Unit III:
Costs of Production and Perfect Competition

Production= Converting inputs into output

Lets look at an example to show the relationship between inputs and outputs

Widget
Production Simulation

Inputs and Outputs

- **To earn profit, firms must make products (output)**
- **Inputs are the resources used to make outputs.**
- **Input resources are also called FACTORS.**

•Total Physical Product (TP)- total output or quantity produced

•Marginal Product (MP)- the additional output generated by additional inputs (workers).

$$\text{Marginal Product} = \frac{\text{Change in Total Product}}{\text{Change in Inputs}}$$

•Average Product (AP)- the output per unit of input

$$\text{Average Product} = \frac{\text{Total Product}}{\text{Units of Labor}}$$

Production Analysis

- **What happens to the Total Product as you hire more workers?**
- **What happens to marginal product as you hire more workers?**
- **Why does this happens?**

The Law of Diminishing Marginal Returns

As variable resources (workers) are added to fixed resources (machinery, tool, etc.), the additional output produced from each new worker will eventually fall.

Too many cooks in the kitchen!

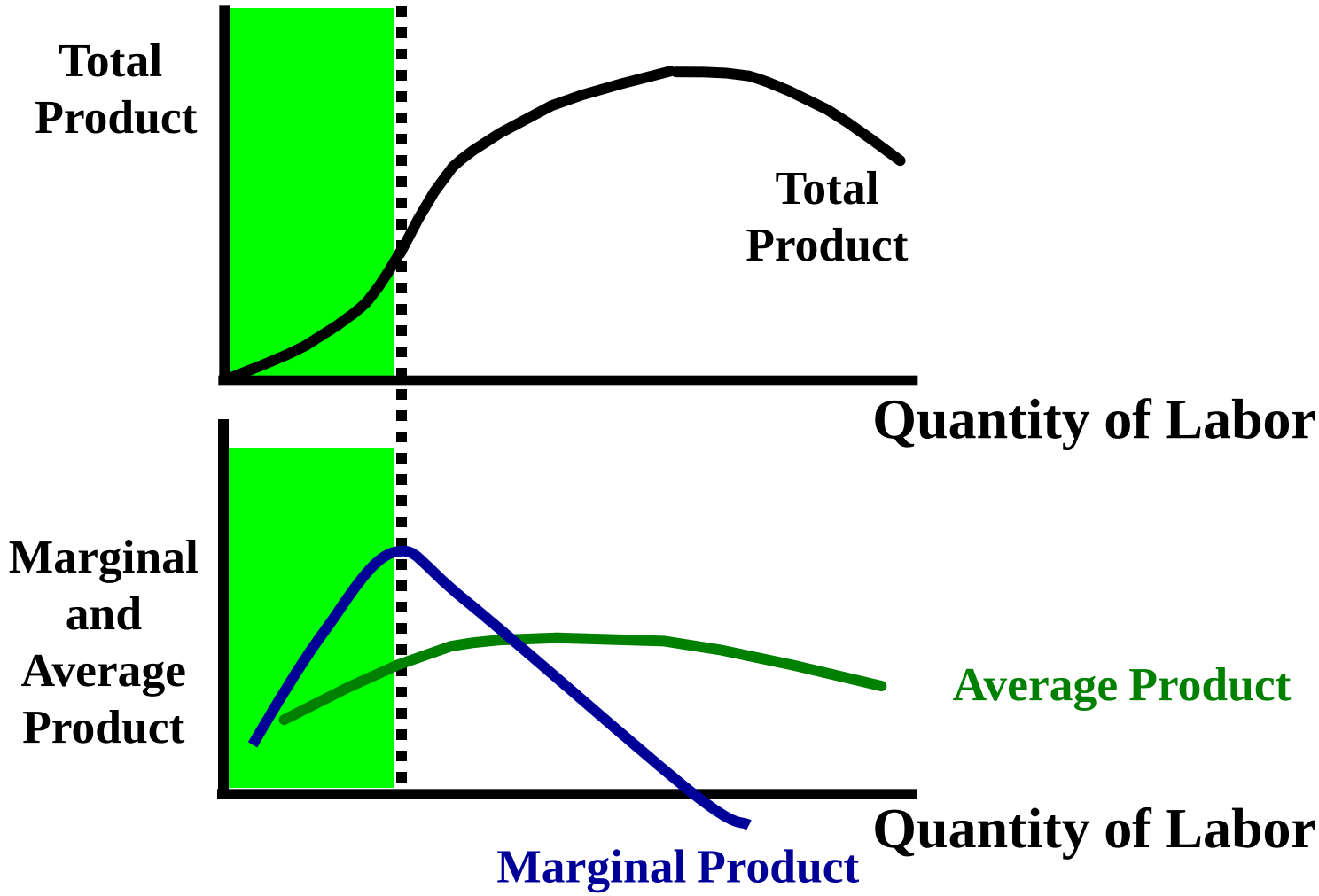
Graphing Production

Three Stages of Returns

Stage I: Increasing Marginal Returns

MP rising. TP increasing at an increasing rate.

Why? Specialization.

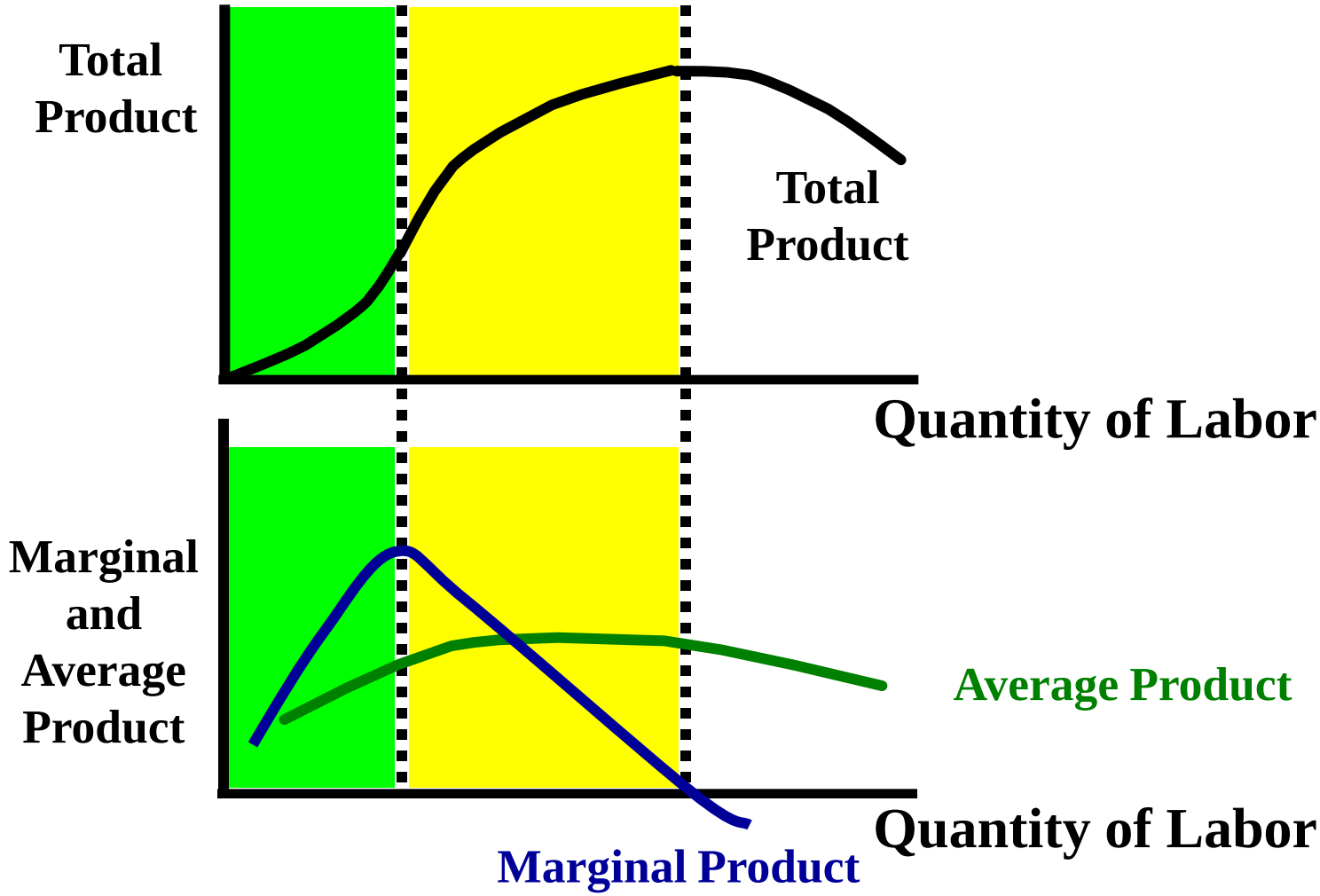


Three Stages of Returns

Stage II: Decreasing Marginal Returns

MP Falling. TP increasing at a decreasing rate.

Why? Fixed Resources. Each worker adds less and less.

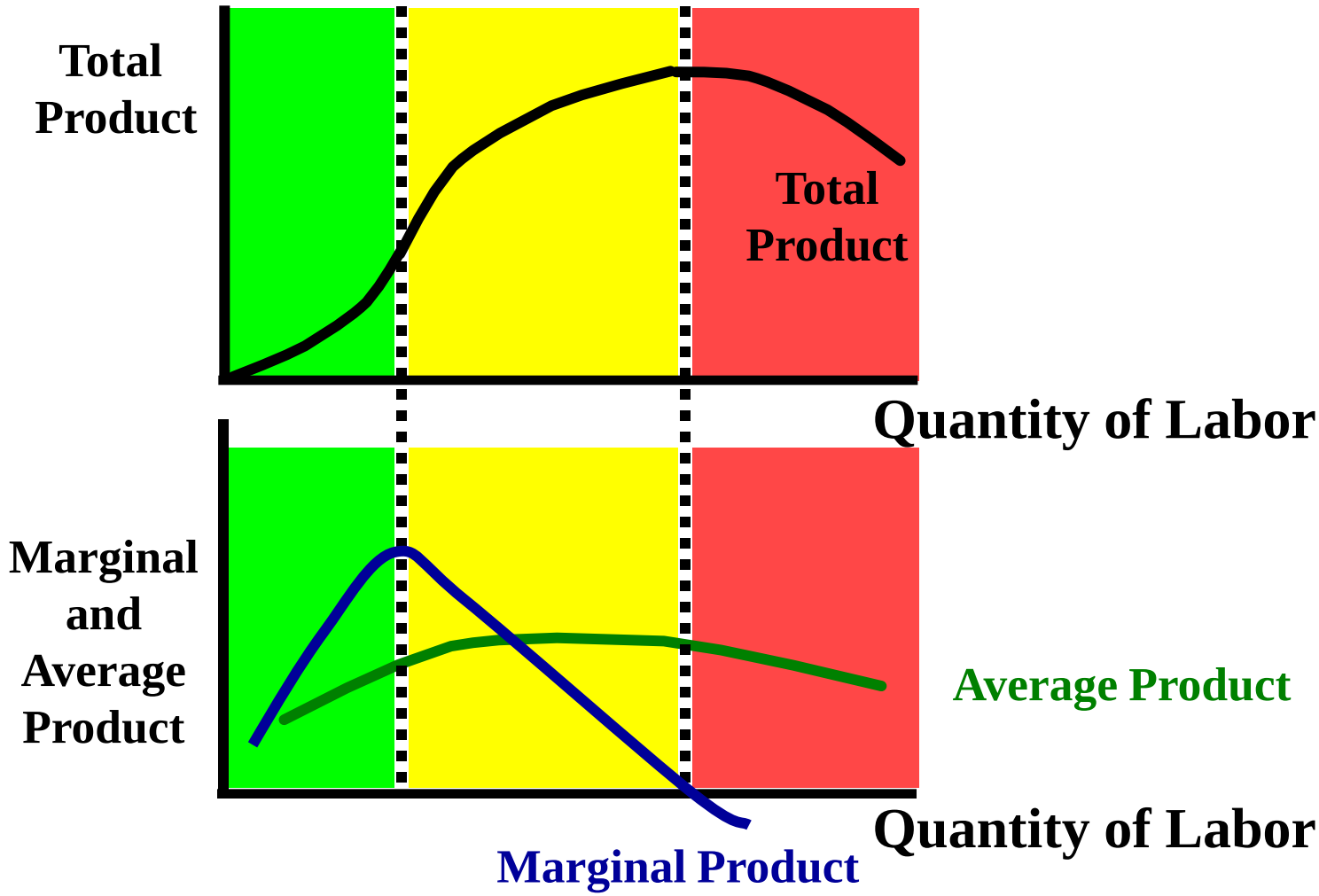


Three Stages of Returns

Stage III: Negative Marginal Returns

MP is negative. TP decreasing.

Workers get in each others way



With your partner calculate MP and AP then discuss what the graphs for TP, MP, and AP look like.

Remember quantity of workers goes on the x-axis.

# of Workers (Input)	Total Product(TP) PIZZAS	Marginal Product(MP)	Average Product(AP)
0	0		
1	10		
2	25		
3	45		
4	60		
5	70		
6	75		
7	75		
8	70		

With your partner calculate MP and AP then discuss what the graphs for TP, MP, and AP look like.

Remember quantity of workers goes on the x-axis.

# of Workers (Input)	Total Product(TP) PIZZAS	Marginal Product(MP)	Average Product(AP)
0	0	-	-
1	10	10	
2	25	15	
3	45	20	
4	60	15	
5	70	10	
6	75	5	
7	75	0	
8	70	-5	

With your partner calculate MP and AP then discuss what the graphs for TP, MP, and AP look like.

Remember quantity of workers goes on the x-axis.

# of Workers (Input)	Total Product(TP) PIZZAS	Marginal Product(MP)	Average Product(AP)
0	0	-	-
1	10	10	10
2	25	15	12.5
3	45	20	15
4	60	15	15
5	70	10	14
6	75	5	12.5
7	75	0	10.71
8	70	-5	8.75

Identify the three stages of returns

# of Workers (Input)	Total Product(TP) PIZZAS	Marginal Product(MP)	Average Product(AP)
0	0	-	-
1	10	10	10
2	25	15	12.5
3	45	20	15
4	60	15	15
5	70	10	14
6	75	5	12.5
7	75	0	10.71
8	70	-5	8.75

Identify the three stages of returns

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0	0	-	-
1	10	10	10
2	25	15	12.5
3	45	20	15
4	60	15	15
5	70	10	14
6	75	5	12.5
7	75	0	10.71
8	70	-5	8.75

More Examples of the Law of Diminishing Marginal Returns

Example #1: Learning curve when studying for an exam

Fixed Resources-Amount of class time, textbook, etc.

Variable Resources-Study time at home

Marginal return-

- **1st hour-large returns**
- **2nd hour-less returns**
- **3rd hour-small returns**
- **4th hour- negative returns (tired and confused)**

Example #2: A Farmer has fixed resource of 8 acres planted of corn. If he doesn't clear weeds he will get 30 bushels. If he clears weeds once he will get 50 bushels. Twice -57, Thrice-60. Additional returns diminishes each time.

Costs of Production

Accountants vs. Economists

Accountants look at only EXPLICIT COSTS

- **Explicit costs (out of pocket costs) are payments paid by firms for using the resources of others.**
- **Example: Rent, Wages, Materials, Electricity Bills**

Accounting Profit = Total Revenue − Accounting Costs (Explicit Only)

Economists examine both the EXPLICIT COSTS and the IMPLICIT COSTS

- **Implicit costs are the opportunity costs that firms "pay" for using their own resources**
- **Example: Forgone Wage, Forgone Rent, Time**

Economic Profit = Total Revenue − Economic Costs (Explicit + Implicit)

Accountants vs. Ec nomists

Ac ntants look at y EXPL COSTS

- •E costs (c ck ar ents paid t f ers.
- •Examp Bills

osts

ly)

Econo d th

- •Implicit c p y c at firms “pay” fo ng wn ces
- •Example: Forgo Vage, F one Rent, T me

From now on, all costs are automatically ECONOMIC COSTS

Economic Profit = otal R venue — Economic Costs (Explicit + Implicit)

Short-Run Production Costs

Definition of the "Short-Run"

- **We will look at both short-run and long-run production costs.**
- **Short-run is NOT a set specific amount of time.**
- **The short-run is a period in which at least one resource is fixed.**
  - **Plant capacity/size is NOT changeable**
- **In the long-run ALL resources are variable**
  - **NO fixed resources**
  - **Plant capacity/size is changeable**

Today we will examine Short-run costs.

Different Economic Costs

Total Costs

FC = Total Fixed Costs

VC = Total Variable Costs

TC = Total Costs

Per Unit Costs

AFC = Average Fixed Costs

AVC = Average Variable Costs

ATC = Average Total Costs

MC = Marginal Cost

Definitions

Fixed Costs:

Costs for fixed resources that DON'T change with the amount produced

Ex: Rent, Insurance, Managers Salaries, etc.

$$\text{Average Fixed Costs} = \frac{\text{Fixed Costs}}{\text{Quantity}}$$

Variable Costs:

Costs for variable resources that DO change as more or less is produced

Ex: Raw Materials, Labor, Electricity, etc.

$$\text{Average Variable Costs} = \frac{\text{Variable Costs}}{\text{Quantity}}$$

Definitions

Total Cost:

Sum of Fixed and Variable Costs

$$\text{Average Total Cost} = \frac{\text{Total Costs}}{\text{Quantity}}$$

Marginal Cost:

Additional costs of an additional output.

Ex: If the production of two more output increases total cost from $100 to $120, the MC is $10 .

$$\text{Marginal Cost} = \frac{\text{Change in Total Costs}}{\text{Change in Quantity}}$$

Calculating TC, VC, FC, ATC, AFC, and MC

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	100					
1	10						
2	16						
3	21						
4	26						
5	30						
6	36						
7	46						

Draw this in your notes

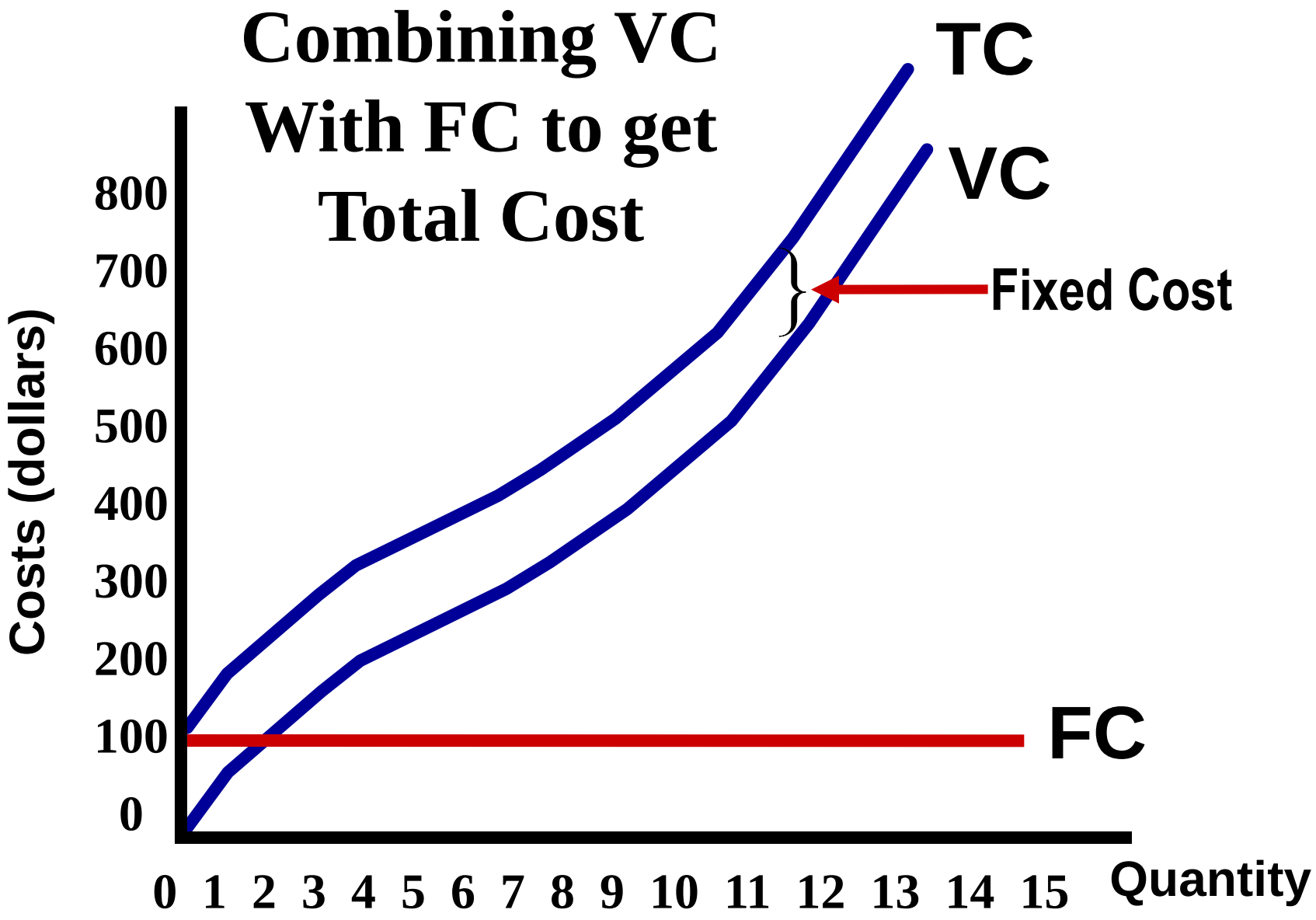
Calculating TC, VC, FC, ATC, AFC, and MC

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	100					
1	10	100					
2	16	100					
3	21	100					
4	26	100					
5	30	100					
6	36	100					
7	46	100					

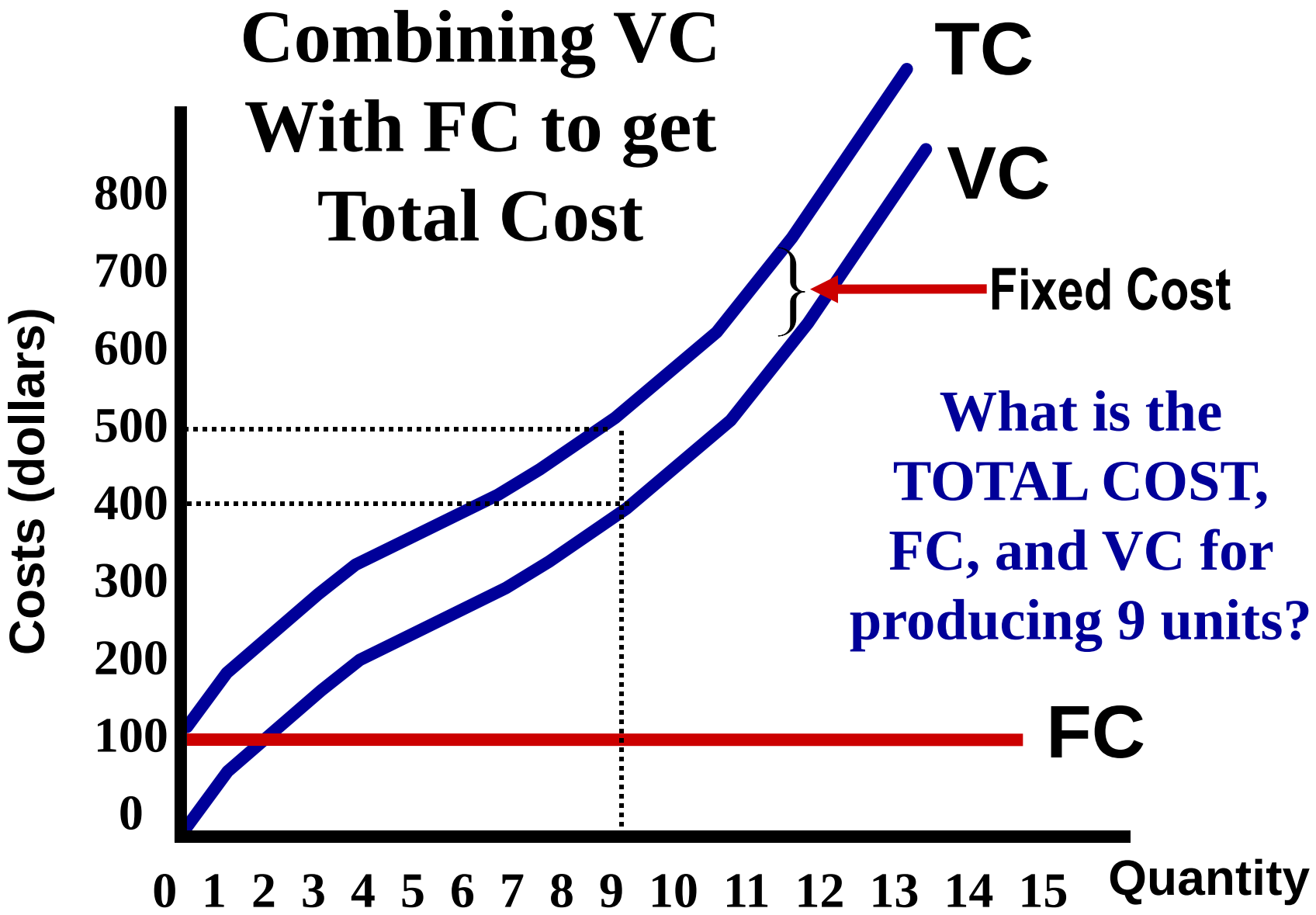
Calculating TC, VC, FC, ATC, AFC, and MC

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	100	100				
1	10	100	110				
2	16	100	116				
3	21	100	121				
4	26	100	126				
5	30	100	130				
6	36	100	136				
7	46	100	146				

TOTAL COSTS GRAPHICALLY



TOTAL COSTS GRAPHICALLY



Per Unit Costs

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	100	100	-			
1	10	100	110				
2	16	100	116				
3	21	100	121				
4	26	100	126				
5	30	100	130				
6	36	100	136				
7	46	100	146				

Per Unit Costs

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	100	100	-			
1	10	100	110	10			
2	16	100	116	6			
3	21	100	121	5			
4	26	100	126	5			
5	30	100	130	4			
6	36	100	136	6			
7	46	100	146	10			

Per Unit Costs

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	100	100	-	-		
1	10	100	110	10	10		
2	16	100	116	6	8		
3	21	100	121	5	7		
4	26	100	126	5	6.5		
5	30	100	130	4	6		
6	36	100	136	6	6		
7	46	100	146	10	6.6		

Per Unit Costs

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	100	100	-	-	-	
1	10	100	110	10	10	100	
2	16	100	116	6	8	50	
3	21	100	121	5	7	33.3	
4	26	100	126	5	6.5	25	
5	30	100	130	4	6	20	
6	36	100	136	6	6	16.67	
7	46	100	146	10	6.6	14.3	

Asymptote

Per Unit Costs

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	100	100	-	-	-	-
1	10	100	110	10	10	100	110
2	16	100	116	6	8	50	58
3	21	100	121	5	7	33.3	40.3
4	26	100	126	5	6.5	25	31.5
5	30	100	130	4	6	20	26
6	36	100	136	6	6	16.67	22.67
7	46	100	146	10	6.6	14.3	20.9

Per Unit Costs

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	100	100	-	-	-	-
1	10	100	110	10	10	100	110
2	16	100	116	6	8	50	58
3	21	100	121	5	7	33.3	40.3
4	26	100	126	5	6.5	25	31.5
5	30	100	130	4	6	20	26
6	36	100	136	6	6	16.67	22.67
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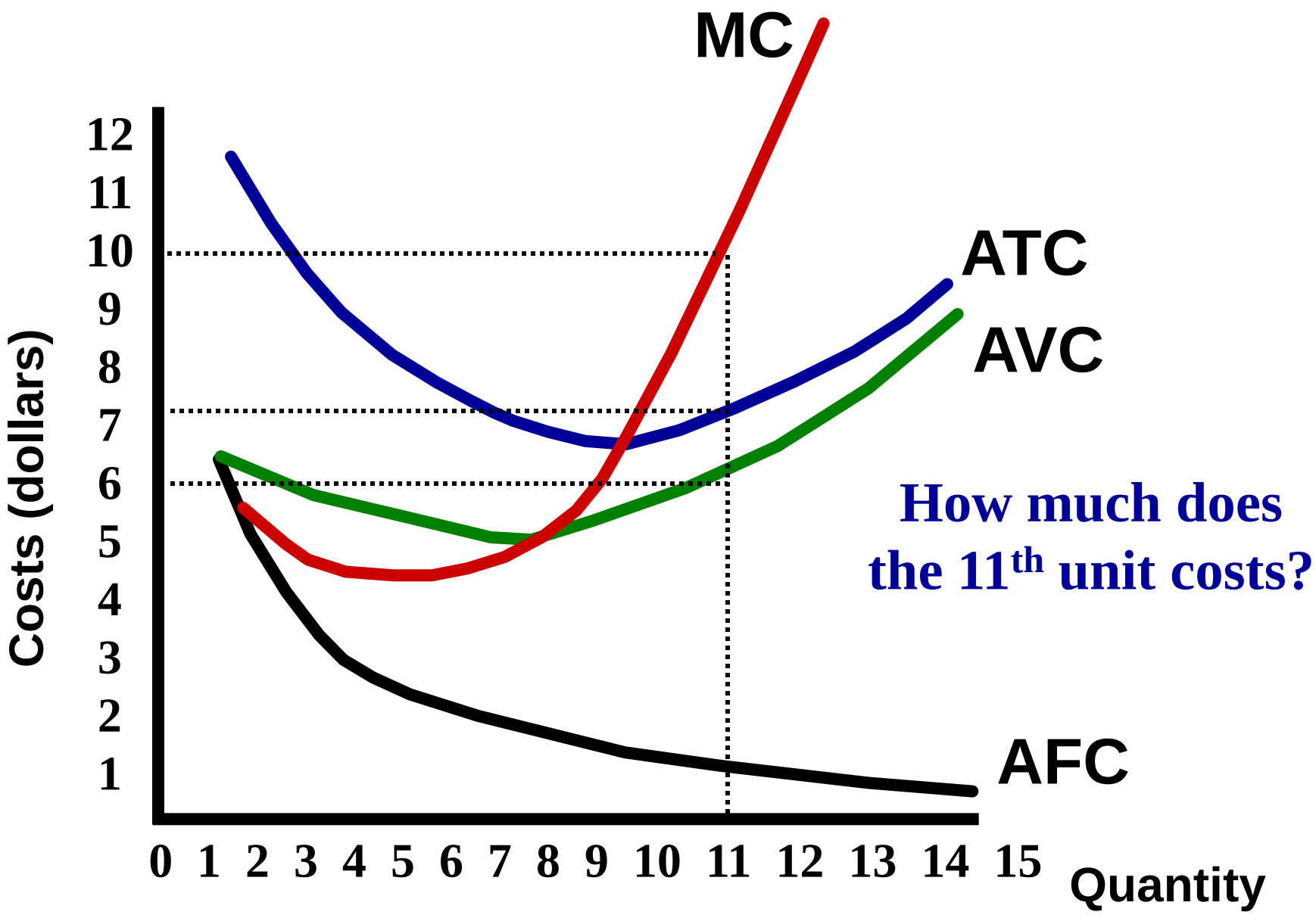
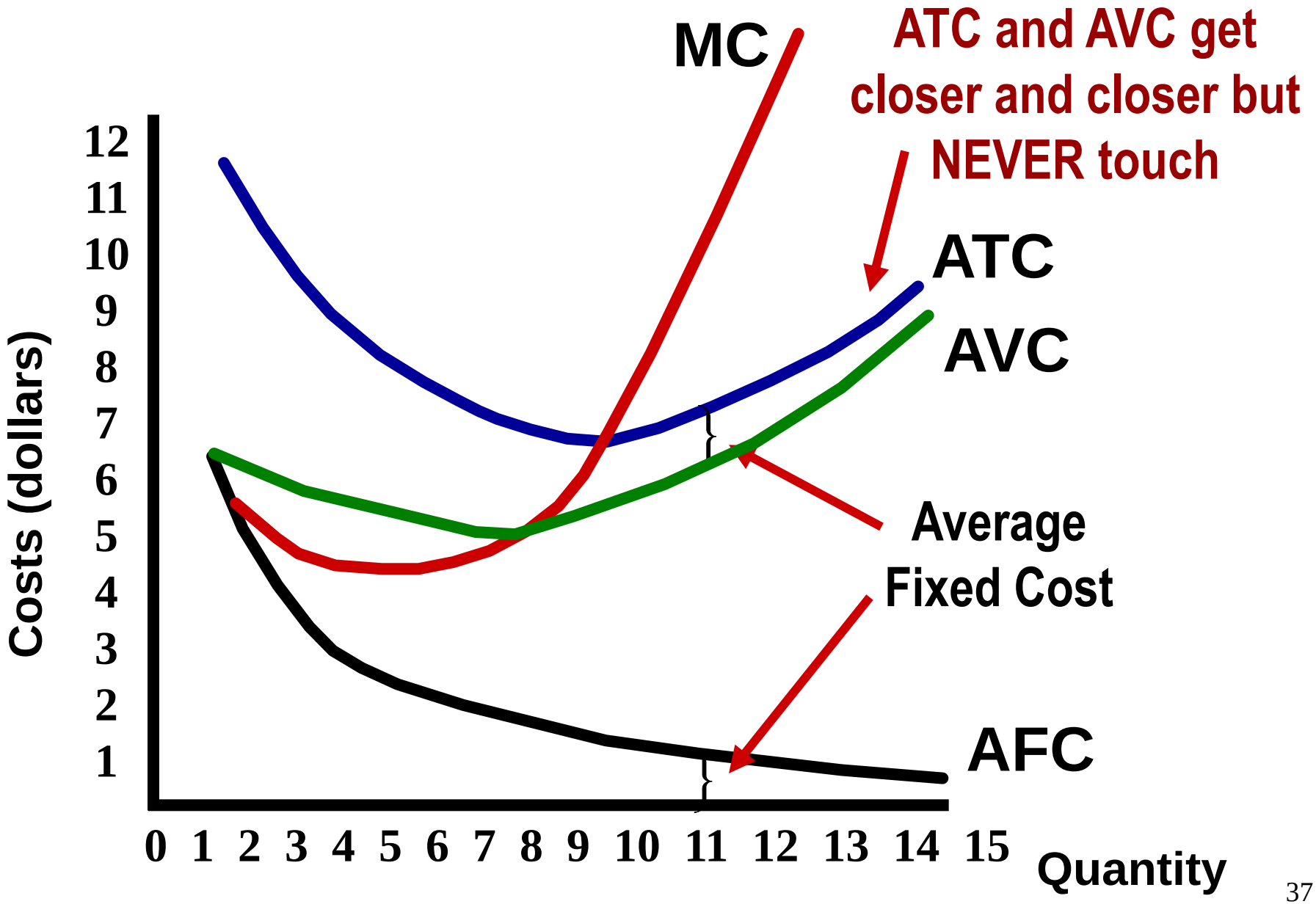
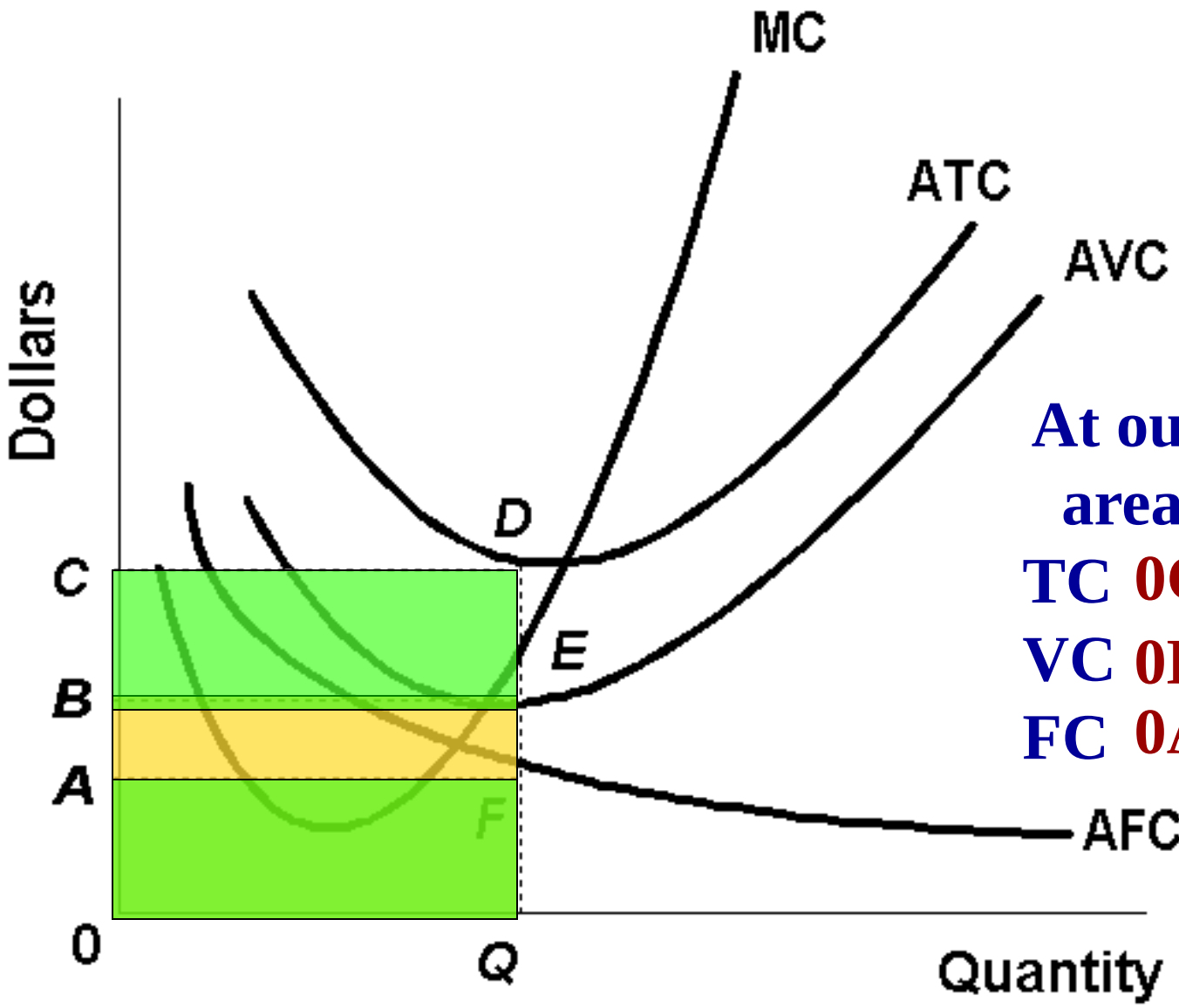
Per-Unit Costs (Average and Marginal)



Per-Unit Costs (Average and Marginal)



Per-Unit Costs (Average and Marginal)



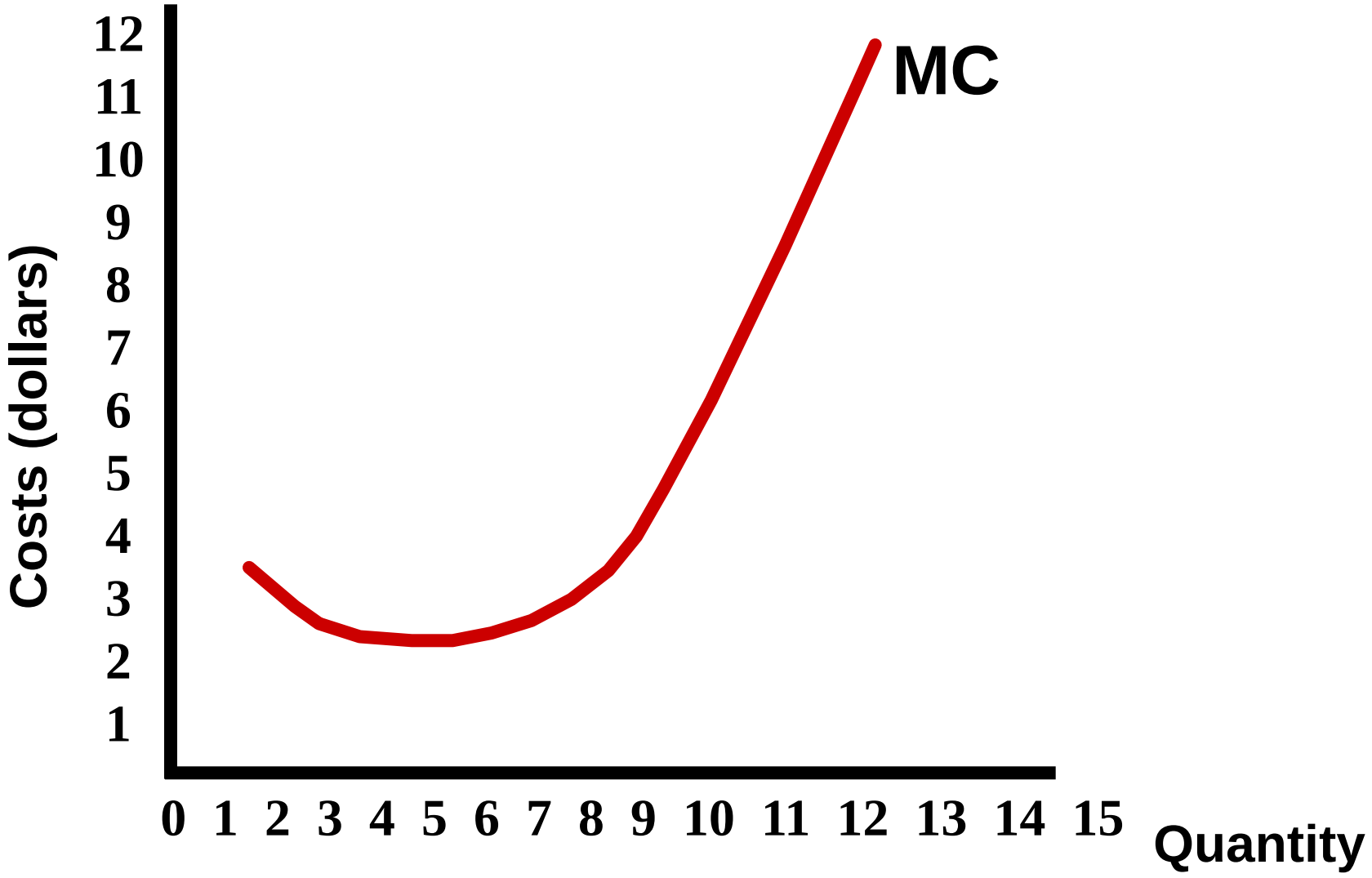
At output Q, what area represents:

TC 0CDQ

VC 0BEQ

FC 0AFQ or BCDE

Why is the MC curve U-shaped?



Why is the MC curve U-shaped?

- **The MC curve falls and then rises because of diminishing marginal returns.**
- **Example:**
  - **Assume the fixed cost is $20 and the ONLY variable cost is the cost for each worker ($10)**

Workers	Total Prod	Marg Prod	Total Cost	Marginal Cost
0	0			
1	5			
2	13			
3	19			
4	23			
5	25			
6	26			

Why is the MC curve U-shaped?

- **The MC curve falls and then rises because of diminishing marginal returns.**
- **Example:**
  - **Assume the fixed cost is $20 and the ONLY variable cost is the cost for each worker ($10)**

Workers	Total Prod	Marg Prod	Total Cost	Marginal Cost
0	0	-		
1	5	5		
2	13	8		
3	19	6		
4	23	4		
5	25	2		
6	26	1		

Why is the MC curve U-shaped?

- **The MC curve falls and then rises because of diminishing marginal returns.**
- **Example:**
  - **Assume the fixed cost is $20 and the ONLY variable cost is the cost for each worker (Wage = $10)**

Workers	Total Prod	Marg Prod	Total Cost	Marginal Cost
0	0	-	$20	
1	5	5	$30	
2	13	8	$40	
3	19	6	$50	
4	23	4	$60	
5	25	2	$70	
6	26	1	$80	

Why is the MC curve U-shaped?

- **The MC curve falls and then rises because of diminishing marginal returns.**
- **Example:**
  - **Assume the fixed cost is $20 and the ONLY variable cost is the cost for each worker ($10)**

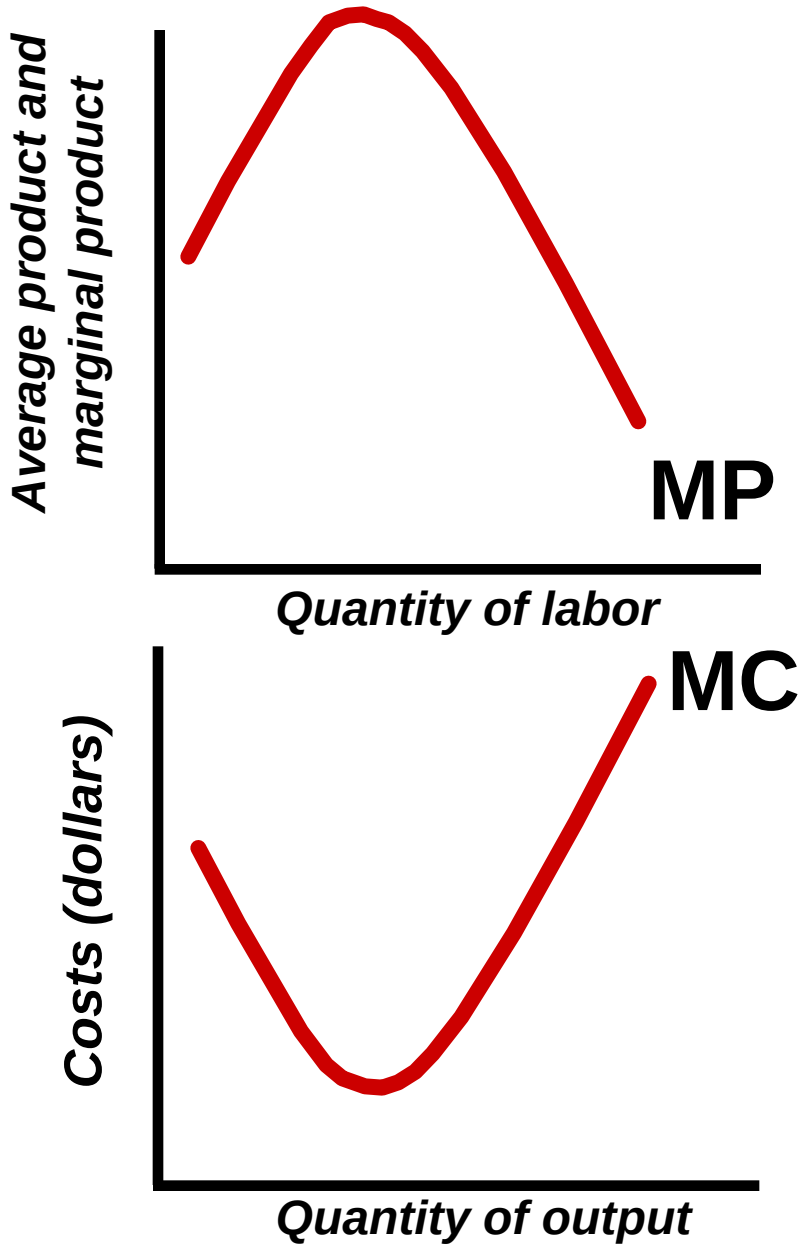
Workers	Total Prod	Marg Prod	Total Cost	Marginal Cost
0	0	-	$20	-
1	5	5	$30	10/5 = $2
2	13	8	$40	10/8 = $1.25
3	19	6	$50	10/6 = $1.6
4	23	4	$60	10/4 = $2.5
5	25	2	$70	10/2 = $5
6	26	1	$80	10/1 = $10

Why is the MC curve U-shaped?

- **The additional cost of the first 13 units produced falls because workers have increasing marginal returns.**
- **As production continues, each worker adds less and less to production so the marginal cost for each unit increases.**

Workers	Total Prod	Marg Prod	Total Cost	Marginal Cost
0	0	-	$20	-
1	5	5	$30	10/5 = $2
2	13	8	$40	10/8 = $1.25
3	19	6	$50	10/6 = $1.6
4	23	4	$60	10/4 = $2.5
5	25	2	$70	10/2 = $5
6	26	1	$80	10/1 = $10

Relationship between Production and Cost

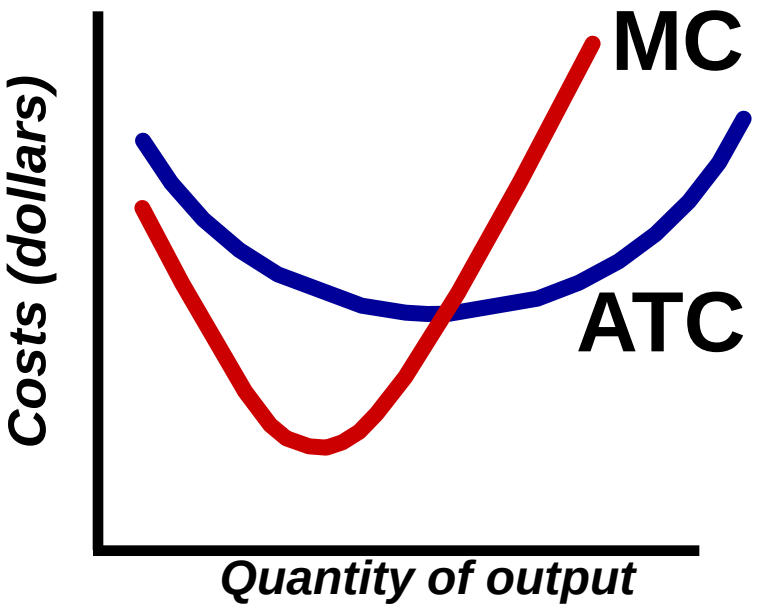


Why is the MC curve U-shaped?

- When marginal product is increasing, marginal cost falls.
- When marginal product falls, marginal costs increase.

MP and MC are mirror images of each other.

Relationship between Production and Cost



Why is the ATC curve U-shaped?

- When the marginal cost is below the average, it pulls the average down.
- When the marginal cost is above the average, it pulls the average up.

The MC curve intersects the ATC curve at its lowest point.

Example:

- The average income in the room is $50,000.
- An additional (marginal) person enters the room: Bill Gates.
- If the marginal is greater than the average it pulls it up.
- Notice that MC can increase but still pull down the average.

Shifting Cost Curves

Shifting Costs Curves

TP	C	FC	VC	AVC	ATC
0				-	-
1					
					58
3					30.3
4					
5	30				26
6	36	100	6		22.67
7	46	100	46	6.6	14.3 20.9

What if Fixed Costs increase to $200

Shifting Costs Curves

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	100	100	-	-	-	-
1	10	100	110	10	10	100	110
2	16	100	116	6	8	50	58
3	21	100	121	5	7	33.3	30.3
4	26	100	126	5	6.5	25	31.5
5	30	100	130	4	6	20	26
6	36	100	136	6	6	16.67	22.67
7	46	100	146	10	6.6	14.3	20.9

Shifting Costs Curves

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	200	100	-	-	-	-
1	10	200	110	10	10	100	110
2	16	200	116	6	8	50	58
3	21	200	121	5	7	33.3	30.3
4	26	200	126	5	6.5	25	31.5
5	30	200	130	4	6	20	26
6	36	200	136	6	6	16.67	22.67
7	46	200	146	10	6.6	14.3	20.9

Shifting Costs Curves

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	200	200	-	-	-	-
1	10	200	210	10	10	100	110
2	16	200	216	6	8	50	58
3	21	200	221	5	7	33.3	30.3
4	26	200	226	5	6.5	25	31.5
5	30	200	230	4	6	20	26
6	36	200	236	6	6	16.67	22.67
7	46	200	246	10	6.6	14.3	20.9

Which Per Unit Cost Curves Change?

Shifting Costs Curves

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	200	200	-	-	-	-
1	10	200	210	10	10	100	110
2	16	200	216	6	8	50	58
3	21	200	221	5	7	33.3	30.3
4	26	200	226	5	6.5	25	31.5
5	30	200	230	4	6	20	26
6	36	200	236	6	6	16.67	22.67
7	46	200	246	10	6.6	14.3	20.9

ONLY AFC and ATC Increase!

Shifting Costs Curves

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	200	200	-	-	-	-
1	10	200	210	10	10	200	110
2	16	200	216	6	8	100	58
3	21	200	221	5	7	66.6	30.3
4	26	200	226	5	6.5	50	31.5
5	30	200	230	4	6	40	26
6	36	200	236	6	6	33.3	22.67
7	46	200	246	10	6.6	28.6	20.9

ONLY AFC and ATC Increase!

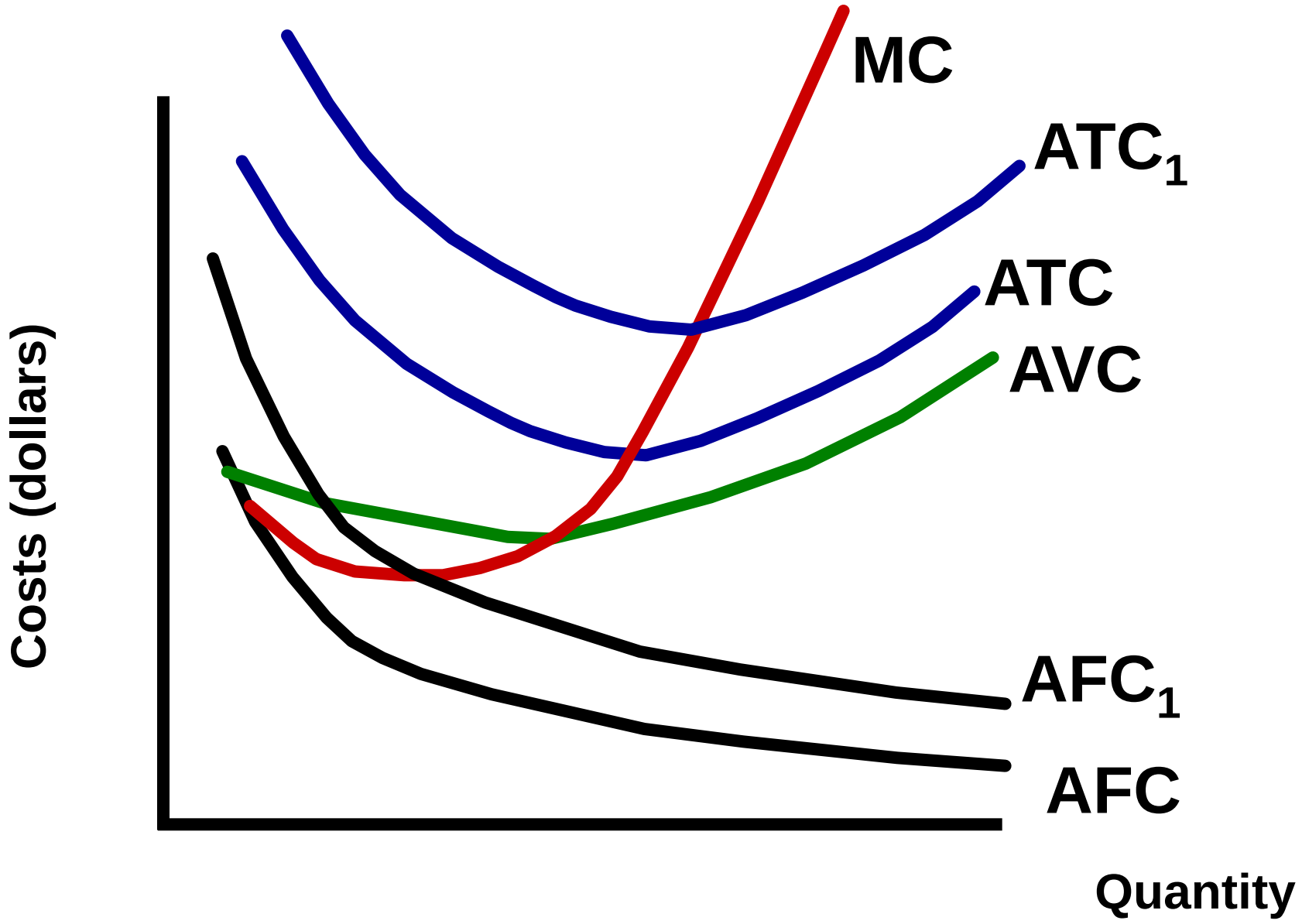
Shifting Costs Curves

If fixed costs change ONLY AFC and ATC Change!

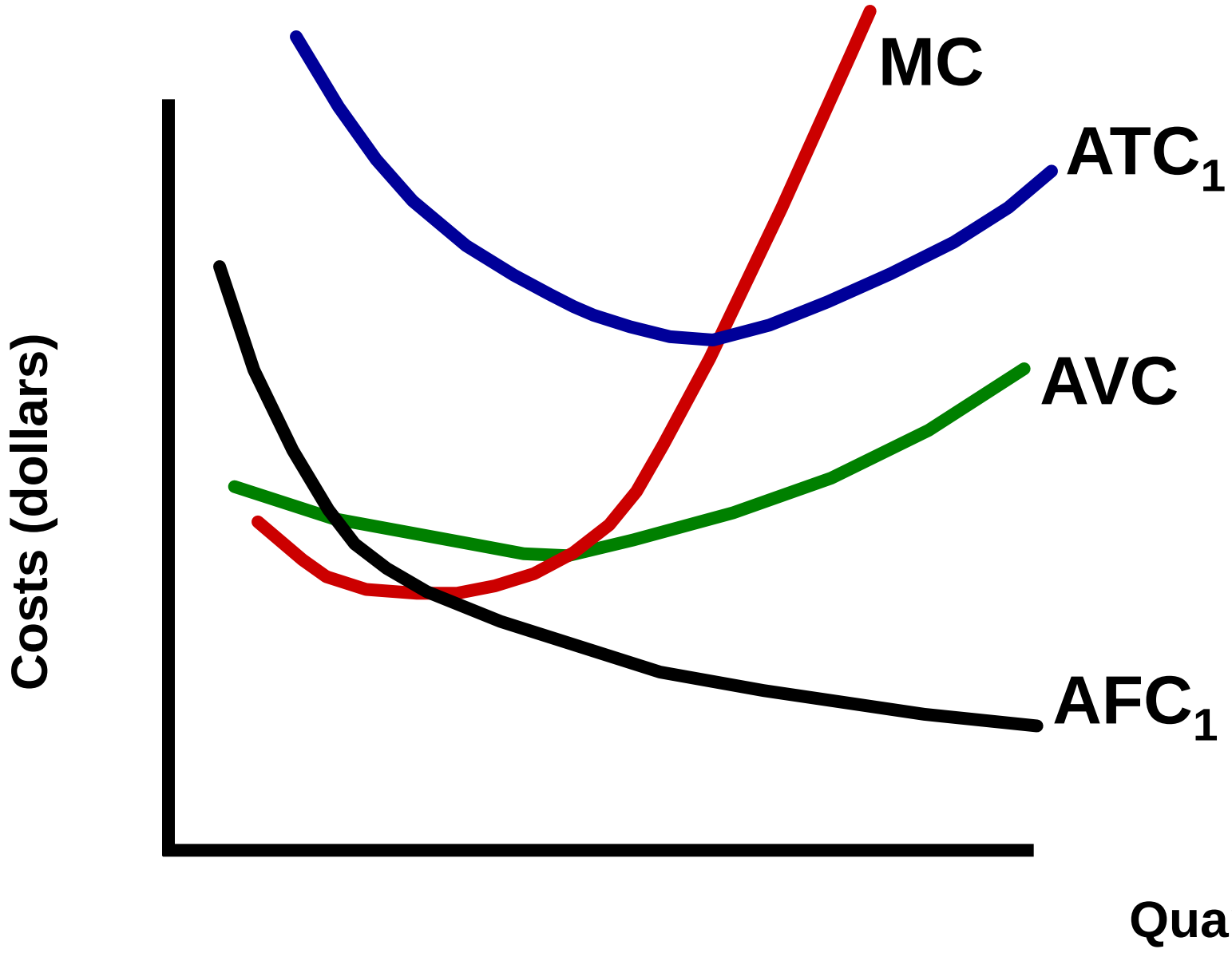
TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	200	200	-	-	-	-
1	10	200	210	10	10	200	210
2	16	200	216	6	8	100	108
3	21	200	221	5	7	66.6	73.6
4	26	200	226	5	6.5	50	56.5
5	30	200	230	4	6	40	46
6	36	200	236	6	6	33.3	39.3
7	46	200	246	10	6.6	28.6	35.2

MC and AVC DON'T change!

Shift from an increase in a Fixed Cost



Shift from an increase in a Fixed Cost



Shifting Costs Curves

TP	C	FC	VC	AVC	ATC
0				-	-
1					
					58
3					30.3
4					
5	30				26
6	36	100		6	22.67
7	46	100	46	10	6.6	14.3	20.9

What if the cost for variable resources increase

Shifting Costs Curves

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	100	100	-	-	-	-
1	10	100	110	10	10	100	110
2	16	100	116	6	8	50	58
3	21	100	121	5	7	33.3	30.3
4	26	100	126	5	6.5	25	31.5
5	30	100	130	4	6	20	26
6	36	100	136	6	6	16.67	22.67
7	46	100	146	10	6.6	14.3	20.9

Shifting Costs Curves

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	100	100	-	-	-	-
1	11	100	110	10	10	100	110
2	18	100	116	6	8	50	58
3	24	100	121	5	7	33.3	30.3
4	30	100	126	5	6.5	25	31.5
5	35	100	130	4	6	20	26
6	43	100	136	6	6	16.67	22.67
7	55	100	146	10	6.6	14.3	20.9

Shifting Costs Curves

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	100	100	-	-	-	-
1	11	100	111	10	10	100	110
2	18	100	118	6	8	50	58
3	24	100	124	5	7	33.3	30.3
4	30	100	130	3	6.5	25	31.5
5	35	100	135	4	6	20	26
6	43	100	143	6	6	16.67	22.67
7	55	100	155	10	6.6	14.3	20.9

Which Per Unit Cost Curves Change?

Shifting Costs Curves

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	100	100	-	-	-	-
1	11	100	111	11	10	100	110
2	18	100	118	7	8	50	58
3	24	100	124	6	7	33.3	30.3
4	30	100	130	6	6.5	25	31.5
5	35	100	135	5	6	20	26
6	43	100	143	8	6	16.67	22.67
7	55	100	155	12	6.6	14.3	20.9

MC, AVC, and ATC Change!

Shifting Costs Curves

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	100	100	-	-	-	-
1	11	100	111	11	11	100	110
2	18	100	118	7	9	50	58
3	24	100	124	6	8	33.3	30.3
4	30	100	130	6	7.5	25	31.5
5	35	100	135	5	7	20	26
6	43	100	143	8	7.16	16.67	22.67
7	55	100	155	12	7.8	14.3	20.9

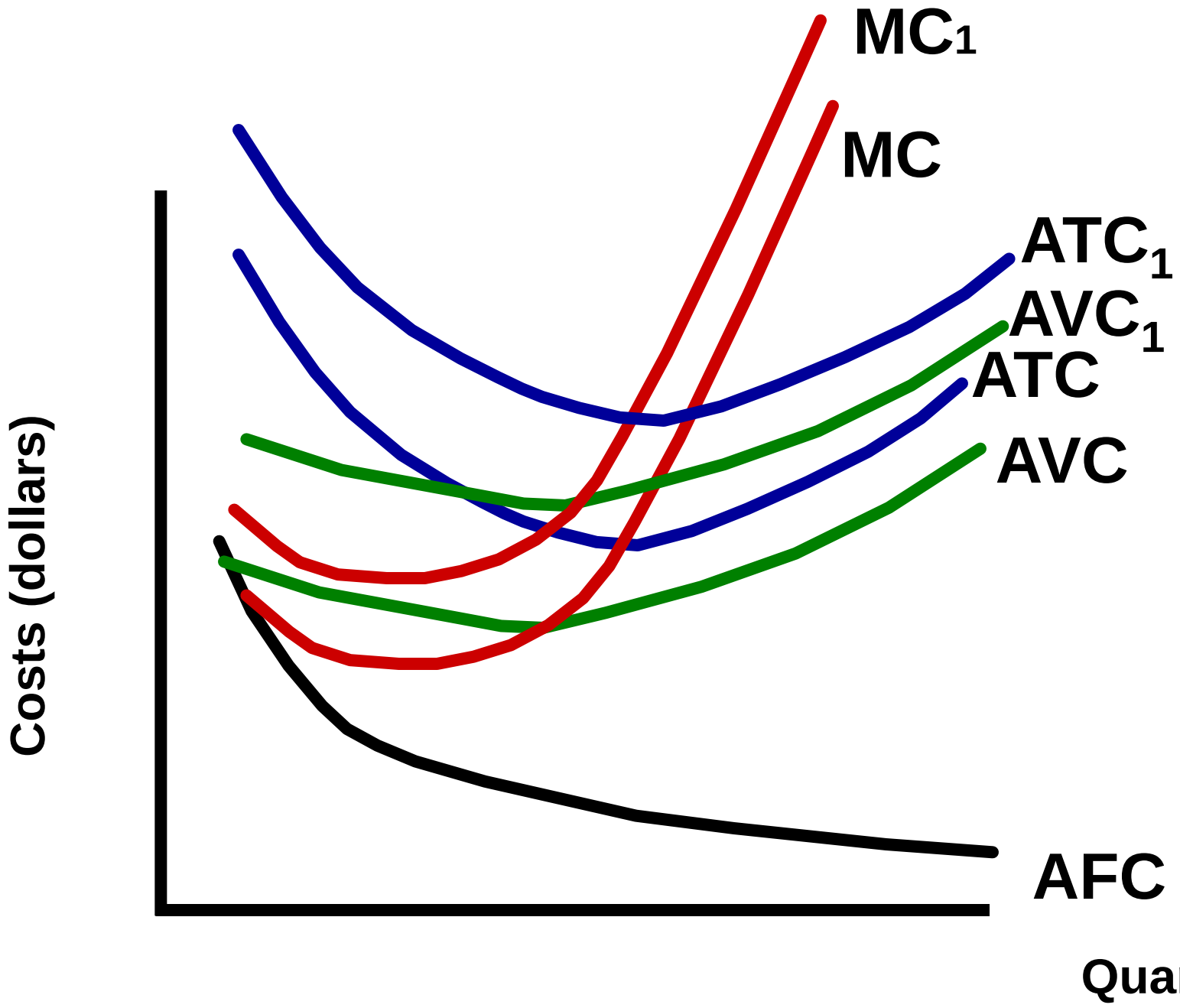
MC, AVC, and ATC Change!

Shifting Costs Curves

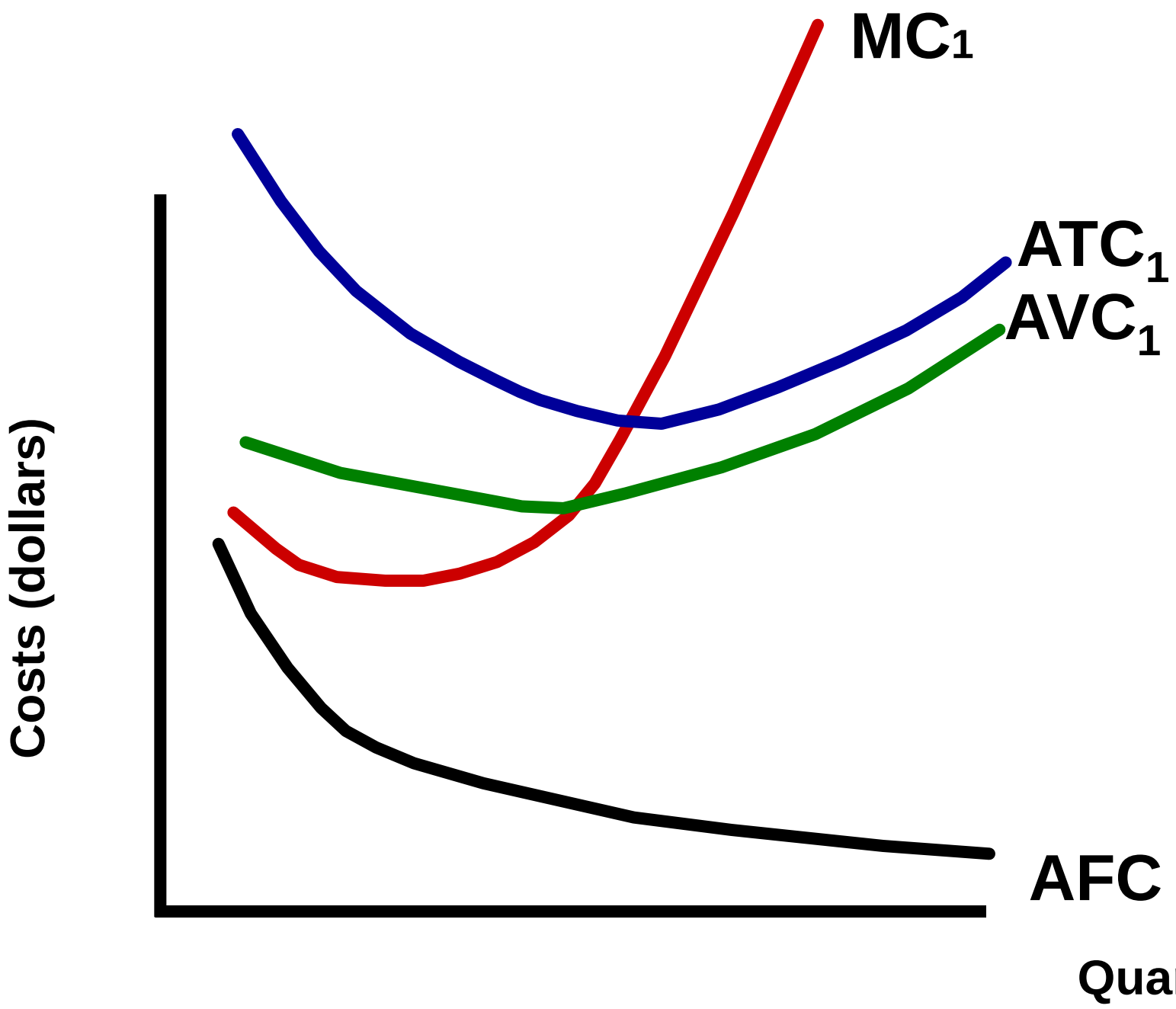
If variable costs change MC, AVC, and ATC Change!

TP	VC	FC	TC	MC	AVC	AFC	ATC
0	0	100	100	-	-	-	-
1	11	100	111	11	11	100	111
2	18	100	118	7	9	50	59
3	24	100	124	6	8	33.3	41.3
4	30	100	130	6	7.5	25	32.5
5	35	100	135	5	7	20	27
6	43	100	143	8	7.16	16.67	23.83
7	55	100	155	12	7.8	14.3	22.1

Shift from an increase in a Variable Costs



Shift from an increase in a Variable Costs



Long-Run Costs

Definition and Purpose of the Long Run

In the long run all resources are variable. Plant capacity/size can change.

Why is this important?

The Long-Run is used for planning. Firms use to identify which plant size results in the lowest per unit cost.

Ex: Assume a firm is producing 100 bikes with a fixed number of resources (workers, machines, etc.).

If this firm decides to DOUBLE the number of resources, what will happen to the number of bikes it can produce?

There are only three possible outcomes:

1. **Number of bikes will double (constant returns to scale)**
2. **Number of bikes will more than double (economies of scale)**
3. **Number of bikes will less than double (diseconomies of scale)**

Long Run ATC

What happens to the average total costs of a product when a firm increases its plant capacity?

Example of various plant sizes:

- **I make looms out of my garage with one saw**
- **I rent out building, buy 5 saws, hire 3 workers**
- **I rent a factor, buy 20 saws and hire 40 workers**
- **I build my own plant and use robots to build looms.**
- **I create plants in every major city in the U.S.**

Long Run ATC curve is made up of all the different short run ATC curves of various plant sizes.

ECONOMIES OF SCALE

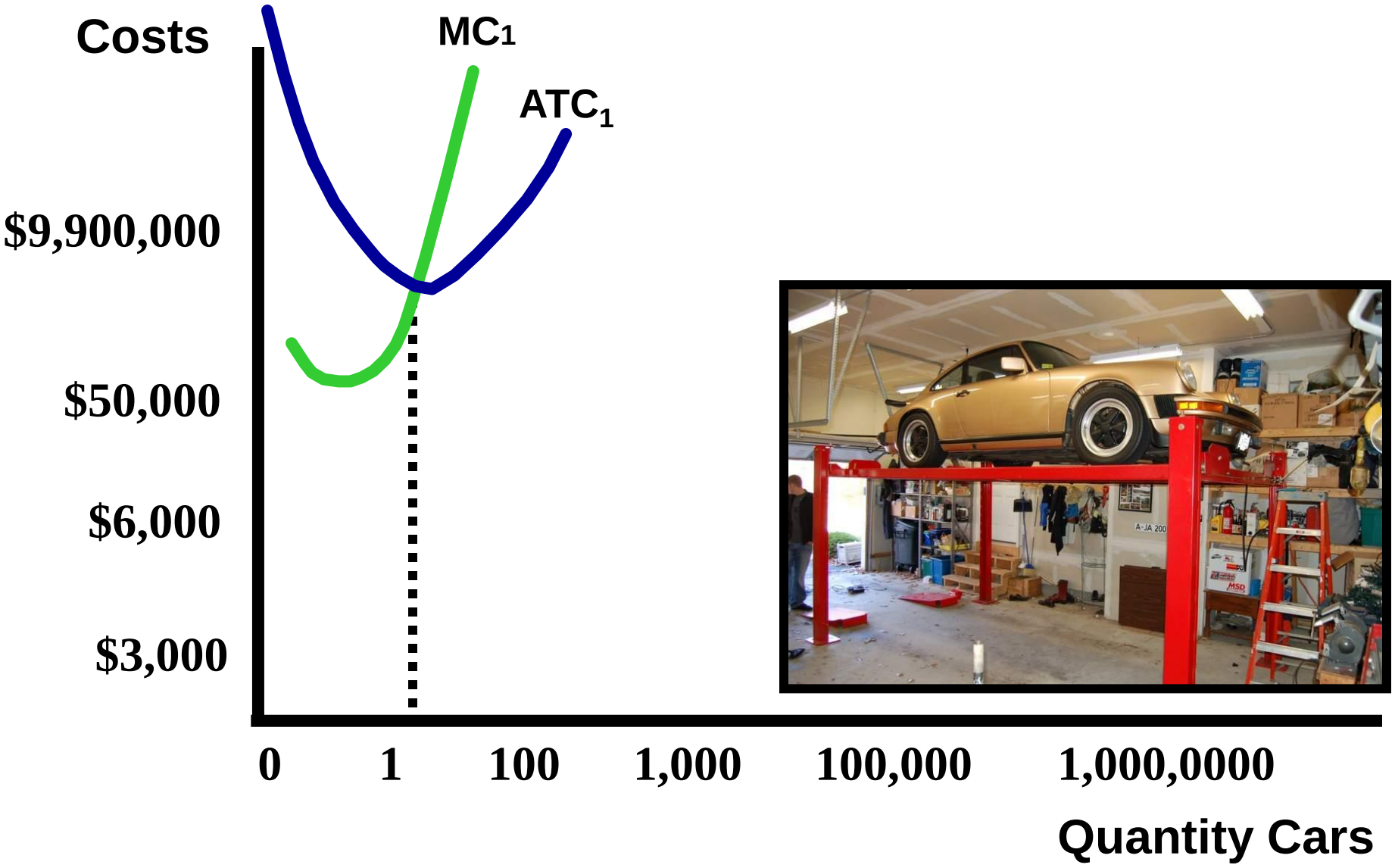
Why does economies of scale occur?

- **Firms that produce more can better use Mass Production Techniques and Specialization.**

Example:

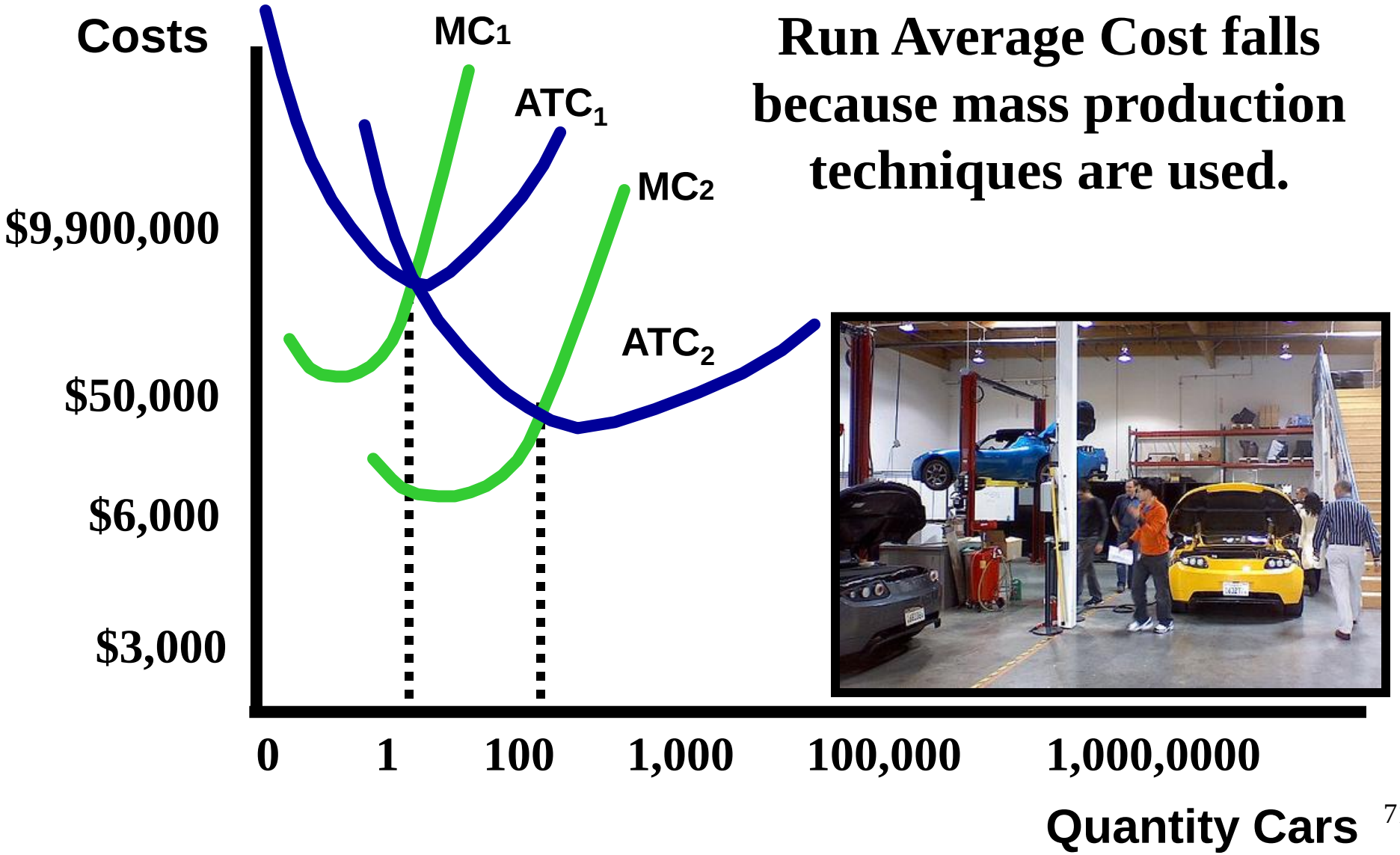
- **A car company that makes 50 cars will have a very high average cost per car.**
- **A car company that can produce 100,000 cars will have a low average cost per car.**
- **Using mass production techniques, like robots, will cause total cost to be higher but the average cost for each car would be significantly lower.**

Long Run AVERAGE Total Cost



Long Run AVERAGE Total Cost

Economies of Scale- Long Run Average Cost falls because mass production techniques are used.



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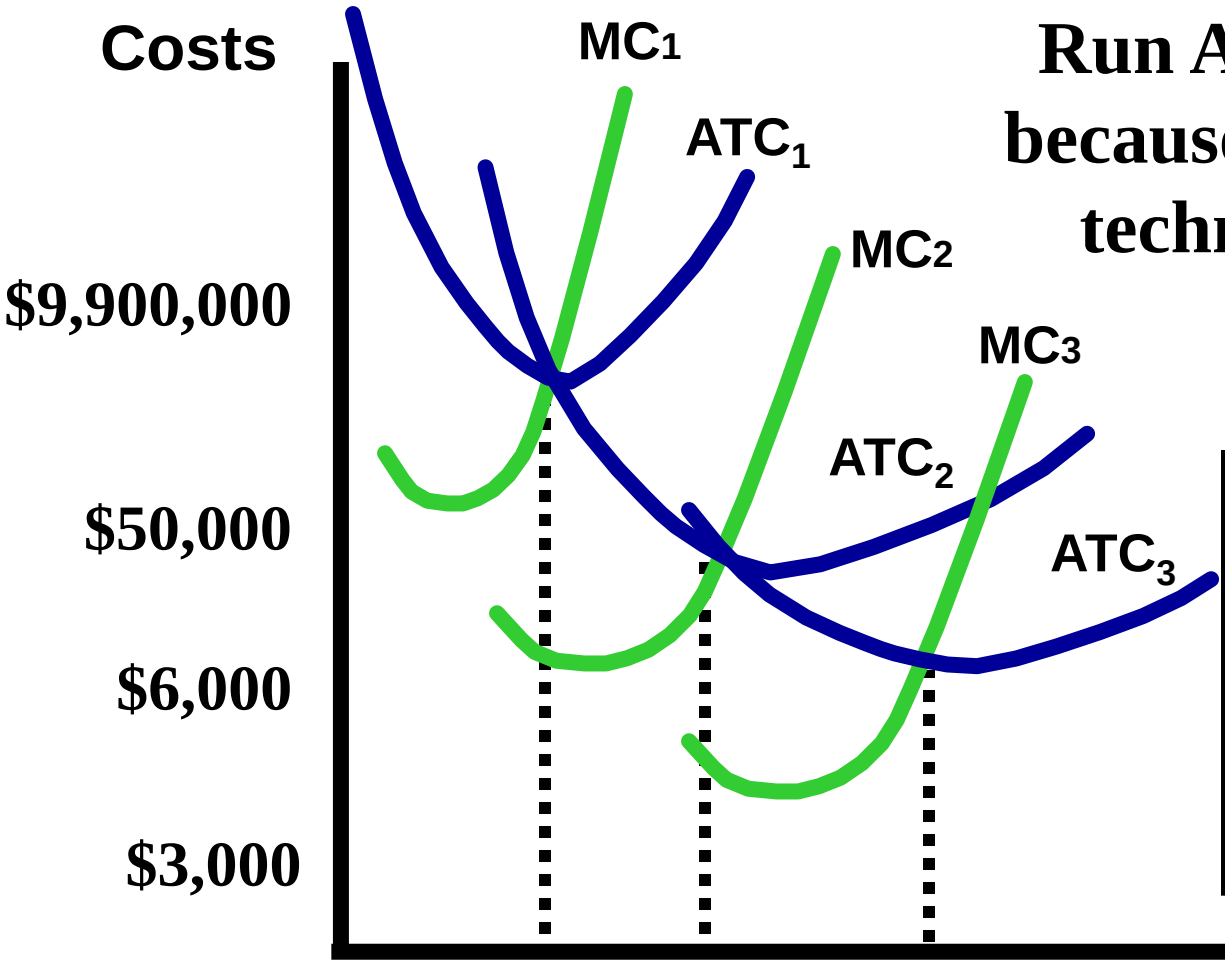
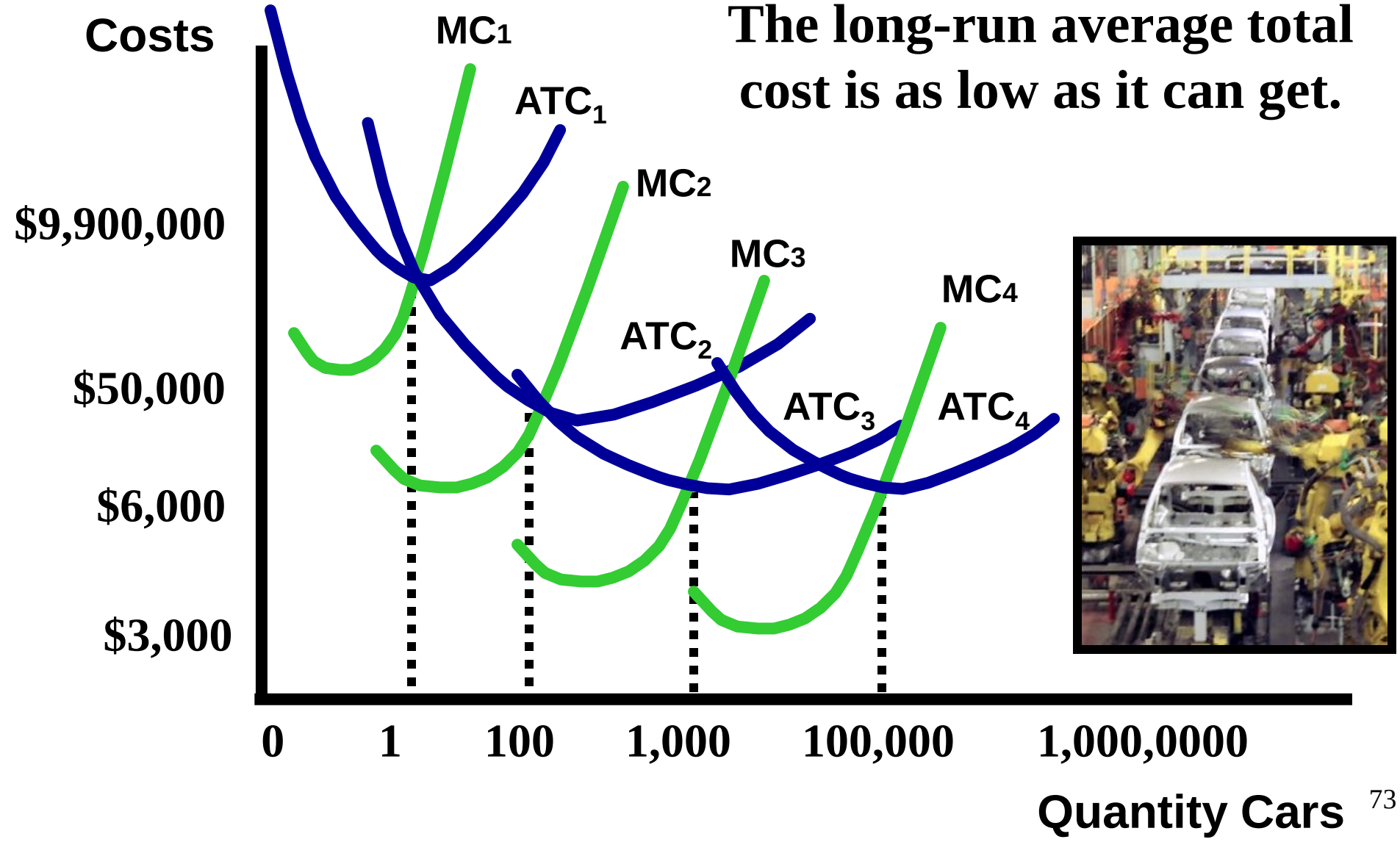


Long Run AVERAGE Total Cost

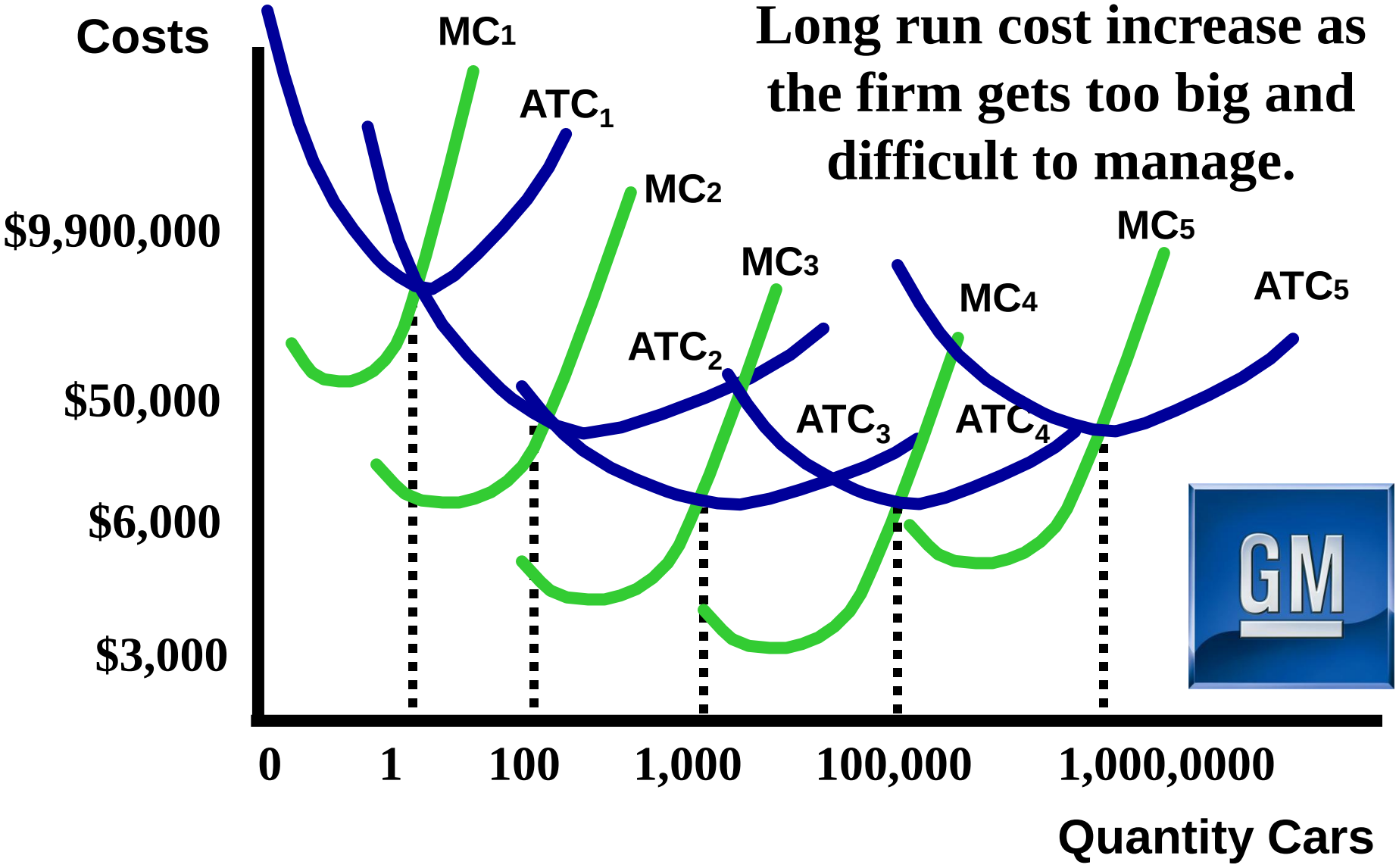
Constant Returns to Scale-
The long-run average total cost is as low as it can get.



Long Run AVERAGE Total Cost

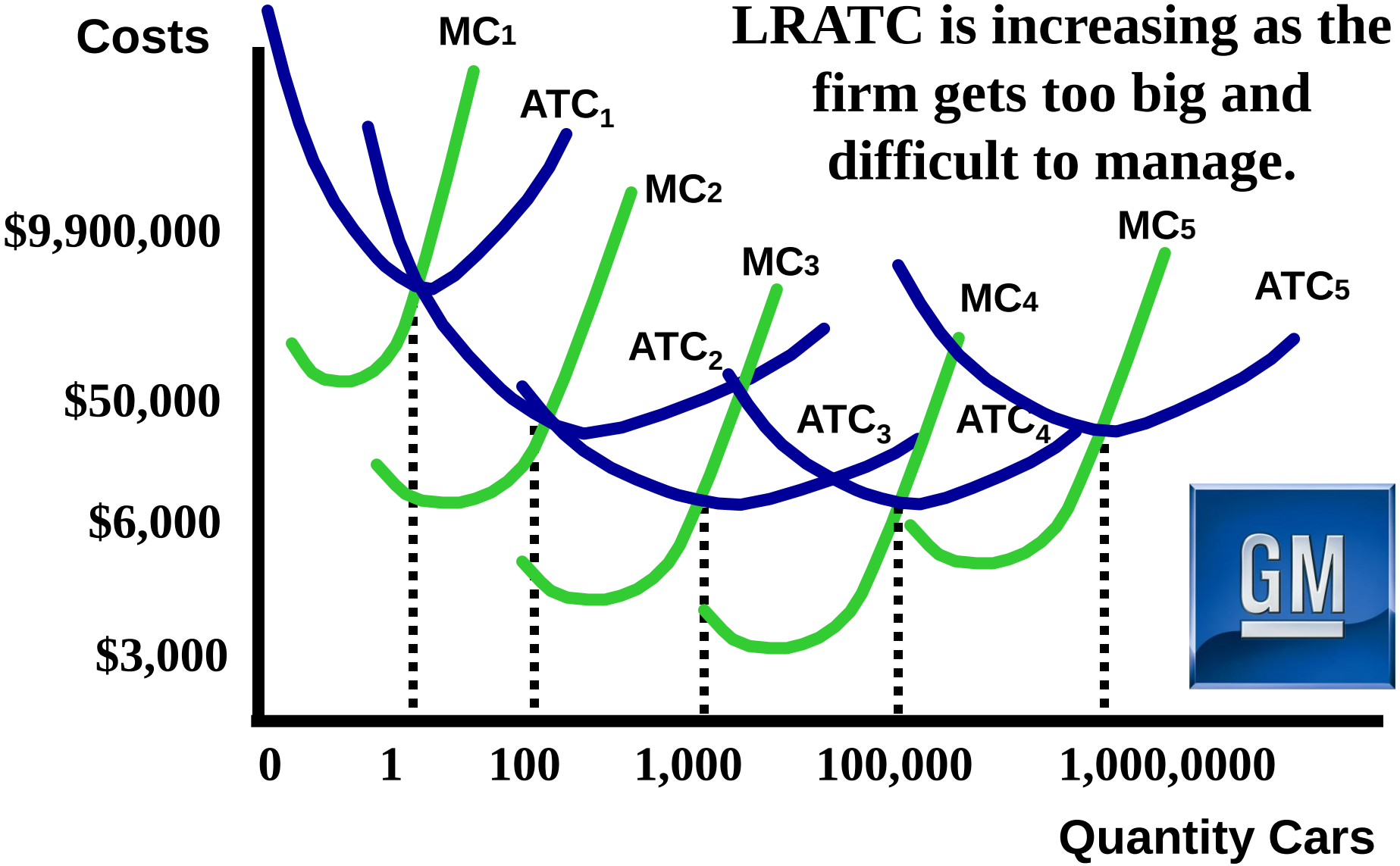
Diseconomies of Scale-

Long run cost increase as the firm gets too big and difficult to manage.

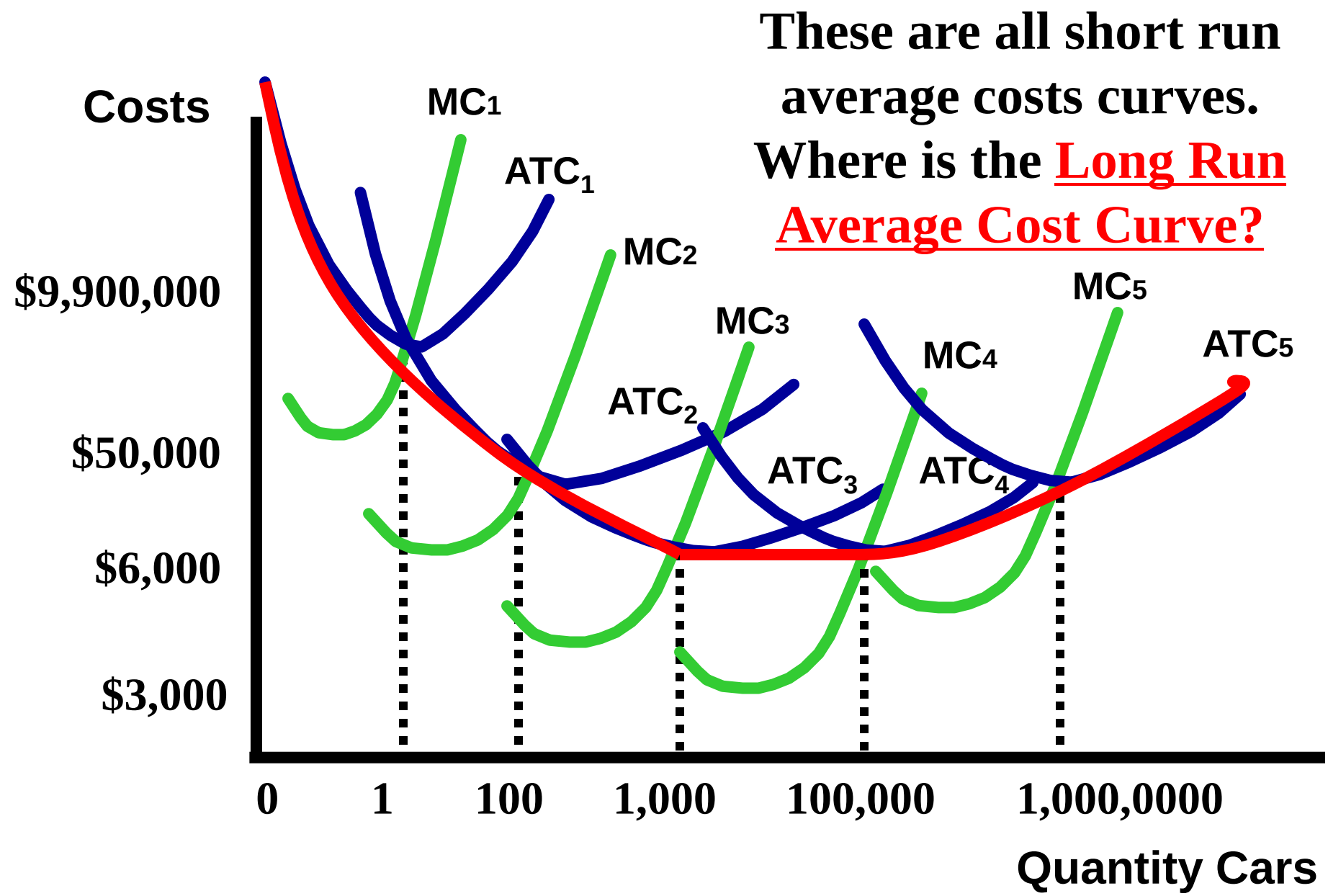


Long Run AVERAGE Total Cost

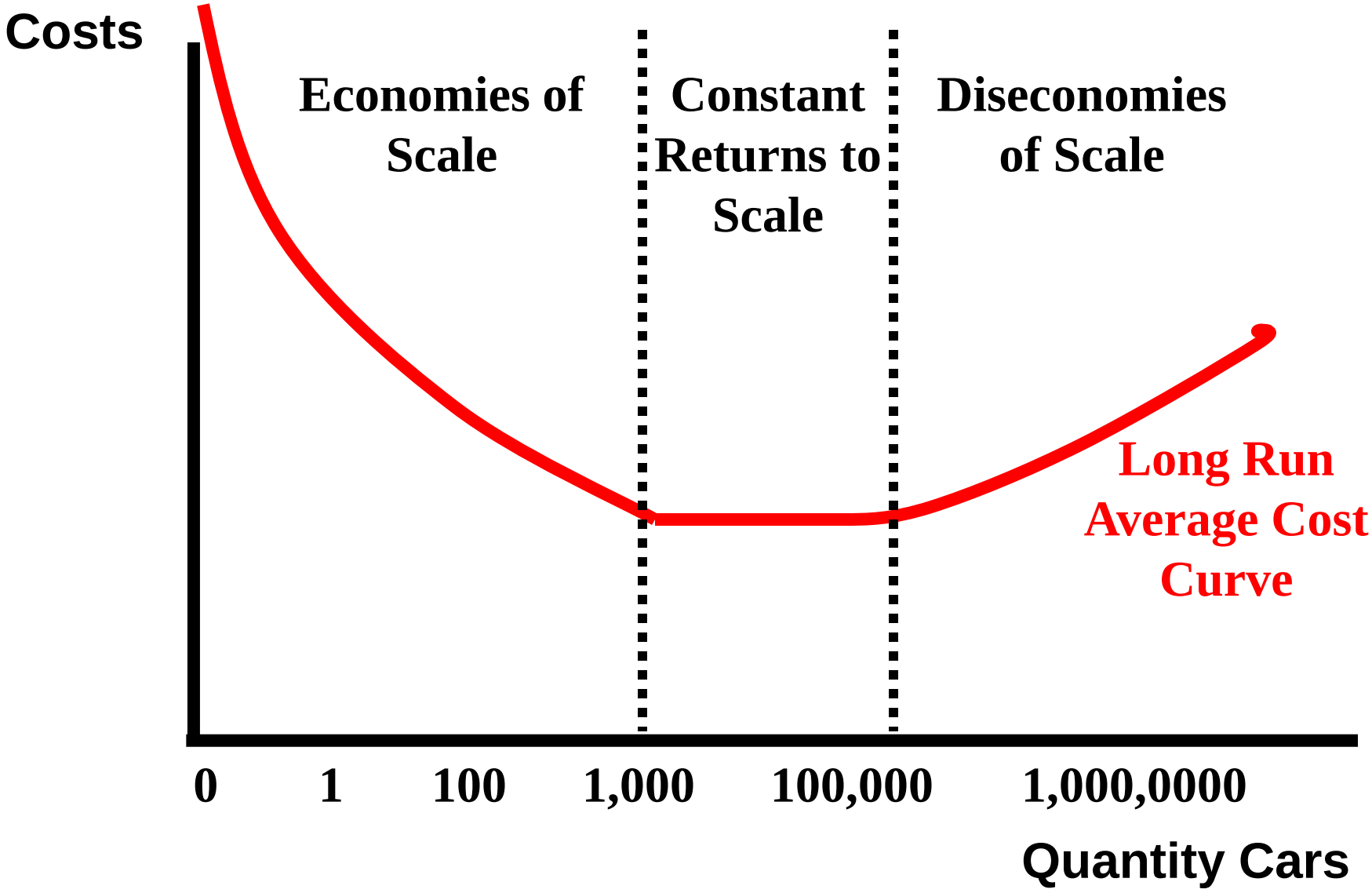
Diseconomies of Scale- The LRATC is increasing as the firm gets too big and difficult to manage.



Long Run AVERAGE Total Cost

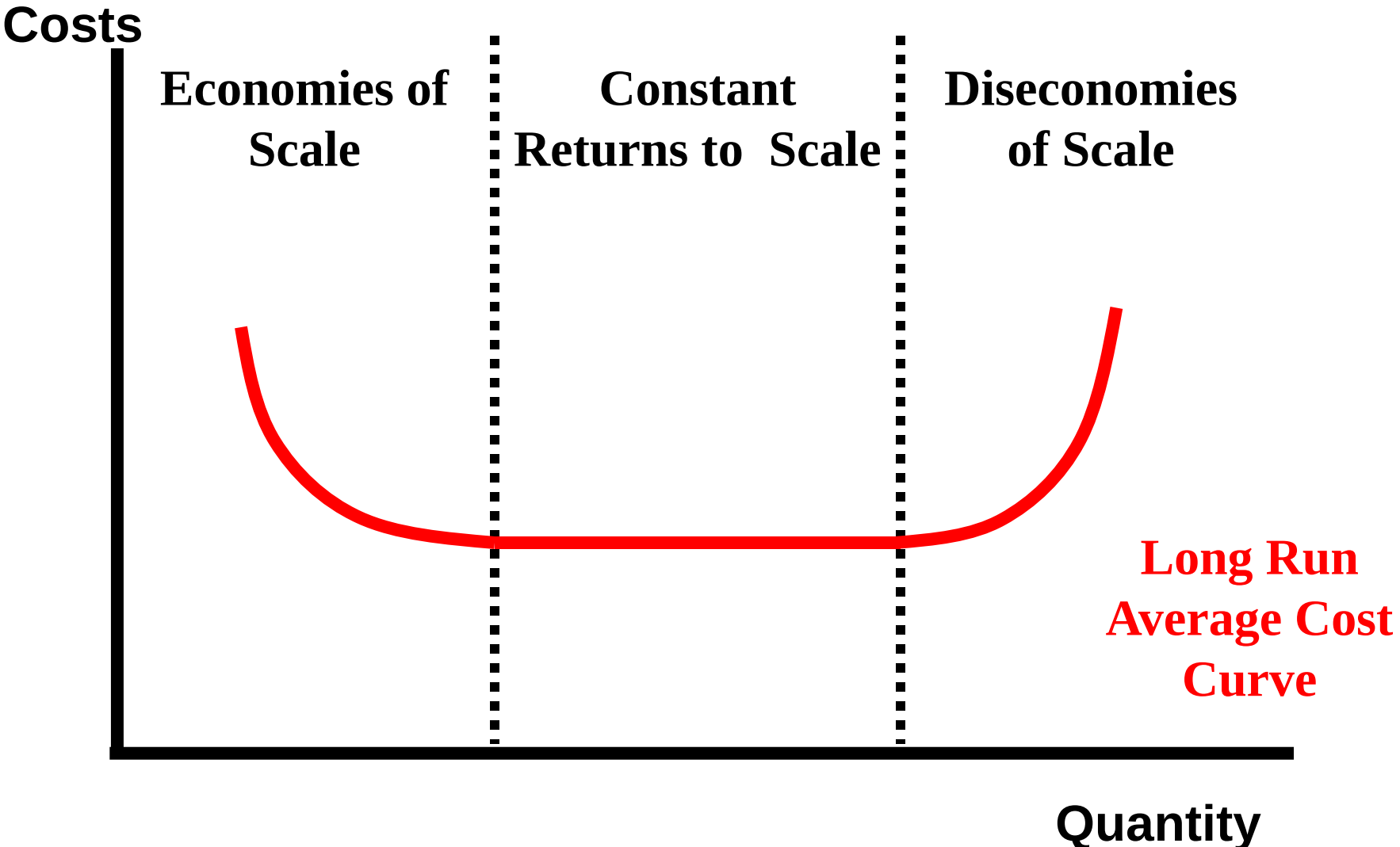


Long Run AVERAGE Total Cost



LRATC Simplified

The law of diminishing marginal returns doesn't apply in the long run because there are no FIXED RESOURCES.



Perfect Competition

FOUR MARKET STRUCTURES

Characteristics of Perfect Competition:

Examples of Perfect Competition: Avocado farmers, sunglass huts, and hammocks in Mexico

- **Many small firms**
- **Identical products (perfect substitutes)**
- **Easy for firms to enter and exit the industry**
- **Seller has no need to advertise**
- **Firms are "Price Takers"**

The seller has NO control over price.

Perfectly Competitive Firms

Example:

- **Say you go to Mexico to buy a hammock.**
- **After visiting at few different shops you find that the buyers and sellers always agree on $15.**
- **This is the market price (where demand and supply meet)**

1. **Is it likely that any shop can sell hammocks for $20?**
2. **Is it likely that any shop will sell hammocks for $10?**
3. **What happens if a shop prices hammocks too high?**
4. **Do you think that these firms make a large profit off of hammocks? Why?**

These firms are "price takers" because the sell their products at a price set by the market.

Demand for Perfectly Competitive Firms

Why are they Price Takers?

- **If a firm charges above the market price, NO ONE will buy. They will go to other firms**
- **There is no reason to price low because consumers will buy just as much at the market price.**

Since the price is the same at all quantities demanded, the demand curve for each firm is…

Perfectly Elastic

(A Horizontal straight line)

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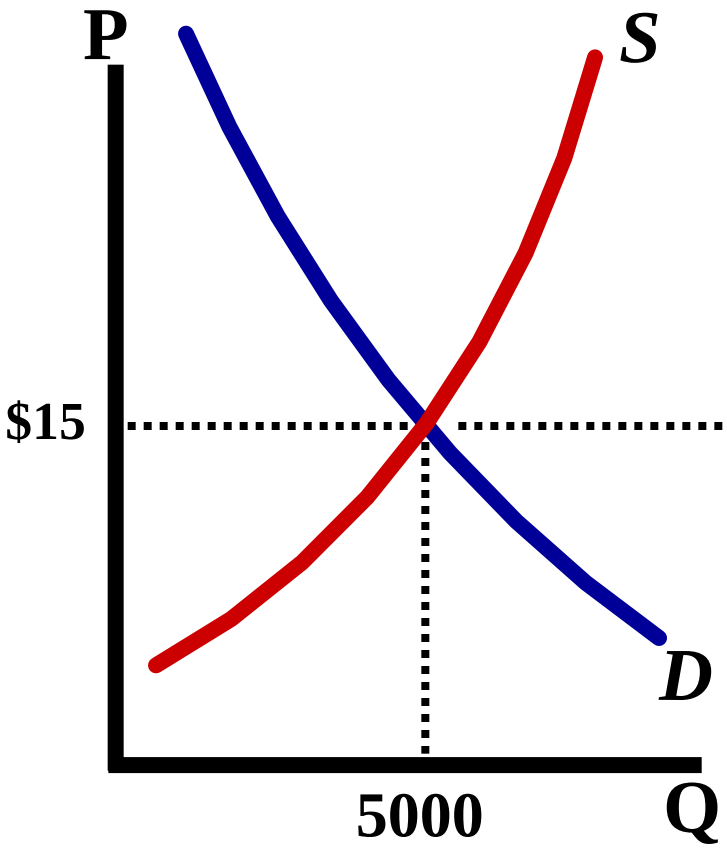
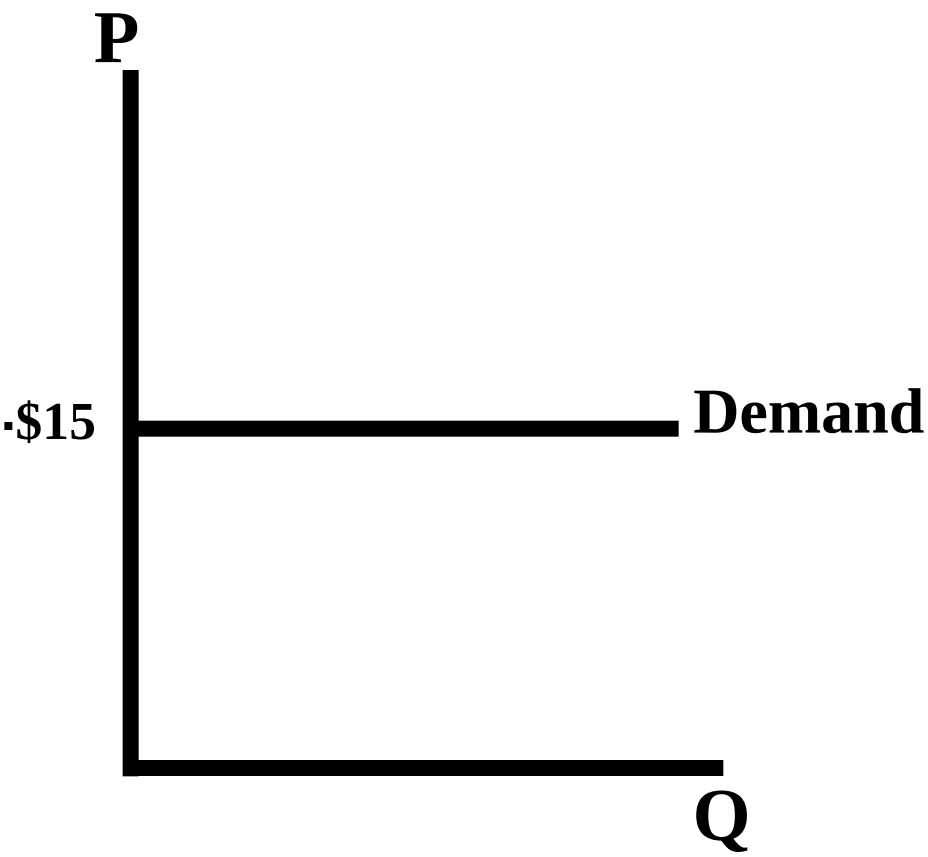
The Competitive Firm is a Price Taker
Price is set by the Industry



Industry



Firm
(price taker)

The Competitive Firm is a Price Taker
Price is set by the Industry

What is the additional revenue for selling an additional unit?

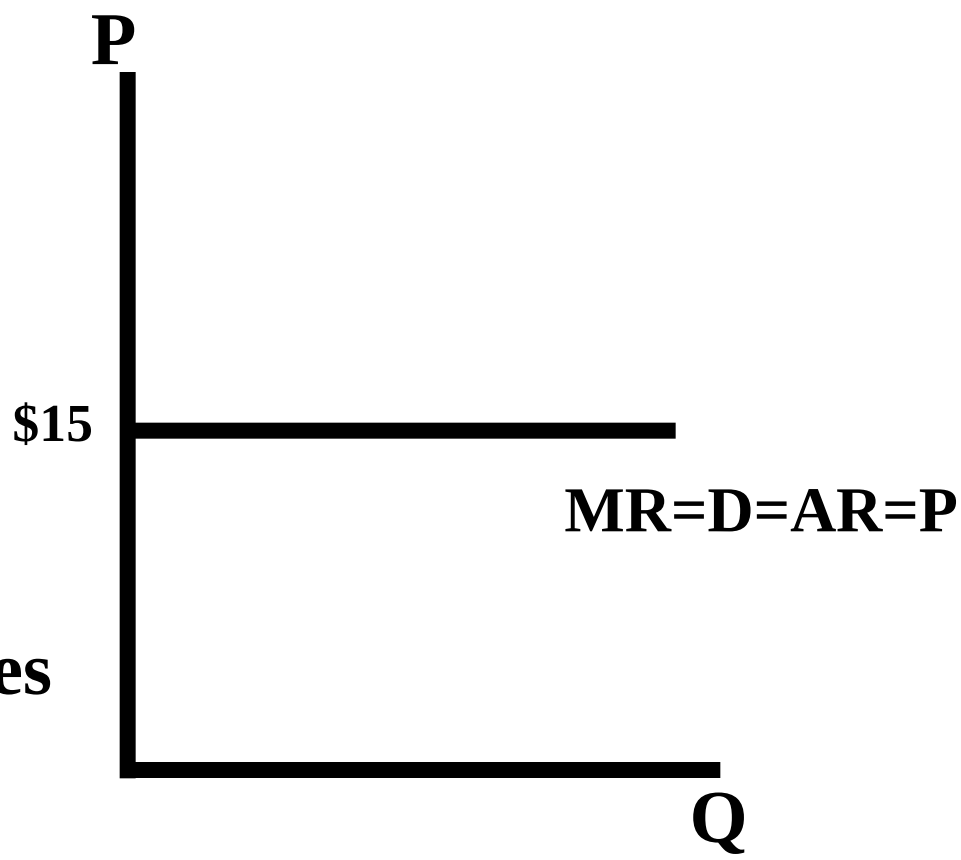
1st unit earns $15

2nd unit earns $15

Marginal revenue is constant at $15

Notice:

- **Total revenue increases at a constant rate**
- **MR equal Average Revenue**



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What
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Notice:

- **Total re s**
  at a co ant ra
- **MR equal Aver**
  Revenue

For Perfect Competition:
Demand = MR
(Marginal Revenue)

Firm
(price taker)

Maximizing PROFIT!

Short-Run Profit Maximization

What is the goal of every business?

To Maximize Profit!!!!!!

- **To maximum profit firms must make the right output**
- **Firms should continue to produce until the additional revenue from each new output equals the additional cost.**

Example (Assume the price is $10)

- **Should you produce…**
  - **…if the additional cost of another unit is $5**
  - **…if the additional cost of another unit is $9**
  - **…if the additional cost of another unit is $11**

Short-Run Profit Maximization

What is the goal of every business?

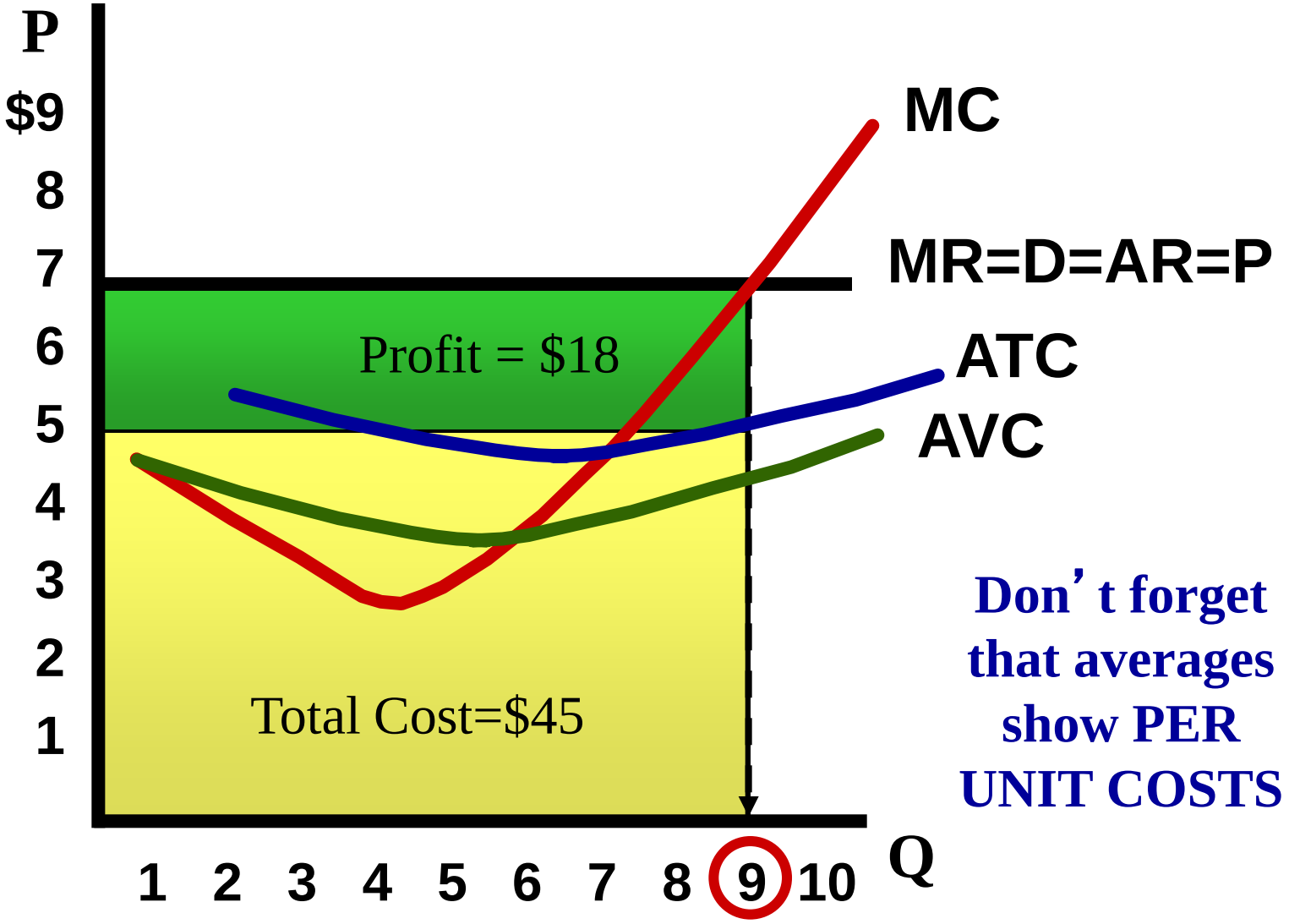
To Maximize Profit!!!!!!

- **To maximum profit, produce the right output**
- **Profit Maximizing Rule**
- **MR=MC**

Example:

- **Should you produce another unit?**
  - **…if the additional cost of another unit is $5**
  - **…if the additional cost of another unit is $9**
  - **…if the additional cost of another unit is $11**

- How much output should be produced?
- How much is Total Revenue? How much is Total Cost?
- Is there profit or loss? How much?



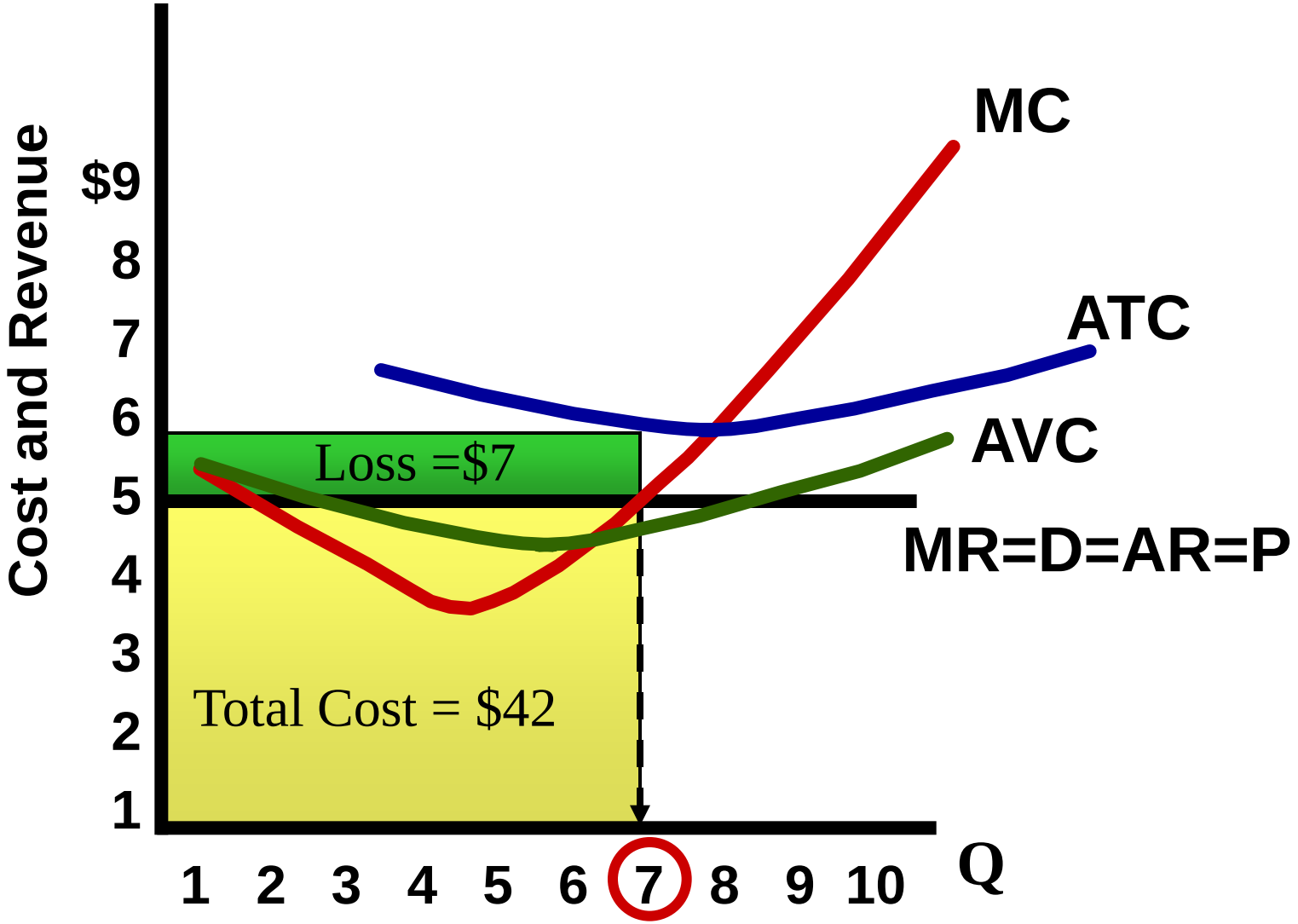
Don't forget that averages show PER UNIT COSTS

Suppose the market demand falls. What would happen if the price is lowered from $7 to $5?

The MR=MC rule still applies but now the firm will make an economic loss.

The profit maximizing rule is also the loss minimizing rule!!!

- How much output should be produced?
- How much is Total Revenue? How much is Total Cost?
- Is there profit or loss? How much?

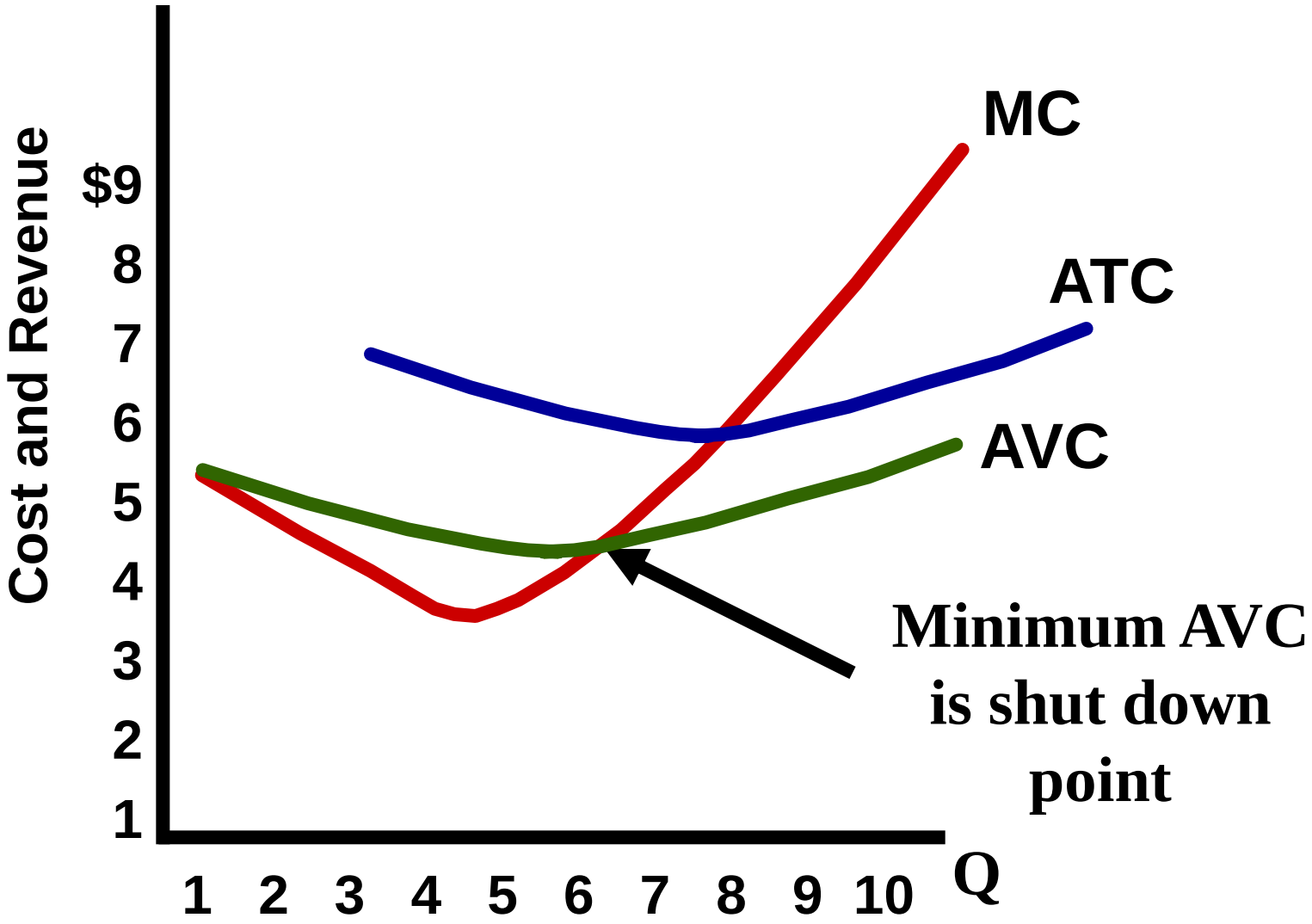


Assume the market demand falls even more. If the price is lowered from $5 to $4 the firm should stop producing.

Shut Down Rule:

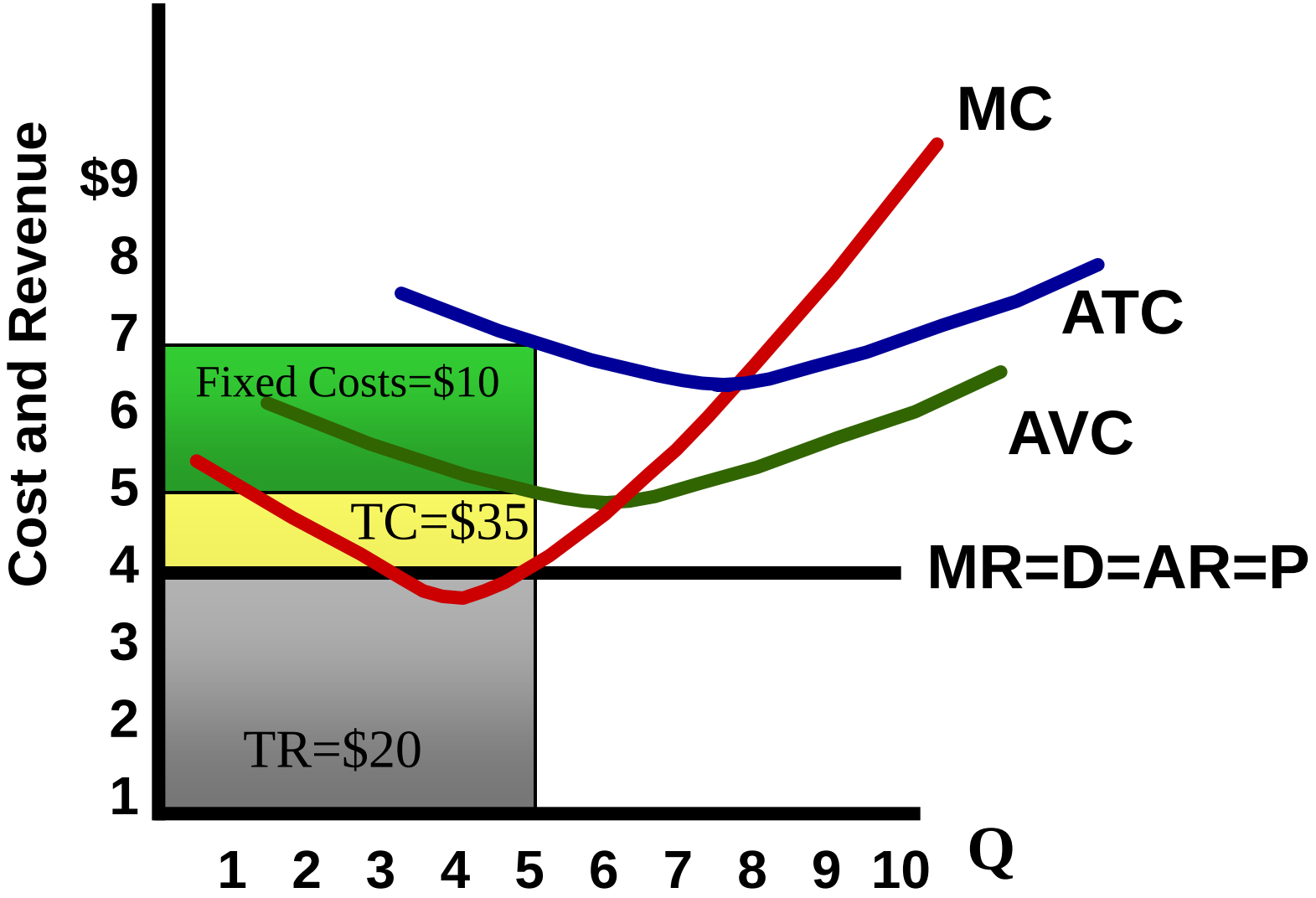
- **A firm should continue to produce as long as the price is above the AVC**
- **When the price falls below AVC then the firm should minimize its losses by shutting down**
- **Why? If the price is below AVC the firm is losing more money by producing than the they would have to pay to shut down.**

SHUT DOWN! Produce Zero



P<AVC. They should shut down

Producing nothing is cheaper than staying open.



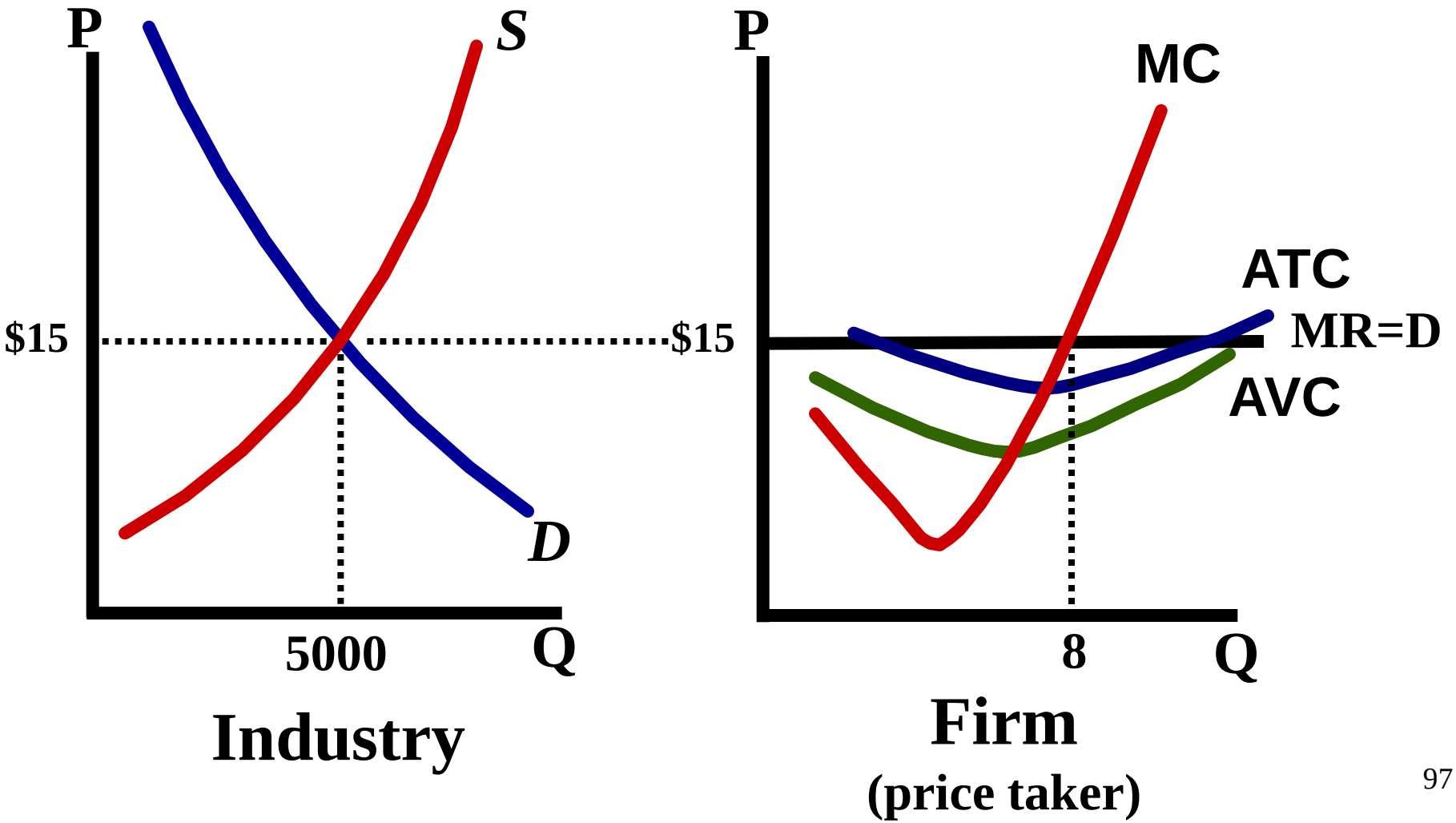
Profit Maximizing Rule
MR = MC

Three Characteristics of MR=MC Rule:

1. **Rule applies to ALL markets structures (PC, Monopolies, etc.)**
2. **The rule applies only if price is above AVC**
3. **Rule can be restated P = MC for perfectly competitive firms (because MR = P)**

Side-by-side graph for perfectly completive industry and firm.

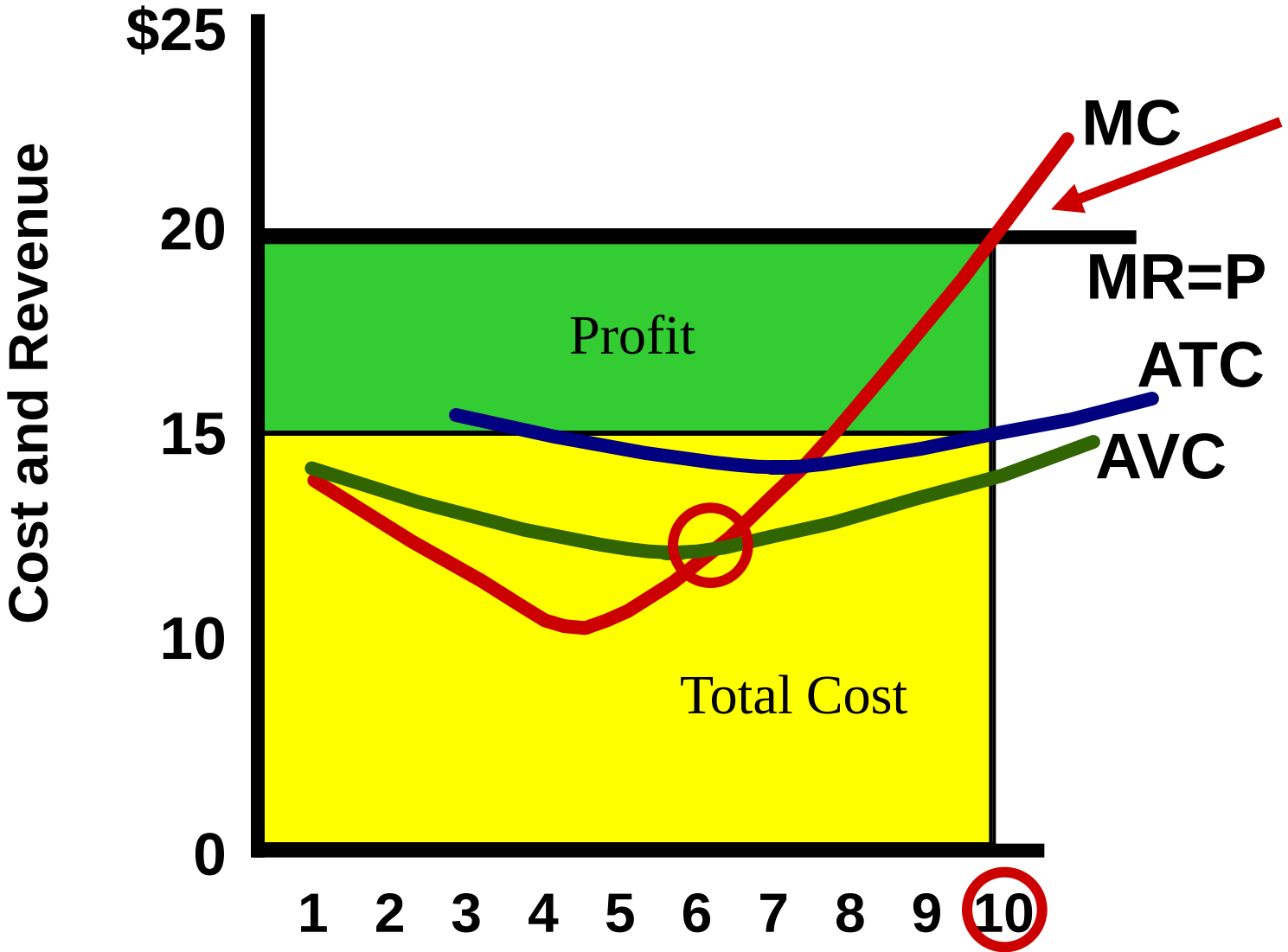
Is the firm making a profit or a loss? Why?



Where is the profit maximization point? How do you know?

What output should be produced? What is TR? What is TC?

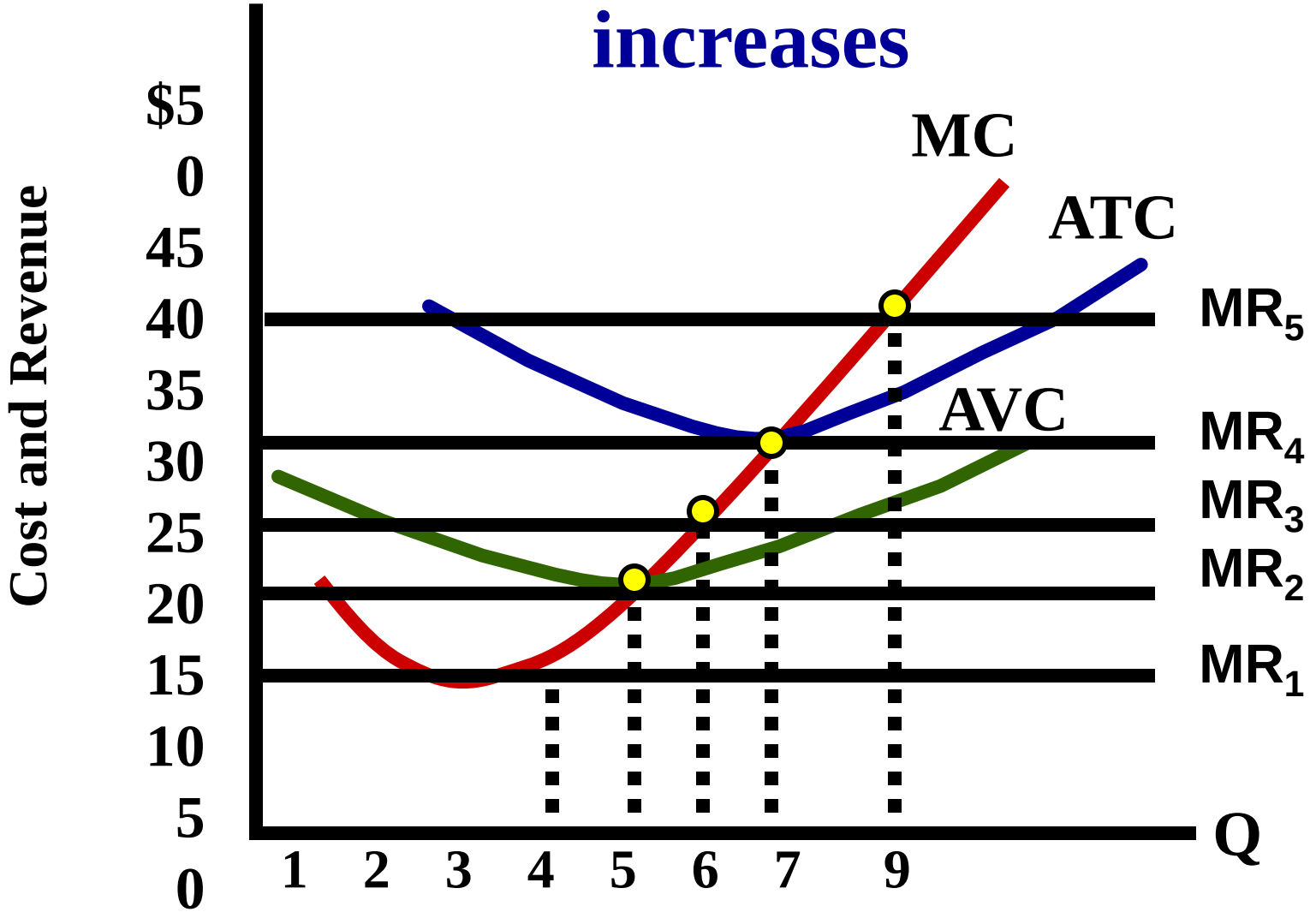
How much is the profit or loss? Where is the Shutdown Point?



Supply Revisited

Marginal Cost and Supply

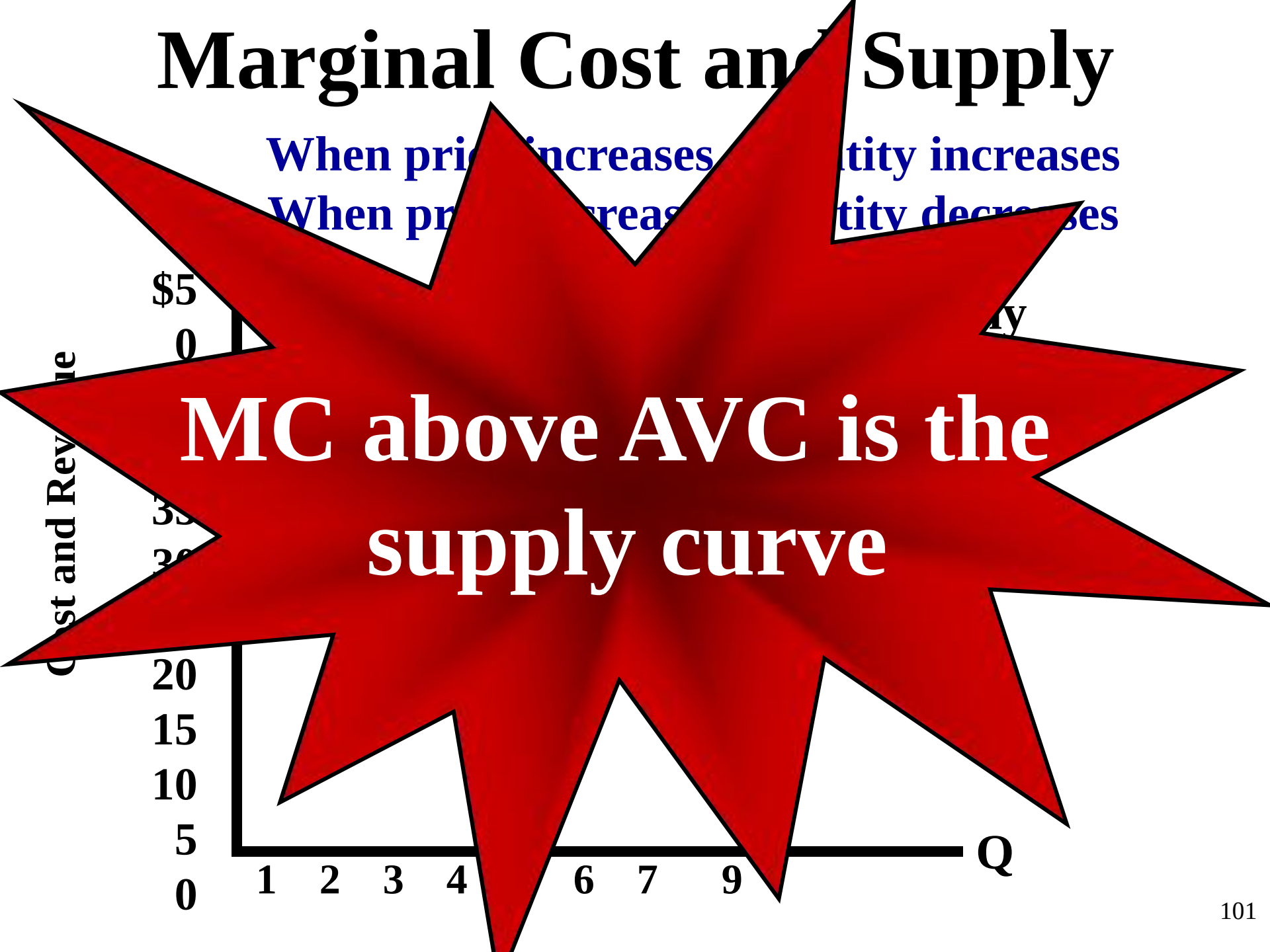
As price increases, the quantity increases



Marginal Cost and Supply

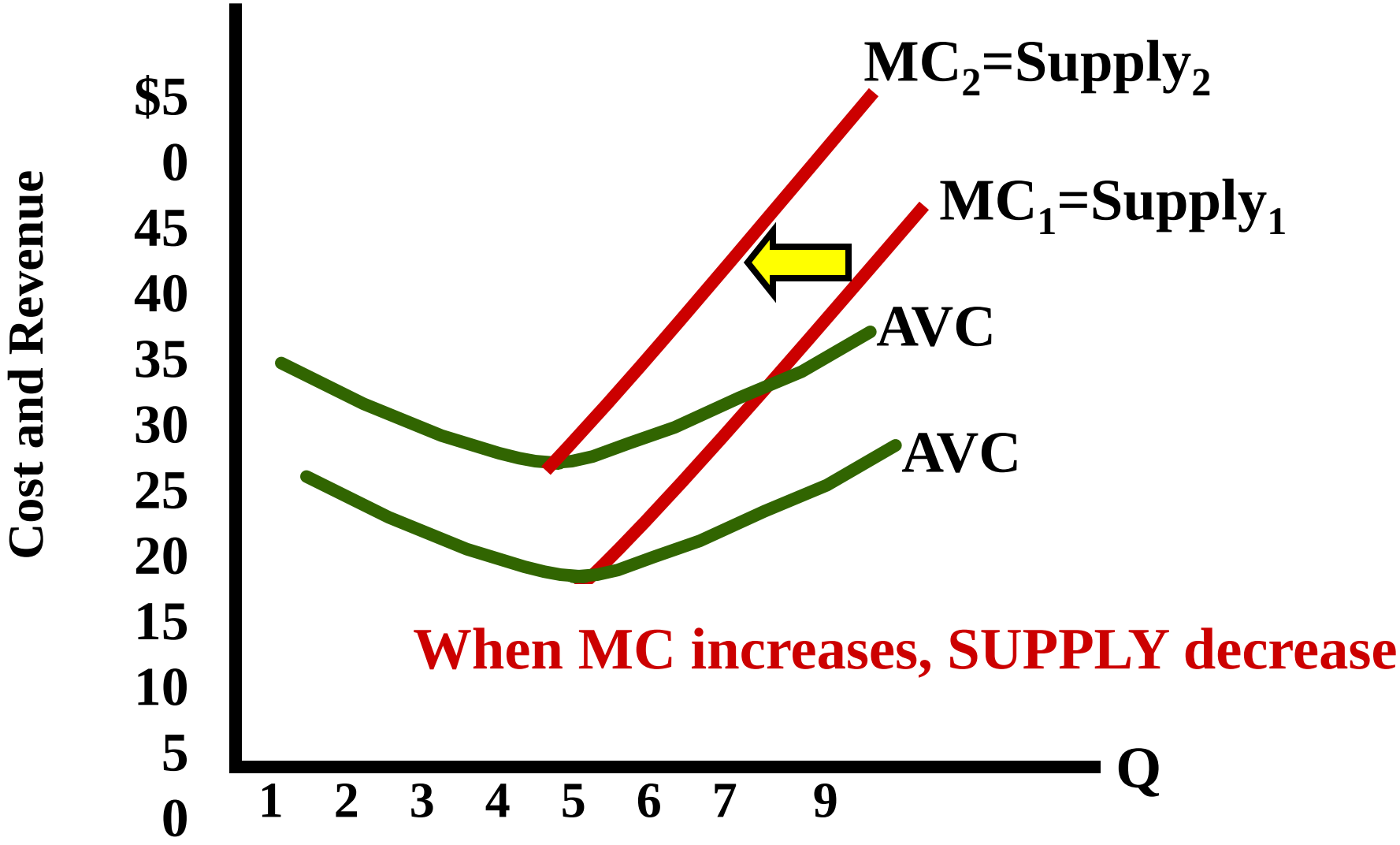
When pri increases tity increases

When pr reas tity decr ses



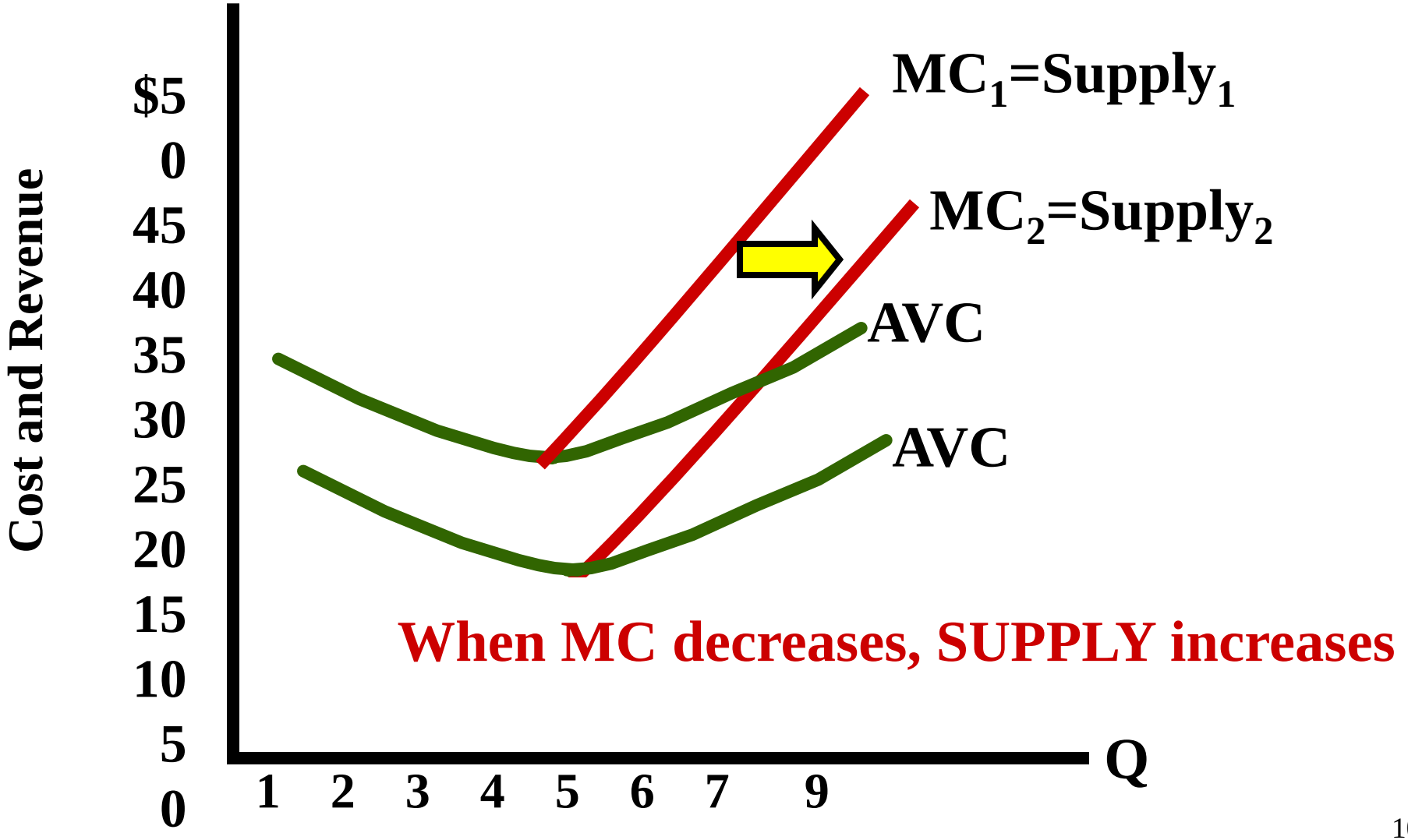
Marginal Cost and Supply

What if variable costs increase (ex: tax)?



Marginal Cost and Supply

What if variable costs decrease (ex: subsidy)?



Perfect Competition in the Long-Run

You are a wheat farmer. You learn that there is a more profit in making corn. What do you do in the long run?

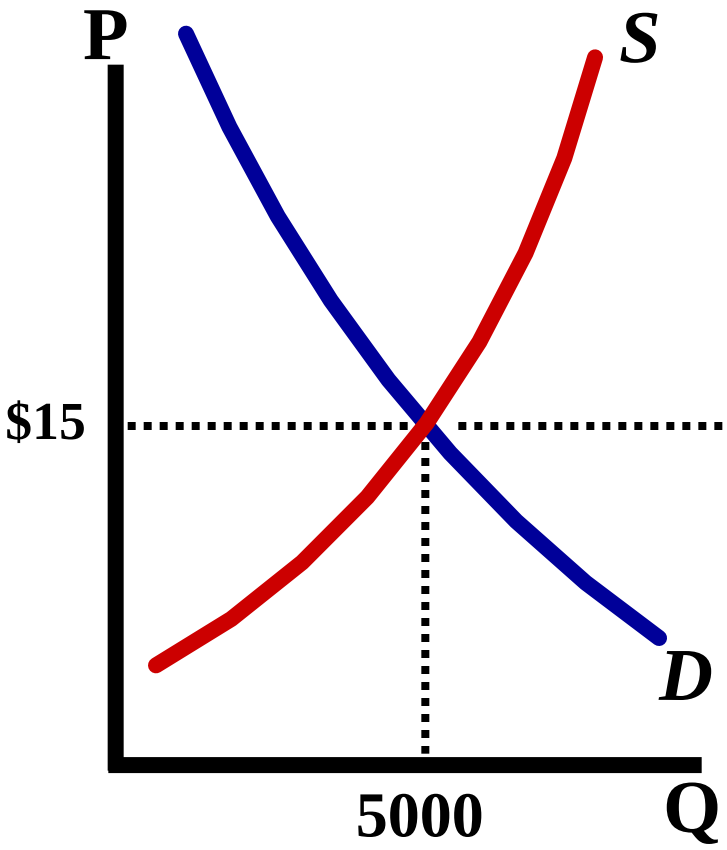
In the Long-run…

- **Firms will enter if there is profit**
- **Firms will leave if there is loss**
- **So, ALL firms break even, they make NO economic profit**

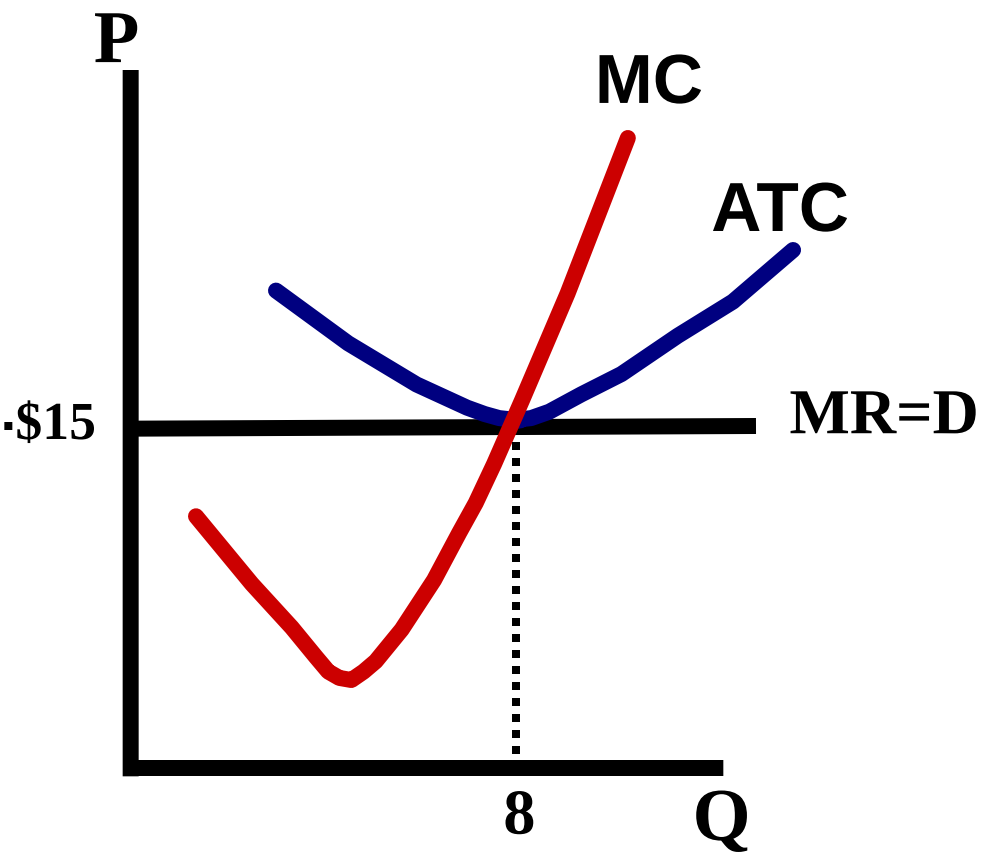
  (No Economic Profit=Normal Profit)
- **In long run equilibrium a perfectly competitive firm is EXTREMELY efficient.**

Side-by-side graph for perfectly completive industry and firm in the LONG RUN

Is the firm making a profit or a loss? Why?



Industry



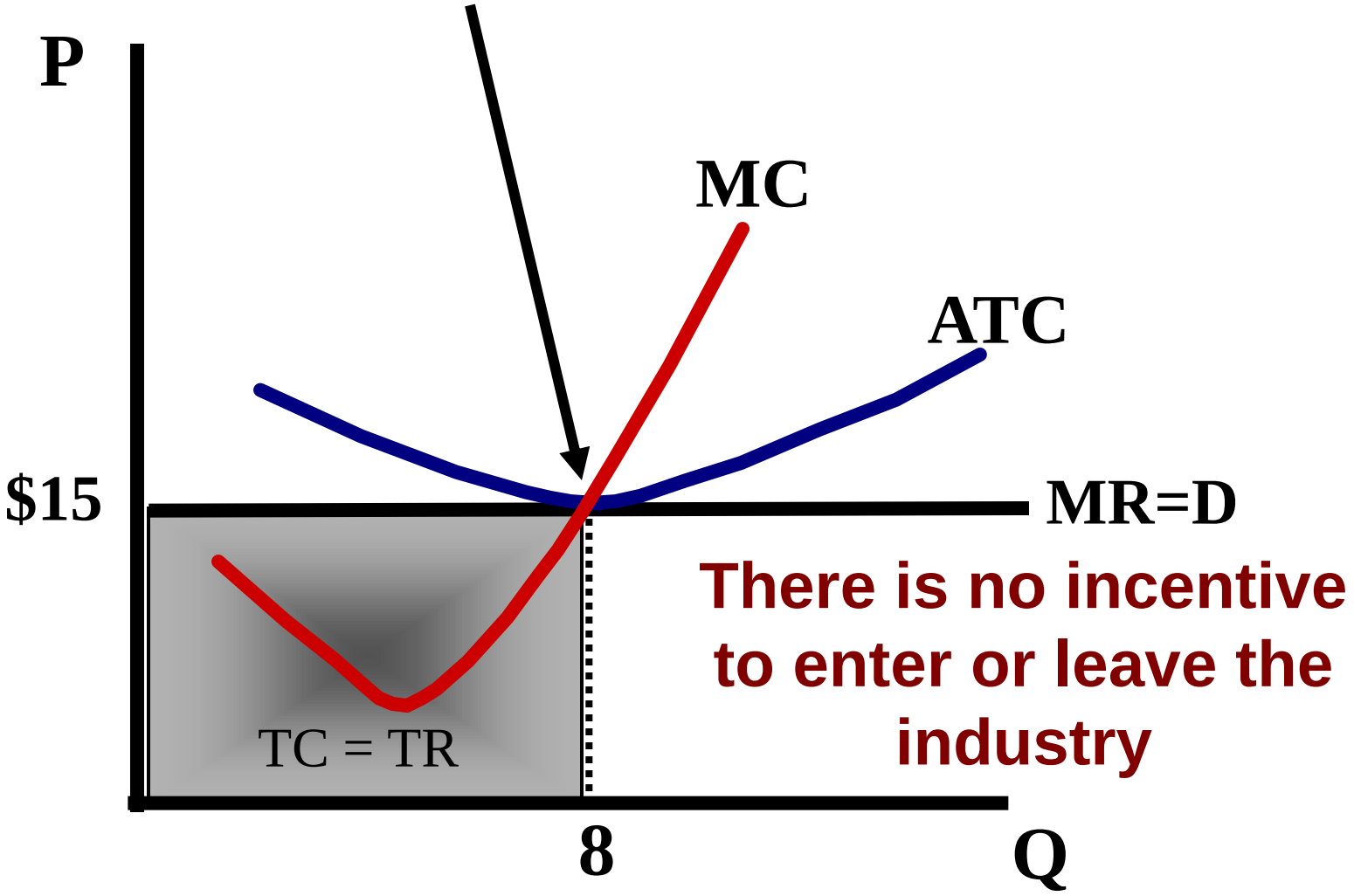
Firm

(price taker)

Firm in Long-Run Equilibrium

Price = MC = Minimum ATC

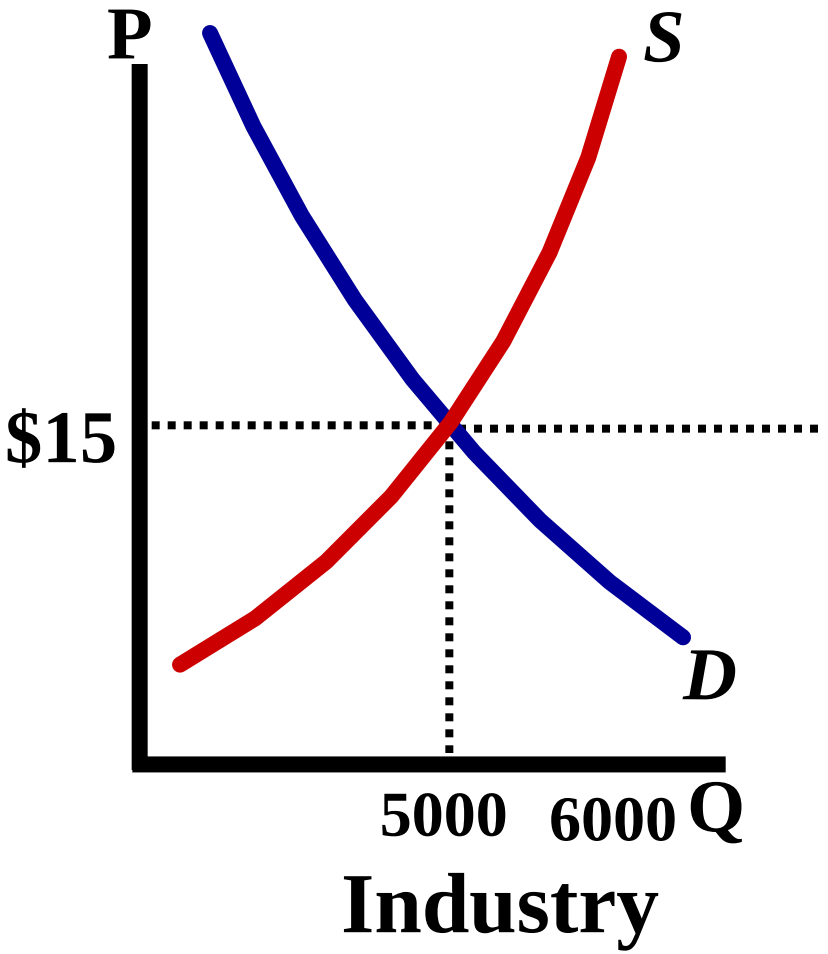
Firm making a normal profit

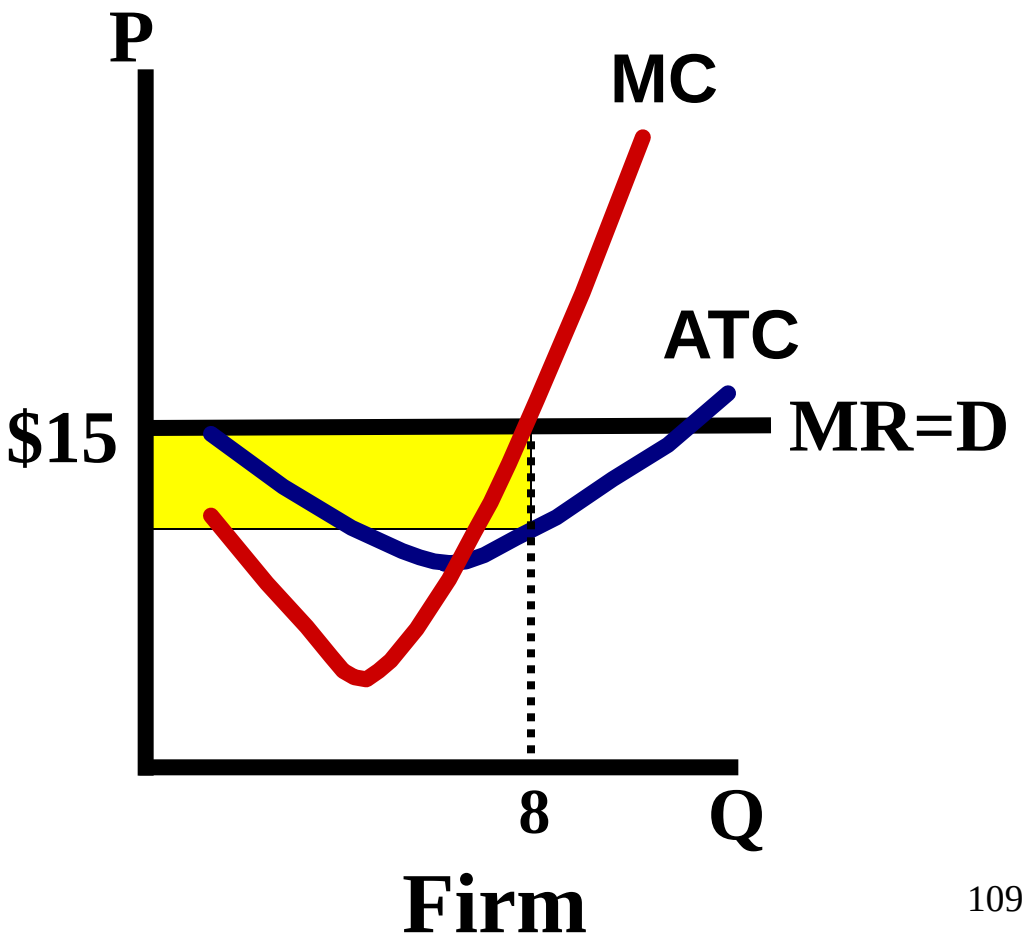


There is no incentive to enter or leave the industry

Going from Long-Run to Short-Run

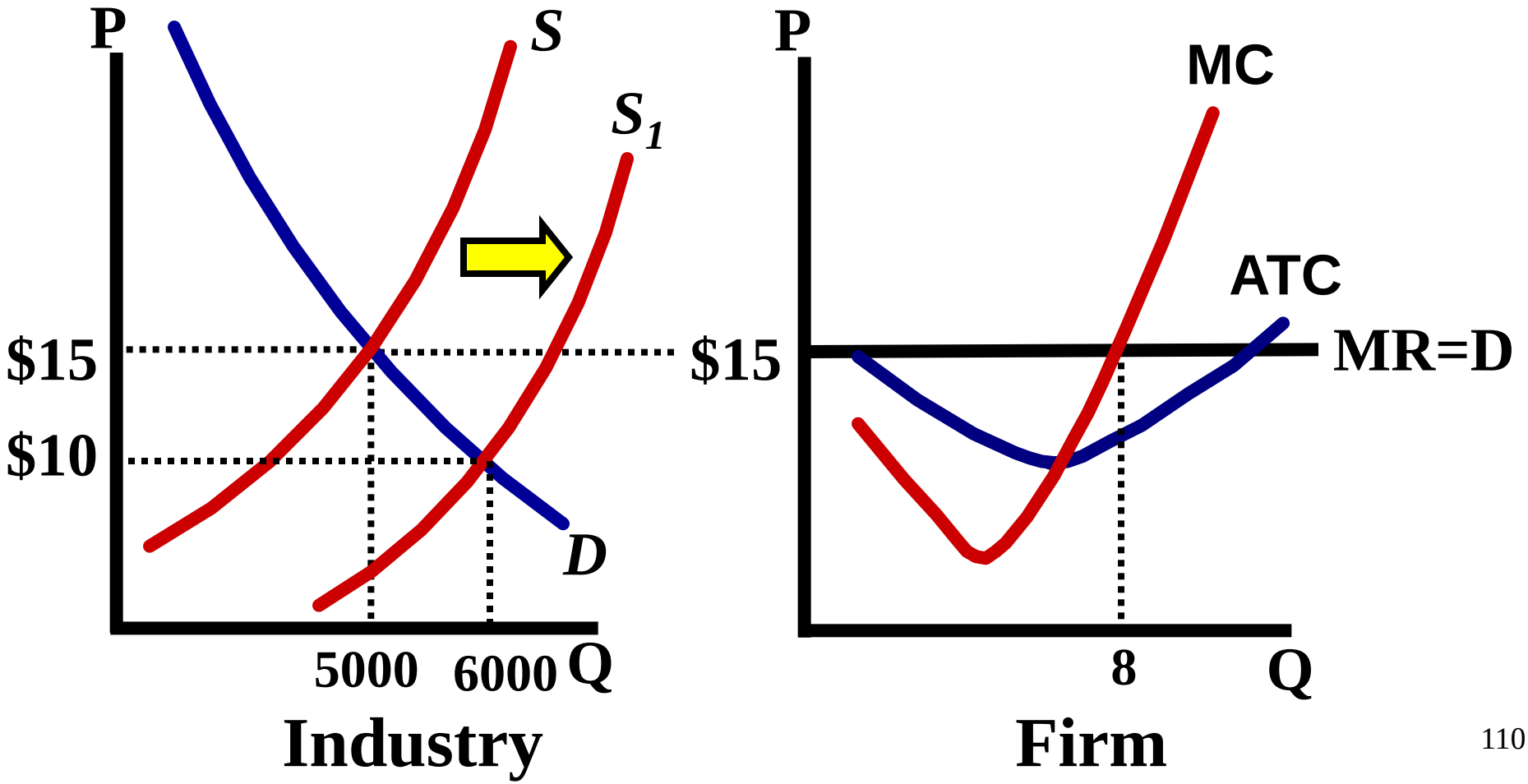
1. **Is this the short or the long run? Why?**
2. **What will firms do in the long run?**
3. **What happens to P and Q in the industry?**
4. **What happens to P and Q in the firm?**





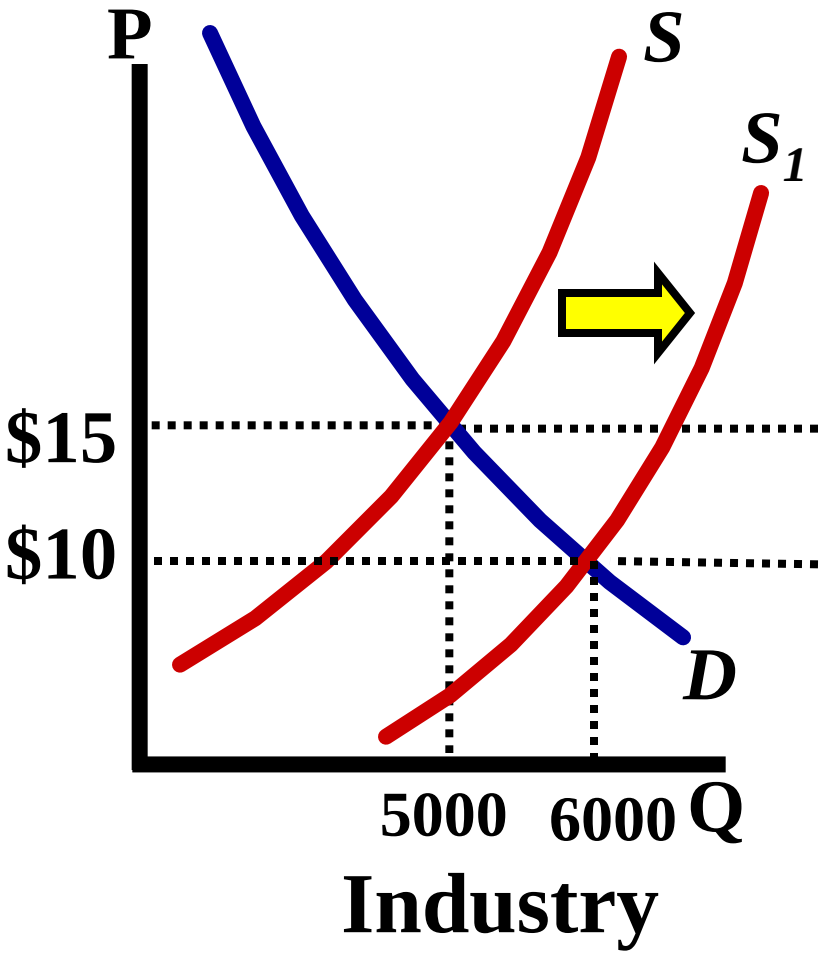
Firms enter to earn profit so supply increases in the industry

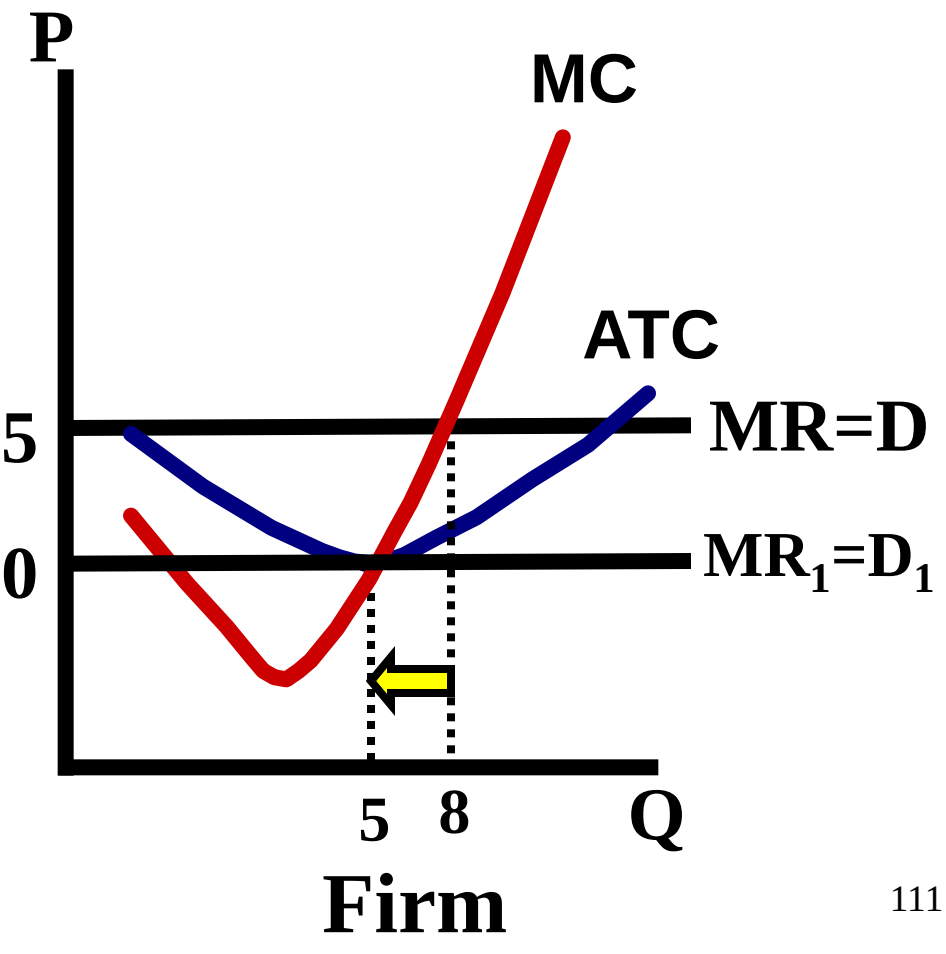
Price decreases and quantity increases



Price falls for the firm because they are price takers.

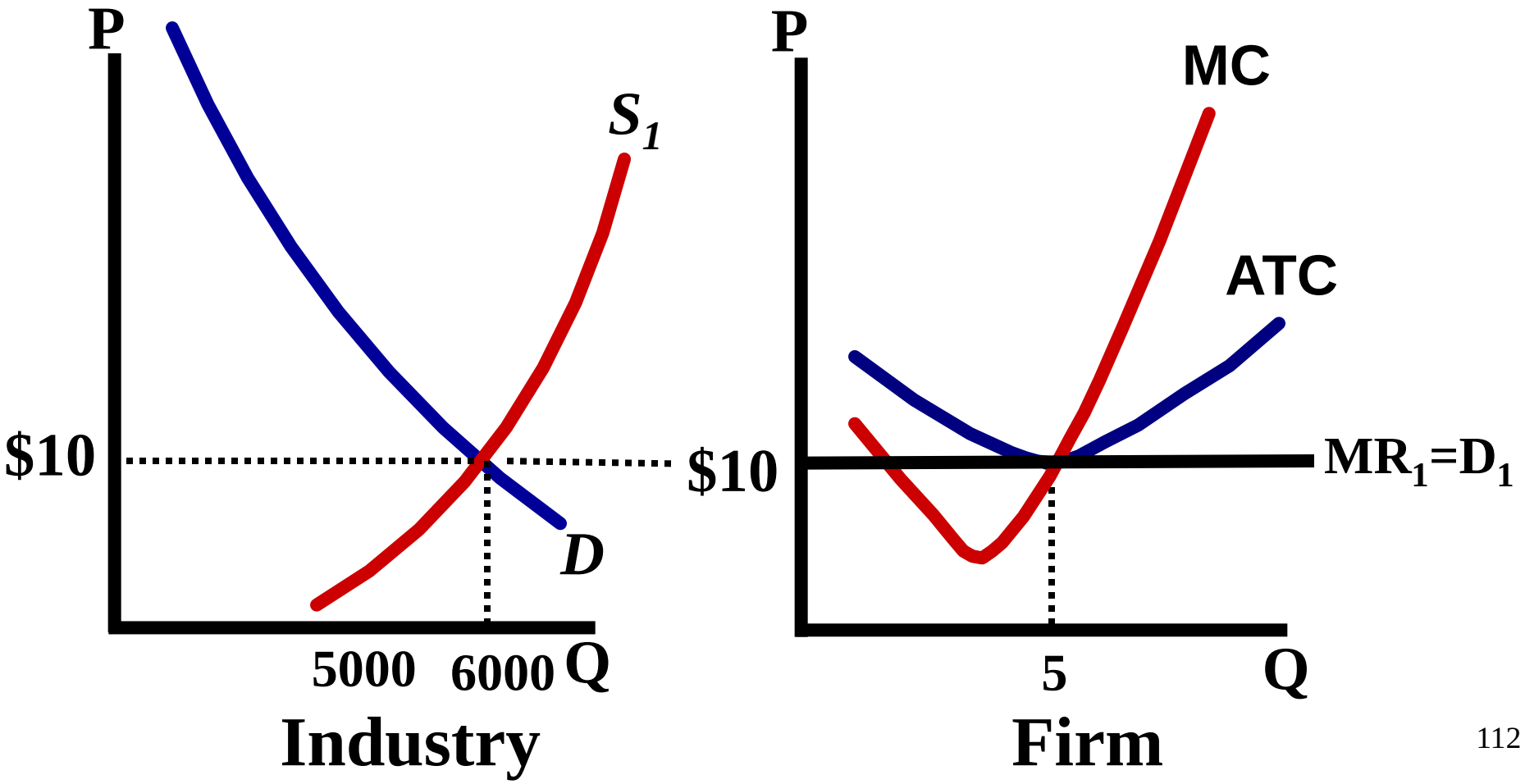
Price decreases and quantity decreases





New Long Run Equilibrium at $10 Price

Zero Economic Profit



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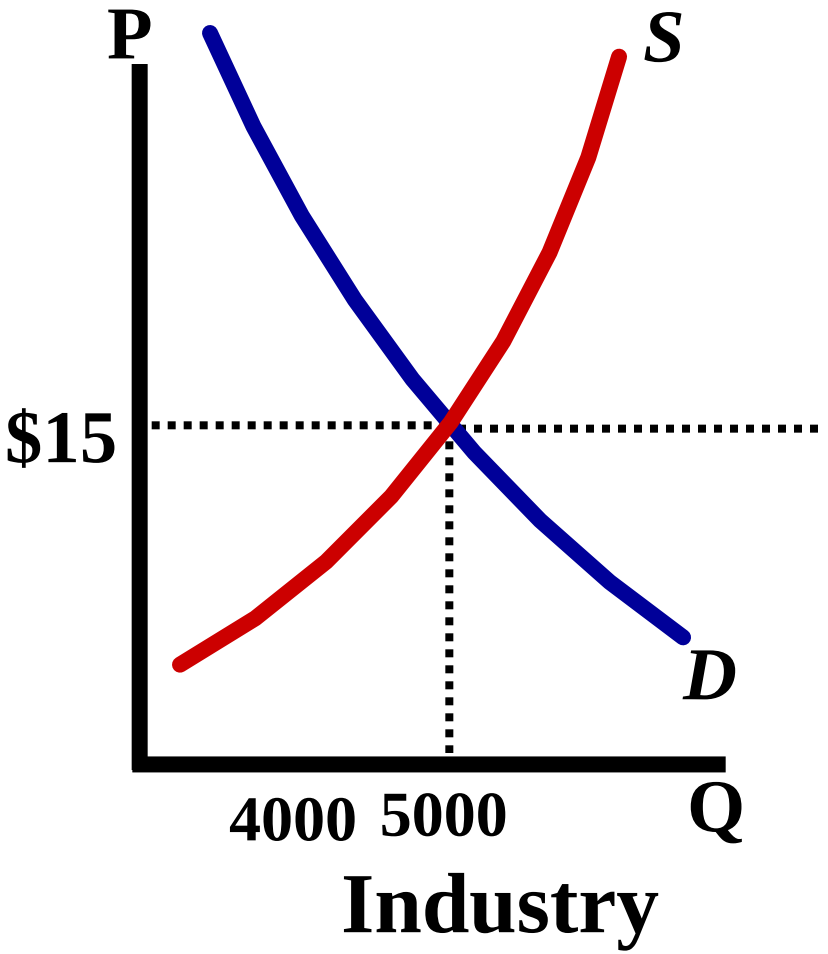
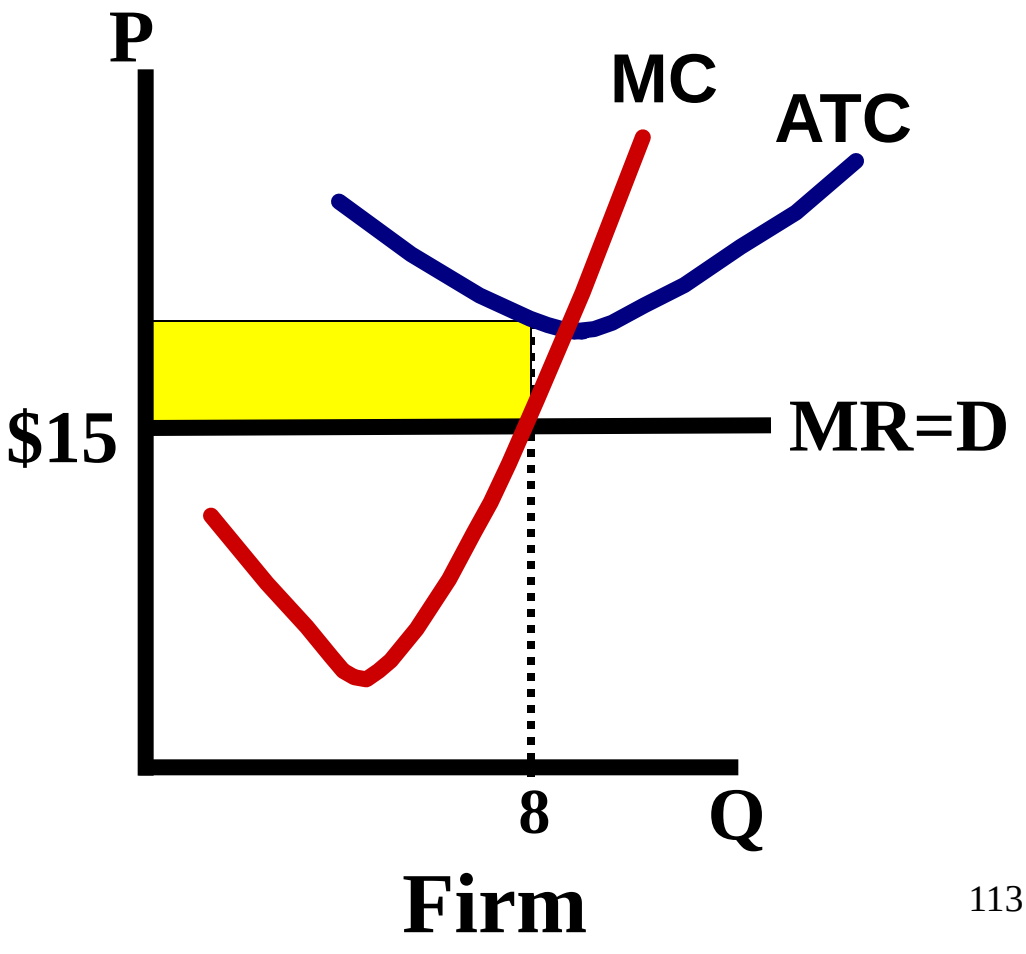
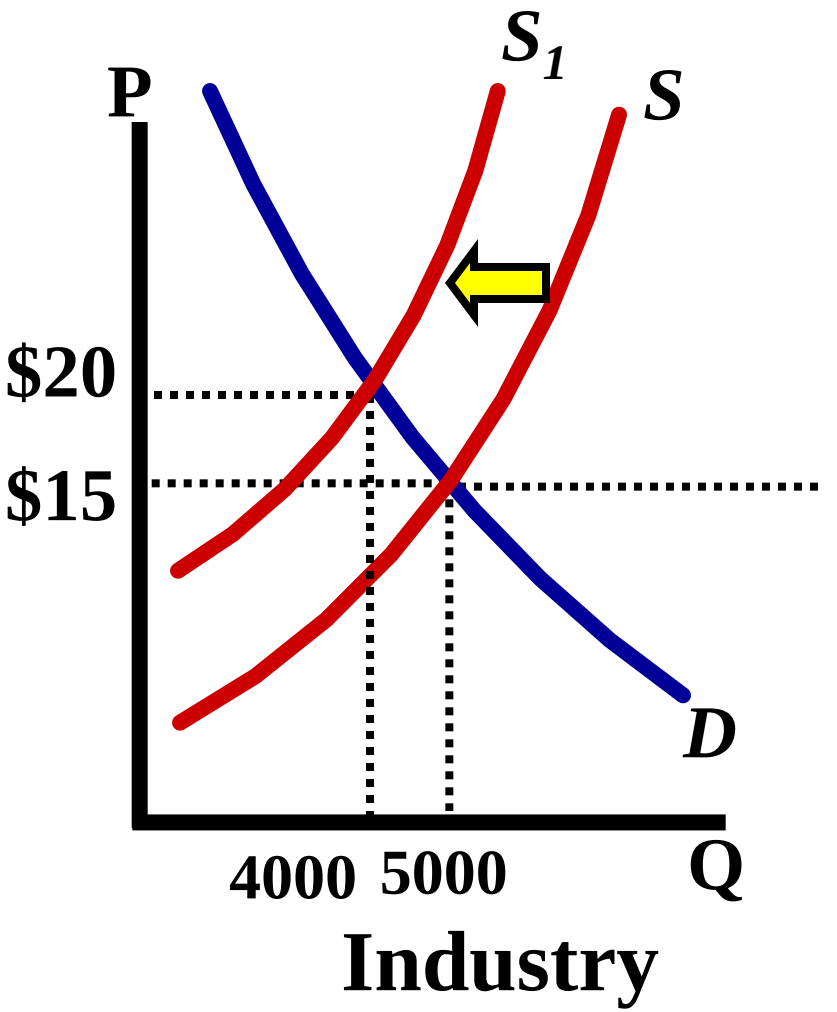
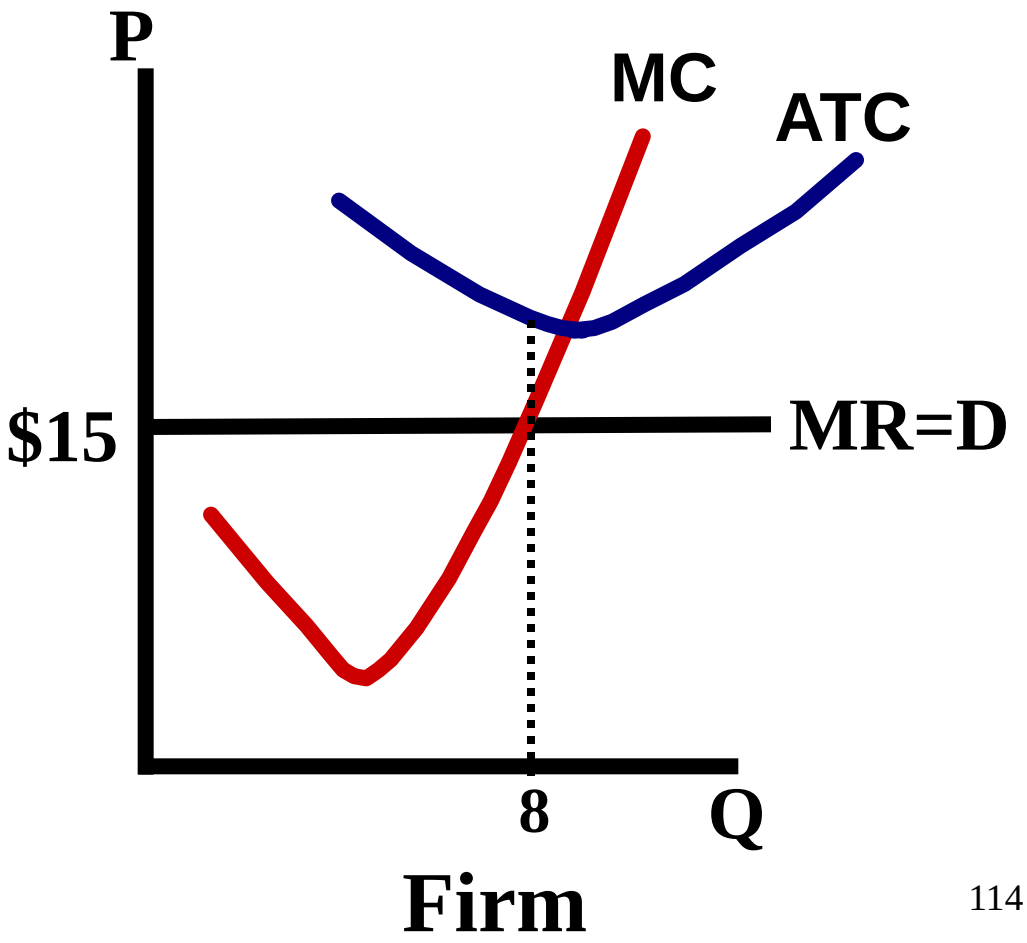




Firms leave to avoid losses so supply decreases in the industry

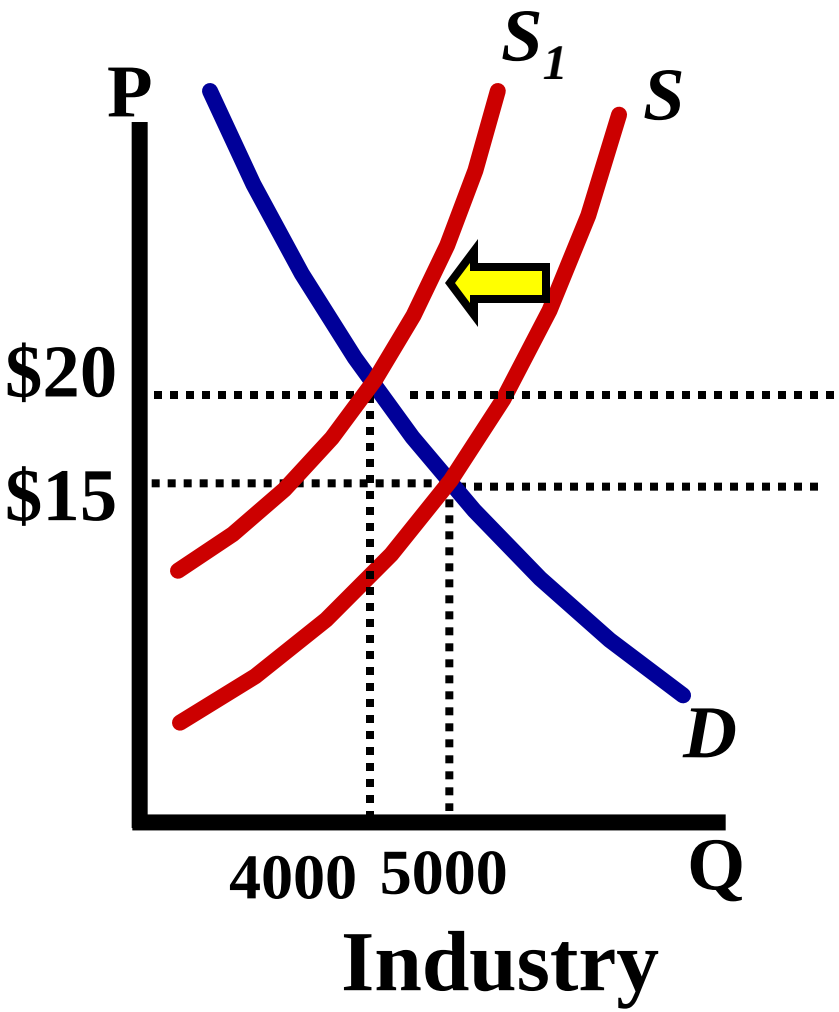
Price increases and quantity decreases

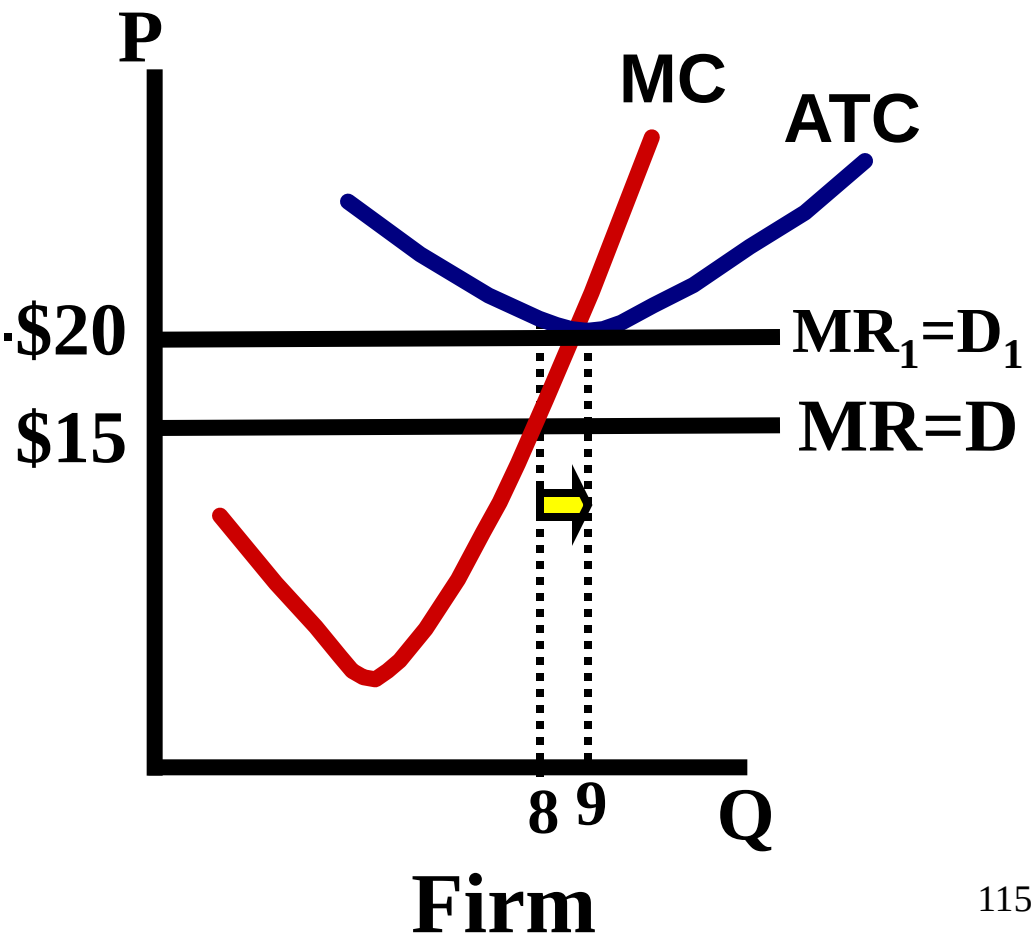




Price increase for the firm because they are price takers.

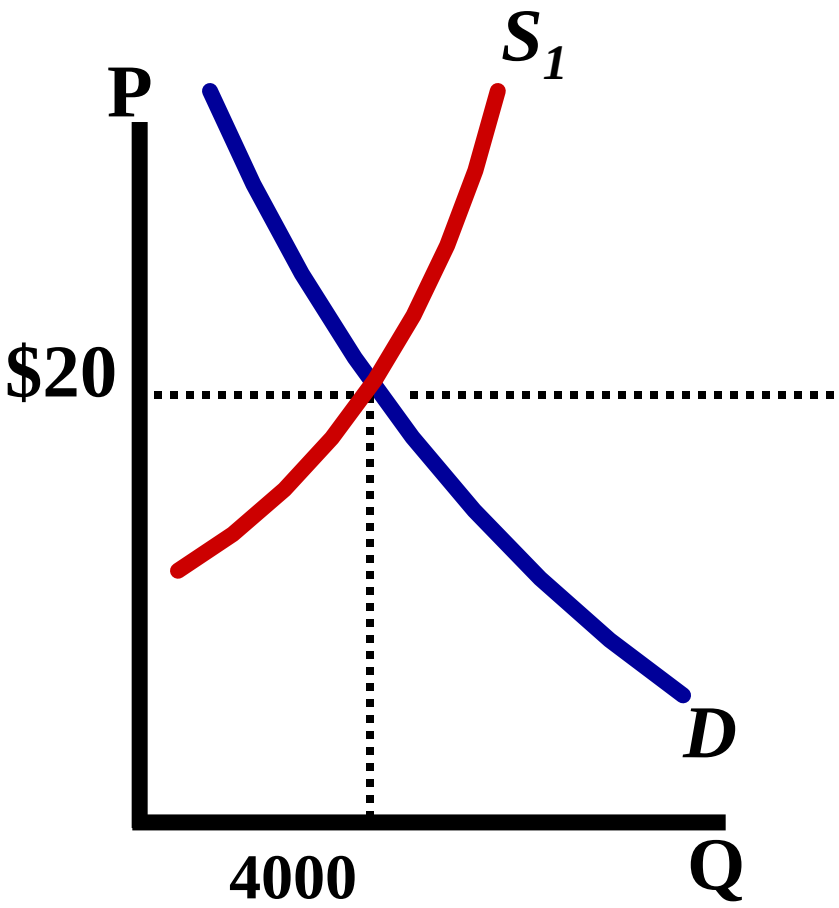
Price increases and quantity increases

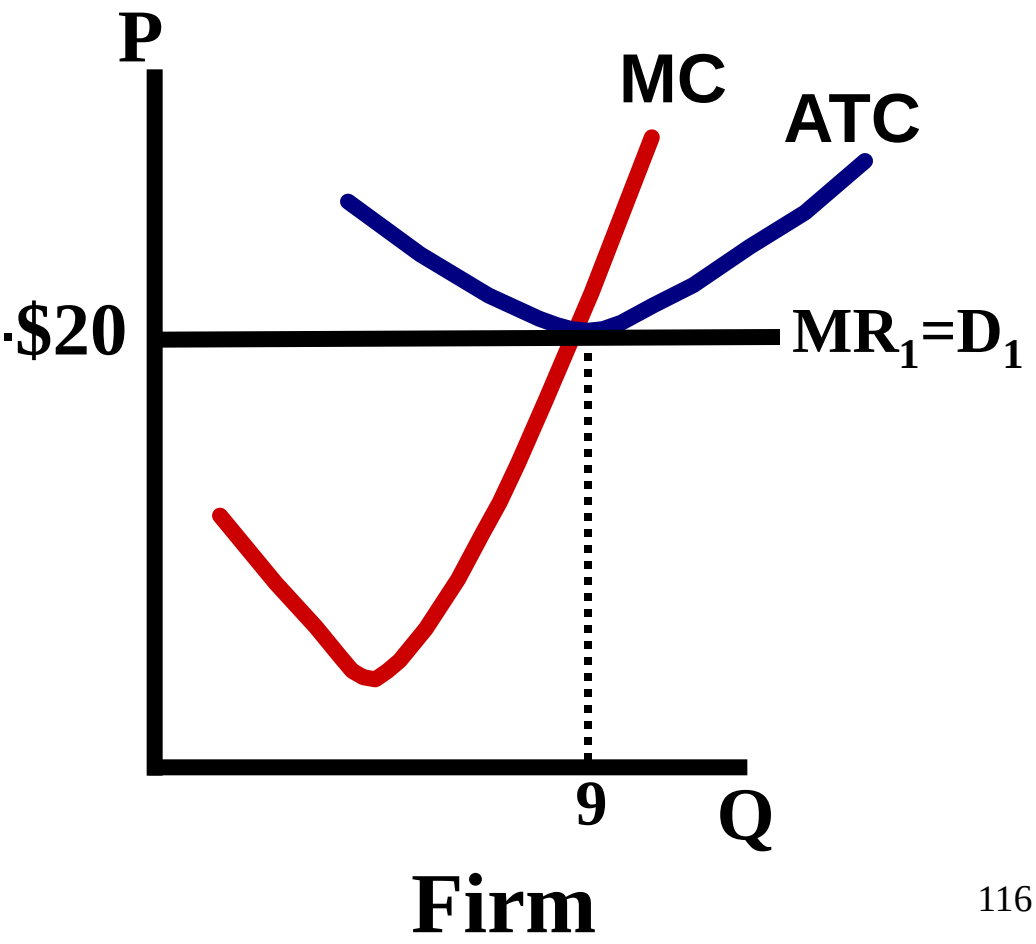




New Long Run Equilibrium at $20 Price

Zero Economic Profit

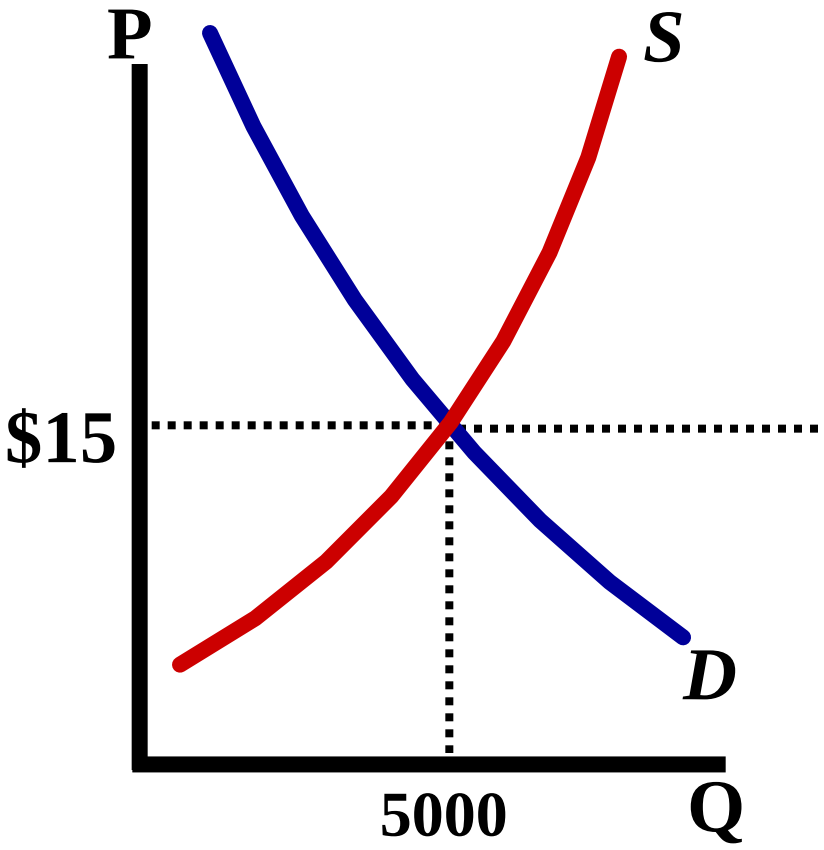




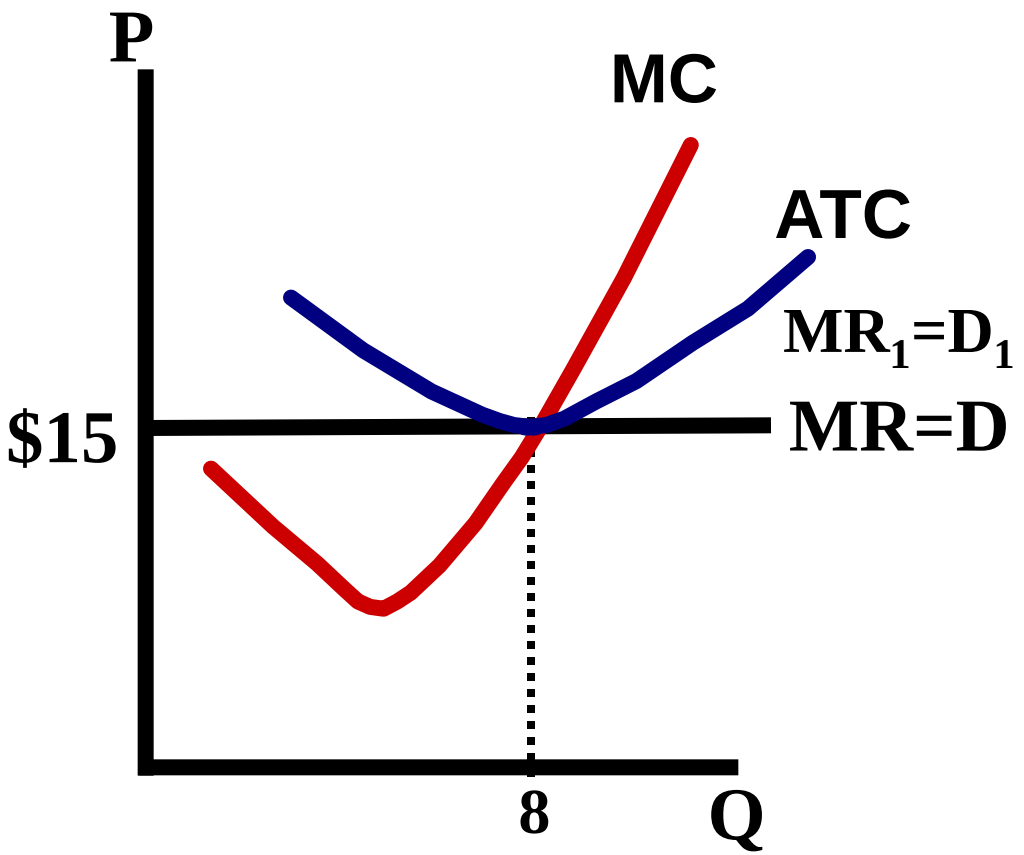
Going from Long-Run to Long-Run

Currently in Long-Run Equilibrium

If demand increases, what happens in the short-run and how does it return to the long run?



Industry

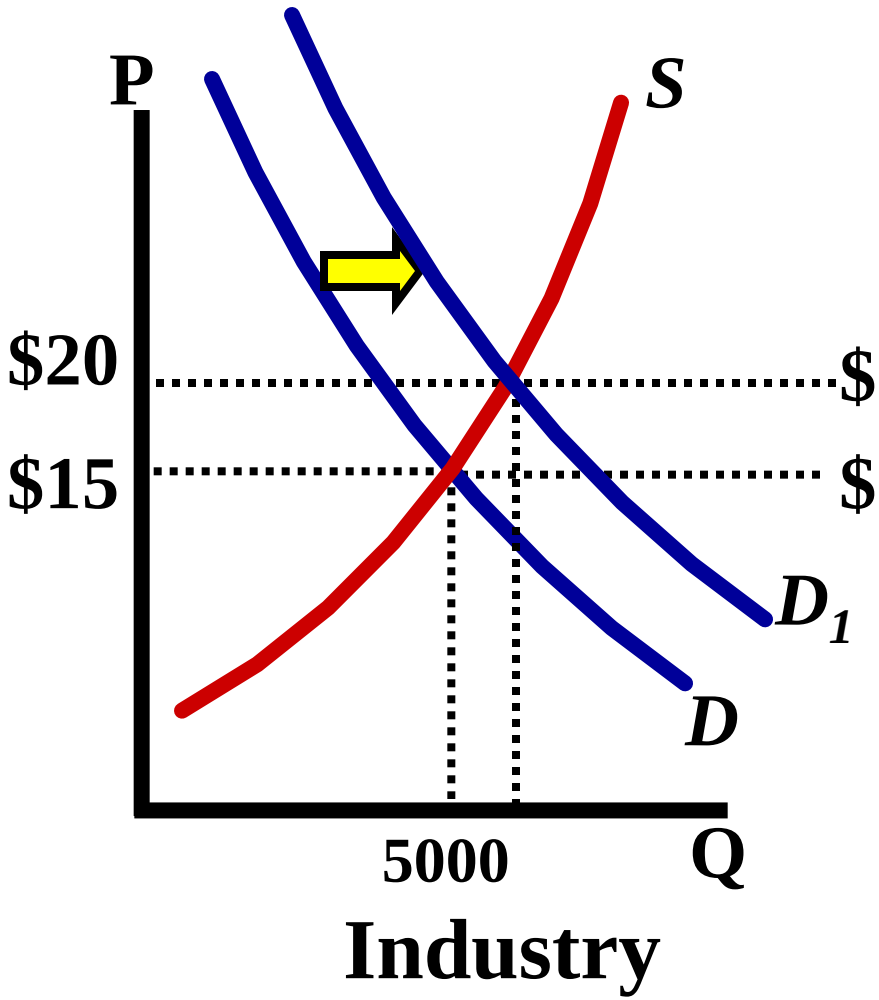


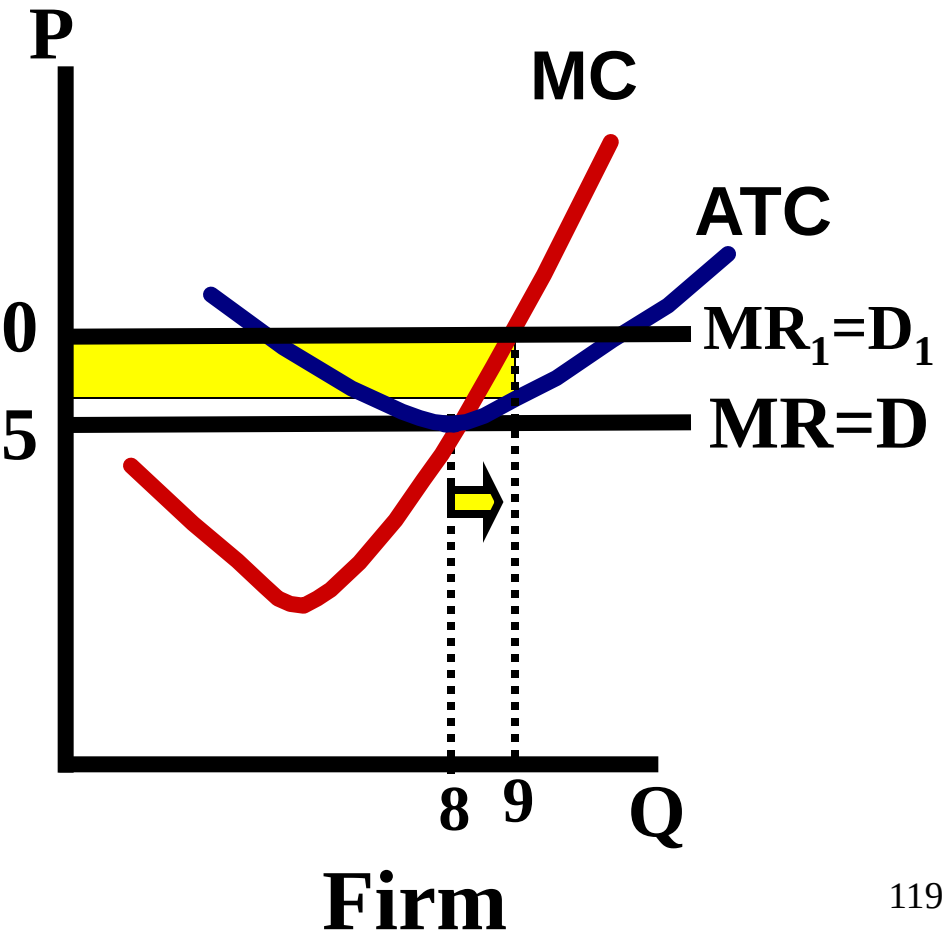
Firm

Demand Increases

The price increases and quantity increases

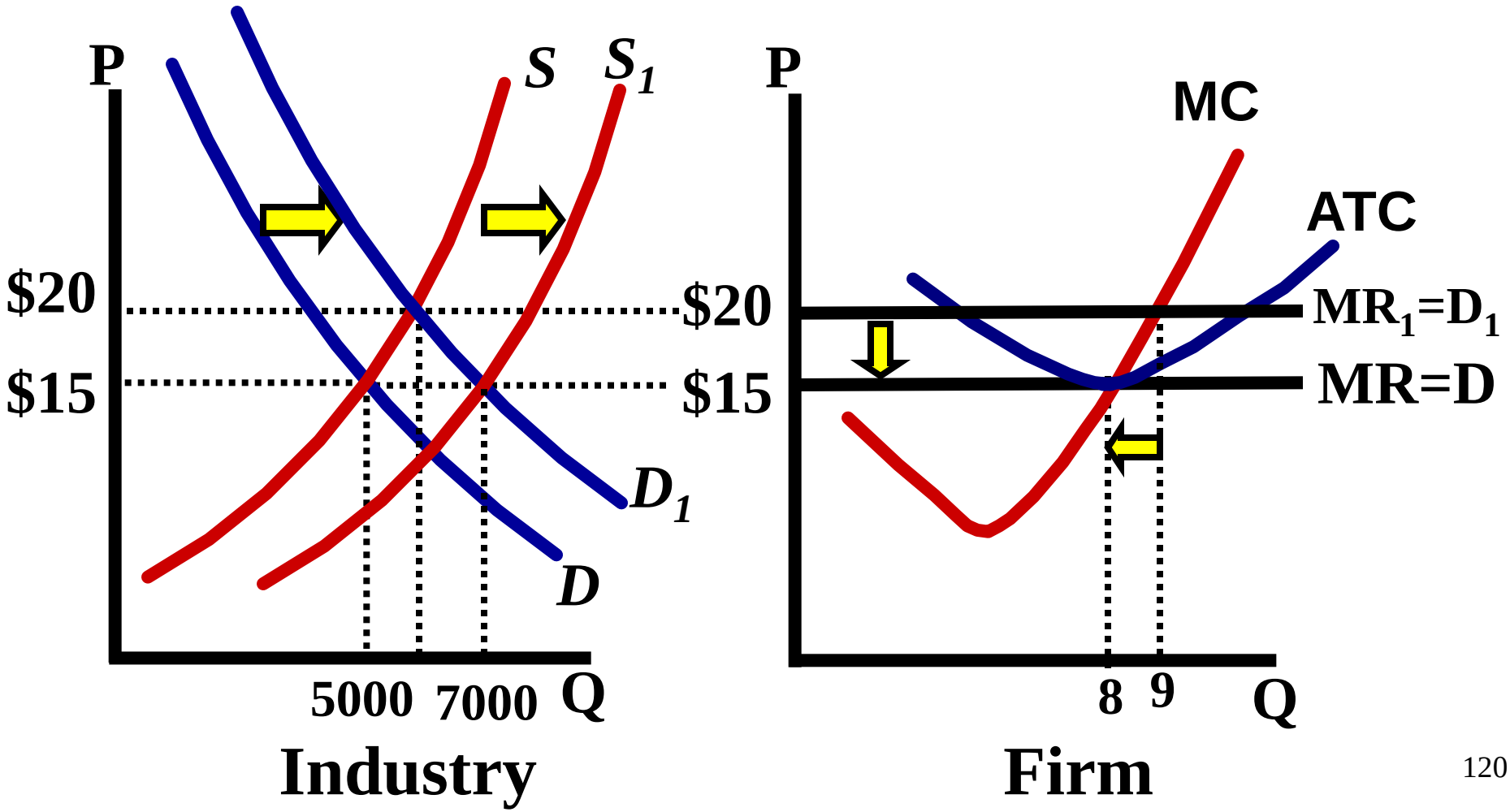
Profit is made in the short-run





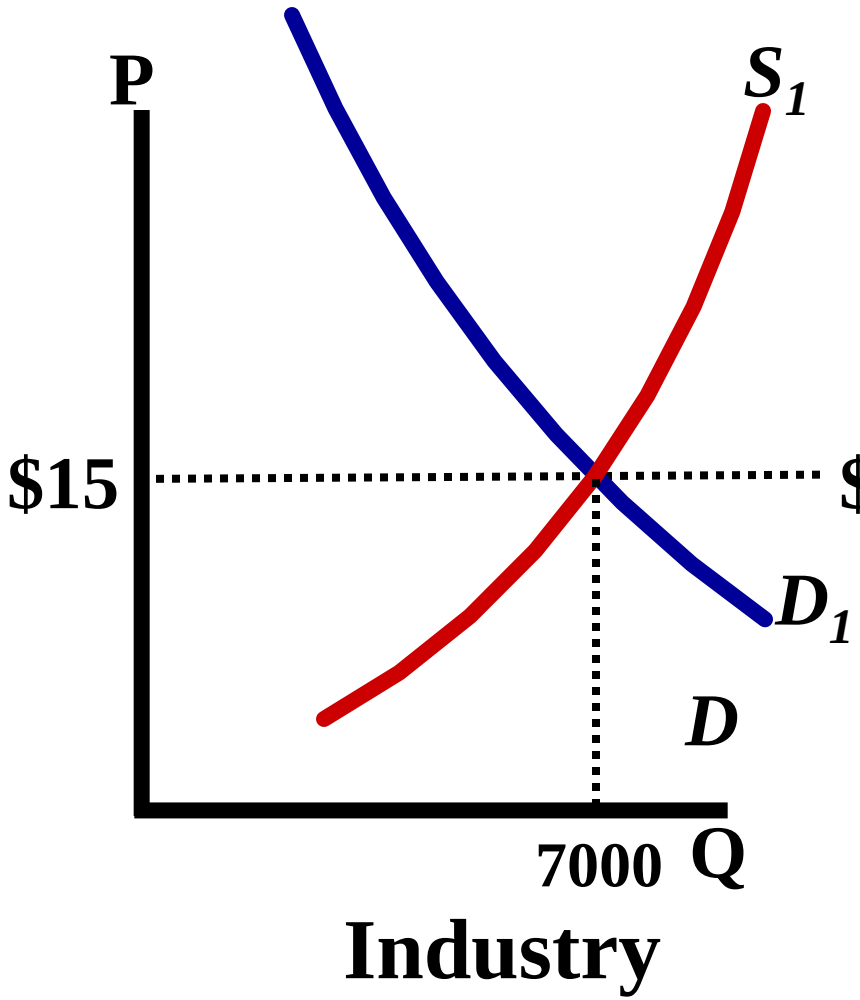
Firms enter to earn profit so supply increases in the industry

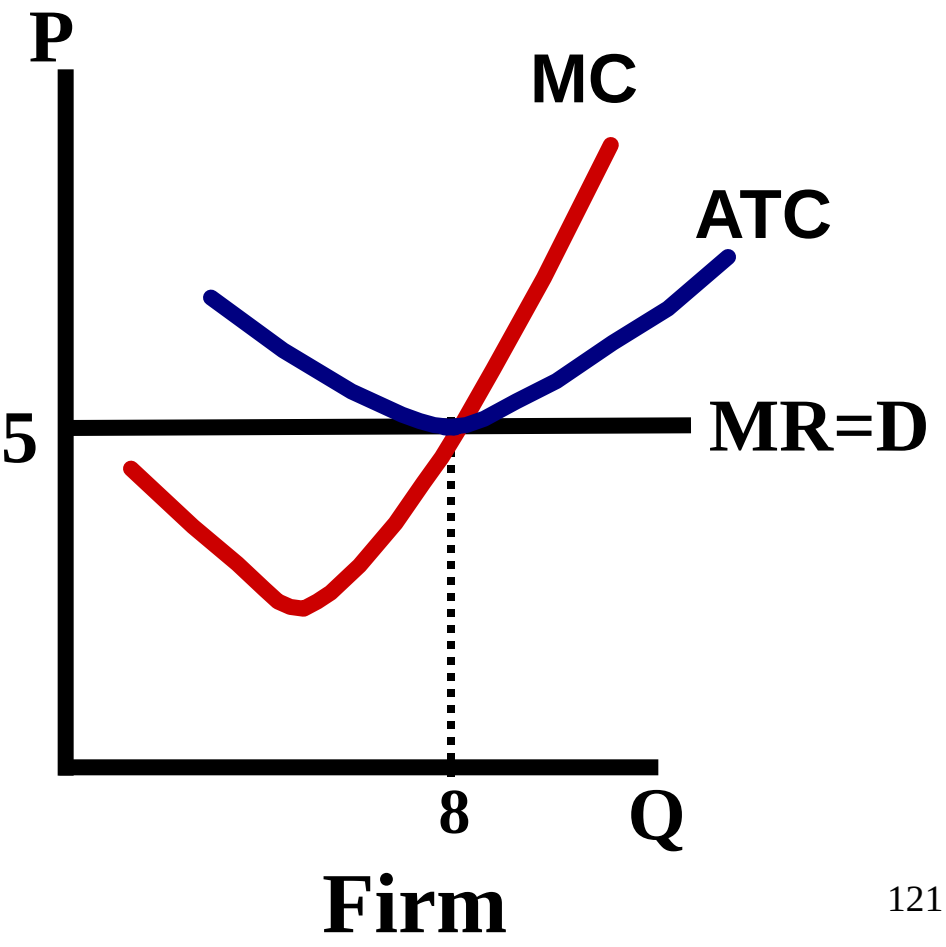
Price Returns to $15



Back to Long-Run Equilibrium

The only thing that changed from long-run to long-run is quantity in the industry





Efficiency

PURE COMPETITION AND EFFICIENCY

In general, efficiency is the optimal use of societies scarce resources

- **Perfect Competition forces producers to use limited resources to their fullest.**
- **Inefficient firms have higher costs and are the first to leave the industry.**
- **Perfectly competitive industries are extremely efficient**

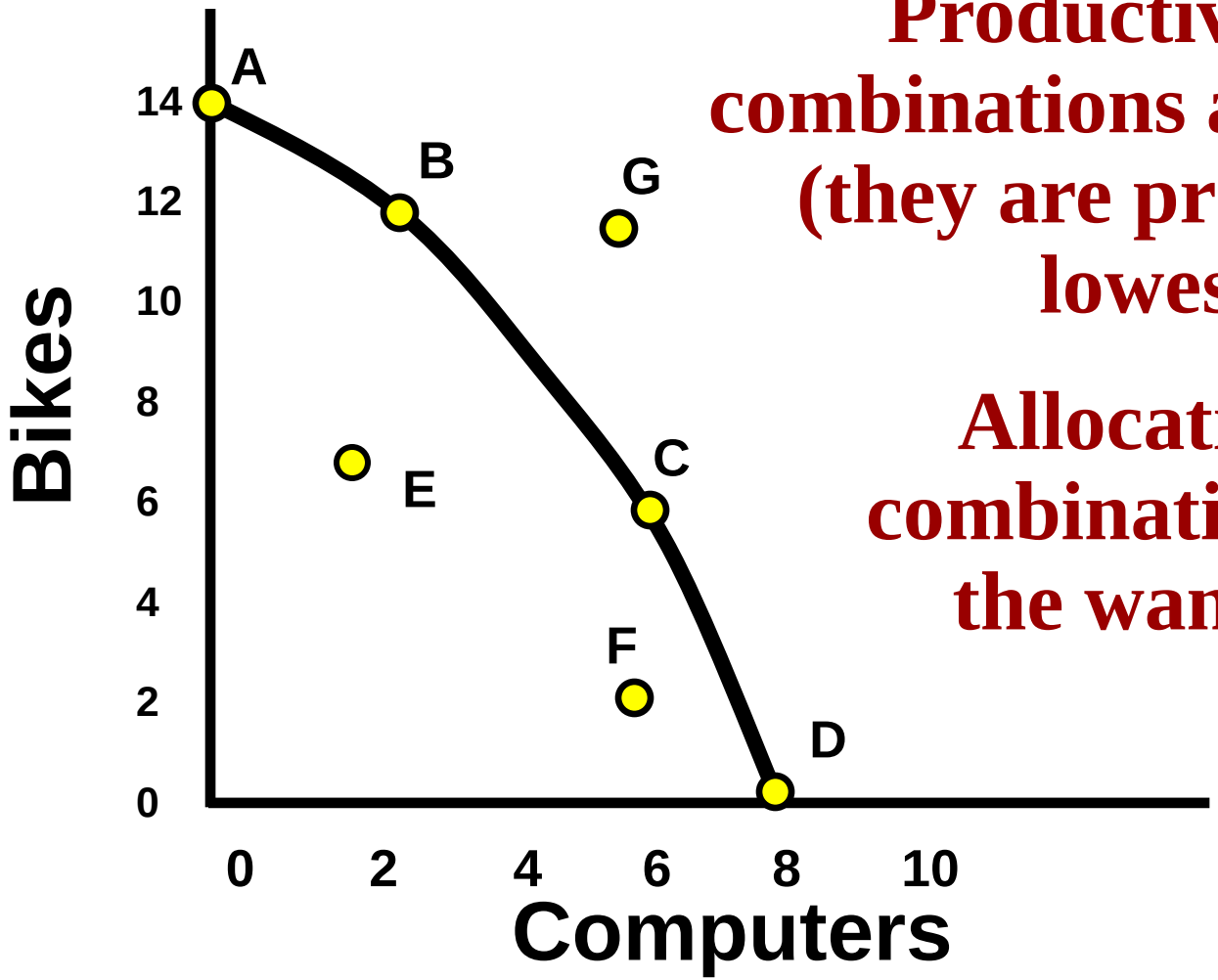
There are two kinds of efficiency:

1. Productive Efficiency

2. Allocative Efficiency

Efficiency Revisited

Which points are productively efficient?
Which are allocatively efficient?



Productive Efficient combinations are A through D (they are produced at the lowest cost)

Allocative Efficient combinations depend on the wants of society

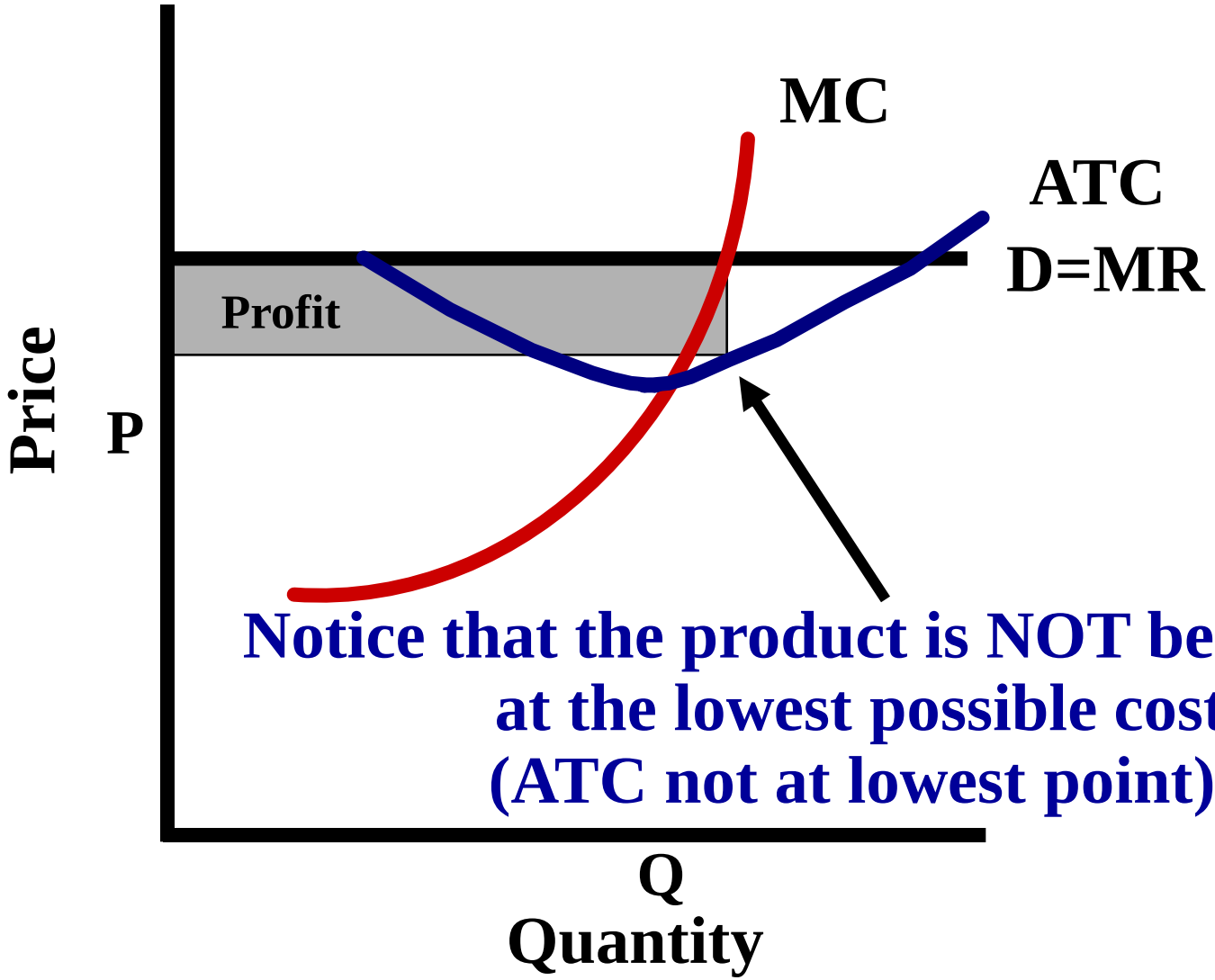
Productive Efficiency

The production of a good in a least costly way. (Minimum amount of resources are being used)

Graphically it is where…

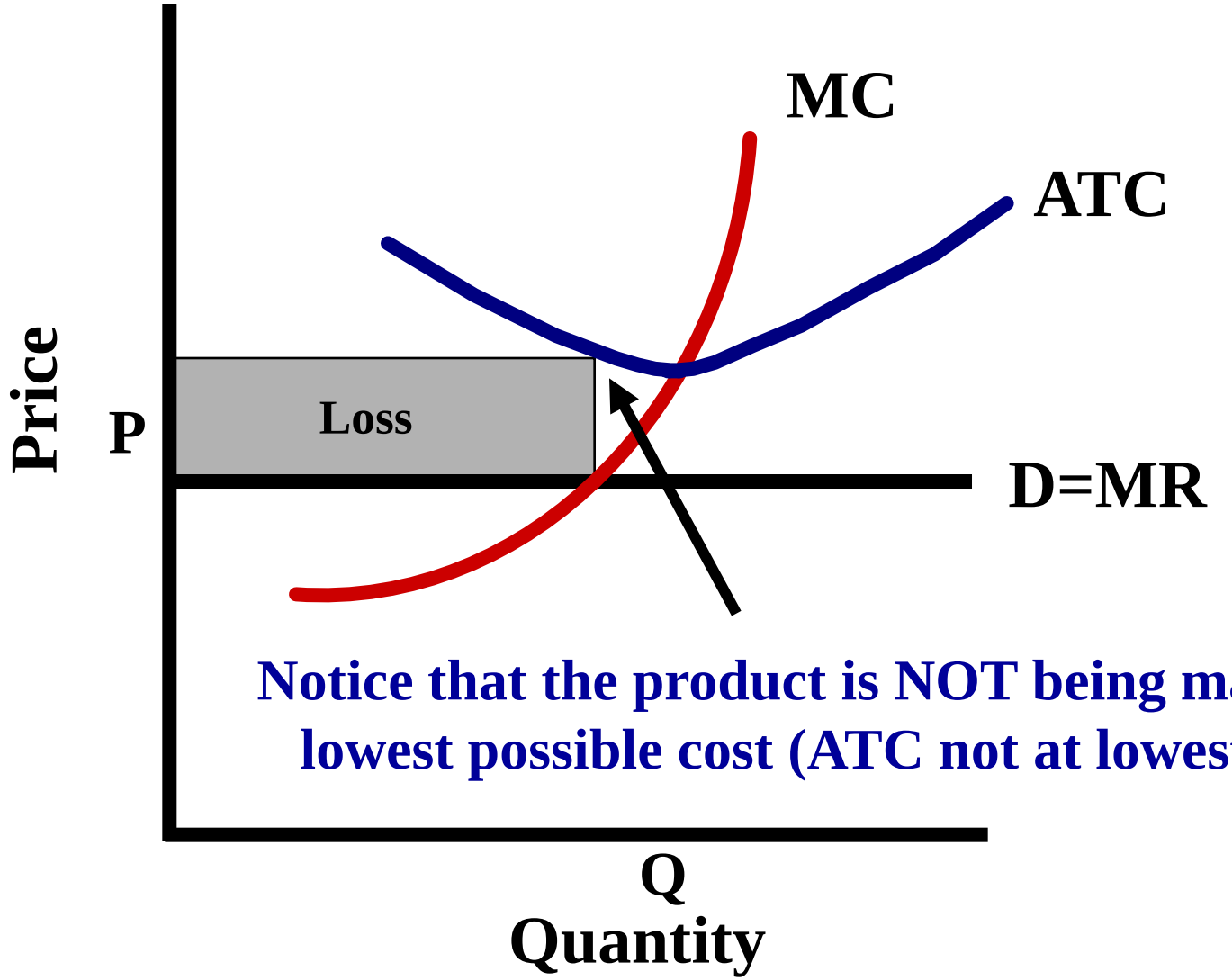
Price = Minimum ATC

Short-Run



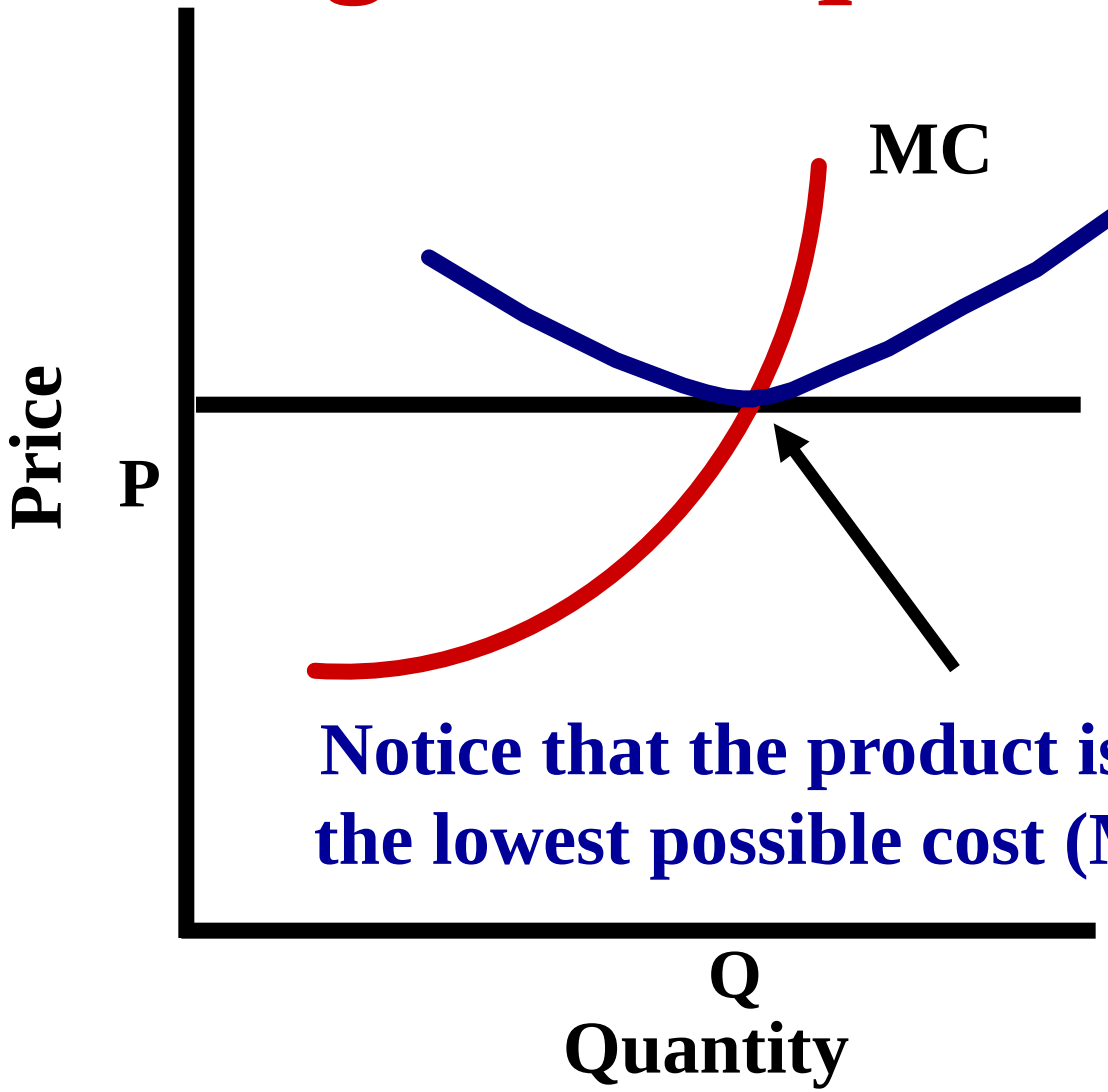
Notice that the product is NOT being made at the lowest possible cost (ATC not at lowest point).

Short-Run



Notice that the product is NOT being made at the lowest possible cost (ATC not at lowest point).

Long-Run Equilibrium



Notice that the product is being made at the lowest possible cost (Minimum ATC)

Allocative Efficiency

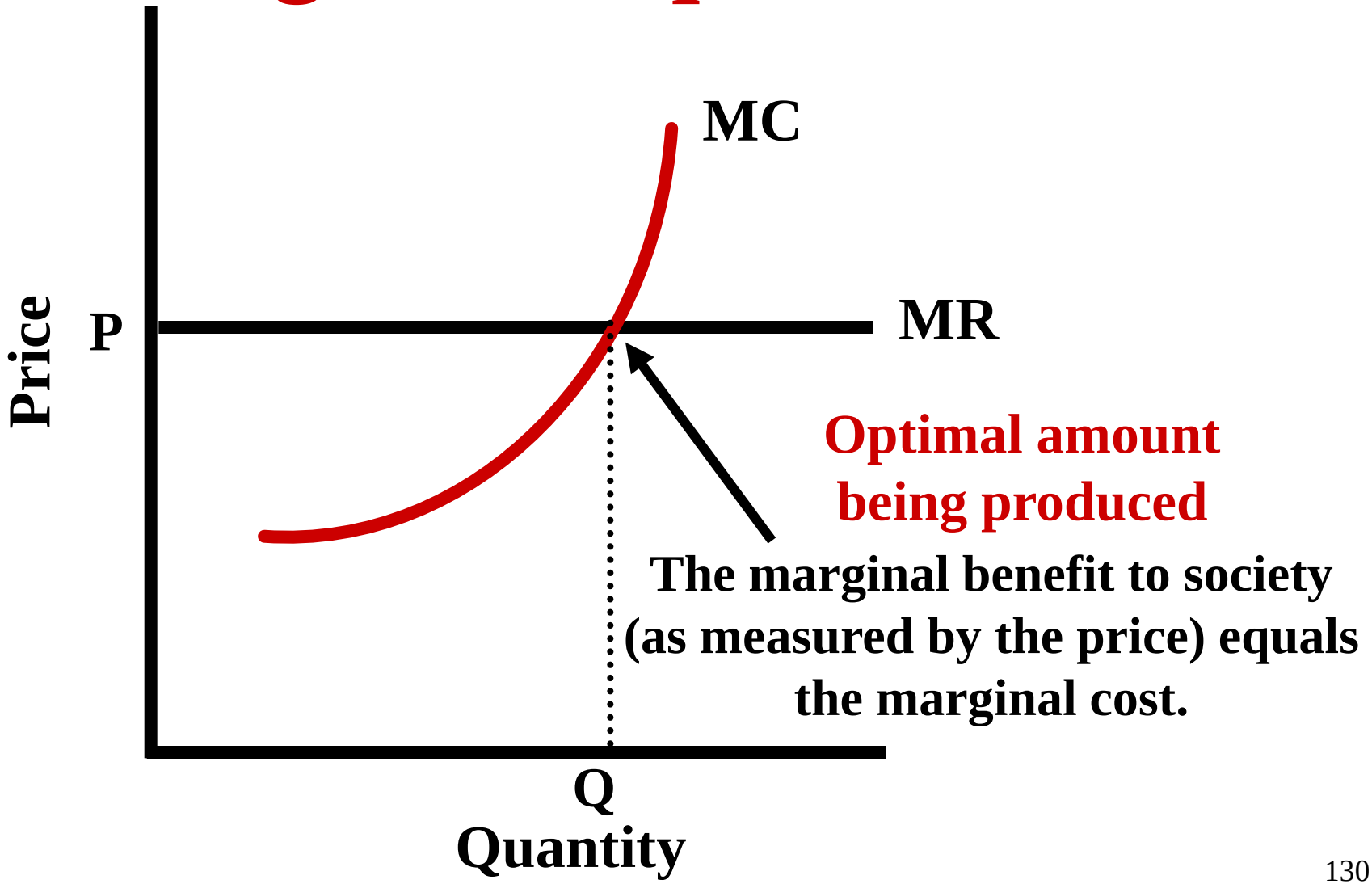
Producers are allocating resources to make the products most wanted by society.

Graphically it is where…

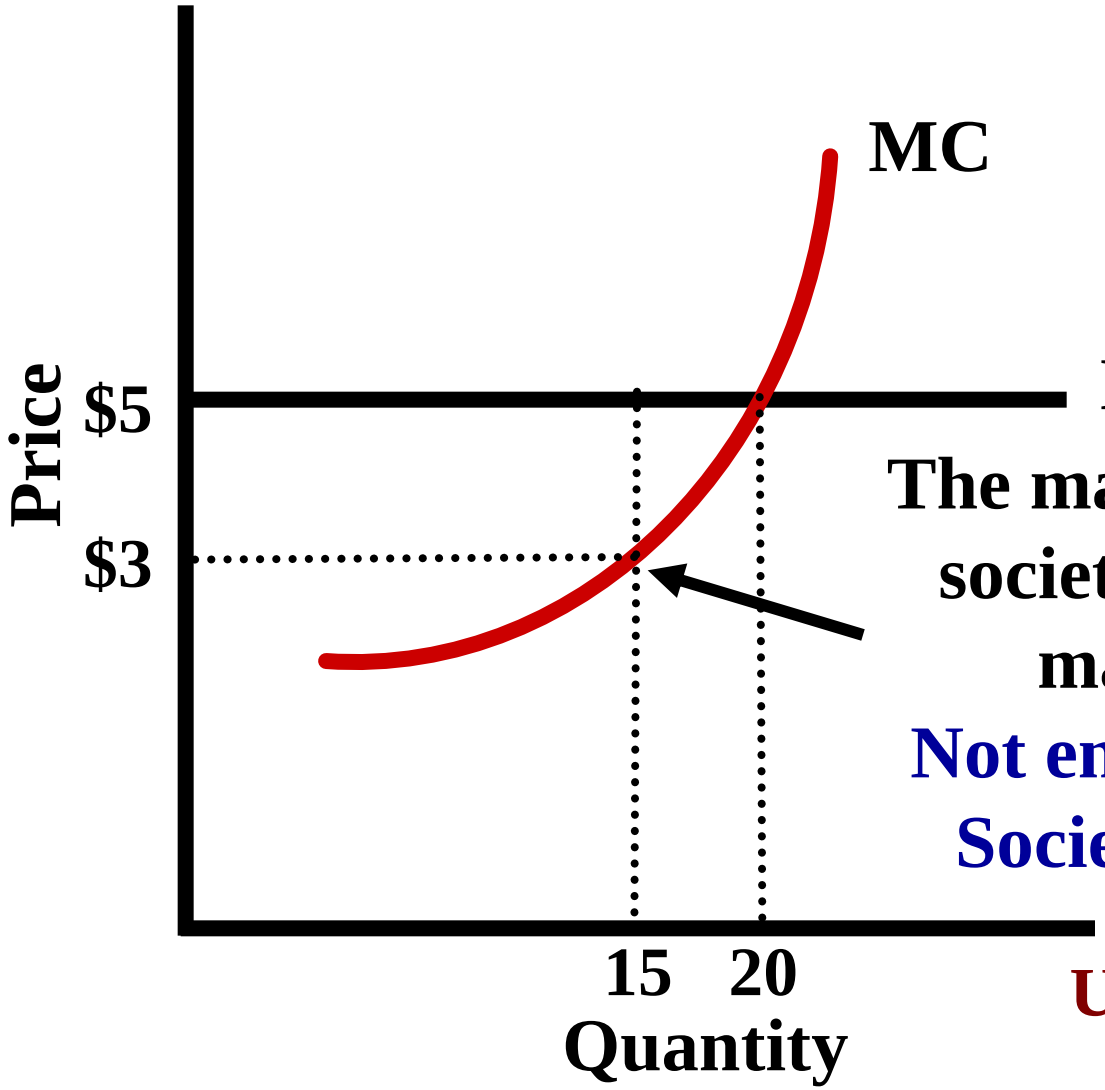
Price = MC

Why? Price represents the benefit people get from a product.

Long-Run Equilibrium



What if the firm makes 15 units?

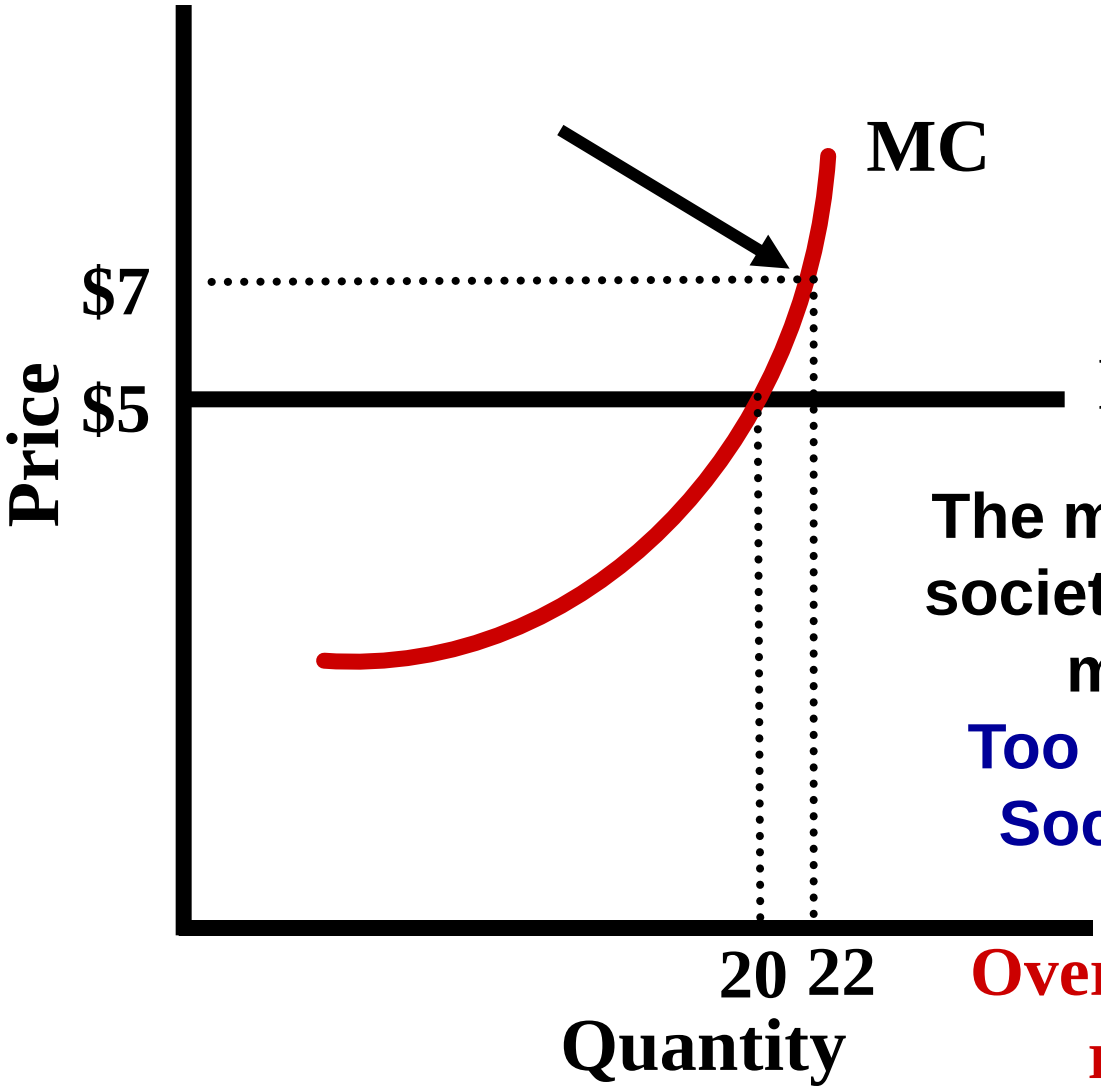


The marginal benefit to society is greater the marginal cost.

Not enough produced. Society wants more

Underallocation of resources

What if the firm makes 22 units?

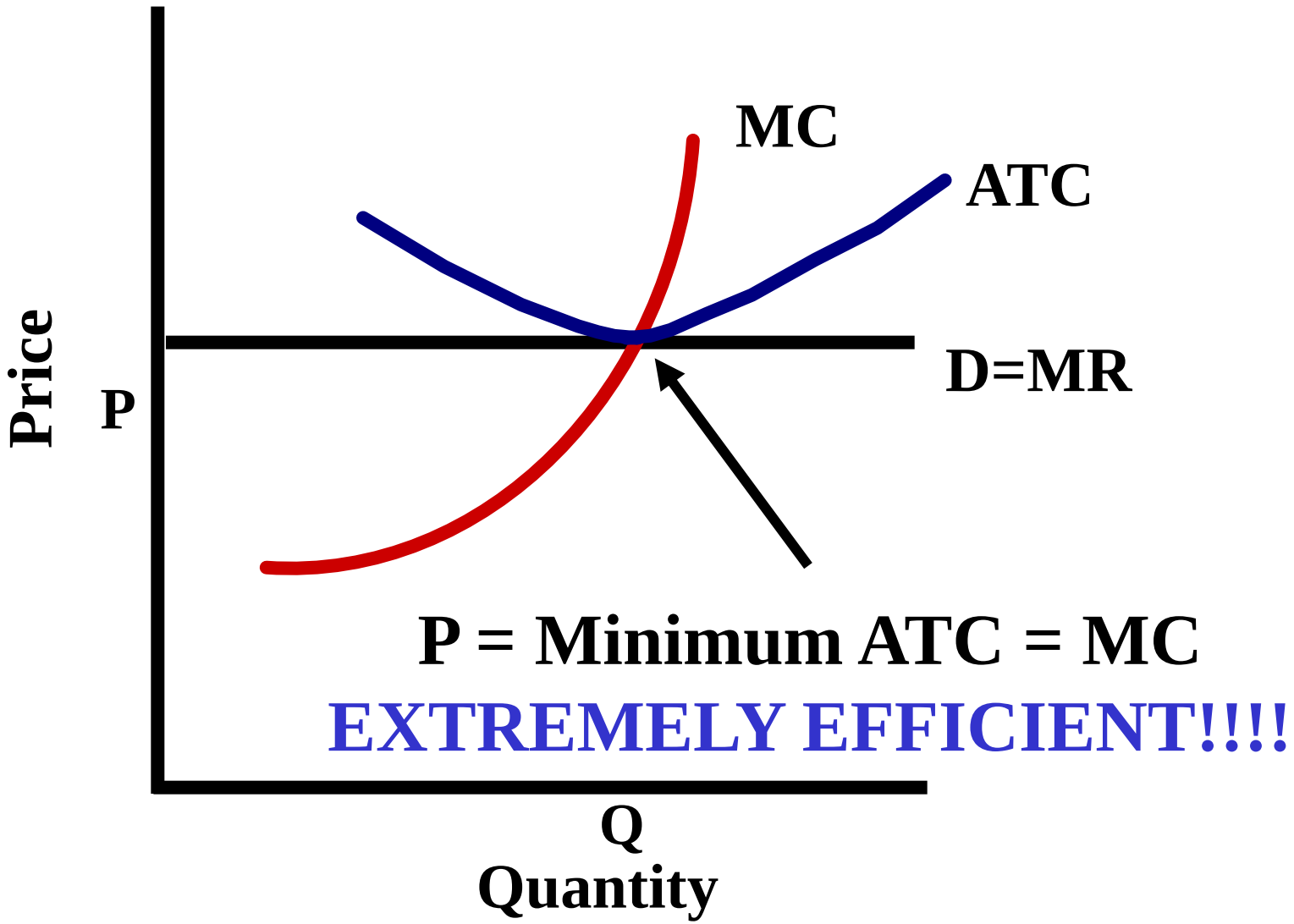


The marginal benefit to society is less than the marginal cost.

Too much Produced. Society wants less

Overallocation of resources

Long-Run Equilibrium



P = Minimum ATC = MC

EXTREMELY EFFICIENT!!!!