Supply Chain Management

Part 1
Basic Notions in Microeconomics

Cost Elements

- Cost is best described as a sacrifice made in order to get something.

- "Cost" is not a simple concept. It is important to distinguish between four different types - **fixed, variable, average and marginal**.

Variable costs

- "Depend in some way on production levels within the organization

examples:

materials cost
inventory cost
transportation cost
backorder cost
opportunity cost

Fixed costs

- Independent of output level

examples:
cost of borrowed money
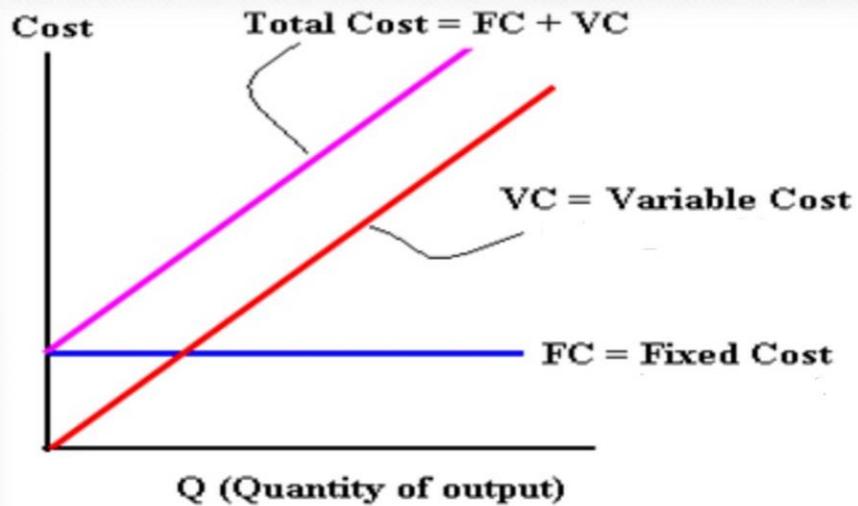rental payments on office/factory space
security cost
insurance

Total cost

- **TC** = total cost, **VC** = variable cost, **FC** = fixed cost, and **AC** = average cost

- $TC = FC + VC$

- $VC = VC(Q)$ where Q is the level of output

- $AC = TC/Q = \underbrace{FC/Q}_{AFC} + \underbrace{VC(Q)/Q}_{AVC}$

Total cost

Marginal cost

- Marginal Cost (MC) is the addition to total cost resulting from the production of an additional unit of output.

- $MC = TC(Q+1) - TC(Q)$

- Example: If the total cost of 5 units is 1550, and the total cost of 6 units is 1900, the marginal cost of the 6th unit is 350.

- Mathematically, the MC is the first derivative of the TC function.

$$MC = \Delta TC / \Delta Q$$
$$= \Delta FC / \Delta Q + \Delta VC(Q) / \Delta Q$$
$$= \Delta VC(Q) / \Delta Q$$

Break-even point

- Profit = revenue – total cost = R – TC

- The break-even point (BEP) is the point at which cost and revenue are equal.

- At breakeven, there is no profit or loss. R = TC

Break-even point
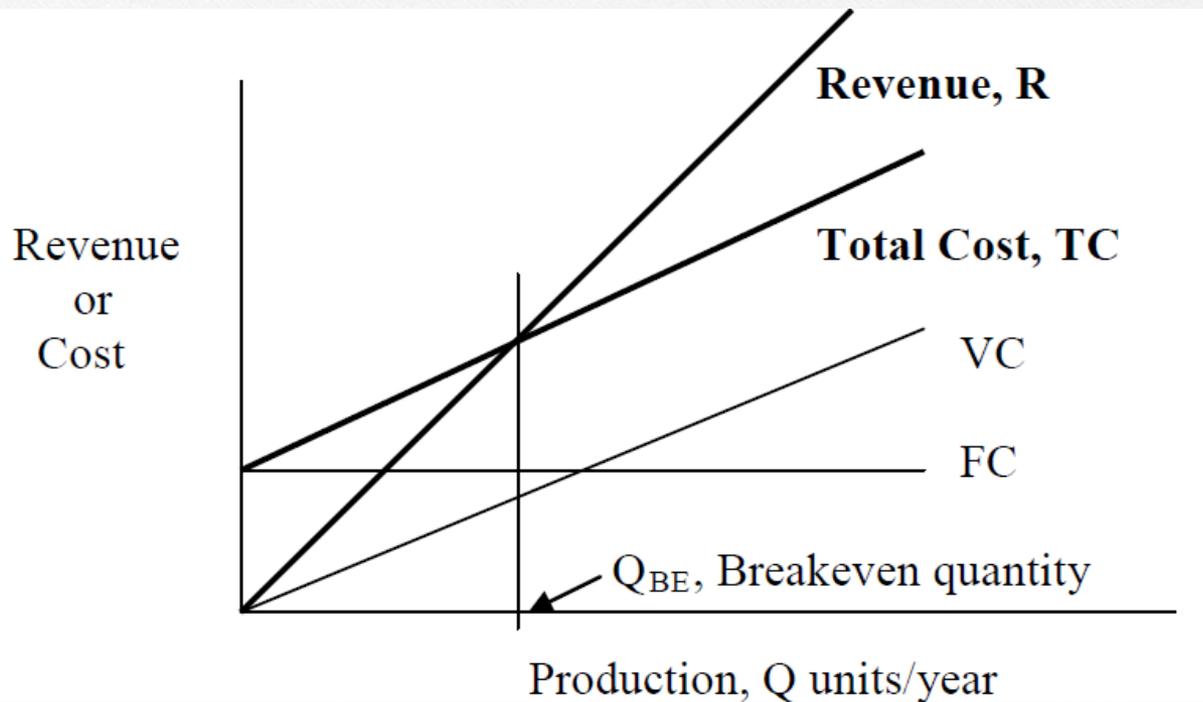
Break-even point

- Example 1. The fixed costs at Company X are $1 million annually. The main product has revenue of $8.90 per unit and $4.50 variable cost. (a) Determine the breakeven quantity per year, and (b) Annual profit if 200000 units are sold.

Let QBE be the breakeven quantity.

8.9QBE = 1,000,000 + 4.5QBE

QBE = 1,000,000/(8.90-4.50) = 227,272 units

(b) Profit = R – TC

= 8.90Q – 1,000,000 - 4.5Q

At 200,000 units: Profit = 8.90(200,000) – 1,000,000 - 4.50(200,000)

= $-120,000 (loss)

Break-even point

- How many customers are needed by a blue jeans shop?

Monthly fixed cost 5000TL/month

Purchase price 100TL

Selling price 180TL

Labor cost 25000TL/month

Break-even point

The breakeven point is the sold quantity where your profit is ZERO.

Monthly cost = Unit profit * QBE

5000 + 25000 = 80 * QBE
$QBE = \mathbf{30000/80 = 375\ pieces/month = 17\ pieces/day}$.

Very optimistic assumption: 1 out of 60 pedestrian 1 buys a jean.

You need 375 * 60 = 22,500 passers-by to achieve the breakeven point!

The location of the shop has ultimate importance!

Types and relations of products

- Complementary goods. Goods which are used together, e.g. TV and DVD player.

- Substitute goods. Goods which are alternatives, e.g. Pepsi and Coca-cola.

- Luxury good. A luxury good means an increase in income causes a bigger percentage increase in demand.

- Inferior good. An inferior good means an increase in income causes a fall in demand.

- Giffen product: Giffen goods are low-priced products, the demand for which rises along with the price. These products are necessary to fulfill the need for food, and they have only a few substitutes. Bread, wheat, and rice are examples of Giffen goods.

Demand function

- The amount of a good that consumers are willing to buy at a given price during a specified time period is the quantity demanded.

Factors affecting demand:

Good/service's own price, consumers' own tastes, information, income; prices of other goods; and government actions.

Demand function

- The demand function shows the correspondence between the quantity demanded, price, and other factors that influence purchases.

The demand function might be Q= D(p, ps, pc, Y)

Q is the quantity demanded

p is its price per unit of the good,
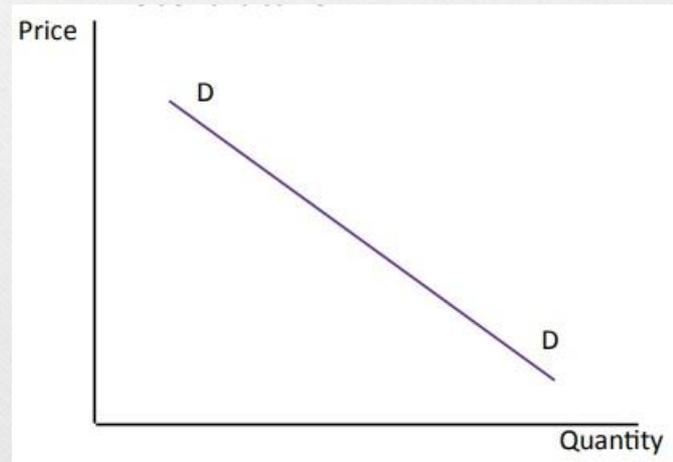
ps is the price per unit of a substitute good,

pc is the price per unit of a complementary good, and

Y is consumers' income.

Usually, we're primarily interested in the relationship between the quantity demanded and the price of the good.

Demand function

- The law of demand states that the higher the price, the lower the quantity demanded; and the lower the price, the higher the quantity demanded.

Supply function

- The quantity supplied is the amount of a good that firms want to sell during a given time period at a given price.

Factors affecting supply:

Good/service's own price, costs of production, and government rules and regulations.

Supply function

- The supply function shows the correspondence between the quantity supplied, price, and other factors that influence the number of units offered for sale.

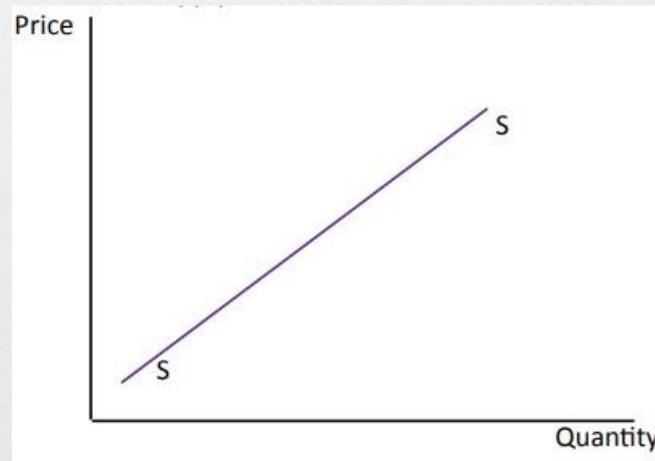The supply function might be Q = S(p, pc)

Q is the produced quantity

p is its price per unit of the good,

pc is the production cost per unit of a good,

Usually, we're primarily interested in the relationship between the quantity supplied and the price of the good.
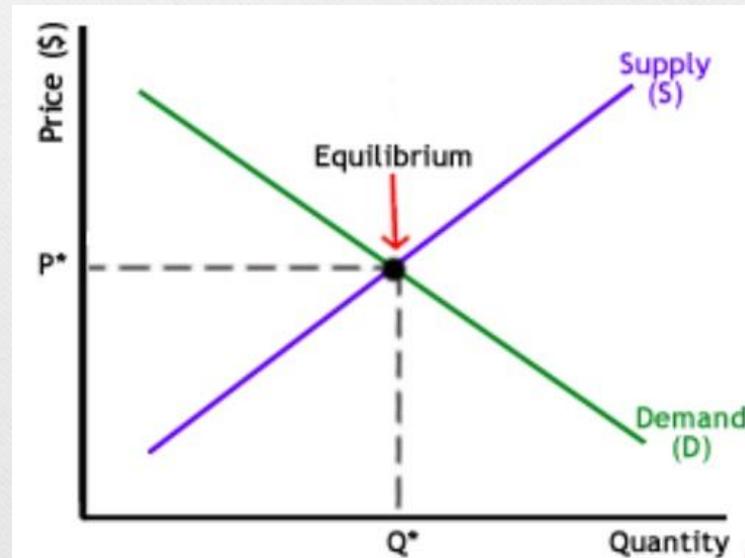
Supply function

- The law of supply states that the higher the price, the higher the quantity supplied

Equilibrium/Market Price

- When supply and demand are equal (i.e. when the supply function and demand function intersect) the economy is said to be at equilibrium.

Monopoly market

- A firm that is the only supplier or seller in a market is said to have a monopoly.

The monopole price is supposed to be greater than the market price because:

A lack of competition allows the firm to charge a much higher price for goods and services, thus generating more revenue

Monopoly market

At Point A the market is at competitive equilibrium, and the supply (S) meets the demand (D).

At Point B there is a monopolistic equilibrium, where one seller controls the market. The seller is able to both restrict the quantity available Qm from and raise the price Pm.

The portion of the red triangle above the dotted line is the amount of inefficiency the consumers experience. This is called deadweight loss and occurs in a monopolistic market as a result of the restricted supply.

A Monopolistic Market Compared With a Competitive Market
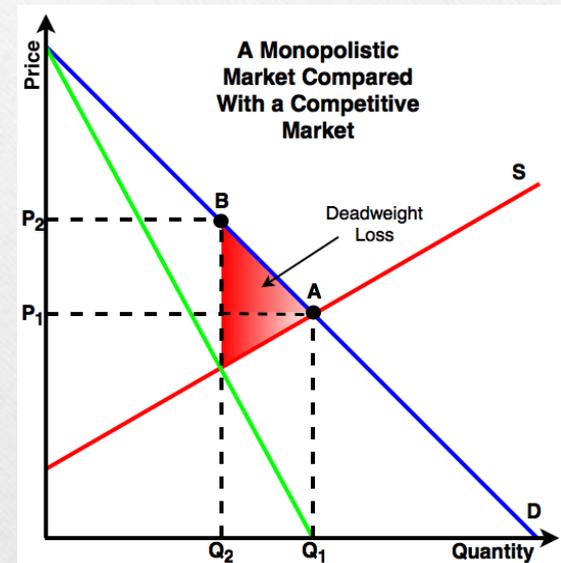
Elasticity

- There are two positive quantities, say A and B. The elasticity of A regarding to B is the change in A expressed in percent if B is changed by 1% and all other factors remained the same.

$$\in AB = \frac{\frac{\Delta A}{A}}{\frac{\Delta B}{B}}$$

If A changes by 3% when B changes by 1%, then the elasticity $\in AB$ is 3. The elasticity is a pure number (it has no units of measure).

Elasticity

- Exmaple3. Consider a competitive market for which the quantities demanded and supplied (per year) at various prices are given as follows:

Price ($)	Demand (millions)	Supply (millions)
60	22	14
80	20	16
100	18	18
120	16	20

Elasticity

a. Calculate the price elasticity of demand when the price is $80. When the price is $100.

b. Calculate the price elasticity of supply when the price is $80. When the price is $100.

c. What are the equilibrium price and quantity?

d. Suppose the government sets a price ceiling of $80. Will there be a shortage, and, if so, how large will it be?

Elasticity

Part a.

$$\in DP = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} = \frac{P}{Q} \times \frac{\Delta Q}{\Delta P}$$

With each price increase of $20, the quantity demanded decreases by 2. Therefore

$$\frac{\Delta Q}{\Delta P} = \frac{-2}{20} = -0.1$$

At P = 80, quantity demanded equals 20 and

$$\in DP = \frac{80}{20} * -0.1 = -0.4$$

Similarly, at P = 100, quantity demanded equals 18 and

$$\in DP = \frac{100}{18} * -0.1 = -0.56$$

Elasticity

Part b.

$$\in SP = \frac{\frac{\Delta S}{S}}{\frac{\Delta P}{P}} = \frac{P}{S} \times \frac{\Delta S}{\Delta P}$$

With each price increase of $20, the quantity supplied increase by 2. Therefore

$$\frac{\Delta S}{\Delta P} = \frac{2}{20} = 0.1$$

At P = 80, quantity supplied equals 16 and

$$\in SP = \frac{80}{16} * 0.1 = 0.5$$

Similarly, at P = 100, quantity supplied equals 18 and

$$\in DP = \frac{100}{18} * 0.1 = 0.56$$

Elasticity

Part c.

The equilibrium price and quantity are found where the quantity supplied equals the quantity demanded at the same price. As we see from the table, the equilibrium price is $100 and the equilibrium quantity is 18 million.

Product differentiation

- There are many competing companies on the same market. They have similar products for the same function. Each producer wants to prove that its product is the most suitable.

- Product differentiation is a marketing strategy designed to distinguish a company's products or services from the competition.

Product differentiation

- The elements of differentiation include product design, marketing, packaging, and pricing.

- Product differentiation increases market competition and controls prices for consumers.

Tesla differentiates itself from other auto brands because their cars are innovative, high-end, and battery-operated.

Choosing Duracell over other batteries because the customer believes that it lasts longer.

Choosing to order a product on Amazon than to visit Walmart as the customer doesn't want to leave his house.

Market segmentation

- There are different customers on a market.

- Market segmentation consists of sectioning the target market into smaller groups that share similar characteristics, such as age, income, personality traits, behavior, interests, needs or location.

- Helping you learn new things about your target customers that will help you communicate your products, services, brand, values, etc. in new and better ways.

Market segmentation

Example. The Volkswagen group is an excellent example of how market segmentation allows a brand to appeal to very different groups of people.
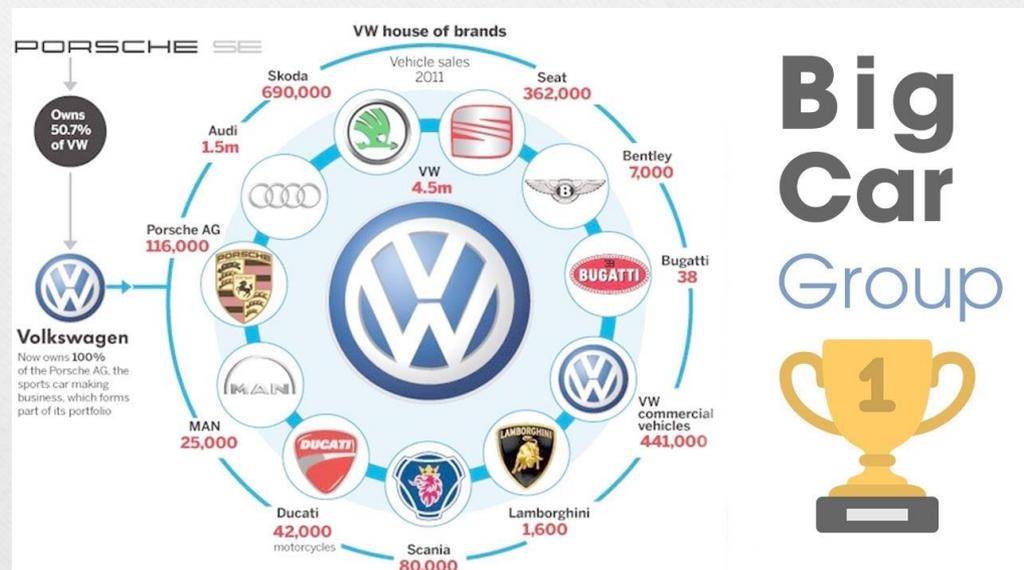
Price discrimination

- Charge high price to the rich but still sell to poor.

- Price discrimination means that different prices are charged for the same product to different customers.

The Canadian entertainment company, Cineplex, is a classic example of a firm using the price discrimination strategy. Depending on the age demographic, tickets for the same movie are sold at different prices.

Price discrimination

Example. Air ticket. Bases for the discrimination are as follows:

1. Rich versus poor passenger.

Who is rich? To whom time is money. Practical translation: the person travels on a working day and returns on the same week on a working day.

Who is poor? The tourist, who spends at least a weekend on the destination.

2. Early bird passenger.

Who is early bird? The customer is early bird who pays much earlier than the time when the flight takes place.

3. Last minute passenger.

Perfect market

- Perfect market is a market, where all agents have the same information.

Best approximation: the stock market.

- Strict rules on using and sharing the information.

- No use of inside information of a company allowed.

Economy of scale

- The greater the quantity of output produced, the lower the per-unit fixed cost.

- Economy of scale is cost reductions that occur when companies increase production.

Manufacturing costs can fall 70% to 90% every time the business doubles its output.

Economy of scale

- The technology giant Intel Corporation is another good example of upscaling advantages. The company invests massively in semiconductor chips and microprocessors. The company manufactures in large quantities. Therefore, Research & Development costs are very low for one unit.

Product-market environments

1- Make-To-Stock (MTS): involves producing or manufacturing goods based on anticipated consumer demand.

MTS is usually used when the leadtime of the production process cannot meet the customer required leadtime.

- The value of a unit of the product is small.

- Batch production.

- Customers are served from stock.

- The forecast of the demand is important.

- Examples: large video game companies like PlayStation or Xbox.
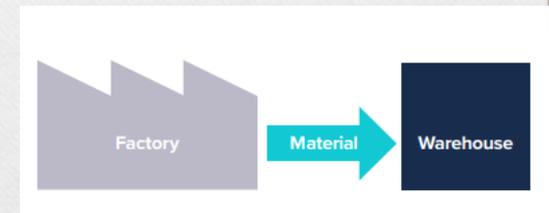
Product-market environments

2- Make-To-Order (MTO): involves producing or manufacturing goods after the customer order has been received.

- The final product has high value.

- The size of the final product is large.

- Examples: train, ship, crane.

- Needs financing.
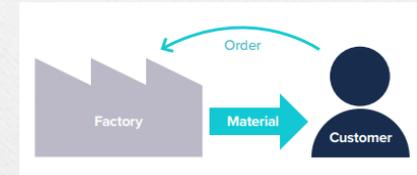
Product-market environments

3- Assembly-To-Order (ATO): is a production and inventory system where components and subassemblies of a final product are manufactured, but not yet assembled before the customer order is made.

ATO is the combination of both MTS and MTO strategies.

• Low number of semifinished products.

• Large number of combinations of the semifinished products as finished product.

• Order information goes directly to assembly line even from dealers.

• Examples: Dell