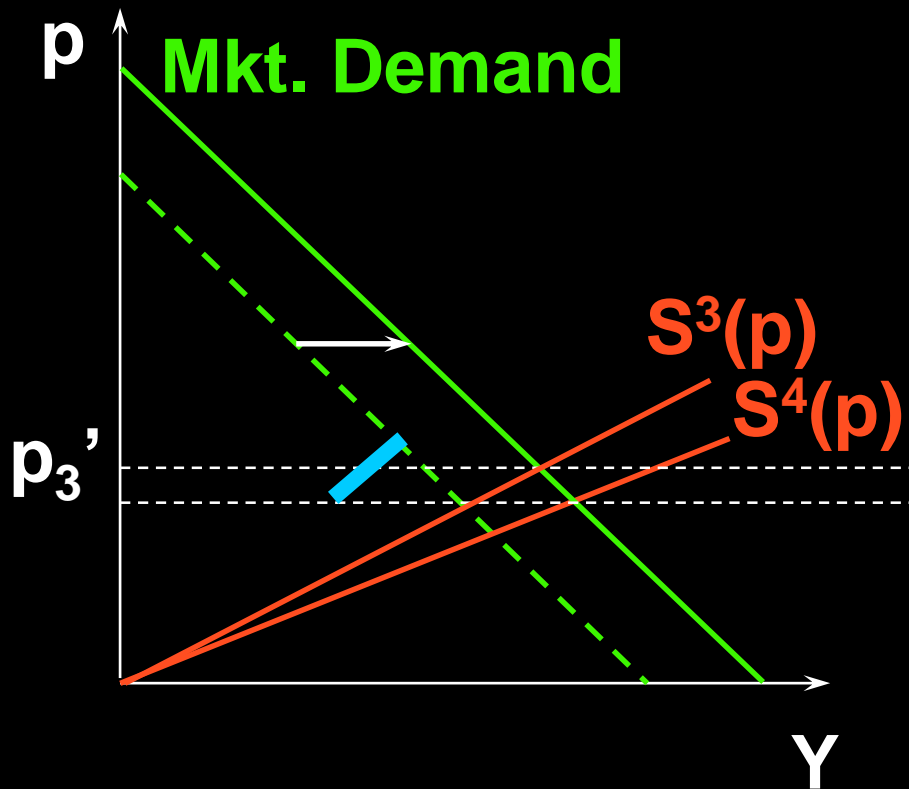
A "Typical" Firm



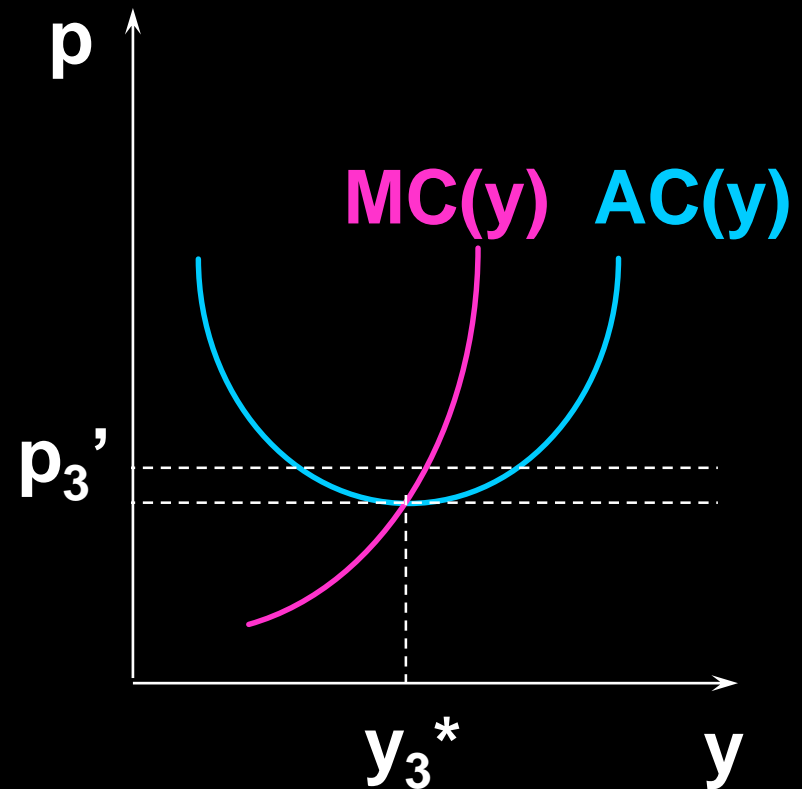
A 4th firm would now earn negative economic profits if it entered the industry.

Long-Run Industry Supply

The Market



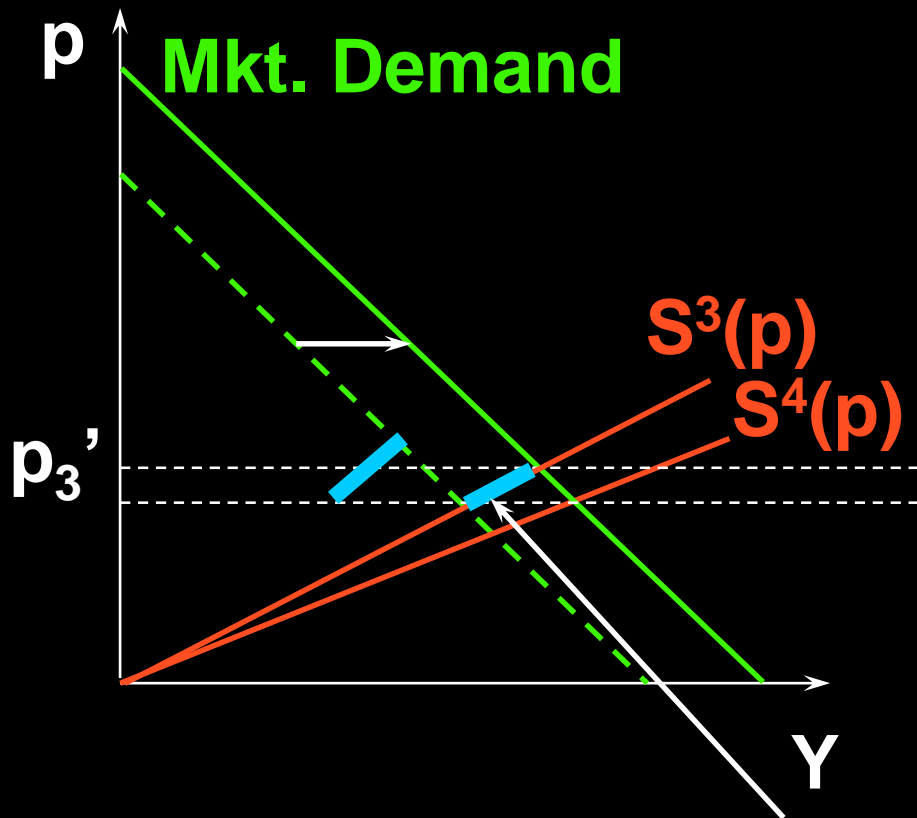
A "Typical" Firm



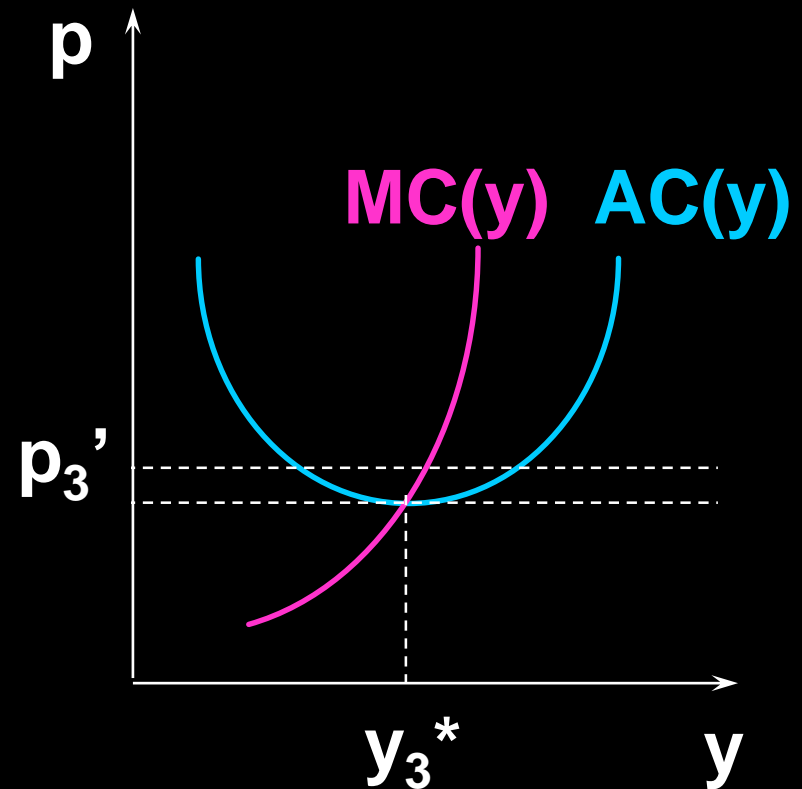
But now a 4th firm would earn zero economic profit if it entered the industry.

Long-Run Industry Supply

The Market



A "Typical" Firm



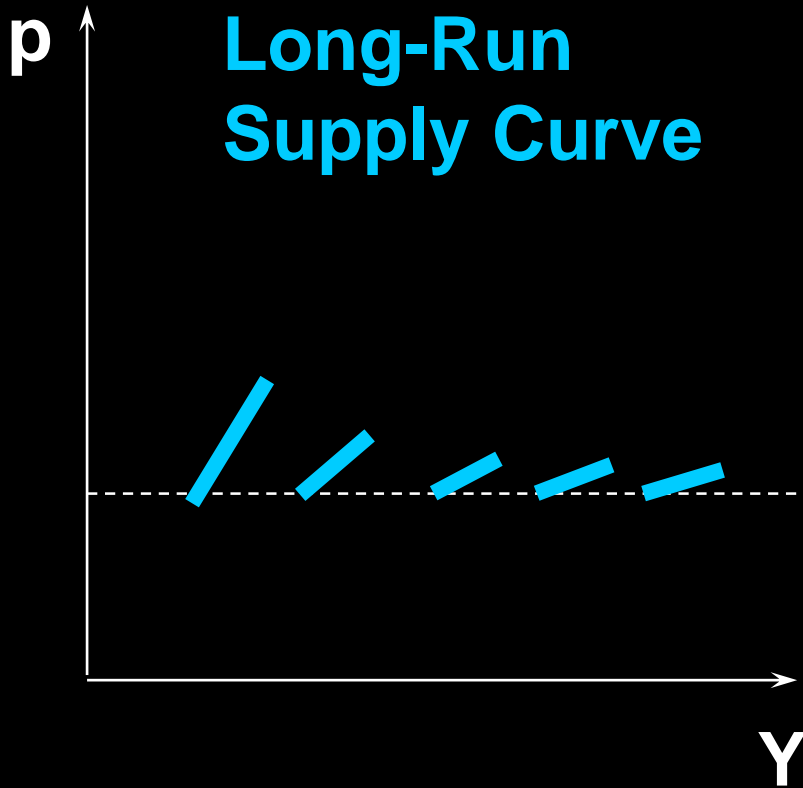
The only relevant part of the short-run supply curve for $n = 3$ firms in the industry.

Long-Run Industry Supply

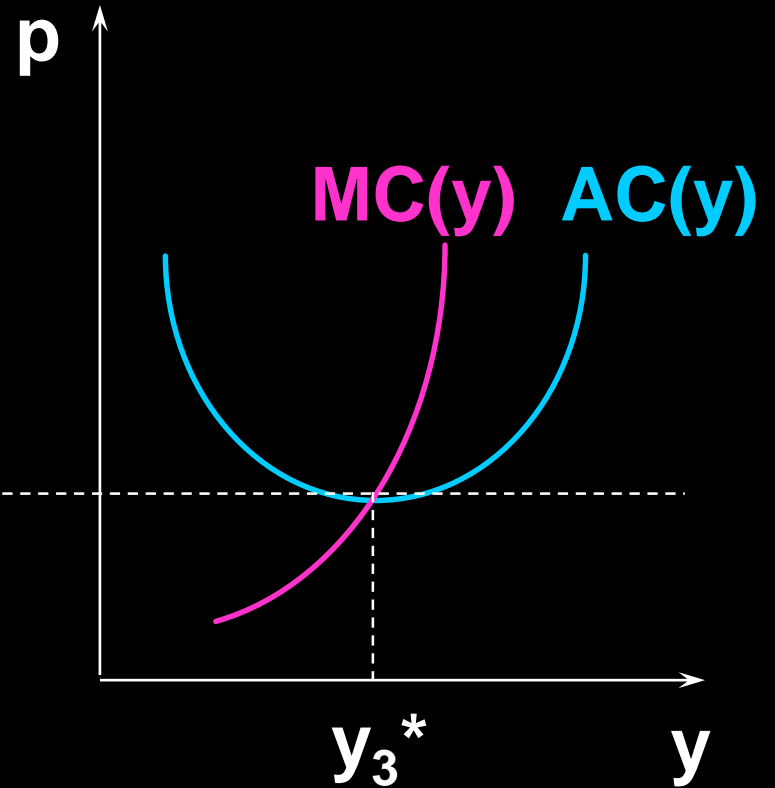
- ◆ Continuing in this manner builds the industry's long-run supply curve, one section at-a-time from successive short-run industry supply curves.

Long-Run Industry Supply

The Market
Long-Run
Supply Curve

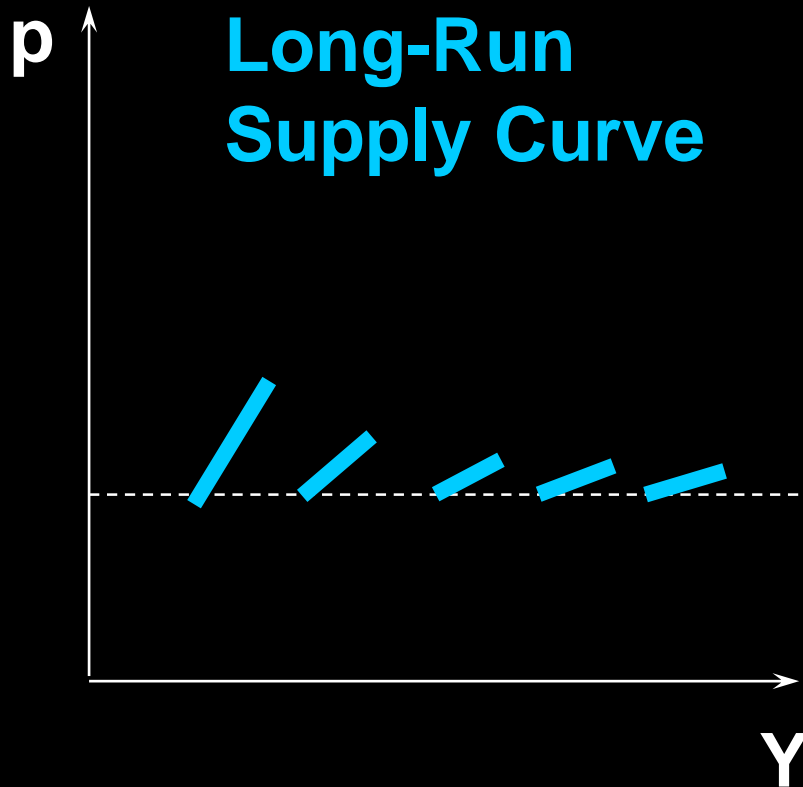


A "Typical" Firm

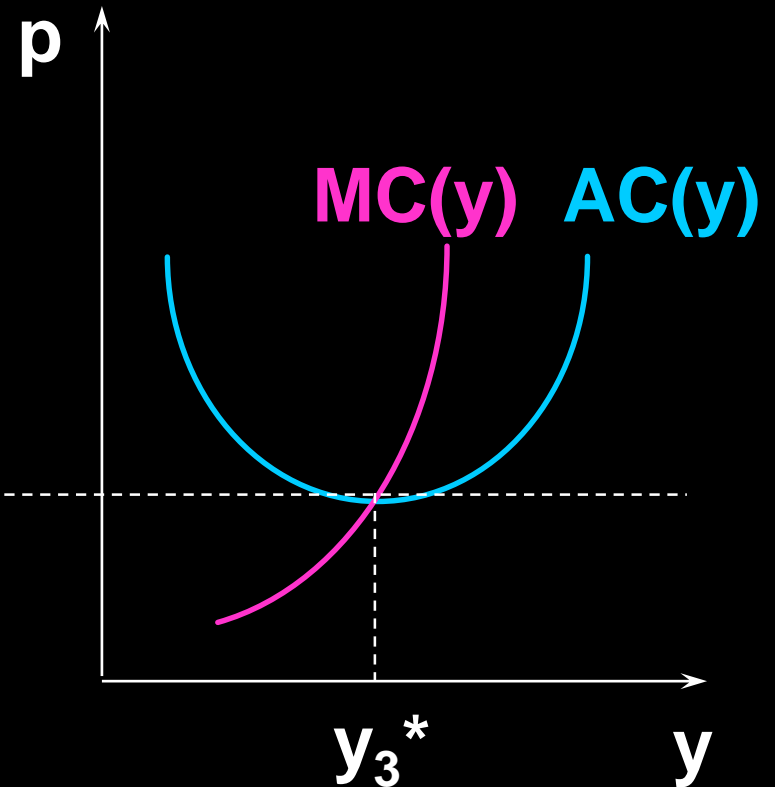


Long-Run Industry Supply

**The Market
Long-Run
Supply Curve**



A “Typical” Firm



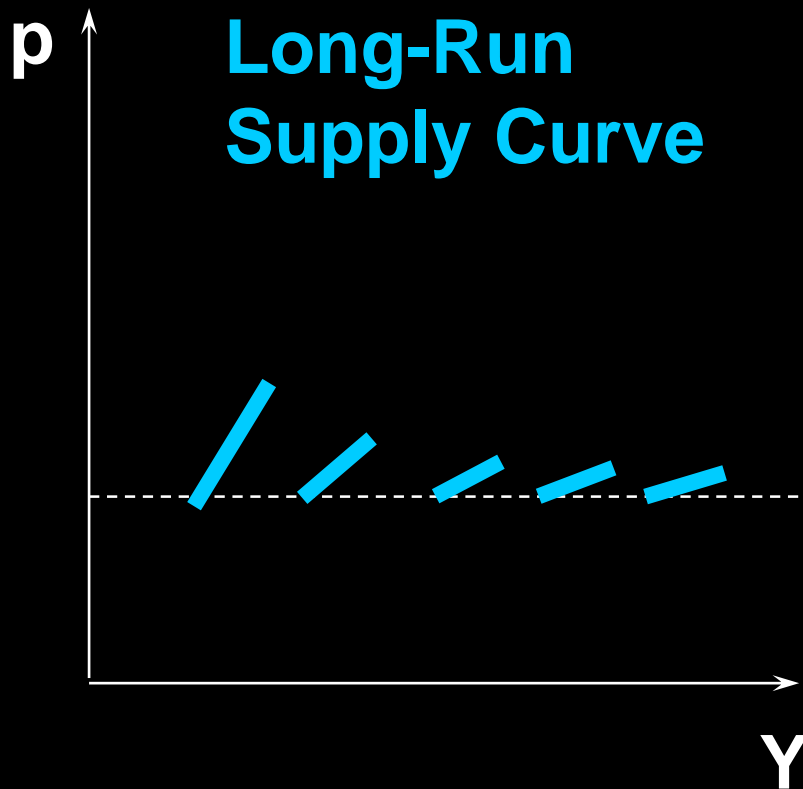
Notice that the bottom of each segment of the supply curve is $\min AC(y)$.

Long-Run Industry Supply

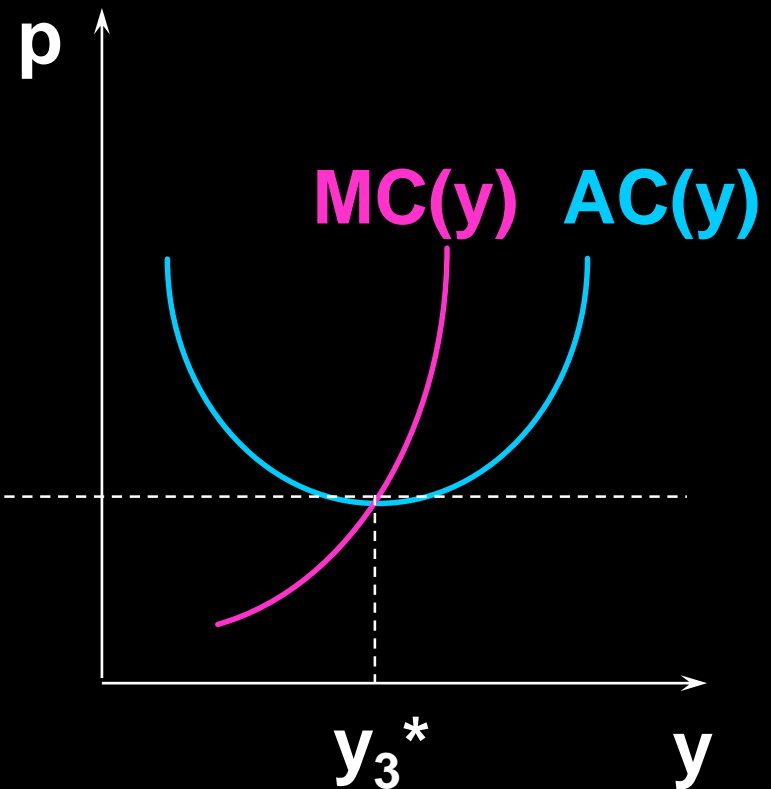
- ◆ As each firm gets “smaller” relative to the industry, the long-run industry supply curve approaches a horizontal line at the height of $\min AC(y)$.

Long-Run Industry Supply

**The Market
Long-Run
Supply Curve**

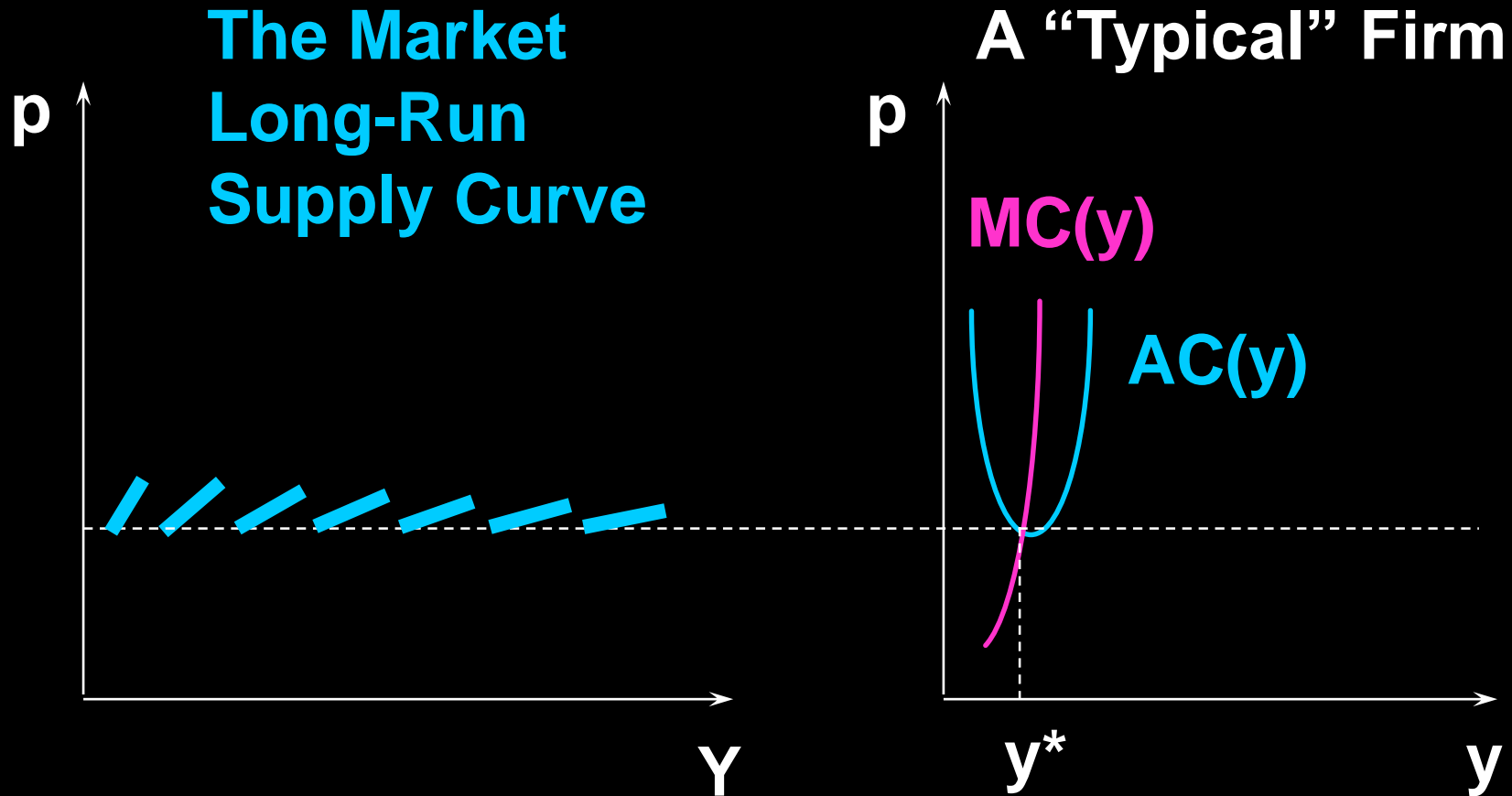


A “Typical” Firm



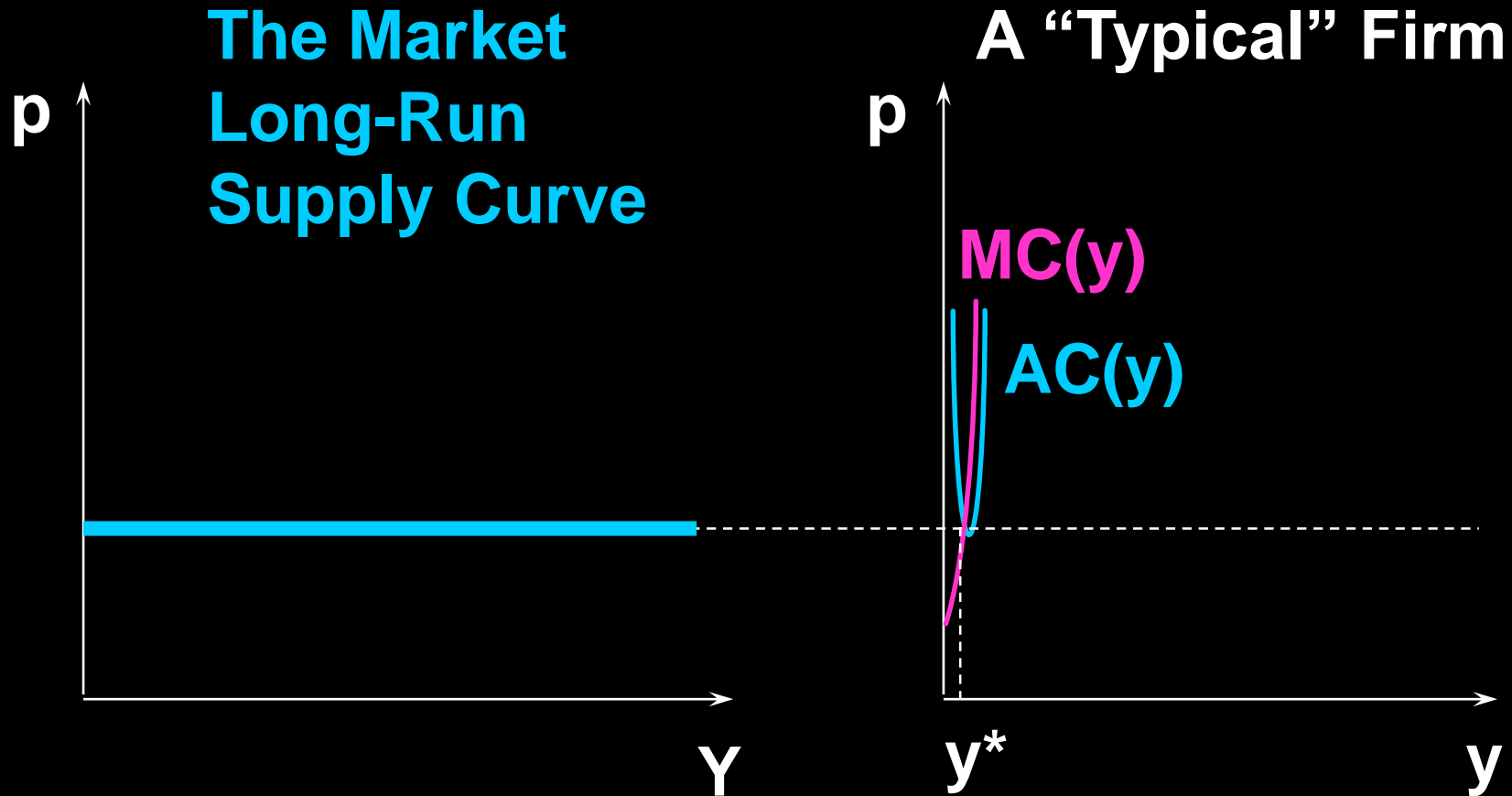
Notice that the bottom of each segment of the supply curve is $\min AC(y)$.

Long-Run Industry Supply



The bottom of each segment of the supply curve is $\min AC(y)$. As firms get “smaller” the segments get shorter.

Long-Run Industry Supply



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.

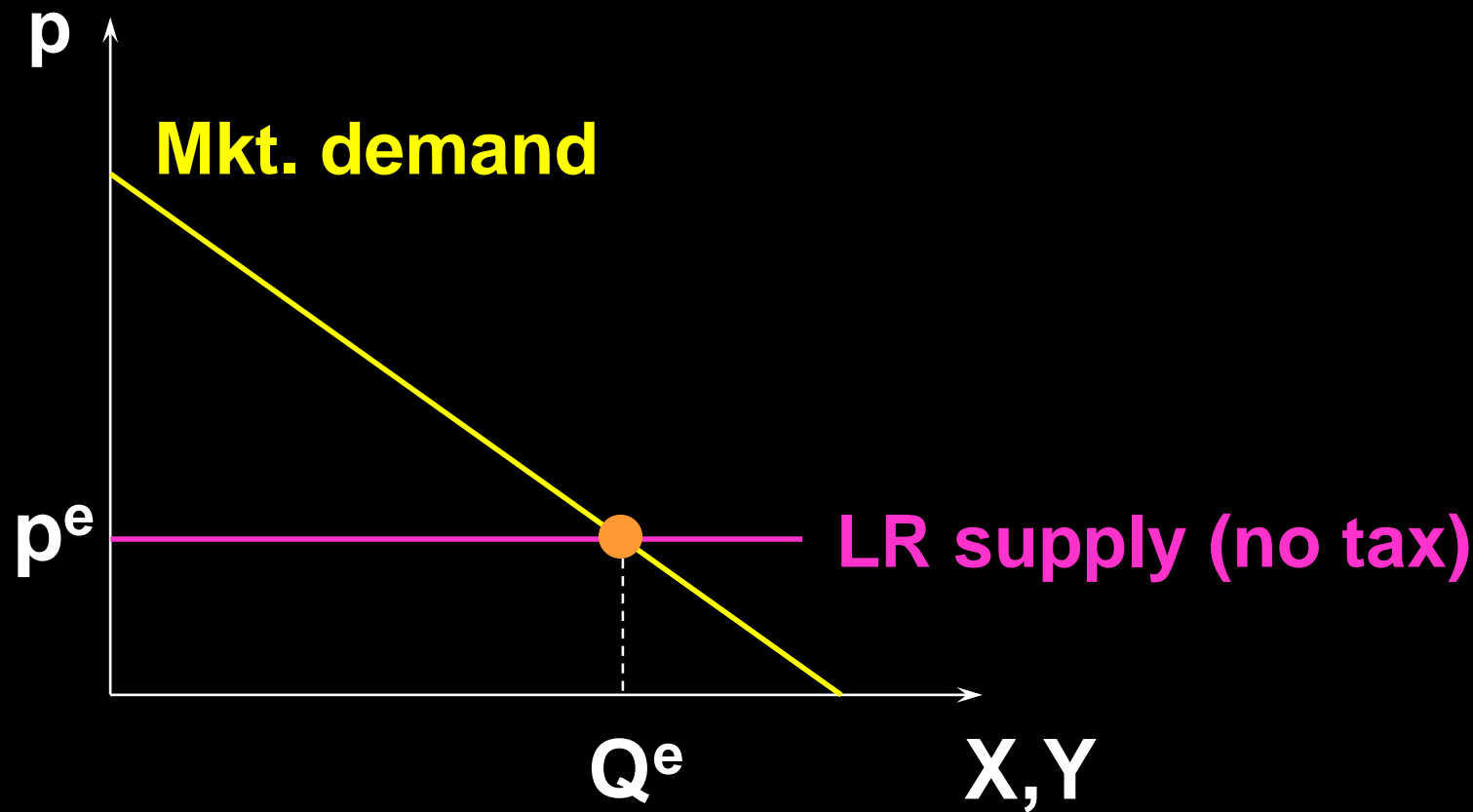
Long-run market price is

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

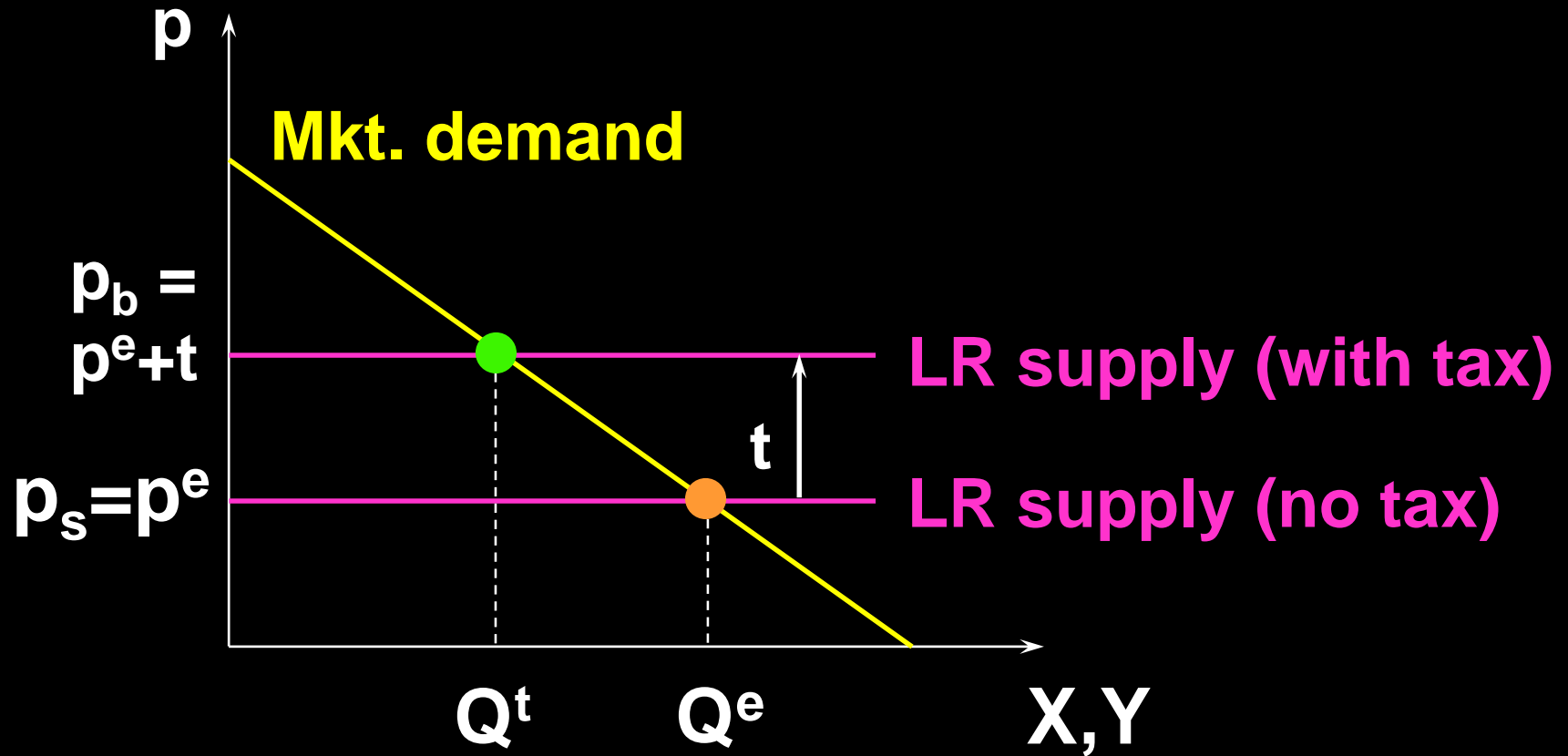
Long-Run Implications for Taxation

- ◆ 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

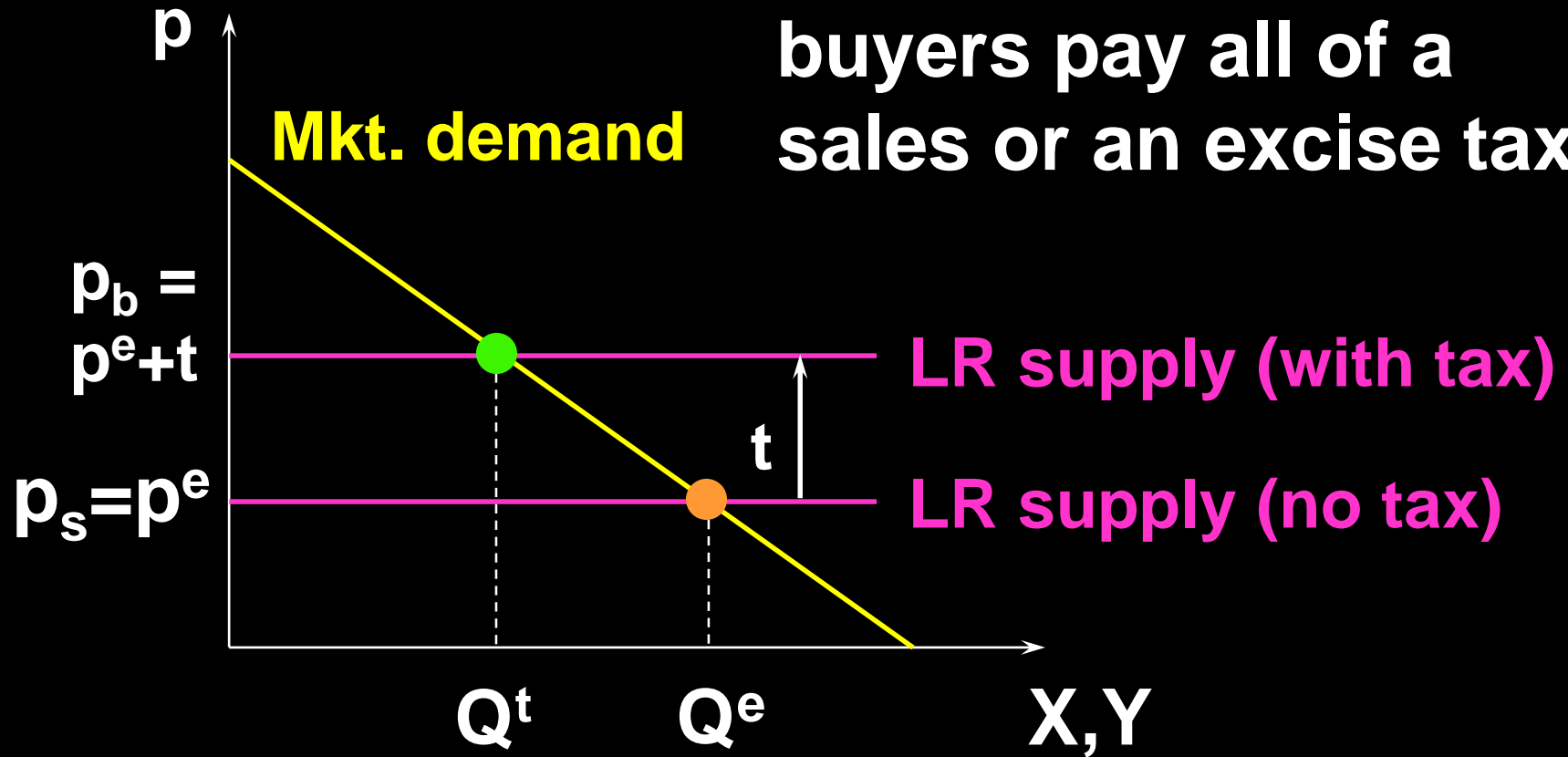


Long-Run Implications for Taxation



Long-Run Implications for Taxation

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



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

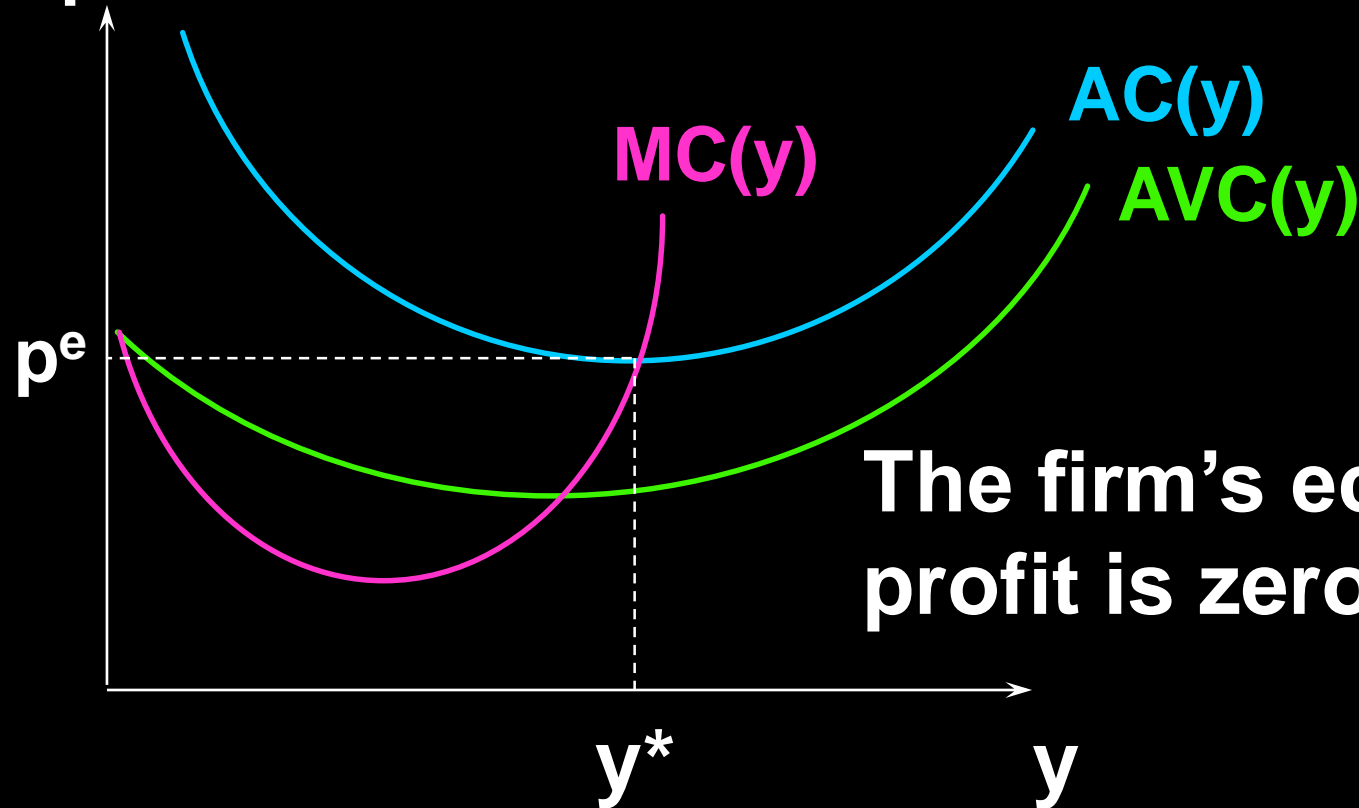
- ◆ Think of a firm that needs an operating license -- the license is a fixed input that is rented but not owned by the firm.
- ◆ If the firm makes a positive economic profit then another firm can offer the license owner a higher price for it. In this way, all firms' economic profits are competed away, to zero.

Fixed Inputs and Economic Rent

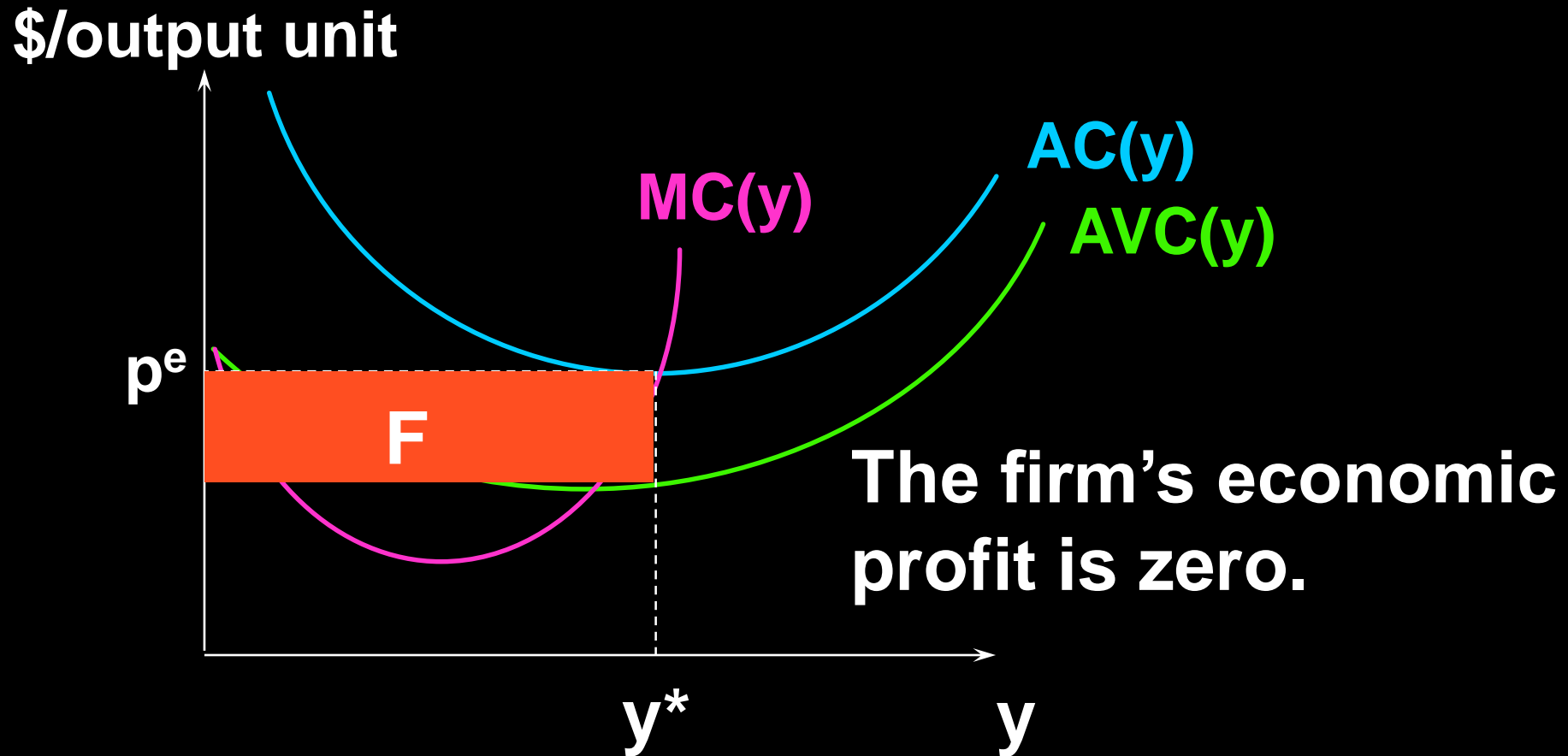
- ◆ So in the long-run equilibrium, each firm makes a zero economic profit and each firm's fixed cost is its payment for its operating license.

Fixed Inputs and Economic Rent

\$/output unit



Fixed Inputs and Economic Rent

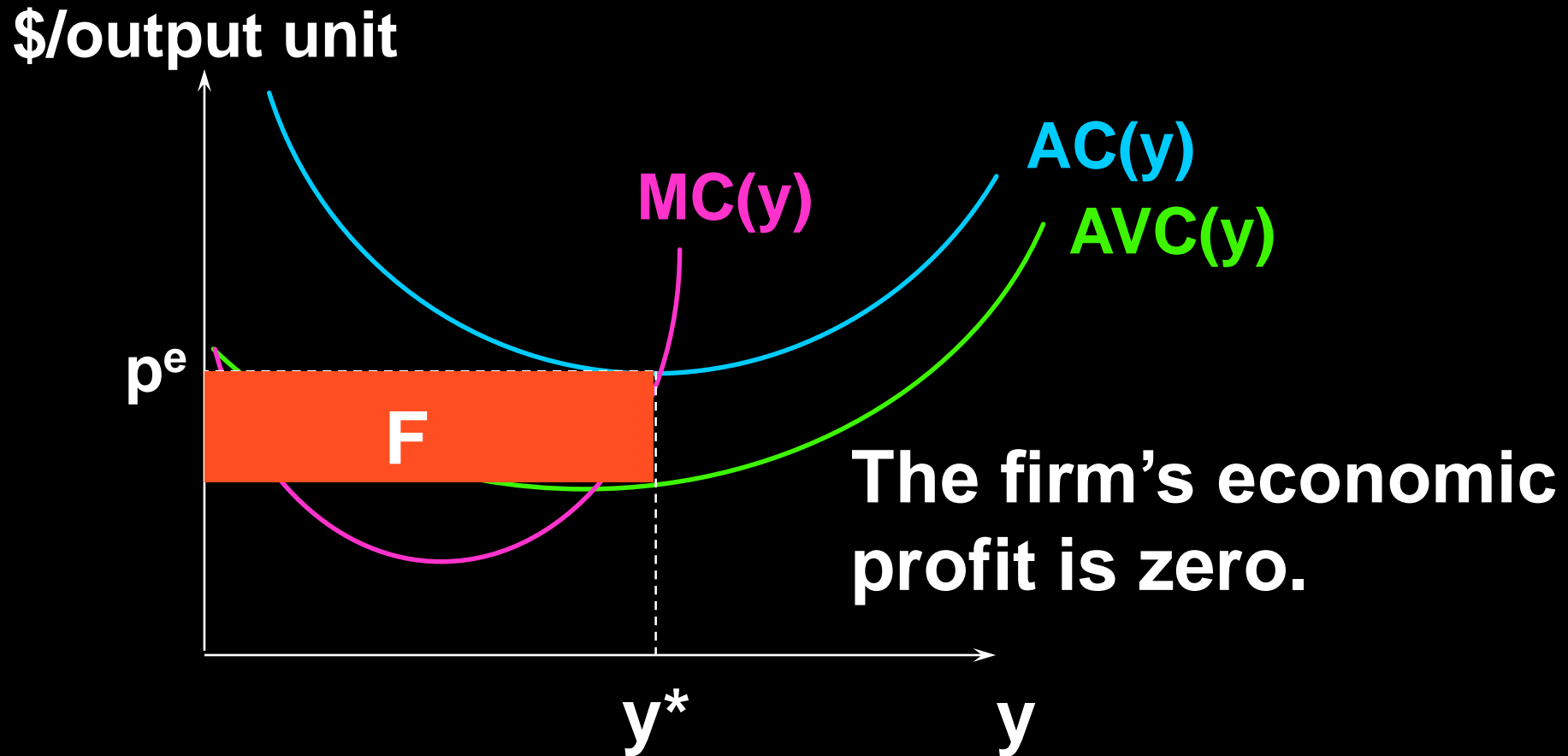


F is the payment to the owner of the fixed input (the license).

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



F is the payment to the owner of the fixed input (the license); $F = \text{economic rent}$.