Perfectly Competitive Market and Efficiency

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Perfectly Competitive Markets

- The model of perfect competition can be used to study a variety of markets

- Basic characteristics of a Perfectly Competitive Market
  1. Price taking
  2. Large number of sellers
  3. Product homogeneity- Every seller's output is a perfect substitute for another seller
  4. Free entry and exit – In the long run
- Price strategy is trivial

Perfectly Competitive Markets

- Classic example of perfectly competitive market is agriculture.
- There are many small farmers, and each is so small relative to the market that he or she has no perceptible impact on the prices of the farm produce.
- There is little difference between corn/wheat produced by farmer A and farmer B.

Implications of the characteristics

- Important **implication** of a product being homogeneous is that all firms producing and selling it must charge the same price.
- This is because between the two firms, if one charges a higher price than the other, no one will buy from the former.
- The existence of a large number of firms implies that each firm is very small compared to the whole market. Thus, no single firm can influence the price.
- In other words, a firm in a perfectly competitive industry is a **price taker**-it takes price as given (no market power of the firm).

Implications of assumptions

- The assumption of ***free entry and exit*** implies that additional firms can enter the market if profits are being earned, and firms are free to leave the market if they are making losses.

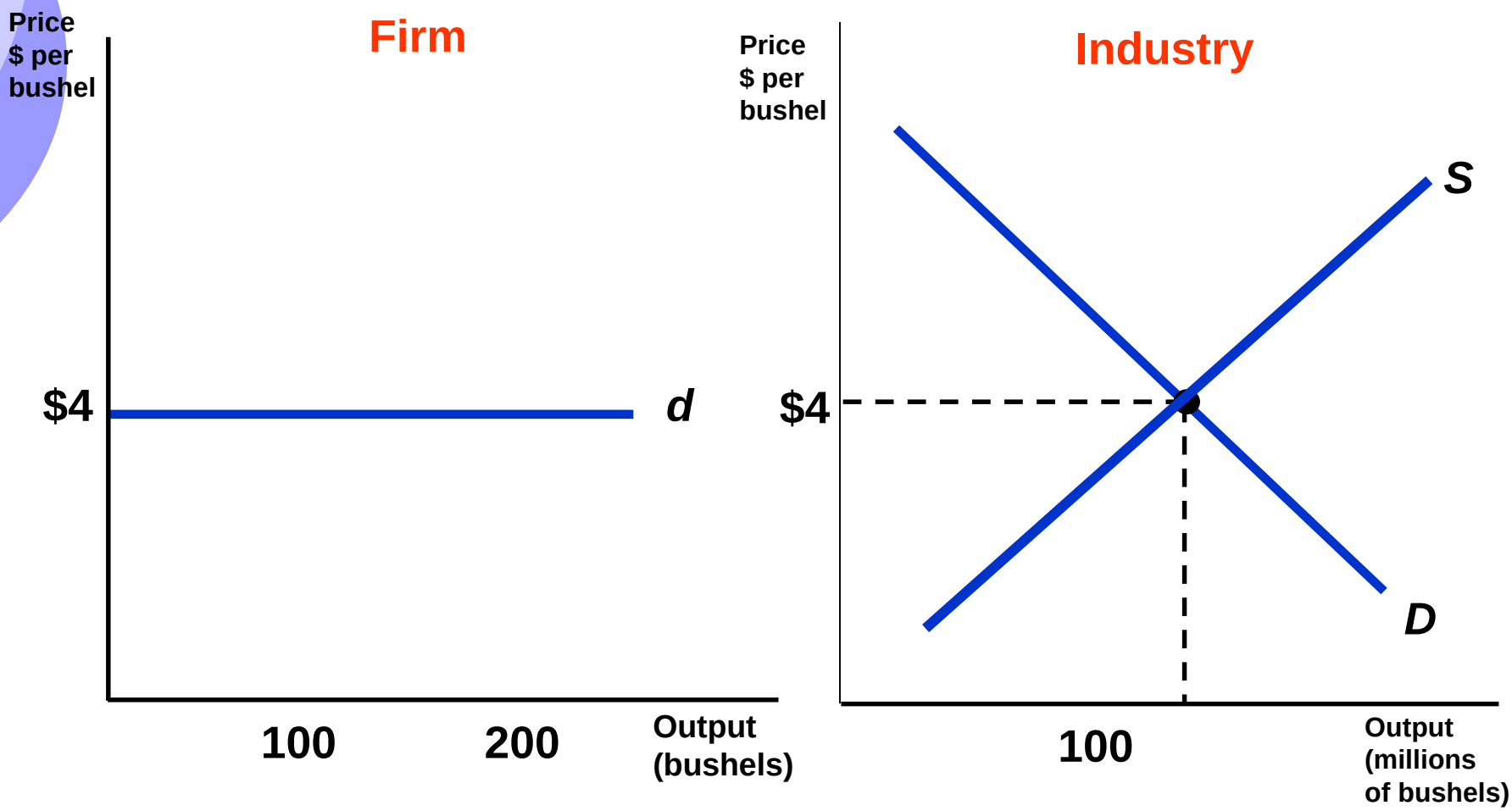
- Assumption of ***perfect (symmetric) information*** implies that consumers know the quality and price of each firm's product.

- There is no transaction costs (such as cost of travelling to a store); if one firm charges a higher price no body would buy from that firm and switch to others.

Demand Curves: Market and what the Firm faces

- Demand curve faced by an individual firm is a horizontal line
  - Firm's sales have no effect on market price
- Demand curve faced by whole market is downward sloping
  - Shows amount of good *all consumers* will purchase at different prices

The Competitive Firm



The Competitive Firm

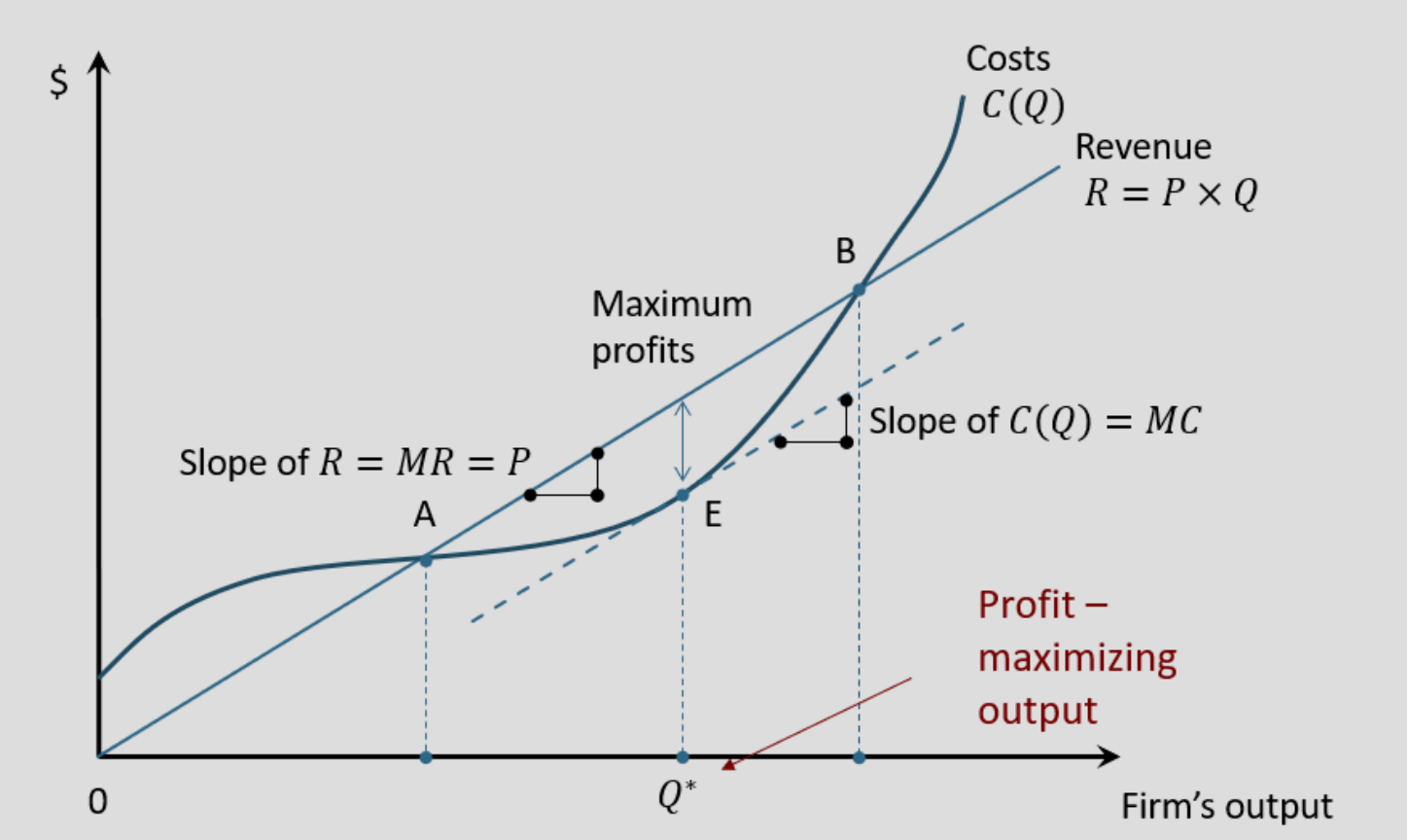
- The competitive firm's demand
  - Individual producer sells all units for $4 regardless of that producer's level of output.
  - MR = P with the horizontal demand curve
  - For a perfectly competitive firm, The profit equation is

$$\pi(q) = pq - C(q)$$

Profit Maximization: Short run

- General rule of profit maximizing output decision: MR=MC
- Difference between revenue and cost should be the largest
- Slope of R is MR.
- Slope of total cost curve C(q) is MC.
- Total cost is positive when output is zero (presence of fixed cost in short run)
- Profit is negative at low levels of output as revenue is insufficient to cover fixed and variable cost.

Revenue, Costs and Profits for a Perfectly Competitive Firm



Marginal Revenue, Marginal Cost, and Profit Maximization

- Profit is maximized at the point at which an additional increment to output leaves profit unchanged

$$\pi = R - C$$

$$\frac{\Delta\pi}{\Delta q} = \frac{\Delta R}{\Delta q} - \frac{\Delta C}{\Delta q} = 0$$

$$= p - MC(q^*) = 0$$

$$p = MC(q^*)$$

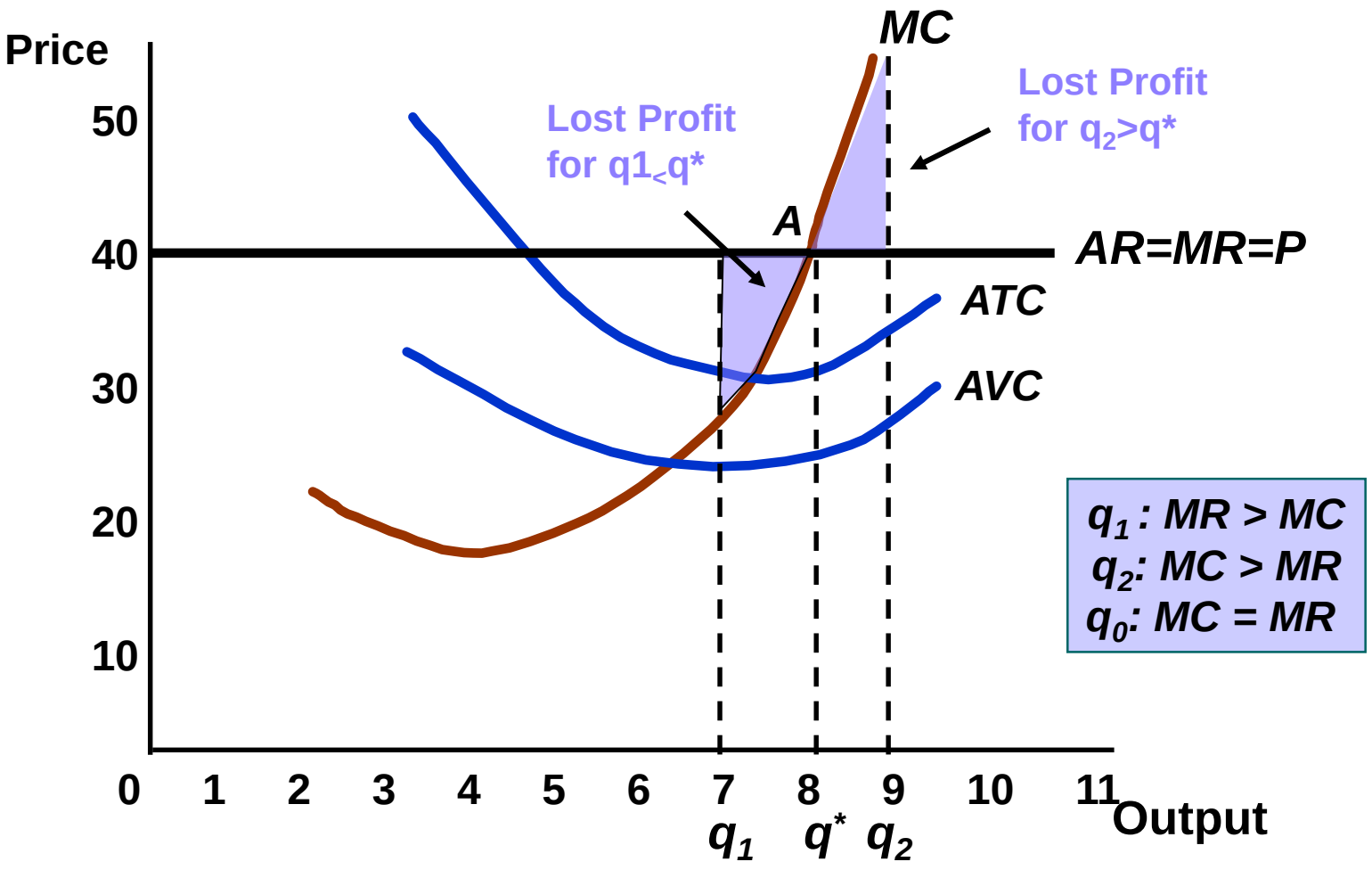
Marginal Revenue, Marginal Cost, and Profit Maximization

Firms maximize profit by producing the level of output q^*, where $MR(q^*)=MC(q^*)$

Example

- The cost function for a firm is $C(Q) = 5 + Q^2$. If the firm sells output in a perfectly competitive market and firms in the industry sell output at a price of \$20, what price should the manager of this firm charge? What level of output should be produced to maximize profits? How much profit will be earned?
- Answer:
  - Charge \$20.
  - Since marginal cost is $2Q$, equating price and marginal cost yields: $\$20 = 2Q \Longrightarrow Q = 10$ units.
  - Maximum profits are: $\pi = 20 \times 10 - (5 + 10^2) = \$95$.

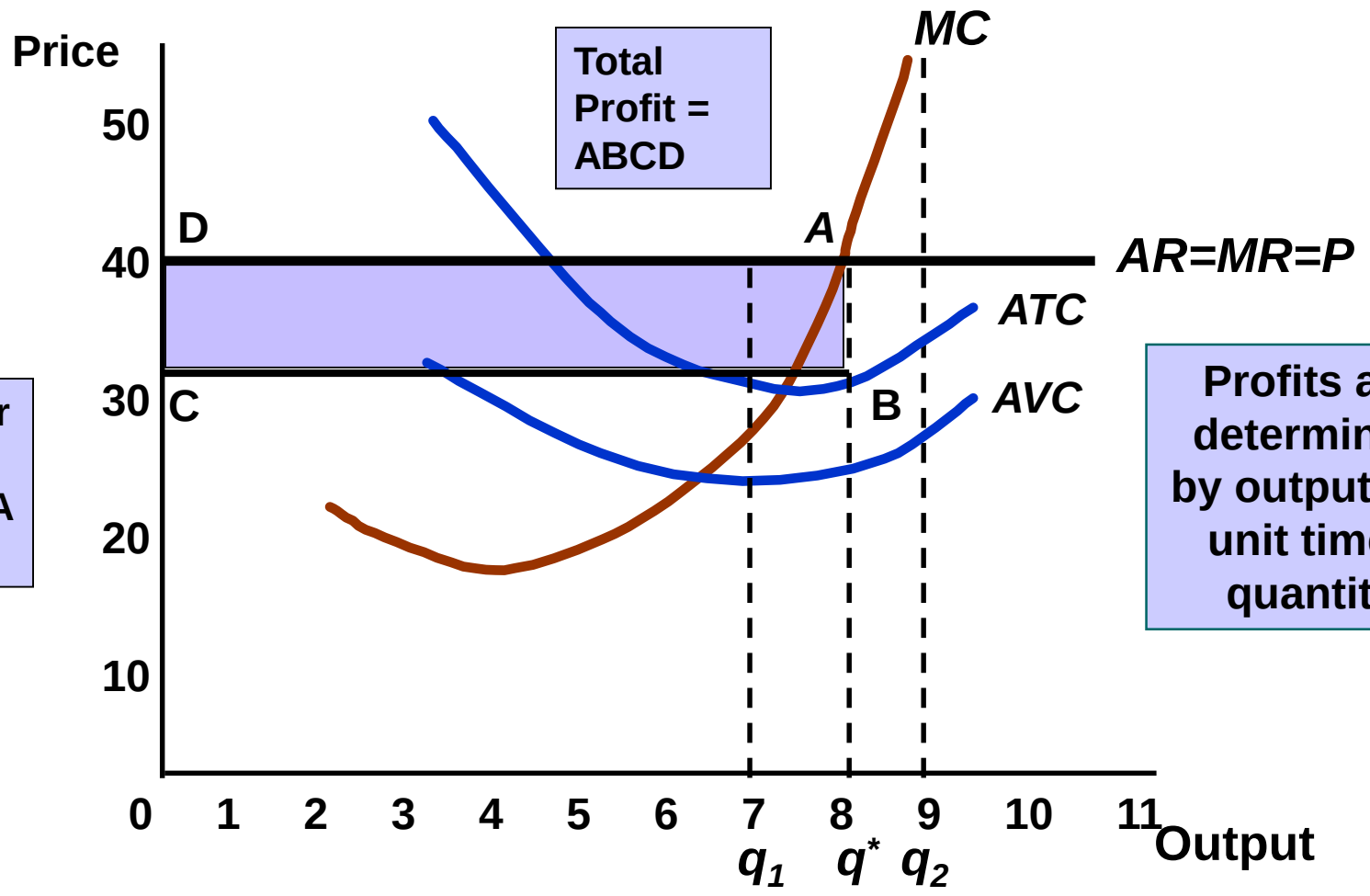
A Competitive Firm – Short Run Profit Maximization



Choosing Output: Short Run

- The point where MR = MC, the profit maximizing output is chosen
  - MR=MC at quantity, q*, of 8
  - At a quantity less than 8, MR>MC so more profit can be gained by increasing output
  - At a quantity greater than 8, MC>MR, increasing output will decrease profits

A Competitive Firm – Positive Profits



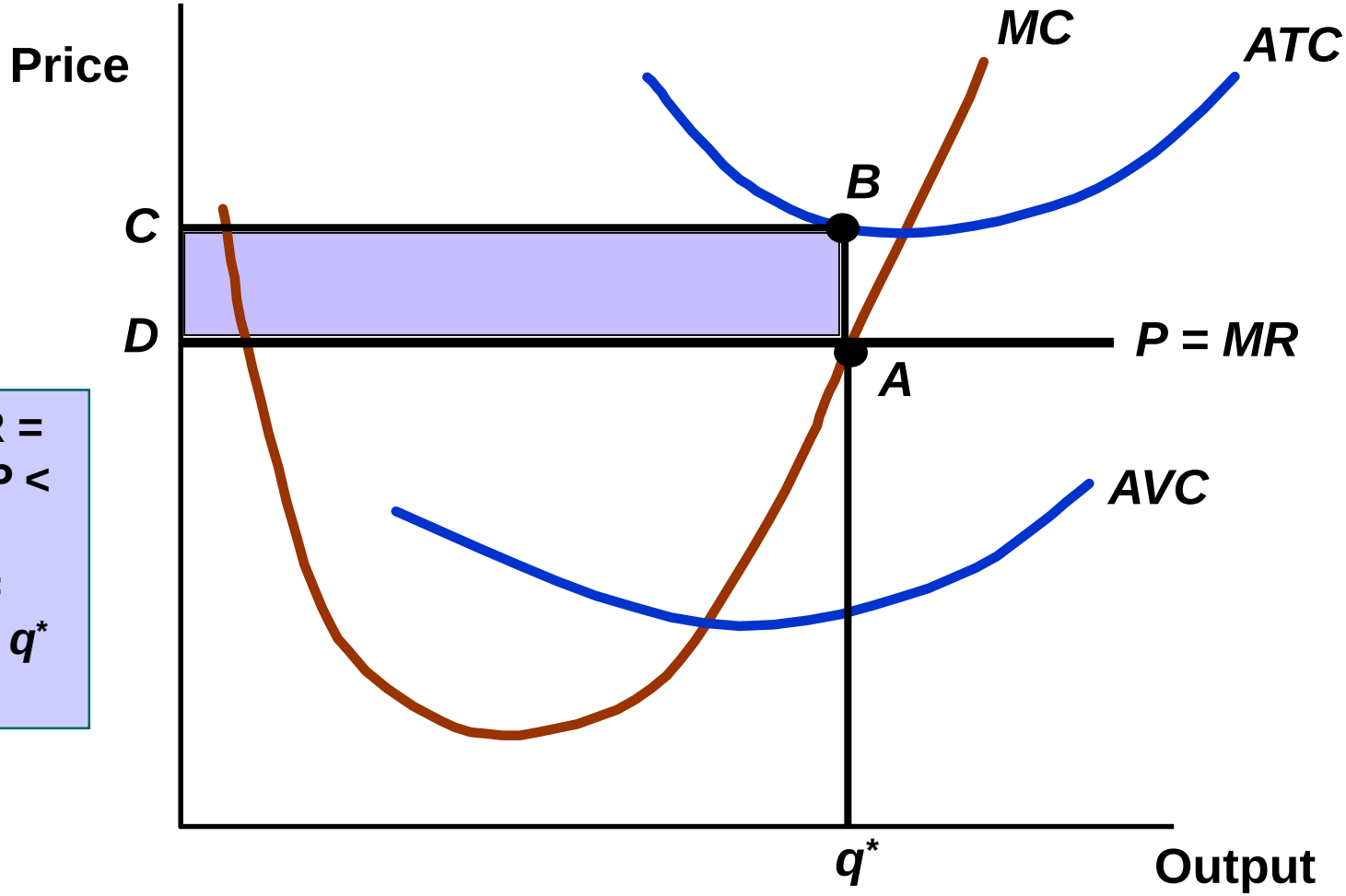
Profit per unit = P-AC(q) = A to B

Profits are determined by output per unit times quantity

The Competitive Firm

- A firm does not have to make profits always in short-run.
- It is possible a firm will incur losses if the P < ATC for the profit maximizing quantity
  - Still measured by profit per unit times quantity
  - Profit per unit is negative (P – ATC < 0)

A Competitive Firm – Losses



At q^*: MR = MC and P < ATC
Losses = (P- AC) x q^* or ABCD

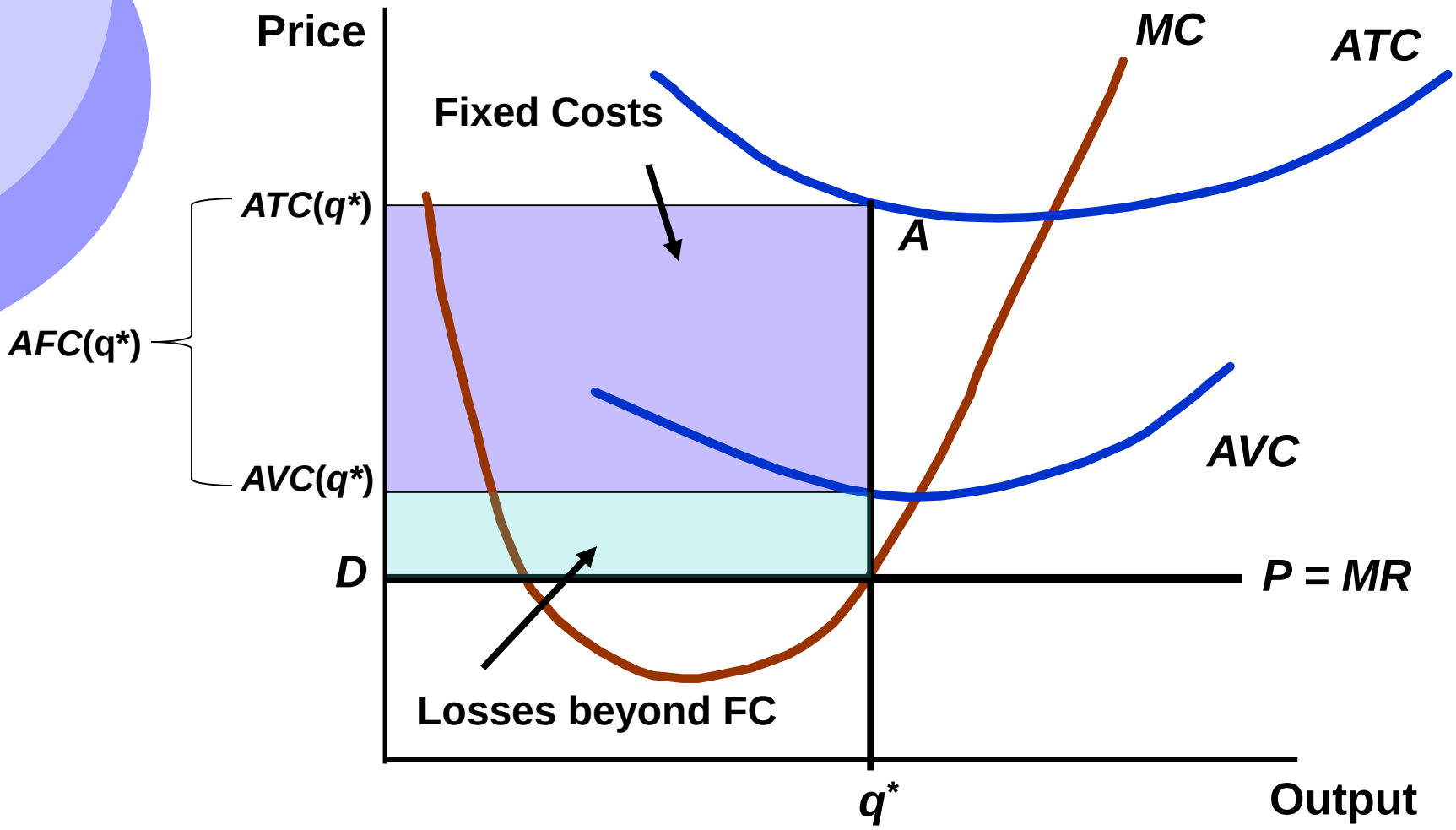
Choosing Output in the Short Run

- Summary of Production Decisions
  - Profit is maximized when MC = MR
    - If P > ATC the firm is making profits.
    - If P < ATC the firm is making losses
      - Can cover some of its fixed costs and all of its variable costs

Short Run Production

- When should the firm shut down?
  - If AVC < P < ATC the firm should continue producing in the short run
    - Can cover some of its fixed costs and all of its variable costs
  - If AVC > P the firm should shut-down.
    - Can not cover even its variable costs

A Competitive Firm – Losses



Competitive Firm – Short Run Supply

- Supply curve tells how much output will be produced at different prices
- Competitive firms determine quantity to produce where P = SMC and SMC slopes upward.
  - Firm shuts down when P < AVC
- Competitive firms supply curve is portion of the marginal cost curve above the AVC curve

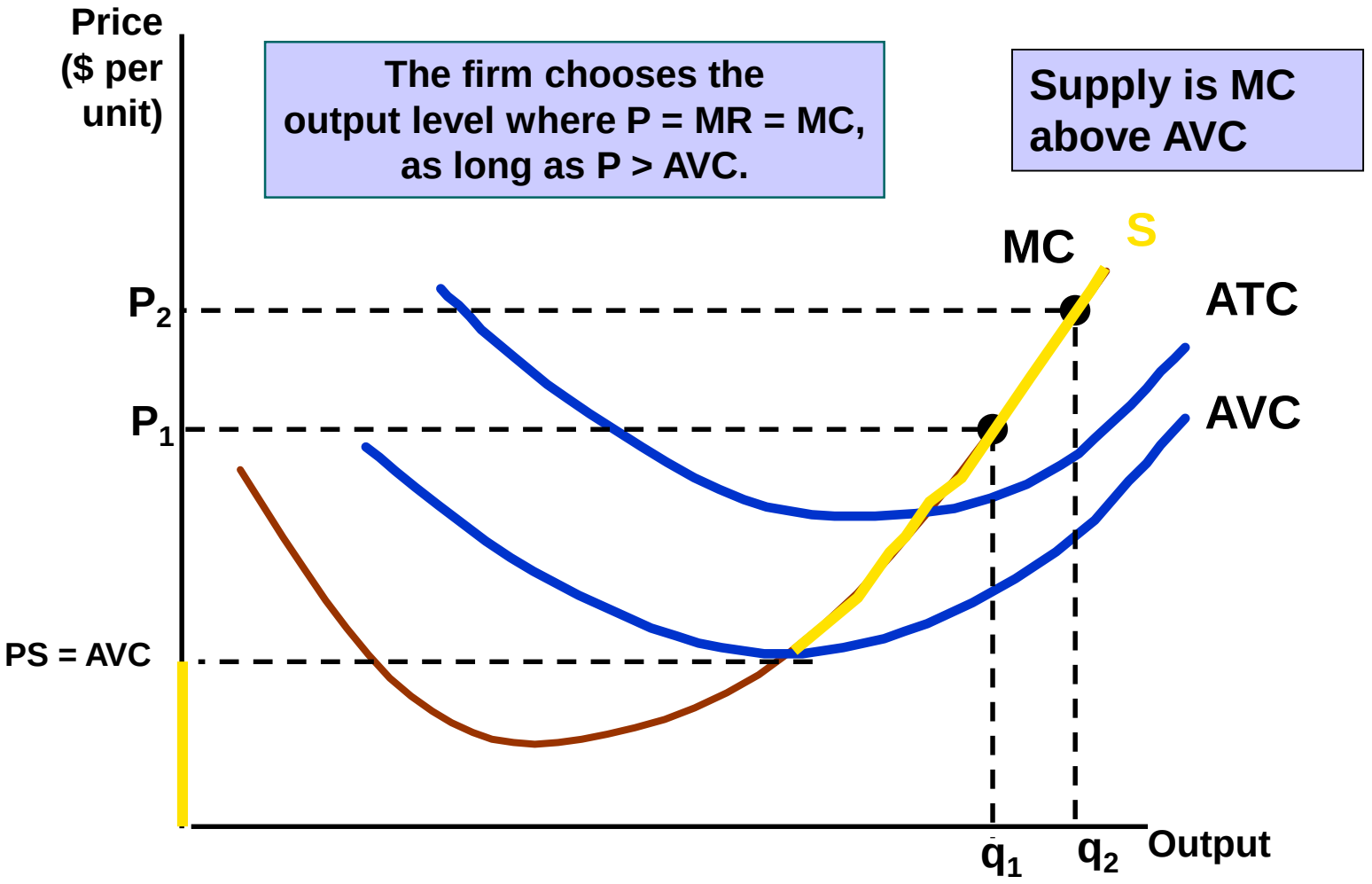
Competitive Firm – Short Run Supply

- The firm would never produce on the portion of the SMC curve where SMC<AVC, this is a portion below the minimum level of AVC, they will produce Q=0.

- If the market price is less than Ps in the graph (see next slide), the firm will supply zero output (i.e. Q=0). This portion of the supply curve is the vertical spike, that coincides with the vertical intercept.

- We call Ps the firm's shutdown price, the price below which it produces quantity of zero in the short run.

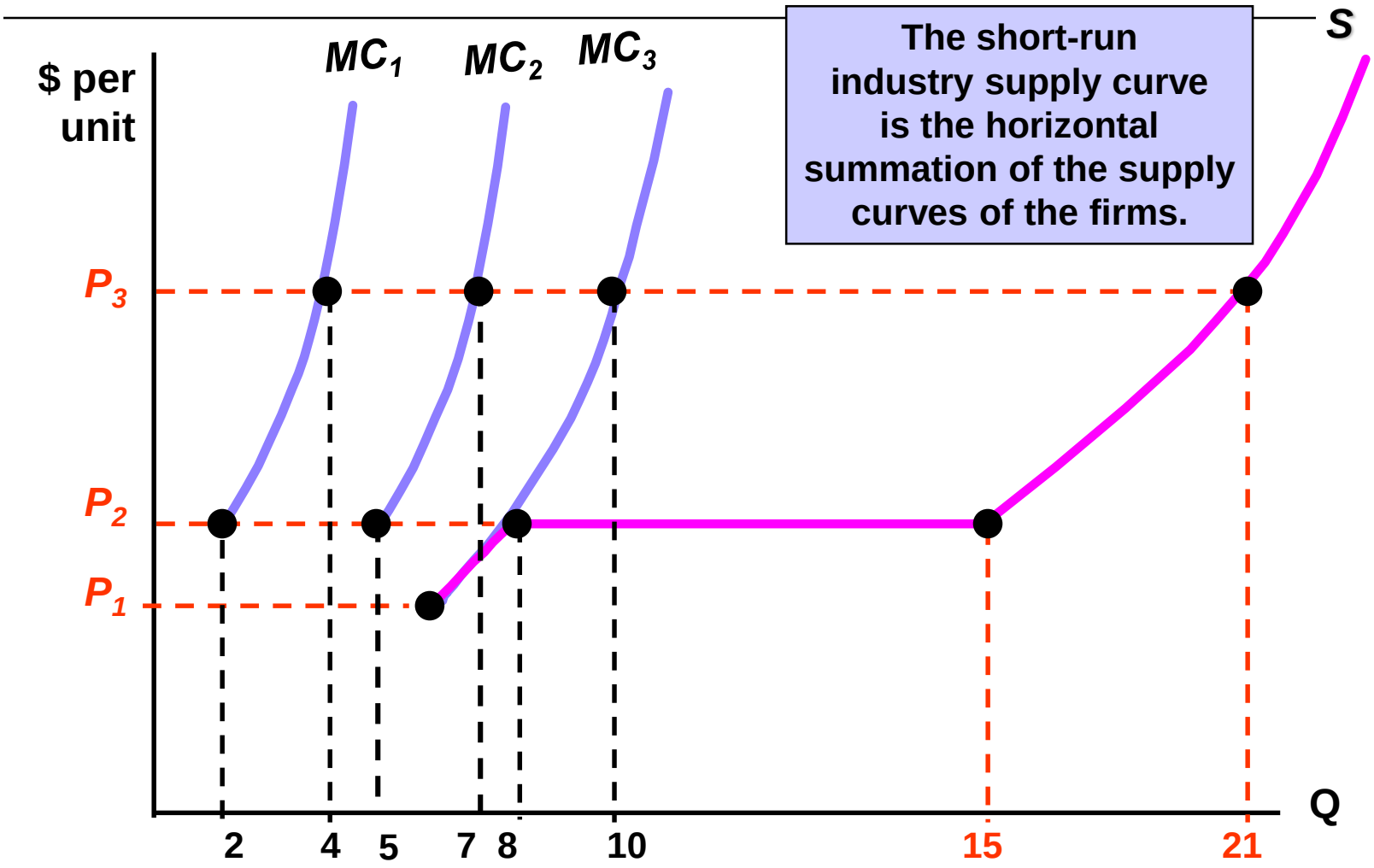
A Competitive Firm's Short-Run Supply Curve



Short-Run Market Supply Curve

- Shows the amount of product the whole market will produce at given prices
- Is the sum of all the individual producers supply in the market
- We can show graphically how we can sum the supply curves of individual producers

Industry Supply in the Short Run



Example: Derivation of Short Run Market Equilibrium

- Example:

Example: Deriving Short-Run Market Equilibrium

300 identical firms

$Q^d(P) = 60 - P$
$STC(q) = 0.1 + 150q^2$
$SMC(q) = 300q$
$FC = 0$ (Assume it is unavoidable)
$AVC(q) = 150q$

Short-run Equilibrium

a. Short Run Equilibrium

Profit maximization condition: $P = 300q$

$q^s(P) = P/300$

Market Supply $Qs(P) = 300\ (P/300) = P$

$Qs(P) = Qd(P) \Leftrightarrow P = 60 - P$

$P^* = 30$

$q^* = 30/300 = .1$

$Q^* = 30$

Short-run Equilibrium

b. Do firms make positive profits at the market equilibrium?

$SAC = STC/q = .1/q + 150q$

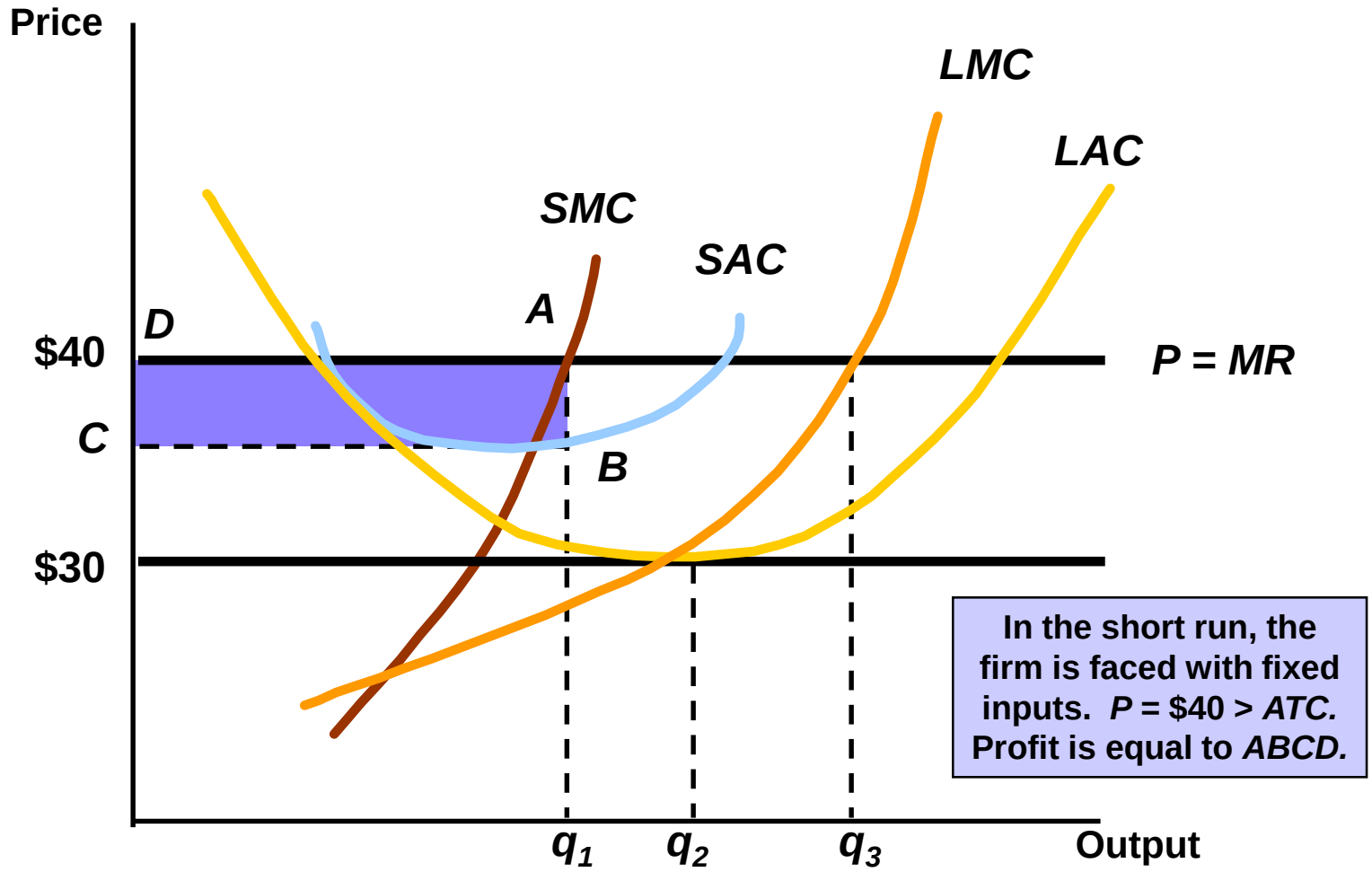
When each firm produces .1, SAC per firm is: $.1/.1 + 150(.1) = 16$

Therefore, $P^* > SAC$ so profits are positive.

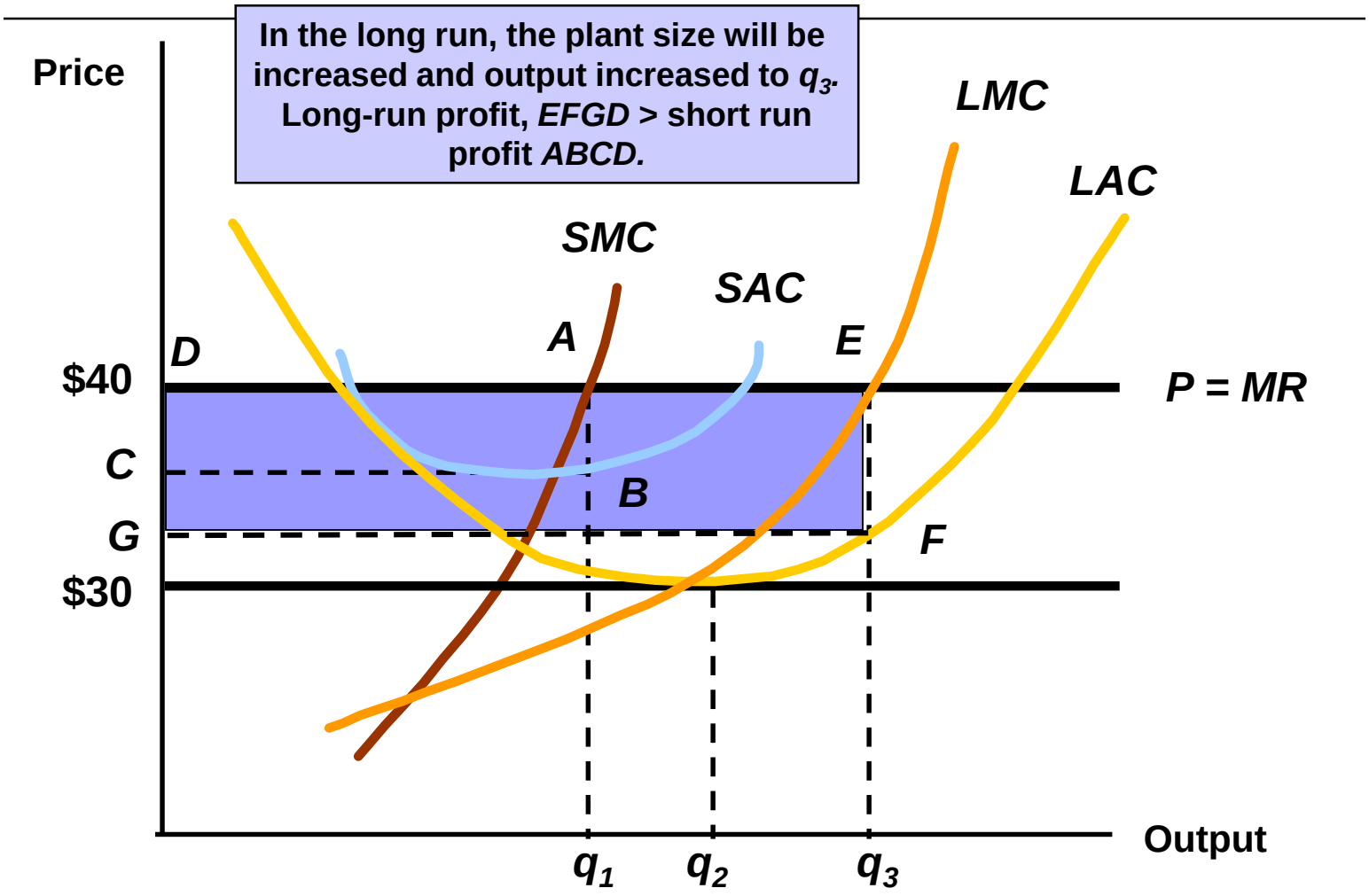
Choosing Output in the Long Run – Perfect Competition

- In the long run, a firm can alter all its inputs, including the size of the plant.
- It can exit industry (if cannot recover its variable cost), or enter being attracted by the profit earned by existing firms.
- We allow for free entry and exit without any cost associated with it or without any legal restriction.

Output Choice in the Long Run



Output Choice in the Long Run



Long-Run Competitive Equilibrium

- Now suppose firms can enter and exit
- For long run equilibrium, firms must have no desire to enter or leave the industry
- Economic profit is zero: firm is earning normal/competitive profit or earning a normal return on its investment.
- It implies that it is doing well as it could by investing money elsewhere.

- **Economic Profit = 0 → What It Means**
- **1. Must understand the difference Between Accounting Profit and Economic Profit!**
- **Accounting Profit** = Total Revenue – Explicit Costs (wages, rent, materials, etc.).
- **Economic Profit** = Total Revenue – (Explicit Costs + Implicit Costs).
  - Implicit costs = opportunity costs (like the income the firm could earn elsewhere, or the return they could get by investing their capital in the next best option).

- **When Economic Profit = 0**
- **We know: Economic Profit** = Total Revenue – (Explicit Costs + Implicit Costs).
- The firm covers **all explicit costs** (so it pays workers, rent, etc.).
- The firm also covers **all implicit costs** (the opportunity cost of the owner's time and capital).
- The owner is doing **just as well as in the next best alternative**.
- This is called **normal profit**.

- **Implications:**
- Zero economic profit ≠ the firm is making losses.
- It means the firm is **earning a fair return**:
  - The entrepreneur gets paid as much as they could in their next best job.
  - The firm's capital earns as much as it would in the next best investment.

- In the long run, this is the **stable outcome** in perfect competition: firms stay in the market, but no one has an incentive to enter or exit.

- Zero economic profit means the firm is still covering **all costs including opportunity costs**.

- It is making **normal profit**, not running at a loss.

- **Example: Accounting Profit vs. Economic Profit**
- **Scenario**
- A small firm produces goods and earns **Total Revenue (TR) = ₹1,000,000**.
- Its **explicit costs** (wages, rent, raw materials, utilities) = **₹800,000**.
- The owner could:
  - Earn **₹150,000 salary** if working elsewhere (opportunity cost of time).
  - Invest the business capital in bonds and earn **₹50,000 interest** (opportunity cost of capital).

Accounting Profit

$$\text{Accounting Profit} = TR - \text{Explicit Costs}$$

$$= ₹1,000,000 - ₹800,000 = ₹200,000$$

- On the books, it looks like the firm is making **₹200,000 profit**.

Economic Profit

$$\text{Economic Profit} = TR - (\text{Explicit Costs} + \text{Implicit Costs})$$

$$= ₹1,000,000 - (₹800,000 + ₹150,000 + ₹50,000)$$

$$= ₹1,000,000 - ₹1,000,000 = 0$$

- The firm makes **zero economic profit**.

Interpretation

The owner's time (₹150k) and capital (₹50k) are fully compensated.

The firm is doing **just as well as the next best alternative**.

No incentive to shut down, no incentive for new firms to enter.

This is exactly the **long-run equilibrium outcome** in perfect competition.

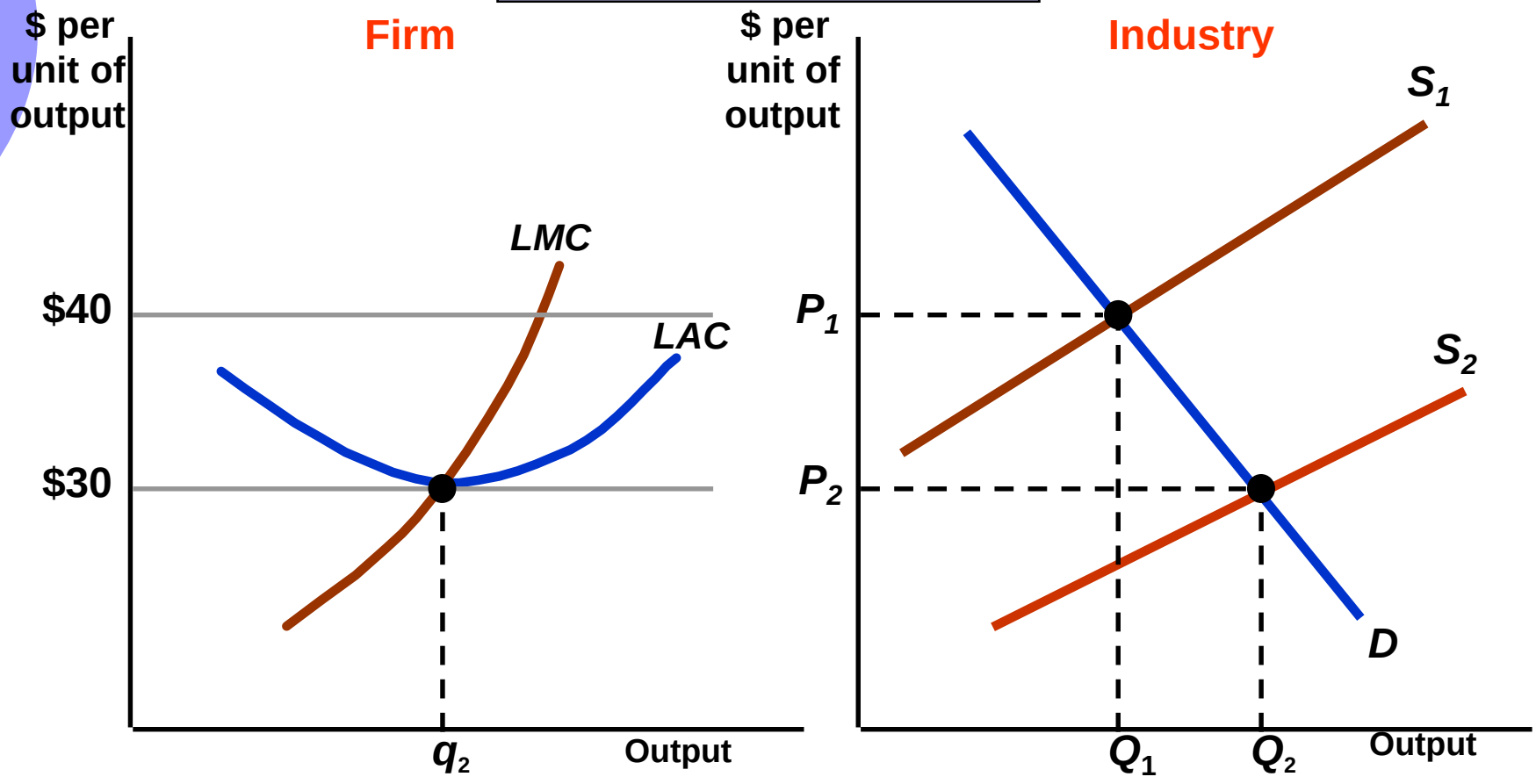
Key Idea:

Accounting Profit = Positive (₹200k)

Economic Profit = Zero → means "normal profit," i.e., the entrepreneur is earning exactly what they could elsewhere.

Long-Run Competitive Equilibrium – Profits

- Profit attracts firms
- Supply increases until profit = 0

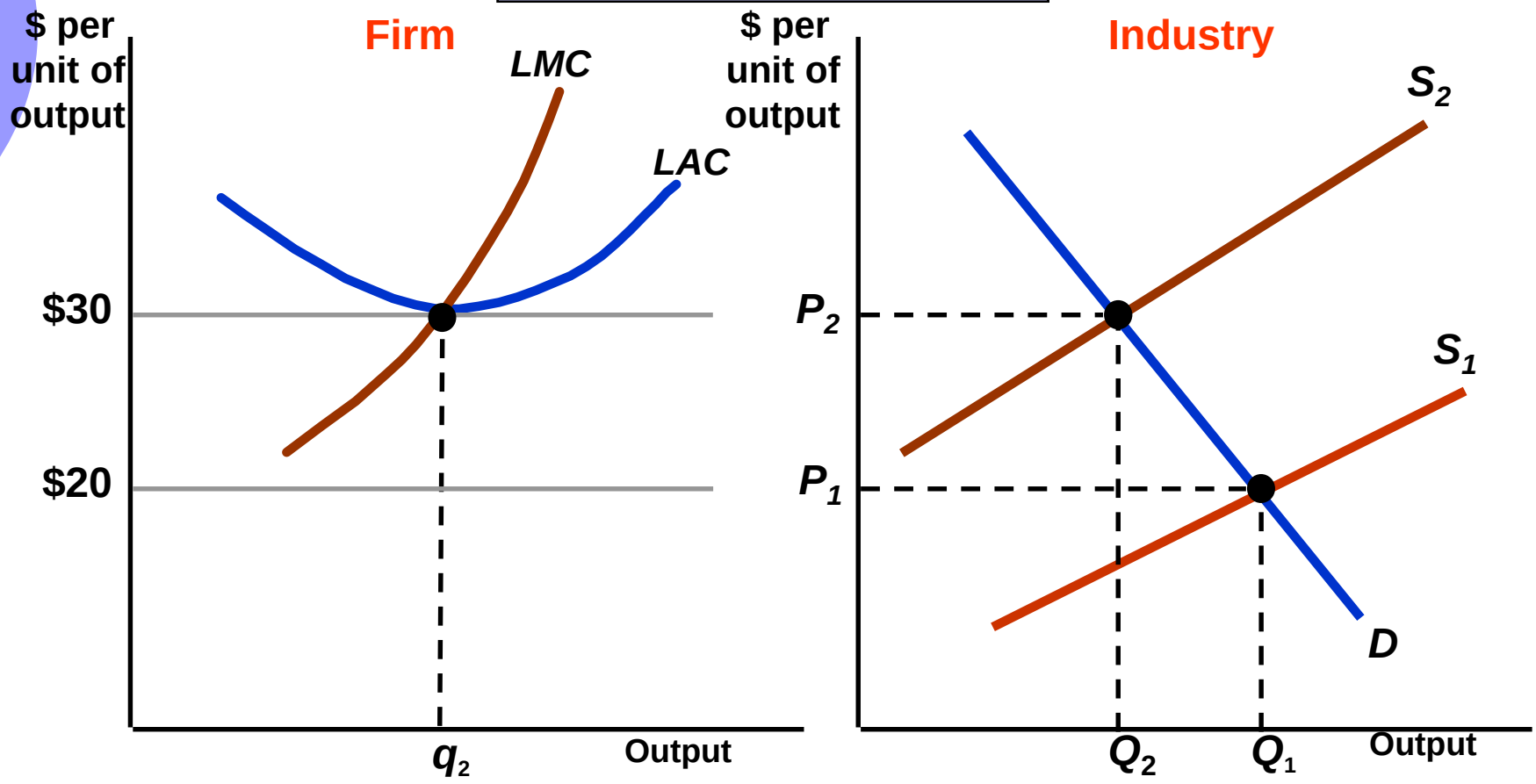


Long-run Competitive Equilibrium

- Entry and Exit
  - The long-run response to short-run profits is to increase output and profits.
  - Profits will attract other producers.
  - More producers increase industry supply which lowers the market price.
  - This continues until there are no more profits to be gained in the market – zero economic profits

Long-Run Competitive Equilibrium – Losses

- Losses cause firms to leave
- Supply decreases until profit = 0



Long-Run Competitive Equilibrium

1. All firms in industry are maximizing profits
   - P=MR = LMC = Min LRAC = Firms all choose optimal firm size
2. No firm has incentive to enter or exit industry
   - Earning zero economic profits
3. Market is in equilibrium
   - $Q_S = Q_D$

Example: Calculating a Long Run Equilibrium

$TC(q) = 40q - q^2 + .01q^3$
$AC(q) = 40 - q + .01q^2$
$MC(q) = 40 - 2q + .03q^2$

$Q^d(P) = 25000\text{-}1000P$

The long run equilibrium satisfies the following:

a. $P^* = 40 - 2q^* - .03q^{*2}$
b. $P^* = 40 - q^* + .01q^{*2}$
c. $25000\text{-}1000P^* = q^*n^*$

Using (a) and (b), we have:

$40 - 2q^* + .03q^{*2} = 40 - q^* + .01q^{*2}$

$q^* = 50$

$P^* = 15$

➔ $Q^d(P^*) = 10000$

Using (c) we have:

$n^* = 10000/50 = 200$

Summary of Logic

- Short run profits leads to entry.
- Entry increases market supply, drives down the market price, increases the market quantity.
- Firm reduces output to maximize profit.
- Long run profits are zero.

Internet-based Price competition

- E-commerce intensifies competition in many ways.
- By allowing a consumer to shop worldwide, the Net vastly increases the number of firms in a virtual market.
- Now even your campus bookstore has to worry about textbook prices available at Amazon.com and many other online booksellers.
- E-commerce also reduces transaction costs. Retailers don't need stores or catalogs to display their products, and they can greatly reduce inventories by selling to order. This is how Dell computer used to supply $20 million computers it sells per day online.

Internet-based Price competition

- The evident advantages of e-commerce have made it the virtual mall of choices of many consumers.
- With Net sales increasing every year, e-commerce is sure to intensify price competition in the economy tomorrow.

Some readings

- Wireless-phone rates in India declining as competition grows.
- Source: the wall street journal, September 1, 2004, p87.
- Analysis: competitive pressures force companies continually improve products and cut prices.

Some readings

- Attack of the iPod Clones: New players give Apple a run for its money in portable music; recording songs from the radio
- (Source: the wall street journal, October 29, 2003)
- Analysis: Economic profits attract entrepreneurs.
- As competition intensifies, products improve and prices fall.

The economy Tomorrow

- Competition didn't end with computers or dot.com companies.
- Just ask Steve jobs, guy who started the personal computer business back in 1977. He introduced another hot consumer product in November 2001 – iPod.
- The iPod was the first mass-produced portable digital music player. It allowed consumers to download, store, and retrieve up to 1,000 songs.

Attack of the iPod Clones

- Its compact size, sleek design, and simple functionality made it an instant success: Apple was selling iPod as fast as they could be produced, piling up huge profits in the process.

- So what happened?
- Other entrepreneurs quickly got the smell of iPod's profit. Within a matter of months, competitors were designing their own digital music players.

- By 2003, the "attack of the iPod clones" (source: The wall street journal, October 29, 2003) was in full force. Major player like Sony (musicBox), Dell (Juke Box), Samsung (Yepp) and creative Technology (Muvo Slim) were all bringing MP3 players to the market.

Attack of the iPod Clones

- Competitors were adding new features, shrinking the size, and reducing prices.
- Under these circumstances, Apple could not afford to sit back and admire its profits. Steve Jobs knew he would have to keep running to stay ahead of MP3-player pack.
- He kept improving the iPod. Within 2 years, Apple had three generations of iPods, each substantially better than the last. Memory capacity increased tenfold (to 10,000 songs), features were added, and the size shrank further. In less than 2.5 years the iPod's price fell by 40 percent even while quality improved dramatically.
- Analysis: Economic profits attract entrepreneurs. As competition intensifies, products improve and prices fell.

Some readings

- Chevron Focuses on Profit Margin: can it Maximize its profit anyway? (Source: Jessica Resnick-Ault, “Chevron Focuses on Refineries,” WSJ.com, May 13, 2009.

- Government Bailouts Threaten recovery of global semiconductor market. (Source: Bruce Einhorn, “Chipmakers on the Edge,” Business Week, January 5, 2009, pp. 30-31. and Evan Ramstad, “Memory chips signal sector getting set for recovery,” the WSJApril 27, 2009, p.B1.