ECONOMICS II.

Tamás Tánczos

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Contents

1. INTRODUCTION

1.1 AIMS, COMPETENCIES AND CONDITIONS OF COMPLETION OF THE COURSE

1.1.1 Aims

The aim of the course is to offer a mathematical model of the rational behaviour of the participants in the market, and of way in which national economy functions, and to develop and further deepen the students' mathematical model based interpretation of economics. The course further aims at using the opportunities offered by methods provided by mathematics in modelling aspects related to the consumer, producer, or decision making, and of other processes taking place in national economy, and thus to contribute to the participants' properly grounded views on economic developments.

1.1.2 Competencies

Following the acquisition of the material of the course the student will:

- know and understand the basic relationships between functions, which are indispensable for modelling the economic processes, particularly with regards to background analysis.
- possess views on economics inclusive of tools offered by mathematics that serve economic decision,
- identify economic problems, which can be solved with the help of some of the micro-, and macro-economic models studied.
- identify the economic relationships mathematically formulated values by way of which the behaviour of individual participants and its consequences can be forecast.
- be capable of abstracting, and simplifying the processes of economy.
- be able to produce a mathematical model of the rational behaviour of consumer market.
- produce a mathematical model of market behaviour of firms functioning under different market conditions and of firms which aim at maximum profit.
- be capable of producing mathematical models of some macroeconomic processes.
- be capable of practical assessment of the results offered by the mathematical models of economic processes.

- be able to formulate independent opinions and arguments regarding economic policies and other economic problems.
- be receptive to mathematics based approach to different problems of economics.
- be open to the study of economic processes on the principles of mathematical models.
- be interested in the application of mathematical tools in the field of economics.

1.1.3 Conditions of the completion of the course

The course can be regarded completed in case the student is in possession of all the required competencies of each lesson, as described in the earlier sub-chapter and comprehend the material included into the study material provided by the individual units.

1.2 THE CONTENTS OF THE COURSE

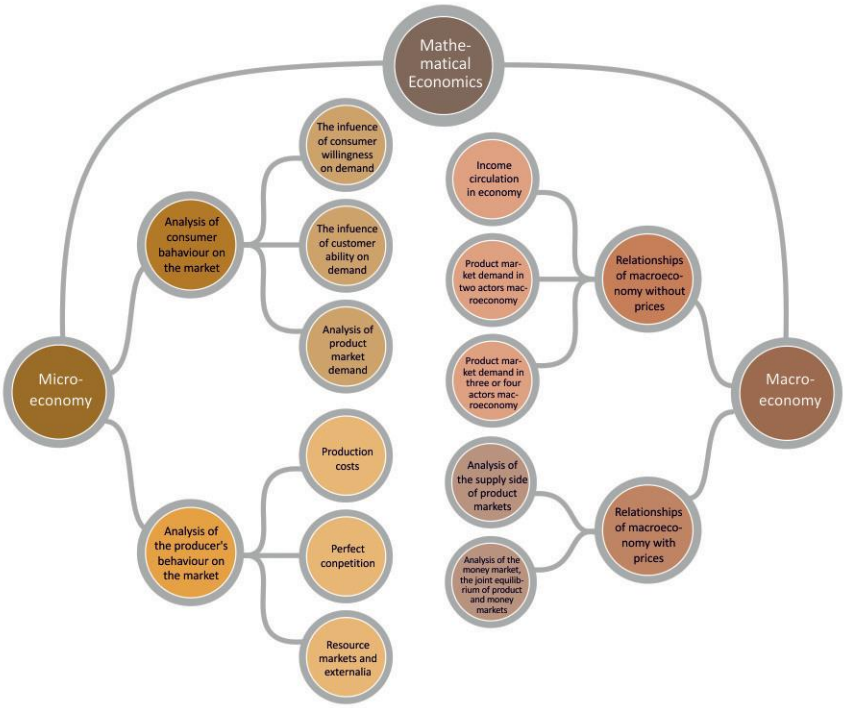

Figure 1 Mind map

1.3 SUGGESTIONS FOR STUDY

Since mathematics based economics employs chiefly the tools of functions theory to create models of economic interactions, before we start examining it, it seems appropriate to revise some of our knowledge of function analysis acquired earlier seems appropriate. Particular emphasis should fall on the interpretation of functions, their transformations and derivation. It follows from the above that most of the illustration of the economic interrelationships is provided through function graphs. The illustrations are always accompanied by textual explanations, and when we try to interpret these explanations it would be important to try and recognize them on the graphs ourselves. The material thus transmitted can be considered knowledge if we understand the economic aspects of the descriptive material and recollecting the interrelationships described does not recall the text but the respective illustration, and following the illustration visualised in our memory we can reproduce the acquired knowledge. Under the same logic it is advisable to answer the questions to be found at the end of the lessons and the tests should also be completed. It is important to emphasize that mathematical economy which forms the core of the course is a science built on logical structure and thus it can be studied by way of close interpretation. Consequently we should avoid memorizing and we should insist on understanding the descriptions and explanations. Should we have problems in understanding certain categories of economics, or accurate definitions, we should make inquiries at the following entry:

1. http://www.dictionaryofeconomics.com/dictionary

As demonstrated by the structure of the course, the material is basically divided into two sections macro-, and micro-economics. We are going to get acquainted with the major representatives of the two fields when discussing the different themes, but we have to state from the very beginning that John Maynard Keynes produced scientific results which are of great relevance even for contemporary study of macro economy.

2. http://www.maynardkeynes.or g/maynard-keynes-economics.html

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2. UNIT: THE INFLUENCE OF CONSUMERS' WILLINGNESS TO PURCHASE ON DEMAND

2.1 AIMS AND COMPETENCIES

The role of the lesson is to analyse the influence of consumers' willingness to purchase on individual goods market demand with the aim to make the modelling of consumer behaviour possible. This can help within the production process to produce goods which can occupy an advantageous position in the competition with other alternative products and thus enable us to realize the greatest possible profit. The mathematical modelling of consumer purchase readiness makes possible not only the formal revelation of consumer readiness, but also makes possible its profitability based visual representation.

2.2 STUDY MATERIAL

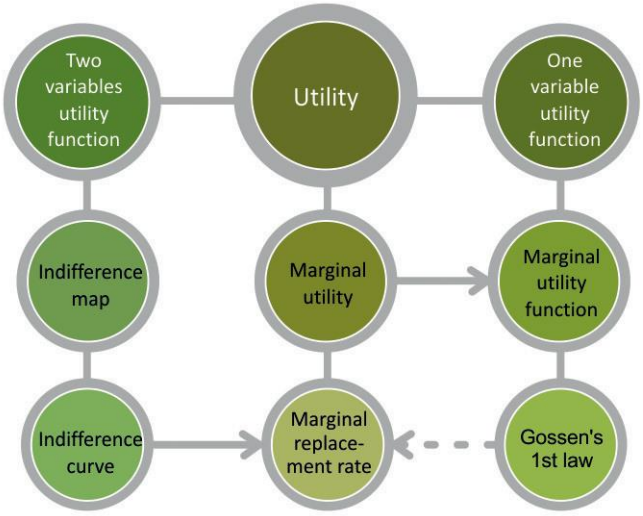

Figure 2 Mind map

2.2.1 Utility as a factor influencing demand

As we already know it from our earlier studies (Economics I.), individual demand is the amount of goods the consumer is ready and able to buy in a given period of time, for a given price. In the present section we

are going to discuss the influence of consumers' willingness to purchase on demand from among the factors influencing demand.

The consumer is ready to buy a product if the product disposes of some characteristics that they want. This means that the willingness of the consumer depends on the utility of the product.

- **Utility is the feeling of satisfaction caused by the consumption of a product or stock to the consumer.**

The utility of a product depends on the qualities of the product and the quantity consumed. As utility depends on the quantity of consumed goods it can be illustrated as a function of the consumed goods. The function thus arrived at is called total utility function (abbreviation: TU; Total Utility).

- **The total utility function shows utility in function of the amount of goods (Q) and illustrates the shape of Total Utility (TU).**
- **Marginal utility (abbreviation: MU) is the extra profit generated by the consumption of a given unit of the extra goods. The figure which shows the amount of gowth of utility if we increase the amount of consumed goods by one unit.**

$$MU = \frac{\Delta TU}{\Delta Q}$$

Marginal utility can also be illustrated in function of the amount of consumed goods, the function thus arrived at is called marginal utility function.

The marginal utility function (MU) shows the state of the margin utility as a function of the quantity (Q) of the consumed goods.

The marginal utility function is the primary quantity based derivate of the total utility function.

$$MU = \frac{dTU}{dQ}$$

From the derivate it follows that the marginal utility function shows the growth rate of the total utility factor in a mathematical sense.

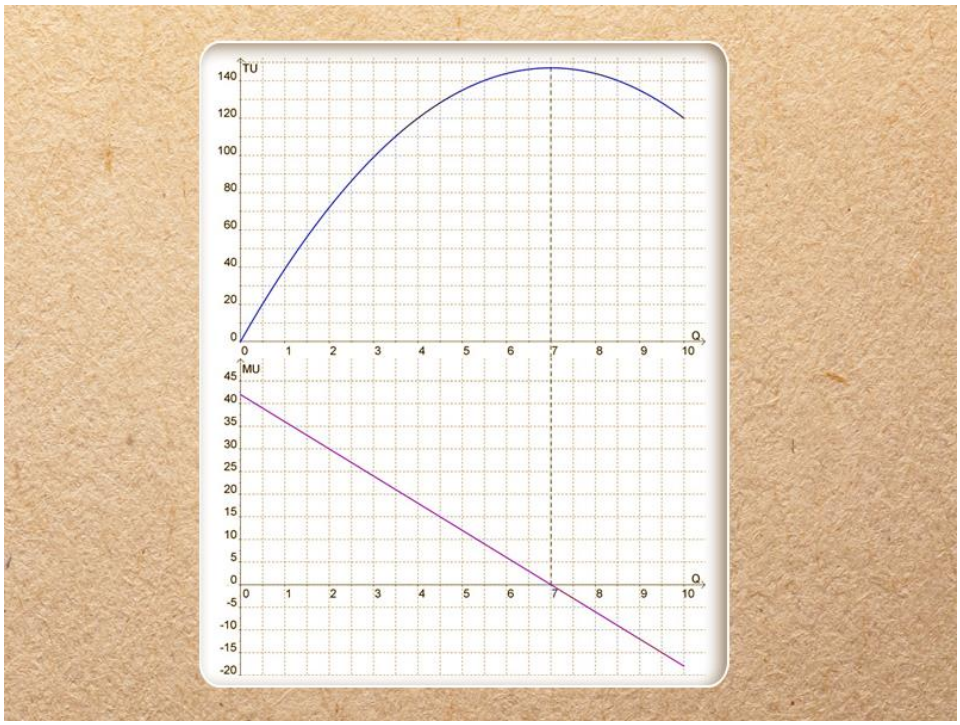

Figure 3 Total utility and marginal utility function

The figures that can be read alongside the functions should be interpreted as follows. If we use the fourth product unit as an example, the figure 120 which can be read on the total utility factor means that in case of consumption of four units the total utility feeling of the consumer will be 120 units. The decreasing phase of the total utility factor is expressive of the fact that following the maximum point (point of saturation) parallel to the increase of consumption utility is decreasing, that is the consumer feels worse. The design of the function shows that there exists a certain consumption level where utility becomes zero again.

Value 18 alongside the utility margin function also means that in case of consumption of a fourth product unit the utility of the consumer increases by 18 units. This also means that the utility of the fourth unit is 18. The negative values of the marginal utility are derived from the decreasing section of the total utility function, as in this region through the consumption of every new good unit the total utility factor of the consumer depreciates.

The increase rate of the total utility function and the direction of the marginal utility function equally demonstrate that with the increase of the consumed goods the marginal utility is continually decreasing. This is expressed by **Gossen's 1st law**.

> **With the consumption of every additional unit of stock the consumer's total utility factor increases in ever lower rate, that is the marginal utility decreases.**

3. http://www.encyclopedia.com/topic/Hermann_Heinrich_Gossen.aspx

In order to produce a model of the transformations of utility with the help of the above and other functions, and if we want to draw economic consequences from the changes of utility, utility has to be measured.

There are two widespread theories regarding the way in which utility can be measured:

- According to the cardinal view the consumer can express the utility of the goods in cardinal numbers.
- According to the ordinal view the consumer is not able to express the utility of the consumed goods in cardinal numbers, yet the consumer arranges the goods on the basis of their utility, creating a so called preference system.

Contemporary economics accepts the ordinal view.

As according to the accepted view utility cannot be expressed through figures, when we create a mathematics based model, we have to abstract from reality. In mathematical models utility can be given estimated values formulated as figures, but it is essential that the relationship of the figures should reflect the appropriate utility transformations. In most cases this means that we should connect increasing utility values with ever increasing quantities of goods, yet the measure of the increase of utility values should be smaller and smaller (Gossen's 1st law).

Rational consumers attempt to maximize their total utility and to this aim they never buy one item, but rather a combination of goods or in other words a consumer basket. For the sake of simplicity we use a two goods (x and y) consumer basket in microeconomic models. In these cases the total utility function shows the transformation of total utility on the basis of the goods. In mathematical terms this isbivariate utility function .

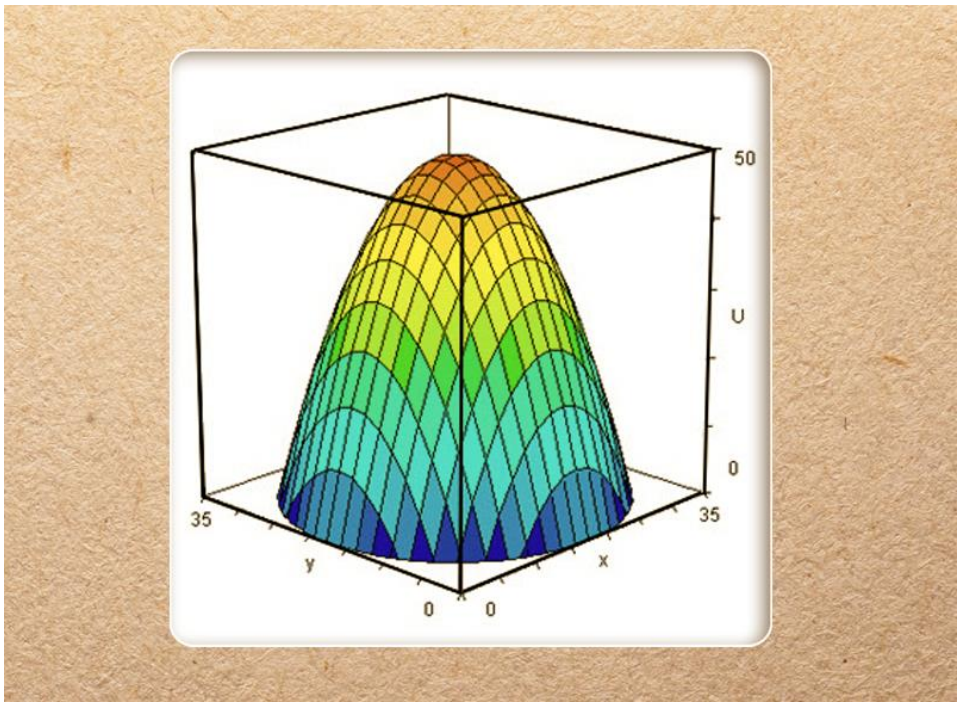

Figure 3 Bivariate utility function

In the case of the above function the qualities of X and Y goods can be read on the horizontal axes while the vertical axis shows the prospective utility (U) that can be attained by the joint consumption of both goods (consumer basket).

2.2.2 The role of indifference and replacement in consumer decision

As we mentioned it earlier, the utility maximizing consumer do not choose one product, but a combination of goods, that is a consumer basket.

The consumer is able to compose consumer baskets, which contain different quantities of the individual goods with the result that their utility is different as well, but can also select consumer baskets with different goods and quantities which nevertheless represent an identical utility. If we illustrate the letter on a curve the result is an indifference curve.

- **An indifference curve is the sum total of reference points in a coordination system, which contains consumer baskets of identitcal utility (combination of goods) for consumers.**
- **The indifference map shows the totality of different utility levels in a chart on the coordination system.**

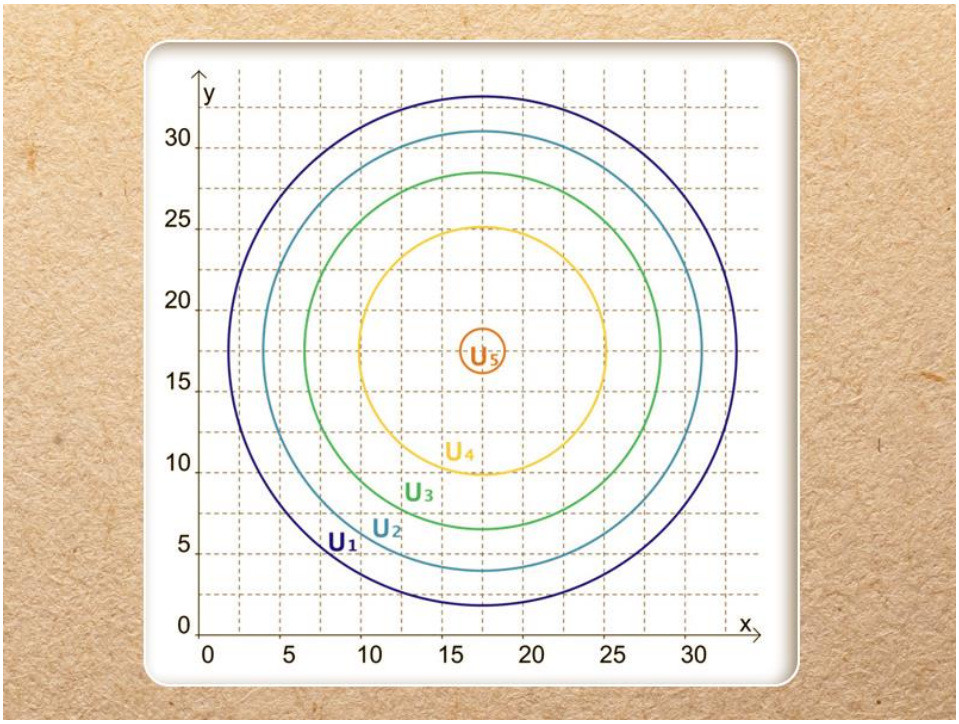

Figure 4 Total indifference map

The illustration shows a total indifference map. Distancing from the origo produces increase in utility up to the point of saturation (the centre of the concentric cycles). One circle of the map is the indifference curve.

We arrive to the total indifference map from the utility function if we „slice it up" with a horizontal plane. Because the circle situated in the innermost centre of the indifference map (U_5) is at the top of the two variable utility functions, its utility is the greatest on the next utility map. As the given circle was dissected in horizontal direction from the two variable utility functions identical utility can be measured at all its points. The next interior circle can be obtained from the two variables utility function if we cut a new slice from the next less valuable utility level, and so on.

If we divide the indifference map into four quarters and examine the given quarters individually we can see that the quarter situated closest to the origo is the only one in which if we increase the consumption of any goods, utility increases as well. In any of the other quarters it is possible in the case of at least one product that increasing the quantity results in decrease of utility. Because a rational consumer intends to maximize profit, he will consume from the first quarter. As during our analysis we are going to assume rational consumers, we intend to examine only the quarter next to the origo of the total indifference map.

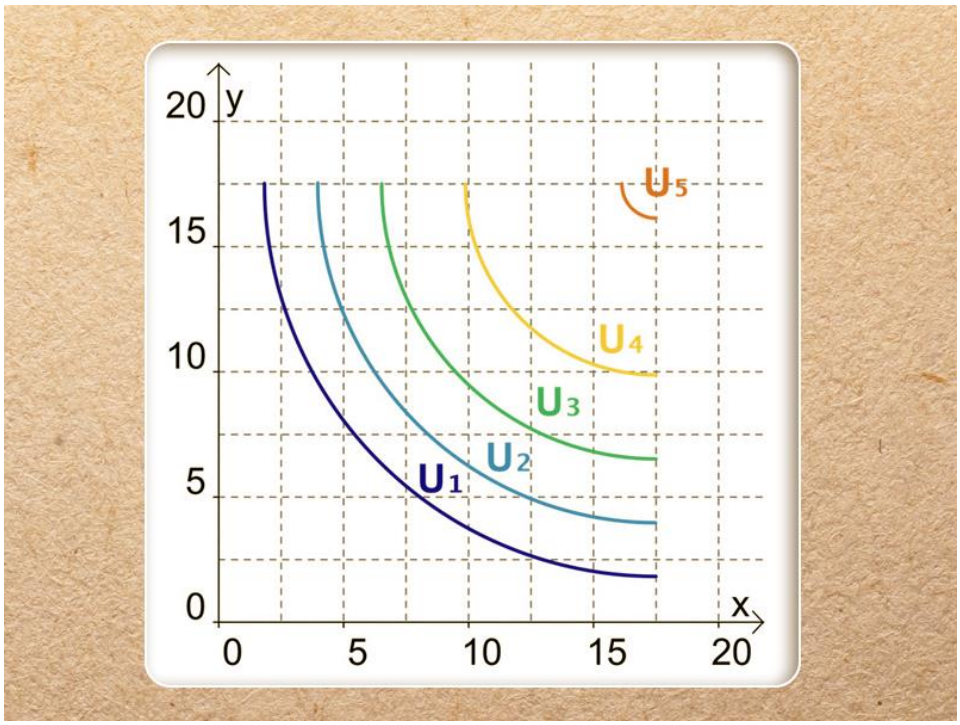

Figure 6 The relevant section of the indifference map

Characteristics of well-functioning indifference curves:

1. *Total utility is constant along the curve.* This characteristic derives from the definition of the indifference curve. On the basis of the following illustration identical utility is provided by 2,64 units "x" plus 12,53 units of "y" goods (basket "A"), as 12,49 units"x" plus 2,65 units "y" goods (basket "B"). That is the two baskets are indifferent from the consumer's point of view, because their utility is identical.

2. *The curve has a negative sloping.* This means that if we increase the consumption of one of the goods (e.g.: x) we have to decrease the consumption of the other one (e.g.: y) to avoid changing total utility and remain on the indifference curve. This is due to the fact that increasing consumption of good „x" utility grows, decreasing consumption of good „y" utility decreases, that is the total utility does not change as a result of the two influences.

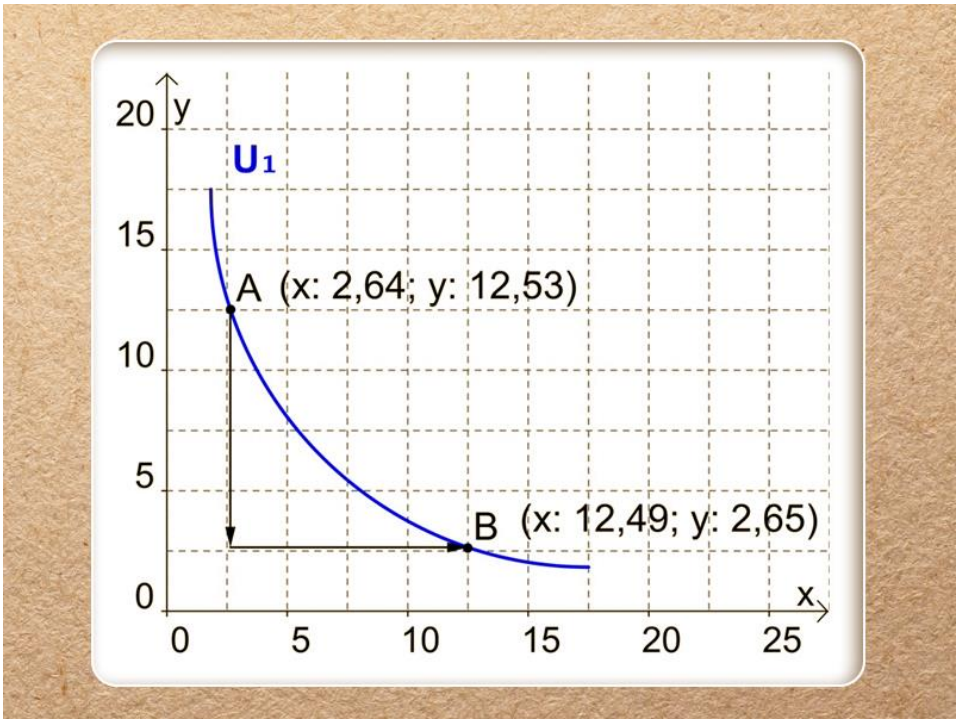

Figure 7 Constant utility, negative sloping curve on a well-functioning indifference curve

3. *The curve is convex onto the origo.* This means that if we increase the quantity of good „x" by one unit constantly, the amount of consumed „y" good should be reduced to a lesser extent, not to change total utility that is to remain on the indifference curve.

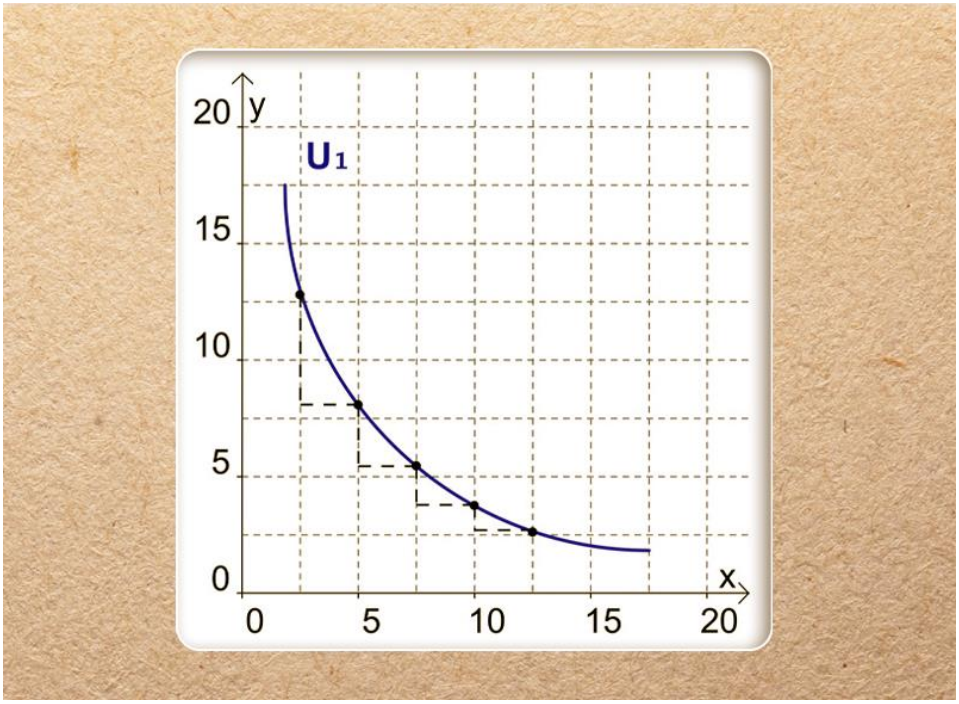

Figure 8 The convex character of a well-functioning indifference curve

The figure which shows the necessary rate by which the units of good (y) should be reduced in case of an optional increase in the amount of consumption by a small unit in the case of one good (x) so that total utility stays unchanged is called marginal rate of substitution and is abbreviated as MRS.

- **Marginal Rate of Substitution (MRS) is the figure which shows that if we increase the consumption of one good (x) by one constant unit, there is a necessary units reduction of the consumption of the other (y) good so as to avoid changing total utility that is to remain on the indifference curve.**

From the above definition it follows, that in case of well-functioning indifference curves the marginal rate of substitution is always negative, so in our calculations we are going to handle it in absolute values.

On the basis of the convex character of the well-functioning indifference curve we can state that the marginal rate of substitution is decreasing along the curve.

The interrelated formulae are known for the calculation of the marginal rate of substitution:

$$MRS_{x,y} = -\frac{\Delta Y}{\Delta X}$$

The negative sign in the formula suggests that increase in the consumption of good „x" imposes the decrease of consumption of good marked „y" to avoid changes in total utility.

We use this formula when neither of the two variables utility function, nor the equation of the indifference curve is known, but the coordinates of the curve are numerically specified.

$$MRS_{x,y} = \frac{dY}{dX}$$

The marginal rate of substitution is the first rate derivate of good „x" on the indifference curve. We use this formula when we know the equation of the indifference curve.

$$MRS_{x,y} = \frac{MUx}{MUy}$$

The marginal rate of substitution is identical with the rate of marginal utility of the goods.

The above formula is used when the equation of the two variables utility function is known, or the utility values related to the good-units are numerically available. If the equation of the two variables utility is known we define the equation of the margin utility of goods „x" and „y" as the partial derivate of the two variables function.

4. *The indifference curves cannot intersect or meet.*

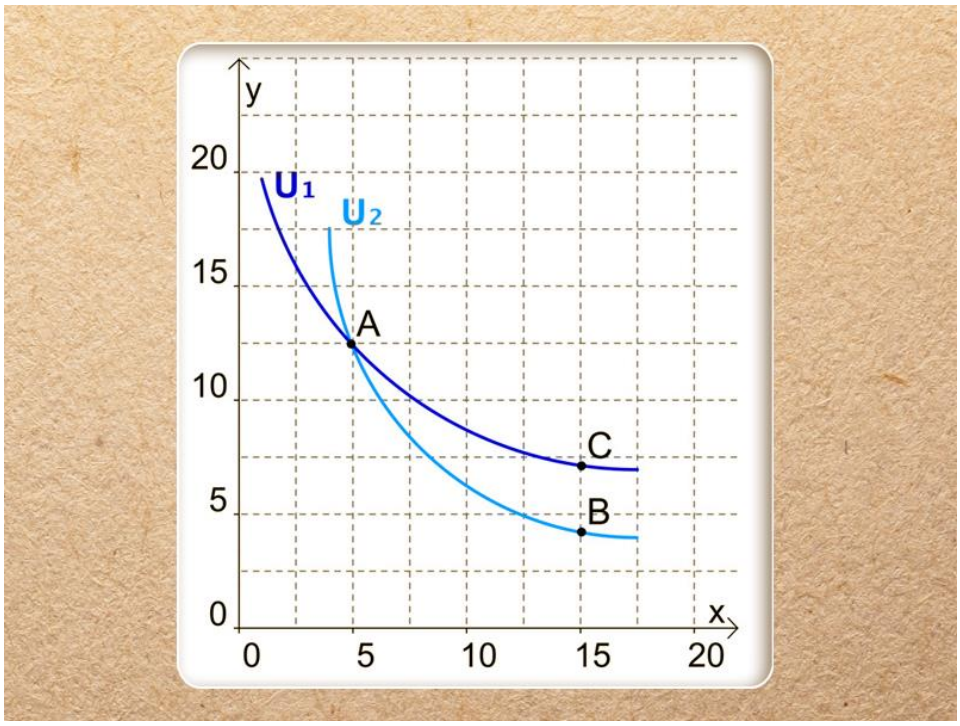

Figure 9 Intersection of indifference curves

As baskets „A" and „B" are on the same indifference curve, as far as utility is concerned „A = B". As baskets „A" and „C" are also on the same indifference curve as far as utility is concerned „A = C". From the presumption that „A = B" and „A = C", the conclusion that „B = C" should follow. But as on the basis of the illustration this is not true the two indifference curves cannot intersect nor can they meet.

On the basis of the illustration consumer basket „A" could represent a basket with two different utilities for the consumer. This is practically impossible.

- We shall discuss special-shaped indifference curves later.

2.3 SUMMARY, QUESTIONS

2.3.1 Summary

In this unit we discussed goods utility as a factor which influences consumer willingness. We clarified the relationships between the quantity

of consumed goods and utility with respect to total consumption and the last unit of consumed goods. With the help of the two variable utility functions, we examined basic consumer behaviour aimed at maintaining a constant utility level through substitution of goods. Thus we paved the way for the analysis of cost and income as factors which determine consumer ability and stated that the substitution of goods is determined not only by utility but costs and income obviously play an important role as well.

2.3.2 Self assessment questions

? How do you define total utility function?

? What is utility margin?

? What is the relationship between total utility and margin utility functions?

? Characterize the well-functioning indifference curves!

? What is marginal rate of substitution and how can it be calculated?

2.3.3 Practice tests

? Moving outwards from the origo in the first quarter of the indifference map containing well-functioning indifference curbs:

- utility grows at a lower rate
- grows at a greater rate
- it decreases at a lower rate
- it doesn't change

? Total utility attainable by classically defined consumer:

- is independent from the quantity of the consumed goods
- grows at a slowing rate with the growth of the quantity of the consumed goods
- decreases parallel with the rate of growth of the consumed goods
- grows parallel with the growth of the quantity of the consumed goods

? On the well-functioning indifference curve:

- the marginal rate of substitution decreases in absolute terms, because the consumer has to replace a given constant unit of one good with an ever smaller unit of the other good in order to preserve total utility

- the marginal rate of substitution decreases in absolute terms, because the consumer has to replace a constant unit of a given product with an ever smaller unit of the other product to preserve total utility
- the marginal rate of substitution decreases in absolute terms, because the consumer has to reduce consumption of one product to increase the consumption of the other product if he wants to maintain total utility
- the marginal rate of substitution decreases in absolute value because the curve is negative in direction

? Utility margin at the maximum point of total utility function is:

- positive
- negative
- zero
- decreasing

? If in the case of five good units utility margin is fifteen this means that:

- if the consumer consumes five units of good, his utility margin will be fifteen
- a consumer can attain fifteen units of utility by consuming five units of the good
- the consumer's utility cannot exceed fifteen units, as it has reached the limits of its utility
- the utility of the fifth product is fifteen

3. UNIT: THE INFLUENCE OF CONSUMERS' ABILITY TO PURCHASE ON DEMAND, INDIVIDUAL DEMAND

3.1 AIMS AND COMPETENCIES

The aim of this unit is to analyse the interrelationship among factors which determine consumers' ability to purchase and its influence on demand as well as the examination of the optimal income spending, changes of real wages, and cost with emphasis on demand.

In the course of our expertise we are going to find out more about changes in cost, real wages, the potential of mathematical and geometrical models of rational consumer decisions contained by price-value relationship, and with the help of the above we intend to set up individual demand functions based on the changes in real wages and price level.

3.2 STUDY MATERIAL

Figure 10 Mind map

3.2.1 The appearance of consumers' ability to purchase on the budget line

The purchasing potential of the consumer depends on his real wages. Real wages depend on the nominal wages and the cost of a good. On the above basis we can state that consumers' ability to purchase is defined by nominal wages and the price of a good.

In accordance with the above consumer ability can be modelled with the help of the budget line.

The budget line or budget constraint (e) is the sum of combination of goods the consumer is able to buy spending all his given income at given prices of the market in the coordinating system.

The equation of the budget line:

$$I = P_x * x + P_y * y$$

Where:

- I: the income of the consumer; constant
- P_x: the price of good „x"; constant
- P_y: the price of good „y"; constant
- x: the quantity of good „x"; variable
- y: the quantity of good „y"; variable

While discussing consumers' ability to purchase in relation to the budget line of the consumer, for the sake of easier modelling, similarly to earlier cases, we are going to start from the simplifying hypothesis that the consumer buys or consumes only two goods as „x" and „y".

In order to be able to examine consumers' willingness to purchase (indifference curve, indifference map) and consumers' ability to purchase (budget line) together we have to illustrate budget line on a coordinate system with axes „x; y" as well. This imposes arranging the equation of the budget onto „y".

$$y = -\frac{P_x}{P_y} * x + \frac{I}{P_y}$$

As P_x; P_y and „I" are constants, on the basis of the above equation we can state that the budget line has a negative sloping, where the vertical

axis intersecting is $\frac{I}{P_y}$. If we rearrange the above equation onto „x" it is also easy to realize that the horizontal intersection of the axis will be $\frac{I}{P_x}$.

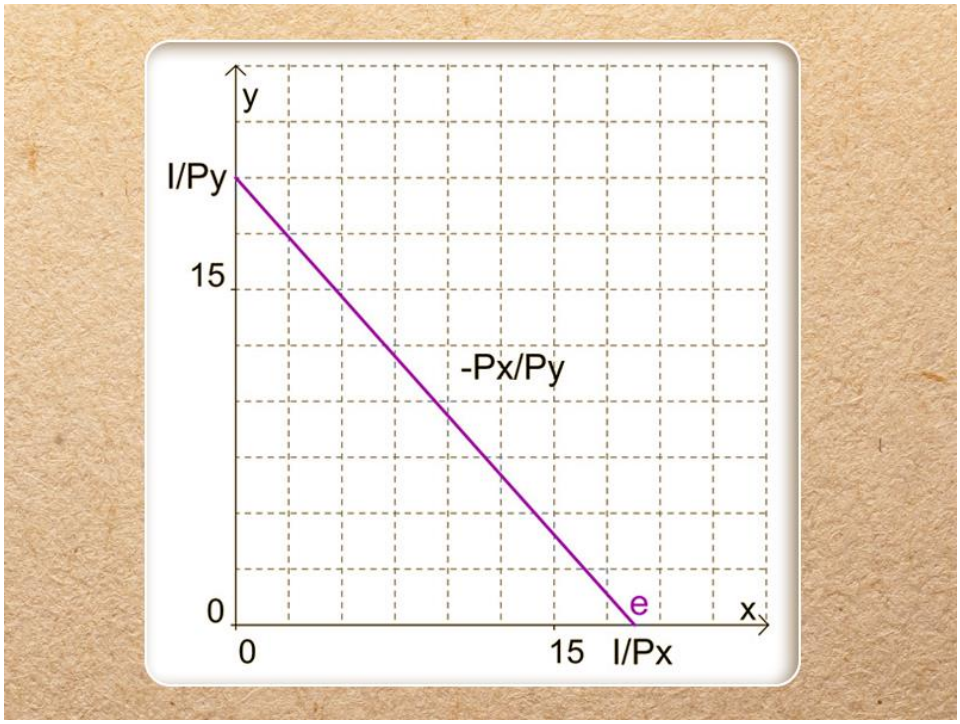

Figure 11 Budget line (constraint)

From the definition of the budget line it follows that at any given point on it, the consumer can purchase the resulting combination of goods „x, y" if he spends all his income. From this it also follows that because the value of „y" on the horizontal axis intersecting the horizontal axis crossing of the line shows the quantity of good "x" the consumer can buy if he spends all his income on good „x". The vertical axis intersecting the line shows the same with reference to good „y". This can be testified by substitution with the parameters which signal the intersecting axes.

On the basis of the equation of the budget line we can say that the line has a negative sloping. This is due to the fact that on the budget line the income of the consumer is constant and if the consumer increases the amount of the good (x) purchased the amount of the other good (y) he buys has to decrease. Although the sloping of the budget line is nega-

tive we are going to consider it to be a constant in the future for the sake of simplicity.

On the basis of the above it is obvious that triangle bordered by the axes of the coordinate-axle and the budget line (we could call it budget pile) comprises „x; y" combinations of goods which the consumer can buy if he doesn't spend all his income. Accordingly outside the budget pile there are variations of goods the consumer cannot afford buying as at the given prices his income is not sufficient.

The shift of the budget line

The budget line either moves parallel to itself, or it turns round its axle-crossing, or it might produce a combination of the above mentioned movements.

Should the nominal wage of the consumer increase at unchanged prices than the budget line could move outwards parallel to itself. The same influence occurs if the nominal wage of the consumer is unchanged, but the price of both goods in the consumer basket decreases in the same proportion at the same time. As the increase of nominal wages at unchanged prices, or the simultaneous reduction of prices of the goods in the consumer basket at the same rate means the increase of real wages we can state that if the real wages of the consumer increase the budget line moves parallel to itself outwards.

The decrease of nominal wages or the simultaneous increase of the goods at an identical rate (real wages are decreasing) will push the budget line in the opposite direction.

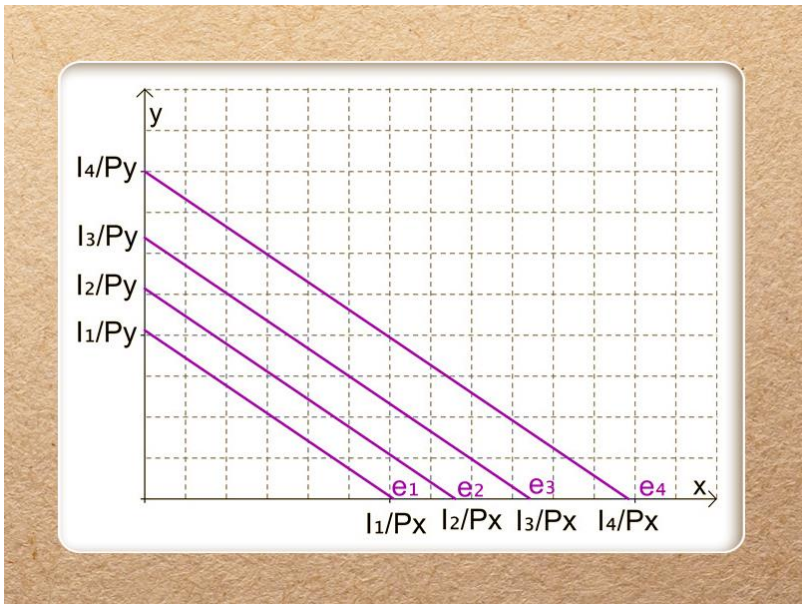

Figure 12 The effect of growth in real wages upon the budget line

The budget line moves outwards around the vertical axis if the price of good „x" decreases while the price of good „y" remains unchanged.

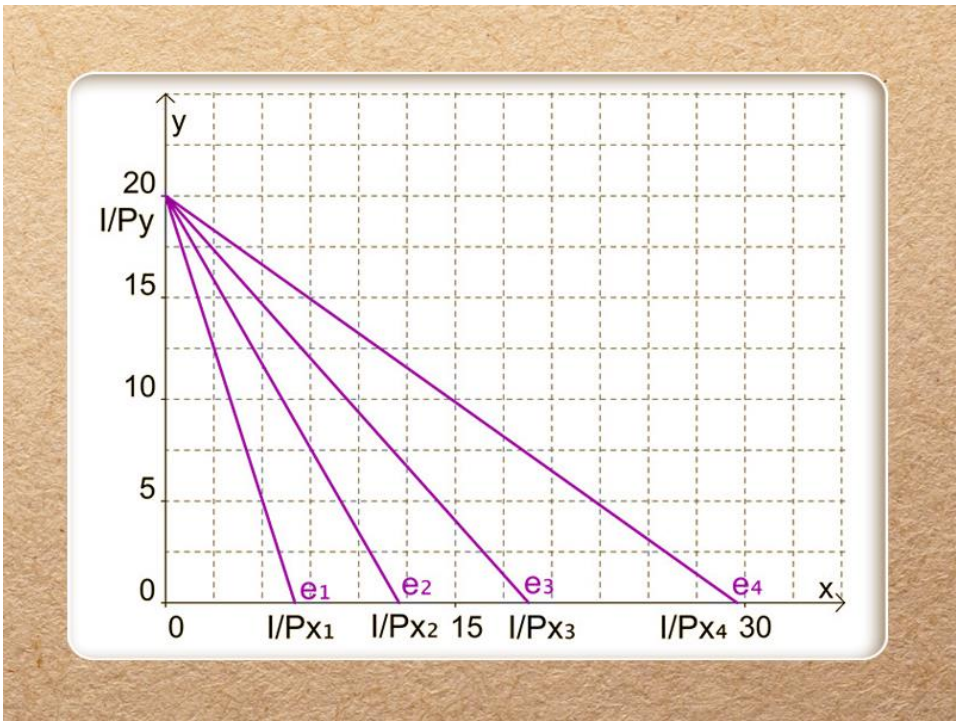

Figure 13 The effect of price reduction of good „x" upon the budget line

It can be seen in the illustration that if the consumer spends all his wages on good „x" (horizontal axis) he can buy more and more of good „x" if the wages of the consumer and the price of good „y" are unchanged. This has to be so, as good "x" became cheaper ($Px_1 > Px_2 > Px_3$).

Of course increase in price will produce the opposite effect, or the change in price of good „y" the budget line will move around the horizontal axis.

We can state that if the proportion of the goods in the consumer basket is changed the sloping of the budget line is altered as well. This is obviously so, as we clarified earlier that the slope of the budget line is a function of the rate of the goods in the consumer basket.

3.2.2 Definition of the optimal consumer basket

In the following we are going to discuss the consumer basket which at a given income and market prices can produce the greatest profit for the consumer, that is it can produce the most optimal consumer basket, and

we represent it on the shared axis of the indifference curve and of the budget line which influences consumers' ability to purchase.

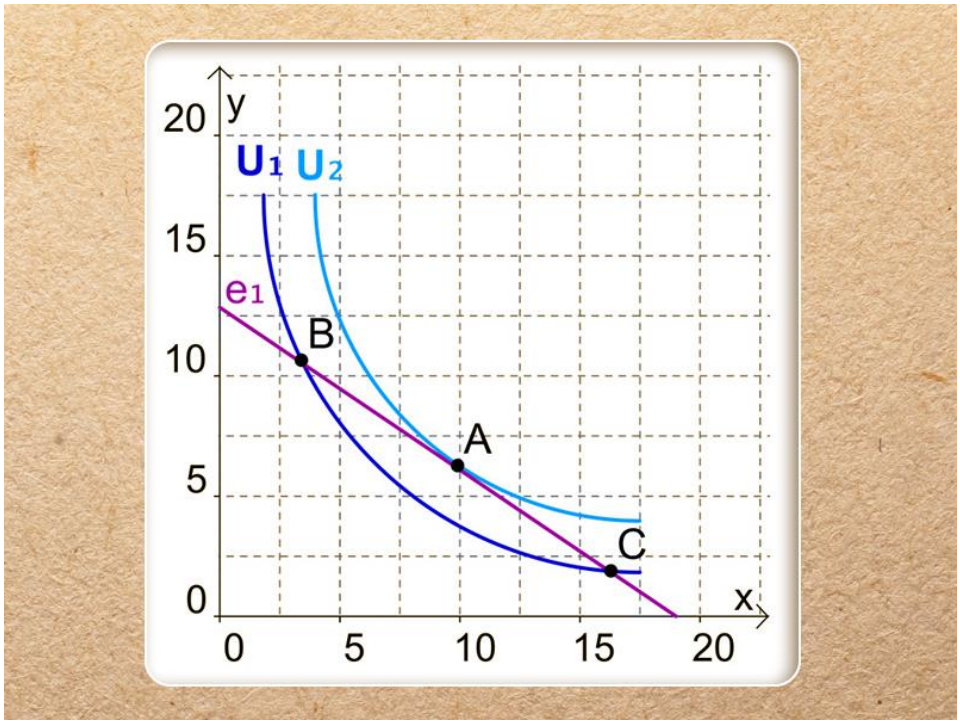

Figure 14 Optimal consumption choice – Illustration of the optimal consumer basket

As consumer baskets „A; B and C" are all on the budget line this means that the consumer can buy „A", „B" or „C" consumer basket should he spend all his income. As consumer baskets „B" and „C" are situated on the indifference curve closer to the origo these baskets represent lower utility for the consumer than basket „A". This means that in this case consumer basket „A" is optimal for the consumer.

- **The consumer spends his income in an optimal way if he buys the consumer basket situated at budget line which tangent to an indifference curve the farthest from origo .**

We stated earlier that the margin of substitution is the primary derivate of the indifference curve, that is, it is the sloping of the indifference curve drawn to one of its given points. The above illustration shows that in the case of an optimal consumer basket the budget line drawn to tangent to

the indifference curve has a sloping $\left|-\frac{P_x}{P_y}\right|$. As in an optimal case this is identical with the primary derivate of the indifference curve, in the case of an optimal consumer basket:

$$MRS_{x,y} = \frac{P_x}{P_y}$$

As $MRS_{x,y} = \frac{MU_x}{MUy}$, this means than in an optimal point:

$$\frac{MU_x}{MU_y} = \frac{P_x}{P_y}$$

If we rearrange the above equation we arrive at the formula of Gossen's II law.

$$\frac{MU_x}{P_x} = \frac{MU_y}{P_y}$$

- **Gossen's II law: the consumer spends his wages in an optimal way if the marginal profit spent on the last good unit is identical in the case of all the purchased goods.**

3.2.3 The influence of changes in income upon demand

The effect of changes in real wages upon demand is shown by the income-consumption curve and the Engel curve.

- **Income Consumption Curve (abbreviation: ICC) shows those consumer baskets which can be bought by the consumer if he spends all his income in an optimal way, at an unchanged price rate proportion of the goods in the respective basket in relation to the real wages of the consumer.**

- **Engel curve (abbreviation: E) shows the changes in quantity of a good in relation to the changes in the real wages of the consumer, at the unchanged rate of the goods in that consumer basket.**

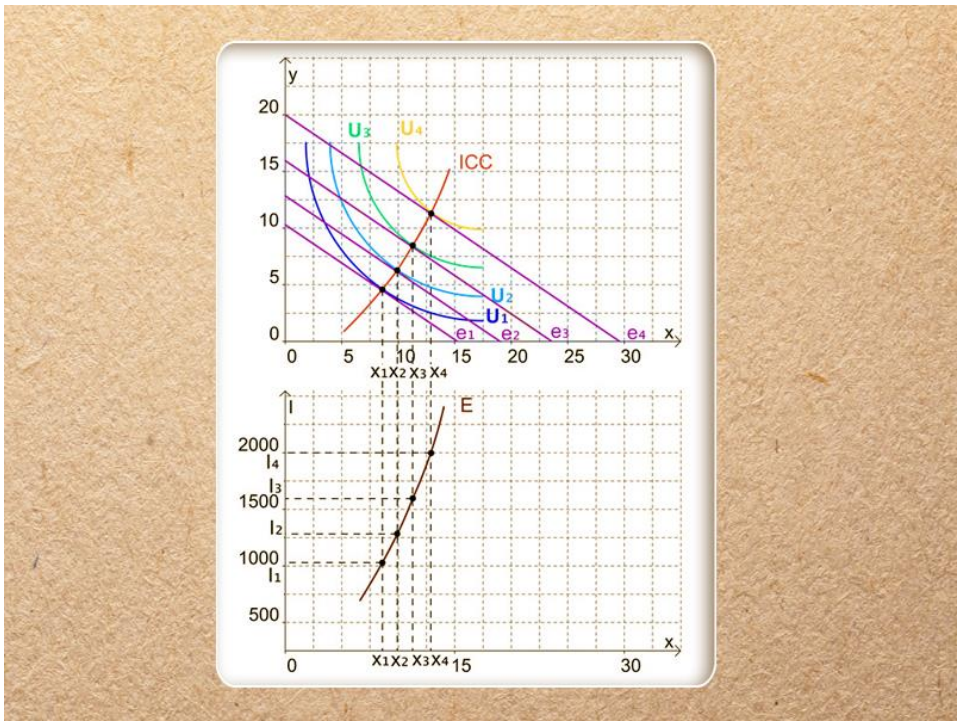

Figure 15 ICC and Engel's curve in the case of normal goods

Drawing the ICC curve resulted in the outward move of the budget line parallel to itself, which shows the unchanged proportion of the goods in the basket and the increase of the real income of the consumer. It then follows that the ICC curve is a function of the real wages at unchanged price rates. As the ICC curve links consumer baskets situated at the intersections of the indifference curve and of the budget line, it is also certain that the ICC curve shows optimal consumer baskets. On the basis of the above it is obvious that the definition of the ICC curve and the representation of its function are closely related, which of course is natural.

In the case of the Engel curve we can observe that in terms of geometry nothing else happened than that we represented one of the goods from the optimal consumer market developed alongside the ICC curve and we rendered the income revealed alongside the ICC curve to the given quantity of goods.

- The ICC and Engel curve of the inferior goods will be discussed later.

3.2.4 The influence of the changes in price onto demand

The influence of the changes in price onto demand is shown by the price-consumption curve and the individual demand function.

- **Price Consumption Curve (abbreviation: PCC) shows change in price of a good from the consumer baskets which the consumer can buy by spending his entire income in an optimal way, at the unchanged price of the other good included into the consumer basket.**
- **Individual demand curve (abbreviation: d;) shows the quantity of a good in related to the price of the good which the consumer is willing and able to purchase at a given time and at a given price.**

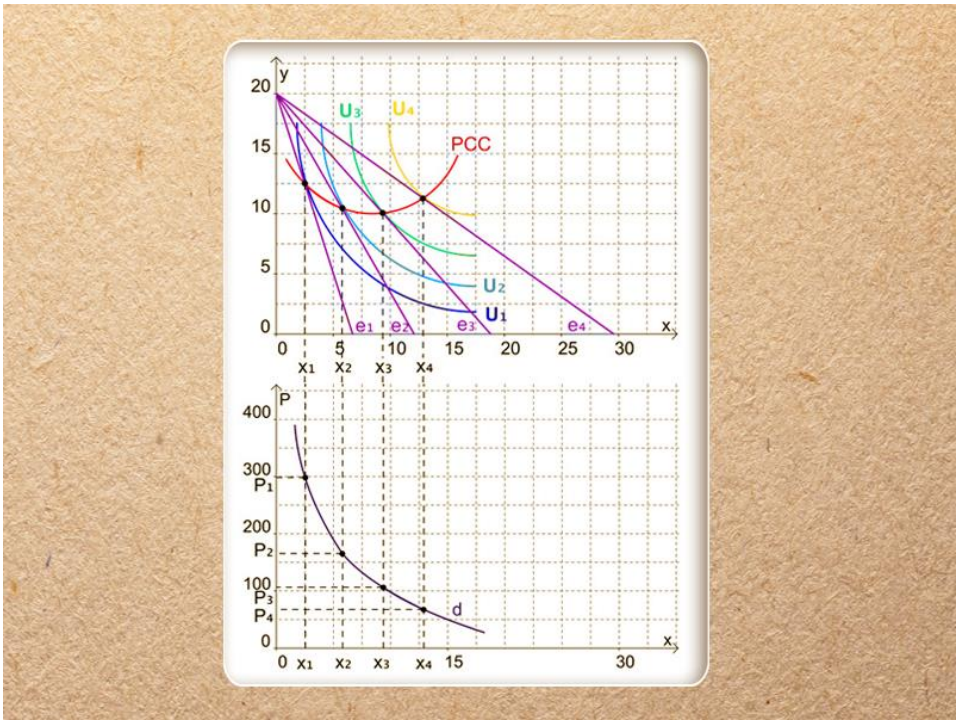

Figure 16 PCC and individual demand curve

- On the basis of our earlier discussions it is clear that if the price of one good in the consumer basket chages then the demand for the good changes, on the other hand the real wages of the consumer also changes, and third the proportion of the goods in the

consumer basket chnages as well. On th basis of the above the change caused by the change in real wages can be divided into demand caused by the change in real wages and demand caused by the change in proportion of the given good in the consumer basket. Sir John Richard Hicks and Evgeny Evgenievich Slutsky deal with the nature of this sort of change in demand.

4. http://www.britannica.com/EBchecked/topic/264875/Sir-John-R-Hicks
5. http://www-history.mcs.st-and.ac.uk/Biographies/Slutsky.html

3.3 SUMMARY, QUESTIONS

3.3.1 Summary

In this unit we discussed the factors influencing the consumer's purchase ability, the mathematical and geometrical modelling of the above and we linked the above discussion to the topic of consumer willingness in order to arrive to the definition of demand and income.

3.3.2 Self assessment questions

- Define the PCC curve!
- Define the Engel curve!
- How does the change in price of good „x" appear on the budget line?
- Describe Gossen's IInd law!
- How do you interpret the vertical section of the budget line in economic terms?

3.3.3 Practice tests

- The consumer can buy one of the consumer baskets situated on the budget line:
  - he can buy it and he can spend the entire income onto the two goods in an optimal way
  - he can buy it, and does not spend the whole income onto the two goods
  - he can buy it, and spends all the income he can afford onto the two goods
  - he cannot buy it, because his income is insufficient

- Individual income function:

- shows how much of a consumer's income has to be spent on the good demanded by the consumer
- it shows the current market prices as a function of the prices of the demanded goods
- as a function of the standard price it shows the amount of goods that a consumer is willing and able to purchase at a given time and at a given price
- as a function of the consumer's income it shows the amount of goods that the consumer is ready and able to buy

? In the case of the increase in the consumer's nominal wages:
- the sloping of the budget line decreases in absolute terms
- the budget line shifts outwards parallel to itself
- the sloping of the budget line increases in absolute terms
- the budget line shifts towards the origo parallel to itself

? On one of the axes of the Engel curve:
- we can read the income of the consumer
- we can read the number of the consumer baskets
- we can read the utility of the consumer baskets
- we can read prices

? In the case of optimal consumer baskets the consumer:
- achieves the greatest possible utility from a given income
- reaches the given utility from the smallest possible income
- reaches the greatest possible utility at a given price
- all the above statements are true

4. UNIT: ANALYSIS OF PRODUCT MARKET DEMAND

4.1 AIMS AND COMPETENCIES

The aim of this unit is to interpret market demand on the basis of the factors that determine individual demand and their interrelationships. This also occasions the analysis of the sensibility of the consumer to price and income from a number of perspectives. We are going to discuss the formation of the gross savings; the consumer's buying ability and willingness, and the „payment compulsion" indicated by market prices. The results of the discussion of the above segments will be of great help in later stages of discussion of the study material, where we are going to deal with the comparative economic discussion of the behaviour of the monopolies on the market, and with the behaviour of the perfectly competitive markets versus monopolistically competitive markets, from the perspectives of welfare society. The closing section of the unit and of the section discussing market demand will occasion the presentation of consumer behaviours other than normal, which might be essential in our assessment of larger demand.

4.2 STUDY MATERIAL

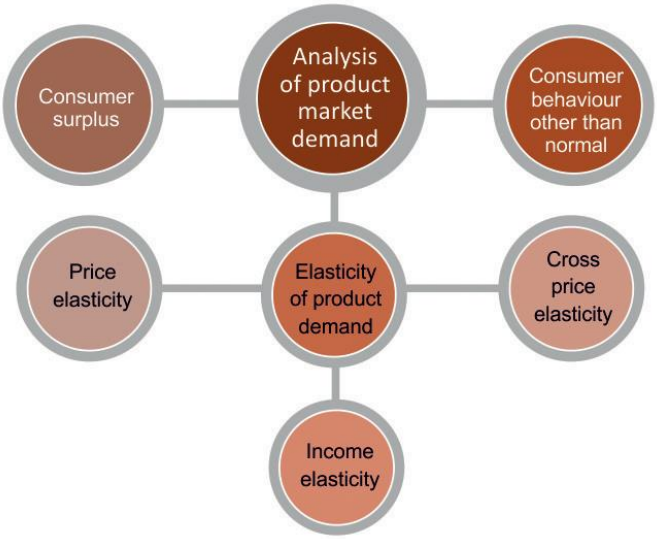

Figure 17 Mind map

4.2.1 The elasticity of market demand

As we know it from our earlier studies (Economics I.), market demand is the sum total of individual demands achieved at a given price. Accordingly the demand function is the sum total of the individual demands in the horizontal axis.

Demand elasticity is the number which shows the percentage at which the quantity of the demand of the analysed good changes in the case of one per cent increase of a given factor while all the other factors influencing it remain unchanged.

From the point of view of elasticity the demand for a good depends on the price of the good, the price of the substitute good and the income of the consumer. On the basis of the above we can speak about elasticity of price, cross-elasticity of price and elasticity of income.

The price elasticity of the product market

- **Elasticity of price is the figure which shows by how many percents does the demand for a certain good increase in case of one percentage increase in price of the good examined.**

Price elasticity practically expresses the sensibility of consumers to changes in price.

Calculating price elasticity on the basis of the elasticity curve

In this case we define the value of price elasticity on the elasticity curve between two randomly chosen points (in this case „A" and „B") on the demand function.

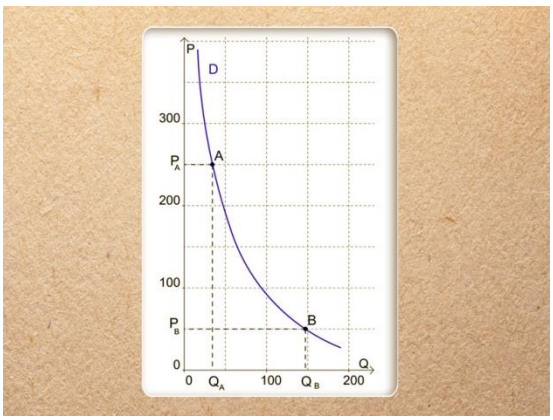

Figure 18 Calculating price elasticity of demand on the basis of arc elasticity

On the basis of the above illustration the formula of the elasticity curve is as follows:

$$\varepsilon_{Q,P} = \frac{Q_A - Q_B}{P_A - P_B} : \frac{Q_A + Q_B}{P_A + P_B}$$

The above formula is called central, or by other name average formula.

The members in the numerator and the denominator can be exchanged, but if we implement a change in the nominator the same has to be done in the denominator as well and this is true the other way round as well.

The central formula only gives us an exact value of the elasticity value of the halving point of the elasticity curve between point „A" and „B", but in practice we accept it as an estimate punctuality for all the points of the curve.

We use the formula of the elasticity curve if the equation of the demand function is unknown, but at least two price values and two related quantitative values are available.

Calculation of price elasticity on the basis of point elasticity

In the case we would like to get exact elasticity values in all points of the demand function we have to employ the formula of the point elasticity.

$$\varepsilon_{Q,P} = \frac{dQ}{dP} : \frac{Q}{P}$$

The first members of the formula of the point elasticity are the price defined primary derivate of the demand function which geometrically is the sloping of the tangent drawn onto the examined point (point C) viewed from the price axis. The second member of the formula is the quantity expressed as the average of price, which geometrically is the sloping of the line drawn to the examined point of the demand function from the origo viewed from the price axis.

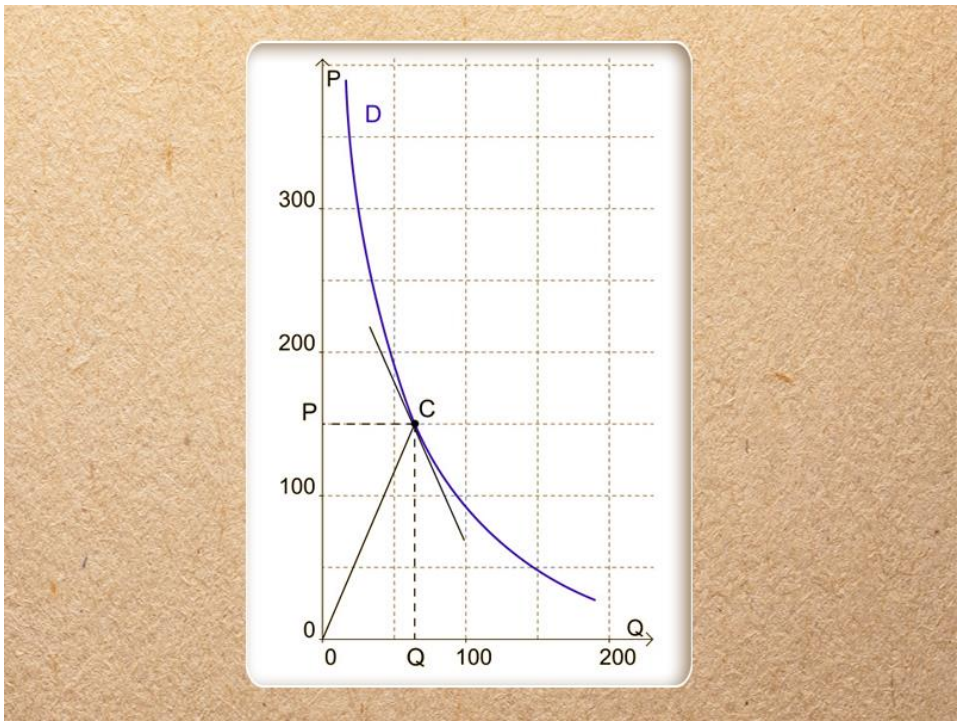

Figure 19 Calculating price elasticity of demand on the basis of point-price elasticity

We use the formula of point elasticity if the formula of the demand function is known.

Grouping of the goods on the basis of price elasticity:

- $|\varepsilon| > 1$ the demand of the good is price elastic, luxury goods for example
- $|\varepsilon| < 1$ the demand of the good is inelastic, basic consumption goods and stimulants for example
- $|\varepsilon| = 1$ the demand of the good is one unit price elastic, common clothing for example

Factors influencing price elasticity:

- The volume of the price of a good compared to the income of the consumer. The higher the price of the good compared to the income of the consumer the more price flexible the demand of the good is. That is in this case a one per cent increase in the price of the good requires a greater percentage

of the consumer's income, if the consumer buys the good, this makes it more likely that he will give up buying it.

- The proximity of the examined good and of the replacement good. The closer the price of the examined good and the price of the replacement good are more flexible the demand of the examined good is. In such cases it is easier for the consumer to pass on to the replacement good, as there is only a minor difference in the prices of the two goods, that is if the price of the examined good increases the replacement good can become cheaper for the consumer.
- The degree of substitution capacity of the good. The more substitute goods a good has the greater price elasticity it has. This stems from the fact that the consumer can find other goods to replace the good with increased price.
- The length of the time at disposition. On a short run the demand for a good is not price flexible because the consumer hasn't got enough time, or does not want to waste time on looking for a replacement good instead of the good the price of which has increased, and thus in the case of an increase in price of the examined good it doesn't, or does not decrease in too great degree the demand for it. On long term the consumer has enough time to look for a replacement good, or realizes the difference so he gives up the examined good.

The relationship between price elasticity and revenue

Total revenue (TR) results from the multiplication of the standard price of a good and the sold quantity.

$$TR = P * Q$$

As price elasticity is the figure which shows by how many percent the demand of a good changes in the case of 1% increase in price, so it is clear that in case:

- $|\varepsilon| > 1$, that is the demand of the good is price elastic, if in the multiplication TR = P * Q in the case of a 1% increase in price the quantity of sold goods decreases to a greater degree than 1%
- $|\varepsilon| < 1$, that is the demand of the good is inelastic, in the multiplication TR = P * Q the quantity of the sold good decreases with less than 1% at the 1% of increase in the price of the examined good, and this means that the profit increases

- $|\varepsilon| = 1$ that is the demand of the good is inut elastic, elasticity that is in the multiplication TR = P * Q in the case of 1% in price determines an exactly 1% decrease in the quantity of the examined good, thus the profit does not change

The cross price elasticity of goods market demand

Cross price elasticity is the figure which shows how many % change the 1% change in increase in the price of one good produces in the change in demand of the other good.

Cross-price elasticity can also be calculated on the basis of arc elasticity, and point elasticity.

The calculation of cross-price elasticity on the basis of arc elasticity

$$\varepsilon_{y,Px} = \frac{y_A - y_B}{Px_A - Px_B} : \frac{y_A + y_B}{Px_A + Px_B}$$

The above formula shows the change in demand of good „y" in the case of a 1% increase in the price of good „x".

The members of the numerator and the denumerator can be inversed, but if we inverse them in the numerator we have to do the same in the denominator as well and vice versa.

We employ the formula of the curve elasticity (central formula) if the equation of the function which shows the demand of good „y" as a function of the price of good „x" is unknown but at least two price values are known and two related quantity values. The formula offers an approximate value of the cross price elasticity.

The calculation of cross-price elasticity on the basis of point elasticity

$$\varepsilon_{y,Px} = \frac{dy}{dP_x} : \frac{y}{P_x}$$

We use the formula of the point elasticity if the equation of the function which shows the demand of good „y" in relation with the price of good „x".

Through the above calculation we get an exact value of the cross-price elasticity.

The sign of cross- price elasticity:

- In the case of substitute goods one another it is positive because it increases the demand for the replacement good as it is relatively cheaper compared to the examined good. This, of course is only true if the price of the examined good exceeds the price of the replacement good.
- In the case of complementary goods it is negative, because in such cases both the examined good and the complementary good are necessary for the consumer (this is why we call them complementary goods) which means that the increase in price of the examined good results not only in the decrease of demand in the case of the examined good, but also in the demand for the complementary good.
- In the case of independent goods the value is zero.

The income elasticity of market demand

Income elasticity is the figure which shows by how many percents demand for the examined good changes if the nominal income spent on consumption increases by 1%.

Income elasticity can also be calculated on the basis of arcelasticity and point elasticity.

The calculation of income elasticity on the basis of the Engel curve.

$$\varepsilon_{Q,I} = \frac{Q_A - Q_B}{I_A - I_B} : \frac{Q_A + Q_B}{I_A + I_B}$$

The elements in the nominator and the denominator can be interchanged here as well, but if we change them in the denominator then they should be changed in the nominator too and vice versa.

We use the formula of the curve elasticity (the central formula) when the equation of the Engel curve is not known, but at least two incomes and related quantitative values are available. The formula gives us an approximately exact value of income elasticity.

Calculation of income elasticity on the basis of point elasticity

$$\varepsilon_{Q,I} = \frac{dQ}{dI} : \frac{Q}{I}$$

We employ the formula of point elasticity if the equation of the market Engel curve is known.

We mentioned repeatedly the Engel curve. In this case similarly to the market demand function we are speaking about the sum total of the Engel curves of the consumers present on the market.

The sign of the income elasticity is generally positive because the increase of income is accompanied by the increase of demand. In the case of some inferior goods above a given income level it is negative, because parallel with the increase of income the consumers restructure their consumption habits and instead of inferior goods they start consuming superior goods and thus the demand for inferior goods decreases.

4.2.2 Consumer surplus

Before passing on to the discussion of consumer surplus we have to clarify the concept of reservation price.

- **Reservation price is the highest price the consumer is willing and able to pay for a good. This price is specified by the demand function as the demand function renders the quantity of the consumer demand to the standard price the consumer is ready and able to pay for a given quantity of the given good.**
- **Consumer surplus is the difference between the reservation price and market price of a given good unit. It is the sum of the individual consumer surpluses mirrored by all the purchased good units.**

This then is expressive of how much cheaper the consumer can buy a given quantity of good compared to how much he would be ready to pay for it. In other words consumer surplus reflected by one good unit expresses how much the consumer can save compared to his planned expenses. The total of the consumer surplus reflects the total savings of the consumer.

Consumer surplus can be interpreted not only in the case of individual consumers but also in the context of the whole market. In this case we refer to the difference between the market price and the reservation price shown by the demand function in the case of one good, in the case of all

the purchased goods we are speaking about the sum of the consumer surplus in the case of all purchased good units. At this point we are speaking about the savings of all the consumers present on the market compared to the average maximal price the consumers would have been ready and able to pay for a given unit of a given good.

We base our illustration of the consumer surplus on the linear demand function for the sake of simplicity.

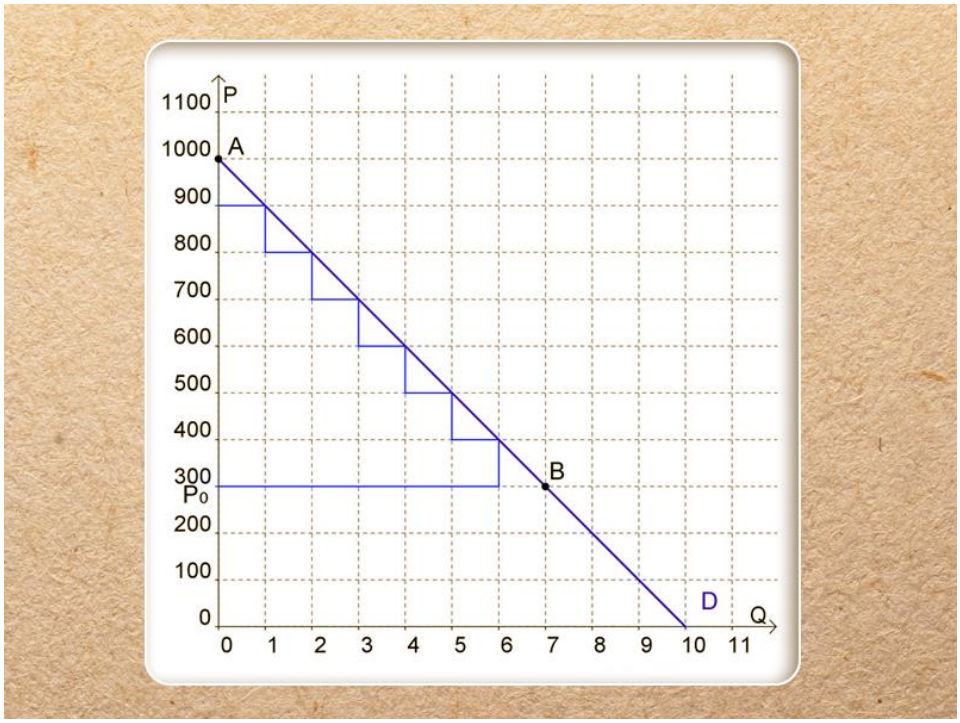

Figure 20 Consumer surplus

Let the market price be P_0 = 300. Accordingly on the basis of the above chart the consumer surplus achieved in the case of the first good is 900 - 300 = 600, in the case of the second unit of good it is 800 - 300 = 500, in the case of the third good is 700 - 300 = 400, and so on up to the sixth good unit. Thus the total consumer surplus is 2100 money units, which is identical with the „graded + plane" area shown by the chart. It can be seen on the chart that the triangles bordered by the demand function and the „graded" plane are not part of the consumer surplus. This is so because we employed larger units for the sake of more comprehensive illustration. If we use infinitely small units (this is the case if we con-

sider the demand function continuous) the above mentioned triangles also form part of the consumer surplus. From the above it follows that on the chart the consumer surplus is identical with the surface of the triangle „P_0; A; B".

On the figure it can be seen that the consumer surplus can be defined on the basis of the surface situated under the demand function. The calculation of the surface under the function can be done with the help of definite integral in the case of non-linear demand function.

4.2.3 Consumer behaviour other than normal

Up to now we have stated that the consumer will buy a good if he needs it, if he has the necessary income and the cheaper the good is the greater quantity he buys of it. We are now going to speak about situations different from the ones mentioned above:

1. **Bandwagon effect:** in this case the consumer buys because the others are also buying and not because he needs the good. Following fashion at all costs is a typical case.
2. **Snob effect:** in this case the consumer will be more determined to buy if the good is more expensive, because in this way he can stand out from among the others. He buys the more expensive good because he knows that the others cannot afford it.
3. **Veblen effect:** in this case the consumer draws conclusions regarding the quality of the good on the basis of the price of the good and he thinks that more expensive goods are of better quality, so the more expensive the good is the higher its quality must be, and he buys it.
4. **Speculative effect:** in this case the consumer buys the good if its price is going up, because he thinks that its price will go even higher, so he is better off if he buys the good before it, and later he could sell it with profit.

4.3 SUMMARY, QUESTIONS

4.3.1 Summary

We have finished the discussion of the economic relationships of the demand section with the analysis of the market demand. Through this we managed to state the marketing oriented influence on the consumer's purchasing intentions on the one hand, on the other hand we opened the possibility for the analysis of the behaviour of monopolies and paved the way for the discussion of the negative social effects of monopolies on the

market. We close down the discussion of the analysis of market demand to deal with economic aspects of the offer side.

4.3.2 Self assessment questions

? How do you interpret cross price elasticity?

? In what cases do we use the central formula for the calculation of price elasticity?

? In what cases do we use the formula of point elasticity to calculate income elasticity?

? How do you interpret reservation price?

? How do you define consumer surplus?

4.3.3 Practice tests

? If the price elasticity of the examined good is |-1,2|, then:
- increase in price results in increase in revenue
- in case of lower prices revenue increases
- lower prices lead to decreased revenue
- in case of increased price revenue does not change

? In the case of complementary goods cross price elasticity:
- is greater than 1 in absolute value
- is smaller than 1 in absolute
- has a negative sign
- has a positive sign

? Negative sign income elasticity means that:
- the demand for the examined good is not flexible
- the demand for the examined good is flexible
- the examined good is a luxury good
- the examined good is an inferior good

? Consumer surplus at unchanged demand function:
- increases parallel with the increase of market price
- decreases parallel with the increase of the market price
- decreases parallel with the decrease of the market price
- it is independent from market price

? Reservation price:
  - is identical with the market price in all cases
  - in case of consumer surplus is higher than market price
  - in case of consumer surplus is lower than market price
  - its relationship with market price cannot be defined

5. UNIT: PRODUCTION COSTS

5.1 AIMS AND COMPETENCIES

The aim of this unit is to produce mathematical models of economic relationships including the function based analysis of production related expenditure. The unit will offer us the possibility to get acquainted with one or two variables production functions, the economic criteria of properly structured optimal input and short term expenditure functions and their interactions. The production oriented discussion of expenditure creates the platform for the discussion of the criteria of profit maximization in the next chapter, by the help of which the supply attitude of firms in various market environments can be analysed.

5.2 STUDY MATERIAL

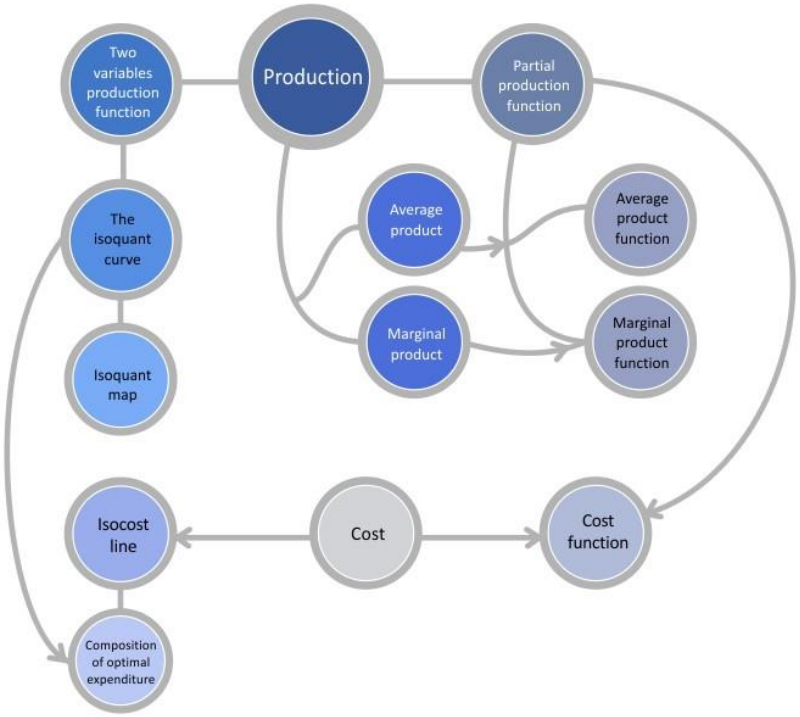

Figure 21 Mind map

5.2.1 Production, production functions

In order to create supply on the market there is need for production.

- **Production is a process in which goods are produced by employing resources.**

  Resources of production:
  - labour
  - capital
  - natural resources
  - entrepreneurial abilities

- Modelling production in microeconomy is based on Adam Smith's labour-value theory which distinguishes two resources namely labour and capital.

6. http://www.biography.com/people/adam-smith-9486480

- **Production function shows the changes in the quantity of goods produced in relation with the quantity of resources employed in the process.**

In mathematical terms we can distinguish between two production functions:

- one variable production functions
- multiple variables production functions

One variable production functions

- **One variable production function (partial) (Total Product, abbreviation: TP) shows the development of the output in relation with one unit investment when all the other factors involved remain unchanged.**

We have to explain to related terms together with their functions before we pass on to the discussion of the partial product function.

- **Marginal Product (abbreviation: MP) the additional product per additional unit of input. Is the figure that shows the extent to which the revenue changes, if we increase the input by one unit.**

$$MP_L = \frac{\Delta Q}{\Delta L}$$

The marginal product function shows the development of the marginal product in relation to the input employed. This function is the primary derivate of the partial product. In mathematical terms it shows the rate of increase (the speed) of the partial product function:

$$MP_L = \frac{dQ}{dL}$$

- **Average product (abbreviation: AP) is the revenue stemming from one unit imput.**

$$AP_L = \frac{Q}{L}$$

The function of the average product shows the development of the average product in its relation with the input employed.

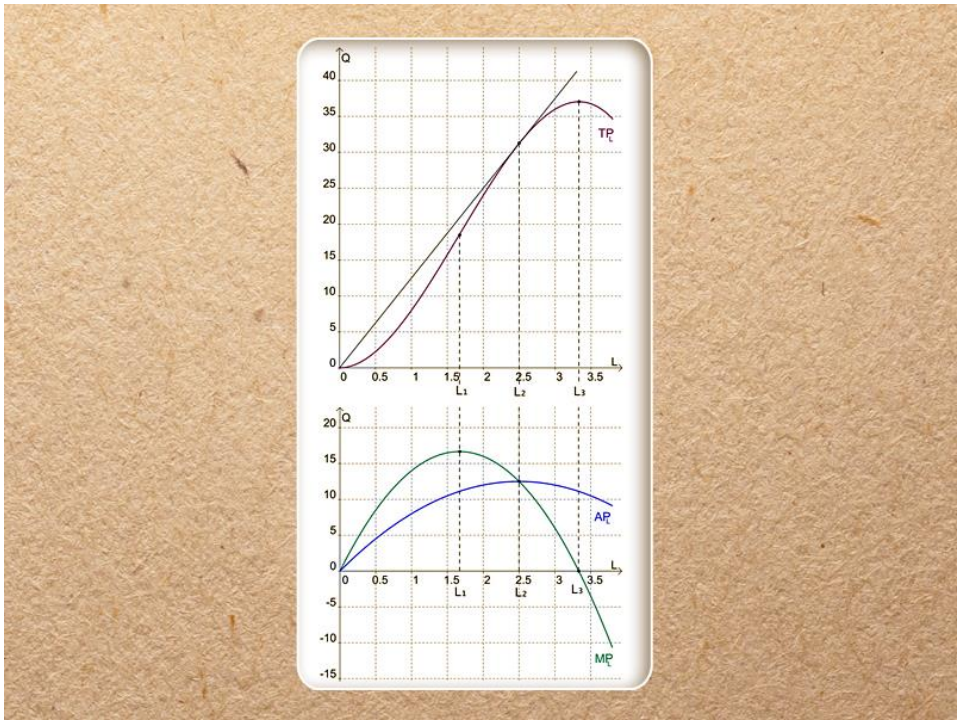

Figure 22 The partial production function, average product and marginal product and their interrelationship

In the upper section of the above illustration we can observe a partial production function TP_L, which shows the shape of the revenues in relation to the work invested. The function increases till point L_1 at an in-

creasing rate, that is the revenue is increasing with every increase in work input. In point L_1 it has and inflexion point. Its growth slows down between points L_1 and L_3, that is the revenue increases at an ever slower rate with each new work investment. The function reaches its maximum in point L_3 and from there it starts decreasing.

As the marginal product function shows the rate of growth of the partial production is in the positive segment up to point L_1 and it is growing, it reaches its maximum point in point L_1 while between L_1 and L_3 it is in the positive segment and it is decreasing, to reach the negative segment and enter the negative segment later. The negative values of the marginal product are from the decreasing section of the partial production function, as in this section the production decreases with every new input unit.

As the average value of any function from a geometric point of view is the sloping of the function drawn from the origo onto a given point of the function, up to the point the sloping of the line drawn from the origo onto the partial production function is increasing (L_2 work investment), the function of the average product also increases, but it starts decreasing from this point on. As in the case of L_2 work investment the line drawn from the origo onto the partial production function, in this point the sloping of the line drawn in this point onto the partial production function (gives the value of the marginal production) is identical with the slope of the line drawn from the origo onto the partial production function (it gives the value of the average product). From the above description it follows that at level L_2 of work investment the function of average product reaches its maximum (AP_L) and it intersects the marginal product function at its maximum and it intersects the marginal production function (MP_L).

According to the law of decreasing yield with each additional investment employed the revenue increases to a lesser degree.

The above mentioned law appears on the functions of the former illustration between points L_1 and L_3.

Multiple variable production functions

The multiple variables production function shows the development of the revenue on the basis of the function of multiple input employed.

For the sake of easier modelling and handling we use a two variables production function, which shows the development of the function with respect to the amount of employed quantities of two of the most important resources (labour: abbreviation: L; capital, abbreviation C or K).

The image of the production function thus arrived at is the three dimensional (spatial) form of the earlier interpreted partial production function.

The analysis of the two variables production function is in perfect analogy with the analysis of the two variables revenue function earlier discussed on the above basis:

- the analogy of the indifference curve is the isoquant curve;
- the analogy of the indifference map is the isoquant map;
- the analogy of the marginal rate os substitution is the marginal rate of technicalsubstitution ;

The analysis of the two variables production function differs from the analysis of the two variables production function in that in the case of two variables production functions revenue we do not examine total utility (TU) in relation with two goods („x" and „y") but the total product (TP) in relation with two production factors („L" and „K").

- With the above in view we are going to discuss the two changeables production functions briefly.
- **Isoquant curve is the sum of investment combinations which bring identical benefits for the firm.**
- **Isoquant map is the sum of isoquant curves representing different revenue levels on a coordinating system.**
- **Marginal rate of technical substitution (abbreviation MRTS) is the figure which shows by how many units the investment quantity should be reduced in case of the continuous increase of an investment factor by one unit to prevent decrease of the revenue, that is to remain on the isoquant indifference curve.**

The marginal rate of technical substitution can be calculated in three ways:

$$MRTS_{L,K} = -\frac{\Delta K}{\Delta L} = \frac{dK}{dL} = \frac{MP_L}{MP_K}$$

5.2.2 Optimal factor combination of production at a given expense limit

The area for investigation mentioned in the title is in perfect analogy with the analysis of consumers' willingness to purchase, on the above basis:

- the analogy of the budget line is the isocost line;

- the analogy of the optimal consumer basket is the optimal factor combination

The analysis of consumers' willingness to purchase and of the composition of the optimal investment resources differs, in that, in the isocost line we do not have the combination of two goods ('x" and „y") at constant costs („P_x" and „P_y") and constant income (I) but we are speaking about the combination of two factors („L" and „C"/„K") at constant combination of costs at constant input prices („P_L" and „P_K") and constant costs (TC).

- With the above in view we are going to discuss the optimalization of investment briefly.

- **The isocost line is the sum of investment combinations of cost in the coordinating system, which result in similar expenses for the firm at given input prices.**

- **A firm uses its investment in an optimal composition if it produces with the combination situated at the farthest intersection of its isocost line and the isoquant curve which is farthest from the origo.**

At the point of osculation the following interrelationship exists:

$$\frac{MP_L}{P_L} = \frac{MP_K}{P_K}$$

- **The firm produces with optimal combination of costs if the money unit spent on the last marginal product is identical in all cases.**

5.2.3 The cost of production

As we know it from our earlier studies (Economics I.) expenses can be grouped according to financial, economic and production points of view. As we put emphasis onto the mathematical modelling of economic relationships in the present material and we discuss the expenses in close connection with production, here we only deal with categorization that allows for illustration in the form of functions.

- **Fixed cost (abbreviation: FC) is the cost the amount of which is identical at all levels of production, for example rent. The average form of this is the average fixed cost (abbreviation: AFC), which is the fixed cost of a product unit.**

$$AFC = \frac{FC}{Q}$$

- **Variable cost (abbreviation: VC) the amount of which increases with the increase of production for example basic material expenses. The average form of this is the average variable cost (abbreviation: AVC), which is the variable cost of one product unit.**

$$AVC = \frac{VC}{Q}$$

- **Total cost (abbreviation: TC) is the total cost of production, that is it is the sum total of fixed and variable cost. Its average form is the average total cost (abbreviation: AC), which is the variable cost of one product unit.**

From the above it follows that:

$$TC = FC + VC$$

$$AC = \frac{TC}{Q}$$

$$AC = AFC + AVC$$

- **Marginal cost (abbreviation: MC) the total or variable surplus of one product unit. It is the figure which shows by how much the total or variable cost increases if production increases by one unit.**

$$MC = \frac{\Delta TC}{\Delta Q}$$

$$MC = \frac{\Delta VC}{\Delta Q}$$

From the point of view of production cost categories can be illustrated as a function of the amount of produced goods, so the resulting functions can be called short term cost functions.

Short term functions of production

Short term functions show the development of cost as a function of the amount of produced goods.

The variable cost function can be deduced from the partial production function we discussed earlier.

If we set up the inverse of the partial production function, than we obtain the cost function (L), which function shows the amount of cost (in this case labour force) necessary for the production of a given quantity of products?

As variable cost is the multiplication of the amount of variable cost employed and of the cost of the expenditure that is in this case

$$VC = P_L * L$$

And because in the course of modelling the cost of labour (P_L) is constant we obtain a variable cost function from the cost function, if we multiply it by the respective constant of labour cost.

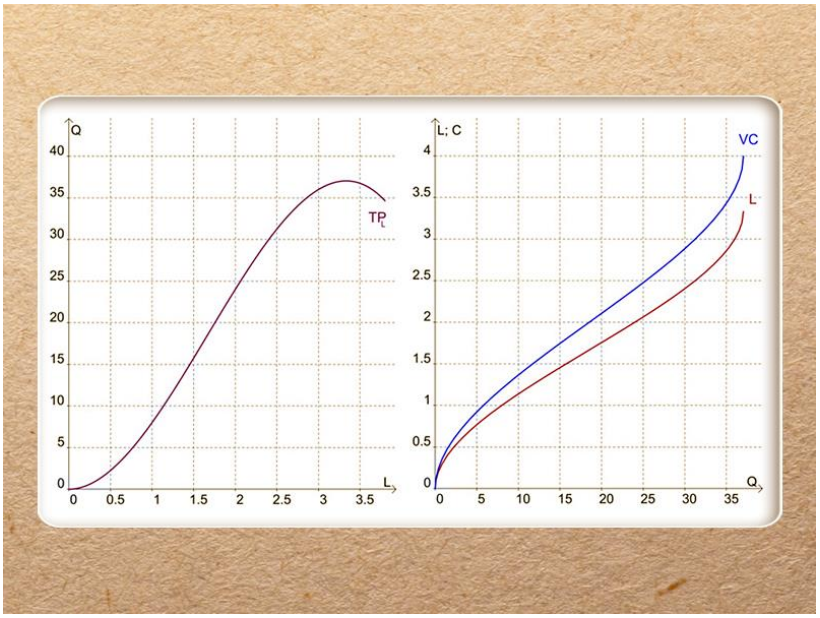

Figure 23 Derivation of variable production cost from partial production function

- From the above illustration it can be seen that the backbending section of the cost function (L) – which is dervied from the decreasing section of the partial production function is not shown. On the one hand this section has no meaning from an economic point of view – it is obvious that the firm does not use more investment for the production of the same product if it can manage from less –, on the other hand it would not make sense as a function either. As the given sections of the function drawn as the inverse of the production function cannot be interpreted as functions, the equation of the function cannot be exactly stated. For this reason we solved the representation of the cost function with the help of a line diagram placed onto the inverse points of the coordinate. We employed a similar method in the case of the illustration of the variable cost function. We have to note though that for the sake of easier handling we are going to operate with the help of the regressive function equation of the variable cost function placed onto the points of the coordinate system, which represents approximately the function of the variable cost function shown in the above illustration.

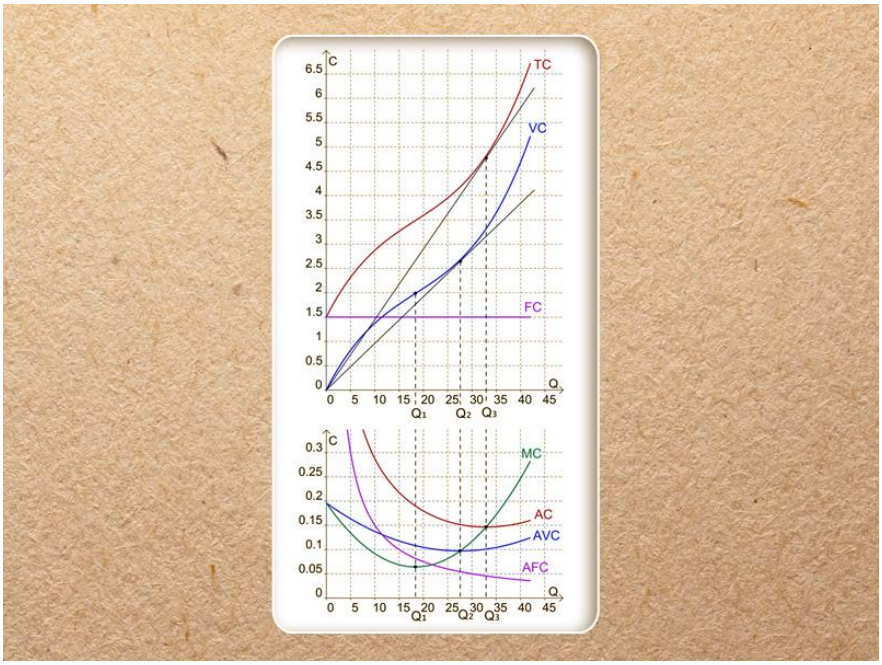

Figure 24 Short-term cost functions and their relationships

As the extent of the fixed cost is identical at all levels of production the fixed cost function is a line parallel to the coordinated axes representing the amount of the produced items.

As TC = FC + VC and as „FC" is constant, we arrive at the total cost function if we add the constant value of the fixed cost to the function of the variable cost function.

As AFC = $\frac{FC}{Q}$ and as on function AFC „FC" is constant while „Q" increases, function „AFC" is a hyperbole, consequently its value is constantly decreasing, but does never attain zero.

Marginal cost is the primary quantitative derivate of the variable or total cost function. In mathematical terms it shows the rate of growth of the variable and total cost functions.

$$MC = \frac{dTC}{dQ}$$

$$MC = \frac{dVC}{dQ}$$

As the marginal cost function is flexible and it shows the rate of growth of the total cost function it is in the positive segment till point Q_1 and it is decreasing (the flexible and total cost function are growing at a slower pace), it reaches its minimum in point Q_1 (the flexible and total cost function are in their inflexion point), from point Q_1 it reaches the positive segment and is growing (the variable and total cost function is growing at an increasing rate).

As geometrically the average value of any function is the sloping of a line drawn from the origo onto a given point of the function up to the point of production where the sloping of the line drawn from the origo to the given point of the variable cost function is decreasing (Q_2 production level), the average variable cost is decreasing, and from here it starts increasing. As the line drawn from the origo to the variable cost function in the case of Q_2 production level is tangent to the variable cost function, the sloping of the line drawn onto the variable cost function (gives the value of the marginal cost function) is identical with the sloping of the line drawn from the origo onto the variable cost function (provides the value of the variable cost function). From the above description it follows that the average variable cost function (AVC) has its minimum and intersects with the marginal cost function (MC) at Q_2 production level.

Following the logic of the explanation of average variable cost function the definition of the average total cost function (AC) can also be defined.

Due to the relationship between the average variable cost function (AVC) and the average total cost function (AC) it should be noted that as

$$AC = AFC + AVC$$

, and as „AFC" decreases simultaneously parallel with the increase of production but it is never zero, functions „AC" and „AVC" stick together but they never intersect.

5.3 SUMMARY, QUESTIONS

5.3.1 Summary

By acquiring the knowledge provided by this unit we are enabled to interpret the economic contents of one and two variables production functions, we are able to define the combination of resources used through the production process which can result in the greatest possible profit at a given cost frame and investment prices, and with the help of our knowledge about the short term expenditure functions we have the opportunity to analyse the behaviour on the market of firms which intend to obtain maximum profit.

5.3.2 Self assessment questions

- What does marginal product express?
- Interpret the isocost line!
- Interpret the criteria of optimal investment!
- What is the relationship between variable cost and marginal cost functions?
- What is the relationship between the average total cost function and marginal cost function?

5.3.3 Practice tests

- Along the isocost line:
  - the price of the goods is constant
  - the production cost of the firm is constant
  - the quantity of the goods is constant
  - all the statements are true

- In the case of the optimal investment combination the producer:
  - reaches the greatest possible revenue from the given cost

- reaches the given revenue from the least possible cost
- reaches the greatest revenue from the given investment cost
- all the statements are true

? The classically conceived partial production function parallel to the increase of the cost above the total interpretation area:

- is increasing at an ever faster rate
- is increasing at a lesser rate
- first is increasing at a faster rate, then it is increasing at a slower rate
- is decreasing

? The variable cost function:

- in the case of increasing investment shows increasing costs
- in the case of increasing consumer prices shows increasing costs
- at increasing incomes shows increasing costs
- in the case of increasing production shows increasing costs

? The average variable cost function in its minimum point:

- the average variable cost is equal with the average total cost
- the average variable cost is equal with the average fixed cost
- the average variable cost is equal with the marginal cost
- the average variable cost is equal with the total cost

6. UNIT PERFECT COMPETITION AND MONOPOLIES

6.1 AIMS AND COMPETENCIES

The aim of this unit is to introduce two extreme types of market present in economy, and to model the activity of firms functioning under such conditions. While discussing the themes of the unit we are going to be introduced to the characteristics of the two above mentioned types of market, the mathematically formulated criteria for the maximization of profit, and we are going to proceed and demonstrate the function of the offer function of the firm functioning under perfect competition and pass on to analysis of the basic types of profit maximization of perfectly competitive firms and monopolistic conditions respectively.

6.2 STUDY MATERIAL

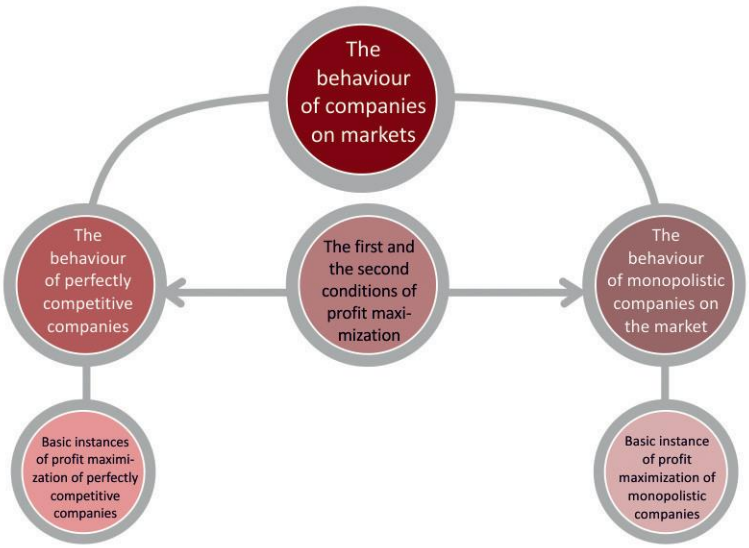

Figure 25 Mind map

6.2.1 The behaviour of perfectly competitive firms

Characteristics of perfectly competitive markets:

- Entering the market is extremely simple because investment expectations are low;
- Sellers are present in extremely high number on the market;

- The products substitute one another extremely well;
- Obtaining information about the market is extremely easy;
- Market competition is extremely intense;
- The firms present on the market cannot exercise influence upon the price, for them price is an exterior element, that is it is a positive constant.

Supply oriented attitude of firms functioning on perfectly competitive markets

The aim of a firm is to maximize profit. As profit is the difference between total revenue and total cost, that is:

$$T\pi = TR - TC$$

Profit can be increased if the firm increases its revenues, and while the firm increases its revenue, it decreases its expenditures. As on the market of human resources competition is perfect (where the price is positive and constant) the firm can only increase its profit if it increases its revenue. As income is the multiplicand of the quantity of the products sold and of their price, that is:

$$TR = P * Q$$

where the price is positive and constant, the firm can only increase its revenue and through it its profits if it increases its production. If the firm increases production, then the expenditures of the firm increase in proportion with the marginal cost of production of every extra product unit ($MC = \frac{\Delta TC}{\Delta Q}$), and its revenue increases in proportion with the marginal revenue.

Marginal revenue is the extra revenue generated by the production of an extra unit.

$$MR = \frac{\Delta TR}{\Delta Q}$$

The figure which shows the amount by which the revenue of the firm increases if it increases production by one unit. As for a firm performing on perfectly competitive markets the price is constant, it sells every unit produced at the same price, that is, its revenue increases with the same amount that is with the market price, with the production of every unit

produced. On the basis of the above in the case of a perfectly competitive firm:

$$MR = P$$

From the above description it follows that the firm is able to increase its profit as long as:

$$MR > MC$$

Because in this case the revenues of the firm increase faster than its costs.

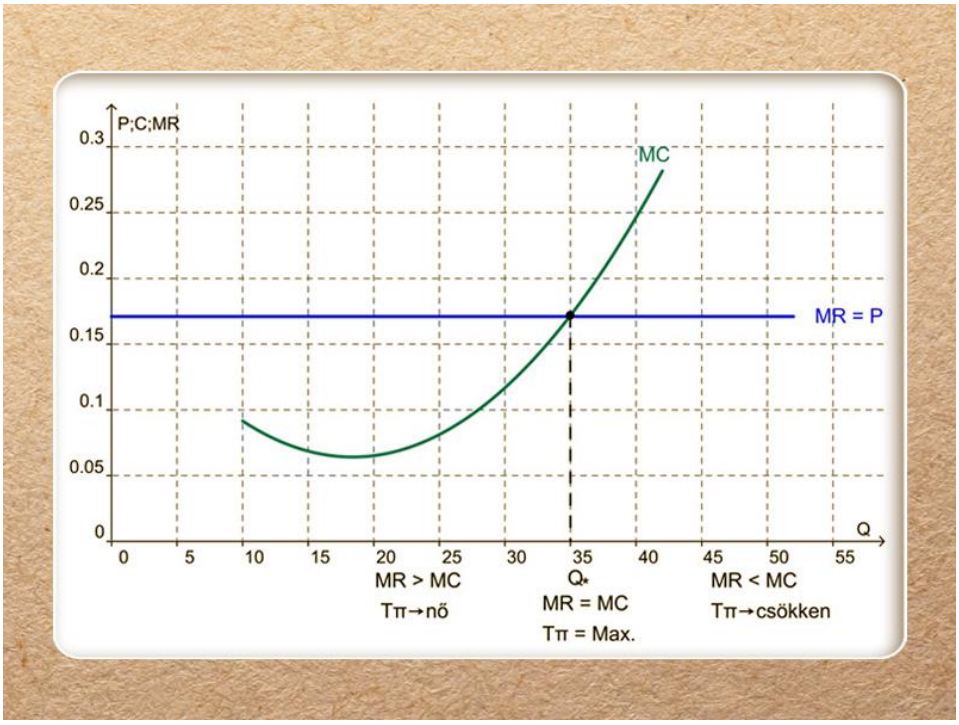

Figure 26 The criteria of maximal profit in the case of perfect competition

On the basis of the above the firm reaches its maximal profit if its marginal revenue is equal with its marginal cost, that is:

MR = MC

The above formula is called the primary criterium of profit maximization.

- As we saw it earleir, the function of marginal cost has a decreasing section as well. As the function of the marginal revenue is linear the two functions can even have two intersections, that is the primary criterium of profit maximization can be achieved in two positions. Because between the two intersections MR > MC, in this region profit increases. It naturally follows that profit can be maximal on the increasing section of the marginal cost function, that is, where the primary derivate of the marginal cost function is greater than the primary derivate of the marginal revenue function determined by the quantity of the products (in the case of perfect competition this is 0, as MR is constant). This is the second criterium of profit maximization, and its formula is: $\frac{dMC}{dQ} > \frac{dMR}{dQ}$

As we can see it on the following illustration, if the market price increases, the quantity of the product which brings maximal profit to the firm increases alongside the marginal cost function. Because the supply function shows the quantity of the goods the firm offers for sale, and as the firm obviously produces the product quantity which brings it maximal profit we can state that the supply function of the perfectly competitive firm is on the marginal cost function of the firm.

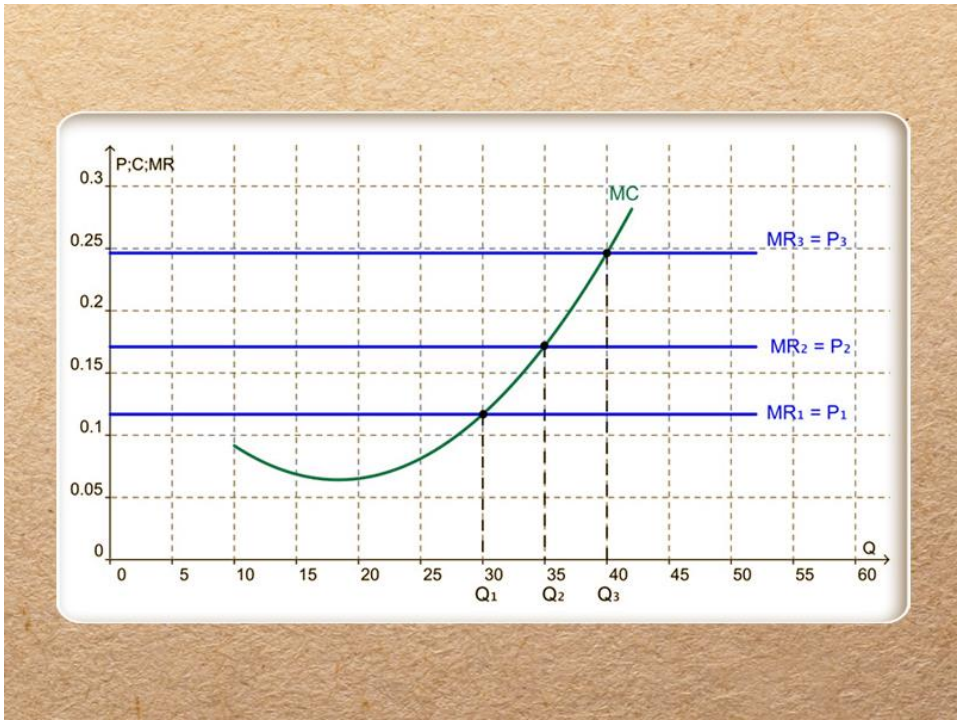

Figure 27 Derivation of the supply function of the perfectly competitive firm from its marginal cost function

Basic cases of profit maximization in the case perfectly competitive firms

In the following we are going to examine the development of production, costs, revenues and profit of a firm in their relation with the increase of the market price.

a) The firm produces in shutdown point

A firm reaches its shut-down state, when the market price (P_0) is identical with the minimum of the averagevariable cost. In this case the production of the firm on the basis of the profit criterium MC = MR is „Q_0".

As TR = P_0 * Q_0, on the illustration below the total revenue equals the entire surface of „P_0"; „B"; „Q_0"; „O" rectangle.

As AVC = $\frac{VC}{Q_0}$, VC = AVC * Q_0. Accordingly, the variable cost in the illustration below is also equal to the surface of the „P_0"; „B"; „Q_0"; „O" rectangle, that is in shut-down point TR = VC, that is the revenue of the firm only covers the variable costs.

As AC = $\frac{TC}{Q_0}$, it means that TC = AC * Q_0. Accordingly on the basis of the illustration below is the surface of the „AC"; „A"; „Q_0"; „O" rectangle.

As TC = FC + VC, this means that FC = TC – VC. Accordingly fixed cost is the surface of „AC"; „A"; „B"; „P_0" rectangle in the illustration below.

Because Tπ = TR-TC, in the illustration below the profit is also the surface of „AC"; „A"; „B"; „P_0" rectangle and it is negative, that is the deficit of the firm in shutdown point is identical with the fixed costs of the firm. As the fixed costs of the firm exist even in the case of zero production and this means that if the market price is identical with the minimum of the average variable cost, it doesn't make any difference whether the firm shuts down or it goes on producing because its losses are identical in both cases. In case of lower price levels the firm is sure to shut down, but at higher price levels it is likely to continue short term production. This is why we call this price level shutdown point.

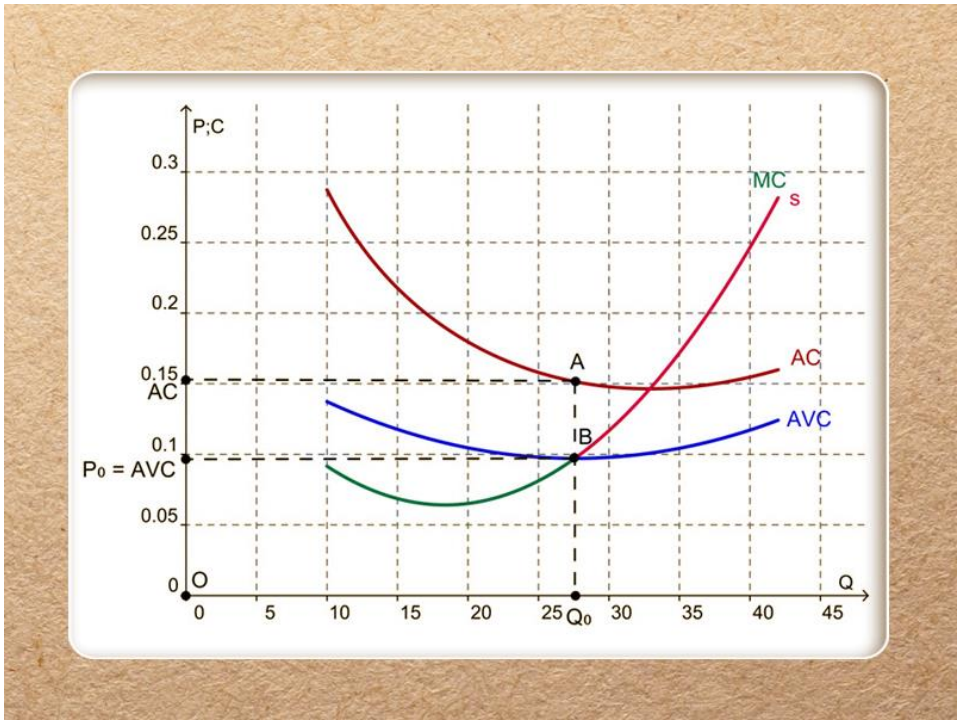

Figure 28 The perfectly competitive firm produces in shutdown point

As the supply function of the perfectly competitive firm is on the marginal cost function of the firm and because a firm can have supply only if it produces, we can state that **the supply function of a perfectly competitive firm is identical with the section of its marginal cost function situated above its shutdown point.**

b) The firm produces in a state of loss minimization

In this case market price is between the minimum of the average total cost and the minimum of the average variable cost.

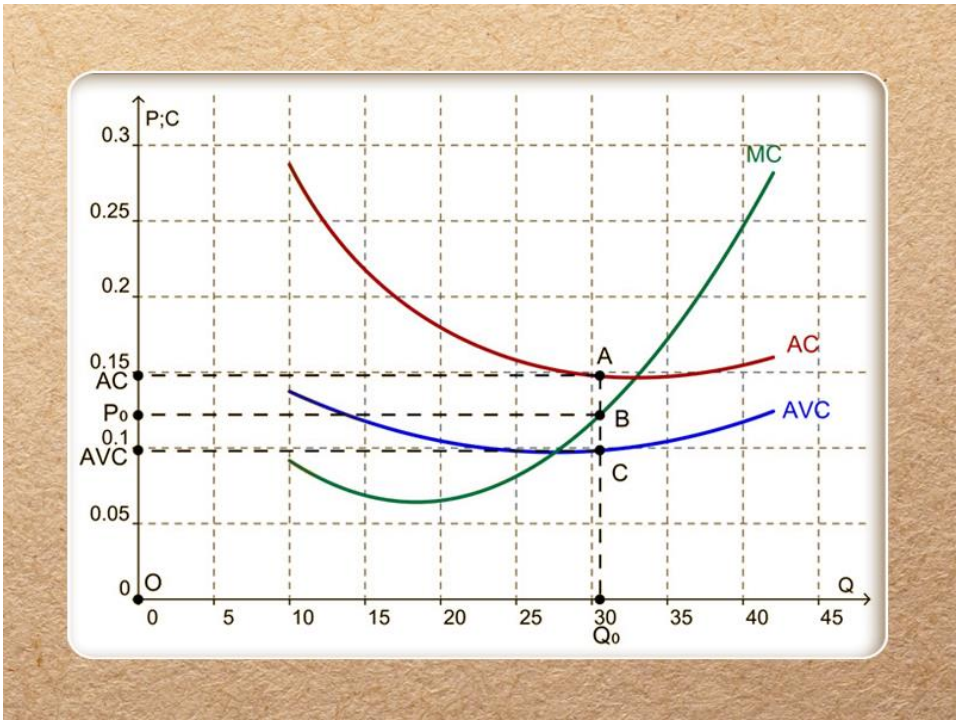

Figure 29 The perfectly competitive firm produces in a state of loss minimization

- Variable cost: surface of „AVC"; „C"; „Q_0"; „O" rectangle
- Total cost: surface of „AC"; „A"; „Q_0"; „O" rectangle
- Fixed cost: surface of „AC"; „A"; „C"; „AVC" rectangle
- Total revenue: surface of „P_0"; „B"; „Q_0"; „O" rectangle
- Profit: surface of „AC"; „A"; „B"; „P_0" rectangle and it is negative

- Loss minimization: surface of „P_0"; „B"; „C"; „AVC" rectangle.
- This is the amount of minimized deficit of the firm if it produces at „P_0" price level, as compared to the case it shuts down.

c) The firm produces in break-even point

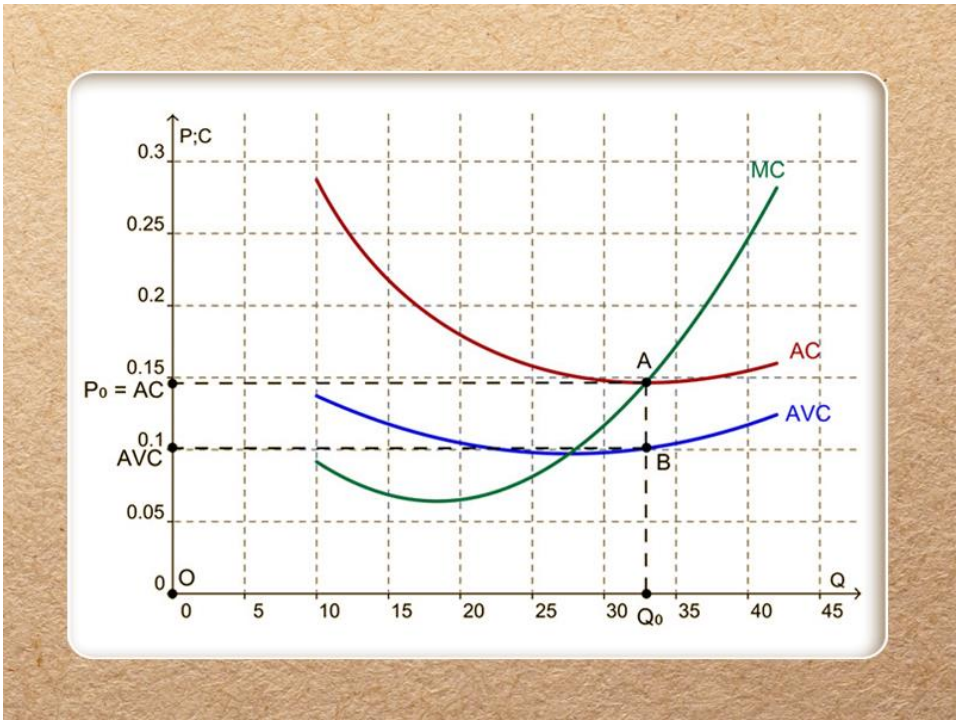

Figure 30 The perfectly competitive firm produces in break-even point

- Variable cost: surface of „AVC"; „B"; „Q_0"; „O" rectangle
- Total cost: surface of „P_0"; „A"; „Q_0"; „O" rectangle
- Fixed cost: surface of „P_0"; „A"; „B"; „AVC" rectangle
- Total revenue: surface of „P_0"; „A"; „Q_0"; „O" rectangle
- Profit: as TR = TC (the incomes of the firm cover all the costs), thus $T\pi = 0$

d) The firm realises positive profit

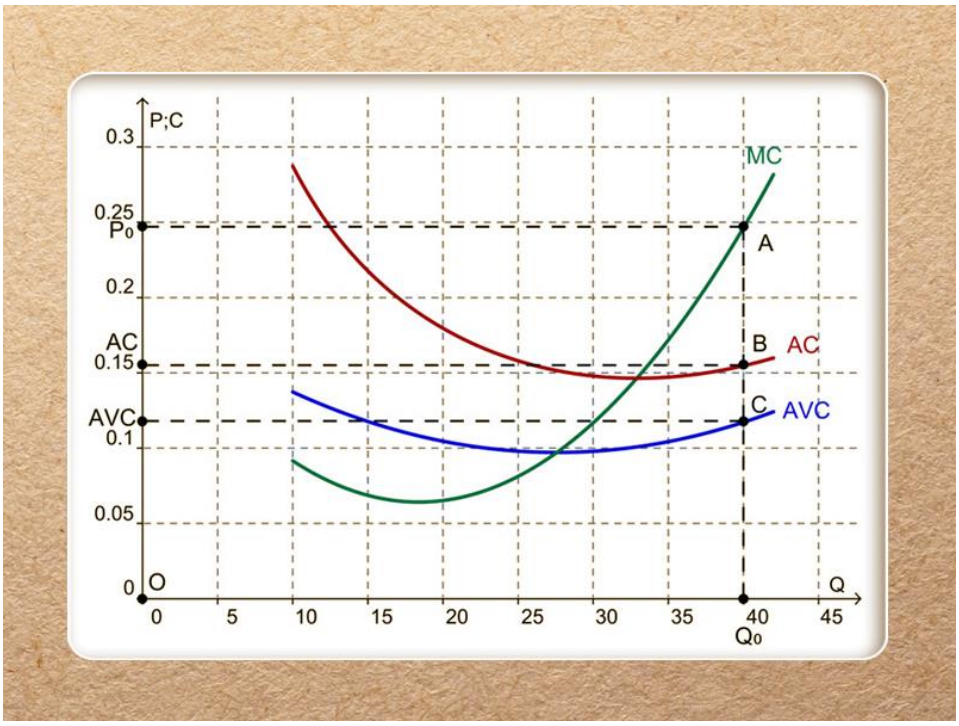

Figure 31 The perfectly competitive firm realises positive profit

Variable cost:	the surface of „AVC"; „C"; „Q_0"; „O" rectangle
Total cost:	the surface of „AC"; „B"; „Q_0"; „O" rectangle
Fixed cost:	the surface of „AC"; „B"; „C"; „AVC" rectangle
Total revenue:	the surface of „P_0"; „A"; „Q_0"; „O" rectangle
Profit:	the surface of „P_0"; „A"; „B"; „AC" rectangle

6.2.2 The behaviour of monopolies

The characteristics of monopolistic markets:

- Entering the market is virtually impossible, because the investment requirements are enormous;
- There is one seller on the market;
- The produced goods do not substitute one another;
- Getting information about the market is virtually impossible;
- There is no competition on the market;
- The firm acting on the market decides on the price alone.

Definition of the marginal income function of a monopoly

The aim of the firm is to maximize profit. Because profit is the difference between total revenue and total cost, that is:

$$T\pi = TR - TC$$

Profit can be increased if the firm increases its revenue or reduces its costs. As on the resources market there is perfect competition (where the price is positive and constant), the firm can only increase its profit if it increases its revenue. As revenue is price multiplied by the quantity of sold goods, that is:

$$TR = P * Q$$

and as the firm has the role of establishing the price it can most easily increase its revenues and through them its profits if it increases the prices. If the price increases the amount of goods sold to the consumers might decrease. Because price elasticity shows the relationship between changes in price and the amount of demand, the revenue of the monopolistic firm and consequently its profit depend on the price elasticity of the good produced.

We shall use a simple example for the definition of marginal revenue and for the sake of simplicity we shall use linear demand market function:

$$D: \quad Q = 167{,}224 * P + 50$$
$$P = -0{,}00598 * Q + 0{,}299$$

As TR = P * Q, this means that:

$$TR = -0{,}00598 * Q^2 + 0{,}299 * Q$$

As $MR = \frac{\Delta TR}{\Delta Q}$, that is the marginal revenue function is the primary derivate of the total income function based on the quantity of goods ($MR = \frac{dTR}{dQ}$), it follows that:

$$MR = -0{,}01196 * Q + 0{,}299$$

The relationship between market demand function and the marginal revenue function of a monopoly is shown by the following illustration.

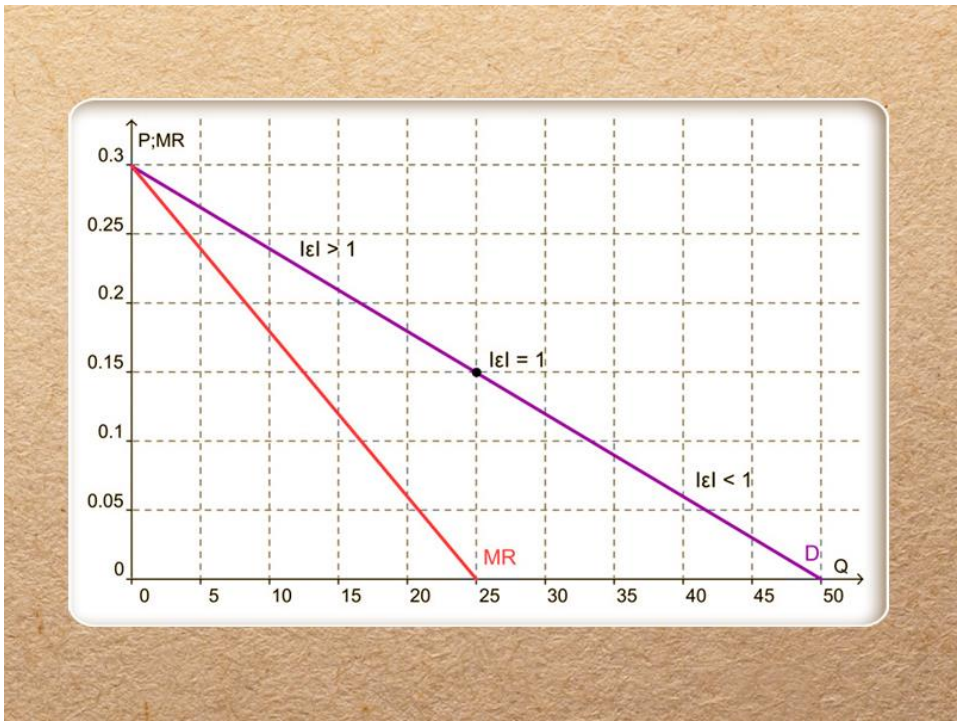

Figure 32 The relationship between market demand function and marginal revenue function of monopolies

The above illustration shows that the intersection of the market demand function and of the marginal revenue function with the vertical axis is identical and the marginal income function halves the market demand function value assets. As the marginal income function reaches zero value about halfway it is certain that in this point revenue does not change and the absolute value of the price elasticity of demand is 1 (see the discussion of the relationship between price elasticity and income). As the marginal revenue function is situated in the positive region of the demand function value in its first „half", in this region revenue increases parallel to the increase of the quantity of the good, that is the price elasticity of demand in absolute terms is larger than one, because the decrease of the price by one unit results in the increase of demand (that is it can be sold by the firm) greater than one per cent. In the „second half" of the value assets of the demand function the relationship is exactly the opposite. From the above it also follows that the income of the firm is maximal at the point that halves the demand function.

Basic cases of profit maximization of monopolies

Modelling is based on the above starting points:

- The cost functions of the monopolistic firm are identical with those of the perfectly competitive cost functions;
- The first and second conditions of profit maximization are identical with the ones discussed in the case of perfectly competitive firms (MR = MC; $\frac{dMC}{dQ} > \frac{dMR}{dQ}$)
- As a monopolistic firm has decisive role in establishing price, it requires the highest price for the good that consumers are ready and able to pay for it, that is the price is dictated by the demand function.
- While modelling we are going to sharpen the sloping of the demand function that is the price sensibility of the consumers decreases. This is the result of the increase of the income of the consumers. The basic situations of profit maximization could be modelled even if we shifted the demand function outward from its initial position, which would result from the increase in the number of consumers.

a) The firm produces in shut-down point

In the case of shutdown point market price is formed at the meeting point of the demand function and the average variable cost function. It is certain that the firm cannot produce at a lower cost in a short term, and it would not produce at a higher cost. If the demand function and the average variable cost function intersect in only one point (point „B"), than it is certain that it is determined by the quantity of goods belonging to maximal profit.

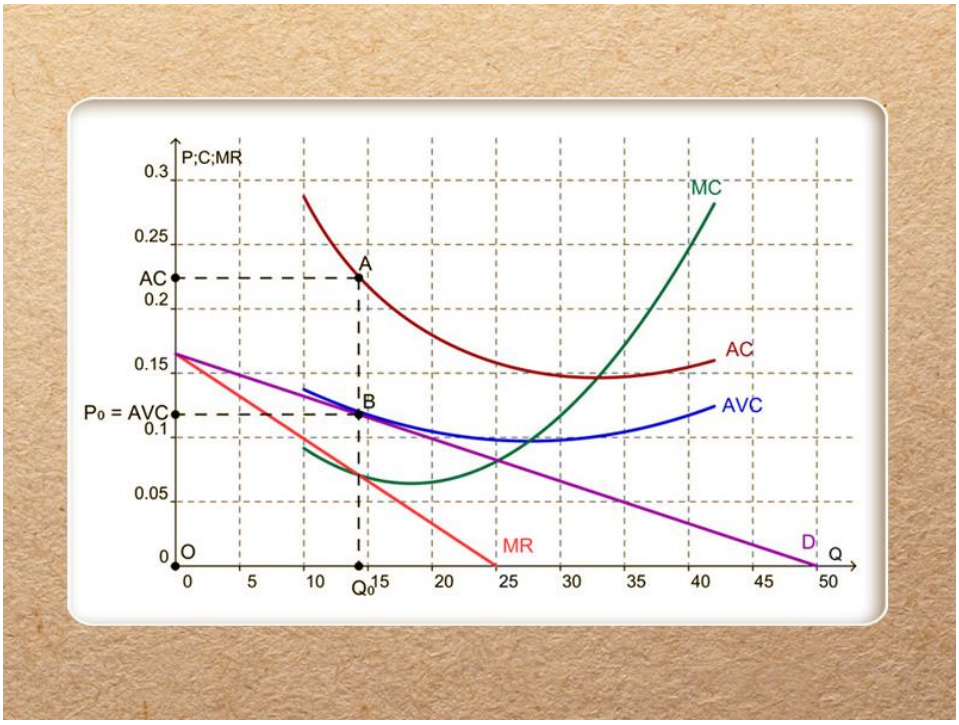

Figure 33 The monopoly produces in shut-down point

- Variable cost: surface of „P_0"; „B"; „Q_0"; „O" rectangle
- Total cost: surface of „AC"; „A"; „Q_0"; „O" rectangle
- Fixed cost: surface of „AC"; „A"; „B"; „P_0" rectangle
- Total revenue: surface of „P_0"; „B"; „Q_0"; „O" rectangle
- Profit: surface of „AC"; „A"; „B"; „P_0" rectangle and it is negative

b) The firm is producing in a state of loss minimization

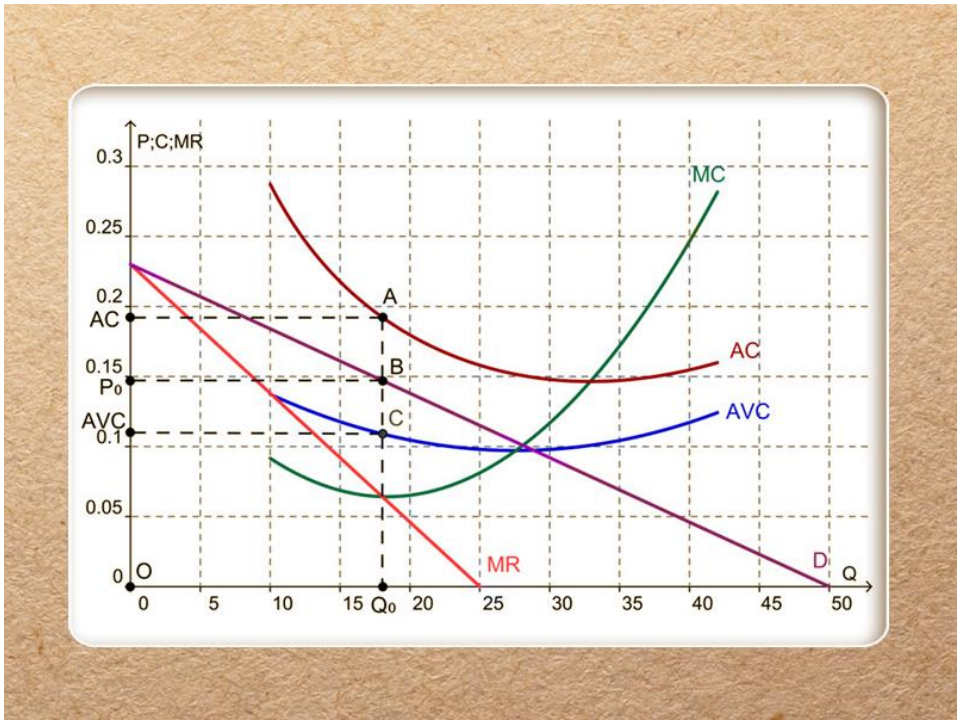

Figure 34 The monopoly produces in a state of loss minimization

- Variable costs: surface of „AVC"; „C"; „Q_0"; „O" rectangle
- Total costs: surface of „AC"; „A"; „Q_0"; „O" rectangle
- Fixed costs: surface of „AC"; „A"; „C"; „AVC" rectangle
- Total revenue: surface of „P_0"; „B"; „Q_0"; „O" rectangle
- Profit: surface of „AC"; „A"; „B"; „P_0" rectangle and it is negative
- Loss minimization: surface of „P_0"; „B"; „C"; „AVC" rectangle. This is loss minimization of the firm if it produces at, „P_0" price level, as compared to shut- down.

c) The firm produces at break- even point

In the case of break-even point market price is formed at the meeting point of the demand function and the average total cost function. If the demand function and the average total cost function have only one common point (point „A"), it develops provided it can produce a quantity belonging to the maximized profit region.

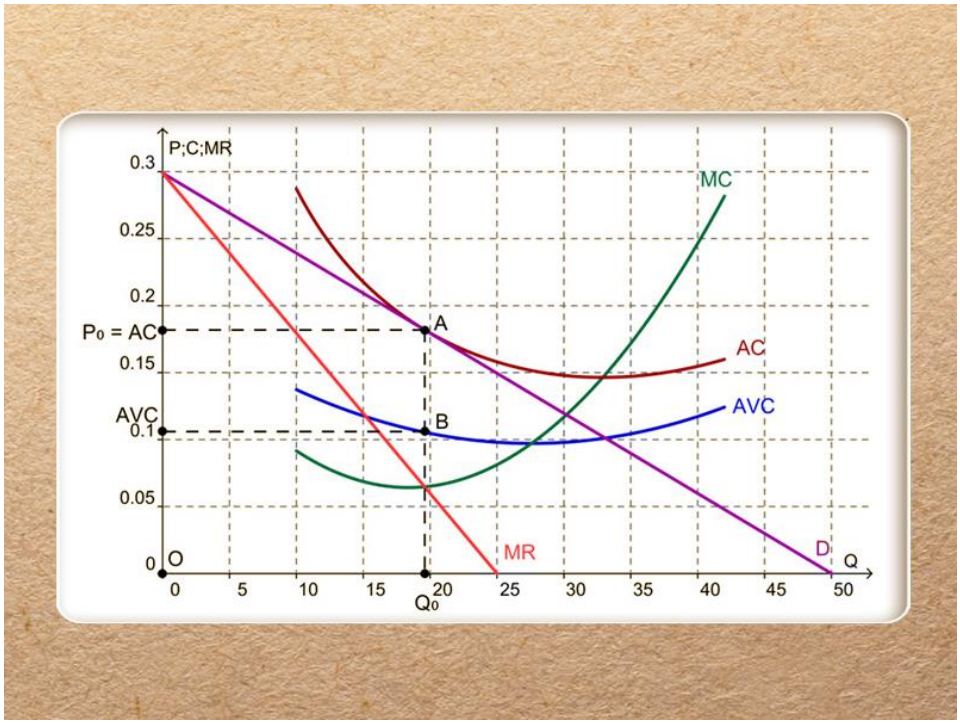

Figure 35 The monopoly produces in break-even point

- VAriable cost: surface of „AVC"; „B"; „Q_0"; „O" rectangle
- Total cost: surface of „P_0"; „A"; „Q_0"; „O" rectangle
- Fixed cost: surface of „P_0"; „A"; „B"; „AVC" rectangle
- Total revenue: surface of „P_0"; „A"; „Q_0"; „O" rectangle
- Profit: as TR = TC (the revenues of the firm cover total costs), so Tπ = 0

d) The firm realizes positive profit

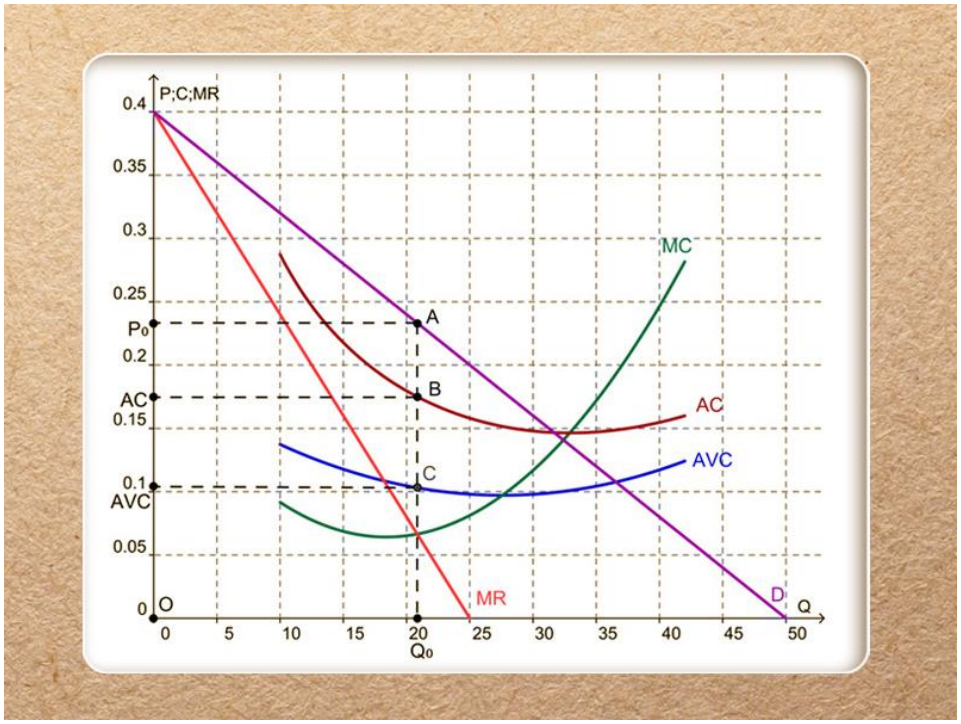

Figure 36 The monopoly realises positive profit

Variable cost:	surface of „AVC"; „C"; „Q_0"; „O" rectangle
Total cost:	surface of „AC"; „B"; „Q_0"; „O" rectangle
Fixed cost:	surface of „AC"; „B"; „C"; „AVC" rectangle
Total revenue:	surface of „P_0"; „A"; „Q_0"; „O" rectangle
Profit:	surface of „P_0"; „A"; „B"; „AC" rectangle

- If we compare the behaviour of the monopolisitc firm to the behaviour of the perfectly competitive firm, we can state that the monopoly sells the same quantity of good at a considerably higher price. This means that the existence of the monopoly causes welfare losses for the society, and this is in part the cause of the fact that the activity of monopolies is limited by law.

6.3 SUMMARY, QUESTIONS

6.3.1 Summary

In this unit we clarified the characteristics of the perfectly competitive and of the monopolies, the criteria of profit maximization and related to this the mathematical formula with the help of which the extent of the output of the firm aiming at profit maximization can be established. We defined the supply function of the perfectly competitive firm, and examined in details the basic cases of profit maximization related to different price levels in the case of perfectly competitive and monopolies. When concluding our analysis of the two kinds of market we agreed that firms which function in monopolistic conditions cause welfare losses to society. We finished the analysis of the supply section of the product market and in the next unit we are going to pass on to the examination of the resource markets.

6.3.2 Self assessment questions

? What does marginal revenue express?

? What is the difference between the marginal revenue function of the perfectly competitive and monopolies?

? Interpret and support your interpretation of the primary condition of profit maximization!

? What does the value of loss minimization express?

? Identify the supply function of the perfectly competitive firm!

6.3.3 Practice tests

? In shutdown point:
- the revenue of the firm covers all the costs of the firm
- the revenue of the firm covers its variable costs
- the revenue of the firm covers its fixed costs
- the revenue of the firm covers its marginal costs

? In break-even point market price is:
- the average variable cost
- the average total cost
- the average fixed cost
- the variable cost

? If the firm realises positive profit, then the market price:

- is equal to the average variable cost
- is equal to the total cost
- is equal to the average fixed cost
- is higher than the average total cost

? In the break-even point of the perfectly competitive firm the market price is equal to:

- the minimal average variable cost
- the minimal average total cost
- the minimal average fixed cost
- the minimal marginal cost

? In the case of loss minimization the revenue of the firm:

- covers the total cost
- exceeds the total cost
- is lower than the total cost
- is lower than the variable cost

7. UNIT: RESOURCE MARKETS AND EXTERNALITIES

7.1 AIMS AND COMPETENCIES

In order to supply firms have to produce and production needs resources. The study of the present unit can help us understand the mathematical modelling of optimal resource demand, the optimal criteria in the case of employing one or more resources as well as the input demand curve.

Furthermore we are going to identify the positive and negative influences of economic transaction upon external actors and some methods of handling these influences both from the perspective of the consumers and that of the producers.

7.2 STUDY MATERIAL

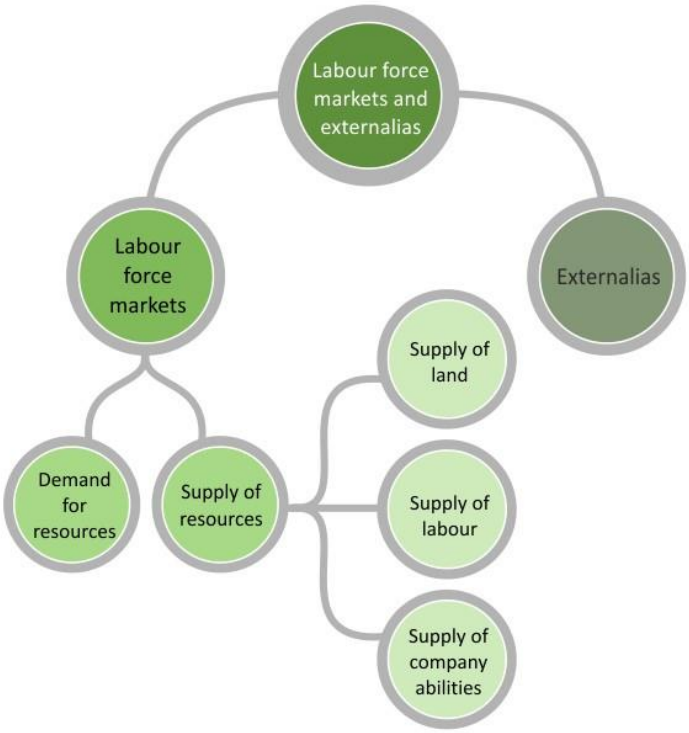

Figure 37 Mind map

7.2.1 The analysis of resource markets

We examine the resource market similarly to all the other markets from the perspective of demand and supply.

Analysis of demand on the resource market

The resource demand of a firm is determined by its ambition to achieve profit maximization. As the growth of the profit is determined by the changes in revenue and cost, in this case we are going to examine the way in which the increase in the quantity of the utilized resources affects the cost of production and revenue.

- **The figure which shows how many units growth is incured in the production cost by one unit growth in the expenditure utilized is called the marginal factor of production cost. (The figure which shows how many units of growth are produced in the production costs byone unit increase in the quantity of input is called the marginal factor cost (MFC_L)**

$$MFC_L = \frac{\Delta TC}{\Delta L}$$

On a perfectly competitive market the price is given, that is it is a positive constant, so if there is perfect competition on the resource market, than the firms can obtain one unit of resources for the same price, that is with the acquisition of every extra unit of resources their expenses are going to increase with the same amount, that is with the price of the respective resources. From this it follows that, in case of perfectly competitive markets:

$$MFC_L = P_L$$

- **The figure which shows by how many units the revenue of the firm increases when one unit of the resources is employed is the marginal resource of production (MRP_L)**

$$MRP_L = \frac{\Delta TR}{\Delta L}$$

Because $MR = \frac{\Delta TR}{\Delta Q}$, $\Delta TR = MR * \Delta Q$. From this it follows that:

$$MRP_L = MR * \frac{\Delta Q}{\Delta L}$$

As $MP_L = \frac{\Delta Q}{\Delta L}$, it follows that:

$$MRP_L = MR * MP_L$$

As on a perfectly competitive market MR = P and is constant, it follows that in case of perfect competition on the goods market:

$$MRP_L = P * MP_L$$

As the marginal factor cost (MFC_L) shows the growth of costs in the case of one unit constant growth of employed cost, and the marginal revenue of the factor (MRP_L) shows the same with respect to revenue, and because profit is the difference between revenue and cost, for the firm trying to maximize profit it makes sense to increase the amount of the quantity of the input employed till $MRP_L > MFC_L$.

- From the above it follows that function MRP_L is the vertical trasformed of MP_L function as it can be seen on the illustration below.

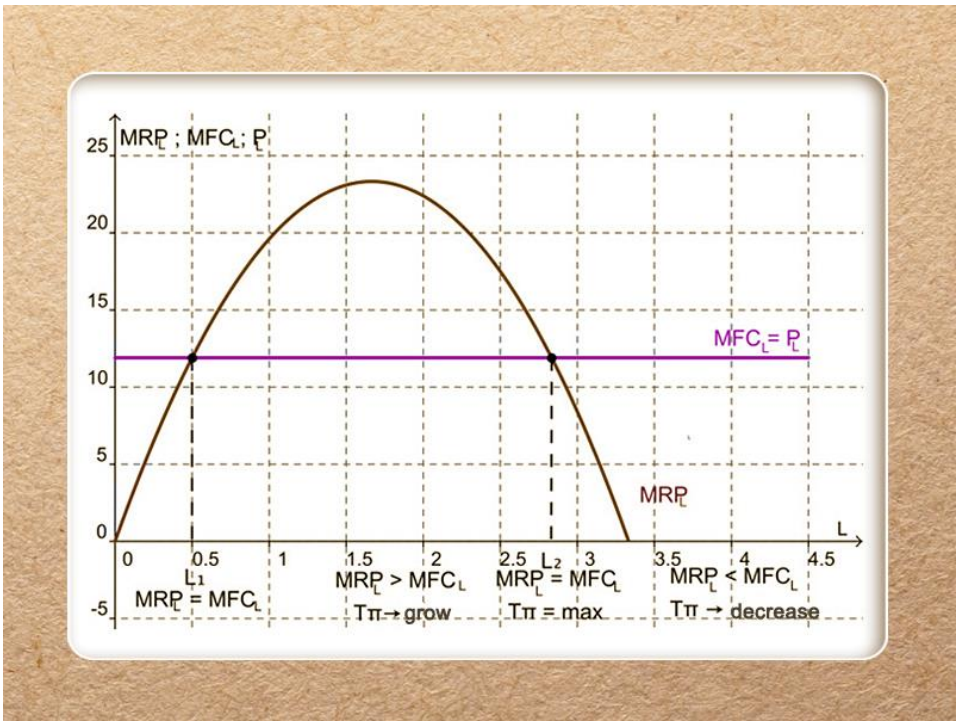

Figure 38 Optimal resource utilization, illustrated on a perfectly competitive resource market

As it is clear from the above demonstration and illustration, a firm aiming at profit maximizing uses the last unit of expenditures in the case of which:

$$\mathbf{MRP_L = MFC_L}$$

And

$$\frac{\mathbf{dMRP_L}}{\mathbf{dL}} < \frac{\mathbf{dMFC_L}}{\mathbf{dL}}$$

As firms functioning on the market are aiming at profit maximization, it is obvious that they are going to buy the amount of resources which generates maximal profit for them. From this and from our earlier statements it follows that the input demand function of the firms is on the downward sloping section of their marginal product revenue function.

- The input demand function shows the amount of resources required by the firm in relation with the price of the resurces.

As perfectly competitive firms produce in the point of the minimum section of their marginal cost function situated above their marginal cost function, which section is related to the section below the marginal product function, the input demand function of the perfectly competitive firms is identical with the section below the maximum point of the marginal revenue function.

As the marginal revenue of the monopolies is lower than the market price in the case of all product units and because $MRP_L = MR * MP_L$, and in the case of perfect competition $MRP_L = P * MP_L$, it is obvious that the input demand function of monopolies is lower than that of perfectly competitive firms, that is monopolies in case of similar input prices buy lesser resources than the perfectly competitive firms, as they produce less under identical market conditions.

Until now we examined the optimal demand of a resource. It should be noted that firms use resources together, in different combinations. In these cases the above discussed optimal criteria has to be met. This criteria can be described as follows on perfectly competitive markets:

$$MRP_L = P_L$$

and

$$MRP_K = P_K$$

As $MRP_L = MP_L * P$ and $MRP_K = MP_K * P$, in optimal cases:

$$MP_L * P = P_L$$

and

$$MP_K * P = P_K$$

From the above it follows that:

$$\frac{MP_L}{P_L} = P$$

and

$$\frac{MP_K}{P_K} = P$$

That is the optimal criteria of the use of more expenditure is:

$$\frac{\mathbf{MP_L}}{\mathbf{P_L}} = \frac{\mathbf{MP_K}}{\mathbf{P_K}}$$

- **The firm uses its resources in an optimal arrangement if the marginal product resulting from the last cost unit is identical in every case.**

From the relationships discussed so far it can be seen that the demand for supplies is in direct relationship with the revenue stemming from the final product resulting from the use of the resources that is with the demand for the finite product. On the basis of the above we can state that the demand for resources is a derivative demand, as it depends on the demand for the finite good, it stems from it.

The analysis of demand for resources

Having in view the fact that the supply of resources differs as a function of their difference in nature, the analysis of the supply side will be pursued on the basis of individual resources.

Supply of labour force

The relationship between wages and individual supply of labour force is shown by the individual labour supply function.

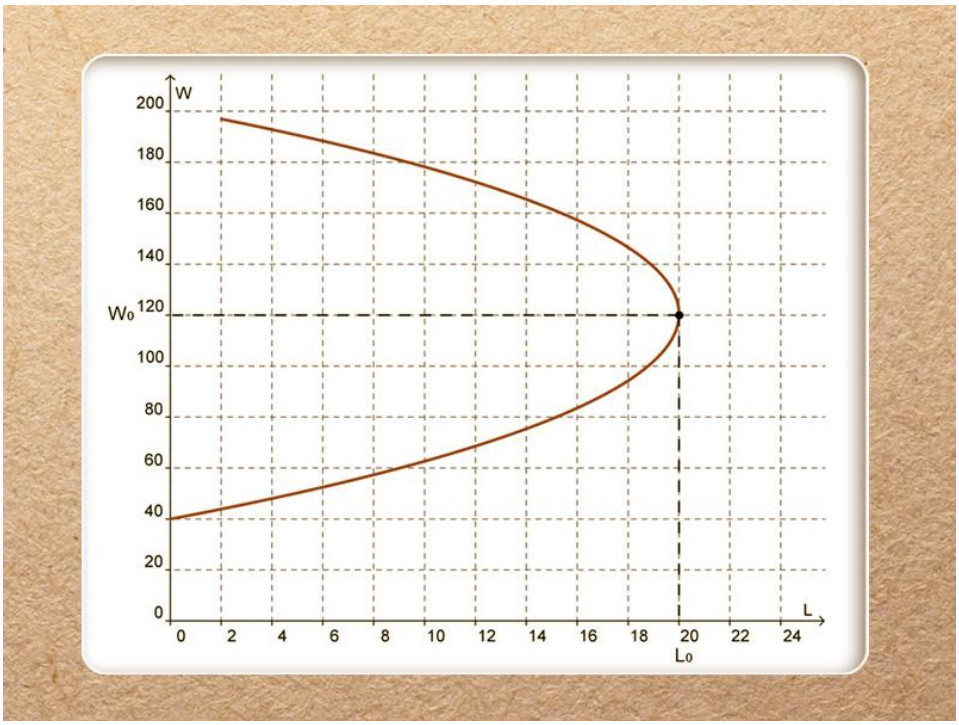

Figure 39 Individual labour force supply function

On the individual labour force supply curve we can see that with the increase of the wages per hour (W) the amount of labour per hour supplied for the firm sector increases up to point L_0 from where it starts decreasing. The increase is obvious as the worker is ready to work more in the case of higher hourly wages. Above W_0 level of hourly wages increase per hour wages generates lesser working hours for the amount of work involved because in this region free time has greater value for the employee than the extra income that can be earned and at higher hourly wages the employee can earn the same sum, by way of which he can satisfy his needs in shorter working time. The exhibit also shows that the supply of labour force does not reach its zero point in the case of zero wages. This is also easy to understand as the employee does not want to work for somebody else in case of extremely low wages but prefers trying to find some possibilities of money earning in his free time.

The causes of difference in wages:

- Differences in wages stemming from production efficiency. Work efficiency is expressed by the revenue of marginal

product (MRP_L). It is obvious that greater wages can be obtained in areas of greater productivity.
- Differences in wages stemming from differences in qualification. Employees with higher qualifications have to be paid more not only due to higher efficiency, but also on the considerent that obtaining higher qualifications impose greater investment (time, money, energy and so on) on behalf of the employee.
- Wage differences generated by differences in abilities. Talented employees are honoured with higher payment by firms.
- Differences in wages determined by the value judgement of the society. Employees working in areas disregarded by society should get higher wages than the accepted value of the goods they are producing so as to have employees ready to perform the respective task. In areas overvalued by society wages tend to be lower.

Supply of land

The supply of land is constant, that is it is totally inelastic because its quantity cannot be multiplied. This means that land has to be sold for the price the representatives on the demand side are ready to pay for it. The price of land is rent.

The forms of rent:
- differential rent
- absolute rent

Differential rent is the surplus of revenue resulting from the cultivation of a higher quality land as compared to a weaker quality land. The differential rent theory was worked out by David Ricardo.

7. http://www.britannica.com/EBchecked/topic/502193/David-Ricardo

Factors of differential rent:
- the extra revenue stemming from better soil and climate;
- The extra revenue produced by investments effectuated on the land. It is obvious that a lot where a well was drilled and there is electricity can produce greater revenue;
- Extra revenue stemming from the location of the land. A lot or land which is closer to a city, and the products grown there can be sold easily is going to bring greater revenue. Similarly

extra revenue is generated by the proximity of transport junctures as it renders transport easy.

Absolute rent which is closely linked to the name of Jean-Baptiste Say stems from the fact that supply of land is continuous; its quantity cannot be increased so the owner of the land has a specific monopolistic status or position. This monopolistic status obviously brings greater revenue to the landowner.

8. http://www.britannica.com/EBchecked/topic/526095/J-B-Say

Supply of capital and entrepreneurial abilities

The intricacies of financial markets were discussed during earlier studies and the theme was thoroughly discussed in chapters of Economics I so we are not going to discuss them at this point.

The entrepreneur employs his abilities during the work process so if approached from a larger perspective entrepreneurial abilities can also be discussed as part of the working process. We still tend to discuss entrepreneurial abilities as a separate resource, because the entrepreneur is not simply an employee, but a „special kind of" man. An entrepreneur is a participant in economy endowed with organizational talent, ready and able to risk, who has some sense of competitiveness and is profit oriented. The appearance of entrepreneurial skills depends on how enterprise friendly society and the given economic environment are. Of course, in socialist societies entrepreneurial skills have a much lesser opportunity to appear than under liberal minded capitalist conditions.

7.2.2 Externalities

Externalityis the name for some sort of external economic effect which offers extra profits either in production or in consumption to actors outside economic transactions which they do not pay for or it causes them damages they did not agree to accept.

Externalities can be grouped on the basis of their sources as follows:

Production, if it stems from the process of production;
Consumer, if it stems from the activity of the consumer

On the basis of their sources externalities can also be:

- Positive, if it is favourable for the external actor;

- Negative, if it is unfavourable for the external actor

- It is a positive consumer externality for example if somebody next door is listening to music and we like that particular music, so we enjoy listening to it. The same situation can be defined as nagtive externality if we do not enjoy the music povided by our neghbour. The pollution of the environment caused by firms is a negative externality too. It is a positive externality if the firm builds a good road which can be used by the population as well.

Internalization of the externality, that is rendering the external effects internal:

- A volunteer, mutual agreement between the parties. If the parties are inclined to, this is the shortest way of solving the problem.
- Compensation reached with the external verdict of Court of Law. This means gaining their rights by way of legal procedures;
- Internalization by way of administrative prescriptions. Taxation of economic actors pursuing activity with negative effects, implementing laws and regulations intended to prevent negative external effects.

7.3 SUMMARY, QUESTIONS

7.3.1 Summary

The material of the present unit helped us understand the concepts of marginal production factor and marginal product revenue, and on the basis of the above we clarified the criterium of optimal resource utilization in the case of one or multiple resources and we constructed the input demand function in the case of perfectly competitive and monopolies alike.

Furthermore we got to know about external effects and methods by way of which they can be handled.

7.3.2 Self assessment questions

- How do you explain decreasing work supply in the case of increasing wages?
- What is an externality?
- What is the relationship between the marginal product function and marginal revenue function?

? What is the relationship between marginal revenue function and input demand function?

? What is differential rent?

7.3.3 Practice tests

? In the case of externality:
- the demand of the consumer increases in the case of increasing prices
- the consumer will buy the good even if he do not need it
- the consumer is buying because the others are also buying
- an external party also enjoys the benefits or suffers the harms of the transaction of the parties who are in economic transaction

? The supply of land is:
- elastic
- inelastic
- unit elastic
- its elasticity cannot be determined

? In the case of optimal utilisation of the last unit of expenditure:
- marginal cost is equal with its marginal product revenue
- marginal cost is higher the its marginal product revenue
- marginal cost is lower than its marginal product revenue
- neither its marginal cost nor its marginal product revenue are essential

? In the case of optimal utilization of joint expenditures:
- marginal profit linked to every marginal revenue related to the last money unit spent is identical in all cases
- total revenue is larger than total cost
- in the case of increased expenditures marginal product revenue can be increased
- marginal product revenue incurred by every last money unit is identical in all cases of expenditures

? Marginal product revenue of the production factor in the case of perfectly competitive firms:

- is marginal product multiplied by market price
- is marginal product multiplied by marginal revenue
- extra revenue generated by one unit extra expenditure
- all the above statements are true

8. UNIT: THE FLOW OF INCOME IN ECONOMY

8.1 AIMS

The aim of the present unit is to clarify the way in which the income produced by national economy circulates between the actors of the economy and the markets functioning in economy. In doing so we are going to highlight the way in which certain groups or actors obtain their revenues and on what they spend their expenses. We also hope to demonstrate that at a social level we can only afford spending the income we managed to produce. Even behind certain transfers effectuated by the state there is some sort of economic achievement in the course of which society generates the taxes from which the state can cover the transfers. We are going to understand the importance of the savings by way of which economy provides the money needed for long term welfare investments. The contexts discussed in this unit will enable us to understand the developments taking place on the product market of economy.

8.2 STUDY MATERIAL

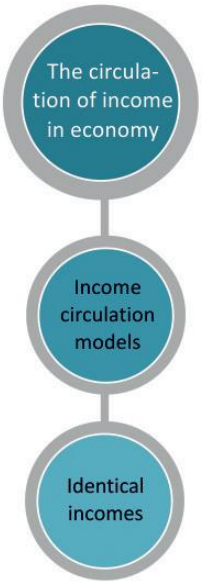

Figure 40 Mind map

8.2.1 Circulation of income in economy

As we already know it from our earlier studies GDP is the most important data regarding the economic achievement of a country, which can be approached from the production and consumption side (GDP balance sheet). It is the value expressed in money of the added value of the products produced by a given national economy, or if we approach it from the point of view of actual consumption, it is the value expressed in money of the final consumption (consumption „C"; investment „I"; government spending „G"; export „X") of national product and services. We have to emphasize at this point that while modelling national (macroeconomic) processes we always take into account the value of employed goods and services in money value and never in their natural measure units. The obvious explanation for this is that in the course of the examination of processes taking place in the national economy (macro economy) we have to think not in terms of the specific market of one particular good but in terms of national economy on a larger scale, where goods are measured by different units (kilo, litre, item, etc.) and cannot be used in their natural measurement unit, so the shared value measurement is money. Convertion to money (currency) is naturally arrived at by multiplying the quantity of a given good or service with its price. If we calculate with the current market price (current price) we can speak about nominal value and if we calculate with earlier prices (unchanged prices) we are speaking about real value as we learned it during our studies in statistics.

When taking into account the achievement of national economy we also clarified that the GDP is the total value expressed in money of all the goods and services produced in a country during a given year. The next step will be to examine the way in which the income stemming from this quantity of goods and services (**macro income**: Y) is circulating among the actors of economy and the markets functioning in the given economy. As there are countless participants and markets in economy for the sake of better understanding we are going to group the actors of the economy into sectors on the basis of their shared characteristics, and we are going to divide the partial markets of the economy into two major markets.

The sectors of economy and their sector wise characteristics:

- Households: consumes and provides labour force
- Firm: produces
- State / Government: creates the frame for the regulated functioning of the economy
- Foreigners / Abroad: we include into this group all those actors of economy, which are located outside the boundaries of

the state being examined but are in contact with the economy being examined.

The markets of economy and their group wise characteristics:

- Capital market: here we take into consideration the savings accumulated in economy. This practically covers the stock exchange and part of the activity of the banking sector.
- Product market: refers to the moneywise value of goods and services produced for final consumption.

Models of income circulation

Models of income circulation serve for the illustration of the circulation (division) of the income produced in economy among different sectors and markets.

Characteristics of models of income circulation:

- They only show the circulation of income, they do not indicate the circulation of goods, services and economic factors adverse to the circulation of income.
- They only show the circulation of the goods produced in the given economy but do not show the circulation of the money produced by the banking sector.
- The models show the circulation of income among the sectors and markets as the revenue or the expenditures of the given sectors or markets.

There are three well known models for the circulation of income: **circular flow of income;** Current accounts of the economy by markets and actors based on the circular flow of income**; income circulation matrix.** All three show the same only their structures differ.

When creating the models we assumed that all sectors have a surplus (their revenues exceed their expenditures), so they possess savings. Should any of the sectors show deficit then the direction of the arrow representing savings should be changed and savings would become negative in all three models. In case of equilibrium the given income would be zero, and consequently the arrow representing savings would cease.

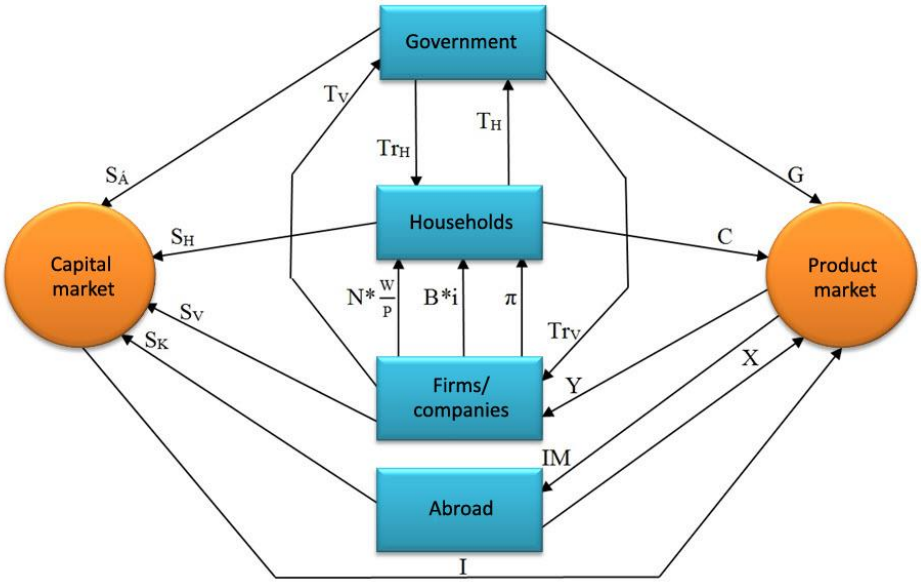

Figure 41 The circular flow of income

Y: macroincome

$N^* \frac{W}{P}$: real wage-stock

B*i: interests generated by share rates

π: dividends to be paid after shares

T_V: firm (corporate) taxes

Tr_V: firm transfer

S_V: firm savings

TH: domestic/household taxes

Tr_H: domestic/household transfer

C: consumption

S_H: domestic/household savings

G: government spending

$S_Á$: state or government savings

IM: import

X: export

S_K: savings abroad

I: investment

You can observe the circulation (division) of the produced income among the different sectors and markets.

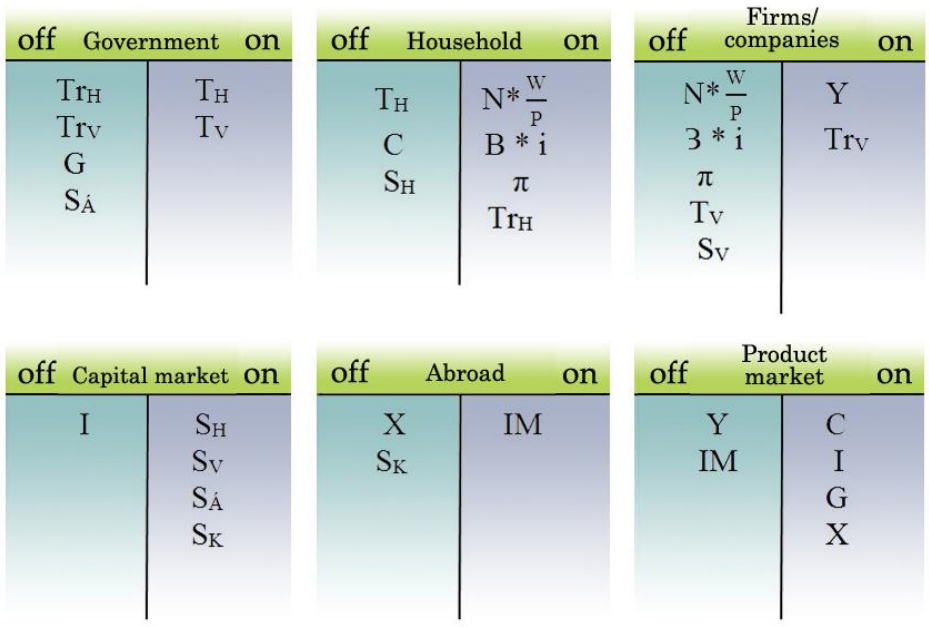

Figure 42 Current accounts of the economy by markets and actors based on the circular flow of income

The animation below shows you the bookkeeping methods of documenting the incomes produced by given sectors and markets.

Identical income equations

Identical income equations are equations which include on one side the sum of the income of a given sector or market and the sum of their expenditures on the other side. Rearranging and joining these equations can lead us to understandable statements which are essential from the point of view of our study.

State/Government:

$T_H + T_V = Tr_H + Tr_V + G + S_Á$
$S_Á = (T_H + T_V) - (Tr_H + Tr_V + G)$

That is government savings equal the sum total of the taxes minus transfer expenses and the sum of government purchases.

Government savings can be:

- $S_Á$ = (+) the state budget shows surplus that is it has suficit
- $S_Á$ = 0 the state budget is in equilibrium that is its balance is zero.
- $S_Á$ = (-) the state budget shows deficit which means its balance is negative

The deficit of the budget can be financed from external sources (foreign loans) which lead to being indebted abroad, or from internal sources (shares, bonds). In the case of domestic financing it uses the savings of the population in order to finance the deficit and because the savings of the population contribute to the basis of investments the amount of the savings that could be used for investments is decreasing, so investments are reduced which in the long run causes the achievement of the economy. This is the so called displacement effect.

Households:

$$N^*\frac{W}{P} + B * i + \pi + Tr_H = C + T_H + S_H$$
$$N^*\frac{W}{P} + B * i + \pi + Tr_H - T_H = C + S_H$$

Where:

- $N^*\frac{W}{P} + B * i + \pi + Tr_H - T_H$: the income at the disposal of the household
- C + SH : the utilisation of the income at the disposal of the household

The available income is the income over which the different actors of the given sector – in this case the households - dispose freely.

Firm:

$$Y + Tr_V = N^*\frac{W}{P} + B * i + \pi + T_V + S_V$$
$$Y + Tr_V - T_V = N^*\frac{W}{P} + B * i + \pi + S_V$$

Where:

- $Y + Tr_V - T_V$: the income at the disposal of the firm

- $N^* \frac{W}{P} + B * i + \pi + S_V$: the utilization of the income at the disposal of the firm

Private sector (Households + Firms):

Private sector should be understood in macroeconomics as the households and the firms together. On the basis of the above the available income of the private sector is the sum of the available income of the households and the firms, and the utilization of the private sector is the sum of the utilized income of the two mentioned sectors.

$$N^* \frac{W}{P} + B * i + \pi + Tr_H - T_H = C + S_H$$
$$+ \qquad\qquad +$$
$$Y + Tr_V - T_V = N^* \frac{W}{P} + B * i + \pi + S_V$$

$$Y + Tr_H + Tr_V - T_H - T_v = C + S_H + S_v$$

Where:

- $Y + Tr_H + Tr_V - T_H - T_V$: the disponable income of the private sector, which we determine as Y_{DI}, so: $Y_{DI} = Y + Tr_H + Tr_V - T_H - T_V$
- $C + S_H + S_V$: the utilization of the available income of the private sector

Abroad:

$$IM = X + S_K$$
$$S_K = IM - X$$

If „S_K = (+)”, then the given country has imported more than it has exported so the budget of the country being examined has a deficit in its import export balance, which can be financed through credits from abroad or foreign currency reserves. From this it follows that in the macroeconomic models discussed in our material the credits obtained from abroad appear in the savings of the foreign country (S_K).

If „S_K =(-)” then the foreign trade of the country being examined has a suficit, that is the country being examined sold greater amounts of goods then the amount of goods it purchased.

Capital market:

$I = S_H + S_V + S_Á + S_K$

The above equation is called **basic equation of investment**. From the equation it can be seen that the savings effectuated in an economy provide the cover of the investments. If the above equation is true than the capital market is in equilibrium, and it is certain that the **product market is also in equilibrium that is the supply of the** product market is equal to its demand.

We return at this point to the explanation of the displacement effect mentioned during the discussion of the state sector. It can be seen in the equation that if the state budget has deficit, that is the savings of the state are negative savings, the sum of this deficit is subtracted from the right side of the equation, so the savings that could provide investments is decreasing, that is investments are decreasing.

In the case of credits from abroad the displacement effect does not function, because in the case of foreign credits, as described earlier the foreign savings are positive, consequently if the deficit of the budget is supported by foreign credits, the savings of that country increase exactly with the sum of the negative savings of the state, that is the sum of the savings and the size of the investment do not change. Yet, this results in incurring foreign debts, and when the credits and their interest rates have to be paid back the process is happening the other way round, so the source behind the investments is decreasing, which results in the slackening of the investments.

Product market:

$$Y + IM = C + I + G + X$$
$$Y = C + I + G + (X - IM)$$

Where:

- Y + IM: the total supply on the product market of a given national economy, out of which:
  - Y: the supply produced by the given supply
  - IM: the supply flowing into the national product market from abroad
- C + I + G + X: is the total demand present in answer to the total supply present in a national economy (national and foreign) out of which:
  - C + I + G: national demand

- X: foreign demand
- C + I + G + (X - IM): total demand (national and foreign alike) as opposed to the supply produced by a national economy (that is only the national one) (Y). We indicate product market demand as Y^D.

The equation „Y = C + I + G + (X - IM)" is called **basic equation of the product market, in other words the basic equation of macro economy**. This equation is only viable if the product market is in equilibrium. Yet, if **the product market is in equilibrium, then it is certain that the capital market is also in equilibrium, so investment is equal with the total savings achieved by economy**.

If we observe the product market we can see that „Y" is not simply the earlier mentioned macro revenue, but it also stands for the supply of the product market. We gave the explanation for this at the beginning of the discussion of this topic, when we stated that macro revenue is the income (gross added value) generated in the process of production of products and services meant for final consumption (practically supply). This means that macro supply (macro supply: Y) covers the income created during the process of production, that is it covers the gross added value (GDP = Y). This can lead us to the question whether the mentioned macro supply refers to already sold supply, or it contains the supply that was not sold (surplus of supply) as well? Supply contains unsold stocks as well, since the production of these goods also generated income, which has been paid; it is enough if we simply think of the wages paid for the households. If it generated surplus of goods (unsold stocks appeared on the market) then the households either bought imported goods from the money they earned (in economy the savings of the foreign country increased), or they simply saved this sum (the savings of the households increased). In any case the surplus appears on the market. Having in view that the unsold stocks are part of the investment, which is on the demand side, in the macroeconomic models the short term balance of the product market can be established if the investment – and thus total demand – increases in proportion with the unsold stocks (surplus). If we approach the question from another point of view we can state that, the macroeconomic model is like a (balance sheet) – this is suggested by the name of balance of account model -, and as all balance sheets close with zero, where the stock accumulation which is included into investment shows the balance.

Surplus of demand appears in macroeconomic models as an estimate from the macro revenue. Having in view that this is the feeling of need of

the economic actors stemming from their demands and desires which were not met; in practice it is very difficult to calculate it.

We dealt with the presentation of four sector income circulation models. But models can cover three or four sectors as well. We arrive to the three sector income circulation model (closed income circulation model) from the four sector model if we drop the foreign sector from the four sector income circulation model. The two sector income circulation model can be arrived at if we leave out the state sector from the three sector income circulation model, so we are left with only the household and the firm.

8.3 SUMMARY, QUESTIONS

8.3.1 Summary

In this unit we got acquainted with the mechanism of the circulation of the incomes produced by economy between different sectors and markets, with the identical characteristics of the revenue of the given sectors and markets, and some comprehensive conclusions that can be drawn from the above. All these offer a good basis for a more minute analysis of the demand side of the product market and of the conditions of equilibrium in the case of two actors macro economy.

8.3.2 Self assessment questions

- What do we mean by displacement effect?
- Give the basic equation of macro economy in the case of macro economy with four actors!
- How does the deficit of the budget appear in the income circulation models?
- What can you conclude if investment is equal to the amount of savings?
- What is the sign for the available income of the private sector, what does it comprise from source and consumption side?

8.3.3 Practice tests

- In income circulation models export:
  - circulates from national product markets abroad, because export means selling goods abroad
  - it circulates to a foreign country from the firm because firms produce the good meant for export

- it circulates from abroad towards the national product market, because the circulation of income is supposed to express the profit resulting from foreign trade that is the balance of foreign trade which is the income of the country being analysed
- it flows from abroad towards the national product market, because the model intends to mirror the income resulting from export

? If the product market is in equilibrium, then it is sure that:
- the budget is balanced
- the savings of the foreign country is positive
- there is equilibrium on the money market as well
- the revenue at the disposal of the household sector exceeds the revenue at the disposal of the firm sector

? The available income of the private sector:
- is the value of macro income plus taxes minus transfers
- is the value of macro income plus transfers minus taxes
- is the credit at the disposal of the households offered by firms
- is the credit provided by the households to the state in the form of bonds

? The source of investment is provided by:
- savings
- tax revenues
- transfers
- the net income paid to the households

? If the budget is in equilibrium then:
- $S_K = 0$
- $S_K > 0$
- $S_A = 0$
- $S_A > 0$

9. UNIT: DEMAND AND EQUILIBRIUM IN THE CASE OF TWO ACTORS MACROECONOMY

9.1 AIMS

The aim of the unit is to clarify the nature of the system of relationships which affects income division among the different sectors and markets functioning in economy and to clarify in what way it influences product market demand (macroeconomic demand; macro demand; Y^D), presuming equilibrium and economic growth in a two actors macro economy. In the course of the discussion of this topic we are going to get acquainted with the role of savings, and the influence of rates and profit expectations on investment, and through this, its role in the increase of the efficiency of economy. The knowledge thus acquired will enable us to examine state intervention, and the influence of foreign trade relationships onto economy as we view economy in its totality.

9.2 STUDY MATERIAL

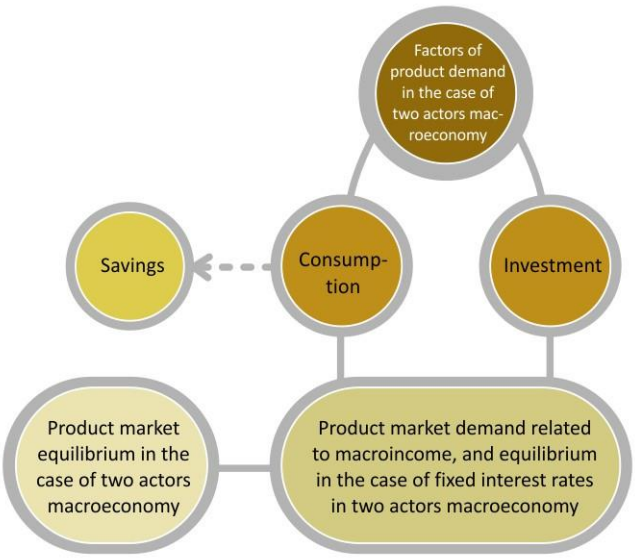

Figure 43 Mind map

9.2.1 The factors of product market demand in the case of two actors macro economy

We already know that, in the case of two actors economy macro demand consists of two components, consumption (C) and investment (I), that is:

$$Y^D = C + I$$

From among the two above mentioned factors we are going to start with the examination of consumption and we proceed with the examination of the savings (S) which form the basis of investment and finally we are going to examine investment itself.

Consumption

- **Consumption (C) is the sum total of expenses the members of the household sector spend on goods meant to meet their basic needs and services.**
- We should not forget that in the macroeconomic models consumption characteristic of the national economy appears in the household sector.

As consumption can be achieved only with the help of income earlier produced and freely available (at the disposal of the consumer) and because the households are part of the private sector, the household consumes from the income available for the private sector (Y_{DI}).

As:

$$Y_{DI} = Y + Tr_H + Tr_V - T_H - T_V$$

And as in the case of two actors economy the state is not present, there are no taxes nor transfers, so in the case of two actors economy

$$Y_{DI} = Y$$

From the above it follows that in a two actors macro economy we can examine the process of consumption in relationship with the macro income of the given period.

Consumption can be divided into two parts with regards to the macro income of a given period:

- C_0: consumption independent from income, autonomous consumption.
- ĉ * Y: consumption depending on income.

Autonomous consumption that is the so called basic consumption which exists even in the case of zero macro income. Society consumes on this level if a natural catastrophe or war occurs and the macro income is reduced to zero, yet for the sake of survival a minimal consumption is essential. This consumption is covered by earlier savings or in the form of loans based on future savings.

Income dependent consumption is the kind of consumption the extent of which increases parallel to the increase of macro income.

On the basis of the above the equation of the consumption function in the case of two actors macro economy is:

$$C = C_0 + \hat{c} * Y$$

The above equation has only one unknown tag „ĉ".

Marginal consumption willingness (ĉ) surplus of consumption based on one unit extra income. It is the figure which shows the extent by which consumption increases in the case of one unit growth of macro income.

$$\hat{c}=\frac{\Delta C}{\Delta Y}$$

„ĉ" gives the sloping of the function and because it is linear its value is constant, and as one more unit of macro income can be spent on consumption:

$$0 \leq \hat{c} \leq 1$$

- Marginal willingness of consumption should not be confused with **consumption rate**, which is practically average consumption, that is consumption per one unit of macroincome is $\left(\frac{C}{Y}\right)$, and its value decreases parallel to the increase of macroincome.

Savings

In the case of two actors economy the total savings of the private sector ($S_H + S_V = S$) is the unspent part of the available savings of the private sector (Y_{DI}).

As we clarified it when discussing consumption, in the case of a two actors economy „$Y_{DI} = Y$", so in this case savings can be interpreted as the unspent part of the savings of macro economy (Y).

From the above it follows then that:

$$\begin{aligned} Y &= C + S \\ S &= Y - C \\ S &= Y - (C_0 + \hat{c} * Y) \\ S &= Y - C_0 - \hat{c} * Y \\ S &= -C_0 + (1 - \hat{c}) * Y \end{aligned}$$

The equation of the savings function in the case of a two actors macro economy is:

$$S = -C_0 + (1 - \hat{c}) * Y$$

Where:

- $-C_0$ (it can also be marked „S_0"): savings available (**autonomous savings**) giving the source of autonomous savings in the case of zero macro income
- $1 - \hat{c}$ (it can also be marked „$\hat{s}$"): **marginal savings willingness**, which is the extra saving per one unit of extra income $\left(\frac{\Delta S}{\Delta Y}\right)$, in other words it is the figure which shows to what extent savings increase if macro income increase by one unit. By analogy with the facts described in the case of marginal consumption willingness $0 \leq \hat{s} \leq 1$ and is constant.

Marginal consumption willingness should not be consfused with **savings rates**, which is practically an average saving that is it is the saving incured by one unit macroincome $\left(\frac{S}{Y}\right)$, and its value increases parallel to the increase of macroincome.

Investment

Investment is the sum total of the expenses which have the aim of maintaining and increasing capital stock. Capital stock comprises

the possessions, used by the firm sector for years in the process of production.

As we clarified it when discussing the income circulation models the sources of investments are guaranteed by the sum total of the savings achieved in economy (in this case $S_H + S_V = S$). In practice this means that the firm sector borrows the savings generated in economy for its investments. As the price of a loan and thus the price of investment is interest rate (i), the size of the investment is primarily determined by the size of the interest rate. Decreasing interest rates will result in increased investments while increasing interest rates will result in decreasing investment.

- Even if the firm covers its investments partly or entirely from its own savings the price of its investment would be the interest rate, that is the interest rate the firm is losing because it does not place its savings on the capital market, as it has to spend it on investment.

On the basis of the above the equation of the investment function in relation to the interest rate is:

$$I = I_0 - a * i$$

Where:

- I_0: **investment is independent from interest rate (autonomous)**; the investment which is performed even in the case of zero interest rate, and its size depends on profit expectations
- a: **the interest sensibility of investment**; the change in investment generated by one per cent change in interest rate $\left(\frac{\Delta I}{\Delta i}\right)$. It is the figure which shows to what extent the investment changes in the case of one per cent change in the interest rate. This is the sloping of the investment function. Its value is positive and constant (the investment function is linear), on the basis of previous experience it is higher than one.

As it is also necessary to examine the development of demand in macro economy (Y) in its relationship with macro investment (as we shall see it later), certain elements of demand have to be shown on the macro income function. The situation is simple in the case of investment because its size is independent from macro economy that is it is identical in the case of all income levels. Changes in investment caused by changes

in interest rates appear on the investment function illustrated on the function of macro economy in the form of parallel shift.

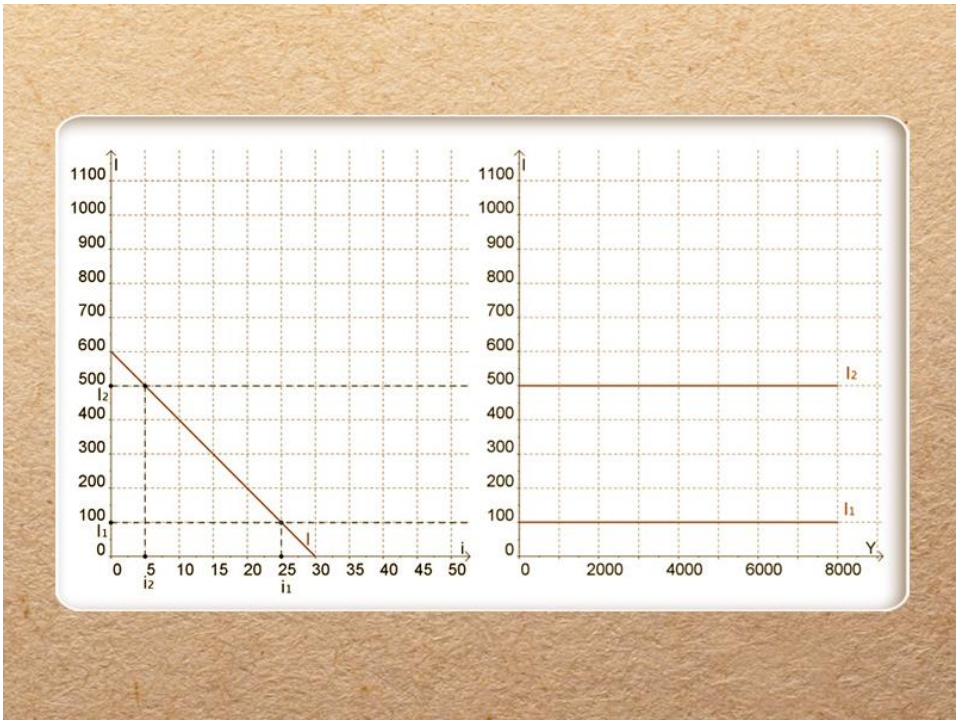

Figure 44 Representation of change in interest rate on the investment function

Besides interest rates investment also depends on profit expectations. In the case of improving profit expectations investors are willing to invest more at the same level of interest rates because they are expecting greater profit. Increasing investment in the case of the investment function illustrated in its relation with the increasing interest rate shifts parallel to itself outward, in the case of the investment shown in its relation with macro income the investment function shifts upwards parallel to itself.

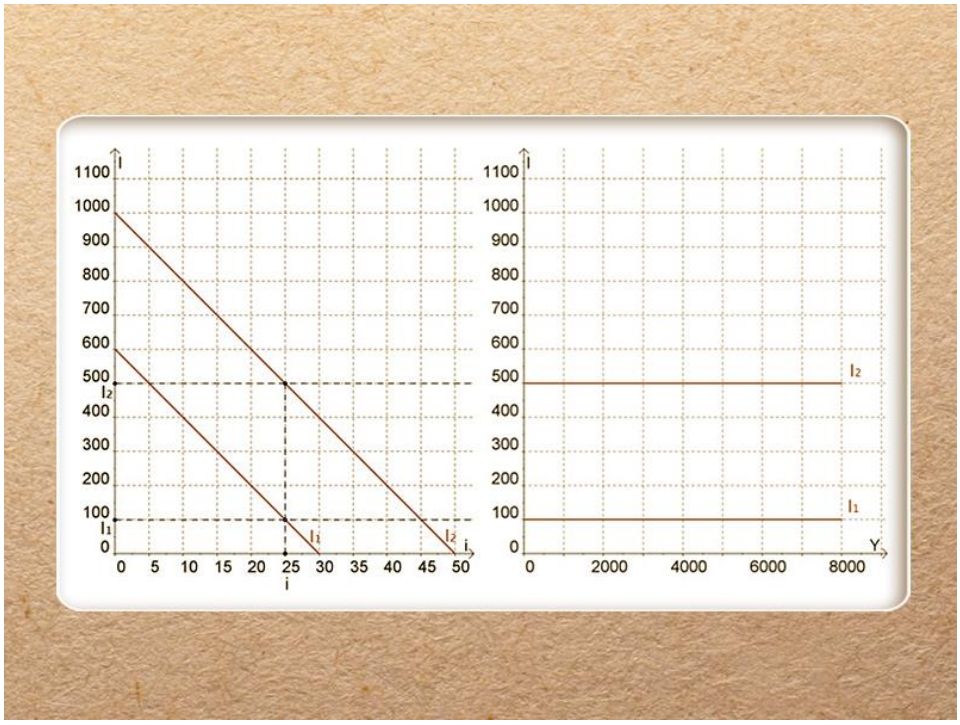

Figure 45 Representation of improving profit expectations on the investment function

Stockpiling is a special form of investment. We mean by this that the cumulated unsold goods of a firm are part of the investment, the size of which is independent from the real factors, interest rate and macro income included.

9.2.2 Product market demand in relation with macro economy, equilibrium in the case of fixed interest rates in two actors macro economy

As we repeatedly mentioned it product demand is the sum of consumption and investment in a two actors macro economy:

$$Y^D = C + I$$

As we are examining macro demand in its relationship with macro income both components of demand have to be observed in relation with macro income, from which it follows that investment is constant. On the basis of the above and of the earlier defined equation of consumption

function the equation of macro demand in its relation with macro income can be described as follows:

$$Y^D = C + I$$
$$Y^D = C_0 + \hat{c} * Y + I$$
$$Y^D = C_0 + I + \hat{c} * Y$$

The equation of macro demand in the case of two actors macro economy is:

$$Y^D = C_0 + I + \hat{c} * Y$$

As in the case of product market equilibrium „$Y = Y^D$" macro income belonging to product market equilibrium (equilibrium income: Y_e) can be defined on the basis of the following relationship:

$$Y = C_0 + I + \hat{c} * Y$$

Having in view that in the case of product market equilibrium the capital market is in equilibrium as well, that is „I = S", we cannot avoid observing the savings function during the examination of product market equilibrium. This means that we also have to note the obvious **relationships** between **the functions of savings and consumption**:

- As $S_0 = -C_0$, the sum of autonomous consumption and autonomous savings is zero.
- As $\hat{s} = 1 - \hat{c}$, the sum of the marginal propensity of savings and consumption equal one

☐ We have to observe, that the proportion of consumption and the proportion of savings also add up as one.

For a better understanding of the relationship among the elements of product market demand, overall demand function, and the product market equilibrium we should consult the following exhibit and listen to the related audio material.

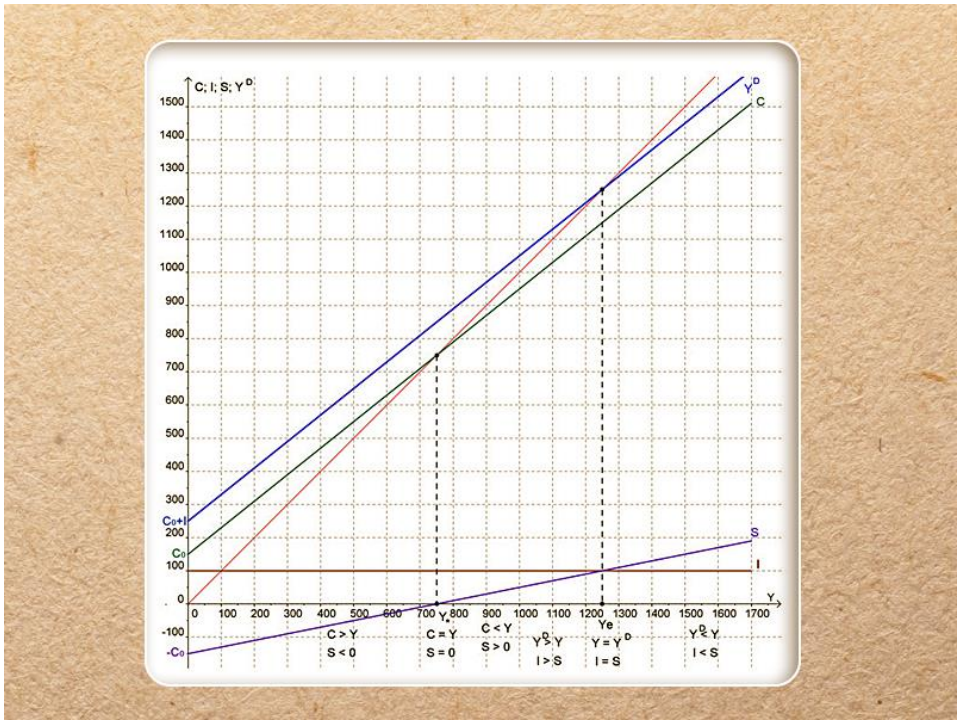

Figure 46 Illustration of product market demand and equilibrium as a function of macro income

One of the most important aims of any economic government is to insure economic growth. Economic growth is GDP, that is it is expressed by income equilibrium (Y_e). As we can see it in the next illustration as well this can be most efficiently achieved through the elements of autonomous demand (C_0; I), as in this case the function of macro demand (Y^D) shifts upwards as compared to itself, which results in the increase of equilibrium income.

- The growth of the sloping of the macrodemand function also brings about the increase of equilibrium income, but it is extremely difficult to exercise influence upon consumption marginal propensity (the sloping of macrodemand function in two actors economy), on the other hand – as we are going to see it when discussing the multplying effect – its influence on equilibrium income is considerably lower than the effect of the autonomous elements.

As we can see it in the following illustration a one unit growth in autonomous demand results in more units growth in the case of equilibrium income. This difference is due to the **multiplying effect**.

- **The multiplying effect is the effect as a result of which a one unit change in autonomous demand produces a more units change in equilibrium macroincome.**

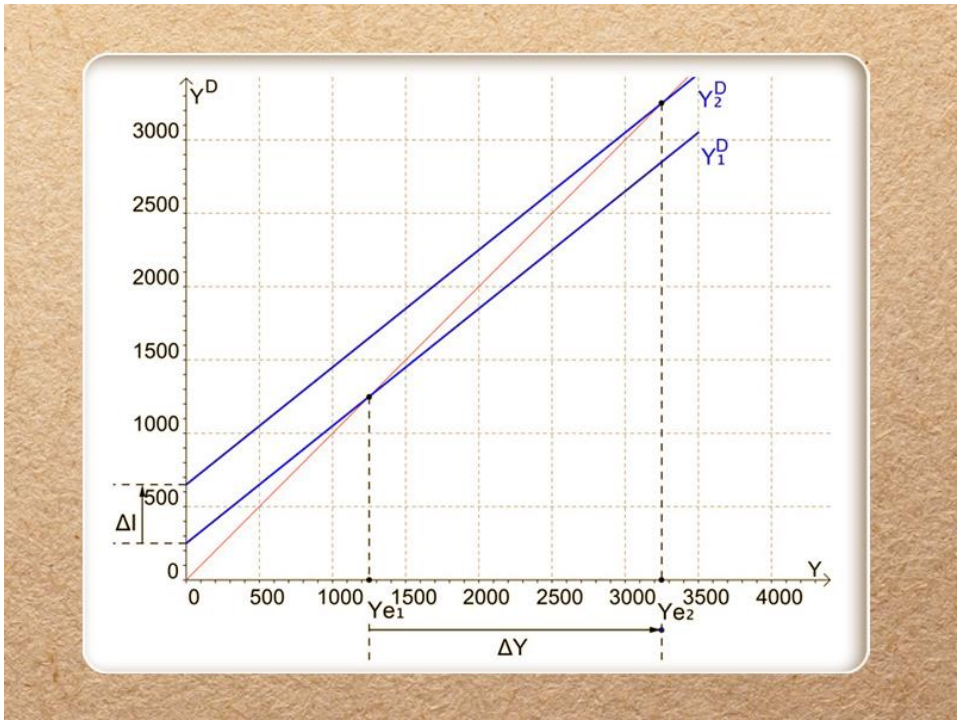

Figure 47 Multiplying effect

The size of the multiplying effect is shown by the multiplier the formula of which in the case of two actors macro economy is as follows:

$$\frac{\hat{c}}{1 - \hat{c}}$$

The above mentioned multiplier formula is called **expenditure multiplier**.

Expenditure multiplier influences all the autonomous elements of macro demand, so in the case of two actors macro economy the following equations are true:

- $\Delta Y = \Delta C_0 * \frac{1}{1 - \hat{c}}$
- $\Delta Y = \Delta I * \frac{1}{1 - \hat{c}}$

The practical appearance of the multiplier effect is shown by the following audio material:

9.2.3 Product market equilibrium in the case of changing interest rates in a two actors macro economy

Until now we discussed equilibrium income in the case of fixed interest rate, but it is obvious that in economy interest rates are not constant. We saw it earlier that the changes in interest rate influenced the developments of investments and as investments are part of total demand it also influenced product market demand. For this reason we have to clarify the relationship between equilibrium income (Y_e) and interest rate (i) which is illustrated by the **IS (Investment – saving) curve**.

- The definition of the curve stems from the definition earlier clarified whereas in the case of product market equilibrium capital market is also in equilibrium, so investment is equal to saving, that is I = S
- **The IS curve is the portion of combinations of macroincome and interest rates in the coordinate system, which produce product market equilibrium.**

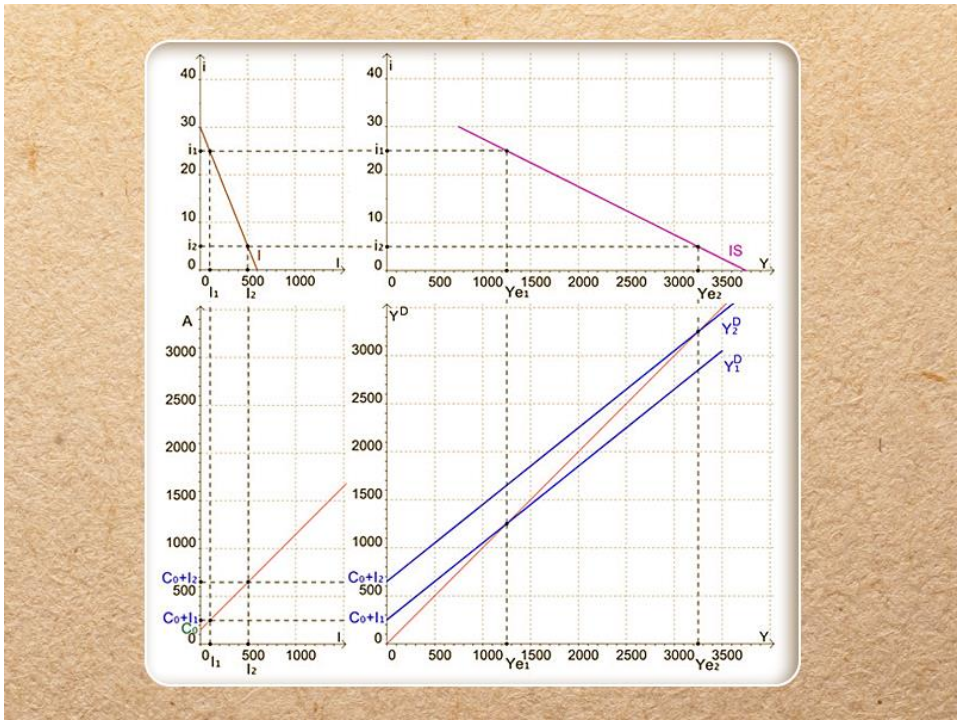

Figure 48 Drawing the IS curve in case of two sector economy

The drawing of the IS curve seen in the above illustration is directed by the following audio material:

On the basis of the shift on the curve it can be observed that interest rate is decreasing, while decreasing interest rate results in equilibrium income, that is economic achievement. At the same time on the basis of the illustration – and of our earlier studies – we know that investment grows not due to the interest rate, but due to favourable profit expectations, then the IS curve shifts outward parallel to itself, that is at the same time equilibrium income grows as well as interest rates. The same effect is produced by the growth of autonomous consumptions as well.

As the IS curve shows combinations of macro income belonging to product market equilibrium and interest rate, naturally we can produce the model of the situation of extra demand and surplus supply as well.

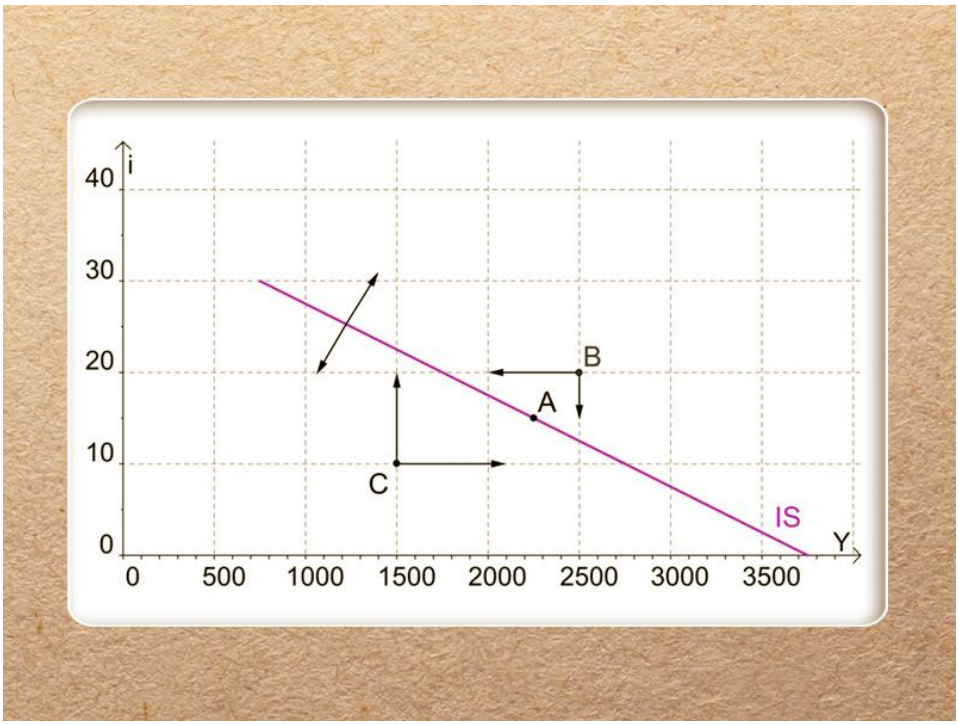

Figure 49 Equilibrium conditions of the product market on the basis of the IS curve

In point „A" the product market is in equilibrium because point „A" is on the IS curve and the curve represents points of equilibrium. In point „B" there is shortage of demand, that is there is a surplus of supply, because the interest rate belonging to point „B" is higher than the interest rate of equilibrium (interest rates of equilibrium are formed on the curve, but this would imply the decrease of the interest rate belonging to point „B"), so demand belonging to point „B" –and with it total demand as well – is lower than supply linked to equilibrium. In point „C" there is excessive demand, the explanation for which is identical with the opposite of the explanation given for point „B".

In the course of the attempt to re-establish equilibrium the aim is to get back onto the IS curve which represents points of equilibrium. To achieve this the reconstruction mechanism is as follows:

On a market with supply surplus (point B), if the surplus of supply stems from the exaggerated production of goods, in the short term the stocks that cannot be sold appear among the elements of investment as cumulated stocks, that is the investment and consequently total demand

grow, with the result that the IS curve shifts outward and point „B" gets onto the IS curve. In the long term supply (Y) obviously decreases – the firm sector would like to get rid of the goods on the stock -, so point „B" is shifting towards the vertical axis and gets onto the IS curve. If excessive supply stems from the overproduction of capital, then besides the mechanism discussed in the case of the consumer goods, the decrease of interest rates (or central bank interventions, we are going to discuss later) can result in the increase of investments, and through this it can re-establish equilibrium, which can be seen in the illustration as a shift towards point „B" onto the IS curve.

In the case of excessive demand (point C), if this stems from the increased demand of capital or goods (exaggerated demand for investment), the demand for sources that can acquire capital, that is, demand for loans increases, which results in the growth of interest rates, so point „C" shifts upward and gets onto the IS curve, and as a result equilibrium is re-established through the normalized demand for investment. Equilibrium can be re-established as the result of deteriorating profit expectations and decrease of investments which can be seen in the inward shift towards the IS curve. Exaggerated demand of course can also result in the increase of supply (as there is demand for the goods produced and services), which is signalled by the horizontal shift of point „B" onto the IS curve.

Of course combinations of the major processes described above can appear in economy.

9.3 SUMMARY, QUESTIONS

9.3.1 Summary

In this unit we discussed the relationship between the concepts of consumption, savings and investment and their relationship with the system of macroeconomic demand, on the basis of which we clarified the state of product market equilibrium at fixed and changing interest rates, and the economy boosting influence of the elements of autonomous demand. Endowed with the above knowledge we can start the analysis of state intervention, and of the effects of foreign trade.

9.3.2 Self assessment questions

? Give the equation of the investment function in relation to interest rate, and the equation of savings function in its relation to macro income!

? How does the effect of disadvantageous profit expectations appear on the investment function?

? Give the equation of the macro demand function in relation with macro income in the case of two actors economy!

? Characterize the product market in a state of surplus supply, extra demand and equilibrium!

? What do we mean by multiplying effect?

9.3.3 Practice tests

? The consumption function:

- shows increasing macro income in case of increased consumption
- shows increased consumption in case of increased macro income
- shows decreasing consumption in the case of increased price level
- all three statements mentioned above are true

? The savings function:

- shows the combination of investment values which provide the equilibrium of the product market
- shows the state of savings in relation with interest rates
- shows the state of savings in relation with macro income
- shows the state of savings in its relationship with consumption

? Consumption in it coverage point:

- $Y = Y^D$
- $I = S$
- $S_Á = 0$
- $Y = C$

? The multiplier is the figure:

- which shows how many units growth in the equation of the central budget is caused by one unit growth of autonomous taxes
- which shows how many units growth does one unit growth in transfers cause in autonomous demand

- which shows how many units increase is caused in the balance of foreign trade by one unit decrease in autonomous consumption
- which shows how many units growth does one unit growth in investment cause in equilibrium income

? In all the points the IS curve:

- money market is in equilibrium
- product market is in equilibrium
- both product and money market are in equilibrium
- the central budget is in equilibrium

10. UNIT: PRODUCT MARKET DEMAND AND EQUILIBRIUM IN THE CASE OF THREE AND FOUR ACTORS MACROECONOMY

10.1 AIMS AND COMPETENCIES

The aim of this unit is to clarify the economic relationship by way of which state intervention and foreign trade activity influences product market demand, equilibrium and economic growth in a presumed three- and four actors macro economy. In the course of our discussion of the topic we can understand the macroeconomic influences exercised by transfers and taxes through consumption and savings on the increase of the mechanisms of macro economy, the influence of state intervention aimed at increasing the intensity of economy and the relationship of all the above with foreign trade. The knowledge thus acquired will enable us to form an overall image of demand in macro economy and predict the influence of certain economic events and government decisions.

10.2 STUDY MATERIAL

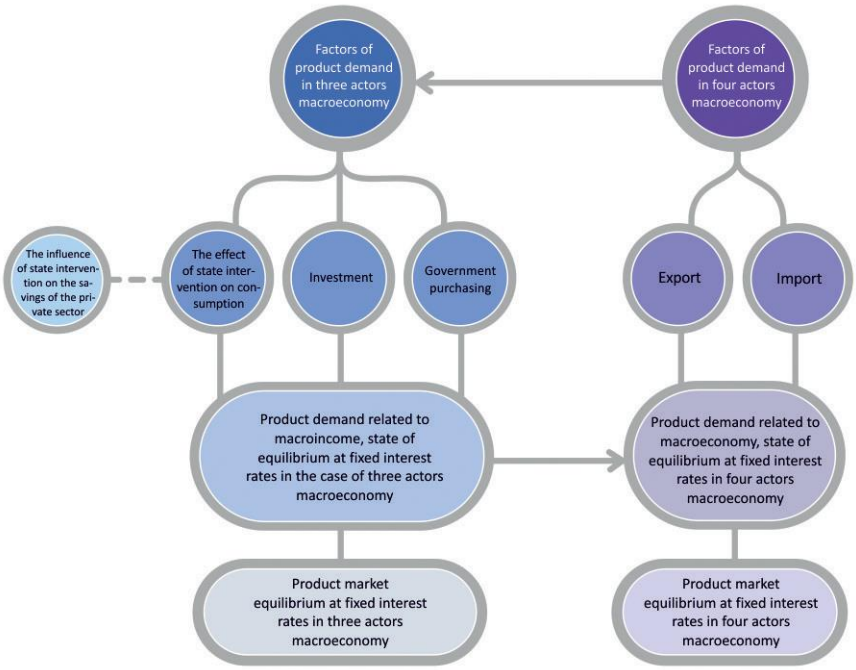

Figure 50 Mind map

10.2.1 Elements of product market demand in the case of three actors macro economy

In the case of three actors macro economy the two actors model is enlarged by the appearance of the state. From among the demand elements discussed on the basis of the two actors model, state intervention only exercised influence on consumption and savings, investment remained unchanged. We have to add to the above government spending (G).

$$Y^D = C + I + G$$

The influence of state intervention on consumption and the savings of the private sector

As we clarified it in unit 9. Consumption and savings can only be effectuated on the basis of available income, and as households are part of the private sector, the household consumes and saves from the income

available in the private sector (Y_{DI}). From this it follows naturally that the consumption function shows the developments of consumption on the basis of the available income while the savings function shows the development of savings, that is:

$$C = C_0 + \hat{c} * Y_{DI}$$
$$S = -C_0 + (1 - \hat{c}) * Y_{DI}$$

As with the appearance of the state (three actors macro economy) taxes and transfers also appear in the model in the case of actors economy:

$$Y_{DI} = Y + Tr_H + Tr_V - T_H - T_V$$

From the above it follows that as compared to the two actors economy in the three actors economy consumption and savings are modified by taxes and transfers.

We can distinguish two types of taxes in macro economy:

1. Taxes which depend on income (T(Y)): their size grows parallel to the growth of macro income, for example income tax.

Method of calculation:

$$T(Y) = z * Y$$

Where:

- z: tax rate, its value is positive and it is constant

2. Taxes independent from income (autonomous) (T_0): their size is identical at all levels of macro income, for example vehicle weight taxes.

We already know that transfers are benefits which have no compensation for example family allowance. In macroeconomic models we only take into account transfers which are independent from income.

The influence of income dependent taxes upon consumption and savings

As in this section we are examining only the influence of taxes which depend on income:

$$Y_{DI} = Y - T(Y)$$

As T(Y) = z * Y, so:

$$Y_{DI} = Y - z * Y$$

If we employ the relationships described above in the equation of the consumption and savings functions:

$C = C_0 + \hat{c} * Y_{DI}$	$S = -C_0 + \hat{s} * Y_{DI}$
$C = C_0 + \hat{c} * (Y - z * Y)$	$S = -C_0 + \hat{s} * (Y - z * Y)$
$C = C_0 + \hat{c} * Y - \hat{c} * z * Y$	$S = -C_0 + \hat{s} * Y - \hat{s} * z * Y$
$\mathbf{C = C_0 + (\hat{c} - \hat{c} * z) * Y}$	$\mathbf{S = -C_0 + (\hat{s} - \hat{s} * z) * Y}$

From the equations it can be noticed that following the implementation of taxes the sloping of the consumption function decreased by „ĉ * z", while the sloping of the savings function decreased by „ŝ * z". As it can be seen on the following chart parallel to the increase of macro income the state subtracts more and more income from the consumption and savings of the private sector as the effect of the implementation of income related taxes.

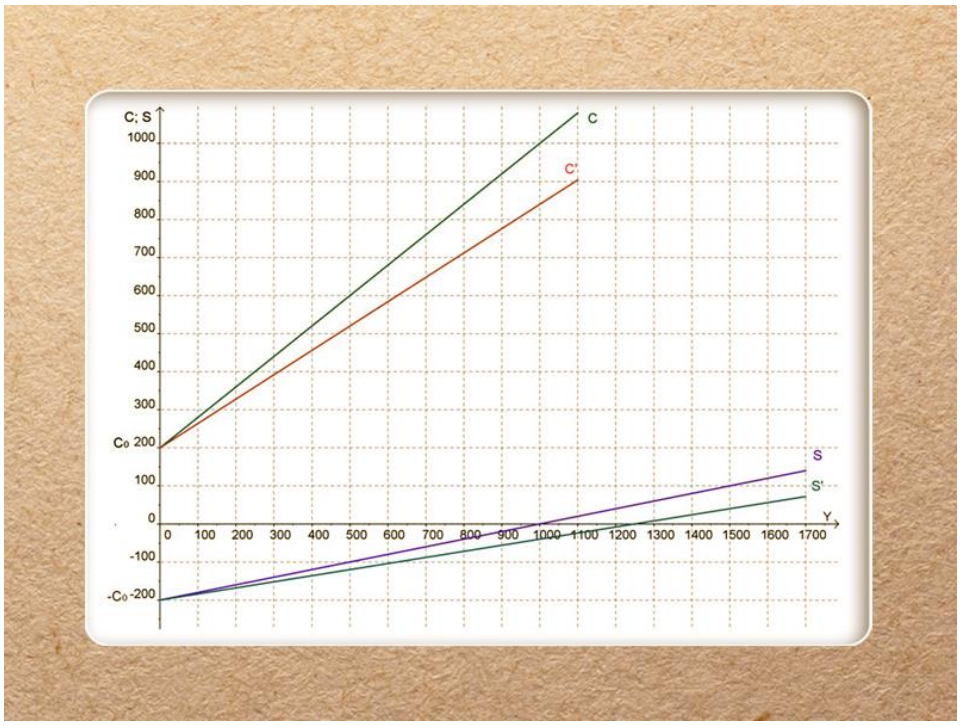

Figure 51 The influence of income dependent taxes upon consumption and savings

The influence of taxes independent from income (autonomous) on consumption and savings

As in the present section we only examine the influence of income dependent taxes:

$$Y_{DI} = Y - T_0$$

If we employ the above relationships in the equation of the consumption and savings functions:

$C = C_0 + \hat{c} * Y_{DI}$	$S = -C_0 + \hat{s} * Y_{DI}$
$C = C_0 + \hat{c} * (Y - T_0)$	$S = -C_0 + \hat{s} * (Y - T_0)$
$C = C_0 + \hat{c} * Y - \hat{c} * T_0$	$S = -C_0 + \hat{s} * Y - \hat{s} * T_0$
$\mathbf{C = C_0 - \hat{c} * T_0 + \hat{c} * Y}$	$\mathbf{S = -C_0 - \hat{s} * T_0 + \hat{s} * Y}$

From the equations it follows that after the implementation of the taxes the constant member of the consumption function decreased by „$\hat{c} * T_0$”,

while the constant member of the savings function decreased by „ŝ * T_0" that is the function shifted downward parallel to itself. As it can be seen on the following illustration at the macroeconomic level the state subtracts identical amount of income from the consumption and savings of the private sector influenced by the implementation of the income-independent tax.

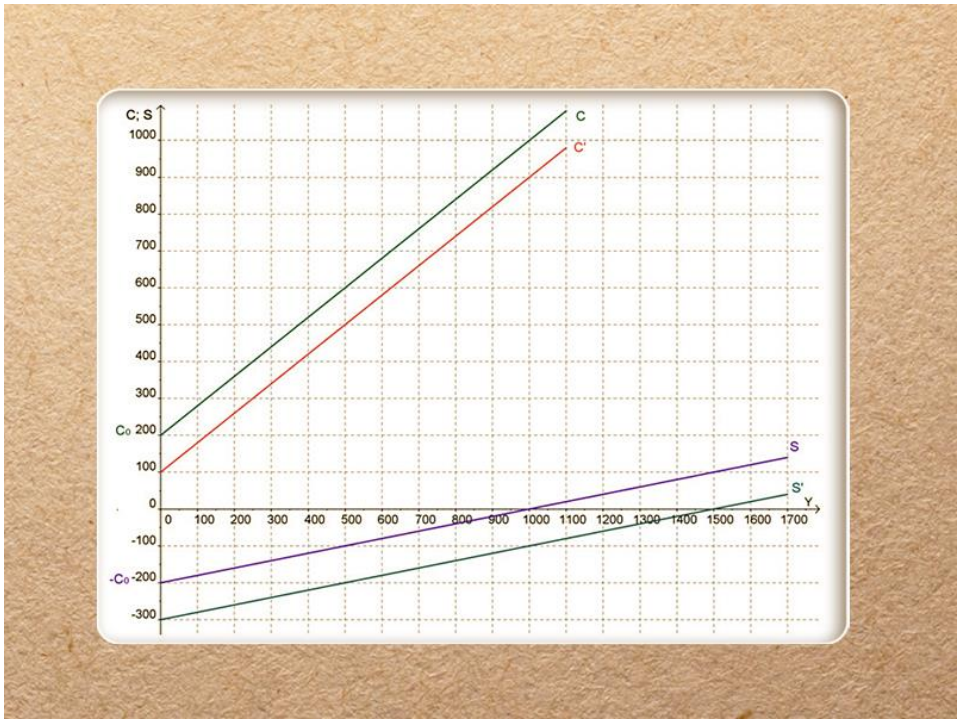

Figure 52 The influence of autonomous taxes upon consumption and savings

The influence of transfers upon consumption and savings

As presently we are examining only the influence of transfers and as $Tr = Tr_H + Tr_V$:

$$Y_{DI} = Y - Tr$$

If we employ the interrelationship in the equation of the savings and consumption functions discussed above:

$C = C_0 + \hat{c} * Y_{DI}$
$C = C_0 + \hat{c} * (Y + Tr)$
$C = C_0 + \hat{c} * Y + \hat{c} * Tr$
$C = C_0 + \hat{c} * Tr + \hat{c} * Y$

$S = -C_0 + \hat{s} * Y_{DI}$
$S = -C_0 + \hat{s} * (Y + Tr)$
$S = -C_0 + \hat{s} * Y + \hat{s} * Tr$
$S = -C_0 + \hat{s} * Tr + \hat{s} * Y$

From the equation it is clear that following the appearance of the transfer the constant member of the consumption function grew by „$\hat{c} * Tr$" and the constant member of the savings function grew by „$\hat{s} * Tr$" consequently both functions shifted upwards parallel to themselves. On the basis of this logic the influence is identical with the ones described in the case of autonomous taxes, but it is opposite as far as its direction is concerned. From the above it follows that the state increases the income available for consumption and savings at the level of macro economy by transfer payments.

The joint effect of taxes and transfers upon consumption and savings

As the government introduces income dependent and income independent taxes simultaneously, and pays transfers, the influence of the above is perceived on the consumption and savings function jointly. We know the individual effects of the individual factors so the representation of their joint effect can be achieved by joining these individual influences. We link the representations of the above individual representations of the effects of transfers and taxes present in the savings and consumption functions and thus we obtain the joint representation of the consumption and savings functions.

$C = C_0 - \hat{c} * T_0 + \hat{c} * Tr + (\hat{c} - \hat{c} * z) * Y$
$C = C_0 + \hat{c} * (Tr - T_0) + (\hat{c} - \hat{c} * z) * Y$

$S = -C_0 - \hat{s} * T_0 + \hat{s} * Tr + (\hat{s} - \hat{s} * z) * Y$
$S = -C_0 + \hat{s} * (Tr - T_0) + (\hat{s} - \hat{s} * z) * Y$

Whether the consumption and savings functions shift upwards or downwards parallel to themselves due to the influence of the autonomous taxes and transfers, that is, whether as a result of state intervention more or less income can be used for savings, because consumption also depends on the influence of the autonomous taxes we have to observe the influence of the transfers as well.

Government spending

Government spending is the sum total of the consumption and investment expenses effectuated by the government.

Government purchases include for example the purchase of water, gas, electricity etc. for public institutions (consumption oriented expenses), or the renovation of public spaces (investment oriented purchases), examples for which you can see on the video material below.

As we mentioned it when discussing investment the different elements of macro demand (government purchases included) have to be represented on the macro income function (Y). The size of governmental purchase is independent from macro income, that is, it is identical at all levels of macro income. This stems from the fact that the government can spend as much as it wants to, but it risks incurring debts. In other words this means that the size of government purchases does not depend on the real factors of economy but depends on the question for how long and under what conditions the creditors are willing to finance the deficit of the budget.

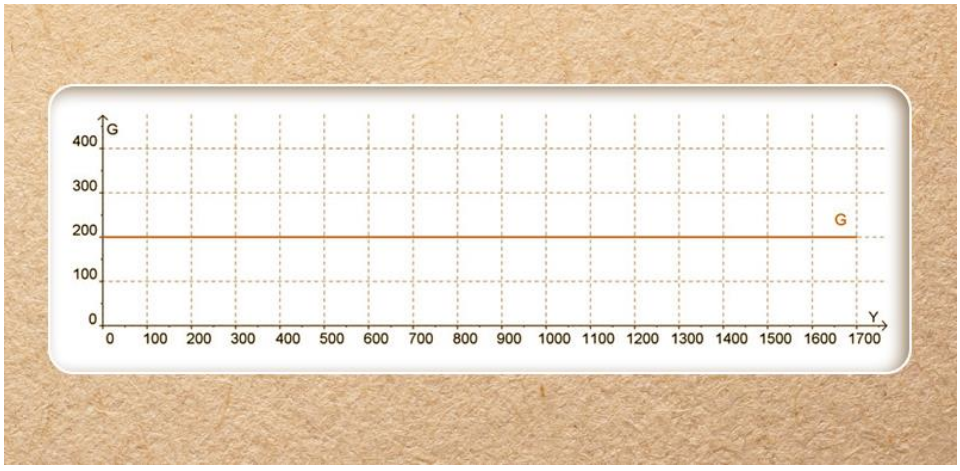

Figure 53 The size of government spending in relation to macro income

After having clarified the relationship among the different aspects of government purchases government incomes (taxes) and spendings (government purchases, transfers) we created the possibility for the introduction of the mechanism of correlation with respect to the savings of the third actors (the state):

$$S_{Á} = T_0 + z * Y – Tr - G$$

10.2.2 Product market demand in its relation to macro income, the state of equilibrium in the case of fixed interest rates in a three actors macro economy

In the case of three actors macro economy product market demand is the sum total of consumption, investment and government purchase:

$$Y^D = C + I + G$$

As presently we are examining macro demand in its relation to macro income we have to consider all the three members of demand in the context of macro income, from which it follows that the equation we established for the equation of macro demand in two actors economy is going to be enriched by a constant member (government spending), and by the influence of taxes and transfers upon consumption. On the basis of the above the equation of macro demand in the case of three actor macro economy is:

$$Y^D = C_0 + I + G + \hat{c} * (Tr - T_0) + (\hat{c} - \hat{c} * z) * Y$$

As in the case of product market equilibrium „$Y = Y^D$" macro income related to product market (income of equilibrium: Y_e) in three actors macro economy can be described through the following:

$$Y = C_0 + I + G + \hat{c} * (Tr - T_0) + (\hat{c} - \hat{c} * z) * Y$$

On the basis of the above description it is obvious that the influence of the taxes and of the transfers onto the macro demand function and through this upon macro demand is identical with the ones described in the case of the function of consumption, that is, the function shifts upwards parallel to itself- and this means that macro demand increases, if the autonomous taxes decrease, or if transfers increase, and the same influence is true if government spending increases. The sloping of macro demand function – under conditions earlier clarified in the case of the function of demand – increases, if the tax levels decrease, which means that macro demand increases. Naturally, all these also result in the growth of equilibrium income.

As we clarified it earlier, one of the most important aims of any government is to achieve economic growth, which is connected to the multiplying effect. With the appearance of the autonomous taxes and transfers

we have to get to know the **tax multiplier** besides the earlier discussed spendings multiplier.

- **The tax multiplier is the figure which shows how many units change is caused in the equilibrium income by one unit change in autonomous taxes or in transfers.**

With the spending and tax multiplier in view the economic growth caused by the income changes in the budget described by the „Haavelmo thesis" can be understood:

- **If the revenues of the budget consit only of autonomous taxes, and the chnage in incomes is identical with the changes which occured in spendings, that is the balance of the budget is not modified, then the income balance caused by the shift of incomes equals the changes which occured in government spending, that is:**

$$\Delta Y = \Delta G$$

The formula for the thesis of the tax multiplier linked to the „Haavelmo thesis" is:

$$\frac{\hat{c}}{1-\hat{c}}$$

10.2.3 Product market equilibrium in the case of changing interest rates in three actors macro economy

Naturally government spending similarly to taxes and transfers influence the IS curve as well. The curve shifts outwards parallel to itself, if government purchase and transfer payments increase, and if autonomous taxes decrease.

The curve turns outward around the vertical axis if tax rates are decreasing.

The above shifts in economic terms mean that in case of constant tax rates the income of equilibrium, that is, the GDP increases, or viewed from a different perspective, the firm sector is ready and able to produce the same GDP at higher tax rates as well.

10.2.4 The factors of the product market demand in the case of four actors macro economy

In the case of four actors macro economy the three actors model is extended by the appearance of foreign trade. On the basis of the above the four actors model is constructed as follows:

$$Y^D = C + I + G + (X - IM)$$

Export (X: export of goods directed abroad) – similarly to government spending – is independent from macro income, as the value of the goods sold by a country abroad does not depend on its income, but it depends on how the amount of available income of the given target country can buy its supplies.

The import function (IM: import of goods from abroad) is similar to those described when discussing the consumption function. Autonomous import is the equivalent of autonomous consumption (IM_0), while the equal of consumption marginal willingness is marginal import willingness (m). Autonomous import is the kind of import which exists even in the case of zero macro income.

On the basis of the above the equation of the import function in its relation to macro income function is as follows:

$$IM = IM_0 + m * (Tr - T_0) + (m - m * z) * Y$$

The state of the balance of foreign trade in its relation to macro income function

In the structure of the model of product market in a four actors macro economy „X – IM", that is the difference between export and import reflects the balance of foreign trade. The following graph shows us that as a result of the growth of macro income and parallel to it the balance of foreign trade is continuously depreciating. From the suficit position (export exceeds import) it reaches equilibrium (X = IM), and then it turns into deficit (export is less than import). From the above it follows that if macro income is increasing at unchanged marginal willingness of export, autonomous import and import, this incurs the depreciation of the foreign trade balance. This is due to the fact that the actors of economy spend part of their surplus income on purchasing imported goods, which thus „flows out" from economy. From the above description it follows that in the long run only economic growth supported by widening export (or from another point of view, with lesser demand for import) is sustainable, as in this

case the equilibrium of the balance of the foreign trade is accomplished at a higher income level.

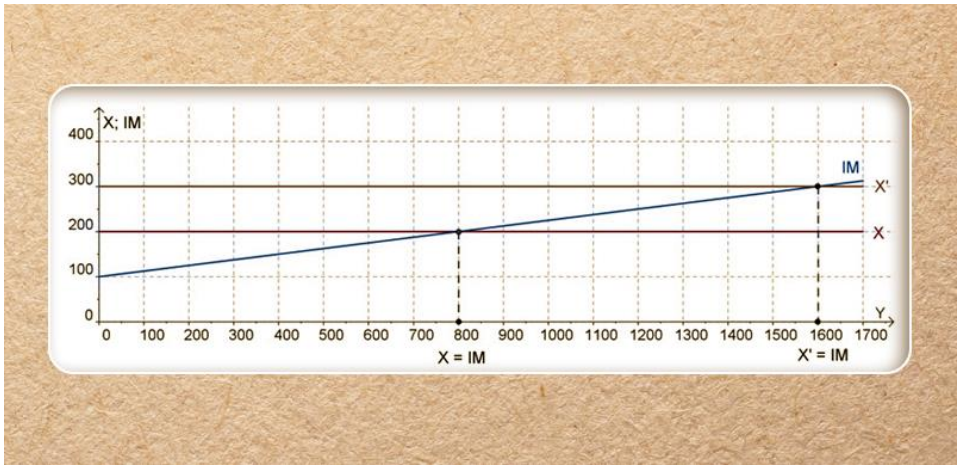

Figure 54 The interrelationship of widening export and the balance of foreign trade

As we clarified it when discussing identical income, the development of the savings of the fourth actor (foreign country) in its relationship with macro income can be described on the basis of the relationships between export and import:

$$S_K = IM - X$$
$$S_K = IM_0 + m * (Tr - T_0) + (m - m * z) * Y - X$$
$$S_K = IM_0 + m * (Tr - T_0) - X + (m - m * z) * Y$$

10.2.5 Product market demand in relation with macro income, the state of equilibrium in the case of four actors macro economy at fixed interest rates

In the case of four actors macro economy the demand of product market is constructed as follows:

,

$$Y^D = C + I + G + X - IM$$

On the basis of the above the equation of the function of macro demand in relation to macro income function in a four actors macro economy:

$$Y^D = C_0 + I + G + X - IM_0 + (\hat{c} - m) * (Tr - T_0) + (\hat{c} - m - (\hat{c} - m) * z) * Y$$

As in the case of balanced product market „$Y = Y^D$" the macro income related to macro income (equilibrium income: Y_e) in the case of four actors macro economy can be defined on the basis of the above relations:

$$Y = C_0 + I + G + X - IM_0 + (\hat{c} - m) * (Tr - T_0) + (\hat{c} - m - (\hat{c} - m) * z) * Y$$

10.2.6 Product market equilibrium in the case of changing interest rates in a four actors macro economy

Export, import and related taxes and transfers exercise influence upon the IS curve as well. The increase of the export shifts the curve outwards parallel to itself. In the case of the import, if we want to simplify the question we can say that as import - in opposition with consumption - is subtracted from macro demand, so the opposite of the changes related to consumption will present themselves on the IS curve. The growth of autonomous import and of autonomous taxes decreases import which will result in the shift of the IS curve outward parallel to itself. The same influence can be noticed when the transfer payments decrease.

The growth of the tax rates through import result in the shift of the curve on the vertical axis outward.

The above shifts from the point of view of economy mean that the shifts signalled result in the growth of the income of equilibrium, that is of the GDP through import at unchanged interest rates. Approached from another point of view, the above changes through import urge the firm sector to be able and ready to produce the same value GDP even if the interest rates are higher.

10.3 SUMMARY, QUESTIONS

10.3.1 Summary

In this unit we got acquainted with state intervention and the influences of foreign trade upon macro economy. We also discussed the influence of state by way of subvention on transfer, consumption, taxation, import of goods from abroad, on savings, and on macro income, and economic growth in the case of fixed and changing tax rates. We concluded that if the foreign trade parameters are unchanged economic growth cannot be sustained, as this is accompanied by the deterioration of the equilibrium of the foreign trade.

The discussion of the above relations signals the end of our analysis of the demand side of the product market of macro economy.

10.3.2 Self assessment questions

? Give the equation of the consumption and savings functions in their relation with macro economy in the case of three and four actors economy!

? Present and assess the shifts caused by state intervention and the development of the equilibrium income function of the macro demand and the development of the equilibrium income in economic terms!

? How do you explain that export and government spending are independent from macro income?

? How can the balance of foreign trade develop in the case of increasing income of equilibrium?

? What does the Haavelmo thesis state?

10.3.3 Practice tests

? Let us consider a three actors macro economy, where the value of autonomous consumption is 500; consumption willingness is 0,7; tax rate is 20%. On the basis of the above data the equation of the consumption function is:

– C = 500 + 0,9 * Y
– C = 500 + 0,56 * Y
– C = 500 + 0,5 * Y
– C = 400 + 0,7 * Y

? As the result of decreasing tax rates the private sector:

– the sloping of the savings function is decreasing, while the consumption function slope is abruptly increasing
– the sloping of both the consumption function and of the savings consumption is decreasing
– the sloping of both the savings function and of the consumption function is increasing
– the sloping of the consumption function is decreasing, while the sloping of the savings function is increasing

? As a result of the appearance of the interest rates the sloping of the savings function of the private sector:

- changes by z
- changes by ŝ * z
- changes by ŝ * T_0
- changes by z * T_0

? Government spending:
- can only be increased if interest revenues are increased
- can only be increased in the case of the reduction of transfer payments
- can only be increased in the case of the growth of macro income
- none of the above statements is true

? In a classical sense the import function:
- shows increased macro income in relation with import
- shows increased import in relation with increased macro income
- in the case of depreciation of the exchange rate of the national currency it shows decreasing import
- in relation with increasing export it shows decreasing import

11. UNIT: THE ANALYSIS OF THE SUPPLY SIDE OF THE PRODUCT MARKET

11.1 AIMS AND COMPETENCIES

In the course of this unit we are going to get acquainted with the relationship between the intricacies of labour market and macroeconomic production. We will be able to form an idea about the influence of price, wages, and the quantity and quality of labour force on the efficiency of economy. We are going to discuss the role of real wages in employment, unemployment and efficiency. Endowed with this knowledge we are not only going to be able to understand better the things we read, hear and see in the media in this respect, but we are going to be able to model the above mentioned relationships with the help of tools offered by mathematics. This model cantered approach will also enable us to draw conclusions regarding expectations generated by certain decisions in the field of economic policy.

11.2 STUDY MATERIAL

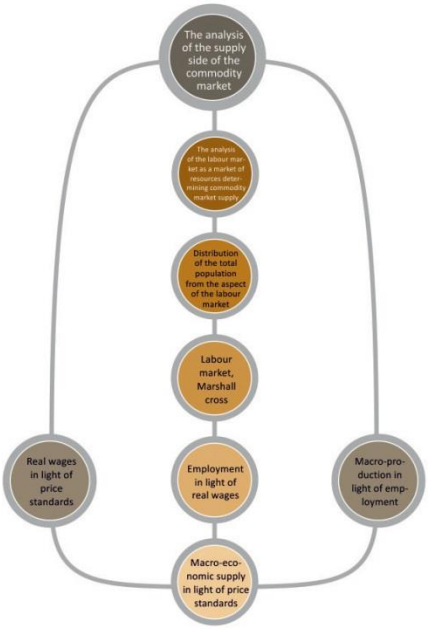

Figure 55 Mind map

11.2.1 The analysis of labour market as resource market which determines product market supply

In order to create supply on the product market there is need for production. Production needs resources, and labour force is one of the most important resources from the point of view of modelling of macroeconomic processes. This is so because work in the short run is the only resource the quantity of which can be changed, and to which all the other resources are related, and the quantity of which can be changed (entrepreneurial abilities, capital) and interpreted, which is not the case with natural resources. This is why the processes of the labour market have to be surveyed along with the analysis of the supply side of the product market.

Elements of labour market:

- Demand for labour;
- Supply of labour;
- The price of labour

Demand for labour (L^D) is the need for labour force of the firm sector. The labour demand function shows its size in its relation with the real wages.

Supply of labour (L^S) the number of labourers who offer their labour force to perform work, that is who are able and ready to participate in the working activity organized at a social level. The labour supply function shows its size in relation with the real wages.

The price of labour is the wage, which has two distinguishable categories – nominal wage (W) and real wage $\left(\frac{W}{P}\right)$:

- Nominal wage is the sum of money the labourer gets in cash for the work done.
- Real wage is the quantity of goods and services that can be bought for nominal wages.

The division of total population from the point of view of the labour market

Total population can be structured as follows from the point of view of the labour market as shown in the chart below.

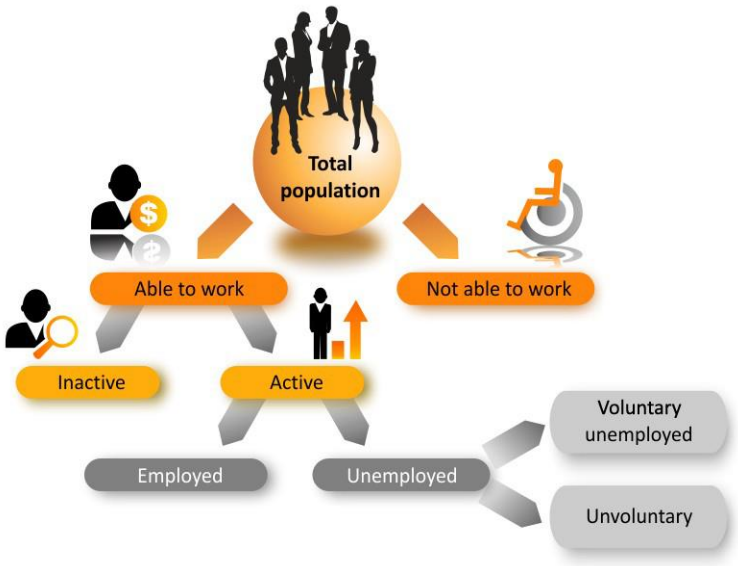

Figure 56 Division of the total population from the perspective of the labour market

Not able to work are those members of the society who due to their age (children; elderly), or due to their health conditions (are not capable of work) cannot be employed to perform working activities.

Inactives form the section of the population able to work, who would be able to work, but in spite of this they do not offer their labour force for work, that is have no intention to take part in the working process organized on a social scale. These are for example people who do not live on wages (they won the lottery; live on the benefits of their investments; etc.), housewives, and also those who used to draw (but they do not any more) unemployment benefit or other social benefits and gave up looking for a job or try to live from odd jobs.

Although the **volunteer unemployed** would like to work, their status is that of volunteer unemployed either because they do not want to do the work they previously did, or not for the money they got in their previous workplace.

Forced unemployed are those who would like to work, but cannot find a job.

- You can get up to date information about the unemployment data in the different countries of the world form the above database:

9. http://www.ilo.org/global/statistics-and-databases/lang--en/index.htm

Labour market Marshall-cross

If we illustrate the supply and demand functions of any market on a shared coordinate system we get the Marshall cross, where the intersection of the two functions represent the equilibrium position of the market. The definition originates from the name of Alfred Marshall.

10. http://www.britannica.com/EBchecked/topic/366539/Alfred-Marshall

The labour market Marshall-cross is the shared representation of labour supply and labour demand functions in a coordinate system.

As we clarified it earlier the labour supply function expresses the demand of the firm sector in relation to real wages, while the labour supply function expresses the number of labourers ready to work on the same real wages function. The direction of the functions is the one characteristic in the case of the demand and supply functions, in the case of increasing prices (real wages) increased supply and decreasing demand are connected.

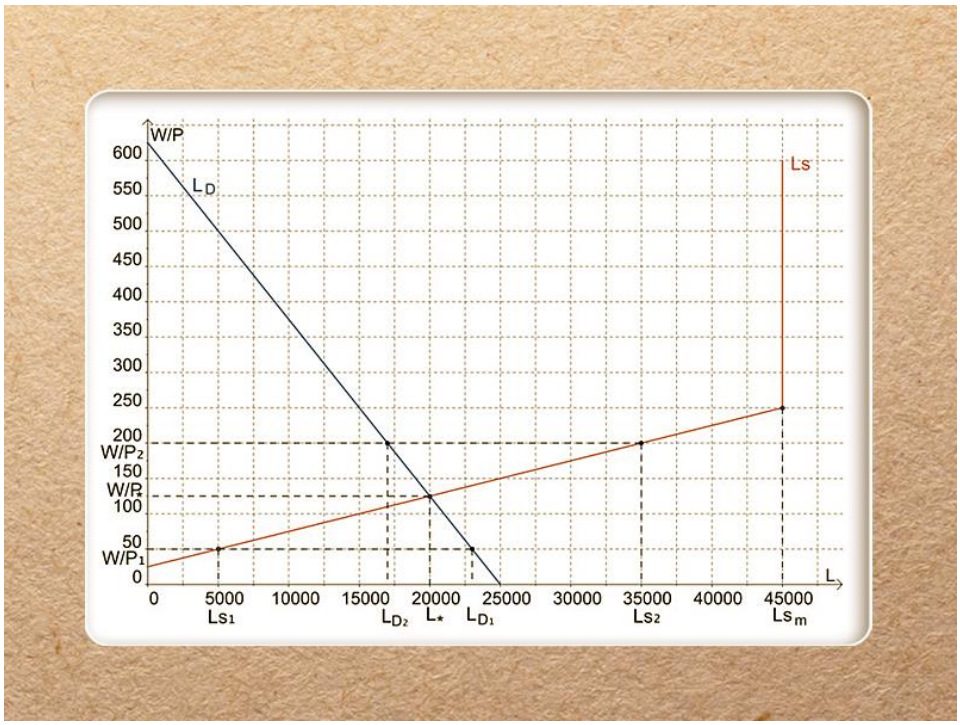

Figure 57 Marshall-cross of labour market

From the above labour market Marshall-cross the following characteristics of labour market can be read:

- Ls_m: maximal supply of labour. This is the active part of the population able to work, that is the labour force stock. Approached from another point of view it is the maximal sum of the employees who are ready and able to perform work in a given society. At this point there is no use in increasing the real wage because this will not lead to increased labour supply, as there are no more available active members of the society, that is, there is a shortage of people who could be employed. This is why the labour supply function changes its position to vertical at this point.
- Ls_2: labour force supply in the case of $(W/P)_2$ real wages, that is the number of workers who at a certain level of real wage are ready and able to perform work.
- Ls_m - Ls_2: The number of voluntary unemployed in the case of $(W/P)_2$ real wages. In other words, this is the number of those

labourers who would be able to, but do not want to work at the given real wages.

- L_{D2}: Labour force demand, that is the demand of the firm sector for labour force in the case of $(W/P)_2$ real wages. At the same time this is the number of active employees at the given level of real wages (we are going to return to this later).
- $Ls_2 - L_{D2}$: the number of unwilled unemployed in the case of $(W/P)_2$ real wages.
- L_*: Equilibrium employment at $(W/P)_*$ equilibrium real wages, which is identical with the maximal employment as well (we are going to return to this later).
- $Ls_m - L_*$: The number of volunteer unemployed at $(W/P)_*$ equilibrium real wages.
- Ls_1 supply of labour, which is at the same time the number of the employed (we are going to return to this later as well) at $(W/P)_1$ real wages.
- $Ls_m - Ls_1$: The number of volunteer unemployed in the case of $(W/P)_1$ real wages.
- $L_{D1} - Ls_1$: Extra demand for labour, in other words shortage of labour force in the case of $(W/P)_1$ real wages.

We can see on the Marshall-cross above that the labour supply function intersects the vertical axis at 25 units of real wages. This 25 unit is practically the real value of the social benefits obtainable in long term (unemployment benefit, other support). Nobody will offer his labour force for a lower real wage which means that supply of labour force reaches zero.

The development of employment in relation with real wages

The development of employment in its relation with real wages can be discussed on the basis of the **shorter side principle**:

If supply and demand of labour force is not equal, then the number of the employed is always determined by the lower figure. This is why in the case of real wages lower than the real wages of equilibrium, supply of labour, and in the case of wages higher than the real wages of equilibrium, demand for labour, will determine the number of employed people, and maximal employment is attained in the point of equilibrium.

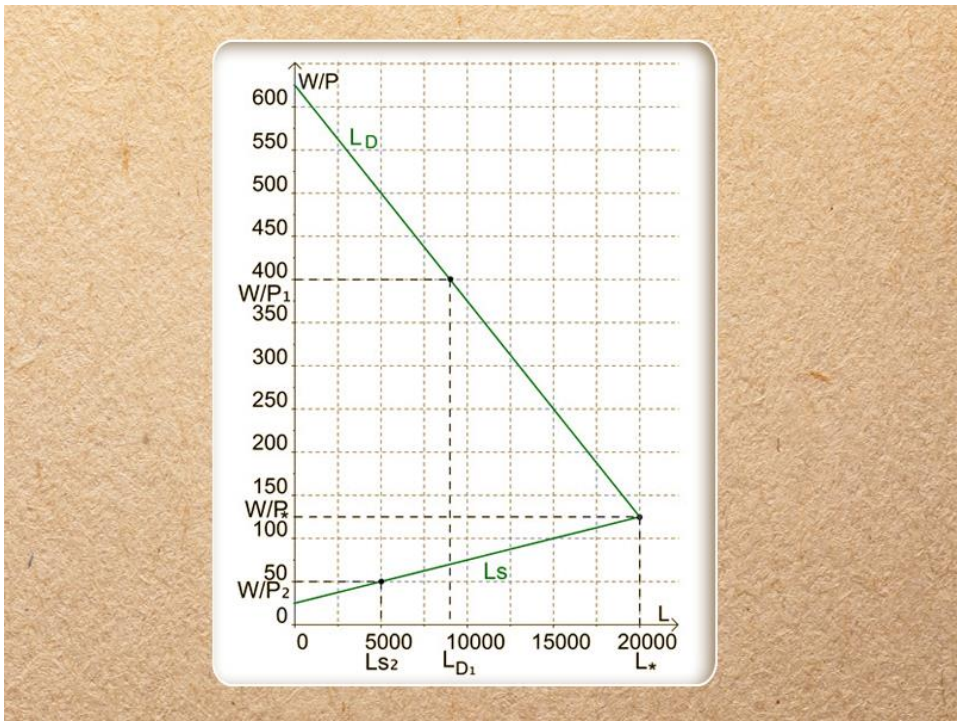

Figure 58 Employment function

If we examine the labour force Marshall-cross we shall see that the number of volunteer unemployed at a given level of real wages depends on the sloping of the labour supply function. It is also obvious that the number of volunteer unemployed at a given level of real wages is determined by the welfare of the society. In the case of wealthier (having more powerful social background, more personal savings etc.) societies the sloping of the labour force supply is naturally smaller, in the case of not so well off societies the number of volunteers could even cease, that is, the labour force supply function is vertical in the case of the active population, which means that the function loses its flexibility .

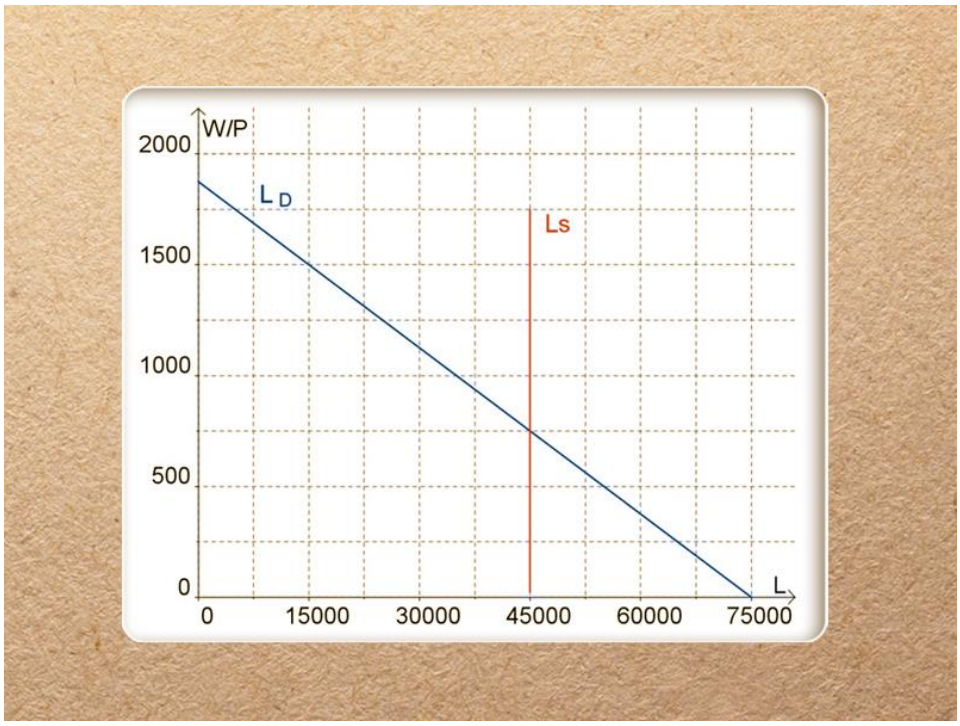

Figure 59 Marshall-cross of labour market in the case of inflexible labour supply

In the case of inflexible work supply of course the shape of the employment function discussed earlier will also change, its positive section will become vertical.

- In the above exhibit for the sake of better illustraion we shifted the labour demand function outward parallel to itself. This practically means that demand for labour force increased independent from real wages – for example as the result of government spending, or improving profit expectations – as compared to the ones illustrated earlier.

Unemployment

The size of unemployment is shown by the unemployment rate:

$$\text{Unemployment rate} = \frac{\text{Registered unemployed}}{\text{Economically active}}$$

$$\text{Munkanélküliségi ráta} = \frac{\text{munkanélküliek száma}}{\text{aktív népessg}}$$

Types of unemployment:

- Unemployment caused by unfavourable economic conditions: unemployment stemming from the decrease of efficiency in economic production. If demand for the products of an economy is decreasing, than supply decreases similarly to production which in turn means that there is need for less labour force and this results in the increase of unemployment.
- Structural unemployment: in this case there are vacant jobs yet there is unemployment as well. The reason for this is that supply of labour force and demand for labour force differ from one another in some relevant characteristics. For instance there is demand for nurses, but there is supply for turners (unemployed).
- Frictional (temporal) unemployment: if the employee hands in his notice then while he is looking for a new job he is considered to be temporarily unemployed. Youngsters after leaving school, while they are looking for their first job are also considered unemployed.
- Technological unemployment: with the advance of technology some of the workers are replaced by technical tools and this leads to the increase of unemployment.

Tools for handling unemployment:

- Active tools: aim, to provide a job for the unemployed.
  - Increasing the autonomous elements of labour demand by way of government intervention which in turn increases the efficiency of economy in a multiplying way.
  - State subventions and favourable loans aimed at starting new firms.
  - Providing possibility for voluntary work
  - High level training and retraining
  - Organizing placement fairs

The active tools enlisted above can help the unemployed, and they can help preventing unemployment. This is the role of the vacancy markets, organized by institutes of higher education. You can see examples for this in the video below.

- Passive tools: aim, to render the state of being unemployed bearable for the unemployed.
  - Unemployment benefit.
  - Early retirement scheme.

11.2.2 The relationship between macroeconomic production and product market supply

Macroeconomic employment is nothing else but the employment of the labour force in the course of production, which influences the size of output.

The relationship between labour and production is shown by the production function.

Macroeconomic production function

Macroeconomic production function shows the development of macroeconomic production at constant capital stock in its relation with employment.

Macroeconomic production is nothing else but macroeconomic supply, that is, macro income.

So on the basis of the above we can state that the macroeconomic production function shows the development of macro supply (macro income (Y) in its relation to employment (L) at constant capital stock.

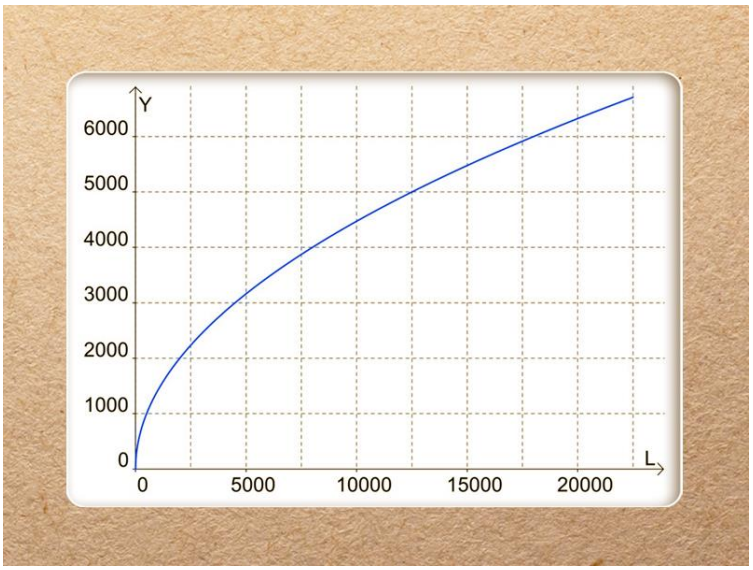

Figure 60 Macro-output function

Due to the growth of the capital stock the MA coproduction function is prolonged upwards, because greater productivity can be obtained with the same amount of labour force. Yet, capital stock cannot be employed at zero labour force level and as a result the produced macro income is zero. The same effect is true with regards to the productivity of labour, which improves as the result of training standards, or when technology develops.

The macro supply curve related to price level

As real wages are the ratio of the nominal wages (w) and of the price level (p), real wages can be given, and illustrated in the case of the fixed nominal wages related to price level. As the employment function shows it the development of employment in its relationship with real wages, and the macro production function show macroeconomic production in its relationship with employment, that is related to supply, and real wages. So on the basis of the macro production function the macro supply function can be drawn in the case of nominal wages fixed at a given price level.

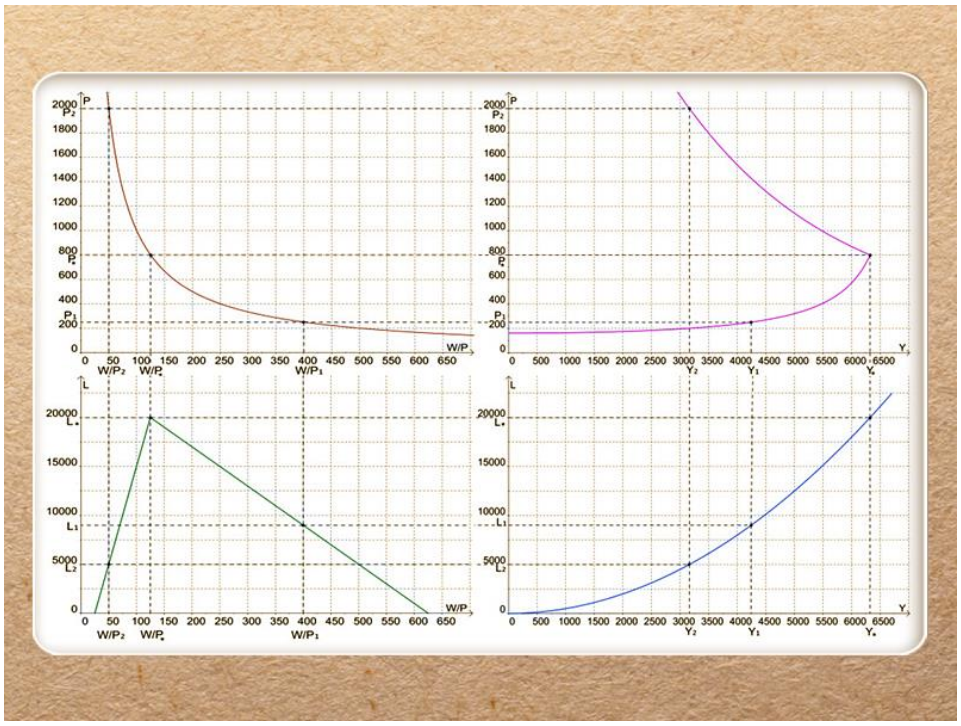

Figure 61 Macro supply function in relation to price level function

We can construct the macro supply function on the basis of the following logic: price level determines real wages on the real wages function; real wages determine employment on the employment function; employment determines production, that is supply, on the production function; thus, finally the price level determines supply. While designing it we should pay attention to the fact that the breaking point of the employment function should appear among the points used in the course of drawing among the points of the coordinating system.

If we examine the macro supply function we can see that, parallel to the growth of the price level it grows until price level P_*, from this point on it decreases along with the growth of the price level. The cause for this can be easily traced in the employment function. Up to price level P_* employment is determined by the labour demand function, and is parallel to the increase of price level the price of labour, that is, the real wages decrease (nominal wages are fixed), demand for labour force and consequently employment increase. Increasing employment results in increasing production, that is increasing supply. Above price level P_* the labour

supply function determines employment, and because parallel to the increase of price level the price of labour, that is, real wages decrease (nominal wages are fixed), supply of labour and employment decrease. Decreasing employment results in decreasing production, that is supply, is decreasing as well.

On the basis of the above it is clear that, in case of non-flexible labour supply the backward bend of the macro supply shifts into the vertical position because in this case above P_* price level employment among the active population is constant.

At price level P_* Y_* output is the maximum possible output under the given circumstances, that is, it is the potential output. It is obvious that the maximal potential output of an economy can be achieved in the case of maximal employment, that is, in the case of labour force market equilibrium.

On the chart system discussed above it can be seen that the macro supply function shift upwards as a result of the growth in nominal wages (the real wages function shifts outward) – parallel to this it is prolonged – so the firm sector can sell the same output at higher price with the result that the firm sector sells the same output at a higher price. This is understandable as the growth of nominal wages increases the expenses of the firm sector, which the firms include into their price.

11.3 SUMMARY, QUESTIONS

11.3.1 Summary

In this unit we got acquainted with the most important relationships within the labour force market, and the relationship between the supply side of the labour force market and of the product market. In the course of our discussion we clarified the representation of the population on the labour force market as well as its composition, the influence of employment and unemployment upon macroeconomic efficiency, by the help of which we drew the macro supply function, which shows the development of macroeconomic production, that is, of the product market supply in its relationship with price level. By this we closed down not only our study of the labour force market, but also our analysis of the product market, so in the next unit we can pass on to the examination of money market from macroeconomic perspectives.

11.3.2 Self assessment questions

? What is the difference between inactive population and the voluntary unemployed section of the population?

? Is there unemployment in the case of labour force market equilibrium?

? In what way does technological development appear on the macro production function?

? What is potential output, in what state is the labour force market in this case?

? How does the growth of nominal wages appear on the macro supply function?

11.3.3 Practice tests

? The labour force demand function:
- shows those potential workers who are looking for a job, in its relationship with the real wages function
- shows the development of the average net income in its relation with the worked hours
- shows the quantity of goods which the consumers are willing and able to buy at a given time and price in its relationship with the real wages
- shows the demand of the firm sector in its relationship with real wages

? As a result of the growth of the number of the active population with all the other factors unchanged:
- demand for labour force decreases
- the supply of labour increases
- real wages increase
- the labour force supply function shifts toward the axis

? Under the equilibrium level of real wages:
- there is no unemployment, because there is a shortage of labour force
- there is imposed unemployment
- employment is regulated by labour force supply
- labour force demand is lower than labour force supply

? Macro supply influenced by increase in price level:
- certainly grows

- certainly decreases
- it can either grow or decrease
- does not change

? The real wages function taken in its classical form:

- shows the development of real wages in their relation with nominal wages, at fixed price levels
- shows the development of the real wages in their relation with price levels, in the case of fixed nominal wages
- it shows the development of the real wages in their relation with tax rates, in the case of fixed nominal wages
- shows the development of the real wages in their relation with macro income, at fixed price levels

12. UNIT: ANALYSIS OF FINANCIAL MARKETS, THE EQUILIBRIUM OF MONEY MARKETS AND PRODUCT MARKETS

12.1 AIMS AND COMPETENCIES

The aim of the present unit is to discuss the factors influencing money demand and money supply and to create, on the basis of the knowledge thus acquired, macroeconomic models of the economic processes functioning on the money market. As a result of this we are going to get acquainted with the factors which motivate the money demand of the actors of economy and the monetary tools with the help of which the central bank regulates the financial processes of economy. Our knowledge of the supply and demand sides of the money market, together with our knowledge of the tools used to regulate financial processes, will enable us to produce the model of the equilibrium of the money market, which linked to the earlier discussed equilibrium mechanism of the product market will help us to analyse the totality of macro economy from the point of view of equilibrium, and thus we can close down our study of macro economy.

12.2 STUDY MATERIAL

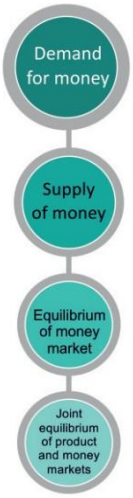

Figure 62 Mind map

12.2.1 The demand and supply side of the money market, the equilibrium of the money market

In the course of our earlier studies (Economics 1) we learned about the baking system, the concept and history of money, different kinds of categorizations of money and the process of creating money. On the basis of these we put emphasis onto the macroeconomic modelling of the way the money market operates.

Demand for money

Demand for money (M^D) is the demand of the actors of economy in the form of M1 money.

Factors which motivate demand for money:

1. Transactionary demand for money (L_t): demand for money designed to cover the expenses of daily purchases. Its size grows parallel to the growth of macro income, because the growth of macro income results in the growth of the welfare of the society, consequently the consumption of the members of the society implies greater value.

$$L_t = k * Y \qquad \text{Where „k” is constant}$$

2. Security demand for money: ($L_ó$): demand for money serving the funding of unexpected expenses. Its size grows parallel to the growth of macro income and it decreases parallel to the increase of the interest rates. The relationship between macro income and security demand for money can be explained through welfare this time as well, its relationship with interest rate can be explained through the fact that the keeping expenses of money kept in M1 form is the rate lost, which the owner of the money would have obtained if he had not kept his money in M1 form, but he would have kept it in M2 or M3 form. From this it follows that the increase of interest rates results in the increase of the cost of keeping of security money in M1 form, so the owner will keep smaller sums for security reasons in M1 form.

$$L_ó = b * Y - d * i \qquad \text{where „b” and „d” are constant}$$

3. Speculative demand for money (L_s): demand for money aimed at increasing fortune. Its size decreases parallel with the increase of

interest rate, because in the case of increasing interest rates it is not worth for the actors of economy to keep their money in M1 form, as the interest rate of money kept in M1 form is practically zero, so if they want to increase their fortune it is worth buying bonds and keeping their money in M2 form. From another perspective we can say that in the case of deceasing interest rates the actors of economy demand more and more money to increase their investments in M1 form.

$$L_s = L_0 - h * i \qquad \text{where „}L_0\text{” and „h” are constant}$$

The total market demand is the sum total of the above mentioned three elements, so:

$$M^D = L_t + L_ó + L_s$$

- $L_t = k * Y$
- $L_ó = b * Y - d * i$
- $L_s = L_0 - h * i$

From the above equations we can see that security demand for money similarly to demand for transaction money grows parallel with the increase of the macro income, and just like the demand for speculative money decreases parallel to the increase of interest rates. This means that the part of the security money which depends on macro income can be included into demand for transaction money, while its part which depends on the interest rate can be included into the demand for speculative money. On the basis of the above the money demand function is:

$$M^D = k * Y + L_0 - h * i$$

As interest rate is the price of money, demand for money has to be illustrated in its relation to interest rate.

On the basis of the image and the equation of the money demand function we can state the demand for money behaves in the way demand functions usually behave, increasing interest rates (price) generate reduced demand for money.

If GDP, that is the macro income, is increasing this appears in the total demand for money as it is reflected by the demand for transaction money and security money. This can be noticed in the parallel upward shift of the total demand of money function.

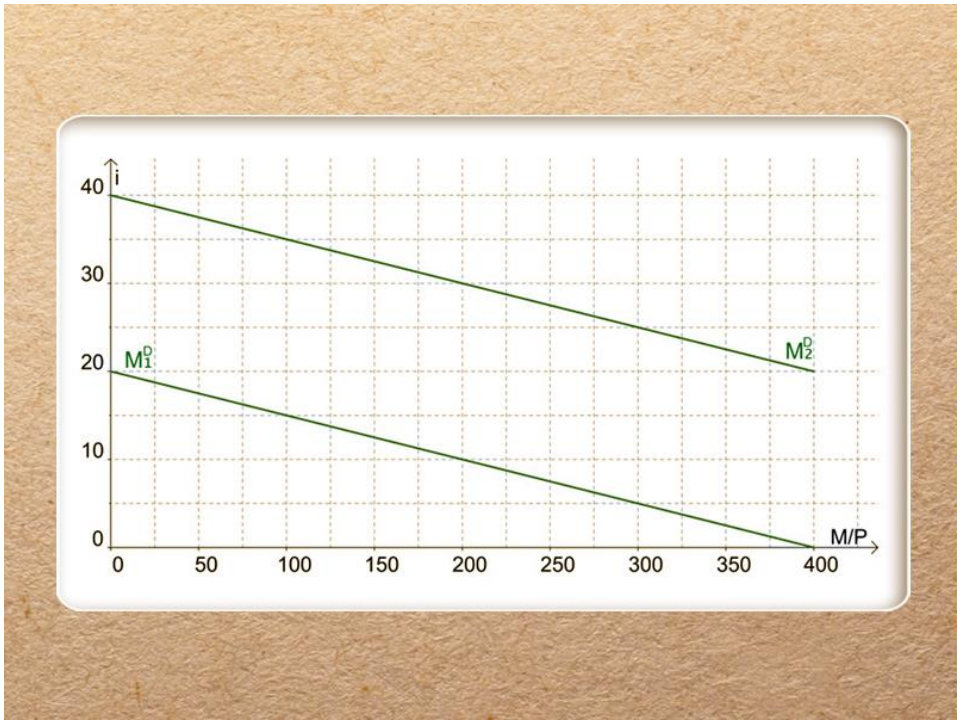

Figure 63 The influence of macro income growth on money demand function

Supply of money

Types of money supply:

- Nominal supply of money (M^S): the sum of M1 money in circulation
- Real supply of money ($\frac{M^S}{P}$): the quantity of goods and services that can be bought for the nominal supply of money

The size of the nominal money supply is regulated by the central bank in its own right, so the nominal supply of money is independent from all the real factors of economy, interest rates included.

Tools for regulating nominal supply of money:

- Compulsory change of savings rate: in the case of the increase of rates of savings the supply of money decreases, because in the case of increase in the greater part of the reserve rate the supply of money is decreasing, as trading banks have to store a greater

percentage of their deposit in the central bank in the form of central bank money and thus their free deposits are decreasing. Because of this they will be able to multiply less money and they can place less money into economy by way of credits. Besides the value of the money producing multiplier is decreasing, which in turn further decreases the supply of money. In this case the trading banks can multiply less money and by less.

- Change of interest rate of refinancing: in the case of increase of interest rate supply of money is decreasing, because the trading banks borrow less money from the central bank in order to multiply it by placing it into economy in the form of loans.
- Open market manoeuvres/activities: in this case the central bank sells or buys bonds. If it sells bonds, then the amount of money in circulation is decreasing, because the trading banks pay for the bonds using their free central bank money reserves, and so they will be able to multiply less central bank money. On the other hand it is not only the trading banks who can buy the bonds issued by the central bank, but also other actors of economy (households, firms), so the money in circulation is decreasing directly as well.

The amount of M1 money needed for the exchange of goods and services, that is the supply of money is greatly affected by the speed of money circulation or velocity.

- **Velocity (V) is the figure which shows in how many transactions does a „piece/unit of money"take part.**

Velocity is determined by, is the ratio of, the nominal income and nominal supply of money in a given year.

$$V = \frac{Y * P}{M^s}$$

If we rearrange the above relationship we get the so called Fisher equation of exchange:

$$M^S * V = Y * P$$

As the velocity of money does not change in the short run, with the help of the Fisher equation of exchange we can define the amount of

nominal money necessary for the undisturbed functioning of the economy, that is the amount of supply of money.

As supply is always represented as the function of the price of the „thing" being discussed, and because the price of money is interest rate, the money supply function shows the developments of money supply in its relationship with interest rate. In the case of the money supply function we operate by real supply of money, because demand for money is always real demand (the demand of the actors of the economy depends on how many goods and services they want to purchase), so we can only analyse supply of money and demand for money together (Marshall-cross), if the dimension of both factors is identical.

From the representation of real supply of money - which is at the same time the formula for calculating it - we can see that its size is determined by the nominal supply of money and the price level. The decreasing of nominal supply and the growth of price level (it signals inflation) determines the decrease of real money supply, which results in the shift of the real money supply function towards the vertical axis.

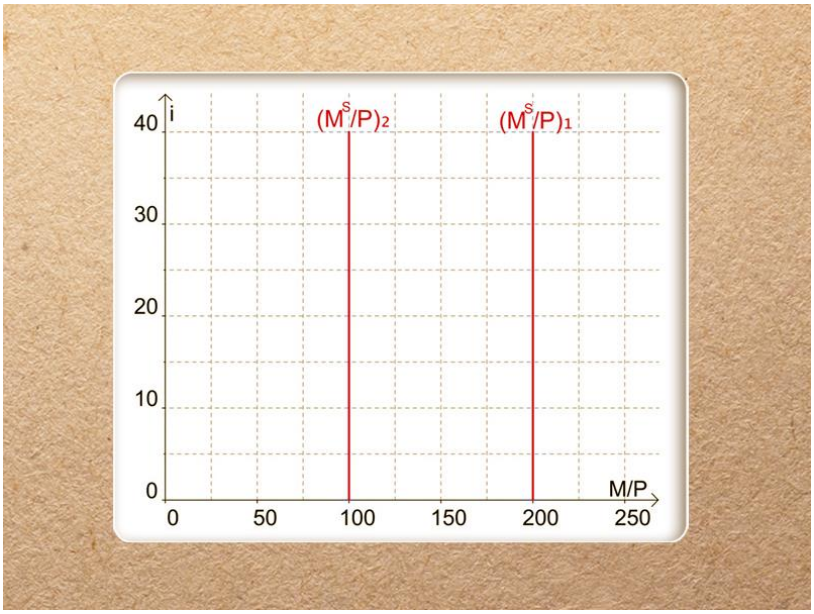

Figure 64 The decrease of real money supply

If we draw the money supply and the money demand function in a common coordinating system we get the market Marshall-cross, on which the intersection of the two functions signals the interest rate characteristic for the equilibrium of economy (i_e).

In economy the decreasing of real supply of money brings forth the increase of the interest rate of equilibrium. On the basis of this, and of the things described above, it is clear that the increase of price levels and the decreasing of the nominal supply of money bring about the increase of interest rates.

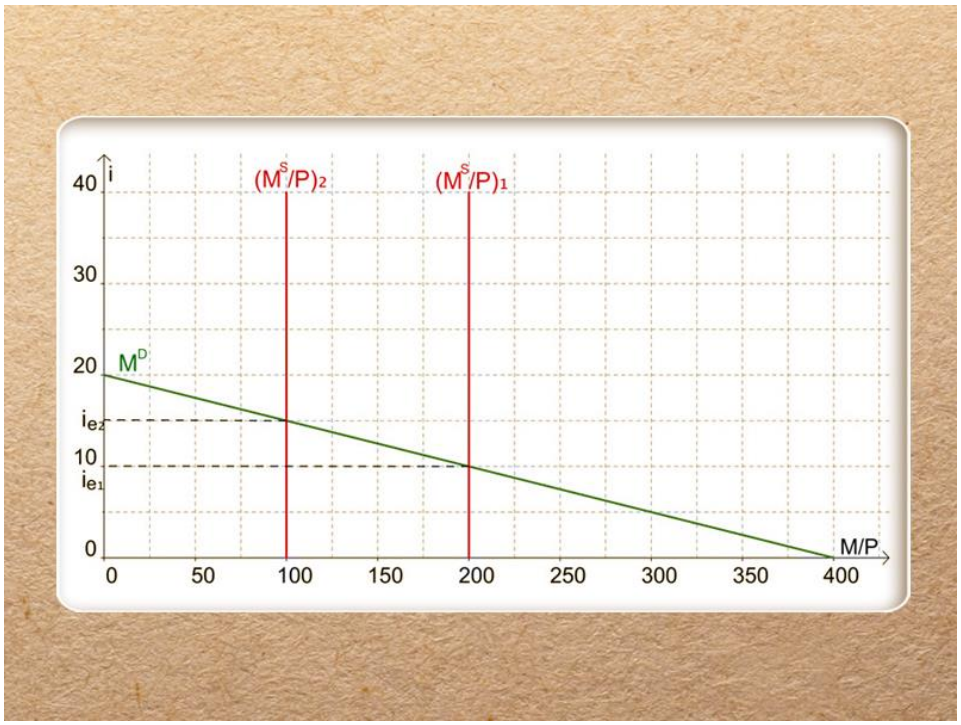

Figure 65 The influence of decreasing real money supply on equilibrium interest rate

The increase of the GDP, that is of the increase of the macro income of equilibrium, brings about the increase of the interest rate of equilibrium on the money market.

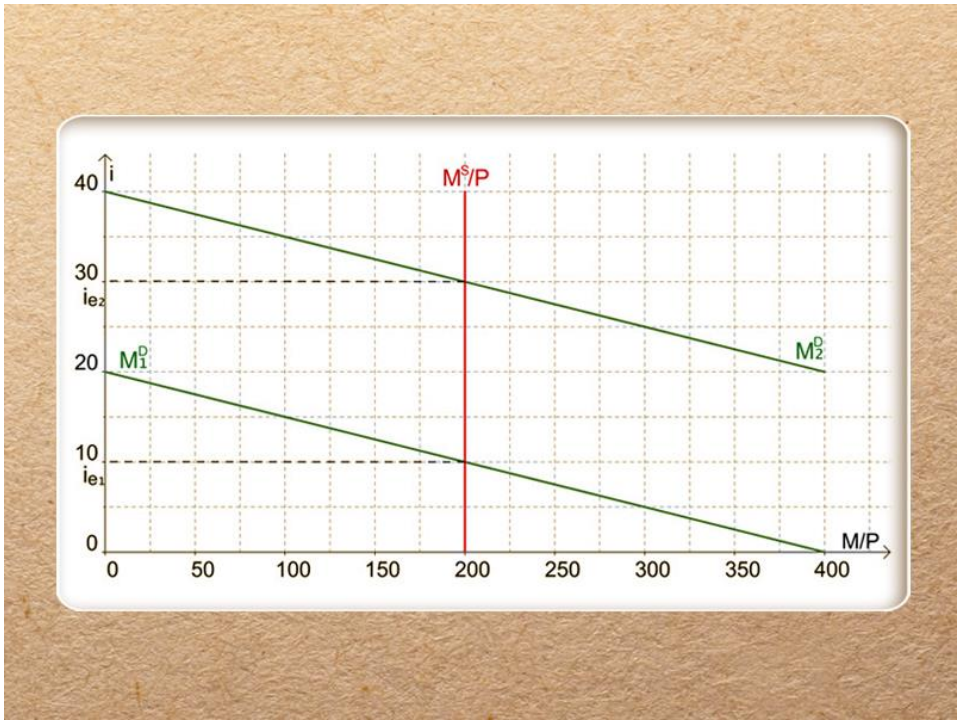

Figure 66 The influence of increasing macro income on equilibrium interest rate

The relationship between macro income and interest rate in the case of money market equilibrium.

The relationship between macro income and interest rate in case of money market equilibrium is shown by the LM curve.

The LM curve is the sum total of combinations of macroincome and interest rate in the coordinate system which provide equilibrium for the money market, that is supply for money is equal with demand for money.

In the illustration showing the influence of macro economy onto interest rate we could see that parallel to the increase of macro income the interest rate of equilibrium also grows. As both the money supply and the money demand functions are linear, it is obvious, that the LM curve which is deduced from them is also going to be linear.

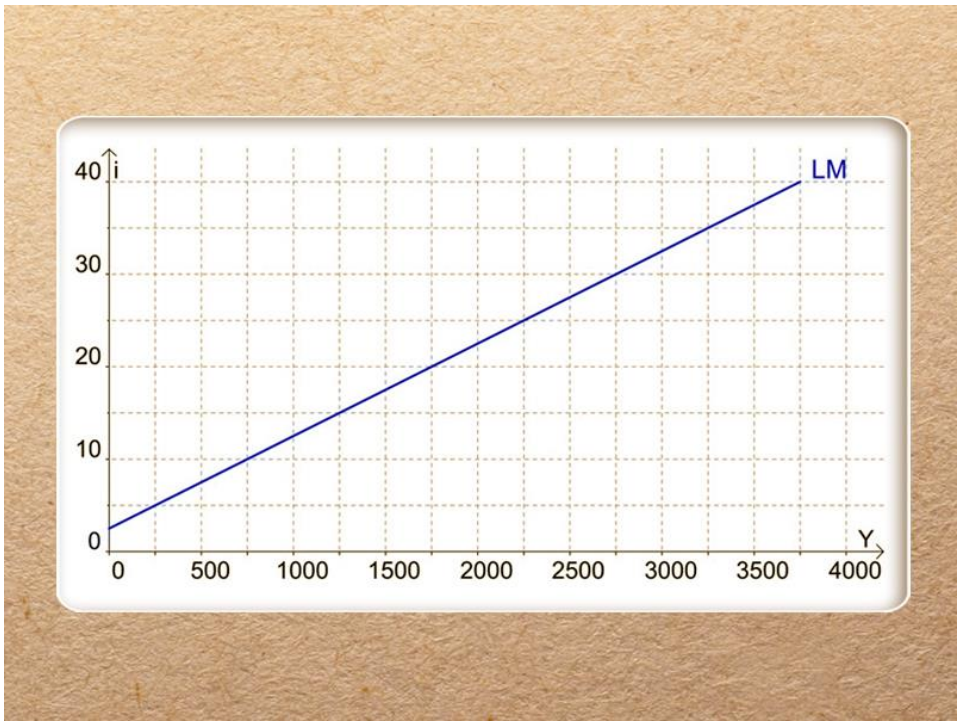

Figure 67 Liquidity – Money (LM) curve

As we have seen it in the exhibit illustrating the influence of the decrease of the real supply of money onto the interest rate of equilibrium the decreasing of the real supply of money generates the increase of the interest rate of equilibrium in the case of unchanged macro income. On the LM curve this can be noticed through the upward shift of the curve parallel to itself, as in this case the interest rate of equilibrium increases at all the levels of the macro income.

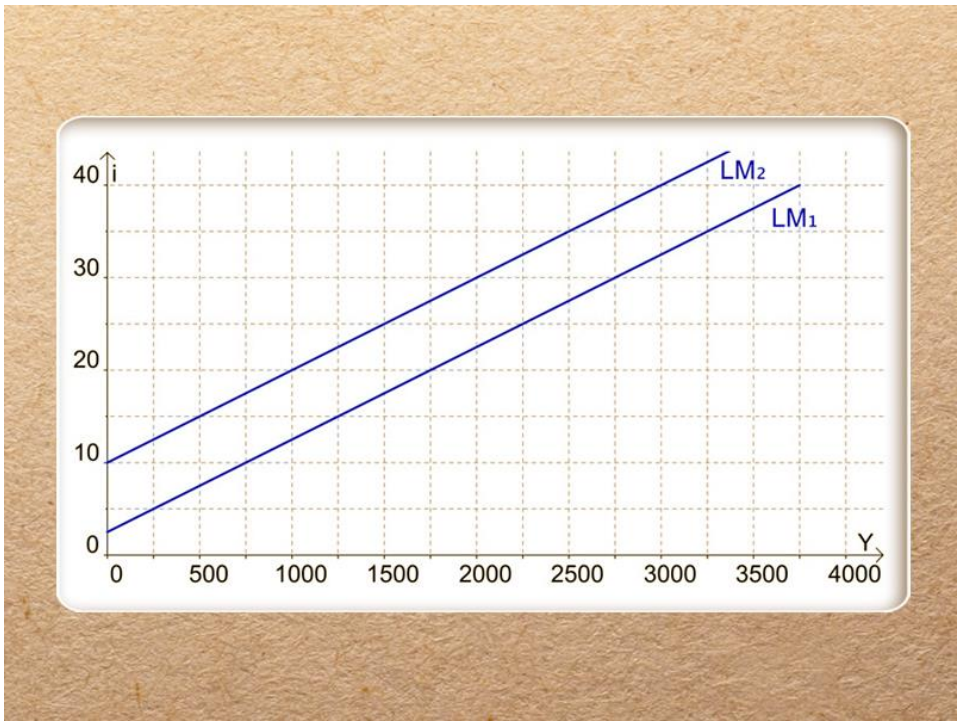

Figure 68 The influence of decreasing money supply on the LM curve

As the macro income and the interest rate belonging to the LM curve show combinations, the situation of the money market can be modelled with the help of the curve in the case of surplus of demand and surplus supply as well.

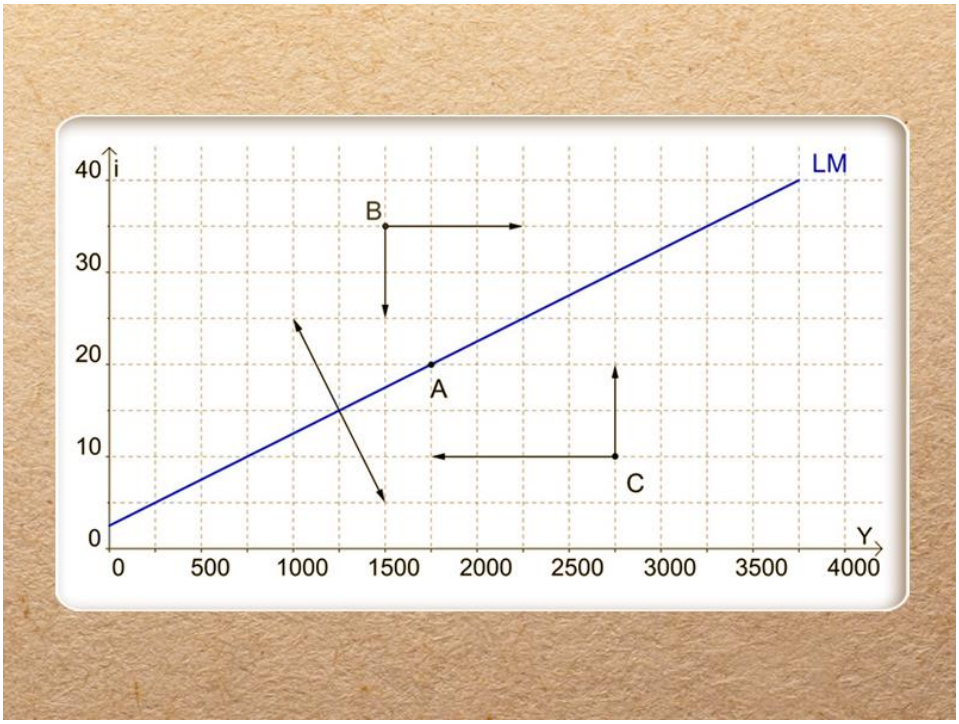

Figure 69 Equilibrium conditions of money market on the basis of the LM curve

In point „A" the money market is in equilibrium, because point „A" is on the LM curve, and the curve represents points of equilibrium. In point „B" there is a shortage of supply, that is there is excessive demand, because the interest rate belonging to point „B" is higher than the interest rate of equilibrium (the interest rate of equilibrium is formed on the curve, but to achieve this the interest rates belonging to point „B" should be lowered), so the speculative demand for money belonging to point „B" – and thus total demand as well – is lower than the demand belonging to the equilibrium (parallel to the increasing of the interest rate the speculative demand for money is decreasing). In point „C" there is excessive demand, the explanation for which is identical with the antithesis of the explanation provided in the case of point „B".

In the course of re-establishing equilibrium of the money market the aim is to get back onto the IS curve which represents the points of equilibrium. To achieve this the mechanism of rehabilitation is as follows:

On a market with excessive supply (point B) either the interest rates have to be reduced with the help of the tools of the central bank, and thus total demand for money has to be increased to the level of supply of

money, through the increasing of the speculative demand for money, or by increasing macro income through the increase of transaction demand for money, the total demand for money can be increased to the level of money supply. In the case of excessive demand the opposite of the rehabilitation mechanism should be employed.

The rehabilitation of the money market equilibrium can be achieved from the supply side as well. As we have seen it in the exhibit illustrating the influence of the decreasing of the real money supply onto the LM curve, the changing of the real money supply results in the parallel shift of the LM curve. On the basis of this it can be seen that the equilibrium of the money market cannot only be re-established by stepping back from the characteristic point of disequilibrium, that is by stepping back from the point of disequilibrium, onto the LM curve, but it is also possible if we we shift the LM curve onto the point of disequilibrium, and thus this point becomes the point of equilibrium.

12.2.2 The joint equilibrium of product and money markets

The discussion of this topic completes our macroeconomic modelling aimed at the interpretation of the intricacies of national economy. The state of equilibrium of the product market and the mechanism of effects of fiscal tools available to the government were represented by the IS curve and its shifts. In this unit we examined the system and effects of the other great market of economy, that is that of money market, we interpreted the LM curve which illustrates the equilibrium of the money market, and the tools available to the central bank, as well as their effects onto the money market and its equilibrium. If we link the curves representing the conditions of the equilibrium of the two about mentioned markets we can analyse the equilibrium of the whole economy, and the macroeconomic effect of its fiscal and monetary policy upon macro economy. This is illustrated by the IS-LM system which represents the joint equilibrium of the product and money markets. From the intersection point of the two functions we can read the characteristic interest rate of equilibrium (i_e), and the income of equilibrium (Y_e) that is the actual GDP achieved.

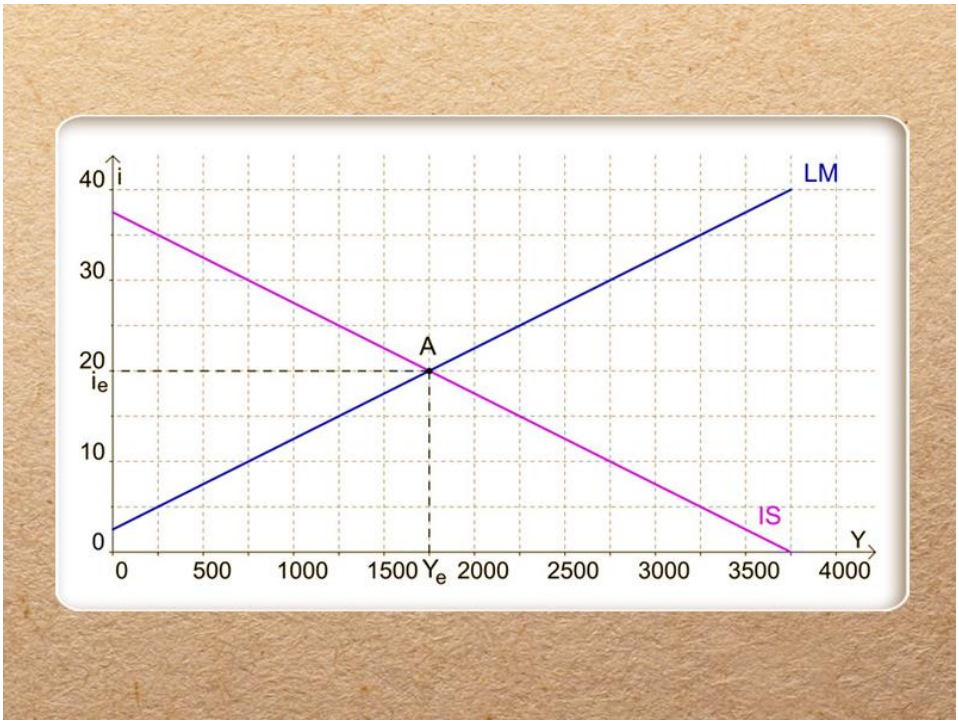

Figure 70 IS – LM system

- You can learn more about the GDP of the different countries of the world, and about other economic data relevant from the point of view of balanced economic growth which also appear in the IS – LM system from the following international database:

11. http://stats.oecd.org/
12. http://www.un.org/en/databases/
13. http://data.worldbank.org/
14. http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/
15. https://pwt.sas.upenn.edu/
16. http://www.rug.nl/research/ggdc/data/historical-national-accounts
17. http://www.ggdc.net/maddison/maddison-project/home.htm
18. https://www.imf.org/external/data.htm

With the help of the IS curve we could illustrate the system of equilibrium relations of the product market, as well as the mechanism of rehabilitation available in case of disequilibrium, and the LM curve helped us achieve the same in the case of money markets, while we learned that the IS – LM system makes it possible to examine the totality of economy in this respect.

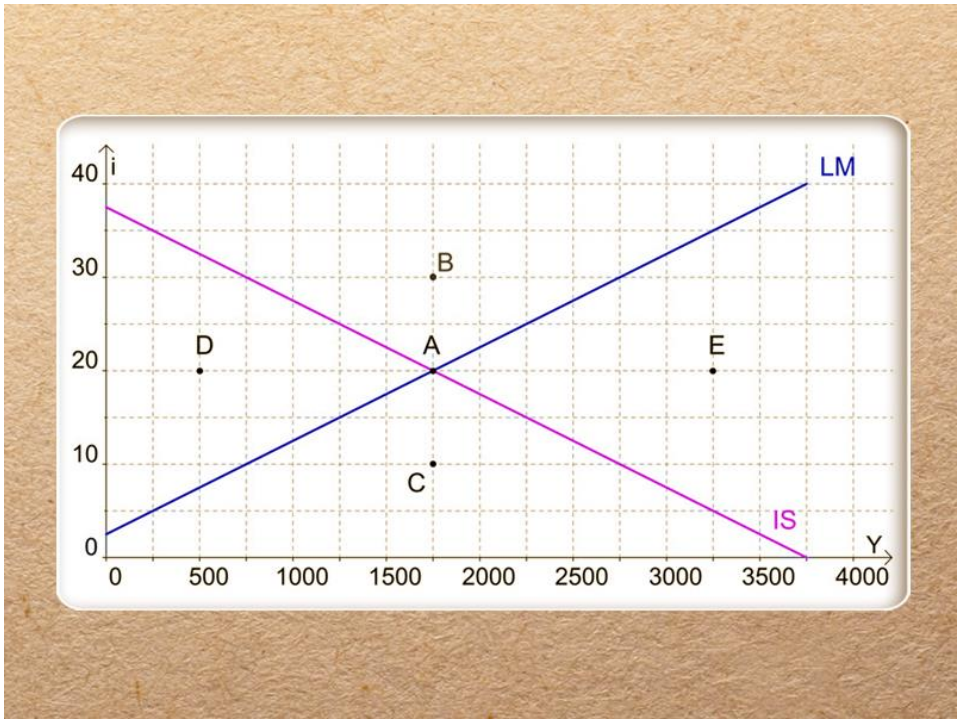

Figure 71 The equilibrium of economy on the basis of IS – LM system

In point „A" there is equilibrium on both markets. In point „B" there is surplus of supply on both markets. In point „C" there is surplus of demand on both markets. In point „D" there is surplus of demand on the product market and surplus of supply on the money market. In point „E" there is surplus of supply on the product market and surplus of demand on the money market.

Interpretation of certain cases of disequilibrium, and possible mechanisms of rehabilitation can be done on the basis of the solutions we described when discussing the IS and LM curves respectively.

12.3 SUMMARY, QUESTIONS

12.3.1 Summary

In the course of our discussion of the topics of the present unit we got acquainted with the factors motivating the demand for money of the actors of economy and the monetary tools by the help of which the central bank can regulate the fiscal and monetary developments of economy. Learning about the supply and demand sides of the money market, and the tools by which the processes of the money market can be regulated enabled us to create the model of money market equilibrium, which we linked to the equilibrium mechanism of the product market earlier studied. Thus we completed our study of economy from the point of view of total equilibrium, and we reached the end of our study of macro economy.

12.3.2 Self assessment questions

? On what does total demand depend?

? How does the increase of the price level influence supply of real money and through this the interest rate of equilibrium?

? By what tools and how does the central bank regulate the amount of cash flow in circulation?

? What does the LM express?

? What is the position of the product and money markets and for what reason when we are above the IS and LM curves?

12.3.3 Practice tests

? Nominal supply of money refers to … in circulation:

– amount of M1 money
– amount of M2 money
– amount of M3 money
– the total amount of M1; M2; M3 money

? If the compulsory rate of reserve increases the rate of interest

– increases
– decreases
– does not change
– it is impossible to state equivocally what happens

? In all the points of the LM curve:

– the money market is in equilibrium

- the product market is in equilibrium
- both the money market and the product market are in equilibrium
- the central budget is in equilibrium

? Under the LM curve it is sure that:
- there is surplus of supply on the money market
- there is surplus of supply on the product market
- there is surplus of demand on the product market
- the central budget has a deficit

? The central bank increases the rate of compulsory reserve in order to hold back inflation. As a result:
- interest rate grows in economy and macro income also grows
- interest rates decrease in economy and so does macro income
- in economy the interest rate grows and macro income decreases
- in economy the interest rate decreases and macro income grows

13. SUMMARY

13.1 SUMMARY OF CONTENTS

In the course of our studies of economics 2. we got acquainted with consumer and producer behaviour, and the analysis and mathematical modelling of the functioning of national economy based on micro- and macroeconomic relationships. In the course of our study of consumer behaviour we analysed willingness and ability of the consumers, and as a result of this we clarified the relationships regarding individual and product market demand as well.

Utility plays a central position in consumer willingness and linked to this we examined the characteristic of the consumer to buy not one but a combination of goods in order to maximize utility, and to effectuate substitutions within this combination of goods.

The ability of the consumer to purchase is determined by the real wages of the consumer, which is determined by the nominal wages and the price of the good. Purchase willingness and ability together determine the demand of the consumer for a certain good, by way of which the consumer is trying to obtain a conveniently balanced price-value ratio.

The total demand of the consumer which appears on the demand side of the product market of a certain good is greatly influenced by the price and income sensibility of the consumers. In the case of price sensibility it is not only the change in demand of the good being examined that is essential, but also the change in demand determined by the change in price of the substitute good.

In the course of our examination of producer behaviour a central role is held by the profit maximization of the firms. Because maximal profit can be achieved by way of production, which production means expenses for the firm, but it also brings revenues, the analysis of producer behaviour has to focus onto the relationship between the produced good and the resources employed for its production and the acfirming expenses, with emphasis on the revenues stemming from the multiplication of the amount of sold products and their market prices. Having in view that for the firm aiming at maximum profit is a central question; cost and revenue determine its attitude towards production. The firm compares the expenses and the revenues incurred by the increase of production.

We analysed the behaviour of the firm sector in two extreme cases, namely, in the case of perfectly competitive and in the case of monopolistic environment. The most essential difference between the firms functioning in the two above mentioned environments is their attitude regard-

ing market price. While for perfectly competitive firms price is an exterior factor, that is, it is positive and constant, in the case of monopolistically competitive firms their prices are the result of their decisions - of course they have to observe market demand.

As mentioned above the firms create their supply by way of production, for which they use resources. As it is the firms which aim at maximum profit that generate demand for resources, the demand for resources, independently of the kind of resources we are speaking about, is determined by the same factors. As in this case for the firms the question is to what extent the amount of employed resources should be increased for the sake of profit maximization, they compare the increase of the expenses and revenues parallel to their increase of the resources, and they use the last resource unit in the case of which the increase of revenue and that of their expenses are identical.

Because production and consumption do not influence only those actors of economy who are directly involved in the production process, but they can exercise positive or negative influence upon exterior actors as well, we closed our discussion of microeconomics with the interpretation of these so called external effects.

In the course of our examination of national economy our first step was to examine the circulation of revenue produced by economy, and then we examined the way in which it was used on the product market. We examined and modelled product market supply in systematically widening economies with two, three and finally four actors macroeconomics and handled product market equilibrium as a central element. We examined the state of equilibrium in its relation with interest rate as well; with the intention to emphasize that interest rate is one of the really essential determinants of economy, which is capable of signalling the achievement of macro economy. In order to make sure that the effects of the tools of fiscal mechanisms in the context of economic policy will be understood properly we touched upon the macroeconomic effects of taxes and transfers with regards to state intervention.

As the national product market supply imposes production, and production necessitates resources, from among which labour can be regarded as changeable in the short run and has a central position among the other resources, we discussed the analyses of the supply side of the product market in its relationship with processes of labour market.

Similarly we analysed the money market with the state of equilibrium in view, and we touched upon the network of the equilibrium of interest rate and of the money market. The set of tools of the central ban employed for the regulation of cash flow was discussed as the key to the implementation of monetary policy. After having clarified the relationship

between interest rate and money market and the system of equilibrium generated by interest rate and money market equilibrium, we created a platform from which we could analyse the collective equilibrium of the two markets and thus we managed to produce a model of mechanisms of the fiscal and monetary policies.

13.2 FINAL THOUGHTS

In the course of this study material we got acquainted not only with the behaviour of the consumers and producers, and with the intricacies of macro economy which can be represented by models drawn with the help of tools offered by mathematics, but we learned that mathematics-function analysis in particular – offers useful tools that can help us model and understand various processes of economy. We could see then, that acquiring knowledge of mathematics is not acquiring knowledge for itself, but it can create the basis for acquiring knowledge applicable in everyday life, which also offers important tools of great help in scientific research.

If you want to further extend the knowledge you acquired in the field of economy you can get further information from the works enlisted below:

- Aghion, P. – Durlauf, S. (eds.): *Handbook of Economic Growth*. 2005.:

19. http://books.google.hu/books?id=bb1fs7hwOJAC&printsec=frontcover&hl=hu&source=gbs_atb#v=onepage&q&f=false

- Quarterly Journal of Economics:

20. http://qje.oxfordjournals.org/

- American Economic Review:

21. http://www.aeaweb.org/aer/index.php

- The Review of Economic Studies:

22. http://restud.oxfordjournals.org/

- Journal of Economic Growth:

23. http://www.springer.com/economics/growth/journal/10887

- Journal of Economic Literature:

24. http://www.aeaweb.org/jel/index.php

- National Bureau of Economic Research:

25. http://www.nber.org/

14. APPENDIX

14.1 BIBLIOGRAPHY

1. Berde Éva (2009): *Mikroökonómiai és piacelméleti feladatgyűjtemény*. TOKK, Budapest. ISBN: 978-963-88622-0-4
2. Berde Éva – Petró Katalin (1999): *Mikroökonómia feladatok*. Műszaki Könyvkiadó, Budapest. ISBN: 963 16 3040 4
3. Bock Gyula – Czagány László – Nagy Rózsa (2001): *Makroökonómia feladatok*. Tri-Mester, Tatabánya. ISBN: 978 963 00 7798 9
4. Daruka Magdolna – Simanovszky Zoltán (2001): *Mikroökonómia Feladatgyűjtemény*. Tri-Mester Kiadó, Tatabánya. ISBN: 978 963 0079 150
5. Dedák István (2010): *Makroökonómia*. Elmélet és gazdaságpolitika. Saldo. ISBN: 978 963 638 335 0
6. Farkasné Fekete Mária – Dr. Molnár József (2013): *Mikroökonómia.* Szaktudás Kiadó Ház Kft., ISBN: 978 615 522 4348
7. Glazer, A. – Hirschleifer, D. –Hirschleifer, J. (2009): *Mikroökonómia. Árelmélet és alkalmazásai – Döntések, piacok és információ*. OSIRIS Kiadó, Budapest. ISBN: 978 896 327 60 148
8. Hall, R. E. –Taylor, J. B. (2003): *Makroökonómia*. Akadémiai Kiadó. ISBN: 978 963 22 41937
9. Hal R. Varian (2010): *Mikroökonómia középfokon*. Akadémiai Kiadó, Budapest. ISBN: 978 963 05 8308 4
10. Kopányi Mihály (2009): *Mikroökonómia*. Akadémia Kiadó, Budapest. ISBN: 978 963 05 8567 5
11. Meyer Dietmar - Solt Katalin (2006): *Makroökonómia*. Aula, Budapest. ISBN: 963 9585 17 3
12. Samuelson, P. A. – Nordhaus, W. D. (2012): *Közgazdaságtan*. Akadémiai Kiadó. ISBN: 978 963 0591 607
13. Solt Katalin (2007): *Mikroökonómia*. Tri-Mester Kiadó, Tatabánya. ISBN:978-963-9561-16-8
14. Solt Katalin (2014): *Makroökonómia*. Tri-Mester, Tatabánya. ISBN: 963 0077 965

14.2 TABLE OF MEDIA ELEMENTS

14.2.1 Exhibits

14.2.2 URL references

1. http://www.dictionaryofeconomics.com/dictionary 12
2. http://www.maynardkeynes.org/maynard-keynes-economics.html 12
3. http://www.encyclopedia.com/topic/Hermann_Heinrich_Gossen.aspx 16
4. http://www.britannica.com/EBchecked/topic/264875/Sir-John-R-Hicks 36
5. http://www-history.mcs.st-and.ac.uk/Biographies/Slutsky.html ... 36
6. http://www.biography.com/people/adam-smith-9486480 51
7. http://www.britannica.com/EBchecked/topic/502193/David-Ricardo 87
8. http://www.britannica.com/EBchecked/topic/526095/J-B-Say 88
9. http://www.ilo.org/global/statistics-and-databases/lang--en/index.htm 137
10. http://www.britannica.com/EBchecked/topic/366539/Alfred-Marshall 137
11. http://stats.oecd.org/ 161
12. http://www.un.org/en/databases/ 161
13. http://data.worldbank.org/ 161
14. http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/ 161
15. https://pwt.sas.upenn.edu/ 161