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MICROECONOMICS

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This textbook acquaints readers with the basic problems of the microeconomic analysis. It contains a statement of the theory of the consumers choice and behavior, opens the model of their balance achievement. Significant attention is given to the theory of production and mechanism of the choice of its volumes which maximize manufacturer's profit in conditions of various market models. Description of the firm's behavior in the commodity and resources market is given.

The textbook is intended for students of economic specialties, teachers, and all those, who are interested in problems of economics.

Цей навчальний посібник знайомить читачів з основними проблемами мікроекономічного аналізу. Він містить викладення теорії споживацького вибору та поведінки споживачів, розкриває модель досягнення їх рівноваги. Значну увагу приділено теорії виробництва та механізму вибору його обсягів, які максимізують прибуток виробника в умовах різних моделей ринку. Наведено характеристику поведінки фірми на ринку товарів та ресурсів.

Посібник розраховано на студентів економічних спеціальностей, викладачів та всіх тих, хто цікавиться проблемами економіки.

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INTRODUCTION

Modern market economy demands from the economist a wide range of knowledge not only of the economic theory bases, but also the profound knowledge of its separate special sections. Microeconomics, as the special component of the economic theory, has been studied at educational institutions of Ukraine rather recently. Basically both students and teachers use the educational literature which is issued in our country and abroad on the basis of the American and German textbooks translation. Also domestic manuals rather interesting in our opinion have appeared recently.

We feel the sharp need in such edition, which would contain the basic tenets of microeconomics, on the one hand, and there would be no superfluous detailed elaboration which does not give an opportunity for a starting economist to comprehend a microeconomic system as a whole on the other hand. It should be accessible for each student in the volume and price. Comprehension of this need has also pushed the authors to preparation of the book edition which you hold in your hands.

Course of lectures which is given for students of economic specialties of Alfred Nobel University (Dnipropetrovs'k) is assumed as the basis of the book. Therefore the language of the book is the language of the living dialogue. The authors tried to find a style of statement which is clear for the reader, and examples for demonstration of the microeconomic laws were taken from daily life.

The offered textbook in microeconomics consists of introductory unit and five parts. Introductory unit acquaints the reader with microeconomics as a component part of the economic theory and as a certain system of economic relations which represents a subject of this discipline studying. The first two parts are devoted to the theories of behavior of

the basic counterparts of a microsystem: a consumer and a manufacturer («Theory of a consumer's behavior» and «Theory of a manufacturer's behavior»). The theory of a consumer choice, model of a consumer equilibrium achievement, the mechanism of a market demand formation and its elasticity are opened here. While analyzing the theory of production, special attention was paid to costs formation and dependence of a product dynamics on dynamics of costs. Conformity to natural laws of costs formation for manufacture in the short-run and long-run is analyzed, as well.

The third part «Commodity market» opens a manufacturer's behavior in the markets of the finished goods. Four units which include this section, are devoted, accordingly, to decision making by a firm in the prices and volumes of manufacture in conditions of various market models: pure competition, pure monopoly, monopolistic competition and oligopoly.

As a firm acts not only as a manufacturer of production, but as a consumer of resources as well, the special part («Resources market») opens an origin of demand for resources and the mechanism of formation of the prices for them.

The fifth part (General equilibrium») is the final one in the book. Mechanism of the general equilibrium achievement is considered in it and estimation of efficiency of the market system functioning at a microlevel is given.

The offered textbook mainly corresponds to the typical program on «Microeconomics» given for students of economic specialties in all educational institutions of Ukraine. It is elaborated for 36 lecture hours and is called to give only basic knowledge in microeconomics which will be extended while studying other courses and disciplines.
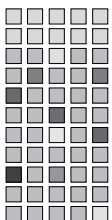
Unit 1 SUBJECT AND METHOD OF MICROECONOMICS

The purpose of introductory lecture of «Microeconomics» consists in finding out of the features of that object which is a subject of this unit of economic theory studying, and specific character of methods of knowledge used for it.

1.1. MICROECONOMICS IN THE SYSTEM OF ECONOMIC SCIENCES

Microeconomics is a part of economic theory studying activity of the individual economic subjects. Individual consumers, workers, investors of capital, firms etc. can be individual economic subjects. On the one hand, microeconomics explains, how and why individual managing subjects make decisions, and on the other hand – it studies interaction of subjects during the process of formation of the big structures – the branch markets.

As independent section of economic theory, microeconomics was formed at the end of the XIXth and in the beginning of the XXth century. However, its formation has gone through a long stage of evolutional development. Bases of microeconomic analysis are found out in classical political economy. So, using dual methodology of economic analysis, Adam Smith investigates external forms of display of economic events, defines functional dependence of many values and laws, and bases of functional analysis by that. During a period of late classicism many economists use this method which frequently results in fundamental discoveries in microeconomics. Such scientists, as T. Malthus and J.B. Say, are considered as ancestors of microeconomics by right. Malthus's law of diminishing profitableness and Say's theory of three factors of manufacture are being used in microeconomic analysis till now. However, with all importance of discoveries of microeconomic character by representatives of late classicism, formation of «microecono-

mics» science was carried out much later and it is connected, first of all, with neoclassic direction.

Formation of economy with market mechanism of its regulation mainly was finished in the second half of the XIXth century. Research of practical issues becomes especially actual in those conditions. It has served the reason of aspects displacement from finding out of the general principles of political economy to the analysis of problems of economic practice. The qualitative analysis, as a rule, is forced out by quantitative one.

Microeconomic analysis development can be presented by distinguishing of its evolution stages:

– *the first stage (1845–1990).* Bases of microeconomics are created within it, the basic methodological principles of research are formed. Famous representatives of this stage are:

а) Hermann Heinrich Gossen. He was the first as to a psychological factor for analysis of economic behavior of the subjects and formulated laws of saturation of the person's needs;

б) The Austrian school (C. Menger, F. Vizer, E. Bem-Bawerk). Its representatives have enriched the economic science with discovery of a principle of marginal utility and have offered quantitative approach to its definition;

в) John B. Clark, representative of the American school who has raised a question about necessity of definition of marginal utility concerning not only consumer goods, but factors of production as well, and, thus, modified the theory of marginal utility into the theory of marginal productivity of factors of production.

– *the second stage (1890–1933).* At this stage Microeconomics is distinguished as a separate part of economic research on the basis of systematization and generalization of ideas of late classics, the Austrian and American schools. After edition of the book «Principles of Economics» (1890) by A. Marshall the science has received its first name – «Economics». The following scientists can be considered as representatives of the second stage:

а) Alfred Marshall. He has offered a compromise variant of a market price definition – by marginal utility and production costs; has formulated laws of supply and demand; a significant part of his research was devoted to the studying of motives of behavior of individual managing subjects;

б) Mathematical school (William Stanley Jevons, Francis Ysidro Edgeworth, Marie-Ésprit-Léon Walras, Vilfredo Federico Damaso Pareto). This school, for the first time, widely used the device of mathematics as a tool of economic research and carried out an attempt of description of the competitive goods market as a closed system of rigid quantitative interdependences. It has offered a qualitative approach to definition of marginal utility and grounded the theory of the general economic equilibrium.

– the third stage (1933 – to present time). Microeconomics is developed on its own basis and is replenished with the following discoveries: the effect of revenue and effect of substitution (E. Slutsky, D. Hiks, P. Samuelson); the theory of imperfect competition (J. Robinson); the theory of monopolistic competition (E.H. Chamberlin); the theory of games (J. Nash, O. Morgenlitern, J. von Neumann).

However, even today, when microeconomics is recognized all over the world, and probably, thousands of research and hundreds of textbooks are written in this discipline, it is necessary to understand, that division into microeconomics and macroeconomic is a little bit conditional. Knowledge of each unit of economic theory provides understanding of interrelation and interdependence of micro- and macro- phenomena. For example, the labor market is the market of one of the resources. That is why it is investigated in microeconomics. At the same time, it is one of the basic problems of macroeconomics, because labor market is connected with unemployment and social stability of a society as a whole.

Identifications of microeconomics with economy of the enterprise is enough widespread among non-specialists. Really these sciences are crossed only partially: both study decision making by the enterprises concerning the market behavior. At the same time, each of them has the specific problems which are very big. For example, microeconomics studies behavior of households, consumer preferences, market demand and market supply, but doesn't study questions of the organizational mechanism of decision making at the enterprises, their organizational forms, parameters of financial condition of the enterprise etc., which are studied in the course of economics of the enterprise.

As well as any other economic science, microeconomics searches for answers to the basic questions arising in front of any economic system. It is, first of all, the question «*what to produce?*». The manufacturer always has opportunity of alternative manufacture. Therefore for a

choice of acceptable variant of manufacture it is necessary to study the consumer's needs. The final purpose of any manufacture is the needs satisfactions. That is why the studying of motives of consumer's behavior and the theory of a consumer choice is one of the key microeconomics problems.

Other question which microeconomics tries to answer, is «*how to produce?*». The manufacturer should solve, what resources and in what quantity to involve into production process. Investigating theory of manufacture, microeconomics helps to find out the mechanism of resources distribution between enterprises and branches of manufacture.

The question «*to whom and what results will be brought with manufacture?*» does not remain without attention of microeconomics. This is connected with the studying of revenues and their distributions to the current and perspective consumption.

Search for answers to the listed questions allows microeconomics to realize the functions among which it is necessary to distinguish the following:

1. Explanation of the observed phenomena. Any science has its theoretical postulates, as the initial positions accepted for axioms. Say, for mathematics this is a concept of a point, having made a start from which it is possible to define what is a line, a plane, a figure etc. For microeconomics such «point» is the thesis that **at a choice of variants of behavior economic subjects pursue the purpose of maximization of their benefit**. Certainly, in our life we meet also irrational behavior of subjects. However, it can be considered as a deviation from a norm. The rational behavior is inherent in the majority of managing subjects.

It is necessary to notice, that benefit can be both current, and perspective. Contradiction between the current and perspective benefit is characteristic for economic life. It is called **«Robin Good's effect»**. Plundering rich merchants and distributing their property between poor people, Robin Good improved life of the last. However, finally, merchants ceased to deliver the goods into this district in general, and that resulted in a sharp rise of the prices and deterioration of poor people's life.

2. Forecasting of economic subjects' behavior. Productivity of realization of this microeconomics function depends on accuracy of starting positions which are laid as the basis of the forecast. They are the economic laws formulated during research. Using the laws investigated in

the course of microeconomics for forecasting of the economic subjects' behavior, it is necessary to understand, that these laws operate as **the tendencies** and not necessarily will work in each specific case.

Explanation of economic phenomena and forecasting of behavior are related to the so-called **positive analysis**. It is possible to approach the microeconomic problems from a position **of the normative analysis** providing an estimation of correctness or incorrectness of actions and answering a question «how should it be?». However, such approach is closely connected to economic policy and is outside the frameworks of tasks of a training course of microeconomics.

1.2. METHODOLOGY OF MICROECONOMICS: THEORIES AND MODELS

Both general scientific methods and special methods are used in microeconomic research. Development of theories and models is a final task of such research.

Microeconomic research, as a rule, is started from gathering and studying of the facts of economic life. Their generalization, distinguishing of the most essential facts and disengaging from minor ones, research of cause and effect relationships allow to find out motives of economic subjects' behavior and to construct a model. **The economic model** is a system of interrelations between the economic variables, allowing to predict result. In other words, it is used for prediction of how the changes of economic conditions will result in the change of economic results. **Economic variables** are actual which somehow can be measured, or the sums of money which can get a line of possible values.

Conclusions from economic models are expressed in the form **of hypotheses,** i.e. statements about the causes and effects requiring for acknowledgement or a refutation by the facts.

The aspiration to understand how this or that sector of economy functions is the purpose of economic modeling. Someone considers that the more model is similar to the real process, the best it is. But this opinion is an error. Criterion of utility of economic model is not the degree of its conformity to the real economic processes, and conformity of the forecasts received with its help to real events. Therefore the model should be simplified as much as possible, that will allow to ex-

pand scales and efficiency of its use. Say, if the glow at a sunset allows to predict windy weather next day with significant reliability, this simple model is much more useful, than the one constructed on difficult studying of directions of air streams movement with the help of probes, satellites etc.

Construction of the model is connected with a loss of a part of information on the researched object. It allows disengaging from its minor elements to concentrate on the main integral parts of the system and their interrelations. The known sizes which are put into a model as a ready made, are called **exogenous;** the sizes which are received within the frameworks of a model at the decision of a task, are called **endogenous.**

Modeling in a two-dimensional space – with the help of diagrams – is the most elementary kind of the economic-mathematical modeling. This method is used in microeconomics more often.

The reference that economic subjects try to maximize their benefit is the key precondition for the economic models construction. And in this situation we say about the net benefit, as differences between the total result and costs which were suffered on its achievement. It is necessary to pay attention to the fact, that for economist the costs are not simply the sums of money or an operating time, but those not received benefits from possible alternative variants of the resources use.

The technique which was called «**the marginal analysis**» is widely used in construction of the microeconomic models. This is a research of how each additional action, which is carried out for the certain period, influences the purpose which the person would like to reach. Marginal costs (the costs necessary for an increase of a result on unit) or marginal utility (utility brought for a consumer after consumption of additional unit of the benefit) may be examples of such marginal sizes. The rational subject should continue a search for the best decisions up to that time while marginal benefit will not be balanced with marginal costs. In this case he/she will achieve maximum realization of the purpose.

The functional analysis is of great significance in microeconomics. During its realization a feature, which is interesting for us, is distinguished in the researched phenomenon, and then we begin a search for the factors influencing it. After these factors had been established, we determine the way of their interaction with the distinguished characteristic, i.e. **function**. It is necessary to emphasize, that finding out of functional interrelation is important even when precise definition of

the cause and effect relationships between the researched phenomena is complicated.

The equilibrium approach to research of the dynamic phenomena and processes is the next important feature of the microanalysis. Examining constant dynamics of economic events, microeconomics tries to study such their condition, which is characterized by relative stability, i.e. by balance. Balance means, that there are no internal tendencies to a change of an existing condition. If at minor alterations of an environment the situation radically changes, such balance is called as **unstable one**. If, at occurrence of such external changes, there are the forces reviving a balance in the system, it is called as **stable one.** Certainly, the changes of external conditions can appear significant. Then such economic system will change over from one equilibrium condition to an other similar condition. Finding out of a way of interaction of forces directly contacting in this interaction, analysis of the results of their interference and steady functioning in an environment which changes dynamically, and then preconditions of occurrence and destruction of such systems and transition to the new ones is one of the key directions of microeconomics development.

Methods of static and dynamics are especially widely used in microeconomic research. **Method of static** provides comparison of different equilibrium conditions, thus, transition from one balance to an other remains outside analysis. **Method of dynamics**, on the contrary, demands analysis of the transition process from one condition of balance to another.

1.3. MICROSYSTEM AND ITS GENERAL CHARACTERISTICS

Microsystem is an object of microeconomic research. Microsystem is a system of economic relations between managing subjects. That is why it is possible to analyze it in three aspects: finding out what subjects enter these relations, why these relations develop, and what are the basic contents of these relations.

The following subjects belong to the basic **subjects of a microsystem:**

a) households. It is a group of people joining their revenues, having common property and making economic decisions together. Fami-

ly is the most typical example of the household. However, an individual, who independently forms and uses his revenues, not entering any associations with other citizens, can fulfill role of household in microeconomics. The role of households in microeconomic system is a double one. On the one hand, they are the consumers of the final goods and the carriers of the final needs. Actually for the sake of these needs satisfaction the economic system functions. Therefore in the market of the final goods, households act on the side of demand as buyers. On the other hand, households are the proprietors of resources delivering them for the production purposes. Therefore in the market of resources, households turn into sellers, and form the supply;

б) enterprises (firms). They are any managing subjects engaged into industrial consumption of resources and producing goods or services for the sake of profit. It is necessary to pay attention to the fact that the concept «enterprise» in microeconomics is much wider, than, say, it is determined in legislation. If for a legislator it is important that the enterprise is necessarily a legal person, and that person has passed the state registration, etc., than for the researcher of microeconomic problems all this has no essential value. The main thing for him is that the enterprise independently makes a decision on output, purchase of resources, the prices and distribution markets and is guided by the purpose of profit maximization at a choice of alternative variants;

в) state (government). In a microsystem it is considered as a set of authorities which fulfill a role of coordinator and regulator of economic life. The researcher of a microsystem disengages from that fact the state is the owner of a significant amount of enterprises, organizes manufacture of goods of the public use, etc. Coordinating role of the state is the most essential for macroeconomics analysis.

Resources of the manufacture and its results are the **objects,** concerning the relations in a microsystem. As well as in other sections of economic theory, labor, capital, natural resources (land) and entrepreneurial abilities are analyzed as **resources** in microeconomics. Labor is a person's purposeful activity, and it is capable to alter natural substance for giving him a form necessary for consumption. All means of production created by a person in the previous production processes are considered as **capital** in microeconomics. Those groups of means of production which were not exposed to processing earlier or the nature forces which are used in the production process are considered as **na-**

tural resources. More often they are called with the help of a generalizing word – «**land**». **Entrepreneurial abilities** are special abilities of individual people who are ready to take risk, to mobilize resources, to organize them in a production process and to use them creatively for the sake of profit.

The account of such resources properties has special value for understanding of behavior motives of economic subjects and construction of the appropriate models:

– *scantiness*. As a rule, microeconomics deals not with absolute, but with relative scantiness of resources. It does not mean that there is no some resources at all. Simply there is no opportunity to get it under the previous conditions. Expansion of this resource attraction into production will be more expensive for a firm. Though, in some cases, microeconomics specially investigates situations arising as a result of absolute scantiness of resources;

– *interchangeability*. It means that some kinds of resources to a certain degree can be replaced with the others. Say, it is possible to dig a trench with the help of a dredge and insignificant quantity of labor or manually with the help of shovels but it is necessary considerably much more labor in the last case. Replacement of two kinds of resources is considered more often in microeconomics: capital and labor;

– *complementarity.* An effective use of each resource is possible only at the certain ratio with the others. Though resources are capable to replace each other, but such ability is limited: it is practically impossible to replace labor completely by the capital or vice versa.

A thing (a material product) or **service** is considered as a result of industrial activity in microeconomics. Quantitatively it can be characterized both with the help of physical parameters, and in terms of value. Terms of value significantly depend on the prices in which the result is calculated. They can be *current,* i.e. such, that have developed at the moment of calculation, or comparable*,* fixed on a certain level. Both the first and the second variants are applied in microeconomics.

We can see that a microsystem is a **market system,** if to examine it from the point of view of **the contents of the economic relations** developing in it*.* The market is a way of interaction of the economic subjects, based on the price system and competition. It is a special mechanism of economic actions coordination.

Market relations, established between the seller and the buyer, have some distinctive features:

– *position of participants equal in their rights*. It means that neither the seller, nor the buyer should have opportunities **of noneconomic** enforcement of the counterpart to enter into the exchange relations. Certainly, it does not exclude a monopoly position of somebody from participants of market relations, but in this case enforcement will have economic character;

– *use of principle of the economic benefit as basic criterion of expediency of entering into market* relations. It is possible to distinguish three key rules by which participants of an exchange are guided: 1) the exchange should bring the benefit; 2) everyone aspires to realize an agreement with the maximum benefit for him; 3) it is better to realize the bargain with a smaller benefit, than to refuse it at all;

– *full economic responsibility of participants for their actions.* If freedom is one side of market position of the subject, then full self-responsibility is a return one. When the economic subject selects the counterpart without enforcement, at his own will, then, certainly, he himself should bear responsibility for his choice.

The sphere of an exchange can be presented as movement of two counter streams: commodities and money. The obvious scheme of commodities and money circulation (fig. 1.1) will help to understand better the market system in general and to understand the logic of microeconomics course construction.
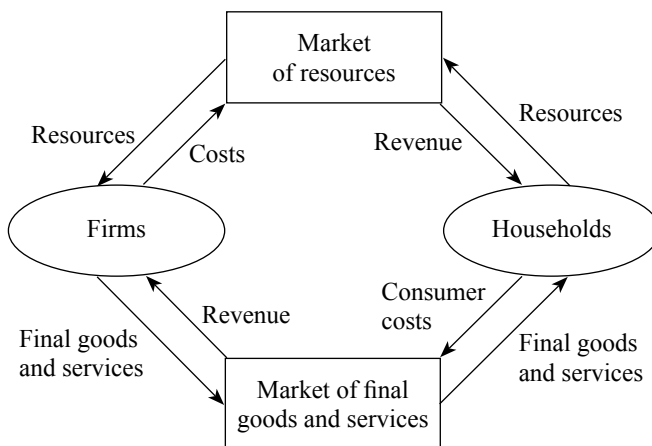
Fig. 1.1. Commodities and money circulation

The behavior of economic subjects in the market depends significantly on the competitive environment condition. Therefore, special attention is given to competition in the microeconomic analysis, separately? to the examining of the markets of pure competition, monopolistic competition, oligopoly and pure monopoly.

The normal condition of a microsystem is its orientation to achieve the balance as individual subjects, first of all, the consumer and the manufacturer, and a system as a whole. Finding out of mechanisms of establishment and restoration of condition of a microsystem balance is the main problem of the unit of economic theory which is called «microeconomics».

The main terms and concepts

General problems of economy
Microeconomics
Macroeconomics
Functions of microeconomics
Robin Good's effect
Positive and normative analysis
Methodology of microeconomics
Economic model
Economic variable
Subjects of microeconomics
Marginal analysis
Resources and their properties
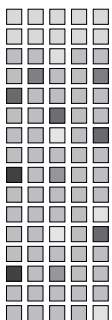
Part 1 THEORY OF A CONSUMER BEHAVIOR

Unit 2 | THEORY OF A CONSUMER CHOICE
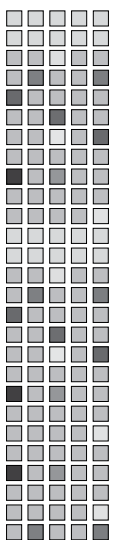
Any of us as a consumer faces the problem of choice every day: which dishes should dinner in students' dining room consist of, to get to the university by trolley-bus, bus or a fixed-route taxi, which book in economics to get? From time to time we make a choice, not realizing why it is exactly this one. It occurs as a subconscious fact. In reality a consumer choice can be modeled rather precisely. There is a part of microeconomics which explains a consumer behavior, mechanism of choice of some set of products which he/she is ready to get in the market. The main problem of this unit is to state substantive provisions of the theory of a consumer choice, i.e. to give scientific explanations to the fact how the consumer spends his/her revenue for maximization of satisfaction.

2.1. CONSUMER'S PREFERENCES

Did you see, how visitors read menu at a restaurant, cafe or bar? As a rule, they firstly pay attention to the left part, where the offered dishes are listed, and stop on some of them. Then they compare their preliminary choice to the right part, where the prices are determined, and even approximately determine if they could make the appropriate order for that sum of money, which they have. This supervision gives a key to understanding of a rather difficult process of a consumer choice, general scheme of which is given in fig. 2.1.

First of all, it is necessary to notice that the consumer will choose only the product which he/she needs. It is possible to say confidently that the consumer choice is based on the people needs. **Needs** are state of satisfaction, which consumer aspires to keep, or state of dissatisfaction which he/she would like to change.

To satisfy his needs a consumer can use different set of products. Say, it is possible to satisfy famine both with a sandwich with sausage

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┌─────────────────┐         ┌──────────────────────┐
│   Consumer's    │         │  Prices of the goods │
│   preferences   │         │                      │
└─────────────────┘         └──────────────────────┘
          ╲                      ╱
           ╲                    ╱
            ▼                  ▼
          ╭────────────────────────╮
          │    Consumer choice     │
          ╰────────────────────────╯
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                     │
          ┌──────────────────────┐
          │   Consumer budget    │
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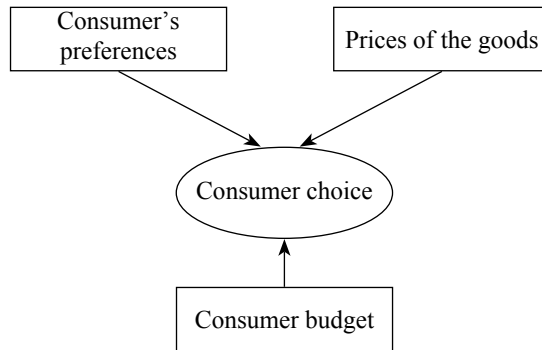
Fig. 2.1. Factors of a consumer choice

and a sandwich with cheese. Depending on tastes the consumer prefers any of them. Depending on the preferences, a consumer prefers one of them. So, the person's needs, being imposed on the person's specificity, are transformed into preferences. ***Consumer's preferences*** are ranks, which the consumer establishes for alternative variants of the needs satisfaction. Those variants which, in opinion of the consumer, are capable to satisfy his/her needs better, will occupy the higher places in this «table of ranks». Thus, appearing in the market, the consumer should choose, which way is the best to satisfy the needs, without spending more than the budget allows him/her.

The specified remarks give enough reasons for construction of a consumer choice model. Nevertheless, this model, as well as any another, provides acceptance of the certain assumptions, initial preconditions that give possibility to understand this situation better and determine conditions, at which conclusions, made with their help, will be the most authentic. Such assumptions are:

1. Ability of the consumer to range alternative of his needs satisfaction. If there are two sets of the goods (A and B), the consumer can prefer anyone of them or recognize that they are equivalent for him/her:

$$A > B; A < B; A = B.$$

2. Consumer's preferences are transitive. If the consumer prefers A set of goods in comparison with B set, and B set in comparison with C set, he/she prefers A set in comparison with C set:

$$\text{if } A > B, \text{ and } B > C, \text{ then } A > C.$$

3. More quantity of goods is more attractive to the consumer, than fewer one. This precondition provides that constructing consumer behavior model, we recognize that his/her needs for any product are not satisfied completely. After achievement of full saturation of the needs by the certain goods, it turns into the antiblessing, and we will have other dependence: the fewer quantity of antiblessing the better it is for the consumer.

2.2. FUNCTION OF THE UTILITY AND INDIFFERENCE CURVES

Giving any ranks to alternative variants of the needs satisfaction, the consumer follows subjective opinion about utility of different blessings for himself. ***Utility*** is satisfaction which consumer receives from consumption of the goods or services or from any activity. In opinion of the majority of modern researchers, utility is not subject to quantitative measurement, therefore the blessings, as carriers of certain utility for the consumer, can be measured only by ratio: the consumer is capable to determine the sequence, in which he/she would select these blessings for satisfaction of his needs. There is also the other point of view, admitting quantitative measurement of utility. Such measurement is rather conditional as there is no precisely certain unit of measurement. Therefore for further comparison of different utilities we shall use the conditional points which the consumer gives to the blessings.

Utility is an extremely individual concept: the thing that can have high utility for one consumer, can be perceived by the others as the antiblessing. Someone appreciates a cup of strong coffee in the morning most of all, and someone will not drink it under any conditions.

The economic theory recognizes that there is a certain functional connection between utility and quantity of the consumed products. It is ***function of utility***, which reflects a ratio between volumes of the consumed goods and services and a utility level achieved by the consumer:

$$U = f(Qx, Qy, \ldots, Qn),$$

where U – utility; Qx, Qy, …, Qn – volumes of the appropriate consumed goods.

For construction of a consumer behavior model we shall introduce one more assumption: let the consumer to form the set only due to two goods (X and Y). Then function of utility can be submitted in the simplified form:

$$U = f(Qx, Qy).$$

If student's week consumption is formed due to pies (goods Y) and cutlets (goods X), it is possible to find such sets which have identical utility for the consumer. The list of such sets forms *a grid of the consumer* (tab. 2.1).

Table 2.1

A grid of the consumer

Set of the goods	$N1$	$N2$	$N3$	$N4$
Cutlets, units	8	10	12	14
Pies, units	20	12	6	2

According to table 2.1 it is possible to construct the appropriate schedule (fig. 2.2). The curve in this schedule is referred to as an indifference curve. The *indifference curve* for the certain consumer is all those combinations of the goods which provide an identical level of satisfaction. Between the sets of goods $N1$, $N2$, $N3$, $N4$ the consumer does not see any difference.
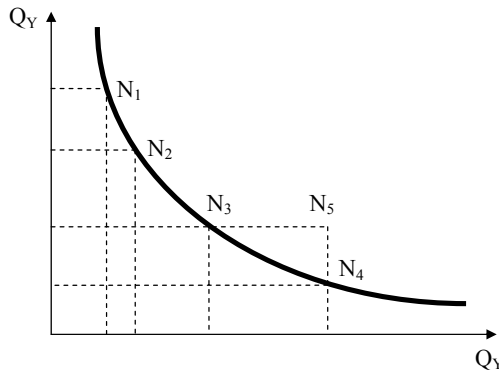
Fig. 2.2. The indifference curve

The set of goods, which corresponds the coordinates of point $N5$, provides the greater level of consumer satisfaction, than any set which belongs to the indifference curve. However, it is possible to find the

other sets which have the same utility, as well as the set in point $N5$. Therefore, through any point which corresponds the certain set of the goods, it is possible to build the indifference curve. These curves form a map of the indifference curves (fig. 2.3).
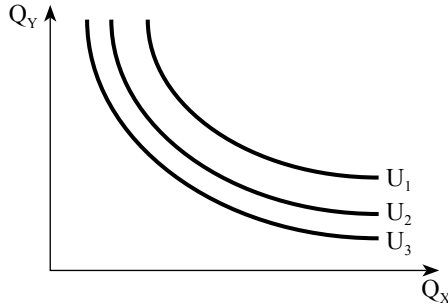
Fig. 2.3. The map of the indifference curves

The map of the indifference curves has the certain properties:

1. The sets of goods on the curves which are more remote from the beginning of coordinates, correspond the supreme degree of consumer satisfaction, than those laying on the less remote curves.

2. The indifference curves do not cross. If to assume, that the curves of indifference $U1$ and $U2$ have crossed, then they have the common point A. Then the set of goods A has the same utility, as well as B set, belonging to the curve $U1$, and C set, located on the curve $U2$. By a principle of transitivity $B = C$. However it is impossible, as these points belong to the different indifference curves.

Analyzing the indifference curves it is necessary to pay attention to ability of the goods to interchangeability. Reduction of cutlets consumption by the certain quantity can be compensated by the consumption increases of pies and on the contrary. Thus, the consumer will be on the same indifference curve, i.e. will receive identical satisfaction. ***The marginal rate of substitution*** is a quantity of the goods Y, which the consumer would refuse to receive one more commodity unit X, remaining on the same indifference curve.

As we see in fig. 2.4, reduction of consumption volume of goods Y on ΔQ_Y $(Q_{Y2} - Q_{Y1})$ is compensated by the consumption increase of goods X on ΔQ_X $(\Delta Q_{X2} - Q_{X1})$. Therefore the marginal rate of substitution (MRS_{XY}) can be calculated as follows:

$$MRS_{XY} = - (\Delta Q_Y / \Delta Q_X).$$
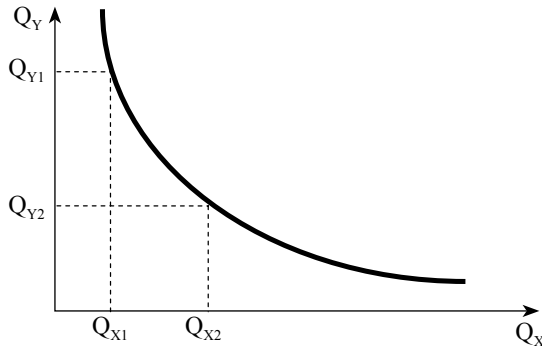
Fig. 2.4. The marginal rate of substitution

It is easy to notice, that at movement downwards along the indifference curve the marginal rate of substitution decreases. Action of the law of diminishing of marginal utility lays in the basis of this process. ***Marginal utility (MU)*** is a gain of satisfaction which is received by the person, consuming an additional commodity unit. The marginal rate of substitution can be easily expressed by ratio of marginal utility of goods X and Y:

$$\Delta Q_X * MU_X = - \Delta Q_Y * MU_Y;$$
$$MRS_{XY} = - (\Delta Q_Y / \Delta Q_X) = MU_X / MU_X.$$

As at the increase of the consumption volumes of any goods the degree of satisfaction of the consumer needs grows, then one will have smaller satisfaction, from each new portion, than from previous one. This dependence is displayed also with the law of diminishing marginal utility. At movement along the indifference curve downwards consumption of goods X grows, and its marginal utility decreases, and consumption of goods Y decreases, and its marginal utility grows, that's why the fraction in the formula will decrease.

2.3. BUDGETARY RESTRICTIONS

As it was marked, the choice of the consumer depends not only on his/her tastes and preferences, but also on the budget. ***The budget*** is a quantity of money which is accessible to the consumer to the charges at

a certain period of time. The revenue of the consumer and purchasing power of money (i.e. the prices of goods) determine ***consumer budgetary restrictions***.

For the analysis of influence of budgetary restrictions on a consumer choice we shall enter some restrictions:

– the consumer spends the revenue only to purchase goods X and Y (in our case those are cutlets and pies);

– the consumer does not make any savings and does not involve the previous savings in charges;

– the consumer does not give and does not take credits.

In this case the consumer revenue (I) will be equal to all his/her charges:

$$I = P_X Q_X + P_Y Q_Y,$$

where P_X and P_Y – the prices, accordingly, for cutlets and pies.

By the equation it is possible to determine the sets of goods X and Y for the purchase of which the consumer will spend the identical means. Provided that $I = 10$ grv., $Px = 1$ grv., and $Py = 0,5$ grv., possible variants of the sets are given in table 2.2.

Table 2.2

**The sets of goods which can be got
at the certain budgetary restrictions**

Set of goods	N1	N2	N3	N4	N5	N6
Cutlets, units	10	8	6	4	2	0
Pies, units	0	4	8	12	16	20

It is possible to present this dependence graphically (fig. 2.5). ***The line of budgetary restrictions,*** presented in this diagram, shows all those sets of goods X and Y, which the consumer budget enables him/her to get. If the consumer wants to get a set adequate to coordinates of point N7 the budget will not allow him/her to do that; if he/she chooses set N8 then he will not spend all available means.

As the line of budgetary restrictions is a straight line, it has constant inclination, which can be expressed through a marginal rate of substitution:

$$MRS = -(\Delta Q_Y / \Delta Q_X) = P_X / P_Y.$$

The more abrupt the line of budgetary restriction is the more goods Y it is necessary to offer to get additional unit of commodity X.
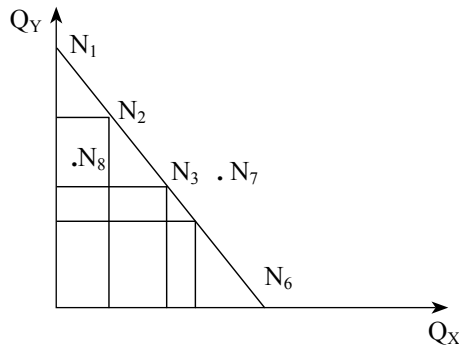
Fig. 2.5. The line of budgetary restrictions

Change of the revenue and the prices for goods changes position of a line of budgetary restrictions. If the revenue changes, the curve will move to the right (an increase of the revenue) or to the left (reduction of the revenue). Thus the corner of the inclination line remains constant. On the contrary, if the price for a product changes, it results in the change of inclination corner: it is increased at a rise in prices for goods X and reduction of prices for goods Y and decreases, if there is an opposite situation in the market (fig. 2.6).
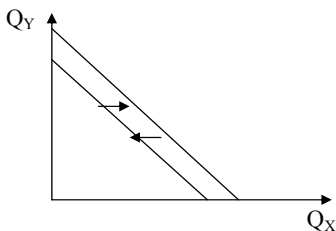
a) the change of the revenue   b) reduction of the prices for goods X
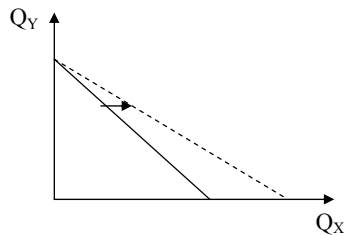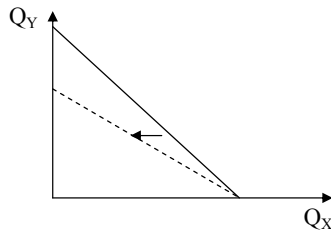
c) a rise in prices for goods Y

Fig. 2.6. Influence of the revenue changes and the prices for position of the line of budgetary restrictions

Construction of the consumer indifference curve and the line of his/her budgetary restrictions enables to determine position of the consumer's equilibrium.

2.4. CONSUMER'S EQUILIBRIUM

The consumer maximizes utility at presence of the certain budgetary restrictions. That is why to explain, how a consumer choice is influenced with tastes, the revenue and the prices for goods, is the main task of the consumer behavior model. For evident demonstration of a choice process let's combine the indifference curves map and the line of budgetary restrictions of any consumer in one diagram (fig. 2.7). As we see, the line of budgetary restrictions crosses the indifference curve, which corresponds the utility U_1 in points A_1 and A_2. It means that the revenue of the consumer at maximal use enables to get both the first, and the second set. Does it mean that in points A_1 and A_2 the consumer receives the maximal utility which is accessible to him/her at existing budgetary restrictions? It is obvious, that it is not present. Every point, which lays on section A_1A_2, will be accessible to the consumer and will have utility more, than U_1, because it is more remote from the beginning of the coordinates. The maximal utility, accessible at the given budget, is achieved, when combination of goods corresponding to the point, where the budgetary line touches the most remote from the beginning of the coordinates of the indifference curve, is consumed.
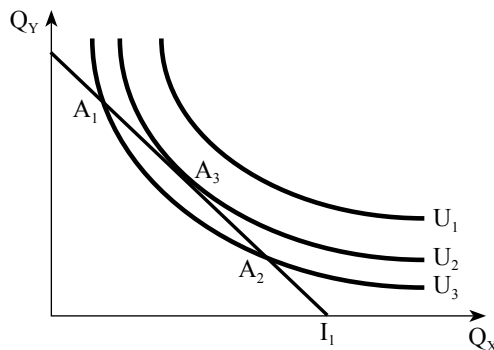
Fig. 2.7. Equilibrium of the consumer

Equilibrium of the consumer corresponds such combination of the acquired goods which maximizes utility at the given budgetary restriction. As soon as the consumer receives such set, his stimulus to replace it with another one disappears.

It is possible to give the geometrical interpretation of the consumer equilibrium. If a balance is achieved in a point of a contact of the budgetary restrictions line I_1 to the indifference curve U_2, it means that inclination of these two lines coincides in point A_3 (inclination of a curve in any point corresponds to inclination of the tangent built to it in this point). Then

$$MU_X / MU_Y = P_X / P_Y, \text{ or}$$
$$MU_X / P_X = MU_Y / P_Y.$$

The consumer, which maximizes the utility, will buy two kinds of goods, so that their marginal utility, in calculation for monetary unit of the price, are equal. This approach is called ***equimarginal principle.***

Equilibrium of the consumer at which he/she will get both goods, is referred to as ***internal*** one. However, it can happen, that the consumer will maximize the utility, purchasing only one product. Such balance is referred to as ***angular*** one. For example, one of students has decided to limit consumption of the flour products then the inclination corner of the indifference curve will considerably increase, and in no one place the line of budgetary restrictions can be a tangent. Equilibrium will be achieved in a point which corresponds to the greatest possible quantity of cutlets which the student can get depending on his budget (fig. 2.8).
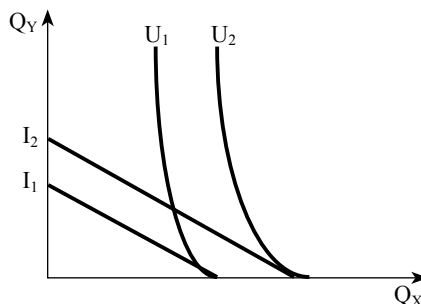
Fig. 2.8. Angular equilibrium of the consumer

In the given example an angular balance can turn into internal one, when the prices for pies will considerably decrease or will considerably increase for cutlets. If the consumer does not wish to refuse cutlets for the sake of pies, the indifference curve will look like a vertical straight line, and transition from angular equilibrium to internal one will be impossible at all.

The consumer balance will be extremely angular, also when one of the goods is ***the antiblessing,*** i.e. such, that has the negative utility value for the consumer. Character of the indifference curve in this case will change: it becomes growing instead of descending. For example, because of any disease the consumer cannot use meat at all, then he/she will be attracted with that set where there are less cutlets, and equilibrium (maximization of utility) will be achieved in a point appropriate to the maximum quantity of pies, which he can get, proceeding from the budget. You see, the consumer will never get the antiblessing voluntarily. We shall notice, that practically each product can turn into the antiblessing, when it is accessible in such quantity, which completely satisfies the consumer needs. The point, in which the consumer ceases to consider additional consumption as one bringing benefit to him/her, is referred to *as a point of saturation.*

It is necessary to pay special attention to consumption of the goods which ideally supplement each other i.e. when effective consumption of one product without a certain quantity of another one is impossible at all (for example, automobiles and license plates). In this case, neither change of the prices ratio, nor the revenue of the consumer will not influence parity of these goods in a set which consumer selects (fig. 2.9).
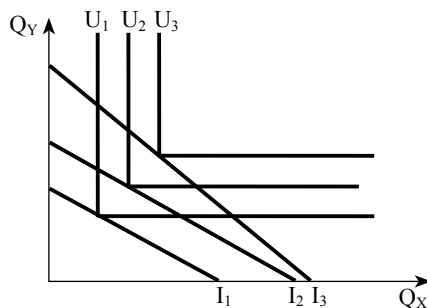
**Fig. 2.9. Equilibrium of the consumer
for ideal complementary blessings**

The theory of a consumer choice has wide practical application. Marketing research is the most widespread sphere of its use. Forecasting of a consumer behavior, understanding of the mechanism of making the decision by him concerning a choice of this or that set of goods enable to develop more effective strategy of a firm and to make more proved economic decisions.

The main terms and concepts

Consumer preferences
Transitivity
Utility
Ratio measured product
Function of utility
Indifference curve
Marginal rate of substitution
Indifference curves map
Marginal utility
Budget restrictions
Line of budget restrictions
Consumer's equilibrium
Equimarginal principle
Internal equilibrium
Angular equilibrium

Unit 3 MODELLING OF A CONSUMER'S BEHAVIOR IN COMMODITY MARKET
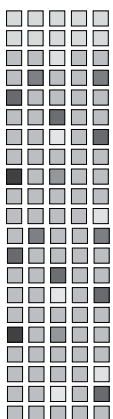
In the previous unit we accepted assumptions that the consumer makes his choice only between two goods: goods *X* and goods *Y*. We shall try to bring our model to reality now. You see actually the consumer chooses the certain goods from the whole mass of the blessings offered to him/her. Therefore it is necessary to analyze, how the consumer makes a choice, opposing goods *X* to all other goods, how his/her choice is influenced with the revenue and the prices and how, as a result of it, individual demand for the goods is formed.

3.1. THE «REVENUE-CONSUMPTION» CURVES. ENGEL'S CURVES AND LAWS

If to enter regulations about a choice between the given goods and all other goods into model of a consumer choice, it, first of all, will be reflected in representation of the budget expenses structure. In this case the formula of the expanded budgetary restriction will get the following form:

$$I = P_X Q_X + S P_{Yi} Q_{Yi}.$$

The line of budgetary restrictions will be also treated a little differently under these conditions. Now in the diagram, on the one hand, there is a quantity of goods *X*, which the consumer can get, preceding from his/her revenue, and on the other hand, there are expenses in the monetary form for the purchase of all other goods (fig. 3.1). The point of crossing of the budgetary line with axis *Y* will correspond to the total revenue of the consumer.

The inclination of this line is constant (as it is a straight line) and is equal to a tangent of a corner:

$$tg \ \alpha = I \ / \ Q_x = P_x.$$
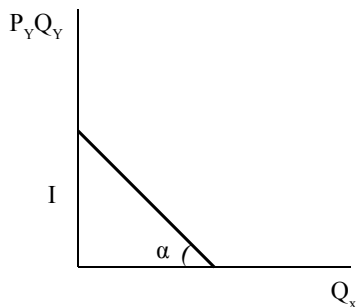
Fig 3.1. The line of the expanded budgetary restriction

It is also possible to build the indifference curve for the consumer in view of new assumptions (fig. 3.2). We pay attention to the fact that in this case the value of all other goods for the consumer gets a term of money.
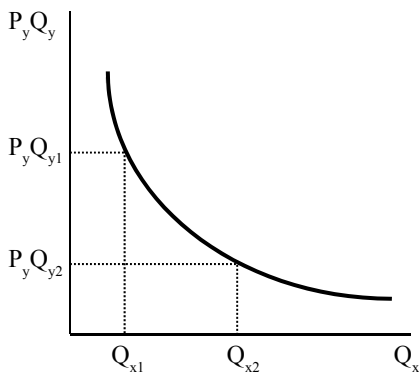
**Fig. 3.2. The indifference curve at the choice of goods X
from the whole mass of the goods**

If to assume that marginal utility of money for the consumer remains constant, then the marginal rate of substitution will be equal to the marginal utility of goods X expressed in the monetary form (MUx) in each point of the indifference curve. Therefore inclination of the indifference curve will coincide with inclination of a line of budgetary restrictions in that point where the marginal utility of goods X, expressed in money, will coincide with the price of goods X. In other words, consumer equilibrium is achieved under condition of equality for him of the goods value and expenses for the goods purchase:

$$MUx = Px.$$

At the smaller volumes of the purchases marginal utility of the goods will be more, than the price, and it will create an interest to increase quantity of goods X. If the purchases appear more than the equilibrium volume, the price of the goods will exceed their utility. And it will push the consumer to reduction of the purchases. *Equilibrium will come, when marginal utility, as the maximal sum of money, which the consumer would like to refuse for the sake of reception of an additional commodity unit, will be balanced with its price.*

The decision of the consumer to purchase goods X in the certain volumes depends not only on his/her tastes and preferences, but also on a level of the revenue. If in the diagram, where the points of consumer equilibrium are shown at different levels of his/her revenue, to draw the line which passes through these points, we will receive **the «revenue – consumption» curve** (fig. 3.3). This curve shows, how the quantity of goods X, consumed for the certain time, will change depending on the revenue change and only the revenue.
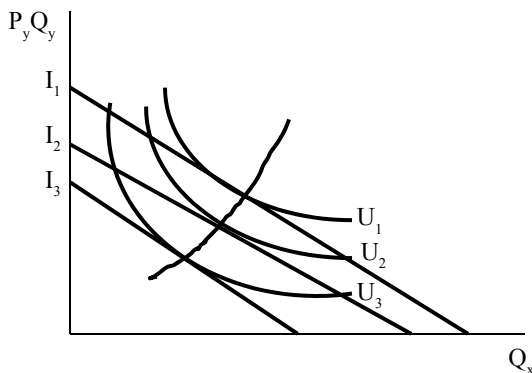
Fig. 3.3. The «revenue – consumption» curve

Character of the «revenue – consumption» curve will depend on the estimation of the goods by consumer. **The superior goods** are such goods which the person consumes more, if his/her revenue grows. **The inferior goods** are such goods the consumption of which is decreased under condition of growth of the consumer revenue. It is necessary to note, that the belonging of the goods to the group of the superior or inferior goods depends not so much on their some specific properties, but on perception of these goods by the consumer. The goods which are the

superior goods for one consumer, another consumer will estimate as the inferior goods.

Besides that, the goods estimation changes depending on the consumer revenues as well. Thus, at the certain level of the revenue a trip to other cities by the private automobile will be perceived as the superior goods, and the quantity of such trips will be increased with the increase of the consumer revenues. However, when the revenues have increased up to the certain level, the consumer will perceive a long-hours trip as inferior one, and a consumer will prefer flight by the plane. That is why a trip by the own automobile will turn into the inferior goods.

Thus, *the curve «revenue – consumption» will have ascending character for the superior goods and a descending – for inferior.*

At the same time, there is a group of the goods which can be attributed neither to qualitative, nor to inferior goods. Volumes of their consumption do not depend on a level of the consumer revenue. Rather cheap goods, which don't have effective substitutes, belong to this group. The most likely, for example, consumption of the table salt doesn't depend on the level of the consumer revenues. Therefore the «revenue – consumption» curve for this group of the goods will look like a vertical direct line (fig. 3.4).

a) the superior goods   б) the inferior goods

в) the neutral goods
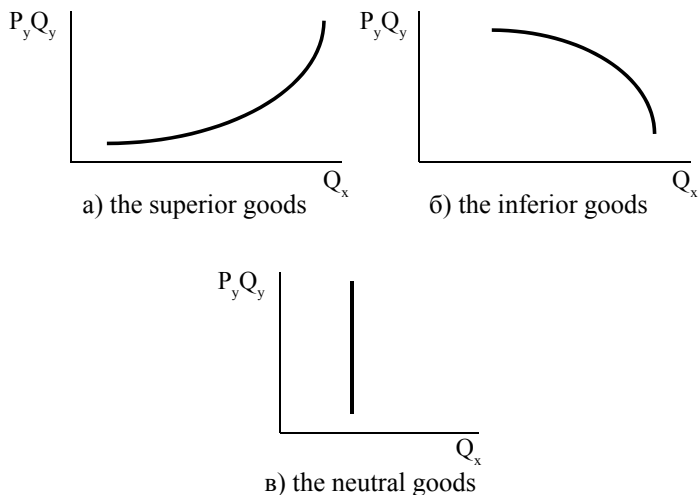
Fig. 3.4. The «revenue – consumption» curves for different categories of the goods

From the «revenue – consumption» curve it is easy to pass to the so-called **Engel curve.** Ernest Engel (1821–1896) – the English economist, who was engaged in studying of that way how a consumption character of the goods and services changed depending on the revenue of family in the XIXth century. Engel curve shows a ratio between the revenue and volume of the certain goods consumption at an invariance of the other factors influencing a demand (fig. 3.5).
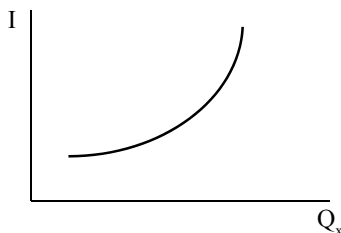
Fig. 3.5. Engel curve

For the majority of the superior goods Engel curve has a growing character with attenuation, i.e. the certain gain of the revenue causes the smaller gains of consumption of goods X. It, first of all, speaks about action of decreasing marginal utility law. Such goods are referred to as normal. However for the certain group of the goods Engel curve can grow with acceleration. Luxury goods can be attributed to this group. The consumption of these goods grows faster, than the consumer revenue increases. These dependences were noticed by Engel and formulated as the laws included into the economic theory as **Engel laws:**

1. At constant prices for all blessings the cost per unit of the family budget, spent for consumption products, tends to reduction at the family revenue growth.

2. Consumption of educational, legal, medical services and the services, connected with the rest, tends to grow faster, than revenues grow.

And though these laws were revealed more than 100 years ago, it is easy to be convinced of their validity, observing our today's life.

3.2. THE «PRICE-CONSUMPTION» CURVES AND DEDUCTION OF THE DEMAND CURVES

While investigating the «revenue – consumption» curves and Engel curves, we started with assumption that only the revenue changes

and all other factors of demand remain constant. If initial preconditions are changed, fixed as the constant revenue, and entered into the model as an economic variable of the price then, it is possible to build a «price-consumption» curve.

Reduction of prices on goods X will result in turn of the budgetary restrictions curve to a new point of its crossing with an axis X, more remote from the beginning of the coordinates. If the revenue and the prices for other goods remain constant, then the point of crossing with axis Y remains former.

The «price-consumption» curve shows, how the volume of the goods X purchases (points F_1, F_2, F_3 on fig. 3.6) changes at transition to the other price level for these goods at an invariance of all other factors of demand.
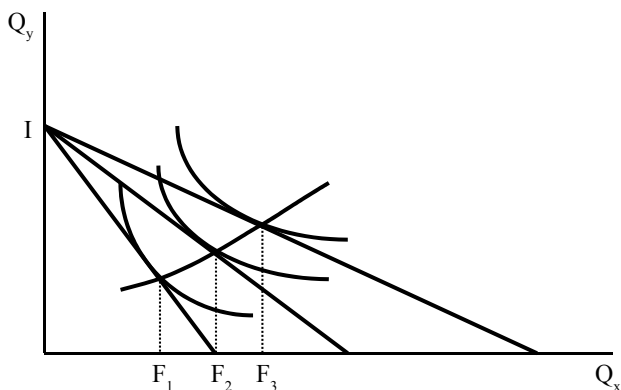
Fig. 3.6. The «price-consumption» curve

It is possible to pass to the individual demand curve from the «price – consumption» curve. The tangent of a corner of inclination of the budgetary restrictions lines corresponds to the price of goods X. It is easy to notice, that reduction to the corner of inclination (reduction of the prices for goods X) is accompanied by an increase of the volumes of these goods purchases. **The demand curve** displays dependence between the price for goods (Px) and the size of its desirable purchases for the consumer (fig. 3.7).

Demand is those quantities of a product which the consumer is ready and able to buy at these or those prices during the certain period of time. The demand curve and the «price-consumption» curve are the

two different ways of description, how the acquired quantity of goods changes at the change of the price for it (provided that other factors stay idle).
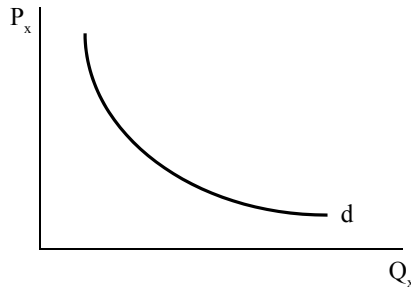
Fig. 3.7. The curve of individual demand

As dependence between the prices of the goods and the size of demand for them are rather steady it is possible to speak about **the law of demand,** which says, that with the rise in prices for the goods the size of demand for them decreases, and reduction of prices is accompanied by growth of the goods quantity, which the consumer wishes to get.

3.3. REVENUE EFFECT AND SUBSTITUTION EFFECT. GIFFEN PARADOX

If the price of the goods X changes, the consumer opportunities to get different sets of goods change as well. On the one hand, reduction of the prices for goods X makes it more attractive to the consumer, since it becomes cheaper concerning goods-substitutes. On the other hand, the released money, as a result of reduction in price of the goods X, allows the consumer to expand consumption of other goods. Thus, the real consumer revenue grows, though his/her nominal revenue remains constant.

Reaction of the consumer to such growth of the real revenue will depend substantially on his/her attitude to consumer qualities of the goods. To model the consumer behavior, it is necessary to differentiate action of two effects, which are noticed at the prices change for one of the goods.

The revenue effect is only those changes in consumption which are caused by the change of the real revenue of the consumer under the

influence of the prices movement. As it was found out earlier, growth of the revenue influences consumption of the superior and interior goods inconsistently: if with the revenue growth the superior goods consumption grows, then consumption of the interior goods decreases.

The substitution effect is only those changes in goods consumption which grow out from the changes in these goods prices concerning the prices for other goods. This effect works equally both in relation to the superior, and to the inferior goods. In the generalized form the action of the revenue effect and the substitution effect is given in table 3.1.

Table 3.1

Action of the revenue effect and the substitution effect

Effect	The superior goods	The interior goods
Revenue effect: – the price decreases – the price grows	consumption grows consumption decreases	consumption decreases consumption grows
Substitution effect: – the price grows – the price decreases	consumption decreases consumption grows	consumption decreases consumption grows

These two effects operate simultaneously. Therefore the real orientation of the consumption changes will act equally effective for the revenue effect and substitution effect. As we see from the table, both effects operate in one direction concerning the superior goods. In this case it is a little bit easier to predict the consumption changes depending on the price changes for the goods. Other picture is observed at the analysis of the price change influence for consumption of the interior goods: the orientation of the influence of the revenue and substitution effects is opposite. Depending on the fact which effect works more strongly, the price changes and the consumption changes will have an identical or opposite orientation.

If the substitution effect has the greater influence, then with growth of the price, goods X consumption decreases, and at its reduction the consumption grows. However there can be a situation when the revenue effect prevails. Then at the price growth the consumption grows as well, and the price reduction causes the consumption change the same orientation.

Last situation happens not very often. The inferior goods, for which the revenue effect prevails over the substitution effect, were

named **Giffen goods,** and growth of these goods consumption with a rise in prices for them is called **Giffen paradox**.

Robert Giffen (1837–1910) – the English scientist who found out, that deprived workers in England increase consumption of the cheap interior food stuffs (rye bread in particular) at their rise in price. The same situation can be observed at the analysis of the consumption structure by needy layers of the population in Ukraine during the economic crisis of 1990s.

Giffen goods should meet such requirements simultaneously:
– to be the inferior goods from the consumer's point of view;
– to be a significant part of his/her expenses.

Giffen paradox, at first sight, seems exception in the law of demand. But at more detailed research, as we have found out, interaction of the revenue and substitution effects serves as the reason in such development of the events.

There are some more examples of imaginary exceptions in the demand law, when with the rise in prices the increase of the purchases of these or those goods is observed. Thus, some consumers can identify the rise in prices with improvement of product quality and react to its purchases increase. In conditions of instability of an economic situation the rise in prices can be perceived and as a harbinger of an inflationary jump as well. Therefore to get of the prize consumers will try to get more products at the today's prices while they have not increased get so much. However it is possible to explain easily all these consumer actions, proceeding from the theory of a consumer behavior.

The main terms and concepts

«Revenue – consumption» curve
The superior goods
The inferior goods
The normal goods
The luxury goods
Engel curve
Engel laws
«Price – consumption» curve
The revenue effect
The substitution effect
Giffen goods
Giffen paradox

| *Unit 4* | # MARKET DEMAND AND ITS ELASTICITY |
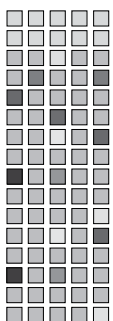
Until now we said about individual demand and about individual demand for a special product. However all these individual demands are united into a market demand in the market. The task of this unit is to find out how a market demand is formed and to define the ways the force measurement from which these or those factors influence quantity of the goods, which the consumer is ready to get.

4.1. THE MARKET DEMAND CURVES

The market demand is formed as a total demand of all consumers. Depending on consumer tastes and revenues their desire and opportunity to get the goods at the identical prices will differ. In table 4.1 the conditional data on individual demand of three consumers for goods X are given. **The market demand is** the sum of the individual demands corresponding the certain price level. In other words, it is the goods quantity which all consumers are ready to get at these or those prices.

Table 4.1

Formation of the market demand

The price of goods X	Demand of the consumer 1 d_1	Demand of the consumer 2 d_2	Demand of the consumer 3 d_3	Market demand D
$P_1 = 15$	–	–	10	10
$P_2 = 10$	–	10	20	30
$P_3 = 5$	10	20	30	60
$P_4 = 2$	25	50	60	135

As we can see from table 4.1, only consumer 3 will show interest to the purchase of goods X at the price P_1, therefore the market demand will coincide with the individual demand of consumer 3. At reduction of the price down to level P_2 the market demand will be formed by two

consumers and at the price P_3 and P_4 three consumers will form the market demand.

   The market demand curve shows the total size of all consumers' demand at any price (fig. 4.1). It arises after summation of the individual demands. As the individual demand curves have negative inclination, then the market demand curve will have the appropriate inclination too.
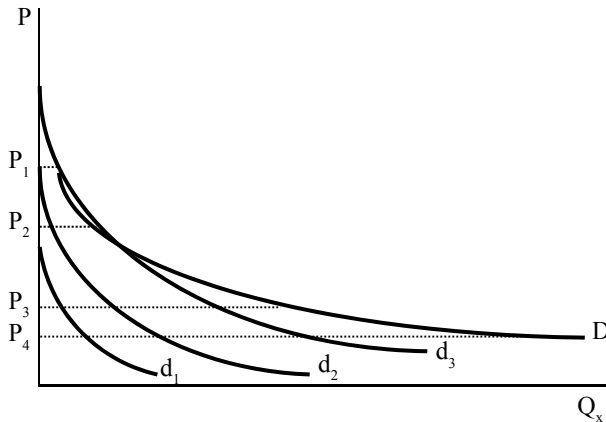
Fig. 4.1. The market demand

   The market demand, on the one hand, depends on all those factors which influence the individual demand, and on the other hand, it depends on the quantity of these demand carriers, i.e. on the quantity of consumers (fig. 4.2).

   The price of the goods influences exclusively the **size** of the demand, i.e. on the movement of a point along a constant demand curve. All other factors, which the quantity of the goods depends on, i.e. what consumers are ready to get, belong to the nonprice factors. Their action results in the demand curve moving in the schedule to the right (the demand increase) or to the left (the demand reduction).

   The following factors concern the nonprice factors:

   – the change of the consumer preferences under the influence of the consumer needs change, a style or advertising;

   – the change of the prices for other goods, in particular, goods-substitutes or the goods-complements;

   – quantity of consumers, which enter a market of these goods;

– price expectations of the buyers;
– the consumers revenues (fig.4.2).
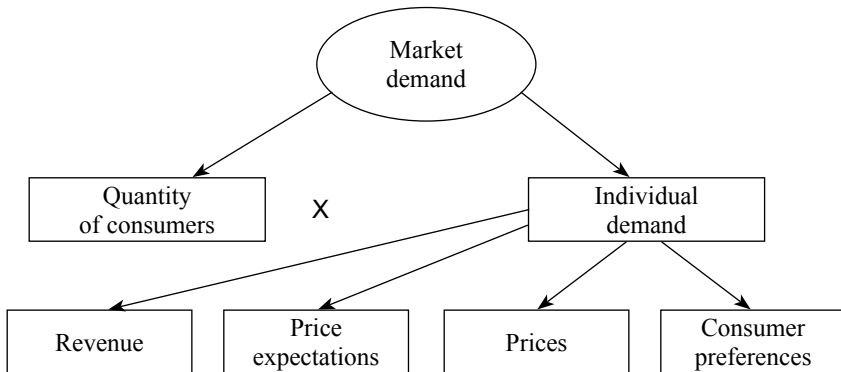
Fig. 4.2. Factors of the market demand

In real life no one of the listed factors operates separately, in the pure state. They intervene, forming complex and inconsistent system, but understanding of their action mechanism gives a key to understanding of many events of the real economic life.

4.2. PRICE DEMAND ELASTICITY AND ITS USE

Until now we said only about the influence orientation of this or that factor on demand. But practical use of the obtained knowledge requires ability to measure the force with which the certain factor influences the volume of the consumer desirable purchases. This problem is solved with the help of the demand elasticity estimation.

As it is known, the price influences the demand size. The **demand elasticity by the price (price demand elasticity)** is a parameter of a percentage change of the quantity demanded at a change by 1% in the price for the goods along the given curve of its demand. It shows sensitivity of the quantity demanded to the goods price changes, provided that all other factors influencing the demand remain constant:

$$Ed = \frac{\Delta Qd \ / \ Qd}{\Delta P \ / \ P}.$$

Elasticity is closely connected with parameters of the demand curve inclination. But if the last parameter gives a ratio between reduction and the volume increase of the purchased goods in natural parameters depending on the change of the prices for 1 USD, UAH or mark the elasticity shows more universal dependence – a percentage change.

As the demand curve has negative inclination, then the elasticity demand by price changes from zero to a minus of infinity. For practical use the demand elasticity by price is taken, as a rule, on the module: $|Ed|$. The greater the value of this parameter the higher the price elasticity level. If:

$0 < |Ed| < 1$ – demand is inelastic;
$|Ed| = 1$ – demand is with unit elasticity;
$1 < |Ed| < -\infty$ – demand is elastic.

Demand elasticity by price depends on a lot of factors, in particular:

– *presence of goods-substitutes*. If there are a lot of goods in the market, capable rather effectively to replace each other, the demand reacts more actively to the change in the prices. For example, they may be automobiles of one class or different kinds of soft drinks. On the contrary, if there are no goods in the market which could serve as a good substitute of the existing one, then the change in the prices for it almost does not cause the appropriate fluctuations in the sales volumes. It may be insulin for patients on diabetes;

– *the adaptation time to the prices change*. In the short-term period the demand is less elastic, than in the long-term period; you see, the search for the goods-substitutes and the change of the consumption structure need time;

– *the part of the consumer budget spent for the product*. There is inverse negative relationship: the greater the part the smaller the elasticity, and vise versa.

Calculations of the demand elasticity by price have rather wide practical application, both for forecasting of the consumer expenses and for realization of a firm price policy. For the seller it is important to know how much money the consumer is ready to spend for the purchase of the given goods at the different level of the price for it. You see total consumer payments are the gross revenue of the seller:

The total payments of the buyers = PQ = the total revenue of the sellers.

The prize of the seller from the price increase for the goods and his/her loss from caused by this price growth of the volume of sale reduction are shown in fig. 4.3. If the area of figure $P_1P_2N_2V$ (the prize from the rise in the prices) is more than the area of figure $Q_2Q_1N_1V$ (the loss from reduction of the sales volume) then the aggregate profits of the seller will increase. If area of the last figure is more, the aggregate profits of the seller will decrease at the price growth. This or that result will depend on the demand elasticity by price: at $|Ed| > 1$ – the seller will lose; at $Ed < 1$ – the seller will win.
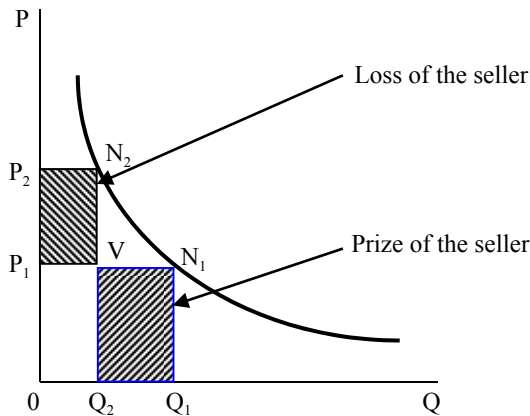
Fig. 4.3. The prize and loss of the seller at the price increase

In the generalized form the influence of the demand elasticity on reaction of the consumer total costs for the goods purchase depending on the price change is submitted in table 4.2. We shall notice in addition, if elasticity is equal to zero, i.e. demand does not react to the price change, acting as absolutely not elastic, then the increase or reduction of the seller revenue will be directly proportional to the price change.

Table 4.2

Influence of the demand elasticity by price on the aggregate seller profit

Demand elasticity by price	Attribute of elasticity	Change of the total revenue at the price reduction	Change of the total revenue at the price increase
Elastic demand	Ed > 1	+	−
Demand with unit elasticity	Ed = 1	0	0
Inelastic demand	Ed < 1	−	+

Practice of managing is rich in examples for the use of the price demand elasticity parameters for acceptance of the economically justified decisions. Rather frequently realization of any economic actions demands the constant costs. Then the profit of the businessman will depend only on the revenue volume, i.e. from that quantity of money which consumers will agree to pay for the offered goods. A concert at the stadium is the classical example of such situation. Costs of organizers for rent of arena, the fee to actors, advertising etc. do not depend practically on the quantity of spectators, who will visit the concert, therefore costs can be considered as constant ones. On the other hand, quantity of spectators and total revenue depend on the prices for tickets. What should organizers be guided with establishing the prices for entrance tickets?

It is possible to recognize that the prices should be such to fill in the stadium as much as possible, not leaving any empty seat. But thus the maximal revenue will not be necessarily achieved. If demand for tickets is inelastic, then the price increase will reduce quantity of spectators in a smaller measure than the prices grow. That is why the total revenue will increase. It will continue until unit elasticity is achieved. The further price increase will result in faster reduction of spectators and, as a result, – to reduction of the revenue. *Thus, the maximal value of the revenue is achieved at the prices which are adequate to the unit value of the demand elasticity.* That is why we can observe the empty halls at the concerts of the well-known actors, half-empty planes and cars of trains etc. In this case capacities of this or that capital are not used completely but the revenue of the businessman is maximized.

4.3. CALCULATION OF THE DEMAND ELASTICITY BY PRICE FOR THE SEPARATE POINT ON THE CURVE

The size of the demand elasticity by price can be measured for the infinitesimal changes of the price in each point of the demand curve. Necessity of such calculations proves to be true, in particular, by that on the same site of a curve at application of a traditional technique elasticity will be different, if the prices grow and if they reduce. For example, we take such situation:

$$P_1 = 10 \text{ grv.}; \; Q_1 = 200 \text{ units};$$
$$P_2 = 12 \text{ grv.}; \; Q_2 = 150 \text{ units}.$$

If the price has grown from 10 up to 12 grv., the demand elasticity will be calculated this way:

$$Ed = [(150 - 200) / 200] : [(12 - 10) / 10] = -1,25.$$

If the situation is examined, when the price is reduced from 12 down to 10 grv., the size of the demand elasticity will be already another:

$$Ed = [(200 - 150) / 150] : [(10 - 12) / 12] = -2.$$

Use of the average values of the price and sizes of demand for calculation of the percentage changes corrects calculation a little. However it will not give exact results for practical use as elasticity in the beginning of a site of a curve and in its end essentially differ. That is why it is necessary to calculate elasticity for each point of the demand curve.

For the beginning, we suppose that we deal with a linear curve of the demand. It has constant inclination in every point ($\Delta Q/\Delta P$ = const), but elasticity is not constant. This indicator may be calculated with the help of a ratio of the pieces on the price axis. In fig. 4.4 $\Delta P = -P_1C$; $P = OP_1$; $\Delta Q = P_1E = OQ$; $Q = OQ$. Calculation of the demand elasticity by price will get such kind:

$$Ed = ((Q / Q) : ((P / P) = ((Q / (P) : (P / Q) =$$
$$= (-OQ / P_1C) : (OP_1 / OQ) = -OP_1 / P_1C.$$

The last formula has received the name **of the distances formula.** It is used for calculation of dot elasticity.
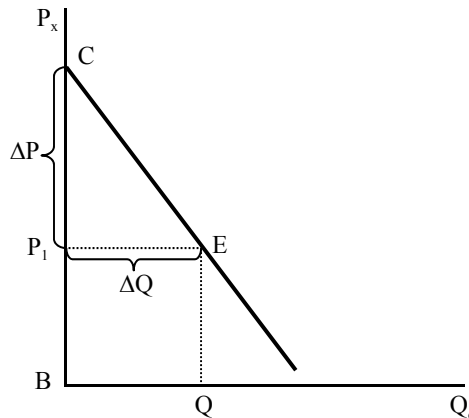
Fig. 4.4. Dot demand elasticity by price for the linear curve of demand

The received results can be used for the demand curves with non-linear dependence too. For this purpose it is necessary to build the tangent to the curve of demand in the point where we would like to determine the elasticity and calculate the ratio of pieces on the prices axis: the piece from the beginning of the coordinates to a level of the price which corresponds the point of the demand curve, and the piece from this price level to the crossing point of the tangent with the prices axis.

4.4. NONPRICE DEMAND ELASTICITY

The general approach to measurement of demand elasticity is kept at that time when we analyze the influence of other nonprice factors on it. The revenues and the prices for other goods occupy the special place among them.

Elasticity of demand by the revenues (the demand elasticity by the revenue) can be defined as the ratio between the relative change of demand and relative change of the consumer revenue (I). In fig. 4.5 the demand increase (shift of the curve to the right) on ΔQ ($Q_2 - Q_1$), caused by the revenue increase on ΔI ($I_1 - I_2$), is submitted. Then the demand elasticity by the revenue will be equal:

$$Ei = (\Delta Q / Q) : (\Delta I / I).$$

Elasticity of demand by the revenues can get the diversified values:

$0 < Ei < 1$ – for the normal goods;
$Ei > 1$ – for the luxury goods;
$Ei < 0$ – for the inferior goods.
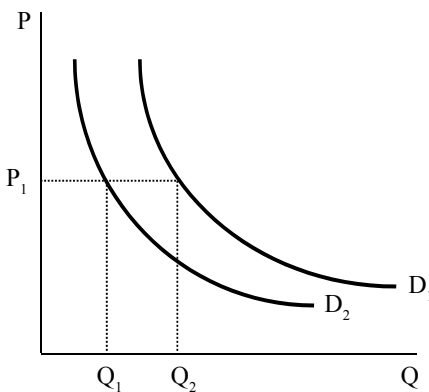
If the demand elasticity by the revenue is equal to zero, it means that consumption of the given goods does not depend at all on the level of the consumer revenue. We said about such goods in the previous unit.

Fig. 4.5. The demand elasticity by the revenue

The prices for other goods (P_y) also influence the demand, and the measure of this influence is shown with the appropri-

ate factor of the elasticity which has received the name **of cross-price demand elasticity.** The cross-price demand elasticity demonstrates the percentage change in quantity of the obtained goods in respond to the 1% price change of anyone good *X*:

$$E_c = (\Delta Q_x / Q_x) : (\Delta P_y / P_y).$$

If elasticity is positive, demand for goods *X* raises with growth of the price for goods *Y*. Such connection is characteristic for goods-substitutes. The better the substitute is capable to replace the given goods, the closer connection between the prices for it and demand for the researched goods will be, and the greater the elasticity value is. We will tell interchangeability of two grades of the rye bread is rather high. Therefore even a slight increase of the prices for one of them will cause a sharp increase of demand for another.

For the goods-complementary the negative value of the cross-price demand elasticity is inherent. The greater the presence of one good determines the sense of the purchase of another, the greater the value of elasticity by the module will be. As the examples, connection between the prices for refueling of the gas bags and demand for road gas cookers, the prices for a film and demand for cameras etc. are possible to be given.

Elasticity will have a zero value for the goods which are not connected between themselves in general.

4.5. A PRIZE OF THE CONSUMER

As it was found out earlier, the consumer will buy the goods in the market only in the case that their price does not exceed marginal utility of the goods for the consumer expressed in money. However rather frequently we can observe situation when the price is below marginal utility. In this case the consumer receives the certain prize. Finding out of the mechanism of a prize reception by the consumer is the purpose of this subunit as well.

Let's assume that marginal utility of each additional commodity unit expressed in money for the certain consumer will look like the one submitted in table 4.3, and the actual price of these goods in the market will be 40 grv.

Table 4.3

The marginal utility of the goods expressed in money

Quantity of commodity units	1	2	3	4	5
The marginal utility expressed in money (grv)	100	80	60	40	20

If the consumer buys four commodity units in the market at the market price, his total expenses will be 160 grv., whereas total utility of the acquired goods – 280 grv. (100 + 80 + 60 + 40 = 280). A difference between the ceiling price which the consumer is ready to pay for additional unit of the product and its market price is called **a prize of the consumer.** The ceiling price is the marginal utility of an additional portion of the goods expressed in money. For the considered case, while purchasing four commodity units, the prize of the consumer will be 120 grv. It will be the same if consumer buys three units (240 – 120 = = 120). Therefore the fourth unit is a limiting commodity unit which the consumer might buy and might not buy. In condition of a balance the consumer will buy the goods up to the time while his prize grows.

The prize of the consumer can be represented graphically. In fig. 4.6 the diminishing marginal utility of the goods with an increase of its purchase volumes is shown. If the consumer can get three or four commodity units at the price of 40 grv., his prize will be equal to the areas of the shaded figure.
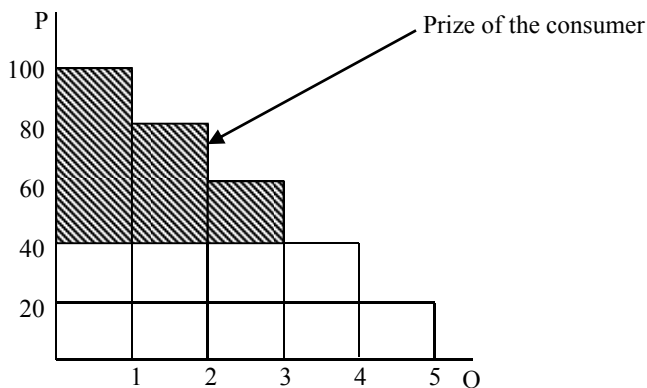
Fig. 4.6. The prize of the individual consumer

The same conclusions can be received at the analysis of a market demand and the total prize of consumers as well. **The total prize of consumers is** a difference between a maximal quantity of money which could be paid for the certain volume of the goods and the real expenses of consumers. It will equal the areas of the figure with the limited axis of the prices, the line of the market price and the market demand curve (fig. 4.7).
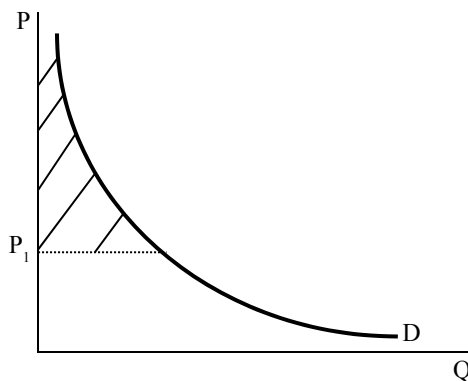
Fig. 4.7. The total prize of consumers

The concept of a prize of consumers can be applied for estimation of the tax burden which lays on consumers' shoulders in result of the tax increase to the added cost. Acceptance of such decision by the state will result in a price rise against the previous period, in the loss of the part of the consumer prize and in an increase of the receipts into the state budget. However the gain of the budget will be smaller than the loss of a prize by consumers. It is well visible in fig. 4.8.

At the tax increase on ΔT the prices will increase up to P_2 and that will result in reduction of a sales volume and loss of the consumers prize. It will correspond the area of figure P_1P_2EM. Thus, the revenues of the budget will increase by the size, adequate to the area of rectangular P_1P_2EC. Thus, the prize lost by consumers but not received by the state as additional receipts into the budget is equal to the area of figure *CEM*. It also will make the **additional tax burden.** It is similarly possible to determine an additional prize of consumers at expansion of the state grants.
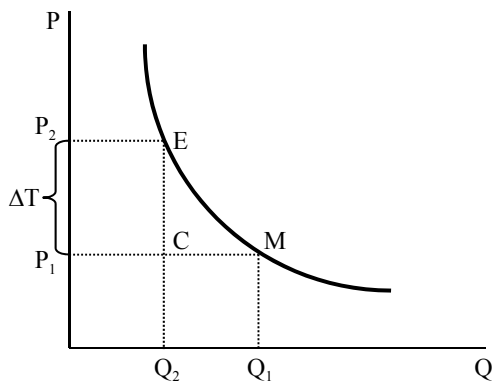
Fig. 4.8. Tax burden

In the end of consideration of the consumer behavior theory it is necessary to pay attention to the fact that practical use of the model demands a quantitative estimation of consumption function and demand elasticity at each moment of time for special consumers. Market experiments, interrogations of consumers with finding out of their intentions, and statistical models are the most widespread methods of such estimation.

Market experiments and interrogations of consumers are used by firms to get information on how the volume of demand reacts to the price changes and other factors. This method has very important lack: the valid results might not coincide with the answers to a question. There are difficulties in reception of representative sample. Otherwise results will be of little significance.

The main terms and concepts

Curve of the market demand
Demand elasticity by price
Demand elasticity by revenue
Cross-price demand elasticity
Prize of the consumer
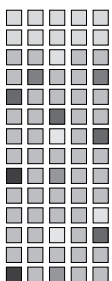
Part 2 THE THEORY OF A MANUFACTURER BEHAVIOUR

Unit 5. THEORY OF PRODUCTION

Unit 6. THE COSTS AND OUTPUT

Unit 5 THEORY OF PRODUCTION
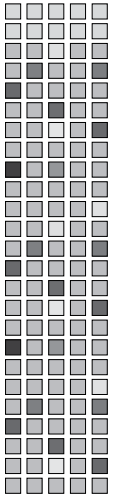
The seller acts as the contractor of the consumer (buyer) in the market. In a modern society the overwhelming majority of the goods grows out of industrial activity. That is why manufacturer stands up a back any seller. Using the limited resources (labor, capital, land and entrepreneurial abilities), he organizes manufacture of the certain volume of production and delivers it on the market. What is the manufacturer guided with at a choice of the goods for production, scoping of its delivery on the market? What factors can affect quantity of the offered goods? How is balance of the manufacturer achieved? To answer these important for the economic theory and economic practice questions it is necessary to begin the analysis from finding out the manufacture process essence.

5.1. PRODUCTION AND PRODUCTION FUNCTION

Production is a process of labor and the equipment (capital) use together with natural resources and materials to create necessary products and grant services. Industrial services of labor, capital, land and entrepreneurial abilities are referred to **as factors of production.**

At the same time, manufacture can be characterized as the certain system of relations between people as well. They can have organizational – economic character (the foreman – the worker, the director of the enterprise – the chief of a shop, the worker – the worker etc.) or social and economic (the shareholder – the non-shareholder, the creditor – the borrower etc.). Manufacture, evident as the combination of productive system and system of relations, is submitted in fig. 5.1.

Social and economic relations in manufacture are determined, first of all, by prevailing relations of the property. Special unit of political economy (bases of the economic theory) is devoted to their studying. Therefore social and economic relations don't act as a subject of studying in microeconomics. It studies, mainly, manufacture as the produc-
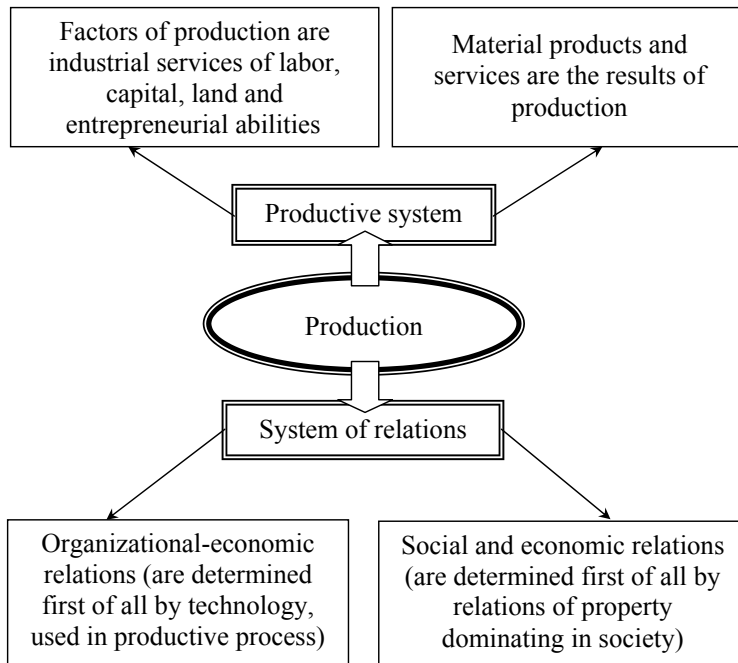
Fig. 5.1. Production as productive system and system of relations

tive system capable to deliver the certain quantity of the goods on the market thus having spent some means and having consumed the certain volumes of resources.

Ability of manufacture to make the goods at the appropriate expenses of production factors is determined, first of all, by technology which is used in it. **The technology** is a practical application of knowledge about ways of products and services production. It is materialized in:

– new samples of equipment;

– new methods of manufacture;

– new organization of work;

– an increase of a general educational and professional level of workers.

In real life the technology is constantly improved that results in the production process changes. However to simplify the producer behavior model at this stage of our analysis we shall assume that tech-

nological changes don't take place. This assumption will not change the producer behavior motives; however it simplifies the process of knowledge.

If the technology remains constant, it will be proved to assume that there is a steady dependence between the certain quantity of resources used in production and that maximal volume of the goods that can be made under the given conditions. Such dependence is shown with production function. **Production function** is a ratio between any set of production factors and the greatest possible volume of the goods, that is made with the help of this set of factors:

$$Q = f(L, K, M),$$

where Q – volume of manufacture; L – labor; K – capital; M – materials.

At constant technology the production function has a number of properties determining ratio between production volumes and quantity of used resources:

1. There is a limit for the output increase which can be achieved due to growth of expenses of one resource under other constant conditions: if, for example, K and M are const, and only L grows, then $\Delta Q \rightarrow 0$.

2. There are certain mutually-complementary factors of production, i.e. effective functioning of each of them demands presence of the certain quantity of another. At the same time there is an opportunity to replace a certain quantity of one factor with the certain quantity of another without reduction of production volumes. However such replacement has its limits.

3. Changes in use of production factors are more elastic in the long run than in the short run period.

The short run period is the production period during which some production factors cannot be changed (more often it is the capital). **The long run period is** the period during which the producer has enough time to change all production factors.

If to simplify production function to some extent while analyzing dependence of production volumes only on quantity of labor and capital, then it is possible to make **an industrial grid:** the table describing production function for the certain maximal volume of output that can be carried out at each combination of production factors (tab. 5.1).

The industrial grid

Working hours (man-hours)	100 machine-hours of the capital	200 machine-hours of the capital	300 machine-hours of the capital	400 machine-hours of the capital
100	20 units	30 units	35 units	38 units
200	30 units	85 units	150 units	210 units
300	55 units	150 units	210 units	270 units
400	65 units	180 units	250 units	315 units

It is easy to notice that identical production volumes can be received at different ratio of production factors: 150 units at $K = 300$; $L = 200$ and at $K = 200$; $L = 300$; 210 units at $K = 400$; $L = 200$ and at $K = 300$; $L = 300$ and etc. There is an opportunity to represent all those combinations of production factors graphically giving identical industrial result. The curve received thus is called isoquant (fig. 5.2).
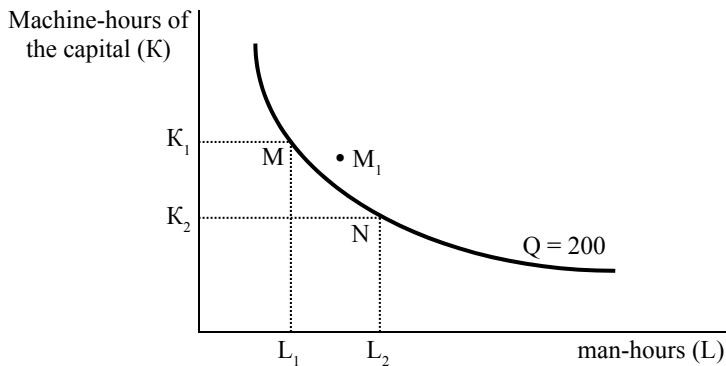
Fig. 5.2. Isoquant

Isoquant is the curve reflecting all different variants of resources combinations which can be used for manufacture of the given production volume. By the definition isoquant reminds the indifference curve. Isoquant reflects alternative variants of expenses of the resources combinations for manufacture of the certain volume of production in the same way as the indifference curve displays the alternative variants of the consumer choice providing a certain utility level.

Isoquant shows that ratio of factors which corresponds the coordinates of M and N points will provide production volume of 200 units.

However at combination M_1 the production volume will exceed the given one. It is possible to draw the isoquant through this point, as well as through any another. In this case we shall receive a map of isoquants (fig. 5.3).
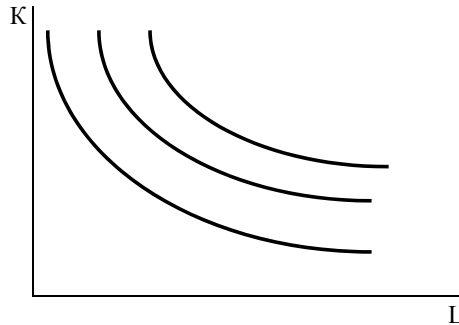
Fig. 5.3. The map of isoquants

The map of isoquants is a number of isoquants reflecting the maximal output at any set of production factors. Like the indifference curves the curves of isoquants never cross on one map. Each isoquant placed further from the beginning of the coordinates corresponds the greater production volume. Isoquant looks like the concave curves. It means that reduction of the capital expenses requires an increase of labor expenses to save the constant production volume.

5.2. LAW OF DIMINISHING MARGINAL PRODUCTIVITY

Change of production volumes means transition from one combination of production factors to another which are on the different isoquants. In the short run period of the production volumes the increase is possible due to the additional labor use at constant expenses of the capital. Therefore production volumes can move along *AB* line in fig. 5.4. The producer can use more labor, passing from one isoquant to another. Thus, the ratio of the capital and labor expenses (ratio K/L) changes.

To find out how the changes of ratio K/L influence the efficiency of their use, it is necessary to introduce a number of the concepts describing the production results:
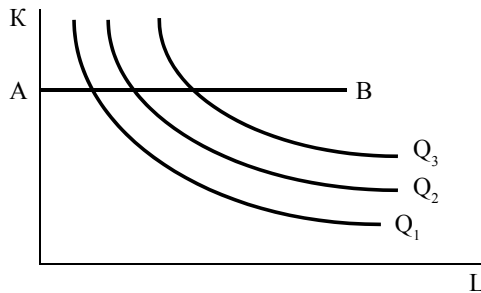
Rice 5.4. Change of the production volumes in the short-run period

– **the total product of the variable production factor** (in our case of labor (TP_L)) is the goods quantity made at certain quantity of this factor under other constant conditions;

– **the average product of the variable production factor** (AP_L) is the ratio of the total product of the variable factor to quantity of this factor used in manufacture: $AP_L = TP/L$. This parameter can be considered as productivity of the variable factor;

– **the marginal product of the variable factor** (MP_L) is how much quantity can be produced if one increases the amount of labor with one unit keeping the other one constant: $MP_L = \Delta TP_L/\Delta L$.

In tab. 5.2 the conditional data describing dynamics of production volumes of socks depending on the increase of the labor expenses at the constant expenses of capital ($K = 50$ machine-hours) are given. They display orientation of the parameters change in real conditions more or less precisely.

Table 5.2

Changes of the socks production depending on growth of the labor expenses

Man-hours (L)	Total product	Average product	Marginal product
10	35	3,5	3,5
20	90	4,5	5,5
30	180	6,0	9,0
40	272	6,8	9,2
50	355	7,1	8,3
60	420	7,0	6,5
70	455	6,5	3,5
80	480	6,0	2,5
90	495	5,5	1,5
100	480	4,8	-1,5

The total product of the variable factor grows if the labor expenses are increased. However this growth is fading. Moreover, the moment comes when the increase of labor does not increase but reduces the total results of manufacture. It means that the production process is oversaturated with labor which cannot find an effective use at the given volume of the capital. In our example it comes at ratio $K/L = 1/2$.

The marked dependences can be shown graphically. In fig 5.5 **the total product curve** is shown. It displays, how total product changes at the change of one of the production factors whereas others remain constant.
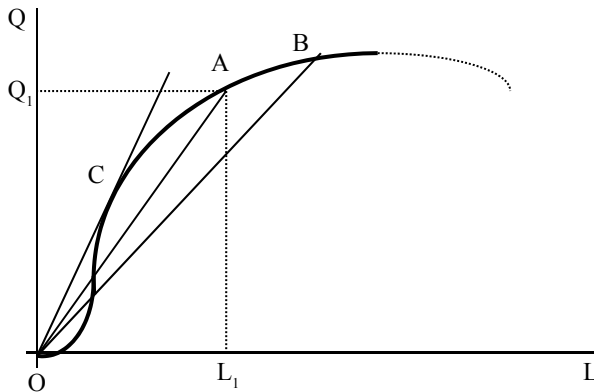
Fig. 5.5. The total product curve of a variable factor

The average product of the variable factor can be determined if to measure inclination of the beam which has been built from the beginning of the coordinates through the appropriate point of the total product curve. The inclination of beam *OA* can be determined through the ratio of the point *A* coordinates: Q_1/L_1. And it will be the average product in this point.

The average product will achieve its maximum at use of labor amount adequate to the contact point of the beam leaving from the beginning of the coordinates and the total product curve. In fig. 5.5 it is point *C*.

If we draw tangents to each point on the total product curve and find tangents of corners which they form with an axis *X,* we receive the marginal product. The curves of average and marginal product are given in fig. 5.6.
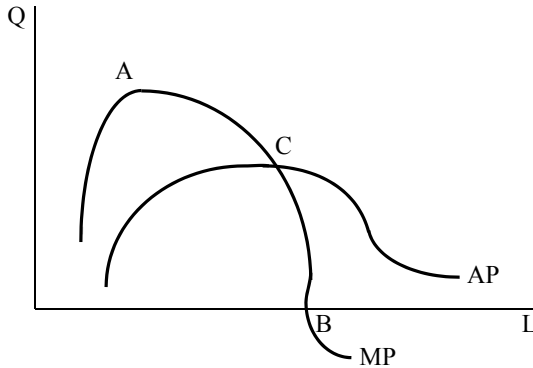
Fig. 5.6. The curves of average and marginal products

The average product will be increased up to that time, while the marginal product is more it. If the new portion of a resource is involved into manufacture and its productivity is more than average one, such attraction, certainly, will increase average indicator as well. On the contrary, if marginal productivity of the variable factor appears less than average one, new attraction will reduce average indicators. Therefore the average product of the variable factor will achieve the maximal value in a crossing point of the average and marginal products curves, i.e. at $AP = MP$. In our example, this point is somewhere in an interval of the labor expenses from 50 up to 60 man-hours.

It is necessary to pay attention to one rather important dependence of dynamics orientation of the marginal product on an increase of a variable factor. The marginal product achieves the maximum in *A* point and then starts to decrease. Moreover, after zero achievement in point *B* the marginal product gets the negative value. From this moment the total product starts to decrease at the variable factor increase. This dependence is rather steady that allows to consider it as economic law. **The law of the diminishing marginal returns** states that the increase will eventually smaller and smaller when the number of hours worked is large enough. It means that the output volume increase is limited, if only one factor changes. The point of the marginal product curve reduction is the limit of the variable factor use behind which its marginal product starts to decrease.

Action of the diminishing marginal returns law becomes obvious if we say, for example, about cultivation of a potato on a personal plot or

in a summer residence. If we increase twice the amount of hours worked on it against the normal level volumes, the collected potato will increase in a smaller proportion. If there was no such dependence, then as economists declare, all agriculture of the world could be placed on one hectare of the ground, having concentrated all labor expenses there.

Finding out of the production volumes dynamic depending on dynamics of the variable factor for special production has an important practical value. First of all, it is used for delimitation in which it is expedient to manufacture from the point of view of factors use rationalization. For the short run period it is possible to allocate three stages of manufacture:

The first stage: from the beginning of manufacture up to achievement of the maximal value by the average product. It is characterized by the capital surplus and labor shortage that results in overexpenditure of resources and, as a rule, to the businessman's losses;

The second stage: from the maximal value of the average product up to achievement of a zero value by marginal product. This stage is the most attractive for the manufacturer as normal equation of production factors;

The third stage: after achievement by the marginal product of a zero value. The manufacture becomes the oversaturated labor and results in the manufacturer's losses more often.

Acceptance of decisions on optimization of the expenses structure on manufacture can be other sphere of the researched laws use. We shall assume that two sites making identical production exist. How to achieve the most volumes of manufacture, maneuvering redistribution of the fixed amount of labor between different sites of production in the short run?

To answer the question it is necessary to compare marginal products of the variable factor on these two sites. If at the certain division of labor between sites $MP_1 > MP_2$, resources need to be redistributed for the benefit of the first site, if the ratio opposite ($MP_1 < MP_2$) – for the benefit of the second site. From two sites the businessman will receive the maximal volume of production, when marginal products on two sites will be balanced: $MP_1 = MP_2$. The ability to estimate marginal products of the variable factor and to maximize results from its use is one making arts of management.

5.3. SUBSTITUTION OF PRODUCTION FACTORS

The analysis of isoquants can be used for definition of substitution opportunities of one production factor by another during their use. **The marginal rate of technical substitution** of the capital by labor ($MRTS_{LK}$) is defined by the capital size which can be replaced by each unit of labor, thus not causing the production volumes change:

$$MRTS_{LK} = -\Delta K / \Delta L.$$

The isoquant form (convex to the beginning of the coordinates) shows that the marginal rate of technical substitution decreases at moving downwards lengthways of isoquant. It means that each hour worked is capable to replace the lesser amount of the capital. The reason of the marginal rate reduction of technical substitution consists of the fact that production factors have property to complement each other. Each of them cannot make the things that another can make, or if one can, it is done worse.

The marginal rate of technical substitution of production factors can be calculated not only through comparison of their gains, but through comparison of marginal products as well. Really, if at reduction of the capital from K_1 up to K_2 and labor growth from L_1 up to L_2 (fig. 5.2) the manufacturer remains on the same isoquant, it means that such equality will be fair:

$$\Delta L \; MPL = -\Delta K \; MPK$$

Then:

$$MRTSLK = -\Delta K / \Delta L = MPL / MPK$$

As the received dependence characterizes inclination of isoquant in each point of the curve, then in the further statement it will be used for substantiation of an equilibrium point of producer.

Though the diminishing marginal rate of technical substitution of capital by labor is inherent for overwhelming majority of the production process, there is a lot of exceptions where this dependence is a little bit other. We shall consider some of them.

1. Factors of manufacture can be used only in the certain proportion. For example, it is possible to name the ratio of computers and operators. If there is the fixed amount of hours worked by the computer during the working day, the increase of operators quantity will not re-

sult in production volumes growth. The converse will be correct also: if there is the fixed quantity of operators, it is impossible to achieve growth of production volumes due to the increase of computers amount. In this case isoquant will look like a right angle, and the marginal rate of technical substitution will be equal to zero (fig. 5.7).
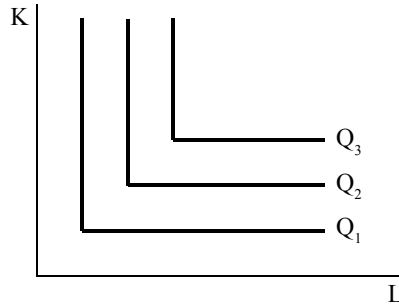
**Rice 5.7. Isoquants at the fixed proportion
of production factors**

2. Full substitution of production factors. Under such condition isoquant would have a kind of a straight line with the constant inclination equal to 1. However this situation needs to be examined only as theoretical abstraction: full substitution of production factors is basically impossible in real life.

5.4. RETURN TO THE SCALE

Unlike the short run period all production factors are the variables in the long run. If to keep the assumption that only two production factors (labor and capital) are used for production and the technology remains constant, then the production growth in the long run can be considered as such that occurs at a constant ratio of production factors. It means that production will be increased when use of its factors grows on a beam directed from the beginning of the coordinates (fig. 5.8). Thus some variants of reaction of an average product to the increase of the production scale are possible: 1) growing; 2) neutral; 3) decreasing. Different consequences, the so-called **effect of the production scale**, are shown here.
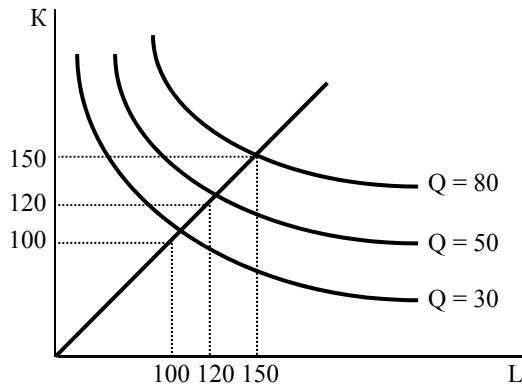
Fig. 5.8. The production increase in the long run

Growing reaction of an average product specifies ***positive effect of the production scale growth (increasing return to the scale)***. It can be achieved due to such factors:

1. A labor division. At the big enterprises deeper internal specialization that derivates effect of labor productivity growth and, accordingly, reduction of expenses is possible.

2. Improvement of management. The profound specialization is distributed to administrative activity. Occurrence of managers, which are specially engaged in marketing, advertising, supply, organization of scientific and technical works etc., allows to increase efficiency of the enterprise activity as a whole, that is shown in an average product growth.

3. The production scale increase does not demand a proportional increase of all resources very often. We shall tell, the charge of teacher's time will not increase, if there is one or two groups of students in a lecture room audience.

Neutral reaction of an average product to the production scale growth means that average productivity of factors remains constant irrespective of the enterprise sizes and volumes of made production (***constant return to the scale***).

At the same time, such situation, when production scale growth negatively results in an average product is possible as well: its level decreases (***decreasing return to the scale***). The production increase can result in occurrence of problems the enterprise faces. It is, first of all,

significant inertia of big systems and flexibility the loss of which is extremely necessary in conditions of the instable market. The firm can leave the limits to the threshold management: too big size of enterprise creates a bulky control system, develop the bureaucratic tendencies, which influence negatively the efficiency of administrative decisions.

At the analysis of the average product dynamics in the long run for the same enterprise on different sites of the production volumes increase, all from the listed reactions, as a rule, are found out. Their combination in many respects depends on specific activity, market situation etc. However we shall say about it in more details in the following unit.

The main terms and concepts

Production
Expenses of production factors
Production function
The short run period
The long run period
Technology
Industrial grid
Isoquant
Map of isoquants
Total product of the variable factor
Marginal product of the variable factor
Average product of the variable factor
The law of diminishing marginal productivity
Marginal rate of technical substitution
The effect of the scale production
Increasing return to the scale
Constant return to the scale
Decreasing return to the scale

Unit 6 | COSTS AND OUTPUT
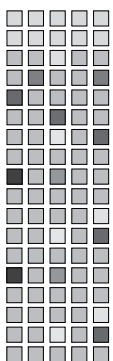
In the previous unit dependences between expenses of production factors in natural expression (man-hours of labor and machine-hours of capital) and volumes of the made product, described by production function, were found out. However in market conditions, when production has commodity orientation, expenses of production factors receive cost expression. In this case expenses of production factors are transformed into production costs. Therefore, first of all, it is necessary to find out their essence and ways of measurement.

6.1. PRODUCTION COSTS

Production cost is the cost of production factors used for creation of the certain production volume. In economic theory there are different approaches to definition of the «cost» category. So, adherents of the labor theory of the cost (A. Smith, D. Ricardo, K. Marks) believe that the cost is the labor embodied in the goods. However, today the concept of alternative cost is more widespread in the economic theory in general and in microeconomics in particular. Production costs will be examined from positions of this concept in the subsequent statement.

How is it possible to estimate alternative cost of the excellent mark, got by you at the exam in microeconomics? To receive it, you had to refuse other variants of the free time use: watching an interesting TV-program, dream or a party with friends. Therefore it is possible to consider that the excellent mark costs for you the most valuable loss which could be avoided at alternative use of time spent for training to exam.

When to judge by analogy, **opportunity cost of the means spent for production** is defined by the greatest possible profit which could be received from this money, if they were invested into something another.

It is necessary to emphasize that economists distinguish external (accounting or obvious) and the internal (latent) costs. **External costs** –

monetary payments to suppliers of resources, which do not belong to owners of the enterprise. It is the sum of all payments of the businessman for attraction of necessary economic resources. There are interests for the received credits, a rent for the land or other property, payment for the given services, wages to employed workers etc.

Internal costs are monetary payments, which owners of the enterprise could receive at alternative use of resources belonging to them. The businessman uses his own money, which he could place in a bank on the deposit; he can use his own rooms, which could be transferred in rent and bring the appropriate revenue etc. Thus, using his own resources for the organization of industrial activity, the businessman loses the certain monetary benefit which he could receive at other variants of resources use. External and internal costs form **economic costs** of the businessman. In the further statement we will say about economic costs exclusively.

Especially it is necessary to pay attention to the fact that the structure of economic costs includes the **normal profit** as payment for fulfillment of entrepreneurial functions by the businessman. Its size is determined by the level of profitablily being normal or average for the certain field of activity, i.e. that level which keeps the businessman in this sphere.

Economic (net) profit is the other form of profit. It is the additional revenue of the businessman as a result of his/her more effective activity in the certain sphere of activity. This form of the profit is received not by all businessmen, and it does not concern the costs. In microeconomics, if it is not stipulated specially, we speak, as a rule, about economic profit.

We would like to use following example for better understanding of the value of economic costs and the economic profit (instead of accounting) for acceptance of the economically justified decisions. Let's assume that there is any advisory firm in which its owner and his wife render advisory services. For its organization the owner has purchased equipment for the sum of $100000, has borrowed the credit in a bank ($50000), has employed three workers and he pays wages $2000 per month, to them and also carries out payment $50000 per year for different services. The firm is located in apartment belonging to the businessman. Is there any sense to be engaged in this kind of activity, if the total revenue of the firm is $300000?

To answer the question, first of all, we shall count up all accounting costs. Apparently from table 6.1, they consist of the employed workers' wages, the credit interest, the depreciation charges and other payments for services to the external organizations. The total sum of these costs is $152000. Then the accounting profit (normal) is $148000. There can be an impression that this kind of activity is rather effective and profitable as the accounting profit is almost 100% in relation to the costs. However for substantiated conclusion it is necessary to analyze, what revenue the businessman would have, if he disposed his resources alternatively. For this purpose it is necessary to count up the internal costs.

Table 6.1

Accounting and economic costs of the advisory firm

Clauses(articles) of charges	Accounting costs ($).	Economic costs ($)
Wages of employed workers (3*2000*12)	72000	72000
Interest on credit (20 % annual)	10000	10000
Amortization (20 % annual)	20000	20000
Other payments for services to the external organizations	50000	50000
Implicit wages of the owner (5000*12)	–	60000
Implicit wages of the wife (2000*12)	–	24000
Interest on capital (20 % annual)	–	20000
Implicit rent for an apartment (3000*12)	–	36000
Normal profit	–	20000
In total	152000	312000

Having refused the work in his advisory firm, the businessman and his wife could: go to work on hiring and receive wages; put the money, spent for equipment, on the deposit and receive interests; to lease an apartment and receive rent. Besides the normal profit for such kind of activity is $20000. The total sum of alternative cost of the own resources involved (internal charges) is $160000. Owner of the firm, if he has made the decision about other use of resources, could receive this sum. As it exceeds the accounting profit, it appears that to create advisory firm is not expedient.

The similar conclusion can be drawn, while comparing economic costs with the total revenue of the firm. It will be found out that the firm does not bring the economic profit, and, on the contrary, its activity is connected with economic damage (300000 – 312000 = – 12000).

Thus, the revenue, which compensates only economic costs, is sufficient for creation of interest in production activity as it brings normal profit for the businessman. Surplus of total revenue above economic costs is economic profit.

6.2. FUNCTION OF COSTS
AND PRODUCER'S EQUILIBRIUM

Economic costs depend on amount of used resources (their expenses) and the prices for services of production factors. Then it is possible to establish dependence between volumes of production and minimally possible costs, necessary to receive it. This dependence is referred to **as the costs function**:

$$Q = f(P_L, L, P_K, K),$$

where L, K – expenses of labor and capital; P_L, P_K – prices of the appropriate resources.

With the help of costs function it is possible to solve both direct and return tasks: minimizing of the costs for the given production volume or maximizing of production at the given costs.

It is easy to notice that costs function is similar to production function: the last one is supplemented with the account of the prices for the appropriate production resources.

The total cost (TC) of manufacture can be calculated as the sum of costs on the purchase of each factor:

$$TC = P_L * L + P_K * K.$$

At the fixed prices for resources it is possible to find different sets of capital and labor which can be got for identical costs. The graphic representation of these sets has received the name isocost. Isocost is a line, which shows expenses of capital and labor at which production costs remain constant (fig. 6.1).

Each level of labor and capital expenses corresponds to any isocost. Inclination of any isocost is equal $(-\Delta K / \Delta L)$. It can be expressed through ratio of the prices:

$$-\Delta K / \Delta L = P_L / P_K.$$
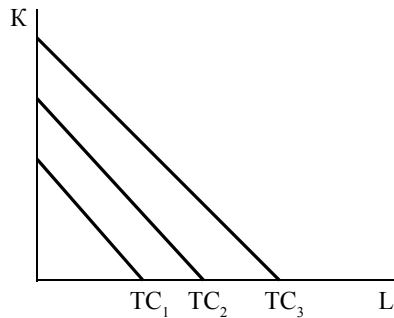
Fig 6.1. Isocosts

The change of labor and capital price can change isocost's inclination. Graph in fig. 6.2 shows different variants of such changes: growth of the capital price and reduction of the labor price increases the corner of inclination; reduction of inclination corner occurs at growth of the labor price and reduction of the capital price.
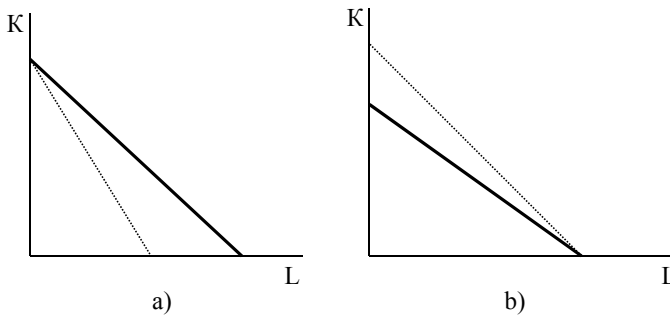
Fig. 6.2. The change of isocost's inclination under the influence:
a) growth of the labor price; b) reduction of the capital price

What set of capital and labor, allocated on isocost, provides the maximal volume of a product? It is necessary to combine isocosts with isoquant map to answer this question (fig. 6.3).

Identical inclination of the isocost and appropriate isoquant, which has the common point with isocost and the most remote one from the beginning of the coordinates (point A in fig. 6.3) is the condition to determine the maximal production volumes at the given costs (as the minimal costs on the given volume of manufacture).
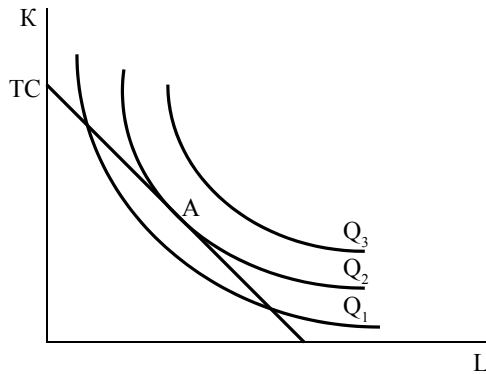
**Fig. 6.3. Maximization of the production volume
at the given cost**

The isoquant inclination is defined by a marginal rate of technical substitution, and isocost inclination – a ratio of the labor price and the capital price. Then it is possible to determine condition **of producer's equilibrium** as equality:

$$MRTS_{LK} = P_L / P_K.$$

As $MRTS_{LK} = MP_L / MP_K$, then the equation will be fair:

$$MP_L / MP_K = P_L / P_K, \text{ or}$$
$$MP_L / P_L = MP_K / P_K.$$

Producer's equilibrium is such his/her conditions, in which he/she does not wish to change the ratio of capital and labor involved in production.

The equation demonstrates **a principle of the least costs,** the essence of which consists in the following: manufacture of the given production volume with the minimal costs demands that simultaneously used resources must have identical size of the marginal product on a unit of the resource prices. If the marginal product on a unit of any factor cost exceeds the marginal product of other factor, the firm can receive a gain of production for realization without additional means due to the change of production factors ratio.

If to connect the points adequate to combinations of production factors which minimize the expenses at the different given volumes of production, we shall receive the so-called trajectory of growth (fig. 6.4).
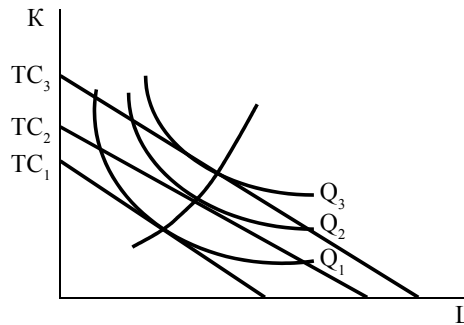
Fig. 6.4. The trajectory of growth

The trajectory of growth shows, how the ratio of production factors, providing the minimal costs, changes at the increase of production volumes.

6.3. THE COSTS IN THE SHORT RUN

At the analysis of costs formation in the short run it is necessary to carry out their division into fixed and variable costs. **Fixed costs (FC)** don't depend on production volumes. Moreover, they exist even when manufacture stops at all. The matter is that, as it follows from the definition of the short run, the shot run is insufficient for the change, first of all, volumes of the capital. Examples of fixed costs may be the expenses connected with payment of the rent, interests for the received credit, amortization etc.

Variable cost (VC) are the costs of the variable resources used for manufacture of the given production volume. They include: wages of workers, costs for the purchase of raw materials, the electric power for the industrial purposes and other.

In the microeconomic analysis we use not only parameters of total costs but average costs as well: **average total (ATC), average fixed (AFC) and average variable (AVC) costs**:

$$ATC = TC / Q$$
$$AFC = FC / Q$$
$$AVC = VC / Q$$

The special role in research of a producer behavior in the market belongs **to the marginal costs** considered as the relation of a gain of the total costs to a gain of production volumes. In other words, the marginal costs show what additional costs for manufacture of an additional unit of product producer spends:

$$MC = \Delta TC / \Delta Q.$$

Marginal costs in the short run don't depend on the constant costs. Their level is influenced only with the variable costs.

To find out the laws of costs dynamics, depending on volumes of manufacture we shall take the conditional data concerning production of the chairs submitted in table 6.2. It is possible to build the appropriate curves on their basis.

Table 6.2

Production costs

Q	FC	VC	TC	MC	ATC
0	200	0	200	–	–
1	200	100	300	100	300
2	200	196	396	96	198
3	200	295	495	99	165
4	200	400	600	105	150
5	200	515	715	115	143
6	200	646	846	131	141
7	200	794	974	148	142
8	200	960	1160	166	145
9	200	1150	1350	190	150
10	200	1370	1570	220	157

As fixed costs don't depend on the changes of production volumes, their curve will look like a direct line in the diagram which passes in parallel to the axis of production volume (fig. 6.5). The picture **of the variable costs curve** displays the form of a total product curve of the variable factor. Each point of this curve corresponds to the minimal expenses of labor necessary for production of the appropriate volume of product. The curve will look like a line growing with gradual attenuation. Somewhere in the long term it will achieve the point of crisis after which the further growth of the variable charges will not be accompanied by growth of production volumes. However this site of a curve is not part of the costs function as it does not correspond to its definition (it
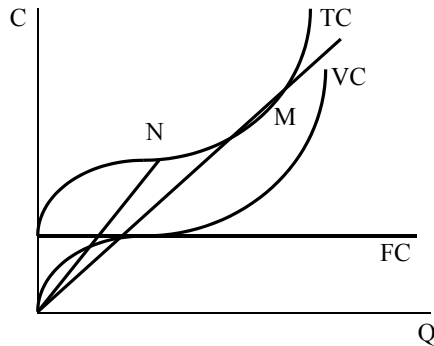
Fig. 6.5. The curves of the total, fixed and variable costs

is not the minimal charges necessary for reception of given production volume as it can be received at the less costs).

The curve of the total costs shows the changes of the total costs of the factors used in manufacture, depending on the increase of production volumes. It will have the same form, as well as the variable costs curve; however it will pass above on size of the constant costs.

Average costs for any production volume are equal to corner tangent of beam inclination which has been built from the beginning of the coordinates through the appropriate point on the total costs curve (for example, point *N*). Average costs will be minimal in the point where the beam inclination corner is the least, i.e. in the point of its contact to the total costs curve (point *M*). It is possible to tell similarly about the average variable costs. If to build their curve then it will come nearer to the curve of average total costs gradually (fig. 6.6).
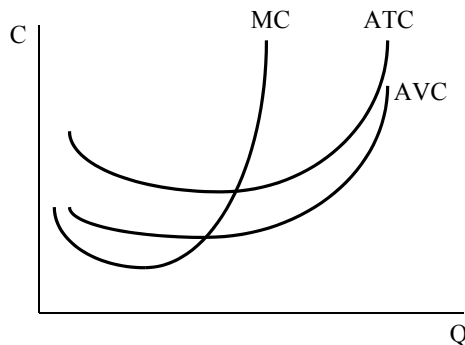
Fig. 6.6. The curves of the average and marginal costs

Marginal costs are inclination of the total costs curve, i.e. tangent of tangents corner, which have been built to any point of the curve. Marginal costs decrease (in our example down to the second unit of product), and then start to grow at the increase of production volumes.

Finding out dependences between dynamics of the average and marginal costs is important for the further research. Until the marginal costs are less then the average costs, production of additional unit of product will reduce the average costs. If manufacture of additional unit is more expensive then the average costs, the increase of production volumes will result in growth of the average costs. Thus, the average costs will be minimal at their equality with the marginal costs, i.e. the curves of the marginal and average costs will be crossed in the point of the minimal value of the average total costs (fig. 6.6). For our example, the point of crossing is between the sixth and seventh unit of product.

The changes of the costs in the short run display action of the law of diminishing marginal productivity of a variable factor. Until then while the firm can find all necessary resources at the stable prices, in the short run it is possible to explain the changes of the costs by the changes of average and marginal product of variable factor completely. The U-shaped form of the average total and variable costs curves displays the fact that average product is increased in the beginning, and then is decreased. The point of a minimum of the average variable costs coincides with the point of average product of a variable factor maximum.

6.4. THE COSTS IN THE LONG RUN

At the analysis of the costs in the long run it is necessary to keep in mind that in this case there is no division into fixed and variable costs: all costs can change depending on production volume. It is possible to refuse rent or to return the credit, to sell a fixed capital or to get new fixed capital on the contrary. Therefore the problem of enterprise size optimization acts on the foreground in the long run.

There is a certain connection and dependence between dynamics of the costs in the short run and long run. We shall give the following example for its demonstration. Let's assume that there are certain industrial modules (industrial sites) and everyone is capable to provide manufacture of 5 thousand chairs per year at the minimal average costs. Then

capacity of the enterprise will depend on quantity of the modules introduced into operation. The curves of the average costs for each of modules are represented in fig. 6.7.
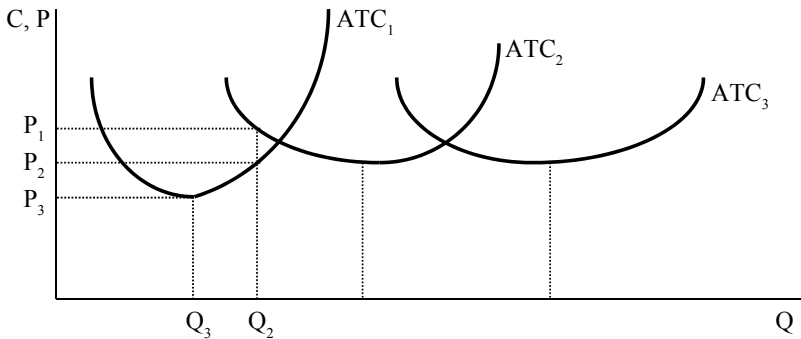
Fig. 6.7. Adaptation to market conditions in the long run

Let's assume that market demand is 7000 chairs (Q_2). This volume can be received both with the help of one industrial module, remaining within the framework of the short run, and with introduction into operation of the second module, i.e. through the long run. In the first case production volumes will not correspond to the minimal level of the average costs ($P_3 = 90$ UAH). They will increase up to 120 UAH per chair. If to keep to the second way, the part of volume (5000 units) can be made at the minimal costs (90 UAH), and another (2000 units) – at the costs which are equal to the appropriate point on the curve ATC_2 ($P_1 = 150$ UAH).

For definition of more attractive variant of production development it is necessary to find that one which minimizes the total costs on the given volume. In the first case they will be equal:

$$TC_1 = P_2Q_2 = 120 \times 7000 = 840000 \text{ UAH}$$

In the second case it is possible to calculate the following:

$$TC_2 = P_3Q_3 + P_1(Q_2 - Q_3) = 90 \times 5000 + 150 \times 2000 = 750000 \text{ UAH}$$

Thus, from the point of view of the total costs minimization for reception of the given production volume the second variant of development providing transition from the short run to the long run is more attractive.

We know that the average product depending on production volumes can grow, decrease or remain constant. That is why the average costs differently react to the effect of the scale too. This reaction in many respects depends on specificity of the activity field, situation in the market, directions of «know-how» improvement and etc. Three the most typical situations are given in fig. 6.8.

In the variant represented in fig. 6.8.a we can see rather short period when growth of manufacture is accompanied by the decrease of the costs, i.e. the positive effect of the scale of production is settled rather quickly. But thus there is a wide range of production volumes at which the constant level of the average costs is kept. In this field business enterprises of different sizes can be equally viable.

Other situation is shown in fig. 6.8.b. We can observe the long-working effect from the increase of the production scale. In such branches big enterprises have advantages.
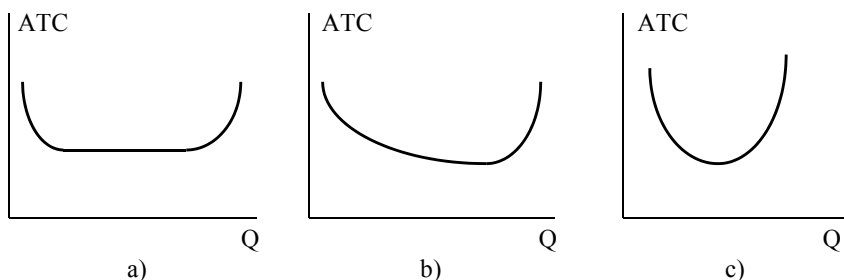
Fig. 6.8. Variants of the long run dynamics of the average costs

On the contrary, in the third case the positive effect of the scale of production is rather quickly transformed into negative. Therefore estimation of the limits of effective manufacture expansion is important for the businessman. Existing barriers of growth make possible the effective functioning of the small enterprises in those fields.

However the aspiration to minimize costs is only one side determining a producer behavior. Definitions of the real scale of manufacture both in the short run and in the long run are determined, finally, by opportunities to maximize economic profit. For this purpose it is necessary to compare the production costs with revenues, and the following unit will be devoted to that.

The main terms and concepts

Opportunity cost of the used resources
Economic costs
Implicit costs
External costs
Internal costs
Function of costs
Isocost
Producer's equilibrium
Principle of the least costs
Trajectory of growth
Costs in the short run
Total costs
Fixed costs
Variable costs
Average costs
Average variable costs
Average fixed costs
Marginal costs
Costs in the long run

Part 3 COMMODITY MARKET
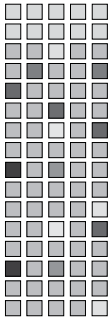
Unit 7. MARKET OF THE PERFECT COMPETITION

Unit 8. MONOPOLY MARKET

Unit 9. MARKET OF THE MONOPOLISTIC COMPETITION

Unit 10. OLIGOPOLISTIC MARKET

Unit 7 MARKET OF THE PERFECT COMPETITION
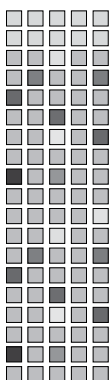
A producer is concentrated on profit maximization while choosing the scale of production. But revenue dynamics being the decisive factor of the profit depends on market situation, first of all, on the type of competition. As it is known according to the type of competitive environment all markets are divided into four following groups: perfect competition, monopolistic competition, oligopoly and monopoly. Thus, we should pay attention to the problem of the volume production choice and profit maximization for each market situation.

7.1. THE FEATURES AND CONDITIONS OF PERFECT COMPETITION

The main conditions which one has to mention while defining different market models are the following: quantity of the independent firms (sellers) in the market, type of product proposed for sale, ability of the firms to control the sellers' market prices; conditions to enter the market for the new firms and to leave for existing ones; method of competition prevailing in the market. The market could be defined as market of perfect competition if following requirements are met:

1. There are a lot of firms in the market competing between themselves in equal conditions. We can not define exact amount for the expression «a lot of». It could be some hundreds or even thousands of the firms. The main requirement is the diminishingly small part of each firm. Thus a firm doesn't affect market situation as a whole by increasing or decreasing its particular production.

Of course, these conditions one can hardly find at the real markets. However, agricultural markets in developed countries, the stock trades or sale of foreign currency in exchange with certain conventions meet this requirement.

2. Standard products offered for sale. This means that the consumer does not distinguish the goods of one seller from another product

even if they actually have differences. Therefore, it doesn't matter from which seller to buy.

3. Particular seller doesn't have possibility to affect the market price. Of course, the seller can offer products at lower prices than those prevailing in the market. This, at first, will not affect the market price at all, because of the rate of a single seller in the market of scrap and secondly, this variant of seller's behavior would contradict the original assumptions of maximizing the profit as the main motives of economic actors. Indeed in the case of keeping prices below the actual market level seller's profit decrease compared with the variant of selling goods at market prices. He is left with no choice but to sell goods at the market prices. Therefore, the seller in perfect competition is often called *price-taker*.

4. Free entry to the industry and free exit from it. Market will be competitive only if there are no legal, technological, financial or other obstacles that could prevent the appearance or disappearance of new firms that produce a particular product. This feature of perfect competition should be especially noted just as it underlies the mechanism of industry adaptation to the market demands in the long run.

5. Absence of non-price competition. The product differentiation usually serves as the basis for non-price competition. As the firms at competitive market produce standard products there are no reasons for non-price competition.

Comparison of these requirements with competitive environment which exists in real economy shows the pure competition as a unique phenomenon. Today there is no area where one could find all these features. But this does not mean that perfect competition does not deserve special analysis. Why?

Firstly, there are several areas (branch markets) where situation is more similar to the pure competition than any other model of the market. Secondly, knowledge of more complex situations of market analysis should begin from the easiest versions like the market of perfect competition.

In a pure competition, as already noted, the firm can not carry out its own pricing policy. It can only adjust to those prices that are currently prevailing in the market. It follows a very important conclusion: no matter how many products are offered for sale by competitive firm, it does not affect the market price. In other words, the demand curve faced by individual producer in a pure competition is completely elastic unlike the market demand (fig.7.1).

a) the demand curve for a single firm   b) the demand curve for a branch
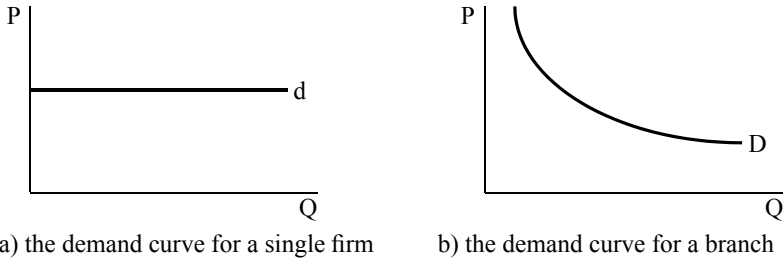
**Figure 7.1. The difference between the demand curves for a single firm
and for a branch**

Such difference between the demand curves for a branch and for
a single firm again warns researcher about falsity of widespread allega-
tions: if it is true in part it is true for the whole.

Peculiarities of product demand for a competitive firm manifest
themselves by the dynamics of the basic parameters that characterize its
revenue depending on sales. These indicators include:

1. Total revenue (TR) – is the total earnings from the sale of all
output.

2. Average revenue (AR) – is the total revenue per unit of prod-
uct sold.

$$AR = TR / Q. \tag{7.1}$$

3. Marginal revenue (MR) – is the growth in total revenue result-
ing from the sale of one more unit of product:

$$MR = \Delta TR / \Delta Q. \tag{7.2}$$

Relationship between the dynamics output and indicators men-
tioned above is represented graphically in fig. 7.2.
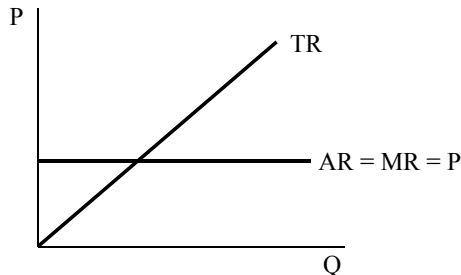
Figure 7.2. Total, average and marginal revenue of a competitive firm

Total revenue of a competitive firm increases in direct proportion to sales. Unit price, average and marginal revenue for a competitive firm are always equal to each other.

Identifying common characteristics and features of competitive market and detection of the firm functioning peculiarities at it gives satisfactory basis for modeling of profit-maximizing-behavior of a firm. This model has specificity for the short-run and long-run. So, let's consider these two situations separately.

7.2. PROFIT MAXIMIZATION IN THE SHORT-RUN

Since in the short-run capital remains unchanged then a firm adjusts its production to the market conditions achieved by maneuvering of the variable costs. Moreover a firm sometimes maximizes profit or (and this happens too often) minimizes its losses.

Modeling of a producer's behavior requires clarification of the mechanism for finding answers to the following three questions:

– Is it worth or not producing a product;

– if it is worth producing then how many;

– will this production bring the profits or losses to the firm and how much?

There are two approaches to finding answers and making decisions in microeconomics: comparison of the total revenue and total costs or comparison of the marginal revenue and marginal costs. Let us examine each of them separately.

A firm should produce if it brings economic profit or even brings loss if this loss is smaller than the loss in the case of production termination. A firm gets economic profit if the total revenue exceeds total costs. So, in this case its task is to maximize profits.

More difficult case, when at any output the total costs exceed gross revenue. In these conditions one should seek a solution that minimizes the losses. If a firm stops production its loss will be equal to the fixed costs. Therefore, if production is unprofitable a firm should produce some output, if the total losses of the company would be lower than its fixed costs. It is easy to see that such result is possible, if total revenue exceeds the variable costs:

$$TC - TR < FC \qquad (7.3)$$
$$(FC + VC) - TR < FC \qquad (7.4)$$
$$VC < TR \qquad (7.5)$$

So, in generalized kind the answer to the first question will be the following: *a firm should carry out production in the short period provided that it receives an economic profit or loss when this loss is lower than the fixed costs.* It should be kept in mind that the loss-making production can only be seen as a temporary phenomenon, as breathing that a company takes to implement more drastic solutions (i.e. to eliminate the fixed costs by the cessation of production altogether or get a profit by reducing the costs).

Having in mind the general principle of a producer's behavior it is quite easy to answer the second question: *in the short-run a company should produce a volume of production at which it maximizes its profits or minimizes its losses.*

To answer the third question a firm must compare gross revenue and total expenditure at the chosen output: *economic profit or loss of the company will be equal to the difference between the total revenue and total costs.*

Let's analyze the data presented in table 7.1 and make conclusions concerning the optimal output and performance.

Table 7.1

Optimal output in the short-run

Q	FC	VC	TC	TR_1	EP_1	TR_2	EP_2	TR_3	EP_3
0	200	0	200	–	-200	–	-200	–	-200
1	200	100	300	147	-135	130	-170	90	-210
2	200	196	396	294	-102	260	-136	180	-216
3	200	295	495	441	-54	390	-105	270	-225
4	200	400	600	588	-12	520	-80	360	-240
5	200	515	715	735	+20	650	-65	450	-265
6	200	646	846	882	+36	780	-66	540	-306
7	200	794	974	1029	+35	910	-84	630	-364
8	200	960	1160	1176	-16	1040	-120	720	-440
9	200	1150	1350	1323	-27	1170	-180	810	-540
10	200	1370	1570	1470	-100	1300	-270	900	-670

Suppose that the market price is prevailing 147 UAH per chair (and we continue to see an example discussed in the previous topic).

In this case the production of 5, 6 or 7 chairs brings economic prof-
it (ER_1). Therefore the company should begin production. The firm re-
ceives the maximal profit if production stops at six chairs. It will be
equal to 36 UAH.

When the market price is 130 USD total revenue (TR_2) would not
exceed the total costs under no circumstances. So, production will al-
ways be unprofitable. So, is it worth producing at all? To answer this
question let's compare the total revenue and the variable costs. Total
revenue exceeds the variable costs even after the fist chair is produced
which leads to reduction of losses compared to fixed costs. These losses
are minimal if five chairs are produced (-165 UAH). Compare it with the
loss of 200 UAH in the case if production is stopped at all.

Reduction in price down to 90 USD makes production feasible at
all: in any case the losses are not less than the fixed costs.

It is possible to give graphical interpretation of the producer's be-
haviour based on the comparison of the total revenue and total costs
(fig. 7.3).
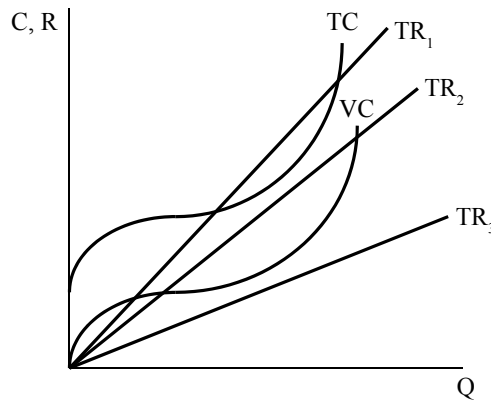
**Fig. 7.3. Variants of profit maximization, losses minimization
and termination of production**

If the curve of total revenue crosses the curve of the total cost and
there is a section of the curve *TR* that is located above the curve *TC* the
company gets economic profit while choosing output which corresponds
to this section. Maximal value of profit could be reached in the point
where the vertical line gap between the curves of the total revenue and
total cost is the largest.

A firm solves the problem of the costs minimizing by production if the curve *TR* is located below the curve of the total costs but crosses the variable cost curve. The minimal loss is when the vertical line gap between the total revenue line and the total cost curve is the smallest.

If the line of total revenue is below the variable cost curve the firm has the smallest losses when shuts down.

Similar conclusions can be received when marginal revenue and the marginal cost are compared. Table 7.2 contains data dealt with the marginal cost and marginal revenue depending on the level of the market prices. If the price of one chair in the market is equal to 147 UAH, the sale of the first chair brings additional 147 UAH to the firm while the additional production costs of this chair are 100 UAH. So production of this the very first chair brings the profit equal to 47 UAH. Therefore, expansion of production in this case would increase the profits of the firm. A similar conclusion can be made in relation to the second, third and other chairs. Therefore, a *firm should produce every unit of output if marginal revenue from the sale of which exceeds the marginal costs of its production*.

Table 7.2

Marginal revenue and the marginal costs

Q	AFC	AVC	ATC	MC	MR_1	MR_2	MR_3
0	–	–	–	–	–	–	–
1	200	100	300	100	147	130	90
2	100	98	198	96	147	130	90
3	67	98	165	99	147	130	90
4	50	100	150	105	147	130	90
5	40	103	143	115	147	130	90
6	33	108	141	131	147	130	90
7	29	113	142	148	147	130	90
8	25	120	145	166	147	130	90
9	22	128	150	190	147	130	90
10	20	137	157	220	147	130	90

Since the seventh chair the manufacture of each additional unit will cost the manufacturer more than the additional revenue generated from this unit's sale. In this situation production should be reduced, not increased. Therefore, *if the marginal cost of additional unit of output exceeds marginal revenue from its sales production of this unit should be avoided*.

Somewhere in the middle between situation when the firm wants to increase output and situation when it prefers to reduce production there is an equilibrium point. It is easy to conclude that this point corresponds to output at which the marginal costs and marginal revenues are equal and the company receives the maximal profit or minimal loss.

$$MR = MC. \tag{7.6}$$

This equation is called **the rule of optimum output**. It has some characteristics that should be considered in further analysis:

– rule can be applied only if the firm prefers to work, not to close down. Otherwise more comparison is required: comparison of the average variable cost and marginal revenue. If marginal revenue exceeds the average variable cost the firm is able to minimize losses or maximize profits. Otherwise it is better to stop production;

– use of rules is not confined to competitive market conditions. It can be used for the analysis of other model as well;

– for a competitive market you can apply a special case of this rule:

$$MC = P. \tag{7.7}$$

Figure 7.4 gives graphical comparison of marginal revenue, the marginal and average costs.
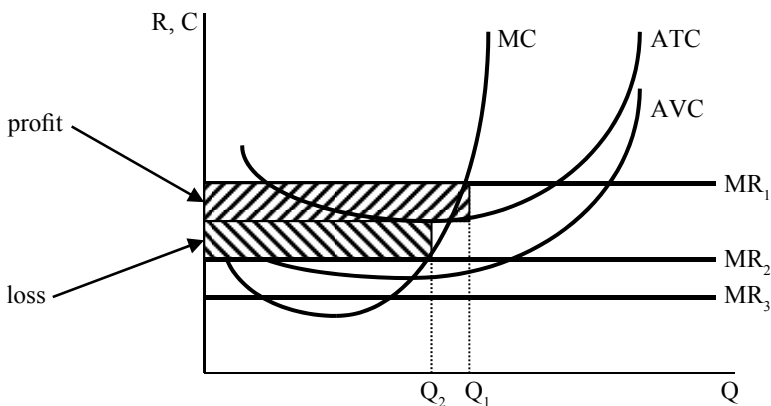
Fig. 7.4. Comparison of marginal revenue, the marginal and average costs

If the marginal revenue line intersects the average cost curve, the firm solves the problem of profit maximization. Its maximal size is reached at the point where the marginal revenue curve intersects the marginal costs curve (Q_1). The total size of this profit will be equal to the rectangle which is formed by the prices axis, marginal revenue line, the output line and the line, which corresponds to an average cost.

If the marginal revenue line is below the average costs curve, but crosses the average variable costs curve, then the firm should solve the problem of losses minimizing. It also will be the lowest at the point of intersection of the marginal revenue line and marginal costs curve. As shown in fig. 7.4, its size can also be defined as an area of the respective rectangle.

If the marginal revenue line does not even cross the average variable costs curve then it is better to stop production and concentrate on the ways of fixed costs eliminating, which in this situation is the minimal possible loss of the company.

Analysis of interconnection between the marginal costs and marginal revenue allows you to build a supply curve of a firm in the short-run. If the price is set below the minimal average variable costs the supply of a firm is zero. The company will begin production and hence offer products for sale since the moment when the price exceeds the minimal average variable costs. Further increase in prices will lead to the production of such output which corresponds to a point of crossing of the marginal revenue line (line of price) and marginal costs curve. Therefore, section of the marginal costs curve that lies above the minimal average variable costs is the **supply curve of the firm in the short-run**.

Thus, using both the first and second approach leads to similar conclusions. The generalized form of decision-making model that maximizes the benefits of enterprise in the short run is proposed in table 7.3.

Table 7.3

Decision-making model of a competitive firm in the short-run

Question	First approach	Second approach
1. Is it worth producing?	Yes, if $TR > TC$, or $TC - TR < FC$	Yes, if $P > AVC$
2. What output should be?	$TR - TC \rightarrow \max$ $TC - TR \rightarrow \min$	$MR = MC$
3. Will the firm receive economic profits?	Yes, if $TR > TC$, no, if $TR < TC$	Yes, if $P > ATC$, no, if $P < ATC$

7.3. PROFIT MAXIMIZATION IN THE LONG-RUN

A switch to the analysis in the long-run requires a switch from analysis of a firm's behavior as individual actor to analysis of interaction between the firms during formation of the market supply and market price. This includes introduction of some new assumptions:

1. Let's assume that the only way to adjust the branch to the needs of the industry market in the long-run is through the entrance of new producers into industry or their exit from industry.

2. Let's assume that all firms have the same or very similar cost curves that gives an opportunity to talk about a certain average, typical firm.

Let the market price for a chair settled at 147 UAH (P_1) which allows a typical firm to get economic profit. How do entrepreneurs of other industries behave in this case? It would be logical to predict that they will try to reorient their activities to production of chairs because it brings not only normal but economic profit. As you know, the supply curve moves to the right under the influence of the increasing number of manufacturers. This leads to the lower market price equilibrium (fig. 7.5). *Therefore, entry of new producers into industry eliminates economic profit.*
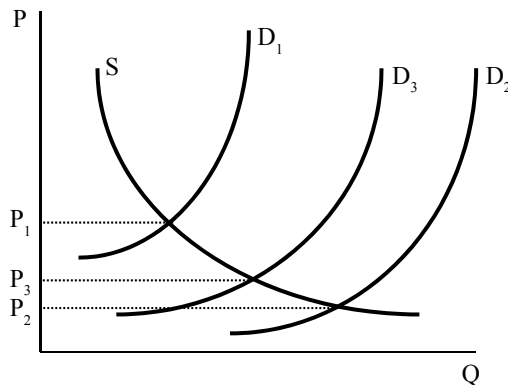
Fig. 7.5. The change in the market price depending on the change of supply

If the price drops down to the level of P_2, the typical firm will not receive economic profit. Moreover, it faces the problem of losses (Fig. 7.6) because the price is lower than the minimal average costs.

In the long-run the outflow of the firms will begin from this industry to those where typical firm can get at least a normal profit. Reducing the number of producers will reduce the market supply that will lead to higher prices. *Therefore, the massive outflow of companies from industry eliminates the losses.*
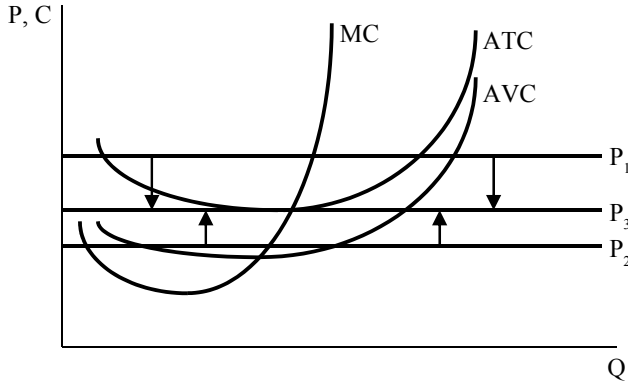
Fig. 7.6. Equilibrium of a competitive firm in the long-run

Such inflow and outflow of capital in industry eventually leads to the price setting which only compensates the minimal average costs (i.e. the typical firm will receive a normal profit but can not have economic one). This makes it possible to formulate general conclusion regarding the company's achievement of equilibrium in the long-run: *after all the long-term adjustments are completed (i.e. when long-term equilibrium is reached) the price of the product will fully meet the point of the minimal average total costs and production of a firm meets this same point.*

7.4. PERFECT COMPETITION AND EFFECTIVENESS

As it is shown in the preceding paragraph, equilibrium is reached in the long-run if the following equality is set:

$$MR = P = MC = ATC. \tag{7.8}$$

A competitive firm can get economic profits only in the short-run. In the long-run it will just cover its costs.

Most researchers converge on the fact that pure competition meets requirements of public production efficiency most of all. The efficiency of a market model can be evaluated based on how it performs its main functions. Because society is always concerned about the limited resources, the better system is that one which on the one hand, produces the required product at the lowest cost and, on the other hand, – provides optimum allocation of scarce resources between branches and certain industries. Accordingly there are two aspects of the problem: production efficiency and effectiveness of resource allocation.

Economy of the competitive prices is aimed at distribution of limited resources in the way to maximize the needs satisfaction.

Production efficiency is embodied in a competitive market because eventually the price is set at the minimal average cost. This means that consumers receive goods they need at the lowest possible prices of all with the existing technology.

A competitive firm, guided by profit maximization motive will attract resources and produce every product to the point where the price equals the marginal costs. This means that resources are allocated in the most effective way.

However, it would be wrong to idealize the competitive market attributing uncharacteristic features to him. Above all, keep in mind that the competitive market only reflects the structure of revenue of the society through the structure of production. A competitive firm is oriented to produce things which are in demand. If society has developed the distorted structure of revenue which contributes to wealthy at the expense of the poor, the market of perfect competition would be willing to offer the lowest prices for luxury goods but also would offer limited quantity of the prime necessity goods, and a market is just unable to solve this contradiction.

Limitation of market mechanism of self-regulation is that it is willing to offer only those products that can be paid by someone. The firm will not produce the so-called public goods, payment for the consumption of which can not be deducted directly from the consumer. Therefore, market mechanism in modern economy is always complemented by government regulation.

Focusing on immediate profit-maximizing of a competitive firm often leads to impossibility of optimum combination of current and future goals (remember the Robin Hood effect which was discussed in the

first topic). Yet despite all these limitations a competitive market should be recognized the most efficient market model.

The main terms and concepts

Pure competition
Price taker
Average revenue
Total revenue
Marginal revenue
Profit maximization
Losses minimization
Shutdown case
$MR = MC$ rule
Short-run supply curve
Economic profits liquidation
Efficiency of production

| Unit 8 | **MONOPOLY MARKET** |
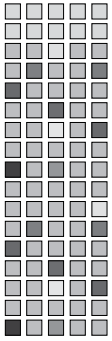
The direct antithesis of a competitive market is the market of pure monopoly (a monopoly market) that is the market where producers are represented only by one seller. This imposes very substantial impact on a decision-making model of manufacturer (the way of setting output which maximizes profits). Knowledge of this model with the already examined model of a competitive market allows finding out the mechanisms of decision-making in the markets of monopolistic competition and oligopoly.

8.1. THE KEY FEATURES OF A PURE MONOPOLY

In the previous topic we were talking about criteria for determination of the specific market types. Regarding the market of pure monopoly they have the following characteristics:

1. The only one manufacturer of specific product operates in the market. This fact means that a fair statement would be: *company-monopolist – is a certain branch of production.* Then there is no difference between demand and supply for the monopoly market in terms of an individual firm and market (branch) supply and demand. These terms are synonymous for pure monopolist.

2. The goods produced by monopolist have no close substitute. Of course, there are almost no such products that can not be replaced by something else. However, regarding the monopolistic goods we can assume that a consumer has only two possible ways of behavior: either refuse consumption of this product, or seek to purchase it from monopoly.

It should be noted that pure monopolist has no direct competitors in the market of goods. But it doesn't mean that monopolist never competes at all. First of all you must accept the fact that the monopolist is a buyer in the market of resources where he faces a competitive environment. However, this issue will be raised in the next section.

3. Pure monopolist himself sets the price for his goods. While we called the competitive company a price-taker, the monopolist is the

one who dictates the price. To understand the mechanism of monopoly dictatorship we must remember how the market price is formed in general. The equilibrium price is the result of interaction between demand and supply. Since demand for the monopolist coincides with the market demand and it can be considered as a given, then the monopolist is able to set the equilibrium price by the supply maneuvering. Increased supply reduces the price and, conversely, decreased supply leads to higher prices.

4. Entry into industry is blocked for other manufacturers. Nearly each manufacturer wants to become a monopolist and restrict competition in the market of his goods. Market monopolization can be achieved in several ways:

1. Growth of companies by profits capitalization, bankruptcy of competitors, acquisitions of competitors to achieve complete domination in the industry.

2. Combination of capital on a voluntary basis and transformation of such association to the ruling manufacturer. There are various forms of monopoly associations, including:

– *cartel* as an agreement on the sharing of markets, setting prices and production quotas while each participant maintains industrial and commercial independence;

– *syndicate* as a special joint unit that provides supplies and distribution for all members of association of the firms that keep independence of production;

– *trust*, where earlier independent enterprises of industry merge and lose both commercial and industrial independence.

However, every monopolist can maintain its monopoly position only when other manufacturers' joining to this branch is securely blocked. Therefore, blocking entry to the industry and establishing appropriate barriers is a prerequisite for existence of pure monopoly. Barriers to entry the branch are relevant not only to the case of pure monopoly, but to oligopoly or monopolistic competition as well, and therefore they deserve special attention.

These barriers can take various forms:

a) economy of scale. As the rule, monopolist is a big firm. Therefore, to create worthy competitor it is necessary to invest significant assets. For the vast majority of potential competitors such investments are neither affordable nor effective.

b) legal barriers. There are certain legislative rules that govern a particular activity. The most common of them are patent (exclusive right to manufacture any product or using any technology) and license (the right to engage in any activity);

c) property rights for the most important resources. A firm can retain its monopoly on the market by capturing the types of resources which provide production monopoly. This works in the case where the absolute scarcity of resources is and they have no close substitutes;

d) unfair competition. Some monopolists use methods of dealing with competitors which do not only meet the code of an entrepreneur's honor, but are prohibited by law in most countries. It could be pressure on suppliers, labor unions, banks, solicitation of competitors leading staff, price war with competitors to get them bankrupted and so on. However, it is difficult to reveal the violator of the law and apply the appropriate punishment.

These features of the monopoly market have a decisive influence on the prices and output of monopolist.

8.2. PRICING AND PRODUCTION VOLUME
OF A MONOPOLY

A decisive difference between pure competition and pure monopoly is the peculiarity of the demand curve (fig. 8.1): if for a competitive company it has absolutely elastic character (horizontal straight line), then for pure monopolist it has a decreasing character.
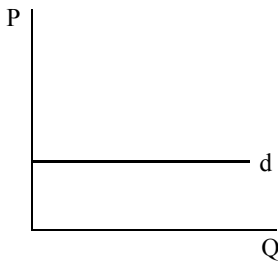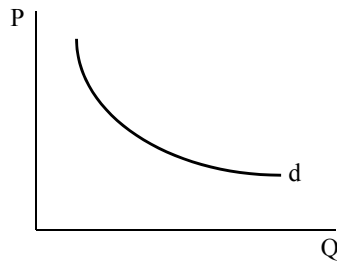
a) demand for competitive firm   b) demand for monopolist

Fig. 8.1. Demand for competitive firm and for monopolist

The fact that the demand curve is decreasing significantly affects the patterns of monopoly in the market when choosing output. First of all, one should mention that *price of additional unit is always higher than additional revenue (marginal revenue).* The cause of it is that the manufacturer can not sell more products without a price reduction. Moreover, he will have to simultaneously reduce the price not only for additional unit of output but the entire number of sales. When a competitive firm adds one more unit to the sales it gains the full price of this unit. Unlike this monopolist gains the price of additional unit too but simultaneously losses the price reduction for all the other units sold.

Let the monopolist can sell 40 units of the goods at the price $P_1 = 150$ UAH. To increase sales up to 50 units he has to reduce the price down to $P_2 = 140$ UAH. In this case total revenue increases for 1000 UAH ($50 \times 140 - 40 \times 150 = 1000$), marginal revenue equals to 100 ($1000/10 = 100$) while the price of additional unit is 140 UAH. So as $140 > 100$ then $P > MR$.

In fig. 8.2 which reflects the situation described, it is clear that the loss of revenue caused by the price reduction equals to the square of rectangle *ABSD* (S_1) and additional revenue earned from the increased sales equals to the square of rectangle *DKNM* (S_2). Depending on the ratio of the rectangular planes marginal revenue can be of a positive value ($S_2 > S_1$), negative ($S_2 < S_1$) or zero ($S_2 = S_1$).
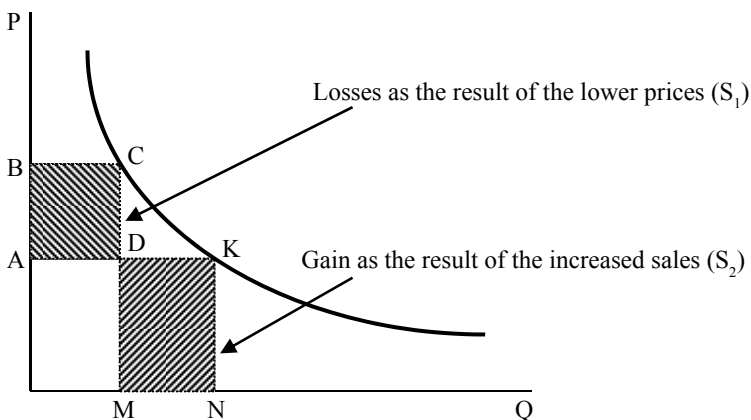
Fig. 8.2. Forming of marginal product of pure monopolist

Let's continue to consider the example of the company that manufactures chairs which was discussed in the previous topic. Suppose that it is pure monopoly instead of working in a competitive market. Then the increase in sales will be accompanied by the lower prices as it is shown in tab. 8.1.

Table 8.1

Key indicators of monopolist

Q	P	TR	MR	ATC	TC	MC	Profit
0	235	–	–	–	200	–	-200
1	220	220	220	300	300	100	-80
2	205	410	190	198	396	96	+14
3	190	570	160	165	495	99	+75
4	175	700	130	150	600	105	+100
5	160	800	100	143	715	115	+85
6	145	870	70	141	846	131	+24
7	130	910	40	142	972	148	-62
8	115	920	10	145	1160	166	-240
9	100	900	-20	150	1350	190	-450
10	85	850	-50	157	1570	220	-720

It should be noted that total revenue increases not necessary while monopolist increases the sales: the sale of the ninth and tenth unit is accompanied by decreasing total revenues. It is easy to see that dynamics of total revenue is closely linked to marginal revenue. If marginal revenue is positive, then the total revenue increases. If marginal revenue becomes negative, the total revenue decreases:

$$MR > 0 \rightarrow TR \uparrow; \tag{8.1}$$
$$MR < 0 \rightarrow TR \downarrow. \tag{8.2}$$

Thus, total revenue reaches maximum in that point where the marginal revenue is zero:

$$MR = 0 \quad TR - \max. \tag{8.3}$$

After analysis of the elasticity of demand (unit 4), we concluded that the elastic demand in combination with price reduction increases total revenue of a seller. In case of inelastic demand total revenue of a seller has the same direction of the changes as the price has. Total revenue reaches its maximum where elasticity of demand equals one ($TR_1 -$ max). By combining this with previous findings we obtain dependence

presented in fig. 8.3. The analysis allows to determine the boundaries within which the manufacturer will choose a combination of quantity and price. If he chooses the price which corresponds to inelastic part of the demand curve (P_2) then it is easy to see that it is possible to gain the same profit while less quantity is sold ($Q_3 < Q_2$). Thus, it is obvious, that a producer who maximizes profit will always try to avoid inelastic section of the demand curve and set certain combination «price-quantity» within elastic section instead.
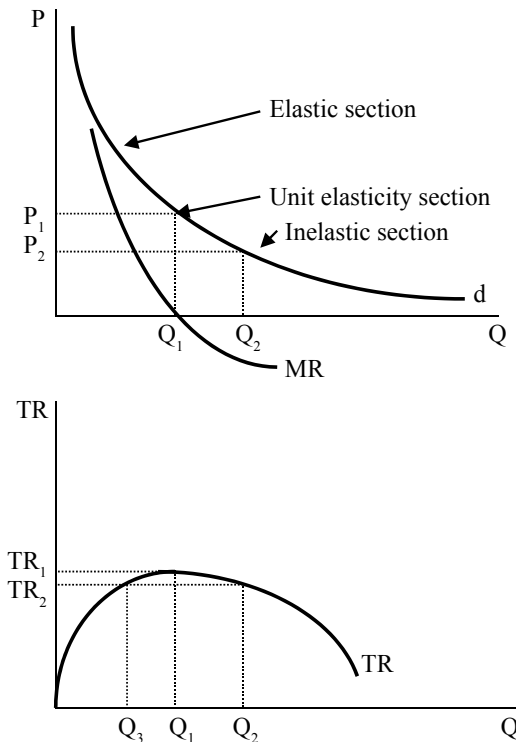
Fig. 8.3. The choice of the demand curve section by monopolist

What is the specific combination of the price and quantity a monopolist will choose? It depends not only on demand but also on production costs. Let us examine the cost analysis for monopolist listed in tab. 8.1. As elucidated in the previous topic, the manufacturer will produce each additional unit of output up to as long as revenue from its sale will exceed the additional costs of its production. For example, a rise

of output from 2 to 3 units costs additional 99 UAH and brings additional revenue of 160 UAH for a producer. If we consider the rise from five to six units, marginal revenue and the marginal costs will be 131 and 70 UAH respectively which proves unreasonableness of such transition. Thus, the monopolist can maximize profits with such combination of the price and quantity which equalizes the marginal revenue and marginal costs. For the example in table it amounts 175 UAH and 4 units of output.

Similar conclusions can be reached by analyzing the balance of the total revenue and total costs. Producer earns maximal profit as excess of the total revenue over the total costs if four units are produced.

Fig. 8.4 suggests geometric interpretation of the «profit-maximizing» choice of monopolist. In the long-run a competitive firm reaches equilibrium if the price equals to minimum of the average costs. But it is not an issue for monopolist. Since the marginal revenue curve of monopolist does not match the price curve (demand curve), the profit maximization point will always be to the left of the intersection of the demand curve and marginal revenue curve. This means that monopoly maximizes profit when output is lower than it could be in a competitive market. ($Q_1 < Q_2$). He also sells products at prices (P_1) that exceed the average costs for the proposed sales (ATC_1) and receives economic profit. In the fig. 8.4 the economic profit of monopolist corresponds to the shaded area.

Since entry into the branch is blocked the monopolist has no threat of competitors who may increase supply, push the supply curve to the right, push the market price down and therefore eliminate economic
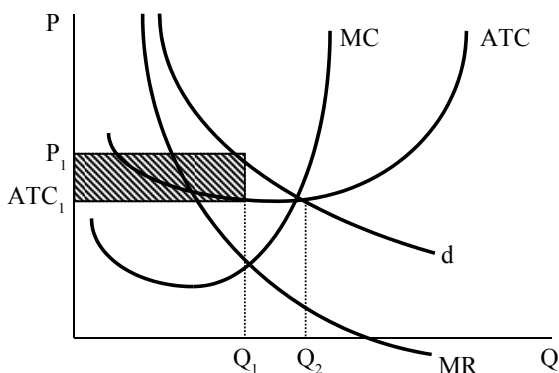
Fig. 8.4. Profit maximization by monopolist

profit. Unlike a competitive firm *a monopolist is able to earn economic profit both in the short-run and long-run*.

Sometimes non-professional way of thinking gives false impression of the monopoly pricing. The most common are the following errors:

1. Monopolist tries to set the highest price. This error is based on misunderstanding the fact that the increasing price causes reduction in sales. In fact, a monopoly is not set to maximize the price but monopolist seeks a level of the price that would provide him the maximal profit.

2. The greater the gap between the sales price and average costs of producing unit, the more profit gets a monopolist. This is true in relation to yield per unit of production. But monopolist **maximizes the total profit**. This maximization is not always consistent with maximization of profit per unit. Guess, what is better for monopolist: to sell 40 units at the price of 10 UAH and costs of 5 UAH per unit or sell 100 units at the price of 9 UAH and costs of 6 UAH per unit? In the first case the monopolist will get 100% profit on each unit, and in the second case – only 50%. However, the total profit of the monopolist in the second case will be 300 UAH v. 200 UAH in the first case. Therefore, the variant which maximizes the total profit will be more attractive for a monopolist although the maximum profit per unit could not be reached.

3. Monopoly guarantees breakeven work. Variant of breakeven work exists only if the demand curve crosses the average total costs curve. It happens very often. But it is easy to imagine situation where the demand curve is generally below the average costs curve, having no common points with it (fig 8.5).
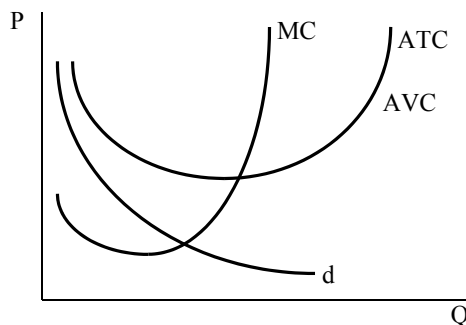
Fig. 8.5. Monopolist gets the loss

Such situation happens when the demand for a good is produced by monopolist decreases sharply. Even if somebody is the only producer of abacus it wouldn't guarantee profitability of his business.

8.3. THE ECONOMIC CONSEQUENCES OF A MONOPOLY

The logical conclusion of the topic dedicated to the monopolistic market should be an assessment of how a monopoly impacts economic process in general.

The most important consequences of the pure monopoly are:

1. Monopolist finds it reasonable to sell fewer amounts of products and assign higher prices than a competitive producer. So on the one hand, society overspends a certain amount of resources because the equilibrium production level does not provide the minimal average costs. Reallocation resources to the monopolized sectors would reduce the average costs. This would give witness to the increasing efficiency of resource allocation. On the other hand, consumers have to pay some kind of the monopoly tax, because the product prices are set higher than the average costs. This «tax» is the economic profit of monopolist. Since the entry of new producers into the branch is blocked, there's no effect of economic profits elimination in the long-run and this distinguishes monopoly from a competitive market.

2. Average costs of monopolists usually do not coincide with the average costs of the competitive firms. We haven't told about such mismatching before. In fact the average costs of a monopolist ($ATCm$) could be both lower and higher than the average costs of a competitive firm.

Since the monopolist is usually a large company, the amount of the average costs can be affected by the economies of scale (fig. 8.6). Sometimes the lower average costs (even with the economic profit, it lays in the price of monopoly) can be transformed into the lower market prices for monopolists' products compared with the competitive firms. However, this situation is quite rare.

All the average costs curves, which we used before, are based on the assumption that the manufacturer uses the involved resources with maximal efficiency. However, with respect to pure monopoly this assumption is often groundless. Actually the *monopoly costs for any out-*
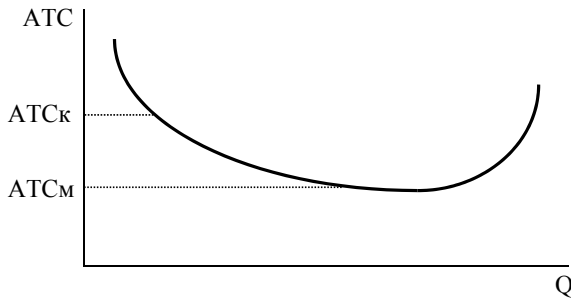
**Figure 8.6. Economies' of scale impact on the average costs
of a monopolist and a competitive firm**

put are usually higher than minimal ones possible. This phenomenon
was called «X-inefficiency». It is explained by the following reasons:

a) personal goals of managers do not match the purpose of costs
minimizing. They can realize the company's growth objectives, ignor-
ing the costs; they can avoid excessive risk by agreeing to higher costs;
they can hire incompetent friends and relatives, reducing the overall
management performance etc.

b) since monopolist doesn't feel endangered having no real com-
petitors he becomes phlegmatic, stops the search for technologies to re-
duce cost;

c) monopolist is forced to bear additional expenses to maintain his
monopoly. It can be both formal (legal) fees for purchase of patents, li-
censes and informal (illegal) expenses for bribery of officials, pressure
on suppliers of resources, etc.

3. Monopoly's contradictory impact on the scientific progress.
On the one hand, the extent of monopoly allows it to devote significant
resources to research and develop new technologies. However, on the
other hand, pure monopolist has no automatic incentive to the scientific
and technical progress. So he can afford to be inefficient.

4. Pure monopolist is able to hold price discrimination. It oc-
curs when a product is sold at more than one price and these differenc-
es are not associated with differences in the costs. A monopolist can
use price discrimination, provided that he has the ability to select dif-
ferent groups of buyers, and if the initial buyer can not resell the prod-
uct or service. There are a lot of examples of such discrimination, espe-
cially when dealing with a natural monopoly. Electricity for households

and businesses in Ukraine is supplied at different prices; Ukrainian Railroads Company overlaps low passenger tariffs by high cargo tariffs etc.

Thus, the monopoly has controversial economic consequences. But one thing is beyond doubt: it disrupts the competition as the basis of market self-regulation. So, the restriction of monopoly and supporting of competitive environment is among the functions of the state.

The main terms and concepts

Pure monopoly
Barriers to entry
Patent
License
Unfair competition
Aims of monopolistic pricing
X-inefficiency
Expenses to hold monopoly
Price discrimination

Unit 9 MARKET OF THE MONOPOLISTIC COMPETITION
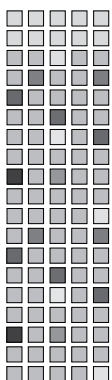
Monopolistic competition is probably the most widespread model for today's market. Especially it concerns the consumer goods. So, the most common situation is when each of us as a buyer meets the manufacturer or seller who behaves as the firm under monopolistic competition. Consideration of this market type is the main object of this unit. This will allow you both acquire specific professional knowledge and better understanding of your counterpart in the market in daily life.

9.1. MONOPOLISTIC COMPETITION AND ITS BASIC FEATURES

Monopolistic competition market is not the same as a monopoly. Although these terms are fairly consonant, they represent very different market situations. The main features of a monopoly were considered in the previous unit. Let us now pay attention to the characteristic features of monopolistic competition.

1. There are a lot of sellers in the market. What does it mean «a lot of»? To be clamed as monopolistic competition market it must meet the following criteria:

– there must be not too many sellers to avoid turning the market into the market of perfect competition;

– there must be not too few sellers to provide small part of sells for each of them and not too much market power;

– there must be not too few sellers to avoid hidden agreements related to output restriction and artificial increase of price;

– there must be enough firms to allow each of them not to feel being dependent; each firm must make its own policy and pay no consideration to possible reaction of competitors.

Therefore, if a pure competitive market needs to have hundreds or even thousands of the firms, then for the monopolistic competition it is enough to have 30, 50 or 70 firms.

2. Products offered in the market are rather differentiated although they belong to one product group. The basis of this differentiation can be both of real and imaginary differences. The real differences are achieved by:

a) quality of goods. Goods may vary by certain functional features, materials of which they are made, design, quality of work and more. Ukrainian Commodity markets are full of goods with the same brand image but produced in different countries: Poland, Italy, Japan, Malaysia, Korea, and Bulgaria. At the same time their quality may have very significant differences;

b) strengthening of after-sales service. Firms try to highlight the goods among similar ones by increasing the warranty period, free delivery of goods to the buyer, making assembly and installation of furniture in the apartment of buyer, etc.;

c) places to sell. This is especially true in the case of goods, demand for which arises in a certain place and you better just meet there. For example, the cafe, located in a crowded area on the bank of the Dnieper River with a magnificent view, or petrol filling station on the route with the active movement of cars will be more attractive for a buyer than other ceteris paribus;

d) sales promotion. To select its own good among the other goods a firm can stimulate sales, giving prizes for customers. For example, Trostyanets confectionery «Crown» gives each customer, who buys 0,5 kg of sweets, a special package with its logo. Petrol filling station «South» provides you with a bottle of mineral water free of charge if you purchase 30 liters of gasoline.

However, sometimes differentiation of goods is based on a virtual difference. Most of them are achieved by active advertising («Our toothpaste is the only reliable protection against tooth decay» or «Our laundry detergent cleans everything but your pockets»). The usage of the trade marks is aimed to achieve this goal too.

3. Limited ability of a firm to set the price. It would be erroneous to believe that the firms generally can not affect the price in monopolistic competition. Good location, colorful packaging, effective advertising campaign gives the company certain advantages over the other ones, giving the opportunity to sell their products somewhat more ex-

pensively. But this possibility is limited by the fact that there are many close substitutes of goods in the market under monopolistic competition. Therefore, the buyer is able to purchase goods from another seller if his price is more attractive.

4. Ease of entry into the branch. It is almost impossible to create barriers to entry into industry for new producers because there is rather large number of the competing firms. However, there are some exceptions to this general rule. For example, the number of the most convenient places to install kiosks is limited, so, there are barriers for more competitors. This is particularly important for understanding the behavioral patterns of the firms in the market of monopolistic competition in the long-run.

Market of monopolistic competition has some intermediate position between a monopoly market and pure competition. Therefore, the mechanism for the prices and output determining in monopolistic competition is the mix of the models which were considered in the previous two topics.

9.2. PRICING AND OUTPUT IN CONDITIONS OF MONOPOLISTIC COMPETITION

Suppose that some firm is focused on monopolistic competition. It produces and sells a certain good and this good differs from the other goods of this group. What form will a demand curve have (the curve of sales) for this product?

On the one hand, we can confidently say that if the demand curve is perfectly elastic, it is only within the certain limits, since the share of the company is not so small not to affect the prices if the sales of the firm increase. More often it has the sloping nature because: a) firm in monopolistic competition has fewer competitors than in a competitive market; b) the products of competitors are close but not perfect substitutes.

On the other hand, the demand curve is more elastic than in monopolistic market. There is possibility to achieve the effect of substitution due to positive product differentiation, when demand for the other goods of this group is switched to the product of the company. Generally, we can say that the elasticity of the demand curve depends on the number of competitors the firm faces and the degree of product differ-

entiation in the industry. *The more competition and less product dif-ferentiation are, the more elastic is the demand curve for each firm*. In this case, monopolistic competition is closer to perfect. *If the number of competitors is limited and depth of product differentiation is significant, the demand curve will have the less elastic form*. It makes situation close to the monopoly. Now after these introductory remarks let's consider the choice of output and the prices in the short-and long-run.

Since the demand curve which characterizes the possible «price-product» in the market of monopolistic competition has decreasing character (albeit with little inclination angle), then (as it is in the market of monopoly) the marginal revenue curve will always be below the demand curve. Applying the general rule, we can say that *the firm in the market of monopolistic competition in the short-run maximizes its profits or minimizes losses by producing output which corresponds to a cross point of the marginal costs curve and marginal revenue curve* (fig. 9.1).
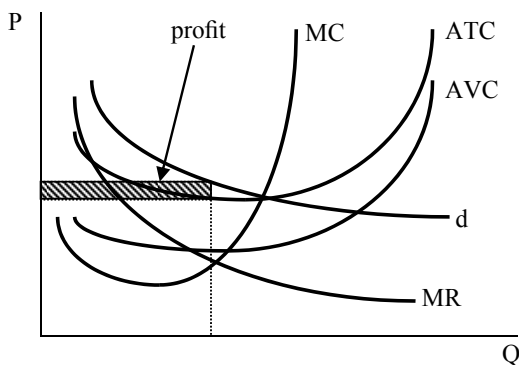
Fig. 9.1. Company maximizes profit

Since the company produces a product that has no absolute substi-tute, the reduction of its supply in the market leads to some increase of the price. Due to this, in the short-run a firm in the monopolistic market can get economic profits, the size of which corresponds to the square of the shaded figure (fig. 9.1).

However, the firm has no immunity to the losses. The ground for the economic profit is the demand for such product of the company, when the demand curve intersects the average costs curve. If it is below the average costs curve, but the demand curve crosses the average vari-

able costs curve the firm will solve the problem of the losses minimizing (fig. 9.2).

If the demand curve is below the average variable costs curve, the firm has to decide to cease production because any of its losses caused by production will exceed the amount of the fixed costs.
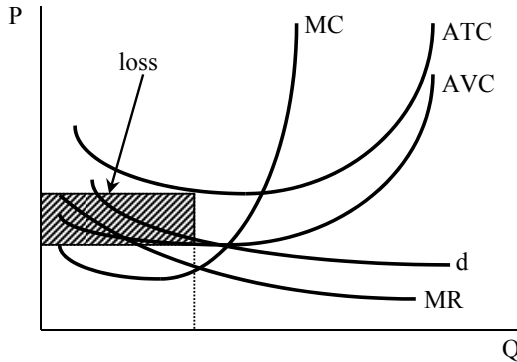
Fig. 9.2. Company minimizes loss

Thus, in the short-run the firm in monopolistic competition can receive economic profits, suffer loss or solve the problem of closure. What will happen in the long-run?

Unambiguous answer to this question is impossible. We can speak only about the general trend. This trend is aspiration to obtain a normal profit, break even, i.e. price setting at the level of the average costs.

Economic profit of the typical firm in monopolistic competition attracts new companies to join the industry. There grows the number of competitors and the number of products that can substitute the product of the typical company quite effectively. This increases the demand elasticity for a typical firm. Market of monopolistic competition approaches a competitive market. The gap between the demand curve and average costs curve became smaller and economic profit is liquidated.

By contrast, if a typical firm suffers losses, the outflow of manufacturers from the industry is observed, the number of competitors decreases, differentiation of the goods deepens, the demand curve becomes more inclined (less elastic). As a result, it can cross the average costs curve, thus eliminating the company's losses.

Equilibrium is set when the demand curve and average costs curve have the only common point (a point of contact), i.e. when the price is

set at the average costs for a certain output; a firm gets neither econom-
ic profit no losses (fig.9.3):

$$P = ATC; \quad MC = MR. \tag{9.1}$$
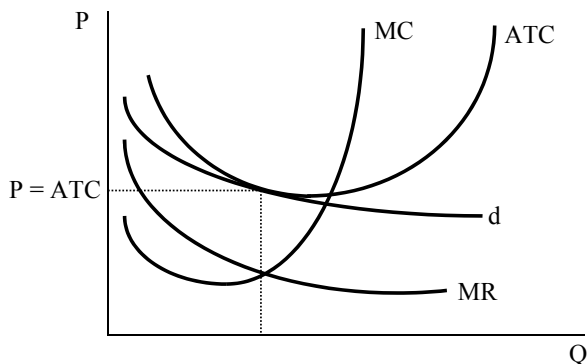
Fig. 9.3. Equilibrium in the long-run

However, you must realize that the price setting at the level of the
average costs in the market of monopolistic competition is just a trend.
There are factors that complicate the forecasting results of monopolistic
competition in the long-run. These include the following circumstances:

1. There are certain barriers to entry the branch with monopolis-
tic competition. For example, to do commerce in the stock market of
Ukraine one must have permission from the State Commission on Secu-
rities and Stock Market (license). This procedure takes a lot of time and
is expensive for a firm. So if a stock trader is able to provide its servic-
es in the way to attract customers, he can be protected against the emer-
gence of new competitors and get economic profit for a long time.

2. Differentiation of product or service can be based on the circum-
stances that are difficult (or impossible) to reproduce. For example, the
advertising firm managed to attract the talented artist who has a posi-
tive impact on its production and allows to distinguish their products
among the products of the similar firms. Enhancing product differenti-
ation, which occurred in this case, can not be eliminated by new com-
petitors, so the company will get economic profit during the long term.

We can give a few similar examples. This gives grounds to assess
the equality of the average costs and prices in the market of monopolis-
tic competition only as a very likely result in the long-run.

9.3. MONOPOLISTIC COMPETITION AND EFFICIENCY

When analyzing the competitive market we have found that the highest efficiency of resource allocation and production efficiency is provided if producer's equilibrium is reached at equality of the prices, marginal costs and minimal average costs:

$$P = MC = ATC \text{ min.} \qquad (9.2)$$

In other words, efficiency ensures customers receiving the highest quantity of products at the lowest prices within the existing technology and production costs. Let's apply this criterion to assess efficiency of monopolistic competition.

As the analysis carried out at the preceding paragraph shows, the producer's equilibrium under monopolistic competition can never be achieved at equality of the prices and marginal costs. It comes at the point of intersection of the marginal costs curve and marginal revenue curve, i.e. when $MC = MR$. Since the price is always higher than the marginal revenue, then in equilibrium the price is higher than the marginal cost. For the equilibrium of a firm in monopolistic competition, such inequality is valid:

$$P > MC. \qquad (9.3)$$

This means that the *element of monopoly, which is characteristic for monopolistic competition, always triggers some underutilization of resources to produce goods*. If the price of a product exceeds the marginal cost, it shows that society evaluates additional units of this product higher than alternative products that could be produced at the same costs. Therefore we can assume that monopolistic competition does not ensure optimum allocation and usage of resources. Conversely, surveillance offers multiple examples of the underutilization of production capacities by the firms under monopolistic competition. For example, one can be surprised by appearance of a new gas station near the existing one, though not overloaded. Excess of the price over the marginal costs allows both producers to get economic profit while capacities are underexploited. Monopolistic competition is not able to provide the highest production efficiency, i.e. minimal prices equal to the average costs as the minimum of the average costs curve is in the point where this curve is intersected by the marginal costs curve. To achieve maximal opera-

tional efficiency the demand curve and marginal revenue curve should pass through this same point simultaneously. Since they do not coincide, the highest efficiency reaching is impossible for monopolistic competition. Instead the price is higher than the minimal average costs both in the short-run and long-run:

$$P > ATC \text{ min.} \tag{9.4}$$

Therefore, customers are always forced to pay the higher price in the market with monopolistic competition than it would be in a competitive market.

Therefore, underused capacities and excessive prices are the social payment for monopolistic competition. However, even this very criticism does not give sufficient grounds for unequivocally negative assessment of monopolistic competition. The fact that the monopolistic competition constantly directs company to find ways to distinguish its own product and to take into account the diversity of the consumer needs most completely. Therefore, analysis of monopolistic competition is not complete without consideration of non-price competition, which encourages a firm to seek new ways to meet the consumer needs.

9.4. NON-PRICE COMPETITION

By this time we kept the assumption that a firm in the market sells an unchangeable product. In fact, while getting economic profit, the firm does not wait until competitors make similar goods and liquidate the excess profits. In order to increase demand for its product the company is constantly looking for ways to improve it. This pushes the company to the non-price competition. Note that non-price competition is just the most common form of competition for the market model being analyzed.

Generally, methods of non-price competition can be divided into two groups: a) related to product improvement and b) focused on advertising and promotional activities.

The product improving can be made without fundamental change in its consumer qualities. This includes packaging of goods, design, selling methods etc. But in the long-run the company is targeted to develop new models of products that would be embodied in a new achieve-

ment of science and technology. Therefore, unlike pure monopoly, monopolistic competition creates an interest in scientific and technological innovations. Many firms are planning the moral aging of products or even provoke it to create more favourable conditions for introduction of new products.

Achieving of temporary advantage over their competitors can be reached not only on the base of real advantages of the product, but also through active promotional activities. The purpose of advertising is to increase the market share and enhance customer loyalty to the product of a company. Success of advertising is graphically displayed by the shift of the demand curve to the right and of its elasticity decrease.

The generalized scheme of the advertising process includes developing of the advertising message, the choice of media to send advertising message, actual advertising and evaluation of advertising effectiveness.

Firms usually pay quite a lot attention to develop the advertising message. Successful core idea of advertising, presentation of material – all these determine the ultimate effectiveness of all advertising.

The choice of media to send advertising message depends on the content of the message, potential consumers, ad type (information, persuading or reminding) and so on.

While timing and placing one should take into account several circumstances. First, each potential customer, tired of all the surrounding advertising, is trying to protect himself by «information shield». And only advertising is expected to be successful that can penetrate this shield: either an unusual form, or content, or place of submission.

Advertising never exists independently. Consumer is always surrounded by entire information field. Information that goes along with
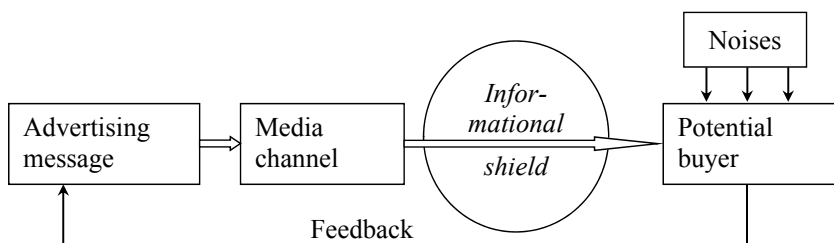
Fig. 9.4. General scheme of the advertising process

advertising is called noise in the scheme. These noises can be so powerful that will completely stifle advertising. Time, attractive enough for television commercials, is the time of football matches. However, if the players of one of the teams had a successful attack and scored a goal, then it would be safe to say that the advertising message you submit to broadcast would not be noticed by anyone.

In economic science, the role of advertising is considered controversial. There are very strong arguments in favour of advertising. The following ones should be especially emphasized among them:

1. Advertising provides information that helps consumers make reasonable choices. After all, one of the most important preconditions for a reasonable choice is completeness of information.

2. Funds for advertising are almost the most important revenue of the media. Neither television, nor radio, nor newspaper could exist if they do not provide the paid advertising services. From the social point of view this externality to viewers and readers justifies some inconvenience due to oversaturation of media with advertising.

3. Advertising encourages advertiser to improve the product. A campaign will be doomed to failure if the product hasn't, at least, several of those properties referred to the advertising message.

4. Advertising stimulates a high level of consumer spending. This creates positive conditions for economic growth, increasing employment and improving the welfare of the nation at all.

However, it is advisable to listen to arguments that speak out against advertising:

1. The main purpose of advertising is to persuade, not inform. Remember the basic content of advertising messages that you watch on TV every day. Most of them are built as opposition to the good being advertised and other goods and aims to convince that to purchase goods from the company is the only right decision.

2. Advertising costs are relatively unproductive; they have little or nothing to add to the prosperity of society. Although most promotional activities create additional jobs (advertising agencies, media etc.), but the alternative usage of advertising funds could bring a greater social effect.

3. Advertising sometimes causes negative externalities such as increased consumption of tobacco, alcohol, etc.

4. Effectiveness of advertising is low, because most of it tends to neutralize each other. For example, active simultaneous campaigns of

«Sanino» and «Colgate» toothpaste causes the fact that the consumer does not know what choice to make, and therefore is governed by other criteria when determining which one to buy.

To conclude we should say that a firm that tries to maximize profits in monopolistic competition achieves this by «price – quantity» manoeuvring, the product, improving conducting advertising and promotional campaigns.

The main terms and concepts

Monopolistic competition
Product differentiation
Real and virtual differences
Conditions of the long run equilibrium
Underutilization of resources
Non-price competition
Advertising
«Pro»-advertizing reasons
«Contra»-advertizing reasons

Unit 10 OLIGOPOLISTIC MARKET
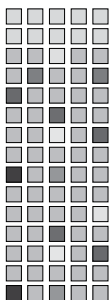
The manufacturer's behaviour in the oligopolistic market is the most difficult to predict. Introduction of new variables into the model, especially reaction of competitors to specific actions of the manufacturer and their respective correction, increases possibility of irrationality in actions of economic agents. Therefore, it needs additionally to constrain conclusions to be derived from the analysis of the oligopolistic market to make them practically useful.

10.1. FEATURES OF THE OLIGOPOLISTIC MARKET

Let us characterize the main features of the oligopolistic market by application of the general criteria for the market models classification.

1. «Oligopoly» from Greek language means «the rule of the few», so the main feature of the oligopolistic market is the **dominance of a small number of the firms**. There could be from three to twenty of them.

Oligopolistic market is formed if a high degree of concentration in the branch is achieved.

To measure this degree the entire system of indicators is used. Among them the following ones are:

– the share of some biggest producers (as a rule, four or eight) in the overall branch output. The limit border for concentration of production in the branch to maintain the competitive environment was set in many countries. Thus, in the United States, it is considered that for the normal development of the industry at least 10 competing firms should be in it. At the same time the share of the largest of them should fall more than 31% of all industry sales, the two companies – no more than 44, three – no more than 54, four – no more than 64%;

– Herfindahl-Hirschman Index (HHI). The base for its calculation is also the share of individual producers in the industry sales. It is calculated by the formula:

$$IXX = \Sigma d_i^2,$$

where d_i – the share of each firm in overall sales, %.

This index achieves its maximum when the industry is represented by a pure monopoly ($100^2 = 10\ 000$). Therefore, the smaller the Herfindahl-Hirschman Index, the more competitive is the market we may assume. The most typical for the oligopolistic market is the index from 1200 to 5000.

Nevertheless, the use of these indicators does not always really indicate the degree of competition, as all indicators are usually calculated in the nationwide market. In reality, each market has its limited geographical scope. Moreover, some products do not constitute a single national market and always form only local markets. For instance, this could be a market of brick or cement, household services or some foods.

Another significant drawback of HHI and all indicators of concentration is uncertainty of the term «branch». Is it a purely regional monopoly in the case if the only enterprise in Dnepropetrovsk region produces clay-sand wall blocks (the so-called double brick)? What should be taken in the denominator to calculate its share in the market: only a similar brick, or a brick at all, wall materials, including cinder block and concrete blocks? It is easy to see that the results of calculation will be significantly different depending on the answer to this question. Unfortunately, the science has not provided satisfactory justification of the way how to determine the denominator correctly.

An external factor of competitive environment (the foreign manufacturers) is quite significant for open economies. Therefore, while identifying the market model in a branch, it is necessary to take into account the availability of this market for similar products of foreign producers.

2. Oligopolies offer both standard and differentiated products. Typical oligopolies are the markets of steel and markets of automobiles. In the first case a standard product is made, whereas in the second case it is quite differentiated. However, the type of product (standard or differentiated) did not significantly affect the functioning of the oligopolistic market. So, we will not pay attention to it in the future.

3. As the share of each manufacturer in the common market of the commodity is quite significant, each of them **can pursue an independent pricing policy.** If independent seller declines its prices and by this encourages overall sector of sales or increases prices due to supply con-

straints in both cases, the overall dynamics of prices in the industry is affected. However, keep in mind that the result of this influence is largely dependent on reaction of other manufacturers in the branch.

4. Entry of new manufacturers into industry is somewhat limited. It is not so blocked, as in the case of the pure monopoly, but there are the barriers to entry the industry similar to those we discussed in topic 8.

The oligopolistic market model is almost as common model, as the market of monopolistic competition. This is due, in particular, to such circumstances:

– a relatively small number of producers allows to get economies of scale in the majority of industries. In this case, the transition to the industry of big firms must be accompanied by absorption of competitors and transition to oligopoly;

– there is an objective tendency of the firms to merge. The union of several companies can significantly increase their share and enables the new structure to achieve better results, including the economies of scale. The merger could give a big economic power, more control over the prices, as well as gains on the prices of resources as a result of becoming a significant buyer.

Concluding the general characteristic of oligopolistic competition, you should pay attention to the fundamental feature of this market model: small number of producers gives everyone the opportunity to carry out their pricing policy, but mutual dependence is so great that no firm dares to take any action, without trying to calculate possible reaction of its competitors.

10.2. PRICING AND OUTPUT
IN THE OLIGOPOLISTIC MARKET

In the three previous topics we discussed the model of producer's behavior concerning the prices and quantity under conditions of pure competition, pure monopoly and monopolistic competition. You can use them with considerable certainty to provide the appropriate behavior of the manufacturer. But this is not true for the oligopolistic market. Accurate prediction in such market is impossible, primarily because of the large number of variants of oligopoly. Oligopolistic branch may have 2 – 4 dominant firms (tough oligopoly) or 10 – 20 (soft oligopoly).

Mechanisms of interaction between the firms under these circumstances are different. In addition, total interdependence complicates prediction of the competitors' reaction and makes it impossible to calculate the demand and marginal revenue for the oligopolistic firm.

Nevertheless, this does not mean that the oligopolistic market in general is not amenable to investigation. Its microeconomic analysis makes it possible to distinguish at least two general patterns:

1. The oligopolistic prices tend to be inflexible, or rigid.

2. If the oligopolistic prices nevertheless vary, it is most certain that all firms do it simultaneously.

Oligopolistic behavior in pricing implies the existence of incentives for concerted action or collusion in the price setting.

Identification of these patterns is the result of the research in oligopoly's pricing. There can be four variants of oligopolists behavior in pricing: the broken demand curve; pricing, due to collusion; leadership in pricing; pricing on a «cost plus» basis (fig. 10.1). We consider each of them in detail.

Broken demand curve	Collusion

Variants of oligopolistic pricing

Leadership in pricing	«Cost plus»
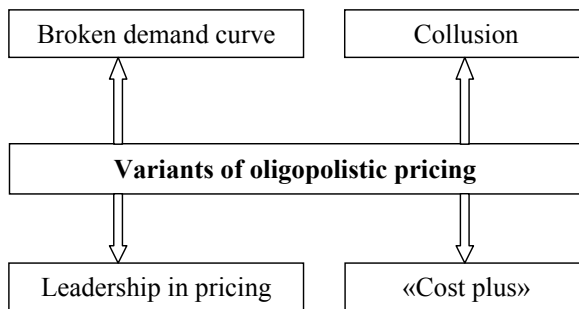
Fig. 10.1. Variants of oligopolistic pricing

Assume that the industry is represented by three firms (A, B and C). Each of them has the same market share and they do not coordinate their prices through open conspiracy or collusion.

What will happen in the market and how will the position of the demand curve be changed for firm A, if the firm A decides to change the price? Everything depends on reaction of competitors. They can either follow the example of the firm A (i.e. align prices) or ignore it.

If the firm tries to realize more of its products and lowers the price of P_1 to P_2, while competitors repeat this manoeuvre, the real growth of

sales can be quite small. It could be mainly due to the switch of the demand from other branches to the relatively cheaper good in this branch. Therefore, it can not be taken into account. The fact is that the response of competitors would remove the demand curve for product of the firm down and the firm will sell previous quantity at lower prices (fig. 10.2).
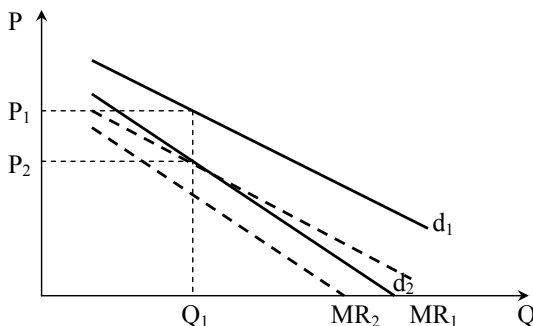
Fig. 10.2. Alignment of the oligopolistic price if the price drops

If an oligopolist increases the prices and his example is repeated by others, it will mean factual transformation of the industry into a pure monopoly. In this case both overall sales and sales of each firm will decrease. Thus, for unidirectional action of oligopolists the demand curve for each of them will have the same elasticity as the curve of the industry demand, i.e. will be fairly inelastic.

However, the competing firms may not follow the price manoeuvre of the initiator. Then, while lowering prices for products of the industry, the initiator can increase sales by taking the market shares of competitors. On the contrary, if a firm increases its prices the competitors will increase their sales at its expense. In this case the demand curve for product of the firm will be quite elastic which will bring the oligopolistic market nearer to the market of monopolistic competition.

Which of these two variants of competitors' behaviour is the most probable?

If a firm in the oligopolistic market decides to cut prices with the hope to increase their own sales, competitors will do the same because, otherwise, they would lose their shares of the market. Thus, the decline in the prices will be aligned, since competitors will follow the example of an initiator. Conversely, if the firm tries to raise its prices, competitors will ignore such behaviour. They will try to seize a part of the mar-

ket which is free after the first firm. The price increases will not happen as competitors try to expand their market share. Thus, the demand curve for oligopolist will look as the broken curve (fig. 10.3).
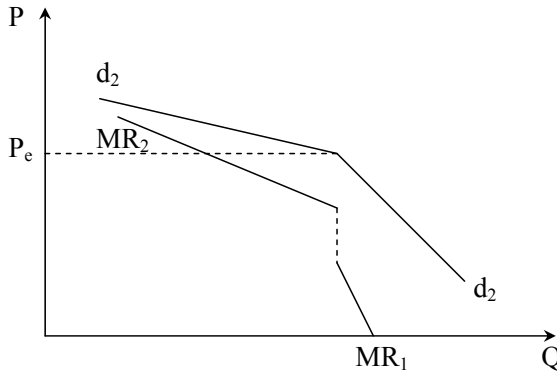
Fig. 10.3. The broken demand curve

The demand curve has very elastic part above the current market price and it has less elastic part (if the product is differentiated) or even absolutely inelastic part (if all of the oligopolists produce the same product) in the part below the market price. The marginal revenue curve has a gap due to such significant differences in the elasticity of the demand curve.

These circumstances explain why the oligopolistic market prices tend to be rigid. It happens because any reduction or increasing in the price does not bring any gains for the initiator. In addition, the gap in the marginal revenue curve means that within the certain limits, the changes in the marginal cost will not affect the output and price. As fig. 10.4 suggests, the point of intersection of MC_1 and MC_2 with the marginal revenue curve will correspond to the same volume of the production and the price.

However, the broken demand curve does not answer why the market price is set exactly at the level of *Pe*. In addition, conclusion about disinterest of oligopolists in a price change does not always coincide with reality: the oligopolistic market prices have steady tendency to increase. Therefore the study of the manufacturer's behavior in the oligopolistic market must be complemented by an analysis of opportunities for collusion of several firms. This collusion has to be secret, since the co-ordinated pricing of manufacturers is forbidden by law in most coun-
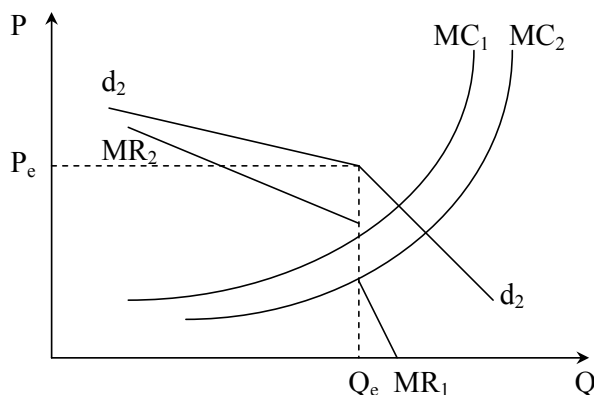
**Fig. 10.4. Insensitivity of the prices and output to the changes
of the marginal costs**

tries. It occurs when companies reach the direct or tacit agreements to fix prices, allocate markets or to limit competition among themselves in some other way.

If some firms in the industry with the oligopolistic markets are approximately of the same size and have the same level of the average costs, then they will choose the same level of the prices and the same output to maximize economic profit. Common price policy they are doing, in fact turns oligopolistic market competition into the market of pure monopoly. The shape of the demand curve and the marginal revenue curve for each firm will be the same as the branch curves, and the market price will meet the one that maximizes the economic profit of each firm. All this pushes the oligopolists to make cartel agreements which were discussed in topic 8.

However, there are many factors that counteract the appearance of new cartels and destroy old ones. The following are among them:

– differences in the costs and sales of oligopolists. In such conditions, prices that maximize the economic profit of each firm wouldn't be the same;

– with «soft» oligopoly the number of firms in the industry is large enough to make agreed action impossible;

– economic fluctuations, particularly a downturn, pushing the company to violate the agreements and endeavour to overcome their own difficulties;

– economic profits can attract new manufacturers into industry who are not the participants of the agreement;

– among the participants of the agreement may be a cheater, who makes secret price reductions to get additional contracts;

– government regulation of the economy by restricting prices and by bringing the members of price collusion to administrative, financial and criminal liability.

The oligopoly market with the different-sized firms shows tendency to concerted action of the firms through the mechanism of the so-called «price leadership». By tacit agreement the most powerful company in the industry is recognized as leader in pricing and all the other firms follow the leader's price.

Due to nature of «the broken» demand curve the prices revision is associated with a risk for the initiator. Thus, even a leader changes its price not so frequently. As a rule, he warns about the upcoming changes in advance. On the one hand, it enables partners to get ready for the next manoeuvre. On the other hand, leader explores possible responses of the other firms by this. In addition, the leader does not try to set prices that maximize profit to keep the barriers to entry related to the inability of the new company to provide a minimal level of the costs and gain economic profit.

Industry leaders often resort to a technique called «cost plus» to simplify the pricing mechanism. In this case some typical costs are taken as the basis and economic profit is added as a surcharge. The advantage of this method is its simplicity. It does not require a deep analysis of demand, revenue and marginal cost. One can only imagine how much analytical work is needed to determine these parameters for several hundred types of products are produced by oligopolistic firm!

The method of pricing «cost plus» fits well with the oligopolistic collusion. If they have at least approximately the same cost, it is enough to agree on the percentage of surcharges to them (5 or 10%) to actually conduct a coordinated price policy for all the products.

Thus, the oligopolists do not actually use price competition: this can be quite dangerous for both the initiator and for all market participants. Price competition has a threat to become a price war. Therefore, non-price competition dominates in an oligopolistic market. Its runaway is less probable. However, the successful solution in advertising, sales service or sales promotion competitor is not able to imitate immediately. So the initiator has the market advantages for some time.

10.3. ESTIMATION OF ECONOMIC EFFICIENCY
IN THE OLIGOPOLISTIC MARKET

Since the oligopoly is pretty close to pure monopoly, evaluating of economic efficiency is also quite close.

First of all, the researchers point out that the price and marginal revenue are never the same for oligopolists because the demand curve is always decreasing. Therefore, the intersection point of the marginal revenue curve and marginal costs curve is always located to the left of the minimal average costs. We can confidently say that oligopolists always set smaller quantity and higher price than a competitive market. Especially it is inherent to collusion and to the «cost plus» pricing method.

Oligopolist receives an economic benefit not only in the short-run, but in the long-run too. This is due to existence of quite significant barriers to entry into the industry, though they are not so difficult to overcome as in the pure monopoly, but they are able to restrict the entry of new competitors into the industry. Thus, the social allowance to the oligopolistic market causes limitations in consumption and higher prices for products of oligopolistic industry.

Some economists think that oligopoly is even more undesirable market model than the pure monopoly. Pure monopoly is apparent and is under constant control of the state. Oligopoly may be masked by monopolistic competition. It carries out a hidden policy of prices coordination to circumvent antitrust law, but actually implements the same principles of market behavior that pure monopoly follows. Therefore it is recommended to improve the antitrust laws in order to recognize better the oligopoly and to take effective actions to restrict this type of the market.

This also concerns economic legislation of Ukraine. Our state has taken only the first steps towards a control of monopoly and oligopoly.

There is also different approach to evaluate oligopoly. This point of view was justified by famous economists J. Shumpeter and J. Galbraith. While recognizing the specific losses to society from domination of oligopolistic competition in some industries, they believed that these losses are many times overlapped by the gain from the role of oligopolies in scientific and technological progress. Existence of large oligopolies that have real market power is acknowledged by the followers of J. Schumpeter and J. Galbraith as prerequisite for rapid improvement of

science and technology. This is due to the fact that modern research re-quires significant funds and only large oligopoly is able to allocate then. Furthermore, stability of the oligopoly market and its economic prof-it makes it possible to make a decision on the financing of the strategic studies with the long-term period of recovery.

Thus, in Section 3 we described the behavior of producers in dif-ferent product markets: perfect competition, monopoly, monopolistic competition and oligopoly. However, a manufacturer is not only a seller of the product. He is also a buyer of resources. The next section exam-ines the manufacturer's behavior in the market of resources.

The main terms and concepts

Oligopoly
Level of concentration
Intersectoral competition
Competition from imports
General interdependence
Broken demand curve
Pricing due to collusion
Price leadership
«Cost plus» pricing
The economic consequences of the oligopoly
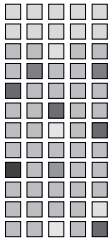
Part 4 THE MARKETS OF RESOURCES

Unit 11 THE DERIVATIVE DEMAND FORMING
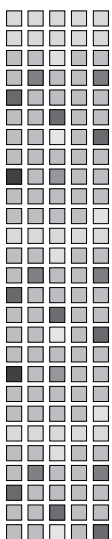
Recall the general scheme of goods and money circulation in topic 1 (fig. 1.1). Firms (producers) and households meet each other twice as market counteragents. Producers are sellers, and households are buyers in a commodity market. There is opposite situation in the market of resources. These two markets are closely interconnected. First, the prices of resources determine the revenue of households, affecting this by their consumer choices. Secondly, the prices of different resources form the structure of revenue and, accordingly, the structure of demand for finished goods. Third, the price of resources for a firm determines the amount of its costs and the quantity of output. The objective of this theme is to clarify the factors that determine the economic resources demand.

11.1. MARGINAL PRODUCTIVITY THEORY AND DEMAND FOR RESOURCES

Producers as buyers can meet different competitive models in the resource markets. Let's analyze the situation when a manufacturer buys resources and sells a product in a competitive market. Resources satisfy the needs of the manufacturer not directly but indirectly. There is no sense to buy labor or capital if there is no possibility to use it productively. Therefore, the demand for any resource depends on: a) demand and prices for manufacturer's product in the market of finished goods, and b) productivity of the resource when creating the goods. If the resource demonstrates high performance in production of goods, and the demand and price in the market of this good are fairly high, then the demand for such resource will be significant. If the resource is phenomenally productive but the goods produced with it do not have the necessary sales, it is unlikely that any manufacturer will want to buy this resource. Unique-

ness and high productivity of the resource is not a guarantee of the demand and high prices for it. After all, everything depends on the demand and prices for the final product. One of the adherents of the marginal utility theory emphasizes: «Not the Tokaj wine is expensive due to Tokaj wineyards are expensive, but on the contrary, Tokaj wineyards are expensive because the Tokaj wine is expensive».

As we found out in previous topics, just one factor is changeable in the short-run, whereas others remain unchanged. Under these conditions, the law of diminishing marginal productivity of variable factor works. From a certain moment, each new additional unit of variable factor causes a smaller increase in the output than the previous one (Table 11.1). Using this table we can calculate the marginal revenue product of a variable factor *(MRP)*.

Table 11.1

**Marginal revenue product of labor in the competitive market
(labor is a variable input factor, capital is a fixed one)**

L, working hours	TP, units	MP, units	P, UAH	TR, UAH	MRP, UAH
0	0	–	4	0	–
1	10	10	4	40	40
2	19	9	4	76	36
3	27	8	4	108	32
4	34	7	4	136	28
5	40	6	4	160	24
6	45	5	4	180	20
7	49	4	4	196	16
8	52	3	4	208	12
9	54	2	4	216	8
10	55	1	4	220	4

Marginal revenue product is a surplus of the total revenue due to usage of the additional unit of a variable resource. Table 11.1 suggests hypothetical marginal revenue product of labor while capital remains constant. Similarly, one could calculate the marginal product of capital provided constancy of labor.

To set the amount of the used labor a producer (if he is oriented to maximize profits) should compare earnings due to usage of the additional unit of resource and additional cost of this usage. The increment of the total costs caused by involving an additional unit of resource into

production is called the **marginal resource cost (MRC).** To maximize profits a firm should use additional units of the resources if every used unit gives more surplus in the total revenue than the increment of its total costs. The boundary of feasible commitment of additional resources is the point of equality of the marginal revenue product and marginal resource cost:

$$MRP = MRC.$$

Since we assume that the producer buys the resources in a competitive market, their prices remain unchanged and do not depend on the amount of the involved resources. In other words, the marginal cost of labor is equal to wages (W). Then the equation takes the form:

$$MRP_L = W.$$

For instance, if the remuneration rate (W) is 20 UAH, then in the situation shown in Table 11.1, it is expedient to dwell on attracting six employees since the seventh will cost 20 UAH for the manufacturer, and the surplus of the total revenue will be 16 USD only.

In the model of a competitive resource market the demand curve for a certain resource coincides with the curve of the marginal revenue product (Fig. 11.1). Research makes it possible to identify several factors that affect the amounts of factor used in productive activities. This is, firstly, the level of wages, which was formed in the labour market. This change shifts the line W_1 up or down and moves the point of intersection W_l and MRP. Secondly, the curve MRR itself can shift in the chart under the influence of the product price changes and under the influence of labour productivity growth.
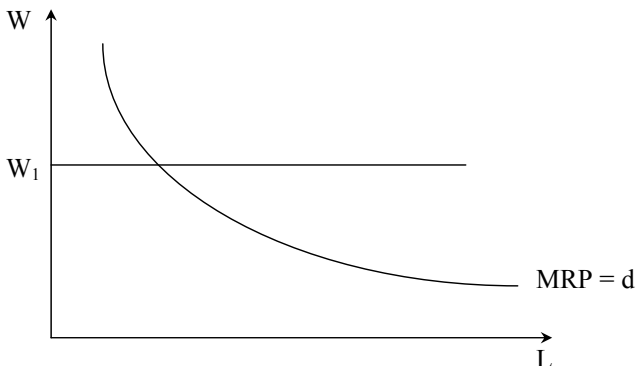
Fig. 11.1. A firms' demand for labour

Somewhat different situation is observed when a firm sells its products in the market of imperfect competition. In this case, to increase the sales, it is forced to down the price as well to increase prices it has to decrease the sales. Consequently, the marginal product in cash will be reduced, influenced not only by the law of diminishing marginal productivity, as it was under conditions of perfect competition, but also under the influence of reduction of the product prices (table 11.2).

Table 11.2

Marginal revenue product of labor in the market of imperfect competition (labor is a variable factor, and capital is a fixed factor)

L, working hours	*TP*, units	*MP*, шт	*P*, units	*TR*, UAH	*MRP*, UAH
0	0	–	5,00	0	–
1	10	10	4,80	48,0	48,0
2	19	9	4,60	87,4	39,4
3	27	8	4,40	118,8	31,4
4	34	7	4,20	142,8	24,0
5	40	6	4,00	160,0	17,2
6	45	5	3,80	171,0	11,0
7	49	4	3,60	176,4	5,4
8	52	3	3,40	176,8	0,4
9	54	2	3,20	172,8	-4,0
10	55	1	3,00	165,0	-7,8

Marginal revenue product (as in the previous example) is the demand curve for labour. However, it will have less flexibility than in a competitive market for models of imperfect competition. Therefore, the manufacturer under imperfect competition responds less to the changes in wages by attracting labour resources than the producer under perfect competition. This can be demonstrated by calculating the number of workers which are involved into production with the same changes in wages under conditions of perfect and imperfect competition (based on Table. 11.1 and 11.2). As we can see in table 11.3, the volume of involved resources responds to the changes in wages more actively under perfect competition.

As we explained in Section 3, ceteris paribus producer in an imperfect competition market produces less than it could be in a competitive market. Naturally, to produce smaller volume of products manufactur-

Table 11.3

Elasticity of demand for resources in the markets of perfect and imperfect competition

Wage, UAH	Labor, working hours.	
	Perfect competition	Imperfect competition
35	2	2
25	4	3
20	5	4
10	8	6

er attracts fewer resources. Therefore, the demand for resources in the markets of imperfect competition is always smaller than in the competitive markets.

Of course, the curves of the marginal revenue product (the demand curves for the particular resources) have different slope and different position in the chart for each firm. Differences are caused by differences in productivity and in marginal product. To determine the market demand for the particular resource one need to summarize the individual demands of each firm.

11.2. THE CHANGES IN DEMAND FOR RESOURCES. DEMAND ELASTICITY

We have already mentioned that the demand curve for the resource may move in the graph to the right (which means the increased demand) or to the left (that corresponds to its decreasing). Let us consider the factors that could cause such changes in more details.

1. The changes in demand for the product. The ceteris paribus changes in the demand for a company's product, produced with usage of certain resources, will shift the demand curve for these resources in the same direction. Thus, the financial crisis in Ukraine, Russia and other countries has led to bankruptcy of the banks and reduced demand for their services. This, in turn, has led to increased unemployment among bank employees.

2. The changes in productivity of resource. Increased productivity of the resource moves the demand curve to the right and a decrease in productivity shifts the demand curve to the left. First of all, the factors

of the changes in resource productivity could be this resource's quality characteristics (skills, reliability of machines, etc.). In addition, constant resource can provide better performance due to the changes of other resources quality, which are used in conjunction with this constant resource. Thus, increasing of workers skills leads to higher productivity both in labour and unchanged capital.

3. The changes in the prices for other resources. As we know, resources are inherent substitutionality and complementarity. The changes in the prices for substitute and complementing resource make different effects on a demand.

So, the changes in the price of substitute resources simultaneously trigger two opposite effects: the *substitution effect* and *volume effect*. If, for example, wages decrease, the labour becomes cheaper in comparison to capital. It will be better for a producer to increase the amount of the used labour and reduce involvement of capital (substitution effect). Consequently, the demand for capital decreases. On the other hand, the cheapening of labour reduces the manufacturer's costs in general and leads to the output growth, accompanied with the rising demand for resources in general (volume effect). The actual change in demand for resources depends on the balance of the forces with which these effects act. If the substitution effect exceeds the volume effect, the changes in the prices and demand will have the same orientation. If the volume effect is stronger, then these changes are in opposite directions.

If the price of complementary resource changes, it triggers only the volume effect. The change in the price of one resource and the demand for other resource have opposite directions.

Thus, we can conclude that the demand curve for a resource is moved to the right (demand increases) under the influence of such factors:

a) an increase in the products demand which are produced with this one resource;

b) an increase in productivity of the resource;

c) reduction in the substitute resources prices provided the volume effect is stronger than the substitution effect;

d) an increase in the substitute resource prices provided the substitution effect is stronger than the volume effect;

e) the decline in the complementary resources prices.

Sensitivity of the demand for resources to the price and non-price factors is determined by elasticities. Price elasticity of the demand for resources depends, in particular, on factors such as:

1. The rate of decline of the marginal product. If addition of labour to the fixed amount of capital causes slight reduction of the marginal product of labour, then the demand curve for the resource has a smaller slope and a trend towards greater flexibility. Conversely, the rapid fall of the marginal product makes the demand curve to be poorly elastic.

2. Substitutability of resources. Here, the dependence is the direct one: the more close substitutes the resource has, the more elastic demand for it is.

3. Elasticity of the demand for producer's product. Since the curve of the marginal revenue product depends on the product price then elasticity of the demand for resources directly depends on the elasticity of a demand for the product.

4. The share of expenditure for the resource in the overall cost. The greater the share of the total cost for the resource falls, the greater the elasticity of demand for this resource is.

11.3. OPTIMUM RATIO OF RESOURCES

Until now we spoke about the short-run. We considered the situation where one of the production factors (labour) changes, while other remains the fixed one (capital). It is time to consider the long-run, when all factors of production are variable.

In the long-run a manufacturer could consider two main questions:

1. What ratio of resources provides minimum total cost to produce the given quantity of the good?

2. What ratio of resources provides the maximal profit?

The answers are given **by the costs minimization rule and profit maximization rule.**

The costs minimisation rule underlines that costs are minimal if ratio of marginal products to the prices is equal for each resource. Suggest both working hour of labour and working hour of capital costs 15 UAH Provided one additional working hour of labour produces 5 units of the good and one additional working hour of capital produces 7 units of the good, a producer gets more goods by reallocating expenditures so to use

more capital instead of labour. Releasing of 15 UAH due to reducing usage of labour by 1 working hour leads to shortfall in production equals to 5 units while spending these funds to attract additional working our of capital gives additional 7 units. The producer's gain is obvious: while keeping the previous output, he can release more funds by reducing consumption of one resource than the additional funding to purchase another resource. So total cost of production of the given output will decrease.

If the ratio of «marginal product / price» for each of the resources changes in favour of labour, the producer will reduce their costs by reallocation of resources in favour of labour. Obviously, the possibility of reducing the overall cost of producing a certain output through the reallocation of funds between different types of resources is depleted, when ratio of «marginal product / price» is:

$$MP_L / P_L = MP_K / P_K.$$

However, the minimal cost of production does not always provide the maximal profit. The costs output minimizing and output profits maximizing will be equal only in a competitive market, where the demand is completely elastic, and the market price of the product remains unchanged regardless of the sales volume of a firm. Another situation takes place in conditions of imperfect competition. Therefore, it is expedient to use a more general approach, which was applied in the previous section: the maximal profit is achieved when the marginal product and marginal costs are equal. As for expenditures to buy particular resource, the profit will increase provided marginal revenue product exceeds marginal resource costs. If the price becomes higher than the marginal revenue product the profits will decrease. It becomes maximum when it's sustained with the following equation:

$$MRP_L / P_L = MRP_K / P_K = 1.$$

Therefore, in a competitive market a firm maximizes its profit by allocating resources when additional unit of a resource has the price which is equal to marginal revenue product of this resource. But the markets of resources are not necessarily competitive. Most often competition is limited, imperfect. The features of the markets for certain resources are analyzed in the next topic.

The main terms and concepts

Derivative demand
Marginal revenue product
Marginal resource cost
MRP = MRC rule
Volume effect
Substitution effect
Minimization cost rule
Maximization profit rule

Unit 12 PRICING IN THE MARKETS OF RESOURCES
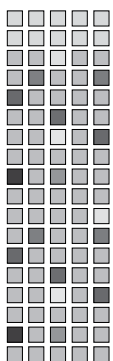
A common feature of the demand for any resource is its derivative nature. However, regulation of the pricing process in the markets of different resources has its own specifics which depend on the characteristics of the resource itself, on the type of market, on the degree of state intervention in the mechanisms of self-regulation. Let us consider in detail how the wages, economic rent, loan interest and entrepreneurial profit are formed.

12.1. WAGE FORMING

Salary – is a payment to involve labour in the production process. It can acquire a variety of forms: salary as such, bonuses, firm's participation in profits, commissions, remuneration for the year, etc. However, in its essence – it is payment received by the owner of the labour resource for supplying the labour services. With some conventionality one can measure the reward of labourer as the sum of money received and the amount of supplied labour as the time of working. Therefore, the term «wages» ($P_L = W$) will be used to refer to the *reward of labourer for providing labour services per unit of time*.

There is considerable variation in the level of wages for different countries. While in developed countries the average wage is some thousands of USD a month, then in countries with poor economies – a few tens of USD. The average level of wages is a mirror reflection of the level of the country's development in general and the level of labour productivity in particular. An economist should understand that real revenue of the owners of the labour force grows at approximately the same rate as the labour productivity.

Since wages are the price of labour services, then the mechanism of their formation (as it was explained in previous section) depends on the market model. Let's consider several variants of the labour market depending on condition of competition in them.

If the labour market is competitive then it is characterized by:

– numerous firms competing with each other for the purchase of labour;

– numerous workers who are of the same qualifications and offer their services independently.

Under these conditions neither the firm nor the employee can control the market wage. In other words, the firm agrees with the market price of labour. At this price it can buy the infinite amount of the labour services (from the point of view of a single firm). Therefore, the supply of labour for a single firm in a competitive market will be a straight line, which will meet the market price of labour and the marginal costs for this resource.

Labour demand for a single firm is defined by the curve of marginal revenue product. Thus it looks like the sloping curve due to the law of diminishing marginal productivity. The firm hires more workers until marginal revenue product exceeds the marginal cost of labour. It maximizes its profit (shaded figure in fig. 12.1) if *MRP* equals *MRC*.
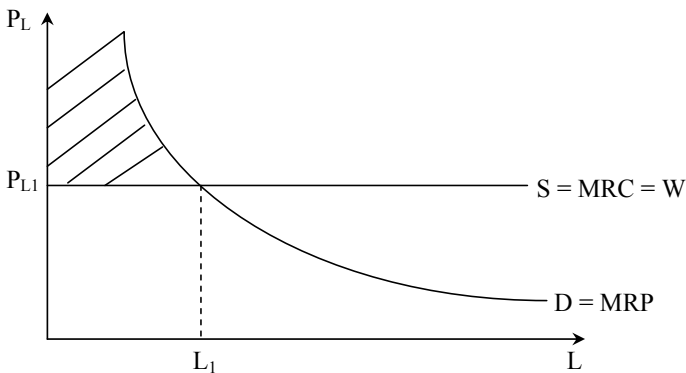
**Fig. 12.1. Supply and demand for a single
firm in a competitive market**

In the labour market a situation where monopoly position has a buyer of labour can often occur. Such market is called a *monopsony*. It is inherent in small towns, where the number of employees at a particular firm is the main part of all employees. Typical examples may be the town of Marganets and the town of Ordzhonikidze (Dnepropetrovsk region) where most workers are employed in mining and processing industry. As labour is immobile in this case (i.e. workers can not quickly

change the location or qualifications) the firm dictates wages by setting the number of recruits.

Since there is only one buyer of labour in the market, then its supply curve coincides with the supply curve of the industry. This curve is increasing due to the increasing nature of the opportunity costs of the resource. To involve additional human resources, the firm is to pay a higher wage. Nevertheless, to remove social tensions the greater wages should be paid not only to additional workers, but to the previously hired ones as well. Therefore, under conditions of monopsony the marginal cost of the resource will not coincide with wage but is always higher than it is. Respectively the curve *MRS* is above the curve *S* and the point of maximizing the firm's profits (*MRR = MRS*) corresponds to the lower wage (W_M) and the fewer recruits (L_M) than it does in a competitive market (Fig. 12.2).
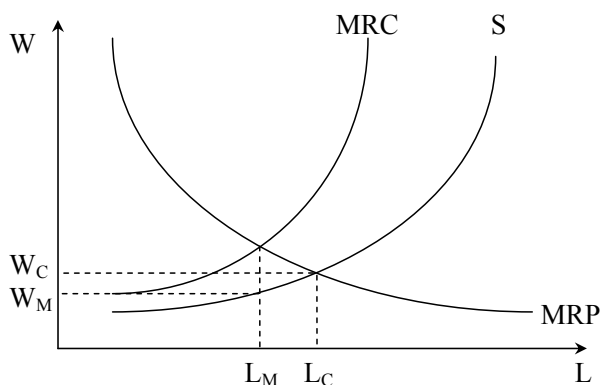
Fig. 12.2. Wage in the market of monopsony

However, monopolization of the labour market is possible not only by the buyer, but by the seller as well. Important role in this process belongs to the trade unions of workers. They can influence the level of wages by increasing the labour demand (to encourage the demand for final products, to contribute to growth of productivity or to promote an increase of the prices for substitute resources). It requires additional explanation. Say, why do associations of qualified workers support the struggle for the minimum wage rising, although this does not directly affect the wages of their members? Here not only solidarity works, but also a shrewd logic. An increase in the cost of unskilled labour increases

the demand for skilled one. The demand curve shifts to the right and increases the equilibrium level of the skilled workers' wages.

Professional associations try to influence the labour supply. Depending on the specifics of labour services, the tactics of a closed (or guild) or an open trade unionism can be used. *Closed trade unionism* is used when formal or informal professional association may have a direct impact on the amount of labour offered by the certain professional group. In this case the entry to this group is controlled by its members too. Say, how can you control the supply of working time by doctors of economic science? As a degree of Doctor of Sciences can be obtained only after a defence of thesis in front of those who already have this scientific degree, an informal association of doctors will adjust their wages by simplifying or complicating the procedure for protection (fig. 12.3, a).

Trade unions apply to open trade unionism only when they are not able to control the influx of new workers in this qualified group. In this case trade unions set the minimal wage through the tariff agreements or by the other way and cut off the section of the supply curve, which is below this level. The supply curve gets a broken character (Fig. 12.3, b).

The labour market gives us the examples where both seller and buyer have a monopoly position (so-called bilateral monopoly). In this case, the plots in fig. 12.2, a and 12.3, b look like overlapping. Trade union demands the wage to be not lower than the minimal level but the company insists on much lower wages. Actual price in such market depends on the balance of power. However, there is a reason to believe that in a bilateral monopoly actual wages are closer to the level in a competitive market than it is in the case of one-sided monopoly on either side.

These models explain the general mechanism of the wage setting, but do not answer the question about the causes of the wages differentiation within various professional groups. It is associated with differences of supply and demand in various segments of the labour market. Because workers are inhomogeneous in terms of skills, abilities, willingness to work in certain circumstances, this leads to differentiation of their individual productivity and determines difference in wages. In addition, there are significant differences in the attractiveness of the work process as such. Producers are forced to pay the higher wage for unattractive job. Wage differences are explained by the fact that among the sellers of the labour services there is usually imperfect competition. It is associated primarily with geographically limited labour mobility, insti-
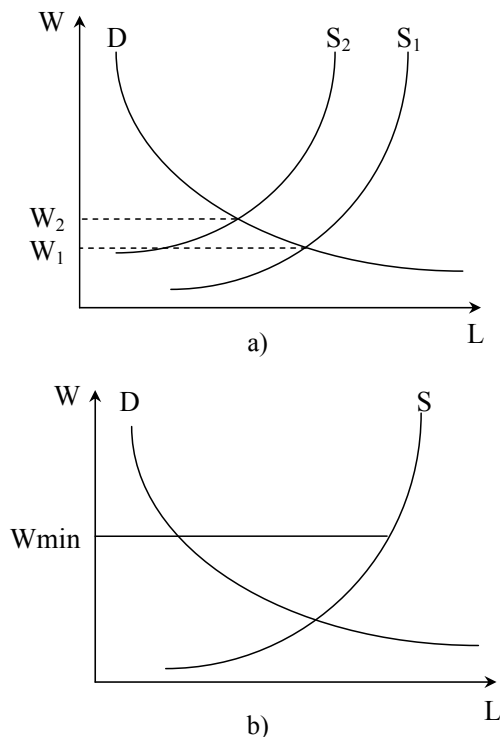
Fig. 12.3. The influence of trade unions on the mechanism of wage formation:
a – a closed trade-unionism, b – an open trade unionism

tutional constraints (one must have higher education or academic degree to possess some positions, etc.), social constraints of mobility.

Wage differentiation is largely explained by differences of previous investments in human capital. ***Investment in human capital*** is any action that enhances skills and abilities of the employee. These include expenditure on education, health care, improving of social mobility. Successful investment returns in the form of employee's wages growth. It is very important to be understood by the modern students.

12.2. THE ECONOMIC RENT

The term «rent» is used in everyday life rather widely, and may have a variety of meanings. To eliminate further confusion, it should be

noted that for an economist the ***rent*** is the price paid for the use of land and other natural resources, the amount of which *is rigidly limited*. The severe resource constraints distinguish the rent from all other types of revenue.

Let us make some assumptions: 1) we assume that all land has the same quality, 2) all land is used to produce only one product, and 3) the land is leased in a competitive market. Under these conditions, the supply curve of land is completely non-elastic (vertical straight line). The only active factor in the rent determining is the demand for land. In turn, it will depend on the prices of products which are grown on the land, productivity of the land and the prices of resources which are used together with the land. For example, if there is the price growth for products grown on the land, the demand curve for the land shifts to the right and the rent increases (R_2 vs. R_1). On the contrary, the prices rising for fertilizer (the use of which provides the desired level of land productivity) reduces the demand for the land, and, consequently, reduces the rent to the level of R_3. The negative impact of the demand factors may be so significant that the demand curve (D_4) and the supply curve do not intersect. Under these conditions, the land brings no rent to the owner (fig. 12.4).
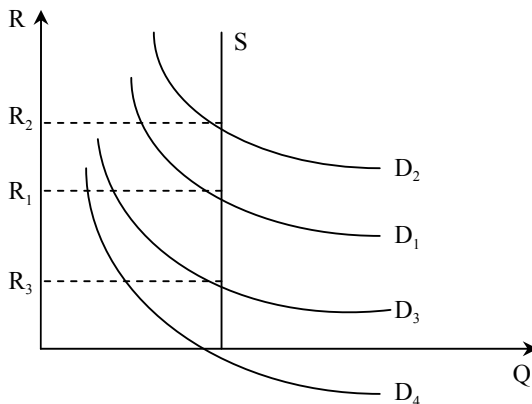
Fig. 12.4. Rent mechanism

As you can see, the rent changing does not affect the amount of the land proposed for use. While concerning other resources the price performs an **incentive function**, i.e. encourages resource owners to increase their supply in the market, in the case of the land the rent does not perform this function. Therefore, economists believe that the rent is

a surplus, i.e. payment which is not mandatory to ensure the availability of the land.

Until now we have assumed that the land has the same fertility. But in fact the quality of different land can differ quite substantially. Therefore, the same labour or capital in combination with the lands of different fertility brings different results. For the more fertile lands the average cost curve lies lower than it does for the less fertile ones. Therefore, users of the fertile land ceteris paribus receive additional economic profit, which is associated with persistent differences in soil quality. This extra profit is called the **differential rent**. Since the amount of land is limited and someone is already using the fertile land, then the differential rent can not be eliminated due to capital mobility. Therefore, the owners of the best land can get more rent, even in the long-run.

The fertility of the land could be changed by the human economic activity. The usage of modern technologies in agricultural production, the additional investments in the land can yield significantly better results compared to the traditionally used land. So these technologies generate the differences in the soil fertility, which can also generate a differential rent. They are less stable and can be eliminated if the competitors will shift to the same version of the land use.

Economic rents can be received not only by the owners of the land which is used for agricultural purposes but the owners of other absolutely limited natural resources as well. There may be a mineral deposit, attractive tourism area, the forces of nature (waterfalls, rivers, etc.). Mechanism of the rents' formation in these cases coincides with the one given above.

12.3. THE LOAN INTEREST

Money by its nature is not an economic resource. However, money is a means to buy all other factors of production. In addition, the spending of manufacturer's money to purchase the capital means the refusal of alternative variants of the money use (for instance, making loans). Consequently, the profit that could get the manufacturer if his money is handed as loan, is the *opportunity cost of capital*. Explanation of the pricing mechanism in the credit market means explanation of the process of forming of the alternative cost of capital.

The price of credit is called the interest rate. The ***interest rate*** is the price paid for the use of money. Most often it is considered not in the absolute value (as money), but in the relative one (as a percentage of the amount of borrowed money). For convenience, the lending rate, as a rule, is given on an annualized basis. If, say, somebody has received 10 000 UAH in credit and is to return 14,000 UAH a year later, it would mean that he had received money under 40% per year.

Since the credit granting and repayment are separated in time, there is a problem of losing money purchasing power due to inflation. Then one part of the payment covers the loss of the purchasing power and another part actually becomes the reward of the owner. It is necessary to distinguish the nominal and real lending rates. The **nominal rate** (r_N) is the interest rate which is denominated in monetary units at the current cash rate. The **real rate** (r_R) is the interest rate which is expressed in constant money or adjusted for inflation. So, if in the previous example the prices in the year grew by 1.25 times $(I_p = 1.25)$ then the purchasing power of 1 UAH at the beginning of the year is equal to the purchasing power of 1.25 UAH at the end of the year. If you re-calculate all the returned money taking into account the lowering of the purchasing power, then 14,000 USD would be equivalent to 11,200 USD (14,000 : 1.25 = = 11,200). Consequently, the real interest rate will be only 12%. The relationship between the nominal and real interest rates is shown by the following formula:

$$r_R = (100 + r_N) / I_p - 100.$$

The lending rate is formed depending on the demand and supply in the money market. However, there is no a unified interest rate for all cases. Credit granting can be differentiated depending on the procedure of the return, on state regulations, on the characteristics of the borrower, etc. Consequently, it is advisable to consider the factors which affect the interest rates.

The lender takes a risk while granting a credit, because the borrower may not return the money under certain circumstances. Therefore, the first factor that determines the specific level of the interest on the specific loans is the ***degree of risk*** (the probability of the money losing by lender). Here, the dependence is direct: *the larger the probability of not returning the money the greater the interest rate is*. However, the threat of the money losing can reach such level that it does

not offset by the increased interest. In these circumstances, the loan is not granted.

Some influence on the interest rate has a *size of the loan*. Ceteris paribus, the lender prefers large loans, as it reduces its costs to explore economic status of the borrower, to provide the loan services, etc. Consequently, *the lender agrees to provide large sums at the lower interest rates*.

The *term of loan* affects the interest rate in different way. Since in the long-run the probability of unexpected events is large*, the interest rate for the long-term loans will also be great* to reinsure the possible losses.

A state tax policy influences the interest rates as well. If the interest earned from the loan is not taxed or taxed at preferential terms, the cost of the loan will be smaller. So, while discounts on the bonds of the internal state loan have not been taxed in Ukraine, the yield was lower, i.e. it had been cheaper to get funds to the state. Once the tax was introduced, the price of the raising funds has increased.

12.4. ENTREPRENEURIAL REVENUE AND ECONOMIC PROFIT

Entrepreneurial revenue (or profit) is the revenue generated from implementation of the entrepreneurial skills. It consists of the normal and economic profit. The *normal profit* is minimal revenue which is required to keep the entrepreneur in a certain industry. As it has been already noted, the normal profit in its essence belongs to the internal (hidden) costs. The *economic profit* is the residue of total revenue after all costs deducting. In a competitive market, in a static economy, the economic profit is always zero.

Static economy is such economic system that is not subjected to a change, all cost figures and data on the supply of resources, on the one hand, and data on demand and revenue, on the other hand, are constant. Under these conditions, the future is fairly well predictable. If the economic profit occurs at some point, then it is to be liquidated by the known mechanism of capital mobility.

The economic profit exists in conditions of the dynamic changes in the economy with their inherent uncertainty. In the *dynamic economy*

all conditions for formation of supply and demand are uncertain. Therefore, the entrepreneur takes the risk that is associated with the expenses and the lack of guarantees to obtain both profits and the expended money. The economic profit is regarded as *a reward in taking risk* by economists.

We must distinguish two types of risk: the risk that undergoes insurance and uninsurable one. Anyone of us is constantly at risk when out of home or sits to drive a car to travel in difficult urban environment or even travelling by an airplane, etc. However, the risk of fire, theft, accidents is the risk that undergoes insurance. Insurance companies calculate probability of this or that insured event and offer customers the appropriate conditions of insurance.

Risks that can not be insured are the risks which are associated with uncontrollable and unpredictable changes in demand (revenue) and supply (cost). Economic gains and losses can be associated with risks which arise due to the cyclical and structural shifts in economy.

Another source of the economic profit is the monopoly power. It is associated with possibility of a monopolist to restrict production and affect the price of product in his favour. We discussed this in the previous section while considering the market of pure monopoly, monopolistic competition and oligopoly.

The economic profits as a reward in risk taking and extra revenue as a result of a monopoly position differ significantly from each other. To take the risk in a dynamic and uncertain economic environment is a socially necessary function of business. Therefore, obtaining of this type of the economic profit is socially justified.

Social necessity of the monopoly profits is very doubtful. Since, as a rule, it is accompanied by reduction of output and the rising prices over the lowest possible level for this technology, the community sees the profit as a kind of the monopoly tax imposed on buyers.

The profit is the ultimate goal of business activity. Expectation of the profit motivates an entrepreneur to find the best options for use of resources. The main function of the profits is to encourage innovations, to search for ways to improve technology. However, the profit reallocates resources between sectors of production as well. Appearance of the economic profit in a particular sector indicates the lack of resources and encourages entrepreneurs to commit resources to increase the supply in this sector. Conversely, the loss-making industry indicates over-

saturation of resources and encourages them to drain out of it. However, realisation of these profits functions may be constrained under imperfect competition.

The main terms and concepts

Competitive market of labour
Monopsony
Closed trade-unionism
Open trade-unionism
Bilateral monopoly
Differentiation of wages
Investments in human capital
Economic rent
Incentive function
Nominal interest rate
Real interest rate
Normal profit
Economic profit
Static economy
Uninsurable risks
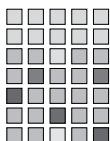
Part 5 GENERAL EQUILIBRIUM

Unit 13. ANALYSIS OF GENERAL EQUILIBRIUM AND EFFICIENCY

ANALYSIS OF GENERAL EQUILIBRIUM AND EFFICIENCY
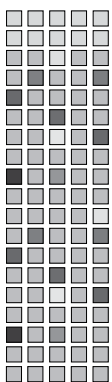
Until now we considered equilibrium of independent economic actors (equilibrium of a consumer or equilibrium of a firm) or independent sectors of a market (market of goods or market of resources). For a holistic understanding of the microsystem functioning we have to consider how the changing situation in one market is transformed into the changes in other markets. It is also necessary to analyze the mechanism of optimum resource allocation to achieve the best overall performance of the economic system.

13.1. ANALYSIS OF PARTIAL AND GENERAL EQUILIBRIUM

Analysis of partial equilibrium mentioned in the previous units, means studying of the equilibrium prices and equilibrium output in many specific markets that are components of the overall market system. However economy is the tough knot of different interconnections between economic agents. Economic impulse emitted by one of them is necessarily transmitted to others. Thus **analysis of general equilibrium** (i.e. comprehensive consideration of all relationships between markets and prices that make the market system as a whole) is essential.

Analysis of general equilibrium could be used for consideration of the long-run feedbacks caused by the price changes in the markets. The effect of feedback is a further change in the prices and volumes of goods and services in the certain markets in response to events caused by the changes in the prices in the related markets. Situation in Ukraine during early 1990-s gives better understanding of it. After breaking of traditional economic relationships and getting independence, oil supply to the markets in Ukraine decreased. The supply curve shifted to the left, leading to higher prices (see fig. 13.1a). It negatively affected the markets of those products which production required oil, including gasoline. The gasoline supply curve also shifted to the left, and the prices on it in-

creased (see fig. 13.1b). Gasoline, in turn, is a complementary good for cars. An increase in the gasoline prices has caused the reduced demand for cars (see fig. 13.1c), gasoline and respectively oil. In addition, the initial appreciation of oil caused the attempts to substitute it by coal. So, it caused the increased demand for coal (see fig. 13.1d). As a result of all these iterations the demand for oil reduced, leading to the lower prices for it. The economic pendulum started moving again but in the opposite direction: an increase in supply of gasoline – the lowering prices for it – the increasing demand for cars – increasing demand for gasoline – an increasing demand for oil – a rise of the oil prices. However, each successive impulse has less power than previous one. Thus, after several iterations potential of initial momentum was exhausted, and general equilibrium was set.

General equilibrium takes place when the prices respond to the initial change in demand or supply so that the volume of demand equals to

a) oil

b) petroleum

c) coal

d) cars
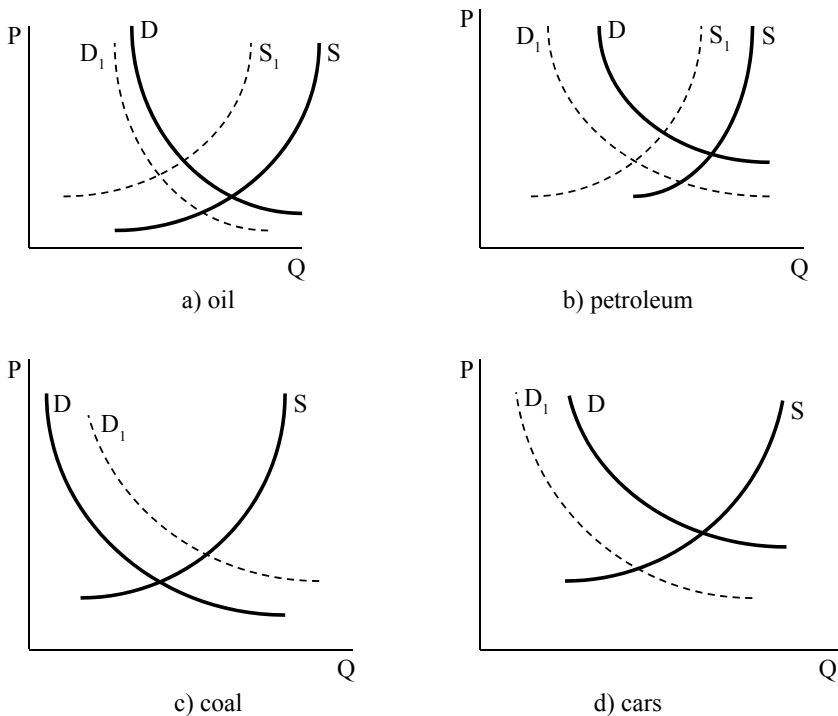
Figure 13.1. The feedback effect

the volume of supply in all markets. In these conditions there are no fur-
ther changes in demand or supply in any market.

13.2. THE EDGEWORTH BOX

In the example given above we have demonstrated the interconnec-
tion between the four markets. In fact the situation is more complicated.
But to understand the basic principles of general equilibrium the two-di-
mensional analysis is sufficient.

Suppose that economic system uses only two inputs (labor and cap-
ital). During a day it is possible to use 40 000 man-hours of labor and
20 000 machine-hours of capital for the production purposes. The total
volume of services inputs accessible over time is called **the resource
constraints of the economy**.

If it is possible to produce only two goods (X and Y) one can ar-
gue that the more X is produced the less opportunity for production of
Y remains and vice versa. In this case the resource constrains look like:

$$L = L_X + L_Y. \tag{13.1}$$

$$C = C_X + C_Y. \tag{13.2}$$

Edgeworth diagram (Edgeworth box) is a convenient tool for
analysis of the resources' distribution in the economy with a fixed
supply of labor and capital. It is a rectangle whose sides represent the
amount of resources, which could be used for production of two goods.
Each point in the chart corresponds to a variant of existing resources' al-
location to produce goods X and Y (see fig. 13.2).
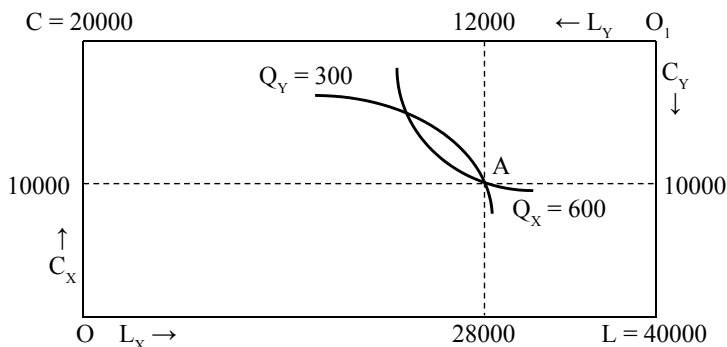
Figure 13.2. Edgeworth box

Point O in the diagram corresponds to the situation when no resources are distributed to production of X and O_1 point represents the same «no-resource» situation for production of good Y. Moving upwards along the vertical axis means the increasing amount of capital distributed to production of X while amount of capital distributed to production of Y is decreasing. It is the same with horizontal axis which demonstrates allocation of labor situation. For instance, point A represents situation when production of the good X takes 10 000 working hours of capital and 28 000 working hours of labor. Production of the good Y takes the rest 10 000 working hours of capital and 12 000 working hours of labor.

To find what amounts of X and Y will be produced with such allocation it is necessary to put relevant isoquants passing through point A. In our case (fig. 13.2) the amounts of production are 600 units of X and 300 units of Y.

Thus, each point at the Edgeworth box meets certain value of six variables: L_X, L_Y, C_X, C_Y, Q_X, Q_Y.

13.3. PRODUCTION EFFICIENCY

To answer the question if allocation represented by the point A is effective or not one should analyse Edgeworth box.

Allocation is effective if it is not possible to re-allocate available resources and produce more of one good while keeping the same production of another good. According to this principle allocation represented by the point A is not effective because we can move along the isoquant $Q_X = 600$ to the left and reach the points which represent more Y and the same quantity (600 units) of X.

It is easy to notice that effective allocation is reached if isoquant Q_X is tangent to isoquant Q_Y. Variants with crossing isoquants are ineffective (see fig. 13.3).

In the points of contact angles of X-isoquant and Y-isoquant coincide. So, it is possible to affirm that affective allocation of resources in production is reached if the marginal rates of technological substitution of labor for capital are equal to each other in production of the good X ($MRTS_{LK}^X$) and in production of the good Y ($MRTS_{LK}^Y$) :

$$MRTS_{LK}^X = MRTS_{LK}^Y. \qquad (13.3)$$
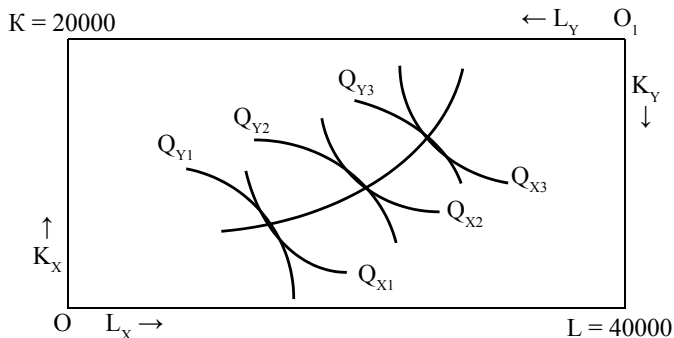
Figure. 13.3. The production contract curve

All points of tangency form a curve called the **production con-tract curve**. This curve shows all combinations of resources directed to production of the goods X and Y which provide effective allocation.

It is easy to derive the **transformation curve** from the produc-tion contract curve. The transformation curve consists of the points the coordinates of which are possible combinations of the goods X and Y. This combination corresponds to the limit of production with giv-en technology and full use of resources. Every point of the curve sug-gests how much of one good could be produced if we have to produce certain quantity of another good. This is the essence of production re-strictions (fig. 13.4).
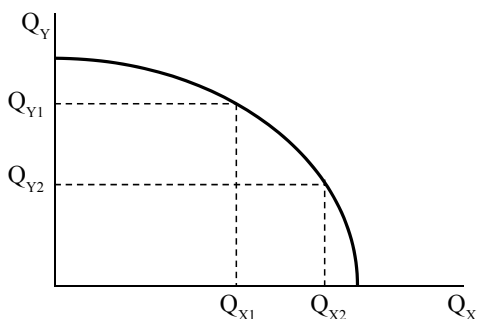
Fig. 13.4. The transformation curve

Using the transformation curve one can find the marginal rate of transformation which is equal to the quantity of the good Y is to be lost in exchange for additional unit of the good X:

$$MRT_{XY} = -\Delta Q_Y / \Delta Q_X. \tag{13.4}$$

Trigonometrically the marginal rate of transformation is the slope (or more correct the tangent of the slope) of the transformation curve multiplied by (–1). Also it is possible to derive it from the marginal costs of the respective goods production:

$$MRT_{XY} = MC_X / MC_Y. \tag{13.5}$$

13.4. EXCHANGE AND EFFICIENCY OF DISTRIBUTION

Distribution is effective if the goods are distributed among the consumers so that it becomes impossible to improve situation without any damage to someone else. We can build Edgeworth box for the case of distribution. Let one of the points on the transformation curve corresponds to production of: $Q_X = 400$; $Q_Y = 300$. These volumes are distributed to the consumers A and B in proportions corresponding to the point C (fig. 13.5).
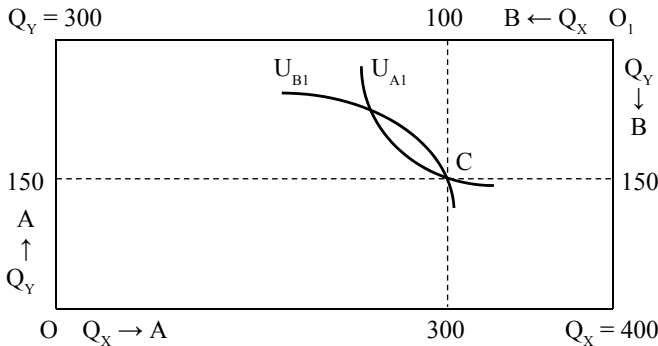
Figure. 13.5. Analysis of distribution in Edgeworth box

To find how consumers A and B are satisfied we portray the relevant indifference curves U_{A1} and U_{B1} through the point C. One can see that distribution suggested by the point C is ineffective. Moving along the indifference curve U_{A1} could provide better situation for consumer B while satisfaction of consumer A remains the same.

Distribution of certain quantity of two goods to the two consumers is effective if it corresponds to the tangent point of their indifference curves (fig. 13.6).
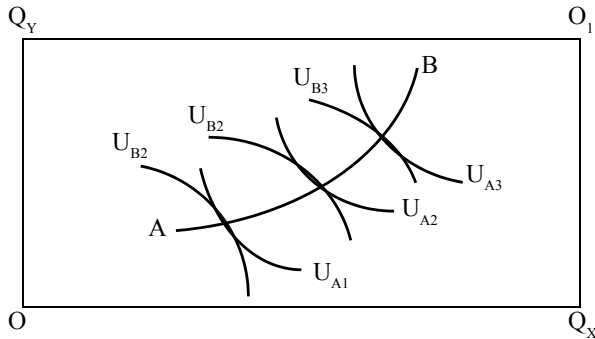
Figure 13.6. Effective distribution

Since in the tangent points the slopes of the indifference curves are the same, the marginal rates of substitution are the same too:

$$MRS_{XY}{}^{A} = MRS_{XY}{}^{B}. \tag{13.6}$$

The curve *AB* consists of all the tangent points of all indifference curves of two combined indifference maps for two consumers and is called the **contract curve**. It shows all possible effective variants of two-goods distribution to two consumers.

If both resources and goods are allocated so as thre is no possibility to improve condition for one person without making situation worse for another person, the **Pareto-optimum allocation** is reached. To achieve such effectiveness means that there is no chance to get additional gains by re-allocation or exchange between consumers. Therefore, conditions necessary for optimum Pareto distribution of resources can be represented in the form of equality:

$$MRS_{XY}{}^{A} = MRS_{XY}{}^{B} = MRT_{XY}. \tag{13.7}$$

For the economy there is a set of the effectiveness points, for those this equality is performed. All of these points form the **curve of consumer opportunities**. It shows the level of utility the consumers gain at all possible variants of effective allocation (fig. 13.7).

Each point on the curve of consumer opportunities corresponds to the effective way to allocate resources and product. If this curve is reached it is impossible to improve the situation for one person without harming another.
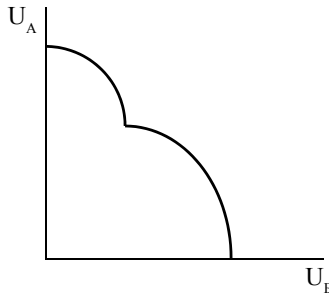
Fig. 13.7. The curve of consumers' possibilities

Does the economic system actually provide effective allocation of product and resources? As it has been noticed in the previous section, only the competitive market can provide this performance. All other models modify the distribution mechanism leading to incomplete use of some resources and higher prices for products in comparison with the competitive market. However, this does not warrant unambiguously assessing perfect competition as the best and all other models so as to be eliminated. Each has some positive consequences of the operation, supplementing each other and all together they form a real mechanism of microsystem.

The main terms and concepts

Partial equilibrium analysis
General equilibrium analysis
Feedback effect
General equilibrium
Resource restrictions
Effectiveness of production
Transformation curve
Marginal rate of transformation
Effective distribution
Contract curve
Pareto-optimum allocation
Consumer's possibilities curve
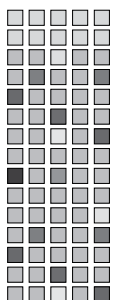
Part 6 COMPLETE SET OF METHODICAL MATERIALS FOR STUDENTS' SELF-STUDY, CONTROL AND SELF-CONTROL OF STUDENTS' KNOWLEDGE

THEME 1. SUBJECTS AND METHOD
OF MICROECONOMICS

Questions covering the matter of the theme

1. Subject of studying in microeconomics. Main stages of evolution in microeconomics. Three main problems of microeconomics. Functions of microeconomics. Robin Hood's effect.

2. Economic model. Economic variables. Exogenous and endogenous values. Marginal and functional analysis. The main features of microanalysis. Methods of microeconomic research: methods of statics and dynamics. Economic experiments.

3. The main subjects of microeconomics: households, businesses, and a state. Objects of microeconomics. Properties of economic resources. Efficiency in distribution and production. Types and models of market economy. Distinctive features of market relationship. Circulation of money and commodities.

Questions for students' self-study

1. Economic experiments and their types.
2. Types and models of market economy
3. Efficiency in distribution and production

Exercises for control and self-control of students' knowledge

Exercise 1. For each statement given below find a corresponding term or concept.

1. Part of theoretical science which defines economy as an integral system, forms objectives of economic policy, defines tools necessary for its realization.

2. Part of theoretical science which defines interaction of individual economic entities at the level of local markets.

3. Individual subjects or groups which combine their profits and make decisions concerning expenses jointly.

4. Science which studies economic relationship concerning production, distribution, exchange and consuming of material benefits and services.

5. Economic entity which makes individual decision concerning production and sale of goods.

6. Knowledge, explanation and forecasting of objectively existing economic phenomena and processes.

7. Finding out of the conditions for achievement of economically maximal result under existing expenses, estimation of the correctness of made decisions.

8. System of interconnection between economic variables which allow to forecast the result.

9. Scientific assumption used for explanation of any phenomena which requires practical verification and theoretical substantiation to become a trustworthy theory.

10. Controversy between interim and final results.

Terms and concepts:
a) Political economy
b) Robin Hood's effect
c) Household
d) Positive analysis
e) Macroeconomics
f) Economic model
g) Microeconomics
h) Hypothesis
i) Firm
j) Normative analysis

Exercise 2. Find the right answer
1. Economic model is not:
a) An ideal type of economics or policy
b) A tool for economic forecasting
c) A complex of economic principles
d) An explanation for functioning of economy and its individual sectors

2. What does microeconomics study from the listed below:
a) Production in the scale of the whole economy
b) The number of persons employed in economy
c) General level of the prices
d) Production of milk and dynamics of its price?

3. What stage is in top priority for model construction:
a) Cognition of motives for subjects' behavior

b) Quantitative exposure of interrelations
c) Collection and treatment of the facts
d) Knowledge of subjects' interaction?

4. The main motive of economic subjects' behavior is:
a) Maximization of benefits
b) Minimization of risk
c) Help for neighbor
d) Consumer goods production

*5. General level of the prices and unemployment are studied in the
course:*
a) Microeconomics
b) Macroeconomics
c) Management
d) International finance

6. Normative analysis is:
a) Explanation of correctness and wrong economic activities
b) Explanation and forecasting of economic activities
c) Examination of the legal acts
d) There is no right answer

7. Macroeconomics is the science which studies:
a) Behavior and interrelation of the individual subjects
b) Economic relations between people
c) Economy as a whole
d) The way of the household rational management

8. Structure of the modern economy is formed by:
a) Microeconomics, economic theory, macroeconomics
b) Microeconomics, political economy, macroeconomics
c) Political economy, macroeconomics, economics
d) Microeconomics, macroeconomics, economics

*9. The following ones do not belong to the subjects of macroeco-
nomics:*
a) Household
b) Ministries and authorities

c) Firms
d) State

10. Microsystem is:
a) Relationship system
b) System of the points of view
c) System of economic issues
d) System of the legislative acts

11. As an individual part of the economic science microeconomics appeared:
a) At the end of the XXth century
b) At the end of the XIXth century
c) In the XVIth century
d) In the XVIIth century

12. The representative of the physiocrats' school is:
a) Antoine Montchrestien
b) Adam Smith
c) François Quesnay
d) David Ricardo

13. The science which studies the households' profitability increase is:
a) Oikonomia
b) Chrematistics
c) Microeconomics
d) Macroeconomics

14. The term «economics» got the total recognition after it had been used in the title of the work:
a) J.B. Say
b) J.S. Mill
c) A. Marshall
d) J.M. Keynes

15. Macroeconomics is defined as a science which studies:
a) Role of the state in economy

b) The global tendencies of the mankind economic development
c) Economic processes going in national economy
d) The same issues which political economy studies

16. If we study economy as an integrated system, this analysis is:
a) Macroeconomic
b) Microeconomic
c) Positive
d) Normative

17. Which of the following cannot be included into the microeconomic methods:
a) Equilibrium analysis
b) Marginal analysis
c) Modelling
d) Contact analysis

18. Macroeconomic analysis is characteristic for:
a) Neoclassical theory
b) Keynes theory
c) Institutionalism
d) Marxism

Exercise 3. Define which statement is true, and which one is false. Explain your answer.
1. Microeconomics is the branch of economic science which studies the behavior of the independent business units.
2. Political economy studies the theoretical issues of the market economy functioning.
3. Normative analysis is investigation of interconnections between economic phenomena and behavior of the economic objects.
4. Economic model is unrelated economic changes, which influence the activity forecast.
5. Theoretical economics is the general methodic basis of all economic research.
6. Robin Hood's effect is the total interaction between the intermediate and final results.

7. A firm is the subject which deals with industrial consumption of resources.

8. The starting point in microeconomics is the thesis about rationality of the economic subjects' behavior.

9. Microeconomics is the science which studies economic behavior of the individual business subjects.

10. A state is considered only as a producer of some goods in microeconomics.

Exercise 4. Problem situations to perform individual tasks and/or discussion during seminars.

1. Is the state regulation of the environmental protection appearance possible under the unlimited natural resources conditions? Does the pollution of the planet with the waste prove the thesis that the market economy can't give the right answers to economic questions: what to produce and how to produce?

2. According to the statistic data majority of Ukrainian population lives below the poverty line. Does the scarcity of the production factors influence this economic index?

3. All economic resources are scarce. Is the capital scarce in the society with the constant process of new technologies discovery? Explain your answer.

THEME 2. THEORY OF A CONSUMER CHOICE

Questions covering the matter of the theme

1. Needs. Consumer preferences. Model of the consumer choice. Ranging of the alternative needs satisfaction. Transitivity of the consumer's preferences.

2. Utility. Function of utility and the indifference curves. Function of utility by R. Stone. A grid of the consumer. The indifference curve. The map of the indifference curves. The properties of the map of the indifference curves. The marginal rate of substitution. Marginal utiity.

3. The budget. Consumer budgetary restrictions. The line of budgetary restrictions. Influence of the revenue changes and the prices on position of the line of budgetary restrictions.

4. Consumer's equilibrium. Equimarginal principle. Internal equilibrium of the consumer. Angular equilibrium of the consumer. Equilibrium of the consumer for ideal complementary goods.

Questions for students' self-study
1. Function of utility by R.Stone.
2. Angular equilibrium of the consumer. Equilibrium of the consumer for ideal complimentary goods.

Exercises for control and self-control of students' knowledge
Exercise 1. For each statement given below find a corresponding term or concept.

1. Ranks which are established by the consumer for alternative opportunities of his needs satisfaction.

2. Satisfaction which economic subject receives during consumption of these or those goods or services or certain type of activity.

3. Money volumes which a consumer is able to spend on the purchase of goods and services during the certain period of time.

4. Satisfaction brought by the additional unit of product consumption to consumer.

5. Goods quantity which the consumer is ready to refuse for consumption of the additional unit of the other product.

6. If the consumer prefers the good A in comparison with the good B, the good B in comparison with the good C, he prefers the good A in comparison with the good C.

7. Combinations of the sets of the goods A and B which bring the consumer equal utility.

8. Condition of the consumer under which he purchases goods at the certain prices in such volumes that he uses, his total revenue and maximizes utility.

9. Marginal utilities of the goods per one price unit are equal.

10. The line which graphically shows the sets of goods the purchase of which requires the same expenses.

11. The set of variants of the consumer choice, each of which has the same utility.

Terms and concepts:
a) the budget;

b) the equilibrium of consumer;

c) consumers' preferences;

d) the indifference curve;

e) the marginal rate of substitution;

f) equimarginal principle

g) utility;

h) marginal utility;

i) transitivity;

j) budgetary restrictions;

k) a grid of the consumer

Exercise 2. Find the right answer.

1. Product has a utility if:

a) It needs an increasing volume of resources for production;

b) It shows the law of demand;

c) It is able to satisfy any of consumer's needs;

d) It is affordable for consumer in price.

2. Marginal utility is defined as:

a) growth of the total utility under the increase of consumption

b) volume of the good per one unit;

c) relation of the total utility to the volume of consumption;

d) sum of the total demand for the good;

e) utility which the consumer refuses to get the additional unit of the other good.

3. Which of the sets of the goods are equal in terms of their utility for the consumer:
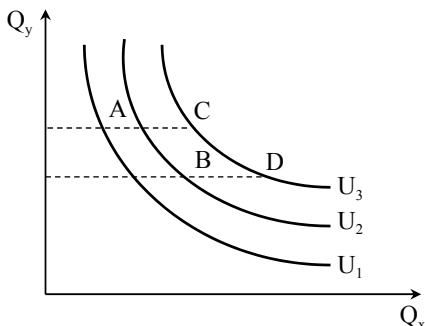
a) A and B;

b) A and C;

c) B and D;

d) C and D?

4. Find the false answer among the given statements:

a) Each point on the indifference curve means different combinations of the two goods;

b) Each point on the line of the budgetary restrictions means different combinations of the goods;

c) All points on the indifference curve mean the same level of the needs satisfaction;

d) There is no right answer.

5. Which of the following lists of changes of the total utility under the influence of increasing output per unit illustrates the effect of the law of the diminishing marginal utility:

a) 400; 500; 600; 700;

b) 200; 250; 270; 280;

c) 200; 400; 700; 1 000;

d) 150; 350; 450; 600.

6. The price per unit of the good A is 1,5 UAH, and the good B – 1 UAH. If the consumer evaluates the marginal utility of the good B as 30 conditional points, then at which marginal utility of the good A will he maximize the utility of these two goods set:

a) 45 points;   b) 30 points;   c) 20 points;   d) 15 points?

7. Position and slope of the indifference curve for an individual consumer depends on:

a) his preferences and revenue volume;

b) the prices for the goods;

c) his preferences, revenue and prices for the goods;

d) only on consumer preferences.

8. The law of diminishing marginal utility illustrates:

a) the decrease of the utility of the goods under the increase of the consumer's revenue;

b) equality of the marginal utilities per one unit of their price;

c) the decrease of the utility from each additional unit of the good for a consumer;

d) relation of the marginal utilities to the prices for the goods of prime necessity.

9. The total utility increases only when the marginal utility:
a) decreases;
b) is the positive value;
c) increases;
d) increases slowly.

10. Theory of the consumer behavior assumes that consumer is able to maximize:
a) total utility;
b) marginal utility;
c) average utility;
d) each of the listed values

11. To maximize the utility of the limited budget a consumer must:
a) not buy the inferior goods;
b) be sure that the price for each good equals marginal utility of money;
c) distribute revenue in the way according to which the last money unit, spent on the good purchase, would bring the same growth of utility as a money unit, spent for the purchase of the other good;
d) to balance the marginal utilities of the last purchased units of the goods.

12. If the consumer chooses the combination which is the point with the coordinates on the plane, limited with the budgetary line, he:
a) maximizes utility;
b) wants to purchase more goods than the budget allows;
c) uses his budget partially;
d) is in position of consumer equilibrium.

13. $U = f(Q_x Q_y \ldots Q_n)$ – is the function of:
a) marginal utility;
b) the indifference curve;
c) total utility;
d) the budgetary line.

14. The utility of each new portion of the good:
a) is more than the previous one;

b) equals to the previous one;

c) is less than the previous one;

d) there is no right answer.

15. Two sets of the goods which have the same utility:

a) belong to the same indifference curve;

b) are on the same supply curve;

c) are on the same line of the budgetary restriction;

d) are on the same demand curve.

16. Mr. Sidorchuk thinks that 8 glasses of milk and 3 glasses of kefir or 6 glasses of milk and 4 glasses of kefir have the same utility for him. In this case the marginal rate of substitution equals:

   a) 6:4;   b) 4:6;   c) 2:1;   d) 1:2.

17. Which of the given variants can explain the shift of the budgetary line into a new position which is marked with the dotted line:
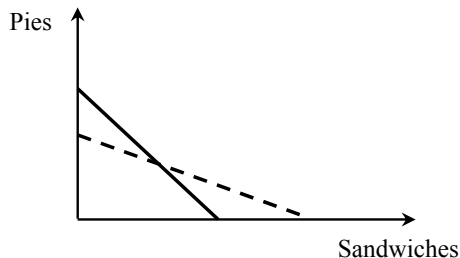
a) the price for sandwiches reduced, pies price rose, revenues changed;

b) the price for sandwiches and revenue reduced;

c) the price for pies increased, revenue increased;

d) everything mentioned is right/

18. Victor has noticed that he gets 10 extra units of utility from consumption of the chocolate bars and additional 20 extra units of utility from consumption of the last portion of banana ice cream. The price bars – 2 UAH, banana ice cream – 5 UAH. How will Victor behave for maximization of the total utility under the budgetary restrictions:

a) will consume more bars and less ice-cream;

b) will consume more ice-cream and less bars;

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**PART 6. COMPLETE SET OF METHODICAL MATERIALS FOR STUDENTS'
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c) will leave consumption without changes;

d) will consume both more bars and ice-cream.

19. The slope of the budgetary line shows:

a) quantity of the one good which the consumer is ready to change for the same amount of the other good to stay at the unchangeable level of welfare;

b) consumption limits of the two goods under the certain prices for them;

c) correlation of the prices for the two goods;

d) an increase of the marginal rate of substitution of one good for the other one.

20. The budgetary line will take a position which is shown with the dotted line in the graph under the condition of an increase of the price for the good A and a decrease of the price for the good B:

a)   b)   c)   d)
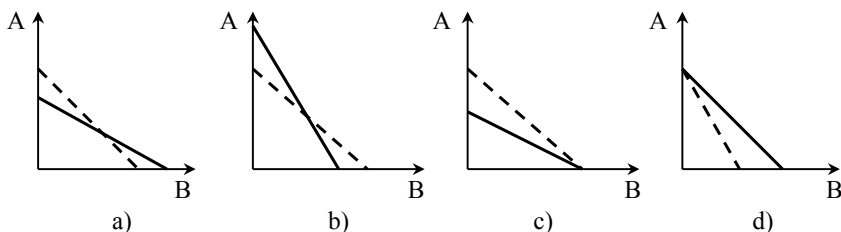
Exercise 3. Solve the tasks.

3.1. Formulas which should be used for the tasks solving:

1. Function of utility:

$$U = f(Q_x\, Q_y \ldots Q_n),$$

where U – utility, $Q_x\, Q_y, \ldots Q_n$ – volumes of the corresponding goods consumed.

2. Marginal utility:

$$MU = \frac{dU}{dQ}.$$

3. The marginal rate of substitution:

$$MRS = -\frac{\Delta Q_y}{\Delta Q_x} = \frac{MU_x}{MU_y}.$$

4. Budgetary restrictions of the consumer:

$$I = P_X Q_X + P_Y Q_Y,$$

where P_X and P_Y are the prices of corresponding goods.

5. Equimarginal principle:

$$\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}.$$

3.2. Examples of the tasks solution.

1. Yuriy is sure, that while he has a cold, 6 spoons of honey per one glass of the hot milk help in the same way as 3 spoons of honey per 2 glasses of milk. What is the marginal rate of substitution of the milk for honey?

Solution:

The marginal rate of substitution of the milk for honey is the number of the glasses of milk (y), the consumer is able to refuse, to get the additional spoon of honey (x).

Thus, the number of spoons of honey – Q_X, the number of the glasses of milk – Q_Y.

Marginal rate of substitution:

$$MRS = -\frac{\Delta Q_y}{\Delta Q_x},$$

where $Q_{X1} = 6$, $Q_{X2} = 3$ $\Rightarrow \Delta Q_X = Q_{X2} - Q_{X1} = 3 - 6 = -3$

$Q_{Y1} = 6$, $Q_{Y2} = 3$ $\Rightarrow \Delta Q_Y = Q_{Y2} - Q_{Y1} = 2 - 1 = 1$

$$MRS = -\frac{1}{-3} = \frac{1}{3}$$

Thus, to get one more spoon of honey, consumer can refuse 1/3 glasses of milk.

Answer: the marginal rate of substitution of milk for honey – 1/3.

2. The consumer spends his revenue 1000 UAH to buy candies at the price P1 = 20 UAH per 1 kg and juice at the price P2 = 10 UAH per 1 liter. Consumer preferences are defined with the following function of utility: $U(x_1, x_2) = x_1^{1/4} \cdot x_2^{1/2}$.

Determine the optimal set of the consumer.

Solution:

The optimal set of the consumer is the set of the goods which the consumer consumes in condition of equilibrium. The condition of equilibrium is the equimarginal principle:

$$\frac{MU_1}{P_1} = \frac{MU_2}{P_2} \qquad (2.1)$$

We will find the marginal utilities of candies and juice as the partial derivatives of the functions of two variables:

$$MU_1 = \frac{\partial U}{\partial x_1} = \frac{1}{4} x_1^{-3/4} \cdot x_2^{1/2}$$

$$MU_2 = \frac{\partial U}{\partial x_2} = \frac{1}{2} x_1^{1/4} \cdot x_2^{-1/2}.$$

Put into the formula (2.1):

$$\frac{1}{4} \frac{x_1^{-3/4} \cdot x_2^{1/2}}{P_1} = \frac{1}{2} \frac{x_1^{1/4} \cdot x_2^{-1/2}}{P_2}.$$

Cut the formula and put the known values of the prices:

$$\frac{1}{40} \frac{x_2^{1/2}}{x_2^{-1/2}} = \frac{1}{10} \frac{x_1^{1/4}}{x_1^{-3/4}}$$

$$\frac{1}{40} x_2^{1/2+1/2} = \frac{1}{10} x_1^{1/4+3/4}$$

$$x_2 = 4x_1.$$

In the other hand, the optimal values must meet the equation of budgetary restriction:

$$I = P_1 x_1 + P_2 x_2$$

$$1000 = 20x_1 + 10x_2$$

Get the following system of algebraic equations with two unknown.

$$\begin{cases} x_2 = 4x_1 \\ 1000 = 20x_1 + 10x_2 \end{cases} \Rightarrow \begin{cases} x_2 = 4x_1 \\ 1000 = 20x_1 + 10 \cdot 4x_1 \end{cases} \Rightarrow$$

$$\Rightarrow \begin{cases} x_2 = 4x_1 \\ x_1 = 50 \, / \, 3 \end{cases} \Rightarrow \begin{cases} x_2 = 200 \, / \, 3 \\ x_1 = 50 \, / \, 3 \end{cases}$$

Solution of the system is the optimal set of the goods of the consumer who maximizes the utility under the defined budgetary restriction.

Answer: optimum set of the goods $\begin{cases} x_2 = 200 \, / \, 3 \\ x_1 = 50 \, / \, 3 \end{cases}$.

3.3. Tasks for individual solution.

1. There are two goods in the consumer's set: A and B. The price per unit of the good A is 14 UAH, the good B – 10 UAH. The total revenue which can be spent by the consumer to purchase goods – 120 UAH. Fill in the table and analyze which quantity of the goods A and B the consumer will consume under the equilibrium condition and what total utility under this condition will be.

Quantity of the good	good A			good B		
	Total utility	Marginal utility	Relation of the marginal utility to the price	Total utility	Marginal utility	Relation of the marginal utility to the price
1	8			10		
2	20			20		
3	28			27		
4	35			33		
5	41			36		

2. Andriy likes to consume fresh juices for breakfast. According to his own tastes he completed the table of utility. Show Andriy's preferences graphically using the indifference curve.

Tomato juice (glasses)	2	1	2	1	3	3
Apple juice (glasses)	2	0,5	1	3	1	3
Utility	40	20	35	40	40	50

3. Sergiy and Volodya believe that it is equal to buy 8 bottles of «Coca-cola» and 3 bottles of «Fanta», or 6 bottles of «Coca-cola» and 4 bottles of «Fanta» at the same time. Find the marginal rate of substitution of «Coca-cola» for «Fanta».

4. Oleksandr's budget equals 30 UAH. On the base of the table values check if Oleksandr maximizes the utility of goods consumption.

Values	good A	good B
Quantity of the goods, units.	10	15
Total utility	200	100
Marginal utility	50	40
Price, UAH	1	2

5. Recognizing the weekly consumption level, Petro concluded that he got 20 points of utility from consumption of the last chocolate and 40 points – from the last cake. What should Petro do to maximize the utility of these goods consumption, if the chocolate costs 5 UAH, the cake – 2 UAH?

6. Sergiy's revenue – 10 UAH. The box of matches costs 5 ko-pecks and cigarettes – 1 UAH. What is the slope of Sergiy's budget re-striction if he spends the total amount of revenue for matches or ciga-rettes?

Exercise 4. Define which of the statements is true, and which one is false. Explain your answer.
1. All points along the budgetary line man the same level of the money revenue.
2. The indifference curves never cross.
3. Consumers' preferences are transitive.
4. Greater quantity of the goods is of more priority than the less one.
5. The far the indifference curve is from the origin of the coordinates, the less utility it shows.
6. Under the decrease of the price for the good X the budgetary line shifts to the right while the angle remains unchangeable.
7. Under the consumer's revenue increase the budgetary line shifts to the right.
8. Equilibrium under which the consumer consumes only one of the goods is called internal equilibrium.
9. Function of utility is relation between the volume of consumption and the level of satisfaction of the consumer.
10. The general equation of the consumer equilibrium is: $MUx = MUy$.
11. A set of the indifference curves is called the map of the indifference curves.

12. The total utility always increases under the increase of the level of consumption.

13. The consumer maximizes the utility when his budgetary line croses the indifference curve.

14. If you purchased more units of any product, your marginal utility would increase.

15. If the marginal utility decreases, the total utility decreases as well.

16. Each point along the indifference curve shows the same revenue of the consumer.

Exercise 5. The problem situations to perform the individual tasks and/or discussion during seminars.

1. The «dogma of A.Smith» is studied in economic theory. According to this paradox the water has more utility then diamonds. Then why does water cost less than diamonds? Explain your answer.

2. It is necessary to have 20 rolls of wall paper to perform the repairing works in a flat. You have just 19 rolls. Is there a contradiction in the law of diminishing marginal utility, if the repairs cannot be completed without the 20th roll? Which utility will this roll of wall paper have?

3. The curve of the marginal utility and the demand curve have the same slope. How can you explain this correspondence?

THEME 3. MODELLING OF A CONSUMER'S BEHAVIOR IN THE COMMODITY MARKET

Questions covering the matter of the theme

1. Formula and the line of expanded budgetary restrictions. The indifference curve at the choice of the goods X from the whole mass of the goods**.** The «revenue – consumption» curve. Superior and inferior goods. The «revenue – consumption» curves for different categories of the goods. Engel laws. Engel curve. Tornquist curves.

2. The «price – consumption» curve. Demand and the curve of individual demand.

3. Revenue effect and substitution effect: essence, influence on consumption of the superior and inferior goods. Revenue effect and substitution effect by J. Hicks and S. Slutskyi. Giffen goods.

Questions for students' self-study

1. Tornquist curves.

2. The revenue effect and substitution effect by J. Hicks and S. Slutskyi.

Exercises for control and self-control of students' knowledge:

Exercise 1. For each statement listed below find the corresponding term or concept.

1. The curve which shows the dependence between the change of the value of consumption and the consumer's revenue change.

2. The goods demand on which decreases under the revenue increases and increases under its decrease.

3. The line which connects all consumer's equilibrium points according to his revenue increase.

4. The goods demand on which increases under the revenue increase.

5. The line which connects all points of the consumer's equilibrium under the price change for the goods from the consumption set.

6. Impact of the price change for one product from the consumption set on the structure of these goods consumption.

7. The inferior goods which take the significant place in the consumer's budget and have the ascending curve of demand.

8. Impact of the price change for one product from the consumption set on the real consumer's revenue.

9. The goods demand on which increases sharply under the revenue increase.

10. There is a demand increase for the inferior goods under the price increase on them.

Terms and concepts:

a) revenue effect;

b) inferior goods;

c) Giffen paradox;

d) substitution effect;

e) the «revenue-consumption» line;

f) Giffen goods;

j) superior goods;

h) neutral goods;

i) the «price-consumption» line;

j) Engel curve.

Exersice 2. Find the right answer.

1. The curve «revenue-consumption» shows:

a) independence of the the goods consumption on revenue;

b) dependence of the goods consumption on the prices;

c) goods combinations which give the consumer a certain satisfaction level;

d) all points of consumer's equilibrium according to his revenue increase.

2. Under the definite prices the part of the family budget for the food tends to:

a) increase with the revenue increase;

b) decrease with the revenue increase;

c) decrease with the revenue decrease.

d) there is no right answer.

3. What is shown in the graph:
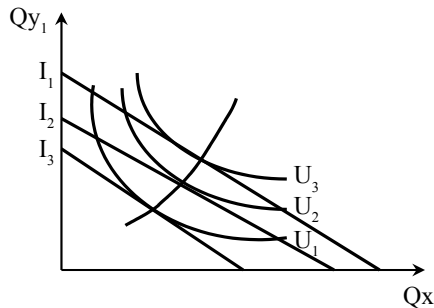
a) Engel curve;

b) the «price-consumption» curve;

c) the «revenue-consumption» curve;

d) Giffen paradox.

4. The consumer recognizes the goods as inferior ones when:

a) consumption of the goods doesn't depend on revenue;

b) consumption of the goods decreases with the increase of revenue;

c) consumption of the goods increases with the increase of revenue;

d) consumption of the goods doesn't depend neither on revenue nor on price

5. If the inferior goods consumption tends to increase with the increase of revenue, this is:

a) Engel law;

b) the substitute effect;

c) Giffen paradox;

d) the revenue effect.

6. If for the good A the volume of demand increases together with the price, then the good A is:

a) Giffen goods;

b) ordinary goods;

c) inferior goods;

d) everything is right in a and b.

7. For which category of the goods is the Engel curve shown:
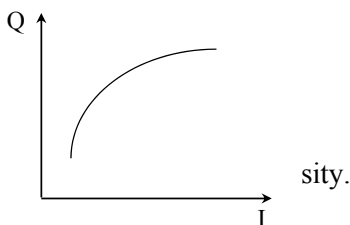
a) for normal goods;

b) for inferior goods;

c) for superior goods;

d) for the goods of the prime necessity.

8. If the price for the goods increases, the substitute effect means:

a) a decrease of the goods consumption and an increase of the other goods consumption;

b) a decrease of consumption just for the given goods only;

c) a decrease of consumption for the given goods and other goods;

d) a decrease of consumption of the given goods and no changes in consumption of the other goods.

9. The revenue effect means that:

a) an increase of the money revenues gives an opportunity for consumer to purchase less amount of the normal goods;

b) a decrease of the price for the goods which allows the consumer to purchase more of the goods because it is cheaper in comparison with the other goods;

c) consumers will choose different combinations of the different goods, while the marginal utilities of the last purchased units of the goods will be equal;

d) if the price for the goods decreases, the consumer has the opportunity to purchase more goods according to the level of the money revenue.

10. If the price for the normal goods A decreases, then:

a) the revenue and substitution effects allow the consumer to purchase more goods;

b) the revenue and substitution effects allow the consumer to purchase less goods;

c) the revenue effect allows to purchase less goods, substitute effect – more goods;

d) the revenue effect allows to purchase more goods, the substitution effect – less goods.

11. If the price for the goods increases, the substitution effect motivates the consumer to purchase less goods, because:

a) real consumer's revenue decreases;

b) real consumer's revenue increases;

c) a product is less expensive in comparison with the other goods;

d) a roduct is more expensive in comparison with the other goods.

12. For Giffen goods:

a) the substitution effect is bigger than the revenue effect;
b) the substitution effect is smaller than the revenue effect;
c) consumption volume increases with the revenue increase;
d) the demand line has the negative slope.

13. The substitution effect is shown in the given graph:
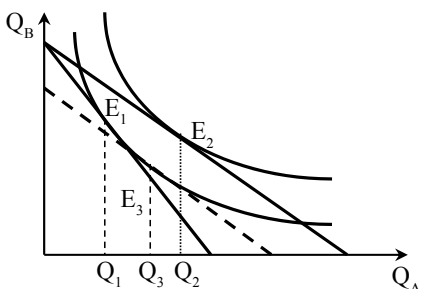
a) segment $Q_1 - Q_3$;
b) segment $Q_1 - Q_2$;
c) segment $Q_3 - Q_2$;
d) segment $E_3 - E_2$.

14. In the given graph in test 13 the revenue effect can be expressed as:

a) segment $Q_1 - Q_3$;   c) segment $Q_3 - Q_2$;
b) segment $Q_1 - Q_2$;   d) segment $E_3 - E_2$.

15. If the «revenue-consumption» curve has the positive slope, then
a) both goods are normal;   c) both goods are inferior;
b) one product is inferior;   d) all answers are wrong.

16. The substitution effect works when:
a) a decrease of the money revenues motivates the consumer to purchase more normal goods;

b) consumer's equilibrium can be achieved only when the consumer purchases the substitute goods;

c) a decrease of the price for the goods allows the consumer to purchase more goods in comparison with the other goods under this level of money earnings;

d) under the increase of the price for the goods the consumer has more opportunity to buy more quantity of the goods with the decrease of consumption of the other goods.

Exercise 3. Solve the tasks.
3.1. Formulas used for the tasks solution:
1. The expanded budgetary restrictions

$$I = P_X Q_X + \sum_i P_{Y_i} Q_{Y_i},$$

where P_X and P_Y are the prices of the goods consumed; $Q_X Q_Y$ – volumes of the corresponding goods.

2. Equimarginal principle

$$\frac{MU_X}{P_X} = \frac{MU_{Y_i i}}{P_{Y i}} = ... = \frac{MU_{Y_i n}}{P_{Y n}}.$$

3.2. Examples of the tasks solution.

1. If Oleksiy buys the goods A and B at the prices P_A = 4 UAH; P_B = 2 UAH, then the «revenue – consumption» line will have the following expression: $Q_A = 2Q_B - 5$. Define, under what budget Oleksiy will consume 6 units of the good A.

Solution:

Under condition of consumption of two goods only, the equation of the budget restriction is the following:

$$I = P_A Q_A + P_B Q_B$$

$$I = 4 \cdot 6 + 2Q_B$$

It is necessary to solve the system of equations to determine the unknown level of the budget:

$$\begin{cases} 6 = 2Q_B - 5 \\ I = 24 + 2Q_B \end{cases} \Rightarrow \begin{cases} Q_B = 5,5 \\ I = 24 + 2Q_B \end{cases} \Rightarrow \begin{cases} Q_B = 5,5 \\ I = 24 + 2 \cdot 5,5 \end{cases} \Rightarrow \begin{cases} Q_B = 5,5 \\ I = 35 \end{cases}$$

Answer: The consumer should provide the budget at the level of 35 UAH.

2. The function of utility of consumer is expressed with the formula $U = \frac{xy}{2}$, where x – volume of banana consumption, y – volume of apples consumption. In summer the consumer spent 20 UAH per week for these goods. In winter the price for bananas increased up to 5 UAH per kg, the price for apples stayed unchangeable. Define:

a) volume of the optimum consumption of bananas and apples in summer;

b) volume of expenses, necessary for achievement of the same level of utility in winter;

c) the quantitative value of the revenue effect and the substitution effect according to Hicks model.

Solution:

a) For definition of the optimum, from the consumer's point of view, set of goods x and y, it is necessary to complete the system of the algebraic equations and to solve it.

The first equation – is the equation of the budgetary restrictions:

$$I = P_X \cdot x + P_Y \cdot y$$
$$20 = 3 \cdot x + 2 \cdot y$$

The second equation we will get, if we apply the equimarginal principle:

$$\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}.$$

The numerator of the right part of the equation is the marginal utility of bananas which we will define with differentiation of the function of utility, assuming that y is the constant value:

$$MU_x = \frac{\partial U}{\partial x} = \frac{1}{2} \cdot y$$

In the numerator of the left part – marginal utility of apples (partial derivative of the function of utility by y:

$$MU_y = \frac{\partial U}{\partial y} = \frac{1}{2} \cdot x$$

Thus, the system will be as follows:

$$\begin{cases} 20 = 3x + 2y \\ \frac{1}{6}y = \frac{1}{4}x \end{cases} \Rightarrow \begin{cases} 20 = 3x + 2y \\ y = \frac{3}{2}x \end{cases} \Rightarrow \begin{cases} 20 = 6x \\ y = \frac{3}{2}x \end{cases} \Rightarrow \begin{cases} x = 3,33 \\ y = 5 \end{cases}$$

Solution $\begin{cases} x = 3,33 \\ y = 5 \end{cases}$ is the optimum set of bananas and apples which the consumer chooses in summer.

So, he achieves the utility level $U = \frac{3,33 \cdot 5}{2} = 8,325$.

b) Now, we'll define under which level of the expenses the consumer will get the same level of utility in winter.

Function of the budgetary restriction of the consumer in winter is expressed in the following way:

$$I' = P'_X \cdot x' + P'_Y \cdot y',$$

where x', y' – optimum volumes of consumption of bananas and apples in winter, P'_X, P'_Y – the corresponding prices of bananas and apples in winter.

Function of utility:

$$U = \frac{x'y'}{2}$$

Under the level of utility which is similar to the summer period we get

$$\frac{x'y'}{2} = 8,325.$$

Condition of maximization of the utility in winter is the following equality:

$$\frac{y'}{2P'_X} = \frac{x'}{2P'_Y}.$$

Put the known values and get the system of three algebraic equalities:

$$\begin{cases} I' = 5x' + 2y' \\ \dfrac{x'y'}{2} = 8,325 \\ \dfrac{y'}{5} = \dfrac{x'}{2} \end{cases}$$

From the last equality we get $y' = \dfrac{5x'}{2}$. Put it in the other equality:

$$x' \cdot \frac{5x'}{2} = 2 \cdot 8,325 \Rightarrow (x')^2 = 6,66 \Rightarrow x'_{1,2} = \pm 2,58$$

We are satisfied only with the positive root $x' = 2,58$. Then, $y' = \dfrac{5 \cdot 2,58}{2} = 6,45$

To purchase this set of the goods the revenue level should be:

$$I' = P'_X \cdot x' + P'_Y \cdot y' = 5 \cdot 2,58 + 2 \cdot 6,45 = 12,9 + 12,9 = 25,8 \, (\text{UAH})$$

c) To define the quantitative value of the revenue effect and substitute effect in Hicks model the compensating budgetary line tangent to the original indifference curve is applied (in our case this is the indifference curve U for summer period). The substitute effect motivates the consumer to change the optimal set of bananas and apples under the influence of the price change for bananas, staying at the same level of utility. This optimum set we got at the previous point. Obviously, that this is possible only under the highest revenue level. Thus, the value of the substitute effect will be equal to:

$$\Delta x^s = x - x' = 3,33 - 2,58 = 0,75$$

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**PART 6. COMPLETE SET OF METHODICAL MATERIALS FOR STUDENTS'
SELF-STUDY, CONTROL AND SELF-CONTROL OF STUDENTS' KNOWLEDGE**
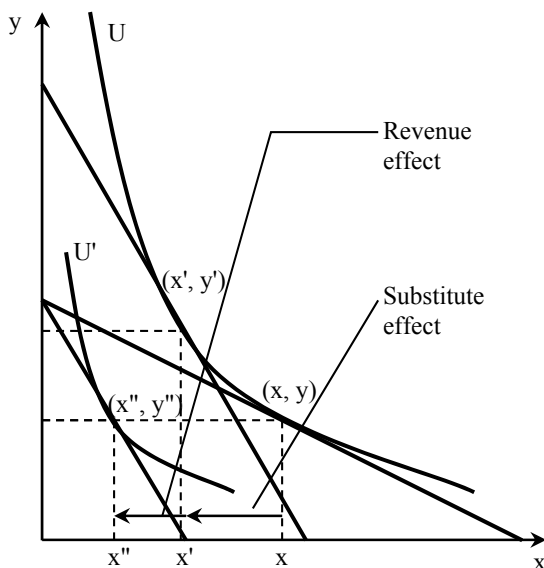
Further, to determine the revenue effect it is necessary to build the new budgetary line parallel to the secondary budgetary line, but without changing the initial revenue level. This will be followed by switching to another indifference curve with the lower utility. The optimum set of bananas and apples under these conditions will be determined by the following:

$$\begin{cases} 20 = 5x'' + 2y'' \\ \dfrac{1}{10}y'' = \dfrac{1}{4}x'' \end{cases} \Rightarrow \begin{cases} 20 = 5x'' + 2y'' \\ y'' = \dfrac{5}{2}x'' \end{cases} \Rightarrow \begin{cases} 20 = 10x'' \\ y'' = \dfrac{5}{2}x'' \end{cases} \Rightarrow \begin{cases} x'' = 2 \\ y'' = 5 \end{cases}$$

Then, the quantitative value of the revenue effect is defined as:

$$\Delta x^I = x' - x'' = 2,58 - 2 = 0,58.$$

We can see that under the price increase, the effects of revenue and substitution are negative. This gives the reason to tell that the presented goods are normal.

Answer: a) the optimum set which the consumer will choose in summer is $-\begin{cases} x = 3,33 \\ y = 5 \end{cases}$;

b) volumes of the expenses which are necessary for achievement of the same utility level in winter as in summer – 25,8 UAH;

c) the substitute effect $\Delta x^s = 0,75$, the revenue effect $\Delta x^I = 0,58$.

3.3. Tasks for individual solution.

1. Artem always consumes the morning tea with sugar. He always puts 2 spoons of sugar per cup of tea.

a) build the indifference curve of the consumer;

b) define how much tea and sugar he will consume, if for the purchase of these products he spends 50 UAH, the price of the cup of coffee is 2 UAH, the price of one spoon of sugar is 1 UAH.

2. Build the «revenue – consumption» curve for the consumer with the function of utility $U = xy$, if the price for the good X – 10 UAH per unit, the good Y – 20 UAH per unit.

3. Equation of the «revenue – consumption» line is expressed with the function $Q_X = 5Q_Y + 3$. How many units of the good X will the consumer consume, if he can purchase the goods at the prices $P_X = 10$ UAH; $P_Y = 20$ UAH, and his budget is 100 UAH?

4. Function of utility for the consumer is explained with the equation: $U = 2X + 3Y$. Weekly revenue which consumer spends for the goods X and Y is 24 UAH, the price of the good Y is 6 UAH. Determine in the analytical way and build the graph:

a) the «price – consumption» curve;

b) the demand curve of the consumer for the good X.

5. Mr. Sidorchuk spends his whole budget per month – 300 UAH to purchase bread and beer. The price of bread is $P_x = 2$ UAH per 1 kg., beer $P_y = 5$ UAH per 1 litre. Function of utility of the consumer is $U = x^2 y^2$. Determine the revenue effect and substitute effect (by Hicks) if the government implements the subsidies for the bread purchase at the level of 1 UAH for 1 kg.

Exercise 4. Define which of the statements is true, and which one is false. Explain your answer.

1. The «price – consumption» curve doesn't show the influence on the volumes of the goods consumed.

2. The essence of the revenue effect is that in the result of the price decrease the consumer becomes comparatively rich.

3. The essence of the substitute effect is in the fact that in the result of the price change the consumer changes the consumption structure.

4. Giffen goods are not always the inferior goods.

5. If margarine is the inferior good, it is Giffen goods.

6. Peter was informed about the wage increase. «I will not drink cheap beer anymore!» – he told the wife. For Peter the cheap beer is the inferior goods.

7. According to the first Engel law the state of the family budget which is spent for the food tends to decrease with the revenue increase.

8. If the consumer recognizes the goods as the inferior ones, then the consumption of the goods increases with the revenue increase.

9. Character of the changes of the «revenue – consumption» curve will depend on the consumer's understanding of the value of the consumer set.

10. Consumption of the legal and medical services tends to increase faster than revenues increase.

Exercise 5. Problem situations to perform individual tasks and/or discussion during seminars.

1. Elasticity coefficient by revenue for the good *A* is negative, for the good *B* is positive. Build the schematic Engel curves and explain your answer.

2. The consumer who had the revenue 1200 UAH per month considered the good *X* as normal one. After some period of time his revenues increased up to 3000 UAH per month and he started to think that the good *X* is the inferior one. Analyzing the influence of the effects of revenue and substitution, show under which condition the good *X* could be a Giffen good?

3. The total real revenues of the family increased for 70%. Under this condition the quantity of the consumed good *X* increased from 5 up to 6 kg. per month. With which Engel law can the dynamics of the good *X* consumption be described? Which groups of products can be distinguished depending on reaction of the consumer on their purchase under the revenue increase?

THEME 4. MARKET DEMAND AND ITS ELASTICITY

Questions covering the matter of the theme
1. Market demand. Formation of the market demand. The market demand curve. Non-price demand factors.

2. Price demand elasticity. Coefficient of the demand elasticity. Elastic and inelastic demand. Factors influencing the demand elasticity. The prize and loss of the seller. The influence of the demand elasticity by the price on the aggregate seller's profit. Calculation of the demand elasticity by price for the separate point on the curve. The distances formula. Use of the demand elasticity.

3. Non-price demand elasticity: demand elasticity by revenues and cross elasticity. Coefficients of the non-price elasticity.

4. A prize of the consumer. The total prize of consumers. Additional tax burden.

Questions for students' self-study
1. Factors which influence the demand elasticity
2. Social effects which influence the individual demand (fashion effect, snob effect, Veblen effect)

Tasks for the control and self-control of the students' knowledge:
Exercise 1. For each statement listed below, find the corresponding term or concept.

1. Relation of the percent change of the quantity demanded and the percent change of the price.

2. Difference between the marginal utility of each additional unit of the good, expressed in money and by the price of the goods.

3. Relation between the percent change of the quantity demanded for this good and percent change of the price of other good.

4. The demand for which the coefficient of the price elasticity is more than one.

5. The demand the value of which stays unchangeable under the price change.

6. Relation of the percent change of the quantity demanded for the given goods to the percent change of the consumer's revenue.

7. The demand for which coefficient of the price elasticity equals zero.

8. Demand for which coefficient of the price elasticity is less than one.

9. Total quantity demanded by all consumers within this market under all price levels.

10. The situation under which the quantity demanded changes under the unchangeable price of the goods.

Terms and concepts:
a) perfectly inelastic demand;
b) the curve of the market demand;
c) elastic demand;
d) coefficient of the price elasticity of demand;
e) coefficient of the cross elasticity of demand;
f) coefficient of demand elasticity by revenue;
g) the prize of the consumer;
h) inelastic demand;
i) perfectly elastic demand;
j) demand of the unit elasticity.

Exercise 2. Find the right answer.
1. Which factors from the listed below influence the change of the quantity demanded for the product B:
a) the price change of the substitute goods;
b) a consumer's revenues increase;
c) the price change for the goods B;
d) the consumer's tastes change.

2. If the price of the goods increases, then the demand curve for the substitute goods:
a) shifts to the left;
b) decreases;
c) shifts to the right;
d) stays unchangeable.

3. Which of the factors listed below results in the shift of the demand curve for the goods A to the left:
a) the population increase;
b) the money earnings increase;
c) the price decrease for the substitute goods B;
d) the price increase for the substitute goods B?

4. If the demand elasticity is 2,5 and the price is decreasing from 2 UAH down to 1,8 UAH, then:
a) quantity demanded increased for 2,5%;
b) quantity demanded decreased for 2,5%;

c) quantity demanded increased for 25%;

d) there is no right answer.

5. Coefficient of the price elasticity shows:

a) consumer's respond to the price change;

b) extent of the shift of the demand curve as a result of the revenues change;

c) the slope of the demand curve;

d) the way the businessmen can return their fixed expenses.

6. The price of the goods X reduced from 100 down to 90 UAH, thus the quantity demanded increased from 50 up to 90 units. We can draw the conclusion, that the demand for the goods X:

a) decreased;

b) has the unit elasticity;

c) is inelastic;

d) is elastic.

7. Demand for the good can be called as inelastic if:

a) consumers do not respond to the price change for the goods;

b) coefficient of elasticity is more than one;

c) the price decrease is followed by the quantity demanded decrease;

d) the price decrease is followed by the quantity demanded increase.

8. The price elasticity is influenced by:

a) the availability of the substitute goods;

b) time for adaption to the price change;

c) the prices for the other goods;

d) part of the consumer's budget which is spent for the goods.

9. Which parameters of the coefficient of elasticity by revenue characterize the inferior goods:

a) 0;

b) 1;

c) 0;

d) 1?

10. The unit elasticity of the demand is characterized by the coefficient of the price elasticity:

a)   c) 0;

b)   d) there is no right answer.

11. The basic formula to calculate the coefficient of the price elasticity of demand is the relation of:

a) the absolute decrease of the quantity demanded to the absolute price increase;

b) the relative change of the quantity demanded to the related price change;

c) the absolute price decrease to the absolute quantity demanded increase;

d) the relative price change to the relative quantity demanded change.

12. Which of the expressions given below doesn't characterize the elastic demand:

a) the relative change of the quantity demanded is more than the relative price change;

b) buyers are relatively sensitive to the price change;

c) the total revenue decreases if the price increases;

d) coefficient of elasticity is less than one?

13. If the demand for the goods A is inelastic, then the increase of the price for the goods A for 3% will result in:

a) a decrease of the quantity demanded for the goods A is more than 3 %;

b) a decrease of the quantity demanded for the goods A is less than 3 %;

c) an increase of the quantity demanded for the goods A is more than 3 %;

d) an increase of the quantity demanded for the goods A is less than 3 %.

14. Perfectly elastic demand is characterized by the line:

a) pointed up and to the right;

b) placed along the vertical axis;

c) placed along the horizontal axis;
d) which can't be shown in two dimensions.

15. For which of the goods the cross elasticity of the demand equals zero:
a) substitute goods;
b) goods, which don't have substitutes;
c) complimentary goods;
d) luxury goods.

16. Set the area of the coefficient change of the demand elasticity by revenue for the luxury goods:
a) 0;   c) 1;
b) 1;   d) 0.

17. Elasticity of the demand by revenue depends on:
a) the price;
b) consumers' tastes;
c) level of the money revenue;
d) some goods supply.

18. Set the area of the additional tax burden in the graph:
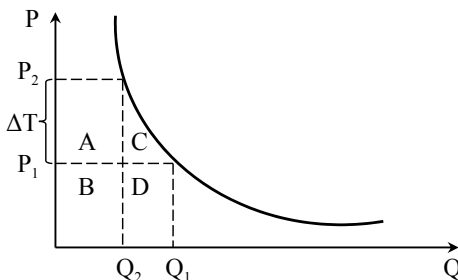
a) A;
b) B;
c) C;
d) D.

19. If the price decrease for 10 % results in the quantity demanded increase for 16 %, this demand is:
a) inelastic;
b) unit elasticity;
c) elastic;
d) perfectly elastic.

20. If despite the price change, for the goods the total revenue does not change, the coefficient of price elasticity:

a) more than 1;

b) less than 1;

c) equals 0;

d) equals 1.

21. If the random number of the goods is sold at the same price, then the demand for this product is:

a) perfectly inelastic;

b) perfectly elastic;

c) inelastic;

d) the unit elasticity demand.

22. If the demand for the agricultural goods is inelastic, then under the high yield the farmers' revenues will:

a) increase because of the sales volumes increase;

b) reduce because the relative price decrease will be larger than the relative increase of the sales volume;

c) increase because the demand increase will result in the increase of the prices for the goods;

d) stay unchangeable because the relative increase of the sales volumes will be equal to the relative price decrease.

Exercise 3. Solve the tasks.

3.1. Formulas used for the tasks solution:

1. Coefficient of the demand price elasticity:

$$E_D^P = \frac{\left(\dfrac{Q_2 - Q_1}{Q_1} \times 100\%\right)}{\left(\dfrac{P_2 - P_1}{P_1} \times 100\%\right)} = \frac{\text{Growth rates of the quantity demanded}}{\text{Growth rates of the price}}$$

2. Coefficient of the demand elasticity by revenues

$$E_D^I = \frac{\left(\dfrac{Q_2 - Q_1}{Q_1} \times 100\%\right)}{\left(\dfrac{I_2 - I_1}{I_1} \times 100\%\right)} = \frac{\text{Growth rates of the demand}}{\text{Growth rates of revenues}}$$

3. Coefficient of the cross elasticity of demand

$$E_D^C = \frac{\left(\dfrac{Q_{x2} - Q_{x1}}{Q_{x1}} \times 100\%\right)}{\left(\dfrac{P_{y2} - P_{y1}}{P_{y1}} \times 100\%\right)} = \frac{\text{Growth rates for the good X demand}}{\text{Growth rates for the good Y price}}$$

4. Formula of the distances

$$E_d = -\frac{b}{a}$$

3.2. Examples of the tasks solution.

1. Price elasticity of demand equals 2. What will happen with the quantity demanded for TV sets, if the price for them increases for 10% and nothing more changes?
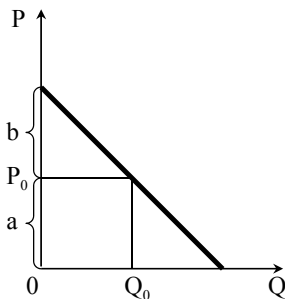
Solution:

Coefficient of the demand elasticity by price is calculated using the formula:

$$E_D^P = \frac{\text{Growth rates of the quantity demanded}}{\text{Growth rates of the price}}$$

In the given example the growth rates of prices per unit of good (10%) and the value of the coefficient of the price elasticity ($E_D^P = 2$) are known.

With the purpose to calculate the growth rates of the quantity demanded for TV sets, we will transform the formula and put the data:

Growth rates of the quantity demanded $= E_D^p \times$
$\times$ *Growth rates of the price* $= 2 \times 10\% = 20\%$

The demand curve has the negative slope, i.e. the price increase results in the decrease of the quantity demanded for the goods. Thus, in our example quantity demanded will decrease for 20%.

Answer: the quantity demanded will decrease for 20%.

5. The demand curve for the tape recorders has the slope, the tangent of which equals -0,5 in all points. If the price for the tape recorders was 300 UAH and there were sold 600 units, calculate the coefficient of

price elasticity of demand for the tape recorders. What will happen with revenue of the tape recorders sellers if they reduce the price for 1%?

Solution:

a) the demand curve for the tape recorders is the straight line which passes through the point with the coordinates $Q_1 = 600$, $P_1 = 300$ and has the slope -0,5. To determine the algebraic form of the demand function we use the equation of the cluster of the lines which pass through the given point:

$$P - P_1 = k(Q - Q_1),$$
$$P - 300 = -0,5(Q - 600)$$
$$P = 300 - 0,5Q + 300$$
$$P = -0,5Q + 600$$

The corresponding straight line is shown in the picture.

According to the equation the line crosses the axis Y in the point with the coordinates (0, 600).

b) As we know the segment which is cut by the straight line of demand on the ordinate axis we can use the formula of the distances to calculate the coefficient of elasticity.
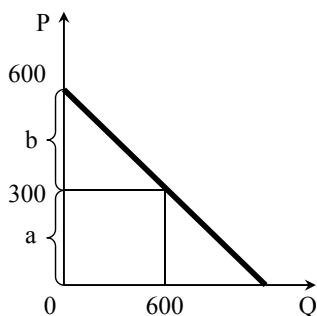
$$E_d = -\frac{b}{a} = \frac{600 - 300}{300} = 1$$

a) Then we determine how sellers' revenues will change under the price decrease for 1 %.

We know that 1% price decrease will result in 1% increase of the quantity demanded for the demand with the unit elasticity. Thus, we go along the demand line to the next point with the coordinates $Q_2 = 1,01\ Q_1$ та $P_2 = 0,99\ P_1$.

The revenue level under these conditions equals:

$$R_2 = P_2 \cdot Q_2 = 0,99 P_1 \cdot 1,01 Q_1 = 0,9999 \cdot P_1 Q_1 = 0,9999 \cdot R_1,$$

where $R_1 = P_1 \cdot Q_1$ – is the revenue got by sellers before the price change.

The relative revenue change is defined in the following way:

$$\frac{R_2 - R_1}{R_1} \times 100\% = \frac{0,9999 \cdot R_1 - R_1}{R_1} \times 100\% = (0,9999 - 1) \times 100\% =$$
$$= -0,0001 \times 100\% = -0,01\%$$

I.e., under the price decrease for 1% the sellers' revenues will decrease for 0,01%.

Answer: coefficient of elasticity equals 1; under this elasticity sellers' revenues decrease for 0,01% under the price decrease for 1%.

3.3. Tasks for individual solution.

1. If the price for the goods A increased from 5 up to 10 UAH per unit, then consumption of the goods B would decrease from 20 down to 5 units. Calculate the coefficient of the cross elasticity of demand. For which group-substitute or complimentary one do the goods A and B belong to?

2. At the price 50 UAH per theatre ticket the number of visitors is 1000 persons. The theatre is able to fit 1500 visitors. Organizers of the theatre performance reduced the price for tickets down to 40 UAH with the purpose to fill all vacant seats. Decide whether the decision of organizers is correct, if the coefficient of the price elasticity of demand equals 3. How will the price reduction influence the total revenue? Prove it with corresponding calculations of revenue before and after the price reduction.

3. If the demand elasticity by revenue for the automobile equals 5, calculate the percent change of the sales volumes which is influenced by the consumers' revenues cutting down for 2%.

4. Analyzing the toothpaste market, marketeers concluded that the price elasticity of demand for the toothpaste A equals 3; price elasticity for the toothpaste B equals 4; the cross elasticity of demand for the good A at the price of the good B equals 5; elasticity of these two goods by revenue equals 2 and 3 correspondingly. Define:

a) in what way the quantity demanded for the toothpaste of the sort A will change if the prices for the toothpaste of the sort B decrease for 3%;

b) how the quantity demanded for the toothpaste of the sorts A and B will change if the consumers' revenue increases for 6 %;

c) how the quantity demanded for the toothpaste of the B sort will change if the prices for the good B decrease for 15%;

d) how buyers of the toothpaste of the sort A will respond to the price increase for 10%?

5. It is known that in supermarket 100 units of the goods at the price 8 UAH/unit are sold each day. If the price decreases for 2%, then

the quantity demanded will increase for 0,8%. Define the function of demand for the goods considering it as a linear one.

Exercise 4. Define which statement is true, and which one is false. Explain your answer.

1. The larger the share of the product in the consumer's expenses structure is the less the elastic demand for this good is.

2. Market demand shows the quantity demanded of each individual consumer.

3. The coefficient of the demand elasticity by revenues which is more than zero corresponds to the inferior goods.

4. One of the factors which influence the price elasticity of demand is availability of complimentary goods.

5. Price elasticity of demand is negative.

6. Additional tax burden results in the loss of consumers' surplus.

7. The consumer who can't start his morning without a cup of coffee will have more elastic demand.

8. Appearance of another copiers increases the demand elasticity for «Xerox» copiers.

9. Coefficient of the demand elasticity by revenues which is more than one corresponds to the normal goods.

10. Substitute goods are characterized with the direct dependence between the price for one of them and demand for the other one.

11. If under the price change for 1 percent the quantity demanded changes for 10 percent, the demand in this case is inelastic.

12. If under the price reduction for the goods from 20 UAH down to 10 UAH the volume of the sales does not change, the demand for this good is perfectly inelastic.

13. The less substitutes the good has, the more elastic the demand for it is.

14. The demand for the luxury goods is more elastic than for the goods of the primary necessity.

15. If along with an increase of the price for good the revenue decreases, the demand for this good is elastic.

16. The positive coefficient of the cross elasticity of two goods means that these goods are the substitutes.

17. Price elasticity along the demand curve doesn't change.

18. Demand for the coal is more elastic than for the fuel.

19. If the consumers' revenues increase the bread consumption increases.

20. Price elasticity of demand depends on the other goods demand.

Exersice 5. Problem situations to perform the individual tasks and/or for discussion during seminars.

1. What does distribution of the tax burden between the buyer and seller depend on? Give examples and explain the answer using the graphs.

2. During 1990–1994 consumption of the main food stuffs per capita reduced in Ukraine, but consumption of potatoes increased for 16%. How can you explain this exclusion?

3. The owner of the concert hall wants to increase the monthly revenue for the tickets selling for the classical music concerts. To achieve this he increased the prices for tickets. Under which conditions can this increase revenue and under which can't?

THEME 5. THEORY OF PRODUCTION

Questions covering the matter of the theme

1. Production. Factors of production. Production as productive system and system of relations. Production function. Properties of the production function. Cobb-Douglas production function. The short-run period. The long-run period. Industrial grid. Isoquant. Types of isoquants. The map of isoquants.

2. The total product of a variable factor and its curve. The average and marginal product of the variable factor. The curves of the average and marginal product. The law of diminishing marginal returns. The stages of production in the short-run period.

3. The marginal rate of technological substitution. Isoquants at the fixed proportion of production factors.

4. Effect of the production scale and its results. Factors of the positive effect of the production scale growth. Neutral and negative reaction of an average product to the production scale growth.

PART 6. COMPLETE SET OF METHODICAL MATERIALS FOR STUDENTS'
SELF-STUDY, CONTROL AND SELF-CONTROL OF STUDENTS' KNOWLEDGE

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Questions for students' self-study

1. Types of the isoquants: linear, leontiev, broken, continuous.

2. Cobb-Douglas production function.

Tasks for control and self-control of the students' knowledge:

Exercise 1. For each statement listed below find the corresponding term or concept.

1. The process of influence on the natural substance with the purpose to give it properties and forms suitable for the needs satisfaction.

2. The increase of production volume with the faster rate in comparison with an increase of the inputs of all used resources production.

3. Everything that a producer purchases for use with the production purposes.

4. The curve which connects all combinations of resources, use of which provides the same volume of output.

5. Volume of output which is used for the definite amount of this factor.

6. The same rates of the volume of production increase as an increase of all inputs of all used resources for production.

7. The volume of the good which is used per unit of the factor.

8. Maximum possible output of the definite good under the use of all possible combinations of production factors.

9. Additional output of the good which is connected with the increase of the production factor per one unit under the other unchangeable production factors.

10. An increase of the volume of production with the slower rates in comparison with an increase of spending of all used resources for production.

11. An isoquant set, each of which shows the maximal output of the goods, which is achieved under the use of the definite resources combinations.

12. The quantity of one resource consumption of which is possible to refuse under the increase of the quantity of the other resource per unit, under condition of saving unchangeable volumes of production.

13. With the increase of use of the definite production factor (under the unchangeable others) the point will be achieved sooner or later, in

which the additional use of the variable factor will result in the decrease of the volumes of the goods output.

14. Period which is enough for the change of all production factors.

15. Period during which producers have the opportunity to change only the part of the used resources.

Terms and concepts:
a) isoquant;
b) constant effect of the production scale growth;
c) the law of diminishing marginal productivity;
d) production;
e) input;
f) positive effect of the production scale growth;
g) total product;
h) average product;
i) long-run period;
j) marginal rate of technical substitution;
k) marginal product;
l) negative effect of the production scale growth;
m) short-run period;
n) map of isoquants;
o) production function.

Exersice 2. Find the right answer.
1. The marginal rate of technological substitution of the capital for the labor is the following:
a) $MRTS_{LK} = -\Delta K / \Delta L$;
 b) $-\Delta K \ MP_K = \Delta L \ MP_L$;
c) $MRTS_{LK} = MP_L / \Delta L$;
d) there is no right answer.

2. The average product of the variable factor is:
a) the total volume of the goods output which corresponds to the definite number of the variable factor under condition of other unchangeable factors;
b) relation of the total product of the variable factor to the quantity of this factor used in production;

c) an increase of the total product of the variable factor concerning the relation to the increase of the variable factor per one unit;

d) relation of the marginal product to the quantity of the variable fctor used in production.

4. The curve which shows all possible variants of combination of the production factors, use of which results in the same output of the goods:
   a) isoquant;
   b) the growth line;
   c) isocost;
   d) constant effect of the production scale.

5. Which of the given graphs shows the dependence between the marginal (MP) and average (AP) productivity of factors correctly?
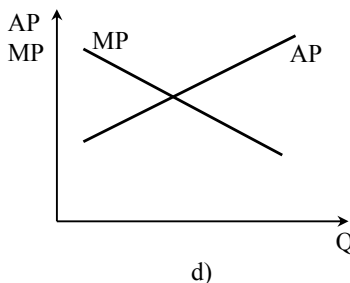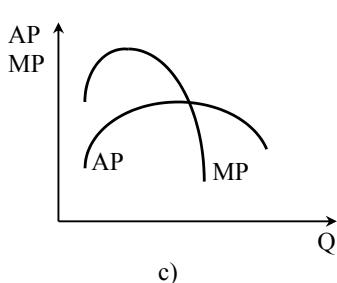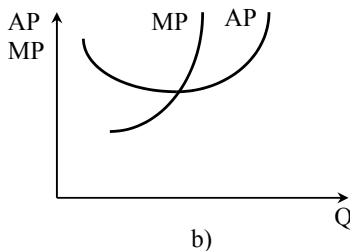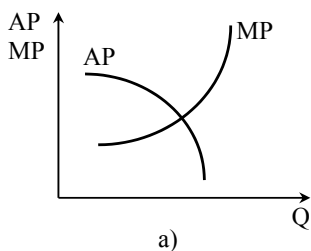
6. *The maximal output achievement under the certain technology means that:*
   a) average and marginal products are equal to each other;
   b) average product achieves its maximum, the marginal product equals zero;

c) the maximum of the values of the marginal product under the minimal values of the average product is achieved;

d) the marginal product equals zero, the average product is reduced.

7. If the marginal productivity increases, then the scale effect is:
a) positive;   c) constant;
b) negative;   d) there is no right answer.

8. The movement down along the isoquant results in the marginal norm of the technological substitution (MRTS):
a) increases;   c) decreases;
b) is constant;   d) there is no right answer.

9. The existing relationship between the changes in average (AR) and marginal product (MP) indicates that in the cross point of the curves of these products:
a) AP reaches its maximum;
b) MP reaches its maximum;
c) AP reaches its minimum;
d) MP reaches its minimum.

10. If under the certain output volume the average product (AP) of the variable factor reaches its maximum, this means:
a) that its value equals the value of the marginal product;
b) that the value of the total product starts to decrease;
c) that the value of the marginal product is negative;
d) that the value of the marginal product is less than the value of the marginal product.

11. The scale effect is shown in the graph:
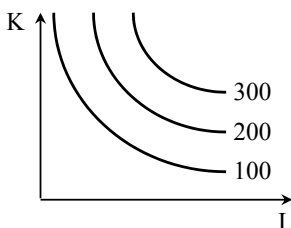
a) positive;
b) constant;
c) negative;
d) the graph is not connected with the scale effect.

12. Period of time enough for the change of the quantity of the labor used but is not enough for the capital quantity change:
a) long-run;
b) momentary;
c) short-run;
d) doesn't have the measurement.

13. Under the production volumes increase the isoquant will shift:
a) up and right;
b) down and right;
c) up and left;
d) down and left.

14. Increase of the firm's budget is graphically expressed in the:
a) shift of the isocost to the left;
b) shift of the isocost to the right;
c) change of the isocost's slope;
d) shift of the isoquant to the right.

15. To produce the cages for birds Pavlo uses 150 steel rods, 5 boards, 2 hours of labor and 2 hours of the machine time per one cage. This production process is illustrated graphically with the help of:
a) linear isoquants;
b) isoquants in the form of the right angle;
c) isoquants which have the standard form;
d) there is no right answer.

16. Which of the figures given below shows the isoquants of the production function?
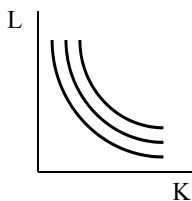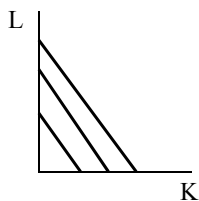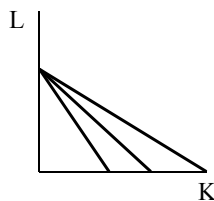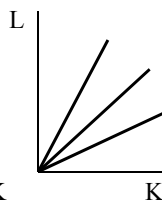
a)   b)   c)   d)

Exersice 3. Solve the tasks.

3.1. Formulas used for the tasks solution:

1. Production function:

$$Q = f(L, K, M)$$

where Q – production volume, L – labour input, K – capital input, M – materials.

2. The average product of the variable factor:

$$AP_L = \frac{TP_L}{L}$$

where TP_L – total product of the variable factor.

3. The marginal product of the variable factor:

$$MP_L = \frac{\Delta TP_L}{\Delta L},$$

$$MP_L = \frac{\partial TP_L}{\partial L}.$$

4. The marginal norm of the technological substitution:

$$MRTS_{LK} = -\frac{\Delta K}{\Delta L} = \frac{MP_L}{MP_K}.$$

5. The neutral scale effect:

$$Q(\alpha K, \alpha L) = \alpha \cdot Q(K, L), \quad \alpha = const.$$

6. The positive scale effect:

$$Q(\alpha K, \alpha L) > \alpha \cdot Q(K, L), \quad \alpha = const$$

7. The negative scale effect:

$$Q(\alpha K, \alpha L) < \alpha \cdot Q(K, L), \quad \alpha = const$$

3.2. Examples of the tasks solution.

1. The volume of production is expressed with the production function $Q = 3K^{1/3}L^{1/2}$. During the working day 8 machine-hours and 9 man-hours are spent. Define the output of the goods and the average product of the labor. Define the character of the return of the production scale effect.

Solution:

Firstly, we'll define the volume of the goods:

$$Q = 3K^{1/3}L^{1/2} = 3 \cdot 8^{1/3} \cdot 9^{1/2} = 3 \cdot \sqrt[3]{8} \cdot \sqrt{9} = 3 \cdot 2 \cdot 3 = 18 \text{ (units)}$$

Then we'll find the average product of labor as production volume per unit of the labor used, i.e.:

$$AP_L = \frac{Q}{L} = \frac{18}{9} = 2 \text{ (units)}.$$

To define the character of the return of the production scale we'll analyze how the volume of production will change under the capital and labor increase in times

$$Q(\alpha K, \alpha L) = 3 \cdot \alpha^{1/3} K^{1/3} \cdot \alpha^{1/2} L^{1/2} = \alpha^{1/3+1/2} \cdot (3K^{1/3} L^{1/2}) =$$
$$= \alpha^{5/6} \cdot Q(K, L) < \alpha \cdot Q(K, L).$$

Thus, the growth rates of the resources volumes are greater than the growth rates of the production volumes. It means the negative return of the production scale.

Answer: under the definite volumes of resources attracted, the volume of production – 18 units, the average product of labor – 2 units. The character of the production function shows the negative effect of the scale.

2. Production function is given as the following: $Q = 2K^{1/2} L^{1/2}$. Find the marginal norm of the technological substitution of the capital for labor if provision with the capital of labor (K/L) equals 5.

Solution:

The marginal norm of the technological substitution of the capital for labor is defined as relation between the marginal products of the capital and labor:

$$MRTS_{LK} = \frac{MP_L}{MP_K}.$$

The marginal products can be found as partial derivatives of the first order of the production function. I.e.:

$$MP_L = \frac{\partial Q}{\partial L} = 2K^{1/2} \cdot \tfrac{1}{2} L^{-1/2} = K^{1/2} \cdot L^{-1/2};$$

$$MP_K = \frac{\partial Q}{\partial K} = 2 \cdot \tfrac{1}{2} K^{-1/2} \cdot L^{1/2} = K^{-1/2} \cdot L^{1/2}.$$

Thus, we have:

$$MRTS_{LK} = \frac{MP_L}{MP_K} = \frac{K^{1/2} \cdot L^{-1/2}}{K^{-1/2} \cdot L^{1/2}} = \frac{K^{1/2+1/2}}{L^{1/2+1/2}} = \frac{K}{L} = 5.$$

Answer: the marginal norm of the technological substitution of the capital for labor equals 5.

3.3. Tasks for the individual solution.

1. The marginal norm of the technological substitution of the labor for capital equals 2. How much should the use of capital be increased for the constant production volume if quantity of the labor use is reduced for 4 units?

2. Calculate the average and marginal products of the firm using the table data. When will the diminishing effect of the production scale act?

L (man-hours)	1	2	3	4	5
TP	30	70	100	120	130

3. Find the value of the total product of production if the marginal product and quantity of the labor factor used are known.

L, men	0	1	2	3	4	5
MP	0	2	3,5	5	7	4,5

4. Build the isoquants for each level of production according to the table data and find the marginal norm of the technological substitution of the capital for labor for any isoquant.

L, man-hours per month	K, machine-hours per month				
	100	200	300	400	500
100	100	141	173	200	224
200	141	200	245	282	316
300	173	245	300	346	447
400	200	282	346	400	447
500	224	316	387	447	500

5. Rent payment of the sewing machines of the enterprise is 100 thousand UAH per year, wage– 50 thousand UAH. Does the enterprise use the optimum relation of the production factors from the point

of view of the revenue maximization if the firm has the quantity of the capital and labor under which their marginal products are 1 and 1,5 correspondingly. Explain your answer.

6. Products are produced under the technology which is expressed with the function $Q = L^{0,25}K^{0,5}$. The prices for the production factors equal $p_L = 1$; $p_K = 3$. Define the minimal average expenses in the short-run period if 10, 15 or 20 units of the capital are used.

Exercise 4. Define which of the statements is true, and which one is false. Explain your answer.

1. The points of one isoquant mean combinations of the production factors with equal utility for the producer.

2. The production volume can continue growing even if the marginal product is negative.

3. Isoquant is the line which shows all possible combinations of the expenses of the production factors at the same price.

4. The law of diminishing marginal productivity says that with the increase of the variable factor, under condition that other factors are constant, its marginal product increases.

5. In the long-run period all the production factors are constant.

6. The marginal product is calculated as a relation of the total product to the output volume.

7. It is possible to define the average product of the variable factor defining the slope of the bend drawn from the beginning of the coordinates through the appropriate point of the total product curve.

8. Production function is the relation between any set of the production factors and the lowest possible expenses.

9. The money capital can be included into the production factors.

10. The marginal norm of the technological substitution of the capital for labor is defined with the volume of labor which can be changed by each unit of the capital.

Exercise 5. Problem situations to perform the individual tasks and/or discussion during seminars.

1.The enterprise which produces kitchens uses such correlation of the production factors which maximizes revenue. Can this fact provide the lowest expenses?

2. Entrepreneurial skills are included into the production factors by the economists. Why does the demand for this resource increase with Ukraine's movement to the mixed economy?

3. Under production of Q units of products the marginal productivity was equal to the average productivity of the labor. How will the average productivity of the capital change if the increase of the production volume is carried out at the expense of the use of the additional labor?

THEME 6. THE COSTS AND OUTPUT

Questions covering the matter of the theme
1. Production costs. Opportunity costs. Internal and external costs. Transaction costs. Economic costs of the enterprise. Normal profit. Economic (net) profit.

2. Function of the costs. The total costs. Isocost. The change of isocost's inclination. Maximization of the production volume at the given cost. Producer's equilibrium. A principle of the least costs. The trajectory of growth.

3. The costs in the short-run period: fixed, variable, marginal costs and their curves. Average total, average fixed and average variable costs. Variants of the configuration of the average costs curve.

4. The costs in the long-run period. Definition of the more attractive variant of production development. Variants of the long-run dynamics of the average costs.

Questions for students' self-study
1. Variants of configuration of the average costs curve.
2. Transaction costs

Exercises for control and self-control of students' knowledge
Exercise 1. For each statement given below find the corresponding term or concept.

1. Expenses for the production factors to the suppliers who are not the owners of the firm.

2. Difference between the total earnings from the products sale and economic costs.

3. The costs per unit of output.

4. The costs changed with the change of the output.

5. The set of all costs for the production.

6. Difference between the total revenue of the sale and external costs.

7. the costs which do not depend on the output.

8. The total amount of the external expenses and hidden expenses.

9. Additional expenses dealt with the production increase of a certain product for one unit.

10. Equal ratio of the marginal productivity of the production factors and their market prices.

11. Variable costs for the unit of the output.

12. Alternative costs of the use of resources which belong the owners of the firm.

13. Alternative cost of the use of entrepreneurial skills.

14. Constant costs for the unit of the output .

15. The line connecting all possible combinations of resources which have the same total cost.

Terms and concepts:
a) Marginal costs
b) Average costs
c) Internal costs
d) Normal profit
e) Average variable costs
f) Economic costs
g) Equilibrium of a producer
h) Variable costs

Exersice 2. Find the right answer.
1. Yuriy has opened a stall for selling an ice-cream. Which of the costs given below shouldn't be included into the external costs.
a) Salary of the hired seller
b) The cost of sugar and syrup
c) Rent payment for freezer
d) Yuriy's revenue as a manager of this production?

2. Isocost connects the points of the:
a) equal costs;
b) stable equilibrium of a producer;

c) the same output of production;
d) equilibrium of demand and supply.

3. Economic profit will be:
a) less than the book profit;
b) more than the book profit;
c) equal the book profit;
d) any of the given above depending on situation.

4. In the point of the minimal average costs the marginal costs must be:
a) more than average costs;
b) equal to the average costs;
c) less than average costs;
d) minimal.

5. Find the right statement among the listed below:
a) average costs are minimal, when marginal costs reach their minimal point;
b) as the constant costs do not change the average constant costs stay unchangeable at any output;
c) the average costs increase always when marginal costs increase;
d) average total and average variable costs are minimal if they are equal to the marginal costs.

6. A short-run period is called in the theory of production as the following:
a) any period of time less than a year;
b) period of time during which all factors of output are variable;
c) period of time necessary to change the volume of output;
d) period of time at which anyone factor stays unchangeable.

7. Variable factors of output are the following:
a) those which can be changed at the change of output;
b) those which do not depend on the change of the output volume;
c) those the price of which is unstable;
d) those the price of which is controlled by a state.

8. If the price of the production factor increases then to provide the same volume of output a firm should:

a) use more of this factor;

b) use less of this factor;

c) use the same quantity of this factor;

d) substitute it for the other production factor.

9. A firm has opportunity to buy capital at the price 100 UAH per unit and hire employees at 50 UAH. If the price of capital reduces 2 times and the price of labor increases 1,5 times, then how will the either costs position be changed?

a)   b)   c)   d)
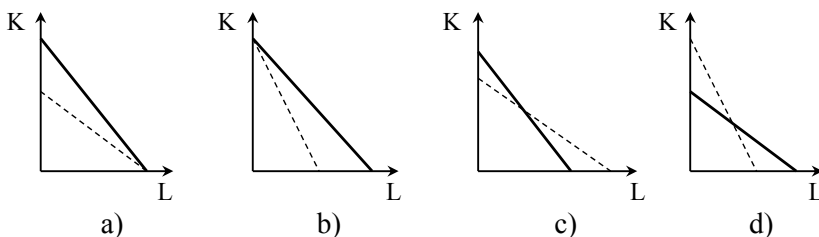
10. If the average variable costs are decreased while output increases, then:

a) marginal costs must also be reduced;

b) total costs must also be reduced;

c) marginal costs must be lower than average variable costs;

d) average total costs must be lower than average variable costs.

11. A long-run period is the period of time at which:

a) all production factors are variable;

b) all production factors are constant;

c) a firm can't change the sizes of its constructions but it can change the extent of machine and equipment loading;

d) a firm can't change neither the sizes of its constructions, nor the quantity of machines and equipment.

12. Which of the following statements characterizes the total costs:

a) $VC - FC$;

b) $FC + VC + MC$;

c) $FC + VC$;
d) $(FC + VC) / Q$?

13. Average total costs reach minimal value at such output when:
a) $AVC = FC$;
b) $MC = ATC$;
c) $MC = AVC$;
d) there is no right answer.

14. The fixed production factors are the following factors:
a) those which do not change a demand for a certain product;
b) the size of which is fixed at different volumes of output;
c) with the stable price;
d) which depend on the firms' sizes.

15. A firm produces 500 units of production in the short-run peri-od. Average variable costs equal 2 UAH, and average fixed – 0,5 UAH. Total costs will be:
a) 2,5 UAH;   b) 1250 UAH;   c) 750 UAH;   d) 1100 UAH

16. Which of the following statements is true:
a) book costs + economic costs = normal profit;
b) economic profit – book profit = external costs;
c) book profit + external costs = economic profit;
d) economic costs – external costs = internal costs?

17. In the point of minimal marginal costs the average costs should
be:
a) decreasing;
b) constant;
c) increasing;
d) minimal.

18. Economic costs include:
a) external and internal costs, including normal profit;
b) only external costs;
c) only internal costs and normal profit;
d) do not include either external or internal costs.

19. Which of the following statements characterizes marginal costs:

a) $\Delta TC : \Delta Q$;
b) $\Delta VC : Q$;
c) $FC : Q$;
d) $\Delta TC : Q$?

20. Which of the following statements concerning the curve of marginal costs in the short-run period is false:

a) $MC = AC$, if AC has minimal value;

b) if AC decrease, then MC – are less than they are;

c) $MC > AC$ in the case when the volume of production is more than the optimum;

d) the size of MC is not influenced by the production factors price change?

21. Which of the graphs given below shows correctly the dependence of the costs on production output?
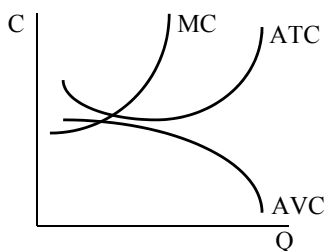
a)
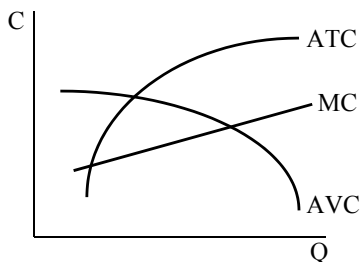
b)
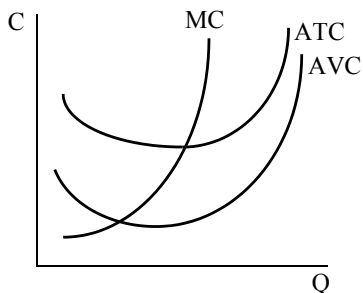
c)
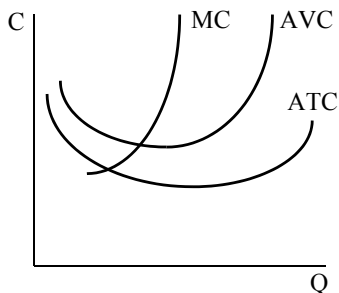
d)

22. *The lost benefit from alternative use of resources owned by the
producer is the following:*
a) external costs;
b) book costs;
c) alternative price of resources;
d) economic costs.

23. *Which costs can be included into the variable ones in the short-
run period:*
a) rent payment;
b) the payment for the administrative office heating;
c) interest on loans;
d) electricity charges for production needs?

24. *The production function of the firm is: $Q = LK$. If the total vol-
ume of the costs should not be more than 30, then at the labor price (P_L)
which equals 4 and capital (P_K) – 5, maximal output Q will be reached
at the combination of labor and capital in correspondence:*
a) 5 : 2;
b) 4 : 1;
c) 7,5 : 6;
d) 5 : 4?

25. *At the salary rate 20 UAH and at the price of the capital costs
50 UAH combination of the production factors is used at which $MP_L = 5$,
a $MP_K = 10$, that means that with the purpose to increase the production
effectiveness it is necessary for the firm:*
a) to use more labor and less capital;
b) to use more capital and less labor;
c) to increase the price for production produced;
d) to cut the production output.

26. *The producer's equilibrium is determined by the law:*
a) of the demand and supply equality;
b) of the output maximization;
c) of the dependences of the marginal productivity of the produc-
tion factors and their market prices equality;
d) the production factors costs minimization.

Exercise 3. Solve the tasks.

3.1. Formulas used for the task solution:

1. Function of the costs:

$$Q = f(P_L, L, P_K, K),$$

where Q – volume of production, L – labor costs, K – capital costs, P_L and P_K – process of the labor and capital accordingly.

2. Total costs:

$$TC = P_L L + P_K K$$

3. Condition of the producer's equilibrium:

$$\frac{MP_L}{P_L} = \frac{MP_K}{P_K}$$

4. Average total costs:

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

5. Average fixed costs:

$$AFC = \frac{FC}{Q}$$

where FC – fixed costs

6. Average variable costs:

$$AVC = \frac{VC}{Q}$$

where VC – variable costs

7. Marginal costs:

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

3.2. Examples of the tasks solution.

1. A firm's production function is $Q = 100KL$. Labor price is 30 UAH, capital price – 120 UAH. How much will the average production costs be if the production output is 100 units?

Solving:

Average production costs are defined as the total costs per unit of production, i.e.:

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

If the total costs

$$TC = P_L L + P_K K = 30L + 120K,$$

then

$$ATC = \frac{TC}{Q} = \frac{30L + 120K}{100} \tag{6.1}$$

Define the resources volumes involved into production, using the condition of producer's equilibrium and production function.

At one side the principle of the minimal costs is carried out:

$$\frac{MP_L}{P_L} = \frac{MP_K}{P_K},$$

where $MP_L = \dfrac{\partial Q}{\partial L} = \dfrac{\partial(100KL)}{\partial L} = 100K$ - marginal product of labor;

$MP_K = \dfrac{\partial Q}{\partial K} = \dfrac{\partial(100KL)}{\partial K} = 100L$ – marginal product of capital.

Thus, $\dfrac{100K}{30} = \dfrac{100L}{120} \Rightarrow L = 4K$ (6.2)

At the other side, the volumes of labor and capital used for the output definition, i.e.

$$Q = 100KL$$

Put into:

$$100 = 100K \cdot 4K = 400K^2$$

Solve the equation depending on K :

$$K^2 = \frac{1}{4}$$
$$K = \pm\frac{1}{2}$$

The amount of capital can't be negative, thus $K = \frac{1}{2}$. Put into the formula (6.2): $L = 4K = 4 \cdot \frac{1}{2} = 2$.

We come back to calculation of the average production costs (6.1):

$$ATC = \frac{30L + 120K}{100} = \frac{30 \cdot 2 + 120 \cdot \frac{1}{2}}{100} = \frac{120}{100} = 1,2$$

Answer: average production costs – 1,2.

2. Total production costs for 100 units of product are 300 thousand UAH, and 500 units – 600 thousand UAH. Considering the function of the costs as a linear one, define the value of the total costs for the output of 400 units of products.

Solving:

If the curve of the costs is a straight line, then its algebraic form could be on using the equation of the line, which passes through the two points with coordinates (Q_1, TC_1) and (Q_2, TC_2). In general this function is the following:
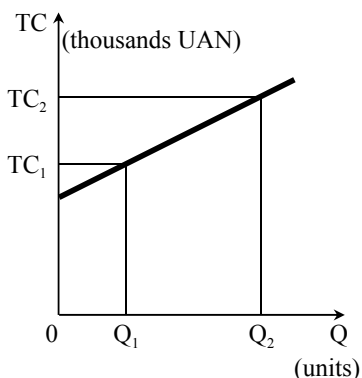
$$\frac{TC - TC_1}{TC_2 - TC_1} = \frac{Q - Q_1}{Q_2 - Q_1}$$

Put the known values and make the necessary transformations:

$$\frac{TC - 300}{600 - 300} = \frac{Q - 100}{500 - 100}$$

$$\frac{TC - 300}{300} = \frac{Q - 100}{400}$$

$$4 \cdot TC - 1200 = 3 \cdot Q - 300$$

$$TC = \frac{3}{4} \cdot Q + 225$$

Got equation – is the equation of the line of the costs. Define the value of the total costs for the output of 400 units:

$$TC = \frac{3}{4} \cdot Q + 225 = \frac{3}{4} \cdot 400 + 225 = 300 + 225 = 525 \text{ (thousand UAH)}$$

Answer: the total costs for the output of 400 units – 525 thousand UAH.

3.3. Tasks for individual solution.

1. A manager has lost the reports of the firm's costs. Her colleagues recovered only some data by the joint efforts. Calculate all data in the table:

Q	FC	AFC	AVC	VC	ATC	MC	TC
0						–	
20					40		
40						16	
60							1920
80			30,25				
100		4			37,8		

2. Dependence of the costs calculated per one unit of the production produced on the volume of this production, is expressed by the function $ATC = 2 Q^2 + 10Q + 20$, where ATC – average costs, Q – volume of production. Calculate the production volume produced at which the firm's costs will be minimal.

3. In what way will the average costs change if at the production of 2 thousand of lights per month the marginal costs are equal to the average variable costs?

4. Entrepreneur, which produces the PVC windows, rents a room which costs 2000 UAH per month and uses his own fixed assets which cost 50000 UAH, which is the value of their loose during a year. When he worked as a sales assistant in a technical goods shop, his salary was 1500 UAH per month. When he started running the business, his revenue was 50000 UAH per year. What are the external costs and economic profit if the bank deposit rate is 15% per year?

5. Given production function is $Q = K^{1/2}$. Calculate the value of the average costs at the output of 500 units, if the price for the capital is 100 UAH.

Exercise 4. Define which statement is true, and which is the false one. Explain your answer.

1. Oleg thinks that he will never be able to sell the house which he owns and uses as the office, as the house has a zero alternative price.

2. Olga is going to open the book shop and needs to purchase the license which costs 500 UAH to do this. She should include the price of the license to the book costs.

3. The average costs are defined by the division of the total costs on for the total quantity of production.

4. A producer achieves the equilibrium at such correlation of resources when their marginal products in relation to the prices for those factors are equal to each other.

5. The more distant from the beginning the isocosts, the coordinates meet a higher level of costs.

6. The trajectory of growth shows how the correlation of the production factors will change at the production output increase.

7. The market price of the production factors is proportional to the marginal productivity of those factors.

8. Economic profit can't be higher than the book profit.

9. Internal costs are included into the economic profit.

10. If the marginal costs are more than the average ones, then the average costs increase.

11. The marginal costs are equal to the average variable costs at the production output when the average variable costs reach their minimum.

12. All factors are constant in the long-run period.

13. The curve of the fixed costs lays above the curve of the total costs.

14. The fixed costs depend on the production output.

Exercise 5. Problem situations to perform individual tasks and/ or discussion during seminars.

1. A large number of the great pianists can quickly learn to type on PC keyboard. Then why do they hire secretaries, which tape the text more slowly than they themselves? Explain the answer from the alternative costs point of view.

2. Majority of the Japanese corporations produce some part of their products in countries such as China, Singapore, and Korea. Which factors will influence the economic and book profit if these companies place production of the TV sets in Ukraine with delivery of all spare parts?

3. Make evaluation of the costs for the woman's image change: price of the clothes purchased, price of the haircut, price of the cosmetic procedures, expenses for the transport, a shortfall of salary, tiredness and so on. Group them into internal and external costs. Explain your answer.

THEME 7. MARKET OF THE PERFECT COMPETITION

Questions covering the matter of the theme

1. Perfect competition. Features of perfect competition. Demand for the competitive firm. Indices which characterize the firm's revenue: total revenue, average revenue, marginal revenue.

2. Profit maximization in the short-run period: comparison of the total revenue and total costs, comparison of the marginal revenue and marginal costs. The choice of the possible variants for the competitive firm: profit maximization, loses minimization and the firm's closure. The rule $MR = MC$. Features of the law of the production output definition. The supply curve in the short-run period. The decision making model is also the maximization of the benefit of the competitive firm in the short-run period.

3. Profit maximization in the long-run period: economic profit in the long-run period, equilibrium of the competitive firm in the long-run period.

4. Production effectiveness and effectiveness of the resources division in the competitive market. Output surplus of the firm.

Questions for the individual study by the students
1. The market supply curve in the short-run period
2. Output surplus of the firm

Tasks for the control and self-control of the of students' knowledge:
Exercise 1. For each statement given below find the corresponding term or concept.
1. The market at which the large amount of sellers and buyers of standardized production act, and no one of them can control the price of a product.

2. The market at which the only one buyer of product or service acts.

3. The market at which a lot of firms sell the differentiated product and the access to which is comparatively free.

4. The total revenue of a firm for the certain period of time from all types of economic activity.

5. The market at which several firms sell the standardized or differentiated products and the control over prices is limited by interdependence of the firms.

6. Revenue which is got by a firm from the sale of one unit of production.

7. A seller of a product who is not able to influence its price to the way of the quantity of production offered at the market of production.

8. Conditions which bring the economic profit to the competitive firm, when it produces the production volume at which the economic profit is maximal or loses are minimal.

9. Additional revenue got as a result of an increase of the volume of the product sale per one unit.

10. Any volume of production of the competitive firm at which the total sum of the costs equals the total revenue.

11. Conditions which cause the loses volume of which is less than the total fixed costs when the competitive firm produces production, which gives it maximal total revenue and when the price at which the firm can sell its production is less than the average total costs, but is higher than the average variable costs.

12. The market at which the only one firm acts, which offers the product which doesn't have close substitutes and it is protected from competition with high barriers to enter the branch.

13. Conditions which cause the loses appearance and which are higher than the total volume of the fixed costs at any volume of production.

14. Branch in which the production expansion is caused by the new firms entrance into it and by the prices increase for resources connected with this fact.

15. The curve which shows the quantity of the product which is offered by a firm in perfectly competitive branch at different prices during the short-run period.

16. The rule according to which a firm maximizes its economic profit, producing production under conditions when the marginal product equals the marginal costs.

17. Branch in which the production expansion is a result of the new firms appearance does not influence the prices of the production resources.

Terms and concepts:
a) profit maximization event;
b) supply curve in the short-run period;
c) market of the perfect competition;
d) one who agrees with the price;
e) branch with the fixed production costs;

f) branch with the increasing costs;

g) loses minimization event;

h) monopsony;

i) the rule $MR = MC$;

j) marginal revenue;

k) average revenue;

l) oligopoly;

m) firm's closure event;

n) the point of the critical production volume;

o) total revenue;

p) pure monopsony;

q) monopolistic competition.

Exercise 2. Find the right answer.

1. The supply curve of the perfectly competitive firm in the short-run period is:

a) part of the curve of the average variable costs which is situated above the curve of the marginal costs;

b) curve of the marginal costs which is situated above the curve of the average variable costs;

c) part of the curve of the marginal costs which is situated above the curve of the average total costs;

d) the curve of the marginal costs.

2. If enterprise in conditions of perfect competition maximizes its profit then:

a) profit per one unit of production can be maximal, but it is not a rule;

b) profit per one unit of production is maximal;

c) profit per one unit of production is minimal;

d) there is a surplus of resources for production manufacture.

3. If at the production volume which meets the condition $MP = MC$, the total revenue is less than the total costs, the enterprise in conditions of perfect competition has:

a) to close the production;

b) to produce production but suffer the loses;

c) to produce production and to have the profit or not to have the profit;

d) to increase the production volume.

4. Which of the listed below is the feature of the market of perfect competition only:

a) a firm doesn't have a market management;

b) a firm maximizes profit;

c) a firm gets the economic profit in the long-run period;

d) the demand line is a line of the average revenue of a firm.

5. In conditions of perfect competition the price equals to minimal average costs:

a) in the short-run period;

b) always;

c) in the long-run period;

d) never.

6. In the short-run period the competitive firm which maximizes the profit or minimizes loses will not continue the production if:

a) the price is less than the minimal average costs;

b) the average fixed costs are higher than the product's price;

c) the price of the product is less than the minimal average variable costs;

d) the price of the product is less than the marginal costs.

7. If the marginal costs are higher than the average costs at the production volume which maximizes the profit, then the firm:

a) gets the economic profit;

b) chooses the production volume which corresponds to the point which lays to the right than the minimum of the average costs curve;

c) everything listed is right;

d) everything listed is wrong.

8. Perfectly competitive firm is:

a) a firm which uses methods of the legal competition only;

b) a firm which doesn't influence the formation of the market price;

c) a firm which uses any forms of the competitive struggle;

d) a firm which can set the desirable price in a competitive struggle.

9. If a firm which acts at the perfectly competitive market cuts the supply of its production then it will:

a) result in the decrease of the product's market price;

b) not influence the market;

c) result in the increase of the product's market price;

d) cut the supply and increase the product's market price.

10. If conditions of perfect competition are carried out at the market, then in the point of the short term equilibrium at any conditions:

a) the product's price will be equal to the marginal costs;

b) the product's price will be equal to the average costs;

c) the product's price will be equal to its marginal utility;

d) the product's price will be equal to the total costs.

11. Let's assume the enterprise in conditions of perfect competition sells 300 production units at 2 UAH per unit. At this level of production the total fixed costs equal 100 UAH, the total variable costs – 400 UAH. According to this, we can say, that the enterprise:

a) maximizes profit;

b) has the profit which can be maximal or not;

c) meets loses;

d) should close production in the short-run period.

12. The enterprise in conditions of perfect competition should produce production and not stop production in the short-run period:

a) only if the total revenue is more than the total costs;

b) only if the total costs are more than the total revenue;

c) only if the total revenue is more than the total costs or total costs are more than the total revenue on the sum which is less than the total fixed costs;

d) if the total costs are more than the total revenue on the sum which is less than the total fixed costs.

13. In the short-run period an enterprise in conditions of perfect competition maximizes profit producing the volume of production at which:

a) the total revenue is more than the total costs on the maximal sum;

b) the total revenue is more than the total costs on minimal sum;

c) the total revenue equals the total costs;

d) the total variable costs are equal to the total fixed costs.

14. An enterprise at the market of the perfect competition is in equilibrium position. If the demand in the long-run period decreases the enterprise should:

a) leave the branch, the price will decrease, production volume will increase;

b) enter the branch, and the price and production volume will increase;

c) leave the branch, and the price and production volume will increase;

d) leave the branch, and the price and production volume will decrease.

15. An enterprise in conditions of perfect competition:

a) has zero economic profit in the short-run period;

b) doesn't get the economic profit in the long-run period;

c) in the long-run period can have both economic profit and loses as well;

d) can't get the economic profit in the short-run period.

16. The rule MR = MC works:

a) in the short-run period and not in the long-run period;

b) in the long-run period but not in the short-run period;

c) both in the short-run and in the long-run periods;

d) under conditions of perfect competition only.

17. Resources are placed effectively if the production volume meets the condition:

a) $MC = AVC$;

b) $P = AFC$;

c) $P = MC$;
d) $P = AVC$.

*18. If under the certain volume of production the marginal costs
are more than the product's price, then the enterprise in conditions of
perfect competition has to:*
    a) maximize the profit;
    b) minimize loses;
    c) close production;
    d) maximize the profit but redistribute resources for the product
production.

*19. Which figure shows position of the perfectly competitive firm
which should stop production in the short-run period?*
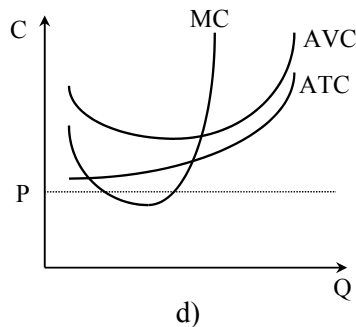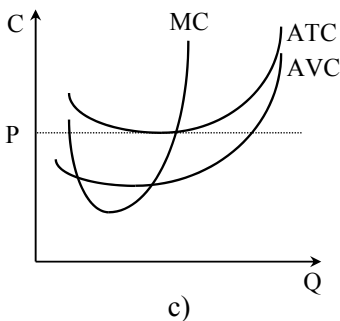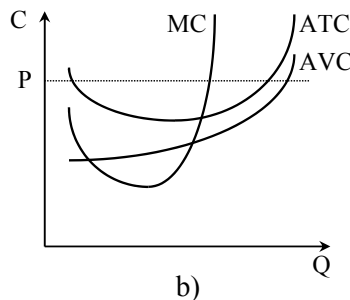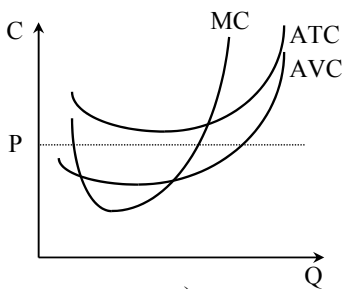
*20. Under which statement a perfectly competitive branch is in
equilibrium:*
    a) $P < LRAC$;

b) $P = LRAC$;

c) $P = LRAC = LRMC$;

d) $P > LRAC$?

21. Volume of the enterprise's loses which is to be closed in the short run period under conditions of perfect competition:

a) equals the total variable costs;

b) equals zero;

c) equals the total fixed costs;

d) can't be calculated.

Exercise 3. Solve the following tasks.

3.1. Formulas used for the tasks solving:

1. Average revenue:

$$AR = \frac{TR}{Q},$$

where TR – total revenue.

2. Marginal revenue:

$$MR = \frac{\Delta TR}{\Delta Q}.$$

3. The rule of the production volume definition:

$$MR = MC.$$

4. Condition of the sense of production manufacture by the competitive firm sense:

$$P > AVC.$$

5. Condition for the economic profit obtaining by the firm:

$$P > ATC.$$

6. Condition of the competitive firm's equilibrium in the long-run period:

$$MR = MC = AC = P.$$

3.2. Examples of the tasks solving.

1. A firm produces a product in conditions of perfect competition and sells it at the price $P = 20$. Function of the firm's total costs – $TC = 4q + q^2$. At which production volume (q) will the firm's profit be maximal?

Solving:

Condition of the profit maximization by the competitive firm is the equality of the marginal costs to the marginal revenue.

$$MR = MC$$

Function of the marginal costs we'll define as a derivative from the function of the total costs:

$$MC = \frac{d(TC)}{dq} = 4 + 2q$$

As under conditions of perfect competition the marginal revenue equals the price for all possible production volumes, then the general rule of the production volumes definition for the profit maximization will be:

$$P = MC$$
$$20 = 4 + 2q$$
$$q = 8$$

Answer: the competitive firm will get the maximal profit if it chooses the production volume $q = 8$.

2. The market of gasoline in the country is in conditions of perfect competition. Demand for the gasoline is defined with the function $Q_d = 200 - 20p$. The average costs of the ordinary firm for gasoline equal $AC = 5 + (q - 5)^2$. Which number of the petrol filling stations acts in the branch in the long-run period?

Solving:

We know the function of the market demand for gasoline $Q_d = 200 - 20p$. If we know the market price for the gasoline (p), which is set in the long-run period and the production volume for each competitive firm (q), then we will be able to define the number of firms in a branch (k).

In the long run period the market price of the product corresponds to the minimum of the average costs of the competitive firm. The function of the average costs reaches the minimum under the volume for which the first derivative function equals 0.

$$AC' = 0$$

Thus,

$$AC' = (5 + (q - 5)^2)' = (5)' + ((q - 5)^2)' = 0 + 2(q - 5)$$
$$2(q - 5) = 0$$
$$q = 5 \text{ (units)}$$

Then we'll find the price in equilibrium which equals the minimal average costs:

$$p = AC_{min} = AC(q = 5) = 5 + (5 - 5)^2 = 5 \text{ (price units)}$$

Define the market demand:

$$Q_d = 200 - 20 \cdot 5 = 100 \text{ (units)}$$

The number of the firms in the branch:

$$k = \frac{Q_d}{q} = \frac{100}{5} = 20$$

Answer: 20 petrol filling stations act in a branch in the long-run period.

3.3. Tasks for individual solution.

1. Function of dependence of the total costs on the production volume of the firm «Arkadiy», which produces chairs on the perfectly competitive market is $TC = 6Q + Q^2$. Calculate the market price of the unit of production if the firm maximizes profit at the production volume of 100 units per month.

2. There are 3 sellers and 3 consumers at the perfect market. Functions of the supply by the price are defined with the formulas $Q_1^s = 2p - 6$; $Q_2^s = 3p - 15$; $Q_3^s = 5p$, and demand functions – $Q_1^d = 12 - p$; $Q_2^d = 16 - 4p$; $Q_3^d = 10 - 0,5p$. Define the equilibrium price and the volume of the purchase or sales for each seller and buyer.

3. At the given data calculate the market price, variable and average costs and determine, what should the firm do: to increase the production output or to close?

P	Q	TR	TC	FC	VC	AC	AVC	VC
	1000	5000		1500			5,5	5

4. Dependence of the total costs of the firm on the production output is shown in the table:

Q	0	10	20	30	40	50
TC	0	75	95	140	200	280

Which production volume will the entrepreneur choose if the price for the unit of production equals 6 UAH?

5. Fill in the table and define which production volume will choose a firm which desires to maximize profit at the price 5 UAH. At which price should the enterprise be closed

Q	TC	FC	VC	MC	AC	AVC	AVC
0	4	2					
1	8						
2	10						
3	14						
4	20						

Exercise 4. Define which of the statements is right and which is wrong. Explain your answer.

1. A competitive firm in the long-run period gets the normal profit only.

2. The demand curve for the competitive firm has the negative slope.

3. The supply curve of the competitive firm in the short-run period is defined with the increasing part of the curve of the average variable costs.

4. For the competitive firm the product's price equals the marginal revenue.

5. The normal profit equals zero at the competitive market in the long-run period.

6. A firm maximizes profit cutting down the production to zero if the product's price is less than the average variable costs.

7. The price which is sufficiently low to force the enterprise to stop the production in the long-run period, can be insufficient to stop the production in the short-run period.

8. The enterprise which wants to maximize profit should comply the rule: while the production is sold at the price which covers the costs for its production, it is necessary to increase the production volumes.

9. If the firm chooses the production level at which the total costs are higher than the total costs for the maximal value then it maximizes the profit.

10. Anyone who agrees with the price – the seller, who affects the price of the goods by changing the number of products offered in the market.

Exercise 5. Problem situations to perform individual tasks and/or discussion during seminars.

1. Some economists believe that unequal distribution of revenues results in the effectiveness decrease, with which resources are distributed at the market of perfect competition. Give the reasons which prevent the market to act in a form of perfect competition.

2. Can the perfect market be attractive for an enterprise if the competitive firms, selling production in this market, do not get the economic profit?

3. The branch demand in the market of perfect competition is formed as a sum of the individual demands, graphs of which are the horizontal lines. Will the branch demand graph have the form of the direct line parallel to the Q axis in this case?

THEME 8. MONOPOLY MARKET

Questions covering the matter of the theme

1. The main features of the pure monopoly. Ways of the market monopolization. Barriers' forms which limit the new producers entering to the market.

2. The price and production volumes definition by the monopolist. The features of the demand curve for the firm – pure monopolist. Monopolist choice of the demand curve part. Economic profit maximization by the monopolist in the short-run and long run period.

3. The economic consequences of monopoly. Correlation of the average costs of the monopolist and the competitive firm. X-ineffectiveness. Contradictory impact of monopoly on the scientific and technological progress. Price discrimination.

Questions for the individual study by the students

1. The main types of the price discrimination
2. Market behavior of the monopsony
3. Indicators of the monopoly power
4. Regulation of the monopolies activity

Tasks for the control and self-control of the of students' knowledge:

Exercise 1. For each statement listed below find the corresponding term or concept.

1. Market at which one firm sells the product which doesn't have the close substitutes and is able to control its market price.

2. The sale of the same product at the same moment to different buyers at different prices.

3. Practice which is used by the firm to block the access of competitors into the competitors' branch which is evaluated by a society as unacceptable way of the certain purpose achievement.

4. Situation when the firm's actual costs for any production volume are higher than the minimal possible costs.

5. Actions which artificially prevent the new firms' entry into the branch.

6. The branch in which the economy at the production scale is so large, that the product can be produced by one firm at the lower average costs than at the situation when this product production will be carried out by more than one firm.

7. The exclusive rights granted to the inventor of the product for its production and sale.

8. Legislative restrictions on the firm's activities.

Terms and concepts:
a) license;
b) natural monopoly;
c) X-ineffectiveness;
d) barriers to entry into the branch;
e) price discrimination;
f) patent;
g) monopoly;
h) unfair competition.

Exercise 2. Find the right answer.
1. In the monopoly model it is shown:
a) sellers and buyers perceive the prices as defined;
b) market penetration of the new firms is not limited;
c) buyers have the limited choice;
d) standardized products are produced.

2. Price discrimination is:

a) the sale of the same production at the different prices to different buyers;

b) discrimination in payments for the employees' labor;

c) the price increase for the product of higher quality;

d) exploitation by setting the higher prices for consumer goods.

3. Barrier to entry the sector may be:

a) patents and licenses;

b) lower costs of the large production;

c) Legislative processing of the exclusive rights;

d) everything listed is right.

4. In contrast to the competitive firm the monopolist:

a) can set any price for the product;

b) maximizes profit under the condition $MP = MC$;

c) can produce any production volume and sell it at any price;

d) at the certain demand curve can choose combination of the price and production output which gives maximal profit.

5. In the long-run period equilibrium in the monopoly market means that products are sold at the prices which:

a) equal marginal costs;

b) equal marginal revenue;

c) are higher than marginal costs;

d) equal average costs.

6. Monopolist sells the products volume at which MR = 180 UAH, MC = 100 UAH, ATC = 200 UAH. What should the monopoly do to get maximum profit?

a) increase the price and increase the output volume;

b) increase the price and decrease the output volume;

c) increase the price and leave the output volume unchangeable;

d) decrease the price and increase the output volume.

7. Monopolist which maximizes profit will decrease the price for its product if:

a) average costs decrease;

b) the costs for ads increase;

c) marginal revenue is higher than the marginal costs;

d) marginal revenue equals marginal costs.

*8. To get the maximal profit monopolist should choose the output
volume at which:*

a) $MC = P$;

b) $MC = TC$;

c) $MR = MC$;

d) $MR = TC$.

*9. The monopolist's marginal costs as a rule are lower than the
product's price because:*

a) the price is lower than the marginal revenue;

b) the price is higher than the marginal revenue;

c) marginal costs are lower than the average costs;

d) marginal costs are higher than the average costs.

*10. Under conditions of monopoly the production price (P) de-
creases with the increase of the output volume (Q). What is the dynam-
ics of the revenue (TR):*

a) *TR* decreases at the price increase;

b) *TR* increases, if $AR = MR$;

c) *TR* increases, if $AR > MR$;

d) *TR* increases, if $AR < MR$?

*11. The given statement: «Private higher educational establish-
ments set the fee for education for nonresident students which is high-
er than for those who live in this area» is an example of the following:*

a) monopolies in higher education;

b) absence of the state control over higher education;

c) price discrimination;

d) ineffective distribution of resources in higher school.

12. The increase of the average costs of the monopolist results in the:

a) increase of the price at the same value;

b) increase of the price only if the *MC* increase is as well;

c) price decrease, because the monopoly should sell more to cover the increasing costs;

d) there is no right answer.

13. Monopolist which wants to maximize profit always produces the production volume at which:

a) demand is inelastic or there is unit elasticity demand;

b) demand is elastic or there is unit elasticity demand;

c) there is unit elasticity demand;

d) monopolist doesn't take into account the demand elasticity.

14. If the demand curve has the unit elasticity, the marginal revenue curve of the monopolist is:

a) always more than zero;

b) at first positive, then negative;

c) always negative;

d) always equals zero.

15. Which from the listed below can be explained with the monopoly power existence:

a) higher prices for «Ford» cars in comparison with the prices for «Crysler» cars;

b) high prices for popcorn in local cinema theatres;

c) high prices for air tickets in summer holidays period;

d) everything listed is right.

16. Under conditions of monopoly the demand for production is such that the curve of the long-run marginal costs of the acting production crosses the curve of the marginal revenue in the point, where the marginal costs are higher than the average long-run costs and do not guarantee the minimization of the last ones. What is necessary to do with the purpose to increase the profit?

a) to increase the output at the existent production;

b) to increase the price for production;

c) to build the plant with production output which will guarantee the minimal long-term average costs;

d) to build two plants with the output at each of them which will guarantee the minimal average short-run costs.

Exercise 3. Solve the tasks.
3.1. Formulas used to solve the tasks:
1. Condition of the profit maximization:

$$MC = MR$$

(marginal costs equal marginal revenue).
2. Total revenue:

$$TR = P \times Q$$

(total revenue is defined with the multiplication of the price per unit of production by the total volume of its sale).
3. Total costs of the firm:

$$TC = ATC \times Q$$

(total costs are defined as the multiplication of the average costs per unit of production by the output volume).
4. Marginal costs:

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

(marginal costs are calculated as the first derivative from the function of the total costs).
5. Marginal revenue:

$$MR = \frac{\Delta TR}{\Delta Q}$$

(marginal revenue is calculated as the first derivative from the function of the total revenue).
6. Lerner's index of the monopoly power:

$$I_L = \frac{P_m - M_c}{P_m} = \frac{1}{E}$$

(monopoly power is the value which is reverse to the demand elasticity for the product by price).

3.2. Examples of the task solving.
1. Function of the total costs of the monopolist is $TC = 8Q + Q^2$, and the product's price is $P = 64 - Q$. If the monopolist produces 12 units of the product per month, how much will his economic profit be? Under which output volume will the economic profit and its value be maximal?

Solving:

The economic profit (E_p) is defined as the difference between the total revenue and the total costs. Thus, calculate these values for the production volume of 12 units:

$$TC = 8Q + Q^2 = 8 \cdot 12 + 12^2 = 240;$$
$$TR = P \cdot Q = 64Q - Q^2 = 64 \cdot 12 - 12^2 = 624;$$
$$E_p = TR - TC = 624 - 240 = 384.$$

The profit maximization is achieved in a cross point of the curves of the marginal revenue and marginal costs. In this point the mentioned values will be equal. Marginal revenue and marginal coasts are the derivatives, accordingly, from the functions of the total revenue and total costs. I.e.:

$$MC = (TC)' = (8Q + Q^2)' = 8 + 2Q;$$
$$MR = (TR)' = (64Q - Q^2)' = 64 - 2Q.$$

Having compared the marginal revenue and marginal costs and having solved the equality related to the Q, find the production volume at which the economic profit will be maximal:

$$8 + 2Q = 64 - 2Q;$$
$$4Q = 56;$$
$$Q = 14.$$

Let's find the economic profit at the production volume of 14 units:

$$TC = 8Q + Q^2 = 8 \cdot 14 + 14^2 = 308;$$
$$TR = P \cdot Q = 64Q - Q^2 = 64 \cdot 14 - 14^2 = 700;$$
$$E_p = TR - TC = 700 - 308 = 392.$$

Answer:

If the production volume is 12 units, then the monopolist gets the economic profit of 384 price units. Maximum economic profit of 392 price units will be received by the monopolist at the production of 14 units of production.

2. Monopolist can sell 10 units of product at the price 100 UAH per unit, but the sale of the 11th unit of product will result in the price decrease down to 98 UAH. Calculate the marginal revenue at the production transition from 10 to 11 units. Is the further increase of the produc-

tion volumes useful (from the point of view of the profit maximization, if it is known that the production of each new unit of the product costs 80 UAH for the monopolist?

Solving:

Marginal revenue is defined as the growth of the total revenue caused by the sale of the additional unit of production:

$$MR = \frac{TR_1 - TR_0}{Q_1 - Q_0} = 98 \times 11 - 100 \times 10 = 1078 - 1000 = 78$$

It is useful to increase the production volumes up to the time until the marginal revenue from the sale of the additional unit of production is higher than the marginal costs for its production. As the 11th unit of production costs 80 UAH to the monopolist, and their sale will increase the total revenue for 78 UAH, then it is possible to prove that the economic profit of the monopolist will decrease under other constant conditions. So, it is useless to produce the 11th unit of production from the point of view of the profit maximization.

Answer: Marginal revenue from production of the 11th unit of production will be 78 UAH. Its production is useless from the point of view of the profit maximization.

1.3. Tasks for individual solution.

1. Let's assume that the function of the costs of the pure monopolist is: $TC = 50 + Q^2$. Demand for the production is expressed as $P = 40 - Q$. Find which quantity of the products will be produced by the monopolist to maximize the profit.

2. A firm produces the product in conditions of the pure monopoly. Function of the demand for this product is: $P = 144 - 3Q$, and function of the average costs is: $AC = (25 : Q) + Q$. Under which output volume will a firm's profit be maximal?

3. The table given below illustrates the demand for production the monopolist's.

Price (UAH)	20	18	16	14	12	10	8	6	4
Quantity (units)	2	3	4	5	6	7	8	9	10

Calculate the monopolist's marginal revenue at transition to each new volume of production. At which volumes of production does the monopolist maximize the total revenue? Which volume of production

will be chosen by the monopolist which maximizes profit if his marginal costs are fixed and equal 6 UAH?

4. A firm-monopolist produces mining equipment and sells it at the domestic and external markets. With the purpose of increasing the profit it is able to use the price discrimination, which is based on the market segmentation. The demand function for the firm's production at the domestic market is $Q_{d1} = 160 - P_1$; and at the external one is $- Q_{d2} = 160 - 2P_2$. Total costs of the monopolist are expressed with the function $TC = 5 + 10Q + 0{,}25Q^2$, where $Q = Q_1 + Q_2$. Define:

a) At which prices in each market does the monopoly get the maximal profit? What is the value of the profit?

b) Which price should the firm set to get the maximal profit in situation of the price discrimination restriction? How will the profit value change?

5. Building of cottages in a city is monopolized by one building organization. Which price for one cottage will the company set if its costs for building can be expressed by the formula $TC = 100Q$, and the demand elasticity for cottages equals 3 by price?

Exercise 4. Define which of the statements is right and which is wrong. Explain your answer.

1. All types of monopolies are established by the state.

2. All monopolists use the price discrimination.

3. All monopolists maximize the profit producing production with the effective relation of the resources.

4. The demand curve has the negative character for the pure monopolist.

5. Marginal revenue of the pure monopoly is higher than the price.

6. Total revenue of the monopolist (*TR*) will be maximal at the condition when the demand elasticity equals one and $MR = 0$.

7. The price decrease on the elastic part of the demand curve does not result in the increase of the total revenue.

8. At the situation of the natural monopoly the long-run costs will be higher if the only one producer is presented in this branch.

9. The average costs of the monopolist and the analogous competitive firm are not equal.

10. Monopoly can have the significant advantages because of the production scale increase.

11. Monopoly maximizes profit choosing such production volume which meets the rule $MC = P$.

12. Monopolist will produce and sell the additional production volume if $MR > MC$.

13. Monopoly always chooses the production volume which corresponds to the inelastic demand curve.

14. Any price discrimination is out of the law.

15. When the branch is a natural monopoly the society needs to regulate it with the help of the state.

Exercise 5. Problem situations to perform individual tasks and/or discussion during seminars.

1. It is known that the state sometimes motivates setting of the different prices for the same production for different consumers. What is the role of the Ukrainian state in applying the price discrimination by the natural monopolies?

2. A lot of factors which show the inhibition of the expansion process of the scientific achievements among the producers by monopolies. Along this the significant number of the famous scientific discoveries and their implementation in production is connected with the firms' activity which take the monopolistic position at the market. Explain the contradictory influence of the pure monopolist on the scientific-technical progress.

3. It is known that managers' interests do not respond the interests of the owners of an enterprise. It results in the fact that sometimes the decisions are made which are not the best from the position of the profit maximization or costs minimization. Why is the opportunistic behavior of managers often a cause of the X-ineffectiveness of the enterprise-monopolist?

THEME 9. MARKET OF THE MONOPOLISTIC COMPETITION

Questions covering the matter of the theme

1. Monopolistic competition and its main features. The ways of products differentiation. The limit of the influence on the price and fac-

tors which define it. Barriers to entry the branch of the new producers at conditions of the monopolistic competition.

2. The price and production volume definition at the monopolistic competition. Factors of the elasticity of the demand curve at the monopolistic competition. Profit maximization or loses minimization in the short-run period. Equilibrium of a firm in the long-run period.

3. Monopolistic competition and effectiveness. The comparative analysis of the pure and monopolistic competition. Social and economic effect of the monopolistic competition. The reasons of the resources partiall use at conditions of monopolistic competition.

4. Non price competition. Advertisement, its mechanism and role in the producer's purposes achievement. The «pro» and «contra» arguments of advertisement.

Questions for the individual study by the students

1. Equilibrium models of Chamberlin and Guttenberg for monopolistic competitor.

2. Graphic expression of the revenue increase of the monopolistic competitor at the expense of the advertisement.

Tasks for the control and self-control of the of students' knowledge:

Exercise 1. For each statement listed below find the corresponding term or concept.

1. Market at which a lot of firms sell the differentiated product and have the opportunity to control the market price in some limits.

2. Methods of competition which are applied in a sphere of the product's differentiation, advertisement and distribution stimulation.

3. Physical or other differences between the products of different firms which call the desire of individual buyers to buy products only of the one firm at condition that sellers sell these products at the same price.

4. Partiall use of resources, higher costs per unit of production, unloaded production power.

5. Quality of production, buyer service, territorial placement of the trading outlets and so on.

Terms and concepts:

a) product's differentiation;

b) monopolistic competition;

c) results of the monopolistic competition;

d) forms of the product's differentiation;

e) non price competition.

Exercise 2. Find the right answer.

1. Monopolistic competition is characterized with the fact that:

a) firms can enter the market and leave it absolutely free;

b) the low number of firms act at the market;

c) firms which act at this market produce the differentiated pro-
duction;

d) firms are in interdependence with each other.

*2. If the monopoly in the branch is changed for the monopolistic
competition, then:*

a) sellers win;

b) buyers win;

c) nobody wins;

d) sellers and buyers win.

*3. Markets of the pure and monopolistic competition are similar in
the fact that:*

a) homogeneous products are produced;

b) price is higher than the marginal costs;

c) there are no barriers for the competitors to enter the branch;

d) there is no right answer.

*4. The long-run equilibrium in the market of monopolistic compe-
tition means that:*

a) market prices equal the minimal values of the long-run average
costs;

b) prices equal the marginal costs;

c) firms do not get the economic profit;

d) all existing production capacities are used.

*5. If the D – is demand, MR – marginal revenue, LRAC – long-run
average costs, and LRMC – long-run marginal costs, then which of the*

graphs given below shows the equilibrium at the monopolistic competition:
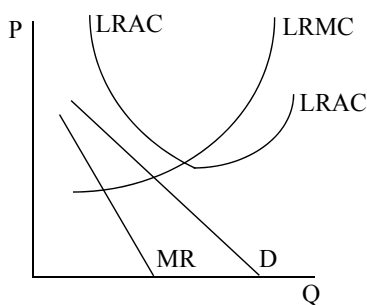
a)
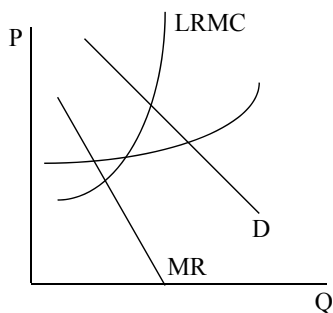
b)
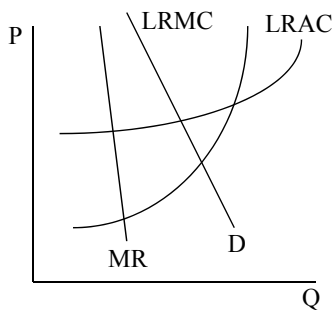
c)
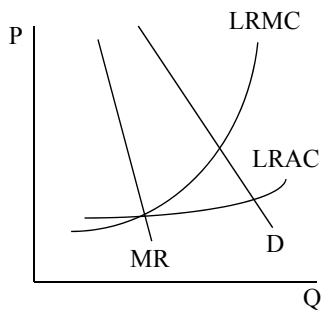
d)

6. *Monopolistic competition is comparatively effective and beneficial to the consumers because:*

a) the product's differentiation results in the best sale of the most hard tastes of consumers;

b) firms produce effective production volume from the point of view of the market;

c) the effective resources use from the point of view of society is achieved;

d) everything listed is right.

7. *Monopolistic competition appears in the markets of those products where the demand elasticity is:*

a) low as a rule;

b) higher than one;
c) almost equals one;
d) can be of any value.

8. What is not included into the non-price competition methods:
a) advertisement;
b) guarantee service offer;
c) consumer credit offer;
d) season sale of products.

9. Under conditions of the monopolistic competition:
a) $P = MR$;
b) $P > MR$;
c) $P < MR$;
d) $P < AR$.

10. For the market of the monopolistic competition the following is not characteristic:
a) limited control over prices;
b) comparatively high costs for production and sale of the products;
c) impossibility of the producer's to influence the demand elasticity;
d) use of the instruments of the non-price competition.

11. The following can't be the forms of the products differentiation:
a) functional features of the product;
b) working hours of the trading outlet;
c) different prices for the same product group;
d) convenient forms of payments.

12. At the high demand elasticity, at the market of monopolistic competition, the seller forms the behavior strategy which meets:
a) insignificant manipulation with the prices;
b) significant change of the production volumes;
c) maximal influence on the demand elasticity;
d) everything listed above is right.

13. Unlike the pure monopoly, in the market of monopolistic competition:

a) there is no monopolistic power at all;

b) the price discrimination is absent;

c) the demand curve for the product of the firm has the decreasing character;

d) free entry and leave the market.

14. If at the definite production volume the marginal costs of the monopolistically competitive firm are lower than its average costs and equal the marginal revenue, this means that:

a) a firm gets profits;

b) a firms faces loses;

c) a firm has achieved the equilibrium production volume;

d) there is no right answer.

15. A firm in condition of equilibrium gets profits in the market of monopolistic competition for sure if:

a) $AC = P$;   c) $AC = MC$;

b) $AC < P$;   d) $MC = MR$.

16. A firm in condition of the equilibrium in the market of monopolistic competition will have loses for sure if:

a) $AC = MC$;

b) $AC < P$;

c) $AC = P$;

d) $AC > P$.

Exercise 3. Solve the tasks.

3.1. Formulas used for the tasks solution:

1. The condition of the profit maximization:

$$MC = MR$$

(marginal costs equal marginal revenue).

2. Total revenue:

$$TR = P \times Q$$

(total revenue is defined as the multiplication of the price per unit of production by the total volume of its sale).

3. Marginal costs:

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

(marginal costs are calculated as the first derivative from the function of the total costs).

4. Marginal revenue:

$$MR = \frac{\Delta TR}{\Delta Q}$$

(marginal revenue is defined as the first derivative from the function of the total revenue).

5. Economic profit:

$$E_p = TR - TC$$

(economic profit is defined as the difference between the total revenue and total costs).

6. The point of minimization of the average costs:

$$ATC_{min} = MC$$

(average costs reach minimal value in a cross point of the curves of the average and marginal costs).

3.2. Examples of the tasks solution.

1. A firm produces coffee machines and acts at the market of monopolistic competition while maximizing profit. Marginal revenue of this firm is expressed by the formula $MR = 20 - 2q$, and its marginal costs in the long-run period (on the increasing part) – with formula $LRMC = 2q - 8$. If the minimal value of the long-run average costs equals 12, then what is the surplus of the production capacities of this firm?

Solving:

A firm in conditions of monopolistic competition maximizes its profit under condition of equality of the marginal revenue and marginal costs: MR = MC. Having compared these two values and having solved the equation related to the production volume we can calculate the firm's capacities which are used:

$$20 - 2q = 2q - 8$$
$$4q = 28$$
$$q = 7.$$

It is known that the curves of the marginal costs and average costs cross in one point of the minimal value of the average costs. This means that at the production volumes which guarantee the minimum value of the average costs they equal the marginal costs:

$$LATC_{min} = LRMC.$$

Thus, having compared these two values and having solved the equation related to Q, we get the production volume which minimizes the average costs:

$$2q - 8 = 12;$$
$$q = 10.$$

Thus, a firm has a surplus of the production capacities which equals 3:

$$10 - 7 = 3.$$

Answer: A firm has a surplus of the production capacities which equals 3.

2. Function of the total costs of the monopolistic competitor is expressed as: $TC = 200 + 30Q$; the demand function for the firm's production is expressed with the equation: $P = 60 - 0,2Q$. Define the optimum (from the point of view of the profit maximization) production volume and the price. What is the value of the economic profit of the firm in this case?

Solving:
The profit maximization is achieved in a cross point of the curves of the marginal revenue and marginal costs. The mentioned indices will be equal in this point. Marginal costs are the derivative from the function of the total costs . I.e.:

$$MC = (TC)' = (200 + 30Q)' = 30.$$

Find the expression which characterizes the total revenue of the firm:

$$TR = P \cdot Q = (60 - 0,2Q) \cdot Q = 60Q - 0,2Q^2.$$

Marginal revenue is the derivative from the function of the total revenue, i.e.:

$$MR = (TR)' = (60Q - 0,2Q^2)' = 60 - 0,4Q.$$

Having compared the marginal revenue and marginal costs related to Q, find the production volume at which the economic profit will be maximal:

$$30 = 60 - 0{,}4Q;$$
$$0{,}4Q = 30;$$
$$Q = 75.$$

And the price will be:

$$P = 60 - 0{,}2Q = 60 - 15 = 45.$$

We can calculate the total costs and the total revenue at the optimum volumes of production:

$$TR = P \cdot Q = 45 \cdot 75 = 3375$$
$$TC = 200 + 30Q = 200 + 2250 = 2450$$

Find the value of the economic profit:

$$E_p = TR - TC = 3375 - 2450 = 925.$$

Answer: A firm will maximize its profit at production of 75 units of production and at the sale of it at the price of 45 UAH per unit. And the profit will be 925 UAH.

3.3. Tasks for individual solution.

1. The marketing department of the firm which acts under conditions of monopolistic competition has made a forecast of dependence of the prices and costs on the production volumes and presented it in the following table:

Q	P	FC	VC
0	100	50	0
1	95	50	30
2	90	50	55
3	85	50	75
4	80	50	100
5	75	50	130
6	70	50	160
7	65	50	200
8	60	50	250

Find with the help of the comparison methods of the total ($TRTC$) and marginal ($MRMC$) values, the price and production volume which maximize the firm's profit. Calculate the profit value.

2. A firm produces the fresh beverages (hundreds of bottles per year) and acts under conditions of monopolistic competition. Marginal revenue of the firm is expressed by the formula $MR = 10 - 2q$, and increasing part of the curve of the long-run costs is expressed by the formula: $LRMC = 2q - 2$. If the minimal value of the long-run average costs ($LRAC$) equals 6, then which surplus of the production powers will a firm have?

3. Each of 25 firms which act in the market of monopolistic competition has the demand curve which can be described by the expression: $P = 25 - Q$, where Q – production volume of each firm. What appearance will the equation of the demand curve have for a separate firm if 10 more analogous firms enter the branch? Will the old firms be able to save the previous production volumes and prices?

4. A firm which acts under conditions of monopolistic competition is shown in the graph. Define:

a) at which production volume a firm maximizes its profit:

b) what is the total revenue of the firm;

c) what economic profit the firm will get;

d) at which production volume the firm minimizes the average costs and what is the surplus capacities in comparison with the production volumes which maximize the profit.
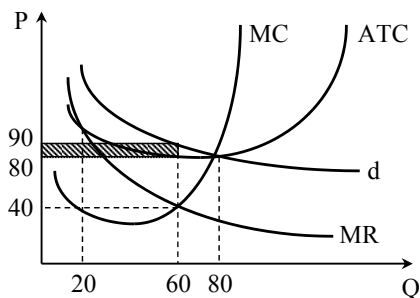
5. Demand for the products of the firm producer of the smoked sausages (in tones), which acts under conditions of monopolistic competition is expressed by the following formula:

$$Qd = 20 - \frac{P}{3}$$

What marginal costs will a firm have if the equilibrium price equals 33 UAH per unit?

Exercise 4. Define which of the statements is right and which is wrong. Explain your answer.

1. A firm can get the economic profit only in the short-run period under monopolistic competition.

2. Monopolistic competition is competition of the monopolistic firms of the different branches between each other.

3. If competition is changed for monopolistic one, then it, under other equal conditions, results in the worse consumers' position.

4. The prices increase for the products under monopolistic competition is the cause of that producers start to get the economic profit unlike the conditions of perfect competition.

5. The use of price competition only is not characteristic for monopolistic competition.

6. The price is lower than the marginal costs under conditions of monopolistic competition.

7. In the market of monopolistic competition the output of the product group is guaranteed by the sufficient number of firms.

8. In the market of perfect competition firms offer different products in comparison with monopolistic competition.

9. In the market of monopolistic competition the effective resources use is not achieved.

10. At monopolistic competition the demand curve for the separate firm is less elastic than for the perfectly competitive firm.

Exercise 5. Problem situations to perform individual tasks and/or discussion during seminars.

1. What monopolistic power has a firm which acts under conditions of monopolistic competition? Which spheres of activity are covered by this power and by which factors is its power determined?

2. Perfectly known statement: «While our advertisement is working – you have your jobs!». Explain your understanding of the sense of this statement. What is, in your opinion, connection between the scales and successful advertisement in society and the rate of employment?

3. It is known that for the opportunity to get the differentiated goods for different needs satisfaction under monopolistic competition

the society pays higher price and ineffective use of production capacities for these products. Is it possible to measure the prize and loses of society from monopolistic competition in comparable units?

THEME 10. OLIGOPOLISTIC MARKET

Questions covering the matter of the theme

1. The features of the oligopolistic market. Concentration rate of production and ways of its evaluation. Herfindahl-Hirshman Index. Spreading of the oligopolistic model of the market and factors which cause it. Oligopolistic market diversity: «soft» and «tight» oligopoly, duopoly.

2. A firm's behavior related to the price and output in the oligopolistic market. Broken curve of demand. Secret conspiracy. Factors that counteract the new cartel agreements making and destroy the old ones. Price leadership. Peculiarities of the price leader behavior. Pricing «cost plus».

3. Evaluation of the economic effectiveness of the oligopolistic market. Comparative characteristics of the oligopolistic market and pure monopoly. J. Schumpeter's and J. Galbraith's concept. Ukrainian legislation on regulation of businesses that hold a monopolistic position in the market.

Questions for the individual study by the students

1. Models of duopoly of J. Bertrand and A. Cournot
2. Criteria of the joint actions of W. Fellner's oligopolistic firms
3. Application of game theory to analyze the behavior of oligopolistic firms.

Tasks for the control and self-control of the of students' knowledge:

Exercise 1. For each statement listed below find the corresponding term or concept.

1. Market at which several firms sell standardized or differentiated products and the control over the prices is limited with interdependence of the firms.

2. The cycle of the gradual prices reduction with the purpose to eliminate the competitors from the oligopolistic market.

3. The firms merger which agree their decisions on prices and production volumes in the way if they merge into the pure monopoly.

4. Agreement on prices, market sharing and other restrictions on competition in oligopoly.

5. Unofficial method of setting prices for manufactured goods when one firm changes the price and other firms do the same soon.

6. The situation at which the price change (or some other parameter) by one firm causes the changes in the volume of sales and profits of the other firm.

7. The demand curve based on assumption that competing firms join the decision on the prices decrease and do not support decision on their increase.

8. Method of setting a target price for goods based on the average production costs by adding a definite percentage to them.

9. Oligopoly in which firms produce differentiated products.

10. Competition which occurs among the firms in one branch with the firms in the other branches.

Terms and concepts:
a) interbranch competition;
b) price war;
c) broken curve of demand;
d) pricing «cost plus»;
e) oligopoly;
f) price leadership;
g) differentiated oligopoly;
h) cartel;
i) general interdependence;
j) secret conspiracy.

Exercise 2. Find the right answer.
1. Which of the listed below encourages companies to agree on production limitation in order to increase prices:
a) a decrease of the interest rates;
b) prize reduction because of the fraud;
c) an increase of penalties for the fraud;
d) less probability to be open.

2. Cartel can set the full monopoly in the market with open information and the opportunity to make trust agreements and with free entrance:
    a) in the short-run and long run period;
    b) in the short-run but not in the long-run period;
    c) in the long-run but not in the short-run period;
    d) only under conditions of duopoly of Bertrand but not Cournot.

3. If a firm decreases the price the competitors will support it, and if a firm increases the price – nobody will follow this example. It is about:
    a) price war;
    b) broken curve of demand;
    c) price leadership;
    d) high level of price competition.

4. Principle «costs plus» is described by the formula:
    a) $AVC + AFC$;
    b) $AFC\,(1 + r)$;
    c) $AVC\,(1 + r)$;
    d) $ATC\,(1 + r)$.

5. «Broken» curve of demand for oligopolistic firm necessarily involves:
    a) break of MR curve;
    b) break of MC curve;
    c) product's price shouldn't be higher than MR;
    d) firm's behavior is not optimum.

6. A firm is oligopolistic if:
    a) sets the price at the MC level;
    b) follows the leader's price;
    c) sets the price at the AVC level;
    d) sets the price according to the demand curve.

7. A cartel agreement will be unstable if:
    a) a cartel regulates production of the homogenous product;
    b) firms are not able to detect the offender;

c) cartel's members have the same costs;

d) there is no right answer.

8. Stimuli to break the cartel agreement are lower than:

a) longer period between exposure and violation of opportunistic actions;

b) low probability that the violations will be noticed;

c) higher the discount coefficient;

d) everything is right.

9. Oligopolistic market has the joint feature as the monopolistic competition market has:

a) there are no barriers to enter the branch;

b) the strategic behavior is typical for a firm;

c) a small number of producers acts;

d) firms have a market power.

10. The marginal revenue is lower than the market price for a firm which acts under conditions of:

a) perfect competition;

b) monopoly;

c) monopolistic competition;

d) oligopoly.

11. The first economist who tried to create a theory of oligopoly, was:

a) Edward Chamberlin;   c) Joan Robinson;

b) Augustin Cournot;   d) John Galbraith.

Exwercise 3. Solve the tasks.

3.1. Formulas used for the tasks solve:

1. Model of duopoly of Cournot:

– linear function of the market demand:

$$P = a - b\,(Q_1 + Q_2);$$

– production volumes definition (response curves):

$$Q_q = \frac{a - bQ_2 - MC}{2b};$$

$$Q_2 = \frac{a - bQ_1 - MC}{2b};$$

$$Q_{1,2} = \frac{a - MC}{3b}.$$

2. Model of duopoly of Stackelberg:
– production volumes definition:

$$Q_1 = \frac{a - MC}{2b};$$

$$Q_2 = \frac{a - MC}{4b};$$

$$P = MC - b.$$

3. Model of duopoly of Bertrand:
– production volumes definition:

$$Q_1 = Q_2 = \frac{a - MC}{2b}.$$

4. Model of duopoly of Edgeworth:
– response curves for firms:

$$P_1 = \frac{a - MC + P_2}{4};$$

$$P_2 = \frac{a - MC + P_1}{4}.$$

– production volumes definition:

$$Q_1 = Q_2 = \frac{2a - MC}{3}.$$

3.2. Examples of the tasks solving.

1. Response function of one producer under condition of duopoly is $Q_1 = 50 - 0{,}4Q_2$, the other one – $Q_2 = 50 - 0{,}5Q_1$. Market demand can be described with the equation: $Q_d = 100 - 2{,}5P$. Define the price for the product according to Cournot's model.

Solving:

According to the model of Cournot duopoly two firms will choose production volumes which will correspond to the cross point of the response curves. We can find the value of the equilibrium production volume for each firm having solved the system of equations:

$$Q_1 = 50 - 0{,}4 \,(50 - 0{,}5Q_1);$$
$$0{,}8Q_1 = 30;$$
$$Q_1 = 37{,}5;$$
$$Q_2 = 50 - 0{,}5Q_1 = 50 - 37{,}5*0{,}5 = 31{,}25.$$

The total production volume will be equal to the production volumes sum of each firm:

$$Q = Q_1 + Q_2 = 37{,}5 + 31{,}25 = 68{,}75$$

Using the market demand equation we can find the price which will correspond to the equilibrium production volume:

$$68{,}75 = 100 - 2{,}5P;$$
$$P = 12{,}5.$$

Answer: The price will be set at the level of 12,5 money units.

2. Four identical in the size firms act in a branch and have the identical marginal costs which are fixed and equal 50 UAH. If firms join the cartel and share the market in equal parts, which will the equilibrium price be and what quantity of product will be sold by each firm? Information about dependence of the market price on the production volumes is presented in the table.

P, UAH	200	180	160	140	120
Q, thousand units	50	70	90	110	130

Solving:
On the base of the table data analysis it is easy to build the market demand function:

$$P = 250 - Q.$$

It gives the opportunity to define the marginal revenue which will be brought after the sale of each additional thousand units of products to the producers:

$$TR = 250Q - Q^2;$$
$$MR = 250 - 2Q.$$

If producers join the cartel then they act as one monopoly as to the production volumes and prices definition, i.e. maximize the prof-

it under condition of the equality of the marginal costs and marginal revenue:

$$MC = MR;$$
$$50 = 250 - 2Q;$$
$$Q = 100;$$
$$P = 250 - 100 = 150.$$

As, under conditions of the task, the firms share the market in equal parts, so, each of them will produce 25 thousand units of production.

Answer: Each firm will produce 25 thousand units of production and sell it at the price 150 UAH.

3.3. Tasks for individual solution.

1. At which minimal quantity of the firms equal in size is it necessary to divide the branch, that in accordance with the rules of Herfindahl-Hirshman index use of this branch is not considered highly concentrated in the USA?

2. The activity of the oligopolistic firms is characterized by the graphic model which is given in the picture.
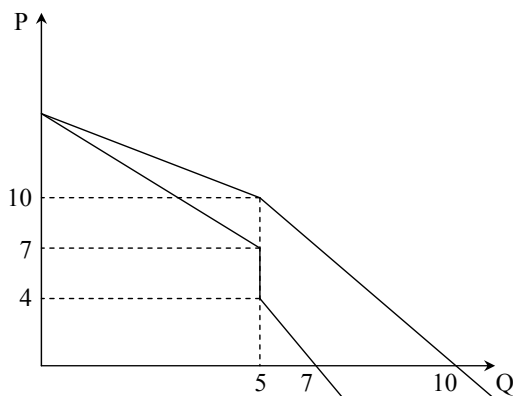
Define according to the graph:

1. Which production volume will the firm produce if the marginal costs for production of the additional unit of products are stable and equal 5.

2. If the marginal costs decrease down to 4,5, how will the sale volume change?

3. Under which increase of the marginal costs will the firm decrease the production volume?

4. The branch demand for production is characterized with the function:

$$P = 195 - 10Q.$$

Two firms act in a branch and maximize their profit with the following functions of costs:

$$TC_1 = 10 + 7{,}5Q_1{}^2;$$
$$TC_2 = 20 + 10Q_2{}^2.$$

According to the model of Cournot duopoly find the equilibrium values of the production volumes and prices, and the profit of each firm.

4. Two firms act in a branch the marginal costs of which are the same and equal zero. Demand for production of the branch is: $P = 200 - Q$.

Define: the price and production volume under condition of the competitive branch (Cournot, Bertrand and Edgeworth models of duopoly); the price and production volume under condition that the firms are organized into the cartel.

5. Under conditions of duopoly the branch demand is $P = 50 - 0{,}25Q$, and functions of the firms' costs are: $TC_1 = 10 + 0{,}15Q_1{}^2$, $TC_2 = 25 + 10Q_2$. Define the equilibrium price and production volume of each firm according to the conditions: a) Cournot model of duopoly; b) Stakelberg model of duopoly under the firm's 1 leadership; в) Stakelberg model of duopoly under the firm's 2 leadership.

Exersice 4. Define which of the statements is right and which is wrong. Explain your answer.

1. If in the oligopolistic market a firm increases or decreases the price this will influence the volume of the sale and the profit of the firms competitors.

2. In the oligopolistic market the prices are less stable than under conditions of perfect competition.

3. The market behavior of the cartel which maximizes the profit is analogous to the behavior of the pure monopoly.

4. It is hard to establish cartels and similar secret conspiracies and support them during long period of time in practice.

5. Competition of the oligopoly firms is accompanied mostly by the price methods.

6. The model of the broken curve of demand explains why the oligopoly will not change the prices and production volume under small or medium changes in costs.

7. Oligopolistic interdependence of the firms always results in domination of one firm over the others.

8. If for oligopoly the price is lower than the average costs, it needs to leave the branch.

9. Cournot's model explains the behavior of producers in the market of monopolistic competition.

10. Existence of the high barriers to enter the branch is characteristic for oligopoly.

Exercise 5. Problem situations to perform individual tasks and/ or discussion during seminars.

1. Under which conditions can price wars serve the effective way of competition? List the historical facts of the price wars between producers. Why, in your opinion, have firms refused the price wars in modern conditions?

2. In the oligopolistic market, near the large producers, the outsiders exist as a rule (small by size enterprises which are not included into the cartels). What can their price and trade policy be which will give the maximal benefits?

3. It is known that there are some international oligopolistic cartels in the world. The most famous of them – organization of countries-exporters of oil. The problem of creation of international gas cartel is discussed actively. Give assessment of such processes. Who will gain from establishment of such organizations? How will it influence the price level and production volumes? What are the factors which push the participants to break the cartel agreements?

THEME 11. THE DERIVATIVE DEMAND FORMING

Questions covering the matter of the theme

1. Demand for resources as a derivative from the demand for the final goods. The theory of the marginal productivity of the production

factors. Indices of resources use in money expression (*MRC*, *MRR*). Producer's equilibrium related to the resources attraction. Graph of the demand for resources.

2. The changes in demand for resources. Demand elasticity for resource as a rate of sensitivity of demand to the change of the price and non-price factors. Factors of the demand change for resource. Factors which determine the demand elasticity for resource.

3. Optimal correlation of resources in the long run period. The rule of the costs minimization. The rule of the profit maximization.

Questions for the individual study by the students
1. Branch demand for resource.
2. Demand for the two variable production factors.

Tasks for the control and self-control of the of students' knowledge:
Exercise 1. For each statement listed below find the corresponding term or concept.

1. Demand for the good or service which depends on the demand for any other good or service.

2. The change of the total revenue of a firm if it uses additional unit of resource.

3. Growth of the total costs for the resource use if the firm uses additional unit of this resource.

4. Additional product produced under the use of additional unit of resource.

5. The rule under which a firm, to maximize the economic profit, should use the resource volume under which $MRR = MRC$.

6. The influence of the resource price change on the quantity of this resource under condition if the firm does not change the output volume.

7. $MRR_L / P_L = MRR_K / P_K = 1$.

8. Production of any definite production volume under which the last money unit spent for each resource gives the same marginal product.

Terms and concepts:
a) marginal costs for resource;
b) correlation of resources which maximizes profit;

c) the derivative demand;

d) the rule of equality of marginal product in money expression and marginal costs for resource;

e) correlation of resources which minimizes the costs;

f) marginal product;

g) marginal product in money expression;

h) substitution effect in production.

Exercise 2. Find the right answer.

1. Marginal product of the production factor in money expression equals:

a) the price of the last unit of product;

b) the change of the total volume of revenue at use of additional unit of production factor;

c) production volume at use of additional unit of production factor;

d) the change of the production price produced with the help of the given production factor.

2. When the competitive firm achieves the production level at which the money expression of the marginal product of each resource equals the price of this resource, then it:

a) produces the product at the minimal costs but does not get maximal profit as a rule;

b) gets maximal profit but does not produce production at the minimal costs as a rule;

c) gets maximal profit at minimal production costs;

d) not surely gets the maximal profit.

3. If in production of the product the labor (L) and the capital (K) are used, $MP_L = 2$; $MP_K = 5$; $P_L = 1$ UAH; $P_K = 20$ UAH; MR = 3 UAH. To get the maximal profit a firm should use:

a) more labor and capital;

b) less labor and capital;

c) more labor and less capital;

d) constant volume of labor and capital.

4. Demand for resources depends on:

a) product's price which is produced with the help of this resource;

b) the prices for substitute resources;

c) the price of the given resource;

d) everything listed is right.

5. If the competitive firm maximizes the profit while selling production at 2 UAH per unit and buying resource at price 10 UAH, then the money expression of the marginal product of resource equals:

a) 2 UAH;

b) 5 UAH;

c) 10 UAH;

d) 20 UAH

6. The changes in production technology which result in an increase of the marginal product of the production factor result in the movement of the:

a) demand curve for the factor to the left;

b) demand curve for the factor to the right;

c) equilibrium point down along the demand curve on the factor;

d) equilibrium point up along the demand curve on the factor.

7. Which of the listed statements is right for the production factor the supply of which is absolutely inelastic in the long-run period:

a) supply curve is vertical;

b) revenue which gets the owner of the production factor is a pure economic rent;

c) factor doesn't have the alternative use;

d) everything listed is right.

8. If in the given production process capital and labor are substitute, then at the capital price increase the demand curve for labor:

a) moves to the right;

b) stays unchangeable;

c) moves to the left;

d) is a horizontal line.

9. Define the factor which doesn't influence the elasticity of the market demand for resource:

a) part of the costs for resource in the firm's costs;

b) demand elasticity for the goods produced;

c) production technology of the given goods;

d) there is no right answer.

10. If the part of the costs for resource increases then the demand elasticity for this resource:

a) increases;

b) decreases;

c) stays constant;

d) possible any of the mentioned variants.

11. In the short-run period the demand curve of the firm for resource coincides with the curve:

a) *MC*;

b) *MP*;

c) *MRC*;

d) *MRR*.

12. The marginal costs for resource are the increase of the total costs caused by the:

a) increase of the production volume;

b) increase of the resource quantity attracted by the enterprise;

c) increase of the resources price;

d) achievement of the limits of the financial capacity of the enterprise to attract resources.

13. A firm has the prices of all resources the same as the attracted resources prices. This means that a firm acts under the rule which allows:

a) to maximize the profit;

b) to minimize the loses;

c) to minimize the costs per unit of production;

d) to maximize the average resources productivity.

14. Use of the rule of the costs minimization and the rule of the profit maximization motivates a firm to attract the same quantity of resource:

a) always;

b) never;

c) only under conditions of perfect competition;
d) only under conditions of imperfect competition.

15. If the competitive firm always strives to achieve equilibrium, then under the decrease of the labor price it will change the use of this resource in the short-run period in the way that the marginal labor product in money expression will:
a) increase;
b) decrease;
c) stay unchangeable;
d) any of the listed variants is possible.

Exercise 3. Solve the tasks.
3.1. Formulas used for the tasks solving:
1. Condition of the additional resources attraction expediency:

$$MRC \leq MRR$$

(it is expedient to attract only those units of resources for which the marginal costs for resource are lower or equal the marginal revenue in the money form).
2. The rule of the costs minimization:

$$MP_L \ / \ P_L \ = \ MP_K \ / \ P_K$$

(costs are minimal if the correlation of the marginal product to the price is the same for each of resources which are used).
3. The rule of the profit maximization:

$$MRR_L \ / \ P_L = MRR_K \ / \ P_K = 1$$

(the profit is maximal when for each of resources the marginal revenue on resource in money expression, divided by its price, equals 1).
4. The marginal revenue for resource in the money form for the competitive firm:

$$MRR = MP \times MR$$

(for the competitive firm the marginal revenue in the money form can be obtained with the multiplication of the marginal product by the marginal revenue).

3.2. Examples of the tasks solving.
1. An entrepreneur hires employees and pays salary 50 UAH per day, and he sells the produced goods at 4 UAH in the competitive mar-

ket. Using on the data given in the table, define which quantity of employees an entrepreneur should hire.

Number of employees, persons	Total product, units per day
0	0
1	24
2	44
3	60
4	72
5	82
6	90
7	96

Solving:

The number of employees which corresponds to the conditions $MRC \leq MRR$ will be optimal. As the rate of the salary is stable (50 UAH), then the optimality condition transforms into $50 \leq MRR$.

For calculations of the marginal product of labor in the money form we will use the formulas $MRR = MP \times MR$ and $MR = \dfrac{\Delta TR}{\Delta Q}$.

As in our task ΔQ always equals 1, and the marginal revenue MR under conditions of perfect competition does not change and always equals the price of the sold production P, then the formula to calculate the marginal product of labor in the money form will be the following:

$$MRR = \Delta TR \times P$$

For the first hired worker MRR equals:

$MRR_1 = (24 - 0) \times 4 = 96$

Analogous for the other workers:

$MRR_2 = (44 - 24) \times 4 = 80$

$MRR_3 = (60 - 44) \times 4 = 64$

$MRR_4 = (72 - 60) \times 4 = 48$

Thus, it is inexpedient to hire the fourth worker, as the marginal revenue from its use is less than the marginal costs for its attraction.

Answer: Under definite conditions it is expedient to hire three workers.

2. A firm sells product A, for production of which it uses the rented automatic machines and hired labor. The number of machines is

5 units, and rent payment – 1500 UAH per month. Monthly costs connected with the labor use are 750 UAH per each employee. Production capacity of machine equals 300 units per month. Dependence between the monthly production volume (Q) and number of workers (L) is described by the formula: $Q = 500L - L^2$. Which correlation of the labor and capital minimizes the average costs of the firm? Does this correlation guarantee the profit maximization?

Solving:

Minimization of the average costs happens when condition is met $MP_L / P_L = MP_K / P_K$. Transforming it we will get:

$$MP_L = (MP_K / P_K) \times P_L.$$

Having put the known values, we find that the marginal product of labor should be equal to $MP_L = (300 / 1500) \times 750 = 150$.

From the other side it equals the first derivative from the total product:

$$MP = TP'$$

As the production volume (Q) in the task is a total product (TP_L), then, by the way of differentiation, we'll get:

$$MP_L = (500L - L^2)' = 50 - 2L$$

Thus, the minimization of the average costs is described by the equation $50 - 2L = 150$. Having solved it, we'll get the answer:

$$500 - 2L = 150;$$
$$-2L = 150 - 500;$$
$$2L = -150 + 500;$$
$$L = 175.$$

Answer: To minimize the average costs it is necessary to hire 175 workers.

3.3. Tasks for individual solution.

1. A competitive firm offers services at the price 3 UAH per unit, and only one necessary resource for production (labor) it buys at the price 15 UAH for the man-hour. Define what will the *MP* and *MRR* of this firm be if it maximizes the profit?

2. A firm uses labor ($P = 5$ UAH) and capital ($P = 7$ UAH). The marginal product of labor is 10 units of production, and a capital –

20 units. Define quantity of which resource a firm should increase and which one to decrease if:

a) it wants to minimize costs of production at the definite production volume;

b) it wants to maximize its profit selling its product in the competitive market at the price 0,5 UAH?

3. The productivity of labor and capital for a firm which sells the production at the perfect competition market is shown in the table:

Quantity of the units of capital	MP_K	Quantity of the units of labor	MP_L
1	21	1	10
2	18	2	8
3	15	3	6
4	12	4	5
5	9	5	4
6	6	6	3
7	3	7	2

The price of labor – 2 UAH, capital – 3 UAH

a) which quantity of labor and capital should use a firm to produce 64 uits of production at the minimal costs;

b) which correlation of labor and capital will guarantee the maximal profit for the firm;

c) under condition, that a firm gets the maximal profit, find the total column of production (TP), total revenue (TR), total costs (TC) and the profit value.

4. A competitive firm «XX» sells its production at 2 UAH per unit. Data of the connection between the number of workers involved (L) and output volume (TP_L) are shown in the table:

L, man-hours	1	2	3	4	5	6
TP_L, units/day	20	50	70	85	95	100

a) build a demand curve of the firm «XX» in labor, make the necessary calculations;

b) define the number of workers which the firm will involve in the competitive labor market if the rate of salary is 25 UAH per day;

c) how will the number of hired workers change if the rate of salary decreases down to 15 UAH per day?

5. The firm «XX» from the previous task is the only one in the market because of the bankruptcy of the competitors. Data related to connection between the price for production (P) and quantity demanded (Q) are given in the table:

P, UAH per unit	1	2	3	3,5	4	5
Q, units per day	100	95	85	70	50	20

a) build a demand curve of the firm «XX» in labor, make corresponding calculations;

b) define the number of workers which the firm will involve in the competitive labor market if the salary rate is 25 UAH per day;

c) how the number of hired workers will change if the salary rate decreases down to the 15 UAH per day;

d) compare the results of this task solution with the results of the previous one, draw conclusions concerning the resources use by the monopolist.

Exercise 4. Define which of the statements is right and which is wrong. Explain your answer.

1. Demand elasticity for resource doesn't depend on the part of the expenses for this resource in the firm's costs.

2. The marginal product of resource in money expression equals the multiplication of the marginal product of resource by the marginal revenue from the sale of the additional unit of the production produced.

3. For a competitive firm the correlation of labor and capital is optimum when the correlation of the marginal products of these factors to their price is the same.

4. The more elastic is demand for production produced, the more elastic is demand for resource with the help of which it was produced.

5. Demand for the goods is a derivative from the demand for resource.

6. Inelastic demand for production produced results in the high elasticity of the demand for resources.

7. The changes in technology can cause the increase of the marginal product of labor.

8. If two resources are substitute, then the price reduction for one of them will cause the demand decrease for the other one.

9. The market demand for the separate resource is a sum of the individual demands of all firms which buy this resource.

10. A firm achieves the minimum level of costs when the marginal product of each factor equals its price.

Exercise 5. Problem situations to perform individual tasks and/ or discussion during seminars.

1. There is a famous saying, which is used as an example to explain the ideas of the derivative demand: «Tokaj wines are not expensive because the tokaj vineyards are expensive, but the tokaj vineyards are expensive because the tokaj wines are expensive». Is this connection really unidirectional?

2. Imagine the production where the tough complimentary of labor and capital exists. Will the demand be elastic:

a) for labor from the side of one firm;

b) from the side of the whole branch for all production factors?

3. It is known that a firm maximizing the profit under conditions of imperfect competition limits the quantity of the production produced to make its price higher than the marginal costs. Can the firm increase its profit limiting the resource use in the way to make its price lower than the marginal revenue from the unit of the resource used? What results will it cause?

THEME 12. PRICING IN THE MARKETS OF RESOURCES

Questions covering the matter of the theme

1. Salary as the price of the resource «labor». Definition of the salary under conditions of imperfect competition. Closed and open trade-unionism. Investments into the human capital.

2. Rent as the price of resources supply of which is toughly scarce. Rent creation mechanism. Absolute rent. Differentiative rent.

3. Loan interest. Interest rate. Nominal and real interest rate. Factors which define the value of the interest rate.

4. Entrepreneurial revenue. Normal and economic profit. The economic profit sources. Static and dynamic economy. Risks that are not insured. Profit function.

Questions for individual studying by students
1. Capital land price
2. Economic rent at the labor market
3. Investments into the human capital

Tasks for control and self-control of the students' knowledge:

Exercise 1. For each statement listed below find the corresponding term or concept.

1. The price for the land and other natural resources use, supply of which is constant.

2. Event which can't be controlled and forecasted and which can result in loses which can't be ensured.

3. Salary in money expression.

4. Events used to increase the quality of workers' labor by the way of the increase of their qualification and abilities for development.

5. Laws which declare permission to work in definite profession from the special bureau.

6. Quantity of the goods and services which a worker can purchase on salary.

7. Interest rate in money expression adjusted for inflation rate.

8. Trade unions practice which is aimed to restrict the labor force supply the way of stopping hiring new members into them with the purpose to increase salary of workers which are the members of trade union already.

9. Market in which a single seller (monopoly) opposes single buyer (monopsony).

10. Groups of workers who do not compete because the skill level of one group significantly differs from the level of qualifications of the other groups.

11. The market in which a lot of firms create the demand for specific type of employment services of the large number of non-union workers.

12. A market in which only one buyer of resource exists.

Terms and concepts:
a) real interest rate;
b) economic rent;
c) noncompetitive groups;
d) closed trade union;

**PART 6. COMPLETE SET OF METHODICAL MATERIALS FOR STUDENTS'
SELF-STUDY, CONTROL AND SELF-CONTROL OF STUDENTS' KNOWLEDGE**

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e) bilateral monopoly;

f) investments into the human capital;

g) monopoly;

h) licensing of professions;

i) real salary;

j) nominal salary;

k) risks that are not ensured.

l) competitive labor market.

Exercise 2. Find the right answer.

*1. Factors of the land rent differentiation do not include:*
a) soil fertility;
b) qualification of agricultural workers;
c) applied technology;
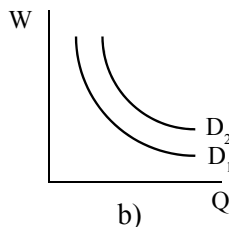d) location of the plots.

2. If the nominal interest rate is 12%, inflation rate is – 8%, then the real interest rate is:
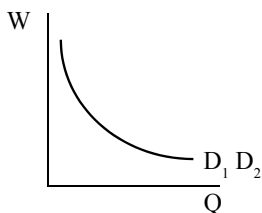a) 3,7%;   b) 1,5%;   c) 4%;   d) 96%.

3. Which of the graphs rightly shows the demand change for the labor of engineers-metallurgists in situation of the stable decrease of the price for the metal:
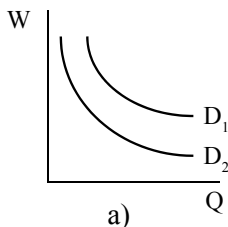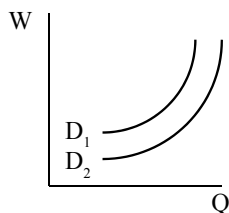
4. Norm of the loan interest is:

a) maximal payment for the credit set by the state;

b) correlation of the loan interest to the loan size;

c) difference between the sum of money which returns and borrowed one;

d) difference between the nominal and real loan interest.

5. If the interest rate decreases then under the other unchangeable conditions, a consumer:

a) saves less;

b) saves more;

c) everything listed above is right depending on the advantages of, present and future consumption;

d) savings equal zero.

6. Minimum salary set by a state is:

a) the lowest recommended level of individual revenue;

b) subsistence level;

c) the lowest level of the worker's salary of any enterprise;

d) cost of the main products of consumption for the certain period of time.

7. Entrepreneurial revenue is:

a) difference between the total revenue and economic costs;

b) the total revenue from the production sale;

c) difference between the external and internal costs;

d) difference between the total revenue and book costs.

*8. Investments into the human capital do not include:*

a) costs for education;

b) costs for health;

c) costs for business trip;

d) costs for training.

9. Diagram shows the monopsony which uses L* units of labor under the absence of the state and trade unions' restrictions. If the state sets minimum salary at W_3 level, will the monopsony receive the profit?

a) gets zero economic profit;

b) suffers loses in W_3BMW_1 plane;
c) gets profit in W_2KMW_1 plane;
d) gets profit in W_3BKW_2 plane.
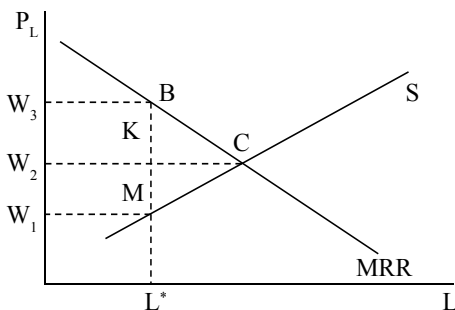
10. If the salary decreases, then under other constant conditions the worker:
a) works more;
b) works less;
c) works at the same level;
d) decides this issue preferring to work or rest.

11. The curves of demand for three land plots are given in the graph – A, B, C. Plane of which figures shows the differentiated rent from the plane A?
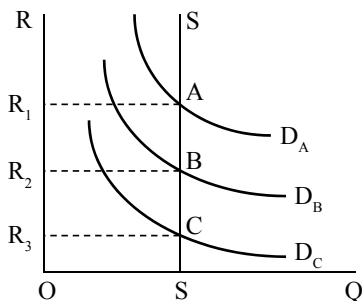
a) R_1ASO;
b) R_1ACR_3;
c) R_1ABR_2;
d) R_2BSO.

12. Rent revenue is the revenue which:
a) the owner of any resource gets;
b) sellers get from the sale of the land;

c) is paid for the land and other natural resources use;

d) is received from the land and other natural resources sale.

13. If the interest rate increases from 5% up to 10%, then to get the annual revenue 1 000 UAH the discount cost should:

a) decrease for 5 000 UAH;

b) decrease for 10 000 UAH;

c) increase for 5 000 UAH;

d) increase for 10 000 UAH

14. The competitive firm which maximizes profit should hire additional workers only when:

a) total revenue is less than the total costs;

b) the marginal product of labor in money expression is lower than the salary rate;

c) the marginal product of labor in money expression is higher than the salary rate;

d) the value of the marginal product in money expression increases.

15. In which labor market the equilibrium volume of employment is lower than in the competitive market of labor:

a) in the monopsony market;

b) in the market where the trade union monopolizes the labor supply;

c) in the market of bilateral monopoly;

d) everything listed is right.

16. Choosing the volume of labor use the monopsony compares:

a) marginal product of labor in money expression and marginal costs for labor;

b) marginal product of labor and marginal costs for labor;

c) marginal product of labor and market price of the unit of labor;

d) marginal product of labor in money expression and market price of the labor unit.

17. If the competitive firm maximizes profit while selling production at the price 2 UAH per unit and buying resource at 10 UAH, then marginal product in money expression of the given resource is:

a) 2;   b) 10;   c) 5;   d) 20.

18. The land price depends on:
a) the value of the annual rent;
b) bank interest rate;
c) the value of the alternative revenue of the land buyer;
d) everything listed is right.

19. The change of the real salary rate can be defined as the comparison of the nominal salary rate with the changes:
a) goods and services price levels;
b) tax rates;
c) revenue norm;
d) working hours.

20. The demand curve for labor in the competitive market coincides with the:
a) curve of the marginal labor costs;
b) curve of the marginal labor product;
c) curve of the marginal labor product in money expression;
d) curve of the marginal product costs.

21. If the rent of the land plot is 1 000 UAH and an interest rate – 5%, then at which price will the purchase of the land plot be profitable?
a) no more than 20 000 UAH;
b) no more than 10 000 UAH;
c) no more than 50 000 UAH;
d) no more than 200 000 UAH.

22. The loan interest rate doesn't depend on the:
a) term of the loan;
b) project risk;
c) loan size;
d) there is no right answer.

23. Which of the listed below will result in the decrease of the demand for the land:
a) a decrease of the land fertility;
b) an increase of the loan interest rate;

c) a decrease of the loan interest rate;

d) there is no right answer.

24. If the land rent is higher than the equilibrium level then:
a) demand for the land will be higher than its supply;
b) optimum volume of the land use will increase;
c) not all land will be used;
d) there is no right answer.

*25. Under which interest rate will the building of the new theatre
with the definite exploitation term 200 years and annual revenue 10%
be profitable?*
a) not more than 2%;
b) not more 20%;
c) 10% or less;
d) 10% or more.

*26. An enterprise tries to invest borrowed money into equipment
which costs 20 thousand UAH with the exploitation term for one year.
It is expected that due to this the additional annual revenue will be
1500 UAH. At which interest rate is it profitable to make investments?*

a) 6%;   c) 10%;
b) 8%;   d) 12%.

Exercise 3. Solve the tasks.
3.1. Formulas used for the tasks solution:
1. Real interest rate (percent):

$$r_R = (100 + r_N) / I_P$$

(increased on 100 percent the nominal rate is divided into the price in-
dex).

2. Price index:

$$I_P = (Ti + 100) / 100$$

(increased on 100 percent the price growth is divided by 100).

3. The total revenue:

$$TR = Q \times P$$

(equals the quantity of sold production multiplied at its price).

4. Differentiated rent from the unit of plane of the land plot:

$$R_i^d = TR_i - TR_w$$

(excess of the total revenue of the tenet of the i-plot over the total revenue of the tenet of the worst plot).

5. Capital price of the land:

$$P_{LN} = \frac{100R}{r}$$

(annual rent multiplied by 100, and divided by the interest rate).

3.2. Examples of the tasks solution.

1. Market demand for the labor (thousand man-hours) and the market supply of labor (thousand man-hours) are described with the equation: $Q_D = 70 - W$, $Q_S = 4W - 30$, where W – hourly rates of salary, UAH. A state sets the minimum level of the salary 30 UAH per hour. Define how this event will influence the volume of labor use.

Solving:

We'll find the equilibrium labor price, having compared the right parts of equations which describe the demand and supply:

$$70 - W = 4W - 30;$$
$$-W - 4W = -30 - 70;$$
$$-5W = -100;$$
$$W = 20.$$

An equilibrium volume of the workers hiring we'll get having put the data of the salary rate into the demand formula:

$$Q_D = 70 - 20 = 50 \text{ (thousand man-hours)}.$$

If a state increases the rate up to 30 UAH, then the hiring volume will be the following

$$Q_D = 70 - 30 = 40 \text{ (thousand man-hours)},$$

Or on $50 - 40 = 10$ persons less than under the absence of this regulation.

Answer: Setting the minimal salary rate at the level of 30 UAH per hour will decrease the volume of the labor use on 10 thousand man-hours.

2. Explain the decision related to the purchasing of the land plot at the price of 500 thousand UAH, if the interest rate is 15% in the future and a land rent from this plot is 60 thousand UAH per year.

Solving:

The capital price of the land can be calculated with the formula $P_{LN} = \dfrac{100R}{r}$. Putting the data we'll get:

$$P_{LN} = \frac{100 \times 60000}{15} = 400000 \, (\text{UAH})$$

Accordingly, the purchase of the plot at the higher price is economically inexpedient.

Answer: The purchase at the price of 500 thousand UAH is inexpedient.

3.3. Tasks for individual solution.

1. Bank offers Mr. Sidorchuk two types of deposits – nominated in gryvnas and euro. Annual interests: 12,5% in UAH and 9% in euro. Which deposit is more profitable if it is expected that the prices will increase on 5% per year and euro rate – from 6,3 up to 6,6 грн.

2. A firm which offers the commercial references announced the additional hiring of employees. During the interview the applicants were divided according to the answer to the question about the acceptable level of the daily salary as the following:
– no less than 40 UAH per day – 2 persons;
– no less than 25 UAH per day – 2 persons;
– no less than 20 UAH per day – 2 persons;
– no less than 15 UAH per day – 1 person.

We know that the demand for labor is described with the equation $L = 10 - 0,2W$, where W – salary rate, UAH per day, define:

a) how many workers the firm will hire and which salary rate will be set;

b) how the number of hired workers will change if the state sets the minimal salary rate at the level of 40 UAH per day?

3. The dependence of the yield of wheat (Q, quintals per hectare per year) on the crop acreage (X, hectars) for the farmer is described with the equation $Q(X) = 50X - 2X^2$. The price of the wheat centner – 50 USD. Which size of the rent payment will the farmer agree to pay for the plot use of 30 hectars?

4. Three farms (A, B and C) grow up wheat on the plots same in size, which differ in productivity. All farmers' costs are absolutely the same to purchase machines, fuel, fertilizers and work force and so on. «A» farm produces 600 hundred weight of wheat (ATC – 50 UAH for hundred weight), «B» farm – 500 hundred weight (ATC – 75 UAH for hundred weight), «C» farm – 400 hundred weight (ATC – 100 UAH for hundred weight). The market price of the wheat is 100 UAH. Define for each farm:

а) the size of the differentiated rent of the first kind;

б) the size of the differentiated rent of the second kind.

5. «XX» firm is a monopolist in the regional labor market and sells the produced products in the foreign market at 5 USD. Dependence of the output volume (Q – thousands of units) on the quantity of the involved labor (L – thousands of man-hours) is described with the formulae: $Q(L)300L – L^2$. Regional offer of labor is defined in the hour rate of labor payment (W, USD.) in the following way: $S_1 – 3W – 120$. Define:

а) the volume of production sale by «XX» firm and the revenue volume;

б) amount of labor involved by «XX» firm;

в) the rate of labor payment which it sets.

Exercise 4. Define which of the statements is right and which is wrong. Explain your answer.

1. When salary increases, the alternative costs of holiday increase as well.

2. From the theoretical point of view it is not possible to think that a person will try to work more when salary increases, and will work less, when salary decreases.

3. If a firm sells its product in the competitive market, then the marginal costs for labor payment always exceed the value of the salary rate.

4. With the growth of the level of the worker's labor, the price of his free time increases.

5. The demand curve of the monopolistic firm for labor doesn't coincide with the MRR curve.

6. The labor price doesn't depend on the ready-made products.

7. Activities of the trade unions can result in the demand increase for labor.

8. The less the amount of the borrowed money, is the lower the interest rate is.

9. Different sizes of the land rent show differences in the marginal productivity of the land plots.

10. When the enterprise gets the economic profit, it always means that it operates more effectively than his competitors.

Exercise 5. Problem situations for individual tasks perform and discussion during seminars.

1. It is known that the economic rent is in the resource markets the supply of which is severely limited. The amount of gold in the earth crust is the fixed value. Can the gold price be considered as rent in relation to that?

2. The amount of the normal profit in different branches, in different markets and in different times differs. Even the factors which, in your opinion, determine the amount of the normal profit.

3. Some economists of the last times believed that the land rent is a survival of feudalism, some kind of taxation with the help of which a landowner taxes an entrepreneur. Besides, the rent doesn't fulfill the motivation function, and that's why is something that is absolutely unnecessary. Imagine that the amount of the land rent has really become zero. Will it result in any negative consequences.

THEME 13. ANALYSIS OF GENERAL EQUILIBRIUM AND EFFICIENCY

Questions covering the matter of the theme
1. The partial and general equilibrium. Effect of the feedback.
2. Edgeworth's diagram. Pareto's principle of optimum. Efficiency of the resources and material values division. The agreement curve.
3. The production capacities curve. The marginal norm of transformation. The consumer power curve.

Questions for individual studying by students
1. The output efficiency
2. Quazioptimum
3. Social optimum

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**PART 6. COMPLETE SET OF METHODICAL MATERIALS FOR STUDENTS'
SELF-STUDY, CONTROL AND SELF-CONTROL OF STUDENTS' KNOWLEDGE**

Tasks for control and self-control of the students' knowledge:
Exercise 1. For each statement listed below find corresponding term or concept.

1. Equilibrium set in a separate market.

2. The choice of the best from the available combinations of the production output, when Pareto-efficient volume of production is impossible.

3. Minimal quantity of product Y which one must refuse for the increase of goods X production on one unit.

4. Effect which shows the change of the partial equilibrium in the certain market in the result of the changes which appear in the joint markets under the influence of the original changes in this market.

5. Equilibrium which appears in the result of interaction of all markets, when the demand change or supplies in a certain market influence the equilibrium prices and sales volumes in all markets.

6. Efficiency which is achieved when it is impossible to redistribute the available resources in the way to increase the output of one economic material value without the output decrease of the other one.

7. The curve, the points of which have coordinates corresponding to the sets of the two products which can be produced under the complete use of available resources of labor and capital and under a certain level of technological development.

8. Distribution of the material values under which it is impossible to improve somebody's welfare (with the help of redistribution) without damaging the other person.

9. The model illustrating the exchange between two subjects and showing the efficiency of agreements under exchange.

Terms and concepts:
a) Effect of the feedback
b) Production efficiency
c) Edgeworth's diagram
d) General equilibrium
e) The marginal norm of transformation
f) Distribution efficiency
g) Partial equilibrium
h) Quazioptimum
i) The production capacities curve

Exercise 2. Find the right answer.

1. During the analysis of the partial equilibrium, if the demand for sugar changes, the economists analyze this factor influence on:

a) only the sugar market

b) all markets where sugar is a substitute product

c) all markets where sugar is a resource for production

d) all markets where the price changes for sugar can result in a decrease of the demand curves or supply curves.

2. If two persons have the indifferent curves between two products which are the straight lines, and the same marginal norms to substitute one product for the other one, then the contract curve between them in Edgeworth's diagram:

a) is a diagonal line

b) is a point in the middle of the diagram

c) coincides with the sides of the diagram

d) is the whole diagram.

3. If two products are produced in conditions of the stable effect of the scale and both enterprises use all resources in the same proportions, the production capacities curve between two products:

a) is convex to the beginning of the coordinates

b) is bent into to the beginning of the coordinates

c) a straight line

d) the form of the curve can't be determined, taking into account the given information.

4. Under the current production level «A» farm can grow up the additional ton of rice with the marginal costs of 500 UAH, and «B» farm can grow up the additional ton of buckwheat with the marginal costs of 300 UAH. Let's imagine that the quantity of rice in the diagram is measured vertically. Having assumed, that all markets are in general equilibrium, one can say, that the marginal norm of substitution of buckwheat for rice equals:

a) 3 : 5;

b) 5 : 3;

c) 1 : 3;

d) 1 : 5.

5. During the free exchange between two consumers the final position on the contract curve depends on their: 1) purchasing power; 2) original distribution of material values; 3) priorities and preferences:

a) only 1;

b) only 2;

c) only 3;

d) only 2 and 3;

e) 1, 2 and 3.

6. If the marginal norm of technological substitution of the labor for capital in milk production equals 4 and in sugar production equals 1, then:

a) resources placement is effective

b) resources placement is ineffective, it is necessary to transfer capital from sugar production into milk production, and labor – from milk production into sugar production

c) resources placement is ineffective, it is necessary to transfer capital into sugar production, and labor – into milk production

d) to cut down the volume of the capital use in both branches

7. Choose the condition of production optimization and products distribution:

a) the marginal norms of substitution of product X for product Y are equal for all consumers

b) the marginal norm of product Y transformation into product X equals the marginal norms of substitution for all consumers

c) the marginal norms of the technological change of labor for capital are equal in all branches

d) the sum of the demand excess over the supply in all individual commodity markets equals zero

8. The change of the equilibrium price and equilibrium production volume in separate markets is the analysis of:

a) general equilibrium

b) consumer equilibrium

c) partial equilibrium

d) producer's equilibrium

9. *X and Y products are produced in economy. At which conditions given below is effective structure of the production output achieved:*

a) $MRT_{X,Y} = MRS_{X,Y}$;

b) $MRT_{X,Y} = MC_X : MC_Y$;

c) $MRS_{X,Y} = P_X : P_Y$;

d) $MRS_{X,Y} = MC_X : MC_Y$.

10. *If product «A» is used in product «B» production, and product «B» is compliment of product «C», then the price decrease «A» will result in:*

a) an increase of product «B» supply and product «C» demand

b) a decrease of product «B» supply and increase of product «C» demand

c) a decrease of product «B» supply and product «C» demand

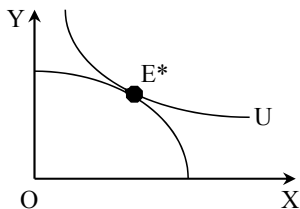d) an increase of product «B» supply and decrease of product «C» supply

11. *Which of the given illustrations corresponds to the optimum placement of resources and maximization of the society utility:*
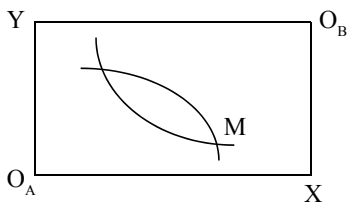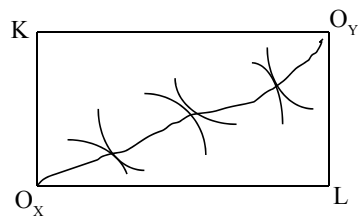

a)
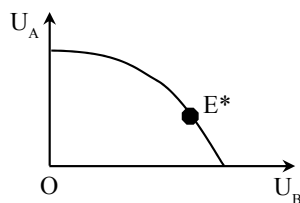
b)

c)

d)

12. *If MRS of two products are not equal for two consumers, then:*

a) one consumer can improve his position without deterioration of the other consumer's position

b) both consumers can improve their position without deterioration of the other persons' position

c) nobody can improve his position without deterioration of the other persons' position

d) general equilibrium will be achieved if the consumption volume of all material values is decreased

13. Which condition from the listed below doesn't show the optimum placement of resources:

a) *MRS* of two products must be the same for any two consumers

b) *MRTS* of two resources must be the same for any two producers

c) *MRS* of two products must be equal to *MRT*

d) *MRTS* of two resources must be equal to *MRT*

14. The limit of the possible utility is related to the contracts curve in the way that:

a) one point on the border of the possible utility corresponds to each point on the contracts curve

b) more than one point on the border of possible utility corresponds to the point on the contracts curve

c) if the contracts curve is shown with a diagonal in Edfeworth's box, then the border of possible utility will also be a linear function

d) there is no right answer

15. If for two consumers products «X» and «Y» are mutually complimentary in proportion 1:1, the quantity of products «X» is 20 units, and products «Y» is 20 units as well, the contracts curve will coincide with:

a) the whole plane of Edgeworth's diagram

b) diagonal of the square which connects the left bottom and right top corners

c) diagonal of the square which connects the left top and the right bottom corners

d) perimeter of the square

16. If the marginal norm of fish substitution for meat for Olga equals 2 and for Yuriy – 4, then:

a) distribution of material values is optimum according to Pareto

b) to achieve the optimum distribution it is necessary to redistribute meat for Olga's utility and fish for Yuriy's utility

c) to achieve the optimum distribution it is necessary to redistribute meat for Yuriy's utility and fish for Olga's utility

d) it is not enough information to answer

17. What is the relation of effectiveness and justice in distribution of the material values:

a) the justice criteria always contradicts the effectiveness criteria

b) the justice criteria coincides with the effectiveness criteria

c) effective distribution of the material values can be fair

d) effectiveness of distribution of the material values as well as justice is impossible to measure

18. The curve of production capacities demonstrates the increasing marginal norm of transformation only if the production function:
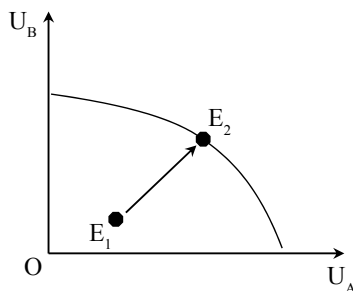
a) for one of the products has a stable return from the scale

b) for both products has a return which decreases because of the scale

c) for one of the products has the increasing return because of the scale

d) for both products has a return which is stable and decreases because of the scale

19. In the situation described there is:

a) transition from ineffective to effective variant of distribution of the material values under the increase of utility for both participants

b) transition from ineffective to effective variant of distribution of the material values under the decrease of utility of participant «*A*»

c) transtition from ineffective to effective distribution of the material values under the decrease of utility of participant «*B*»

d) transition from effective to ineffective variant of distribution of the material values under the increase of utility for both participants

20. All conditions of Pareto-optimum can be met only under:
a) regulated monopoly
b) monopolistic competition
c) perfect competition
d) oligopoly

Exercise 3. Solve the tasks.
3.1. Formulas used to solve the tasks:
1. The marginal norm of technological substitution of capital for labor:

$$MRTS_{KL} = \frac{MP_K}{MP_L}$$

(relation of the marginal product of capital to the marginal product of labor).

2. The marginal norm of substitution of product «*X*» for product «*Y*» :

$$MRS_{XY} = \frac{MU_X}{MU_Y}$$

(relation of the marginal utility of product «*X*» to the marginal utility of product «*Y*»).

3. The marginal norm of transformation:

$$MRT_{XY} = \frac{MC_X}{MC_Y}$$

(relation of the marginal costs in product «*X*» production to the marginal costs in product «*Y*» production).

4. Condition of general efficiency of production and distribution:

$$MRS_{XY} = MRT_{XY}$$

(the marginal norm of substitution for each subject equals the marginal norm of transformation of product «*X*» into product «*Y*»).

3.2. Examples of the tasks solution.

1. «*A*» and «*B*» subjects divide 2 kg of product «*A*» and 12 kg of product «*Y*» between themselves. Functions of utility for «*A*» and «*B*» subjects are correspondingly $U_A = XY$ та $U_B = XY^2$. «*A*» subject has taken 1 kg of product «*X*». How should the rest products be distributed to achieve Pareto-optimum distribution?

Solution.

Let's mark the quantities of products «*X*» and «*Y*» consumed by subject «A» as X_A and Y_A, and by subject «B» – X_B та Y_B.

For each point on the contracts curve the marginal norms of substitution both consumers will be the same: $MRS_{XY}{}^A = MRS_{XY}{}^B$. The marginal norms of substitution equal the relation of the marginal utility of product «*X*» to the marginal utility of product «*X*».

The marginal utilities of products «*X*» and «*Y*» we'll find as the derivatives from function of general utilities:

$$MU_X = \frac{\partial U}{\partial X}; \ MU_Y = \frac{\partial U}{\partial Y}$$

$$MU_X{}^A = Y^A; MU_Y{}^A = X^A; MU_X{}^B = Y_B{}^2; MU_Y{}^B = 2X_B$$

Thus, the equilibrium equation is

$$Y^A / X^A = Y_B{}^2 / 2X_B$$

Putting the values for X^A, we can get the values of the other parts of the formula. If X^A equals 1, then from condition of X material restriction (3 kg) we get $X_B = 2 - 1 = 1$. The values Y_A and Y_B we'll find from the equation system:

$$\begin{cases} Y_A + Y_B = 12; \\ Y^A / 1 = Y_B^2 / 2. \end{cases}$$

Deciding this system, we'll get $Y_A = 8$ and $Y_B = 4$.

Answer: «*A*» subject will get 1 kg of product «*X*» and 8 kg of product «*Y*», subject «*B*» – 1 kg of product «*X*» and 4 kg of product «*Y*».

2. «*A*» subject and «*B*» subject from the above task create the closed economic system. Production of products «*X*» and «*Y*» requires the same resources, and the curve of production capacities is described with equation $Y = 20 - 2X^2$. Using the data related to the volumes and distribution of products «*X*» and «*Y*» from the above task find out:

a) if the existing resources are used completely

b) if the economic system is in equilibrium position

Solution:

To decide the question concerning the complete use of resources let's check up if the production volume «X» – 2 and «Y» – 12 corresponds to the border of production capacities. Let's define what maximum quantity of product «Y» can be received while producing 2 kg of product «X» . Having put $X = 2$ into equation $Y = 20 - 2X^2$, we'll get: $Y = 20 - 2 \times 2^2 = 12$, which corresponds to the achieved production volume. Thus, the border of the production capacities is achieved.

To check up the equilibrium of the system let's use the formula:

$$MRS_{XY} = MRT_{XY}.$$

In condition of equilibrium the marginal norms of substitution for both subjects will be equal to each other and to the marginal norm of transformation as well.

The marginal norm of transformation equals the module of the corner tangence to the slope of the touch to the curve of production capacities, that's why it is possible to define it by the differentiated function of this curve:

$$MRT_{XY} = |Y'| = |(20 - 2X^2)'| = |-4| = 4.$$

Let's calculate the marginal norms of substitution for «A» and «B» subjects, using the data of the above task:

$$MU_X = \frac{\partial U}{\partial X}; \quad MU_Y = \frac{\partial U}{\partial Y}$$

$$MU_X^A = Y^A; MU_Y^A = X^A; MU_X^B = Y_B^2; MU_Y^B = 2X_B,$$

And as $MRS_{XY} = \dfrac{MU_X}{MU_Y}$, then, putting the data related to the products volumes received by «A» and «B» from the results of the above tasks, we'll get:

$$MRS_{XY}^A = \frac{8}{1} = 8;$$

$$MRS_{XY}^B = \frac{4^2}{2 \times 1} = 8.$$

The marginal norms of substitution for both subjects are more than the marginal norm of the technological substitution which points to the non-equilibrium of the system.

Answer: The resources are used completely but their distribution is non-optimum, that's why the system is not in position of equilibrium.

3.3. Tasks for individual solution.

1. In competitive market economy consumers evaluate the marginal utility of product «*X*» as 8 points, and product «*Y*» – as 10 points. For the firms the marginal costs of product «*X*» production are 6 UAH, and of product «*Y*» – 9 UAH. Is distribution of resources Pareto-optimum in such economy? How can the existing distribution of resources be improved?

2. The limited amount of resources (capital – 50 units, labor – 100 units) is distributed between products «*A*» and «*B*» production. Production functions are expressed: $Q_A = 2KL$ and $Q_B = 0,5KL$. Build the contract curve (according to three points as minimum).

3. Robinson has 4 bananas and 2 pineapples. Friday has 3 bananas and 3 pineapples. Under such conditions the marginal norm of substitution of bananas for pineapples for Robinson is 3, and for Friday is 1. Draw the diagram of Edgeworth and show if such distribution is effective.

4. Situation in society is described with the help of the following equation:

– The curve of production capacities $Y = 2500 - X^2$;

– Function of utility $U(X, Y) = XY$.

Define the optimum volume of the production output *X* and *Y*.

5. Functions of utility (in points) of #1 and #2 individuals consuming products «*a*» and «*b*» have the following appearance:

$$U_1 = Q_{a1} + Q_{b1}$$
$$U_2 = Q_{a2} \times Q_{b2}$$

Each individual has 40 points of product «*a*» and 50 units of the material values «*b*». Is that distribution Pareto-effective? How many points can the utility, received by #1 individual, be increased that the utility received by #2 individual stays unchangeable?

Exercise 4. Define which of the statements is right and which is wrong. Explain your answer.

1. Ann and Yuriy have different marginal norms of substitution of ice-cream for candies. If each girl has certain amount of ice-cream and

candies, any change of ice-cream for candies between them will be improvement according to Pareto.

2. Competitive prices lead to Pareto-effective distribution of resources, if all of them are price-takers and there are no bankruptcies.

3. Production will be more effective if the enterprise uses more labor and less capital under condition that the prices for labor and capital are the same, and the marginal norm of technological substitution of labor for capital equals 1:1.

4. Rich people have an excess of money, that's why the improvement, according to Pareto, will be, if they build apartments for those who do not have it.

5. The choice between the points on the contracts curve is possible only when somebody wants to make the position of one person worse to the utility of the other one.

6. The marginal norm of transformation equals the corner value between the horizontal line and the touch to the production capacities curve.

7. Under Pareto-optimum distribution of material values people have no motivation to exchange.

8. The contracts curve combines all points of the competitive equilibrium in a certain commodity market.

9. The marginal norm of transformation for two products is characterized by the relation of their marginal utilities.

10. The general equilibrium can be reached even under condition of contradiction of the demand volumes and supply in the little number of the commodity markets.

Exercise 5. Problem situations to perform individual tasks and/ or discussion during seminars.

1. It is very difficult to reach general equilibrium. Can economy develop being in non-equilibrium position?

2. Compare the criteria of social optimum of distribution according to Bentham, Nietzsche, Rawls and others. What concept is closer to you personally?

3. How do the development of international trade and international transfer of economic resources influence the efficiency of products and resources distribution in national economy?