

TODAY
21/01/2009

CFA – Level I

Microeconomics

David Henriques

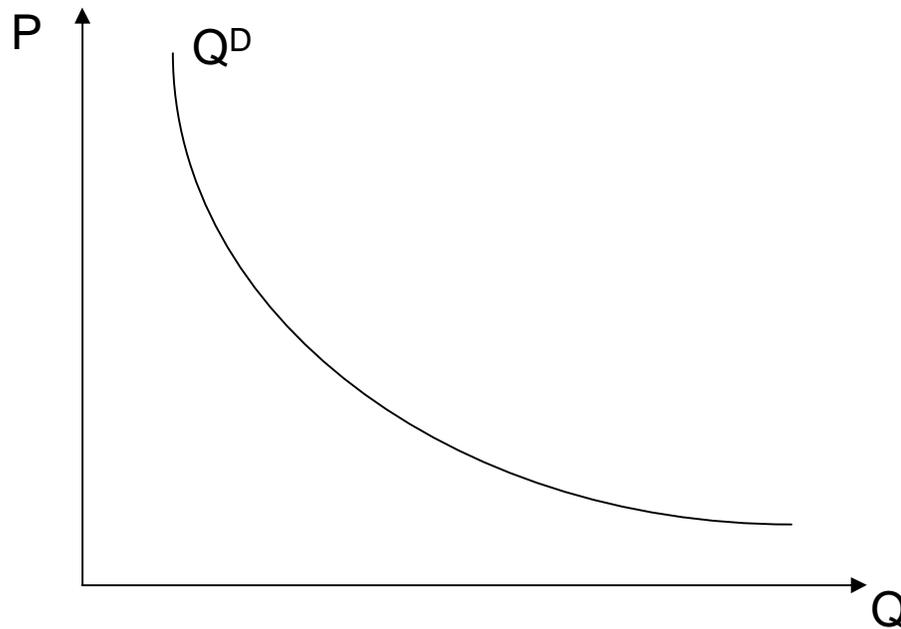
dthenriques@fe.unl.pt // docentes.fe.unl.pt/~dthenriques

Micro session structure

- 1) The demand side** (preferences, income, elasticity,...).
- 2) The supply side** (costs).
- 3) Markets structures** (Perfect Competition, Monopoly, Oligopolies, Monopolistic Competition).

The demand curve

- The usual (individual) demand curve.
What does it mean?



The demand curve

- Aggregate Demand (or market Demand) for a good is found by adding individual demands.
- We see that the demand curve is **downward sloping**, for an increase in Price P , the aggregate quantity of good demanded Q decreases.

Price Elasticity of Demand

- Suppose the demand function for the good is $Q(P)$.
- Price elasticity of demand at a price P is defined as:

$$E_{Q,P} = \frac{\Delta Q / Q}{\Delta P / P} = \frac{\% \text{ change in } Q}{\% \text{ change in } P}$$

Price Elasticity of Demand

- Price elasticities give you a measure of how sensitive Q is to changes in P .
- While it is not the straightforward derivative dP/dQ , dividing the derivative by P/Q does have the advantage of making elasticities dimensionless.
- We can talk about elasticities without bothering about units.

Price Elasticity of Demand

- At a price point P , elasticities computed will differ based on the change in P and consequent change in Q .
- The correct elasticity is the one for a very small change, but as that may not be available, we can try to obtain a better approximation by taking averages.

Price Elasticity of Demand

- If the price changes from P_1 to P_2 , and quantity changes from Q_1 , to Q_2 , then we compute price elasticity as:

$$\% \text{Change in } Q = \frac{Q_2 - Q_1}{(Q_1 + Q_2) / 2}$$

$$\% \text{Change in } P = \frac{P_2 - P_1}{(P_1 + P_2) / 2}$$

$$\text{Hence, } E_{Q,P} = \frac{\frac{Q_2 - Q_1}{(Q_1 + Q_2) / 2}}{\frac{P_2 - P_1}{(P_1 + P_2) / 2}} = \frac{(Q_2 - Q_1)(P_1 + P_2)}{(Q_1 + Q_2)(P_2 - P_1)}.$$

An example with real number

Exercise: Suppose the price of peaches are \$1.99 per kg, and quantity demanded is 3 million kgs. Following an increase in price to \$2.09 per kg, the quantity demanded falls to 2.75 million kgs. What is the price elasticity of demand for peaches?

The computations

$$\% \text{Change in } Q = \frac{2.75 - 3}{(2.75 + 3)/2}$$

$$\% \text{Change in } P = \frac{2.09 - 1.99}{(2.09 + 1.99)/2}$$

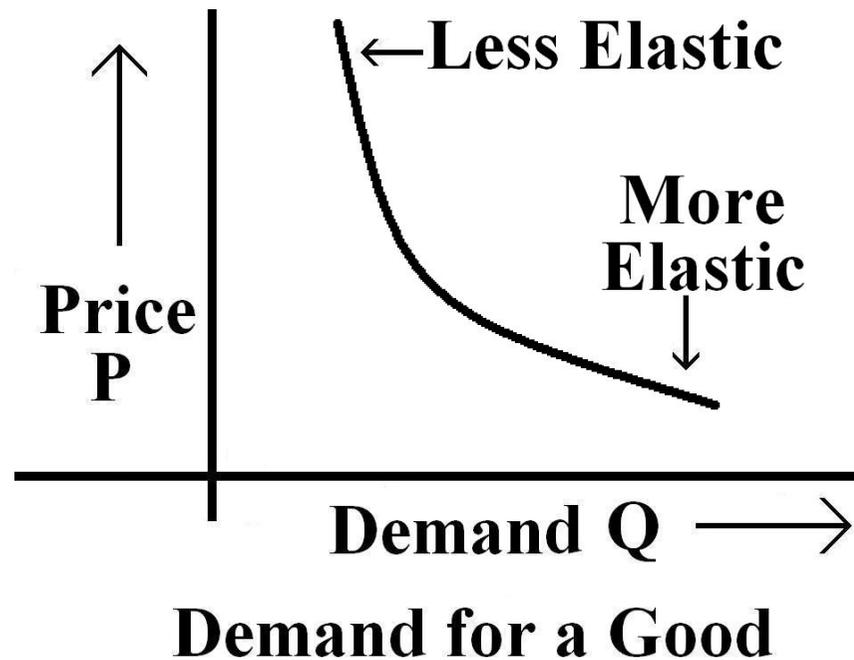
$$\text{Hence, } E_{Q,P} = \frac{\frac{2.75 - 3}{(2.75 + 3)}}{\frac{2.09 - 1.99}{2.09 + 1.99}} = -1.77 .$$

Price elasticity of demand

- The higher (lower) the price elasticity, the greater (lower) will be the change in Q for a given change in P . The demand for the good is said to be more elastic (inelastic).
- An elasticity of 0 implies that there is no change in Q for a change in P . The demand curve is vertical – perfectly inelastic demand curve.

Price elasticity of demand

- Typically, the price elasticity of demand will change over the demand schedule.



Revenue and Elasticity

- The price elasticity was -1.77 in the example we considered before. What does that say about total expenditure?
- If you compute total expenditure, you can see that it has reduced from:

$$3\text{M kgs} * \$1.99 = \$5.97\text{M to,}$$
$$2.75\text{M kgs} * \$2.09 = \$5.7475\text{M} < \$5.97\text{M}.$$

Revenue and Elasticity

- Indeed, it can be shown that when the magnitude of price elasticity is greater than 1, an increase in price will reduce total money spent on the good. One convention calls this an elastic demand.
- If magnitude is less than 1, then total money spent will increase (inelastic demand).
- You can prove it! (just for fun).

Income Elasticity of Demand

$$E_{Q,I} = \frac{\frac{Q_2 - Q_1}{(Q_1 + Q_2)/2}}{\frac{I_2 - I_1}{(I_1 + I_2)/2}} = \frac{(Q_2 - Q_1)(I_1 + I_2)}{(Q_1 + Q_2)(I_2 - I_1)}$$

Good classification according to **income**:

- If $E_{Q,I} < 0 \Rightarrow$ inferior good
- If $E_{Q,I} > 0 \Rightarrow$ normal good
- If $E_{Q,I} > 1 \Rightarrow$ luxury good

Cross Elasticity of Demand

$$E_{Q_i, P_j} = \frac{\frac{Q_{i,2} - Q_{i,1}}{(Q_{i,1} + Q_{i,2})/2}}{\frac{P_{j,2} - P_{j,1}}{(P_{j,1} + P_{j,2})/2}} = \frac{(Q_{i,2} - Q_{i,1})(P_{j,1} + P_{j,2})}{(Q_{i,1} + Q_{i,2})(P_{j,2} - P_{j,1})}$$

Goods classification according to cross elasticity of demand:

If $E_{Q_i, P_j} > 0 \Rightarrow$ good i and j are substitutes

If $E_{Q_i, P_j} < 0 \Rightarrow$ good i and j are complements.

General view about elasticities

- We can compute an elasticity in any relation between two variables X and Y simply by doing,

$$\% \text{Change in } X = \frac{X_2 - X_1}{(X_1 + X_2)/2}$$

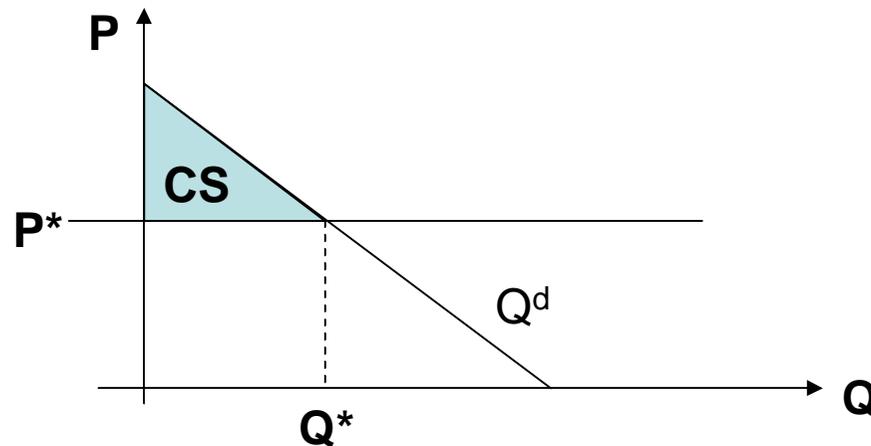
$$\% \text{Change in } Y = \frac{Y_2 - Y_1}{(Y_1 + Y_2)/2}$$

$$\text{Hence, } E_{Y,X} = \frac{(X_1 + X_2)(Y_2 - Y_1)}{(X_2 - X_1)(Y_1 + Y_2)} \text{ or}$$

$$E_{Y,X} = \frac{dY}{dX} \cdot \frac{X}{Y} \text{ when } \Delta X \rightarrow 0.$$

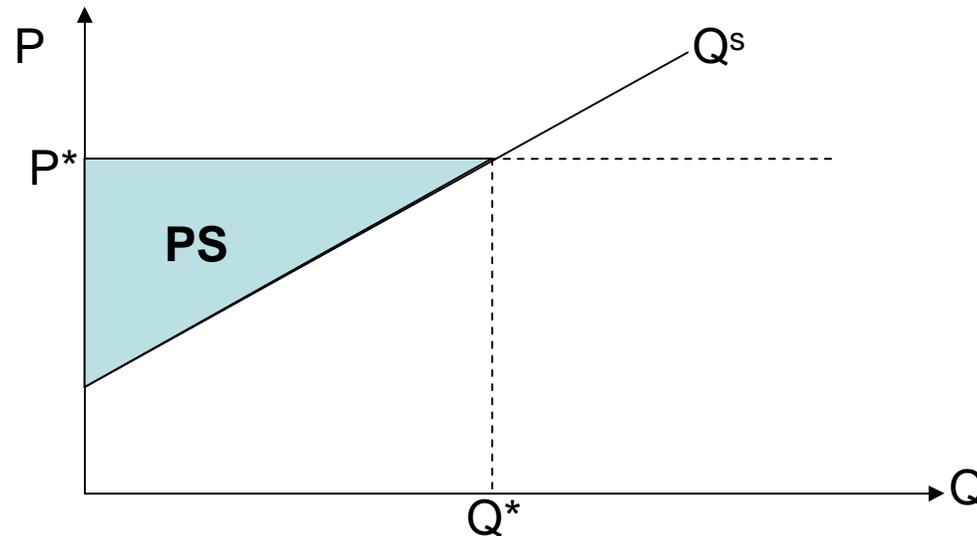
Efficiency and Equity

- Demand and Marginal Benefit
- Demand and Willingness to pay
 - A demand curve is a marginal benefit curve.
 - Behind the demand curve - the principle of diminishing marginal utility.
- Consumer Surplus



Efficiency and Equity

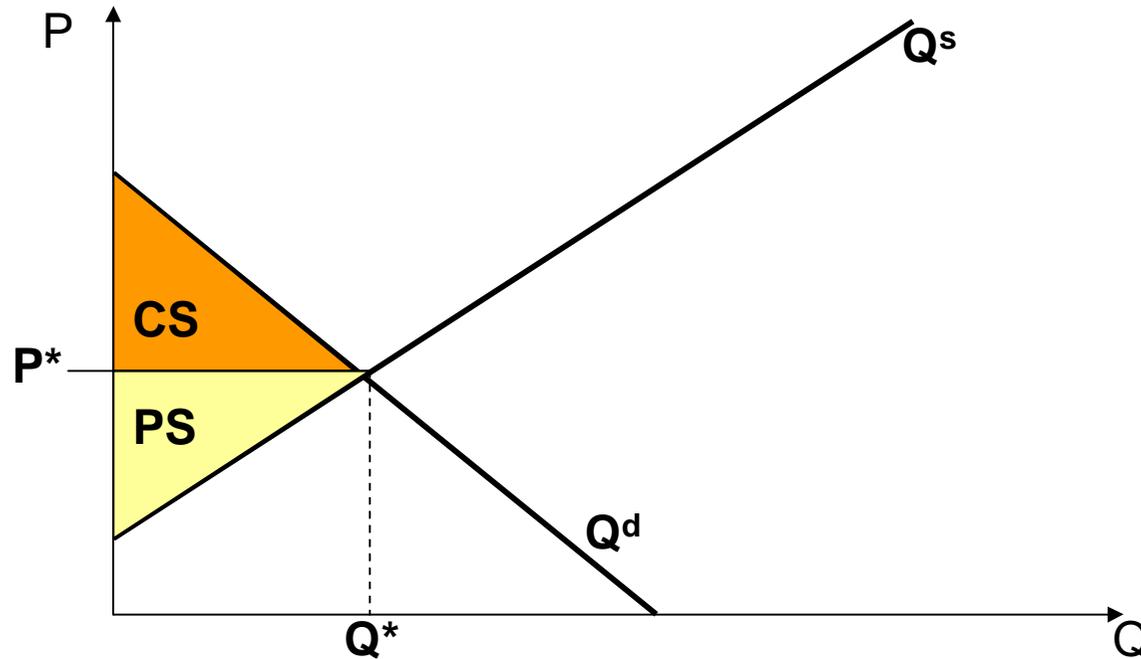
- Supply and marginal cost
- A supply curve is a marginal cost curve: it tells the minimum price that the producer is willing to accept to sell 1+ unit of output.



- The aggregate supply curve is the horizontal sum of the quantities supplied by each individual producer.

Efficiency and Equity

- Putting supply and demand together (1)
- The competitive equilibrium (Q^* , P^*) in the graph:



- P^* is the equilibrium price.

Efficiency and Equity

- Putting supply and demand together (2)
- In a competitive equilibrium, marginal social benefit equals marginal social cost and resources allocation is efficient.
- Buyers and sellers acting in their self-interest end up promoting the social interest (the *invisible hand* of Adam Smith).
- The sum of consumer surplus and producer surplus is maximized.

Efficiency and Equity

- Putting supply and demand together (3)

- Some extensions of the demand and supply model (obstacles to efficiency):
 - **Price and quantity regulations** (price floors, price ceilings, quotas);
 - **Taxes and subsidies;**
 - Externalities (side effects that the free market doesn't take into account);
 - Public goods and common resources;
 - **Monopoly;**
 - Others.

Efficiency and Equity

- Is the competitive market fair? (1)

- **Efficiency:** So far we saw that competitive market is efficient (in the absence of distortions).
- **Equity:** Is the competitive market fair?
- Ideas about fairness can be divided into two groups: fair *results* and fair *rules*.

Efficiency and Equity

- Is the competitive market fair? (2)

- **Fair-results** ideas require income transfers from the rich to the poor that lead to a greater overall social benefit.
 - **Utilitarianism** is a principle arguing that income must be transferred from the rich to the poor up to the point of complete equality, where there's no rich and no poor.
 - **Rawlsianism:** is the principle where the fair distribution of the economic pie is the one that makes the poorest person in the society as well off as possible.

Efficiency and Equity

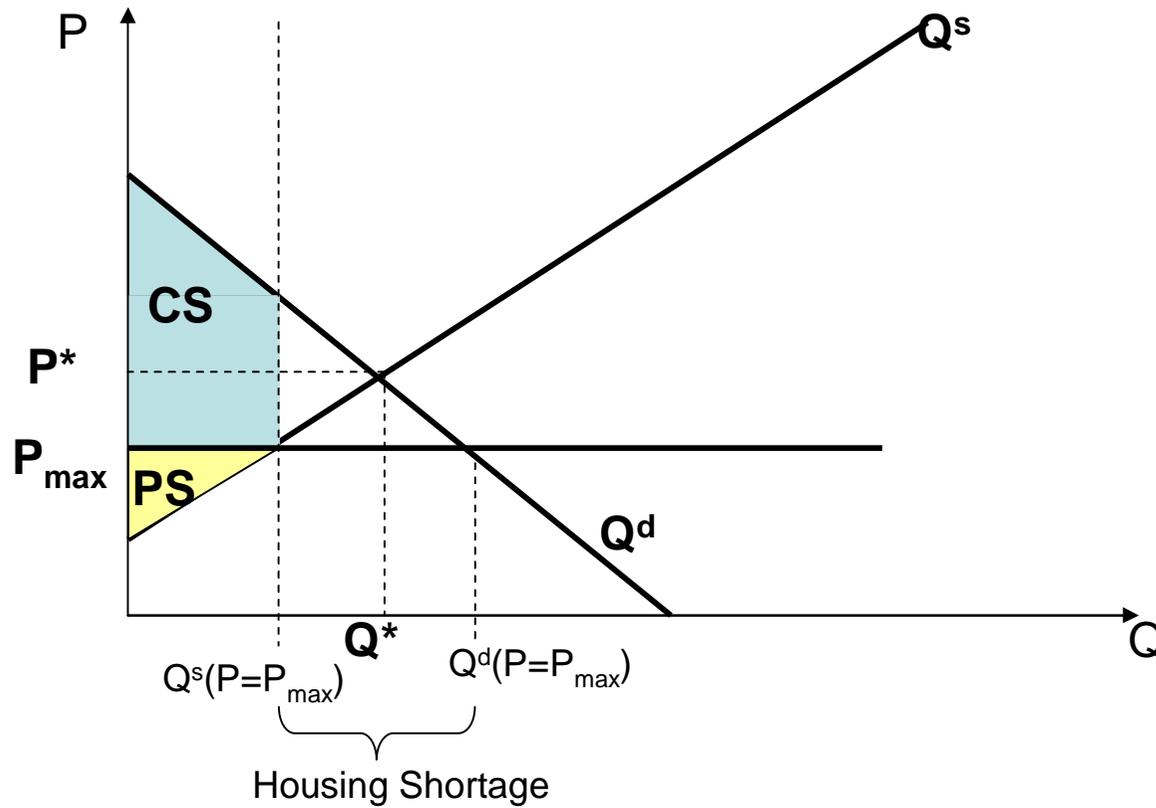
- Is the competitive market fair? (3)

- **Fair-rules** ideas require property rights and voluntary exchange.
 - The symmetry principle is the requirement that people in similar situations be treated similarly.
 - If the rules are fair, then it is expected that the result will also be fair.

Markets in action

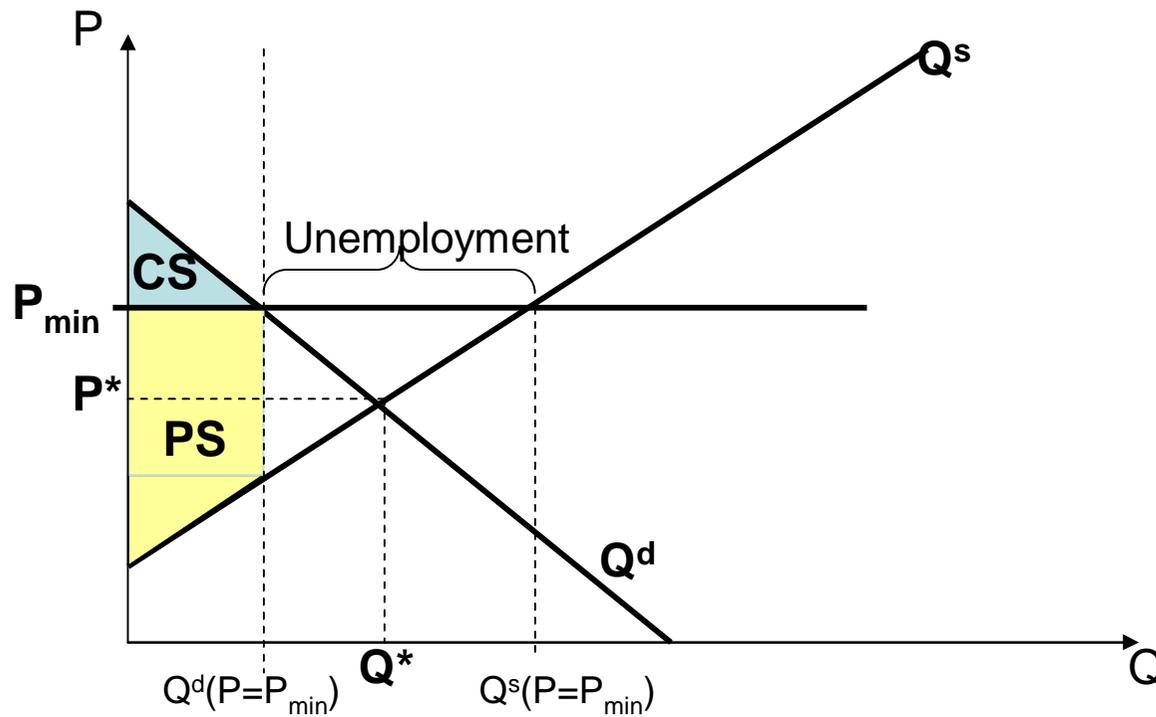
- Price regulation: Rent ceiling (price ceiling)

Welfare analysis



Markets in action

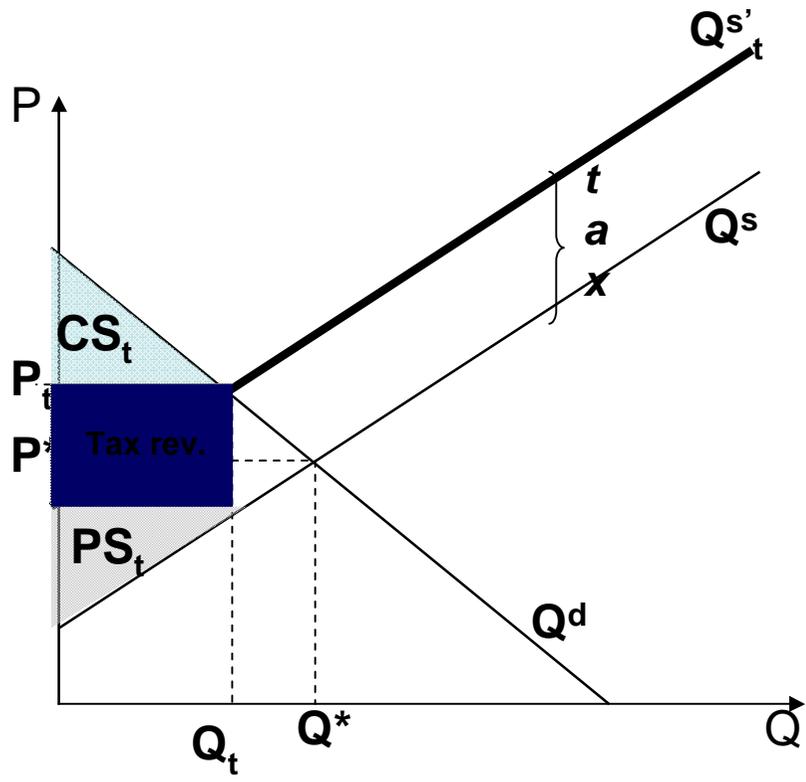
- Price regulation: Minimum wage (price floor)



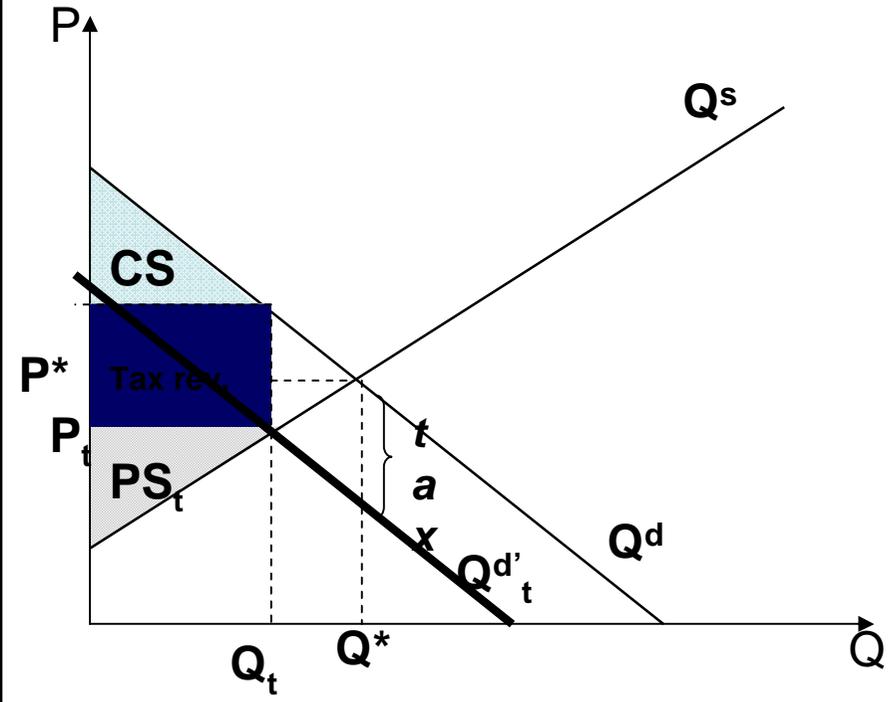
Markets in action

- Tax incidence

i) on producers



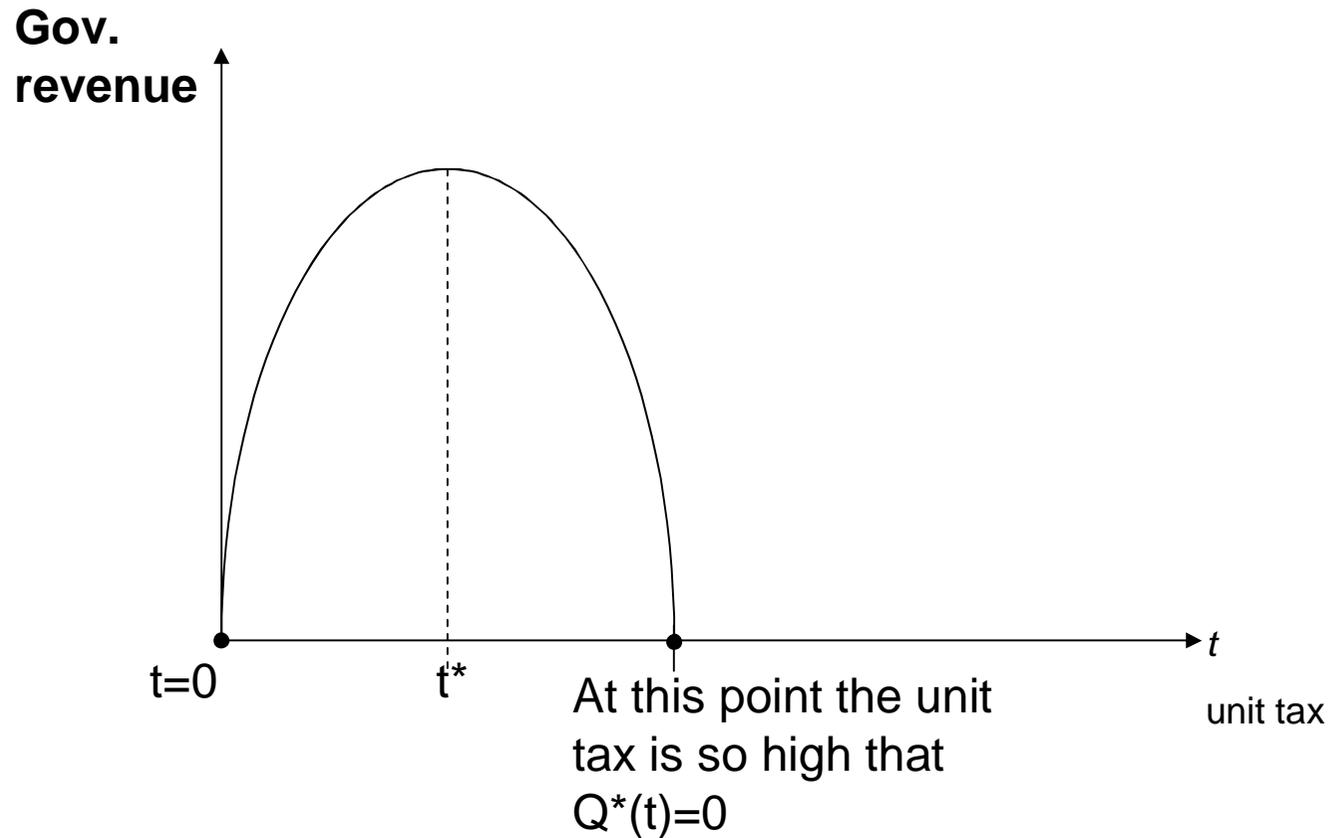
ii) on buyers



Markets in action

- Tax incidence: **The Laffer curve**

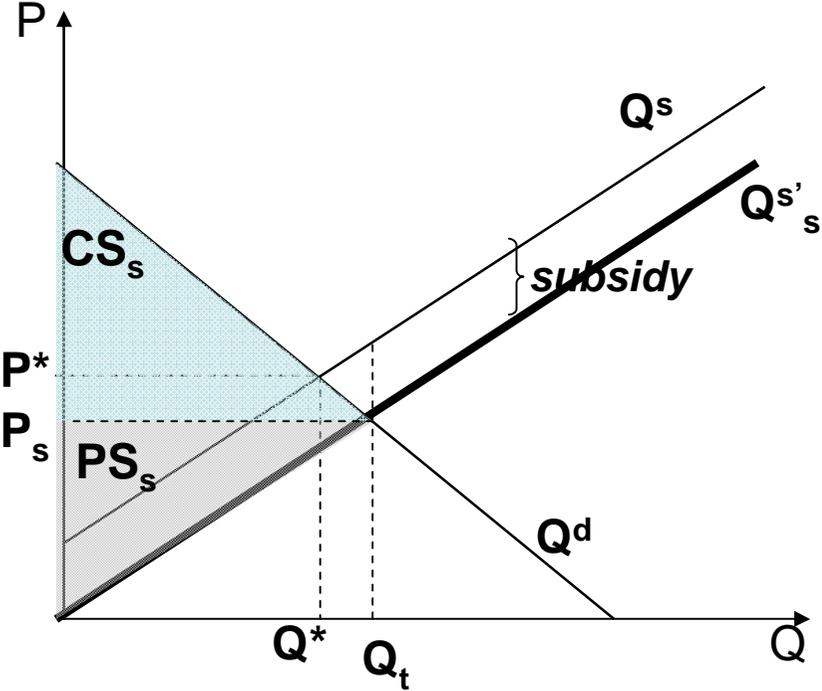
- Gov. revenue = $t \cdot Q^*(t)$.



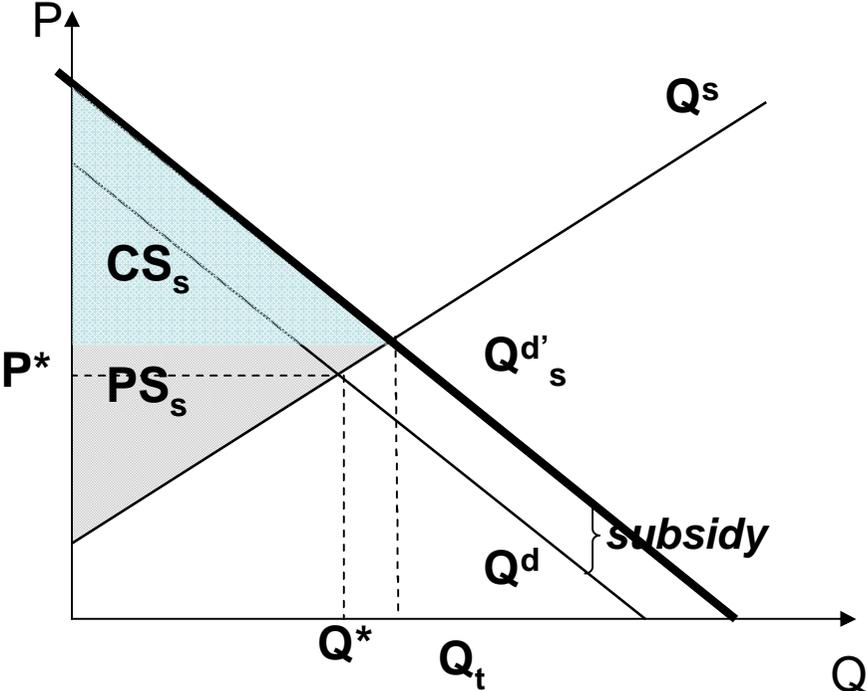
Markets in action

- Subsidy

i) on producers



ii) on buyers



Organizing Production

- The Firm and its economic problem (1)
- The firm's goal is to **maximize profit**.
- The **opportunity cost** of any action is the highest-valued alternative forgone, which includes:
 - **explicit costs**: the money that goes out of the firm;
 - **implicit costs**: the money generated by the highest-valued alternative forgone that does not enter to the firm.
- **Example**: The cost of using capital owned by the firm is an implicit cost because the firm could have rented the capital to another firm.

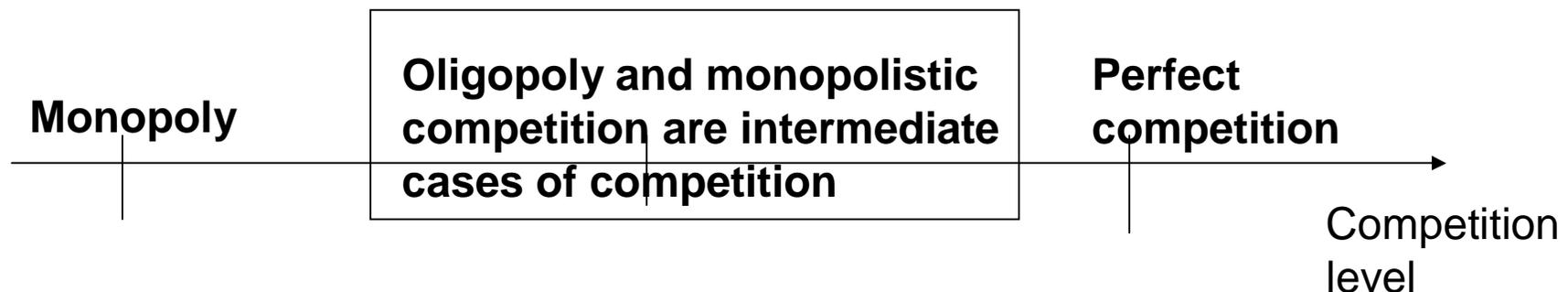
Organizing Production

- The Firm and its economic problem (2)
- **Question:** What's your opportunity cost of being here having CFA classes?
- Economic Profit = Total Revenue – Total Costs, where total costs is the opportunity cost.
- Economic Profit \neq Accounting Profit
- Economic profit takes into account not only the money you spent but also the money forgone related with the highest-value alternative forgone.

Organizing Production

- Market and the competitive environment (1)

- Economists identify four market structures:
 - Perfect competition: typically the benchmark of **economic efficiency**, i.e. firms produce a given output at the least cost.
 - Monopolistic competition;
 - Oligopoly;
 - Monopoly.



Organizing Production

- Market and the competitive environment (2)

- In order to determine the level of competition in a market, economists use two measures of concentration:

- The four-firm concentration ratio

$$C_4 = \sum_{i=1}^4 s_i$$

- The Herfindahl-Hirschman Index

$$H = \sum_{i=1}^N s_i^2$$

Organizing Production

- Market and the competitive environment (2)

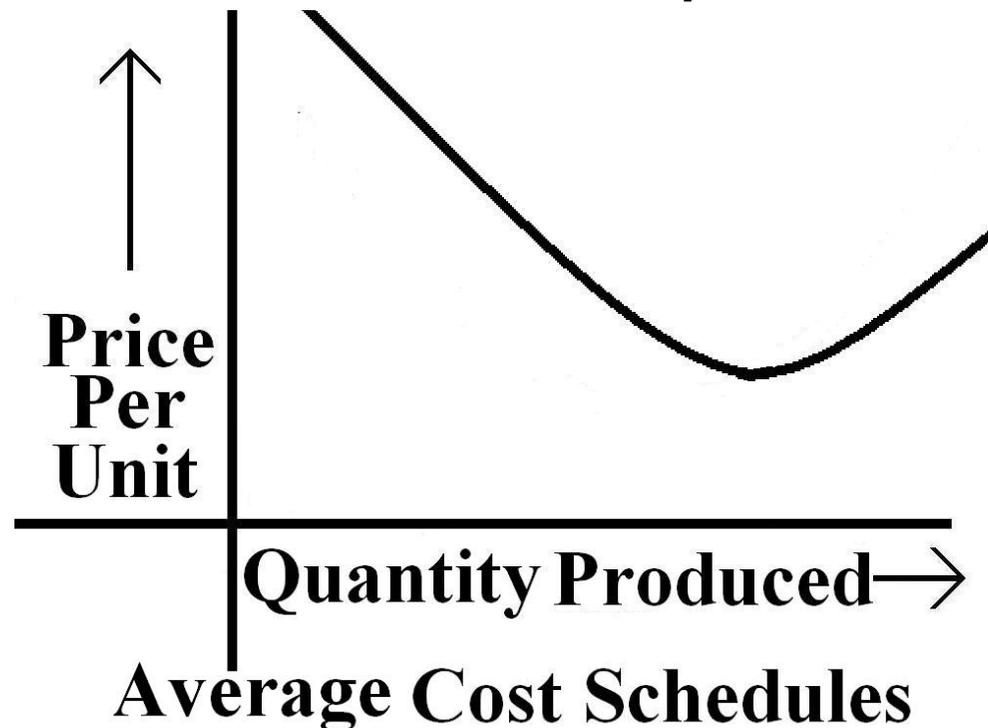
- **Exercise.** Consider the following market structure with 7 firms, 35%, 20%, 15%, 10%, 10%, 5%, 5%.
- **Question.** Compute the C_4 and the H concentration measures.

Sol.: $C_4 = 0.8$; $H = 0.21$.

Output and Costs

- Cost Schedules (1)

- We now plot a typical Average Cost Schedule, that is a plot of cost per unit against number of units produced.



Output and Costs

- Cost Schedules (2)

- The Average Cost Schedule initially declines, that is as the firm produces more it has a declining cost per unit.
- This could be due to fixed costs. The fixed cost to produce 10 units could be the same as to produce 20 units. If 20 rather than 10 units are produced then the fixed costs per unit are half.

Output and Costs

- Cost Schedules (3)

- However as production increases, we find that average cost starts rising. This could be due to the law of diminishing returns.
- Suppose the good Y is produced by combining a variable input, say X, to other inputs.
- The Marginal Product of X is defined as the additional Y produced for one more unit of X, provided other inputs remain constant.
- The **law of diminishing returns** states that as we combine additional units of X to a constant amount of other inputs, after a point its Marginal Product falls.

Output and Costs

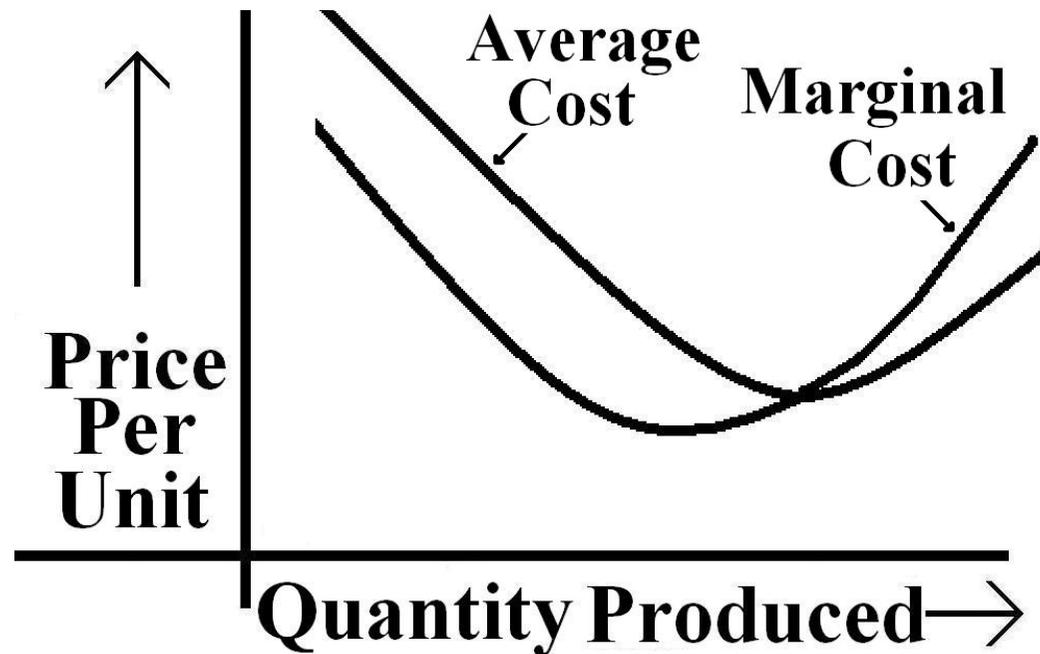
- Cost Schedules (marginal cost) (4)

- From the Average Cost Schedule we can infer the Marginal Cost Schedule, which is the cost of producing the last (marginal) unit.
- Total cost can be found by multiplying Average Cost by number of units produced. The Marginal Cost is the increase in Total Cost when production is increased by one unit.
- Notice that the efficient price that a good should be provided corresponds to its marginal cost.

Output and Costs

- Cost Schedules (5)

- It should be noted that the Marginal Cost Schedule intersects the Average Cost Schedule at its bottom. Why?
- How does one quiz influence the CFA average?



Avg & Marg Cost Schedules

Output and Costs

- Cost Schedules (6)

- In the long run, if a firm has falling average costs as it expands output, it is said to experience **Economies of Scale**. On the other hand if it has rising average costs, it has **Diseconomies of Scale**.
- Costs can be affected by the following (among other factors): Prices of Inputs; Taxes/ subsidies; Technological Advancement; Bargaining Power, etc.

Market structures (1)

- A **market** is where firms sell their products. There are four major forms of markets:
 - 1) **Perfectly competitive:** Many firms sell identical goods, hence each firm is a **price taker**. The amount sold by a firm does not affect the price per unit it receives. It faces a flat demand schedule for its product. A common example is a farmer selling wheat. The barriers to entry and exit into the industry are low or entirely absent.

Market structures (2)

2);3) Oligopoly and Monopolistic competition: A few firms sell products that could have similar characteristics. Substitutes are present for a firm's products, but the firm does have some amount of **market power**. The firm faces a downward sloping demand schedule, it can sell more at lower prices. An example would be the automobile industry.

Market structures (3)

4) **Monopoly**: There is only one producer, which therefore has maximum market power. It sets the market price by deciding upon how much to produce. An example of a monopoly is an electric utility. Consumers have no alternative suppliers.

Profit Maximizing Output

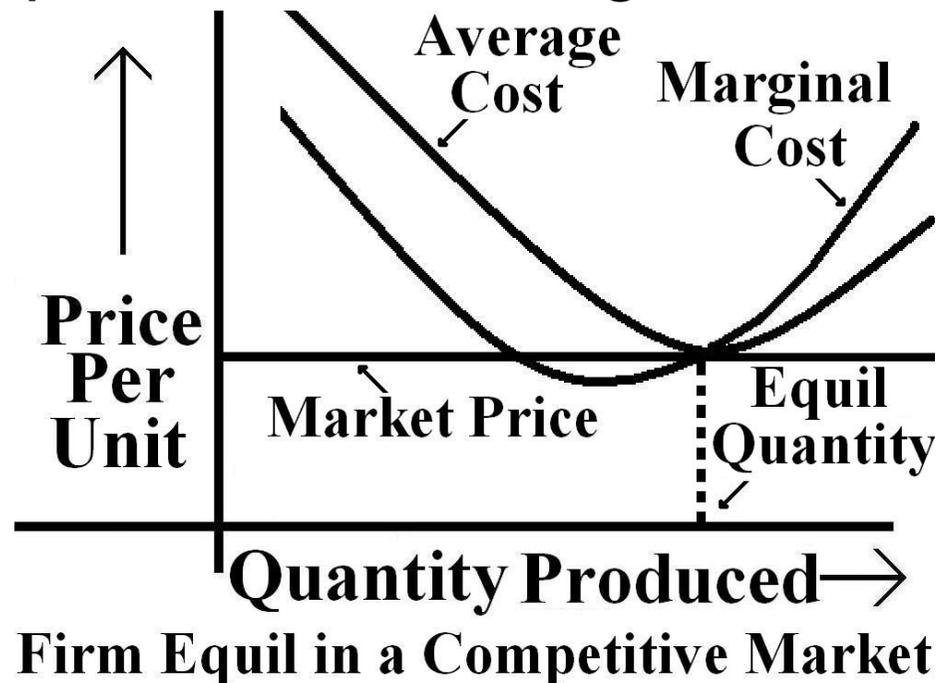
- How much will a firm produce? The amount that will maximize its profits. This is given by the amount of output where: **Marginal Cost = Marginal Revenue.**
- A firm keeps increasing its output as long as the marginal unit costs it less than the increase in revenue it produces.

The competitive market (1)

- Two conditions must be satisfied:
 - 1) Firms have to earn zero (economic) profits.
Why?
 - 2) Marginal cost must equal marginal revenue.
- What is the marginal revenue for a firm in a competitive market?
- Hint: Firms are price takers.

The competitive market (2)

- From the previous 2 conditions what must be the **competitive market equilibrium**?
- It is the point where both average cost and marginal cost equal price, hence it must be the bottom point of the average cost curve.



Efficiency of Competitive Markets

- A competitive market is efficient as production occurs at the point of minimum average cost.
- This corresponds to the most efficient use of available resources.

Short Term and Long Term Equilibrium (1)

- What happens if say demand for the product increases?
- In the short term the number of firms in the industry doesn't change, and price rises to the point where demand equals supply.
- The rise in price provides an inducement for firms to increase output, and also consumers will wish to consume less at the higher price.
- The rise in price results in firms making positive profits in the short run.

Short Term and Long Term Equilibrium (2)

- In the long run, the positive profits attract new firms to the industry and the price once again gets pushed down to the zero profit point.
- Similarly if there is a **fall in demand**, the price will fall, causing firms to make negative profits in the short run. In the long run some firms will exit the industry, reducing supply and pushing price back to the point of zero profits.

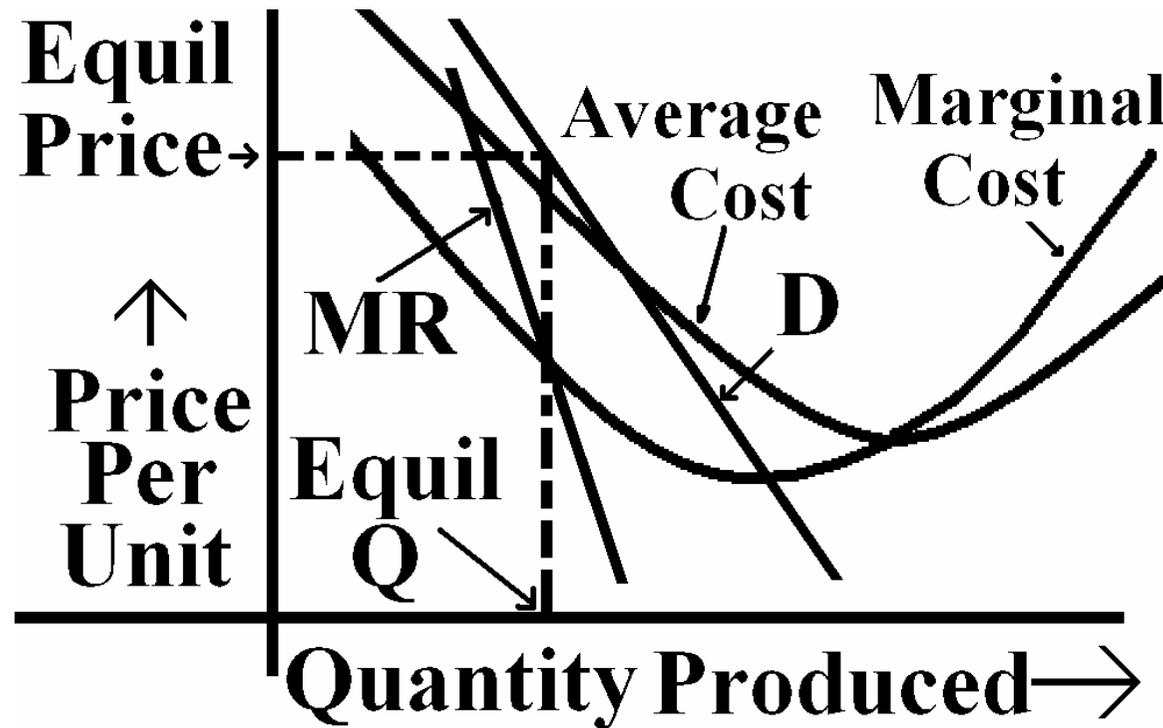
Equilibrium in Monopolistic and Oligopolistic Markets (1)

A monop./oligopolistic market differs from a competitive market in two important ways:

- 1) **Positive profits for firms are possible** in monop/oligop markets as there are barriers to entry.
- 2) **The demand and MR schedule slope downwards**, that is as a firm sells more the price it receives per unit falls.

Equilibrium in Monopolistic and Oligopolistic Markets (2)

- The profit maximizing point for a firm is where $MR = MC$.



Equilibrium for Monop/Olig

Equilibrium in Monopolistic and Oligopolistic Markets (3)

- At the point of equilibrium, the MC for the firm is lower than the price it charges.
- What does this mean?
- It means that there are consumers in the economy willing to pay, but who are not being catered to.
- This is an economically inefficient situation.

Equilibrium in Monopolistic and Oligopolistic Markets (4)

- Unlike a monopolist, an Oligopolist also has to worry about price/quantity choices made by other oligopolists in the industry. This leads to situations that are analyzed by Game Theory.
- The optimal solution for oligopolists is to **collude** and act like a monopolist. That is, set output and price at the point where the monopolist would have set.
- To prevent this from happening (due to the resulting economic inefficiency) governments make it illegal to collude.

Equilibrium in Oligopolistic Markets (5)

- 2 players: A, B
- 2 possible strategies: confess, not confess.
- Payoff table:

A \ B	Confess	Not confess
Confess	<u>-5</u> ; <u>-5</u>	<u>0</u> ; -10
Not confess	-10; <u>0</u>	-1; -1

Equilibrium in Oligopolistic Markets (6)

- 2 Firms: A, B
- 2 possible strategies: *i*) produce half of the monopoly quantity $Q^{\text{mon}}/2$; *ii*) stick the knife and produce $Q^{\text{olig}} > Q^{\text{mon}}/2$.
- Payoff (profits) table:

A \ B	Q^{olig}	$Q^{\text{mon}}/2$
Q^{olig}	<u>5</u> ; <u>5</u>	<u>15</u> ; 3
$Q^{\text{mon}}/2$	3; <u>15</u>	10; 10

Inputs and Profit Maximization (1)

- Consistent with its goal of profit maximization, a firm will use inputs to the point where: $MC \text{ of Input} = MR \text{ from use of Input}$
- For **example**, suppose at equilibrium a firm pays a secretary \$14 per hour.
- Assume that the firm has the flexibility to vary its employment of secretaries (maybe hiring them from a temp firm). It means the firm will employ secretaries to the point where an addition of one for an hour produces an increased revenue of \$14.

Inputs and Profit Maximization (2)

- It also follows that at equilibrium the ratio of productivity to price must be the same for all inputs.
- Why is this true? Suppose the ratio is larger for A compared to B. Then the firm can gain by employing more A at the cost of B. Only when the ratios are equal will no further gain be possible => Point of Maximum Profit.

Inputs and Profit Maximization (3)

- Inputs (resources) themselves respond to prices, and if price of a resource rises, its supply will increase in the long run.
- Instead of a resource, we can use a “**Substitute Resource**”. A “**Complimentary Resource**” on the other hand is used together.
- Demand for a resource will increase (decrease) with the rise (fall) in price of a substitute.
- Similarly, demand for a resource will decrease (increase) with the rise (fall) in price of a complimentary.