AP Micro Review

Calculating Elasticity

- **When given price and quantity for two points on a line, you can use the midpoint formula or the percent change formula to calculate elasticity**

- Midpoint formula

$$\frac{\frac{Q_2 - Q_1}{\frac{1}{2}(Q_2 + Q_1)}}{\frac{P_2 - P_1}{\frac{1}{2}(P_2 + P_1)}}$$

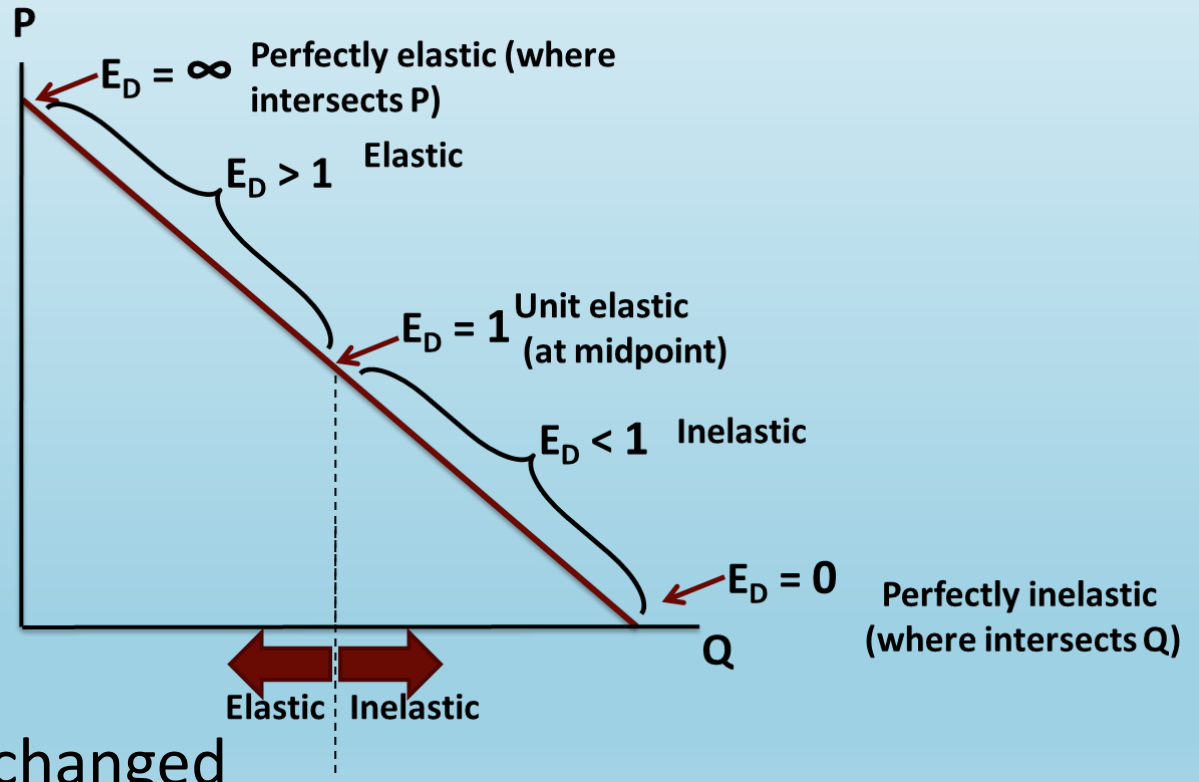
★Use whichever makes the math easier★

- Percent change formula

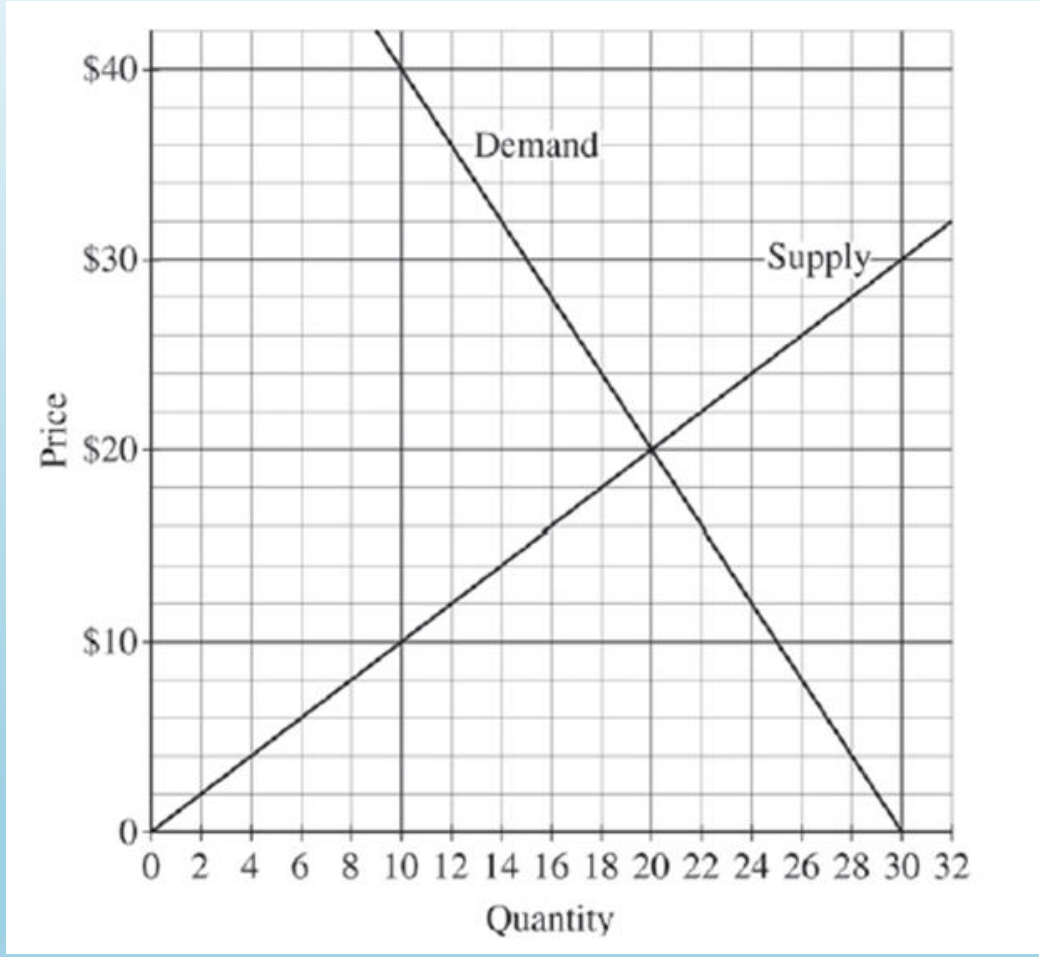
$$\frac{\frac{Q_2 - Q_1}{Q_1}}{\frac{P_2 - P_1}{P_1}}$$

Elasticity: Total Revenue Test

- **Total Revenue = Price x Quantity can be used to calculate E_D**
  - ****Easier than previous formulas: use if at all possible****
- **Elastic Demand: If $E_D > 1$**
  - Price **increase** causes TR to **decrease**
  - Price **decrease** causes TR to **increase**
- **Inelastic Demand: If $E_D < 1$**
  - Price **increase** causes TR to **increase**
  - Price **decrease** causes TR to **decrease**
- **Unit Elastic: If $E_D = 1$**
  - A change in price changes leaves TR unchanged
- ****TR test CANNOT be used for supply****

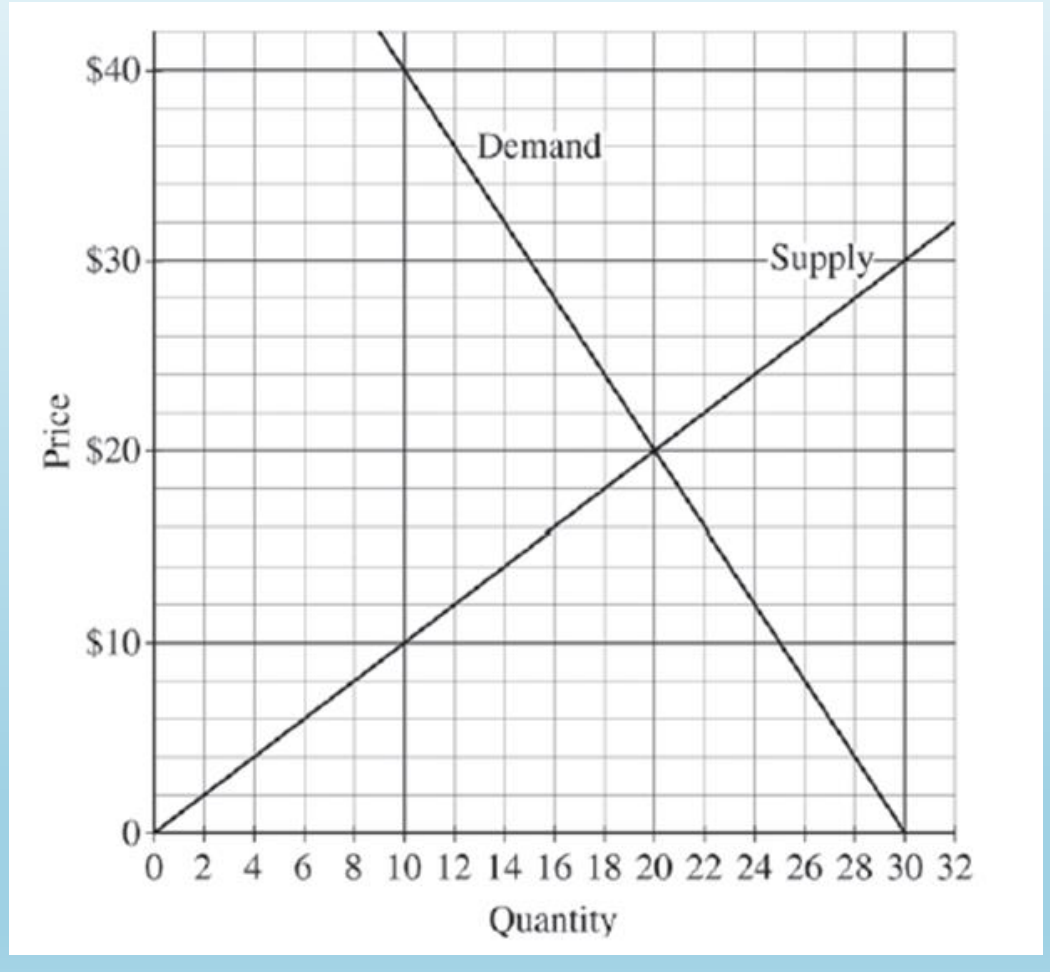


Elasticity Using S+D Graph



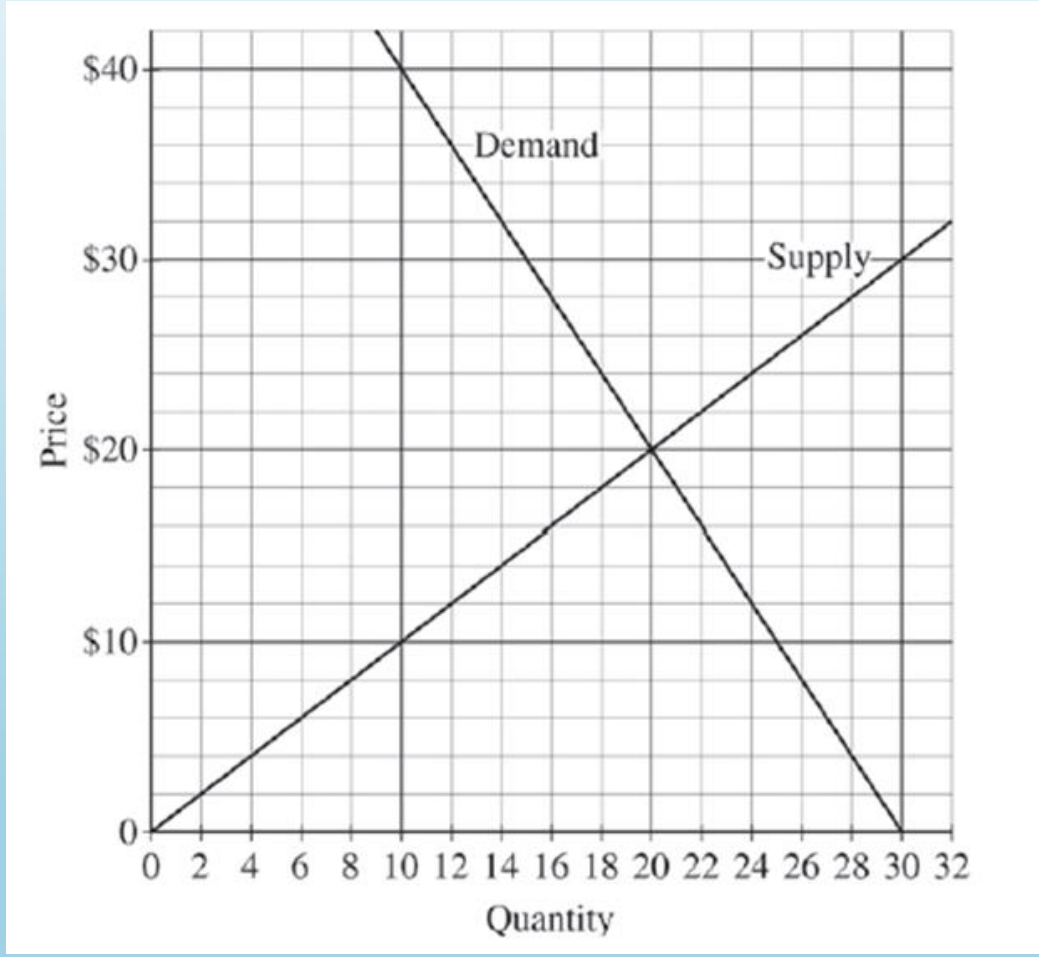
- Calculate total PS at market equilibrium P and Q. Show your work.
- If the government imposes a price floor at $16, is there a shortage, surplus, or neither? Explain.
- If instead the government imposes a price ceiling at $12 is there a shortage, surplus, or neither? Explain.
- If instead the government restricts market output to 10 units, calculate the DWL.
- Assume the price decreases from $20 to $12.
  - Calculate price elasticity of demand. Show your work.
  - In this price range, is demand perfectly elastic, relatively elastic, unit elastic, relatively elastic, or perfectly inelastic?

Elasticity Using S+D Graph



- Calculate total PS at market equilibrium P and Q. Show your work.
- **PS= ½ x 20 x 20=$200**
- If the government imposes a price floor at $16, is there a shortage, surplus, or neither? Explain.
- **Imposing a price floor at $16 is ineffective because it is not binding**
- If instead the government imposes a price ceiling at $12 is there a shortage, surplus, or neither? Explain.
- **Shortage: Quantity demanded will be greater than supply (the ceiling is binding)**

Elasticity Using S+D Graph



- If instead the government restricts market output to 10 units, calculate the DWL.
- **½ x 30 x10=$150 [or (½ x 10 x 10) +(½ x 20 x 10)= $150]**
- Assume the price decreases from $20 to $12.
  - Calculate price elasticity of demand. Show your work.
  - In this price range, is demand perfectly elastic, relatively elastic, unit elastic, relatively elastic, or perfectly inelastic?
  - **[(24-20)/20]/(12-20)/20= -0.5**
  - **Demand is inelastic**

Income Elasticity of Demand

- **Income elasticity of demand** measures the responsiveness of demand to changes in income
  - Positive and negative values matter

$$E_{Income} = \frac{\%\text{ change in Demand}}{\%\text{ change in Income}}$$

Normal goods: $E_{income} > 0$

- **Necessity**: $0 < E_{income} < 1$ (greater than 0 and less than 1)
- **Luxury:** $E_{Income} > 1$

Inferior goods

- $E_{Income} < 0$ (negative number)

Cross–Price Elasticity of Demand

- **Cross–price elasticity of demand** measures the responsiveness of demand to changes in prices of other goods
  - Positive and negative values matter

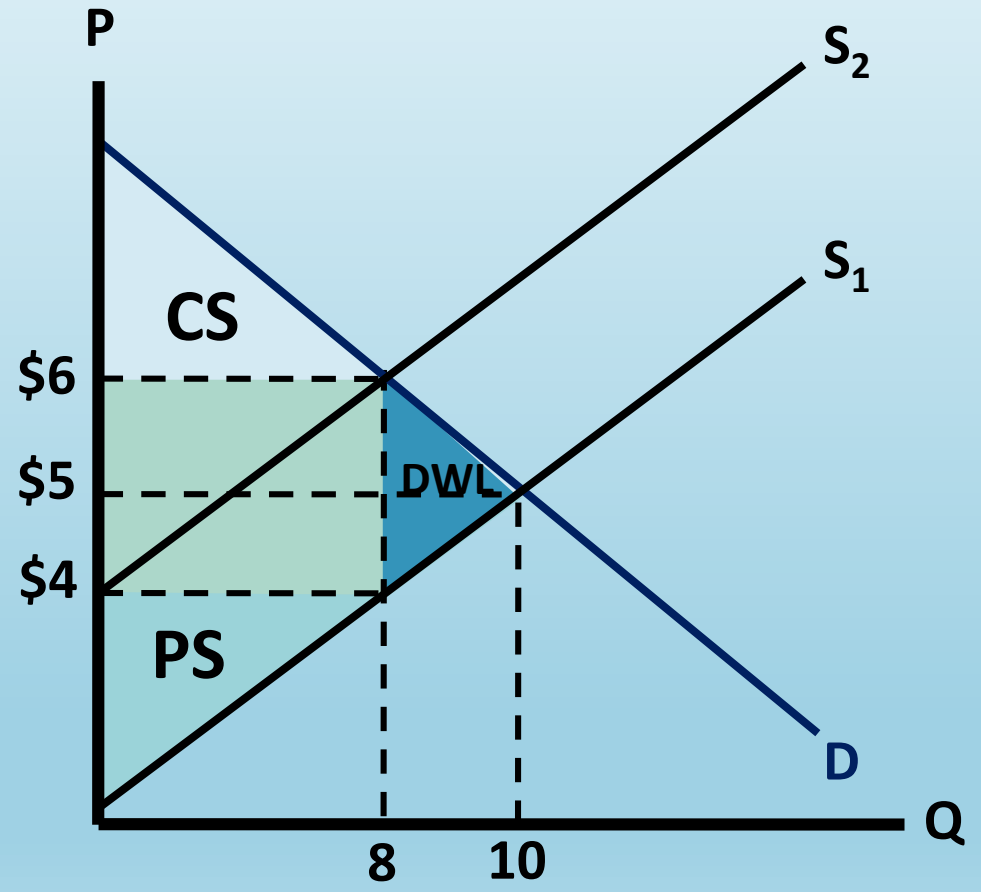
$$E_{\text{cross-price}} = \frac{\%\text{ change in Demand}}{\%\text{ change in P of related good}}$$

- **Substitutes:** $E_{\text{cross-price}} > 0$ (positive number)
- **Complements:** $E_{\text{cross-price}} < 0$ (negative number)

CS, PS, Taxes, World Price, and Tariffs

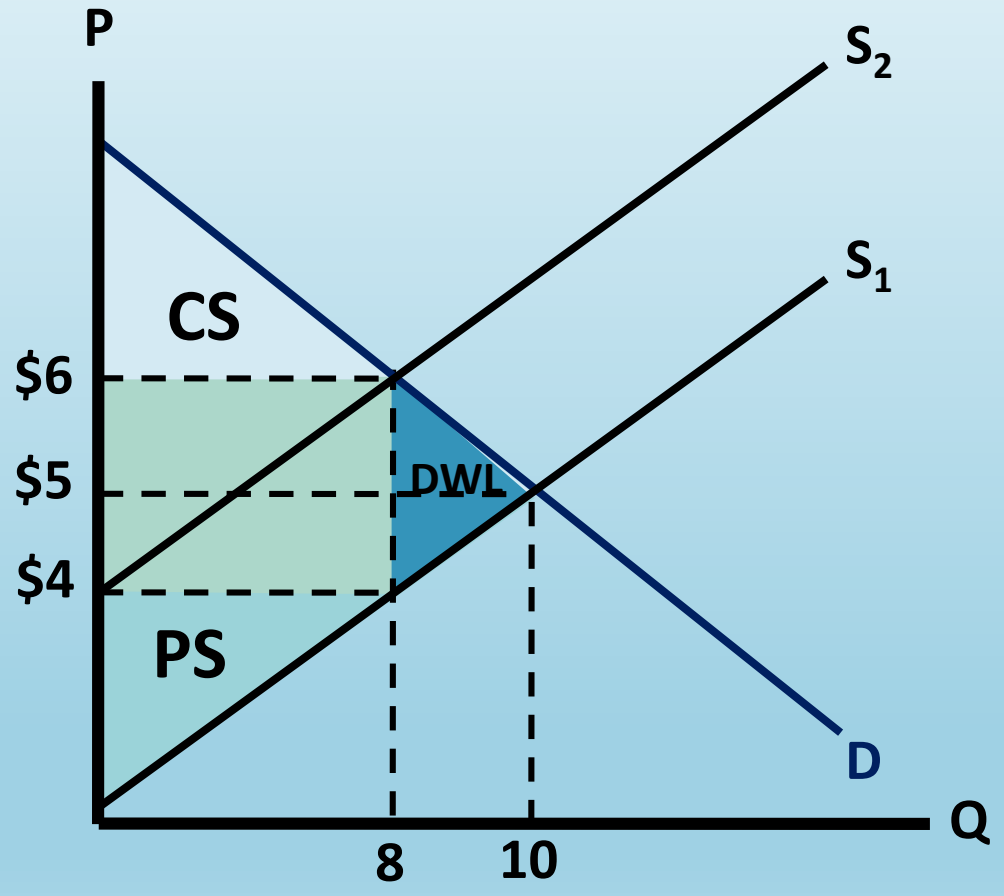
- Taxes **reduce CS and PS** and **cause DWL**; the **distance between new supply and old supply is the amount of the tax**
- Whoever's demand **OR** supply is more **inelastic** bears the greater burden of a tax
- When **seller's pay the tax**: the after tax price at the new equilibrium is **not** the price that they keep (they keep that price ***less*** than amount of the tax)
- Be able to calculate the **tax revenue box, CS (before and after the tax), PS (before and after the tax),** and **DWL** if asked

CS, PS, and Taxes



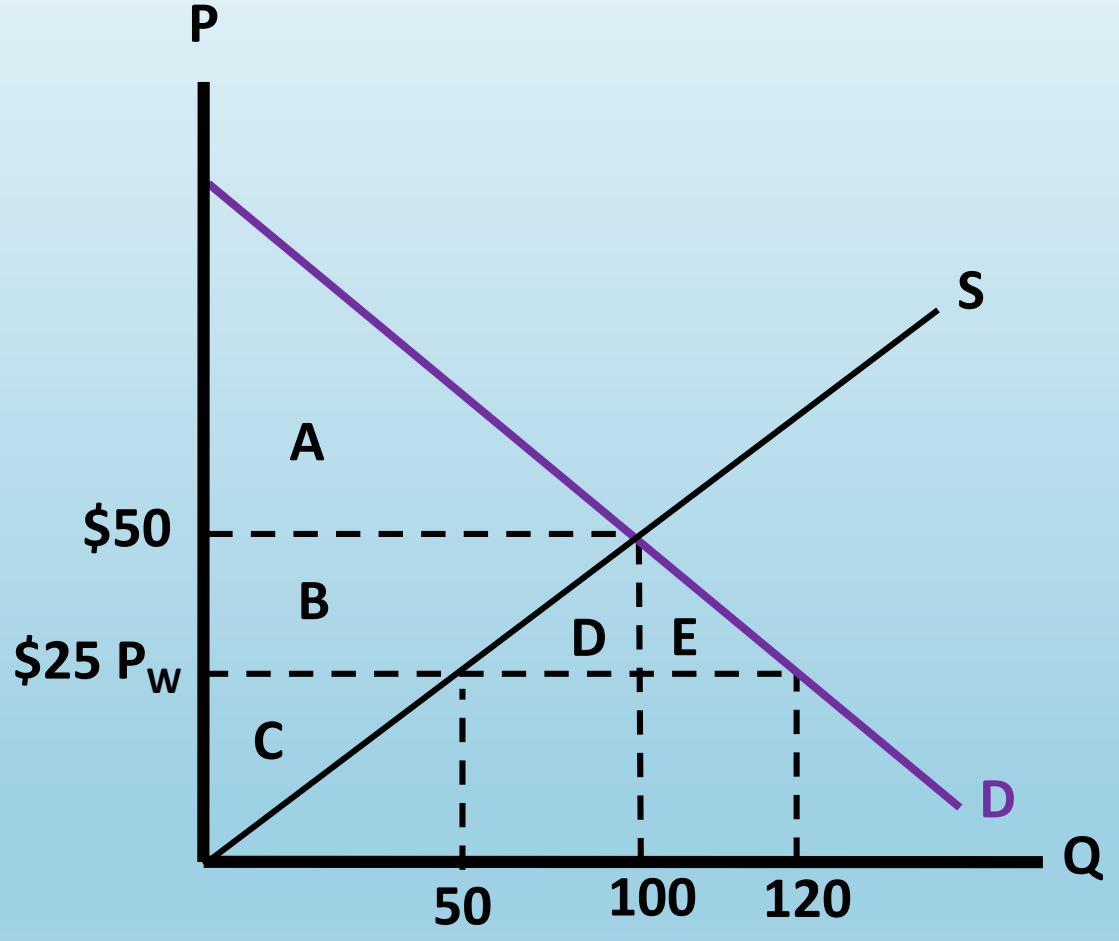
- What is the amount of the tax?
- What price do buyers pay?
- What is the price sellers keep?

CS, PS, and Taxes



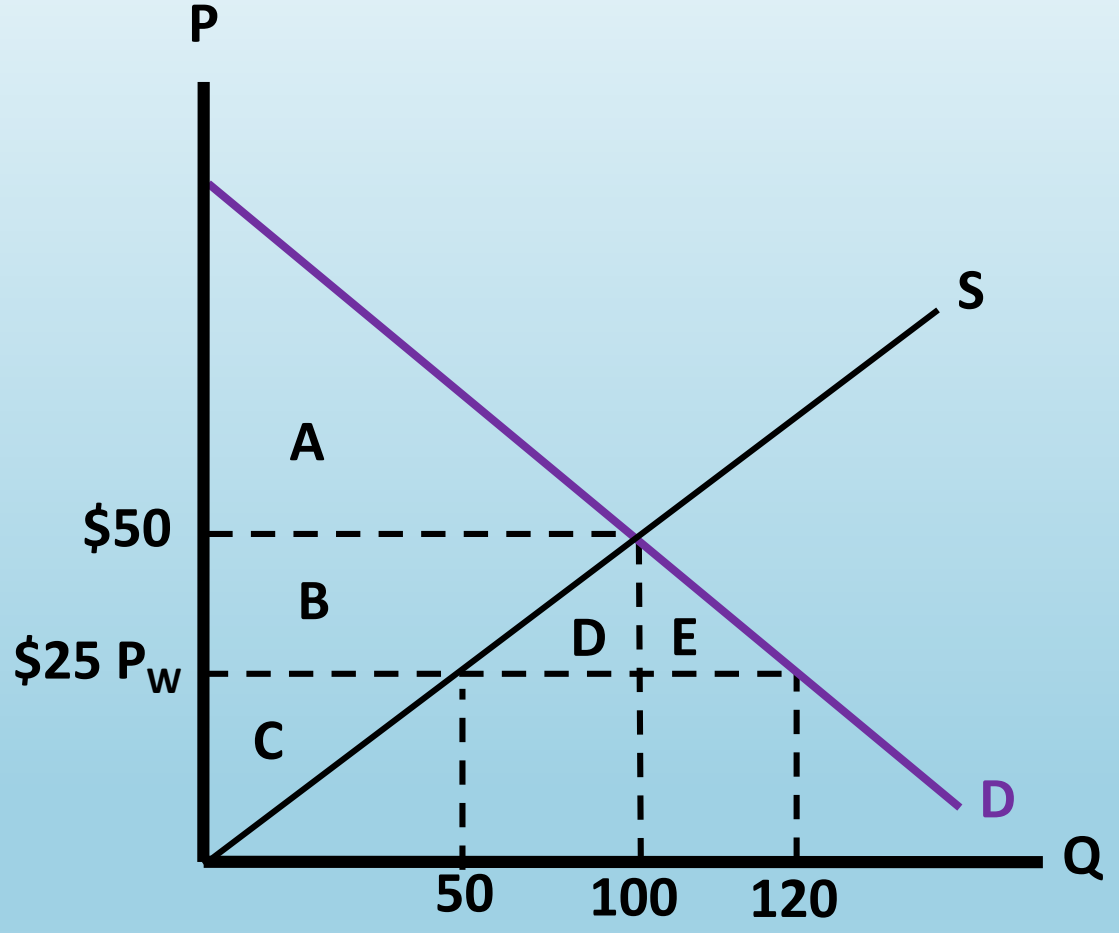
- **What is the amount of the tax?** $2
- **What price do buyers pay?**
- They pay **$6** (were paying $5 before the tax; an increase of $1)
- **What is the price sellers keep?**
- **$4** (the new price is $6 but they have to pay the $2 tax)

CS, PS, Taxes, World Price, and Tariffs



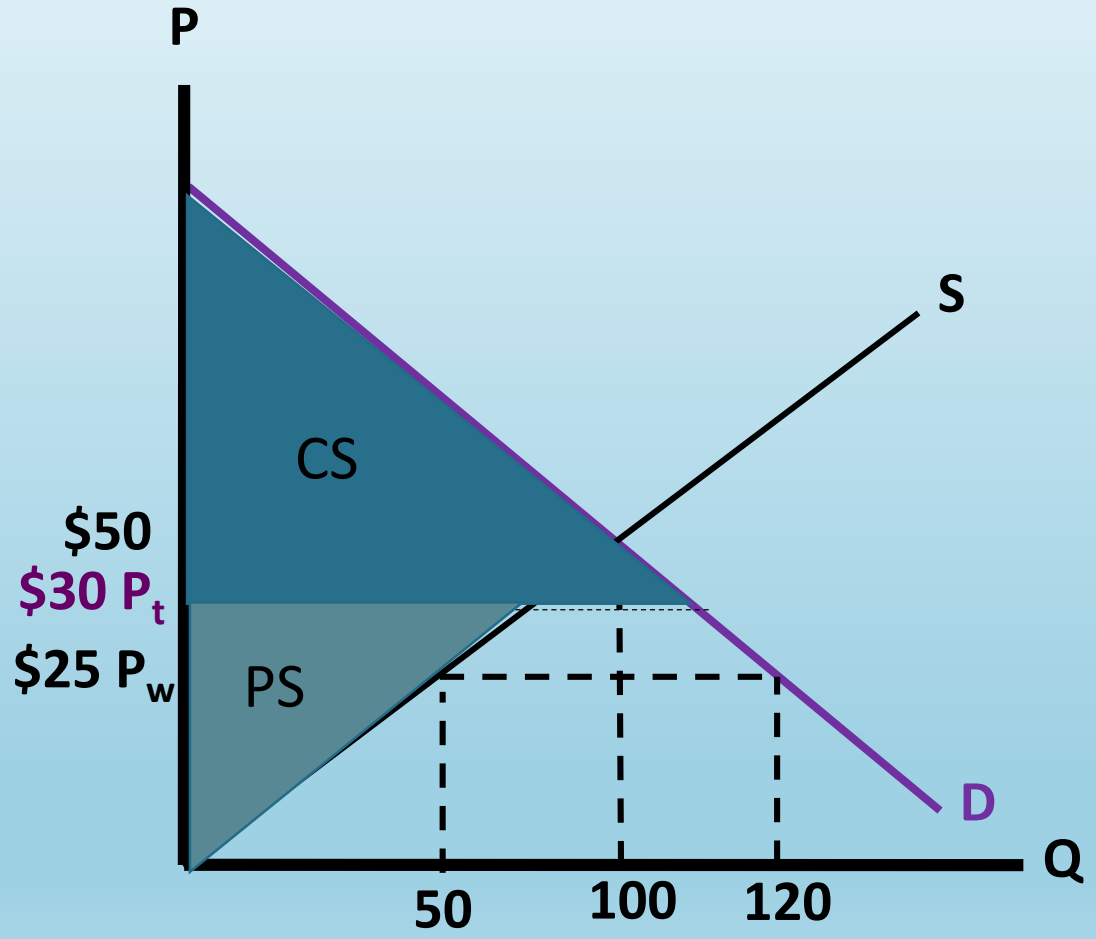
- **Equilibrium P and Q:**
- **CS before trade:**
- **CS after trade:**
- **PS after trade:**
- **Net gain from trade:**

CS, PS, Taxes, World Price, and Tariffs



- **Equilibrium P and Q:** $50; 100
- **CS before trade:** A
- **CS after trade:** ABDE
- **PS after trade:** C
- **Net gain from trade**: DE (will import 70 units from another country)

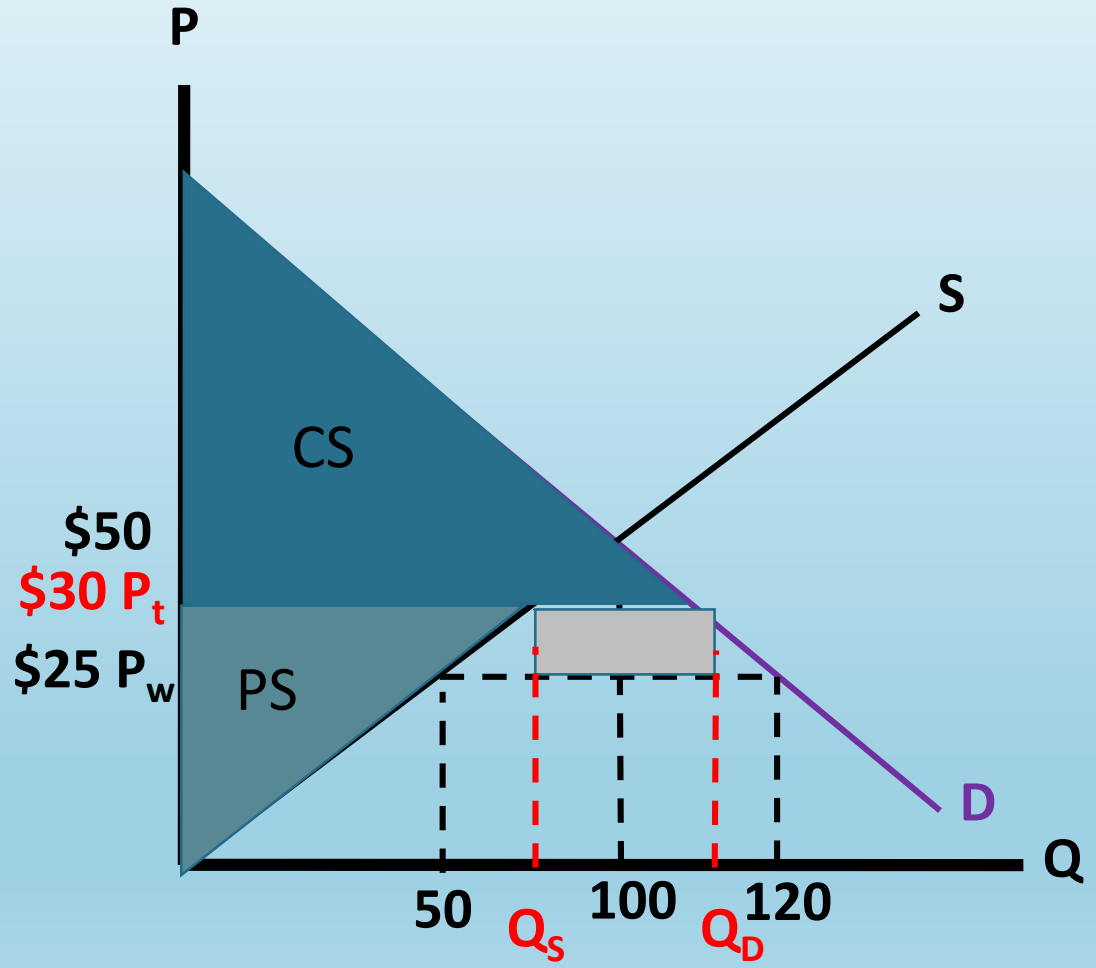
CS, PS, Taxes, World Price, and Tariffs



Now, the government places a $5 tariff on this good.

- **What happens to CS?**
- **What happens to PS?**
- **Shade tariff revenue.**

CS, PS, Taxes, World Price, and Tariffs



Now, the government places a $5 tariff on this good.

- **What happens to CS?** Decreases
- **What happens to PS?** Increases
- **Shade tariff revenue.** Grey box

Utility (Rational Choice Theory)

- **Total utility:** When at its max, MU is zero
- **Marginal utility:** additional satisfaction; eventually hit **diminishing marginal utility**
- **When asked to use marginal analysis you should compare MUx/Px versus MUy/Py**
  - **It equal, the consumer is maximizing MU/P**
  - **If not, consume MORE of the good with the higher MU/P**
  - **Careful: If the problem gives total utility you need to calculate marginal utility first in order for the above formula to work**

Utility

Tacos cost $2 and pizza costs $1.
What is Mary's optimal combination if she has $7 to spend?

Quantity of Tacos	Total Benefit of Tacos	MB Tacos	MU/P Tacos	Quantity of Pizzas	Total Benefit of Pizza	MB Pizza	MU/P Pizza
0	$0	0	0	0	$0	0	0
1	$6	6	3	1	$6	6	6
2	$10	4	2	2	$10	4	4
3	$12	2	1	3	$12	2	2

- **First we need to calculate MB (MU) and MU/P.**
- Find where the MU/P for tacos is equal to that for pizza.
- Her optimal quantity would be 2 tacos and 3 pizzas.

Economic vs. Accounting Profit

- **Economic profit =** (explicit and implicit revenue) – (explicit and implicit cost)
  - Takes opportunity cost into consideration
  - The problem will usually only give explicit revenue
- **Accounting profit:** = explicit revenue – explicit cost
  - ALWAYS larger than economic profit
- **When asked: even when a firm is making zero economic profit they are making a positive accounting profit**
- **Normal profit=Zero economic profit**

Costs of Production

- SR: some costs are fixed
- LR: all costs are variable

- Even when the firm is producing **zero** units they still face **fixed costs**

Costs of Production

Quantity (units)	Total Cost
0	$30
1	40
2	47
3	51
4	59

- **Calculate the AVC of producing three units.**

Costs of Production

Quantity (units)	Total Cost
0	$30
1	40
2	47
3	51
4	59

- **Calculate the AVC of producing three units.**
- From the table you know that FC are $30 (at output of zero the only costs a firm has are fixed costs)
- 3 units
  - FC=$30; VC=$21
  - 21/3=**$7**

Returns to Scale

- **Returns to scale indicates what happens to production in the long run**
  - **If output more than doubles, increasing returns to scale occurs**
  - **If output doubles, constant returns to scale occurs**
  - **If output less than doubles, decreasing returns to scale occurs**
  - **Note: Returns to scale is only looking at production, not costs**

Long run ATC (LRATC)

- The law of diminishing marginal returns does not apply in the long run since all inputs are variable

- The shape of the long-run cost curve is due to the existence of economies and diseconomies of scale
  - Here, we are looking only at costs of production

Long run ATC (LRATC) and Economies of Scale

- **Economies of scale** exist when long-run average total costs **decrease** as output **increases**
  - These are shown by the **downward sloping portion of the long-run ATC**
  - **If you double your inputs, but output more than doubles**

- **Why does economies of scale occur?**
  - Firms are able to use mass production techniques and specialization to produce more
  - Think of the car industry

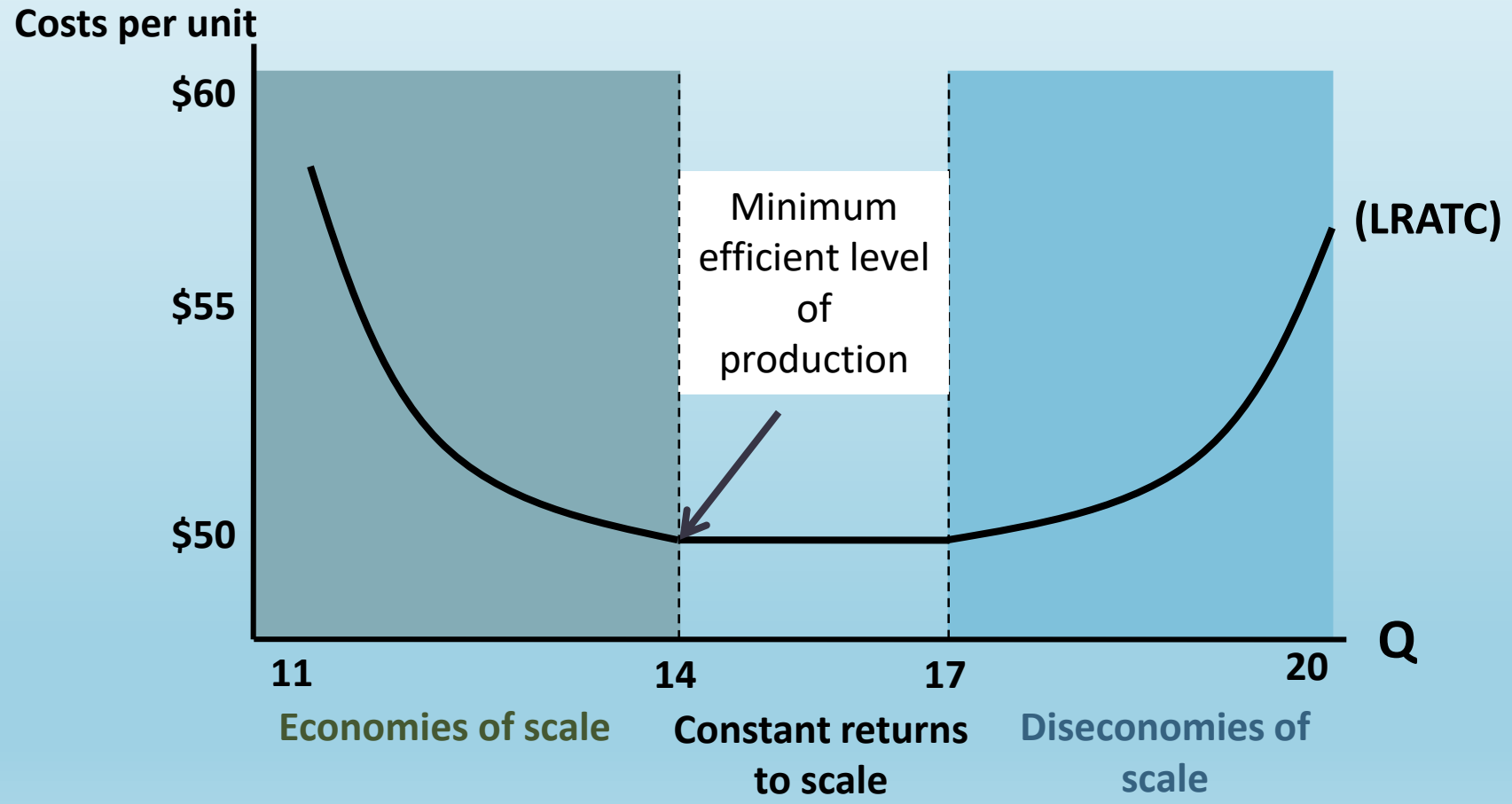
Long run ATC (LRATC) and Economies of Scale

- **Constant returns to scale** exist when average total costs **do not change** as output increases
  - **This is shown by the flat portion of the long-run average total cost curve**
  - **A company triples their inputs and output triples**
- **Constant returns to scale occur when production techniques can be replicated again and again to increase output**

Long run ATC (LRATC) and Economies of Scale

- **Diseconomies of scale** exist when long-run average total costs **increase** as output increases
  - The ATC is being driver upward as the quantity being produced increases
  - **Shown by the upward sloping portion of the long-run average total cost curve**
- Example: as a company becomes larger they add more and more departments

A Typical LRATC



LRATC Table

Q	TC of Labor ($)	TC of Machines ($)	TC ($)	ATC ($)
11	381	254	635	58
12	390	260	650	54
13	402	268	670	52
14	420	280	700	50
15	450	300	750	50
16	480	320	800	50
17	510	340	850	50
18	549	366	915	51
19	600	400	1000	53
20	666	444	1110	56

ATC falls because of economies of scale

ATC is constant because of constant returns to scale

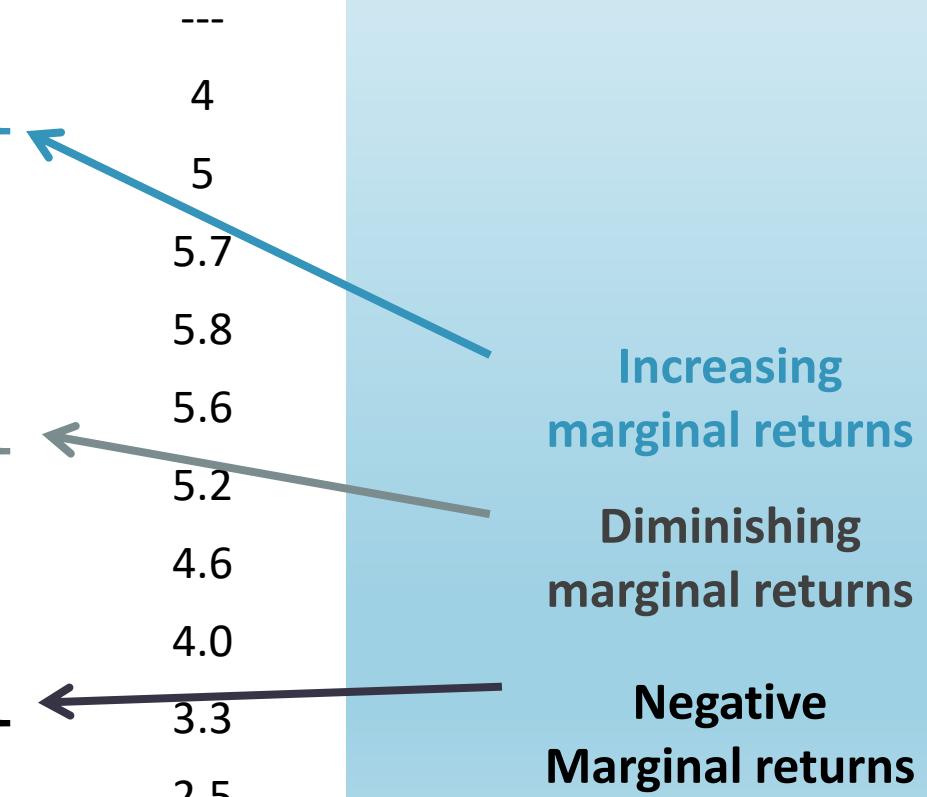
ATC rises because of diseconomies of scale

Diminishing Marginal Returns

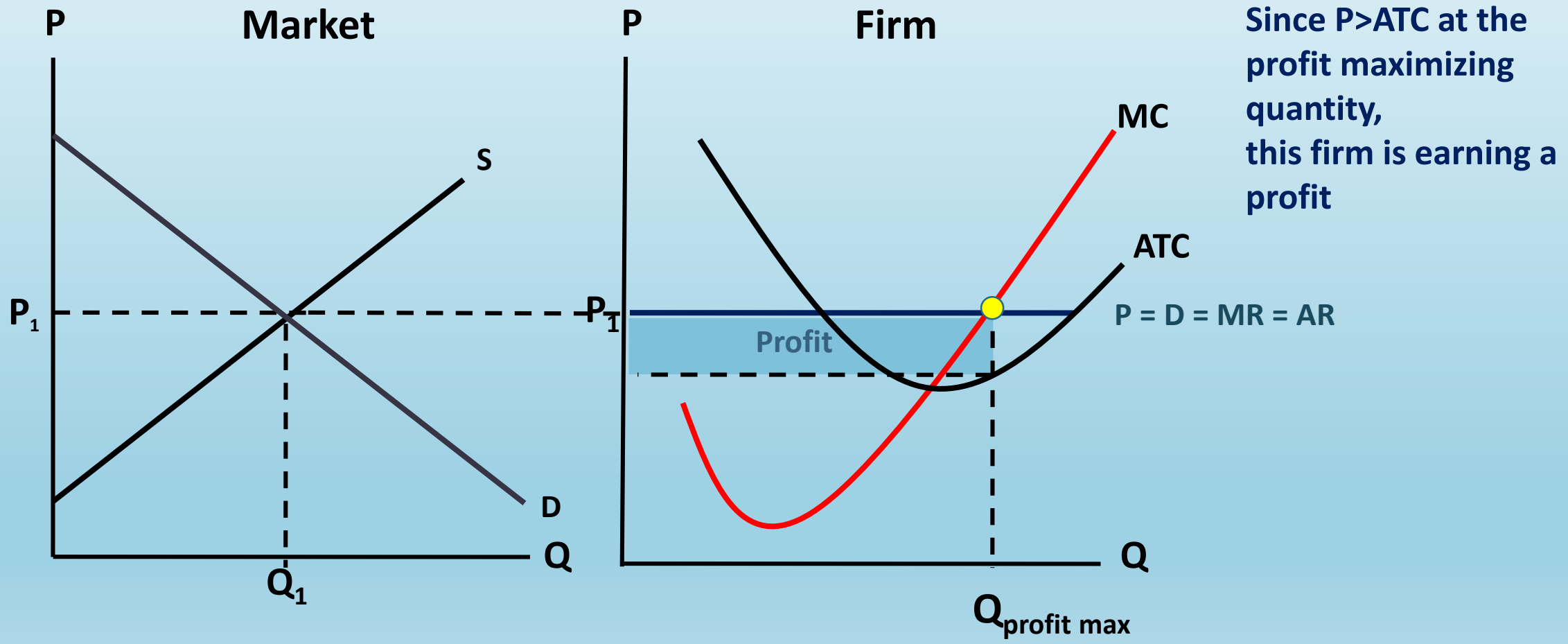
- **Law of diminishing marginal returns (productivity):** as more of a **variable input** is added to an existing **fixed input**, after some point the additional output from the additional input will **fall**

Law of Diminishing Marginal Returns

# of workers	Total Output	Marginal Product	Average Product
0	0		---
1	4	4	4
2	10	6	5
3	17	7	5.7
4	23	6	5.8
5	28	5	5.6
6	31	3	5.2
7	32	1	4.6
8	32	0	4.0
9	30	-2	3.3
10	25	-5	2.5

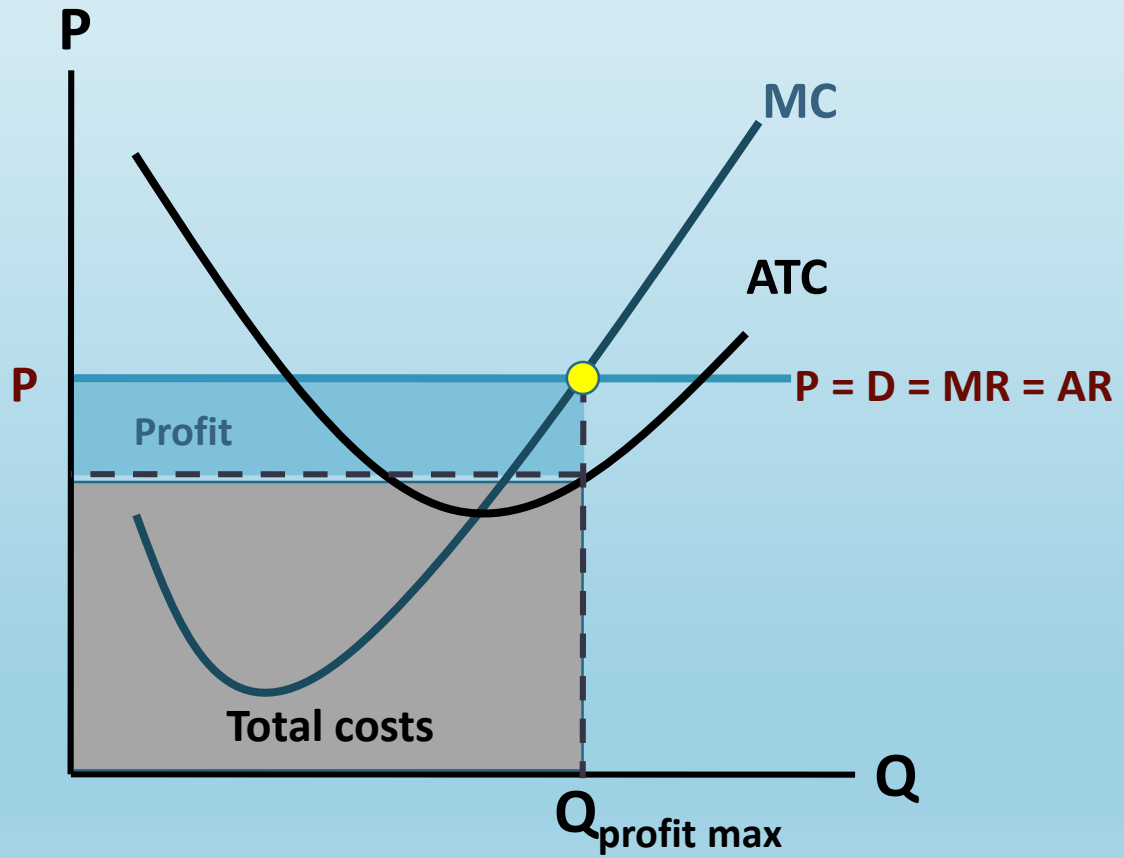


Perfect Competition Profit in the Short Run



Since P>ATC at the profit maximizing quantity,
this firm is earning a profit

Perfect Competition (Firm)

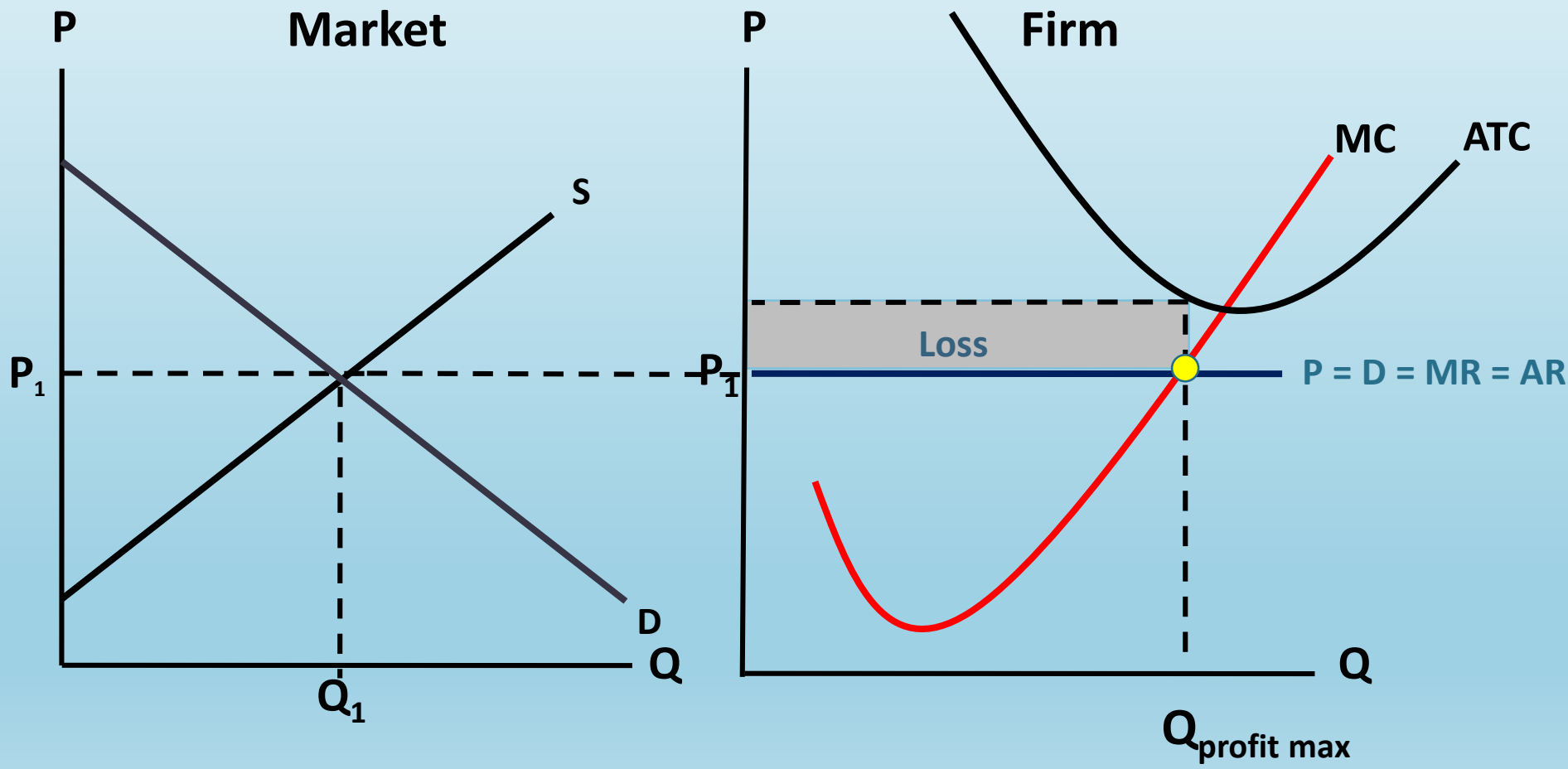


Is this firm making a profit, loss, or zero economic profit? Profit

Shade the area that represents total costs. Grey box

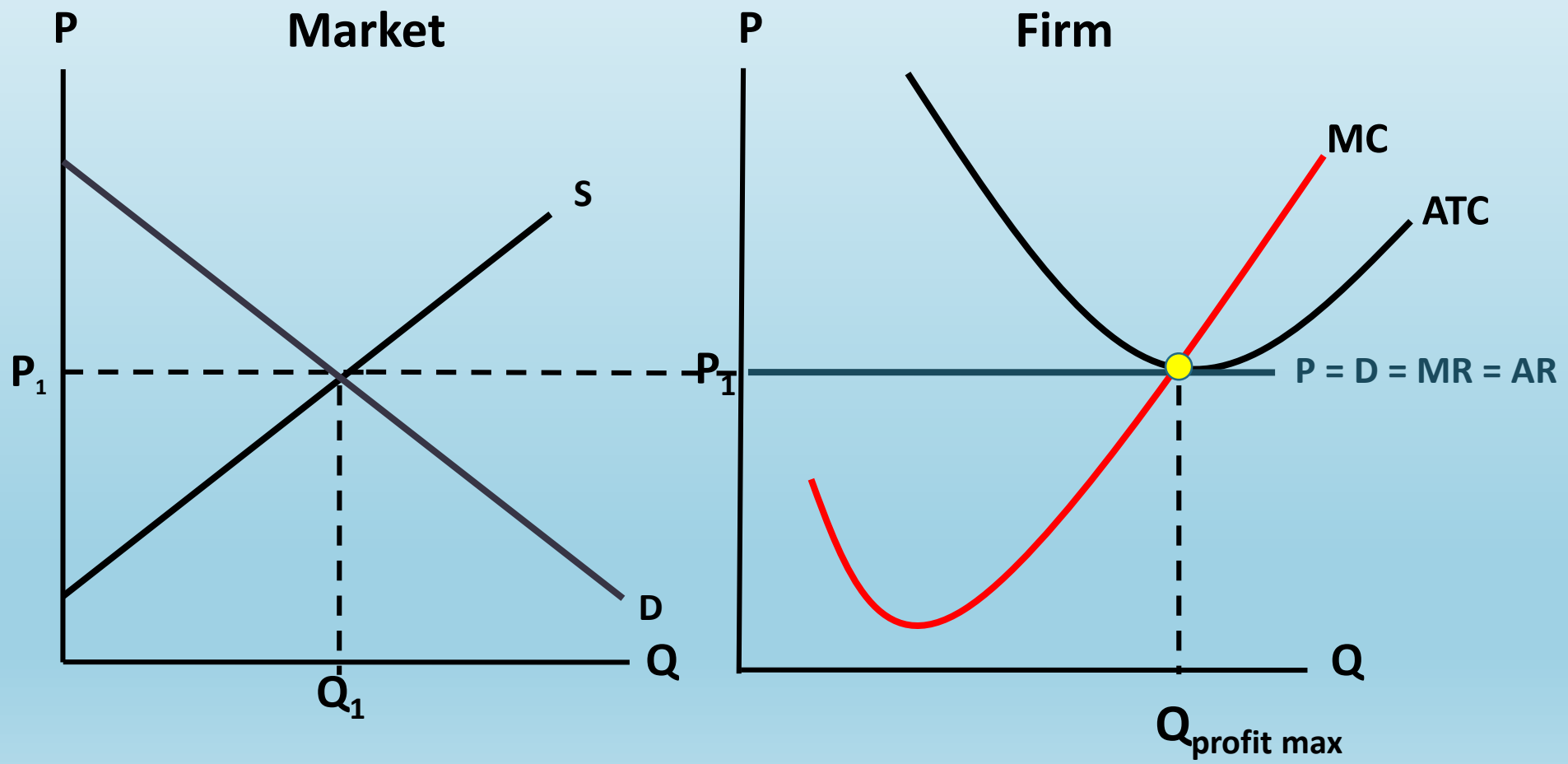
Does the firm operate at socially optimal?
Yes, it produces where MC=D.

Perfect Competition Loss in the Short Run



Since P<ATC at the profit maximizing quantity, this firm is earning a loss

Perfect Competition
Zero Economic Profit (Normal Profit) in the Long Run



Since P=ATC at the profit maximizing quantity, this firm is earning zero economic profit

In the long-run a firm is also productively efficient, as it produces at its minimum ATC.

The Shutdown Point for Perfectly Competitive Firms

- In the short run, fixed costs are sunk costs —they must be paid whether or not the firm produces anything
- A firm pays attention to its variable costs when deciding to shutdown
  - As long as a firm is covering its variable costs it should continue producing
  - When price falls below AVC is when the firm should shutdown
  - **This shutdown rule applies to the other market structures as well**

Perfect Competition

- **Constant cost industry:** we assume that the entry and exit of firms does **not** impact ATC
- When a firm earns economic profit there is an incentive for other firms to enter the market
  - This causes supply to increase which lowers the price until P=ATC
- If firms are earning a loss, some firms will exit the market
  - This causes supply to decrease, which raises price until P=ATC
- LR **supply curve** for constant cost industry is **perfectly elastic**

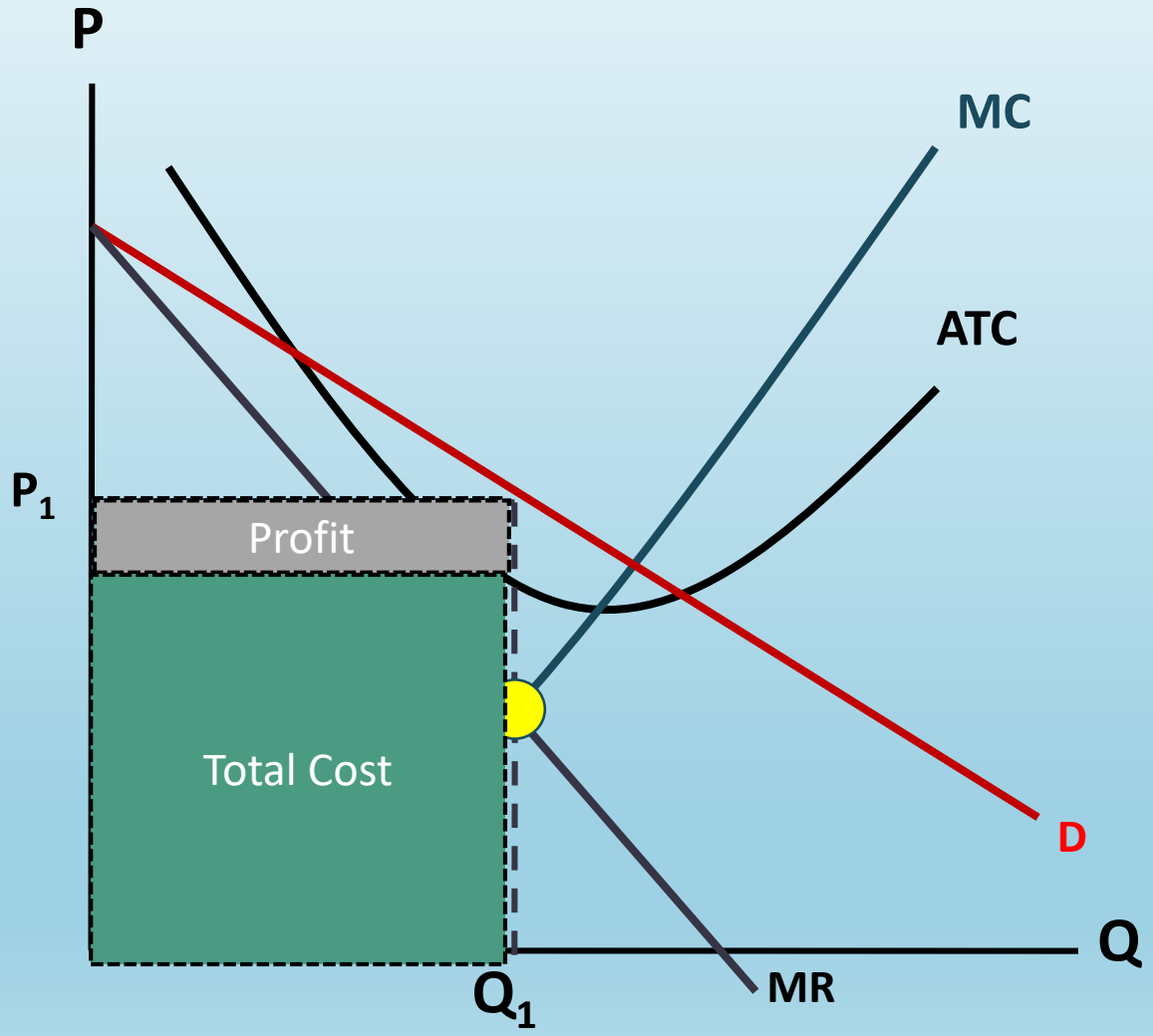
Perfect Competition

- **Increasing cost industry:** if firms enter due to the existence of profit, then ATC increases
  - Firms are competing for resources
  - The increase in supply causes the market price to decrease

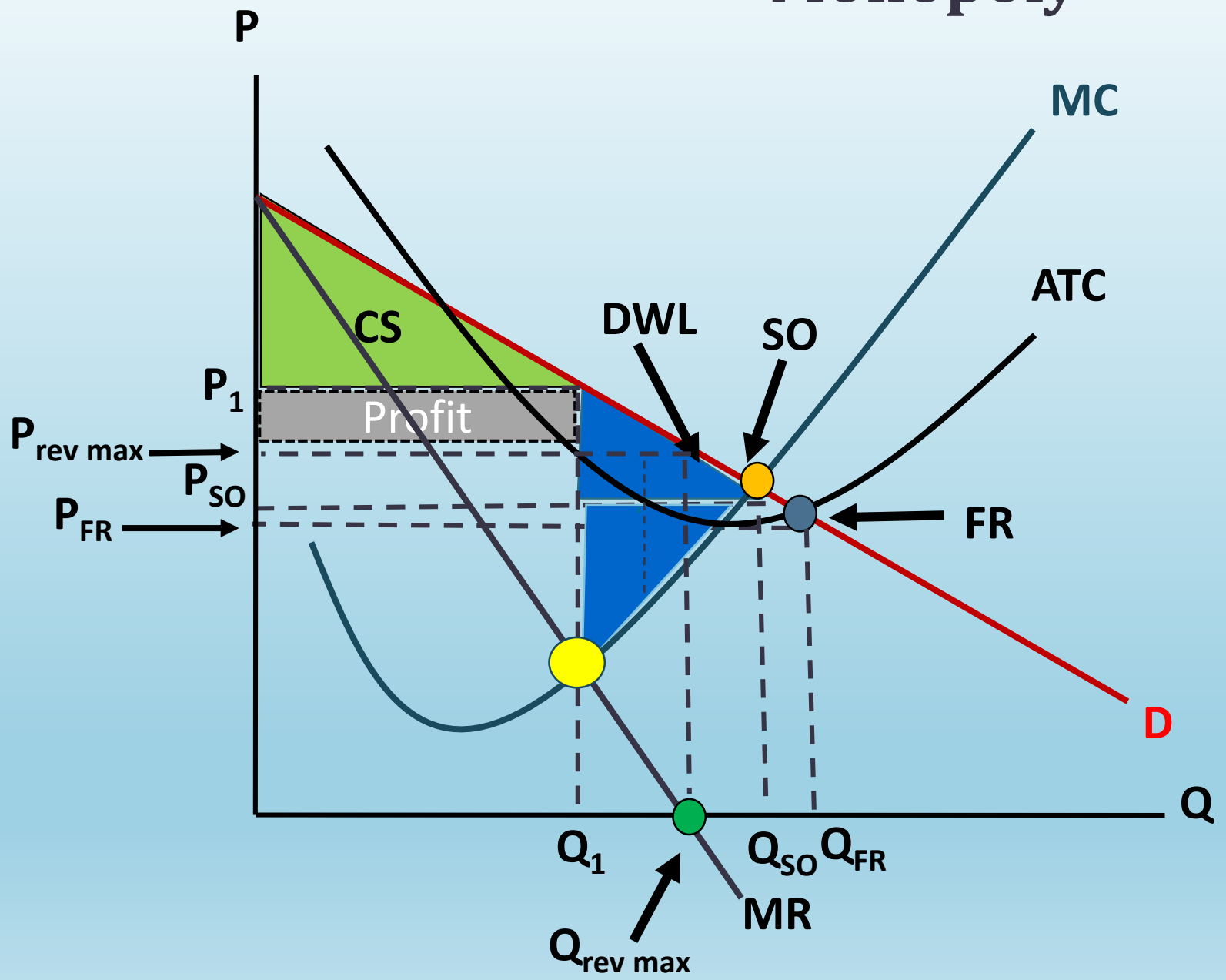
Monopoly

- **Unregulated monopoly and single price monopoly** mean the same thing
- **Socially optimal:** where MC=D; does **not** produce here; where a perfect competitor would produce **(maximizes CS and PS)**
- **Fair return:** where D=ATC; firm makes **zero economic profit** (could be forced to produce here if government subsidizes the firm)
- **Price-discriminating monopoly:** No CS; no DWL; D=MR; is socially optimal (produces where MC=D)

Monopoly



Monopoly

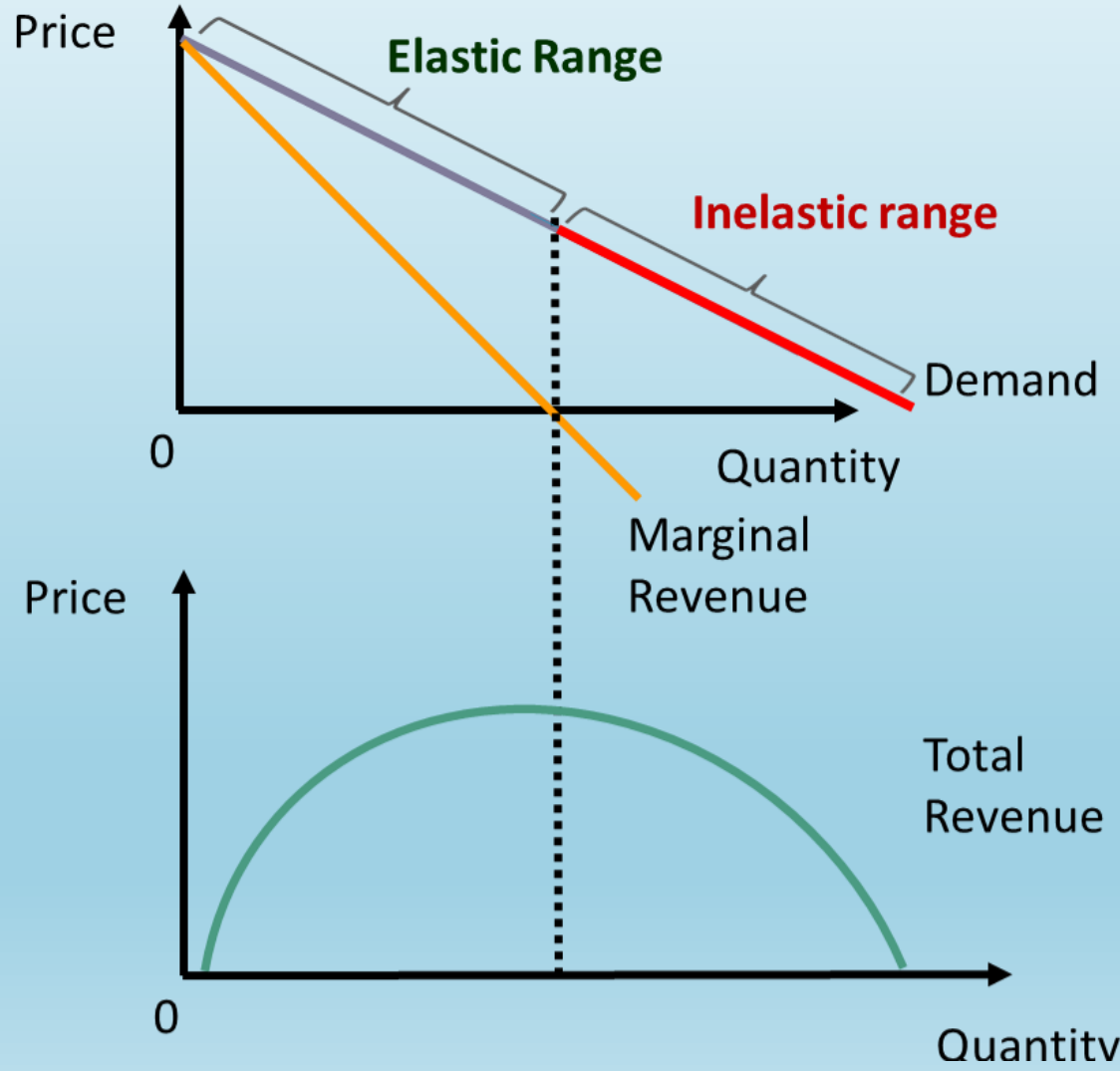


Be able to identify:

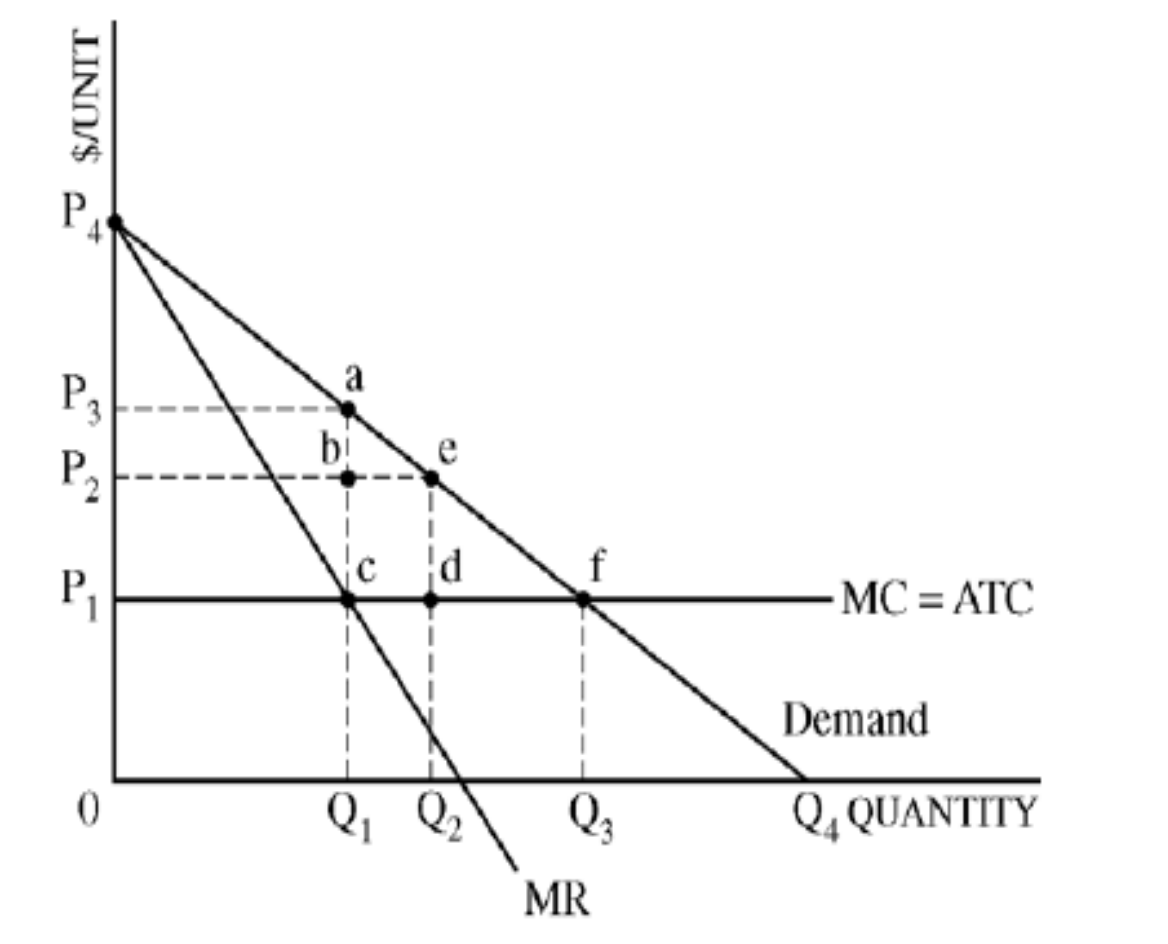
- P and Q profit max
- P and Q socially optimal
- P and Q fair return
- P and Q revenue maximizing
- CS
- Profit/loss

Monopoly

- Always produces in **elastic** range
- When MR crosses quantity axis is the point that divides the demand curve into the elastic and inelastic region
- This is the **revenue maximizing point**

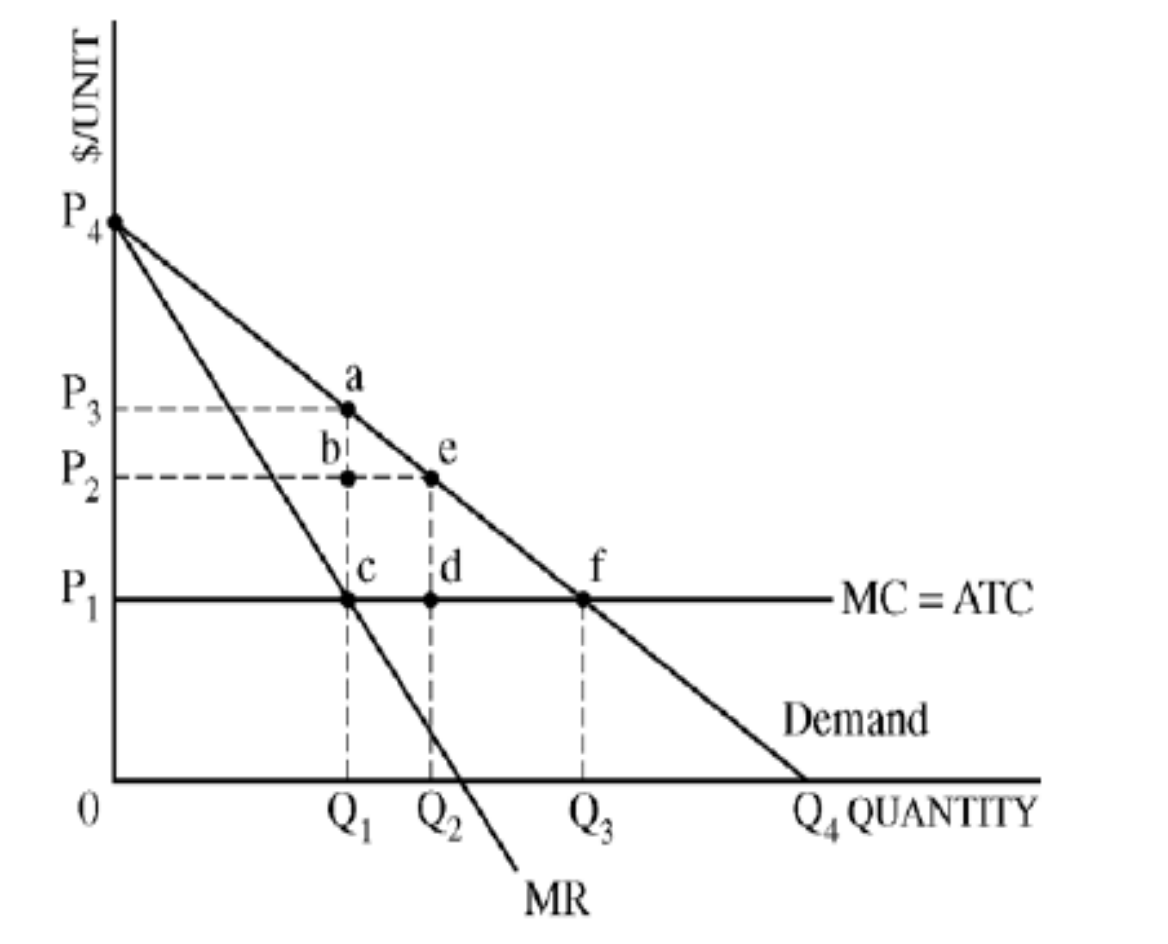


Monopoly



- P and Q for the monopoly:
- Profit:
- DWL:
- Price discriminating Q:
- Price discriminating Total revenue:
- Socially optimal Q:
- Earning a profit at Q_3?
- CS at socially optimal:
- Point f: Elastic? Inelastic? Unit elastic?

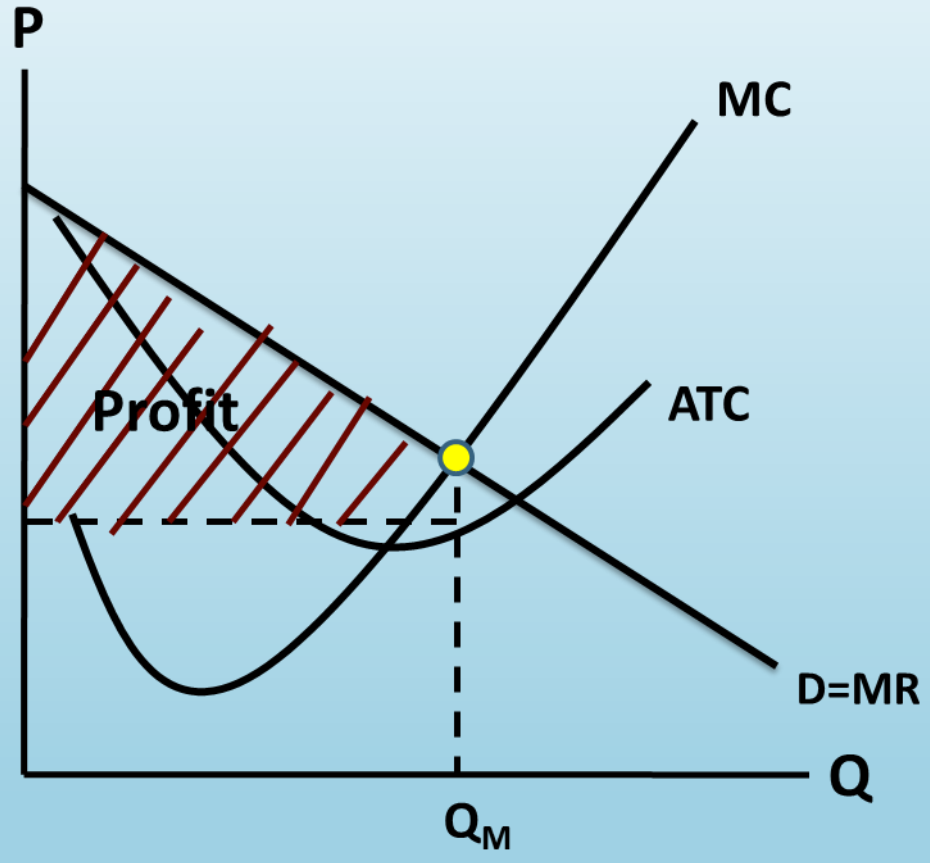
Monopoly



- P and Q for the monopoly: **Q_1 and P_3**
- Profit: **P_1P_3AC**
- DWL: **ACF**
- Price discriminating Q: **Q_3**
- Price discriminating Total revenue: **P_4FQ_30**
- Socially optimal Q: **Q_3**
- Earning a profit at Q_3? **No; zero econ profit since P=ATC**
- CS at socially optimal: **P_1P_4F**
- Point f: Elastic? Inelastic? Unit elastic? **Inelastic; MR is negative**

Price-Discriminating Monopolist

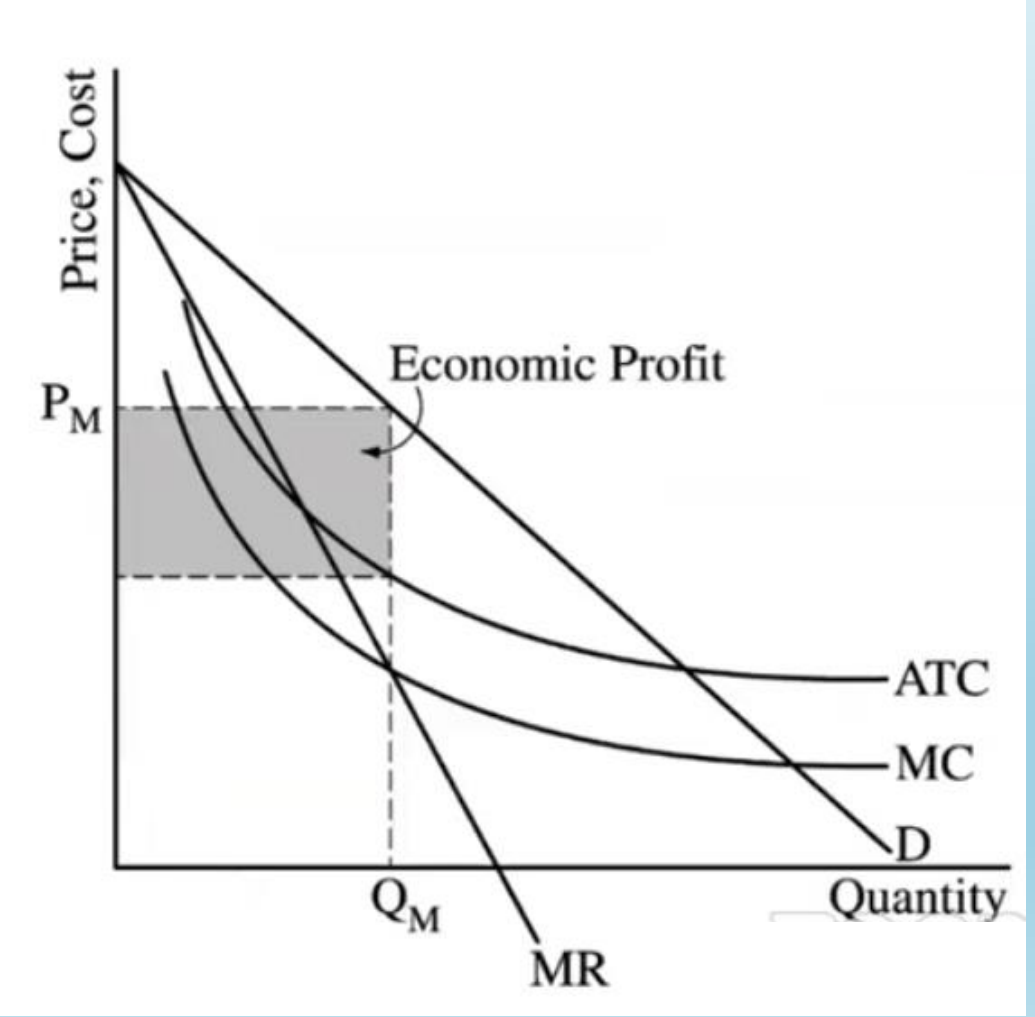
- Price is set where MC=D; so it is allocatively efficient
- MR<P=AR=D
- D=MR
- No CS
- No DWL



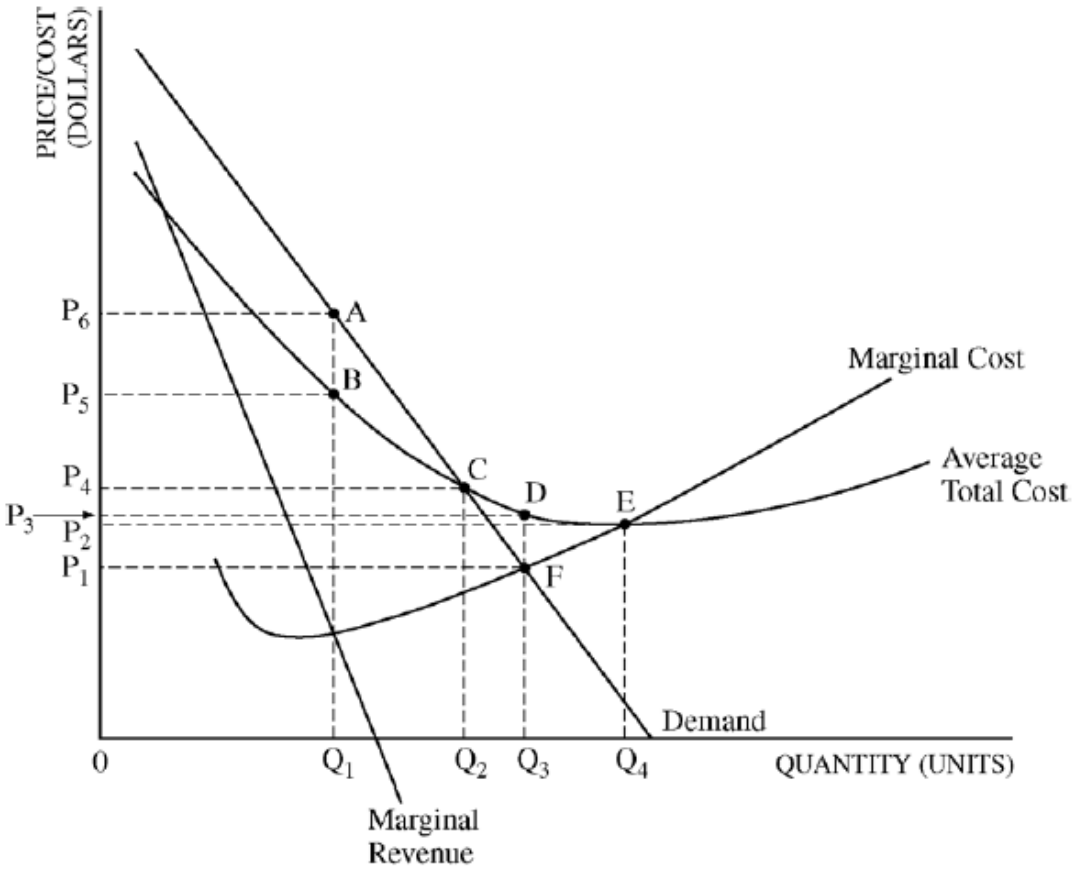
Price isn't labeled; consumers pay what they are willing and able to

Natural Monopoly (or Regulated Monopoly)

- What distinguishes a natural monopoly from a typical monopoly is the **ATC is downward sloping** throughout the entire range of market demand (it is experiencing economies of scale)
- Needs a **per-unit subsidy** to be able to produce the **socially optimal level**



Natural Monopoly



(i) Using the labeling in the graph, identify each of the following.

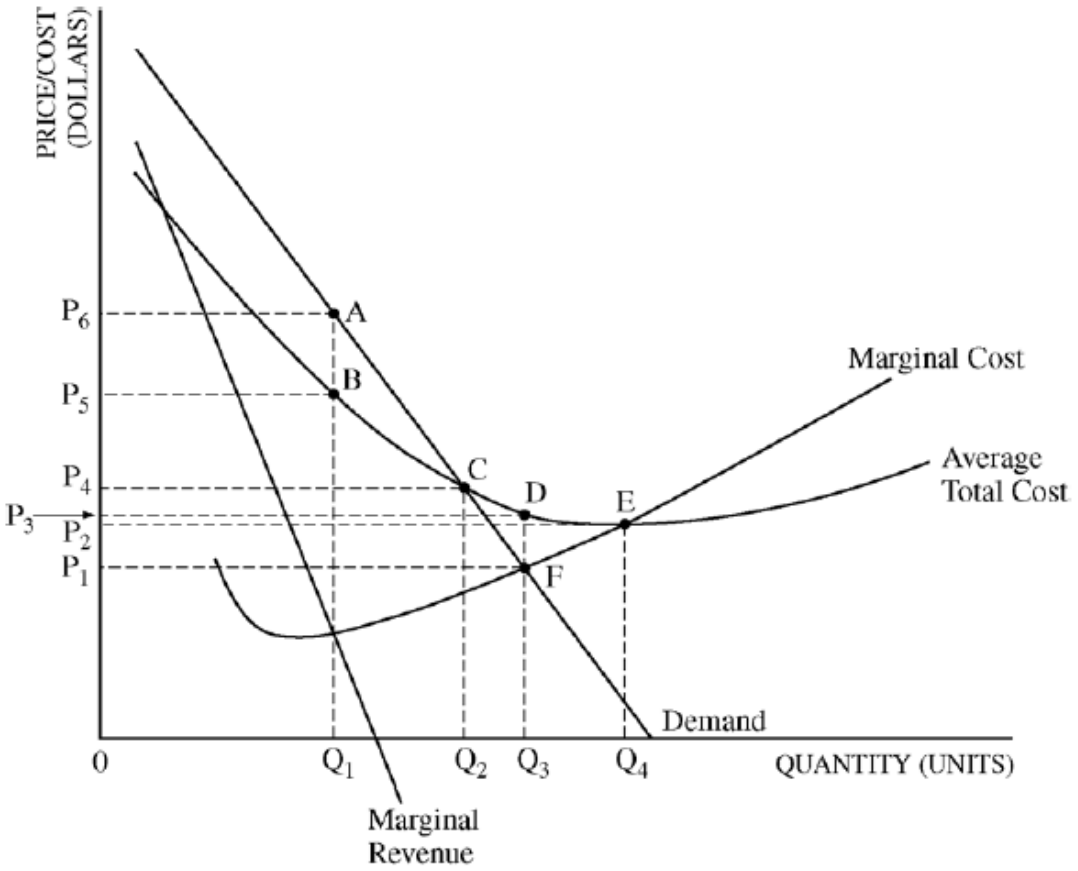
(1)The profit-maximizing output

(2)The socially efficient output

(ii) At the socially efficient output, is the monopoly making a profit or incurring a loss? Using the labeling on the graph, identify the area of profit or loss.

- **Profit maximizing output:**
- **Socially optimal output:**
- **At socially optimal, profit or loss?**

Natural Monopoly



(i) Using the labeling in the graph, identify each of the following.

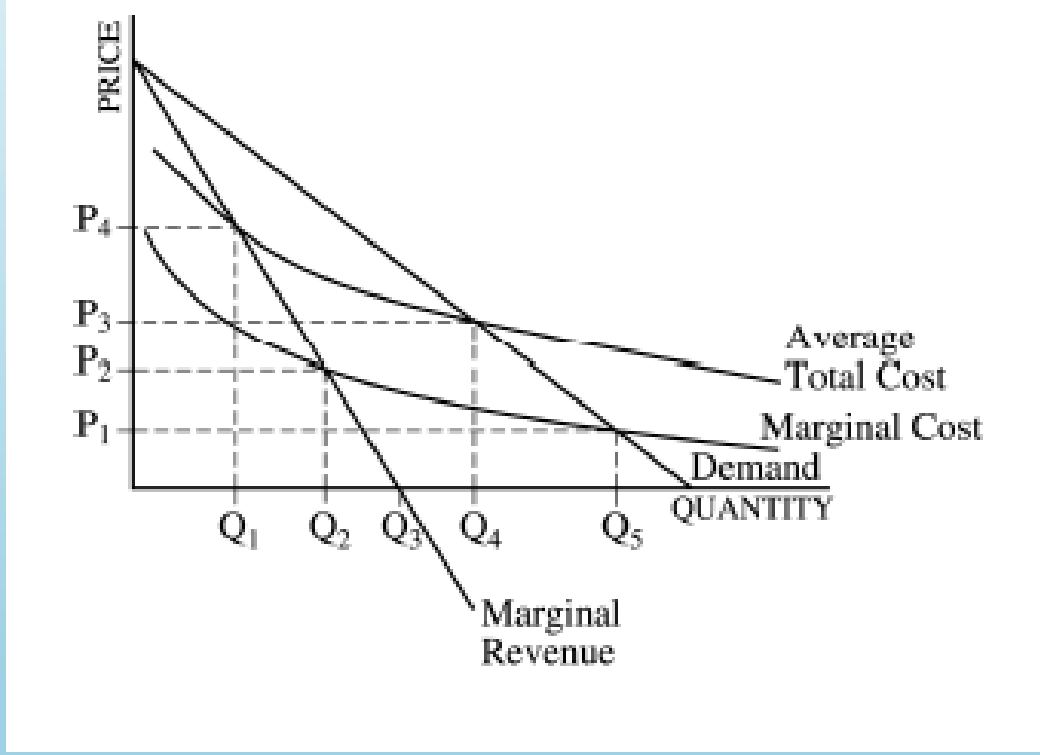
(1)The profit-maximizing output

(2)The socially efficient output

(ii) At the socially efficient output, is the monopoly making a profit or incurring a loss? Using the labeling on the graph, identify the area of profit or loss.

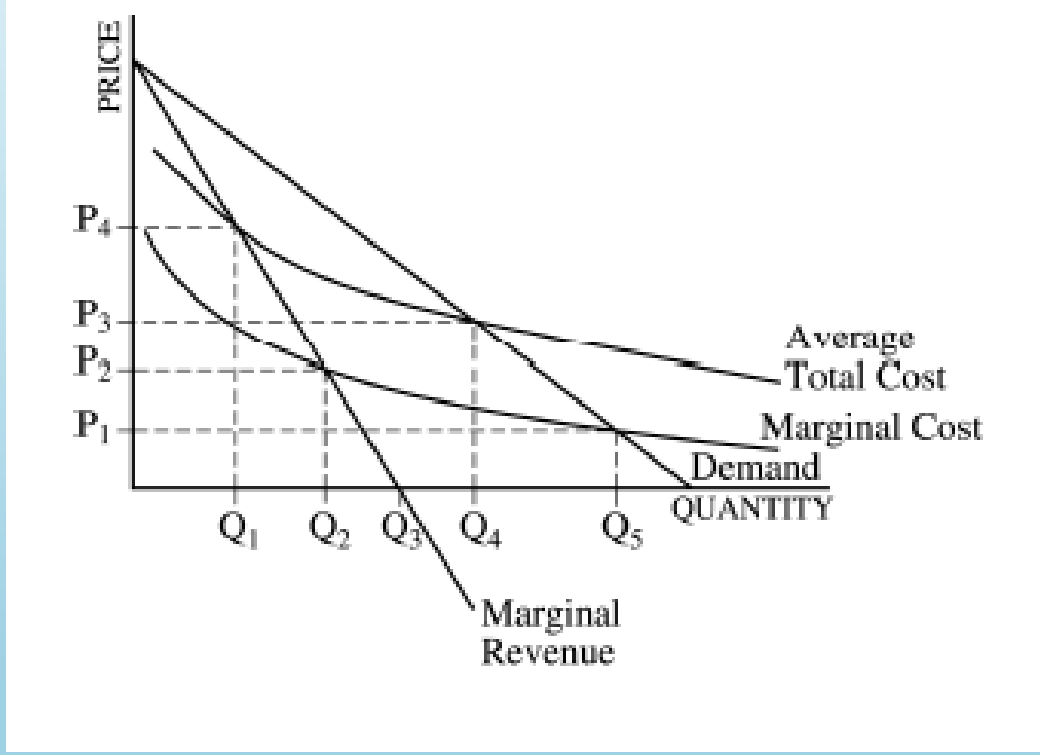
- **Profit maximizing output:** Q_1
- **Socially optimal output:** Q_3
- **At socially optimal, profit or loss?** Loss of P_1P_3DF

Natural Monopoly



- **What type of firm is this?**
- **At what quantity can the government regulate output so that the firm earns zero economic profit?**

Natural Monopoly



- **What type of firm is this?**
- Natural monopoly; ATC is decreasing where demand intersects ATC
- **At what quantity can the government regulate output so that the firm earns zero economic profit?**
- Q_4 (where ATC=D)

Lump-sum Tax

- A **lump-sum tax** affects fixed costs (AFC and ATC)
- It shifts ATC upward
- It does **not** affect MC
- P and Q do **not** change
- It would decrease profit

- ★**Be able to apply to perfect competition and monopoly**★

Per-unit Tax

- A **per-unit tax** affects variable costs (AVC, ATC, and MC)
- It shifts MC upward (left)
- Q would decrease and P would increase
- It would decrease profit
- DWL increases

- **★Be able to apply to perfect competition and monopoly★**

Lump-sum Subsidy

- A **lump-sum subsidy** would affect fixed costs (AFC and ATC)
- It does **not** effect MC
- P and Q do **not** change
- It would **not** impact DWL

- ★**Be able to apply to perfect competition and monopoly**★

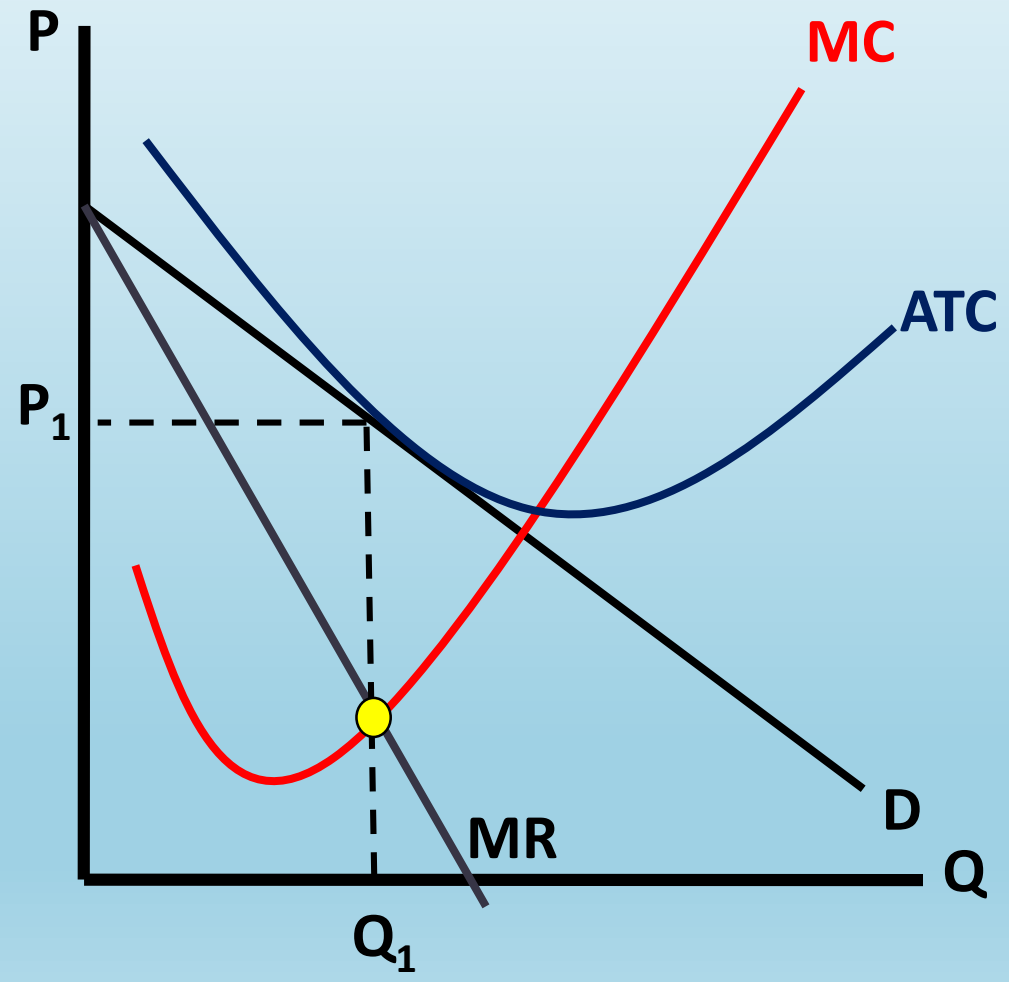
Per-unit Subsidy

- A **per-unit subsidy** would affect variable costs (AVC, ATC, and MC),
- MC would shift down (to the right) and would allow the firm to produce where MC=D (where a perfect competitor would produce)
- P would decrease and Q would increase

- ★**Be able to apply to perfect competition and monopoly**★

Monopolistic Competition

- Has **excess capacity**: produces at lower output and higher price (does **not** produce at socially optimal)
- **Zero economic profit** in long run
  - ATC tangent at P
- Producing in downward sloping portion of LRATC, so **economies of scale exist**



Oligopolies/Game Theory

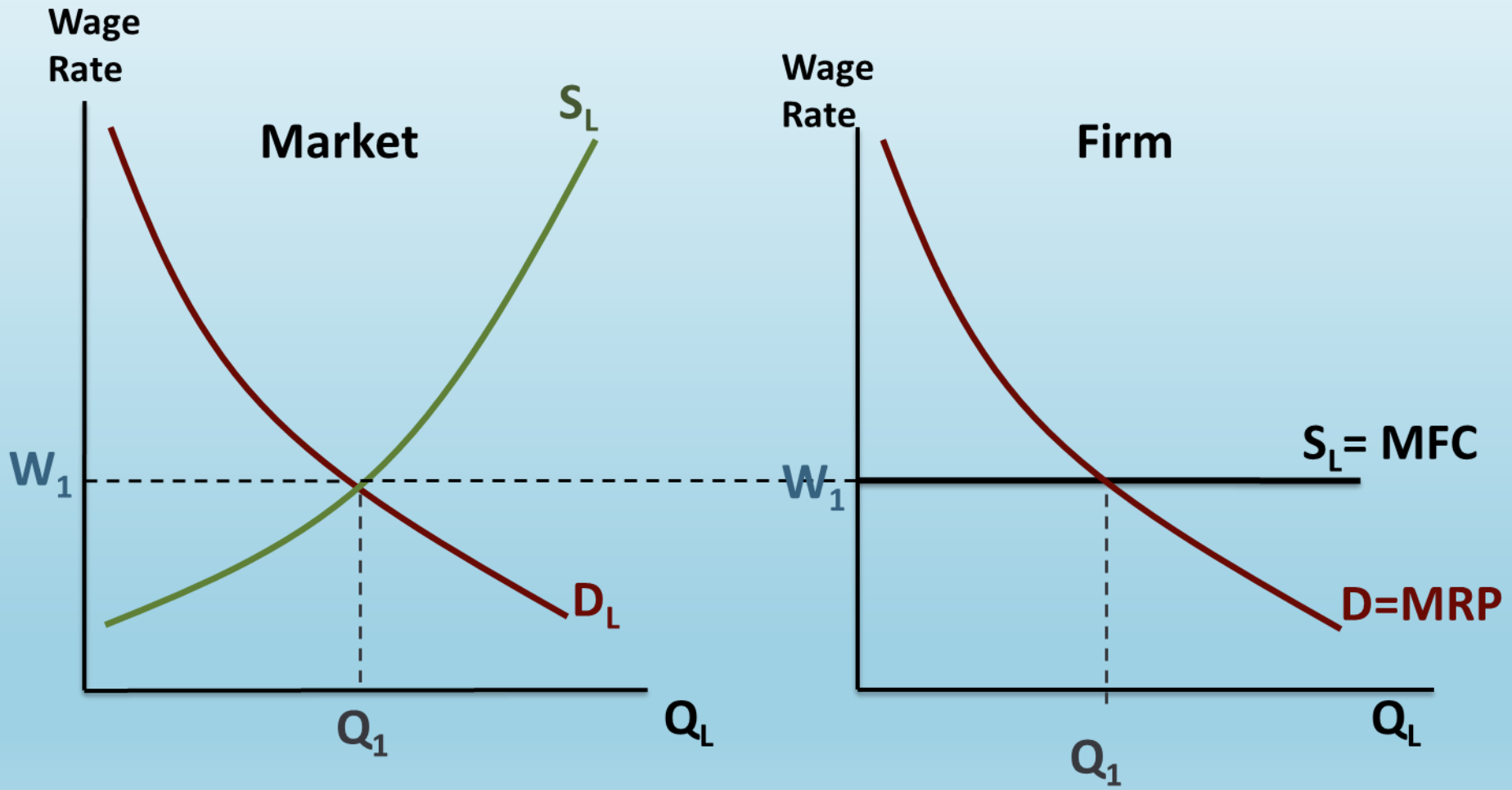
- **Dominant strategy:** the payoff or choice/strategy a player/firm will take independent of the action taken by the other player/firm

- **Nash equilibrium:** when no player/firm can increase his/her payoff by taking any other action given the other player/firms action
  - Could be more than one in a matrix

Review of Market Structures

Market Structure	Number of Sellers	Type of Product	Control over Price	Barriers to Entry	Example
Perfect competition	Many	Identical	None (price taker)	None	Wheat farm
Monopoly	One	Unique	Complete (price maker)	Very high	Medicine (patent)
Monopolistic competition	Many	Differentiated	Some	Very low	Restaurants
Oligopoly	Few	Similar or differentiated	Interdependent	Very high	Car companies

Perfectly Competitive Labor (Resource) Market



Shifts in Supply and Demand for Labor

Demand for Labor	Supply for Labor
Productivity: An increase in productivity causes an increase in the demand for labor	Availability of alternative options for workers
Price of good being produced: higher prices lead to a higher demand for labor	Immigration: An increase in immigration causes an increase in the supply of labor
Increase in demand of the good being produced	Education: the higher the level of education needed for a job, the lower the supply of labor

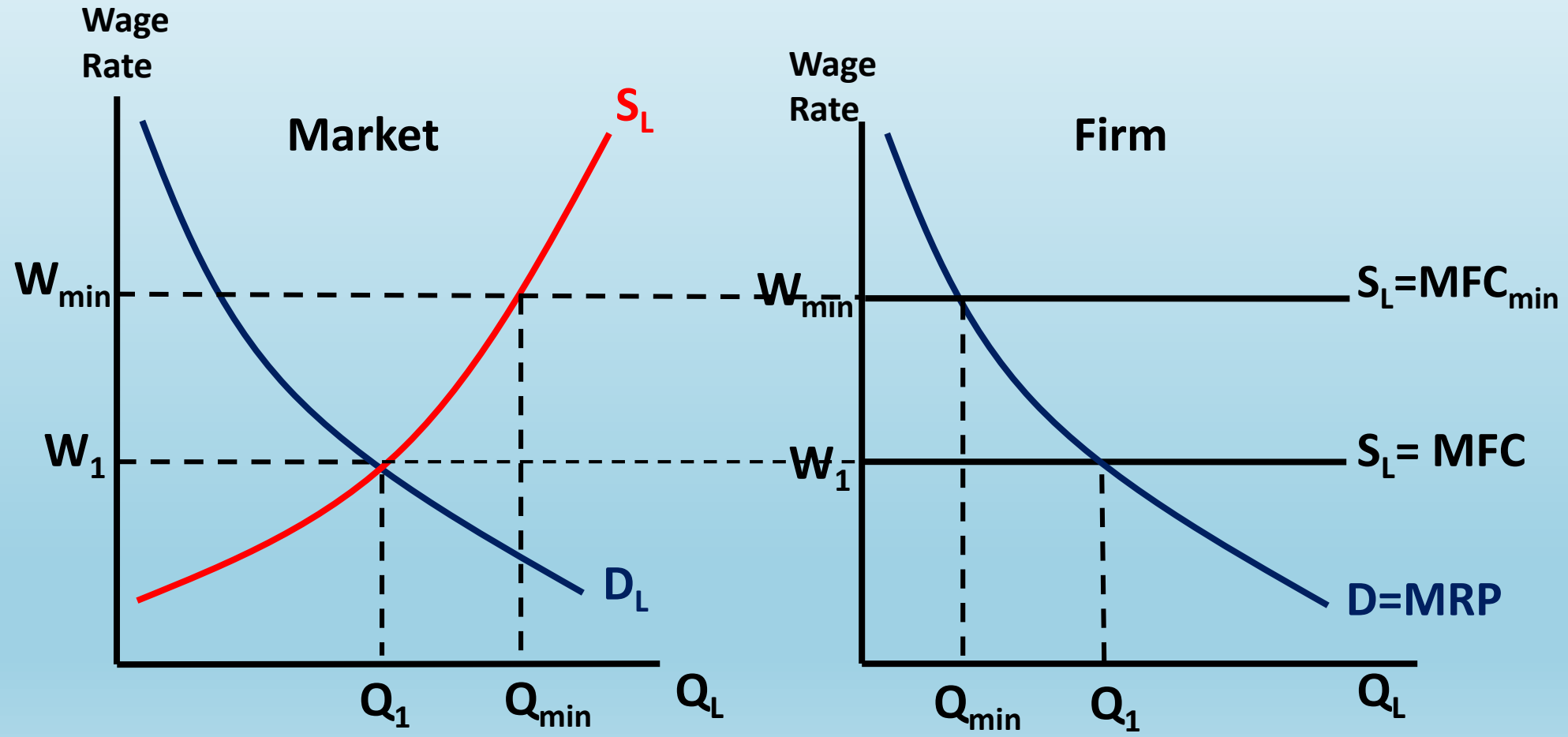
Labor (Factor/Resource) Market

- MPP x P= MRP
- Hire where **MRP=MFC;** hire up to the MRP that a worker generates the firm
- Firms are **wage takers**; pay workers same amount; can hire as many as they want at the **market wage**
- An increase in **price** of the product **increases MRP** and **demand** for the resource
- Technological advances **increase** marginal product and therefore MRP (**demand**)

Perfectly Competitive Labor Market

What would happen if a minimum wage was imposed?

There would be an excess supply of labor and more unemployment

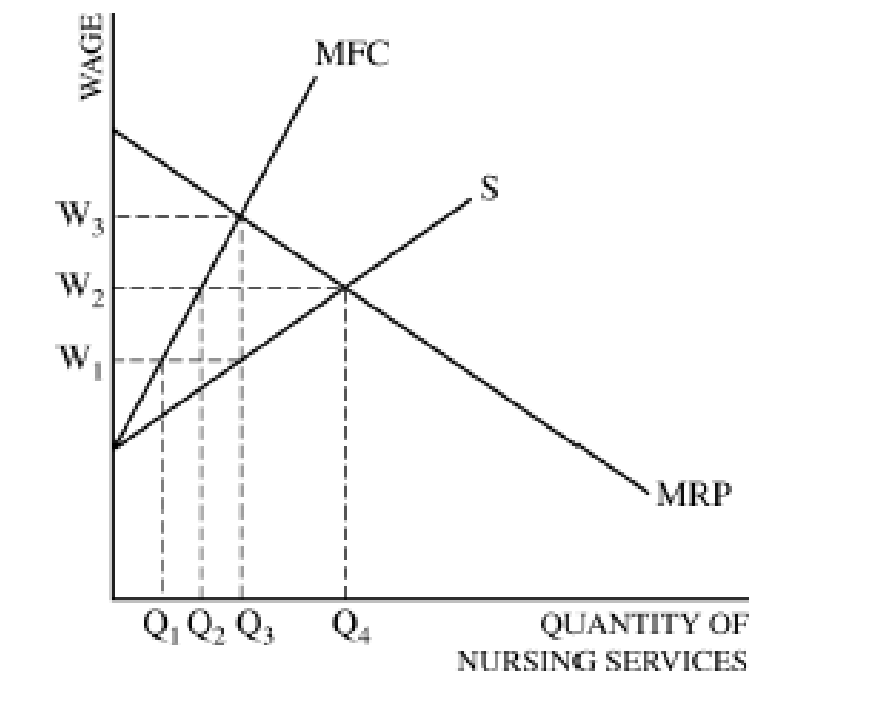


Cost Minimization Condition (or Least Cost Rule)

- **Cost minimization condition**: where the ratio of marginal product to the price of an input is equal for all inputs
- $\frac{MP_l}{P_l} = \frac{MP_c}{P_c}$

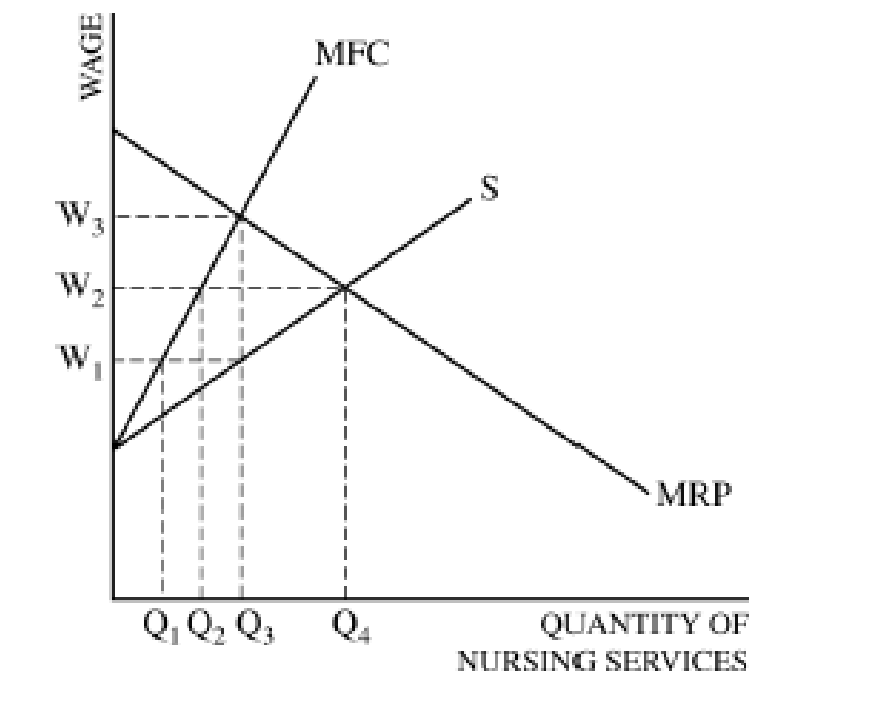
- **Marginal product of labor/price of labor** compared to **Marginal product of capital/price of capital**
- **Employ more of the one that gets more MPL/P**
- ★**Apply same logic as MU/P: Want more MPL per P**★

Monopsony



- **This firm will hire workers at which wage and quantity?**
- **If this firm hired workers in a competitive market, what would the wage and quantity be?**

Monopsony



- **This firm will hire works at which wage and quantity?**
- W_1 and Q_3
- **If this firm hired workers in a competitive market, what would be the quantity of workers hired?**
- Q_4

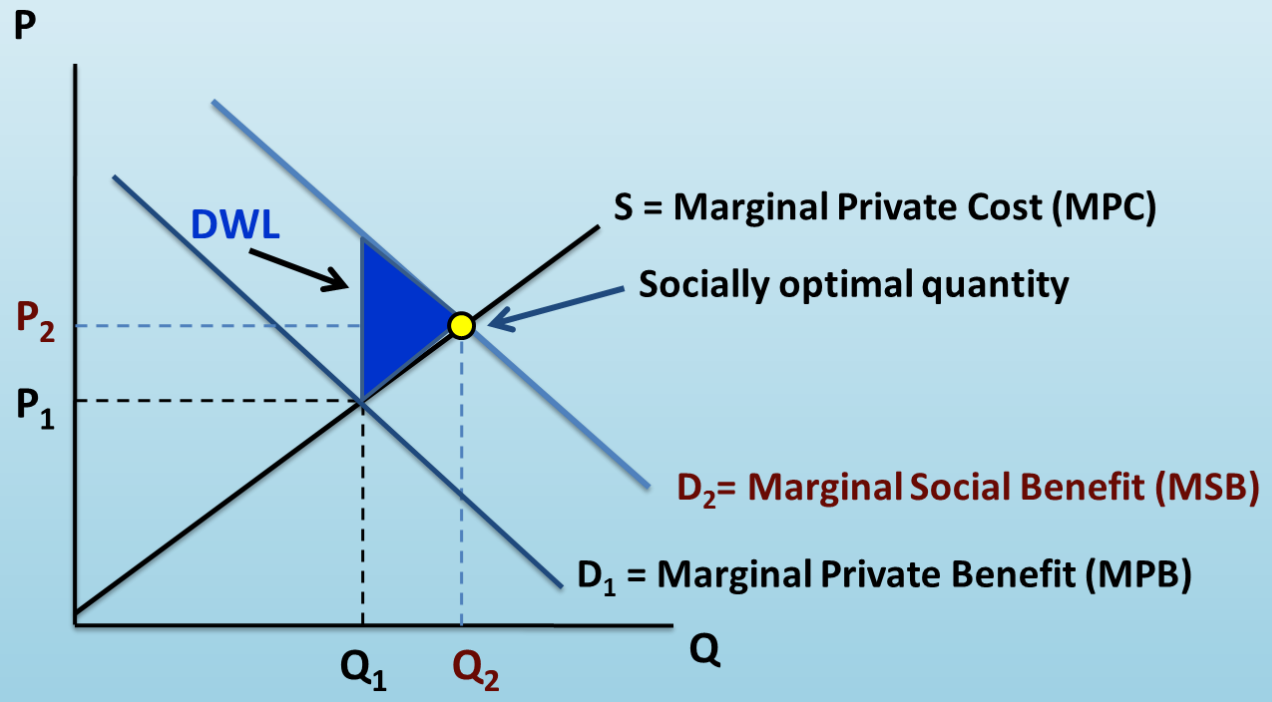
Externalities

- **Positive externality: underproduces**
  - **Need to increase Q and produce where MPB=MPC**
  - **Government can subsidize**

- **Negative externality: overproduces**
  - **Need to decrease Q and produce where MSB=MSC**
  - **Government can tax**

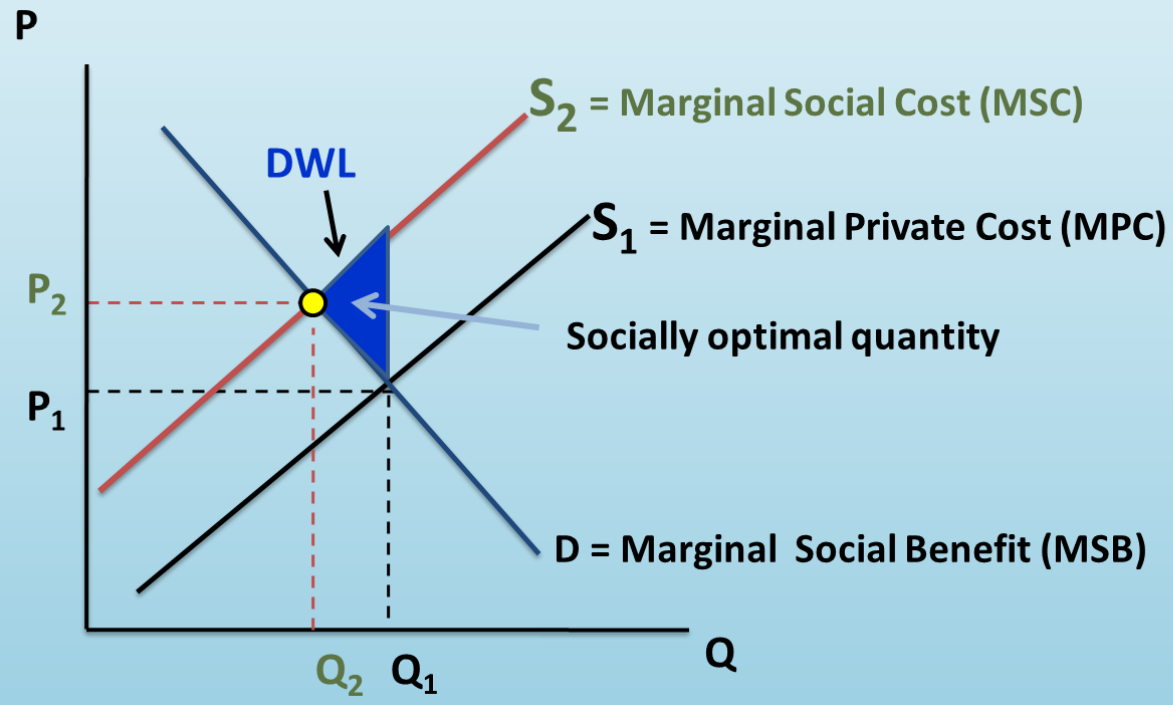
Externalities

Positive



If asked: Label P_2 as P_{SO} and Q_2 as Q_{SO}

Negative



If asked: Label P_2 as P_{SO} and Q_2 as Q_{SO}

Public Goods

- **Probably one MC question on characteristics**

- **Nonexclusive:** everyone can use the good no one can be excluded from its benefits (even if they don't pay)

- **Nonrival (shared consumption):** consumption by one does not reduce the usefulness to others

Tax Rates

- **Marginal tax rate:** the rate paid on the last dollar earned
  - Marginal tax rate= △taxes due/△taxable income

- **Average tax rate:** the proportion of total income paid to taxed
  - Average tax rate=total taxes due/total taxable income

- Maybe one MC question

Types of Taxes

- **Progressive tax:** average tax rate increases with income
  - It takes more income from the rich than the poor

- **Proportional tax (flat rate):** taxes each income group at the same rate
  - Does **not** redistribute income

- **Regressive tax:** the average tax rate decreases as income increases
  - It takes more from the poor than the rich
  - Sales tax