

Perfect Competition

APEC 3001

Summer 2007

Readings: Chapter 11

Objectives

- Accounting versus Economic Profit
- Profit Maximization Assumption
- Characteristics of Perfect Competition
- Perfect Competition in the Short Run
- Short Run Industry Supply
- Perfect Competition in the Long Run
- Perfect Factor Mobility in the Long Run
- Industry Supply in the Long Run
- Price Elasticity of Supply

Accounting versus Economic Profit

- Accounting Profit
 - Explicit Costs
 - Explicit Benefits
 - Does Not Incorporate Opportunity Costs
- Economic Profit
 - Explicit & Implicit Costs
 - Explicit & Implicit Benefits
 - Incorporates Opportunity Costs

Example of Accounting Versus Economic Profit

- Suppose a corn farmer
 - spends \$300 an acre on seed, fertilizer, & pesticides,
 - spends \$50 an acre on equipment to plant, cultivate, & apply chemicals,
 - produces 150 bushels per acre, &
 - sells the crop for \$3.00 a bushel.
- Question: What is the farmer's accounting profit?
 - $\$3 \times 150 - \$300 - \$50 = \$100/\text{acre}$
- Question: What is missing for economic profit?
 - Opportunity cost of land.
 - Opportunity cost of labor.

The Profit Maximization Assumption

- What is a firm's objective?
 - Fundamental Assumption: Firms seek to maximize economic profit.
- Is this a good assumption?
 - It depends on the extent to which our socio-economic institutions reward firms that generate more profit.
- How do firm's maximize profit?
 - Trial & Error
 - Cold & Calculating
 - Imitation
- Does it really matter how they get there?
 - No!
 - It only matters that they tend to get there.

Characteristics of Perfect Competition

- Sale of a Standardized Product
- Firms are Price Takers (Perfectly Elastic Demand)
- Factors of Production Are Perfectly Mobile in the Long Run
- Firms and Consumers Have Perfect Information

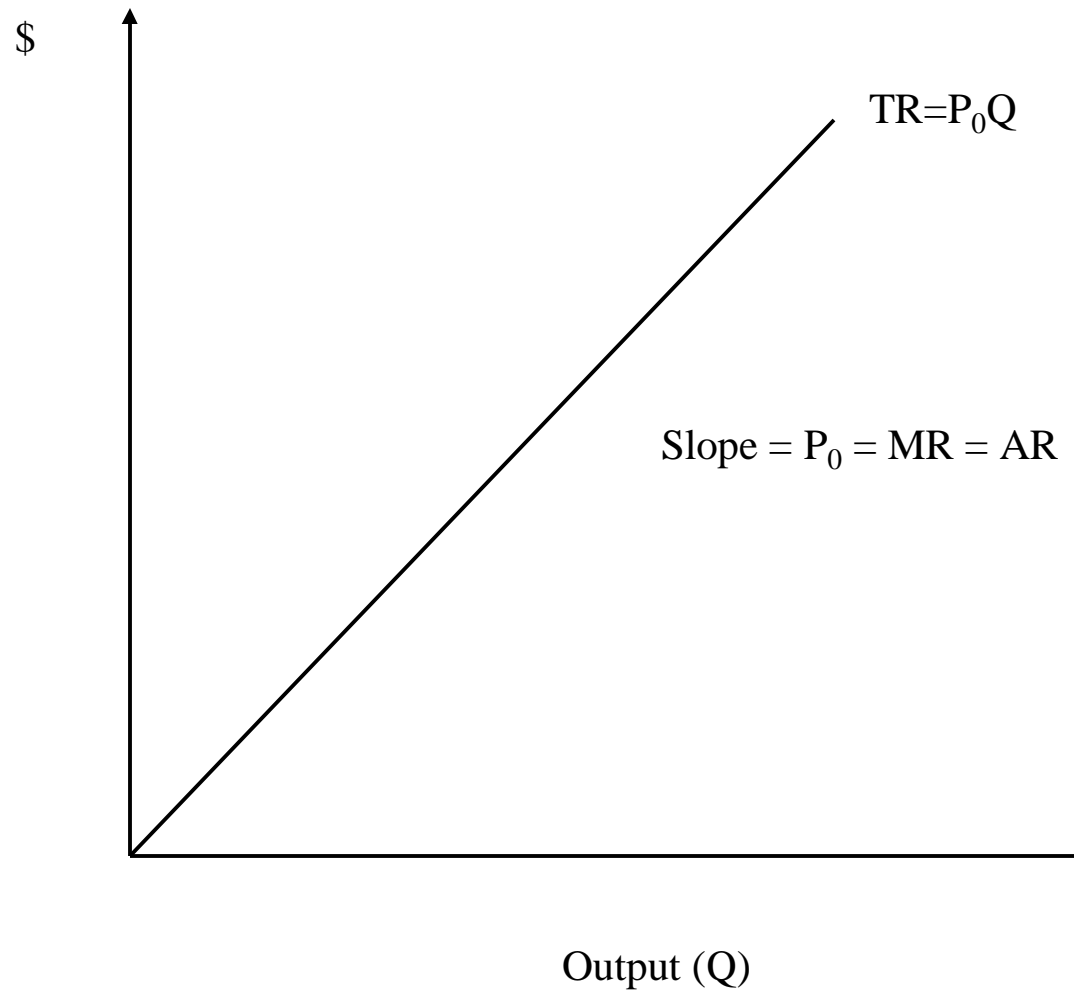
Sufficient, but not necessary!

Perfect Competition in the Short Run

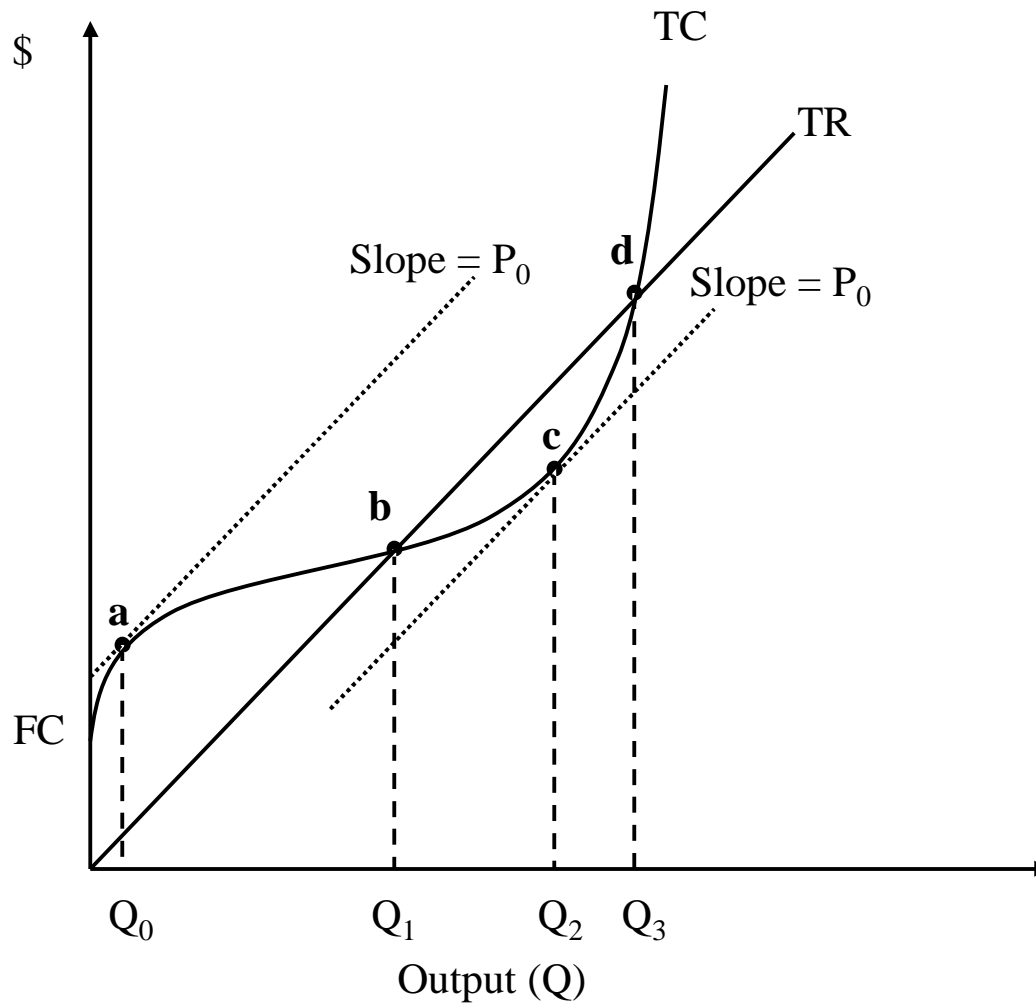
Definitions

- Profit:
 - $\Pi = TR - TC$ where TR is total revenue & TC is total costs.
- Total Revenue:
 - Price \times Quantity ($TR = P_0Q$ where P_0 is the market price).
- Marginal Revenue (MR):
 - The change in total revenue that results from a one unit change in sales:
 $MR = \Delta TR / \Delta Q = TR'$.
- Average Revenue (AR):
 - Total revenue divided by output: $AR = TR/Q$.

Total Revenue for a Competitive Firm



Total Revenue and Cost for a Competitive Firm



a: $MR = MC$ & $\Pi < 0$

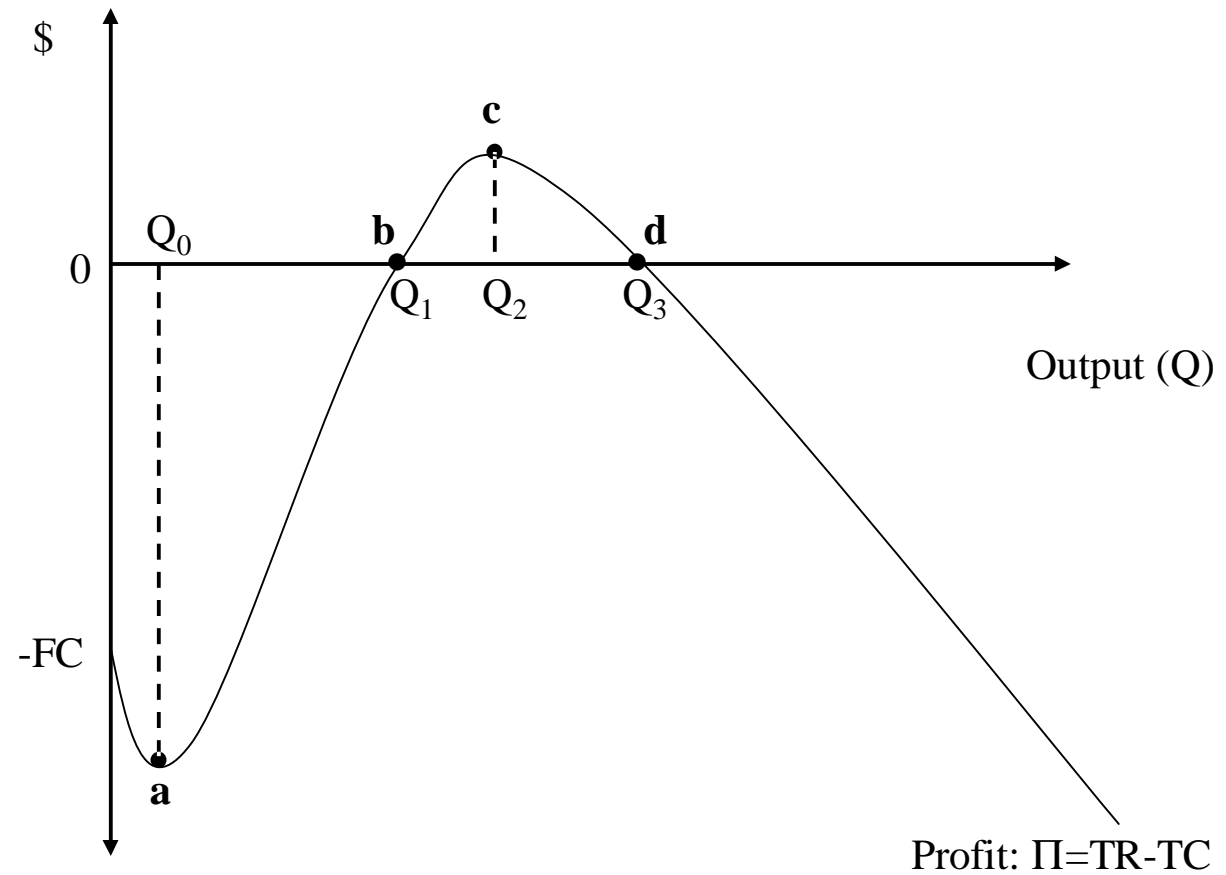
b: $MR > MC$ & $TR = TC$

c: $MR = MC$ & $\Pi > 0$

d: $MR < MC$ & $TR = TC$

Profit Curve for a Competitive Firm

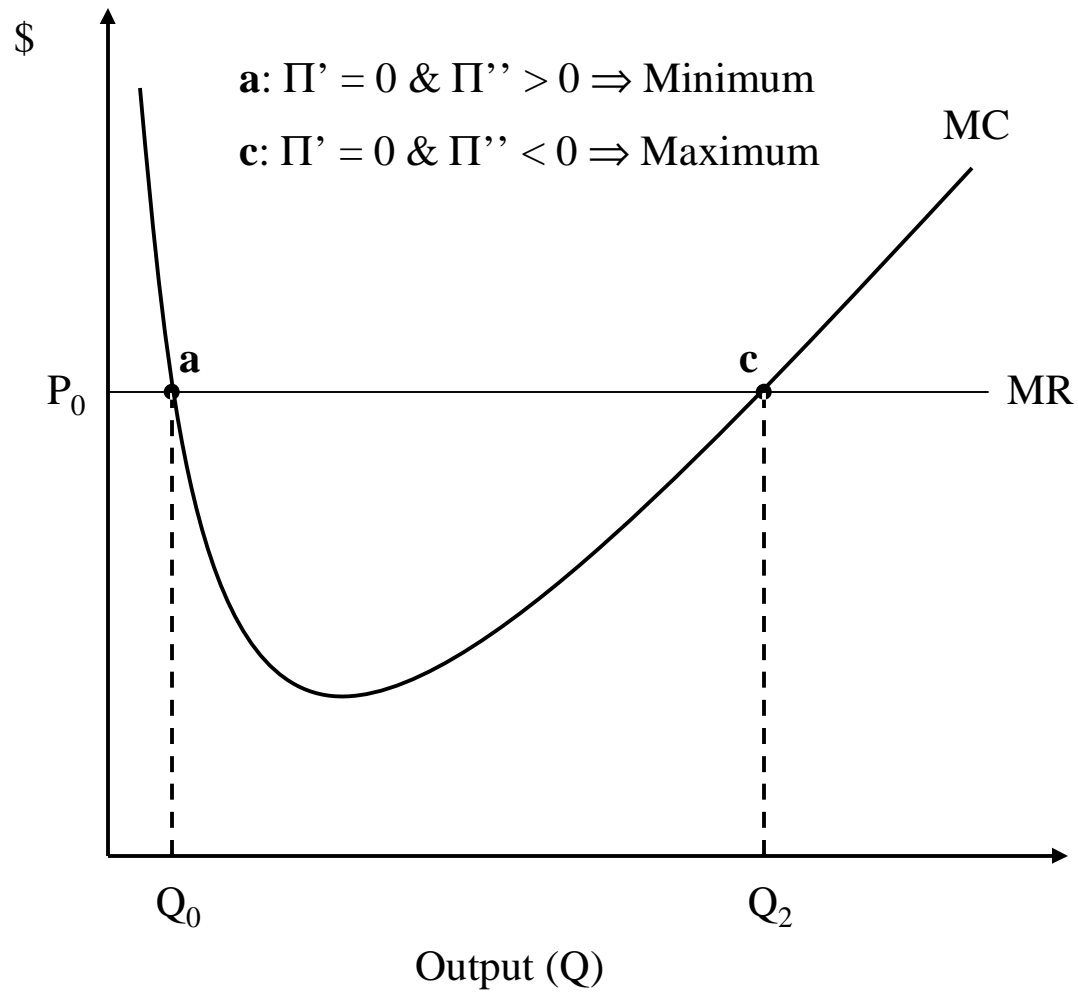
- a:** Minimum Π
- b:** $\Pi = 0$ & Increasing
- c:** Maximum Π
- d:** $\Pi = 0$ & Decreasing



Finding the Profit Maximizing Output

- How do we maximize a function, say $\Pi = TR - TC$?
 - We can take the derivative & set it equal to 0: $\Pi' = TR' - TC' = 0$.
 - Recall that $TR' = MR = P_0$ & $TC' = MC$.
- Profit is maximized where $P_0 = MC$!
 - But this happens at two points: **a** & **c**!
 - But we know **c** is better than **a**!
- How can we tell these two points apart?
 - For a maximum, the second derivative must be negative: $\Pi'' = TR'' - TC'' < 0$.
 - $TR'' = 0$ & $TC'' = MC'$
- Profit is maximized where $P_0 = MC$ & $MC' > 0$ (increasing marginal costs)!

Marginal Revenue and Cost Curves



So, is that all there is to it?

- Well, no!
 - $P_0 = MC$ & MC increasing tells us how to maximize profit when we choose to produce.
 - It does not tell us whether or not we should produce.
- Question: When will we be better off producing something instead of nothing?

Different Profit Curves for a Competitive Firm

$\Pi' = 0$ tells us to look at \mathbf{a}_1 , \mathbf{a}_2 , \mathbf{c}_1 , & \mathbf{c}_2

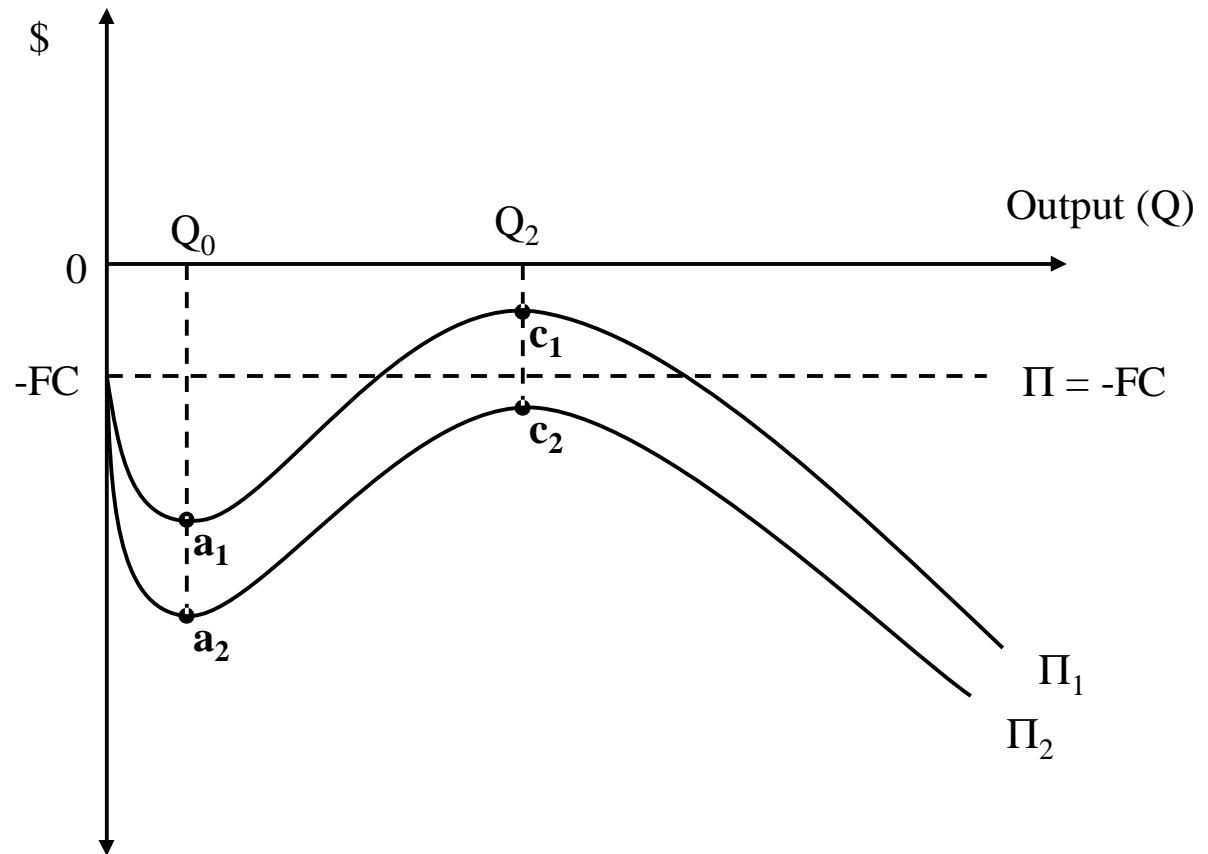
$\Pi'' < 0$ tells us to throw out \mathbf{a}_1 & \mathbf{a}_2

For \mathbf{c}_1 , should we produce Q_2 or 0?

Notice that for \mathbf{c}_1 $\Pi_1 > -FC$, so we should produce Q_2 .

For \mathbf{c}_2 , should we produce Q_2 or 0?

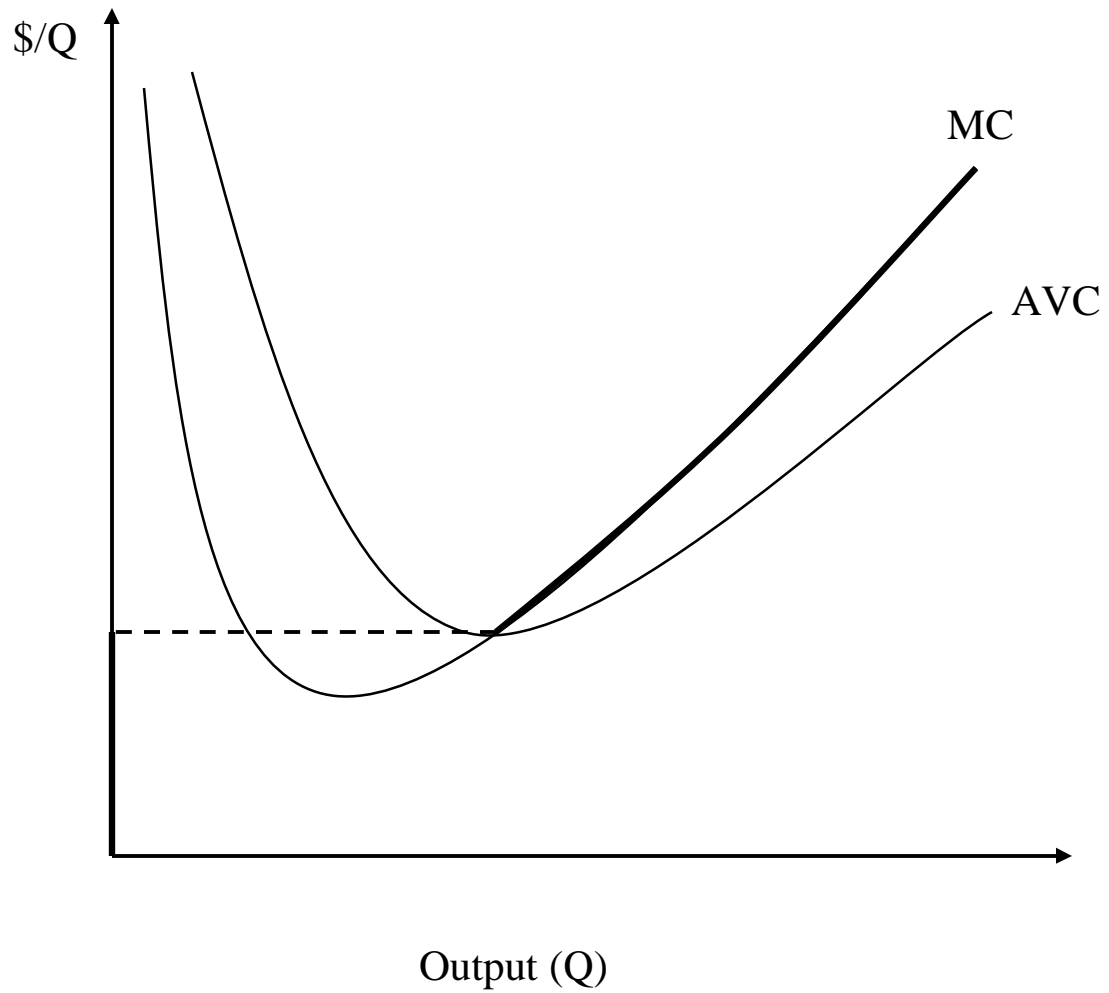
Notice that for \mathbf{c}_2 $\Pi_2 < -FC$, so we should produce 0.



In the short run, we should produce only if profit exceeds fixed costs ($\Pi > -FC$)!

- $\Pi > -FC \Rightarrow TR - VC - FC > -FC$ or $TR > VC$
- Dividing by Q : $AR = P_0 > AVC$
- Three Profit Maximizing Conditions:
 - $P_0 = MC$
 - $MC' > 0$ (Marginal Costs are increasing)
 - $P_0 > AVC$
- These conditions imply a firm's supply curve equals marginal costs above minimum average variable costs & 0 below minimum average variable costs!

Perfectly Competitive Supply in the Short Run



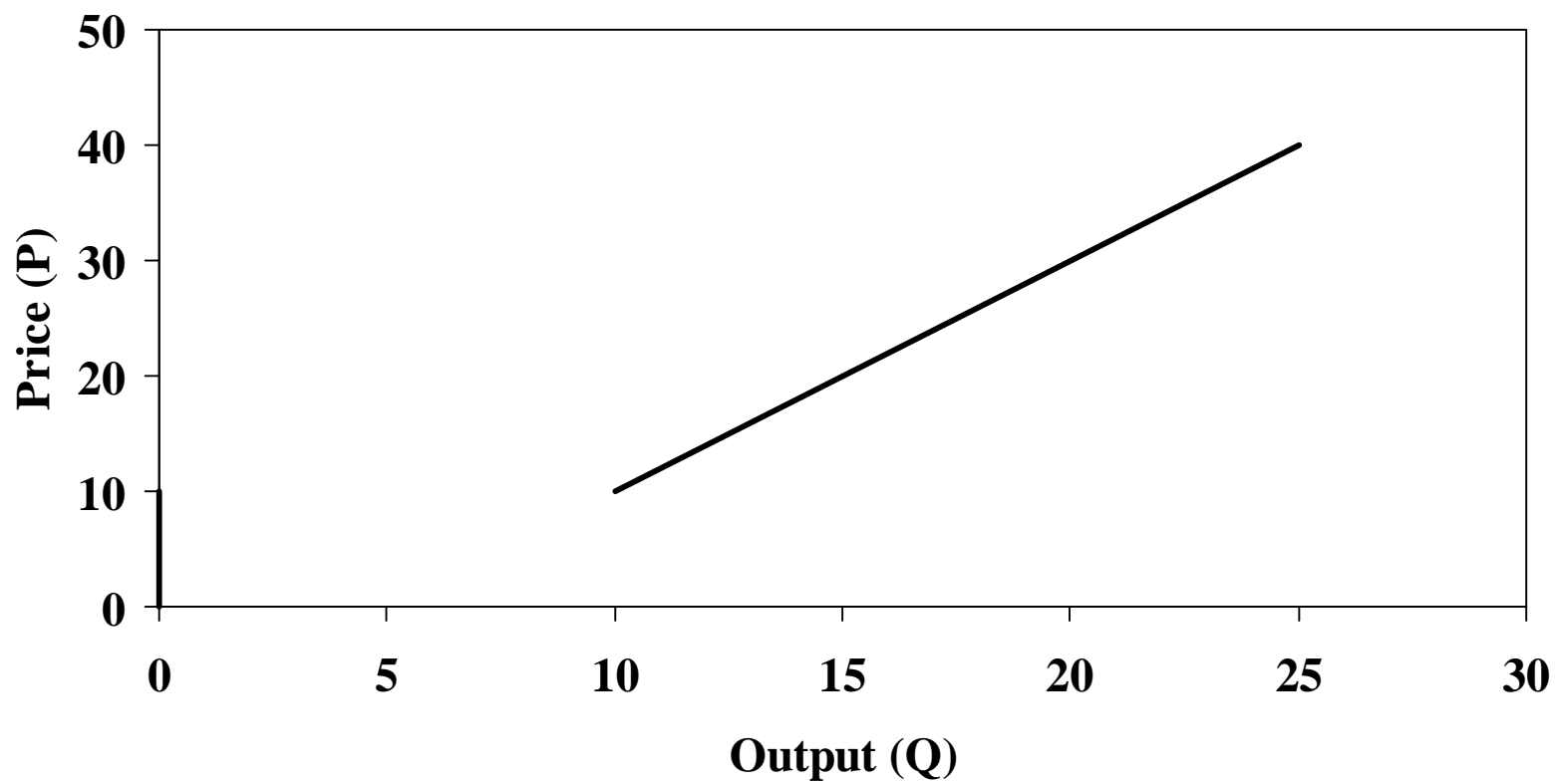
Short Run Industry Supply

- To find the market demand for a product, we horizontally summed individual demand curves.
- To find industry supply in the short run, we also need to horizontally sum individual firm supply in the short run.

Example Short Run Industry Supply

- Suppose
 - Firm A's supply is
 - $Q_A = 0$ for $P < 10$ &
 - $Q_A = 5 + 0.5P$ for $P \geq 10$
 - Firm B's supply is
 - $Q_B = 0$ for $P < 20$ &
 - $Q_B = 5 + P$ for $P \geq 20$
- Industry Supply:
 - For $P < 10$, $Q_S = 0$
 - For $20 > P \geq 10$, $Q_S = Q_A = 5 + 0.5P$
 - For $P \geq 20$, $Q_S = Q_A + Q_B = 5 + 0.5P + 5 + P = 10 + 1.5P$

Firm A's Supply



Firm B's Supply

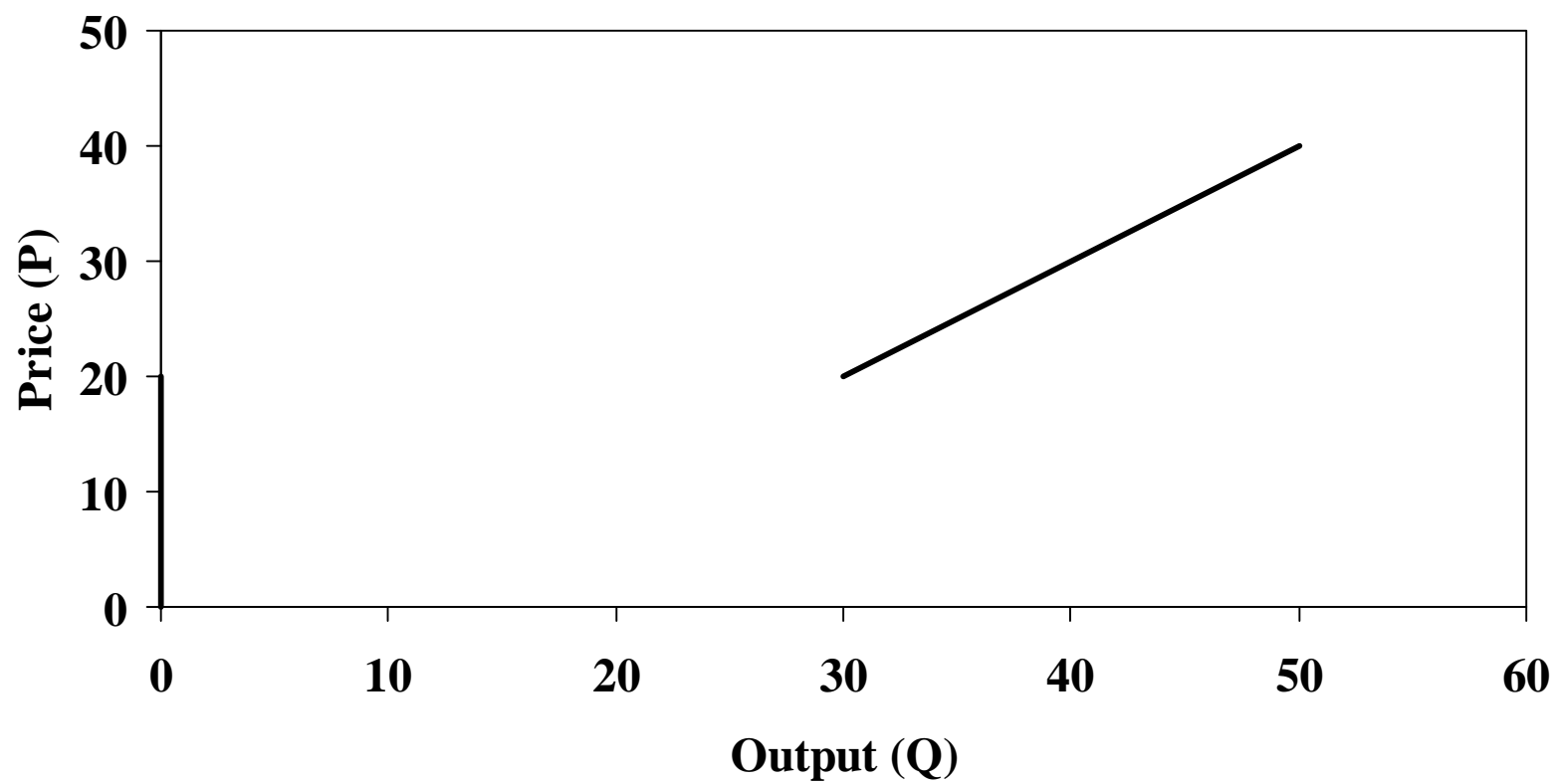
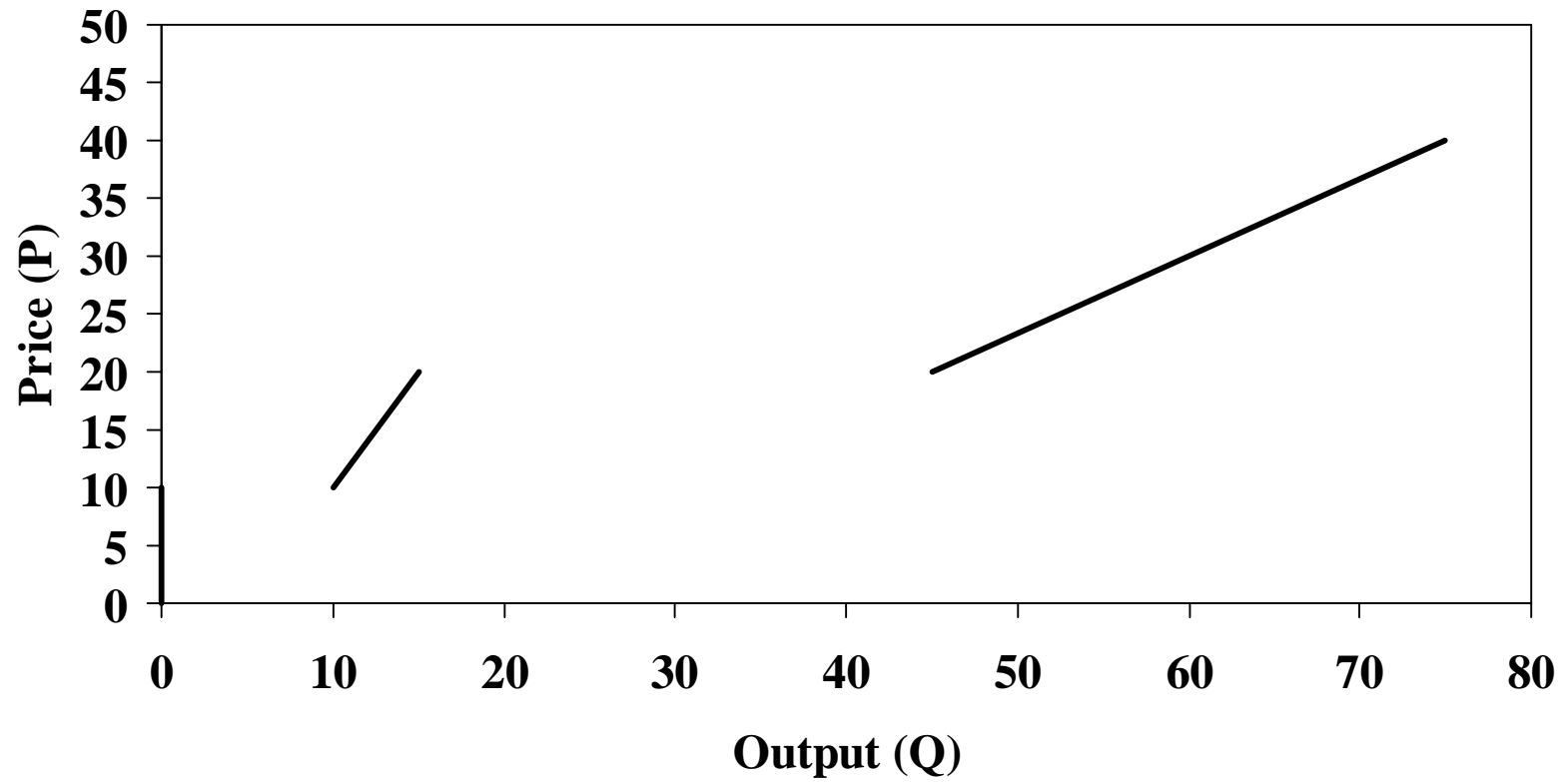


Figure 9: Industry Supply for Firm A and B

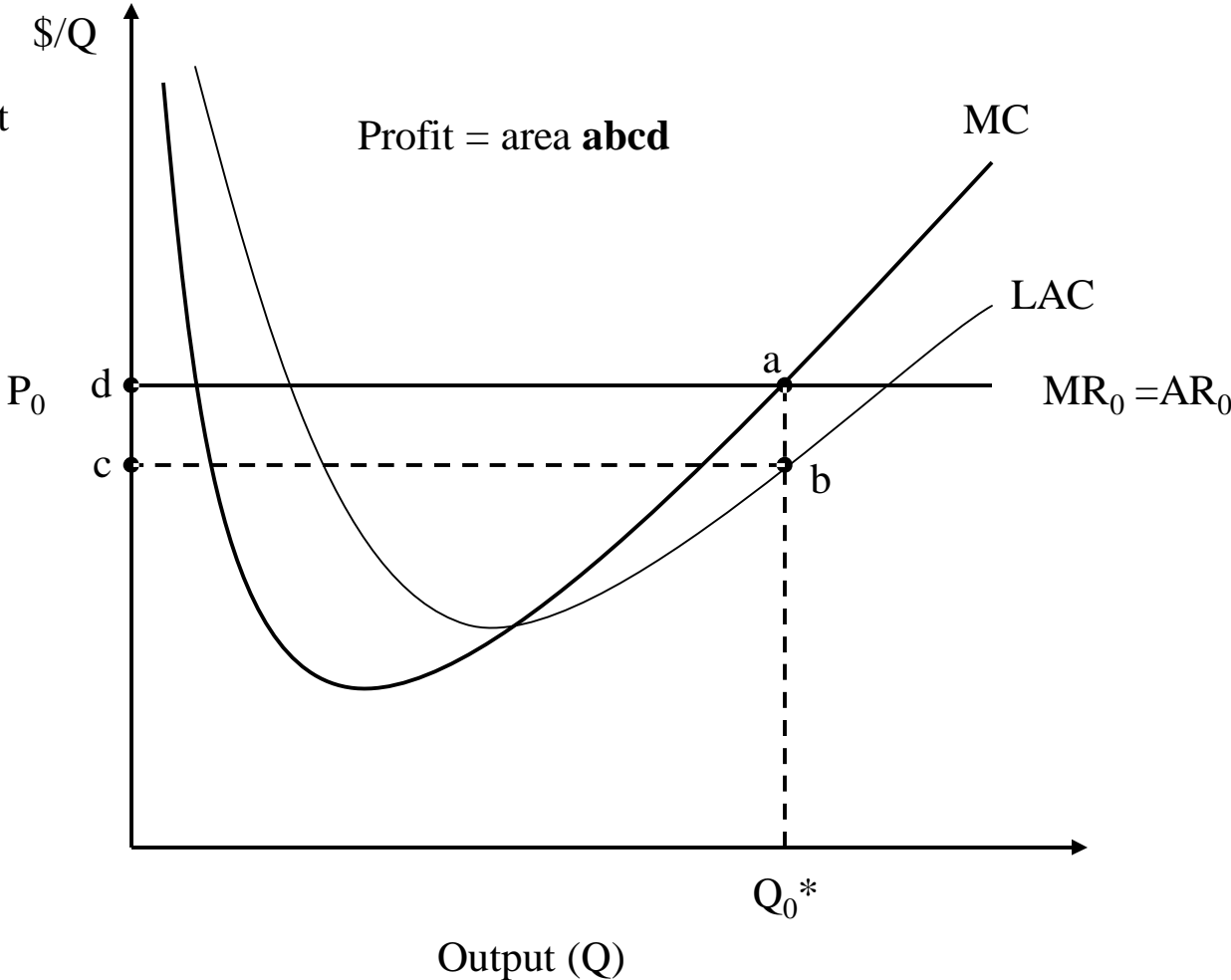


Perfect Competition in the Long Run

- Three Profit Maximizing Conditions:
 - Marginal Revenue Equals Marginal Costs: $MR = P_0 = LMC$
 - Marginal Costs Must Be Increasing: $LMC' > 0$
 - Average Revenue Must Exceed Average Costs: $AR = P_0 > LAC$

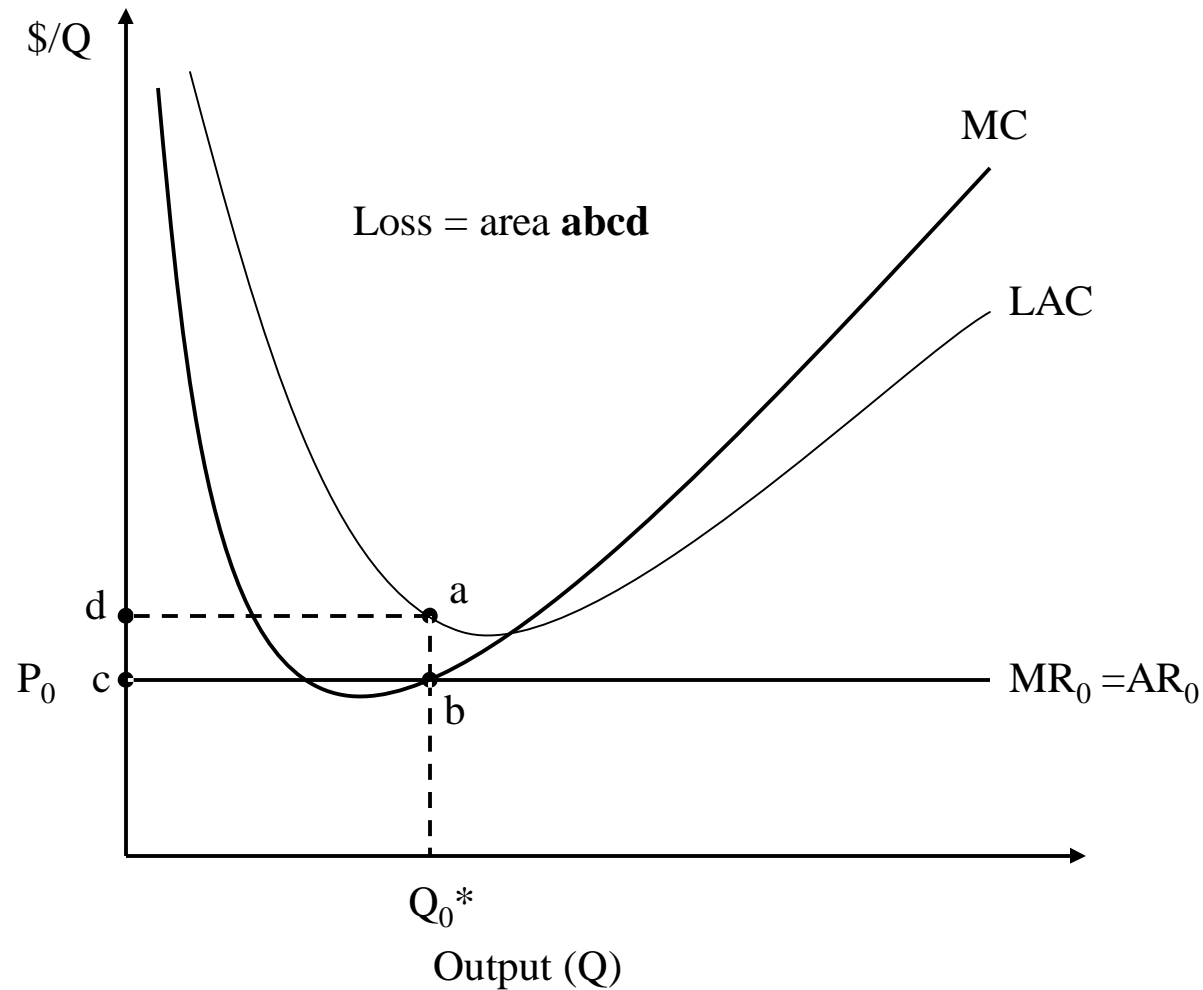
Long Run Production For Perfect Competition: An Example With Economic Profits

This firm will want
to produce in the
long run!

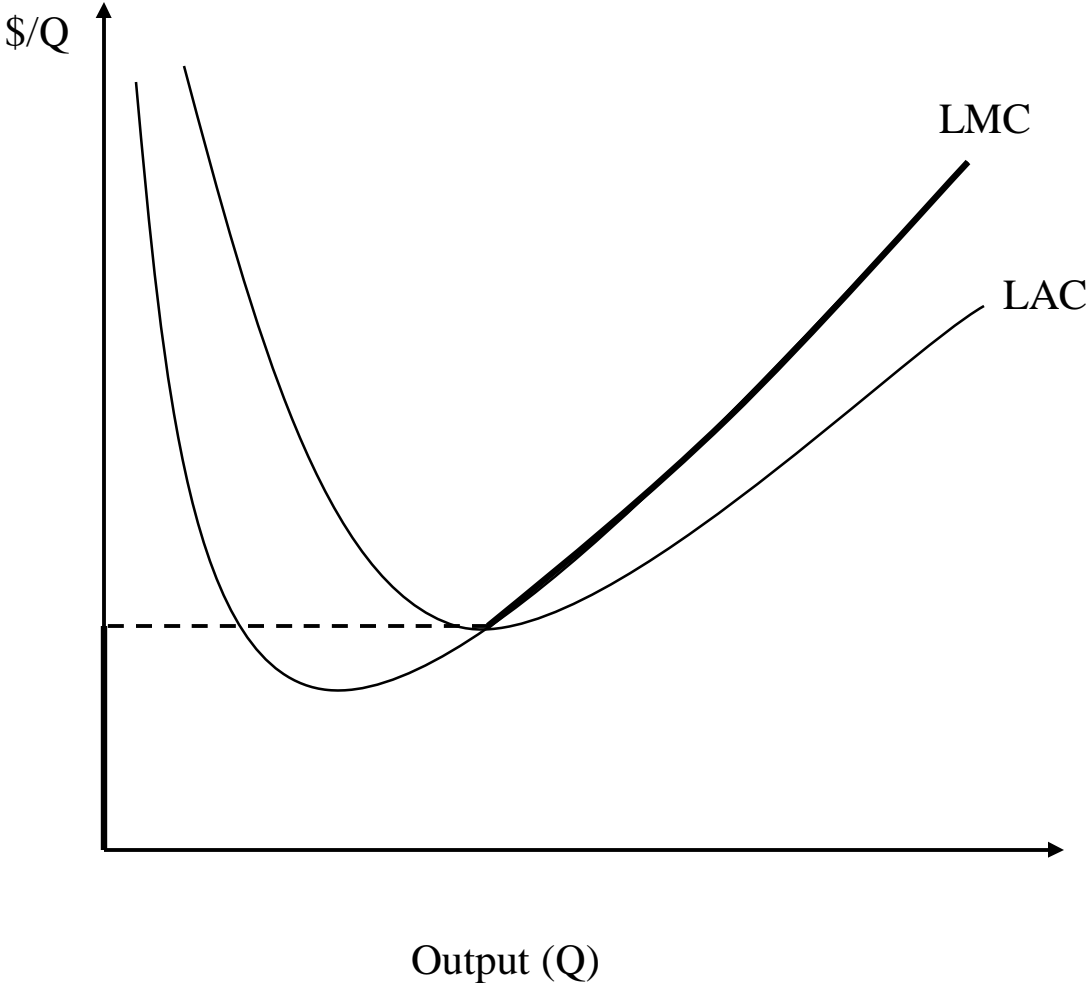


Long Run Production For Perfect Competition: An Example With Economic Losses

This firm will not
want to produce
in the long run!



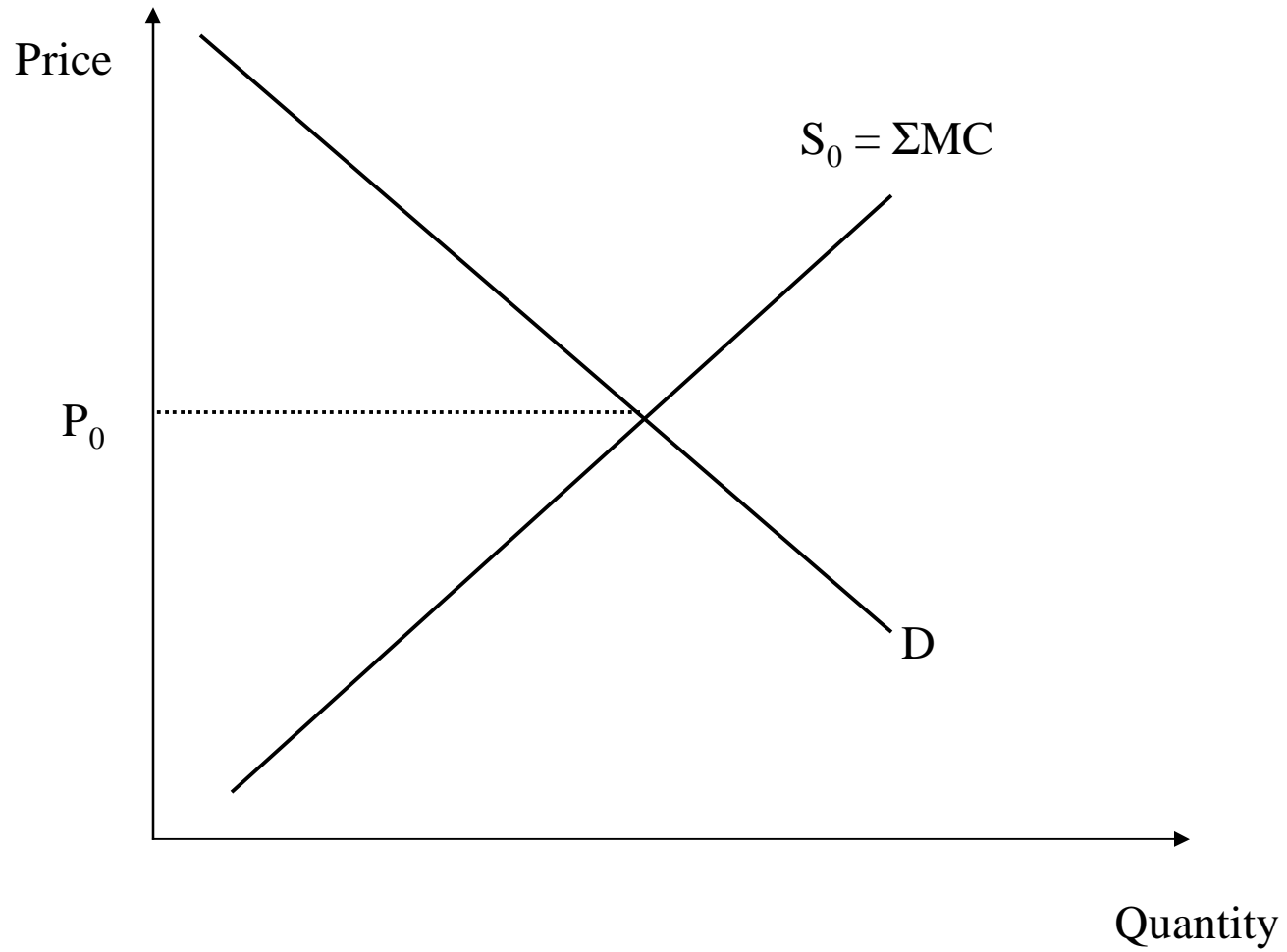
Perfectly Competitive Supply in the Long Run



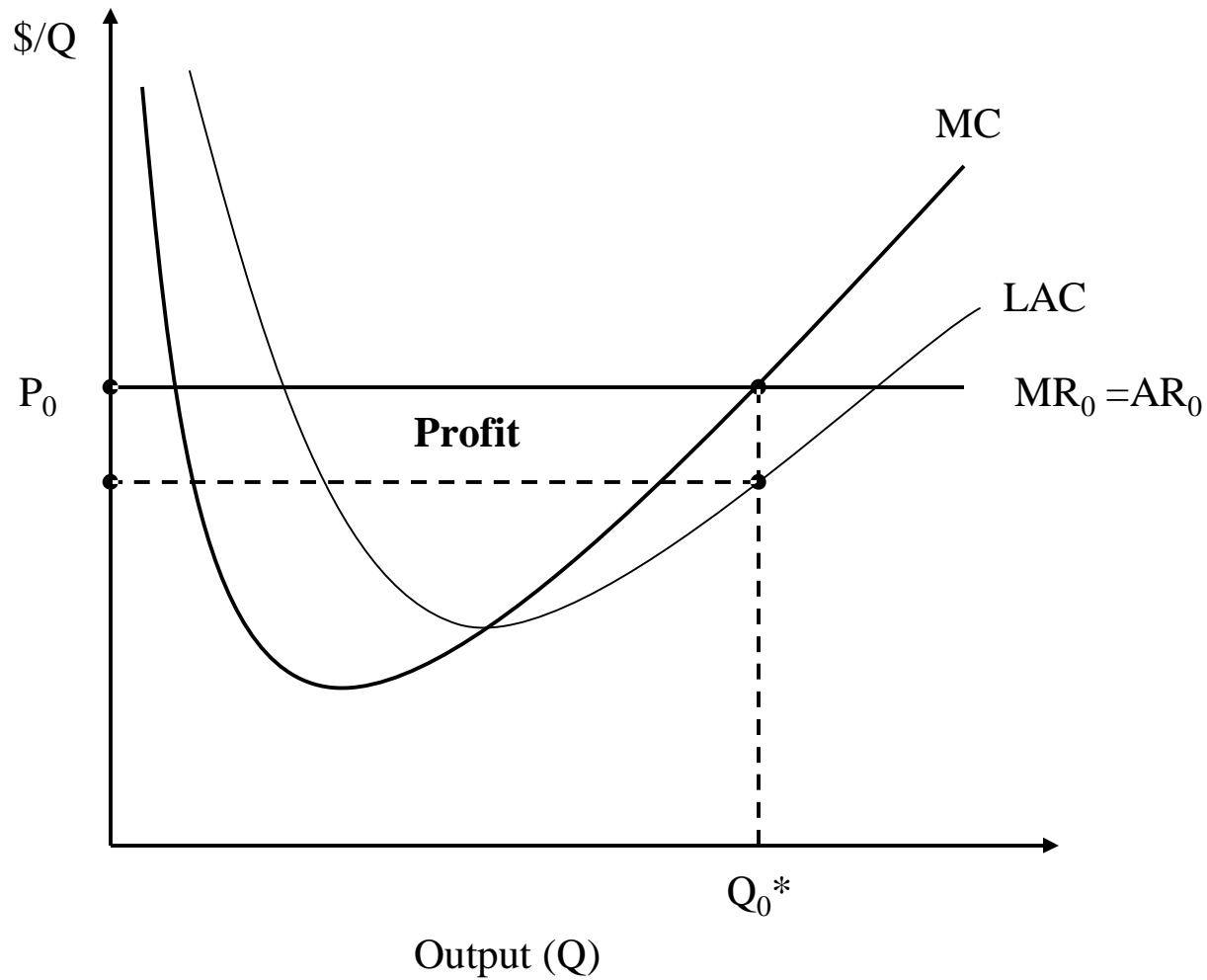
Perfect Factor Mobility in the Long Run

- Can economic profit persist in the long run?
- Not with perfect factor mobility!
 - Firms will see economic profits & choose to enter the industry.
 - Firm entry will increase supply and drive down the equilibrium price.
 - As the equilibrium price falls, so will economic profit.
 - As long as there are economic profits to be had, there will be new firms entering the industry.

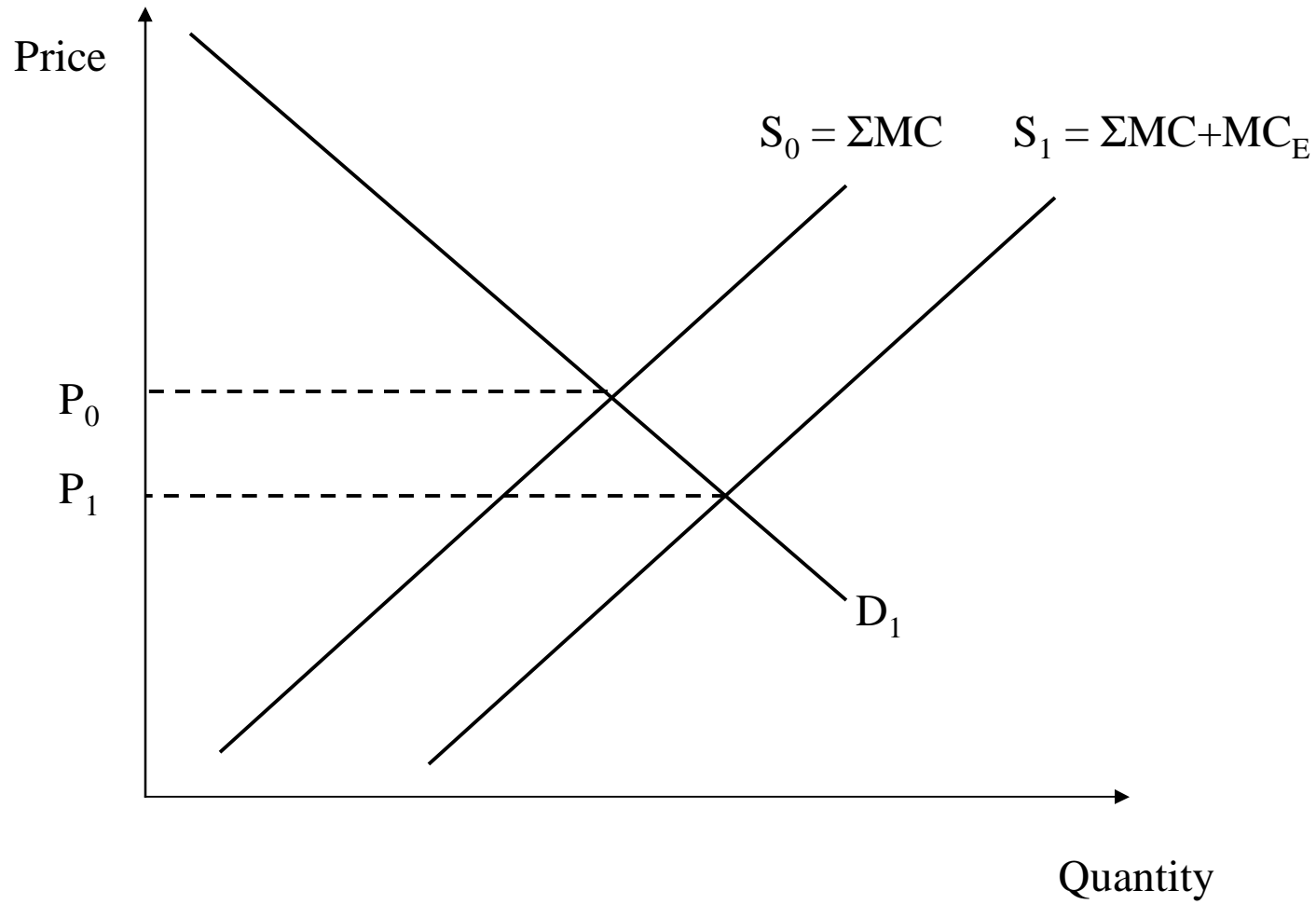
Market Equilibrium



Long Run Profit Maximization for a Perfectly Competitive Firm

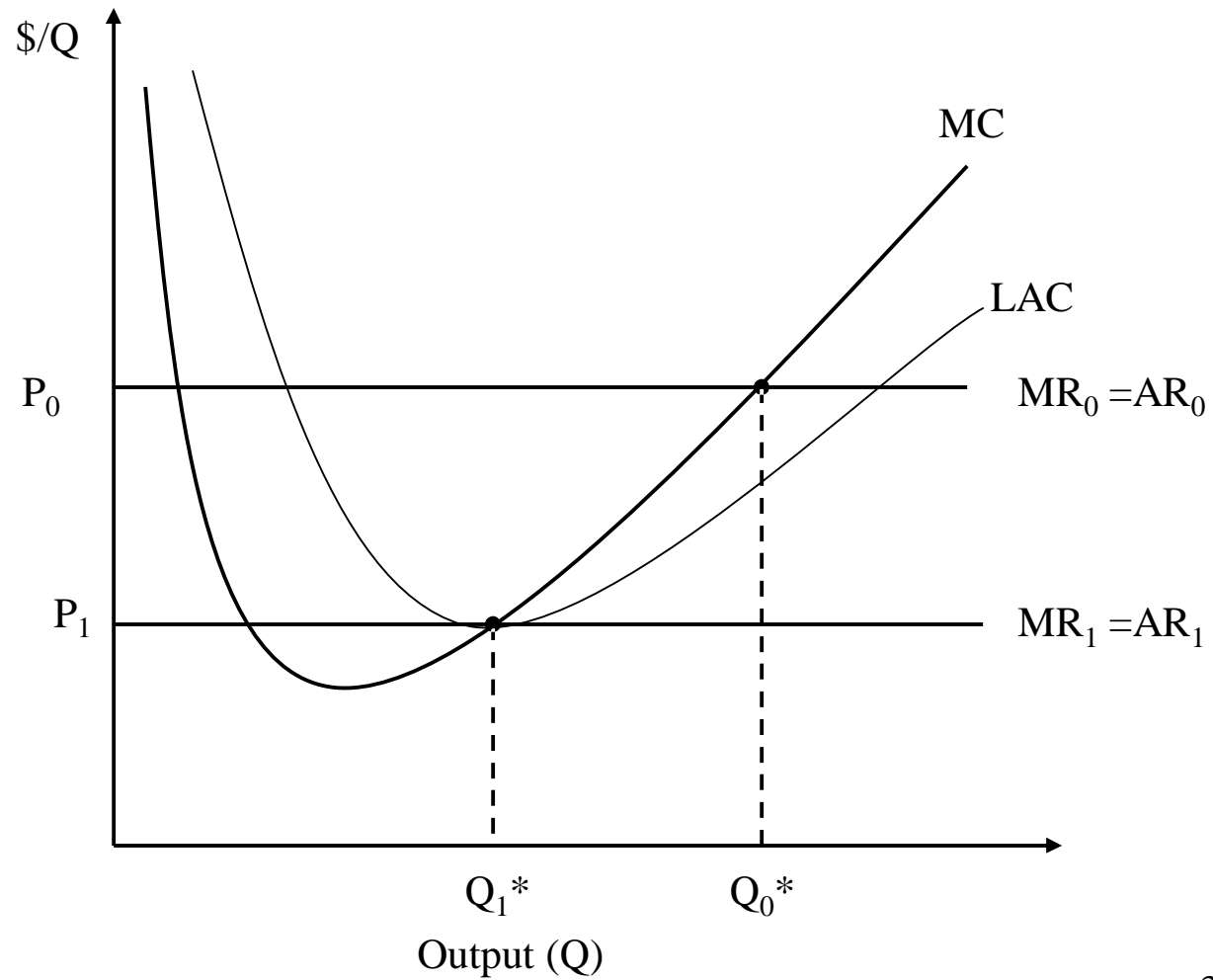


New Market Equilibrium With Entry

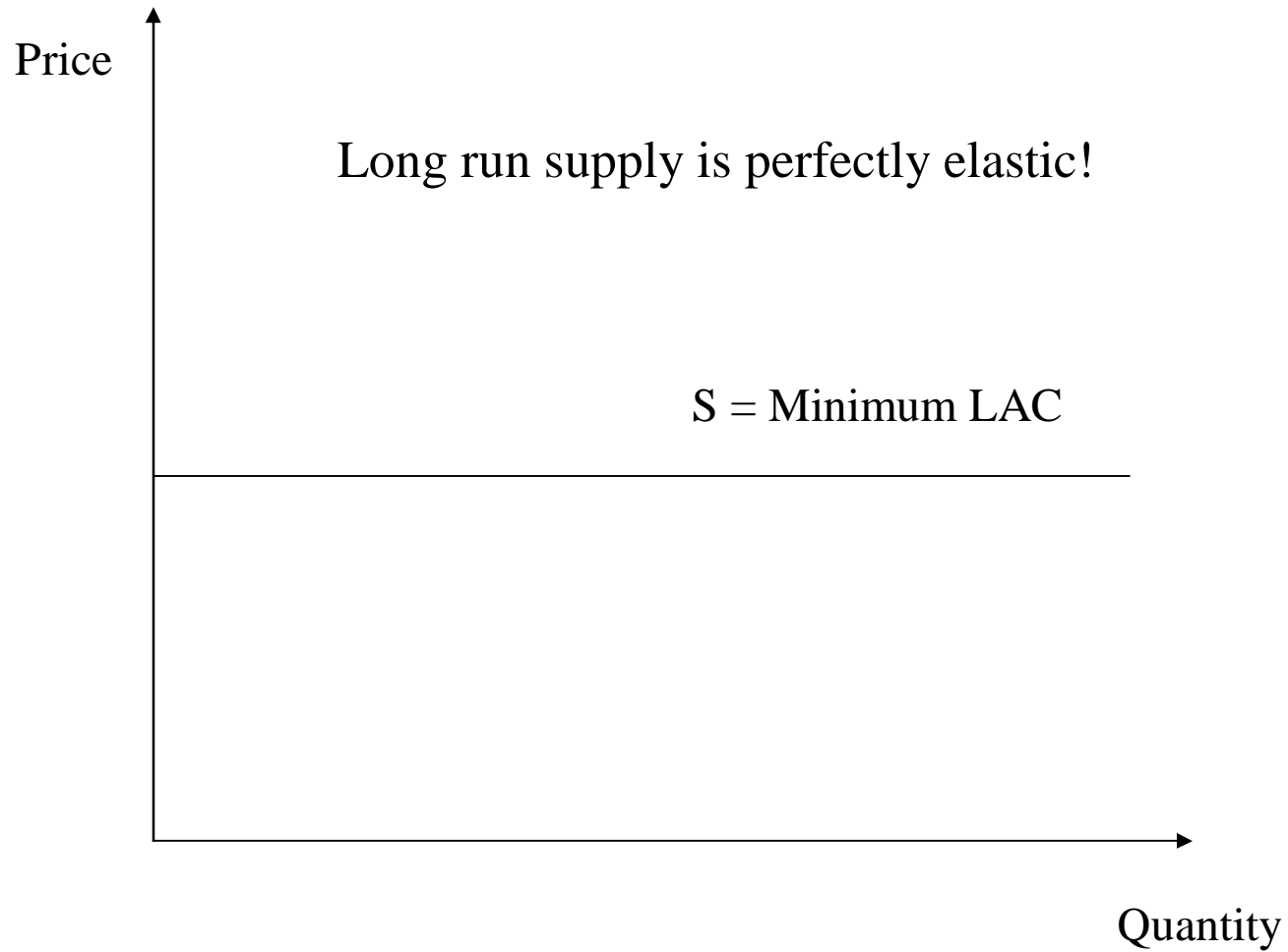


Long Run Profit Maximization With New Equilibrium Prices

Perfect factor mobility means there will be entry as long as there is economic profit. Entry stops when the price is driven down minimum long run average costs.



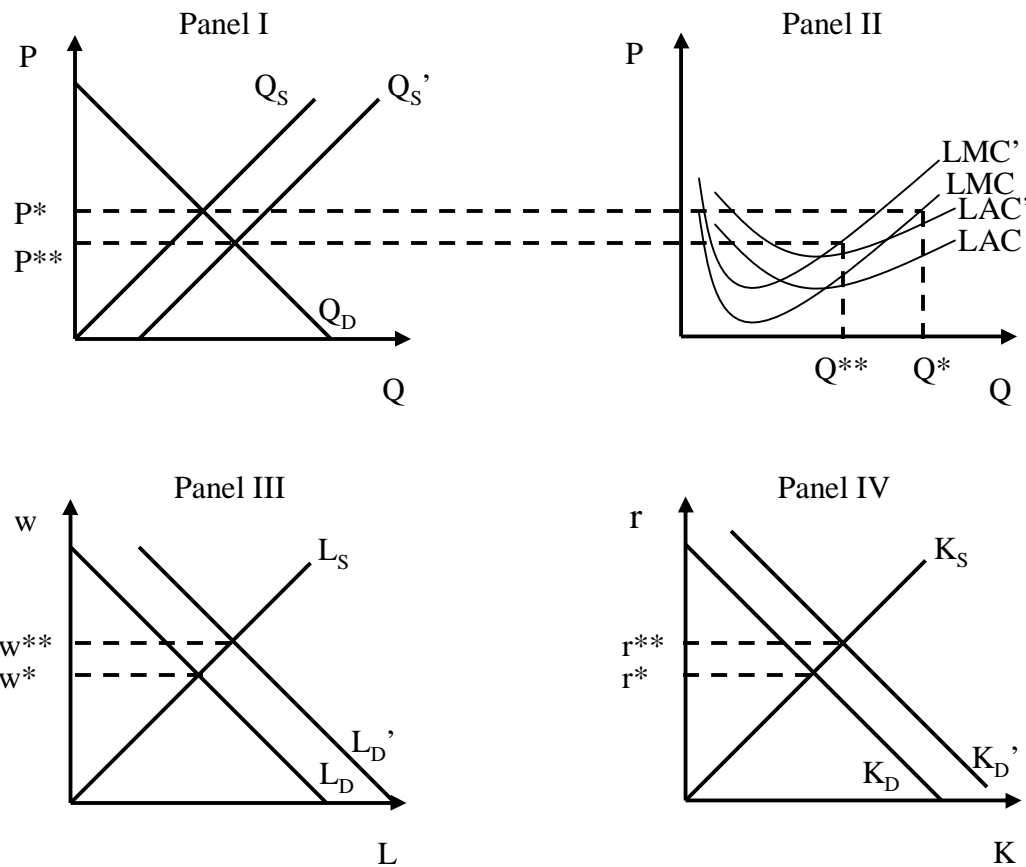
Long Run Supply with Constant Input Prices



Question: Are there any instance where the long run supply curve will be something other than a horizontal line?

- Pecuniary Diseconomy:
 - A rise in production cost that occurs when an expansion of industry output causes a rise in the prices of inputs.

Example of Increasing Long Run Average Cost



Shape of Long Run Supply

- Horizontal Line (Perfectly Elastic):
 - Factor supplies must be perfectly elastic.
- Upward Sloping:
 - Pecuniary diseconomies imply factor supplies are positively sloped.

Price Elasticity of Supply

Definition

- The percentage change in the quantity supplied divided by the percentage change in price:

$$e_s = \frac{\frac{\Delta Q_s}{Q_s}}{\frac{\Delta P}{P}} = \frac{\Delta Q_s}{\Delta P} \frac{P}{Q_s}$$

Price Elasticity of Supply An Example

- Suppose $Q_s = 10P - 5$ & $P = 2$
 - $Q_s = 10 \times 2 - 5 = 15$
 - $\Delta Q_s / \Delta P = 10$

$$e_s = \frac{\Delta Q_s}{\Delta P} \frac{P}{Q_s} = 10 \frac{2}{15} = 1 \frac{1}{3}$$

Price Elasticity of Supply

A Few Facts

- $\epsilon_s = 1$ whenever a linear supply curve goes through the origin.
- Long run supply curves are more elastic than short run supply curves.

What You Need to Know

- Difference in Accounting & Economic Profit
- The Profit Maximization Assumption
- The Characteristics of Perfect Competition
- Implications of Perfect Competition for Short Run Production
- Short Run Industry Supply with Perfect Competition
- Implications of Perfect Competition for Long Run Production
- Implications of Perfect Factor Mobility for Long Run Supply
- Determinants of the Shape of Long Run Industry Supply
- How to Calculate the Price Elasticity of Supply