MARKET STRUCTURE

Perfectly Competitive Market

- What is a perfectly competitive market?
- How does a competitive firm determine the quantity that maximizes profits?
- When might a competitive firm shut down in the short run? Exit the market in the long run?
- What does the market supply curve look like in the short run? In the long run?

Market Structure and Firm Behavior

- Firms have **market power** when they can influence the price of their product or the terms under which their product is sold
- The competitiveness of the market is the extent to which individual firms **lack** such market power
- A market is said to have a **competitive structure** when its **firms have little or no market power**

The Significance of Market Structure

- When a firm decides how much output to produce in order to maximize its profit, it needs to know the demand for its product and also the costs of production
- Market structure enters the picture because the details of market structure determine how we get from the industry demand curve to the demand curve facing any individual firm in that industry

The Theory of Perfect Competition

The Assumption of Perfect Competition

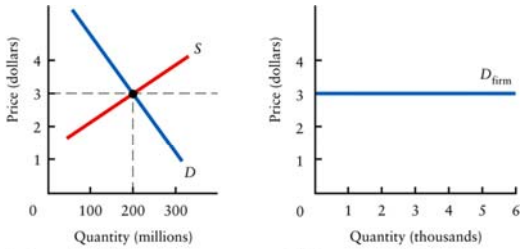
1. **Homogenous product**
   All the firms in the industry sell an identical product
2. **Firms Are Price Takers**
   This means that the individual firm treats the market price of the product as given

   The level of a firm's output at which its long-run average cost reaches a minimum is small relative to the industry's total output
3. **Firms and Consumers Have Perfect Information** Consumers know the nature of the product being sold and the prices charged by each firm
4. **Free Entry and Exit**

The Demand Curve for a Perfectly Competitive Firm

- Even though the demand curve for the entire industry may be negatively sloped, **each firm in a perfectly competitive market faces a horizontal demand curve** because variations in the firm's output have no effect on price
- The horizontal demand curve **does not indicate** that the firm could actually sell an infinite amount at the going price
- It **indicates** that the variations in production that it will normally be possible for the firm to make will leave price unchanged because their effect on total industry output will be negligible

The Demand Curve for a Competitive Industry and for One Firm in the Industry



The Revenue of a Competitive Firm

- Total revenue (*TR*) $TR = \boldsymbol{P} \times \boldsymbol{Q}$
- **Average revenue (*AR*)** $AR = \dfrac{TR}{Q} = \boldsymbol{P}$
- **Marginal revenue (*MR*)**: The change in *TR* from selling one more unit. $MR = \dfrac{\Delta TR}{\Delta Q}$

Using Marginal Analysis

Marginal revenue is the change in total revenue generated by an additional unit of output.

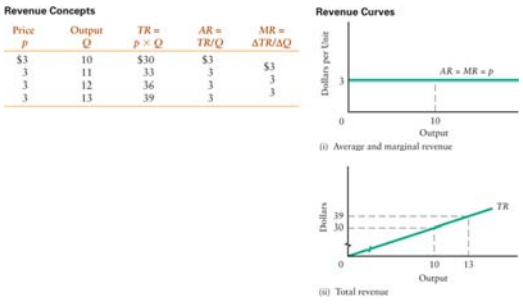
$$\text{Marginal revenue} = \frac{\text{Change in total revenue}}{\text{Change in output}} = \text{Change in total revenue generated by one additional unit of output}$$

MR = ΔTR/ΔQ

Example

If an increase in output of three units is accompanied by an increase in revenue of $1500, the marginal revenue is $1,500/3 or $ 500

Revenues for a Price-Taking Firm



Calculating *TR*, *AR*, *MR*

Q	*P*	*TR*	*AR*	*MR*
0	$10		n/a	
1	$10		$10	
2	$10			
3	$10			
4	$10	$40		$10
5	$10	$50		

Q	P	$TR = P \times Q$	$AR = \frac{TR}{Q}$	$MR = \frac{\Delta TR}{\Delta Q}$
0	$10	$0	n/a	
1	$10	$10	$10	$10
2	$10			$10
3	$10	$30	$10	$10
4	$10	$40	$10	$10
5	$10	$50	$10	

Notice that *MR* = ***P***

MR = *P* for a Competitive Firm

- A competitive firm can keep increasing its output without affecting the market price.
- So, each one-unit increase in ***Q*** causes revenue to rise by ***P***, i.e., *MR* = ***P***.

MR = ***P*** is only true for firms in competitive markets.

Profit Maximization

- What ***Q*** maximizes the firm's profit?
- To find the answer, "***think at the margin***."

  If increase ***Q*** by one unit, revenue rises by *MR*, cost rises by *MC*.

- If *MR* > *MC*, then increase ***Q*** to raise profit.
- If *MR* < *MC*, then reduce ***Q*** to raise profit.

The Optimal Output Rule

The **optimal output rule** says that profit is maximized by producing the quantity of output at which the marginal cost of the last unit produced is equal to its marginal revenue.

Short-Run Decisions

Rules for All Profit-Maximizing Firms

Two rules apply to all profit maximizing firms, whether or not they operate in perfectly competitive markets

1. Whether the firm should product at all
2. How much it should produce?

Should the firm produce at all?

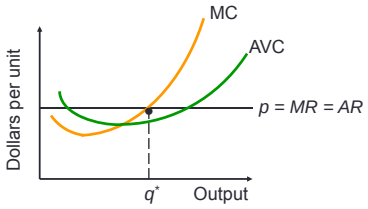
The firm always has the option of producing nothing

- If it produces nothing, it will have an operating loss that is equal to its fixed costs
- If is decides to produce, it will add the variable cost of production to its costs and the receipts from the sale of its product to its revenue

Therefore, because it must pay its fixed costs in any event, it will be worthwhile for the firm to produce as long as it can find some level of output for which revenue exceeds variable cost

If its revenue is less than its variable cost at every level of output, the firm will actually lose more by producing any level of output than by not producing at all

A firm should produce only if at some level of output, price exceeds ***AVC***.



Example Negative Profits and the Firm's Shut-Down Decision

				Price = $2		Price = $5	
Q	TVC	TFC	TC	TR	Profit	TR	Profit
0	0	200	200	0	−200	0	−200
10	50	200	250	20	−230	50	−200
20	80	200	280	40	−240	100	−180
30	100	200	300	60	−240	150	−150
40	110	200	310	80	−230	200	−110
50	130	200	330	100	−230	250	−80
60	160	200	360	120	−240	300	−60
70	200	200	400	140	−260	350	−50
80	260	200	460	160	−300	400	−60
90	320	200	520	180	−340	450	−70
100	380	200	580	200	−380	500	−80

At a low price of $2, there is no level of output at which the firm's revenues cover its variable costs.

The Shutdown Condition

- ***Shutdown condition:*** if price falls below the minimum of average variable cost, the firm should shut down in the short run.
- The ***short-run supply curve*** of the perfectly competitive firm is the rising portion of the short-run marginal cost curve that lies above the minimum value of the average variable cost curve

A Firm's Short-run Decision to Shut Down

- Cost of shutting down: revenue loss = *TR*
- Benefit of shutting down: cost savings = *VC* (firm must still pay *FC*)
- So, shut down if $TR < VC$
- Divide both sides by ***Q***: $TR/Q < VC/Q$
- So, firm's decision rule is:

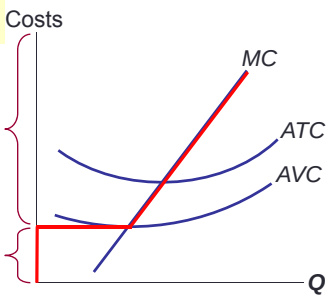
Shut down if $P < AVC$

A Competitive Firm's SR Supply Curve

The firm's SR supply curve is the portion of its *MC* curve above *AVC*.

If ***P*** > *AVC*, then firm produces ***Q*** where ***P*** = *MC*.

If ***P*** < *AVC*, then firm shuts down (produces ***Q*** = 0).



Production Decision

At the shut-down price the firm can just cover its average variable cost, and so is indifferent between producing and not producing.

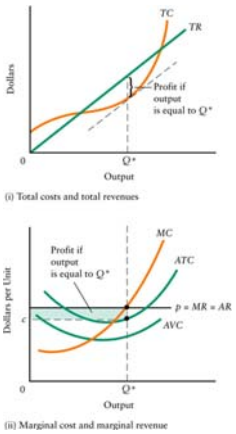
How Much Should the Firm Produce?

When p > AVC, the firm does not shut down.

To maximize profits, the firm chooses the output where *MR* = *MC*. But for a competitive firm, *MR* = *p*:

The rule: choose output where *p* = *MC*.

Profit Maximization for a Competitive Firm



Example Profit Maximization

At any ***Q*** with *MR* > *MC*, increasing ***Q*** raises profit.

At any ***Q*** with *MR* < *MC*, reducing ***Q*** raises profit.

Q	*TR*	*TC*	Profit	*MR*	*MC*	ΔProfit = *MR* – *MC*
0	$0	$5	–$5			
				$10	$4	$6
1	10	9	1			
				10	6	4
2	20	15	5			
				10	8	2
3	30	23	7			
				10	10	0
4	40	33	7			
				10	12	–2
5	50	45	5			

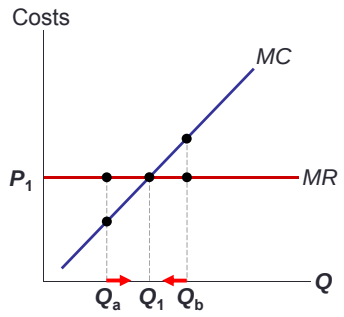
MC and the Firm's Supply Decision

Rule: *MR* = *MC* at the profit-maximizing ***Q***.

At Q_a, *MC* < *MR*. So, increase ***Q*** to raise profit.

At Q_b, *MC* > *MR*. So, reduce ***Q*** to raise profit.

At Q_1, *MC* = *MR*. Changing ***Q*** would lower profit.



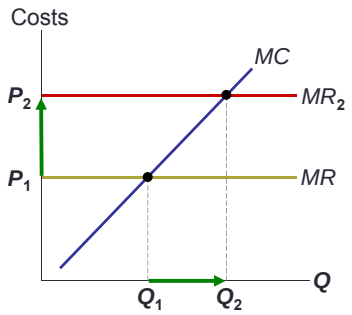
MC and the Firm's Supply Decision

If price rises to P_2, then the profit-maximizing quantity rises to Q_2.

The *MC* curve determines the firm's ***Q*** at any price.

Hence,

the *MC* curve is the firm's supply curve.



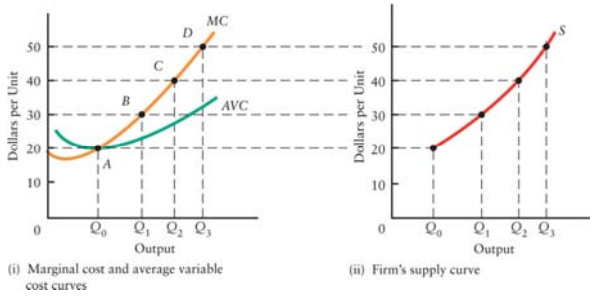
Short-Run Supply Curves

The Supply Curve for One Firm

- The firm's MC curve gives the MC corresponding to each level of output
- For prices below AVC, the firm will supply zero units
- For prices above AVC, the competitive firm will choose its level of output to equate price and MC

A competitive firm's supply curve is given by the portion of its MC curve that is above its AVC curve

The Derivation of the Supply Curve for a Competitive Firm



- **The Supply Curve for an Industry**
- In perfect competition, the industry supply curve is the horizontal sum of the MC curves (above the level of AVC) of all firms in the industry
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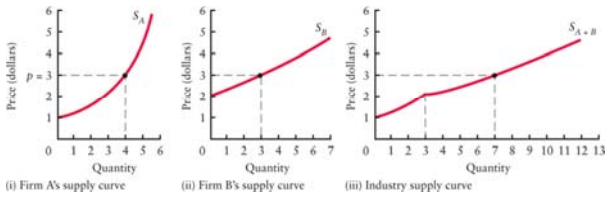
The Derivation of a Competitive Industry's Supply Curve



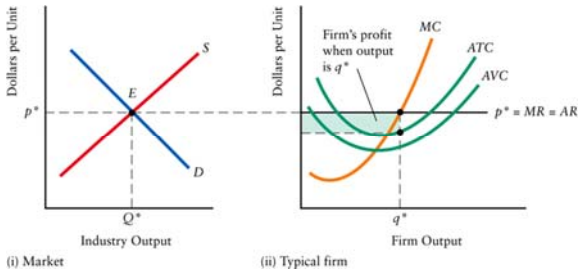
Short-Run Equilibrium in the Competitive Market

- When an industry is in short-run equilibrium, quantity demanded equals quantity supplied, and each firm is maximizing its profits given the market price
- Three possible positions for a firm when the industry is in short-run equilibrium
  - The firm is suffering losses
  - The firm is breaking even
  - The firm is making profits

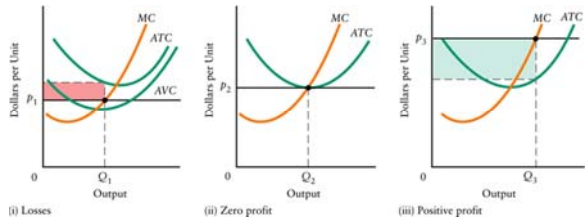
Profit, Break-even or Loss

- The **break-even price** of a price-taking firm is the market price at which it earns zero profits.
- Whenever market price exceeds minimum average total cost, the producer is profitable.
- Whenever the market price equals minimum average total cost, the producer breaks even.
- Whenever market price is less than minimum average total cost, the producer is unprofitable.

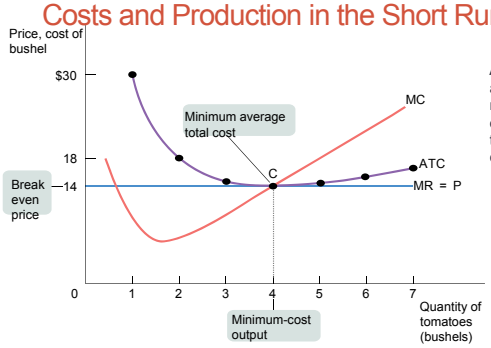
A Typical Firm When the Competitive Market Is in Short-Run Equilibrium



Alternative Short-Run Profits of a Competitive Firm



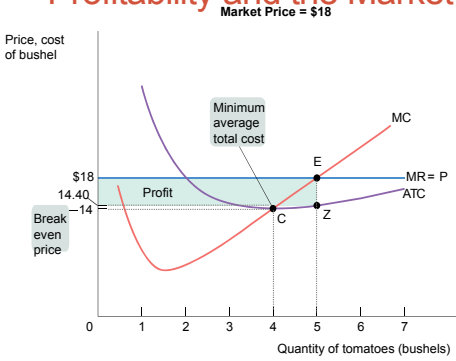
Costs and Production in the Short Run



At point *C* (the minimum average total cost), the market price is $14 and output is 4 bushels of tomatoes (the minimum-cost output).

This is where MC cuts the ATC curve at its minimum.
Minimum average total cost is equal to the firm's *break-even price*.

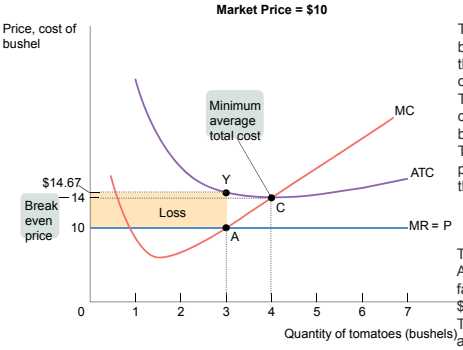
Profitability and the Market Price



The farm is profitable because price exceeds minimum average total cost, the break-even price, $14.
The farm's optimal output choice is (E) → output of 5 bushels.
The average total cost of producing bushels is (Z on the *ATC* curve) →$14.40

The vertical distance between E and Z:
farm's per unit profit, $18.00 − $14.40 = $3.60
Total profit:5 × $3.60 = $18.00

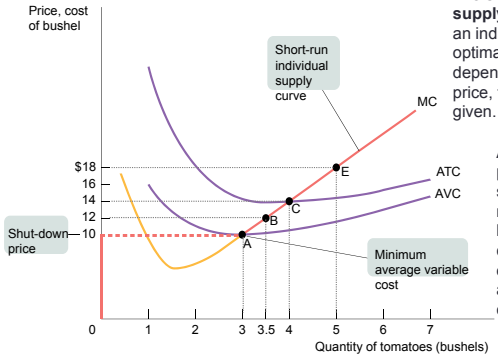
Profitability and the Market Price



The farm is unprofitable because the price falls below the minimum average total cost, $14.
The farm's optimal output choice is (A) → output of 3 bushels.
The average total cost of producing bushels is (Y on the *ATC* curve) →$14.67

The vertical distance between A and Y:
farm's per unit loss, $14.67 − $10.00 = $4.67
Total profit:3 × $4.67 = approx. $14.00

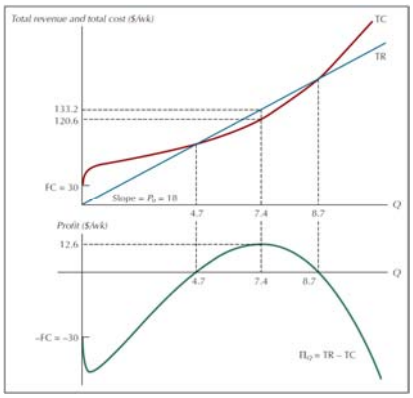
The Short-Run Individual Supply Curve



The **short-run individual supply curve** shows how an individual producer's optimal output quantity depends on the market price, taking fixed cost as given.

A firm will cease production in the short run if the market price falls below the **shut-down price**, which is equal to minimum average variable cost.

Revenue, Cost and Economic Profit



Summary of the Competitive Firm's Profitability and Production Conditions

Profitability Condition (minimum *ATC* = break-even price)	Result
P > minimum *ATC*	Firm profitable. Entry into industry in the long run.
P = minimum *ATC*	Firm breaks even. No entry into or exit from industry in the long run.
P < minimum *ATC*	Firm unprofitable. Exit from industry in the long run.
Production Condition (minimum *AVC* = shut-down price)	**Result**
P > minimum *AVC*	Firm produces in the short run. If *P* < minimum *ATC*, firm covers variable cost and some but not all of fixed cost. If *P* > minimum *ATC*, firm covers all variable cost and fixed cost.
P = minimum *AVC*	Firm indifferent between producing in the short run or not. Just covers variable cost.
P < minimum *AVC*	Firm shuts down in the short run. Does not cover variable cost.

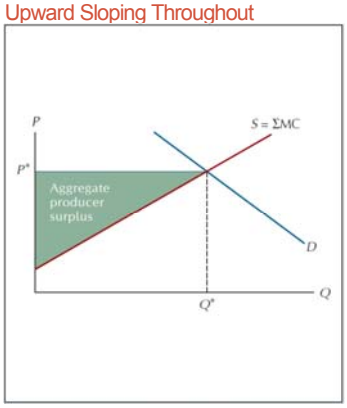
The Efficiency Of Short-run Competitive Equilibrium

- ***Allocative efficiency:*** a condition in which all possible gains from exchange are realized.

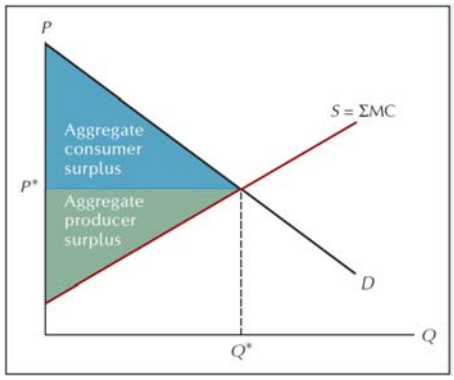
Producer Surplus

- A competitive market is efficient when it maximizes the net benefits to its participants.
- ***Producer surplus:*** the dollar amount by which a firm benefits by producing a profit-maximizing level of output.

Aggregate Producer Surplus When Individual Marginal Cost Curves are Upward Sloping Throughout



The Total Benefit from Exchange in a Market



Long-Run Decisions

Long-Run Decisions

Entry and Exit

If existing firms have positive economic profits, new firms have an incentive to enter the industry.

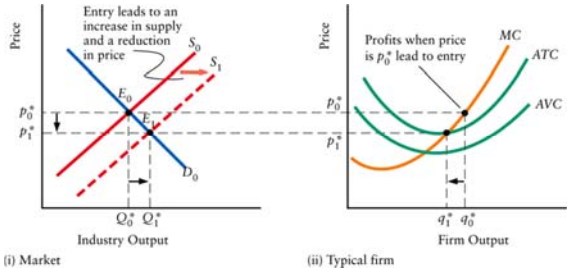
If existing firms have zero profits, there are no incentives for new firms to enter, and no incentives for existing firms to exit.

If existing firms have economic losses, there is an incentive for existing firms to exit the industry.

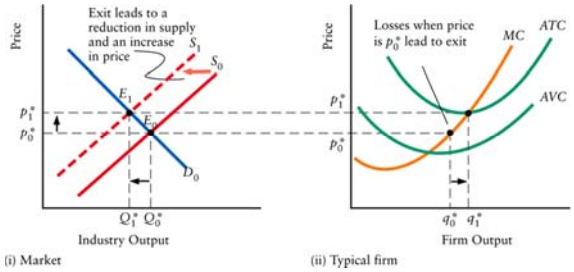
Adjustments In The Long Run

- Positive economic profit creates an incentive for outsiders to enter the industry.
- As additional firms enter the industry the industry supply curve to the right.
- This adjustment will continue until these two conditions are met:
  (1) Price reaches the minimum point on the LAC curve
  (2) All firms have moved to the capital stock size that gives rise to a short-run average total cost curve that is tangent to the LAC curve at its minimum point.

The Effect of New Entrants Attracted by Positive Profits



The Effect of Exit Caused by Losses



Sunk Costs and the Speed of Exit

The process of exit is not always quick and is sometimes painfully slow for the loss-making firms in the industry.

This depends on how quickly capital becomes obsolete or becomes too costly to operate.

The longer it takes for firms' capital to become obsolete or too costly to operate, the longer firms will remain in the industry while they are earning economic losses.

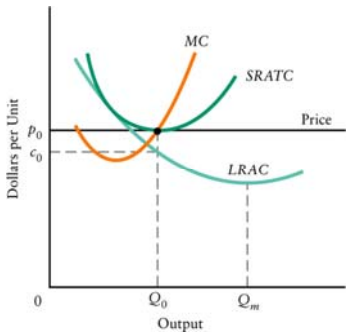
Long-Run Equilibrium

- The LR industry equilibrium occurs when there is no longer incentive for entry or exit (or expansion)
- The LR equilibrium of a competitive industry occurs when firms are earning zero profits

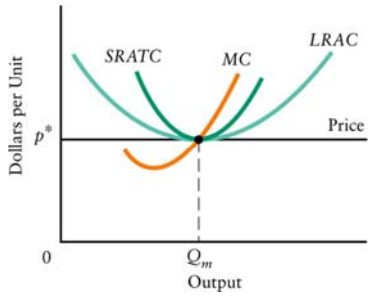
4 conditions for a competitive industry to be in long-run equilibrium

1. Existing firms must be maximizing their profits, given their existing capital
2. Existing firms must not be suffering losses
3. Existing firms must not be earning profits
4. Existing firms must not be able to increase their profits by changing the size of point of its LRAC curve

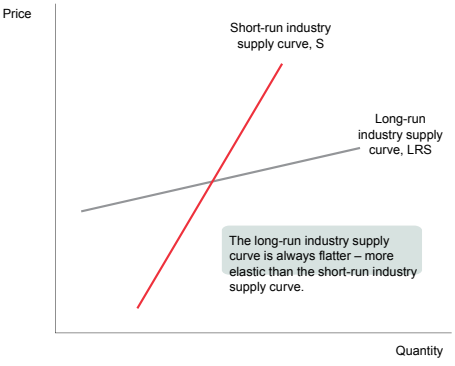
Short-Run versus Long-Run Profit Maximization for a Competitive Firm



A Typical Competitive Firm When the Industry Is in Long-Run Equilibrium



Comparing the Short-Run and Long-Run Industry Supply Curves



LRS may slope upward, but it is always flatter—***more elastic***—than the short-run industry supply curve.

This is because of ***entry and exit***:

- a higher price attracts new entrants in the long run, resulting in a rise in industry output and lower price;
- a fall in price induces existing producer to exit in the long run, generating a fall in industry output and a rise in price.

CONCLUSION:
The Efficiency of a Competitive Market

- Profit-maximization: $MC = MR$
- Perfect competition: $P = MR$
- So, in the competitive equilibrium $P = MC$

- *MC* is cost of producing the marginal unit.
  P is value to buyers of the marginal unit.

- The competitive equilibrium is efficient, maximizes total surplus

Sources:

- Krugman, P. and Robin Wells (2008)
- Frank, R.H. (2010)
- Mankiw, N.G. (2012)
- Lipsey, Ragan, and Storer (2008)