

**Topic 1: Microeconomics as a science.**  
***Demand and supply, their relationship and elasticity.***

**Outline:**

1. Subject matter and entities of microeconomics. Methods of analytical economics.
2. Limited resources and the problem of choice. Production capacity frontier. Alternative cost and marginal analysis.
3. Demand, supply and market equilibrium.
4. The concept and types of elasticity.

**1. Subject matter and entities of microeconomics. Methods of analytical economics.**

***Microeconomics*** is one of the components of modern economics, which studies the behavior of economic entities and the decision-making mechanism of individual microsystems that try to achieve their goals using limited resources that can be used alternatively, ie explains why and how they make certain economic decisions.

In addition, microeconomics analyzes the process of market formation in different industries and their interaction, as well as focuses on the laws of pricing depending on the type of market structures (so microeconomics is also called price theory).

**The object of microeconomics** is the study of microeconomics is the behavior of microeconomic actors, ie the process of developing, making and implementing decisions regarding the selection and use of resources in order to obtain the greatest benefit.

**The subject matter of microeconomics** is the behavior of economic entities and the mechanism of their economic decisions about the production and consumption of economic goods in conditions of limited resources.

The main *economic entities* in the microsystem are the household and the firm:

1) **Households**. This is a group of people who pool their income, share property and make economic decisions together. (family).

2) **Enterprises** (firms) - any economic entity engaged in the productive consumption of resources and producing goods and / or services for profit.

The movement of material flows (goods and resources) and financial (costs of these goods and resources) between firms and households, which occurs in different directions, is combined in the model of circulating flows.

A *market* is a group of economic entities that interact with each other to buy and sell a product or service.

In the resource market, producers act on the demand side as users of the means of production, and households act on the supply side as the owner of these means.

In the market for goods and services, producers act on the supply side as producers of goods, and households on the demand side as consumers.

The coordinator and regulator of economic life is the *state* through a set of authorities.

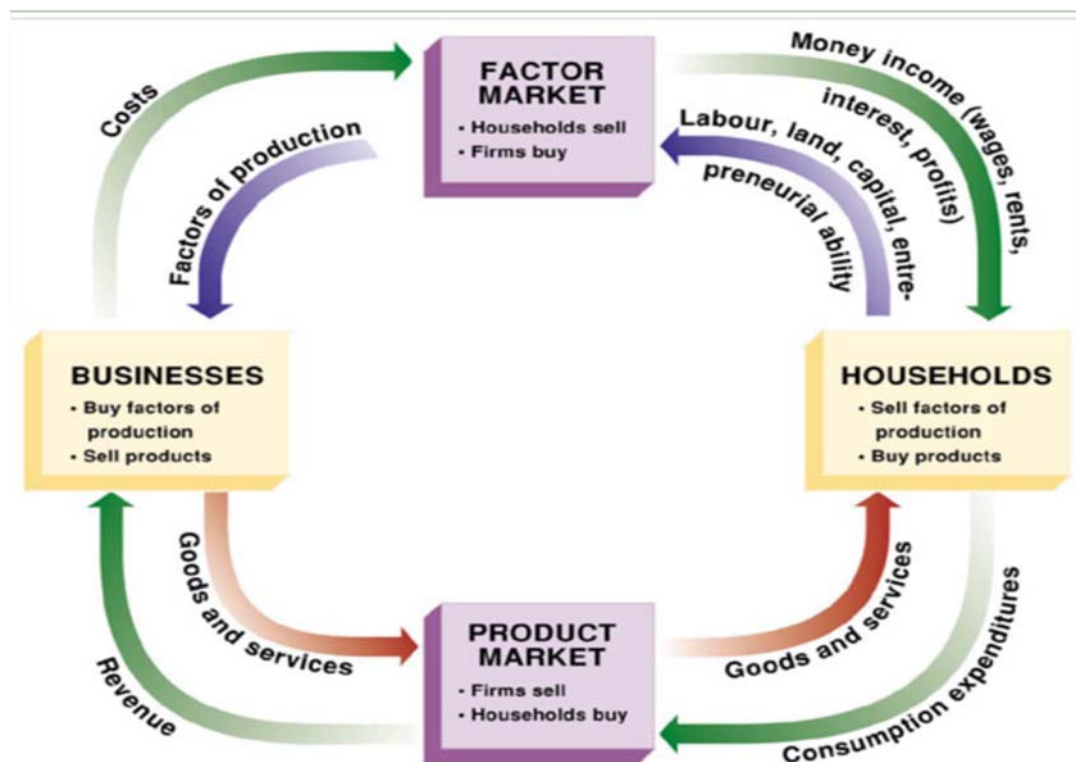


Fig.1.1. Model of circulating flows

Methods of microeconomic cognition include a number of general economic methods.

- The most common scientific method is the method of **dialectics**. It involves the study of all economic phenomena and processes in the relationship and interdependence.

- Method of **scientific abstraction**. It means separation from all accidental, insignificant, penetration into the essence of economic phenomena and processes.

- Method of **system analysis**. It consists in identifying the coordination and subordination of economic categories and laws that would reflect the objective structure of the social organism.

- Method of **analysis and synthesis**. In the process of **analysis** is the division of the object into components, the study of individual parts. Due to this, the transition from the visible, concrete to abstract. In the process of **synthesis**, knowledge about the parts is generalized, reduced to a single whole.

- Methods of **induction** and **deduction**. **Induction** - a method of cognition from the individual to the general. **Deduction** - from general to individual.

- Method of **logical and historical analysis**. Its essence is that the economy is studied in specific historical conditions, while rejecting random phenomena and revealing the general logic of economic development.

- **Economic-mathematical** and **statistical** methods. Are to determine the quantitative parameters of the studied processes.

- Method of **economic modeling**. It consists in a formal description of economic processes and phenomena, which allows to abstractly reflect real economic life.

- Method of **economic experiment**. It consists in the artificial reproduction of

economic phenomena and processes in order to study them and further implement them in practice.

- **hypothesis** (previous unproven principle);
- **analogy** (comparison).

*Specific methods* of microeconomics include **marginal analysis** and **microeconomic modeling**.

*Marginal analysis* is an analysis of incremental values, in which all factors, except for the studied one, are accepted as invariant, and the consequences of infinitesimal growth of a variable factor are studied. Marginal analysis is based on the use of the mathematical concept of the boundary of a function to explain the complex interaction of various factors influencing the process.

Methods of *statics* and *dynamics* are especially widely used in microeconomic research:

- the **method of statics** involves the comparison of different equilibrium states, while the transition from one equilibrium to another remains beyond analysis.
- the **method of dynamics**, on the contrary, requires an analysis of the actual transition from one state of equilibrium to another.

Economic theory in general, and microeconomics in particular, is based on an organic combination of empirical observations with models that are a tool of economic analysis.

An ***economic model*** is a conditional image (reflection) of an economic phenomenon, object or process, constructed for simplicity of its research due to the unavailability of the original object or the danger of its direct research.

Models are:

- logical;
- graphic;
- numerical;
- statistical;
- tabular;
- physical;
- mathematical;
- computer.

The economic model reflects the relationship between *economic variables* (*endogenous and exogenous*) - measurable quantities that take on different meanings.

The toolkit of economic theory distinguishes:

- *positive analysis* examines the economic phenomenon as it is. This is a statement of the type "if", then...";
- *normative analysis* is based on the study of how it should be and aimed at making recommendations that help achieve a certain goal.

Optimization and equilibrium models are quite common in the economy.

- *optimization models* are used in the study of the behavior of individual economic entities. The main method is boundary analysis, developed by the theory of marginalism.

- *equilibrium models* are used in the study of relationships between economic entities.

## 2. Limited resources and the problem of choice. Production capacity frontier. Alternative cost and marginal analysis.

**Scarcity (Rarity, limitation)** is a situation in which a person is unable to meet all their needs for goods. The consequence of limited resources is competition for the right to use them, ie competition between individual alternative purposes of resource use in the production of a particular type of product (good or service).

The main questions to which the problem of choice is reduced and which the economy must answer are:

- what
  - how
  - for whom
  - how many
- } to produce?

**The resource scarcity model** consists of deciding what goods and how much to produce.

**The production possibilities frontier** is a curve, each point of which shows the maximum number of units of means of production and commodities produced with the full and efficient use of resources in the economy.

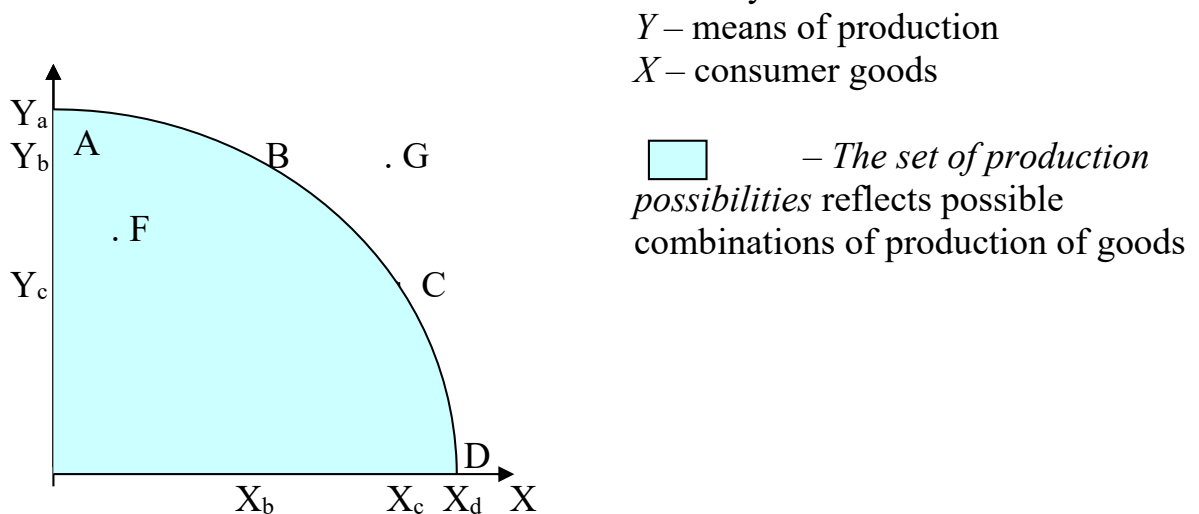


Fig.2.1. Production possibility frontier

Moving along the curve, one should abandon the production of a certain number of units of means of production in order to produce an additional number of units of consumer goods, and vice versa.

**Alternative value (or value of lost opportunities)** is the number of units of goods that must be donated to produce one additional unit of another product.

The slope of the curve is defined as,  $\Delta Y / \Delta X$ , where:

$$\Delta Y = Y_C - Y_B$$

$$\Delta X = X_C - X_B$$

One of the principles for deciding on the optimal production plan is **marginal analysis**, a technique used in deciding on the net gain from a particular action. If the return on the production of an additional unit of commodities is equivalent to the relative cost of its production, expressed in units of output of those means of production that we give up, then the sacrifice of some goods for the greater production of others is justified by an increase in profitability.

With the adoption of an alternative solution with a method of achieving the highest efficiency (the ability to win the highest rank of those who can support their order in order to achieve the best result), it is safe to ward off the advancing laws:

The law of increasing additional costs is the lack of interchangeability and elasticity of resources and the associated need to increase the number of resources that are switched from the production of one product to produce more and more of another. It determines the convexity of the shape of the production capacity curve.

Law of diminishing returns - each additional means of production (machine, worker, etc.) increases the number of products to a lesser extent than the previous one.

### 3. Demand, supply and market equilibrium.

*Demand* is a form of expression of needs presented on the market and provided with money. Demand is the willingness and ability of people to buy goods.

*Individual demand* for a good is the volume of a good that an individual consumer wants and has the opportunity to purchase on the market at each specific price based on his financial condition.

*Market demand* for the good consists of the sum of individual demands.

*Demand function* is the dependence of sales of a particular good on its price.

$$Q_D = f(P)$$

Mathematical (analytical) linear expression of the demand function:

$$Q_D = a - b \cdot P$$

$Q_D$  – quantity demanded for a product,  $P$  – the price of the product,  $b$  – the slope of the demand curve,  $a$  – point of intersection of the demand curve with the y-axis:

*The demand curve* is a graphical representation of the demand function.

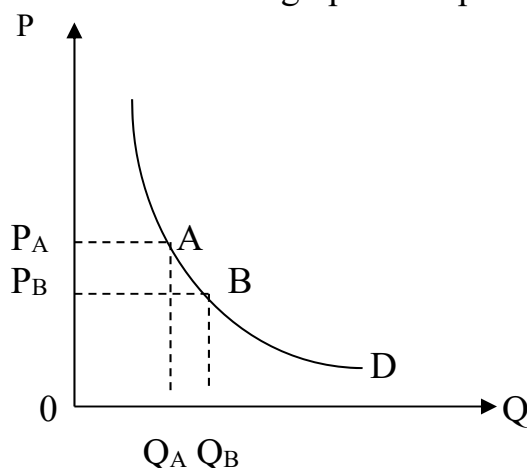


Fig. 3.1. Demand curve

**Law of Demand** - The quantity demanded decreases when the price rises, and vice versa, the quantity demanded increases when the price falls.

There is a difference between the concept of "*demand*" and "*quantity demanded*":

- ✓ demand is a set of ratios of prices and quantities;
- ✓ the quantity demanded corresponds to a specific quantity that the consumer intends to buy at a certain price.

It is also necessary to distinguish between the concept of "*change in demand*" and "*change in the quantity demanded*":

- ✓ "*change in the quantity demanded*" is the transition from one combination of "price - quantity of production" to another. Graphically, this corresponds to moving along the demand curve from one point to another, while the position of the curve does not change.
- ✓ "*Change in demand*" means that at each price, consumers will buy a relatively larger (smaller) amount of goods. Graphically, this corresponds to a parallel shift in the demand curve as factors other than price change.

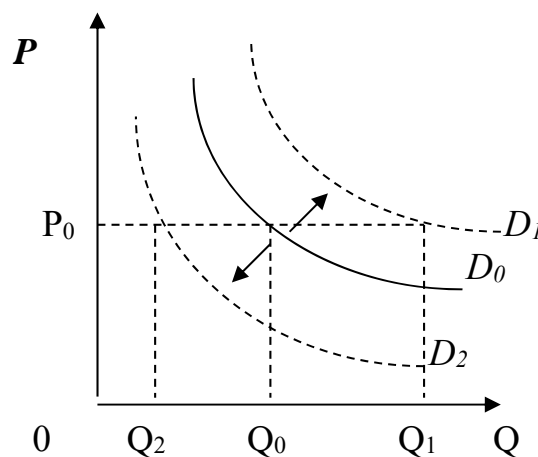


Fig. 3.2. Change in demand

Factors that affect the change in demand are called non-price determinants of demand. These include:

- tastes and preferences of consumers;
- number of buyers;
- income;
- prices for related goods:
  - ☐ substituted;
  - ☐ complementary;
- consumer expectations.

*Substituted goods* are the following two goods, an increase in the price of one of which leads to an increase in demand for the other.

*Complementary (complementary) goods* are two goods, an increase in the price of one of which leads to a decrease in demand for the other.

Consumer demand (according to X. Leibenstein) is divided into two major groups: *functional* and *non-functional*:

**Functional demand** is the part of demand that is due to consumer properties inherent in the most economic good (good or service).

**Non-functional demand** is the part of demand that is due to such factors that are not directly related to the inherent qualities of economic good: *social, speculative and irrational*.

**Social** - related to the attitude of buyers to the product:

1. *Bandwagon effect* - the dependence of the line and the demand curve is more elastic when it is present.

2. *The snob effect* - the desire to stand out from the crowd, the dependence is inverse and the demand curve becomes less elastic when it is present.

3. *Veblen effect* - to create an impression, increase consumer demand associated with higher prices. The Veblen effect is similar to the snob effect. However, the fundamental difference is that the snob effect depends on the size of the latter's consumption, while the Veblen effect depends primarily on price. If the Veblen effect dominates, then the consumer demand curve is less elastic and has areas with a positive slope.

**Speculative** demand arises in a society with high inflation expectations, when the danger of rising prices in the future stimulates additional consumption (purchase) of goods today.

**Irrational** demand is unplanned demand that has arisen under the influence of an instantaneous desire, a sudden change of mood, whim or whim, a demand that violates the premise of rational consumer behavior.

**Supply** is a scale showing the varying amounts of a product that a manufacturer is willing and able to produce and offer for sale on the market at any given price from a range of possible prices over a given period of time.

Distinguish *individual* and *market supply*. The **market supply** is the sum of the individual offers of producers, it consists of the sum of the volumes of goods that individual firms can and want to offer for sale at each specific price

**The function of supply** is the dependence of the volume of supply of goods on its price.

$$Q_s = f(P)$$

Analytically, the linear supply function can be written using the formula

$$Q_s = f(P) = -c + dP,$$

$P$  – price per unit of goods;

$Q_d$  – quantity supplied;

$c, d$  – positive constants ( $c > 0, d > 0$ ).

**The supply curve** is a graphical representation of the supply function. Unlike demand, the supply function has a positive slope.

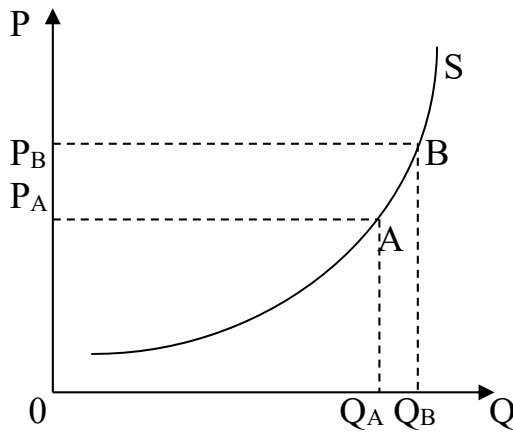


Fig. 3.3. Supply curve

**The law of supply** - the quantity supplied increases when the price rises, and vice versa, the quantity supplied decreases when the price decreases.

It is necessary to distinguish between the concepts of " *supply* " and " *quantity supplied* ":

- ✓ The *quantity supplied* corresponds to a specific quantity of goods that the company sells at a certain price. A change in supply graphically corresponds to moving from one point to another along a stable supply curve
- ✓ A change in *supply* means that producers will supply more or less of a product at each price, other factors being equal. Graphically, this corresponds to a shift in the supply curve to the left or right

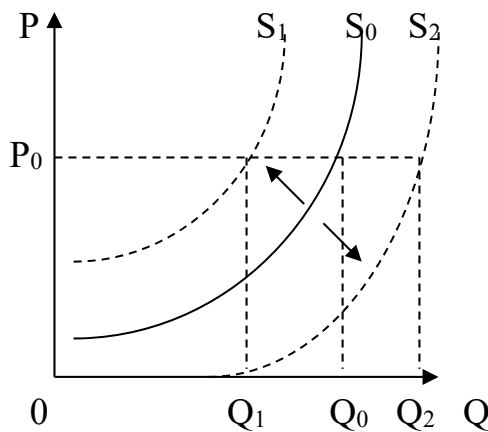


Fig. 3.4. Change in supply

The factors influencing the change in supply are called non-price determinants of supply. These include:

- number of producers;
- the number of sellers in the market.
- resource prices;
- production technologies;
- grants and taxes;
- prices for other goods;

- natural and climatic conditions of production;
- producers' price and deficit expectations.

**The equilibrium of supply and demand** in a commodity market is a state of the market in which the volume of supply and demand coincides at a certain price level. Since we are talking about a separate market, this equilibrium is called a partial equilibrium. Graphically, the equilibrium point is the point of intersection of the supply and demand curves, which corresponds to the equilibrium price.

*The equilibrium price* is the price at which supply and demand are the same.

*The equilibrium volume* is the volume of sold/purchased goods at the equilibrium price.

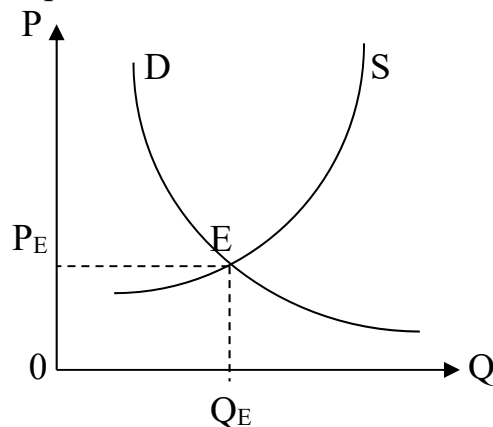


Fig. 3.5. The equilibrium of supply and demand

If the supply and demand functions are linear:

$$Q_S = a + b \cdot P$$

$$Q_D = c - d \cdot P,$$

then under the condition of equilibrium  $Q_S = Q_D$ ,

and therefore  $a + b \cdot P = c - d \cdot P$ .

Hence, the equilibrium price:

$$P_E = (c - a) / (b + d)$$

Equilibrium volume:

$$Q_E = (a \cdot d + c \cdot b) / (b + d)$$

Violation of the equilibrium state can be associated with the influence of non-price determinants of supply and demand, causing a corresponding shift in the curves:

- with the growth (decline) of demand, the price and volume of equilibrium increase (fall);
- with an increase (decrease) in supply, the equilibrium volume increases (decreases), and the equilibrium price decreases (increases)

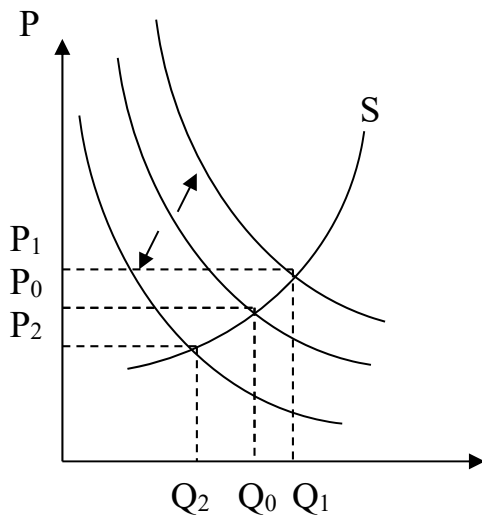


Fig.3.6. Equilibrium due to a change in demand

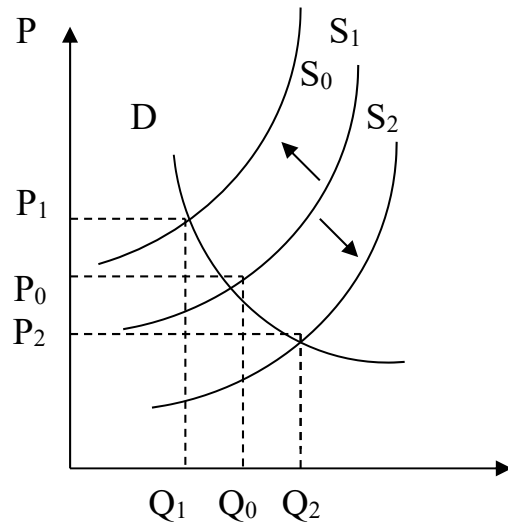


Fig.3.7. Equilibrium due to a change in supply

Basically, the factors affecting supply and demand act simultaneously in one or different directions. Therefore, in order to adequately assess the impact on imbalance, it is necessary to consider them in stages.

An imbalance is possible when the state intervenes in the pricing process:

- when the price is set above the equilibrium price, there is a *surplus* of production, and sellers will be inclined to reduce it;
- when the price is set below the equilibrium price, there is a *shortage* of products, and buyers will be inclined to increase it.

When deviating from equilibrium, there is a tendency to gravitate towards it.

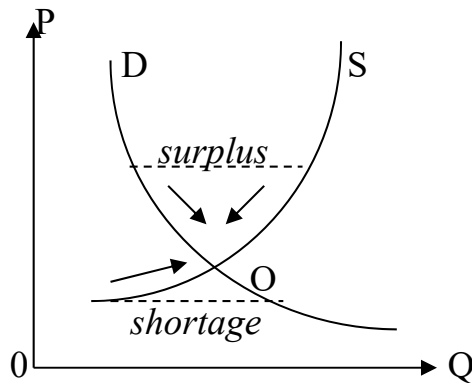


Fig.3.8. Shortage and surplus on a market

#### 4. The concept of elasticity. Price elasticity of supply and demand.

**Elasticity** is the sensitivity of the response of supply or demand to a change in price, which is defined as the ratio of the relative change of the dependent variable to the relative change of the functionally related independent variable.

**Price elasticity  $E_D$**  is the relative change in demand per unit of relative price change.

Elasticity is calculated by the formula:

$$E_D = \frac{(Q_2 - Q_1) / Q_1}{(P_2 - P_1) / P_1} \quad \text{or} \quad E_D = \frac{\Delta Q / Q}{\Delta P / P} \quad \text{or} \quad E_D = \frac{\% \Delta Q_D}{\% \Delta P}$$

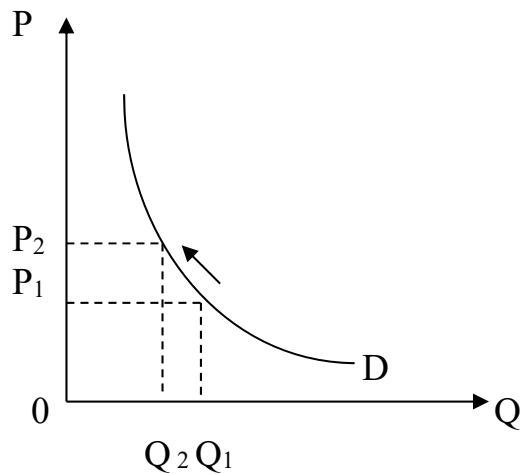


Fig. 4.1. Determination of the elasticity of the demand curve

Sometimes some discrepancies are possible in the calculations, therefore, for greater accuracy, the arc elasticity formula (or the central point formula) is used, where the average values on the corresponding segment are selected in the base indicators:

$$E_D = \frac{\Delta Q_D}{\Delta P} \cdot \frac{(P_1 + P_2) / 2}{(Q_1 + Q_2) / 2}$$

There are three options for price elasticity of demand:

- elastic demand - when  $|E_D| > 1$ ;  
     ✓ absolutely elastic demand - when  $|E_D| = \infty$
- inelastic demand - when  $|E_D| < 1$ ;  
     ✓ absolutely inelastic demand - when  $|E_D| = 0$
- unit elasticity - when  $|E_D| = 1$ .

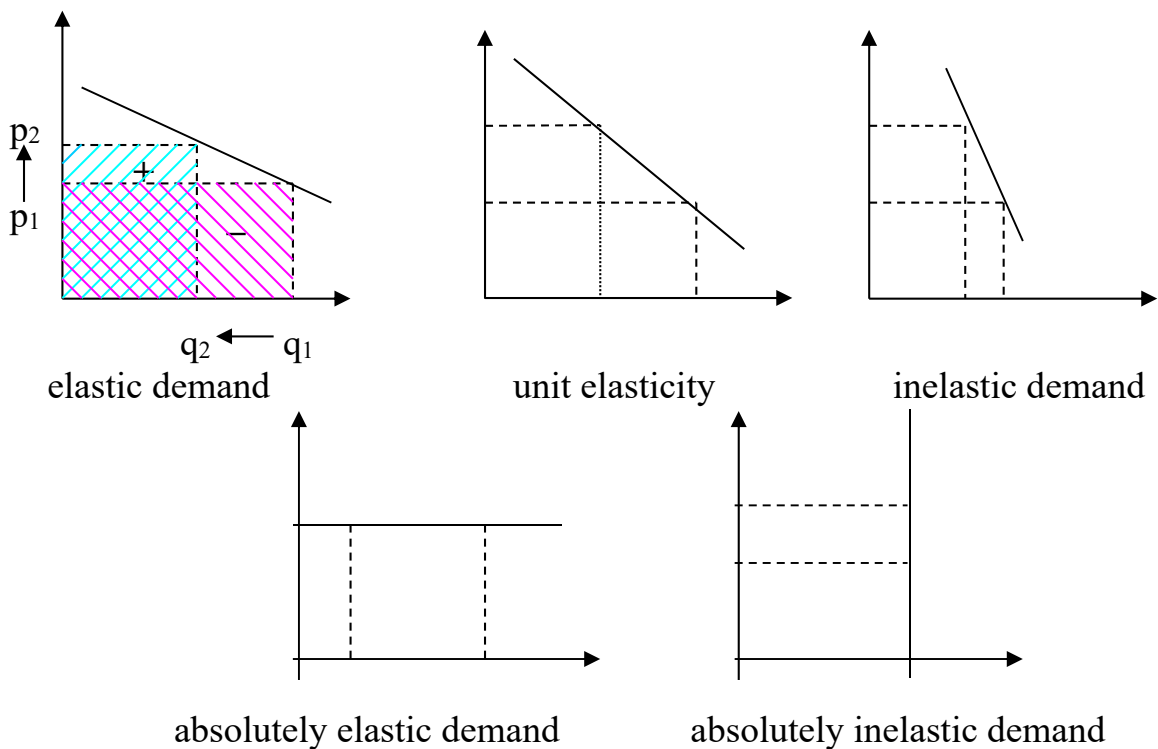


Fig. 4.2. Types of price elasticity of demand

### ***Factors of price elasticity of demand:***

#### ***1. Interchangeability:***

- the more quality substitutes for a given product, the more elastic the demand for it;
- if the price of an interchangeable product increases, then the demand for another increases, and this one falls;
- demand for goods that cannot be replaced (insulin, salt, etc.) is inelastic;
- the demand for similar goods in the middle group is elastic, but if there is no substitute for the group, then the total demand is inelastic.

2. *The share in the consumer's income* (the more space a product takes in the consumer's budget, all other things being equal, the higher will be the elasticity of demand for it).

#### ***3. Importance of goods:***

- demand for necessities is inelastic;
- demand for luxury items is elastic;

4. *Time factor* (the demand for the product is more elastic, the longer the period of time for decision making because:

a) consumers have habits,

b) short-term demand for a product is less elastic than long-term demand for this product).

#### **Goods of low elasticity (inelastic):**

- agricultural products;
- essential goods;
- mutually irreplaceable goods (having no substitutes);
- elite (luxury) goods for customers that are not vulnerable to price changes;
- goods occupying a meager share in the consumer's budget (salt, pepper...)

According to non-price factors of demand, income elasticity of demand and cross elasticity of demand are distinguished. Both indicators measure how many percent the demand curve will shift under the influence of a given non-price factor.

The most important factor determining the nature of elasticity is the ease of replacement of a given product with another product of a similar purpose.

**Cross elasticity** indicates how sensitive a consumer's demand for product X is to a change in the price of another product Y.

$$E_{xy} = \frac{(Q_x - Q_x) / Q_x}{(P_y - P_y) / P_y} \quad \text{or} \quad E_{xy} = \frac{\Delta Q_x / Q_x}{\Delta P_y / P_y} \quad \text{or} \quad E_{xy} = \frac{\% \Delta Q_x}{\% \Delta P_y}$$

From the point of view of cross elasticity, goods are distinguished:

- *substitutional*, serving for the same purposes. When the price of a good rises, the volume of its sale decreases, and the volume of sale of a substitute good increases, even if its price remains unchanged. The cross elasticity for these goods is positive;

- *complementary*, which can be consumed separately. When the price of one of these goods increases, the demand for both decreases. The cross elasticity for these goods is negative;

- *independent in consumption*, not interconnected. Cross elasticity on these products is zero.

**Income elasticity of demand** is an indicator of the magnitude of the change in the size of demand with a change in consumer income.

$$E_I = \frac{(Q_2 - Q_1) / Q_1}{(I_2 - I_1) / I_1} \quad \text{or} \quad E_I = \frac{\Delta Q_D / Q_D}{\Delta I / I} \quad \text{or} \quad E_I = \frac{\% \Delta Q_D}{\% \Delta I}$$

Goods for which demand increases with income are called *normal* or superior goods. The income elasticity of demand for them is above zero.

Goods for which demand decreases with increasing income are called *lower categories*. Their income elasticity of demand is below zero.

$E_I = 0$  for goods for which demand does not depend on income (essential goods).

On each linear demand curve there are points with elastic and inelastic demand. If the demand function is given as  $Q_D = a - b \cdot P$ , then the *coefficient of elasticity* for the function in the general case is calculated:

$$E_D = -b \cdot (P / Q_D)$$

If  $Q_D = a \cdot P^{-b} \rightarrow E_D = -b$ .

If  $Q_D = a \cdot P^{-1} \rightarrow E_D = -1$ .

**Price elasticity of supply** is the relative change in supply per unit of relative price change.

$$E_S = \frac{(Q_2 - Q_1) / Q_1}{(P_2 - P_1) / P_1} \quad \text{or} \quad E_S = \frac{\Delta Q_S / Q_S}{\Delta P / P} \quad \text{or} \quad E_S = \frac{\% \Delta Q_S}{\% \Delta P}$$

If  $E_S > 1$ , then the supply is elastic; if  $E_S < 1$ , then the supply is inelastic. Since, according to the law of supply, the relationship between price and volume of production is direct, the elasticity of supply is always  $> 0$ .

The most important factor determining the elasticity of supply is the time available to the producer to respond to price changes. The longer the period, the more the volume of production will change, and, accordingly, the elasticity of supply.

There are three periods of time:

1. *Instantaneous period* - the producer does not have enough time to increase production in response to growing demand, so supply is completely inelastic (Fig. 4.3.a).

2. *Short run* - production capacities remain unchanged, but the volume of production can be changed due to their more intensive use and an increase in variable factors of production, so the supply will be more elastic and will have a positive slope (Fig. 4.3.b).

3. *Long-term run* - the commodity producer has more time to take all the desired measures aimed at adapting to the changed demand. Both variable and fixed factors of production, production capacities can be increased, which will make the offer even more elastic (Fig. 4.3.c):

- for an industry with increasing costs, the supply curve will look sloping, since the expansion of the industry leads to an increase in prices for the limited resources it consumes, and hence to an increase in the price of the goods produced;

- for an industry with fixed costs, the supply will be absolutely elastic, since an insignificant amount of the corresponding resources is used in production, which means that an increase in demand for them will not lead to an increase in prices.

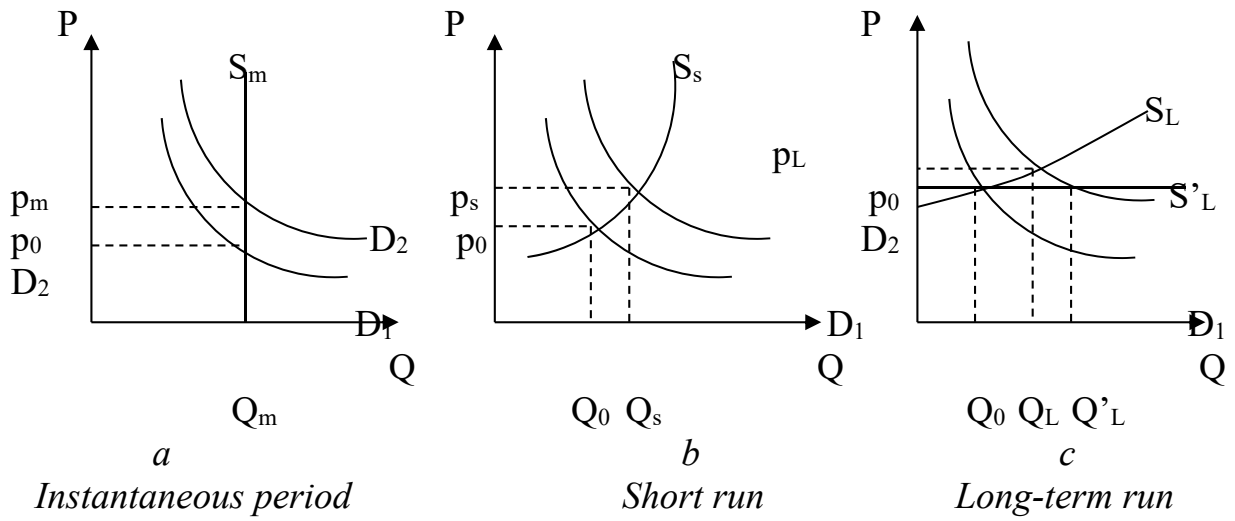


Fig. 4.3. Elasticity of supply over time