Essential Economics

Book · January 2014

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Essential Economics

Lecture notes for

students of BSc in Agriculture

Essential Economics

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ISBN 978-963-9639-64-5

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Foreword

The targeted readers of this textbook are undergraduate students with no preliminary training in economics, and its purpose is to provide an introduction to the key economic concepts necessary for their further studies. The material is intended for one-semester courses of 14 weeks and 2 contact hours per week. The textbook assumes preliminary knowledge of basic mathematics – approximately at the level of secondary school maths. Nevertheless, most of the simple mathematical analyses applied to economic issues are explained briefly for the less experienced reader. The textbook is structured accordingto the general contents of introductory economic textbooks. The first chapter explains the basic economic concepts of scarcity, resources, production, markets and economic actors. The rest of the textbook is divided into two main parts: microeconomics and macroeconomics.

Microeconomics is discussed in Chapters 2 - 7, covering the operations of the market (Chapter 2), basic elements of consumer behaviour (Chapter 3) and production (Chapter 4), relying on marginal analysis. The specialities of factor markets are discussed in Chapter 5, and Chapter 6 discusses the behaviour of imperfect markets and market failures.

Chapters 7 - 10 deal with macroeconomics. Chapter 7 introduces the basic tools and concepts of macroeconomic analysis, and summarises the indicators of macroeconomic performance and incomes including GDP and related measures. Chapter 8 discusses the components of the goods market and the money market, leading to the construction of the Keynesian model of macroeconomic equilibrium. Macroeconomic output and aggregate supply are discussed in Chapter 9, covering production, employment, the labour market and unemployment, eventually building the model of aggregate demand and aggregate supply, and explaining the formation of the price level and the causes of inflation. The last chapter (Chapter 10) offers a brief introduction to economic policy, applying the macroeconomic tools and methods developed in the earlier chapters; the key elements of fiscal and monetary policy are explained, and some of the most important policy issues: the current account, government deficit and national debt, economic growth, development and business cycles – are presented. Each chapter ends with a list of questions for reviewing the topics.

An introductory text like this cannot discuss the covered topics in full depth. The author's objective was to provide sufficient knowledge for the users of this textbook to acquire the skills and knowledge needed for their further business and management studies and to understand the processes of the economy in which they live and work – as consumers, employees, or entrepreneurs, decision makers in the public sector or voters at parliamentary elections trying to influence economic decision-making. The textbook does not offer a full mathematical discussion of the topics, and the introduced mathematical formulae do not go beyond the basic secondary school level; instead of mathematical precision the emphasis was on the interpretation and explanation of the economic processes discussed. Many excellent books are available in English that explain macroeconomic topics in much more detail. The terminology, definitions and concepts discussed here are based on a wide range of excellent textbooks, of which only the most important ones are referred in the text itself, to keep it readable and concise. A small sample of these are listed at the end of the textbook in the References section, but the list is far from being complete.

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CHAPTER 1: INTRODUCTION TO ECONOMICS – BASIC CONCEPTS

1.1. What is Economics?

1.1.1. Economics, Scarcity, Opportunity Cost, Efficiency

When you open this textbook and start reading it you may wonder: why to spend precious time trying to understand economics? Some of you may hope to get a good job. Others might want to understand how rising prices affect their everyday standard of living. Others may wish to understand what is behind figures of unemployment and inflation or what kind of policies may speed up economic growth, or slow down global warming.

We encounter many problems and decisions for which the understanding of economics is very useful. Everyone benefits from understanding the operations of the markets, either as consumers, or producers of some goods. As employees, workers we try to sell our knowledge and skills at the labour market, and to spend the earned wages or salaries in the market to buy some product or service. We should make responsible decisions about when to buy a car, when to start saving for a house, and whether to keep savings in the bank or buy a washing machine on credit. We must be aware of the opportunity cost of our decisions, that is, what we sacrifice to attain our aim. Besides, as responsible citizens of the society, we wish to make informed and considerate decisions when voting in elections to choose the government for the next few years. As the government will decide about economic policy, it seems reasonable to cast our vote based on some knowledge of economics, for the economic policy we prefer (Hyman, 1991; Mabry – Ulbrich, 1994; Samuelson – Nordhaus, 2010).

Economics is a basic discipline that defines a set of concepts, rules and relationships, which provide the foundation of many other disciplines. Business management, marketing, finance, agricultural economics or economic policy cannot be studied without the knowledge attained studying the science of economics.The science of economics relies on logical reasoning and mathematical tools, and it heavily builds upon sociology and history, as the object of its analysis is the behaviour and decisions made by human beings and social groups. Economics deals with the mechanisms of the economy and the behaviour of the economic actors: consumers, workers, producers and other decision-makers.

The economy *is the mechanism that organises the use of labour, equipment, vehicles, land and other natural resources in order to satisfy the desires of the people who live in a society* (Hyman, 1991). This mechanism involves the complexity of interactions related to the production, distribution, and consumption of goods and services. The economy is closely intertwined with other spheres of society, such as politics, culture and ideology. Economics is the science that analyses the economy, its processes and actors, and it is concerned with the use of the available productive resources to satisfy the often conflicting desires and demands of the society.

Economics teaches us how to make choices. Individuals – being consumers, workers and producers - always make decisions. You may consider whether to spend the next hour studying or going to a restaurant; whether to spend your money on a cup of coffee or of milk; to choose nursing

or engineering as an occupation, to choose weightlifting or swimming as your recreational activity. People make decisions through their elected governments about how to spend tax revenues: on constructing highways, modernising national defense or on public housing, or all of these, sharing the available resources among them.

But do we really have to make choices? If infinite quantities of every good could be produced, and people could earn unlimited incomes, nobody would worry about choices. However, our world is not such a world of affluence. Resources required for producing goods and services are limited, as well as the resources we can use for purchasing and consuming them. Resources are limited, although they could be utilised for almost unlimited purposes. One of the most important limited resources is time. The day lasts 24 hours, the human life span is limited. The time spent on studying cannot be utilised for playing tennis or making a cup of coffee. Agricultural land is a limited resource, just like coal, oil, the number of welding machines, concrete and human labour, while their possible uses are unlimited. Simply there are not enough resources to produce all the cars, jeans, computers, televisions or food needed by people, therefore we have to decide how to use our resources.

Scarcity: *The availability of resources is limited, while human needs to utilise these resources are unlimited. It represents the imbalance between human desires and the means of satisfying these desires* (Mabry – Ulbrich, 1994; Hyman, 1991).

Productive **resources are scarce**, so we are compelled to make choices about their utilisation. Economics deals with choices and decisions under the conditions of scarcity. Thus the science of economics is the study of how people allocate scarce resources among competing uses to achieve the highest possible level of satisfaction.

Economics *is the science of decisions and choices in the world of limited opportunities* (Mabry – Ulbrich, 1994). Economics studies the use of limited resources to satisfy the unlimited desires of the members of the society (Hyman, 1991).

As decisions are made under the conditions of scarcity, all choices involve a cost. Choosing one of the available alternatives we must give up something else – while you are reading this book you cannot go for a bike ride. People want to attain the best outcome, the greatest enjoyment or highest satisfaction, i.e. they expect the maximum benefit from their choices in exchange of sacrificing all the other alternatives. The benefit of the second best alternative forgone when making the best choice is called opportunity cost (Mabry – Ulbrich, 1994; Case et al, 2009; Samuelson – Nordhaus, 2010).

Opportunity cost: *The opportunity cost of using a resource is the value of the second best alternative forgone when using the resource for the best option. The cost of choosing to use a resource for one purpose is measured by the sacrifice of the next best alternative for using the resource* (Mabry-Ulbrich, 1994; Hyman, 1991).

The science of economics studies how societies utilise scarce resources for producing valuable goods, and how they distribute these among various groups of the population (Samuelson – Nordhaus, 2010). The logic of economics is applied to the problems of the economy in its strict sense, such as production, markets, or exchange rates. Economics, therefore, is a social science, dealing with the alternative decisions that people or groups of people make in production, distribution, exchange and consumption, as well as with the consequences of these choices.

As wants and needs are unlimited, the economy should make the best use of its limited resources, which raises the issue of efficiency. Efficiency means the most effective use of a society's

resources in satisfying people's wants and needs. **Economic efficiency** *requires that the economy produce the highest combination of quantity and quality of goods and services given its technology and limited resources.* **Productive efficiency** *is attained when the economy produces the highest possible output of one good while keeping the outputs of all the other goods unchanged* (Samuelson – Nordhaus, 2010; Hyman, 1991).

The methodology and logic of economics may be applied to a wide range of problems in psychology, statistics, politology, management science and operations research. Decisions of various types involve limited resources while looking for the best possible alternative. Such decisions have a few features in common. The decision-making individuals **pursue their self-interest** comparing and assessing alternatives by their tastes and value judgements, trying to find the one that leads to the greatest benefit. **Efficiency** means – as it was defined before – that people utilise the available resources so that they can attain the greatest possible benefit or satisfaction and the best alternative among the available options. Decision-makers are assumed to choose **rationally,** i.e., relying on available information they choose the alternative which seems to lead to the greatest satisfaction or benefit – for instance when choosing to purchase the product that is the cheapest among those of the same quality, so that more units could be bought for the same money (Mabry – Ulbrich, 1994).

People base their decisions on the logic of **marginal analysis**. In daily life the decisions of the 'all-or-nothing' type are relatively rare, and most of the decisions involve some incremental change: whether to consume a little more of a particular product (e.g. to go eating out another time in the month), to produce a little more of something (e.g. the baker may produce a little more of the baguettes than the usual amount), with the purpose of maximising benefit or profit. Marginal analysis helps us to make the best choice by comparing the costs and benefits arising from an incremental change of production or consumption.

Therefore, throughout this book we assume that the *decision-making individual makes choices at the margin about allocating scarce resources among competing uses, considering the opportunity cost of alternatives, engaging in self-interested, rational, profit-maximizing behaviour* (Mabry – Ulbrich, 1994).

Economists often use simplified **models** to describe the key components of a decision problem. Constructing a model first the problem has to be clearly stated, then the main factors of the situation are identified, and then the essential relationships between these factors are outlined. When building a model several simplifying assumptions are made, focusing the model on the key components of the situation while neglecting less important factors. The analysis[1] is then limited to the changes of these main factors, assuming that all the other factors remain unchanged. This assumption is called '**ceteris paribus**' (in Latin: assuming all else unchanged). Economic problems may concern the short run, or the long run. The **short run** means that time is too short for some of the factors to change. This is a limitation for the decision-maker, and the decision alternatives are assessed assuming that these factors are fixed. The **long run**, however, is a time period which is long enough for any factor of the situation to change, so the decision makers may respond flexibly to economic incentives and take advantage of opportunities (Mabry – Ulbrich, 1994; Case et al, 2009).

[1] It is assumed that readers are familiar with graphs, graphical representation of functions, and the terms of independent variable, dependent variable, positive and negative relationships, the slope of a line or a curve, increasing slope, decreasing slope, as these are taught in elementary mathematics courses in secondary schools.

1.1.2. Microeconomics and Macroeconomics, Positive and Normative Economics

Economics is divided to two major fields: microeconomics and macroeconomics. **Microeconomics** *is the branch of economics that is concerned with the behaviour of the individual entities: decision-makers at specific markets, individual market agents (consumers, households, business managers, enterprises, investors) and market laws.* It can analyse the price trends of running shoes, the impacts of taxes on petrol prices and petrol consumption, the impact of spring chills on the price of orange juice, and help us decide whether road construction is more efficient by many workers and only a few machines, or many powerful machines and only a few workers (Mabry – Ulbrich, 1994, Hyman, 1991; Samuelson − Nordhaus, 2010). **Adam Smith** (the author of *The Wealth of Nations* published in 1776) is considered to be the founder **of microeconomics**.

Macroeconomics *looks at the economy from a broader perspective. It is concerned with aggregates, i.e., with the sum of transactions in the various markets. Macroeconomics analyses the economy as a whole, including total output* (and not output of a particular product), *aggregate price level* (and not the price trends of one specific product), *employment and unemployment in the economy* (and not the labour demand of one particular firm, or the labour supply of an individual) (Mabry – Ulbrich, 1994, Hyman, 1991; Samuelson – Nordhaus, 2010). The evolution of macroeconomics in its current form is attributed to **John Maynard Keynes** and his book *General Theory of Employment, Interest and Money* published in 1936.

In our daily actions we may be more involved in microeconomic decisions, while newspapers and TV programmes dealing with economic policy often discuss the topics of macroeconomics: inflation, unemployment, economic growth or recession, government deficit and foreign debt. The first part of the present book deals with the fundamentals of microeconomics, while the second part deals with macroeconomics.

But why should we analyse the economy as a whole separately from its parts? Should it not be sufficient to assume that the sum of the microeconomic decisions simply explains macroeconomic processes? The *'fallacy of composition'* says that the whole is different from the sum of its parts, and what is true for the individual, may not be necessarily true for the sum of all individuals. If a farmer achieves higher yields and therefore decides to sell more of the crop than before, the farmer will probably attain higher sales revenues, because the extra output is sold at the same price as the rest. However, if all the farmers attain higher yields, and all of them decide to sell the extra output, the considerable increase in the supplied quantity of the crop probably leads to falling prices, resulting in lower revenues for all, even if higher amounts were sold. The individual decision-maker assumed a '*ceteris paribus'* situation, expecting unchanged supplies of the other producers. However, for all the farmers – i.e., for the macro level – the '*ceteris paribus*' condition is no longer true, so the laws of microeconomics cannot be extended to macroeconomics automatically.

Besides microeconomics and macroeconomics the science of economics covers many other specific fields. *International economics* analyses interactions of national economies (e.g. export, import, capital flows and currency exchange rates). *Comparative economics* (the theory of economic systems) is concerned with economies of different types: market economies, command economies and mixed economies. Several applied sciences rely on the theoretical results of economics: *business management, corporate finance, agricultural economics, industrial organisations, trade and commerce*, and new areas such as *health economics* and education economics. Economics itself relies on methodologies developed by other sciences, e.g. *mathematics, statistics, sociology and*

psychology. Economists base their theories on statistical data of the past, applying the methods and tools of *econometrics* to draw simple, but statistically reliable and true conclusions.

When viewing economic issues, the questions involving facts should be distinguished from questions involving values or norms of fairness. The first approach is the realm of **positive economics**, while the second one is of **normative economics**. **Positive economics** assesses economic issues free of any value judgements restricting itself to figures and facts, with the intention of predicting the outcomes of various economic decisions. **Normative economics,** however, looks at the same problems from the viewpoint of fairness and ethical aspects. The normative economist tries to evaluate the desirability of alternative outcomes, relying on value judgements about what is good or bad. While economic analysis provides information for these questions, the final decision should be made by social and political debates (Hyman, 1991; Samuelson – Nordhaus, 2010).

1.2. Resources, Technology and Production Possibilities

1.2.1 The Three Basic Economic Questions

In the face of scarcity and limited resources all societies have to answer three economic questions (Hyman, 1991; Mabry – Ulbrich, 1994; Samuelson – Nordhaus, 2010):

- What to produce?
- How to produce?
- Whom to produce for?

What to produce, and how much?

The first question is to decide what goods should be produced using the scarce productive resources. Society must decide what to produce, and in what quantity and quality, deciding at the same time about the preferred use of the limited resources. Consumer goods (food, clothes, weapons, etc.) increase the well-being of the society in the present, while productive goods (machinery, tools, plantations, vehicles, roads, etc.) will facilitate higher outputs in the future. The question should be answered not only at the level of the national economy, but by individual producers, too. Each producer faces the scarcity of available resources, so the same decision emerges: what – and how much – to produce using these resources. The decision implies that resources should be used for goods that are desired by the society, i.e., the consumers, otherwise they are wasted on outputs noone needs.

The producer also has to consider the issue of efficiency, so that the least possible amount of the resources is used up for producing the highest possible amount of desired products. This leads us to the second question.

How to produce the goods?

The question of 'how' implies the choice of technology, i.e., to decide what combination of resources are used to produce the desired goods. A country should decide how to employ its labour force (in agriculture, manufacturing, service, trade, etc.), what energy sources to use (oil, coal, solar power), what materials to use in manufacturing (metals, plastics, etc.), and which technology option

to apply (an environmentally damaging one or a less polluting one)? The individual producer must also choose a technology option, keeping in mind the costs and the efficiency.

Whom to produce these goods for?

The question 'for whom to produce' implies the identification of the final users of the output. Who will get the output? Will those who work harder receive a larger share of the products? For the economy as a whole the question refers to the distribution of produced goods and generated incomes among the individuals and various groups of society. For the individual producer the question refers to the targeted consumers. The question of 'for whom to produce' is closely linked to 'what to produce': the two questions cannot be answered separately.

1.2.2. Inputs, Resources,Factors of Production

Production is the process of using resources to produce goods and provide services for the society. These goods and services are called outputs. Economic resources are the inputs used in the process of production. Thus, ***inputs*** are commodities or services that are used to produce goods and services. These inputs are called ***productive resources*** or ***factors of production***. ***Productive resources*** are classified into five groups*: labour, natural resources (as land, or minerals), capital resources, entrepreneurial skills and information* (Hyman, 1991; Mabry – Ulbrich, 1994, Samuelson − Nordhaus, 2010). Time may also be considered a productive resource, although its use is always linked to the application of another productive resource.

1. **Labour (*L,* *i.e. Labour*)**: It represents the physical and mental services of human beings in production, including the time spent working. It is the most crucial input of all, as labour is needed to manage the use of all the other inputs, too. ***Human capital*** is considered an important component of labour, comprising the accumulated physical and mental skills acquired by education or experience. While labour, i.e., the working capability of individuals, is a natural phenomenon of all human beings, and in this aspect it is similar to natural resources, the *skills* and knowledge acquired in education or experience are in many aspects similar to real capital.
2. **Land, or natural resources (**notation: ***A,*** *i.e. Agricultural Land***)**: These are physical resources in nature, to be used in production in their raw, natural form. Examples of these include the land used for farming, the energy resources for fueling our cars and heat our houses, the ores and other minerals used in manufacturing, and today even such environmental resources as clean air and drinkable water also belong to this category.
3. **Capital (*K*, *i.e. das Kapital, in German*)**: Capital resources are the durable goods of the economy produced in order to produce other goods. Thus capital resources are productive resources created by an earlier production process, and utilised in a future production process. This definition identifies capital resources as ***real capital*** including all the physical resources produced as machines, tools and buildings. However, economists also use the term capital in a special way as in ***nominal capital***, referring to money that is also considered a capital resource. Money in the production process is needed to buy all the other necessary factors of production, including real capital. Capital resources also include the available

knowledge of techniques and processes of producing goods or services, or, in other words, ***technology.***

4. **Enterprise, entrepreneurial skills (*E,* *i.e. Enterprise, Entrepreneur*)*:*** This is a specialised kind of labour, which should be distinguished, for its special role in the production process. Enterpreneurial skills includes the scarce human ability to organise and operate other resources efficiently in order to produce desired goods and services. The entrepreneur is an individual who engages in enterprise, organising the utilisation of resources, taking risk and innovating, while employed managers usually do not bear all the risks involved in their decisions.
5. **Information:** The last input listed is information, i.e., knowledge of the production, the economy and the environment. Information is accessed by communication technology and is utilised in the process of decision-making, although up to now the efficiency of this resource has been hard to measure or assess.

1.2.3. The Production Possibility Frontier

As our world is a world of scarcity, choices must be made about the allocation of resources to possible uses. A baker may bake buns and bread, but he/she must decide how much to produce of each. The baker may choose to use all the available resources, e.g. the full capacity of ovens, all the labour force and raw materials (flour, yeast, salt) to bake buns. Therefore, no bread will be made, production will be specialised, and the baker will produce the maximum possible amount of buns utilising all productive inputs for this product. On the other hand, the baker may decide to use some amount of the available inputs to bake buns, and the rest for baking bread. Clearly, allocating some of the resources to baking bread, less remains for the production of buns, so the amount of buns produced will decrease. In other words, the decision about the amount of buns to be baked will determine the amount of bread that can be produced using the remaining resources. Thus, for any amount of buns, using the resources left, the baker can calculate how much bread can be produced.

The same is true not only for two products of one enterprise, but also for two industries of an economy. The example in the left panel of *Figure 1.1* represents an economy that produces cars and food, utilising its productive resources at full capacity. Points *A-B-C-D-E-F* represent the possible combinations of food and cars that can be produced simultaneously. The curve connecting the possible combinations of the two products is called **Production Possibility Frontier (PPF):** *a curve showing all the possible combinations of the maximum output of goods that can be efficiently produced using the available resources and the technological knowledge of the economy*. Each point of the curve represents a combination of goods, and an increase in the produced quantity of one good necessarily leads to a decrease in the other (Mabry − Ulbrich, 1994, Samuelson − Nordhaus, 2010). The combinations of goods in the PPF are **Pareto-efficient combinations,** meaning that no increase of one good is possible without the decrease of the other. The production possibility frontier in the left panel of *Figure 1.1* shows the Pareto-efficient food - cars combinations.

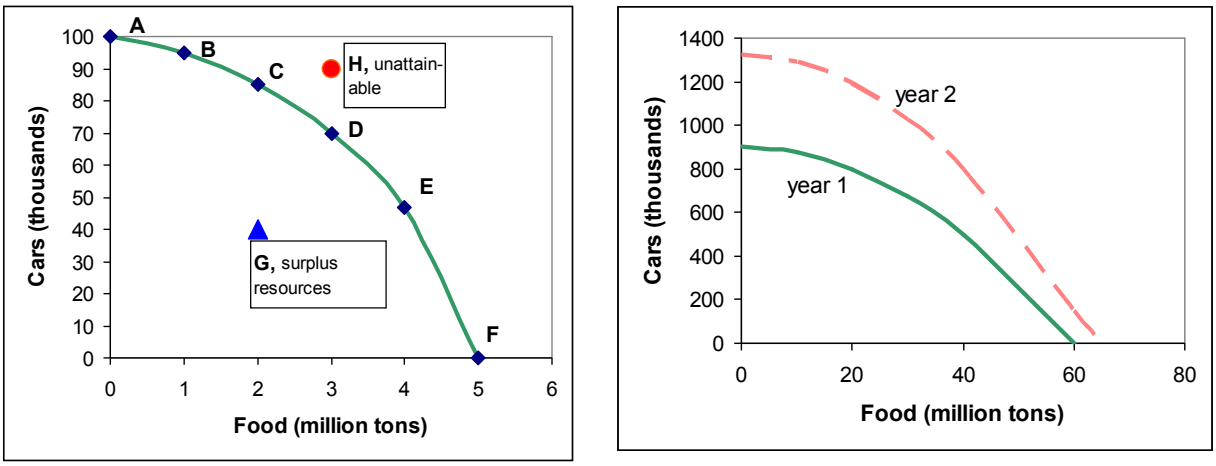


Figure 1.1: ***The production possibility frontier, and its growth***
Source: Author's own construction

Clearly, increasing the amount of food from *0* tons to the possible maximum amount of *5* million tons, the amount of cars must gradually decrease; and at higher amounts of food, the number of cars that has to be sacrificed for producing an additional unit of food is also higher – in other words, the PPF curve is concave. In the example a *1* million ton increase of food from *0* tons to *1* million tons requires giving up *5* thousand cars (see points *A* and *B*), while the same 1 million ton increase from *3* million tons to *4* million tons requires us to sacrifice *23* thousand cars (points *D* and *E*, decreasing car output from *70* thousand to *47* thousand). The same is true for the opposite direction, increasing the output of cars, while giving up production of food.

Point *G* in the left panel of *Figure 1.1* lies below the PPF curve, meaning that point *G* is not Pareto-efficient. At *G* of *2* million tons of food and *40* thousand cars the amount of food can be increased keeping car output unchanged, and the number of cars can also be increased keeping the output of food unchanged. In point *G* some resources are wasted. Point *H*, on the other hand, lying outside of PPF, is unattainable at the current resource availability, because producing *3* million tons of food, as in *H*, the amount of cars could not be higher than *70* thousand (as in point *D)*.

The production possibility frontier can be used to show economic growth. The right panel of *Figure 1.1* illustrates an outward shift in the production possibility frontier of a country from year 1 to year 2. This may be the result of increasing the available resources or of improved technology. Thus the production capacity of the country increases, the attainable output combinations also increase, and formerly unattainable combinations become attainable.

1.3. The Key Actors of the Economy, Economic Coordination

1.3.1. Households, Business Firms, Governments

The economy is a huge network of various markets of all kinds of goods and services. Actors of these markets – producers and consumers – interact in many fields, each being a seller in one

market and a buyer in another one, complying with market rules and regulations. The sum of all these markets and actors add up to establish the macroeconomy, i.e. the aggregate level of economic activity. The organisational structure of a national economy comprises the following entities: households, business firms and the government.

Households are the people of the country where each household is an economic unit. The main role of households in the economy is consumption: they purchase and consume most of the goods that the firms produce. The second important role of households is to sell or rent their productive resources to firms. They sell their working capacity in the market of productive resources, and receive wages in exchange. They spend the wages to buy the goods and services produced by firms. Households may save a part of their income, and these savings, if deposited in banks, are offered as loans to others. Households are also owners of a considerable amount of national wealth in the form of houses, real estate and other durable goods, and they may also produce some goods for home consumption, occasionally selling small amounts, especially agricultural products (Mabry – Ulbrich, 1994).

Business firms produce goods combining the productive resources they purchase from households. They produce goods that households need and want and therefore they can sell their outputs in the market. They earn their revenues by selling the output, and they pay the costs of productive resources; the difference between their revenues and costs being their profit. In the rest of this textbook it is assumed that the key motivation for the firms' behaviour is the intention to maximise their profits. Although the term 'firm' usually refers to some form of organisation, we will use the expression to cover all forms of business entities (firms, corporations, sole traders, family farms, etc.) that have one thing in common: they produce goods for sale (Mabry – Ulbrich, 1994).

Government and governmental institutions are crucially important actors in modern societies. The government is a special agent in contemporary economies; it actively influences all economic relationships and processes representing public power. Government interventions have three key functions in the economy: to enhance the efficiency of the economy, to maintain macroeconomic stability and to guarantee social justice, fairness and equity (Samuelson − Nordhaus, 2010), although the efficiency of these interventions is constantly debated.

1.3.2. Economic Coordination: Market, Command and Mixed Economies

Different societies are organised through alternative economic systems, answering the questions of *what, how* and *for whom*. The system of economic coordination is the system of various mechanisms that the society uses to allocate scarce resources (Samuelson − Nordhaus, 2010).

A market economy is an economic system in which most economic questions are settled by the market mechanism. Market actors – private firms and individuals – make major decisions about production and consumption, acting as independent decision-makers. The main objective of firms is to maximise their economic gains expressed in money. They are equal in their market relationships; none of them has significant power over the others. Consumers are free to decide how to spend their incomes. No economic agent or organisation has power to restrict or control the actions of other individuals or firms. This market mechanism is also called *spontaneous market coordination*. The market agents are guided by market prices; money flows provide the most important information for the individuals' decisions through prices, costs, incomes, profit and loss. The extreme case of a

market economy in which the government has no influence over economic decisions is called a **lassez-faire economy.**

A command economy is an economy, where all important economic decisions are made by the government. The economy is directed by central plans and decisions. Economic agents are subordinate to the government who directs the economy by commands and prohibitions. The market is coordinated by a ***bureaucratic (centralised) mechanism.*** In a command economy the government decides about the use of productive resources and directs the operations of most of the enterprises. The government employs the labour and will tell the workers how to do their jobs. The government will decide how the output of the economy is divided among the members of the society, setting prices and income levels. The implementation of central decisions are enforced by law, the role of the market is negligible. The history of Eastern and Central Europe before 1990 is a good illustration of command economies, showing the inefficiency of such a system. Modern economies can only temporarily return to command, e.g. in times of war or natural disasters.

Contemporary developed economies are **mixed economies**, characterised by a mixture of market mechanisms and government regulations. In mixed economies the elements of the market play the key role. Government intervention is done mainly in the market in order to correct market anomalies or to prevent the emergence of situations that restrict market competition. Government intervention is justified when the market leads to an outcome not acceptable to the society. The labour market is a good example, where the government sets a minimum wage that is usually higher than the market equilibrium, to provide higher incomes and a better standard of living for workers. However, as the example of rising minimum wages and unemployment shows, government intervention often fails to provide the optimum outcome expected by the society (Mabry-Ulbrich, 1994,. Samuelson – Nordhaus, 2010).

Review Questions and Problems[2]

1) Explain the terms *scarcity* and *opportunity cost*.
2) What does the concept *ceteris paribus* mean?
3) Explain *short run* and *long run*.
4) List and describe the productive resources of an economy, give examples.
5) Explain the production possibility frontier, give an example.
6) What are the three basic economic questions?
7) Explain the meaning of spontaneous market coordination, bureaucratic coordination and mixed economic coordination. Which is typical for contemporary developed economies?
8) Explain the meaning of and the difference between microeconomics and macroeconomics.
9) Describe the roles and functions of firms (business entities) in the economy.
10) Explain the main role of households in the economy.
11) Explain the functions of the government and government institutions in the economy.

[2] Source for Problems 12, 13 and 14: Case et al. (2009)

12) A student signed up with an internet provider for a fixed fee of $ 20 per month. This fee covers unlimited access to the world-wide web. During an average month last year the student was logged onto the web for 17 hours. What is the average cost of an hour of web time to the student? What is the marginal cost of an additional hour?
13) For each of the following situations identify the full cost of the activity – in terms of opportunity cost.
    a. A worker earning an hourly wage of $100 decides to cut back on part-time work to attend a college.
    b. A student spends the night in a wild party, and stays out all night before his physics exam.
    c. Alex's father has a small grocery shop, and Alex works 40 hours a week there without receiving wages.
14) A country has fixed quantities of productive resources, and uses these resources for producing two goods: bread and ovens. The following table shows the possible combinations of bread and ovens:

Bread (million kg)	Ovens (thousands)
75	0
60	12
45	22
30	30
15	36
0	40

The figures above assume that the country owns a certain amount of ovens produced previously, which are available in the current period for baking bread.

a. Using the figures in the table graph the production possibility frontier. (Use the horizontal axis for the number of ovens.)
b. What happens to the opportunity cost of baking bread (measured in the number of ovens) if the quantity of bread baked increases?
c. If the country keeps producing both bread and ovens, what happens to the production possibility frontier over time? (Explain your answer!)
d. Now suppose that a new technology is introduced, and then every oven can produce twice as many kg of bread than before. Graph the new production possibility frontier.
e. Suppose that before the introduction of the new technology the country produced 22 ovens. After introducing the new technology the country produces 30 ovens. What is the impact of the new technology on the quantity of bread produced? (Give the amount of bread produced before and after the new technology was introduced.)

PART 1 – MICROECONOMICS

CHAPTER 2: BASIC ELEMENTS OF THE MARKET

2.1. Markets: Purposes and Functions

The first chapter introduced the three basic economic questions that every economy must answer: what to produce, how to produce and for whom to produce. Modern mixed economies answer these central questions primarily through the market mechanism. People exchange both goods and productive resources in markets. Households would like to satisfy their many needs by purchasing goods and services. These goods are produced by firms, who use the labour and other productive resources of households in the production process. Households will therefore purchase the goods and services produced by firms, spending the income that they receive from these firms for their productive resources[3].

These exchanges take place in the market; the market is the arrangement through which the exchange of goods and services or productive resources, such as labour, takes place. In the market of consumable goods – e.g. of food, clothes, CD-s – the buyers' purchase intention – their *demand* – is focused on the goods that can satisfy some of their wants. Their behaviour is influenced by the money they can afford and want to spend on these goods. They want to spend their income in a way that allows the purchase of the largest possible quantity of goods leading to the greatest level of satisfaction. Firms, however, wish to sell their output at the highest possible price, as the sales revenue should cover the cost of buying productive resources for the next period, and the remaining amount is their profit. The sales revenue received in exchange of goods and services is the source of the income for business firms. The interaction between sellers and buyers is established through the market mechanism (Hyman, 1991; Samuelson − Nordhaus, 2010).

*The **market** is the mechanism through which buyers and sellers meet or communicate to carry out transactions, trading goods, services and assets. Therefore the market consists of interaction between sellers and buyers, and its key elements are: demand, supply, price and income.*

The markets of consumer goods and the markets of productive resources work very similarly, although they may slightly differ. In the **market of consumer goods**, i.e. in ***output markets***, the buyers are households and the sellers are business firms. The situation is just the opposite in the **market of productive resources** or ***input markets***, where the firms are the buyers, because they need inputs for production, while households are the sellers, who want to earn income by selling their productive resources to firms. As an example, let us have a look at the labour market. Households offer their labour resource in exchange for wages, thus earning the income necessary to maintain life. The labour sold by households is purchased by business firms to be used in the

[3] Besides labour households may own other productive resources: land or buildings, and they can lend their savings to business firms, too.

production process. The market price for labour is the wage at which labour is exchanged, and it is paid by the firms to the households. This price generates the income for the seller, while being a cost for the buyer (the firm).

The market allows **buyers and sellers** to interact, and their bargaining process will define the price of the goods and the quantity sold. **Demand** describes the buyers' willingness and ability to buy a certain quantity of goods at different prices. **Supply** means the sellers' willingness and ability to sell, showing the quantities the sellers intend to sell at different prices. The **price** of the goods expresses the value that the buyers and the sellers attribute to the product in terms of money. This price is the source of the seller's **income,** while the consumers' income represent their capability of purchasing the goods they want. The money possessed by the consumer to spend on goods is called **nominal income**, while the amount of goods that can be bought for this money is called **real income**. Sellers try to raise prices to increase their incomes by maximising their profits, while buyers want to buy at low prices, so that their limited income could buy more goods. Therefore the buyers and sellers bargain over their opposing interests. The market processes are shaped by the decisions of rational, self-interested individuals, but in spite of their conflicting interests the market mechanism leads to regular and predictable behaviour, where general laws, called **market automatisms,** prevail.

2.2. Demand, Supply, and Market Equilibrium

2.2.1. Demand

Demand describes the buyer's behaviour in the market.

***Demand** is the relationship between the price and the quantity of a particular good that the buyer is able and willing to buy (Hyman, 1991).*

The buyer is assumed to spend his/her income in a way that maximises his/her satisfaction. Therefore the buyer considers both the price and the useful features of the good when deciding about the purchase. Demanded quantity is the quantity of the goods that the buyer intends to buy at a particular price. Demand means that the buyer does not only desire the good, but is also able to pay for the demanded quantity. Individual demand is the demand of one individual consumer, while market demand is the sum of all the individual demands for the particular commodity.

The demanded quantity is determined by the price of the product, but many other factors influence demand. These are (Samuelson – Nordhaus, 2010; Hyman, 1991):

- the consumer's available income,
- the consumer's tastes and habits (or preferences),
- the attributes of the product (its quality, usefulness),
- the prices of other products related to the demanded product (e.g. of substitute goods, that can be used instead of the demanded good, or of complementary goods that are consumed together with the demanded good),
- the consumer's expectations about the future (e.g. expectations about increasing incomes or price changes),

- the number of buyers present in the market.

The first five factors influence both the individual and market demand. The last factor has an impact on the overall market demand of a particular good. These factors are briefly explained below.

- ***The utility (usefulness) of the product:*** The utility of a product is its ability to satisfy some needs of the consumer. Utility may depend on the quality of a product, its design, size, colour, etc., all of which are mainly the objective properties of the product.
- ***The consumer's preferences:*** Preferences express the consumer's relationship towards the product, his/her opinion or value judgement about the utility of the product. Preferences describe the consumer's subjective opinion, attitude towards the goods. Even if the product has useful properties, the consumer may not be aware of it, or may simply dislike it. Advertising is aimed at changing consumer preferences.
- ***The buyer's income:*** With higher incomes the consumer is able, and usually willing, to purchase larger amounts of the goods. The impact of decreasing incomes is just the opposite[4]. Income is a limiting factor over consumer demand.
- ***Prices of other products:*** Consumers usually find several goods in the market that can be used for the same purposes, i.e. substitute each other. Various brands of coffee, milk, or DVD players can satisfy nearly the same wants. The consumer may ***substitute*** one product by another similar product, if the latter is cheaper, and this decreases the demand temporarily, or even permanently, for the originally preferred product. ***Complements (complementary goods)*** are usually consumed together and therefore the demand for one also influences the demand for the other. CDs and CD-players are consumed together and therefore an increased demand for CD-players may lead to increased demand for CDs.
- ***The consumer's expectations about the future:*** When the buyers expect that the price of the goods rise in the near future, they may buy larger quantities today, bringing ahead the purchases planned for the near future. As a result, the current demand increases. The opposite is true when the consumers expect future price decreases. Similarly, when consumers expect increased wages they may start to consume more now, which leads to increased demand, but if they expect to lose their jobs, they would start to save for the hard times, decreasing their current demand.
- ***Number of buyers (the size of the market):*** The total market demand depends on the number of buyers present in the market. With more consumers demand is usually higher, while smaller numbers of buyers result in decreasing demand.

As was shown above, individual demand is influenced by many factors. Some of these are objective facts independent of the decision-making individual; others are subjective, closely related to the person. Every buyer forms his/her own opinion about the purchase, and decides whether the product is worth its actual price for him/her or not. The ***reservation price*** *is the maximum price an individual buyer is willing to pay for one unit of the product.* Reservation prices differ for each buyer,

[4] This property holds true for so-called normal goods. Demand for inferior goods, however, is different. When the consumer's income rises, he/she no longer buys these goods, turning to more expensive goods of better quality instead. Increasing income leads to decreasing demand for inferior goods. Examples of inferior goods are cheap food or cheap clothing of poor quality.

and this is the reason why some units of a product may be sold at high prices, although most buyers can afford it only at low prices.

There exists a definite relationship between the market price of a good and the quantity demanded. This relationship is called ***demand schedule*** or demand function. *The **demand function** measures the demanded quantity of a product as a function of price, ceteris paribus, assuming all other factors held constant*.

The **demand curve** is the graph of the demand function or demand schedule, in the coordinate system of price and demanded quantity. The price is denoted by ***P*** and the quantity demanded is denoted by ***Q***. The letter ***D*** denotes demand. The demand curve is downward-sloping, describing a negative relationship between price and demanded quantity. When prices are high the buyer can buy less of the product, assuming unchanged income, and there are fewer buyers in the market who can purchase the product at high prices (that is, whose reservation prices are higher than the actual price). When prices are low, consumers are able to buy more of the product, and there are more buyers whose reservation prices are above the actual price.

The demand schedule or demand function of an individual consumer is called individual demand schedule or function, while the demand schedule representing the total demand in the market is called market demand schedule. A demand function can be constructed for the total market demand as well as for the individual demand. The latter is called individual demand function, and its graphical representation is called individual demand curve[5].

The law of demand: *the lower the price of a good, the greater the quantity that consumers are willing and able to buy, other things being equal. When the price of a good increases, the demanded quantity will decrease, and when the price decreases, the demanded quantity will increase, ceteris paribus*.

The left panel in *Figure 2.1* shows a price change from $80 to $40. With the higher price the demanded quantity is lower (point *A*), while the lower price at point *B* leads to a higher quantity demanded. A change in the price leads to a movement along the demand curve, assuming all other factors unchanged. But what happens if some other factor changes? What is the impact of a rise in the consumers' income on the demand schedule? The initial assumptions for the original demand function are changed and therefore the demand function itself will change, and a new demand function will be defined.

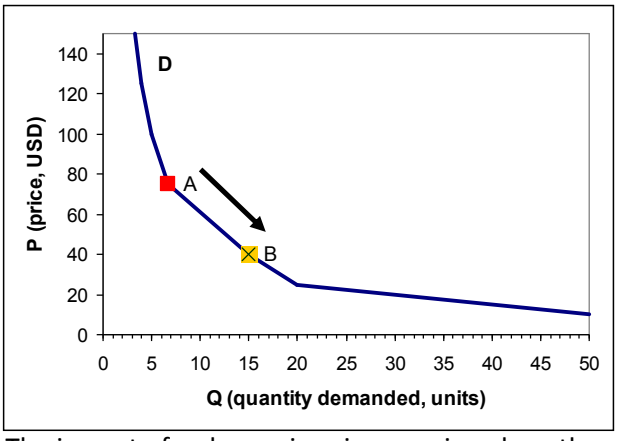
The right panel of *Figure 2.1* illustrates such a change, a shift in the demand function itself, as a result of increasing incomes. Having larger income, the consumer can afford to spend more and buy more of the product than before, at any price. Then at any price the quantity demanded will be higher than before, so the demand curve shifts upwards to the right. The new demand curve becomes *D'*.

A similar shift occurs when the consumer's preferences change in favour of the product, or the consumer expects a price rise in the future, or new consumers enter the market increasing the

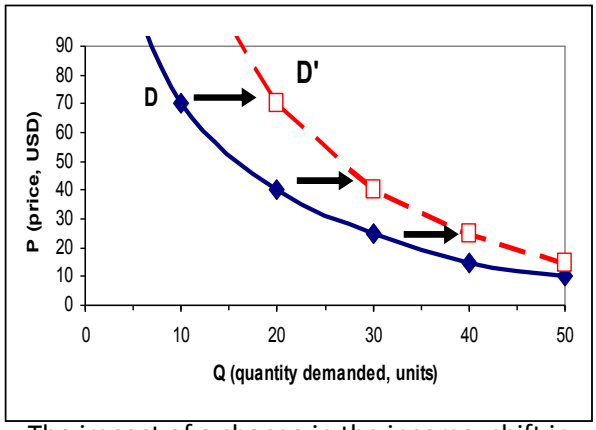
[5] According to the definition of the demand function, the demanded quantity *(Q)* is expressed as the function of the price *(P)*, so price is the independent variable and quantity is the dependent one. Then price should be shown on the horizontal axis and quantity on the vertical one. Following Alfred Marshall's work, the standard graphical representation of the demand curve uses the axes in the opposite way, with price on the vertical axis, and quantity on the horizontal one. An explanation may be, that in perfectly competitive markets market agents decide about quantities, and the actual market price will evolve as the equilibrium of the demand and supply schedules.

number of buyers. Naturally, a decrease in the consumer's income, a negative change in the consumer's preferences or a decrease in the number of consumers will have an opposite impact, shifting the demand curve downward to the left.

Altogether, the impact of price change is a movement along the demand curve, assuming no change in the other factors, while the impact of any other change is a shift of the demand curve itself.



The impact of a change in price: moving along the demand curve



The impact of a change in the income: shift in the demand curve

Figure 2.1: ***Demand curve, the graph of the demand function/schedule***
Source: Author's own construction

Q (units)	P (USD)
0	45
1000	40
2000	35
3000	30
4000	25
5000	20
6000	15
7000	10
8000	5
9000	0

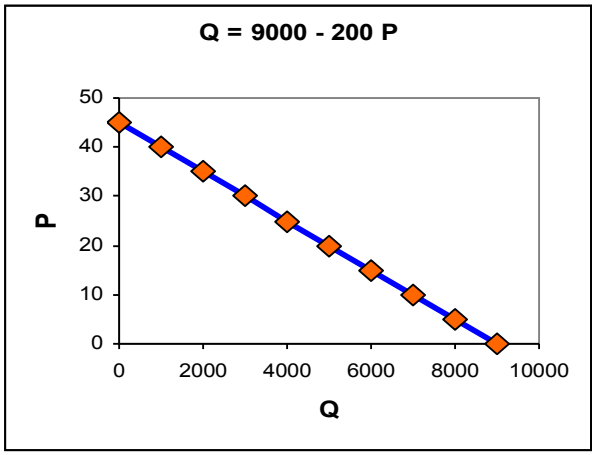


Figure 2.2: ***Example of a linear demand function***
Source: Author's own construction

Economic models often use *linear demand functions*. A linear demand function defines the relationship of price and quantity as: $Q = a - b \times P$, where Q and P are the demanded quantity and the price of the product, respectively. Coefficient b shows how much the demanded quantity decreases in response to a unit price rise, and a shows the quantity demanded at $P=0$. The *inverse*

demand function gives price *P* as a function of the quantity demanded. With a linear demand function the inverse demand function is also linear. For the above demand function the inverse demand function is: $P = (a/b) - (1/b) \times Q$.

The left panel of *Figure 2.2* gives a linear demand schedule. The linear demand function is $Q = 9000 - 200 \times P$. Simple computations give the inverse demand function as: $P = 45 - 0{,}005 \times Q$. A price increase of *$5* decreases the demand by *1000* units, therefore a price rise of *$1* leads to a *200* unit decrease in the demand.

2.2.2. Supply

*The **supply** of a commodity is the relationship between its market price and the amount of that commodity that producers are able and willing to produce and sell, other things being constant (Samuelson – Nordhaus, 2010). **The supply schedule*** relates the quantities supplied of a commodity to its market price.

The seller's aim is assumed to be to maximise his/her profit, therefore he/she is willing to sell more at higher prices, because this makes production more profitable. Similar to demand, supply can also be defined for individual sellers (individual supply) and for the market as a whole (total market supply), or in more general terms, the total supply of an industry.

Supply depends not only on price, but on many other factors (Samuelson – Nordhaus, 2010). These include:

- the cost of production,
- the availability of productive resources,
- the price or supply of other products competing with the actual product, or competing for the scarce productive resources,
- the seller's expectations about the future,
- the number of sellers (producers).

The first four factors influence the individual seller's decisions, while the fifth item relates to the total market supply of a commodity, which is usually higher when more sellers are present in the market. The mechanisms of these factors are explained below.

- **The costs of production of the good:** When production costs for a commodity are high, the seller needs higher market prices to attain profit. The cost of production is usually determined by technology, and changing the technology often changes the supplied quantities of the commodity. Improvement of productive efficiency decreases production costs, and may lead to increased supply. An increase in the prices of raw materials, energy or other inputs leads to decreased supplied quantities assuming unchanged product prices.
- **The availability of the productive resources needed for producing the good:** Even with efficient technology, the production of a given commodity may require scarce inputs. There are alternatives for utilising these scarce productive resources, and they might earn higher profits when used for producing something else. The producers, therefore, are inclined to use the scarce resources for products earning the highest profits, and this may decrease the

market supply of the given commodity. Sometimes the producer cannot access the required amount of scarce resources even at high prices, thus the availability of this scarce resource may limit the supply of the commodity. Such a scarce resource may be, for example, the specially trained labour.

- **The prices and supplies of other products:** The market may offer close substitutes for our commodity, and sellers must consider their prices and supplied quantities. If the producer can produce the commodity at higher costs than the market price of the substitute product, then there is no hope of attaining profit, and the seller may choose to exit the market, thus decreasing the market supply of the commodity. If, on the contrary, a producer expects high profits due to an advantageous position compared to producers of close substitutes, he/she may be inclined to increase production.
- **The seller's expectations about the future:** When a producer expects a price rise for the product in the near future, he/she may leave the product in the inventory, waiting to sell it after the price rises. This leads to decreased supply in the current period. An expected change in the government regulations has similar impact on supply. When an expected quality-related regulation may imply a necessary investment in the production technology, this may motivate some producers to sell out all the output now, and move out of the market. A favourable change in tax regulations may convince the sellers to increase their production capacities.
- **The number of sellers in the market:** The total market supply of a product is usually higher when more sellers are present in the market, while fewer sellers usually supply less of the commodity.

The supply schedule can also be represented as a function. *The **supply function** measures the supplied amount of a commodity as a function of its price, ceteris paribus (assuming all other factors held constant).*

The **supply curve** is the graph of the supply function or supply schedule. The product price is denoted by ***P***, and the supplied quantity is ***Q***. Supply itself is denoted by ***S***. The supply curve and the supply function describe a positive relationship between the price of the commodity and its supplied quantity, so the supply curve is upward-sloping. The producers are willing to sell more of the good at higher prices, and less at lower prices. At low prices some sellers may try to leave the commodity in the inventory, waiting for a future price rise and higher profits. Others cut back production, because the lower sales revenue allows them to buy less of the productive resources than before, or use the resources in a more profitable way, producing something else. Some producers may even decide to exit the market, and finish production. A rise in the market price will lead to the opposite result.

The law of supply: *other things being equal, the higher the price of a commodity, the greater the quantity of the commodity supplied by sellers. As prices increase ceteris paribus, the amounts offered for sale also increase, and decreasing prices decrease the amounts offered for sale* (Hyman, 1991).

The left panel of *Figure 2.3 shows* the supply curve. At lower price the seller offers less of the commodity for sale (point *A*), while at higher price the offered quantity is also higher (point *B*).

What happens to the supply function and the supply curve, when a factor other than the commodity's price changes? Suppose that the producer finds a possibility to access some resource cheaper than before, so the cost of production falls. Then the producer can attain the same profit even if the product is sold at a lower price. In other words, with unchanged prices production

becomes more profitable, and the producer can produce more of the commodity at the same total costs. This means that at each price the quantity supplied increases, and the original supply curve (*S*) shifts downward, to the right (*S'*), as is shown in the right panel of *Figure 2.3*.

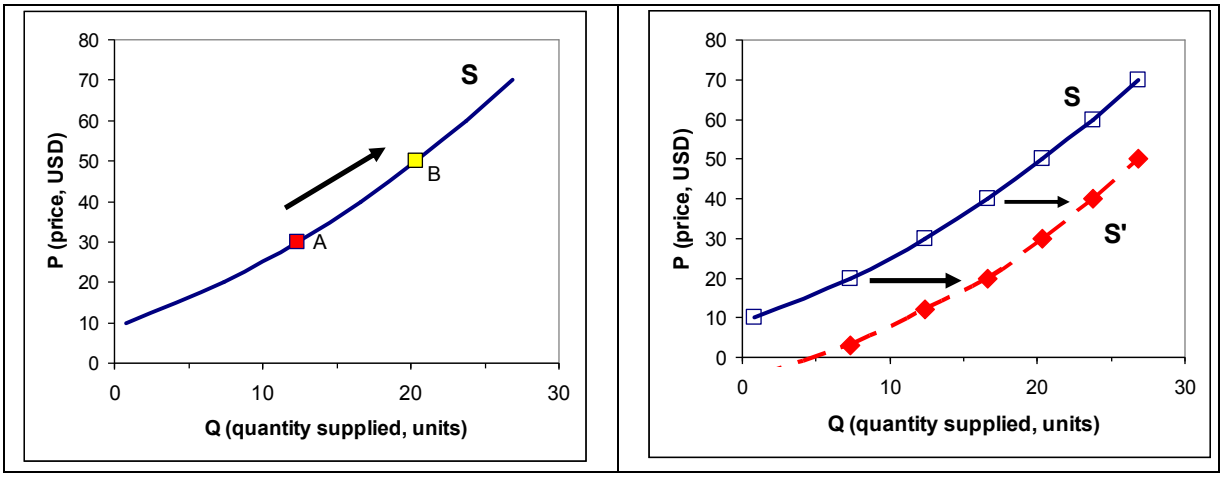


Figure 2.3: ***The supply curve and its downward shift***
Source: Author's own construction

It is easy to see that the same kind of shift occurs when more sellers enter the market, because then the amount offered for sale becomes higher at any price. A decrease in the number of sellers, or an increase in the cost of production will lead to the opposite result, shifting the supply curve upwards, to the left. The impacts of all the previously listed factors can be estimated similarly.

We can conclude that the impact of price change is a movement along the supply curve, while the impact of a change in any other factor is a shift of the supply curve itself.

2.2.3. Market Equilibrium

The above sections defined the market supply of, and demand for a commodity and their response to prices and other influencing factors. Now let us see how the market price of a commodity is determined.

The demand for, and the supply of restaurant dinners in a town restaurant are presented in *Figure 2.4.* The figure shows, that at high prices the supply is high and demand is low, thus supply is higher than demand. At low prices, on the contrary, demand is higher than supply. *There is only one price, at which the demanded quantity is equal to the supplied quantity,* and this price is called **equilibrium price.** *The quantity demanded and supplied at this price is called* **equilibrium quantity**.

If the actual market price is below the equilibrium price, the buyers demand more of the commodity than the quantity supplied by the sellers. **Excess demand**, that is, *shortage* is experienced in the market. As sellers notice that the commodity offered for sale is running out, and buyers still want more, they start to raise the price. Buyers respond to rising prices by starting to decrease their demanded quantities, while the sellers' willingness to sell increases. This process gradually decreases

excess demand. The process continues as long as excess demand is present in the market, and finally the equilibrium price is attained.

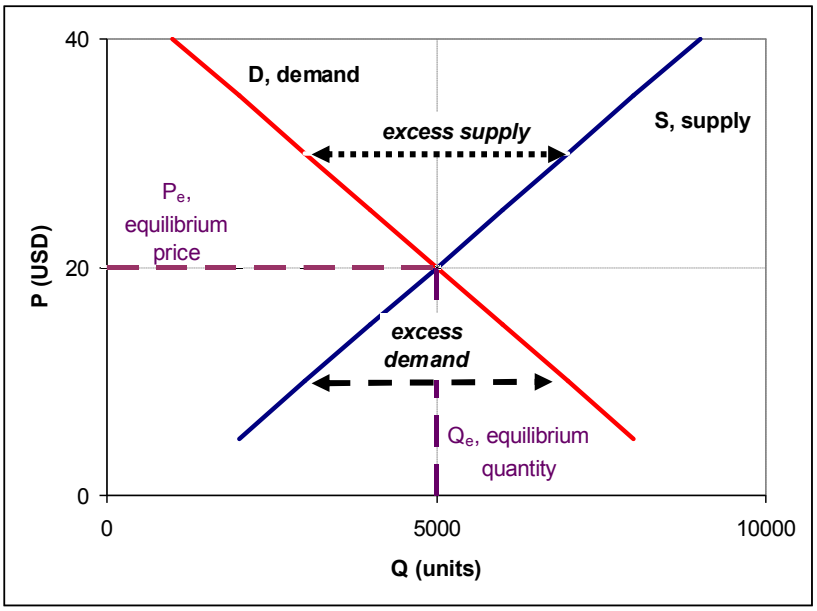


Figure 2.4: ***Equilibrium of supply and demand***
Source: Author's own construction

In the opposite situation *the actual market price is above the equilibrium price, causing* **excess supply** *(surplus) in the market*. The quantity supplied for sale is larger than the quantity demanded by the buyers, and the commodity is in surplus. Then the sellers realise that they are unable to sell all the produced quantities and therefore they start to decrease the price, and buyers respond to that by increasing demand. The process goes on until the equilibrium price is reached, and the surplus disappears.

Therefore, non-equilibrium prices create competition among consumers or producers, initiating an automatic adjustment of the price towards the equilibrium. The final outcome of this automatic adjustment is the disappearance of excess demand or excess supply, and the market attains the equilibrium. The equilibrium price is also called **market-clearing price**, because it clears both surpluses and shortages from the market. This self-regulating feature of markets is called **market automatism,** or as Adam Smith called it the '*invisible hand*', guiding individual decision-makers in the market towards the equilibrium (Case et al., 2009).

The market balance is illustrated by plotting the demand curve and the supply curve in the same coordinate system. The market equilibrium is the intersection of the two curves, the price at the intersection (P_e) is the equilibrium price, and the quantity (Q_e) is the equilibrium quantity. This type of analysis was first applied by Alfred Marshall (1842-1924), the famous British economist, whose major work (*Principles of Economics)* established the currently used methodology for supply-demand analysis.

An important attribute of market is the following fact: if, for some reason, the market is not in equilibrium, then the actual amount sold will be equal to the smaller one of the demanded and the

supplied quantity. In case of excess supply, it is the demanded quantity, while at excess demand it is the supplied quantity. This also implies that the quantity sold is largest when the price is in the equilibrium position, and the market is being cleared [6].

Assuming now, that the demand or the supply curve is shifted for some reason, e.g. an increase in the cost of production shifts the supply curve upward, as curve *S'* shows in *Figure 2.5*. Therefore any quantity is offered for sale at a higher price than before.

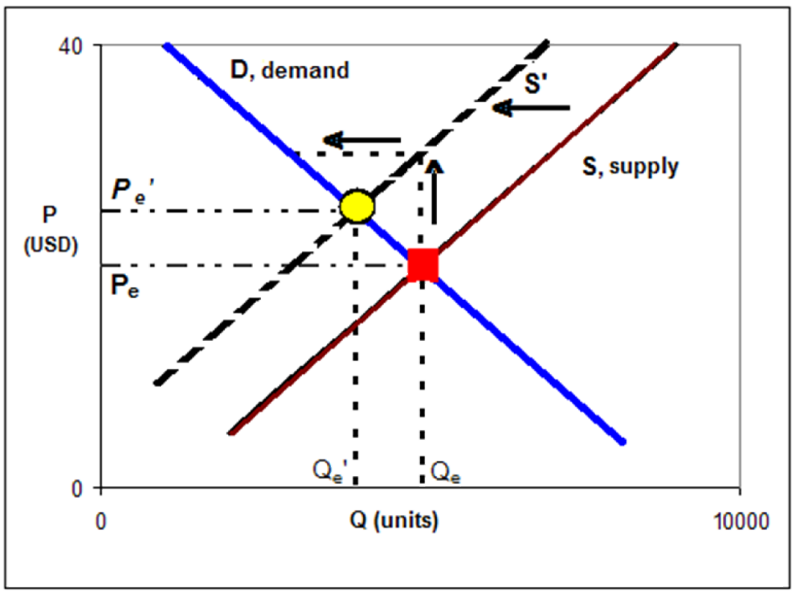


Figure 2.5: ***Change of the market equilibrium***
Source: Author's own construction

Thus, the sellers are no longer willing to sell the former equilibrium quantity Q_e at the former equilibrium price P_e, wishing to raise prices. However, at higher prices the buyers would purchase less than Q_e, so the market shows excess supply. As a result, producers are forced to decrease the price as well as the quantity offered for sale. The buyers respond to the price decrease by increasing demand. Eventually the new market equilibrium is attained at a higher price (P_e'), and smaller quantity (Q_e'), so the market clearing situation changes.

2.3. *Elasticities in the Market*

The previous section defined the law of demand: growing prices lead to decreasing demand. The price elasticity of demand measures how big the reaction of the quantity demanded is to price changes.

[6] Note, that the described market mechanism works in competitive markets (market structures will be described in detail in Chapter 5.). However, in a monopolistic market, or when government regulation prevents the self-regulation of the market, the market disequilibrium may prevail for a longer period.

The demand for a commodity may be influenced by many factors, including its price, the price of its substitutes, the consumers' incomes, etc. Generally speaking, the **elasticity of demand** measures the percentage change in the demanded quantity of a commodity in response to a one percent change in any specific factor influencing the demand.

*The **price elasticity of demand** shows the ratio of the percentage of change in the quantity demanded to the percentage of change in its price (Case et al., 2009).*

Similarly, the ***income elasticity of demand*** *shows the ratio of the percentage of change in the quantity demanded to the percentage of change in the consumer's income, and the **cross-price elasticity of demand** shows the ratio of the percentage of change in the quantity demanded to the percentage of change in the price of another commodity.*

The elasticity of demand is measured by the **coefficient of elasticity (*ε*)**. The formula is the following: $\varepsilon = (\Delta x/x) / (\Delta z/z)$, where x is the current (initial) value of the demanded quantity, Δx is the change in this quantity, z is the initial value of the influencing factor, while Δz is the actual change in its value. Therefore:

The **coefficient of price elasticity of demand** is: $\boldsymbol{\varepsilon = (\Delta x/x)/(\Delta p/p)}$**,** where x is the initial value of the demanded quantity, Δx is its change, p is the price of the commodity, and Δp is the price change.

The **coefficient of income elasticity of demand** is**:** $\boldsymbol{\varepsilon = (\Delta x/x) / (\Delta I/I)}$**,** where x is the initially demanded quantity, Δx is its change, I is the consumer's income and ΔI is its change.

The **coefficient of cross-price elasticity of demand** is: $\boldsymbol{\varepsilon = (\Delta x/x) / (\Delta p_y/p_y)}$**,** where x is the initial quantity, Δx is its change, p_y is the price of another good, and Δp_y is its change.

Although it is simple to use the initial values as the base values calculating the percentage changes, it is somewhat misleading, because elasticities would differ if the direction of the change turns to the opposite. Therefore more accurate coefficients are attained if the base of the percentage change is taken to be the midpoint of the initial and the final values both for the quantity demanded and for the price or the income (Case et al., 2009).

The absolute values and signs (+ or -) of coefficients of elasticity convey important information. The coefficient of price elasticity is usually negative, as the impact of price rise is usually a decrease in the demand. The value for the income elasticity is positive, because the rising income leads to higher quantity demanded. The coefficient of cross-price elasticity of demand may be positive when the increasing price of another product leads to an increasing demand for our commodity (which is typical for substitute products), or negative when the increasing price of the other product leads to a decreasing demand for our commodity (a typical property for complementary products consumed together). The elasticity of demand is classified by the absolute value of the elasticity coefficient. When the absolute value of the coefficient of elasticity is above 1, demand is called ***elastic***, meaning that the percentage change in demand is larger than the percentage change in the influencing factor. When the absolute value of this coefficient is below 1, then ***the demand is called inelastic***, meaning that the percentage change in demand is smaller than the percentage change in the influencing factor. When the absolute value of this coefficient is exactly 1, then it is called ***unitary elasticity***, meaning that the percentage change in demand is exactly the same as the percentage change in the influencing factor. (Samuelson – Nordhaus, 2010).

The idea of supply elasticity is very similar to demand elasticity. *The **price elasticity of supply** shows the percentage change in the supplied quantity of a commodity in response to a one percent change in its price.*

The importance of price elasticity of demand reflects the relationship between a price change and the resulting change in the sales revenue. With elastic demand, i.e., when the coefficient of price elasticity is above 1 in absolute value, then a small change in prices leads to a relatively large change in demanded quantities. Thus, a small price fall will lead to a large increase in the demanded quantity, resulting in increasing sales revenues. A small price rise, however, will lead to a large decrease in the quantity, with an overall negative impact on the revenues. For elastic demand it is worth decreasing the price because it will lead to increasing revenues, while raising the price will cause smaller revenues than before the price change.

Review Questions and Problems[7]

1) Explain the meaning and essential elements of the market.
2) Define demand and explain the factors that can influence it. Explain the concepts of the demand function, demand schedule and demand curve.
3) Define the meaning of supply and explain the factors that influence it. Explain the concepts of the supply function, supply schedule and supply curve.
4) Explain the concept of market equilibrium, and graph it. Explain the following terms: equilibrium price, equilibrium quantity, excess demand, and excess supply.
5) Explain the following terms: price elasticity of demand, income elasticity of demand, and cross-price elasticity of demand. Explain the sign and value of the elasticities, and give the formulas for calculating their values.
6) The supply and demand for sandwiches in a fast food restaurant are shown in the table below.
   a. Draw the graphs of the demand and supply functions (the demand curve and the supply curve).
   b. Find the equilibrium price and the equilibrium quantity of sandwiches.
   c. How will the market equilibrium change after an increase in the consumers' incomes that leads to a 10 % increase in the demand for sandwiches at any price? Draw the graph of the new equilibrium situation, and calculate the new equilibrium price and quantity.

Supply of sandwiches		*Demand for sandwiches*	
P (EUR/meal)	*Q_D (units)*	*P (EUR/meal)*	*Q_S (units)*
4.0	9000	4.0	1000
3.5	8000	3.5	2000
3.0	7000	3.0	3000
2.5	6000	2.5	4000
2.0	5000	2.0	5000
1.5	4000	1.5	6000

[7] Source for problems 7 and 8: Case et al. (2009)

1.0	3000	1.0	7000
0.5	2000	0.5	8000

7) The market of a rock band's new CD is described by the following demand and supply functions: $Q_D = 140 - 5 \times P$, $Q_S = 2 \times P$. Draw the supply and demand curves and calculate the equilibrium price and quantity.

8) Suppose that the market demand and market supply for pizza are given by: $Q_D = 3000 - 200 \times P$; $Q_S = 200 \times P - 1000$ respectively (P is the unit price of pizza).

a. Graph the supply and demand functions for pizza for prices from $ *5* to $*15*.

b. How many pizzas are sold in market equilibrium, and at what price?

c. What happens in the market if the sellers set the price at $*12*?

d. Suppose that hamburger is a substitute for pizza, and the price of hamburgers doubles. This leads to the doubling of the demand for pizza, (at any price consumers demand twice as much pizza as before). Give the new market demand function for pizza.

e. Calculate the new equilibrium price and quantity using the new demand function.

CHAPTER 3: CONSUMER BEHAVIOUR AND DEMAND

Let us have a closer look on how market demand is formed. The previous chapter introduced the concept of market demand, and identified its core components: the consumer's willingness and ability to purchase the goods. The present chapter will look at the individual consumer's demand behaviour, identifying the way how the consumer chooses to spend his/her income on the preferred goods.

The consumer demand depends on how much money the consumer can spend on goods, and how useful these goods are for the consumer, i.e. what needs or wants they are suitable to satisfy. The utility of goods, i.e., their ability to satisfy needs and wants, depends partly on their objective properties, and partly on the consumers' subjective value judgements. These two components determine the consumer's preferences. At the same time, the consumer's choice of preferred goods is limited by the consumer's income and the purchasing power of this income – the relative value of the income compared to the prices of commodities. Therefore, the consumer's choice is mainly based on the value he/she attributes to the utility of the goods, while his/her budgetary constraint limits the available options. The true quantity demanded is determined by these two factors.

The present chapter introduces first the factors that determine the consumer's ability to buy certain amounts of goods, and then describes the consumer's willingness to buy. Finally, the two components are applied together to define the optimal choice of the consumer, leading to the definition of individual demand.

3.1. The Budget Constraint

Let us try to determine how much a consumer is able to buy of a commodity. All of us experience the way how our limited income constrains our ability to buy goods. The higher the price, the smaller the amount of goods we are able to purchase. Moreover, the limited income is usually divided among buying several goods at the same time, the prices of all having an impact on the final bundle of goods we can purchase.

The decision problem is illustrated by a simple example. Suppose that the consumer – a student – spends $20 each day in the canteen to buy two things: scones and sandwiches. The money is spent every day, on these two goods and nothing else. The question is how much the student can buy of each product, spending all the money she has.

To answer the question, we have to know the prices of the two goods. One scone costs $1 in the canteen, and the price of one sandwich is $*2.5*. Thus the student has many purchase options:

- She can spend all the money on scones, buying *20* units of them;
- Alternatively, she can spent all the $20 on sandwiches, to purchase *8* units of them;
- She may divide the $20 between scones and sandwiches, buying, for example, *2* sandwiches and *15* scones;
- Similarly, she can have *4* sandwiches and *10* scones;

- Another possibility is to buy *6* sandwiches and *5* scones;
- Furthermore, assuming the units are divisible, then *7* sandwiches and *2.5* scones also cost exactly $20.

In order to describe the alternative purchase decisions, the available income ($*20*) was divided into two parts, a sum spent on scones (i.e. the number of scones multiplied by the unit price of scones, $*1*) and a sum spent on sandwiches (that is, the number of sandwiches multiplied by the unit price of sandwiches, $*2.5).* Therefore:

$20 = $2.5×the number of sandwiches + $1×the number of scones. This relationship shows how the attainable amount of scones depends on the actual purchased amount of sandwiches. This equation is called **budget constraint** or **budget line** (as the formula implies a linear relationship between scones and sandwiches).

The budget constraint (budget line) *is the limits imposed on consumer choices by incomes and product prices (Case et al., 2009)*. Therefore, the budget constraint defines the set of all bundles of goods that the consumer is able to purchase at given prices and a given income, assuming all the income is spent on these goods.

The equation for the budget constraint (budget line) is:

$$I = p_x \times x + p_y \times y,$$

- where *I* is the consumer's income,
- *x* is the amount of the first product (sandwiches), and *y* is the amount of the second product (scones) purchased,
- p_x and p_y are the unit prices[8] of products *x* and *y*, respectively.

In our example the income and prices are $I = 20$, $p_x=2.5$, $p_y=1.0$, so the budget line is:

$$20=2.5 \times x +1.0 \times y$$

The equation for the budget line holds for exactly those *(x ; y)* combinations of goods that the consumer is able to buy at the given income and given prices, spending all the income on these goods. Feasible sandwich-scone combinations are *(0;20), (8;0), (2;15), (4;10), (6;5)* and even *(7;2,5).* The consumer's income and the unit prices of the two goods precisely define the budget constraint.

The budget line is graphed in a coordinate system with the purchasable quantities of the two products on the horizontal and the vertical axes. In the example the *x*-axis shows the amount of sandwiches, and the *y*-axis shows the amount of scones, and each pair (or bundle) of attainable products is represented by a point in the budget line (*Figure 3.1*).

The points below the budget line define product combinations that are cheaper than the consumer's income. Point *A* in the figure *(4* sandwiches and *5* scones) cost only $*15*, as with *4* sandwiches the consumer could buy as much as *10* scones without breaking the budget constraint. On the other hand, points above the budget line, – e.g. point *B* in the figure – represent product combinations that are more expensive than the consumer's income. Point *B* indicates a bundle of *20* scones and *2* sandwiches, costing $*25*, as with *20* scones no sandwiches could be bought.

[8] When the analysis refers to several products, prices and quantities will be denoted by small-case letters, as here. For assessing prices and quantites of one single commodity capital letters P and Q are used for prices and quantites, as in the former chapter.

The transformation of the budget constraint equation $I = p_x \times x + p_y \times y$ leads to the equivalent formula: $I - p_x \times x = p_y \times y$, which is equivalent to: $I / p_y - (p_x / p_y) \times x = y$, therefore the budget line equation can be written as: $\boldsymbol{y = (I / p_y) - (p_x / p_y) \times x}$.

In our example: $y = (20/1.0) - (2.5/1.0) \times x$, that is, $\boldsymbol{y = 20 - 2.5 \times x}$. Looking at *Figure 3.1* it is easy to see that the budget line intersects the vertical axis at $y= 20$ (that is, at I/p_y), and the slope of the line is *-2.5*, which is the negative of the ratio of the prices of the two commodities: $- p_x/p_y$.

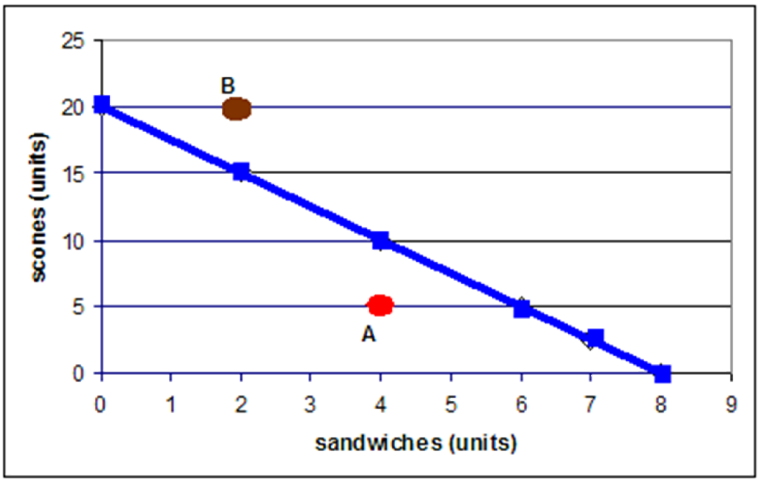


Figure 3.1: ***Plotting the budget line 20=2.5 × x +1.0 × y***
Source: Author's own construction

How does the consumer's budget constraint change if the income or any of the prices change? Suppose, for example, that the consumer's income is halved, that is, instead of $*20* only $*10* can be spent daily on scones and sandwiches, so $I = 10$. The formula for the new budget line is $10=2.5 \times x + 1.0 \times y$, that is, $y = 10 - 2.5 \times x$. This means that spending all the income on scones, *10* units can be bought instead of *20*, and spending all the income on sandwiches only *4* units are attainable instead of the previous *8* ones. And the same logic applies to all product combinations, the current income allows only half of the previous quantities (e.g. instead of the previous combination of *4* sandwiches and *10* scones now only *2* sandwiches and *5* scones are attainable). This means that due to a decrease in income the budget line shifts downwards, and it shifts upwards with increasing incomes. As the prices are the same, their ratio does not change, so the slope of the budget line remains the same as before, the new budget line is parallel to the previous one (line *(2)* in *Figure 3.2*).

To illustrate the impact of price changes suppose, that having the previous income *(I=20)* unchanged, the unit price of sandwiches doubles (i.e. it becomes *$5.0* instead of the former *$2.5*), while the price of scones remains the same *($1.0)*. When we spend all the income on scones, altogether 20 scones are still attainable as before, but when spending all our money on sandwiches, now only *4* units can be bought instead of the previous *8* units. The new budget line is: $20=5.0 \times x + 1.0 \times y$, that is, $y = 20 - 5 \times x$, and, as is shown by line *(3)* in *Figure 3.2,* the slope of the line has changed.

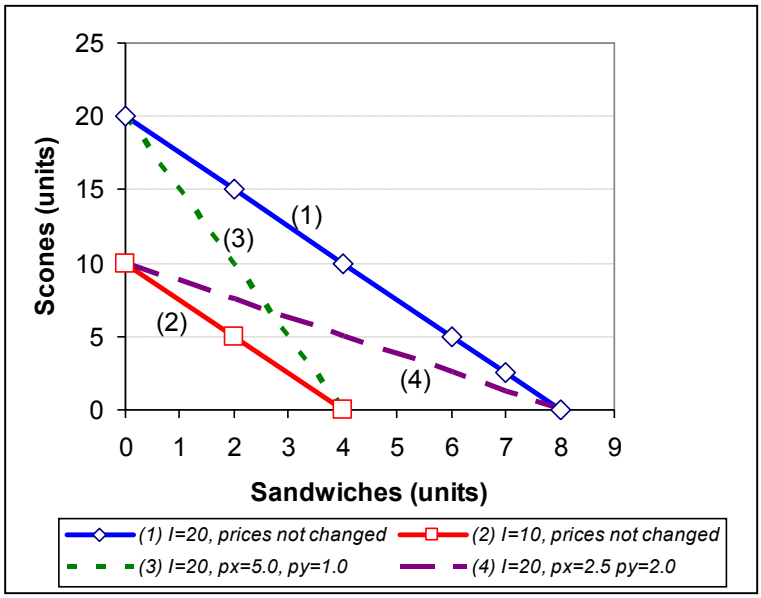


Figure 3.2: ***The impact of changing incomes or prices on the budget line***
Source: Author's own construction

The impact of the change in scone prices – e.g. the doubling of scone prices (from $*1.0* to $*2.0*) – can be described similarly with the same income of $*20* and the same unit price of sandwiches, $*2.5.* The bundle of (*8 sandwiches; 0 scones*) is still attainable, but spending all our money on scones (buying *0* sandwiches), only *10* scones are attainable at the increased prices. The new budget line is: $20=2.5 \times x + 2.0 \times y$ that is, $y = 10 - 1.25 \times x$, as is shown by line *(4)* in *Figure 3.2.*

Finally, suppose that the prices of the two products change in the same proportion, e.g. both of the prices double, while the income remains unchanged. Spending all our money either on sandwiches or on scones, we can buy only half of the previous amount, and choosing to buy any combination of scones and sandwiches, the amounts will be exactly half of the previously attainable bundle. The new budget line is: $20=5.0 \times x + 2.0 \times y$, or in another form: $y = 10 - 2.5 \times x$. This equation has been graphed earlier as line *(2)* in *Figure 3.2,* so the product bundles attainable for the consumer are exactly the same, as the ones attainable at unchanged product prices and halved income. Therefore the consumer does not find any difference in the attainable bundles if the prices of all products rise at a certain proportion, or the income falls by the same proportion. The eventual outcome is the decrease of the attainable product bundles - in other words, the consumer's **real income** – by the same proportion. The rise in the consumer's income or the decrease in the product prices can both be interpreted as the increase in the consumer's real income, because both will lead to the increase in the product bundles attainable for the consumer.

The **real income** *is the set of opportunities to purchase real goods and services available to a consumer as determined by prices and money income (nominal income)* (Case et al., 2009)

The above example defined the budget constraint when the consumer's choice was limited to two commodities. In the real world, however, consumers divide their incomes among many

products and services at the same time. The simple model of two goods is an idealistic, simplified situation, although it can help us to understand more general situations[9].

3.2. Consumer Preferences

As we have seen in the previous section the consumer is able to buy all the goods within the budget constraint. Now we have to find out how to choose from the attainable bundles, how to find the most valuable one. The answer depends on the consumer's opinion about the goods and bundles of goods, about their usefulness and preferred character. Goods and services may satisfy various wants and needs, and under the conditions of scarcity the consumer must choose which needs should be satisfied by purchasing commodities, and which ones to sacrifice. The consumer will have to choose which of his/her needs are more important than the others, by ranking these needs and wants in a conscious or a subconscious way. This ranking is called the consumer's *scale of preferences* (Sloman, 2006). The consumer's scale of preferences depends on the consumer's tastes, habits, and reflects mainly the individual's subjective opinion and value judgement, although it may be influenced by the actual socio-economic environment, too. Consumer preferences often differ from the consumer's choices, because preferences depend basically on the utility of the product for the consumer, and not on its price, while the actual amount purchased strongly depends on the consumer's budget constraint, determined by the price of the product. Let us have a closer look at the consumer's scale of preferences and the utilities of commodity bundles.

Using our example introduced in Section 3.1, take the bundles of scones and sandwiches, and assess them by their useful properties, i.e. their ability to satisfy some needs and wants of the consumer. Assume for a moment, that the consumer has *4* sandwiches and *8* scones. Suppose that the consumer likes sandwiches and scones, too, therefore she will be happy to have an extra sandwich. In other words the consumer prefers the bundle of *8* scones and *5* sandwiches to the bundle of *8* scones and *4* sandwiches. Similarly, higher utility, or satisfaction is attained from any bundle having more than *4* sandwiches with the *8* scones, because the consumer has the option of consuming *8* scones and *4* sandwiches, and has some additional sandwiches to use as he/she likes. He/she may eat these additional sandwiches, or he/she can exchange it with a friend for some favour, so the additional sandwiches can be used for some valuable purpose. The situation is similar when the bundle contains a fixed amount of *4* sandwiches and the amount of scones is increased from *8* units up. Summing up, the consumer prefers – that is, attributes higher use to - all the commodity bundles in which the quantity of one commodity is the same as in the initial bundle, and the quantity of the other commodity is higher. Of course, all bundles that contain larger amounts of both commodities are preferred to the initial bundle.

[9] The logic of the described simple version of two products for the budget constraint can be applied to more products. In theory a multi-product budget constraint can be written as $I = p_1 \times x_1 + p_2 \times x_2 + p_3 \times x_3 + \ldots + p_n \times x_n$, where p_i is the price and x_i is the quantity of product i, but for practical applications another solution is used: in which the income is divided between a particular product x and all the other commodities that the consumer buys. Then the equation of the budget constraint is: $I = p_x \times x + 1 \times y$, where x stands for the quantity of the particular product of interest, p_x is its price, y represents a fictitious product measuring the income left after buying product x (applying $p_y = 1$ as its fictitious price).

Applying the same reasoning, all the bundles containing the initial amount of sandwiches (*4* sandwiches) and less scones than in the initial bundle are less valuable, less preferred than the initial bundle. Similarly the bundles with the same amount of scones and less sandwiches are also dispreferred as well as all the bundles of less sandwiches and less scones than in the initial bundle.

Therefore, compared to the initial consumer bundle (*4* sandwiches; *8* scones) we have identified the set of clearly preferred bundles and the set of clearly dispreferred ones. However, we are unable to decide about the exact preference ranking of consumer bundles containing more than *4* sandwiches and less than *8* scones, or more than *8* scones and less than *4* sandwiches, because the ranking of these bundles depend on how many scones the consumer is willing to exchange for one sandwich without feeling a loss or a gain in his/her well-being. Thus the consumer should decide about the units of one commodity that he/she is willing to give up for getting another unit of the other product.

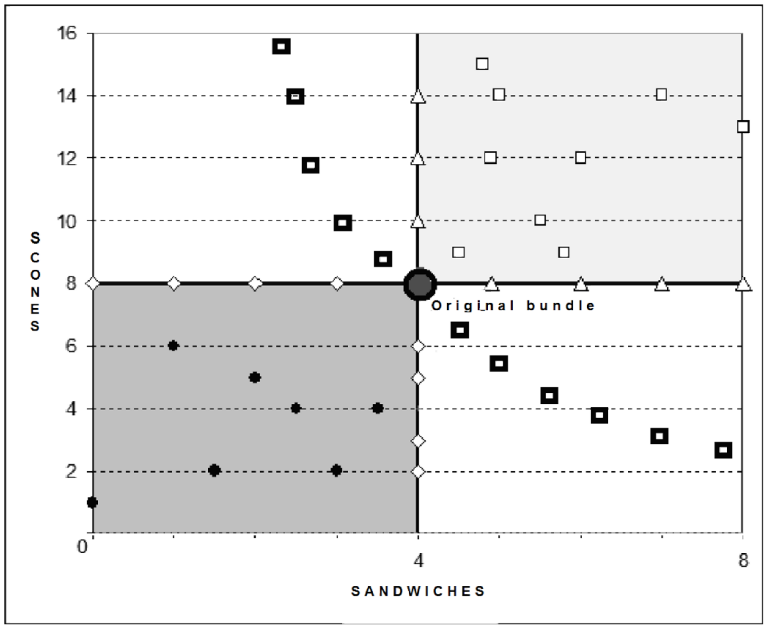
The original consumer bundle (*4* sandwiches and *8* scones), and the definitely preferred or dispreferred bundles are illustrated in *Figure 3.3*. Obviously, the bundle of *(4;8)* divides the set of attainable bundles into 4 sections. The lower left section (dark grey area) contains the bundles definitely dispreferred to the initial one, the upper right section (light grey area) contains the bundles definitely preferred to the initial one. However, the lower right and the upper left sections (white areas) may contain bundles that are preferred to the initial bundle and bundles that are dispreferred to it, and bundles that are exactly as useful as the initial bundle. Certainly, all bundles of the same utility as the initial bundle must lie here, namely in the upper left and the lower right sections of the graph, and nowhere else.

All bundles of the same level of satisfaction as the initial bundle are called indifferent bundles for the consumer's choice, or *the indifference set*: these are the alternative combinations of goods that yield the same level of satisfaction compared to the original bundle. When plotting all these indifferent bundles, the resulting series of points is called indifference curve.

The indifference curve *is a line that defines all those combinations of goods between which the consumer is indifferent: i.e. the bundles that give the same level of utility*. (Sloman, 2006).

Assuming that the commodities are infinitely divisible, the indifferent product combinations are scattered infinitely densely in the consumption space and the indifference curve is a continuous curve. This will be assumed throughout the rest of the text, although real-world situations are rarely like this. In spite of this, the assumption of divisibility leads to many useful results that are also valid for non-continuous situations of the real world.

Figure 3.3 shows the indifference curve belonging to the commodity bundle *(4;8).* Naturally, indifference curves may be constructed to any other initial bundle. Thus, for example, constructing the indifference curve of the initial bundle of *(4; 10)* we can declare, that this curve is preferred to the indifference curve of the bundle *(4;8)*, and lies above it in the consumption space, because the *(4;10)* bundle is preferred to the *(4;8)* bundle. Similarly, the indifference curve of a dispreferred bundle will lie below the indifference curve of the initial bundle. Thus, an infinite number of indifference curves may be plotted in the consumption space. The diagram plotting all these indifference curves is called **indifference map** of the two goods analysed.



△ preferred bundle: more of one good, same of the other good
◇ dispreferred bundle: less of one good, same of the other good
□ preferred bundle: more of both goods
● dispreferred bundle: less of both goods
◘ indifferent bundle: more of one good, less of the other good, the bundle has the same value as the initial one

Figure 3.3: ***The indifference curve and the scale of preferences***
Source: Author's own construction

The left panel of *Figure 3.4* shows the indifference map. The figure demonstrates the **most important properties of indifference curves**:

- **Indifference curves are downward-sloping:** Moving down along an indifference curve, increasing the amount of product *x* the amount of product *y* must decrease to keep the utility of the bundle unchanged.
- **Indifference curves running higher represent higher levels of utility:** Considering commodity bundles with the same amount of product *x,* with increasing quantities of *y* the bundles are increasingly preferred; therefore the indifference curves containing such preferred bundles lie above the initial curve. The indifference curves *(1), (2)* and *(3)* in the left panel of *Figure 3.4* illustrate this attribute of the indifference map.
- **Indifference curves cannot intersect:** Assume that the indifference curves *(3)* and *(4)* in the left panel of *Figure 3.4* are different, but intersect in point *B*. Being different curves they must have different points. Take point *C* in curve *(3)* and point *A* in curve *(4)*, representing two bundles with the same amount of product *x*, and different amounts of commodity *y* (higher in *A* than in *C*). This means that bundle *A* is preferred to bundle *C*. However, bundle *A* is indifferent to bundle *B* as both lie along the indifference curve *(4).* But bundle *B* is also indifferent to bundle *C* along the indifference curve (*3*). Therefore, as both *A* and *C* are indifferent to *B*, they must be indifferent to

each other, too. This is a contradiction, because their *y*-amounts differ, while *x*-amounts are the same. This means that our initial assumption was false: no such intersection point *B* exists.

- **Indifference curves are convex:** rather than using the exact mathematical definition for convexity, take the intuitive geometrical interpretation: a curve is convex if connecting any two points of the curve the connecting line lies above the curve (see the right panel of *Figure 3.4).* Bundle *A* in the figure contains a large quantity of commodity *y*, and only a small amount of commodity *x*. On the other hand, bundle *B* contains only a small amount of *y* and a large amount of *x.* Thus both *A* and *B* contains somewhat extreme combinations of the two goods. Connecting the two bundles *A* and *B,* take the bundle represented by point *D*, halfway in the connecting line. Bundle *D* contains less of *y* and more of *x* than bundle *A*, and more of *y* and less of *x* than bundle *B*, therefore it represents a more balanced bundle than either *A* or *B*. However, bundle *D* lies above the *A-C-B* indifference curve. Thus it is preferred to all of the bundles lying along the curve (and therefore to *A, B* and *C,* too), and its utility must be higher than of those. Thus, convexity means that balanced commodity bundles are preferred to any extreme bundle.

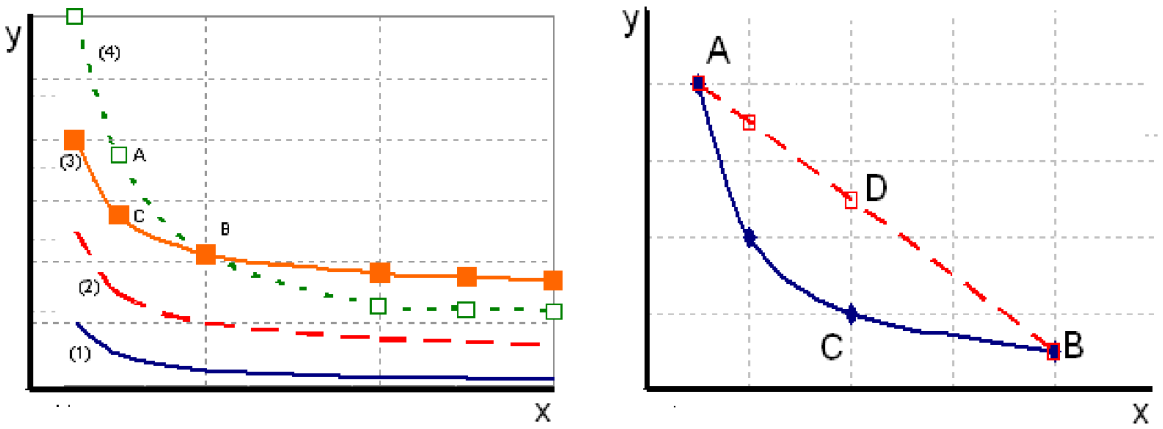


Figure 3.4: ***Properties of the indifference curve and the indifference map***
Source: Author's own construction

The term 'well-behaved indifference curve' is used for continuous indifference curves that have the above properties. Typical commodities and consumers behave this way, although there are specific consumers, or specific goods that differ from the above. In the rest of the text – when it is not indicated otherwise – we assume that the analysis refers to well-behaved indifference curves.

The definition of the indifference curve says that the consumer is willing to exchange any two bundles lying along the curve. As the curve is downward sloping, the consumer is willing to give up a certain amount of commodity *y* for getting an additional unit of commodity *x* and similarly, the consumer is willing to give up one unit of commodity *x* for getting some additional units of commodity *y*. This phenomenon is called substitution along the indifference curve, that is, the consumer substitutes a certain amount of commodity *y* for one additional unit of commodity *x*. The rate of the exchange between the two commodities is an important property of the indifference curve. Naturally, substitution depends on the actual amounts that the consumer owns of the two commodities, because having a large quantity of one of the commodities and a very small amount of

the other, the consumer is willing to give up more of the first one for getting an additional unit of the second one.

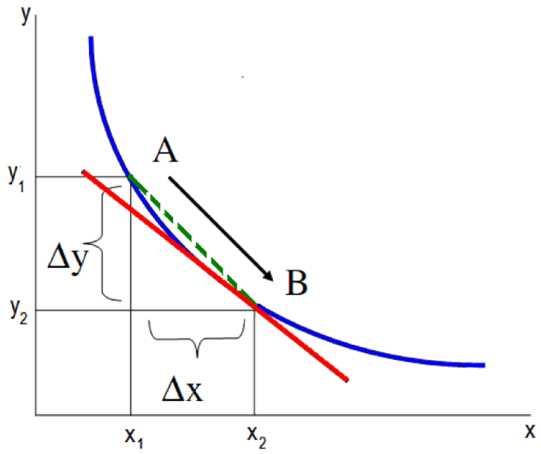


Figure 3.5: ***Substitution along the indifference curve***
Source: Author's own construction

Figure 3.5 shows such an exchange: the consumer is exchanging bundle *B* for bundle *A*, decreasing the amount of *y* for some additional amount of *x*. Giving up *Δy* of commodity *y* an additional amount of *Δx* is requested of commodity *x* as a compensation. The quotient of the absolute values of these two amounts is called the **Rate of Substitution** *(RS).*

The formula for computing the rate of substitution is: RS=|Δy / Δx| = - Δy/Δx. RS measures the absolute value of the slope of the *A-B* line. It is easy to see that this slope depends on the positions of and the distance between *A* and *B* along the indifference curve. Moving *A* towards *B* along the curve, the absolute value of the slope of the connecting line decreases, as well as the rate of substitution, therefore *RS* keeps changing. To solve this problem, imagine that *A* gets infinitely close to *B*, i.e. the two points become one, and compute the rate of substitution for these infinitely close points. This introduces a new concept: the **Marginal Rate of Substitution** *(MRS)* measures the amount of commodity *y* that the consumer is willing to give up for an infinitely small additional unit of commodity *x,* assuming that the utility of the new bundle remains the same as that of the initial bundle.

The formula for the marginal rate of substitution is: MRS = |lim Δy/Δx| = |dy /dx | = - dy / dx. The marginal rate of substitution gives the absolute value of the slope of the tangent line of the indifference curve at point *B* (that is equal to the first derivative of the curve by *x*). While *RS* depends on the positions of two points, *A* and *B*, *MRS* is defined by the position of only one point in the indifference curve.

3.3. The Concept of Utility

People spend their incomes on many goods and services, dividing their money among them. Now let us assume that the consumer buys constant amounts of all commodities except one, and

look at how the level of satisfaction changes with the changing amounts of this one good. In our simple model of two goods assume that the consumed amount of commodity *y* remains constant at the level y_0, while the consumer *ceteris paribus* increases the consumption of *x*. By increasing the quantity of *x* while *y* remains constant the consumer attains increasingly preferable bundles, moving to higher indifference curves, as is shown by the left panel of *Figure 3.6. U1, U2, U3* and *U4* indicate the increasing levels of satisfaction, and the lower part of the panel shows, *ceteris paribus,* the increasing utility levels associated with the increasing consumed quantities of *x*.

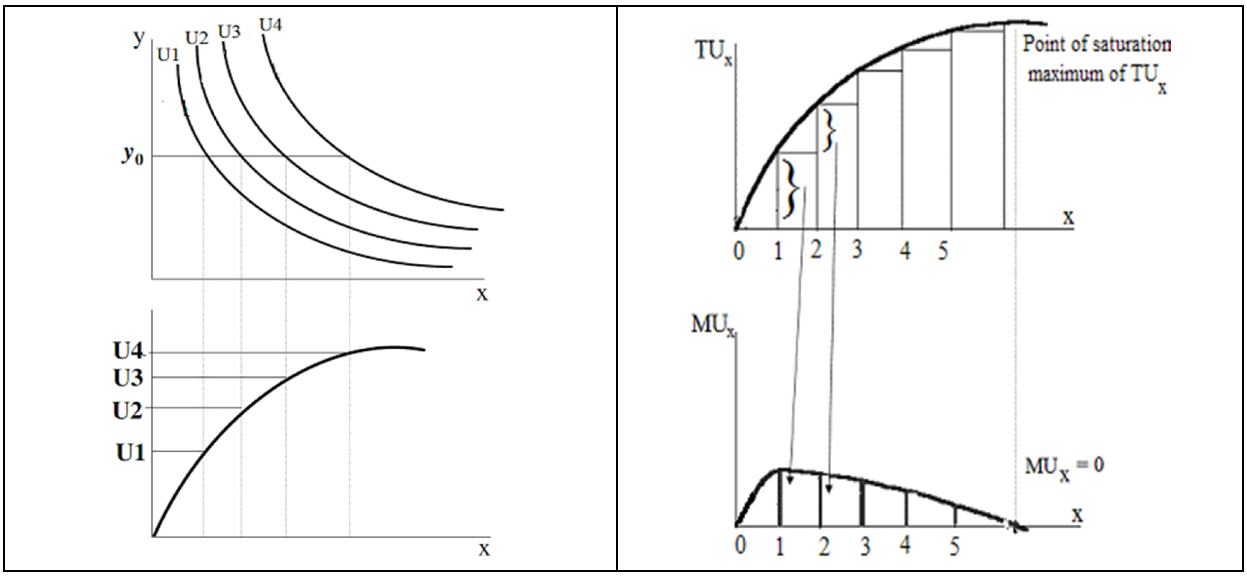


Figure 3.6: ***The Indifference Curves and the Utility Function***
Source: Author's own construction

Utility (*U*) or **Total Utility** *(TU)* means *the useful properties of a commodity, i.e. the level of satisfaction that the consumption of the commodity yields for the consumer (Sloman, 2006).*

The lower left panel of *Figure 3.6* measures the increasing utilities the consumer gains by increasing the consumption of commodity *x, ceteris paribus*[10].

The utility experienced by the consumer grows with each subsequent unit of the commodity, assuming other circumstances constant. However, consuming an additional unit of the good will not always yield the same additional utility. Looking at our previous example (*x* being the amount of sandwiches), when we are very hungry (having only eaten a small amount of scones or sandwiches, or none of them), the first sandwich yields very high utility, but as the amount of sandwiches

[10] Measuring utilities of consumer bundles is not an easy problem, and it is not obvious whether the measurement is possible. Various utility theories deal with this problem in different ways. **Cardinal utility** theory attaches a magnitude to utility, saying that the utilities of consumer bundles can be measured by absolute numerical values, so their utilities are not only comparable to each other but the proportion of their utilites can be expressed, too. **Ordinal utility theory**, however, states, that the bundles can be compared and ranked by their preferences, so the consumer can decide which is more useful of any two bundles, but the difference of their utilities cannot be measured. In the rest of the text the approach of the cardinal utility theory is used, assuming the notion of measurable utilities (Varian, 1987).

consumed increase, our hunger subsides, and the satisfaction attained from the additional units decrease.

The **Marginal Utility** (MU) of a commodity measures *the additional utility gained by consuming an additional unit of the commodity* (Sloman, 2006). Assuming that commodities can be divided into very small fractions, the notion of marginal utility can be defined more precisely, as the change in utility experienced by consuming an infinitely small additional unit of the commodity. The **utility function** (TU_x – *Total Utility*) measures the total utility obtained by consuming a certain amount of commodity ***x***. Therefore total utility is equal to the sum of all marginal utilities obtained by consuming subsequent units of the commodity. Thus the marginal utility of the good *x* can be computed using the formula:

$MU_x = \Delta TU_x / \Delta x \quad (\Delta x \rightarrow 0)$, that is, the total change in utility obtained by changing the consumed quantity of commodity *x* (*ceteris paribus*, the consumption of *y* being constant). The total utility (TU_y), and the marginal utility (MU_y) of commodity *y* is defined similarly, assuming, *ceteris paribus,* the consumption of *x* kept constant: $MU_y = \Delta TU_y / \Delta y \quad (\Delta y \rightarrow 0)$.

As the product is consumed in increasing quantities, the extra units consumed will yield less and less satisfaction. The utility of the first sandwich for the hungry consumer is enormous, the second and the third sandwiches yield somewhat less satisfaction, and the tenth one may not be desirable at all. *After a certain level of consumption the extra unit will not yield any satisfaction and the consumer feels saturated; the utility function reaches the* **saturation point**. *As consuming an extra unit yields no increase in the total utility, the value of marginal utility becomes zero* (as in the right panel of *Figure 3.6*).

This is *the law of* **diminishing marginal utility** (Samuelson − Nordhaus, 2010; Varian, 1987**)**: *As the consumption of a good is increased (ceteris paribus), then the increase in total utility attained by the additional units consumed will decline (this is also known as Gossen's First Law**).***[11]

3.4. The Optimal Choice

The consumer ranks the various commodity bundles comparing the level of satisfaction, or utility they offer. Indifference curves contain all the bundles generating the same feeling of satisfaction, therefore the consumer is willing to exchange these bundles without a feeling of gain or loss. Suppose, that the consumer has two such bundles of commodities *x* and *y*, the first bundle containing the respective quantities of x_1 and y_1 and the second bundle of x_2 and y_2. *Figure 3.7* represents these bundles by the notation $A(x_1;y_1)$ and $B(x_2, y_2)$. *B* contains more of *x* and less of *y* than *A,* but both bundles yield the same utility, denoted by *U2*, consequently the consumer is willing to substitute one for the other. What does the substitution of bundle *A* for bundle *B* mean?

[11] In our daily experience sometimes we encounter increasing marginal utilities, too: for devoted collectors an additional unit of the collection yields increasing satisfaction. The same is true for addictions (drugs or alcohol). Increasing marginal utility may be experienced for normal goods too, when a new product is just introduced to the consumer, and the consumption of the first unit creates only moderate satisfaction. Then as the consumer learns to enjoy the commodity, the successive units bring about growing satisfaction, and diminishing marginal utility will be encountered only after having consumed a substantial amount.

Let us take bundle *A,* and at first, decrease the amount of *y* to the level of y_2, keeping the quantity of *x* at x_1. This way bundle *A* is exchanged for bundle $C(x_1,y_2)$. Obviously, this results in a fall of total utility, as x_1 has been constant, while the quantity of *y* has decreased. Therefore point *C* lies on the indifference curve *U1,* below the initial indifference curve *U2*. Now bundle *C* is exchanged for bundle *B*, by keeping the amount y_2 constant while increasing the quantity of *x* from x_1 to x_2. The total utility level rises, bundle *B* is on the initial indifference curve *U2,* so it has the same utility level as the initial bundle, *A*.

At first, substituting *C* for *A*, the total utility decreased by the difference of *U1-U2*, while the quantity of *x* was constant. Thus, by the definition of the marginal utility of commodity *y* ($MU_y = \Delta TU_y / \Delta y$) the resulting decrease in total utility is: $\Delta TU_y = \Delta y \times MU_y$. In the second step, substituting *B* for *C*, the total utility increased by the difference of *U2-U1*, with a constant quantity of commodity *y.* Thus, by the definition of the marginal utility of commodity *x* ($MU_x = \Delta TU_x / \Delta x$) the total utility increased by: $\Delta TU_x = \Delta x \times MU_x$. Finally, the sum of these two successive steps gives the eventual change in total utility – a decrease from *U2* to *U1* first, followed by an increase from *U1* to *U2,* the final outcome being no change in utility.

Thus the total change in utility is: $\Delta TU_y + \Delta TU_x = 0$, so $\Delta y \times MU_y + \Delta x \times MU_x = 0$. Rearranging this equation[12] we get: $-\Delta y/\Delta x = MU_x / MU_y$. However, as it was seen previously, the value of $-\Delta y/\Delta x$ is equal to the marginal rate of substitution *MRS* (assuming infinitely small change in commodity *x* which was also the assumption associated with the notion of marginal utilities of *x* and *y*). Therefore, as $MRS = -\Delta y / \Delta x$, we get the following relationship: $\boldsymbol{MRS = MU_x / MU_y}$, that is, the marginal rate of substitution is equal to the ratio of the marginal utilities of the goods *x* and *y* at the consumption levels of the actual bundle.

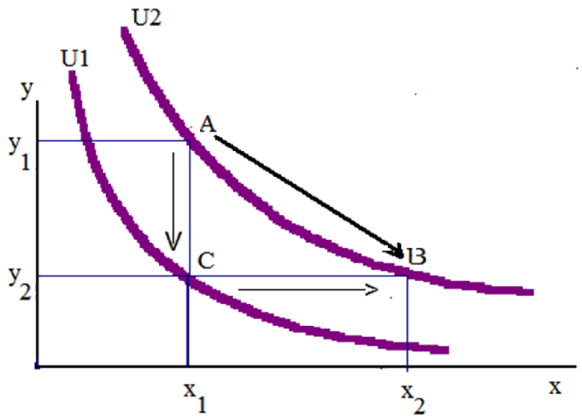


Figure 3.7: ***Indifference Curves and Substitutions***
Source: Author's own construction

[12] The equation is rearranged as follows: $\Delta y \times MU_y + \Delta x \times MU_x = 0$, that is, $-\Delta y \times MU_y = \Delta x \times MU_x$. Hence, dividing both sides of the equation by MU_y we get the following: $-\Delta y = \Delta x \times MU_x / MU_y$, and finally dividing both sides by Δx the equation becomes: $-\Delta y / \Delta x = MU_x / MU_y$.

Now we can put together all the previously obtained relationships to select the optimal bundle for the consumer.

As we have seen, the consumer's choice is limited by his/her income and the unit prices of the commodities, and these define the budget constraint (budget line) containing all the attainable commodity bundles. The question is how to find the best such bundle, that is, how to choose the point of the budget line that has the highest utility level.

Figure 3.8 shows the process of the consumer's choice. Graphing the budget line and the indifference map in the same diagram, some of the bundles of the indifference curves lie below the budget line – being cheaper than the consumer's income –, others lie just in the budget line – costing as much as the consumer's income – and others lie above the budget line, being too expensive. There are two bundles (marked by the two stars) in the indifference curve *U1* that cost exactly as much as the consumer's income. However, the utility level *U1* is attainable choosing cheaper bundles, e.g. the bundles lying in the indifference curve between the two stars are lying under the budget line. This means that the consumer can buy bundles of higher utility than *U1* with the current level of income. The indifference curve *U2* represents a higher utility level, but again, there are bundles along this curve that lie below the budget constraint, so this curve is not optimal either. The curve *U3* however, is unattainable, all the bundles of this curve lie beyond the budget constraint. The consumer's best choice is the indifference curve of the highest utility level among all the curves having at least one attainable bundle. This will be the indifference curve that *has at least one point lying in the budget line, and no point falling below the budget line.* This indifference curve is denoted by *U** in *Figure 3.8.* Therefore the consumer's optimal choice is the bundle represented by the **tangency point** of the indifference curve *U** and the budget line *(*assuming well-behaved indifference curves*).* The budget line is tangent to the indifference curve *U** in the optimal point representing the best attainable bundle.

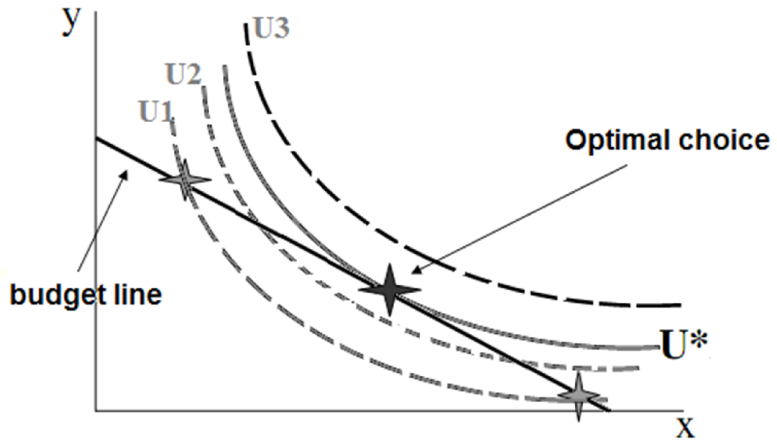


Figure 3.8: ***The Consumer's Optimal Choice***
Source: Author's own construction

The previous section introduced the concept of marginal rate of substitution, which is, by definition **the slope of the tangent line to the indifference curve:** $dy/dx = -MRS$**.** On the other hand, the slope of the budget line is – by definition – equal to the price ratio of the two goods: $-p_x / p_y$. In

the point of the optimal bundle the tangent line to the indifference curve is the budget line itself, so the two slopes must be equal: $MRS = p_x / p_y$. As we know from the previous sections $MRS = MU_x / MU_y$, the marginal rate of substitution is equal to the ratio of the marginal utilities of the two commodities. Thus, for the optimal bundle the following must hold: $MU_x / MU_y = p_x / p_y$, i.e. the ratio of the market prices of the goods, representing the opinion of the market, must be the same as the ratio of the marginal utilities – representing the consumer's opinion.

Rearranging the relationship: $MU_x / p_x = MU_y / p_y$. This formula can be generalised to consumer bundles of many commodities: $MU_x / p_x = MU_y / p_y = MU_v / p_v = MU_w / p_w$ *.etc*.

The above relationship can be stated as (Samuelson − Nordhaus, 2010**)**: *A consumer will spend his/her income in an optimal way achieving maximum satisfaction when the marginal utility of the last unit of income spent on each good is exactly the same (this is* **the equimarginal principle***, also known as Gossen's Second Law).*

This relationship presents a simple way of deciding whether a particular bundle of goods is optimal for the consumer or not. *Table 3.1* gives a numerical example of this idea.

The table describes the consumption patterns of two products: chocolates and oranges. For both products the table shows the marginal utilities associated with increasing consumption. Thus, for instance, eating 2 units of chocolates instead of 1, the consumer's utility increases by *50* units, so the marginal utility is *50* (assuming no other change in the circumstances). As we know, the consumer's optimal choice is the bundle in which the ratio of the marginal utility of the last consumed unit of chocolate to its unit price is equal to the ratio of the marginal utility of the last consumed unit of oranges to its unit price. This occurs in the table at consuming *3* units of chocolates and *5* units of oranges. The decision process is the following: at first the consumer decides whether to choose an orange or a chocolate as the first unit to consume. As the value of *MU/p* is higher for the first unit of oranges *(200),* than for the first unit of chocolates *(133),* the first consumption choice is to buy *1* orange, spending *20* eurocents. The second purchase is another orange, as the *MU/p* value of the second orange (*150)* is still higher than the same value for the first chocolate *(133).* The consumer spends again *20* eurocents. The third purchase will be a unit of chocolate because the *MU/p* value for the first chocolate is *133* while it is only *100* for the third orange. The fourth purchase is an orange again, the fifth purchase is a chocolate, the sixth is an orange, while the order of the seventh and eighth purchases cannot be decided, because the *MU/p* values for third chocolate and the fifth orange are the same *50,* so the consumer can choose them in any order.

Table 3.1: **Example for Maximising the Consumer's Utility**

Chocolates (unit price: $p_{choc's}$ = € 0.60)			**Oranges (unit price: $p_{oranges}$ = € 0.20)**		
Chocolates	***$MU_{choc's}$***	***$MU_{choc's} / p_{choc's}$***	***Oranges***	***$MU_{oranges}$***	***$MU_{oranges} / p_{oranges}$***
1 unit	80	133.3	**1 unit**	40	200.0
2 units	50	83.3	**2 units**	30	150.0
3 units	30	**50.0**	**3 units**	20	100.0
4 units	20	33.3	**4 units**	12	60.0
5 units	10	16.7	**5 units**	10	**50**.0
6 units	5	*10.0*	**6 units**	4	20.0

7 units	2	3.3	**7 units**	2	*10*.0
8 units	2	3-3	**8 units**	1	5.0
9 units	1	1.7	**9 units**	1	5.0
10 units	1	1.7	**10 units**	0,5	2.5

Source: Adapted by Farkasné Fekete – Molnár (2007), page 82.

The consumer can carry on the same way as long as the income is sufficient for the purchases of the subsequent units of chocolates and oranges. This income should be at least *€2.80* in the example (three chocolates costing *€1.80* and five oranges costing *€1.00*). With higher incomes of at least €5*.00,* the process continues, as shown in the table, where the purchase of *6* chocolates and *7* oranges also satisfy the equimarginal principle, while with an income less than that, the decision process described above will terminate earlier.

To check whether a given commodity bundle is optimal or not, a similar method is followed. Suppose that the consumer's income is *€5*, and the bundle he intends to buy is *5* chocolates (costing *€3*) and *10* oranges (costing *€2*). With this bundle, however, $MU_{choc's}/P_{choc's}$ *= 16.7 >* $MU_{oranges}/P_{oranges}$*= 2.5.* Therefore the decision is not optimal. How should we rearrange the consumer's bundle towards the optimal bundle? The $MU_{choc's}/P_{choc's}$ value should be decreased while the $MU_{oranges}/P_{oranges}$ increased. As the consumer cannot change the unit prices of the goods, the marginal utilities should be changed, namely decreased for chocolates and increased for oranges. For this purpose the amount of chocolates should be increased while the amount of oranges decreased. Thus the consumer will buy fewer oranges, and use the money thus saved for buying more chocolates.

3.5. The Consumer's Choice with Changes in Incomes and Prices

The consumer identifies the optimal commodity bundle by the budget constraint and the indifference map representing the consumer's preferences. The budget constraint is defined by the consumer's income and the unit prices of the goods. The prices and the income are external conditions for the consumer, and they may change in time. How will these changes affect the consumer's optimal choice?

Let us consider first the **impact of the change in the consumer's income**. Suppose that the consumer's income to be spent on a particular bundle of goods increases (e.g. due to a wage rise or a tax cut, or a decrease of other commodity prices leaving more money for the consumer to spend on the actual commodities). The increased income will change the budget constraint, expanding the set of attainable commodity bundles and shifting the budget line upward, parallel to the initial line. The optimal indifference curve tangent to the budget line will also change as well as the tangency point. Let us have the three incomes I_1, I_2 and I_3 in the following order: $I_1 < I_2 < I_3$, and $(x_1; y_1)$, $(x_2; y_2)$ and $(x_3; y_3)$ the respective optimal bundles in the budget line.

The **Income-Consumption Curve** *(ICC) is the curve representing the consumer's optimal commodity bundles at varying incomes and constant prices (Varian, 1987).*

The impact of rising incomes can be assessed with respect to only one commodity, e.g. commodity *x*. Let us graph the amounts of commodity *x* on the horizontal axis, and income on the vertical axis, allocating the respective incomes to the *x*-values of the respective optimal bundles. The resulting set of points defines the Engel –curve (see the left panel in Figure *3.9*).

The **Engel-curve** *describes the relationship between the consumer's income and the consumed amount of a particular commodity assuming constant prices.*

Let us analyse the **impact of price changes.** Now the consumer's income and the unit price of commodity *y* are constant, while the price of commodity *x* keeps decreasing. As one of the prices is decreasing, the slope of the budget line is also changing, allowing the consumer to buy more of product *x*, shifting the intersection of the budget line and the *x*-axis to the right, towards larger amounts of *x*. Thus, the optimal indifference curve, that fulfils the tangency condition, will change, and so does the tangency point. The three different prices of commodity *x* are denoted by $P1_x > P2_x > P3_x$, and the optimal bundles in the three respective budget lines are $(x_1; y_1)$, $(x_2; y_2)$ and $(x_3; y_3)$.

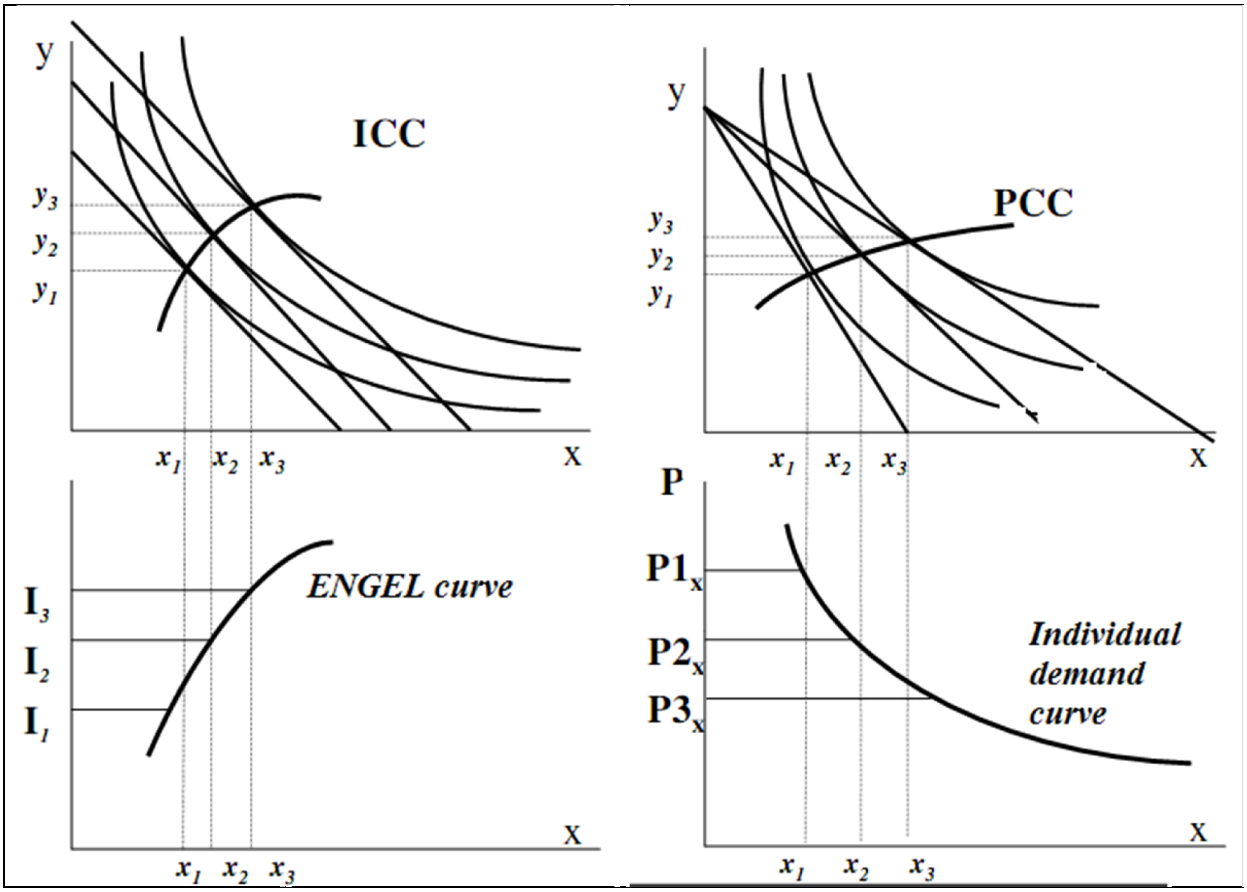


Figure 3.9: ***ICC and PCC***
Source: Author's own construction

The **Price-Consumption Curve** *(PCC): This is a curve representing the consumer's optimal commodity bundles chosen at changing prices of one commodity while the consumer's income and price of the other commodity are kept constant (Varian, 1987).*

Assessing the impact of the decreasing prices on consumption, let us draw a graph with the changing prices of commodity *x* on the vertical axis and the consumption of commodity *x* on the horizontal axis. Linking the *x*-values of the PCC curve to the respective price levels the resulting set of points define the individual demand curve of the commodity (see the right panel of Figure *3.9*).

The ***individual demand curve (function)*** *shows the quantities of a particular commodity that the individual consumer is willing and able to consume at different prices.*

The approximate knowledge of the shapes of *ICC* and *PCC* may help enterprises to estimate the impacts of price changes or government tax reductions or raises and help them to respond appropriately.

Review Questions and Problems[13]

1) Explain the meaning of the budget constraint.
2) Explain the notions of indifference curve and indifference map.
3) What does the consumer's preference ranking mean, how is it related to indifference curves?
4) Explain the notions of substitution, rate of substitution and marginal rate of substitution.
5) Define the notions of utility and utility function. What does saturation mean?
6) Explain marginal utility and give the formula for computing its value.
7) Explain the Law of Diminishing Marginal Utility.
8) What is the relationship between the marginal rate of substitution and marginal utility?
9) Describe the consumer's optimal choice, and explain the equimarginal principle.
10) What does ICC represent, and how is it related to the Engel-curve?
11) What does PCC represent and how is it related to the individual demand curve?
12) What will the impact of a government decision – e.g. increased value-added tax – be on the demand for a product, if the producer must respond to the government decision by raising the price of the product? What happens to demand if another government decision – e.g. an increase in the rate of personal income tax – leads to a *10 %* decrease in the consumers' disposable income? Illustrate the changes in the diagrams of *ICC* and *PCC*.
13) On 1st January a professor made a resolution to lose some weight and save some money. Therefore she decided that she would spend exactly €*100* for lunches each month. For lunch, she has only two options: the university canteen, where the price of a lunch is €*5*, and a nearby restaurant, where the price of a lunch is €*10*. Every day that she does not eat lunch, she runs *5* kms.
    a. Assuming that the professor spends the €*100* for lunch each month, eating either in the restaurant or the university canteen, sketch her budget constraint, giving the actual numbers of lunches on the axes.

[13] Source for problems 13 and 14: Case et al. (2009)

b. Last month the professor chose to eat at the canteen *10* times and in the restaurant *5* times. Does this choice fit within her budget constraint? Explain your answer.

c. Last month the restaurant offered a special half-price lunch all month, that is, all lunches were reduced from *€10 to €5*. Show the effect on the professor's budget constraint.

14) The following table gives the total utility schedule for a cookie fan:

Cookies consumed (units)	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Total utility (TU)	*0*	*100*	*200*	*275*	*325*	*350*	*360*	*360*

Calculate the marginal utilities for the respective consumption levels. Draw a graph of the total utility and the marginal utility schedules. Suppose that the unit price of cookies is *€0.2*, and the disposable income of the cookie fan is very high. What is the maximum number of cookies she would most likely eat?

CHAPTER 4: SUPPLY AND PRODUCTION

Analysing the supply side of the output market we have to assess the process of production and the producer's behaviour. Commodities (goods and services) are produced by firms, business organisations. The role of an enterprise is to allocate and combine productive resources to provide products and services that are wanted by consumers. Thus, a business firm produces its output with the purpose of selling it in the market, and maximise its profit earnings. To achieve this aim the firm will make decisions and take risks, answering the questions of 'what, how and for whom', i.e., it will choose the product or service and the produced quantity, the technology and the resources to use and the market where the output is taken to be sold.

Profit is sales revenues minus production costs. Therefore the enterprise wants to increase its revenue and decrease its costs, utilising the resources efficiently, choosing an efficient technology, and trying to produce the largest possible quantity of output using the available resources, or, in other words, to use the fewest possible resources to produce the same amount of output. The entrepreneur considers profitability the most important issue, and technological efficiency is a requirement for this. However, technological efficiency may still lead to financial losses, e.g. when input prices are high and output prices are low. Therefore, the firm will have to consider technological efficiency together with financial profitability.

Choosing the right technology means the best choice of the types and quantities of various productive resources. The ability of the firm to change the amount of some resource in the production process depends – among other things – on the time available for the change. In reality the firm may be unable to increase the number of machinery units in a limited time period because the purchase of a new piece of machinery is a decision with long-term impacts, and raising money may be difficult, and the new machine may not be needed permanently. Thus, producers may find that they are able to adjust the quantities of some resources, while those of others not. Such decisions are called short-run decisions. Long-run decisions imply that the time available is long enough for the decision-maker to change the quantities of all productive resources.

The producer's decisions also depend on the surrounding market structure. Other producers may sell very similar goods, and our firm must compete with them, adapting to the market processes, being unable to influence them to any significant extent. This is a typical attribute of competitive markets. If, however, a firm possesses an excessive market share, or being the only seller of some product, then it is able to influence or determine the market price. Market structures are discussed later in this chapter.

4.1. Technical Relationships of Production

4.1.1. The Production Function

The production function is a technological relationship that specifies the maximum possible output produced using given combinations of inputs at a given technological level of development (Samuelson – Nordhaus, 2010).

The formula for the production function can be written as: ***Q = f(K,L),*** where *Q* denotes the quantity of output, *K* and *L* are the utilised quantities of capital *(K)* and labour *(L)*, respectively.

Sometimes in real life the firm may not be able to change all of its inputs and therefore it faces short-run decisions. Then, the quantities of some resources may be changed, while others are fixed. Most of our everyday decisions are like that. Long-run decisions are encountered when the time is long enough for the decision-maker to change the applied quantities of all resources.

Examine first the short-run production function. Assume that the producer has two resources: capital and labour, and within the available time span the amount of labour can be changed, while the capital factor is fixed, at the value K_0. *The* ***short-run production function*** *gives the quantity of output as the function of one input, assuming that the other inputs are constant.* The mathematical formula for the short-run production function is:

Q = f(K$_0$,L), where K_0 is fixed, *L* is changing. The usual notation for the amount of output is ***TP*** , short for *Total Product*: ***TP = f(K$_0$,L).*** A simplified notation is*:* ***Q=f(L)*** or *TP=f(L)* with the level of capital fixed at K_0 .

The short-run production function is shown in the top panel of *Figure 4.1*.

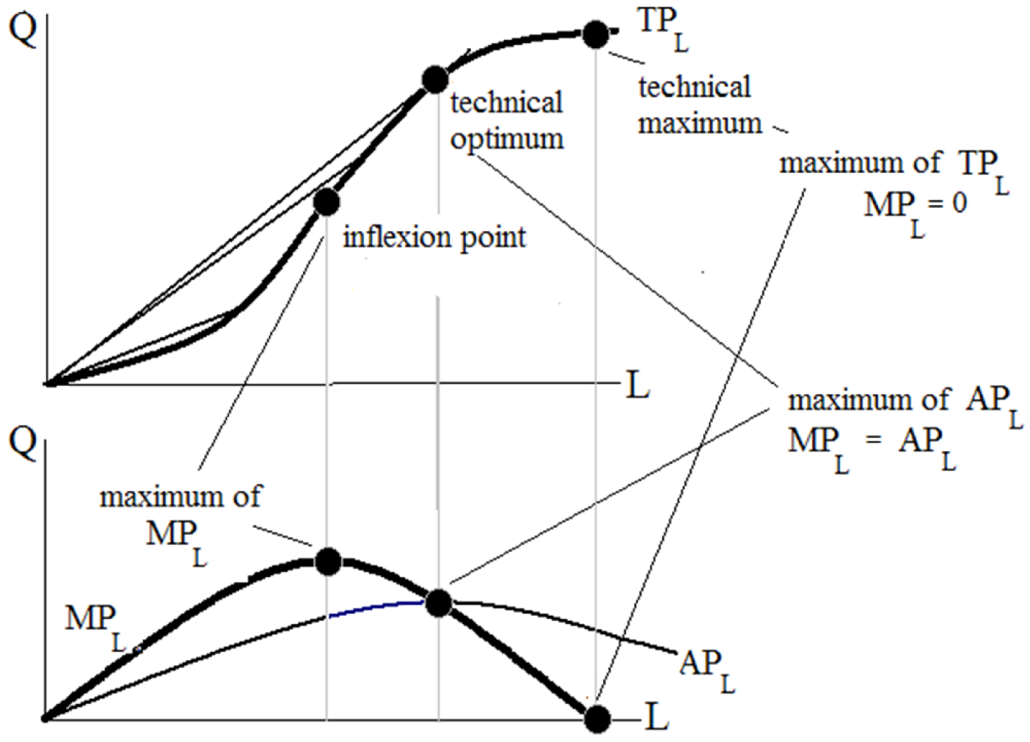


Figure 4.1: ***The Short-Run Production Function***
Source: Author's own construction

The short-run production function quantifies the change in output as a result of a small change in the changeable (variable) input – labour in our example. This relationship is measured by the **Marginal Product** *(MP)* of the input. ***The marginal product of an input*** *is the extra output produced by one additional unit of that input while other inputs are held constant* (Samuelson – Nordhaus, 2010).

*The **marginal product of labour** (MP_L) shows the change in total output when an additional (small) unit of labour is used in production: $MP_L = \Delta Q/\Delta L$ (if $\Delta L \rightarrow 0$).*

As it follows from the definition, marginal product measures the rate at which the production function (total product) changes, in other words, it is the slope of the production function at a given point. (The slope of a curve is defined as the slope of the line tangent to the curve at the given point.)

Another important piece of information is the productivity of the input at the given level of use. ***The average product of labour, AP_L** shows the average quantity of output produced by each unit of labour: **$AP_L = Q/L$.***

The marginal product and the average product can be defined in the same way for capital as the variable input while labour is the fixed one (e.g., in crop production the variable input is the amount of fertiliser). Then the short-run production function is: ***Q=f(K),*** with L_0 being constant. The ***Marginal Product of Capital** (MP_K) shows the change in total output due to applying an additional (small) unit of capital: **$MP_K = \Delta Q/\Delta K$** ($\Delta K \rightarrow 0$). **The Average Product of Capital (AP_K)** shows the average quantity of output produced by each unit of capital: **$AP_K = Q/K$.***

The production function is usually non-linear, as the same extra unit of the variable factor does not always result in the same increase in output (see the top panel of *Figure 4.1*). At small values of labour as the variable input with capital being available at substantial (but fixed) quantity a small increase in labour creates a large increase in output. As every worker has access to enough material and tools to work with, each new worker may do exactly the same as the former ones have done. But the new workers can also cooperate with the old ones, everyone may specialise in some task, therefore increasing the average output for all of them. So, at low levels of labour, any new unit of labour brings about larger increases of output than the former one. The slope of the production function increases, the marginal product rises. This, however, cannot go on infinitely. After reaching a certain level of labour the capital resources start to become insufficient. The new worker will not have enough tools, or materials to work with, and the output cannot rise at the former rate. Although output may still rise, as the new worker can work efficiently for short periods while the others have a break, this additional output becomes less than that of the former workers. Increasing the quantity of labour for a while may still be reasonable, but output will grow at a decreasing rate. If the quantity of labour is still increased, after a while the capacity of the capital factor is reached and new workers cannot find anything to work with, their marginal product falls to zero, output will not grow any further. This process is shown in the top panel of *Figure 4.1*. The production function attains a typical S-shape: at first it grows at an increasing rate, and later it switches to a decreasing rate, finally the curve flattens out.

The bottom panel of *Figure 4.1* presents the marginal product of labour. While increasing the quantity of labour brings about growing outputs at increasing rates, the same extra units of labour result in larger and larger quantities of extra output, and marginal product rises. When the growth of the production switches to decreasing rates, the marginal product starts to fall. The average product of labour shows a similar pattern. As long as additional units of labour lead to increasing additional outputs, the output per unit of labour (that is, average product of labour) will grow. The average product will continue growing as long as the extra output produced by the extra labour unit (that is, marginal product) is higher than the output per labour (the average product) of the former labour units. Therefore, the average product will increase as long as marginal product is higher than the average product. When average product rises to the level of marginal product, any new additional unit of labour will result in decreasing marginal product, and the average product starts to decrease.

Average product may also be explained by its graphical representation. At any level of labour, connect the relevant point of the production function to the origin. The slope of the connecting line is the ratio of the vertical and the horizontal coordinates of its endpoint in the production function, in other words, the ratio of the output and the amount of labour belonging to this output. This is exactly the average product, by definition.

Let us summarise the properties of the short-run production function. The first stage of the short-run production function shows increasing growth. In this stage the marginal product, (i.e. the growth rate of the production function) also increases. In the second stage the short-run production function still increases, but at decreasing rates, until it reaches its maximum value. In this stage the marginal product, although positive, decreases. *The output level, at which the short-run production function turns from increasing growth rate to decreasing growth rate, is called the* ***inflexion point****.* Marginal product reaches its maximum value at this point, growing up to this point and falling afterwards. *The level of output where the production function reaches its maximum value, with the marginal product becoming zero, is called* ***technical maximum*** – called so, because with the present technology this is the maximum level of attainable output.

As the average product is the ratio of the vertical coordinate and the horizontal coordinate of any point of the production function, it is the slope of the line connecting this point to the origin. Moving along the production function from the origin upwards, i.e. increasing the quantity of the variable input, this slope increases at first, then, from the point where the line is just tangent to the production function, it starts to decrease. Therefore the average product grows at first, and then starts to decrease. *The point of the production function, where the value of the average product is the highest, is called* ***technical optimum.*** This point is optimal in the sense, that the output per unit of labour is the highest, so the productivity of labour is the best at this level of input use. As shown earlier, the maximum value of the average product is attained at the level of input where average product is equal to marginal product. Here the tangent line of the production function connects the production function to the origin. *At the point of technical optimum the average product reaches its maximum value, being equal to the marginal product*.

The production process can be divided to four stages according to the level of the variable input that defines the shapes of the production function (the total output) and the marginal product.

- Stage 1 – from the origin to the inflexion point: total output grows at increasing rates, marginal product also grows, and this stage is called the stage of increasing returns.
- Stage 2 – from inflexion point to technical optimum: total output grows at decreasing rates, average product grows, marginal product decreases.
- Stage 3 – from technical optimum to technical maximum: total output grows at decreasing rates, marginal product decreases, but is still positive, and average product decreases.
- Stage 4 – after the technical maximum is reached: total output does not grow any more, it may even start to decrease, marginal product is negative and decreasing, while average product is also decreasing.

The first stage is called the stage of increasing returns, the second, third and fourth stages together are the stages of diminishing returns. ***The principle of diminishing returns*** *says that applying additional units of a variable input while keeping the other inputs constant, the marginal product of the variable input will decline (Samuelson – Nordhaus, 2010).*

4.1.2. The Long-Run Technical Relationships of Production

Long-run decisions mean that the producer is able to change the quantities of all inputs. Let us examine the technical properties of production under this assumption. A simple example will be presented for illustrating the main relationships. Suppose that a firm deals with excavations, earthwork for construction. The firm employs manual labour (*L*), and it can rent excavators (*capital, K*). The firm is contracted to dig out a 10 km long canal within one week (therefore the planned output – the answer to 'what, and for whom' – is known). Considering 8 working hours a day, and 5 days a week, the total work time for the job is 40 hours. *Table 4.1* presents the possible technology options:

Table 4.1: **Alternatives of Technology**

	1.	**2.**	**3.**	**4.**	**5.**
L, labour (persons)	100	60	30	25	25
K, number of machines	1	2	3	4	5

Source: Author's own construction

Alternative *No. 5* in the table is certainly not reasonable, as the same output is achieved using more resources than with option *No. 4.* (This situation may occur when we plan to use more machines, but some tasks still require the exclusive use of manual labour, as the surface or the access to the work area is not suitable for machines.) Altogether we can choose from four technically efficient options. These efficient alternatives are plotted with the available capital on the horizontal axis, and the available labour on the vertical one. The common property of the four alternatives is the same level of output that they produce. Each alternative of labour and capital combinations is represented by a point in the diagram, and joining these points the result is a curve of the same output. This curve is called an **isoquant**.

*The **isoquant** is a curve connecting all combinations of capital (K) and labour (L) that yield the same level of output (*Samuelson – Nordhaus, 2010; Case et al, 2009*).*

The isoquant curve of excavating a *10 km* canal is shown in the left panel of *Figure 4.2*. The curve is drawn as a continuous curve, connecting the points of the four alternatives. The curve shows clearly, that if the quantity of labour is to be decreased, the quantity of machines must be increased. Taking the first alternative, and decreasing the number of the *100* units of labour to *90* units we have to increase somewhat the number of machines, to about *1.2* units. This, of course, does not mean cutting up a machine to pieces, but the second machine will not be used for *8* hours a day, but only *20 %* of the time, that is, about *1.6* hours. This way fractional units of labour and capital make sense and the isoquant is continuous.

The isoquants describing the input combinations needed for the weekly outputs of *11* km, *15* km, *20* km, *and 25* km canals are plotted in a similar way. It is easy to see that we need more inputs to attain more outputs; the input combinations needed to achieve higher outputs must lie above, or rightwards from, the isoquant of the 10 km canal, as is plotted in the left panel of *Figure 4.2*. Plotting

the isoquants of all possible levels of outputs an isoquant map is created (as shown in the right panel of *Figure 4.2*).

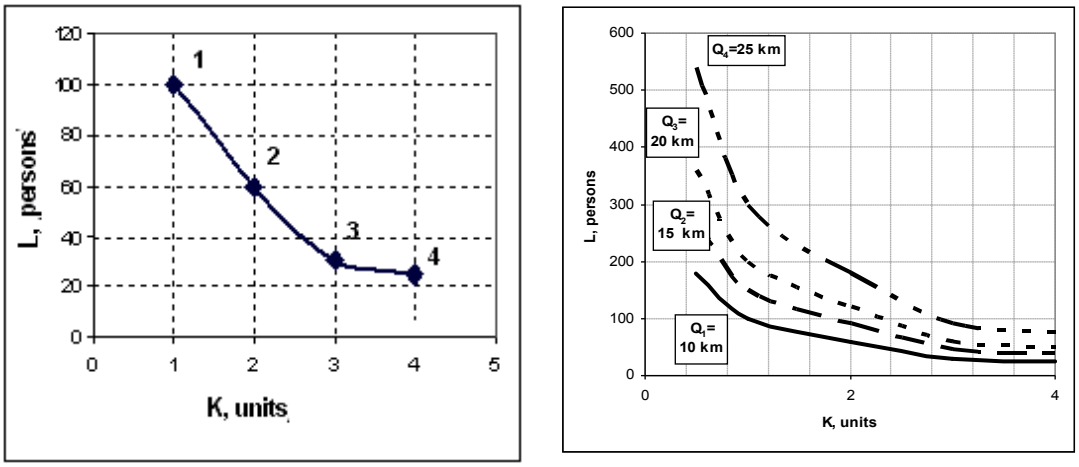


Figure 4.2: ***Isoquants and the Isoquant Map***
Source: Author's own construction

When the quantity of one input is decreased, the quantity of the other input must be increased if we want to maintain the level of output. Thus, the slope of the isoquant is negative. How many units of extra labour should be employed to maintain the level of output when the quantity of capital is decreased by a small unit (e.g. the machine works a few hours less)? The ratio of the change in labour to the change in capital is measured by the **Rate of Technical Substitution (*RTS*).** More precisely, *RTS* measures the absolute value of the ratio of the change in labour to change in capital while output is held constant. The Rate of Technical Substitution is defined by the following formula: ***RTS*= $|\Delta L/\Delta K| = -\Delta L/\Delta K$** (see the left panel of *Figure 4.3).*

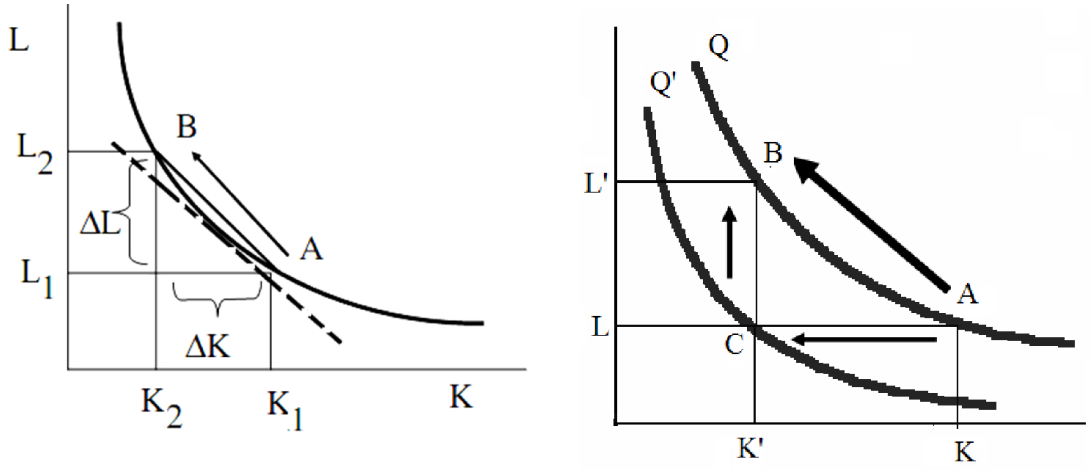


Figure 4.3: ***Substitution by the Isoquant***
Source: Author's own construction

As a negative value of *ΔL* implies a positive value of *ΔK,* the ratio itself is negative, *and* the absolute value of it is obtained by multiplying it by *-1*. Point *A* in the left panel of Figure *4.3* represents a capital-intensive technology, while point *B* is a labour-intensive one. Changing the technology from *A* to *B* implies substituting labour for capital, and results in a rate of substitution that is equal to the absolute value of the slope of the *A-B* line. It is easy to see that this line is steeper when *B* lies far from *A*, the value of *RTS* changes according to the position of *B*. Consequently, the rate of substitution, assuming an infinitely small distance of *B* from *A,* defines an important feature of the isoquant in point *A.*

The **Marginal Rate of Technical Substitution *(MRTS)*** *shows the increase of one input necessary to replace a small unit of the other input maintaining the same level of output* (Hyman, 1991). The formula is: ***MRTS= lim|ΔL/ΔK| = lim(-ΔL/ΔK)= |dL/dK| = -dL/dK,*** measuring the absolute value of the slope of the line tangent to the isoquant.

The relationship between the production function – more precisely the marginal product functions – and the isoquants is shown in the right panel of *Figure 4.3*. Using the notations of the figure, assume that our current output level is *Q* with inputs *L* and *K* (see point *A* in the figure). Now with a change of technology less capital is used (*K'*) and to keep the output constant labour has to be increased to the level *L'*, as the move from *A* to point *B* shows along the isoquant. This change is carried out in two steps. First, holding labour constant at level *L,* the quantity of capital will decrease from the level *K* to *K'*, (a move from *A* to *C*). This results in a decrease of output: ***ΔQ =Q'- Q***, a move from isoquant *Q* to isoquant *Q'*. As labour was fixed during this step, the formula of marginal product of capital is applied: ***MP_K = ΔQ/ΔK, so MP_K× ΔK= ΔQ (= Q'- Q)*** gives the change in output.

Then the quantity of labour is increased to *L'*, keeping capital fixed at *K'* , moving from point *C* to point *B*. This leads to an increase of output ***ΔQ=Q-Q'***, and with capital fixed, the formula of marginal product of labour can be applied: ***MP_L=ΔQ/ΔL,*** that is**, MP_L× ΔL= ΔQ (= Q- Q').**

Putting the two parts together, the decrease of output in the first step is offset by its increase in the second step, so the output eventually remains the same. Thus, ***MP_K× ΔK+ MP_L× ΔL=0.*** Rearranging the equation[14] *the following result is obtained:* ***MP_K / MP_L= - ΔL/ ΔK = MRTS.*** Therefore, the ratio of the marginal product of capital to the marginal product of labour at the relevant labour-capital combination is equal to the absolute value of the slope of the line tangent to the isoquant.

4.1.3. Returns to Scale, Economies of Scale

Now look at a situation when the producer changes both inputs at the same time – making long-run decisions instead of short-run ones. The producer may increase both inputs at the same rate and the resulting output may also increase at the same rate. If the technology is not changed, then applying twice as many inputs as before the output could also be doubled.

[14] The detailed computation is: ***MP_K× ΔK+ MP_L× ΔL=0,*** hence: ***MP_K × ΔK= - MP_L× ΔL.*** *Dividing both sides of the equation by MP_L , and then by ΔK ,* the result is ***MP_K / MP_L= - ΔL/ ΔK.*** The absolute value of the ratio of *ΔL* to *ΔK (= - ΔL/ ΔK)* is, however, equal to *MRTS* by definition (assuming infinitely small changes), being equal to the absolute slope of the tangent line to the isoquant. Eventually we get: ***MP_K/MP_L=MRTS***.

The return to scale of production is defined by the ratio that shows how the output increases when increasing all the inputs at the same rate (Samuelson – Nordhaus, 2010). Using the general formula of the long-run production function $Q=f(K,L)$ the return to scale measures the relationship of an increased output $Q'=f(\alpha \times K, \alpha \times L)$ to the value of Q, increasing both of the inputs at the same rate α, to see whether the increased output may grow at this rate or higher or lower than that.

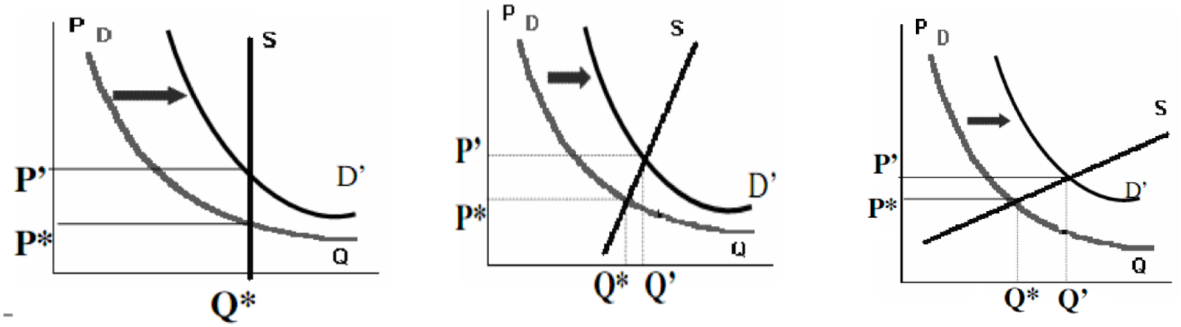
- **Increasing returns to scale** occur, if $Q' > \alpha \times Q$, that is, $f(\alpha \times K, \alpha \times L) > \alpha \times f(K,L)$.
- **Constant returns to scale** occur, if $Q' = \alpha \times Q$.
- **Decreasing returns to scale** occur, if $Q' < \alpha \times Q$.

When the scale of production is increased, e.g. all the inputs are doubled, the output may also be doubled by establishing another production unit identical to the initial one. However, it is also possible to create a different production structure combining the inputs in a more efficient way, employing the capacities better and achieving higher productivity of all or some of the inputs. This implies increasing returns to scale and leads to **economies of scale,** associated with increasing levels of output.

4.1.4. The Concept of Time in Microeconomics

Production requires not only capital and labour, but also time. The length of time for the producers refers to their ability to adjust their production in response to external changes in the market (Samuelson – Nordhaus, 2010).

Depending on the producer's ability to change the quantities of resources used in the production process, three time periods are distinguished in microeconomics, as they are illustrated in *Figure 4.4*.



Very short run (Immediate) ***Short run*** ***Long run***

Figure 4.4: ***Short-Run and Long-Run Decisions***
Source: Author's own construction

Immediate 'run' (very short run) *is the time period during which the producer is unable to change any of the inputs.* In response to a change in market demand, no change in the supplied quantity is possible, and only the market price can adjust.

Short run: *the time period during which the producer is able to change at least one input, but not all of them,* so responding to a change in demand the supplied quantity may somewhat adjust.

Long run: *the time period during which the producer is able to change all of the inputs,* so responding to a change in demand the supplied quantity may change considerably.

4.2. Short-Run Costs of Production

As we have seen, the producer most often faces short-run decisions. Answering the 'what-how-for whom' questions he/she decides about the type and quantity of resources to be used for production in the next period, but is unable to change the quantity of some resources, while being able to change the quantities of others.

The **cost of production** *is the money value of the resources utilised in the production process*. As it was explained earlier, the profit is the attained sales revenue (that is, the market value of the products or services sold) minus the costs of production (the money value of resources, factors of production).

Previously the short-run production function was analysed, describing how the quantity of output responds to varied quantities of inputs. Short-run cost functions describe the inverse of this relationship, explaining the response of costs (value of inputs) to the various quantities of output.

The Total Costs of Production (*TC*) is divided into two parts in the short run: **fixed costs** and **variable costs.**

Fixed Costs *(FC)* *are the costs of resources that the firm cannot change in the short run, so these are the costs that do not depend on the level of the output, being fixed regardless of output levels* (Samuelson – Nordhaus, 2010).

Variable Costs *(VC)* *are the costs of resources that the firm will change together with the level of output* (Samuelson – Nordhaus, 2010).

The total cost is the sum of the fixed and the variable costs: ***TC = FC + VC.***

Examples of fixed costs are the rent for the place of production that the firm must pay even if production is stopped temporarily due to large unsold inventories. Other examples of fixed costs include the interest to be paid after the borrowed money needed to carry on production, the insurance fee paid for the machinery, the flat rate of veterinary service that a farmer pays the vet for regular check-ups; or the salary of an office worker who does the administration of the business regardless of the actual level of output. Typical variable costs are the costs of raw materials, fuel, wages of labour directly employed in production (whenever this labour is adjusted to the level of output, or wages are paid by output produced), the costs of herbicides, fertilisers (the dosage of those being directly related to yield), fodder costs in livestock farming, or the packaging material used for selling the product. Some costs (e.g. labour costs) may be partly fixed, partly variable costs, depending on their relation to the quantity of output produced.

Variable costs vary together with varying quantities of output. This change may or may not be proportional to the change in production. When it is proportional, the variable costs show a *linear* pattern. Variable costs may be *degressive* when these costs change (grow) less than the output, and *progressive*, when the variable costs change (grow) more than the output. In reality one firm may encounter all of the above situations, facing degressive variable costs at a certain range of output,

linear costs in another and progressive costs in a further one. The short-run cost functions of production values of VC*, FC* and *TC* as functions of the output (*Q*) (*Figure 4.5*).

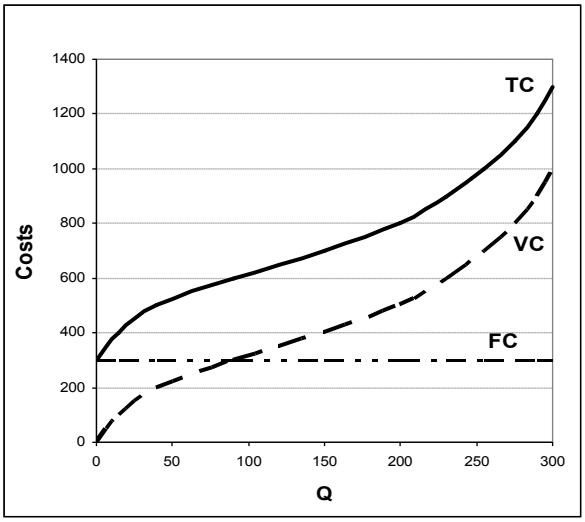


Figure 4.5: ***Short-Run Cost Functions (VC, FC and TC)***

Source: Author's own construction

The short-run cost functions are the inverse functions of the short-run production function and therefore the shapes of the cost functions may easily be derived from the production function. Assume again, that the variable input is labour, *L.* The growth rate of the short-run production function is increasing at low input levels, and decreasing at higher levels of input use. The *variable cost* of the input is $VC = w \times L$, *w* denoting the unit cost of labour. As long as the unit increase of labour leads to larger and larger increases in output, a unit increase of output will require less and less labour, which incurs less and less additional wage costs, therefore the variable cost function grows at a decreasing rate. When the growth rate of the production function starts to decrease, the same increase in the input will lead to less and less additional output, so more and more additional input is needed to achieve a unit increase in the output. Thus, the variable cost grows at increasing rate. Therefore the variable cost function starts with a stage of decreasing growth rate, and from a specific output level its growth rate starts to increase.

Fixed costs are always the same at any level of output (and occur even at zero output), as is shown in *Figure 4.5*. The *total cost* function is the sum of the variable and fixed costs. The shape of the total cost function is the same as that of the variable cost function (first degressive, then progressive), but its value is higher than *VC* by the value of *FC*.

The decision-maker considers not only the general pattern of costs, but should also know the impact of a small change in the quantity of output on the total costs. This is measured by the notion of marginal cost. The other key question is whether the sale of a certain amount of the output at the current market prices will result in profit or not – and the notion of average cost, or unit cost of production helps answering this question.

The **Average Cost *(AC)*** *(also called* **Average Total Cost, ATC***) is the total cost divided by quantity of output*. It measures how one unit of output costs on average, and it can be directly compared to unit market price to know whether the firm attains profit or loss. The formula for average cost is *AC* =(*ATC* =) *TC/Q*.

The notion of average cost is defined for all types of costs discussed earlier:

Average Variable Cost (*AVC*) *is the variable cost divided by quantity of output, the variable cost falling to each unit of output, AVC=VC/Q.*

Average Fixed Cost (*AFC*) *is the fixed cost divided by quantity of output, the fixed cost falling to each unit of output, AFC=FC/Q.*

Obviously: *ATC=AFC+AVC*.

Marginal Cost (*MC*)*: the change in total costs divided by the (very small) change in output,* i.e., the change in costs brought about by producing an additional small unit of output. The formula for marginal cost is: $MC = \Delta TC/\Delta Q = \Delta VC/\Delta Q$ where, in theory, the value ΔQ is an infinitely small change. (In real-world situations it is approximated by a unit change in output instead)[15]. As fixed costs do not change with a change in output, the change in total cost is always equal to the change in variable costs.

The shapes of the average cost functions and the marginal cost function are shown in *Figure 4.6*. The average fixed cost curve *(AFC)* decreases as the output increases (as the same fixed cost is divided among more and more units of output). The marginal cost curve is declining at first, as the variable cost function rises at a decreasing rate, an additional unit of output brings about a smaller increase in costs than the former one. The increase in costs brought about by an additional unit of output is the marginal cost by definition, so the marginal cost curve is decreasing throughout the degressive stage of the variable cost. When the variable cost curve starts to grow at increasing rates, any additional increase in the output will generate a higher increase in costs than the former one, so marginal cost starts to grow. This means that the marginal cost curve is a *U-shaped* curve.

The average variable cost curve *(AVC)* is also *U*-shaped. While the *VC* curve grows degressively, the *AVC* curve shows a decreasing shape, because an additional unit of output increases the costs by the value of the marginal cost ($MC=\Delta VC/\Delta Q$, thus $\Delta VC=MC\times\Delta Q$), and this value keeps decreasing with any additional unit of output, so the average of the variable costs will fall. When the *VC* curve turns from degressive to progressive growth, the marginal cost starts to rise, but for a while it remains lower than the value of *AVC*. Therefore, as the additional unit of output ΔQ generates an additional increase in costs, which is smaller than the former *AVC* value, the value of *AVC* continues to decrease (this is easy to understand by the example of average school test grades: when the test result of a new student is poorer than the average of the former ones, the new average will become lower than before). This fall continues while the value of *MC* is below *AVC*. When *MC* gets higher than *AVC*, the higher additional cost of the additional output will pull *AVC* up, so the average variable cost starts to rise. Another consequence of the above is that *AVC* reaches its minimum value when it is equal to *MC* (see point *A* in *Figure 4.6*).

Finally the average total cost curve is also *U*-shaped, and as *ATC=AVC+AFC,* with increasing output levels *AFC* falls and *ATC* gets closer to the *AVC* curve. At low output levels, at which both *AVC* and *AFC* are decreasing, the *ATC* curve is decreasing, too. The decrease of *ATC* continues as long as *AVC* is falling. After reaching its minimum the *AVC* curve starts to rise, but *AFC* still continues to fall.

[15] *MC* measures the rate of growth of the cost functions *TC* and *VC,* and this is equal to the slopes of these functions, or the first derivatives of them by variable *Q*.

As long as the increase in *AVC* is smaller than the decrease in *AFC*, the value of *ATC* continues to decrease. Later, as *AVC* grows considerably, while the decrease in *AFC* remains small, *ATC* starts to increase. We can state again, that while *MC* is smaller than *ATC* then *ATC* is decreasing, and when *MC* is larger than *ATC,* the latter is growing. Thus, the curves *ATC* and *MC* intersect at the minimum point of *ATC* (see point *B* in *Figure 4.6)* at a somewhat higher level of output than point *A*.

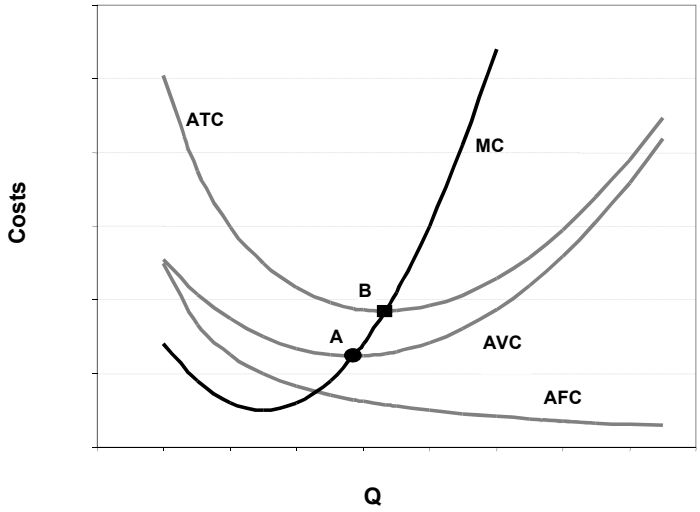


Figure 4.6: ***Average Cost and Marginal Cost Functions***
Source: Author's own construction

4.3. The Supply of a Competitive Firm: Profit Maximisation

Profit is the difference of revenue and costs, therefore to understand profits the properties of sales revenue must also be understood. **Total revenue (*TR*)** is measured by multiplying the quantity of the output by the unit price of the output sold, as the following formula shows: $TR= P \times Q$[16] , where *P* is the price of the output and *Q* is its quantity sold. When the firm increases its output, and the sold quantity rises, the sales revenue will change. However, larger quantities sold do not always imply larger sales revenue, because the larger supply may lead to falling prices and decreasing revenue. This concept has been described when the price elasticity of demand was discussed. To assess the impact of increased outputs on revenue the notion of marginal revenue is introduced.

Marginal Revenue *(MR)* is t*he extra revenue that a firm takes in when selling an extra (infinitely small) unit of output: MR=ΔTR/ ΔQ.* When the extra output sold does not cause significant increase in market supply, and therefore it does not cause any change in the market price *p*, then the extra revenue is $\Delta TR=p \times \Delta Q$, and the marginal revenue is $MR=p$.

[16] For more than one commodities total revenue is the sum of the revenues of each of these: $TR= \Sigma (p \times q)$

Marginal revenue tells the firm how much increase it can expect in its revenue if it increases its output for sale. The marginal revenue depends, however, on the size of the firm and its volume of output, compared to the market as a whole, i.e. to the total demand and supply, as well as on the number and attributes of competitors, and the firm's power to control the market or the prices to any extent.

A ***perfectly competitive market*** is a market composed of many actors. Many firms produce the market supply, each being small compared to the total market size. Similarly, the demand side is also characterised by many consumers, all buying only a small proportion of the total amount sold. Therefore, neither the supply side nor the demand side has any single actor that has power to control the prices. If a firm decides to increase its output, this is insignificant compared to total market supply, so it does not cause excess supply, nor price decreases. A small change in the consumers' demand will also go without any noticeable change in the market. The entry to and exit from perfectly competitive markets is easy, without any restrictions, so a firm may enter the market whenever it likes and may move out of it easily, too. The same is true about consumers. In a perfectly competitive market all firms produce the same homogeneous product; the output of one firm can be substituted for that of any other producer. This implies that producers cannot charge a price of their own choice; they are forced to accept the market price. As there are many producers, they are unable to agree on a high price either because such an agreement is usually impossible with too many people involved. Consumers are also unable to agree on a low price to buy at for the same reason. The price will be determined as the result of the bargaining process in the market; no single market actor has any control over it. Market actors will have to accept the market price as an external factor, so they are *price takers.* In the real world of mixed economies such perfectly competitive markets do not exist. Each market has spatial limitations, limited flow of information, the governments may intervene in markets, the products of various firms are not completely homogeneous – but still many markets show more or less the basic properties of competitive markets, and the model of a perfectly competitive market is very useful in explaining the behaviour of these.

*The **perfectly competitive market** is a market structure with many producers and consumers, each being relatively very small compared to the size of the market, the product is homogeneous (virtually identical), entry to the market is free, the market agents are price takers, and the flow of information is free.*

A firm in a perfectly competitive market is free to decide how much to produce for sale. Knowing and taking the actual market price, its aim is to maximise its **profit (π),** which is the difference between the attained sales revenue and the costs incurred by production. For this purpose the firm will choose the size of its production, the volume of the output that yields the highest profit attainable.

$$Profit = Total\ Revenue - Total\ Cost = TR - TC, \text{ where}$$
$$TR = P \times Q, \text{ and } TC = VC + FC.$$

The firm decides about the produced quantity of output *Q* with the aim of maximising the difference ***TR-TC,*** knowing that larger quantities imply larger revenues but larger variable costs as well. In the real world the firm will probably make a decision in the following form: if we have produced the quantity *Q* so far, *could we achieve higher profit by increasing our output by a small*

quantity ΔQ? The firm should increase its output as long as it brings about larger profit, up to the possible maximum.

What profits are generated by the respective output levels *Q* and *Q+ΔQ?* The profit of output *Q = P×Q – VC(Q) – FC (*because *VC* depends on the quantity of output, while *FC* does not). If the quantity of output is raised by the extra quantity *ΔQ*, the total revenue will increase by *P× ΔQ.* However, the additional costs incurred by the additional output are equal to the change in variable costs, and using the definition of marginal costs (*MC = ΔVC/ΔQ)*, the change in costs incurred by a small *Δq* increase of output is equal to *ΔVC= MC × ΔQ.*

Eventually, the increase in total revenue (*P× ΔQ)* should be added to the former profit, while the increase of total costs (*MC × ΔQ)* should be deducted from it. So the total change in profit *= P× ΔQ – MC × ΔQ.* Output should be raised whenever this difference is positive (or non-negative, as the increased output with the same profit means that the firm will be able to employ more people, and increase its market share without losing profit).

Thus, output should be increased as long as the inequality holds: *P× ΔQ ≥ MC × ΔQ,* i.e., while *P ≥ MC. The* ***profit-maximising level of output*** *in a perfectly competitive market is the largest quantity of output for which the marginal cost does not exceed the market price of the product* (see *Figure 4.7*).

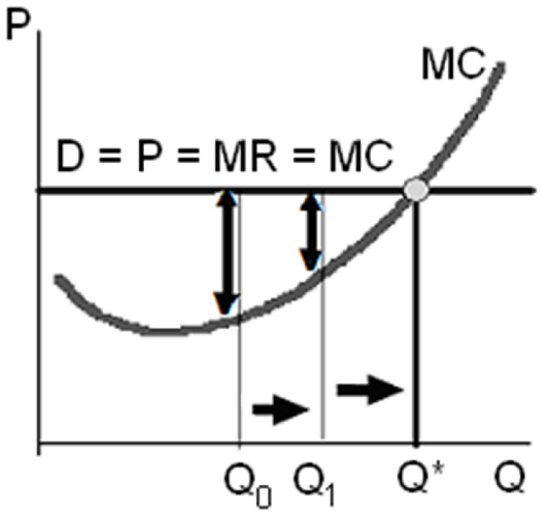


Figure 4.7: **Profit Maximisation for a Perfectly Competitive Firm**
Source: Author's own construction

In *Figure 4.7* the formula *D=P=MR=MC* implies, that all firms sell their total output at price *P*, each of them facing an infinitely large demand at this price, so the demand curve is horizontal *(P=D)* for all of them. Marginal revenue, or the extra revenue of an extra unit of output is equal to the unit price *P (P=MR).* Finally, the producer will attain the highest possible profit when the marginal cost of the output is equal to the market price, or marginal revenue (*MR=MC*), because this is the output level above which profit will start to fall.

4.4. Market Structures of Imperfect Competition

The model of perfectly competitive markets describes an idealistic situation which does not occur too often in the real world. Some market situations show similarities to perfect competition, when a product or a service is provided by many small producers, and none of the producers have a market share considerably higher than that of the others. However, some properties of perfect competition – the large number of market agents, homogeneous product, perfect information, no barriers to prevent entrance to, and exit from the market and the resulting price-taker behaviour – do not occur in perfect form in modern markets. The most frequent causes of deficiency include the existence of large-scale companies or the unique attributes of the products, government intervention and imperfect flow of information. Therefore the firms – or some of them – are not price-takers, but will set their own prices, or sell at the prices commanded by the government, and therefore the consumers will access the commodity at prices different from the market equilibrium. Firms are unable to sell 'unlimited' quantities at the constant market-clearing price, but every single firm faces a negative relationship between price and demanded quantity.

'Imperfect competition' *prevails in an industry (or in a group of industries) in which the demand curves faced by single firms are not horizontal, so that the firms have some control over the price of their products and competition* Samuelson − Nordhaus (2010).

Examples of imperfect competition include the monopoly (a single producer representing the total market supply), the oligopolistic market (the overwhelming market share of a few large companies), and monopolistic competition (many firms in the supply side of the market, selling products that, while being close substitutes of each other, show unique properties and are sold at unique prices).

4.4.1. Monopoly, Oligopoly, Monopolistic Competition

Monopoly *is a market structure composed of only one firm that produces the total market supply.* Monopsony is demand-side monopoly, i.e. the total market demand is represented by one single consumer – the government, for example, or a trader being the exclusive buyer of some commodity. Bilateral monopoly is a specific market structure with only one actor at both the supply and the demand side. Many factors can cause the emergence of monopolies. The essence of the monopoly is the fact, that the consumer finds no alternatives, no substitutes for the product in question.

The real world occurrence of both perfect competition and perfect monopoly are very rare. Instead, mixed market structures are frequent, in which sellers find themselves in somewhat competitive situations, while they also have some control over market prices. Oligopolistic markets and monopolistically competitive markets are typical examples of such mixed markets.

Oligopolistic market structures *are made up of a few rather large firms in the supply side of the market, the activities and supply decisions of each affecting the market positions of the others.* The main property of such a market is the small number of independent firms in the supply side. Although 'the small number' of firms is difficult to quantify in exact terms, the essence of this feature is the fact, that whenever one firm modifies its supplied quantity or the price of its product, it will

noticeably affect the total market supply and the prices and behaviour of its competitors. The market agents when making their decisions, take into consideration the expected behaviour, or reactions of the other agents. Many examples of oligopolistic markets exist in contemporary economy, e.g. the market of cellular phone services, or automobile manufacturing. *Duopoly* is a special case of oligopoly, with two firms providing the total market supply. The duopolistic firms make their decisions about output levels or prices, trying to forecast the other's reactions.

Monopolistic competition *is a market structure with many firms in the supply side of the market; their products being not homogeneous but differentiated, therefore the firms have price-setting power. No barriers exist to prevent entry to, or exit from the market.* Therefore, although the products of the firms may satisfy similar – or nearly the same – consumer wants, the products of various firms have unique attributes, creating high appeal and strong preference for the brand in the consumer's mind, and this minimises the danger of being substituted by another product. Therefore each firm becomes a monopoly in the market of its own product, setting its own price. However, firms must consider that consumers might change their minds and turn to other products under specific conditions (e.g. when excessive price differences occur). Thus, monopolistic competition shows attributes of monopoly, oligopoly and perfect competition at the same time. Many examples may be given for monopolistically competitive markets, as the market of blue jeans, where sellers try to inform and attract consumers by their brand names, creating strong consumer preferences; or the market of soft drinks, where large companies as Coca-Cola and small local juice companies also find their customers.

In perfect competition and monopolistic competition entrance to the market is free. In monopolistic and oligopolistic markets, natural or artificial **barriers to entry** prevent other firms to enter the market. *Such **barriers** include the high level of capital needed for entering the market or high levels of fixed costs, which require high volumes of output for each firm to be profitable (i.e. the minimum efficient scale[17] is high compared to the total market size). Other typical barriers may be the difficulties of accessing resources, the high costs of licences, patents or know-hows of production technology or government regulations and permits that restrict the businesses in the provision of a product or a service.*

Natural monopoly (or natural oligopoly*) is a market structure in which one firm (or a few firms) can produce an additional unit of output at lower costs than a firm newly entering the market.* In other words: in a naturally monopolistic market a single firm can produce the total market supply at lower average costs than if the same amount were produced by several firms in smaller quantities. The explanation is often the high fixed costs and low variable costs associated with production, and the minimum efficient scale being high compared to the size of the market. Natural monopolies are usual in the markets of public services, and in such situations the government may guarantee the monopoly of a single service provider by law.

4.4.2. Profit Maximisation of the Monopoly

The monopoly – similar to other firms – intends to maximise its profit, and to achieve this it will choose the supplied quantity. As it was shown previously, the logic of profit maximisation means

[17] Minimum efficient scale *(MES)* is the level of output when the average total cost is at its minimum within the range of total market demand (Varian, 1987).

maximising the difference between the total revenue and production cost. In perfectly competitive markets the firm takes the market price as an external attribute of the market and determines the profit-maximising level of output. The monopoly, on the contrary, – being the only supplier of the product – can set the price as it likes. Thus, the monopoly decides first on how much to produce, and then on the profit-maximising price for the output.

The supply decision is based on the same idea as was shown for perfectly competitive markets. Assuming that the firm currently produces the quantity Q, producing an extra quantity ΔQ may increase or decrease the profit. The profit achieved by the output quantity Q is the difference of the total sales revenue and production costs:

$$\pi(Q) = P(Q)\times Q - TC(Q) = P(Q)\times Q - FC - VC(Q)$$

An additional quantity ΔQ of output will change both the revenues and the costs. The change in costs, ΔTC is determined using the notion of marginal cost: $MC = \Delta TC/\Delta Q$, so the change in total costs is $\Delta TC = MC\times\Delta Q$. To measure the change in revenue we will use the notion of marginal revenue, as this measures the change in total revenues ΔTR incurred by a change in output ΔQ: $MR = \Delta TR/\Delta Q$. Thus, the change in total revenue is $\Delta TR = MR \times \Delta Q$. Due to a ΔQ increase in output, the total revenue will increase by $MR\times\Delta Q$, while total cost grows by $MC\times\Delta Q$, so the profit changes by: $MR\times\Delta Q - MC\times\Delta Q = (MR-MC)\times\Delta Q$. Therefore, as long as the inequality $MR-MC \geq 0$ holds, an additional unit produced leads to an increase in profit (or, assuming equality, unchanged profit). We can conclude, that **the profit-maximising output for a monopolistic firm** *is the largest output for which the marginal revenue of the firm is at least as high as its marginal cost, i.e., $MR \geq MC$ holds*.

However, in order to apply the above formula, we should know something more about the marginal revenue of the monopolistic firm. In perfectly competitive markets the firms face practically unlimited demand at the actual market clearing price, therefore marginal revenue always equals the market price. In monopolistic markets the supply of the firm is compared to the total market demand, which is a decreasing function of price. Thus, the monopoly can sell more of the output if it allows the price to decrease. The marginal revenue of a monopoly reflects the joint impact of increased quantity and decreased price. The total sales revenue is $TR = P(Q)\times Q$, and the actual market price $P(Q)$ is the price the consumers are willing to pay to buy the quantity Q, that is, the market price given by the demand function at quantity Q.

As increasing quantities imply decreasing the market prices, the revenue will depend on the way these two changes are related to each other. As it was shown previously, depending on the shape of the demand curve a small price decrease may imply a large increase in demanded quantity or a large price cut may lead to only a small increase in demand. Therefore the change in total revenues, i.e., the pattern of marginal revenue, is determined by the demand function.

Note that marginal revenue defined by the formula $MR = \Delta TR/\Delta Q$ is exactly the first derivative of the total revenue function TR by the quantity Q (assuming infinitely small ΔQ). Let us denote the total revenue associated with the increased output TR', and calculate the marginal revenue of the increased output:

$$TR' = (P+\Delta P)\times(Q+\Delta Q) = P\times Q + P\times\Delta Q + \Delta P\times Q + \Delta P\times\Delta Q, \text{ and therefore:}$$
$$\Delta TR = TR' - TR = (P\times Q + P\times\Delta Q + \Delta P\times Q + \Delta P\times\Delta Q) - P\times Q = P\times\Delta Q + \Delta P\times Q + \Delta P\times\Delta Q$$

$$Thus\ \boldsymbol{MR} = \Delta TR/\Delta Q = P + \Delta P \times Q/\Delta Q + \Delta P = \boldsymbol{P + \Delta P \times (Q/\Delta Q + 1)}.$$

With positive ΔQ the value ΔP must be negative, therefore at any value $\Delta Q>0$ the value of *MR* is smaller than *P*, ***MR<P*** **,** *which means that the marginal revenue curve always runs below the demand curve, i.e. the marginal revenue is smaller than the market price*.

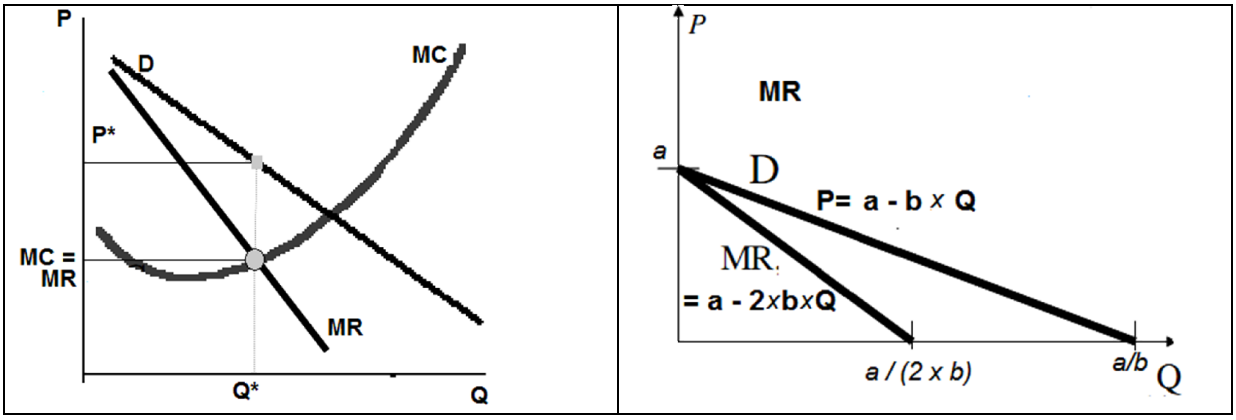


Figure 4.8: **Profit Maximising Decision for a Monopoly**
Source: Author's own construction

The example of a linear demand function shows the calculation of marginal revenue in detail. Take the inverse demand function: $P= a - b\times Q$, *and denote the market price belonging to the quantity* $Q+\Delta Q$ *by* $P'=P+\Delta P$. *We can compute this price using the inverse demand function:* $P'= a - b\times (Q+\Delta Q)= a - b\times Q - b\times \Delta Q = P - b\times \Delta Q$. *Thus, the price change is:* $\Delta P= P'-P = - b \times \Delta Q$. *Then marginal revenue is computed as:*

$$MR = P + \Delta P \times (Q/\Delta Q + 1) = P - b \times \Delta Q \times (Q/\Delta Q + 1) = P - b \times Q - b \times \Delta Q.$$

Now taking the inverse demand function ($P= a - b \times Q$) for the price, we get the following formula: $MR = a - b \times Q - b \times Q - b \times \Delta Q = a - 2 \times b \times Q - b \times \Delta Q$.

Assuming an infinitely small change in quantity, i.e., $\Delta Q \to 0$, the marginal revenue function is written as $MR(Q) = a - 2\times b\times Q$. Comparing this formula to the formula of the inverse demand function $P= a - b \times Q$ we can see that the *slope of the marginal revenue function is the double of the slope of the inverse demand function.* A monopoly's marginal revenue curve intersects the quantity axis halfway between the origin and the point where the demand curve intersects the quantity axis (see the right panel of *Figure 4.8*).

As the figure shows, the monopolist chooses to produce the profit-maximising quantity defined by the intersection of marginal revenue and marginal cost, and sells this quantity at the price taken from the demand curve. This price is always higher than the marginal revenue and therefore it is also higher than marginal cost. *The monopoly will always sell its output at a price higher than its marginal cost, while the perfectly competitive firm sells its profit-maximising output at the price that is equal to its marginal cost* (see the left panel of *Figure 4.8*).

Review Questions and Problems[18]

1) What are the properties of the short-run production curve?
2) What does the isoquant mean, what is the marginal rate of technical substitution?
3) Explain the notions of average product and marginal product and their relationship to the marginal rate of technical substitution.
4) Explain the notions of technical maximum, technical optimum and point of inflexion.
5) Explain the concepts of 'return to scale' and 'economies of scale'.
6) Explain the meanings of the following cost categories: fixed cost, variable cost, average cost, and marginal cost. Describe the shapes of these cost curves.
7) Describe the properties of perfectly competitive markets, monopoly, oligopoly, monopolistic competition, natural monopoly/oligopoly.
8) How does a perfectly competitive firm determine its profit-maximising output?
9) Explain the meaning of marginal revenue and its value in perfectly competitive markets.
10) Calculate the marginal revenue of a monopoly assuming linear market demand.
11) How does a monopoly determine its profit-maximising output?
12) Two former university students worked in an investment bank earning a salary of $1000 each for 2 years after they graduated. Together they saved $15000 during this time. After 2 years, they decided to quit their jobs and start a business designing websites. They used their savings of $15000 to buy computer equipment, desks and chairs. For the next 2 years they took in $20000 in revenue each year, paid themselves $5000 annually each. They rented an office for $6000 per year. Prior to the investment, their savings of $15000 in bonds earned interest at a rate of 10 percent. Are they now earning economic profits? Explain your answer.
13) Assume that in a production process with the currently used amounts of labour (*L)* and capital (*K)* the marginal products of the factors are $MP_L = 5$ and $MP_K = 10$. Assume, furthermore, that the factor prices are $P_L = 6$ and $P_K = 15$. Should the producer substitute labour for capital? Why?
14) Suppose that there are two technology alternatives *A* and *B* for producing an electronic device. The table below shows the resource requirements of the two technologies at five levels of output.

Output	**Q=1**	**Q=2**	**Q=3**	**Q=4**	**Q=5**
Technology	***K L***	***K L***	***K L***	***K L***	***K L***
A	2 5	1 10	5 14	6 18	5 20
B	5 2	8 3	11 4	14 5	16 6

a. Suppose that the price of labour is $P_L = 300$ and the price of capital is $P_K = 600$. Calculate the total production cost for each level of output assuming that the producer always chooses the best (the cheapest) technology.
b. Give the quantity of labour and the quantity of capital used for each level of output.

[18] Source of problems 12-17: Case et al. (2009)

c. Plot the total cost function for the five output levels with costs on the *Y*-axis, and quantities on the *X*-axis, assuming that each output is produced using the optimal technology.
d. Answer questions a – b – c again, with factor prices $P_L = 900$ and $P_K = 600$.

15) The following table shows the variable costs of a production process. The value of total fixed costs is *100*. Suppose that the market price of the output is *15* and calculate the desirable level of output for the firm. Calculate the total revenue and the total cost for this quantity and give the value of its marginal cost.

Q	0	1	2	3	4	5	6
VC	0	5	10	20	40	65	85

16) The following table gives some cost components for a perfectly competitive firm. Fill the table calculating the missing short-run costs. Calculate the profit-maximising output of the firm assuming the following respective market prices: *P= 50, 60, 90, 120, 150, 180, 240, 300, and 400*.

Q	**FC**	**VC**	**TC**	**AVC**	**ATC**
0	300	0			
1		100			
2		150			
3		210			
4		290			
5		400			
6		540			
7		720			
8		950			
9		1240			
10		1600			

17) Uncle Joe just died and left *$10000* to his nephew payable when he turns *30* years old. The young man is now *20*. Currently, the annual rate of interest that can be obtained by buying *10*-year bonds is *6.5 %.* The nephew's brother offers him *$6000* cash right now to sign over his inheritance. Should the nephew accept the offer? Why?

CHAPTER 5: THE MARKET OF PRODUCTIVE RESOURCES

5.1. Demand and Supply of Inputs

The key attributes of product and factor markets were introduced in Section 2.1. As it was stated there, the demand side of the factor markets is represented by firms who need the inputs to produce goods for the product market. Therefore, the demand for factors of production depends eventually on the quantity of resources needed for the goods that the firms wish to produce. A firm, however, produces goods and services if these are demanded by the buyers in the product markets. Therefore, the demand for productive resources depends on the demand of the goods and services produced using these resources.

The demand for factors of production is **derived demand:** *the firm demands a quantity of some input if and only if consumers demand the output that those resources are used to produce, in a way that the costs of the demanded resource and the revenues received by selling the output make profit for the producer (*Samuelson – Nordhaus, 2010*).*

As it was explained in the previous chapter, a profit-maximising firm will increase its output as long as the additional revenue generated by the additional output is not smaller than the additional production cost. Therefore the firm will employ an extra unit of a resource as long as the resulting additional cost is not higher than the resulting additional revenue generated by the extra output produced.

Households **supply the factors of production**. They offer their labour for sale to earn income. Households own most of the natural resources (e.g. land) that they sell or rent to farming businesses. Households also supply most of the capital resources. They deposit their savings in banks, which, in turn, loan these deposits to firms. Buildings owned by households are often rented out to firms for business purposes.

The factors of production are grouped into two broad categories. Primary factors of production such as labour or natural resources exist in nature without any economic reason. Secondary factors of production are created for, or by, some economic activity, and they include capital goods (real and nominal capital), and entrepreneurial skills. The following sections will give a brief overview of the markets of particular productive resources.

5.2. Labour Demand and Labour Supply

Labour refers to the ability of people to do work, and because this ability is a natural attribute of human beings, labour is a primary factor of production. Demand for labour – as for all other inputs – is represented by firms, business organisations, while supply is provided by households. Households sell their labour force to earn their income which they will spend on buying

goods and services they need. The price of labour is the wage or salary paid to the employee[19]. The *households' supply of labour* is determined by two factors: first their intention to earn as much income as possible, so that they can buy more goods to satisfy their wants, and second: their need for leisure time, which is also an important component of the quality of life. Workers have to divide their time between work and leisure. The time spent on work will decrease the time available for leisure, while leisure will decrease the time available for earning income. Therefore the wage (or salary) can be interpreted as the opportunity cost of leisure. Workers earning very low wages might find that the low wage is not sufficient to maintain life, and therefore it is not worth taking the job and spending the time on earning the low wage. Choosing leisure as an alternative will involve only a very low opportunity cost, while this time may also be used for other activities that improve the quality of life, or decreasing the costs of living (e.g. growing vegetables for home consumption in the kitchen garden, providing day care for children or sick relatives, etc.). When the wage increases, the opportunity cost of leisure also increases, the workers' willingness to work grows. Very high wages (salaries), however, may provide a high living standard for the worker, who may consider working fewer hours, as working only part-time can provide sufficient income for a pleasant way of living. Labour supply is illustrated by a 'backward-bending' supply curve, as is shown in the left panel of *Figure 5.1.*

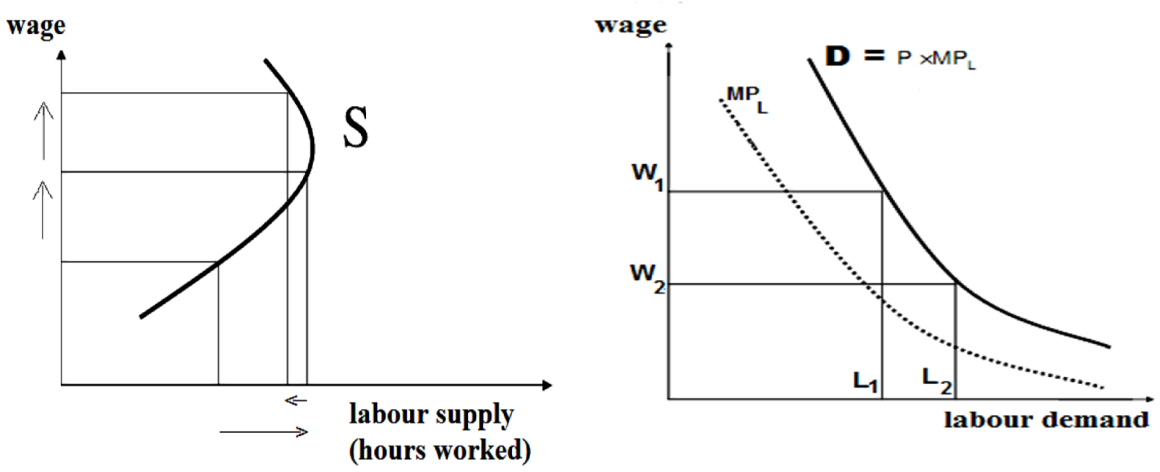


Figure 5.1: ***The Labour Supply and Labour Demand Curves***
Source: Author's own construction

Now looking at the demand side of the labour market we know that the firm is able to pay no more wage for a unit of labour than the market value of the output produced by this unit of labour (the market value of the marginal product of labour): $W \leq P \times MP_L$. This inequality determines the **upper limit for wages**, that is, the maximum wage that a firm is able to pay in market conditions. The **lower limit for wages** is determined by the income needed for the worker to recreate his/her ability

[19] The labour costs include not only the wage (salary), but social insurance taxes (payroll taxes) as well, which are usually proportional to the wage. The gross wage (salary) paid to the worker is not freely disposable either, because the worker will also have to pay social insurance tax and personal income tax.

to work in the short-run, and to reproduce the labour force for the economy in the long-run, i.e. by bringing up and educating the young generation of workers. Thus, the wage should cover the costs of living for the worker and for his/her family, and the education for the children. In real life wages are not subject to the usual bargaining procedure of competitive markets, and they usually differ from the market-clearing price. The labour market is one of the markets where government intervention is substantial. This process will be discussed in detail in Chapter 9.

5.3. The Market of Capital Goods

Capital is a secondary factor of production. Capital resources are divided to two broad categories: real capital and nominal capital. Real capital includes machinery, buildings, tools, equipment and materials to be used in the production process, while nominal capital means the financial funds used for production, being either money or stocks and bonds. The market of real capital is called the market of capital assets, while the market for nominal capital, the financial market, is made up of two markets: the money market (market of money and short-term loans) and the capital market (the market of stocks and bonds and long-term loanable funds) (Mishkin, 2004).

5.3.1. Capital Assets

The market of capital assets, i.e. the market of real capital refers to the sale of machinery, equipment, raw materials, and fuels. The firm, deciding about the purchase of materials used up completely during one production cycle, will simply compare the costs of buying these factors and the total revenue received after selling the resulting output. The situation is more complicated when capital assets are used for several years, several production cycles. Such long-term assets include buildings, expensive machinery and vehicles. These contribute to the total sales revenues of several subsequent years, but the whole expenditure for buying the assets occurs now. The decision-maker must consider the impact of the time factor: the value of the revenue earned now is not the same as of the revenue that will be earned a year later. Assume that the revenue earned this year is $*100000*, and we decide to deposit this revenue in the bank for a year at *5%* interest rate. Thus, next year we will own $*105000*. If, however, the revenue of $*100000* will be earned only next year, we lose the *$5000* interest earnings. Assuming that the revenue will be earned next year, but we need money now, we have to take out a loan from a bank. As next year we will have only $*100000* in revenue, we cannot pay back more than this amount for the borrowed capital and its interest. The *$100000* will, therefore, cover the borrowed amount plus the interest payable. Obviously, the bank would offer a loan less than *$100000.* Therefore, money received now will be worth more than its current value a year later, and money receivable a year later is worth less now than its nominal value.

The **Future Value (*FV*) of a cash flow received today** is calculated using the formula for compound interest. The future value of a present cash amount *C* in *t* years' time, at annual rate of interest *r is*: $\boldsymbol{FV_t = C \times (1+r)^t}$. Assume, for example that we receive $*1000000* today. In *5* years' time, at an annual interest rate *10 %,* this amount of money is worth:

$$FV_5 = 1000\,000 \times (1+0{,}1)^5 = 1000\,000 \times 1{,}61051 = \$1610510.$$

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The projects have been supported by the European Union.

The Present value (PV) of a cash flow to be received in the future, in *t* years' time, is calculated by the method of discounting, as the opposite of the future value. The present value of a cash amount of *C* due in *t* years, at an annual interest rate of *r* is given by the following formula: $PV_t = C / (1+r)^t$. For example, we are going to receive the sum *$1000000* in *5* years from now, and the annual rate of interest is *10 %,* so the present value of this future sum is: $PV_5 = 1000000/(1+0,1)^5 = 1000000/ 1,61051 = \$620\ 921.$

In making investment decisions the concepts of present value and future value should be carefully considered. Typically, when the firm decides whether to purchase a valuable piece of machinery or not, the valuation of the asset is done by the logic of business management. The income-generating capacity of the asset is assessed, and the capitalised value of the machinery is calculated as the discounted sum of the successive revenues or profits that the machine will earn. Assume, for example, that the machine will earn a profit of *$1000000* each year of its 5 –year life span. Assuming 10 % interest rate per year, the sum of the present values of the annual earnings is: *PV=1000000/1,1 + 1000000/1,12 + 1000000/1,13 + 1000000/1,14 + 1000 000/1,15 = 909091 + 826446 + 751315 + 683014 + 620921 = $ 3790787.* If the price payable today is *$ 3 600 000,* should the firm buy the machine*?* The decision is made by calculating the net present value of the investment. **Net Present Value (*NPV*)** *is the difference of the present value of the yield of investment and the cost of establishing the investment.* In the former example *NPV = $3790787 – $3600000 = $90787.* Generally speaking, investments with positive net present value are worth implementing, but the investor should also consider the risks involved, the uncertain character of future cash flows including expected earnings and varying interest rates, which are rather difficult to forecast. The business agents differ in their expectations about the future, some being more pessimistic about future earnings or interest rates than others. This is the reason why some agents give up a business negotiation, while others persist until the end.

5.3.2 Money, Loanable Funds, Securities

The **money market** deals in transactions about the right of using money. In the supply side of this market we find all the agents possessing excess money or savings, while the demand side represents borrowers of money. *Interest is the fee for the use of borrowed money.* Savers earn *interest by their deposited funds*, borrowers pay *interest for the loan they take*, the latter being usually higher than the former. The banks are financial intermediaries between savers and borrowers. They establish the linkage between depositors and borrowers, and they collect the interest due after the loan, and pay a part of it as the interest payable on deposits to savers. The difference between the loan interest rate (the interest income of the bank) and the deposit interest rate (the interest expense of the bank) is the *interest margin* which covers the expenses of the bank's operations and the rest contributes to the profit of the bank. *The interest rate* is the annual interest payment divided by the principal (the amount of the loan or the deposit), expressed in percentages. The demand for loanable funds is determined by the market value of the goods produced using these funds, which the borrower compares to the interest payable, i.e. the costs of the loan.

Why would a firm take a bank loan? It may need it for raising funds for its daily operations or for investment purposes. Taking a bank loan is only one of the possible ways for a firm to raise funds; another possibility is to exchange securities (stocks or bonds). *A* **security** *(also called a financial*

instrument) is a tradable claim on the issuer's future income or property that is subject to ownership. The main types of securities are the promissory note, the bond and the common stock.

A **promissory note** *is a legal promise in written form of paying a specified sum of money to a specified payee at a specified time in the future* (Brealey-Myers, 2003). A firm may issue a promissory note when it needs some resource, e.g. raw materials for production, but it does not have money to pay for it. The firm expects to sell the product within a fixed time in the future, e.g. within 3 months. The price is expected to cover all the firm's costs, including the cost of the raw materials. As the firm needs the raw material well before the sale of the output, but lacking the money to pay for it, it promises to the owner of the raw material to pay for the resource after the sale of the output – paying not only the current price but an interest as well. The transaction can be understood as if the firm borrowed the money needed to pay for the input from the owner of the input for the specified time (three months in the example). Naturally, a firm cannot force the input provider to accept a promissory note instead of the actual payment. The input provider will do that only if he/she considers the borrower a trustworthy partner, who will repay the borrowed sum and its interest by the specified deadline. The promissory note can be *transferred to other parties* as a form of payment instead of money (assuming that the other party accepts it), and it can be *discounted* in a bank, i.e. sold to the bank for cash before its expiry date, for which the bank charges interest.

A ***bond*** *is a debt security that promises to pay a fixed yield to maturity, making pre-defined payments periodically for a specified period of time.* Firms or institutions issue bonds when they need a loan. Savers will purchase these bonds. The *face value (or the principal) of the bond* is the nominal value written on the bond, and a *fixed interest* is paid on this face value. The *issue price of the bond* is the price at which the first bondholder buys the bond (this may be equal to the face value of the bond, or lower than that). The bond can be traded between the date of issuing and its maturity, and the *price of the bond* will be determined by its demand and supply. *Government bonds* are long-term debt instruments issued by the government to finance the government's budget deficit. They are issued at larger units than the private (corporate) bonds, and their maturity is also longer. *Treasury bills* are issued in smaller units and for shorter maturity with the same purpose of financing budget deficits (Brealey-Myers, 2003; Mishkin, 2004).

The ***common stock*** *(typically just called a stock) represents a share of ownership in a corporation. It is a security with no maturity date, and it represents a claim on the earnings and assets of the corporation.* Stocks have face value, issue value and market price, similar to bonds, but the issue value of the stock cannot be lower than its face value. The stockholders are the owners of the stock, and they, by purchasing the stock, give their funds to the corporation for good. Stockholders cannot return their stock for money, but they can sell it to someone else. Stockholders are entitled to a share of the corporate profit, called **dividend**, in proportion to their shares, and have a right to vote about the decisions of the corporation. The yield of the stock is the dividend, or the capital gains collected when selling the stock at a price higher than the price at which it was purchased. Stockholders must bear the risk of capital losses as well. Stocks are usually classified by their tradability and ownership rights, some stocks may restrain the tradability of stocks, others restrain the stockholder's interference to managerial decisions (Brealey-Myers, 2003; Mishkin, 2004).

The **primary market** of securities deals with the trade of newly issued securities. In this market securities are sold to the first owner, and the capital saved by the first owner and paid for the security is transferred to the issuer of the security. The **secondary market of securities** deals with the trade of securities that had been issued earlier and are owned by their holders. Transactions in the

secondary market do not directly affect the corporation that issued the security; the transactions take place among savers. The top institution of secondary security markets is the **stock exchange.** The main role of the stock exchange is the trading of securities, although the stock exchange prices also provide valuable information for the economic agents about the market processes and market value of corporations too. Some of the stock-exchange transactions – purchases of securities – take place with the objective of long-term investment, while others are done with the aim of speculation for capital gains. Speculation in the stock exchange plays an important role vitalising the market. Normal forms of speculation are not prohibited, but regulated, while collusion, fake transactions, misinformation, the abuse of information and other forms of incorrect behaviour are heavily penalised (Mishkin, 2004).

5.4. Land, Natural Resources

Natural resources, including land, have an essential property in common: these resources are available in fixed, limited supply; their supplied quantity cannot be increased. The demand for land and other natural resources is similar to the other inputs, determined by the market value of their marginal product. The demand for farmland is derived demand, depending on the demand for agricultural products that are grown on it.

The supply of land and of all natural resources – including mines, oil fields and thermal springs - is perfectly inelastic. The price of such factors is determined by the demand. The price of (or return to) such factors of production is called rent (pure economic rent). **Pure rent** *is the return to any factor of production that is available in fixed supply.* A factor of production available in fixed supply can be sold or rented to the user, and in the latter case the rental price is paid by the user to the owner. The economic rent is the pure return on land that remains after the costs associated with its use are deducted from the sales revenues of its output. If the land is cultivated by its owner, then this rent is included in the owner's profit, and if the user does not own but rents the land, he/she has to pay the rent to the owner. The profit after deducting the production costs from the revenue depends on the fertility, quality of the land as well as its location, which determines the climatic conditions and the distance from the markets. Therefore **differential land rent** *is the land rent that is defined by the quality differences of various lands. This land rent is further classified: defining fertility-related differential rent* (because more fertile lands produce higher yields with the same costs*), intensity-related differential rent* (as the additional resources will yield higher outputs in more fertile lands) and *location-related differential rent* (due to the advantage of a location closer to markets, incurring lower transportation costs of inputs and output).

This is the logic of the rental market of land. However, land may not only be rented but also sold. The owner will consider a **sale price** reasonable if the amount of money can earn him/her a return at least as high as the former rental income. Therefore, depositing the price of the land in a bank, the annual interest should be equal (or not less) than the former rent. The theoretical **price of land** is determined by the present value of the stream of land rents. Land prices considerably differ from this theoretical price in the real world, because land is not only a factor of production, but also a form of storing wealth, and besides farming it can be used for many other, often more profitable, purposes. Contemporary land markets are determined by many factors besides the relationships

described by classical theory. Rental payments prevail in Europe; most of the land is rented to users, but rental prices depend on non-market instruments such as subsidies.

5.5. Entrepreneurial Skills

The entrepreneur's role is different from labour, as its essence is to efficiently allocate and combine (other) resources for the purposes of production. Entrepreneurship includes the manager's job, but the entrepreneur differs from the employed manager: the entrepreneur may not earn a salary, should take risks, while earning profit as well as facing losses sometimes.

The value of entrepreneurial activities is measured by its contribution to the profits of the firm, therefore, the returns to entrepreneurial skills are considered to be the economic profit earned by the business. The economic profit is the sum of money left after the costs of all other factors of production are deducted from the total revenues. These costs include not only the costs of labour, real capital, interests paid after loans and rents of natural resources, but the returns on own capital (this latter being equal to the opportunity cost of own capital, or the interest payable for a loan of the same amount) and the opportunity costs of the entrepreneur's time spent on managing the business (i.e. the salary that the entrepreneur could have earned working elsewhere). When the economic profit is positive, that means that the enterprise covered all the costs payable to its external partners (providers of raw material, labour, energy, rented buildings or land), and besides these the business earned enough to pay more for the entrepreneur's time and own capital than their opportunity costs. This implies that the entrepreneur has chosen the best possible way of using his/her money and time managing his/her own business.

Enterprises can operate in various business forms. The businesses can be classified by their activities: dealing with production, services, commerce, etc. Another way is to group them by the ownership structure: defining privately owned, state-owned businesses or firms owned by foundations, organisations, firms in municipal ownership, cooperative ownership or mixed ownership. Another way of classification is by profit-related categories as profit-oriented ('for-profit') businesses and non-profit ones. Categories by the size of activity define micro-, small, medium and large-scale enterprises, and finally, by legal form the businesses are classified as sole proprietorship or partnerships, the most frequent partnerships being the private partnership, the limited liability company and the corporation (owned by stockholders).

A **sole proprietorship (sole trader)** is a business structure in which a single individual forms a single business entity for tax and liability purposes. Sole proprietorships are easy to start with a small amount of capital. They are suitable for implementing a good business idea quickly, and their greatest advantage for the owner is the flexibility, the possibility to make decisions alone without the involvement of others. The main disadvantages of this business structure are the limitations on available capital, the difficulties of taking loans and the unlimited liability of the owner. Unlimited liability means that the owner of the sole proprietorship is liable for any business debts, and the private property of the owner must be used to pay for the debts of the business.

A **partnership** is the cooperation of two or more partners to conduct business for mutual benefit. The private partnership has at least one internal partner and one external (sleeping) partner;

the internal partner should actively take part in the management of the business and bears unlimited liability for business debts. The external partner usually provides (most of) the initial capital for the business, bearing limited liability, that is, risking only the capital introduced into the partnership. The establishment of a private partnership requires the partners to prove that they can provide a legally required minimum capital for the business.

A **limited liability company** is a business structure, in which all the owners bear only limited liability for the debts of the business, their private properties are not risked. The requirement of a minimum amount of initial capital that the partners should provide for the company is defined by law, and the partners (the owners) are expected to take part personally in the operations and management of the company.

A **corporation** is a business structure of legal entity which raises the initial capital by issuing stocks. The corporation – contrary to partnerships and limited liability companies, which are based on the *personal cooperation of all owners*, is based on *the financial contribution of the owners.* The stockholders are owners of the corporation and their share is proportional to the stock they hold. They bear limited liability and acquire *property rights* and *membership rights* in exchange for the stocks they own. Property rights mean that the stockholders are entitled to a dividend, i.e. a share of the corporate profit, while membership right means that the stockholders are entitled to vote about the managerial decisions of the corporation at the annual general assembly. The general assembly of stockholders elects the board of directors, who appoint managers to direct the operations of the corporation throughout the year. Holders of small stocks usually do not take part in the general assembly, because their primary interests lie in their property rights and not their membership rights (they are interested in dividends and not so much in voting). Therefore, the corporation will be governed by a few holders of large stocks. The decisions made at the general assembly require the majority votes of the stockholders present. The proportion of stocks that is sufficient for the majority vote in the general assembly is called *'control stock'*, and the owner of such stocks has *'controlling interest'* over the corporation, and this is often achieved by a relatively small proportion of stocks, because owners of small shares do not usually come to participate in voting (Brealey-Myers, 2003).

Review Questions

1) Explain the properties of demand and supply in the factor markets.
2) List the primary and secondary factors of production.
3) Explain the meaning of the term 'derived demand'.
4) Explain the notion of the 'backward –bending' labour supply curve.
5) Define the lower and upper limits to wages.
6) Explain the notions of present value, future value and net present value.
7) Explain the notions of promissory note, bond, stock, and describe their yields.
8) Explain economic rent, differential rent and pure land rent.
9) What are the main attributes of sole trader, partnership, limited liability company and corporation as forms of business entities?
10) Collect data in your place of residence about land prices, land rents and their relation to land quality. Explain the data.

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11) Collect data in your place of residence about the wage levels of the past 5 years and about the number of employed and unemployed people. Plot the wages against the employment data. Explain your results.
12) Describe the yields of bonds in the past 10 years in your country. Collect data about the interests that government bonds yielded and the dividends that major corporate stocks yielded in the period. Explain your findings.

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CHAPTER 6: MARKET IMPERFECTIONS, MARKET FAILURES

6.1. Private and Public Choices

The markets of the contemporary developed economies are governed by mixed coordination, the joint action of market components and government intervention. As it is well-known, the equilibrium generated by free markets does not fully agree with the interests and expectations of the society, the government intervention is often justified. The reason for the deficiencies of free markets is the fact, that the market is unable to measure and evaluate all interests and values important for the society, and similarly, it cannot measure fully all the harmful processes either.

Monopoly is a good example for such *market imperfections or market failures.* Monopoly means that one single firm produces all the supply of a commodity. This firm can freely decide to produce only a small quantity and sell it at high prices, focusing only on maximising its own profit. Consumers will be provided with only a small quantity of the product, but they have to spend a lot of money to get access to it. This has a negative impact on the consumers' welfare, while the monopoly fails to allocate the available resources efficiently. The state restricts the emergence of monopolies and the use of their excessive market power by antitrust laws, and regulates market competition in order to maintain *efficiency*. Another reason for government intervention is the principle of *fairness*: when some members of the society do not own sufficient resources to earn their living – being ill, or handicapped, or just too old, the state intervenes into the market mechanism providing social support for citizens lacking the means to earn sufficient income (at least in the so-called welfare societies (social market economies). Other examples are the economic activities that may bring about side-effects that are harmful for the society, disturbing the environment and the people living in the neighbourhood – e.g. causing noise, smells, etc., causing extra costs for the people who want to protect themselves against these negative impacts. The activities of these firms incur *negative external economic impacts (negative externalities)*. In such situations government intervention is needed again, to force the profit-oriented firm to consider the interests of the society, too. Finally, there are many activities that are very useful for the society, but cannot be provided for consumers by the usual market mechanisms. Participation in public schooling is in the best interests of the whole society – therefore the state provides the basic education to all of its citizens free of charge , financing the service from the taxes collected from the society. The state does not leave it to its citizens to decide how much education they are able and willing to buy at the market price defined by supply and demand, but collects taxes to provide these services free, and commands the citizens to use these services. Such services and products are called *public goods*, and the state will have to arrange the production of such goods, and citizens can get access to these goods and services without paying for them.

Rational, self-interested market agents wish to optimise their own situation, trying to maximise their income or total utility, and to minimise their costs. The market can measure the gains (income or utility) attained by the individual market agent by the individual's private marginal benefit (*MR*), or private marginal utility (*MU*). The costs that the individual has to pay are measured in the market by their marginal cost *(MC*). The individuals improve their own situation whenever the

private marginal cost remains smaller than the private marginal utility or private marginal income: *MU ≥ MC (*or *MR≥ MC).*

However, there are many situations in various areas of the economy, in which the result of an economic activity cannot be precisely measured in money, or its utility is not measurable at all. Sometimes business actors, while focusing on maximising their own benefit, positively or negatively influence the business environment or the living conditions of others. This is also true about costs: an economic activity may have negative side-effects on economic agents independent from the firm causing these side-effects. Therefore it is reasonable to distinguish the private and the social interpretations of the costs and benefits associated with an economic activity. The notions of marginal cost and marginal utility are generalised now to facilitate this distinction:

- **Marginal Private Cost** (*MPC): it is the sum of all marginal costs that are imposed on economic agents due to their own economic activities as measured by the market.*
- **Marginal Private Benefit** *(MPB): is the sum of all marginal revenues and marginal utilities that are bestowed on economic agents due to their own economic activities, as measured by the market.*

To measure the full social impacts of any transaction the notions of marginal social cost and marginal social benefit are introduced:

- **Marginal Social Cost** *(MSC): is the total cost to the society of producing an additional unit of a good or service. MSC* is equal to the sum of the marginal private costs of producing the product – as measured by the market – and the correctly measured damage costs of production imposed on other members of the society outside the transaction.
- **Marginal Social Benefit** (*MSB): is the total utility bestowed on the society of producing and consuming an additional unit of a good or service.* Marginal social benefit, therefore, equals the sum of marginal private benefits – i.e. marginal revenues and utilities as measured by the market – and the marginal utilities and revenues that are bestowed on other members of the society not involved in the transaction (production or consumption).

Market efficiency requires the *efficient allocation of factors of production, that is attained if the marginal private benefit gained by producing and consuming the good produced by the last unit of the factor is equal to the marginal private cost of using this factor: MPB = MPC.*

The principle of **socially efficient resource allocation** is an extension of the notion of market efficiency: *The allocation of a factor of production is optimal for the society if the marginal social benefit attained by producing and consuming the good produced by the last unit of the factor is equal to the marginal social cost of using this factor: MSB = MSC.*

If markets could measure all costs and benefits that are important for the society, the marginal private cost would be equal to marginal social cost, and marginal private benefit to marginal social benefit: *MSC= MPC* and *MSB=MPB*. In the real world, however, the marginal social cost includes costs not measured among marginal private costs, and the marginal social benefit includes benefits not measured in marginal private benefits: *MSC > MPC* and *MSB > MPB*. This is so, because some resources used in production are not measured by the market (such as the pollution of natural resources), and as some economic activities have positive side-effects not measured by the market

(when, for example, a hotel builds a nice park around its building, and not only its clients, but all the people living in the neighbourhood can enjoy this park). As a result, the market often chooses optimal resource allocations that are very different from the socially optimal resource allocation, and the society is not even aware of this fact (Case et al., 2009).

Figure 6.1 illustrates the above issues. Point *A* denotes the market equilibrium measured as the intersection of marginal private benefit (*MPB)* and marginal private cost (*MPC*) with optimum output at *Q**. Social efficiency would, however, choose the intersection of the *MSB* and *MSC* curves to identify the socially optimal output level – see point *B*. In *Figure 6.1* point *B* shows that the marginal benefits not measured by the market are much higher than the marginal costs, therefore point *B* indicates a higher output level (Q_1) than the output defined by point *A* –, although at higher prices, too, because of the higher costs. In the real world the situation is usually the opposite, the negative impacts not measured by the market are much higher than the positive impacts, as it is shown by the position of the *MSC'* curve, and the resulting socially optimal equilibrium (point *C* in the figure). This equilibrium suggests that the socially optimal quantity (Q_2) be much smaller than the former market equilibrium *Q** in point *A,* and the relevant price (P_2) be much higher than the original price *P**. Economic activities causing considerable environmental damage are like this: when we want to consume the products of such industries, we pay less than the true costs of production, so we buy more than we would facing a higher price that covered all the costs of environmental damage.

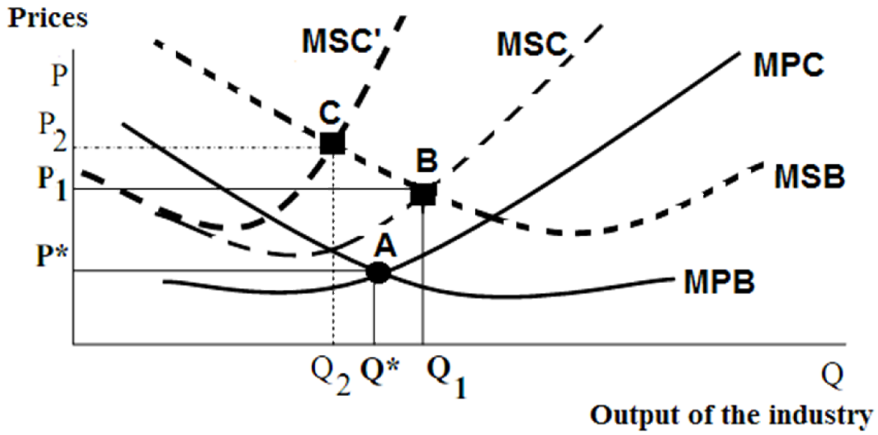

Figure 6.1: ***The Difference of the Private and Social Optimum***
Source: Authors's own construction

The above explanation justifies the need for market intervention in many areas, to eliminate, or at least diminish the market imperfections. The market cannot measure the true value of all the inputs used nor the utilities generated by actual economic activity; the flow of information is not perfect, the market can only measure the costs and benefits that the agents directly involved in the transaction are willing to pay. In the following sections two typical examples of market imperfection – public goods, and externalities – will be presented.

6.2. Externalities

6.2.1. Categories of Externalities

Externalities, or external economic impacts *occur when an economic agent influences the situation of another economic agent incurring costs or bestowing benefits although they are not related by market transactions.*

Externalities may impose additional costs or bestow additional benefits, and may be the result of production processes or consumption, too.

- ***Positive externalities*** *bestow additional benefits to the individual or group, who is outside (being external) to the transaction.*
- ***Negative externalities*** *impose additional costs on the individual or group, who is outside (being external) to the transaction.*
- ***Production externalities*** *occur, when the external damage or benefit is caused by a production process.*
- ***Consumption externalities*** *occur, when the external damage or benefit is caused by the consumption of a product or a service.*

A well known example of positive production externalities is the story of the beekeeper and the orchard. The beekeeper and an apple orchard are neighbours. The beekeeper's bees pollinate the blossoms of the neighbouring orchard 'free of charge', and it leads to high fruit yields. On the other hand, the bees also benefit from the blossoming orchard, as honey production becomes more successful. Therefore both the owner of the orchard and the beekeeper benefit from the 'service' provided by the other, although neither of them is paying for the other's services. Both enjoy the benefit of positive production externalities. (Case et al., 2009).

Negative production externalities often emerge related to pollution. When a factory of washing powder lets sewage into the river without filtering, the factory damages the environment. Doing so the factory does not pay the cost of filtering out the pollutants, so the costs of production, and the variable costs are lower than with correct filtering, and the **marginal costs (MC) of production are also lower**. The firm can sell the washing powder at a low price and still earn profits. The factory's partners in the market are its consumers, who are interested in buying more washing powder at low prices, as the market demand is inversely related to prices. At the same time, people living near the river find that their environment has been damaged, because of the polluted water. Therefore the total utility of the people living in the neighbourhood of the factory has decreased, regardless of their buying washing powder or not. The costs of the environmental damage, the clearing of the polluted water must be paid by the society, if they are unable to reclaim it from the polluter.

An example of a negative consumption externality is the noise caused by our neighbour mowing his lawn disturbing our relaxation in a summer afternoon, and a positive consumption externality is the sound of our favourite CD that our next-door neighbour plays loud enough in his own house so that we can also enjoy it at home.

6.2.2 Economic Theories on Externalities

Welfare economists claim that because of externalities the allocative efficiency of the society is less than optimal, and leads to welfare losses: externalities imply differences between the social benefits and private benefits, social costs and private costs. Therefore the principles of market efficiency lead to a market equilibrium that considerably differs from social optimum.

The British economist A. C. Pigou (1920) made recommendations on how to deal with externalities. Pigou suggested that external impacts should be internalised, i.e. they should be incorporated into market valuation. The positive externalities should be transformed into a revenue measured and paid by the market, and negative externalities should be transformed to costs measured and paid by the market. This way the externalities would turn into internal components of the production and consumption processes, and would automatically be taken into account in the market equilibrium. The process of internalisation may take place through the following stages:

- *Voluntary agreement:* the party causing the externality and the party affected by its impacts make a voluntary agreement about the value of the damage (or benefit) caused and the compensation to be paid.
- *The involvement of an independent expert*: whenever the two parties cannot agree about the impact of the externality, they call an independent expert, who, assessing the damage caused, gives a recommendation about the compensation. The two parties can make an agreement accepting the expert's recommendation.
- *Legal procedure to force compensation:* when the parties fail to make an agreement, the harmed party goes to court to initiate a legal procedure that involves assessment of the situation by experts appointed by the court. The court will decide about the damage and the compensation that the damager will have to pay.
- *Administrative measures:* many activities imposing negative externalities – e.g. environmental pollution – are legally prohibited. If anyone carries out such activities, a fine will be charged. Therefore the negative externality becomes a cost for the polluter (in the form of the fine). Economic agents generating positive externalities are encouraged by subsidies to continue their activities – e.g. a firm employing formerly unemployed people is granted a deduction from payroll taxes.

The other well-established theory claims that the main causes of externalities are the poorly defined **laws and property rights.** This approach states that externalities occur because the property rights of some economic resources (e.g. water, air, and other natural resources) are not defined clearly. The theory was first defined by *Ronald Coase,* who argued that by clearly assigning the property rights of all resources to some economic agents, and making the society accept these rights, the problems of externalities could be resolved by private bargaining in the market, without the need of government intervention.

When a firm uses a natural resource, and by polluting it, restrains others from using the same resource, the first issue is to identify who is the owner of the resource. The owner of the resource will decide about its use. If the owner is some other party and not the firm, this owner may prohibit the firm's using and polluting the resource. Another possibility is that the firm and the owner

start to bargain about the price for which the owner is willing to let the firm use the resource. If the bargain ends with a price acceptable for the firm, the firm, paying this price, will become the rightful user of the resource. The price paid can be considered the compensation for the pollution. If it is the firm, who owns the resource, property rights mean the right of use as well, the firm can prohibit others to use the resource, and pollution will not cause externalities to anyone. In this case the person who feels harmed by the pollution can start bargaining with the firm, offering compensation for the firm to diminish or stop pollution. If the firm finds the offer satisfactory, it may give up the polluting activity, otherwise the harmed person has no right to force the firm to change its behaviour. Therefore the resource will be used by the party who assigns higher value to it (if the firm pays for the damage, it means that the firm values the use of the resource higher than its owner), therefore efficient resource allocation is attained. All the process happens by voluntary negotiations, without any government intervention, the natural resource being the object of private bargaining in the market. Coase argues that this procedure works if the property rights can be clearly defined, and the negotiation process does not incur very high costs. Unfortunately, in most real situations many people should be involved in such bargaining, and the negotiation procedure is nearly impossible to be concluded, so the resolution suggested by Coase cannot be implemented (Case et al., 2009).

6.3. Public Goods

Public goods can be defined in contrast to private goods.

Private goods are goods consumed *individually*, and if a unit has been consumed by someone, then noone else can also consume the same unit. Private goods are scarcely available, and consuming a unit will decrease the amount available for further consumption. Therefore consumers compete for private goods, i.e. private goods are ***rival*** in consumption. Consumers can consume them if they pay the price, ***nonpayers are excludable*** from consumption (Case et al., 2009).

Public goods are consumed *collectively,* they are provided for all members of a community, ***noone can be excluded from their consumption***. The ***consumption by one person does not decrease the consumption possibilities for others.*** Public goods are available for everybody *without paying*, and these goods cannot be rationed: they are either provided for the whole community, or for noone. Examples of public goods include the public lighting system, public roads, radio broadcasts, national defence, lighthouses, town pavements, etc.

To sum up the above, private goods are rival in consumption, and the non-payer is excludable of their consumption, while public goods are non-rival, and their benefits are non-excludable (Case et al., 2009).

Mixed goods are goods showing ***one of the properties of public goods, but not the other.*** Mixed goods may be non-rival in consumption, but the non-payer cannot access them (like cinema, where the film is watched together by those having bought the ticket) or they may be rival in consumption, but their benefit being non-excludable (as for free university education, where admission is limited to the best students) (Case et al., 2009).

Public goods are usually not traded in the market. The production of public goods incurs costs – often very high investment costs. The citizens consume these goods without paying the price, therefore no revenue is generated. Public goods – products, or mainly services – are goods that

should be consumed by every member of the society. It is the best interest of the society that every single person should participate in basic education, or receive vaccination against contagious diseases, because even one person left out of the consumption of these services may substantially worsen the quality of life for the whole society. Therefore it is not reasonable to charge a fee that covers the production costs of public goods, because this would prevent the consumption by the poorer members of the society. Public goods are usually provided by the state (or a municipal authority), acting as the 'buyer': buying the chosen amount from a firm (the producer), and paying for it from the tax revenues collected from the citizens. Then the state provides the purchased public goods for the citizens free of charge.

It is not advisable to make the consumer pay for public goods and public services, leaving the allocation of these goods to the market. In order to sell these goods in the market the same way as private goods, first the quantity of individual consumption should be measured. For many examples of public goods this is technically impossible, or would incur very high costs. Take the example of public lighting: to measure the individual's consumption, we should measure how much time each individual is spending in the streets during the time of the day when the lights are on, or what kind, and how much of their properties are protected by the good visibility during the nights. Second, if consumers buy these goods in the market, paying for the quantity consumed, the provision (that is, production) should be adjusted to individual demand. Taking the example of public lighting again, the provider should provide different amounts of light to those who spend much time outside in the nights, and those who usually go to bed early, never going out in the dark hours. As the service cannot be varied like this (it can be provided in the same quantily for all), everyone can consume it only in the same quantity.

Therefore, consumers use public goods without paying the true price for them (occassionally they may pay some very low fees), while they know well that the state pays for these goods from the tax revenues collected from the citizens. Therefore the rational, self-interested individual wants to use as much as possible of the available public goods – to recover the value of the tax he/she paid for the state (or, if possible, even more), wishing to decrease the personal costs of the consumed public service and increase the personal benefits received. As you have access to public goods without paying for them, why should you pay at all? This behaviour is called the free rider problem[20]: wishing to use a service while leaving it to others to pay for its production. As a result of the free rider behaviour, citizens seem to require more of the public goods than the current provision. If, in response, the state decides to increase the provision of public services, taxes should be increased to cover the extra costs. Therefore even the free rider will have to pay more in the form of taxes, for an additional amount of public service that is not really wanted.

Private provision of public goods fails, due to the free rider problem. However, private companies can produce these goods, if the state pays for the produced amount. Therefore the state regulates and coordinates the provision of public goods for increasing the welfare of the society, but

[20] The Tragedy of the Commons is a well-known example of the free rider problem. Each farmer wants to keep as many cows in the common grazing land as possible. This works for all as long as the number of cows is not higher than the capacity of the land. But as farmers want to maximise their own profit, they try to graze more cows in the common land. Soon the total number of cows will be too high for the land, and it will be overgrazed, not providing enough feed for the cows. The milk yields of all the cows decrease, then they will starve and die. The free use of the common grazing land brings disaster to all (Varian, 1987.).

we must remember, that excessive government intervention may damage the efficiency of the economic system (Case et al., 2009).

Review Questions[21]

1) Explain the notion of market imperfections and give examples.
2) Explain the terms 'marginal social benefit' and 'marginal social cost'. Why does social efficiency differ from market efficiency?
3) Explain the notion of externalities, and define their main categories.
4) Explain the approach of welfare economics to the problem of externalities.
5) Why can poorly defined property rights generate externalities?
6) Explain environmental pollution, as an externality.
7) Explain the notions of private goods, public goods and mixed goods.
8) Describe the supply and demand of public goods. Explain the free rider problem.
9) Describe some services in your place of residence that are considered public goods. Why is it necessary to provide these services as public goods?
10) A company produces fruit pulp, and the side-effect of the production process is bad smell, air pollution. Higher outputs generate more pollution, affecting the residents of the area. The fruit pulp is sold in a perfectly competitive market, and its marginal cost function is linear. The marginal cost of the pollution (i.e. that of the externality) is proportional to the output, being one third of the marginal cost of production.
    a. Draw a diagram, sketching the costs and revenues of the company, as the functions of output. Mark the output level that maximises the company's profit.
    b. Indicate the social costs of production in the diagram, and the level of output in the figure, that is optimal for the society. Is this quantity larger or smaller than your answer to a)?
    c. How could you convince the company to produce the socially optimal quantity?
11) Collect information about production-related environmental disasters that occurred in the last 10 years in your place of residence. What solutions have been established since then to eliminate or diminish the negative externalities?

[21] Source of problems 9, 10 and 11: Case et al. (2009).

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The projects have been supported by the European Union.

PART 2 – MACROECONOMICS

CHAPTER 7: MACROECONOMIC CONCEPTS, GOALS, TOOLS

7.1. The Goals, Problems and Tools of Macroeconomics

The first part of the textbook described the particular markets and the determination of specific prices and quantities, that is, the microeconomic aspects of the economy. The second half of the textbook will focus on macroeconomics, shifting our attention from the component parts of the economy to the economy as a whole. Macroeconomics looks at the key attributes of the economy (total output, employment, change in the overall performance over time, price rises, etc.), analysing its processes and interactions, attempting to explain its problems.

Macroeconomics *is the study of the behaviour of the economy as a whole. It analyses the forces that influence the homogeneous groups (aggregates) of economic agent: firms, consumers and workers* (Samuelson – Nordhaus, 2010).

The birth of macroeconomics as an independent science is linked to John Maynard Keynes, as he tried to explain the economic mechanisms that had led to the Great Depression (1929-33). The economic units that macroeconomy is concerned with, are not individuals and particular markets, but so-called **aggregates**. Macroeconomics uses the method of double aggregation. First, the homogeneous groups of economic agents are aggregated to define the **sectors (spheres) of economy**: firms, households, employers, and the government. Second, the goods, commodities and services produced are also aggregated into **commodity groups**, and the sum of all these product groups represents the **total output of the economy**. The ultimate goal of economic activity is to provide the goods and services that the population needs. The principal issues of macroeconomics are related to various aspects of this ultimate objective. They include issues related to the **efficient operations of the national economy**, on the one hand, and the **management of the state budget**, on the other. This latter is of particular importance, because the state is the only economic actor that has the power and means – by collecting taxes, allocating transfers, and managing its deficit – to help to improve the economic mechanisms that lead to the efficient utilisation of the resources and the highest level of output of an economy. Therefore the **two central themes** of macroeconomics are:

- *economic growth:* the longer-term trends of growth in total output and living standards;
- *business cycles*: the short-term fluctuations in total output, employment, prices and financial conditions, that are called *business cycles*.

Altogether, **macroeconomics** explains how the economy, as a whole works, describes its inherent rules and mechanisms, and provides theoretical foundation for the economic policy of the government. Assessing macroeconomic performance in longer-term periods as several decades, the outputs of all countries tend to grow. This growth, however, is not even, but periods of outstanding growth are followed by periods of decline. Therefore, while the longer-term behaviour of the economy follows a growing trend, the short-term performance shows frequent fluctuations – *business cycles.* Typical properties of business cycles are the fluctuations of output and employment, subsequent periods of recessions and expansions. This cyclical behaviour is not good for the

economy, because fluctuations are irregular, and difficult to forecast. During the periods of expansion output grows together with employment, while unemployment decreases. During recession, however, the opposite happens: output falls, employment declines, unemployment rises. One of the main goals of economic policy is to maintain stable longer-term growth, and the other essential issue is to diminish short-term economic fluctuations, and to stabilise the economic environment (Mankiw, 1997). The instruments to achieve **the long-term goal**, i.e., to **promote economic growth** are the following:

- *Develop public education (to increase human capital.)*
- *Encourage savings and investments (to increase physical capital, or real capital).*
- *Promote research and development (technological development, innovation).*
- *Stabilise the legal and political environment (ensuring favourable business environment)*

.

In the short-run, stabilisation policy is focused on diminishing economic fluctuations *of total output and employment*, *stabilising the price level* and *slowing down inflation.* The main instruments available are (Hall –Taylor, 1991 ; Mabry – Ulbrich, 1994):

- *Fiscal or budgetary policy,* affecting the spending and revenues of the state budget.
- *Monetary policy,* affecting the amount of money in circulation and the interest rates.
- *Income redistribution policy*, i.e. government measures directly affecting the decisions on prices and wages, to slow down inflation, while keeping unemployment low, and preventing economic recession. By supporting the poorest and weakest members of the society, this policy also attains social policy objectives.
- *Foreign trade policy,* concerned mainly with the external and internal balance of the economy, by the instruments of exchange rates, trade policy (tariffs, contingents, etc.), and occassionally by the instruments of fiscal and monetary policy.

It is a subject of debate among economists, to decide which kind of economic policy is the most efficient. The answer always depends on the actual situation and the attributes of the problems encountered. The assessment is especially difficult, because of the time lag that elapses between the emergence of a problem and the time of action and its effect, because the external economic environment may considerably change during the time elapsed. *Keynesian economists* argue that stabilisation policy is desirable and efficient, and both fiscal and monetary policy instruments are suitable to promote the welfare of the society. The economists of the *monetarist school of MIT, Chicago* (e.g. *Milton Friedman*) argue, that although stabilisation is desirable, government intervention cannot be efficient, and it may even enhance fluctuations instead of diminishing them, due to the time lag between government action and the response of the economy. Therefore competitive markets free of any government intervention lead to the most efficient operation of the economy. The *theory of real business cycles (RBC)* argue, however, that economic fluctuations are not harmful, but natural responses of the economy to external shocks, and trying to prevent them is harmful for the overall economy (Samuelson – Nordhaus, 2010).

7.2. Basic Macroeconomic Concepts[22]

7.2.1. Output, Consumption, Investment, Price Level

Economic processes *are annual movements of goods and money related to the production and consumption of goods, as well as the generation and distribution of incomes.* Some of these are real processes, others are income processes.

The **total output (***Q) of the economy is all the goods (products and services) created by the economy. The value of realised (sold) total output is* **the income** *(Y, Yield), which is distributed among the owners of all the resources that were used in the production process. Therefore income is divided to two main parts:* **labour income** *and* **capital income**.

Nominal income *is the value of the output of the economy measured in actual market prices.* **Real income** *is the value of the output measured in constant prices (base-year prices), neglecting the impact of price changes (inflation) on the value of output.* **Potential output** *is the maximum sustainable level of output that the economy can produce using the current level of resource endowments in the most efficient way, producing at full capacity.*

The difference between nominal and real income is caused by the annual change in prices. Therefore, assuming that the economy produces exactly the same amount of goods in two successive years, the nominal income may still change. If, for instance, the prices of goods rise uniformly by 5% from the first year to the second, the nominal income of the second year will be 5% higher than in the first one, although the amount of goods available for consumption remains the same as before. The value of real income in the second year is calculated using the prices of the first year to measure the value of the goods produced in the second year. In our example real income is the same in both years, while nominal income is higher in the second year due to higher prices.

Probably the most popular measure of national income is **GDP (***Gross Domestic Product).* There are three ways to measure GDP. First: by measuring the value of the output; second: by measuring the factor incomes received by owners of productive resources; and third: by measuring the spending of all incomes earned in the production of GDP.

Some part of the national income is consumed, the rest is saved. **Consumption** (C) is the part of the income which the members of society spend on goods (products and services) to satisfy their needs. **Saving** (S) is the part of income not spent on consumption.

The incomes not consumed, i.e. savings are used to finance capital accumulation. **Capital accumulation** consists of productive resources to be used to increase future production. Capital accumulation is divided into two categories: investment goods and inventories. **Investment** consists of the additions to the country's capital stock of buildings, vehicles, equipment, and software, more precisely **business fixed investment** is the purchase of capital assets for either replacing used equipment to maintain productive capacity, or installing new equipment to expand productive capacity. **Inventory investment (accumulation of inventories)** consists of goods that the firms hold in

[22] The terms explained here, in Chapter 7 are defined – whenever otherwise not indicated - by Samuelson-Nordhaus (2010), Hall-Taylor (1991), and Mankiw (1997).

storage, that is, inputs needed for future production, or finished products waiting to be sold. *The replacement of used fixed capital is called* **replacement investment**. *Its role is to compensate for the wear and tear of fixed assets (depreciation of fixed assets),* thus it does not expand productive capacity but maintains its current level. **New capital investment**, *on the other hand, means the expansion of productive capacities by installing new fixed capital (e.g. equipment), increasing the amount of fixed assets.* **Net investment** *is the value of total investment minus the value of depreciation (or replacement investment,* therefore net investment consists of new capital investment, while gross investment is the sum of replacement investment and new capital investment: *gross investment = replacement investment + new capital investment = = depreciation + net investment.*

As it was explained above nominal and real income must be distinguished to interpret the impacts of changing outputs and changing prices correctly . However, prices of goods do not usually change at the same uniform rate, the prices of some goods increase at above-average rates (e.g. prices of energy and fuels), while the prices of others may remain the same, or even decrease (e.g. electronic appliances, cellular phones, computers). The **price level (P)** *is the average of prices of goods weighted by the quantity of these goods*. Take the goods that the economy produces (or consumes) during a year, and to calculate the price level the unit prices of these goods are weighted by their produced (or consumed) quantities, to compute the weighted average. The absolute value of the price level is not so interesting in itself, but the change of the price level is far more important for the economy. To track the changes in the price level statisticians construct an index called price index.

Changes in the price level are measured by the price index. **The Price Index *(P)*** *is the ratio of the current price level to the price level of the previous year, measured as a fraction, or as a percentage value.* Denoting the current price level by P_t , and the price level of the former year by P_{t-1} , then *price index is* P_t / P_{t-1} in fractional form, and $100 \times P_t / P_{t-1}$ in percentage form. For example, if all the prices rise by 6 % from the first year to the second, the price index is *1.06* (or *106 %*) . A price index of *91%* means an average price decrease of *9% (= 100% – 91%)*.

Naturally, the calculation of the price level of a particular year requires the exact specification of which goods, products and services are included, together with the weights attached to them. Several indicators of somewhat different sets of goods are used for measuring price level changes. The starting point of computing a price index is to choose which goods in which quantities enter the *basket of goods used in the calculation. The value of this basket is measured at first in base year prices, and then in the prices of the actual year, and finally the ratio of the two values is computed to find the price index.*

The most frequently used indicator of price level changes is **Consumer Price Index** (*CPI*). For *CPI the basket of goods contains all the goods (products and services) that the people of the country purchase in the given year* – including goods produced at home as well as imported goods, e.g. food, cars, electronic devices, etc. The other popular indicator is **GDP deflator**, *which is the ratio of nominal income (nominal GDP) and real income (real GDP) of the country*. Thus, GDP deflator compares the value of total output of the current year measured at current prices to the value of total output of the current year, measured at the prices of the previous year (that is, at constant, or base year prices). This is the same logic as was described above, the basket of goods containing all the goods produced by the economy in the current year.

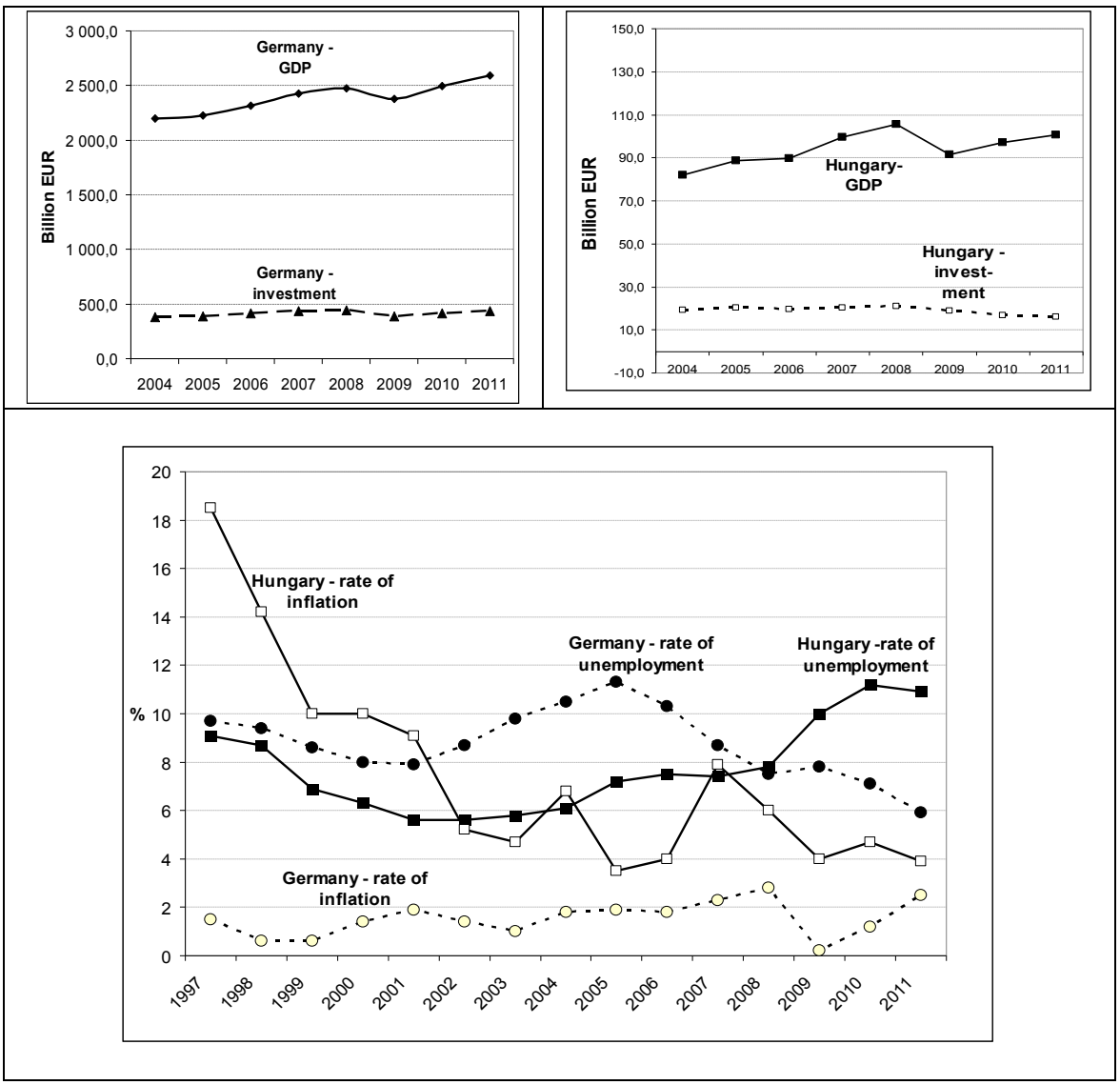

Figure 7.1: ***Macroeconomic Indicators in Germany and Hungary***

Source: Author's own construction based on data published by Eurostat (http://epp.eurostat.ec.europa.eu/)

The main *differences between GDP deflator and CPI* are related to the choice of the basket of goods used in the calculations:

- The basket of the *GDP* deflator contains all the goods produced domestically, by the national economy. It does not contain imported goods, but contains exported goods produced domestically. The basket used for consumer price index, however, contains goods purchased by consumers, including imported goods, but excluding domestic products exported to foreign countries.
- *CPI* contains goods purchased by households, and does not contain goods purchased by firms and the government, while *GDP* deflator does include these if produced domestically.

- The basket used for *CPI* is a fixed basket, in which the goods and their quantities are defined by the statistical bureau of the country based on the consumption statistics of households, and the same basket is used for several years, containing the sa me quantities (although the basket is updated in regular intervals of several years). The GDP deflator, on the other hand, uses the actual basket of goods produced in the actual year, so its contents change each year.

The changing price level leads to changing purchasing power of incomes. As the price level rises, the same money can buy less amounts of goods, and the purchasing power of money decreases. Therefore the price level and the purchasing power of money are inversely related. The *purchasing power of money is defined as the reciprocal value of the price level, referring to the amount of goods that one unit of money can buy*. **Inflation** *is a persistent rise of the price level, the continuous decrease of the purchasing power of money.*

7.2.2. Aggregate Demand and Aggregate Supply

The economic performance of a country depends on the activity of economic agents. Producers make decisions about production, and the quantities produced, and these determine the total output of the economy, the aggregate supply, in relation to prices. Consumers make purchase decisions, deciding about how to spend their incomes, depending on the actual price level, and this behaviour is summarised in aggregate demand. The economic activities of a country are described by the interactions of aggregate demand and aggregate supply.

Aggregate Supply *is the total quantity of output that the businesses of the country produce and sell at given prices, productive capacities and costs. Total output is usually measured by its value, which is, by definition, the same as the real income of the country. The* **aggregate supply curve (AS)** *is the aggregate supply plotted against the price level.*

Aggregate Demand *is the quantity of goods that the economic agents (households, firms, and the government) desire to purchase at given prices. The* ***aggregate demand curve (AD)*** *is the aggregate demand plotted against the price level. Aggregate demand is usually measured as the real income that the consumers are willing to spend on demanded goods and services.*

Total output depends on the available productive resources, factors of production, and the amount of these resources actually in use, as well as on the actual price levels (that determine the producers' income and costs). Today contemporary developed economies utilise only a part of their available labour force, while a part of the working age population is looking for work without success, being unemployed. Unemployment is one of the major problems of modern market economies. The unemployed earn no income, therefore they cannot buy goods, cannot spend on consumption. The socially sensitive market economies, welfare states provide government support for the unemployed – for varying lengths of time. Unemployment is measured by the unemployment rate, which compares the number of unemployed to the number of the labour force (those wanting to work, being either employed or unemployed). One of the central issues of economic policy is to decrease the number of unemployed, and increase the number of employed workers. This policy leads to

double benefits: it increases the total output of the economy (the aggregate supply), and raises the total income of the economic agents, generating a rise in the aggregate demand. Therefore such a policy is a step both to the direction of economic growth, and to the improvement of the society's living standards..

7.3. Sectors of the Economy

The economy is a huge network of markets and activities. Economic agents may be grouped according to their roles in this network. Firms (businesses) produce the goods (products and services), while households consume them. Aggregating the economic agents of the same roles and functions four sectors are defined: firms, households, the government and the rest of the world (the foreign countries) (Mabry – Ulbrich, 1994).

- *The sector of* **households** *consists of individuals, i.e. the citizens of the country, as economic agents who spend their income to consume goods. They own the productive resources of the country, and selling them to firms, earn their income which they spend on consumption.* Households may also produce (goods or services) for home consumption, but this is not markedly separated from their role as consumers.
- *The sector of* **firms (businesses)** *consists of economic agents whose role is to organise production buying productive resources from households. Combining these resources firms produce the output of the country, with the purpose of selling in the market.* The sector of firms earns its revenue by selling its output in the market, and provides income to households by paying for the productive resources owned by households.
- *The sector of* **the state or government** *consists of bodies and institutions of the central government, of local governments, the bodies of social security, and the organisations and bodies handling the financial funds and the wealth of the state. The role of the government in the economy is to provide a framework of property rights, to enforce those rights, to give the markets a set of rules by which they operate. Besides, the government collects taxes, and purchases goods and services from the private sector (households and firms) to maintain its own institutional system, provide public goods and services, support the needy and handicapped, and implement its economic policy to promote economic growth, price stability and full employment.*
- *The* **rest of the world** *(***foreign countries, economies)** *consists of all individuals, bodies, organisations operating in other countries, not being part of the national economy. To put it simply, all the economic agents are included in this sector, who do not belong to any of the formerly defined three sectors.* Note that business units owned completely or partially by foreigners, working in our country, do not belong to the sector of the foreigners, but to the sector of firms.

7.4. Measuring Economic Performance, the Flow of Incomes

7.4.1. Measuring Economic Performance, the System of National Accounts

The economic performance of a country is measured by the total annual output of the economy, the values of all produced commodities and services. The value of this output is the total income of the country, which is divided among the owners of productive resources (labour and capital resources) that were involved in the production process. This division is called the primary distribution of incomes. Nevertheless, the owners of productive resources cannot spend all their income as they like, because some of this income will have to be given to the government as taxes. The government will use taxes to provide public services and subsidies (called transfers) to members of the society. This process is called government redistribution of incomes. Factor owners use their disposable income, i.e. the available income left after income redistribution, to buy the goods produced by the economy. Therefore the sum of the spending of all incomes must be equal to the value of total output produced by the national economy. The incomes not spent by their owners on goods – that is, the savings of economic agents – are offered to others as loans (with the assistance of the banking system), and then spent by these borrowers to buy goods. This circular flow of incomes is shown in *Figure 7.2.* The values of consumption, savings, wages, and other values mentioned in the circular flow diagram are regularly measured by national economic statistics.

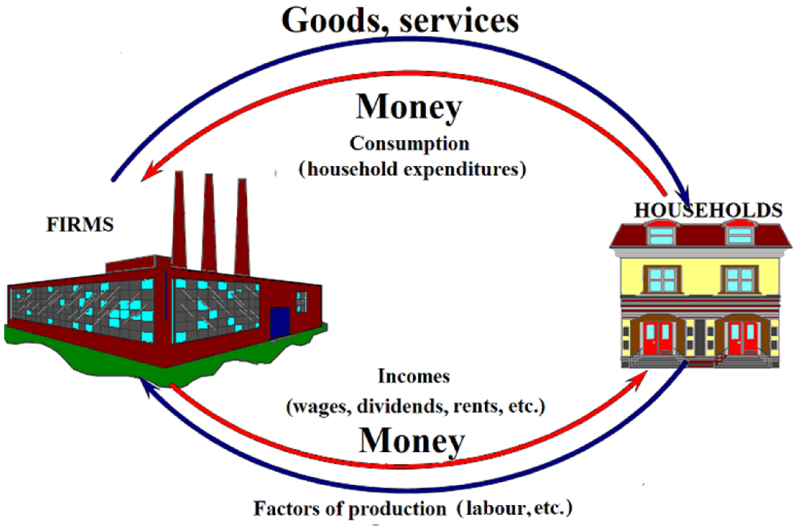

Figure 7.2:The ***Circular Flow of Incomes in the Economy***
Source: Author's own construction

National economic statistics are used to compare the economic performance of countries. This comparison makes sense only if all countries use the same methodology for measurement. The *System of National Accounts (SNA)* was constructed by the *UNO* in 1953 to provide a standardised methodology by which to account for the economic performance of nations. In 1993 the system was

amended and today this is the only internationally acknowledged system in use to measure national economic performance.

Table 7.1 presents the structure of *SNA.* The table contains three rows (gross, semi-net and net indicators) and three columns (indicators of domestic, national and disposable values). The 1993 adjustment of the system deleted the line of gross indicators, and changed the name of the second line (the semi-gross or semi-net line) to gross indicators.

Table 7.1: ***Indicators in the System of National Accounts***

	Domestic indicators	**National indicators**	**Disposable indicators**
(Gross)	**GO:** *Gross Output*	-	-
Semi-net (semi-gross)	**GDP:** *Gross Domestic Product*	**GNI:** *Gross National Income*	**GNDI**: *Gross National Disposable Income*
Net	**NDP:** *Net Domestic Product*	**NNI:** *Net National Income*	**NNDI:** *Net National Disposable Income*

Source: Author's own construction

Domestic indicators of *SNA* measure the outputs produced within the borders of the country, ***national indicators*** measure the incomes earned by the residents of the country regardless of the place of their production**,** while ***disposable indicators*** adjust the national indicators by the values of international transfers paid to, or received from other countries (e.g. supports, grants, subsidies, membership fees to international organisations, etc.).

Gross Output (GO) *is the sum of the values of all outputs produced by the economic agents within the country.* **Intermediate goods (producer goods)** *are goods produced to be sold to producers for further processing.*

Gross Domestic Product (GDP) *is the total value of domestically produced goods and services for final consumption in a year.* In other words, *GDP is the total gross income without double counting, earned domestically during a year, or the sum of all values added within the country GDP is equal to the value of Gross Output minus the value of intermediate goods.* However, when computing the annual *GDP* an adjustment must be made: the *value of inventories – outputs produced, yet unsold, and intermediate goods yet unused –, and investment goods should be added,* because these values have been produced during the actual year, but not included yet in goods sold for final consumption. As *GDP* is the sum of goods produced for final use, these goods can be used by households, firms, the government or foreigners: GDP equals all final goods consumed by households, purchased for investment purposes, for government use, or for export. Looking at GDP from the viewpoint of value added, it includes all new values produced for consumption or investment, including not only new investment, but replacement goods (replacing depreciated goods), and from the viewpoint of incomes it is equal to the primary incomes of owners of factors of production, plus the value of capital depreciation. **Net Domestic Product (NDP)** *is the total net income earned domestically during a year, which is equal to GDP minus the annual capital depreciation of fixed assets.*

Now the 'domestic' column of *SNA* is defined. Let's move on to 'national' indicators. While domestic indicators account for outputs and incomes produced within the territory of the country, national indicators contain incomes earned by the residents of the country anywhere in the world. Therefore, a national indicator is calculated deducting from the relevant domestic indicator the primary incomes (labour and capital incomes) earned within the country by foreigners, and adding to it the primary incomes earned abroad by the residents of the country.

Gross National Income (GNI) *is the total annual primary income of all residents of a nation. It is calculated from GDP, adding the primary incomes (labour and capital earnings) of the residents of the country earned abroad, and deducting the primary incomes of foreign residents earned in the country.* **Net national income (NNI)** *is the value of gross national income (GNI) minus capital depreciation.*

Now the final question is, how much of the national income the residents of the country can spend for their own needs. It may sound surprising, that the incomes spent on the welfare of the residents may considerably differ from the income earned by these residents. Residents may give some part of their incomes to foreign countries without any compensation (e.g. as an aid to a country severely hit by a natural disaster, or as payment of the annual membership fee for an international organisation), and similarly, they may receive income transfers from abroad, as a gift, aid, subsidy, or grant. The national income indicators are corrected for international transfers to calculate the indicators of 'disposable income'.

Gross National Disposable Income (GNDI) *is the total annual income that the residents of a country can spend on their own purposes. It is calculated from GNI by adding the international transfers coming from abroad, and deducting the international transfers outflowing from the country.* **Net national disposable income (NNDI):** *the value of GNDI minus capital depreciation.*

The difference between ***gross*** and ***semi-net indicators*** and the meaning of double counting are easy to understand by an example. Assume that the economy deals with wheat production and processing, the final output being bread. The wheat grower produces *20 tons* of wheat a year, using home-produced wheat seeds, and no other purchased inputs, and the total annual output is *20 tons* of wheat. The farmer sells the wheat to the mill at the unit price of *$100 per ton*, so the value of the farmer's output is *$100/ton × 20 tons =$2000.*

The mill purchases wheat for *$2000*, and produces *15* tons of flour. The flour is sold to the baker, at a price of *$250/ton*, thus the value of the baker's output is *$250/ton ×15 tons =$3750.*

The baker purchases the *15 tons* of flour for *$3750*, and (adding some water) bakes *30* tons of bread, selling it to the grocery shop at a unit price of *$500/ton,* therefore the value of the baker's output is *$500/ton ×30 tons =$15000.*

The grocery buys *30* tons of bread for *$15000*, and sells it to the consumers at a unit price of *$750/ton*, so the value of the grocery's output is *$750/ton ×30 tons =$22500.*

The value of *GO* in the example is the sum of the output values produced by the wheat farmer, the mill, the baker, and the grocery: *GO =$2000 +$3750+$15000+$22500=$43250.*

However, eventually the consumers of the country consumed only *30 tons* of bread, worth of *$22500* (the value of the bread sold by the grocery), and not *$43250*. The difference is explained by the fact, that the latter sum contains double and multiple counting of the same values: the mill's output contains the farmer's wheat purchased as input for the mill. The baker's output contains the mill's flour, which again contains the farmer's wheat. The grocery's output contains the baker's

output, which again contains the mill's output, and the farmer's output. Therefore all intermediate products, that will be further processed by another producer, are counted twice or more, in the value of *GO*. The true output produced by any economic agent is only the added value of the total output above the values of the inputs purchased from elsewhere.

The added value produced by the farmer is *$2000* (because the farmer does not purchase any inputs), the mill's added value is *$3750 – $2000 = $1750,* the baker's is *15000 – $3750 = $11250,* and the grocery's is *$22500 – $15000 = $7500.* Summing up the added values *the total value added is =2000 + 1750 + 11250 + 7500 = +$22500*.

Note that this is exactly the same as the value of *30 tons* of bread purchased by the consumers. This value is defined according to the methodology of *SNA* as the *gross domestic product of the country, i.e. the GDP*. Therefore *GDP* is defined as the *total value of final goods for consumption,* and it can also be measured as *the sum of all values added at each stage of production.* Outputs that are sold to other firms for further processing are called *intermediate goods*. The farmer, the mill and the baker produce intermediate goods in the example: *the value of intermediate goods is $2000+$3750+$15000 = $20750.* Obviously, deducting the value of intermediate goods from gross output, the result is exactly the value of *GDP*: *$43250 – $20750 = $22500.*

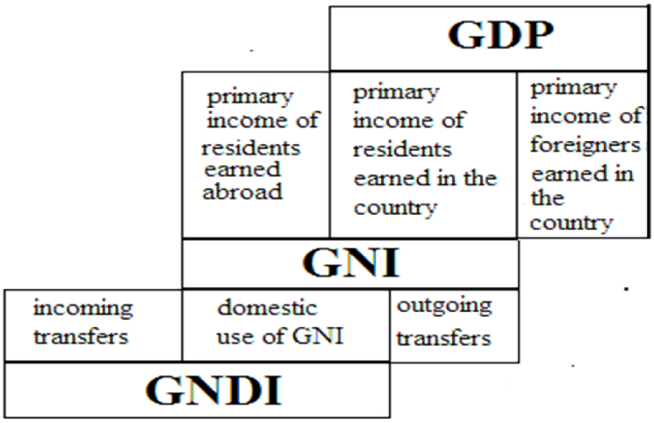

Figure 7.3: ***The SNA Indicators***
Source: Author's own construction

The amount of produced incomes and spent incomes differ considerably in many countries, as *Figure 7.3* shows. When the residents of a country own very little of productive resources, the incomes earned by the residents in the country make only a small part of *GDP,* the larger part produced by foreign firms or labour. However, labour incomes earned by the residents working abroad may be considerable, and a poor country may receive considerable amounts of international grants (transfers), too. Thus, *GDP* may be small, but the value of *GDNI* may still be reasonably high.

The *SNA* indicators may be calculated at the current price level of the actual year, to produce nominal indicators. To compute the real values of the indicators constant prices of a base year should be used instead. There is an easy way to compute real indicators from nominal ones: the nominal indicator should be divided by the price index (in fractional form) of the current year to the base year. Real indicators can be used to compare the income indicators for several years. Nominal indicators cannot tell us whether an increase or decrease of an indicator is due to the impacts of

changing output levels or to price changes. Real indicators filter out the impact of price changes, so they are suitable for intertemporal comparisons.

The *SNA* indicators are all based on the methodology of computing the *GDP*, so they are based on the sum of all the goods (the total output) produced by the country. However, high *GDP* does not necessarily imply high living standards and good living conditions for the population. Many things highly valued by the society, are not measured by the markets, so these are not included in the flow of incomes and *GDP*; and on the other hand, many activities may generate incomes and contribute to the increase of *GDP*, though they actually worsen the quality of life. A car crash results in the purchase of health care services for the injured driver, and payment of the repair cost for the damaged car. These expenditures increase *GDP*, but clearly, the quality of life for the people involved in the crash would have been higher without the accident. Thus the income indicators derived from the notion of *GDP* are not very useful for measuring the quality of life of the society, and many attempts have been made to define more appropriate new indicators. Some of these will be briefly discussed in Chapter 10.

7.4.2. The Circular Flow of Incomes, Equilibrium in the Four-Sector Model

Incomes move in the four-sector model between firms, households, the government and the rest of the world, and these flows take place through the goods market and the capital (financial) market, and sometimes or directly from one sector to the other. The goods market represents the market for final goods – final products and services for consumption (not including intermediate products, but including investment goods).

The following notations will be used to describe the flow of incomes shown in *Figure 7.4*:

Y: Total national income,
C: Consumption,
G:Government expenditures;
IM: Import
T: Taxes;
T_F: Taxes paid by firms;
TR_F: Transfers paid to firms;
S: Savings;
S_H: Savings by households;
S_G: Savings by the government (the state budget)
Q: (total) output
I: Investment;
X: Export;
W: Wages (and other factor earnings)
TR: Transfers;
T_H: Taxes paid by households
TR_H: Transfers paid to households.
S_F: Savings by Firms;
S_W: Savings by the rest of the world;

The total output of the economy is produced by the firms, that is, firms produce the total quantity of final goods, and sell these goods in the goods market. The total value of these final goods gives the total income (*Y*) of the economy, and this is the incoming flow of money to the sector of firms. Firms use this income to pay for the factors of production purchased from the household sector, the most important of these being labour, its earnings are wages (*W)*. (Actually, firms pay the primary income of households not only for labour, but for all other productive resources including rent or price for land and other natural resources, dividends or interests for using the savings of

households invested in the firms as capital. For simplicity all these factor incomes will be incorporated into the value of *W).* Productive resources purchased from other firms are intermediate goods, so the value of these inputs is already included in *Y*. The values of intermediate goods are moving among firms within the sector, not causing any inflows to, or outflows from the sector of firms. Firms pay tax to the government (T_F), and they may receive transfers (TR_F) from it, e.g. subsidy for introducing environmentally safe investments. Deducting the sum of outflows from the sum of inflows gives the savings (S_F) of the sector, which the firms will deposit in the financial market (e.g. in a bank), or, borrow from the banking system (with negative S_F value).

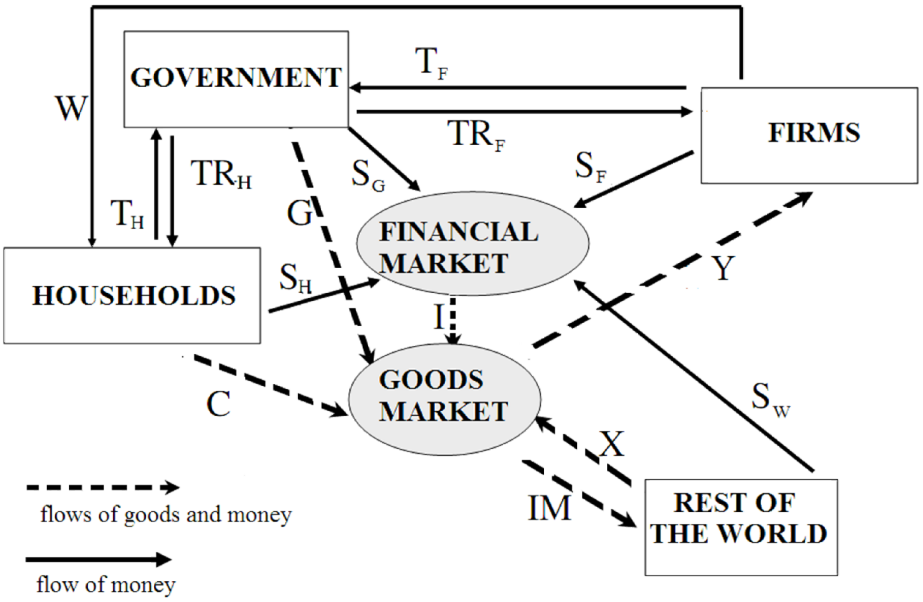

Figure 7.4: ***Circular Flows of Incomes in the Economy***
Note: for 'flows of goods and money' the arrow shows the direction of money flows, goods moving into the opposite direction.
Source: Author's own construction

The households earn their income as wages and other factor incomes received from the firms (*W*). Some of this income is paid to the government as tax (T_H), although households receive transfers from the government (TR_H) as well (e.g. maternity benefits, unemployment allowances, grants, etc.). The disposable income of the household sector after paying taxes and receiving transfers is spent on consumption: purchasing consumer goods in the goods market (*C*), or saved (S_H) and deposited in banks.

The government (the sector of the state) receives its revenues by collecting taxes from firms and households (T_F and T_H), although some of these taxes are paid back to these two sectors as transfer payments (this is the process of income redistribution). Another part of the government revenues is spent on government expenditures (*G*), covering the costs of maintaining and running government administration, i.e. spent on products and services sold in the goods market. In an ideal world the government revenues were higher than the amount spent on transfers and government expenditures, so the state would save the remaining money (S_G), depositing it in the banking system.

In the real world, however, there are hardly any countries with positive government savings. Most of the governments spend more than their collected tax revenues, so the value of S_G is negative, and the government has to take loans from the banks to cover the deficit, absorbing a considerable part of the private savings deposited in the financial system.

The fourth sector of the economy is the 'rest of the world', that sells its own products to our national economy (this is our import: *IM*), and purchases goods and services from our economy (this is our export: *X*). When export and import values are equal, our goods market still contains the same value of goods as produced by our national economy (*Y*), although its composition is different. When import is higher than export, our goods market contains more goods for home consumption than our own production, but the income left at the residents of our country is less than *Y* (because more money was paid for imports than received for exports). To cover the difference the residents of our country must borrow from the rest of the world, while the rest of the world, having more income than the goods available in their market, saves the unspent income (S_W). The savings of the rest of the world are offered as a loan for our economy, and our country takes this loan to spend it in the goods market. Therefore the savings of the rest of the world are equal to the difference between import and export. Naturally, when our import is less than our export, our country will spend less than its income, so our country provides loans for the rest of the world, whose savings are negative. The difference *X-IM* is also called *net export* (*NX*).

Finally let's consider the financial market. The sum of savings accumulated in this market (positive and negative values) shows the share of national income not spent by the economic agents in the goods market. This is the share of *Y* left after spending *C*, *G* and *X-IM.* When the sum of savings is positive ($S_F+S_H+S_G+S_W > 0$), the value of *Y* is larger than the sum of *C, G* and *X-IM*, therefore some goods are left in the goods market not included in the above three items. These goods are the investment goods (*I*) purchased by those wanting to enlarge productive capacities using their own savings and those of other economic agents.

Table 7.2: ***Income identities for the four sectors***

Firms		***Households***		***Government***		***Rest of the world***		***Financial account***		***National income account***	
Out	**In**	**Out**	**In**	**Out**	**In**	**Out**	**In**	**Out**	**In**	**Out**	**In**
W	Y	C	W	G	T_F	X	IM	I	S_H	Y	C
T_F	TR_F	T_H	TR_H	TR_F TR_H	T_H	S_W			S_F	IM	G
S_F		S_H		S_G					S_G		I
									S_W		X
Financial account: $I = S_F + S_H + S_G + S_W$											
National income account: $Y + IM = C + G + I + X$											
National income accounts identity: **$Y = C + G + I + X - IM$**											

Source: Author's own construction

For each sector of the economy the inflows and outflows of incomes can be summarised in the form of 'T-accounts', also called ***current income accounts.*** Similar T-accounts can be defined for the goods market (*national income account*) and the financial market (*financial account*) as is shown in *Table 7.2*. The financial account deserves special attention, because it states that the total value of investments in an economy is equal to the sum of the savings of the four sectors, that is, the savings

of the domestic and foreign economic agents. Consequently, a high deficit of the state budget (a negative value of S_G) will absorb a large share of the private savings, therefore only a small amount remains for investing into the improvement of the future productive capacity of the economy.

The the equilibrium condition for the goods market are presented in the national income account. T**he national income accounts identity** is derived from this, using the notation of *net exports* (*NX =X− IM*): **Y = C + G + I + NX.**

The national income accounts identity may be interpreted as the equality between the amount of goods produced, and the amounts of goods demanded by the four sectors of the economy. The identity can also be interpreted as an income equality: Y being the source of all incomes in the economy, and household consumption, government expenditures, investment spending, and net export being the various purposes of spending this income.

Table 7.3: **Macroeconomic indicators for selected developed countries, 2008**

	Hungary	Germany	USA	China
GDP, current prices, billion USD	154.2	3623.7	14219.3	4521.8
GNI, current prices, billion USD	129.3	3491.3	14561.6	4030.7
C – Household consumption, as % of GDP	55	56	71	35
I – Gross investment, as % of GDP	22	19	18	44
G –Government expenditures, as % of GDP	22	19	16	13
X – Export, as % of GDP	82	48	13	35
I – Import, as % of GDP	81	42	18	27
Total national debt, as % of GDP	74.3	43.1	55.5	-

Source: Author's own construction based on data of World Bank Data and Statistics and the website of KSH (http://econ.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/, and http://www.ksh.hu/docs/hun/eurostat_tablak/, accessed: 21st 09. 2012.)

Review Questions[23]

1) What is macroeconomics concerned with, what kind of problems does it analyse?
2) Explain the instruments of stabilisation policy.
3) Explain the following concept: nominal output, real output, potential output, consumption, saving, accumulation of capital, investment, price index, inflation, aggregate demand, aggregate supply.
4) Explain CPI and GDP deflator, and explain their differences.
5) What are the actual values of GDP, inflation, unemployment in your country?
6) List the sectors of the economy, and describe their main functions.
7) Describe the indicators of *SNA*, explain the difference of 'domestic' and 'national' indicators. Define *GDP*, *GNI* and *GNDI*.

[23] The source for problems 11, 12 and 13 is Mankiw (1997)

8) Sketch the circular flow of incomes in the four-sector model of the economy.
9) What do the T- accounts of incomes mean?
10) Write the 'national income accounts identity', and explain its meaning.

11) Which of the categories of consumption, investment, government spending, net export do the following economic processes belong to?
a. The American Boeing factory sells an aircraft to the US Air Force.
b. The American Boeing factory sells an aircraft to American Airlines.
c. The American Boeing factory sells an aircraft to Air France.
d. The American Boeing factory sells an aircraft to Amelia Earhart.
e. The American Boeing factory produces an aircraft to sell it in the following year.

12) What are the impacts of the following events on the value of real *GDP*? Will the change of real *GDP* cause the same change in the welfare of the country?
a. A hurricane in Florida makes Disney World shut down for a month.
b. The discovery of a new variety of wheat increases the harvested yield.
c. Increased hostility between unions and management of corporations leads to a series of strikes.
d. Firms throughout the economy experience falling demand, causing them to dismiss workers.
e. The Parliament passes new environmental laws that prohibit firms from using production methods that emit large quantities of pollution.
f. Many high-school students drop out of school to take jobs mowing lawns.
g. Fathers reduce their workweeks to spend more time with their children.

13) An economy produces and consumes two goods: bread and cars. The following table gives the production and consumption data for two years:

Year	2000	2010
Price of a car	*$25000*	*$30000*
Price of a kg of bread	*$0.5*	*$1*
Number of cars producted	*100*	*120*
Amount of bread produced, in kg	*500000*	*400000*

a. Taking the year *2000* as base year, calculate for both years: nominal *GDP*, real *GDP*, *GDP*-deflator, consumer price index (*CPI*).
b. How much did the prices rise from *2000* to *2010*?
c. A member of the parliament proposes that social security benefits and pensions should be increased by the level of inflation to compensate people for the increased costs of living. Should the level of price increase be measured by *GDP*-deflator of by the consumer price index? Explain your answer.

14) Collect data of Hungary and at least two other countries for *GDP*, household consumption, government expenditure, investment, export and import in the last *5* years. How is the

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The projects have been supported by the European Union.

GDP spent? What percentage of it went for *C, G, I,* and *X-IM*? What similarities and differences may be pointed out between Hungary and the two other countries?

15) An economy is decribed by the following data: $Y = 3500$, $C = 1800$, $W = 2500$, $I = 1000$, $S_F = 800$, $S_G = 40$, $T_F = 280$, $T_H = 580$, $X = 40$, $IM = 45$. Calculate the following indicators:
a. government expenditure: $G = ?$,
b. household saving: $S_H = ?$
c. transfers paid to firms and transfers paid to households: $TR_F = ?$, $TR_H = ?$

CHAPTER 8: AGGREGATE DEMAND - THE GOODS MARKET AND THE MONEY MARKET

The national income accounts identity (the equilibrium condition of the goods market) represents the balance between the supply in the goods market (*Y,* the total market value of the final products and services, that defines total national income), and the demand in the goods market (*C+G+I+X-IM,* the desired spending of household consumption, planned investment, government expenditure and net export).[24] This chapter will examine one by one the components of the demand side, relying on Samuelson – Nordhaus (2010); Hall – Taylor (1991); Mabry – Ulbrich (1994) and Mankiw (1997).

8.1. Basic Components of the Goods Market

8.1.1. Disposable Income and Household Consumption

What factors determine the households' consumption spending? As it was explained in Chapter 3, the consumers' income is essential in the consumers' decisions. The income available for comsumption *C,* depends on the income that households receive from primary income distribution (earning factor incomes from firms) and the outcome of income redistribution (paying taxes to and receiving transfers from the government). The income left after primary income distribution and income redistribution is called *disposable income.*

The main sources of household income are the wage *W* (and other factor incomes) received from firms, and the transfers TR_H received from the government. Households use their incomes to pay taxes to the state (T_H), for consumption (*C*), and for saving (S_H). Consequently the wage must cover the households' consumption expenditure, savings, and net payments to the state (net taxes, $NT_H = T_H - TR_H$), therefore: $W = C + S_H + NT_H$.

The source of wage *W, is* however, the revenue of the sector of firms, i.e. *Y*, the national income. Firms spend their revenue (*Y*) to cover wages and other factor incomes (*W)*, the net taxes paid to the state ($NT_F = T_F - TR_F$) and the rest is saved (S_F). Thus, the following equation holds: $Y = W + NT_F + S_F$.

Eventually the total income of an economy covers household consumption, household savings, net taxes paid by households and firms, and savings by the firms:

$$Y = C + S_H + NT_H + NT_F + S_F.$$

[24] The generally accepted Keynesian approach states that the actual equilibrium income of an economy is determined by the demand side, because there are always capacities currently not used in the economy (e.g. unemployed labour), therefore any changes initiated in the demand side lead to the automatic adjustment of the supply side in the short run. This explains why government intervention usually focuses on the demand side.

Therefore national income is used to cover household consumption, the savings of the private sectors, and the net taxes paid by the private sectors[25]:

$$Y = C + S_{H+F} + NT_{H+F}$$

As the private sector has no power over the net taxes (these are decided by the government), the private sector can decide freely about the utilisation of the income left after net taxes are paid: $Y - NT_{H+F} = C + S_{H+F}$. This income is called the *disposable income of the private sector*, and it is either saved or spent on consumption, as the equation above shows.

The **disposable income of the private sector** is: $\boldsymbol{Y^{DI} = Y - NT_{H+F}}$, *national income minus net taxes (taxes plus transfers).*

Therefore household consumption is determined by the level of disposable income, and some of this is spent on consumption, the rest is saved. We may ask, whether the current consumption is affected by incomes earned in the previous years, or only the income earned in the current year. Keynes introduced the so-called **Keynesian absolute income hypothesis**, arguing that current consumption is determined by the disposable income of the current year (Hall – Taylor, 1991; Samuelson – Nordhaus, 2010), and the statistical data support this hypothesis reasonably well[26].

Now let's examine the relationship between annual disposable income and annual spending on household consumption.

8.1.2. The Consumption Function

The left panel of *Figure 8.1.* shows the consumption patterns of American households in 1985, in relation to disposable income, presented by Samuelson – Nordhaus (2010). As the figure shows, the various components of consumption and their sum, total consumption, grow together with disposable income, although consumption spending rises slower than disposable income. The same pattern is true for Hungarian households, too. The right panel of *Figure 8.1* shows monthly consumption patterns of the Hungarian residents in *2007*, published by TÁRKI. The general tendencies are very similar to those in the US in 1985.

Relying on the empirical data the planned consumption expenditure of households can be described as a linear function of disposable income, as:

$$C(Y) = C_0 + \check{C} \times Y^{DI}, \quad \text{where}$$

- C_0 is called **autonomous consumption**, showing the level of consumption that would occur at zero national income (although this is only a theoretical assumption),
- $\check{C} \times Y^{DI}$ is the amount of **consumption induced by an increase in income**, and
- $\check{C}$ is the **marginal propensity to consume**, (falling between zero and one: $0 < \check{C} < 1$) that shows the amount by which consumption increases when disposable income grows by one unit.

[25] In the rest of the text $S_{H+F} = S_H + S_F$, and the notations T_{H+F}, TR_{H+F}, NT_{H+F} will be similarly interpreted. Later the notations *T, TR, NT* will also be used as short forms for T_{H+F}, TR_{H+F}, NT_{H+F}.

[26] Economists can describe consumption by more refined approaches, too. The ***relative income hypothesis*** by *Duesenberry* states, that people base their current consumption on the highest income level of the past years. The ***permanent income hypothesis*** argues that current consumption responds to permanent changes in income, measured by a properly weighted average of the past incomes. To apply these theories in practical analyses would require very detailed and refined collection of data, and their power and accuracy to explain consumption patterns would not be much better than that of the simple Keynesian theory (*Samuelson-Nordhaus, 2010).*

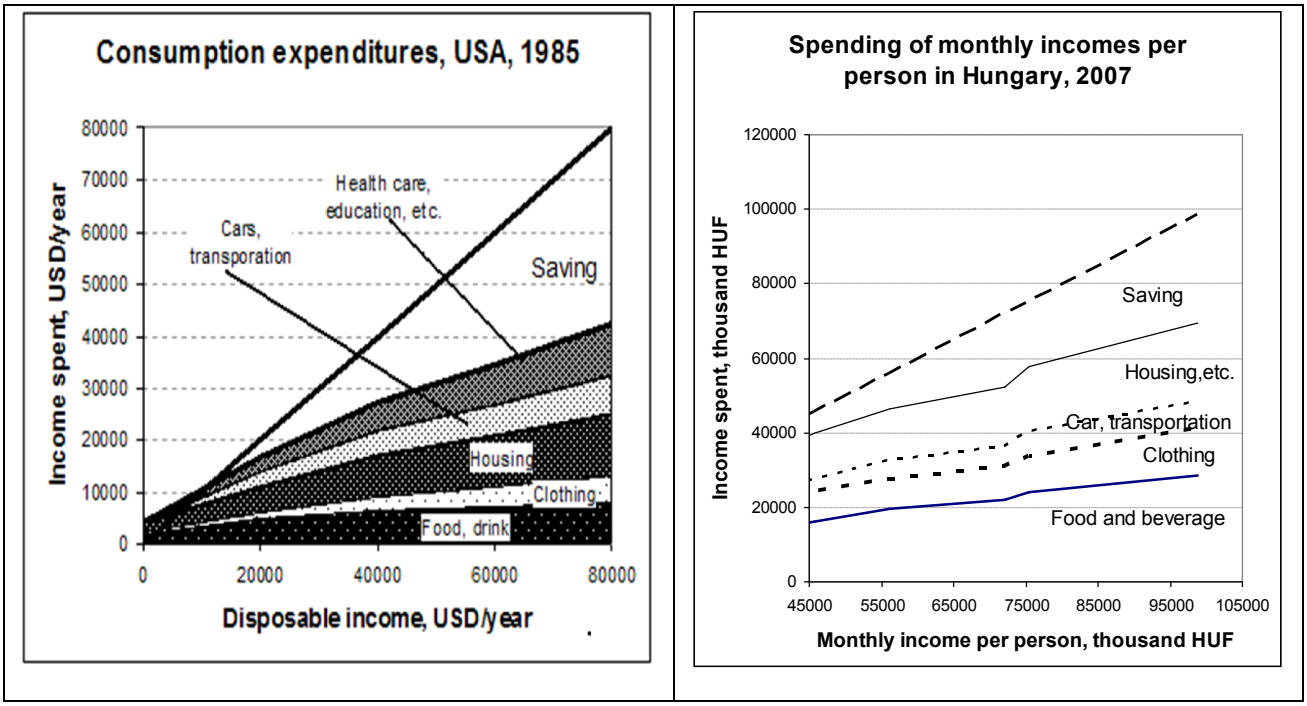


Figure 8.1: ***Consumption as a Function of Disposable Income***

Source: Author's own construction based on *Samuelson – Nordhaus (2010),* and *Tárki Monitor Jelentések 2008 (eds: Szívós P – Tóth I.Gy., 2008)*

The above linear consumption function assumes that the marginal propensity to consume is constant. This may not be quite true, but it is a good approximation of true consumer behaviour in the short run. The equation supports the empirical experience that higher disposable incomes mean higher consumption, and higher saving, too.

Consumption is positively related to disposable income (Y^{DI}), growing together with that. Disposable income is equal to national income minus net taxes. Therefore, with rising taxes disposable income falls, and so does consumption, while an increase in transfer payments will increase disposable income resulting in increased consumption.

Figure 8.2 shows a line starting from the origin with a slope of *45°*. This line represents the disposable income (as the horizontal coordinate of this line is always equal to the vertical one). The consumption function $C(Y^{DI})$ shows the proportion of this income spent on consumption. The proportion of disposable income left above consumption represents the saving of the private sector. Saving is defined as: $S = Y^{DI} - C$, therefore the saving function is also determined by the disposable income:

$$S = Y^{DI} - (C_0 + \check{C} \times Y^{DI}) = -C_0 + (1-\check{C}) \times Y^{DI}$$

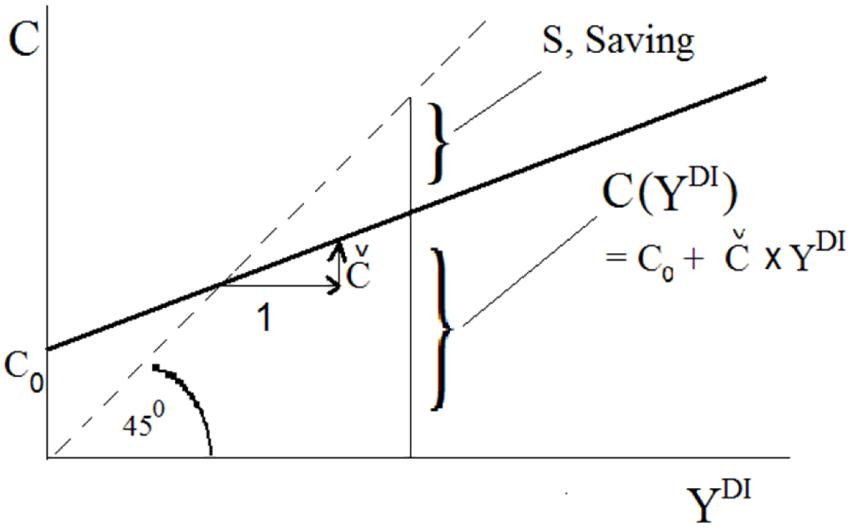


Figure 8.2: ***Consumption as the Function of Disposable Income***
Source: Author's own construction

Taxes affect disposable income, but taxes themselves depend on income, because some taxes are defined as a percentage of incomes earned by the private sectors (e.g. personal income tax, corporate tax, etc.). There are other taxes that are independent of incomes (e.g. property tax, car registry tax, etc.). Thus the total amount of taxes will be divided into two parts: T_0 is the amount of autonomous tax (not depending on income) and $z \times Y$ is the amount of tax induced by growing incomes, where z $(0<z<1)$ is the tax rate, understood as the percentage of income taken as tax. When incomes are higher, the total value of taxes is also higher, therefore a one dollar growth of income raises disposable income by less than one dollar. The value of transfers, on the other hand, does not show any measurable relationship to the annual national income, it is the government's decision how much of the collected tax revenues are given back to the private sector as transfers. The transfers are usually defined in the law about next year's state budget, and are not tied to the level of GDP. Therefore transfers are considered autonomous, independent of Y. Net taxes are equal to taxes minus transfers, and taking into account the components of autonomous tax and income-induced tax the following formula holds: $NT=T_0+z \times Y-TR$. Thus disposable income is:

$$\boldsymbol{Y^{DI}} = Y - NT = Y+TR- T_0 -z \times Y = \boldsymbol{TR-T_0+(1-z) \times Y.}$$

As the above formula shows, an increase of total income ΔY will lead to $z \times \Delta Y$ increase of net taxes, and disposable income will grow by $(1-z) \times \Delta Y$. This increases consumption by the proportion of taxed income that consumers wish to consume[27]: $\Delta C = \check{C} \times (1-z) \times \Delta Y$. The increase in autonomous

[27] The consumption function can be written in more detailed form as:

$$C(Y^{DI}) = C_0 + \check{C} \times Y^{DI} = C_0 + \check{C} \times [(1-z) \times Y + TR - T_0] = C_0 + \check{C} \times (1-z) \times Y + \check{C} \times (TR - T_0),$$ that is,

$$\boldsymbol{C(Y^{DI}) = C_0 + \check{C} \times (TR - T_0) + \check{C} \times (1-z) \times Y}$$

taxes or in the tax rate will decrease consumption (and savings, too), while an increase of transfers will increase both of them.

8.1.3. The Investment Demand

Now look at another component of demand in the goods market: investment demand. Investment demand is the desire of economic agents to buy investment goods, to implement some investment. Investment demand is also called planned (or desired) investment. This plan becomes an implemented investment if producers produce investment goods needed by prospective investors, and the economy provides sufficient savings to finance the implementation of the investment (that is, sufficient proportion of income is put aside for saving instead of being consumed). What factors determine investment demand?

Firms intend to implement an investment if the resulting expansion in productive capacities generates increased revenues, so they expect profit from the investment. Profit possibilities arise with expanding markets, rising consumer demand, favourable market prices if these prevail when the new productive capacity starts to produce goods. All these depend on many factors, including the behaviour of the market agents (consumers, competitors, suppliers), and government regulations (e.g. taxes and investment subsidies). The investors' subjective judgement also plays an important role, some people are always more optimistic than others in assessing the expected profitability of an investment under the same conditions. Altogether, investment demand strongly depend on the ***expectations on the profitability*** of the investment, optimistic expectations will increase the demand for investment goods, while pessimistic expectations decrease it.

Besides positive profitability expectations the availability of financial resources for the investment is also crucial. When the investor needs a loan to finance the investment, the investor has to consider the costs of the borrowed money: the interest rate payable at the loan. The profit from the investment should cover repayment of the loan, and the interest payable, too. So the higher the ***interest rate*** the less desirable is the investment, as it requires higher profits to repay the loan plus the high interest. The way of thinking is somewhat similar when the investor intends to use his/her own funds to finance the investment. The interest rates are still important: at high interest rates it may be more profitable to deposit the money in the bank, as the interest received may be higher than the expected return on the investment. Therefore higher interest rates will decrease the investor's desire to spend his/her own funds on the investment. Summing up, high interest rates will decrease the demand for investments, and low interest rates will increase it. The impact of the national income, is not significant on the level of desired investments, as investors make investments to raise income in the future, and not because of the present level of income.

The investment demand function defines desired investment as the function of the interest rate:

$I = I_0 - a \times i$, where I is the planned level of investment,

- i is the (real) interest rate in the market of loanable funds, in percentages,
- I_0 is the *autonomous investment* (defining the upper limit on investment demand obtained at *0 %* interest rate assuming constant expectations on the profitability of the investment), and
- a is the interest rate coefficient, showing the additional investment demand obtained at a *1%* decrease of the real interest rate.

The left panel of *Figure 8.3* shows the investment demand as a function of interest rates. The level of planned investment increases with improving expectations at any interest rate, and decreases with deteriorating expectations, as is shown by the upward or downward shift of the investment demand curve.

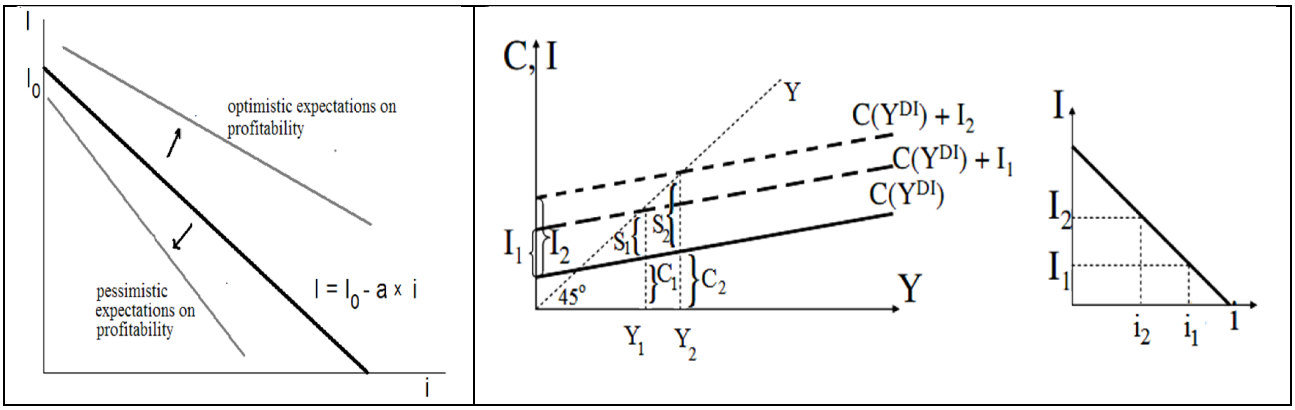


Figure 8.3 ***The Investment Demand Function and Equilibrium Level of Income***
Source: Author's own construction

The right panel of *Figure 8.3* shows the relationship between planned investment and planned consumption. As it was shown earlier, total national income has to cover household consumption, government expenditure, investment and net exports.

Assume, for the sake of simplicity, that government expenditure is zero (*G=0),* collected taxes are spent entirely on transfers (*TR = T)*, and export is equal to import, so net export is zero (*X-IM=0)*. Hence, as the national income accounts identity suggests, *Y = C+I* must hold. On the other hand, as *TR = T* the value of disposable income must be equal to total national income ($Y=Y^{DI}$), and this income is spent on consumption and saving, therefore *S=Y–C.* Therefore the balance in the goods market holds, if the total savings of the private sector is equal to the level of planned investment at the actual interest rate: *I = S*, or *I = Y-C*. The right panel of *Figure 8.3* shows the consumption function, which is an increasing function of disposable income, being equal now to national income. The investment demand curve shows, that a high interest rate i_1 generates a low level of planned investment I_1. The equilibrium of income and expenditure will be attained at an income level for which the savings left after the income-generated consumption are exactly the same as the planned investment I_1. The line $C(Y^{DI})+I_1$ in the figure shows the sum of consumption and investment demand as a function of income, at the interest rate i_1. As the *45°* line indicates, the sum of planned consumption and planned investment will be equal to the national income at the income level Y_1, that is, consumption associated with this income will leave exactly as much income for the purposes of savings (S_1), as is the level of desired investment I_1 . At a lower interest rate (i_2) the level of desired investment rises (I_2), therefore the total aggregate demand $(C(Y^{DI})+I_2)$ also increases. Now as investment demand is higher, savings should also be higher for equilibrium, and that requires a higher level of national income (Y_2).

8.1.4. The Roles of G, X and IM

Now let's introduce the impacts of government expenditure (*G)* and of foreign trade export (*X*) and import (*IM)* - to complete our model of the goods market.

Government Expenditure (G) is similar to transfers, as it does not directly depend on the level of national income *Y*. The government defines its spendings in the law that specifies the annual state budget, and this law is usually debated and voted for in the Parliament in the previous year, the actual national income is not known at the time of decision-making. During the year the government carries out expenditures according to this law, regardless of the actual progress of *GDP*. As *GDP* directly determines tax revenues, when the *GDP* differs from the expected value (used in last year's planning process), and *G* (and *TR*) spendings take place as planned, the government's budget deficit may change, but spending on *G* and *TR* goes on as planned. Therefore *G* will be treated as an autonomous factor, independent of the actual national income.

The value of ***Export (X)*** depends on the intention and ability of the rest of the world to buy our products and services, and it does not depend on our national income *Y*. Therefore, *X* might be low at high levels of *Y* if our products are not desirable for foreign countries, or foreign countries do not have enough income to pay for our products, and exports may be relatively high at lower *Y* values if our products find high demand abroad.

Theoretically, ***Import (IM)*** might depend somewhat on our national income, because to buy foreign goods we need income to pay for them. On the other hand, when the national income is high, our country produces large amounts of goods, so there is no need for buying goods from abroad. Due to this double impact of national income, the impact of national income on the value of import is hardly noticeable, so *IM* will also be treated as an autonomous factor.

To sum up the above: the demand components G, X and IM will be treated as autonomous factors that do not depend on national income *Y*. As it was explained earlier, transfers (*TR*) are also considered autonomous, while taxes will be divided into an autonomous component and an income-related one ($T=T_0+z \times Y$). The government can influence the position of the private sector by taxes and transfers, modifying disposable income, and also by government spending, i.e. its demand for goods and services (*G*).

8.2. The Equilibrium of the Goods Market: The IS Curve

The goods market of the four-sector model is in equilibrium if the following equation holds*:* $Y=C(Y^{DI})+I(i)+G+X - IM$. This means that national income is spent on household consumption (dependent on national income), desired investment (dependent on the interest rate), government expenditure (considered autonomous) and net exports (the difference of export and import - both of them autonomous). Household consumption (and saving) depends on national income *Y,* so the question arises: at what level of national income *Y* will the goods market be in equilibrium, at a given interest rate *i* defined by the money market?

National income will determine disposable income, and this, in turn, determines consumption. The part of national income left after consumption will have to finance government

expenditure and net export, and deducting these items from *Y*, the remainder should be just enough to cover the planned investment: $I=Y - C(Y^{DI}) - G - (X- IM)$. Planned investment, however, depends on the interest rate (and on profitability expectations), so the goods market in the economy is in equilibrium, if the value of investment demand *I(i)* is equal to $Y - C(Y^{DI}) - G - (X- IM)$. With rising interest rates the level of planned investment decreases, therefore aggregate demand falls, generating lower national income in the equilibrium. Decreasing interest rates lead to the opposite result: the higher planned investment raises aggregate demand, and generates higher national income at equilibrium.

The relationship between the interest rates (determined in the market of loanable funds) and the associated equilibrium incomes of the goods market is described by the ***IS curve****, that prescribes the condition of equality between actual investments (I), and savings (S) (*Hall-Taylor, 1991.*)* This relationship is shown in *Figure 8.4.*

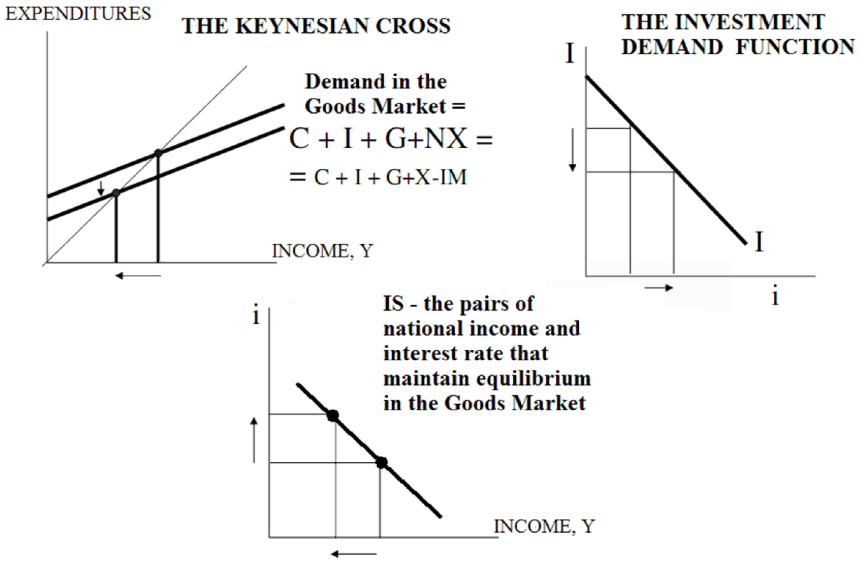


Figure 8.4: ***Balance in the Goods Market, the Origin of the IS Curve***
Source: Author's own construction

Any increase in one of the autonomous factors (government expenditure, net export, autonomous consumption and autonomous investment demand) implies a rise in the equilibrium income at any interest rate, shifting the *IS curve* upward, while a decrease in these autonomous factors will shift it down. Increasing autonomous taxes or tax rates also cause a downward shift of IS, while the impact of increasing transfers is just the opposite.

The *IS* curve shown in *Figure 8.4* gives all the pairs of interest rates and equilibrium incomes that maintain equilibrium in the goods market. If the goods market happens to be out of balance, e.g. with the actual national income the prevailing interest rate is too high for equilibrium (i.e. the point of the actual *(Y,i)* pair lies above the *IS* curve), investment demand becomes too low compared to savings, left of disposable income after consumption, government spending and net exports. This means, that the aggregate demand for goods (*C + I + G +NX*) is below aggregate supply (produced

goods of the value *Y*), so producers find the accumulation of unsold finished goods in their inventories. In response to that, firms will decrease production, and the value of aggregate supply (*Y)* starts to fall. Then the decreasing income will decrease the level of consumption and saving, and this adjustment process continues until savings fall back to the level of planned investments. This automatic adjustment process eventually establishes the equilibrium in the goods market. A similar adjustment takes place when the actual national income is too low for the interest rate (represented by a point below the *IS* curve). In this case investment demand is too high, and aggregate demand is higher than aggregate supply. Excess demand encourages firms to increase their production, which leads to higher outputs, and higher national income. Higher national income will increase consumption as well as savings, and the higher level of savings will finance the high investment demand, and equilibrium will be restored.

The position of *IS* is determined by *G, X* and *IM* and the autonomous parameters of *C* and *I.* A change in any of these will change *IS* itself. Rising government expenditures will result in an increase in aggregate demand that requires higher national income to maintain the equality of savings and planned investments at any constant interest rate. Therefore the IS curve shifts upward. An increase in net export, autonomous consumption, marginal propensity to consume, or transfers will lead to similar results.

8.3. Functions of Money, Commodity Money, Fiat Money

Money plays several important functions in the economy. The most obvious of these is the function when money assists the exchange of goods, with money and goods exchange hands, moving parallel to each other, but in opposite directions. However, in many economic activities flows of goods and flows of money are separated from each other, taking place at different moments of time. When we pay our taxes, we receive public services in exchange, but clearly the time of payment differs from the time of using the services. The purchase of goods on credit, or the purchase of a service with pre-payment are other examples of the same thing. In these examples money flows seem to take place on their own, seemingly unrelated to flows of goods or services. This is the reason monetary processes should be analysed separately from production processes.

First, let's define the essential attributes of money. Any instrument may operate as 'money' in the economy, if it performs the functions required of money. The **functions of money** are (Mankiw, 1997):

- **A unit of account***:* Money allows us to compare the value of goods and services, or assets. Consumers can compare the value of a loaf of bread or a gallon of fuel to his/her daily income, producers can compare the value of their products to the values of the productive resources used. Money does not have to be physically present to fulfill this function, it is sufficient to understand the notion of value that it represents.
- **Medium of exchange:** In this function money assists the exchange of goods or services, it is an intermediary in the exchange. To fulfill this function, money should be universally accepted in the economy in exchange of goods. People accept money because they know

that later they can also use it to pay for valuable goods. In this function, the only purpose of holding money is to give it away for goods.

- **A standard of deferred payments (a means of establishing future claims and payments):** In this function money is used to pay or accepted as payment without any exchange of goods or services. The transfer of money is separated from the transfer of goods. This happens when some goods are bought on credit, with payment occurring later in time, or when the consumer makes an advance payment well before the actual goods or services are delivered. All money transfers that are independent of any transfers of goods belong to this category (e.g. paying taxes, receiving grants and subsidies).
- **Store of wealth***:* Money can also be used to accumulate wealth, savings. Of all the forms of accumulating wealth the form of money is the most liquid one[28], because wealth kept as money can any time be easily used on buying goods or properties, that is, used as a medium of exchange. To be suitable to store wealth, money should also be able to hold its value for a long time, which is not obvious for our money of banknotes and metal coins, which lose their values during the times of inflation. Other forms of money in history (e.g. gold coins) were more suitable to store wealth, because the internal utility of their material maintained their value for long times. The modern forms of money, if used for storing wealth, should have some guarantee for maintaining their original value, therefore wealth stored in the form of money should be deposited in banks, where the deposit interest protects the deposited value against inflation.
- **World money** *(international currency):* In this function money shows all the first four functions in international contexts. It acts as medium of exchange in international trade transactions, it is used as unit of account in international comparisons, nations can store their national wealth in international currencies, loans borrowed from abroad are received and repaid in internationally accepted currencies. Currencies regularly used for international transactions - e.g. the USD, or EUR – are examples of world money.

The purchasing power of money depends on the actual price level. Rising price levels imply that the same amount of goods require higher amounts of money to pay for. Therefore economic agents need more money just to make the same purchases as before. How much money is actually needed for an economy? To answer this question the first thing to consider is the purchasing power of money. With rising price levels economic agents need increasing amounts of money (to maintain the same purchasing power as before). Therefore terms of money related to its absolute quantity and purchasing value should be defined:

- **Nominal quantity of money (*M,*** short for *money*)**:** the amount of money, measured in units of the currency (e.g. *$1500, €10000, £50, ¥2000*).
- **Real money balances (*L,*** short for *liquidity preference*)**:** the purchasing power of the nominal quantity of money (measured in money of constant purchasing power), representing the quantity of goods and services it can buy. As this purchasing power is inversely related to price

[28] The term 'liquid' means, in this context, that it can be easily converted to cash, and then exchanged for goods any time, with no significant loss of value. This is usually not true for other forms of storing wealth – e.g. real estate, or other valuable property – because, if real estate should be sold urgently for money, the seller is often forced to accept a price much lower than its true value.

levels, it is measured as the ratio of the nominal quantity of money to the price level, *L=M/P.* When price level rises to maintain the same purchasing power, the demand for nominal money should increase proportionally. If this happens, real money balances remain the same.

The history of the evolution of modern money may be divided to four periods. In the *first period* the functions of money were performed by a commodity that also satisfied a consumer demand (e.g. salt, tea, animal skin, herds of cows, spices). Therefore the same thing was used either as a commodity on its own, or as money, called *commodity money*. The *second period* is the era of gold as money. The functions of money were performed at first by noble metals, gold, silver and copper. Later gold gained preference over silver, and became the unique medium of exchange satisfying all money functions, therefore this period is called the *first stage of the gold standard*. The *third period* is called the *second stage of the gold standard*, in which, besides money minted in gold, the representatives of gold - paper money, banknotes – were introduced into circulation to substitute gold in its function of medium of exchange, with the promise of redemption in gold. The *fourth period is the stage of fiat money, or deposit money* – in which money cannot be redeemed in gold, it has no intrinsic value. The main physical form of money now is a checking account in a bank that is a promise from the bank to make payments for our transactions. This means, that our income arrives at a checking account in a bank, and at our request the bank will pay our debts (invoices, shopping bills, etc.) in our names. Besides checking accounts token coins and banknotes are also used as cash, but today they are of secondary importance, as non-cash payments have become general in contemporary economy. The modern deposit money (*fiat money)* of no intrinsic value is perfectly suitable to perform all the functions required of money, although the function of storing wealth is interpreted in a slightly modified form: fiat money is capable of storing wealth if deposited in a bank, or traded in the money market. Cash stored outside the banking system is unable to preserve its value or purchasing power (Mankiw, 1997; Mishkin, 2004).

The properties of fiat money are:

- Fiat money has *no intrinsic value*, its general form is a *checking account*, and it is created by the process of *deposit creation,* by way of making loans against deposits.
- The official currency of a country is *the unique medium of exchange by law*, and money *supply is controlled by the central bank* of the country (the Federal Reserves of the United States of America, the Bank of England, the National Bank of Hungary, etc.).
- *The value of fiat money* – compared to the currencies of other countries – is determined by the *output produced by the country*, so people holding the currency are convinced that they can find goods and services to exchange for the money. In this sense fiat money is backed by the economic performance of the country, and it can maintain its purchasing power if the increase in money supply is followed by a similar increase in the total output of the country. However, neither the producers, nor the consumers have any means to check whether the amount of fiat money supply is in balance with the amount of goods and services produced holds, therefore as long as the economic agents trust in money, believing that they find the valuable goods for their money, they will accept the face value of fiat money. Therefore the value of fiat money is guaranteed by the confidence that economic agents feel about it. This is illustrated by the workings of stock exchanges, where speculative behaviour may significantly devalue a currency.

Summing up the above, the purchasing power – or the real value – of fiat money with no intrinsic value is stable if the growth of money supply is in balance with the growth of total output. When the total output and the real income of an economy increase, the real money supply should increase at the same rate, so that the extra output can be exchanged for money in the market. To achieve this, higher real money supply is needed at stable price level, therefore the supply of nominal money should increase.

8.4. Money Supply in Contemporary Economy

The amount of money is one of the key components of the purchasing power of money. Therefore the proper determination of money supply is essential for the success of the economy. **Money supply** *is the quantity of money in circulation, in the forms of cash (banknotes or coins), and as currency deposited on checking accounts (current accounts) in banks.* Money supply is interpreted as a nominal amount of money (M^S). Its real value, its purchasing power, is determined by the actual price level (P). Therefore the real value of money is equal to M^S/P. Money supply is determined by the banking system: the central bank, and the commercial banks of the country. The modern banking system is called **two-tier banking system**, consisting of a central bank and several commercial banks. The central bank provides banking services for the government acting as the bank of the state, it provides the money supply, **implements monetary policy by controlling the amount of money in circulation**, and regulates and supervises the operations of commercial banks. The central bank is independent of the government, although some cooperation is necessary to maintain a successful and healthy monetary policy. Commercial banks are profit-oriented monetary institutions. Their main role is to provide banking services for the private sectors.

The central bank regulates the operations of commercial banks by four instruments: the refinancing interest rate, the reserve ratio, the rediscount rate and the open market operations. The **refinancing interest rate (the base rate**, or prime loan rate) is the interest rate at which the central bank makes a loan for a commercial bank. When a commercial bank wishes to offer loans above its own financial resources, it can borrow funds from the central bank at this interest rate. The **reserve ratio** is the ratio of checking deposits commercial banks are required to hold on reserve at the central bank - so this ratio of deposits cannot be offered for borrowing loans. The **rediscount rate** is the interest rate that the central bank charges when it buys bonds or other securities from commercial banks. **Open market operations** refer to the central bank's transactions of buying or selling securities (mainly government bonds), by which the central bank actually influences the amount of money in circulation.

The quantity of money in circulation is controlled through the money deposited on checking accounts in commercial banks. The various deposits held in banks are very different according to their liquidity. The the current account (checking account, or sight deposit) is the most liquid form of bank deposits: its owner can access the money any time. Savings deposits, and other time-deposits are somewhat less mobile for transactions, because the owner, accessing them before their maturity date may lose the deposit interest. Long-term securities, and deposits in foreign currency are still less liquid and the access to them is more complicated. Checking accounts are used to hold money with the aim of spending it on immediate tansactions, regular expenditures, while the other forms of

deposits are kept with the purposes of saving. The money in circulation is classified according to ease of access, the groups are called **monetary aggregates:**

- **M0** money: cash (banknotes and coins) issued by the central bank, and the reserves of commercial banks deposited in the central bank.
- **M1** (*money in narrow sense, narrow money*): includes the cash currency in *M0* and the deposits in checking accounts (sight deposits), which are perfectly liquid, suitable for immediate everyday payments.
- **M2**: includes *M1*, plus deposits in savings accounts, small denomination time-deposits, short-term deposits, which are less liquid than *M1*, although relatively easily transferred to liquid forms at a small cost.
- **M3**: adds less liquid assets to *M2*, namely the long-term securities of large denominations, international currency deposits, mutual funds shares.

M1 – type money is money *in the narrow sense*, it is readily available for transactions. Monetary aggregates *M2*, and *M3* are often called *'quasi-money'*, or *'near money'*, their original purpose is not spending, but saving, although they can be transformed for spending purposes at a cost. **Money supply and money demand refer to supply and demand of *M1* money**, indicating the quantity of money readily available for immediate spending. The money supply function defines the supplied quantity of nominal money as $M^S = M1$, while **real money supply** is the real value, i.e. the purchasing power of this money: $\boldsymbol{M^S/P} = M1/P$, also called **real money balances.** The central bank controls nominal money supply, while the real money supply depends on the actual price level, and it is determined by the market.

Summing up the above we can state that the central bank controls the nominal money supply by way of five main instruments: *the quantity of cash currency (banknotes and coins) and central bank money introduced into circulation through the banking system; the reserve ratio; the base rate of interest determined by the central bank; the rediscount rate, and the open market operations of the central bank.* These are the *instruments of monetary policy*. Money supply is determined by the banking system. It is not directly related to the real processes in the economy, so it is considered as an exogeneous attribute for the economy.

8.5. Money Demand, Equilibrium in the Money Market

Money demand *is the desire of economic agents to hold liquid money (M1).* People wish to hold *M1*-type money for various purposes of spending. The *alternative to holding liquid money is to save*, that is, to hold the money in *a savings account*. Therefore money demand defines the quantity of money that economic agents wish to spend immediately.

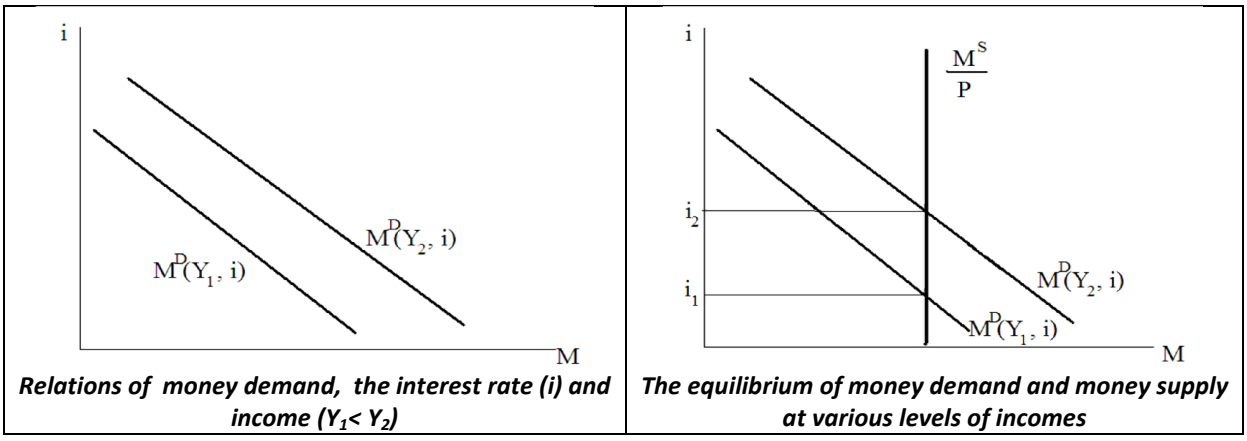
Money demand is considered as a demand for real money balances, because the *need for keeping a certain amount of money to spend depends on the purchasing power of money*. Therefore the nominal, face value of the currency is irrelevant, and the required purchasing power of money is determined by basket of goods that economic actors intend to buy. There are three major motives why the economic actors require readily accessible, liquid money. The main **motives for holding money** are:

- *Transactions demand* – money needed for everyday transactions, purchases, payments, (i.e. for household consumption, usual business expenses of firms).
- *Precautionary demand* – money kept for unexpected, unpredictable expenses.
- *Speculative (or 'assets') demand* – people, who possess wealth, trying to find the best form of keeping this wealth, may want to switch from one form to another, temporarily transforming their wealth to liquid money. (When accumulated wealth is deposited in savings accounts, or in securities; speculative money demand arises when the owner sells securities for liquid money to buy other forms of wealth instead).

Money demand is the sum of transactions demand, precautionary demand and speculative demand. Let's have a closer look at them.

The transactions demand is determined by income. The higher our income the more purchasing power we have, so the more we spend on regular, everyday predictable transactions. Transactions demand is positively related to income. Precautionary demand is similar, also increasing with rising incomes: we tend to keep more money for precautionary motives, when our income is high – but as most of this precautionary money may not be spent, we lose the actual deposit interest of savings, as the opportunity cost of keeping this money in liquid form. Therefore, at high interest rates precautionary money demand may be somewhat lower. Altogether, the precautionary demand depends positively on income and negatively on the interest rate. Speculative demand does not depend on actual income, because wealth is about incomes earned and saved previously and not now. When interest rates are high, this wealth is kept in a savings account or in securities, and will not be mobilised, because of the considerable loss of interest associated with it. When interest rates fall, the owners of accummulated wealth look for more profitable forms of storing wealth, and they are more motivated to mobilise their savings, knowing that the associated loss of interest is not too high. Therefore speculative demand for money and the interest rates are inversely related.

Eventually, money demand is defined as the sum of the above three motives, being a positive function of income (due to transactionary, and precautionary demand), and a negative function of the interest rate (due to speculative demand).



Relations of money demand, the interest rate (i) and income ($Y_1 < Y_2$)

The equilibrium of money demand and money supply at various levels of incomes

Figure 8.5: ***Equilibrium in the Money Market***

Source: Author's own construction

The money demand function is shown in the left panel of *Figure 8.5,* at various levels of income, with money demand *M* on the horizontal axis, and the interest rate *i* on the vertical one. At any income level the transactionary and precautionary demands are fixed values, and rising interest rates decrease speculatory demand, therefore the money demand curve is a decreasing function of the interest rate. With rising incomes the money demanded is higher at any interest rate, so the curve shifts upwards, to the right. The right panel of the figure shows the balance of money demand and money supply. The figure shows that the actual real money balances available in the money market will be determined by the real money supply, while the interest rate will be defined to establish the equilibrium of money supply and money demand. Higher incomes imply higher equilibrium interest rates. The money market equilibrium is defined by the equation: $M^S/P = M^D(Y,i)$.

The equilibrium of money demand and money supply determines a single equilibrium interest rate to any level of income, defining a relationship between incomes and equilibrium interest rates. As increasing incomes lead to increasing equilibrium interest rates, the interest rate is an increasing function of income. This relationship is described by the *LM* curve.

The LM curve (Liquidity preference & Money) defines the combinations of interest rates and incomes at which the money market is in equilibrium (Mankiw, 1997; Mishkin, 2004). The LM curve is shown in the left panel of *Figure 8.6*.

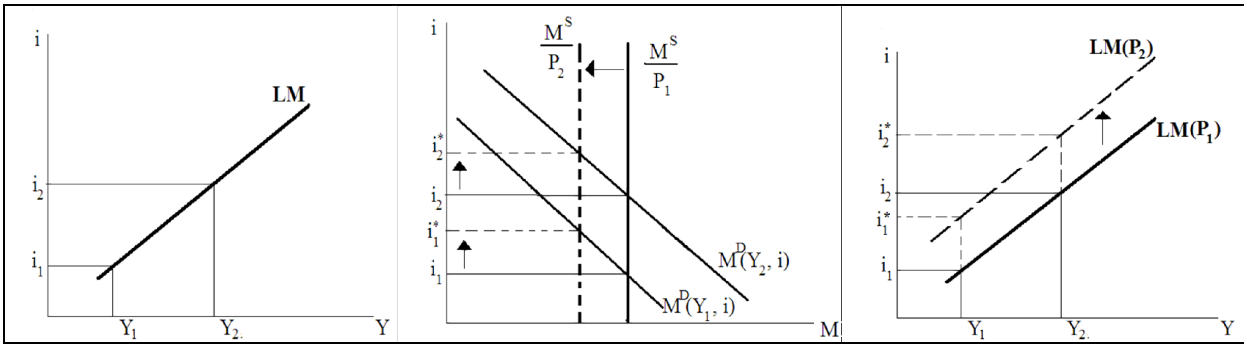


Figure 8.6: ***The LM Curve and its Response to Changing Price Levels***

Source: Author's own construction

When the money market is out of equilibrium, for example, the actual interest rate is too high for the actual income level, so that the point of (*Y,i*) lies above the *LM*-curve, money demand is lower than money supply, because speculative money demand is lower than the money supply available above transactionary and precautionary demand. The excess supply in the money market pushes down the interest rate, and this raises speculative demand, and the money market moves towards equilibrium. The points lying below *LM* represent too low interest rates for the actual income therefore speculative demand is too high, compared to money supply and the level of transactionary and precautionary demand. The excess demand experienced in the money market raises the interest rate, which, in turn, decreases speculatory demand and moves the market closer to the equilibrium.

LM is defined by the equilibrium of real money supply and real money demand. As real money supply depends on the price level, the position of *LM* also depends on the price level. When the price level grows,the real value of the same nominal money supply falls. Therefore at any constant income level the interest rate must increase to restore the equilibrium between the real

money demand and the decreased real money supply. As a result, the *LM* curve shifts upward *(see Figure 8.6,* central and right panels).

8.6. The Keynesian Model of Macroeconomic Equilibrium, the AD Curve

IS defines the equilibrium condition of the goods market, by the formula of $Y=C(Y^{DI})+ G+ I(i)+X – IM,$ determining the pairs of equilibrium incomes and interest rates. The equilibrium in the money market is defined by *LM*, by the formula $M^S/P = M^D(Y,i)$, and this again defines pairs of equilibrium incomes and interest rates. The simultaneous equilibrium of the goods market and the money market requires the combination of interest rate and income that is right for both *IS* and *LM*. The level of income determines the level of consumption and savings, and adding the autonomous values of government expenditure and net export to these the remaining amount of income will define the level of possible investment. This level of investment, however, will be demanded only at specific interest rate. On the other hand, the equilibrium interest rate will be determined in the money market according to the actual level of income (assuming exogeneous nominal money supply and price level). If this interest rate is higher than the one required for the investment in the goods market, the actual investment demand will be too low, and the goods market will be in disequilibrium. If the interest rate defined by the money market is too low, then investment demand will be too high for the available savings, and the goods market will be in disequilibrium again. Therefore there is only one combination of income and interest rate that brings both the goods market and the money market to simultaneous equilibrium. This is represented by the intersection of *IS* and *LM* in the left panel of *Figure 8.*).

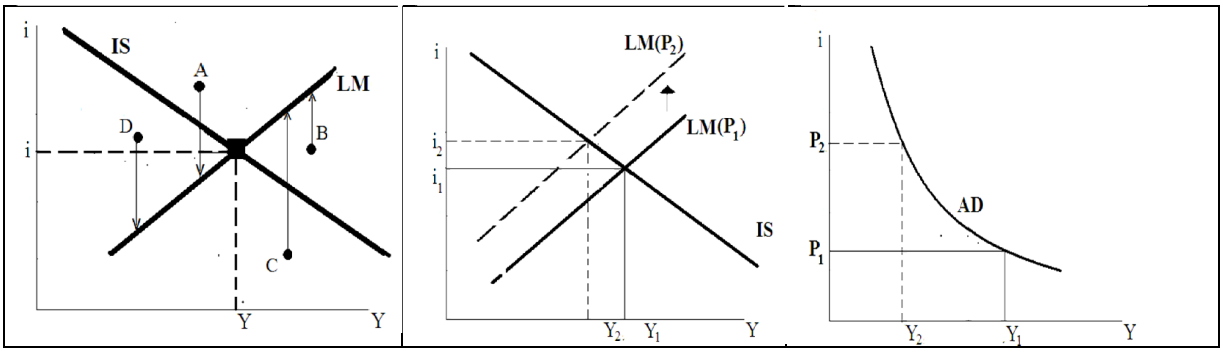


Figure 8.7: ***The IS-LM equilibrium and the Aggregate Demand Curve***
Source: Author's own construction

When the economy is out of the *IS-LM* equilibrium, the income is either too high or too low for the actual interest rate. Points *A, B, C* and *D* in the left panel of *Figure 8.7* show such situations. Point *A* lies above *IS* and also above *LM.* This means that at the actual income level the interest rate is too high for both the goods market and the money market. Therefore investment demand in the goods market is less than savings. Speculative money demand in the money market is also smaller than the money available above transactionary and precautionary demand. The adjustment process

starts in the money market: first the interest rate starts to decrease, speculative money demand rises, and the money market moves towards equilibrium. After some time the falling interest rate raises investment demand in the goods market, therefore equilibrium income in the goods market starts to rise. The increasing income increases transactionary and precautionary money demand in the money market, thus the decreasing interest rate and the increasing income brings the system towards the *IS-LM* equilibrium. Similar automatic adjustment takes place in the situations defined by points *B, C* and *D*.

The *IS-LM* equilibrium will change together with changing price levels. Higher price levels will decrease the value of real money supply therefore the equlibrium interest in the money market will rise at any income *Y*. Therefore the *LM* curve will be shifted upwards, and will intersect the *IS* curve at higher interest rates and lower income levels (see the middle panel of *Figure 8.7*). Due to the higher interest rate the investment demand falls therefore , the national income will decline, assuming constant consumption, government spending and net export.

Altogether, any increase in the price level incurs a decrease in the simultaneous equilibrium income of the goods market and the money market. This relationship is described by the **aggregate demand function AD**, that was already briefly described in section 7.2 (see the right panel of *Figure 8.7*).

The position of the *AD* curve depends on the positions of *IS* and *LM*. Any component of the goods market or the money market that shifts either of them will shift the aggregate demand curve, too. When, for example, the government expenditure grows, the *IS* curve shifts upwards, intersecting all *LM* curves of specific price levels at higher interest rates and higher incomes than before. Therefore the higher demand at the goods market will increase the national income, increasing transactionary demand and precautionary demand in the money markets. Assuming constant money supply, this induces the increase of interest rates and incomes at any price level, eventually shifting the *AD* curve upwards.

Review Questions

1) Describe the components of demand in the goods market.
2) Explain the notion of 'disposable income' and its relation to consumption.
3) Describe the determinants of investment demand, draw the investment demand function.
4) Define the '*IS* curve', give the formula of equilibrium in the goods market.
5) Explain the functions of money, the notions of nominal and real money supply.
6) Explain the meaning of monetary aggregates *M0* and *M1.*
7) Describe the components of real money demand, write the real money demand function.
8) Explain the meaning of the '*LM* curve'. How is it related to the price level?
9) Explain the concept of *IS-LM* equilibrium and its relationship to aggregate demand.
10) An economy is described by: $Y = C + I + G$, where $Y = 5000$, $G = 1000$, $T = 1000$, $C = 250 + 0{,}75 \times (Y - T)$, $I = 1000 - 50 \times i$.
    a. Calculate total private savings, the saving of the government, and the equilibrium interest rate.
    b. Assume that *G* rises to *1250.* Calculate again the values of private savings, government saving and total savings, and the equilibrium interest rate.

11) The following values hold for a four-sector economy: $Y = 4500$, $W = 2950$, $IM = 560$, $X = 520$, $S_W = 40$, $TR_H = 820$, $T_H = 480$, $C = 3200$, $TR_F = 200$, $T_F = 1300$, and the deficit of the government budget is: *200.*
   a. Calculate the disposable income of the private sector.
   b. What is the value of investments?
   c. What is the value of government expenditure?

12) In a two-sector economy the consumption function is: $C(Y) = 30 + 0{,}9 \times Y$. The investment demand function is: $I = 170 - 10 \times i$. The money demand function is defined by: $M^D = 0{,}4\ Y - 10 \times i$. Nominal money supply is: $M^S = 600$, and the price level is: $P=2$
   a. Write the formula for *IS* and for *LM*.
   b. Calculate the equilibrium interest rate and income that balances *IS* and *LM.*
   c. Give the value of consumption and of investment in the *IS*×*LM* equilibrium.

13) Real money demand is defined by $M^D = 1000 - 100 \times i$, where i is the interest rate in percentages. Nominal money supply is $M^S = 1000$, the price level is $P=2$.
   a. Draw the real money supply and real money demand curves.
   b. Calculate the equilibrium rate of interest in the money market.
   c. How does the equilibrium interest rate change if the price level is constant and the quantity of nominal money supply grows from the initial value of *1000* to *2000*?
   d. If the central bank wants to raise the interest rate to *7 %*, how large should nominal money supply be to achieve it?

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CHAPTER 9: THE TOTAL OUTPUT OF THE ECONOMY, THE LABOUR MARKET AND THE PRICE LEVEL

9.1. The Aggregate Production Function, Output and Employment

The production function of the individual firm was defined in Part I, defining the firm's quantity of output as the function of the amounts of inputs. A similar production function can be defined for the economy as a whole, defining the total output of the economy as the function of the amounts of productive resources used.

The **aggregate production function** *relates the total of output produced by the economy (i.e. by all economic agents) at the current level of available technology to the quantity of inputs ,as land, capital and labour* (Mankiw, 1997; Samuelson – Nordhaus, 2010*).* The production function is written as: $Q = f(K, L)$, where K is the quantity of capital, L is the quantity of labour, f is the functional relationship that represents the actual technology that converts the capital K and labour L into total output.

In real-world situations historical data of input combinations and total outputs produced offer a possibility for the statistical estimation of this functional relationship. The difficulty lies in the aggregation of the inputs K and L: the quantity of physical capital could be measured by its value, but the same total value may mean completely different structure, age, level of wear and tear, and consequently, productivity. The quantity of labour measured by the number of people employed, or the total hours worked does not specify the workers' skills, qualifications, experience, creativity, physical capability, although these and many other properties also affect labour productivity. In spite of these difficulties the notion of the aggregate production function is useful in economic decision-making, as it reveals general rules of the production process.

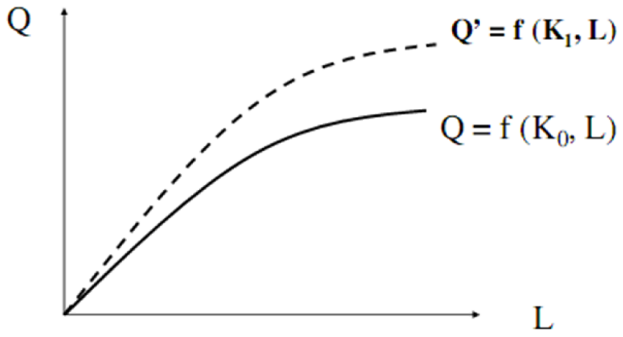


Figure 9.1: ***The Aggregate Production Function***
Source: Author's own construction

Let's introduce the concept of short-run aggregate production function, which, similarly to its microeconomic counterpart, relates the level of output to the actual level of labour employed,

assuming constant level of physical capital K_0 and constant level of technology. The mathematical formula for the short-run aggregate production function is $Q = f(K_0, L)$, or simply: $Q = f(L)$, with capital being constant (K_0). The level of technology, the amount of machinery, and altogether the total quantity of physical capital cannot be changed easily, as it takes a long time to carry out large investments. The quantity of labour, on the contrary, can be changed in a rather flexible way. Therefore the amount of output produced in the short run is determined by the actual quantity of labour employed (see *Figure 9.1).* The curve *Q* denotes the short-run production function, with capital K_0 being constant. An increase in capital resources from K_0 to K_1 is attained by an investment, and this will shift the production function upwards (as is shown by curve *Q')*.

Thus, total output of the economy in the short-run is determined by the quantity of labour employed. But what will determine the level of employment, the amount of labour used in production? Let's have a look at the labour market, and examine labour supply and labour demand.

Labour supply *is the quantity of labour offered by households in the labour market.*

Labour demand *is the quantity of labour that firms wish to employ.*

The supplied and demanded quantities may be measured by the number of persons, but a more refined way is to measure them as the number of hours demanded or offered to work. The actual quantity of labour employed in the economy depends on the properties of the labour market. Labour market equilibrium defines not only the quantity of labour employed, but also its price, the wage paid to workers. However, labour market equilibrium is a feature rarely seen in most of the contemporary market economies. Labour markets usually operate under the conditions of disequilibrium, is reflected by high unemployment figures.

9.2. Labour Supply and Real Wage

Labour supply is the amount of labour that households offer to firms. The total quantity of labour supplied in the national economy is derived as follows.

The *total population* of the country consists of working-age adults and *people older or younger than the working age*: children and old people obviously do not count in labour supply. The *adult, working-age population* also consists of two groups. Those wanting to work (either actually working, or looking for jobs) are called the *labour force*, or *active* population. The other group is those who currently do not intend to take a job for various reasons (e.g. they are full-time students, or are at home raising children, or supported by some other family member, etc.). They are adults *not in the labour force* (or the *inactive* population). The labour force consists of those *employed*, and those looking for jobs without success, the *unemployed* (Mankiw, 1997).

The above categories are summarised in *Table 9.1*[29].

Several statistical indicators are used to describe the actual labour supply and the employment situation.

[29] Note that by some statistical classifications (e.g. that of the Central Statisctical Bureau in Hungary), the labour force is divided into three groups: the employed, the unemployed, and the self-employed (entrepreneurs, sole proprietors) .

- ***Labour force participation rate:*** *labour force per adult (working-age) population (%).* This rate is also called *activity rate*, and it measures the participation of adult population in the labour supply.
- ***Employment rate:*** *number of employed workers per working-age population (%)*
- ***Unemployment rate:*** *number of unemployed per labour force (%)*

Table 9.1: ***The Structure of Labour Supply***

Total population		
Working-age population (*Adults*)		**Population not in working-age** *(too young or too old)*
Labour force	**Adults not in labour force**	
Employed / **Unemployed**		

Source: Author's own construction

Table 9.2 illustrates the structure of labour supply in Hungary from 1998 to 2011 by the data of the Central Statistical Bureau of Hungary. Note that working age population is defined in the table as those between 15 and 74 years of age. Different statistics may use different age ranges for that.

Table 9.2: ***Employment and Unemployment in Hungary***

	Employed	**Unemployed**	**Labour force**	**Adults not in labour force**	**Population of age 15 to 74 ys**
year	***1000 persons***				
1998	3 695.60	314.0	4 009.60	3 792.70	7 802.30
1999	3 809.30	285.3	4 094.60	3 693.10	7 787.70
2000	3 856.20	263.7	4 119.90	3 659.60	7 779.50
2001	3 868.30	234.1	4 102.40	3 670.00	7 772.40
2002	3 870.60	238.8	4 109.40	3 652.80	7 762.20
2003	3 921.90	244.5	4 166.40	3 578.50	7 744.90
2004	3 900.40	252.9	4 153.30	3 567.90	7 721.20
2005	3 901.50	303.9	4 205.40	3 517.10	7 722.50
2006	3 930.10	316.8	4 246.90	3 474.90	7 721.80
2007	3 926.20	311.9	4 238.10	3 481.30	7 719.40
2008	3 879.40	329.2	4 208.60	3 501.60	7 710.20
2009	3 781.90	420.7	4 202.60	3 487.10	7 689.70
2010	3 781.20	474.8	4 256.00	3 430.40	7 686.40
2011	3 811.90	467.9	4 279.80	3 395.90	7 675.70

Source: Author's own construction based on data by *KSH* (Central Statistical Bureau of Hungary) (http://www.ksh.hu/docs/hun/xstadat/xstadat_eves/i_qlf001.html), accessed: 21st Sept 2012.

Unemployment may be voluntary or involuntary. *Involuntary unemployment* consists of those who would like to take a job at the current real wage, but cannot find one. *Voluntary unemployment* means that the person does not want to take a job at the current low wage rate, waiting for a job with higher real wage offered. Voluntary unemployment is present in all economies,

because e.g. adults who have just returned to the labour market after completing a training course for a new qualification are naturally looking for new jobs for higher wages. Those who change their place of residence also belong to this category, quitting their former job at their own intention.

It is often difficult to define precisely the number of unemployed and the number of adults not in the labour force. Many people currently not in the labour force are *discouraged workers*, who had looked for labour without success, and have given up looking. Now they try to maintain their life relying on incomes other than wage – e.g. financial support from their relatives, or production of vegetables for home consumption, or illegal work, etc. Many of these people would immediately return to the labour market if conditions changed offering some hope of finding a job. Others remain out of the labour force because not seeing any good opportunity for themselves in the labour market, they choose to pursue other goals of life – studying full-time, or raising children. Thus, many of the people currently not in the labour force are really unemployed, but not visible in unemployment statistics (Mankiw, 1997). Therefore the ***total (potential) labour supply in the economy is*** *higher than the sum of employed and unemployed (i.e. the labour force), but includes some of the adults currently not in the labour force.*

Unemployment is classified by its causes as:

- **Frictional** unemployment is a natural property of every economy. It is caused by continuous voluntary movement of people between jobs. Workers may decide by their free will to quit one job and look for another one, so they become unemployed between the two jobs, though this unemployment is *voluntary.*
- **Cyclical unemployment** is the result of the business cycles in the economy. As the national economy moves between recessions and expansions, the firms' need for labour changes accordingly. During expansionary periods firms increase their production, therefore they need more labour, and unemployment falls. During recession these firms decrease production because they cannot sell their output, therefore they dismiss some of their workers, and that leads to rising unemployment.
- **Structural unemployment** is caused by discrepancies of labour demand and labour supply. When an economy is changing its production structure, the newly established industries may be unable to find labour with the required skills and experience, while, the industry being closed down dismisses many skilled workers. The mismatch of supply and demand may occur geographically, i.e., when newly established firms look for labour in one region of the country, while large numbers of the labour force look for jobs in another, remote region. In countries where the georgraphical mobility of the population is very low, this latter situation often presents a serious problem. Another cause of structural unemployment may be the educational system, when training programmes offer skills and qualifications which are not needed by the economy.
- **Technical (technological) unemployment** is a specific kind of structural unemployment. It is caused by technological modernisation of the economy, which introduces automation and mechanisation, introducing capital-intensive technologies instead of the old labour-intensive ones, leaving large numbers of workers unemployed.

Cyclical, structural, and technological unemployment are types of *involuntary unemployment,* while frictional unemployment is *voluntary*.

Unemployment is always present in all economies. Voluntary unemployment occurs in times of labour market equilibrium, with no involuntary unemployment - that is, there are unemployed adults who do not wish to take jobs at the current real wages. *Natural unemployment* is the situation when labour demand equals labour supply, the labour market is in equilibrium, and no involuntary unemployment is experienced. The associated total output of the economy is called *potential output* (as we will see later, this is the highest possible output of the economy at the current capital level, because the highest possible number of the labour force works) (Mankiw, 1997; Hall – Taylor, 1991). Now let's give the precise definitions and attributes of labour supply and labour demand.

Labour supply (L^S) *is the amount of labour that households offer ('for sale') to firms at any given wage level. Labour supply depends on real wage, i.e. the purchasing power of nominal wage, which is the price of labour.* The higher the real wage the higher the labour supply, because at high real wages some adults currently not in the labour force, and some voluntarily unemployed workers enter the labour market looking for jobs, and currently employed workers are more willing to work overtime. Therefore an increase in real wage will lead to increasing labour supply. Although most people in the labour force, having no other source of income, want to work in a wide range of real wages, supplying the same amount of work regardless of the actual changes in wages, there is a small proportion who may be attracted to the labour market by high real wages. At very low real wages some of the labour force cannot afford to take the job, because the real wage earned by spending all the worktime at a job may be too low compared to work-related costs (e.g. travelling to the workplace) and to other alternative uses – e.g. housework, produce vegetables for home consumption, studying for a qualification, or even recreation and travelling – of the same time.

Nominal wage (W) *is the money that workers earn in exchange for their work done.*

Real wage (*W/P*) *is the purchasing power of nominal wage, i.e. the amount of goods (products or services) that can be purchased in exchange for the nominal wage.*

The labour supply function *describes the relationship between real wage and the quantity of supplied labour.*

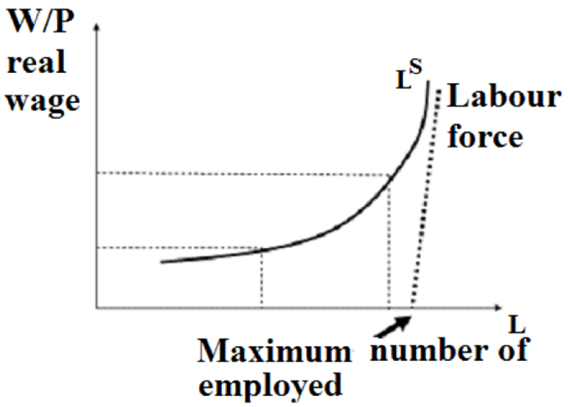


Figure 9.2: ***Labour Supply as the Function of Real Wage***
Source: Author's own construction

9.3. Labour Demand and Real Wage

Firms represent the demand side of the labour market, because labour is an input, required by producers in the production process.

Labour demand (L^D) *is the amount of labour that firms wish to employ.* To understand the properties of labour demand let's recall the attributes of the firms' profit maximising behaviour.

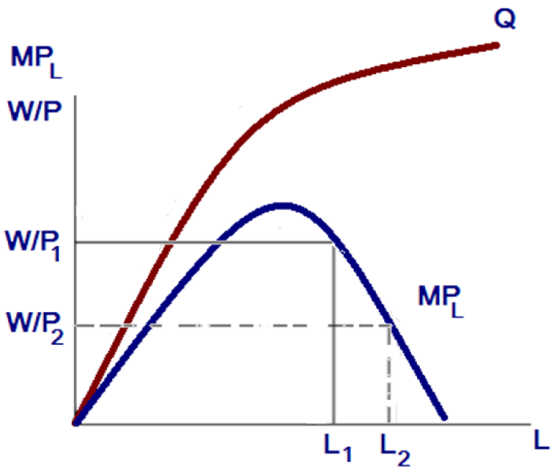


Figure 9.3: ***The Labour Demand Curve Derived from the Marginal Product of Labour***
Source: Author's own construction

A firm will employ an additional amount of labour *ΔL,* if the resulting additional revenue is higher than the incurred additional cost. Marginal product of labour gives the quantity of additional output resulting from the use of an additional amount of labour, therefore the additional output produced is equal to $MP_L \times \Delta L$. Assuming $\Delta L=1$ the additional output is MP_L. This output is sold in the market, generating the revenue $MP_L \times P$. The additional cost of the additional amount of labour is the wage paid to the worker ($W \times \Delta L$), thus for $\Delta L=1$ the additional cost is the nominal wage W. Therefore firms will increase the number of labour employed as long as the additional revenue $MP_L \times P$ is not smaller than the additional cost of wage W : $MP_L \times P \geq W$, or $MP_L \geq W/P$.

This result shows that the firms increase the amount of labour employed as long as the marginal product of labour is not lower than the real wage, therefore the labour demand curve is the same as the marginal product of labour (*Figure 9.3*).

Obviously, with rising real wages the demand for labour falls, as the marginal product of labour is higher at lower levels of employment. The impact of real wage decrease is just the opposite, implying increasing demand for labour, because a lower real wage can be covered by a lower value of marginal product, which allows higher employment.

The labour demand function *describes the relationship between real wage and the supplied quantity of labour*. Labour demand and real wage are inversely related, high real wage implies low demand for labour, and low real wage implies high demand for labour (*Figure 9.4*).

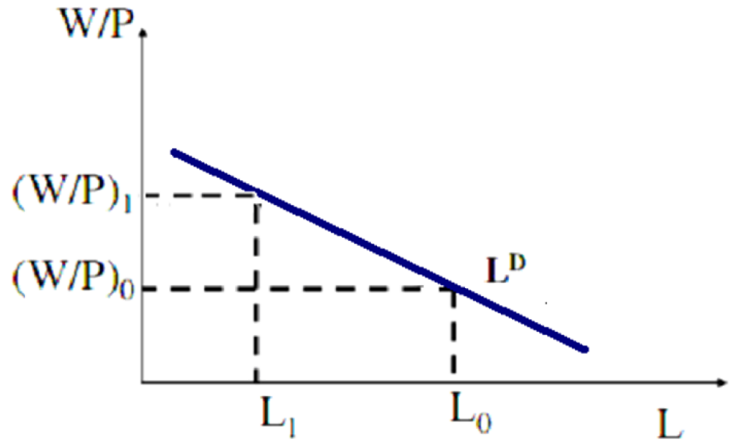


Figure 9.4: ***The Labour Demand Function***
Source: Author's own construction

9.4. Equilibrium and Disequilibrium in the Labour Market

Labour market equilibrium means that labour demand equals labour supply. In equilibrium, at the equilibrium real wage, the number of people wanting to take a job is equal to the number of jobs offered by firms. In this situation no involuntary unemployment occurs, because everyone finds a job who wants to take one. *The real wage in the equilibrium of the labour market is called* ***equilibrium real wage****, the amount of labour in the equilibrium is called the* ***equilibrium level of employment****.*

When the real wage is higher than the equilibrium real wage, firms demand less labour than the equilibrium employment, while households offer more labour than the equilibrium employment. Therefore actual employment will be determined by the low demand of firms, and the difference between the labour supply of households and the demand of the firms give the number of (involuntarily) unemployed people. In the opposite situation, real wage being below the equilibrium real wage, the firms require more labour than the equilibrium employment, while households supply less, therefore the low supply will determine the actual level of employment. The difference between high demand for and low supply of labour gives the number of job vacancies there is no involuntary unemployment in the economy. Whenever the real wage differs from the equilibrium real wage (being either higher or lower than that), the number of employed workers is less than the equilibrium level of employment. *The highest level of employment is obtained when the real wage is equal to the equilibrium real wage and the labour market is in equilibrium (Figure 9.5).*

To maintain the **equilibrium position** in the labour market the real wage should adjust to supply and demand flexibly . As real wage depends on nominal wage and the price level, any change in the price level change the real value of the same nominal wage. To adjust real wages to the level

of equilibrium real wage, the nominal wages should be also adjustable. With flexible nominal wages the impact of any change in the price level an immediate adjustment of the nominal wage can restore real wage to the level of equilibrium real wage. Therefore a rise in the price level will be followed by a rise in the nominal wage, and a fall of the price level will lead to a decrease in the nominal wage, to keep real wage constant. As a consequence, the labour market maintains the equilibrium position, there is no involuntary unemployment, and the level of employment is at its highest possible level. The aggregate production function allocates potential output to this level of employment, while involuntary unemployment prevails, being equal to natural unemployment.

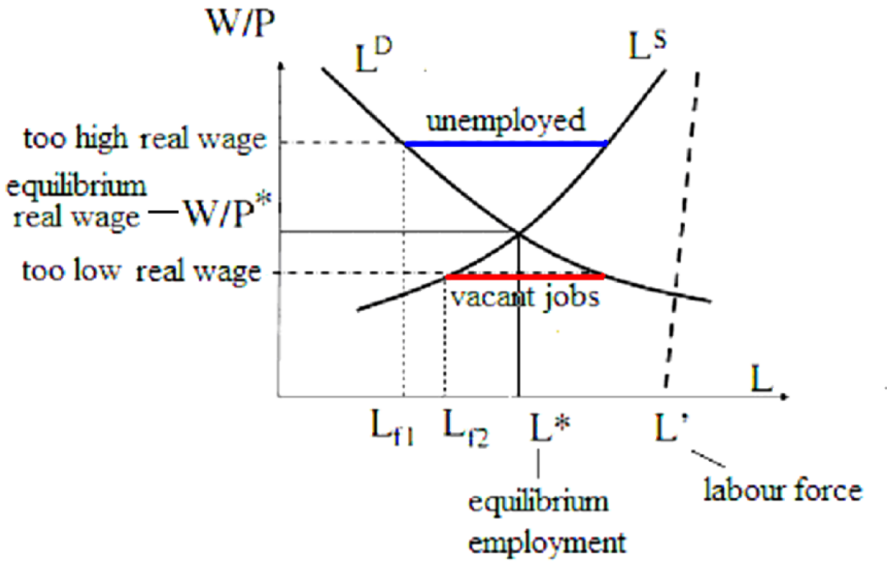


Figure 9.5: ***Equilibrium in the Labour Market***
Source: Author's own construction

The above situation rarely occurs in contemporary economies. Nominal wages are usually fixed (tied by long-term work contracts), regardless of the price level (***sticky nominal wages***), and usually increase in the long-run. The government intervenes setting the nominal wages by several instruments, including *minimum wage, wage rates and wage differences, and sometimes indexing the wages to compensate workers for inflation*. Unions representing the workers in collective wage bargaining also contribute to the rigidity of nominal wages. As a result, nominal wages tend to be fixed in the short-run, and when the price level changes, real wages also change. In response to changing real wages the number of employed workers will also change, being usually lower than the maximum, i.e. equilibrium level. As employment is lower than the maximum, the output will also be lower than the potential level of output. With high real wages neither households, nor firms have any power to resolve the situation, as nominal wages cannot be decreased, due to the pre-defined minimum wages and the bargaining power of trade unions, therefore unemployment will prevail. With too low real wages, firms can choose to raise nominal wages, attracting more adults back to the labour market. Employment will rise, as well as output, and the process continues until potential output is reached (Samuelson – Nordhaus, 2010).

Table 9.3: ***The Employment Situation of the Population Aged 15 to 64 Years, in Europe***

Country	Employment rate, %					Unemployment rate, %				
	2007	2008	2009	2010	2011	2007	2008	2009	2010	2011
Austria	71.4	72.1	71.6	71.7	72.1	4.5	3.9	4.9	4.5	4.2
Belgium	62	62.4	61.6	62	61.9	7.5	7	8	8.4	7.2
Bulgaria	61.7	64	62.6	59.7	58.5	6.9	5.7	6.9	10.3	11.3
Czech Republic	66.1	66.6	65.4	65	65.7	5.4	4.4	6.8	7.4	6.8
Denmark	77	77.9	75.3	73.3	73.1	3.8	3.4	6.1	7.6	7.7
Estonia	69.4	69.8	63.5	61	65.1	4.8	5.6	14.1	17.3	12.8
France	64.3	64.8	64	63.8	63.8	8	7.4	9.2	9.4	9.3
Germany	69.0	70.1	70.3	71.1	72.5	8.8	7.6	7.9	7.2	6.0
Greece	61.4	61.9	61.2	59.6	55.6	8.4	7.8	9.6	12.7	17.9
Hungary	57.3	56.7	55.4	55.4	55.8	7.4	7.9	10.1	11.2	11.0
Italy	58.7	58.7	57.5	56.9	56.9	6.2	6.8	7.9	8.5	8.5
Latvia	68.3	68.6	60.9	59.3	61.8	6.1	7.7	17.5	19	15.6
Lithuania	64.9	64.3	60.1	57.8	60.7	4.4	5.9	13.9	18	15.6
Luxemburg	64.2	63.4	65.2	65.2	64.6	4.1	5.1	5.2	4.4	4.9
Poland	57	59.2	59.3	59.3	59.7	9.7	7.2	8.3	9.7	9.8
Romania	58.8	59	58.6	58.8	58.5	6.8	6.1	7.2	7.6	7.7
Slovakia	60.7	62.3	60.2	58.8	59	11.2	9.5	12.1	14.4	13.6
Spain	65.6	64.3	59.8	58.6	57.7	8.3	11.4	18.1	20.2	21.8
Sweden	74.2	74.3	72.2	72.7	74.1	6.2	6.3	8.5	8.6	7.7
United Kingdom	71.5	71.5	69.9	69.5	69.5	5.4	5.7	7.7	7.9	8.2

Source: Data published by KSH (http://www.ksh.hu/docs/hun/xstadat/xstadat_eves/i_int012.html, and http://www.ksh.hu/docs/hun/xstadat/xstadat_eves/i_int013.html), accessed: 21st Sept 2012.

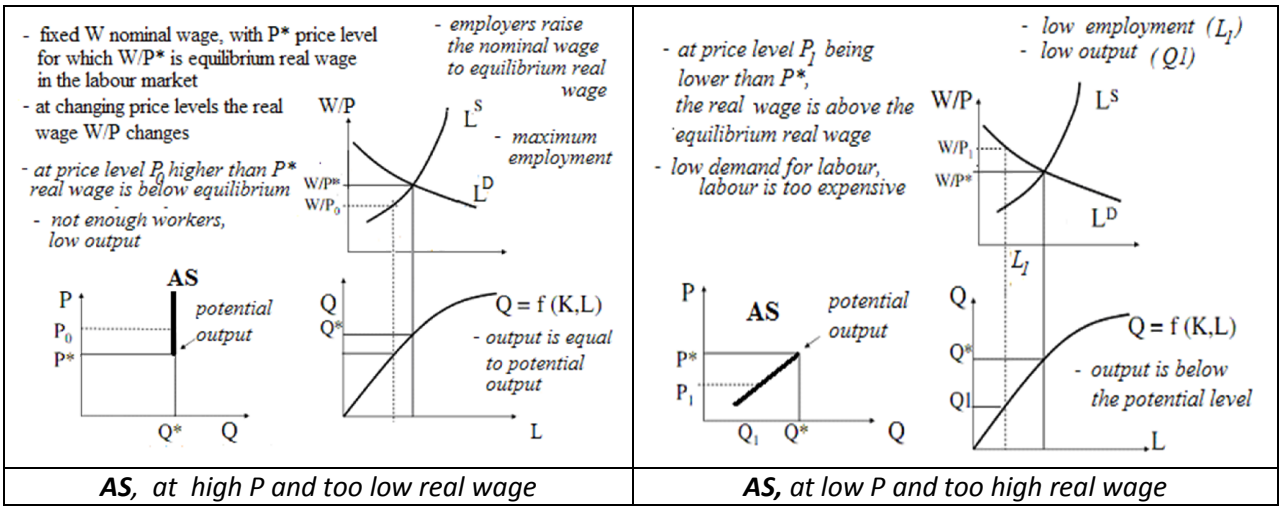
9.5. Deriving Aggregate Supply from the Labour Market

Aggregate supply was briefly introduced in section 7.2. Now let's have a closer look on it again to see how its value is exactly determined.

Aggregate supply (AS) *describes the relationship of total output and the price level, determining the total amount of goods and services produced by the economy at any given price level.* This level of output is the function of employed labour in the short run – determined by the aggregate production function. The level of employment is determined in the labour market, depending on real wages, and real wages depend on nominal wages and the price level. Assume now, that the labour market is in equilibrium at the actual price level and nominal wage (that is, the sticky nominal wages are set at a level that provides equilibrium real wages at the actual price level).

Assuming sticky (i.e. constant) nominal wages, a rising price level will decrease real wages, therefore labour supply will decrease, and firms cannot find enough workers. In such a situation firms may choose to raise nominal wages, and nothing prevents them to do so, as neither minimum-

wage requirements nor trade union agreements will be broken by wage rises. Therefore real wages approach the equilibrium real wage, employment approaches the level of equilibrium employment, and the economy produces its potential output level. Another price rise brings about the same action again therefore labour market equilibrium is repeatedly restored, while total output of the economy remains at its potential level. Consequently, aggregate supply remains equal to the potential output of the economy (*Figure 9.6,* left panel).



***AS**, at high P and too low real wage* | ***AS**, at low P and too high real wage*

Figure 9.6: ***Aggregate Supply in a Rigid Labour Market, at Sticky Nominal Wages***
Source: Author's own construction

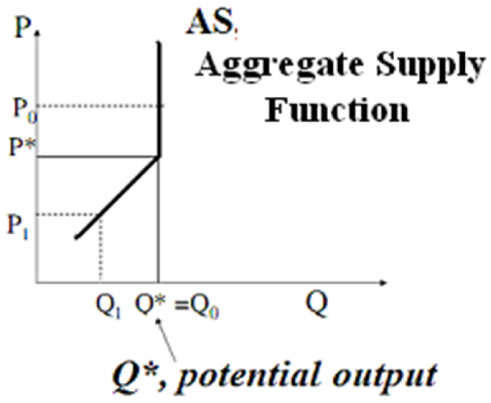


Figure 9.7: ***The Aggregate Supply Function (AS)***
Source: Author's own construction

When, on the other hand, too high minimum wages and low price levels bring real wages above the equilibrium real wage, the economy experiences low labour demand and high unemployment. To resolve the situation nominal wages should be decreased. However, nominal wages, being sticky, cannot be adjusted downward (as minimum-wage requirements and agreements

with trade unions cannot be broken), therefore low employment and low level of output prevail. In this situation a rise in the price level will decrease real wages, closer to the equilibrium real wage, and leading to higher labour demand. The level of employment will rise, so does total output and aggregate supply. Therefore, when the price level is too low compared to the actual nominal wage, an increase in the price level leads to an increase in employment and total output (the right panel *of Figure 9.6*).

Thereforeassuming fixed (sticky) nominal wages, there is one price level that equates the real wage to the equilibrium real wage. For price levels below this price level the aggregate supply AS is an increasing function of the price level, and for price levels above this price level the aggregate supply AS is constant, being equal to potential output (*Figure 9.7*). This short-run concept of aggregate supply is called *Keynesian AS (aggregate supply)*.

Aggregate supply is interpreted as the total output of the economy. However, as total output comprises hundreds of various goods, it is difficult to measure aggregate supply as the sum of all goods produced. Therefore the practical solution is to measure the value of the output as real income, assuming constant (base) prices, and interpret total output as real income (*Y*) instead of quantity (*Q*). Assuming constant prices a rise in quantities is equivalent to a rise in real income, and a fall in *Q* corresponds to an equivalent fall in *Y*.

9.6. The Determination of the Price Level

The short-run aggregate demand and aggregate supply functions (at sticky nominal wages) describe a relationship between total output (or the value of the output, i.e. real income) of the economy and the price level. Aggregate demand gives the income that economic agents intend to spend at various price levels, while aggregate supply gives the value of total output, i.e. national income, which the economy produces at various price levels. The economy attains the equilibrium of aggregate supply and aggregate demand when the value of total output and the income to spend are equal at a certain price level. Therefore the price level in the economy is determined by the equilibrium of aggregate demand and aggregate supply.

The potential output (the maximum value of total output) defined by *AS* is attained at the price level that sets the equilibrium real wage in the labour market (*P** in *Figure 9.8*). When the price level is higher *P**, low real wages discourage workers from working, and the firms find it reasonable to raise nominal wages to the level of equilibrium real wage. The equilibrium real wage induces equilibrium employment in the labour market *(L*),* leading to the production of maximum total output (*Y**). However, this level of output is attained only if economic agents are willing to purchase it, i.e. aggregate demand is as high as that, at the actual price level. Usually, the price level *P** that sets equilibrium in the labour market is associated with excess supply in the economy, as aggregate demand is lower than the potential output of the economy. The equilibrium of *AD* and *AS* will imply a price level P_e, which is lower than *P** that belongs to the potential output level of *AS* (see *Figure 9.8).* As P_e is lower than *P**, the real wage implied by P_e is higher than the equilibrium real wage of the labour market, leading to excess labour supply, low employment and unemployment. Low employment means lower total output and national income than the potential level, so the economy performs below its capacity. Therefore the aggregate macroeconomic equilibrium means an

equilibrium between aggregate demand and supply (*AD-AS*), equilibrium in the goods market and the money market – as all points of *AD* are *(P,Y)* pairs which attain simultaneous equilibrium of *IS* and *LM,* – but disequilibrium and unemployment in the labour market.

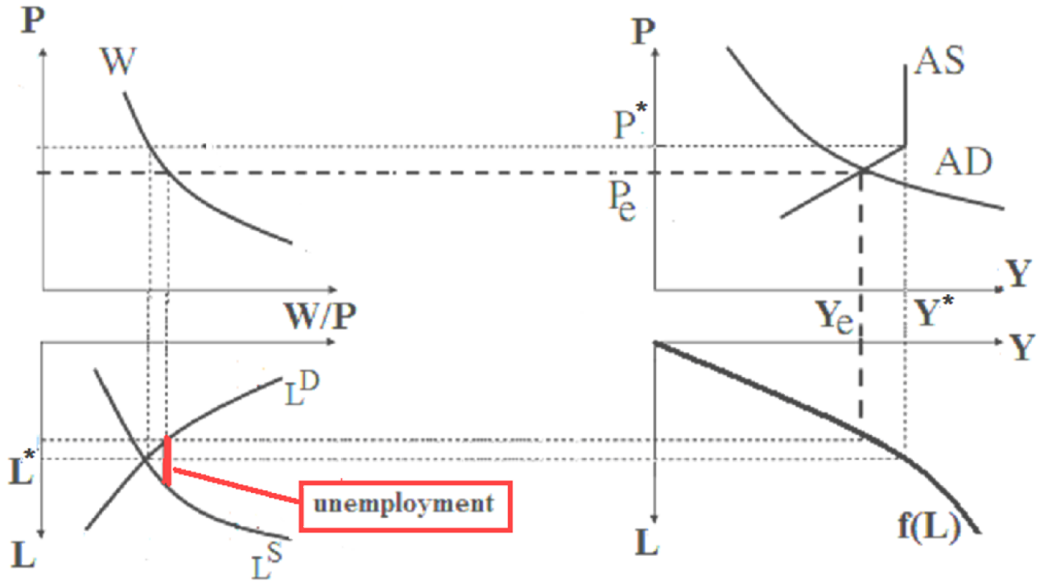


Figure 9.8: ***Equilibrium of AD and AS, the determination of the Price Level***
Source: Author's own construction

9.7. Inflation – Concept, Measurement, Causes

Inflation *is a persistent increase of the price level, the continuous decrease of the purchasing power of money.* The purchasing power of money is the reciprocal value of the price level. During periods of inflation the amount of nominal money increases without a similar increase in goods produced by the economy. The decrease in purchasing power is a typical attribute of fiat money. Historical data show that during and after wartimes prices increased substantially, and price decreases were experienced in times of peace Inflation has occurred many times in the past, and since the early 19th century prices have multiplied in Europe. The USA faced its first significant inflation (of nearly 100 %) in the civil war of 1861-1865 (Samuelson − Nordhaus, 2010). Periods of extreme price rises, hyperinflationary periods occurred in the years following the two World Wars. Inflation, although at much lower rates, is a general feature of contemporary market economies. ***Deflation*** *means the general decrease of the price level.*

The rate of inflation is measured by the price index. The **rate of inflation** measures the price change expressed as a percentage of the price level in the previous year, i.e. the price index between the two years. Price indices – as it was discussed in Chapter 7 – can be measured by several methods, the most popular one referring to the value of a consumer basket and called consumer

price index (*CPI*). Therefore *inflation is usually understood as an increase of consumer prices.* The notions of producer price levels and producer price indices – either industrial or agricultural – are defined similarly, and the meaning of the *GDP*-deflator is also similar to a price index.

Inflation (i.e. rising price level) does not mean that the prices of all goods rise at the same rate. Some prices may rise more than the average, while others – e.g. high-tech electronics – might even become cheaper than before. Inflation is a weighted average of these price changes, and the impacts of inflation depend on the contents of the actual basket of goods that an individual buys.

Inflation is more severe for those, whose consumer basket contains goods affected by above-average price increases. People who had deposited their savings in banks at a fixed nominal interest rate are also major losers of inflation, as by the time they withdraw their savings plus interest, the purchasing power of all these may be less, than what they had expected at the time of depositing the money.

The winners of inflation are people whose consumer basket contains goods that were affected by below-average price rises, or even price cuts. These goods typically include valuable electronic appliances, luxury goods, etc., while everyday food items or fuel and energy are usually affected with above-average price rises. These items usually represent a smaller share in their total spending of high-income families, and a larger share for poorer people. Another group of winners are people who borrowed money at fixed nominal interest rates, because by the time of repayment the purchasing power of the repayment plus the interest will be less, than what they had expected at the time of borrowing. Thus inflation redistributes incomes among the population, and it is difficult to tell who will win or lose (Samuelson – Nordhaus, 2010).

Inflation is classified by its major causes. As inflation is generated by the disequilibrium of aggregate demand and aggregate supply, its major cause may be either an increase in demand, or a decrease in supply. Therefore the **two basic types** of inflation are **demand-pull inflation**, and **cost-push inflation**.

Demand-pull inflation *is caused by a persistent rise in aggregate demand. It is usually caused by a change in some factors affecting aggregate demand – components of the goods market, or the money market.* The reasons associated with the goods market include excess government spending, increased household consumption, or growing investment demand, due to improved business confidence, more optimistic expectations on profitability, or growth of money supply (a money market change) leading to decreasing interest rates. Households may decide to bring ahead spending planned for the next year, either for fear of future price rises or for an unexpected increase in disposable incomes (due to tax cuts or wage rises). A decrease in the propensity to save may induce consumers to spend more of their disposable income than before. Eventually the result is an increase in aggregate demand, causing an upward shift in the position of the *AD* curve. Consequently the price level will rise, and equilibrium income level of the economy also increases (see the left panel of *Figure 9.9*).

Cost-push inflation *is induced by a change in the supply side, a decrease of aggregate supply. It is usually caused by rising prices of some factors of production* – e.g. payroll taxes, fuel prices or rising nominal wages. Thus the producers can purchase less of the more expensive productive resources, or buying still the same amount as before, they have to raise the price of the output to cover the rising production costs. Therefore aggregate supply decreases, the aggregate supply curve is shifted upwards. Finally the price level rises and national income decreases (see the middle panel of *Figure 9.9*).

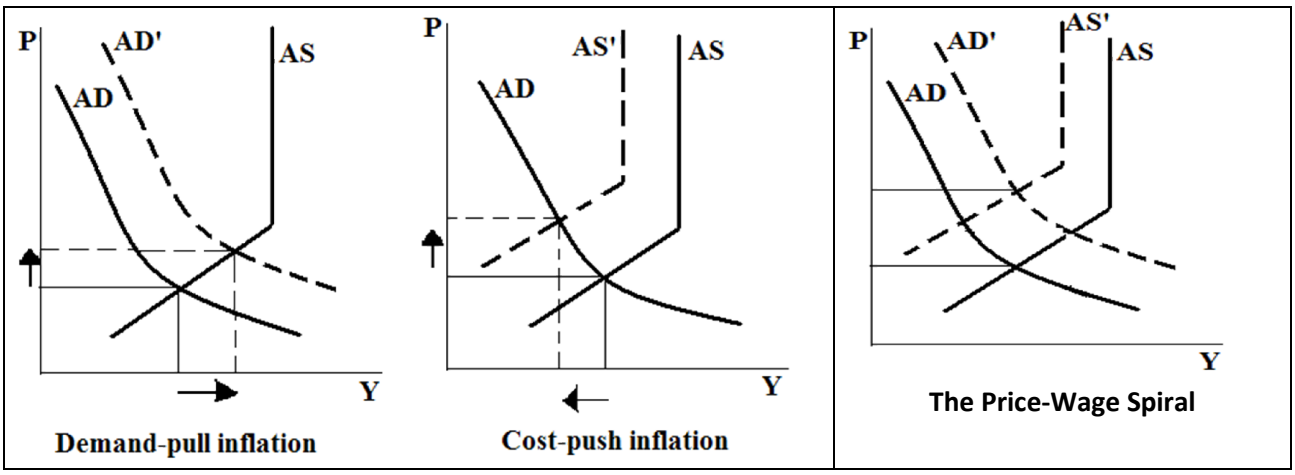


Figure 9.9: ***Demand-Pull Inflation, Cost-Push Inflation, and the Price-Wage Spiral***
Source: Author's own construction

It is not surprising, that economic agents try to prepare for inflation and to minimise its negative impacts. The phenomenon of the **price-wage spiral** demonstrates the impacts of inflationary expectations. Consumers in the goods market expect rising prices, and to minimise the negative impacts of higher prices they try to purchase as much as possible today, at the current, lower prices. This behaviour increases the current demand in the goods market, therefore it induces demand-pull inflation. However, households want compensation for the decreasing purchasing power of their incomes, therefore they start to negotiate a nominal wage increase in their workplace, and eventually they achieve it. This increases the cost of labour, a productive resource, making production more expensive, and leading to cost-push inflation with decreasing aggregate supply. Eventually both *AD* and *AS* are shifted upwards, and the resulting new equilibrium will bring about a higher price level, while the rise in income generated by the demand-pull shift in *AD* is counteracted by the fall of income generated by the cost-push shift in *AS*. Eventually national income remains the same, but prices have risen considerably. People feel justified in their expectations, and this reinforces their behaviour, so next year the whole process is repeated again (right panel of *Figure 9.9*).

Inflation is classified by its rate – distinguishing the strains of low inflation, galloping inflation and hyperinflation:

- **Low inflation** *is the increase of the price level at an annual rate of a few percents.* Prices rise at a moderate rate, causing no major difficulties for the economy, the impact of the expected price rise is easy to predict. Inflation in Europe and in the USA belongs to this category.
- **Galloping inflation** *is inflation of the double or triple digit annual rate of the range 20% to100 % or even to 200 %.* The economy operates more or less in a normal way, but money loses its value fast, and economic agents do not use money for storing their wealth, but choose more stable forms of saving. People try to spend their money quickly before considerable devaluation, and it results in a fast growth of demand.

- **Hyperinflation** *is inflation of a weekly or even daily rate of double or triple digits.* This level is too high for the economy to operate in a normal way, as the purchasing power of money rapidly decreases, losing its value within days, or even hours. Transactions increasingly avoid the use of the home currency, and barter trade prevails, or the use of stable foreign currencies becomes widespread. Such hyperinflationary periods were experienced in Germany in the 1920s and in Hungary just after World War II in 1946.

Table 9.4: ***Changes in the Price Levels in Europe and the USA***

Consumer Price Index (%)	Hungary	Germany	USA	Czech Republic
2006	4.0	1.8	3.2	2.1
2007	7.9	2.3	2.9	3.0
2008	6.0	2.8	3.8	6.3
2009	4.0	0.2	-0.3	0.6
2010	4.9	1.2	1.6	1.5
2011	3.9	2.5	3.1	1.9
2012 (first quarter of year)	5.2	1.9	2.1	3.5

Source: Author's own construction based on IMF (2012)

Review Questions

1) Explain the long-run and short-run macroeconomic production functions.
2) What is the relationship between the macroeconomic production function and labour force?
3) Explain the meanings of labour force, adults not in the labour force, unemployed, labour force participation rate, employment rate and unemployment rate.
4) Define the notions of labour demand and labour supply. How are they related to real wage?
5) Explain the meaning of labour market equilibrium, and the employment in labour market disequilibrium situations.
6) How is aggregate supply derived from the labour market and the macroeconomic production function?
7) Explain the equilibrium of *AD* and *AS*, and show how the price level is defined in the economy.
8) Explain the meaning of inflation, describe its causes and types. How can we measure inflation?
9) What are the causes of demand-pull inflation and supply-push inflation? How does the price-wage spiral evolve?
10) An economy is described by the production function: $Y = K^{1/3} \times L^{2/3}$. The capital resource available in the economy is *1000* units, the labour force consists of *1000* persons.

a. Write the labour demand function as the function of real wage and of capital. (Help: labour demand is determined by $MP_L = W/P$, and MP_L is the first derivative of the production function by L: $MP_L = (2/3) \times K^{1/3} \times L^{-1/3}$).
b. Assume that real wage can flexibly adjust to labour supply and labour demand, to obtain labour market equilibrium. Calculate the equilibrium real wage, the number of employed people and the value of total output. How much wage is paid altogether to the employed labour force?
c. The parliament intends to improve the employees' living standard, so it passes an act, declaring that real wage should be equal at least to *1* unit of output. How does this real wage relate to the equilibrium real wage?

13) The labour demand function is given by $L^D = 220 - 40\ W/P$. The labour supply function is $L^S = 80\ W/P - 20$. The total population is = *400* persons, *150* persons of which are not of working-age.

a. How many people are employed at $W/P = 2.5$? How many are unemployed, and what is the unemployment rate?
b. Calculate the number of labour force as the sum of the employed and unemployed workers. What is the labour force participation rate, how many people are outside the labour force?
c. At what real wage will the number of employed be the highest? How many people are working now?
d. The macroeconomic production function is $Y = K \cdot L - L^2$ and $K = 300$ is the amount of capital available for the economy. Calculate total output at equilibrium real wage.

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The projects have been supported by the European Union.

CHAPTER 10: ECONOMIC POLICY, FOREIGN RELATIONS, DEVELOPMENT

10.1. Government Intervention: Areas and Roles

Chapter 6 discussed the topics of public goods and externalities, explaining briefly the need for government intervention in contemporary market economies. Governments often have to intervene in the markets either to restrict, or to enhance the activities of the private sector. ***The main areas of government intervention are the centralisation and redistribution of incomes, the provision of the institutional framework for the operations of markets, and protection of the national economy in the global environment.*** Some government actions are justified by the needs of *efficiency*, others of *fairness*. Government subsidies or tax reductions related to the implementation of energy-efficient technologies are provided for enhancing efficiency, while allowances or grants for handicapped people are provided for the sake of fairness, helping those who lack the ability to earn their own living, while maternity benefits acknowledge the social importance of the unpaid work of child-rearing.

Government intervention is organised by three main functions: stabilisation, a redistribution (fairness) and resource allocation (efficiency) (Samuelson – Nordhaus, 2010).

Stabilisation *means maintaining the institutional framework for the market economy, including government institutions, the legal system, law enforcement bodies, the mechanisms of economic control and regulation.* The government keeps a close watch on the main economic processes (inflation, employment and economic growth) trying to govern their trends and tendencies applying its policy instruments.

Redistribution *covers the tasks related to income centralisation and redistribution. Some parts of incomes are centralised in the form of taxes, and collected tax revenues are used for the purposes of transfers supporting various groups of the private sectors, while the rest is used to maintain government institutions (state organisations, police, national defence).*

Allocation *refers to the allocation of productive resources to activities that benefit the interests of the society. The citizens of the country often require goods and services that markets cannot provide therefore the government has to take care of their provision.* These activities usually imply large capital investments with doubtful, or very small returns (e.g. the public transport network, the construction of highways and motorways, etc.), or they have no measurable financial gains (e.g. public education and public health care services), but are essential for the well-being of the society.

10.2. Components of Fiscal and Monetary Policy

Economic policy *comprises of the views, decisions and actions by which the government intervenes into the national economy to attain its political and socio-economic objectives.* Economic policy defines the government's goals and the instruments to attain these goals. *The enhancement of*

the economic well-being of the country is considered to be the ultimate goal of any economic policy, and this general objective is broken down to specific objectives, smaller tasks and targets. These specific objectives are *to maintain economic stability* (stability of the price level, employment, and balance of payments), *to enhance economic growth*, *to support the structural reorganisation of the economy*, and *to influence the redistribution of incomes*.

The above objectives are all related to each other, connected at several points, and a step towards one often makes the other more difficult to attain. Economic policy should be very careful to avoid conflicting objectives, and this often requires the ranking of particular objectives, setting up priorities. *Growth-oriented economic policy* gives the priority to enhance economic growth, while *anti-inflationary economic policy* prefers measures and actions that slow down the increase of prices. Typical instruments of attaining policy objectives may affect aggregate demand or aggregate supply.

Demand side instruments *of economic policy affect aggregate demand, influencing either the goods market (and the IS curve) or the money market (the LM curve).*

Supply side instruments *affect aggregate supply, i.e. the total output of the economy, influencing the labour market (by payroll taxes and other labour-related measures), or the aggregate production function (by taxes and subsidies affecting factor prices and technological development).*

Monetary policy is a major demand side policy influencing the money market (i.e the position of the *LM* curve). **Monetary policy** *affects the amount of money in circulation, by controlling the interest rates, the reserve ratio or the foreign exchange rate*. The key institution managing monetary policy is the central bank of the country.

Fiscal policy *manages the government budget, dealing with taxes (the government's revenues), subsidies and government spending (government's expenditures).* Fiscal policy instruments include supply side instruments influencing factor prices and factor costs, and demand side instruments affecting the goods market (the *IS* curve) (Mankiw, 1997; Samuelson – Nordhaus, 2010). These approaches are summarised in *Figure 10.1*.

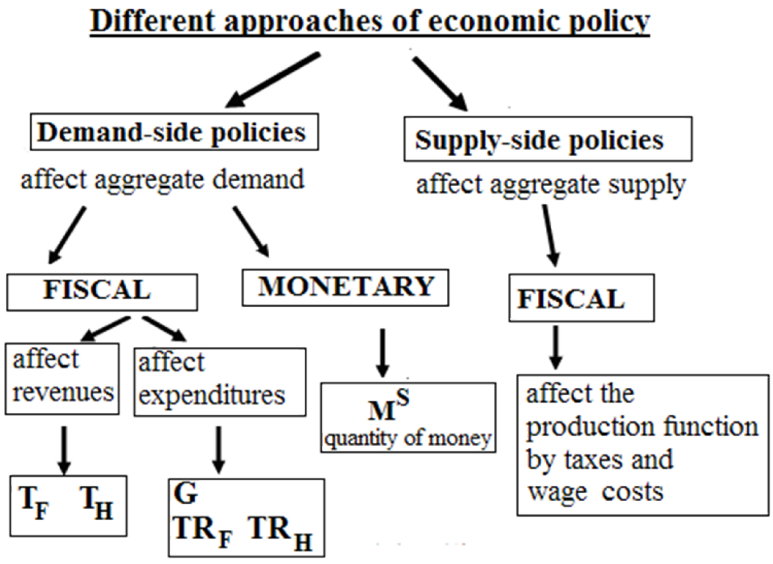


Figure 10.1: ***Economic Policy Approaches***
Source: Author's own construction.

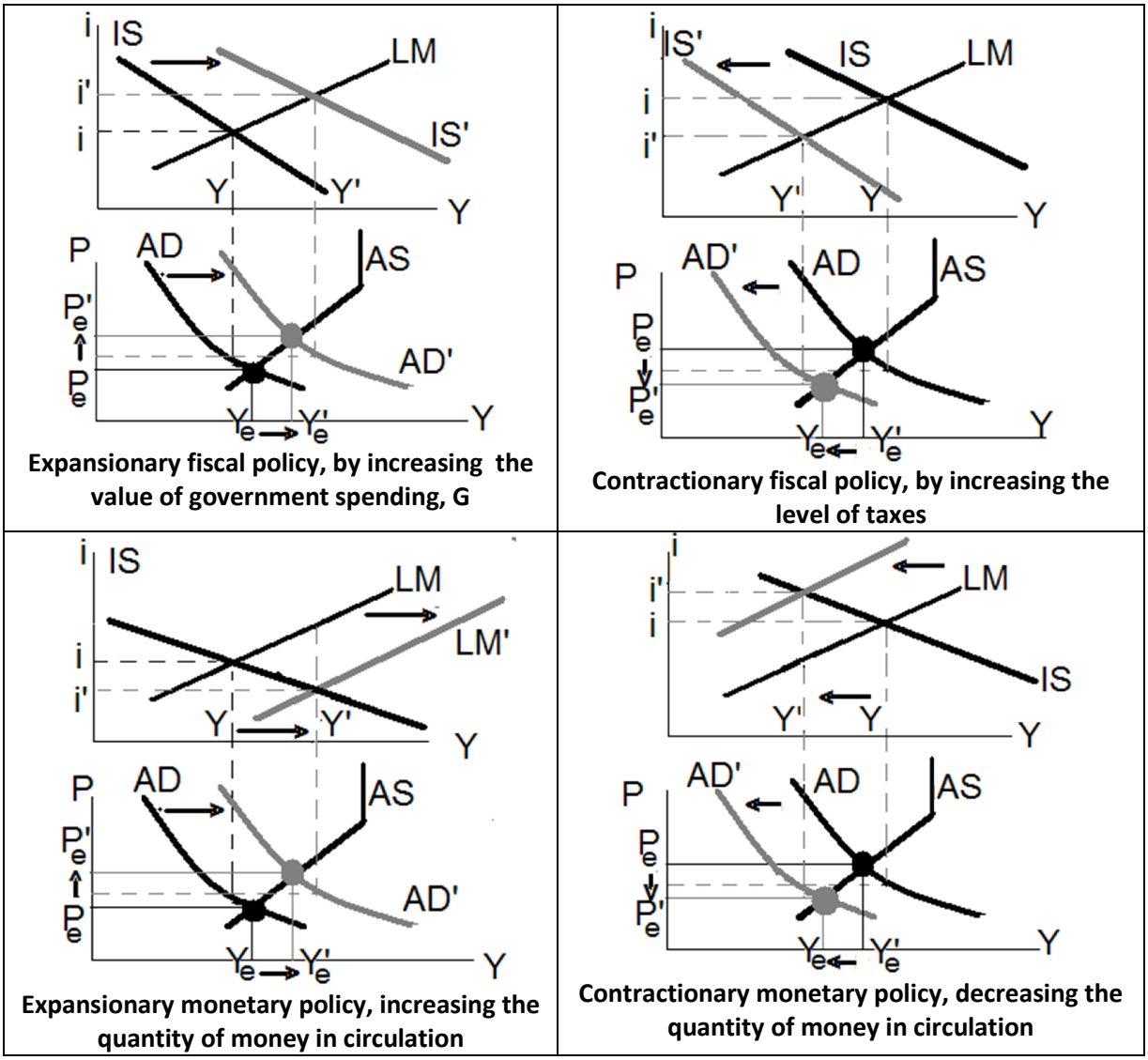


Figure 10.2: ***Fiscal and Monetary Policy in the IS-LM Model***
Source: Author's own construction

Both fiscal and monetary policy may be expansionary and contractionary. Expansionary fiscal policy focuses on the target of increasing aggregate demand, and its typical instruments are increasing government spending, increasing transfers or decreasing taxes. Contractionary fiscal policy is typically accomplished by the opposite changes of the above variables. Fiscal policy actions will shift the *IS-curve* (upward for expansionary policy and downward for contractionary policy), that lead to a similar shift of the aggregate demand curve *AD.* Monetary policy affects the position of the *LM-curve*, expansionary measures setting lower interest rates, and contractionary measures higher ones for any level income. Expansionary monetary policy increases the money supply in circulation, which shifts LM outward (downward), and increase aggregate demand, shifting the *AD* curve upward.

Contractionary monetary policy decreases the money supply, which shifts the *LM* curve upward, and the *AD* curve downward. *Figure 10.2* shows some examples of fiscal and monetary instruments.

As the ultimate aim and main priority of macroeconomic policy is to enhance economic growth, demand-side policy instruments should try to shift the *AD curve* upwards, to the left. This can be done by applying either monetary or fiscal measures. However, a move like that should be taken by care, because it may affect some other important indicators of the economy in an unfavourable way (e.g. price levels).

Let's have a closer look at an **example of expansionary fiscal policy.** As the government intends to generate an increase in *GDP* (i.e. national income *Y*), it chooses to increase government spending *G*. This step will eventually incur higher national income at any interest rate, implying higher consumption as well, and *IS* shifts upwards. The higher income raises money demand in the money market, initiating a move along the *LM* curve, towards higher interest rates. The new simultaneous equilibrium of *IS-LM* is attained at higher incomes and higher interest rates (at any *P* price level) compared to the initial situation. Therefore *AD* shifts upwards (aggregate demand increases), and in response to that aggregate supply starts to grow (generating an upward move along *AS*). The higher aggregate demand and aggregate supply sets a new *AD-AS* equilibrium at higher income and higher price level (top left panel of *Figure 10.2*). Economic growth was accomplished, but with inflation.

An **example of expansionary monetary policy** implies an increase in nominal money supply (by e.g. cutting the reserve ratio, or the refinancing interest rate set by the central bank). Therefore real money supply M^S/P grows. Therefore, at any level of national income and price level *P* the same money demand is met by larger money supply, resulting in lower interest rate in the money market. This means a downward shift of the *LM* curve. The lower interest rates increase investment demand in the goods market, leading to higher incomes in the goods market, and a downward move along the *IS* curve, towards lower interest rates and higher incomes. The new *IS-LM* equilibrium defines a lower interest rate and a higher income at the prevailing price level *P,* than before. Therefore *AD* will shift upward, and responding to increased demand aggregate supply start to grow (along *AS*). The equilibrium of aggregate demand and aggregate supply leads to higher national income and a higher price level (bottom left panel of *Figure 10.2*).

An **example of contractionary fiscal policy** introduces an increase in taxes *(T),* which decreases disposable income and the households' consumption demand. Then at any interest rate the equilibrium in the goods market will be attained at lower national income, therefore *IS* shifts downwards. The lower level of income decreases the demand in the money market, and that implies a move downward along *LM*. The new *IS-LM* equilibrium determines lower interest rates and incomes at any price level *P,* than before. Consequently, the *AD* curve shifts downward (aggregate demand decreases), and the new *AD-AS* equilibrium implies lower total output and lower price levels (top right panel of *Figure 10.2*).

An **example of contractionary monetary policy** may start by a decrease in the nominal money supply, which leads to the fall of real money supply M^S/P. The lower real money supply is met by the same money demand (for any income and price levels), leading to a rise in the interest rate, with *LM* shifting upward (to the left). The higher interest rates decrease investment demand in the goods market, therefore total demand in the goods market is falling, implying a move upward along *IS,* towards higher interest rates and lower incomes. The new *IS-LM* equilibrium will be achieved at

higher interest rates and lower incomes for any price level *P,* than before. Therefore *AD* will shift downward, and aggregate demand starts to fall (implying a downward move along *AS)*. The equilibrium of aggregate demand and aggregate supply is attained at lower national income and lower price level (bottom right panel of *Figure 10.2*).

The **Government (State) budget** is an account that presents all the revenues and expenditures of the government. Taxes collected from households and firms are listed in the revenue side, while government spendings, transfers (grants, subsidies) to the private sectors, are listed in the expenditure side, and government savings are equal to revenues minus expenditures. The **budget is balanced** when the value of revenues and the value of expenditures are equal, with savings being zero (i.e. tax receipts exactly cover all government spendings and transfers). The **government runs a budget surplus** when budget revenues are higher than the sum of expenditures, implying positive savings of the government. Only a few countries of the world manage to have a balanced budget, or run budget surpluses. The government runs a budget deficit when the sum of all expenditures (i.e. government spending and transfers) is higher than the collected tax revenues. This implyes negative government saving, i.e. the government has to borrow money to cover all the expenditures. Most of the countries of the world run considerable budget deficits. Budget deficit is usually measured as a percentage of the annual *GDP,* and it is a major objective of macroeconomic policy to keep this figure low. The accession criteria of the Eurozone specify an upper threshold value of *3 %* for this figure. The problem of budget deficit is related to many social issues of government policy, because to decrease deficit governments often have to cut back transfers and provide less of public services.

10.3. The Foreign Balance of Payments, Government Deficit and Debt

Most countries in the world are connected to each other by many linkages. Some of these are related to the goods markets, and are represented by the foreign trade relationships involving exports and imports of goods and services. Countries are connected to international financial markets by international capital flows and by the exchange rates of the national currency. Another important link is the international movement of labour and migration. A country is considered to be an open economy when the sum of its export and import is high compared to its *GDP*. Export and import in the USA are around *15-20%* of the annual GDP, while the same values are about *80 %* in Hungary.

The foreign balance of payments records the total outcome of the above transactions. The ***foreign balance of payments*** *accounts for all the economic transactions of a country and its residents with the rest of the world.* The structure of the foreign balance of payments, as is illustrated in Table 10.1, was established by IMF in 1993. The account contains three main components. The **current account** records all current payments and receipts, including international flows related to merchandise trade, trade in services, factor payments (incomes of labour and capital), and unilateral transfers. The **capital and financial account** records international inflows and outflows of capital investments (i.e. transactions of capital assets and property), *unilateral capital flows,* or *current capital transfers* (e.g, investment grants and international debt relief) and international *financial asset flows* (foreign direct investments, portfolio investments and international loans) (Samuelson –

Nordhaus, 2010; Sloman, 2006). The third component of the balance of payments is the **change in the central bank's official foreign currency reserves.** This refers to the corrections that the central bank performs, when the net balance of the current account and the capital account differ from zero. This means, that *the net balance of the current account plus the net balance of the capital account plus the change in the official central bank reserves equals zero.* The **foreign trade balance** is the difference of export and imports. **The overall balance of payments** is equal to the net balance of the current account plus the net balance of the capital account.

Table 10.1: ***The Structure of the Balance of Payments***

	DEBITS *(PAYMENTS)*	**CREDITS *(RECEIPTS)***
I. Current Account		
Trade-in-goods balance	Merchandise import	Merchandise export
Trade-in-services balance	Import of services Outflows	Export of services Inflows
Factor incomes	Outflows	Inflows
Unilateral (current) transfers		Inflows
IIa. Capital Account		
Unilateral capital asset flows		
IIb. Financial Account	Capital outflows	Capital inflows
Flow of financial assets	(Export of capital)	(Import of capital)
III. Change in central bank's official foreign currency reserves	Increase in foreign currency reserves when the net balance of I. and II. is positive	Decrease in foreign currency reserves when the net balance of I. and II. is negative

Source: Author's own construction based on Sloman (2006).

When the sum of payments is higher than the sum of receipts the balance of payments is in deficit. In such situations the central bank should cover the difference from its official foreign currency reserves. If reserves cannot cover all the deficit, then the country must borrow foreign currency from abroad. This loan, however, incurs interest payments, and loan repayment in foreign currency, in the future years. Interest payment is a new obligation in the payment side of the current account, while the repayment of the principal is a new obligation in the payment side of the financial account. These two new payment obligations will further increase the deficit of the balance of payments in the future. If the country is unable to decrease its international payment obligations or increase its international receipts, the same problem is repeated each year, new loans will be needed to finance the deficit, the interest payment and loan repayment obligations still lead to deteriorating foreign balance of payments. The country soon finds itself in a *debt trap*, leading eventually to *insolvency or bankruptcy*. The way out of this situation is twofold: a considerable cut of foreign currency expenditures (e.g imports) and a significant increase of revenues (e.g. of export) can help, but these cannot be accomplished without a considerable improvement of the country's macroeconomic performance.

The ***level of indebtedness*** of a country compares the total debts of the country to another economic indicator, such as the number of population, the values of national wealth or the annual *GDP*. The first two are not very useful, because they cannot tell us anything about the possibility of

decreasing the debt. The third one, the ***ratio of total debt to annual GDP,*** is a widely used indicator of macroeconomic performance. The value of debt depends to a great extent on the exchange rate of the national currency, as annual GDP is generated and measured in national currency, while foreign debt is usually recorded and should be repaid in some foreign currency. The obligation of **debt service** consists of *interest payments on the loan* and the *repayment of the principal* itself. The **debt service ratio** *compares the value of the annual debt service obligation to the total receipts of the current account.* Debt service payment should be accomplished in foreign currency, and the annual source of foreign currency for the country is the inflows (receipts) of the current account. As a summary, the following indicators are used to measure foreign indebtedness:

- *Level of indebtedness = total value of debts / annual GDP (%).*
- *Debt service = annual repayment of the principal + interest payment on the loan.*
- *Debt service ratio = debt service / total receipts in the current account.*

10.4. Economic Growth and Development

The issue of economic growth is a complex problem. It is related not only to production and output of a country, but involves aspects of social, political, and cultural conditions, because the long-run trends of production are closely related to the socio-economic environment of the country.

Economic growth *means an increase in the productive capacity of an economy, that facilitates the production of increasing amounts of goods and services to satisfy the consumption demand of its population.* Economic growth should take place as *sustainable growth*, i.e., the country should use its productive resources in a way, that does not diminish the consumption and growth opportunities for future generations. The concept of growth refers primarily to quantitative growth, i.e. more goods and services produced and higher incomes attained than before, while the notion of *development* implies not only more output and income, but an improved quality of life for the population as well.

Development *is a broader concept than growth, because it includes not only an increased capacity to produce consumption goods, but the opportunity to improve health care and education services, infrastructure, cultural enrichment and freedom for the population, too.*

Many countries in the world possess relatively low levels and low annual growth rates of *GDP*, while they enjoy a reasonably good quality of life; in the other extreme a few countries with very high *GPD* levels and growth rates suffer from severe social inequalities.

Economic growth is usually measured by the annual change of the real GDP expressed as a percentage of the real GDP attained in the previous year.

National output is determined by the aggregate production function and the employed amounts of labour and capital, as it was discussed in Chapter 9. Therefore *economic growth* is essentially determined by the quantities of labour and capital and their qualities, as well as the factors affecting their productivity: the *growth rate of the labour force, the growth rate of labour productivity, the growth rate of capital assets, and technological development*. **Technological development** *includes the invention and implementation of new production processes, resulting in increased quantities of output at the original level of input use.* Theories of economic growth usually

explain the growth of output by these factors. One of the most widely accepted models of economic growth is the *Solow's neoclassical growth model,* which describes output and national income by the formula $Y=A \times f(K,L)$ (Mankiw, 1997; Samuelson − Nordhaus, 2010). *K* and *L* denoting the quantities of capital and labour, *f* representing the way how these resources are turned into output, and *A* being a coefficient of technological development. The model explains economic growth by the growth of labour (*L*), the growth in labour productivity (i.e. output per unit of labour *Y/L*), the growth of the capital stock per labour (*K/L*), and the impact of innovation and technological development (*A*) that can enhance the impact of the former factors.

Economic growth measured as the growth of total *GDP* neglects the fact, that increasing *GDP* does not always mean increasing *per capita GDP* (and, therefore better consumption opportunities for the population), as the total growth of the population might be faster than the growth of *GDP.* Therefore the *annual growth rate of the per capita GDP (*measured in % of the *GDP* per capita in the previous year), is a more realistic measure of economic growth. Denoting the annual *GDP* of the actual year by Y_t, and the actual population by N_t, the annual *GDP* per capita in year *t* is computed as $y_t=Y_t/N_t$. The growth rate of y_t is $g_t\ (\%) = 100 \times (y_t - y_{t-1}) / y_{t-1}$. The calculations should be done using real *GDP* values, applying the constant price level of a selected base year otherwise the computed growth rates might show nominal growth caused by price rises although output may be the same.

The well-being of a nation cannot be correctly assessed relying only on the growth rate of *GDP* per capita, the most popular indicator of economic growth (Soubbotina, 2004). Neither the value of the *GDP* per capita, nor its growth rate reflects the following problems (Sen, 1999):

- The value of *GDP* per capita, being an average figure, may include severe inequalities, as a high average may be attained when a small proportion of the population enjoys extremely high incomes, and huge masses of people live in the extreme poverty and deprivation.
- Some of the incomes accounted for in *GDP* are actually associated with damage or harmful activities: car crashes, road accidents, severe injuries do not improve the well-being of the society, although they increase the income of car repair mechanics and the medical staff; an environmental disaster cause harm and misery to the people, but increases the incomes of those involved in the rehabilitation of the area. Increasing *GDP* is often associated with activities that actually worsen the living conditions and the quality of life for the people.
- *GDP* does not take into account the change in the environmental conditions, the damages and losses of natural resources caused by pollution or excess use.
- *GDP* cannot measure the amount of labour and time required to earn the same income, the value of leisure time, as a component of well-being is completely neglected.
- *GDP* cannot measure all the outputs produced in the economy: it cannot account for the incomes earned by illegal economic activities, nor for the value of unpaid housework, or child rearing.
- High income does not automatically implies high quality of life. The struggle for high income creates stress and induces diseases typical of rich civilised societies, while high income groups of welfare societies often indulge in unhealthy consumption (alcohol, smoking, too much food, purchase of needless products).

To account for the quality of life of a nation the GDP or its per capita version are not satisfactory indicators. Economists and social scientists have developed several new indicators in the past decades with the purpose of amending the deficiencies of *GDP* as a welfare indicator. Nordhaus and Tobin (1972) introduced *MEW (Measure of Economic Welfare*), as an attempt to improve the contents of *GDP*. *ISEW (Index of Sustainable Economic Welfare,* Cobb et al., 1995), an improvement to *MEW* includes a refined evaluation of the environmental conditions of a country. Another well-known indicator, the *Ecological Footprint,* focuses on the state of the environment (Daly, 1997). Detailed discussion of these indicators is out of the scope of the present text, the interested reader can find more on them in the referred literature.

Table 10.2: ***HDI and Its Components, 2011***

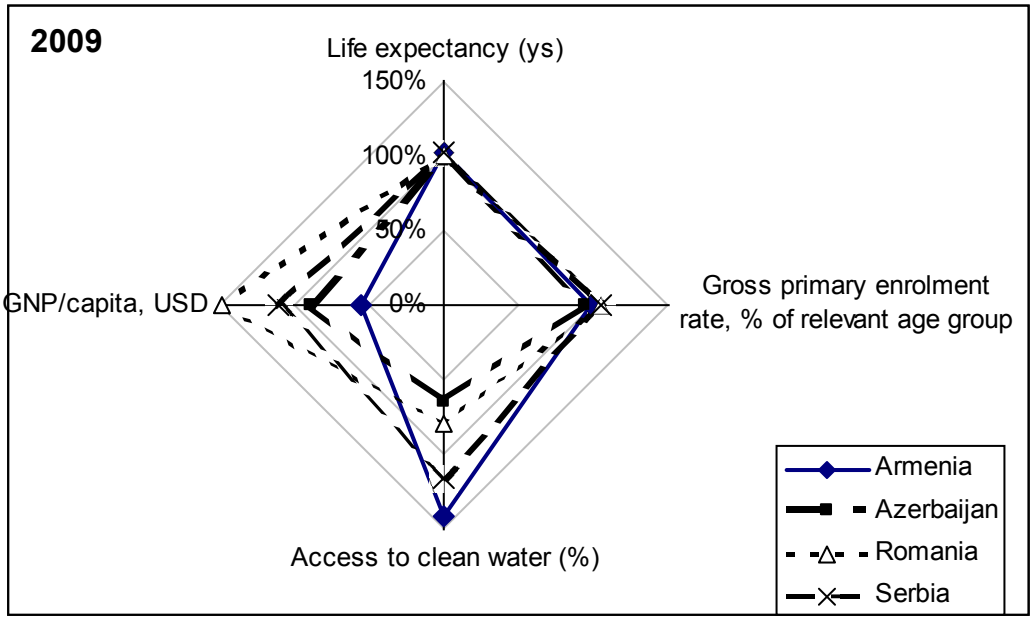
Country	HDI value (rank)	Life expectancy, years	Average school years accomplished	GNI/capita USD, in purchasing power parity
Norway	***0.943 (1.)***	81.1	12.6	47557
USA	***0.910 (4.)***	80.7	12.4	43017
Slovenia	***0.884 (21.)***	79.3	11.6	24914
United Arab Emirates	***0.846 (30.)***	76.5	9.3	59993
Hungary	***0.816 (38.)***	74.4	11.1	16581

Source: Author's own construction based on data of *HDR (2011)*

A widely used indicator for measuring the quality of life is *HDI (Human Development Index*). It was established by the *United Nations Development Programme (UNDP*) in 1990, with the purpose of creating a development indicator that includes not only the per capita income (*GDP*), but the health status and educational level of the population as well. The health status of a country is measured by the average life expectancy of the population at birth, the educational level by the average school years accomplished by the adult population, and income by the per capita *GDP* (Todaro, 2000; HDR 2011). *HDI* is an index number between *0* and *1,* the higher values indicating higher level of development. The Human Development Report (HDR, 2011) lists the countries of the world ranking them by their *HDI* values, and showing the values of the components of HDI as well. It is worth considering that some countries with high per capita GDP attain rather low HDI values, while others get relatively high HDI at lower per capita GDP *(Table 10.2*).

The *Development Diamond* is another multidimensional indicator of development often used by the World Bank *(Figure 10.3*). This is based on four components – life expectancy at birth, educational level (gross primary enrolment rate) of the population, access to clean water, and *GNI (*or *GNP)* per capita, to assess the level of development of a country (*Soubbotina, 2004*).

In spite of the wide range of new indicators (of which only a few was mentioned here), most of the international comparisons still rely on the per capita values of *GDP* or *GNI*. The *United Nations* use the *HDI* to compare and classify countries by their level of development, defining the following categories: very high level of human development: values above *0.79* ; high human development: values from *0.69* to *0.78;*, medium level of human development: from *0.52* to *0.69* ; low level of human development: below *0.52* (HDR, 2011).



Note: The value of 100% measures the average value of the respective indicators for the four countries

Figure 10.3: ***The Development Diamond***
Source: Author's own construction based on data of http://data.un.org (accessed: 21st Sept 2012)

10.5. Business Cycles

Actual growth rates are rarely constant. In some years, countries experience high rates of economic growth, in other years growth slows down or turn negative: the economic performance fluctuates between booms and recessions. Such cyclical fluctuations of economic performance are called *business cycles*.

Expansion *is a period of rapid economic growth of output (GDP),* ***recession*** *is a period of economic slowdown, with declining GDP. Phases of* expansion and recession follow each other periodically, while the long-run trend of economic performance (i.e. total output) shows a growing pattern. The repeated regular pattern of upward or downward swings around a long-term trend, the periodical repetition of expansion and recession is called *business cycle*. The fluctuations are characterised by *the length, and the magnitude of the phases; the* ***business cycle*** *itself is the period between two successive phases of expansions (or recessions).*

Figure 10.4 illustrates the phases of the business cycle. The line of positive slope shows *the long-term growth trend of the output*, the waving curve illustrates the actual pattern of output. The rising section of the curve above the trend line is called *expansion,* which, reaching the peak, turns to *slowdown,* a decreasing section still above the trend line. The decline continuing below the trend line is called *recession*. Reaching the trough (the deepest point of recession), the curve slowly turns back to increase, starting the phase of *upturn or recovery*. The phase of recovery ends when output

reaches the level of the long-term trend, and then the process continues with expansion again (Sloman, 2006). The notion of recession is often used for the successive phases of slowdown and recession, and expansion is often identified with the successive phases of upturn and expansion (Samuelson – Nordhaus, 2010).

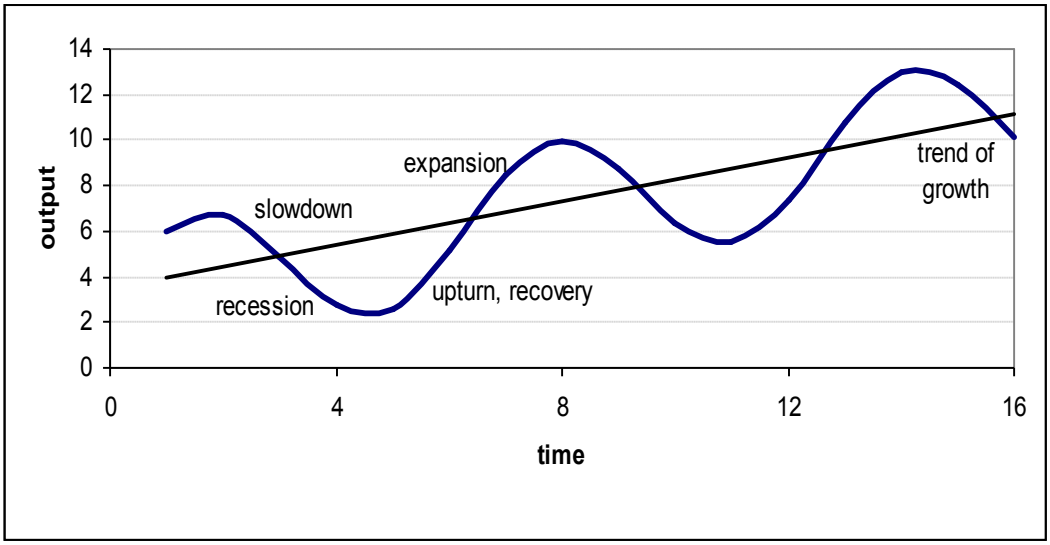


Figure 10.4: ***The Business Cycle***
Source: Author's own construction based on Sloman (1997)

Business cycles may be classified by **the area of the economy** where the fluctuations are experienced, or by the length of the cycle. There are financial cycles, agricultural cycles, investment cycles and general economic cycles by economic area, and *seasonal fluctuations, classical business cycles, Kuznets-cycles, Kondratyev-cycles and super- long cycles are distinguished* by their length.

- ***Seasonal fluctuations*** are cycles shorter than one year, typically occurring in the area of finance.
- ***Classical business cycles*** are of a few years in length, as the 2-year hog-cycle in agricultural production, or the *Kitchin-cycle* of *3-5* years occurring in the financial and banking sector, and in the inventories, and the *8-10* year long *Juglar-cycle*.
- ***Kuznets-cycles*** are *15-20*-year cycles, experienced in fixed capital formation, in the buildings and construction industry and in ship-building.
- ***Kondratyev-cycles*** take *40-60* years, experienced in the total output of the national economy, present in the empirical data of economic history, although their theoretical explanation is still insufficient.
- **Super-long cycles** are the cycles longer than *100* (or even *150-200*) years, long-term trends of agricultural production, and scientific and technological development may belong to this category.

Classical business cycles emerge as a result of disequilibrium between aggregate demand and aggregate supply (Samuelson – Nordhaus, 2010). A supply-side disturbance or a demand-side one

may turn the equilibrium to disequilibrium inducing a cyclical fluctuation (Sloman, 2006). When an external shock *suddenly increases aggregate demand*, the output inventories suddenly start to decrease. As a response, producers start to *increase production*, so they start to employ more productive resources than before. Therefore owners of these productive resources receive increasing incomes. These *increasing incomes* induce further increase in aggregate demand. As producers increase production, *employment will also increase* (unemployment falls), and *investments will also grow*. These processes increase production still further, and this *cumulative process* generates *expansion* in the economy. Eventually the process will stop, because reaching the level of *full employment* the number of workers cannot increase any more, and therefore the rise of incomes and consumption will also stop (this is called the **peak of the cycle**).

After reaching the peak, *the growth of production starts to slow down, slowing down the growth of incomes as well. Consumption will not grow any further*, and *output inventories start to accumulate. Therefore producers start to decrease the level of investments and the production of output. The decreasing production requires less labour,* producers dismiss some of their workers and unemployment increases. Consequently incomes also decrease, which *further decreases consumption*, and that again implies *decreasing production, investment and employment,* starting again a *cumulative process of recession.* After some time recession will stop because output inventories clear up and production must be re-started, therefore producers will make *replacement investments* to maintain their productive capacities (this is called the ***trough of the cycle).*** The re-starting of production leads to a slow increase of employment and incomes, and that *initiates the process of recovery* (upturn).

Various processes move together with production, some in the same direction, some in the opposite one. Investments, employment, intended inventories, and price level *change together with production,* (i.e. increase in expansion and decrease in recession), while unemployment and the not intended inventories *change opposite to production* (decrease in expansion and increase in recession). Investments and aggregate demand change *before the change is experienced in production,* while inventories and employment change *after the change in production*.

The reasons leading to **fluctuations and cyclical behaviour** may be external or internal factors (Sloman, 2006; Samuelson – Nordhaus, 2010). **External causes** include social and political events (wars, revolutions), or changes in the natural environment (natural disasters, or exhaustion of some natural resources), while the most typical **internal cause** is the change in investment behaviour**.**

Unpredictable, irregular shock-like fluctuations are harmful for the economy, the uncertain economic conditions make business decisions difficult, and discourage investments, eventually slowing down economic growth. Therefore economists recommend government intervention to smooth out the business cycle. Other economists say, some fluctuation is a natural phenomenon of the market economy, and any action trying to prevent the market mechanisms will disturb the normal processes of the economy causing more harm than benefit.

Economic policy usually attempts to diminish fluctuations. Governments often use various instruments for intervention, including fiscal and monetary policy measures. The key to successful intervention is to predict the cyclical pattern as precisely as possible. The analysis of economic time series that change before the change in production can be useful in predicting business cycles. The other favoured possibility is the regular calculation of business confidence indices based on surveys

among economic agents. The discussion of these tools is beyond the scope of the present textbook, and should be the topic of a more advanced analysis.

Review Questions

1) What are the main tasks and functions of the government in the national economy?
2) Explain the concept of economic policy, and list the main policy approaches. What are fiscal and monetary policy?
3) Explain the structure of the government budget, and the meaning of budget surplus and budget deficit.
4) Illustrate by the IS-LM model the impacts of the following events on interest rate, national income, consumption and investment:
   a. The central bank increases the money supply.
   b. The government increases its expenditures.
   c. The government raises taxes.
   d. The government increases its expenditure and the taxes by the same amount.
5) Assume that the government intends to increase investments, while keeping the level of output the same. Show in the IS-LM model the possible measures of monetary and fiscal policy that attain this aim.
6) Look for historical examples when the government decreased taxes and, as a result, run a high budget deficit.
7) Describe the structure of the foreign balance of payments.
8) How can we measure the level of indebtedness of a country? What is debt service ratio, and how can a country find itself in a debt trap?
9) Explain the notion of economic growth and the way to measure it. Is development the same thing as growth? Explain your answer.
10) How can we measure the welfare of a country, the quality of life of its inhabitants?
11) Describe the properties of business cycles, and classify them by their length.
12) Describe the process of the business cycle, explain its phases.

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Manuscript closed: 24th November, 2014

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The project is supported by the European Union.

The curriculum was supported by TAMOP-4.1.1C-12/1/KONV-2012-0011, "Pannon model" - implementation of regional, sectoral cooperation in higher education in the field of food safety and gastronomy" project