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?
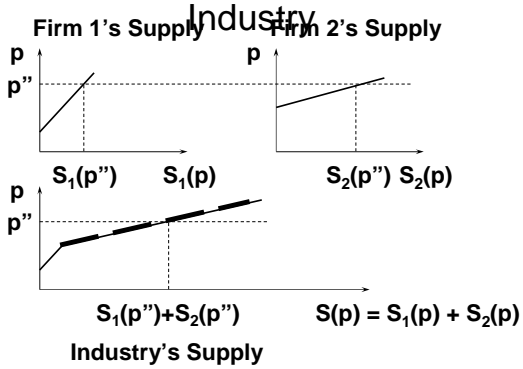

Supply From A Competitive Industry

- 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, … ,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**

p p

p''

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

p

p''

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

Industry's Supply
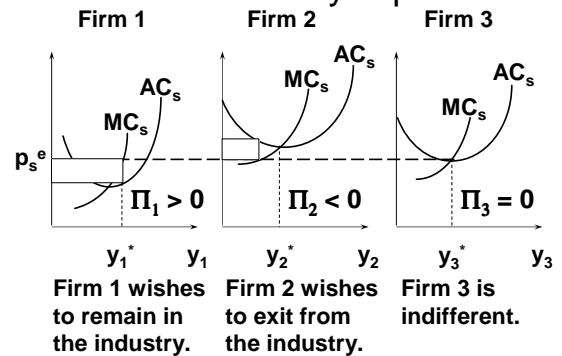

Short-Run Industry Equilibrium

- 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 industry supply

p_s^e

Market demand

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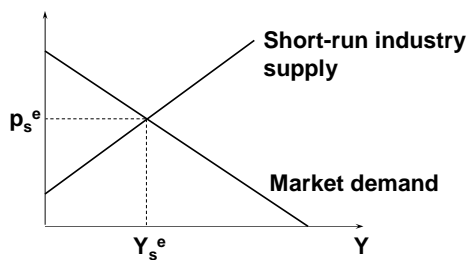
Short-run equilibrium price clears the market and is taken as given by each firm.

Short-Run Industry Equilibrium

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

AC_s

MC_s AC_s AC_s

MC_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

Firm 1 wishes to remain in the industry.   **Firm 2 wishes to exit from the industry.**   **Firm 3 is indifferent.**
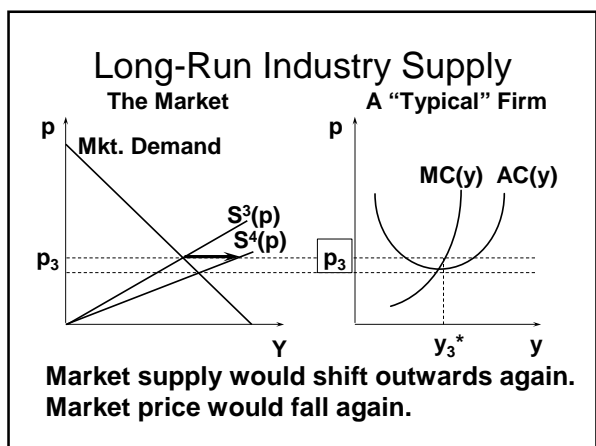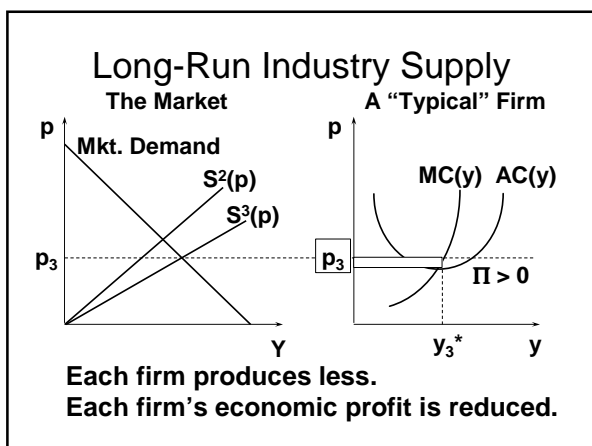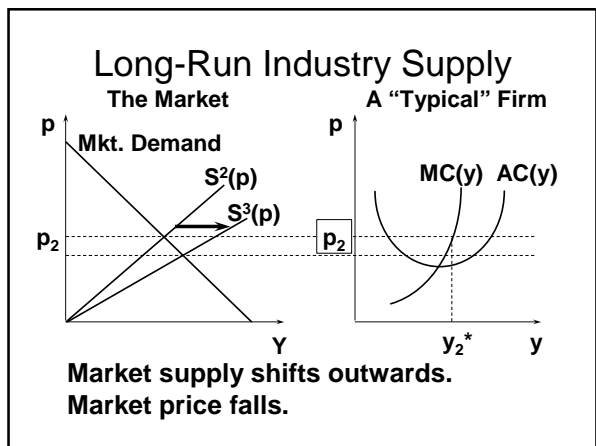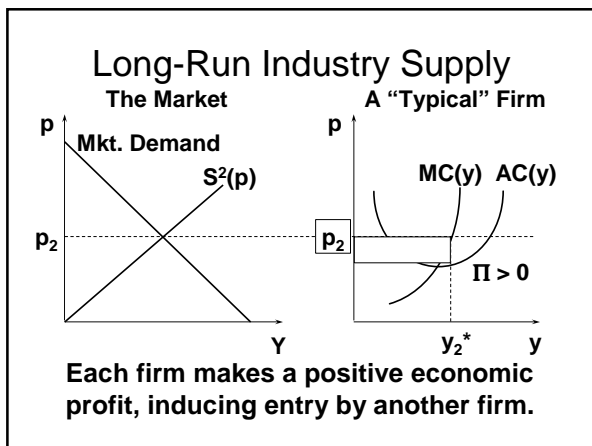
Long-Run Industry Supply

- 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. 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.
Market price falls.

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**

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

Long-Run Industry Supply

The Market　　　　A "Typical" Firm

p　Mkt. Demand

$S^3(p)$
$S^4(p)$

p_4

p

$MC(y)$　$AC(y)$

p_4

$\Pi < 0$

Y

y_4^*　y

Each firm would produce less again. Each firm's economic profit would be negative. So the fourth firm would not enter.
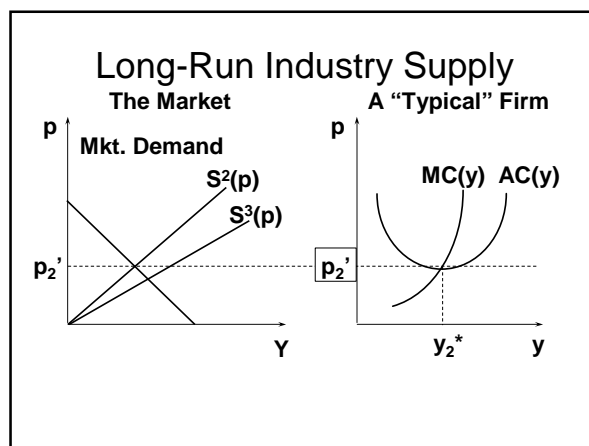

Long-Run Industry Supply

- 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

p　Mkt. Demand

$S^2(p)$
$S^3(p)$

p_2'

p

$MC(y)$　$AC(y)$

p_2'

Y

y_2^*　y

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.
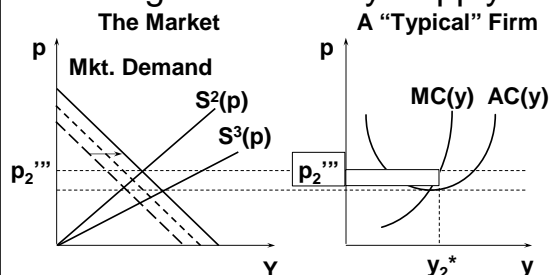

Long-Run Industry Supply

The Market   **A "Typical" Firm**
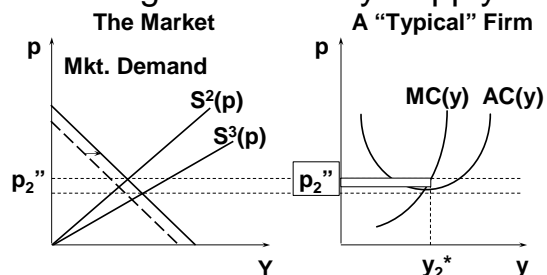
Notice that a 3rd firm will not enter since it would earn negative economic profits.

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
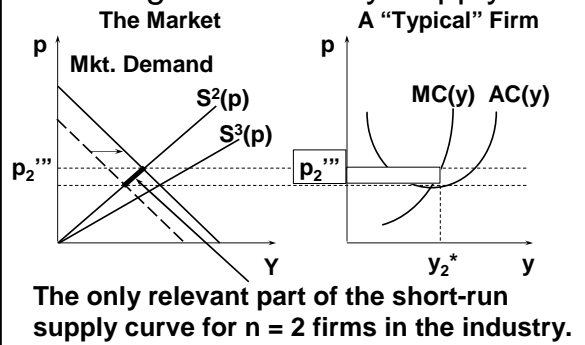
The Market   **A "Typical" Firm**

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

Long-Run Industry Supply

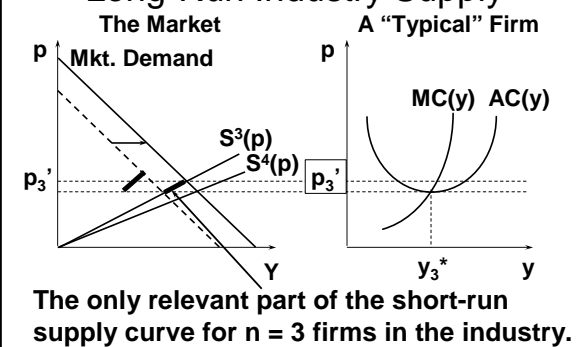- So any further increase in market demand will cause the number of firms in the industry to rise to three.

Long-Run Industry Supply

The Market   **A "Typical" Firm**

p Mkt. Demand

$S^2(p)$

$S^3(p)$

p

MC(y)   AC(y)

p_2''' 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**

p **Mkt. Demand**

p

MC(y)   AC(y)

$S^3(p)$

$S^4(p)$

p_3' p_3'

Y y_3^* y

The only relevant part of the short-run supply curve for n = 3 firms in the industry.
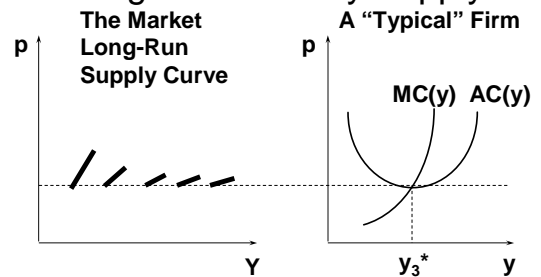
Long-Run Industry Supply

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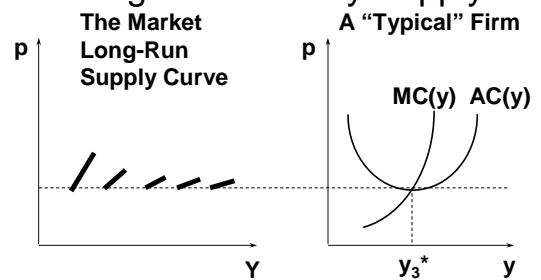
Long-Run Industry Supply

The Market
Long-Run
Supply Curve

p

A "Typical" Firm

p

MC(y) AC(y)

Y

y_3^* y

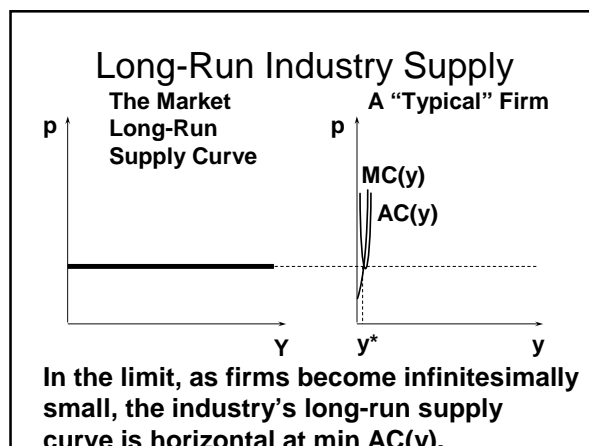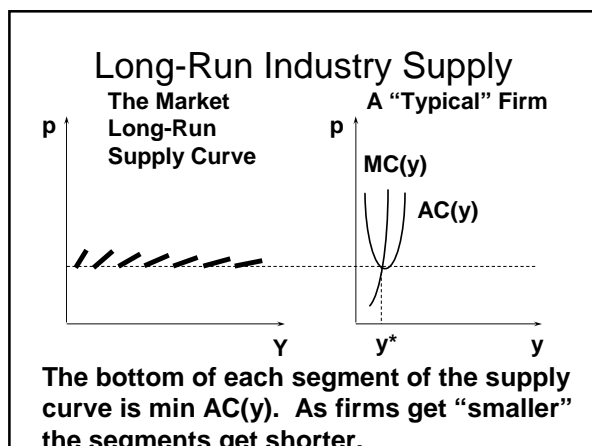**Notice that the bottom of each segment of the supply curve is min AC(y).**

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

p

A "Typical" Firm

p

MC(y) AC(y)

Y

y_3^* y

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

p

p

MC(y)

AC(y)

Y

y*

y

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

p

p

MC(y)

AC(y)

Y

y*

y

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.
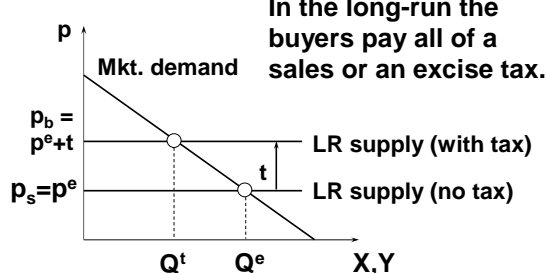
  Long-run market price is

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

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

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

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

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?
- 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.
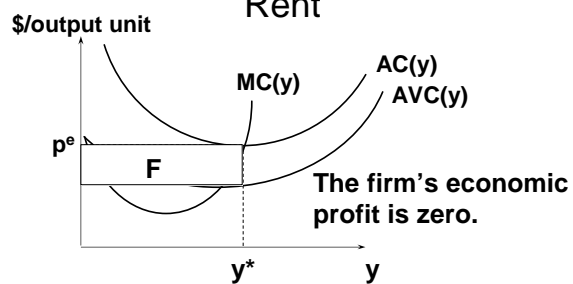
Fixed Inputs and Economic Rent

$/output unit

AC(y)
MC(y)
AVC(y)

p^e

F

The firm's economic profit is zero.

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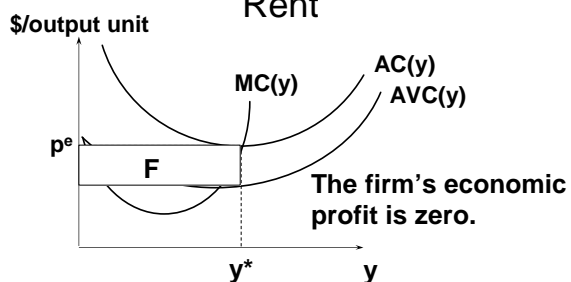
F is the payment to the owner of the fixed input (the license).

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

AC(y)

MC(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.