

THE HUMAN CAPITAL AS THE PRODUCTION FACTOR

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Abstract: *Economic growth is the objective of economic policies in many countries. View of what constitutes major production factors and sources of economic growth, historically evolved. In the past, there existed the combined production of various production inputs in different types of human society. The article discusses the importance of human capital and learning as a form of investment in human capital in the formation of production functions and the achievement of extensive and intensive economic growth.*

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JEL Classification: *E22, E23, E24.*

1. Introduction

Growth of the total output of the economy - economic growth - is one of the main objectives of the economic policies of current governments. Economic growth is achieved by extensive or intensive use of production factors. *Extensive growth* is the result of increasing the quantity of used production factors. Basic factors of production are land, labour and capital. *Intensive economic growth* is caused by the increase in production per unit of input. This type of economic growth is influenced by the quality, efficiency and manner of combining production factors. There are extensive and intensive growth resources. Human capital is an important source of extensive and intensive growth, too. There are different opinions and different economic schools about importance of the human capital as economic input. Opinions on it are different in different economic schools depending on the conditions in which the economy worked, depending on the extent and level of processing available knowledge.

The article's aim is to summarize the evolution of views of the role of human capital as source of economic growth and to show the possibility of increasing its value in current economic conditions.

2. The Human Capital as Source of Economic Growth

Extensive economic growth is achieved by increasing the number of production factors. **The land** as production factor includes all components of the natural environment. This source is often used for marking natural sources, but some economists connected this factor with capital. It was the decisive factor of production to achieve growth, in the period before the Industrial Revolution. The most of the workforce is employed in agriculture in many developing countries, currently. If economic growth rate is too high, then there is the depletion of natural sources. For this reason, we are talking about sustainable growth not leading to their depletion.

The labour is another source of economic growth, which is achieved through the increase of labour force. It is influenced by demographic trends, amount of labour force, scientific and technical progress level, the social division of labour and labour productivity in various sectors. Present modern technologies require fully skilled workers for the operation and maintenance. Therefore it is necessary to increase the labour force qualification.

The capital is a rare resource. The term capital is very wide and capital as a source of economic growth includes buildings, machinery, equipment, technology. A prerequisite of capital accumulation is the creation of savings. Capital accumulation changes the ratio between production factors. At present, capital accumulation is increasingly directed to education and research. The economists demerged capital on physical and human capital in the 80-ies of the 20th century.

The human capital includes the natural ability, innate and acquired skills, knowledge, experience, talent, inventiveness. All these characteristics are components of the human capital. The essence of creation, increasing the value and effectiveness of human capital, is spending money now but expected benefits will flow in future. Forms of increasing the value of human capital are expenditure oriented for example to health, safety, science, research and education.

Intensive economic growth is reflected in the product increase in conjunct with unchanged inputs. The intensive growth factors include the technical progress and enhancement of the total factors productivity.

Technological progress is reflected by developing new and better capital goods and technologies. It is supported by large innovations. The application of technical progress requires the introduction of more modern and better management methods, work organization, career development, increasing education level of managers and workers who work with new technologies. Technological progress requires a rising level of education and research. But particularly highly skilled and educated people contribute to technical progress, through innovations. In this way, technological progress leads to increasing productivity and efficiency of all production factors.

Aggregate productivity growth occurs, when the product increases by effective use of inputs, with the same quantity of production factors. This is reflected in:

- labour productivity – increase in volume of the real product that created a employee,
- efficiency of capital growth – it is reflected in a higher volume of real product, which falls on the capital unit employed,
- decline in material and energy intensity of production - reducing the quantity of material and energy needed to produce a unit of product.

Determinants of aggregate productivity factors are: the level of work organization, technology, technical support, the level of education, motivation of employees to increase their performance, and also the natural and soil conditions. In the current period, which is characterized by rapid and extensive introduction of technical

innovations, education is the most important factor. It contributes to the technological progress, factors productivity growth, increasing value of the human capital and overall economic growth. New knowledge and skills must be adapted to current needs and possibilities of concrete firms and economies in an innovative and creative way. Economists Th. Schultz and E. Denison emphasized investments in education contribute to economic growth and its accelerating, already in the 50-ies and 60-ies of the 20th century.

3. The Human Capital in Production Functions

The views about which are the key factors of production, are not uniform and historically have gradually changed. This caused the forming of the same production functions, which included various combinations of production factors to achieve the desired output of the economy.

Neoclassical theories of economic growth (from 50-ies of the 20th century) examined economic increase in term of supply of production factors. They considered the capital and labour as the basic production factors. Theories accepted substitution of these factors and natural resources included into the capital. Those theories were based on the *general production function*:

$$Y = f(L, K),$$

and its advanced form, called *Cobb-Douglas production function*:

$$Y = A \cdot L^\alpha \cdot K^\beta$$

where:

- Y real product (Gross Domestic Product),
- L quantity of consumed workload,
- K quantity of consumed capital,
- A the influence of other, immeasurable factors,
- α, β labour and capital elasticity coefficient ($\alpha + \beta = 1$).

This production function was extended by American economist R. Solow by another growth factor - technological progress. He saw the technology as an autonomous ongoing at the time, thus as an exponential function in the time. Solow said the economy continuously increasing its savings rate, will have a higher level of production, but this economy will not achieve a consistently higher rate of economic growth. Permanent growth rate of production per unit of labour input depends on the rate of technological progress and not the savings rate. [7]

The recognition of technological progress as a new factor of economic growth means a qualitative change in the development of growth theories. Solow edited general shape of the production function as follows:

$$Y = f(L, K, t)$$

where:

- t technical changes as a function of time.

Following the introduction of neutral technical progress the form of production function can be developed - Cobb-Douglas function - modified:

$$Y = A \cdot L^{\alpha} \cdot K^{\beta} \cdot e^{rt}$$

where:

e^{rt} time factor, which reflects the influence of qualitative changes in production, including technological progress.

New theories of economic growth – theories of endogenous growth (80-ies and 90-ies of 20th century) brought further change. They divided the capital as a production factor and source of economic growth into physical and human capital. Physical capital is created by machinery and technical equipment. The human capital is characterized as the sum of the individual congenital and acquired skills, knowledge, experience of individuals. Endogenous growth theories can be divided into two basic groups.

The first group considers the most important factor of economic growth as a result of innovation, scientific research and development. The leaders of this group are P. Romer, G. Grossman.

According to the second group including R. Lucas, P. Romero, S. Rebelo, technical progress is related to investment in the human capital. Production function in endogenous theories of economic growth takes the form:

$$Y = A \cdot K$$

where:

Y real product (output) economy,

A coefficient reflecting the level of technique and technology,

K capital - including physical and human capital.

New growth theories also explain the paradoxical situation, where investment in physical capital without increasing the level of education of the population does not lead to economic growth. By contrast, investment in education and science, are ineffective if they exceed the absorptive capacity of the other production factors. [3]

N. G. Mankiw, D. Romer and D. R. Weil included in the original Solow model a new factor, human capital, in 90-ies of the 20th century, as follows:

$$Y = A \cdot L^{\alpha} \cdot K^{(1-\alpha-\beta)} \cdot H^{\beta}$$

where:

H human capital stock.

The importance of human capital for economic increase can be characterized in relation to the implementation of structural changes that contribute not only to quantitative, but mainly to qualitative changes in the development of society and its output.

4. The Combination of Production Factors from the Aspect of Society Historical Development

Structural changes caused, that at various stages of society development the importance and the combination of key production factors varied. If we look at the use of production factors in terms of historical development of society, then in the long term **agrarian society** considered the land as a key factor in combination with *heavy physical labour*.

Several millennia-long primacy of land was terminated by the industrial revolution in England in 1760 and this was the start of an **industrial society**. The *capital* - again in combination with the *physical labour* - was the most important production factor in this type of society. Industrial society included the development of mechanization, automation, introduction of new technologies and techniques leading to higher labour productivity and to economization the labour force.

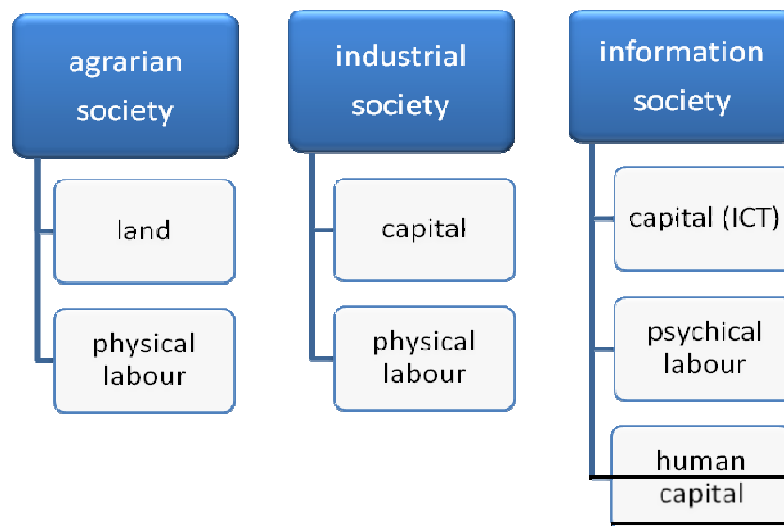


Fig. 1: The combination of key production factors from the aspect of historical development of human society

Source: (own design)

Industrial society was replaced by the **information society** (or post-industrial, knowledge society) in the U.S.A. in the 50-ies years of the 20th century. As a result of globalization and strong competition fight, important innovations, massive use of information and communication technologies (ICT) are very important in this type of human society.

Introduction of robotics increases the importance of *psychical labour* to the detriment of physical labour. The *human capital* began to be regarded as an important source of economic growth.

The basic prerequisite for the successful building an information society is a high level of education in economic subjects. Education is therefore crucial and from the perspective of ICT it has two levels. It is education in computer science. Here the education is the subject and object of science, too and the education is designed to prepare professionals in the field of informatics. The second plane is about education in other areas using the methods and means of informatics, when we talk about informatization of education.

5. Importance of Education for Economic Growth and for Increasing the Value of Human Capital

Education is the process of purposeful mediation, active creating and acquisition of knowledge, practical experience, creating of interest and attitudes. Education and training is currently considered as one of the major factors for recovery of economic growth and development, growth of welfare of individuals and international competitiveness.

Intensive technical development brings new discoveries, new and rapidly changing technology, a new focus on the technical level, quality of services based primarily on the customer and his needs.

New and dynamically changing market environment forces companies to maintain its competitiveness in order to constantly provide customers with exceptional value and creative search for ever new ways to create this value, how about it and how to inform their target market to provide. [1]

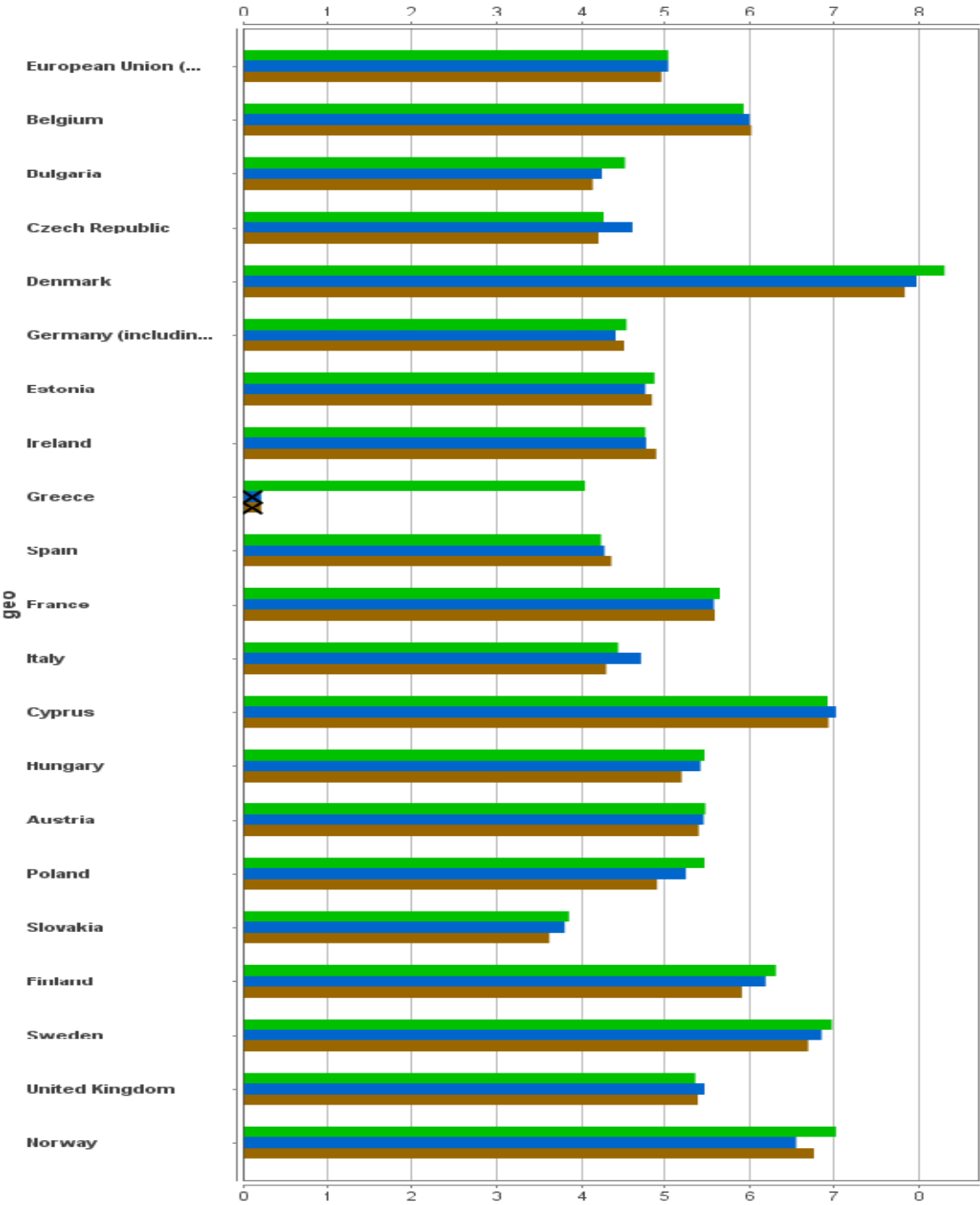
All this requires constant improvement and expansion of knowledge, skills, formation of professional skills of employees.

We know different **types of education**. *Formal education* is obtained, when the individual is not employed. It provides primary, secondary and higher education. *Informal education* acquire during employment. This may be general (exchangeable) or special (unalterable) education. General education is focused on the ability to obtain information, to understand and analyze it. Special training is aimed at creating a special qualification for a special type of work. Informal learning is considered a natural part of everyday life. It is not made deliberately.

Expenditure on education oriented to achieve, sustain and enhance the range of skills and abilities of people are considered to be **investments**, because they contribute to output growth in the future. Investments represent a form of increasing the value of human capital as one of the production factors. Investments allowing the creation of a strong and flexible labour force being able to respond flexibly and rapidly to changes are associated with the globalization process and the transition to an information society.

These conclusions are effectively applied in their economic policies, especially northern European countries, where public expenditure on education relative to GDP ranks among the highest in the world in the long term (Fig.2). Indicator (public expenditure/GDP * 100) value depends on the size of GDP. Fluctuation in GDP relativises the results obtained and also cause changes in the value of this indicator.

Level of public expenditure on education in Slovakia is low and it is below the average level of countries in European Union in the long run. Data in the graph do not include development in 2008-2009, but results will be likely substantially worse than in 2007 for most countries due to global economic crisis.



Greece published data only for 2005

Fig.2: Total public expenditure on education (percent of GDP) 2005-2007 in selected European countries

Source: (www.epp.eurostat.ec.europa.eu)

6. Conclusion

Knowledge-based society requires more and more expertise, and therefore it promotes lifelong education, improvement of scientific and research activities for continuous self-education and improving the quality of work skills and habits that bring a positive effect on economic performance. [5]

Changes in economic development today and in future will require increased investment in human capital, especially in education at all its levels. Therefore it is important to pay attention to education and lifelong learning of citizens. It is the best investment that activates the human and the whole nation. Economists of past and present economic schools emphasize just that.

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