

# Chapter 12

## Perfect Competition and the Supply Curve

*Competitive* markets have many buyers and many producers selling the same good.



Rice

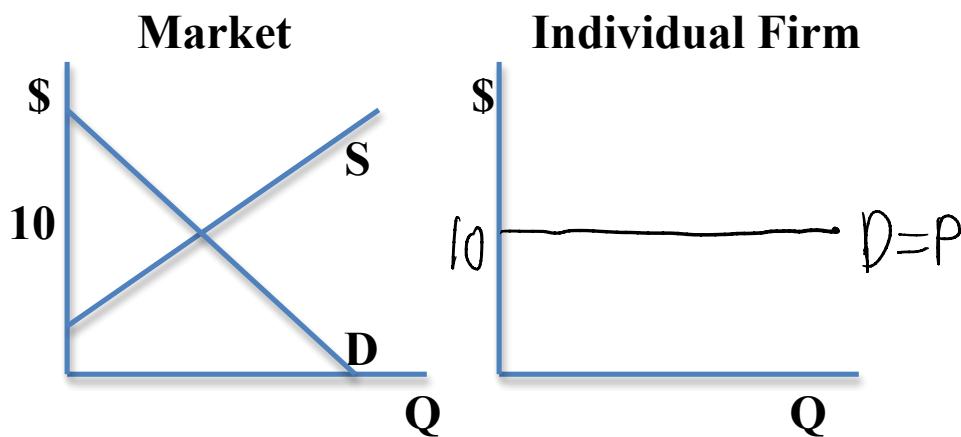
Wood

Fruit

Oil

Consumers know the same good is available from many different firms, so if one firm tries to increase the price of its good it will not be able to sell anything

Firms must take the market price as a given, so they are price takers. Consumers are also price-takers.

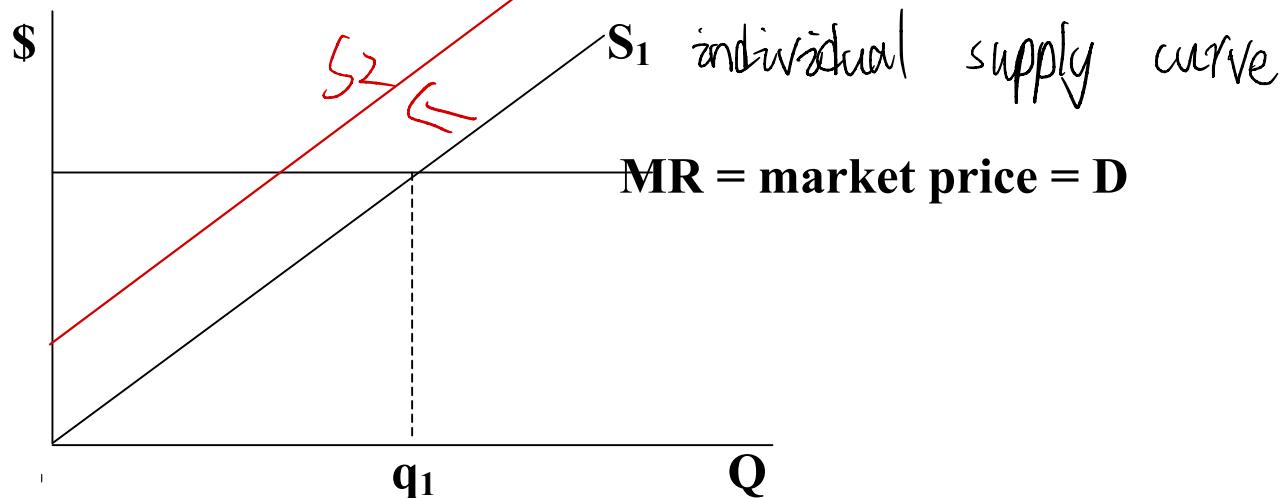


P	Q	TR	MR
10	5	50	
			10
10	6	60	
			10
10	7	70	
			10
10	8	80	
			10
10	9	90	

The individual firm would sell 0 units if they charge a price greater than \$10, so from the perspective of the individual firm demand is perfectly elastic at the market price

## The Perspective of an Individual Firm:

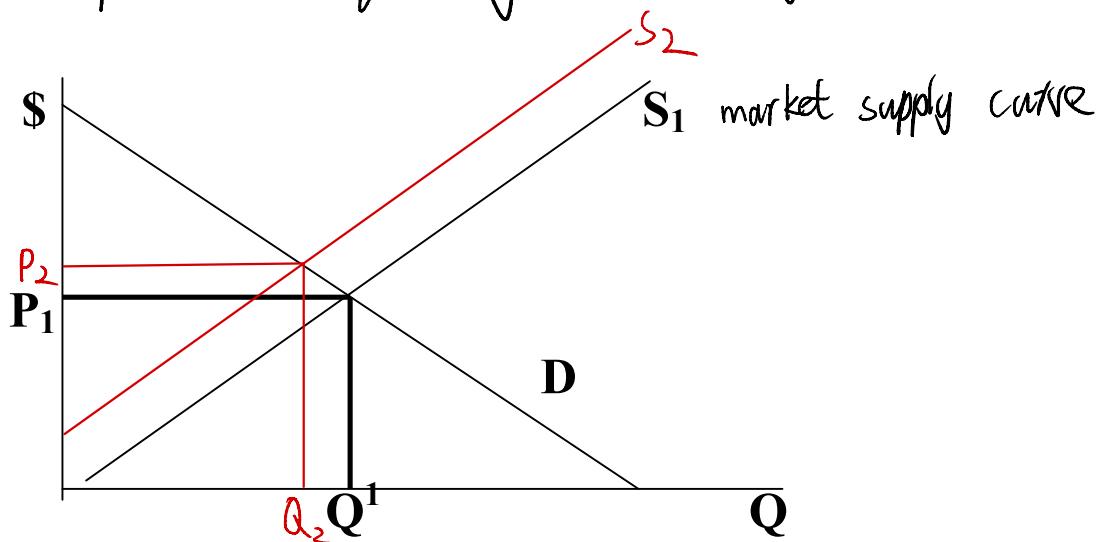
The demand curve that an individual firm faces is perfectly elastic at the market price.



When supply changes the individual firm's quantity changes, but the price does not change.

## The Market Perspective: all Producers and Consumers

The demand curve is downward sloping because when the supply of all the producers changes at once both the market price and quantity will change.



## Characteristics of a Perfectly Competitive Market

1. The good is a standardized product, or a commodity.
  - Consumers cannot differentiate between goods from different producers, so the goods are perfect substitutes.

E.g. Grains



- As long as consumers cannot tell the difference, consumers will not pay more for goods from one producer over another.

Perfectly competitive goods do not include goods that are **branded** because brands differentiate goods.

Louis Vuitton bags



Mercedez Benz cars

Branded products have different prices because consumers are willing to pay more for certain brands → not perfectly competitive markets.

**2. There are many producers and no one producer has a large market share.**

**E.g. Each wheat farmer produces less than 1% of total wheat production**



**\*\*Markets dominated by a few big producers are not perfectly competitive.**

**E.g. Kellogg's has 1/3 share of the cereal market.**



**3. The industry has free entry and exit: firms can easily close down or start-up**

- There are no obstacles, like government regulations or higher start-up or shut-down costs.**



**High start up costs = not a very competitive market**

- Producers cannot prevent entry of other producers into the industry.**

## Production and Profits

When firms are *price takers* they cannot choose an optimal price, but instead they choose an optimal quantity of output that will maximize their profits.

The profit maximizing output level is found using marginal analysis → the optimal amount of any activity is where  $MC = MB$ .

For producers, MB is the marginal revenue.

Firms can increase their profit when they produce one more unit only if  $MR > MC$  for that unit

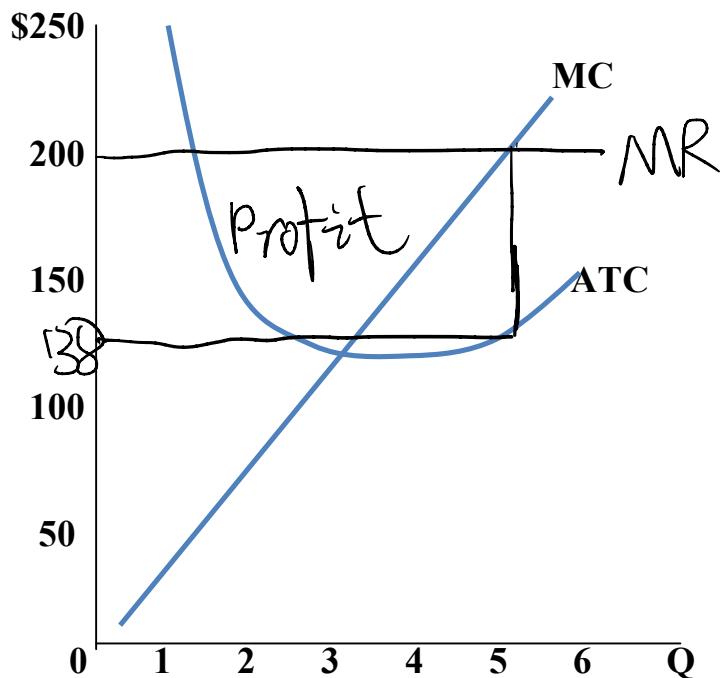


Optimal output rule = profit is maximized by producing the quantity where  $MR = MC$ , or the last unit for which  $MR > MC$ .

*The profit maximizing quantity is not where ATC is lowest!*

## Example: Ted's Tailored Suits

$Q$	$TR = P \times Q$	$TC$	Profits $= TR - TC$	$MR = \Delta TR / \Delta Q$	$MC = \Delta TC / \Delta Q$	$ATC$
0	0	240	-240			
1	200	250	-50	200	10	250
2	400	300	100	200	50	150
3	600	390	210	200	40	130
4	800	520	280	200	170	130
(5)	1000	690	310	200	210	138
6	1200	900	300			150



Optimal quantity is where  $MR = MC$ , or the last unit for which  $MR > MC$ .

At  $Q = 5$ :

$MR = \$200$

$MC = \$170$

## Exercise 1: Terry's Toy Trucks

First calculate the marginal cost:

Q	TC	MC
0	50	
1	80	30
2	105	25
3	125	20
4	150	25
5	180	30
6	215	35
7	255	40
8	300	45
9	350	50
10	405	55

If  $P = 25$  what is the optimal quantity of trucks?  $Q=4$

If  $P = 40$  what is the optimal quantity of trucks?  $Q=7$

If  $P = 50$  what is the optimal quantity of trucks?  $Q=9$

## Profitability

Production will be profitable as long as the market price is more than a firm's minimum SRATC

$$\text{Profit} = TR - TC$$

$$\frac{\text{Profit}}{Q} = \frac{TR}{Q} - \frac{TC}{Q}$$

$$\frac{\text{Profit}}{Q} = P - SRATC$$

$$\text{Profit} = (P - SRATC)Q$$

If  $P > SRATC$  the firm earns a profit

If  $P = SRATC$  the firm breaks even

If  $P < SRATC$  the firm incurs a loss

## Example:

Q	TC	MC	ATC
0	240		-
		10	
1	250		250
		50	
2	300		150
		90	
3	390		130
		130	
4	520		130
		170	
5	690		138
		210	
6	900		150

If  $P = \$200 \rightarrow Q = 5$

$$\text{Profit} = (200 - \frac{690}{5})5 \\ = \$320$$

If  $P = \$100 \rightarrow Q = 3$

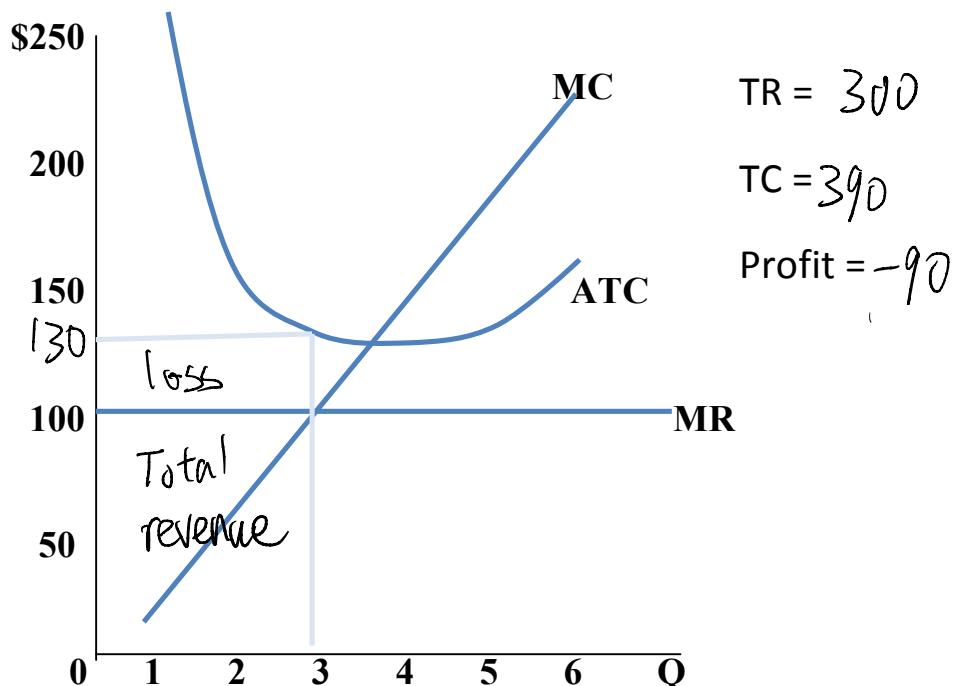
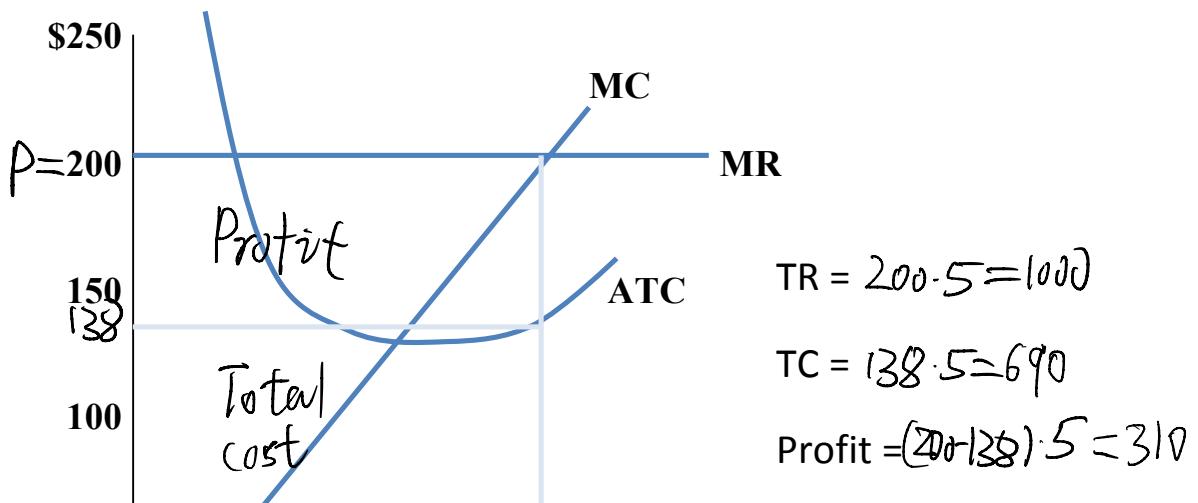
$$\text{Profit} = (100 - \frac{240}{3})3 \\ = -\$90$$

Why continue producing with a loss?

If  $Q = 0$  Profit =  $-\$240$

So  $Q = 3$  minimizes the loss

## Graphically:



To calculate the profit: First identify the quantity (where  $P = MC$  as long as  $P \geq$  shut down price); second identify the average total cost; and third calculate profit as  $\text{Profit} = (P - ATC)(Q)$ .

## Exercise 2: Terry's Toy Trucks

First calculate the average total cost:

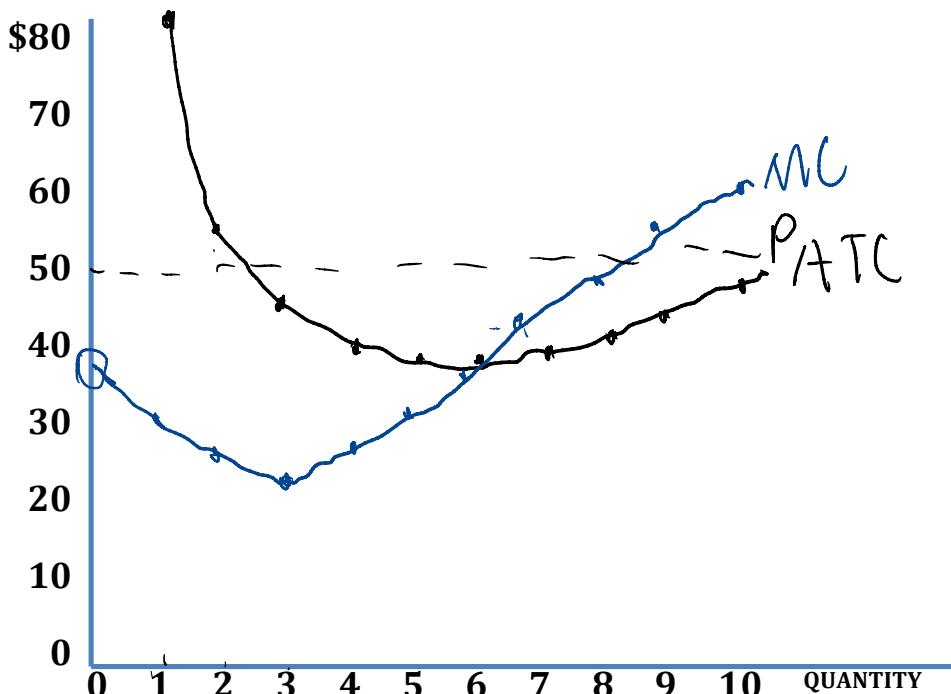
Q	TC	MC	ATC
0	50		
1	80	30	80
2	105	25	52.5
3	125	20	41.67
4	150	25	37.5
5	180	30	36
6	215	35	35.83
7	255	40	36.43
8	300	45	37.5
9	350	50	38.89
10	405	55	40.5

$$MC \geq \frac{\Delta TC}{\Delta Q} = TC'$$

$$ATC = \frac{TC}{Q}$$

break even price

Graph the ATC and MC curves.



If  $P = 50$  calculate the profit and show on the graph.

$$\text{Profit} = (50 - 38.9)(9) = \$100 \quad \text{OR} \quad \text{Profit} = (50)(9) - 350 = \$100$$

The break-even price is where  $P=MC=ATC \rightarrow$  the minimum point of the SRATC.

<b>Q</b>	<b>TC</b>	<b>MC</b>	<b>ATC</b>
<b>0</b>	<b>240</b>		-
		<b>10</b>	
<b>1</b>	<b>250</b>		<b>250</b>
		<b>50</b>	
<b>2</b>	<b>300</b>		<b>150</b>
		<b>90</b>	
<b>3</b>	<b>390</b>		<b>130</b>
		<b>130</b>	
<b>4</b>	<b>520</b>		<b>130</b>
		<b>170</b>	
<b>5</b>	<b>690</b>		<b>138</b>
		<b>210</b>	
<b>6</b>	<b>900</b>		<b>150</b>

Above this price they will earn a profit.  
Below this price they will have a loss.

### Ted's Tailored Suits:

Break-even price = \$130

If  $P = \$130$  then  $Q = 4$  and  
 $\text{Profit} = (130 - 130) \cdot 4 = \$0$

### A Firm's Shut Down Decision

Fixed costs are *sunk costs* in the short run, so they should not factor into decisions about production in the short run.

But variable costs *need to be paid* or a firm cannot get any variable inputs.

$TR \geq \text{Total Variable Costs}$

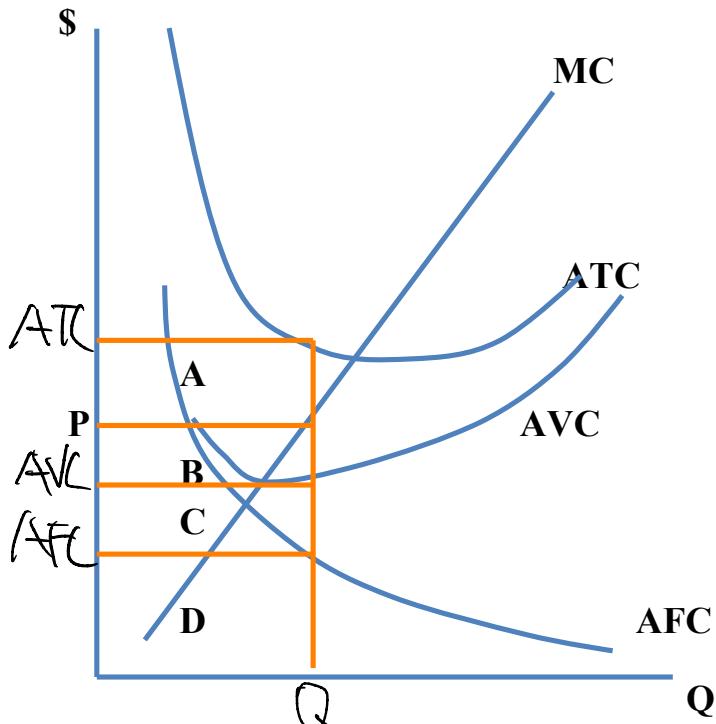
$$P \cdot Q \geq AVC \cdot Q$$

$$P \geq AVC$$

As long as  $P \geq \text{minimum ATC}$  the firm should continue production. If  $P > \text{minimum AVC}$  they will be able to pay the VC and some of the FC.



Not likely!!

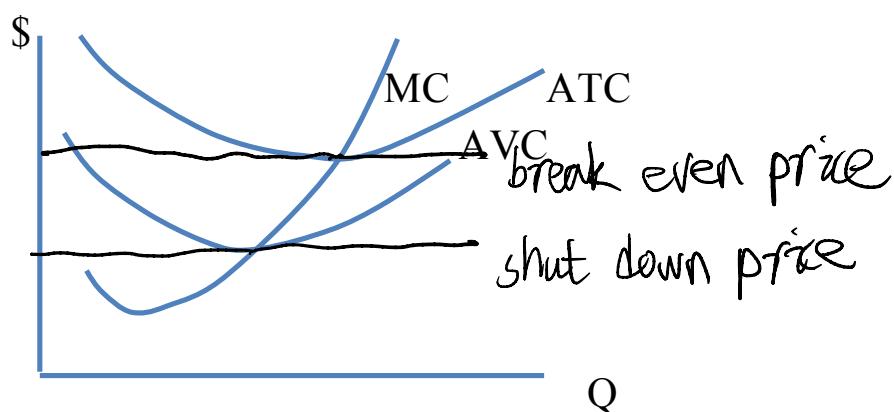


$$\begin{aligned}
 \text{Total revenue} &= P \times Q \\
 \text{Total Cost} &= ATC \times Q \\
 \text{Profit} &= P \times Q - ATC \times Q \\
 \text{TVC} &= AVC \times Q \\
 \text{TFC} &= AFC \times Q
 \end{aligned}$$

The firm should continue producing because their revenue will pay for TVC and part of TFC.

If  $P <$  minimum AVC, the firm should shut down or stop production

The *shut down price* is the minimum AVC.



### Exercise 3: Terry's Toy Trucks

Fill in the columns:

Q	FC	VC	TC	MC	AVC	ATC
0	50	0	50			
1	50	30	80	30	30	80.0
2	50	55	105	25	27.5	52.5
3	50	75	125	20	25	41.7
4	50	100	150	25	25	37.5
5	50	130	180	30	26	36.0
6	50	165	215	35	27.5	35.8
7	50	205	255	40	29.3	36.4
8	50	250	300	45	31.3	37.5
9	50	300	350	50	33.3	38.9
10	50	355	405	55	35.5	40.5

What is Terry's shut down price?

\$25

If P = 20 how many trucks will Terry produce? What will his profit be?

0, -50

If P = 30 how many trucks will Terry produce? What will his profit be?

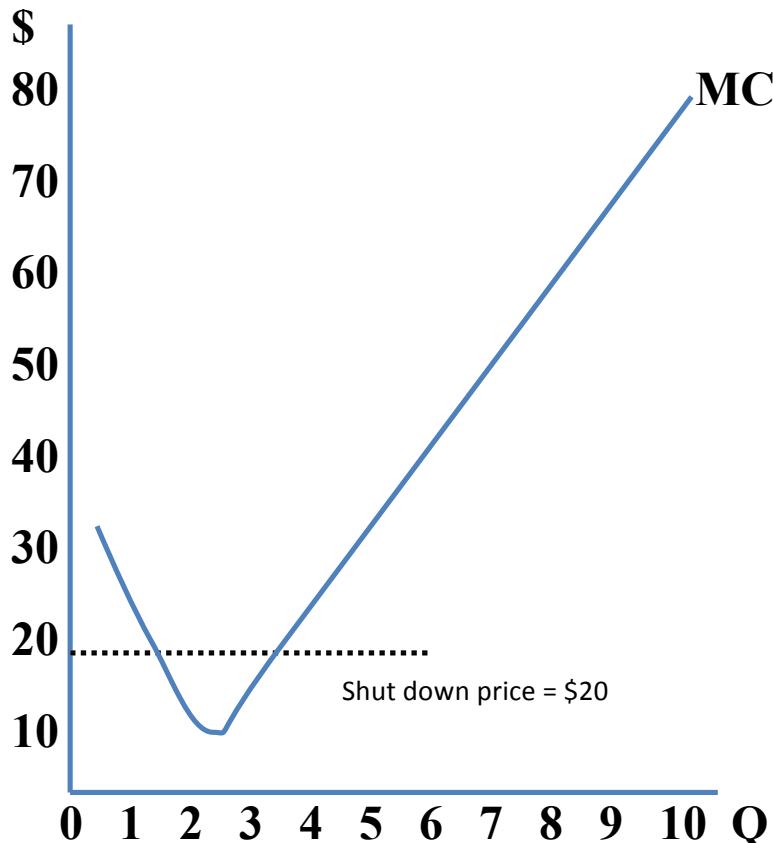
5, -\$6.5 = -\$30

## Short-run Individual Supply Curve

The short run supply curve shows the relationship between the market price and an individual producer's profit-maximizing quantity of output, taking fixed costs as given.

Firms won't produce anything unless  $P \geq \min \text{AVC}$

If  $P \geq \min \text{AVC}$  then the firm will supply the quantity where  $P = MC$ .



Q	MC	AVC
0		
	30	
1		30
	20	
2		25
	10	
3		20
	20	
(4)		20
	30	
5		22
	40	
6		25
	50	
7		28.6
	60	
8		32.5
	70	
9		36.7
	80	
10		41

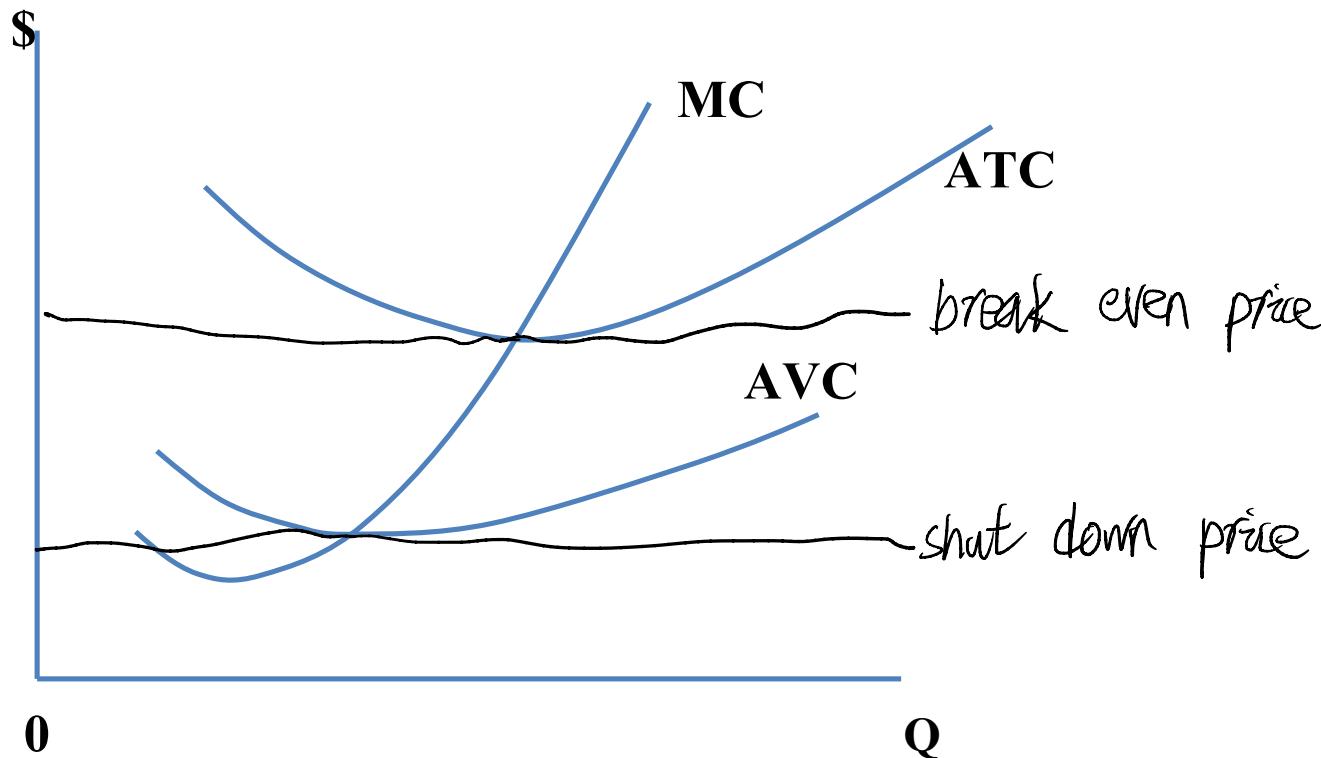
E.g. If  $P = \$18$   $Q_s = 0$

If  $P = \$25$   $Q_s = 4$

If  $P = \$40$   $Q_s = 6$

If  $P = \$60$   $Q_s = 8$

## Individual Firm's Supply Curve

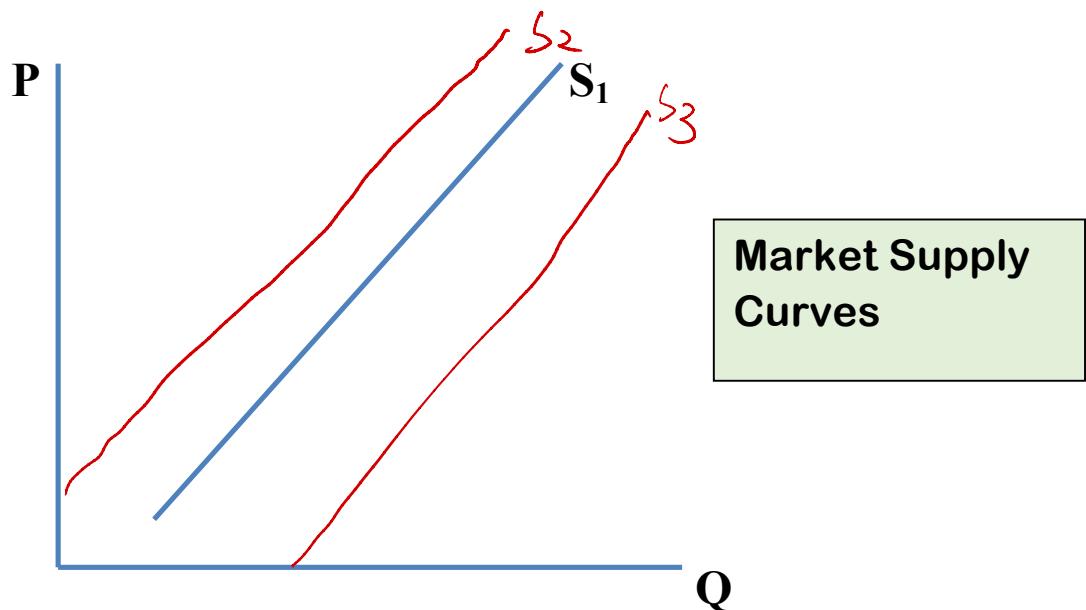


Quantity supplied = 0 when  $P <$  shut down price.

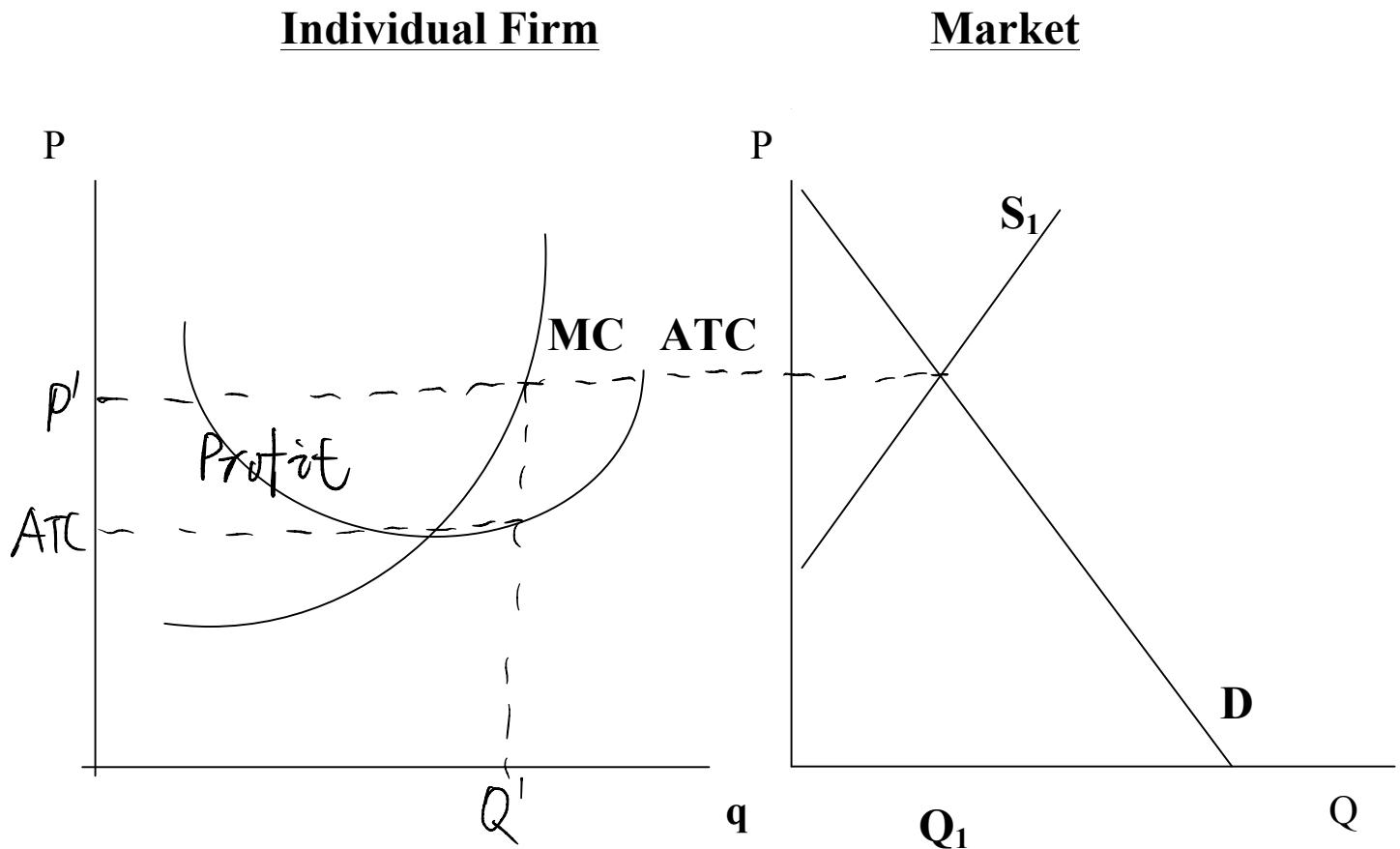
Quantity supplied = quantity where  $P \geq MC$   
when  $P \geq$  shut down price

## Long Run

- Firms can change their fixed costs (fixed inputs).
- If  $P < \min \text{ATC}$  (break-even price) the firm  
can sell off fixed inputs and go out of business.
- If  $P > \min \text{ATC}$  (break-even price) new firms  
can acquire fixed inputs and start a business.
- In the short run the number of producers is fixed.
- But in the long run firms can enter or exit the market.
- Firms will enter the market if profits are being made  
→ supply shifts right.
- Firms will exit the market if there are losses  
→ supply shifts left.



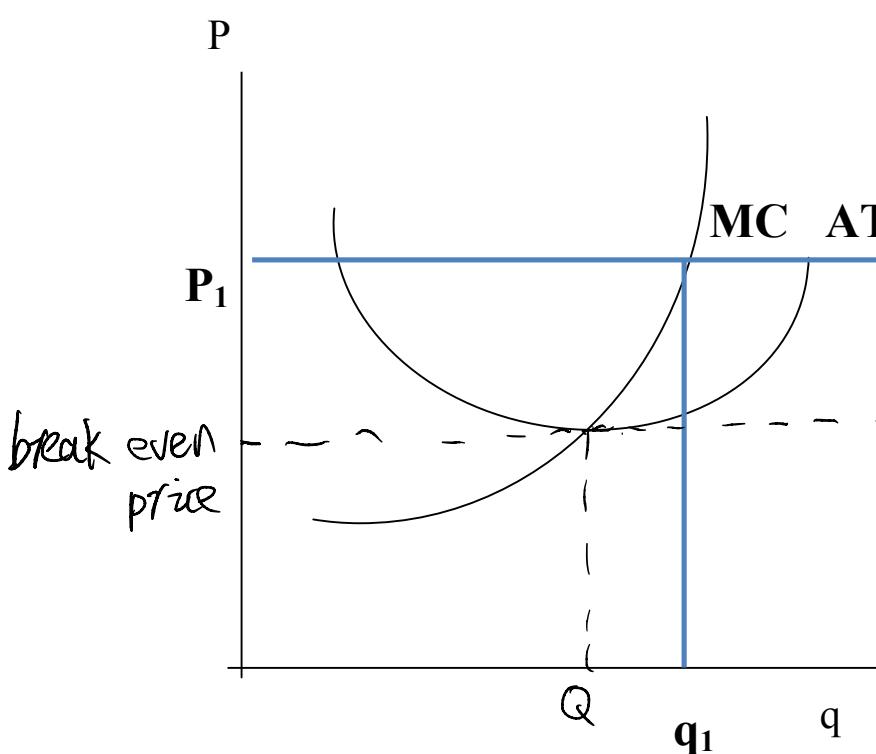
## Example: Market Price > Breakeven Price



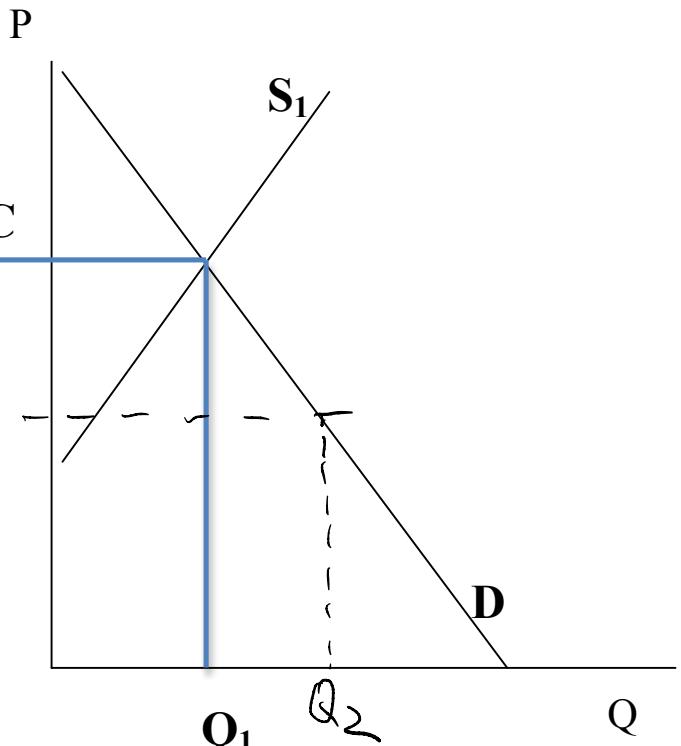
At  $P^1$  there are economic profits

- New firms will enter the market
- The market supply curve shifts to the right
- The market price will decrease
- Each producer will produce less.

## Individual Firm



## Market



The equilibrium market price falls to  $P^2$ , at the break even price

Each firm decreases production but there are more firms, so the market quantity supplied increases.

At  $P^2$  there are no more economic profits, so no more firms will enter the market, and there will be no more shifting of the market supply curve.

The *long run equilibrium* is  $P_2, Q_2$ , where profits = 0

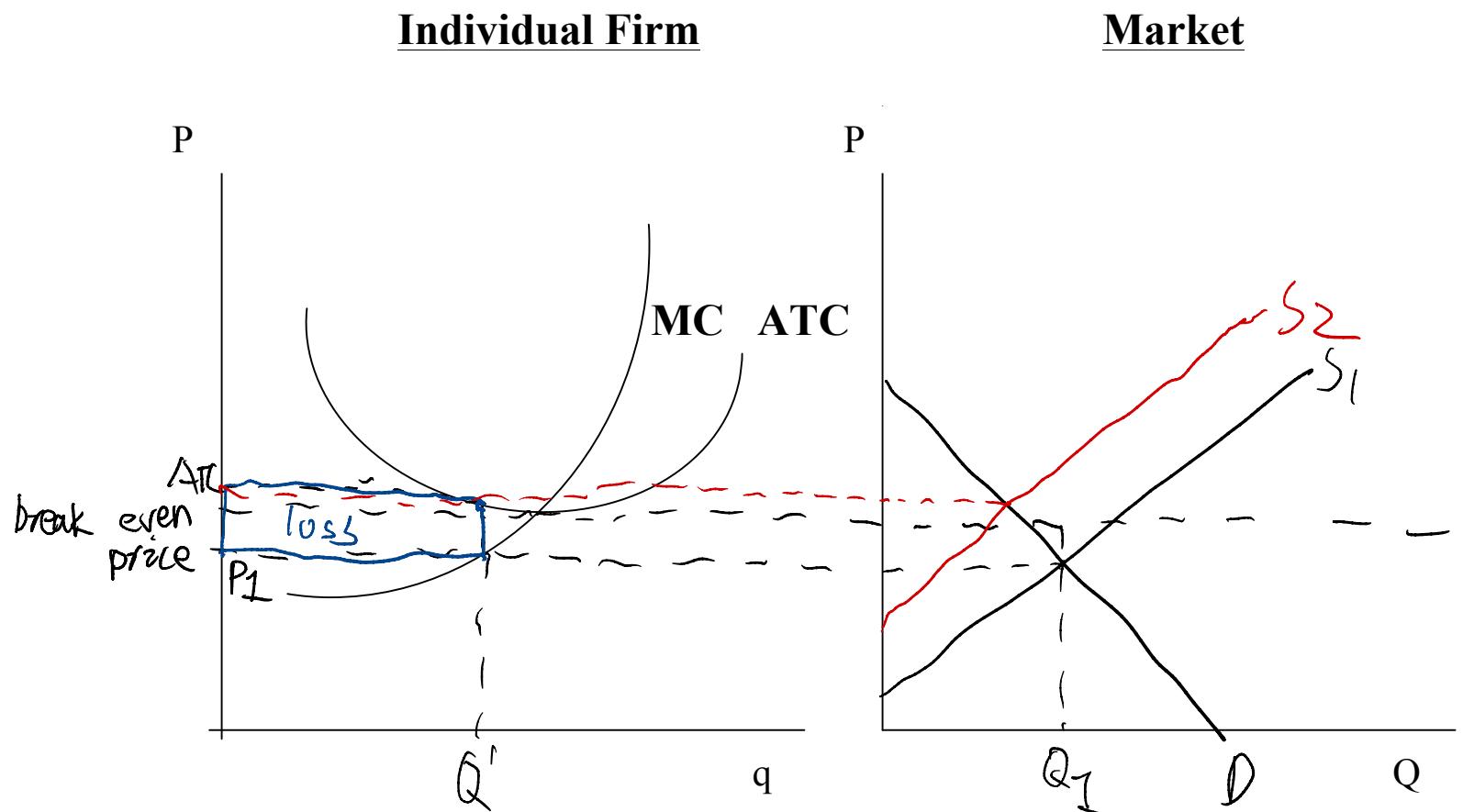
Long run equilibrium: the equilibrium price and quantity that is reached after entry (or exist) of firms is complete.

## Example: Market Price < Breakeven Price

Show a market equilibrium such that the market price is less than the breakeven price.

Show the quantity that the individual firm will produce.

Show the loss for the firm.



What will happen in the long run? Show the long run equilibrium in the graphs above.

In the long run some firms will exit the market, shifting the market supply curve to the left until the price reaches the break even price.

## Why do firms stay in the market if economic profits are zero?

*Suppose a firm is making revenues of \$100,000 and they have explicit costs of \$60,000 and zero depreciation.*

**Accounting Profit = \$40,000**

*Now, suppose that they could make \$40,000 being a taxi driver instead.*

**Economic Profit = 0**

*→ zero economic profits means that the benefit of what they are doing and their next best alternative are the same.*

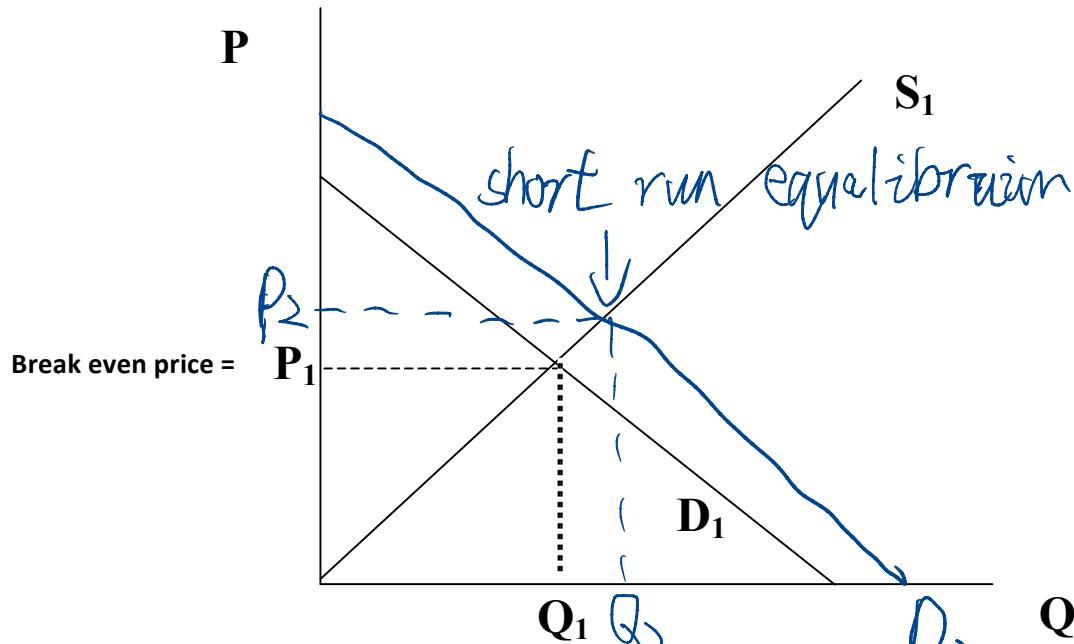
*→ Firms will stay in the market since they are still making \$40,000 in normal or accounting profits.*

***Economic Profits = Account Profits – Implicit Costs***

***Economic Profits = \$0***

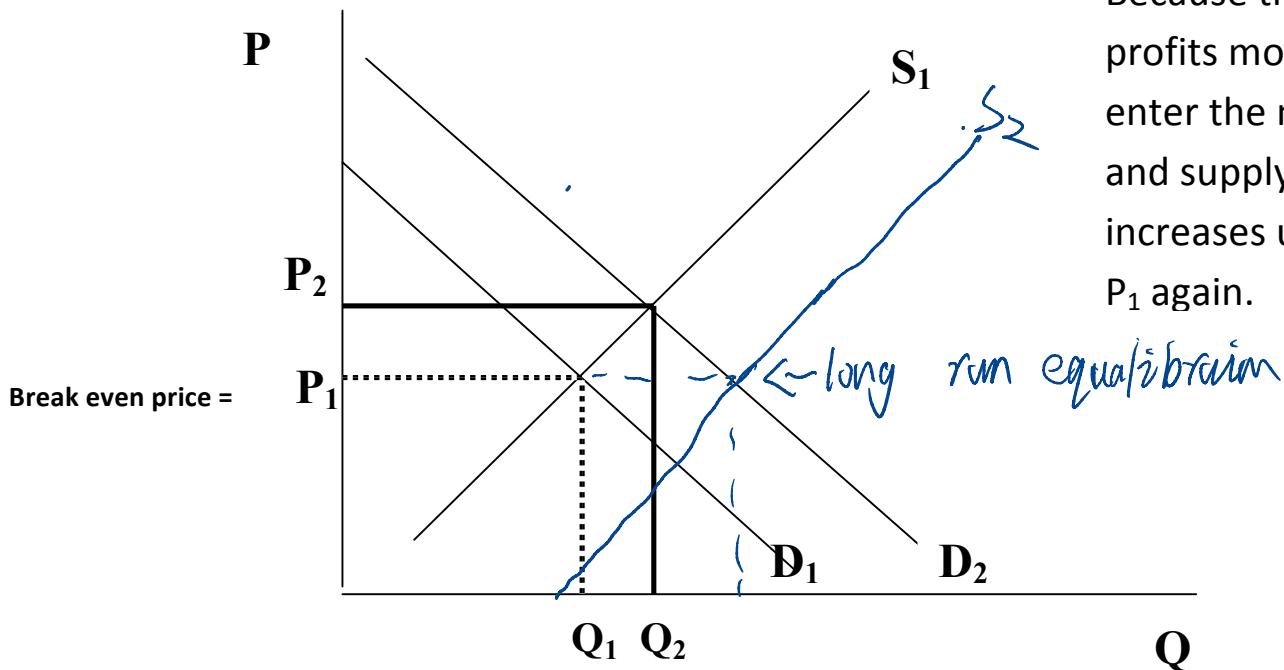
***Normal Profits = Accounting Profits = > \$0***

## Short Run response to an increase in demand:



In the short run the supply does not change, so the price increases to  $P_2$ .

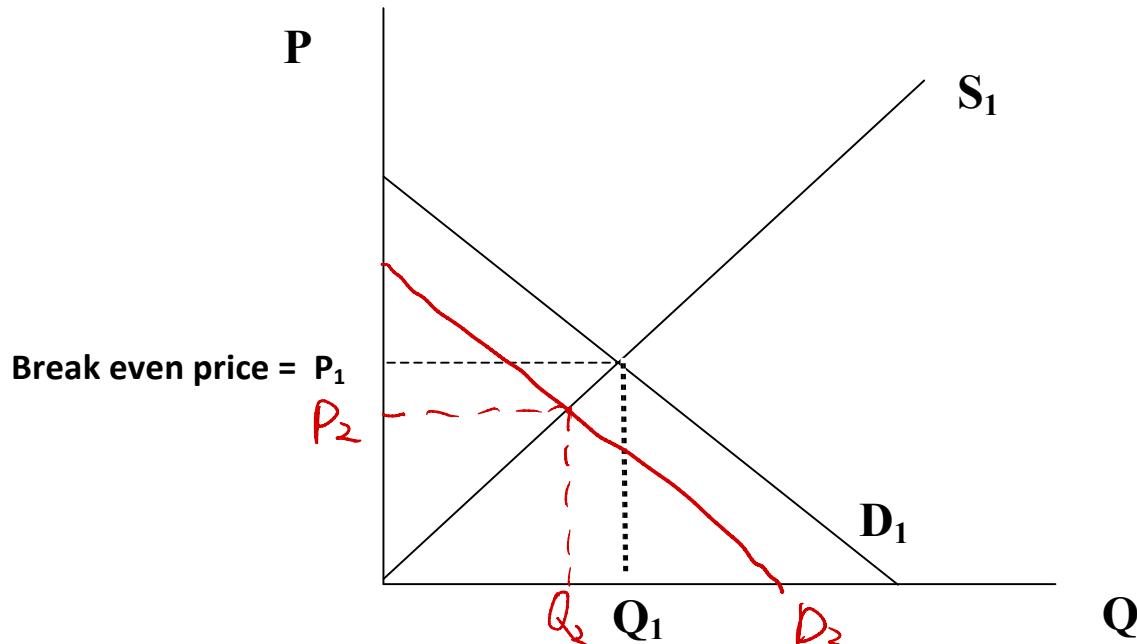
## Long Run response to an increase in demand:



Because there are profits more firms enter the market and supply increases until  $P = P_1$  again.

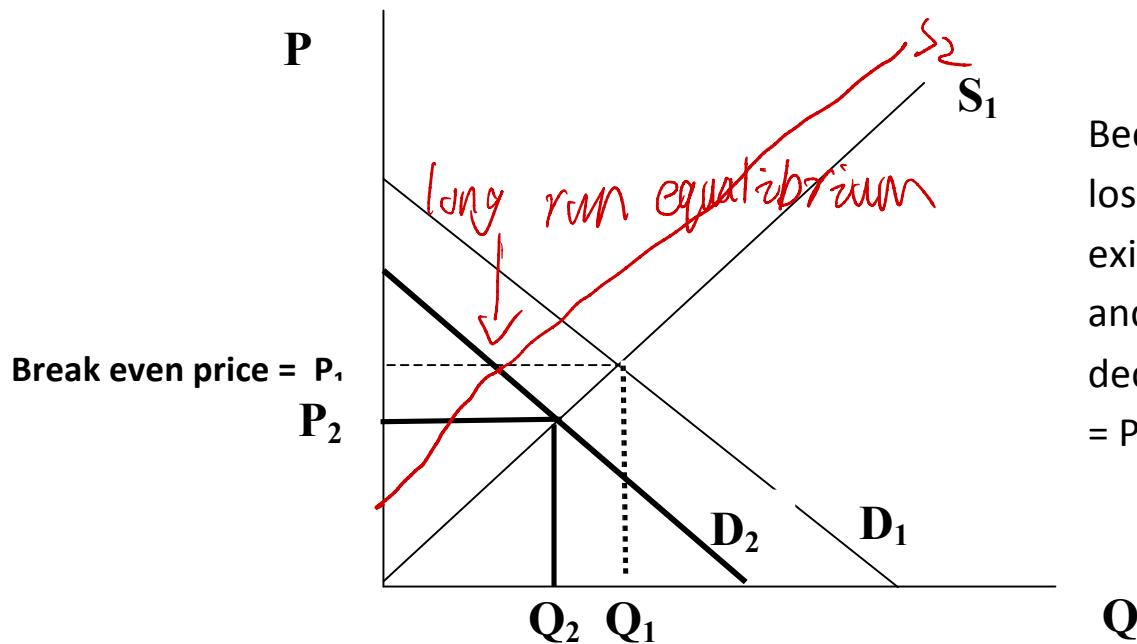
- The long run supply curve is always more elastic than the short run supply curve.
- The LRS curve follows the path of the break even price because in the long run the price is always the break even price.

## Short Run response to a decrease in demand:



In the short run the supply does not change, so the price decreases to  $P_2$ .

## Long Run response to a decrease in demand:



Because there are losses some firms exit the market and supply decreases until  $P = P_1$  again.

## Conclusions

**In the LR equilibrium no firms will earn any economic profits. Each firm produces at their min ATC, so the total costs for the industry are minimized.**

## Exercise 4:

A firm in a perfectly competitive market has cost functions as follows:

$$TC = 100 + 2Q + 0.5Q^2$$

$$MC = 2 + Q$$

The market price is \$20.

a) What is the firm's ATC function?

$$ATC = \frac{1}{2}Q + 2 + \frac{100}{Q}$$

b) What is the firm's breakeven price? (Hint: it is where

$$MC = ATC = P)$$

$$Q + 2 = \frac{1}{2}Q + 2 + \frac{100}{Q}$$

$$\frac{1}{2} - \frac{100}{Q^2} = 0$$

$$\text{when } MC = ATC,$$

$$ATC' = 0$$

$$\frac{Q}{2} = \frac{100}{Q}$$

$$Q^2 = 200$$

$$Q = \sqrt{200}$$

$$P = 2 + Q = \$16.142$$

c) What quantity will the firm produce given the market price?  $P = MC$

$$20 = 2 + Q$$

$$Q = 18$$

d) At that quantity what will be the firm's profit?

$$\text{Profit} = TR - TC$$

$$= 20 \cdot 18 - [200 + 2(18) + \frac{1}{2}(18)^2]$$

$$= 360 - 298$$

$$= \$62$$

$$= (P - ATC)Q$$

$$= (20 - \frac{100}{18} + 2 + \frac{1}{2} \cdot 18)$$

$$= \$62$$