



UDC 330.34

## INTERCONNECTION OF THE ECONOMIC GROWTH CONCEPTS WITH INTERNATIONAL TECHNOLOGY TRANSFER

### ВЗАЄМОЗВ'ЯЗОК КОНЦЕПЦІЇ ЕКОНОМІЧНОГО ЗРОСТАННЯ З МІЖНАРОДНИМ ТРАНСФЕРОМ ТЕХНОЛОГІЙ

Kohut M.V. / Когут М.В.

*PhD in Economics, as.prof./к.е.н., в.о.доц.*

ORCID ID: 0000-0001-8275-134X

*Lviv National University of Nature Management,**Dublyany, Volodymyra Velykyho Street 1, 30831**Львівський національний університет природокористування**Дубляни, вулиця Володимира Великого 1, 30831*

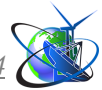
**Abstract.** This article summarizes and systematizes the theoretical approaches of representatives of economic science to international technology transfer and economic growth. The evolution and defining provisions of the main theories of economic growth are analyzed. This made it possible to assess the role and significance of international technology transfer from the point of view of each of the considered concepts. Based on the analysis of theoretical concepts of economic growth, a classification of factors affecting economic growth is proposed. The classification was carried out by groups, in particular: investment, innovation, economic, demographic, natural, psychological and force majeure. The role and significance of innovative activity and international technology transfer for economic growth in the conditions of a globalized economy are also outlined.

**Keywords:** innovations, international technology transfer, world economy, globalization.

**Introduction.** The problem of economic growth has existed at least since the birth of the classical economy in the late XVIII century. However, for a long time the understanding of economic development was narrowed to the category of quantitative growth, mainly taking into account only economic factors. Only the achievements of the growth economy of the twentieth century made a difference when the study of economic change began to attach importance to the importance of qualitative factors of a non-economic nature. In particular, these non-economic factors are largely related to generally accepted social development. Thus, various theories of socio-economic growth have emerged.

Their cognitive and applied value is a problem of this article research. Since the aim of the article is to present the evolution of theories included in the growth economy of the 20th century, we put forward the following thesis. Given the current problems of development, referring to historical sources, their correct understanding and interpretation allows us to formulate important conclusions for the present and set more precise goals for the future. It also makes it possible to avoid mistakes in current socio-economic policy. Proper theoretical orientation is needed to be able to make optimal decisions in the development and implementation of development measures at the local, regional, national and global levels.

The study of the concepts of economic growth has always been the focus of economics. Understanding the mechanism of operation of basic models makes it possible to reveal typical, common features that are not subject to market changes and are relatively unchanged over time.



Under the influence of various processes in the world economy, there are basic models, basic principles, structural changes and mechanisms of economic development. They are formed under the condition of separation from specific examples of economic development of certain countries, statistical materials that characterize economic growth trends and so on.

This is due to the fact that the driving force of economic growth of the state is the need to fully meet the needs of individuals and legal entities.

**The results of the research.** The main macroeconomic goal of any country is its economic growth. This is due, first of all, to the following factors: the need to increase the standard of living and well-being of the population in this country, the level of competitiveness of its economy, ensuring the employment of the population, an integral balance of trade and payment balances and, in general, increasing the role of the respective state on the world stage.

Economic growth is characterized as one of the most important signs of the country's economic development. However, these concepts should not be equated. Because contrary to popular belief, economic development can be observed even with a reduction in the share or even with the complete disappearance of some elements (sectors) of the economy, in particular, outdated and inefficient industries. At the same time, there may even be a significant deterioration of some key macroeconomic indicators, such as, for example, the employment rate of the population. This is inevitable when converting or repurposing obsolete and inefficient industries. Therefore, the short-term effects can even be quite negative.

Therefore, economic growth in most cases should be understood as a long-term trend of increasing the real volume of output in the economy. In other words, economic development should cause not only quantitative but also qualitative changes in the economy. It is these qualitative changes that ultimately become decisive for the development and sustainable growth of the economy in general [12].

Economic growth is a concept related to measurable elements of the economy, such as increases in output, income, employment, and investment. The better the economy uses the resources at its disposal, the higher it achieves economic growth. It can be argued with all reasonableness that in our time innovative solutions are the main factor contributing to economic growth.

Let's consider some definitions of economic growth.

Scientist S. V. Mocherny believed that "economic growth is a process of quantitative and qualitative changes within the limits of the technological method of production, caused by the relevant contradictions and factors, and which is expressed in an increase in the volume of social production." In the conditions of a closed economy, O. V. Bezugla believes that "the country's economic growth is sustainable over time, territorially balanced quantitative increase and structural and innovative improvement of production results in the form of manufactured goods and provided services. It occurs proportionally in all sectors of the economy and is based on the optimization of reproductive processes." [10].

Also I.B. Vysotska notes that "economic growth is an increase in the volume of the country's production, that is, an increase in the real gross domestic product per capita." [17].



At the same time, Glukha G.Ya. believes that "economic growth should be understood as one of the basic components of economic development. This component is manifested in the dynamics of qualitative and quantitative indicators under the influence of exogenous and endogenous factors of an economic, organizational, structural, and institutional nature. They are closely related to state regulation and characterize the process of certain changes in the macroeconomic system and the efficiency of social production." [18].

Instead, we systematized various interpretations of the factors of economic growth:

- a) sources of economic growth;
- b) resources actually involved in the production process;
- c) the main elements of production that ensure GDP growth;
- d) important conditions for GDP growth;
- e) main elements of GDP growth potential;
- f) phenomena and processes that determine the scale of growth.

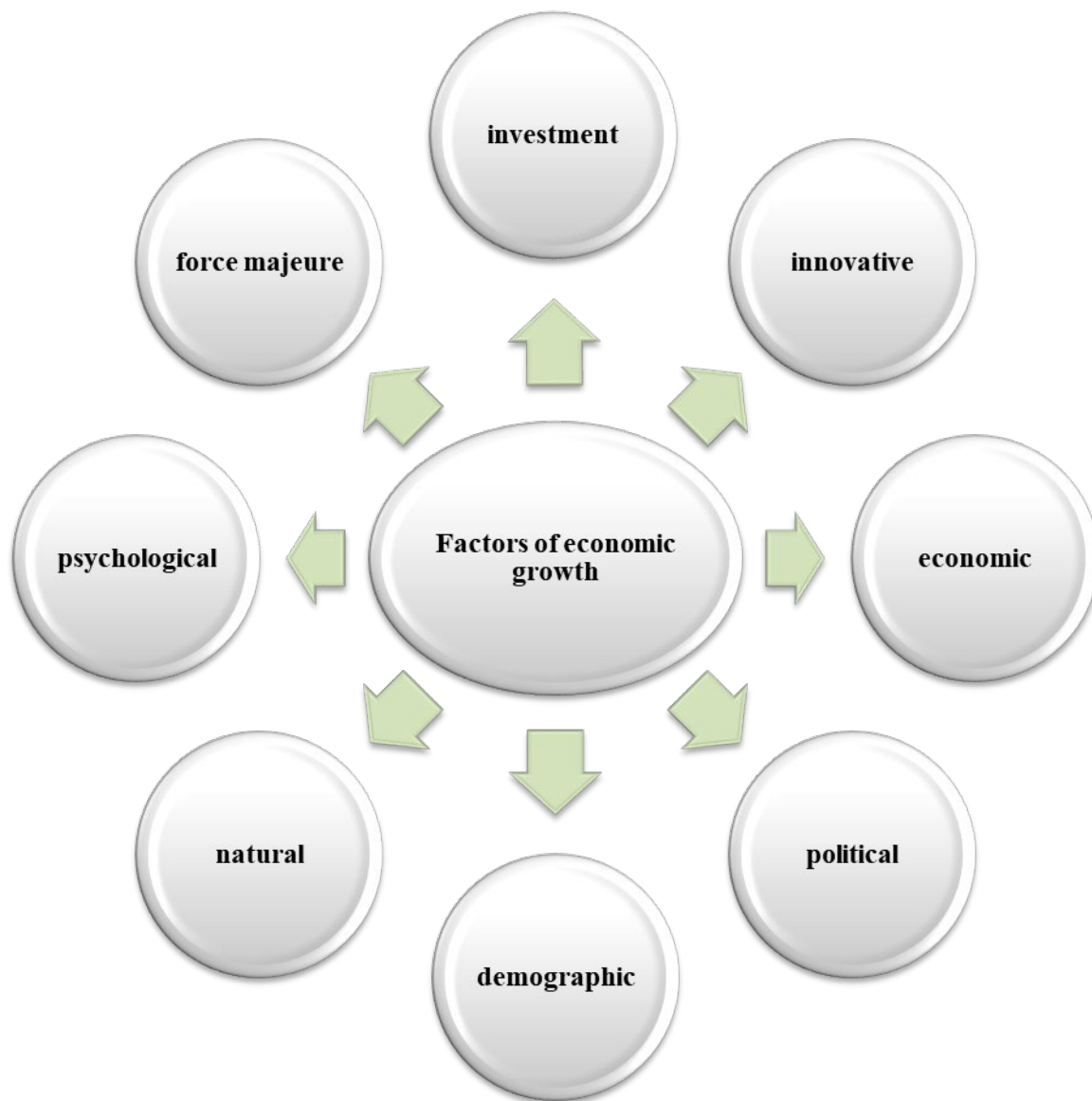
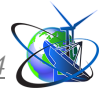
The main factors affecting economic growth are classified by groups, namely:

- investment (attraction of foreign investments, investment activity, capital goods);
  - innovative (promotion of scientific and technical progress, level of development of science);
  - economic (cyclical fluctuations, trends);
  - political (policy in the field of foreign trade, institutional policy, tax policy, etc.);
  - demographic (level of employment of the population, level of education of the population, composition of the population);
  - natural (climatic conditions, geographical location of the country, availability of minerals);
  - psychological (entrepreneurial abilities, economic culture, mentality);
  - force majeure (natural disasters, wars, terrorist acts, man-made disasters)
- [6] (Fig. 1).

Innovation and an economy based on knowledge and the field of scientific research are undoubtedly among the most important factors. It is they who determine modern development both at the regional and national levels.

At the same time, more and more attention is paid to the development of intangible factors of production, which are transformed in the world economy under the influence of acquired experience. Over the past three centuries, the main source of wealth in countries with a market economy has shifted from natural assets (for example, land, unskilled labor) to intangible assets (for example, knowledge and information of various kinds), which can be part of human potential, organization or physical capital.

In accordance with the above, we can state that the technological factor to a certain extent causes the blurring of once clear boundaries between the main factors of production. For example, concepts such as "human capital", "technological capital", etc. appear, which are absurd from the point of view of classical economic theory, but are completely justified in the context of modern economic realities.



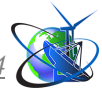
**Fig. 1. Classification of factors affecting economic growth**

*Source: created by the author.*

In general, although theories of economic growth are a modern phenomenon, interest in the concept of economic growth goes back to the origins of economic thought. Considering the topic of our article, we will analyze the main theories of economic growth and their connection with the sphere of innovation and technology transfer.

The theory of economic growth of the English classical school (Smith, Ricardo, Mill) gives the greatest importance to two factors of production: labor and capital. At the same time, capital is considered more important. Capital is considered the main factor of economic growth, which is achieved due to the constant growth of capital, the volume of which mainly depends on the accumulation of private savings. Instead, representatives of the classical theory consider non-economic factors as secondary.

In 1912, I. A. Schumpeter was the first to describe cases of the emergence of new combinations of human productive forces and new elements and materials, which were later called innovations. According to the Austrian economist, competition exists in areas that define new products, materials, technologies and



forms of organization. The model developed later by I. A. Schumpeter [13], compared to the neoclassical approach to the growth process, was based on the analysis of variables. Before that, they were considered as fixed, that is, scientific research and development, innovations, technologies. In his opinion, they are the important factors that determine capital and create opportunities for its multiplication.

From the point of view of chronology, the beginning of modern theories of growth can be considered the researches of F. Ramsey [8], which were published in 1928. However, the model received recognition thirty years after its publication, only in the early 60s, when R. Solow's model was published.

In his work "Measuring economic growth" [7], S. Kuznets presents the following interpretation of economic growth: "economic growth is a process consisting of separate interactions, as a result of which economic matter enters the national economy and is transferred from one part of it to another » [7, p. 11]. In his subsequent studies, S. Kuznets expanded this concept, namely: "economic development is a long-term increase in the economy's ability to provide the most diverse needs of the population with the help of more effective technologies and corresponding institutional and ideological changes" [7, p. 13].

F. Ramsey's study of household optimization problems over time gave impetus not only to the development of the theory of economic growth, but also to the theory of business cycles, consumption, prices, and assets. At the same time, the neoclassical model of economic growth found its most complete form in the work of R. Solow [14]. The model he developed is still a canon of growth theory and does not lose its relevance.

The starting point for analyzing the impact of innovation on economic growth is R. Solow's neoclassical growth model [14]. It is also known as the Solow-Swan model, created on the basis of research by Robert Solow and Trevor-Swan [15]. The model they proposed ushered in the era of neoclassical theories of economic growth.

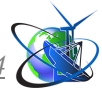
It assumes that in the long term, economic growth is determined by three main factors: technological progress, capital accumulation through savings (investments), and labor force growth. In their research, R. Solow and T. V. Swan used the Cobb–Douglas production function. R. Solow's model proves that in a state of quasi-equilibrium only the factor of technological changes can ensure effective economic growth.

However, technical progress was not precisely defined and marked by the residual, capital constituted in a different way than capital and labor, which influenced growth. Based on this model, R. Solow conducted a study that showed that in the 1909-1949 years in the USA, labor and capital accounted for only 12.5% of economic growth. R. Solow's model assumes the exogeneity of technical progress, which means that its formation method is not explained by the model, because the main driving force of economic growth is not explained.

The main conclusions of the Solow-Swan model can be considered that GDP growth rates are defined as the sum of technical progress and population growth rates, and also that GDP growth per capita is a reflection of technical progress [15].

In particular, we can add that R. Solow [14] came to the conclusion that the rate of economic growth is not proportional to the rate of growth of thrift and investment,





and even in the early period is not independent from them. The rate of growth of production volume per unit of labor almost does not depend on the rate of savings/investment, but entirely on the rate of technical progress. Therefore, only increasing technological progress leads to economic growth. Other factors affect only the level of the economy.

On the basis of considerations regarding the Solow-Swan growth model, H. Uzawa [16] presented a description of a model in which the development of technical knowledge is achieved by attracting scarce resources in such a way as to ensure optimal growth. In addition, he believed that any change in technical knowledge is contained in the composition of the labor force, and the increase in the efficiency of the labor force does not depend on the amount of capital used. A further modification of the Solow–Swan model was proposed by N. G. Mankew, D. Romer, and D. N. Weil. It consisted in expanding the number of variables related to human capital (assuming that the growth of human capital is the difference between capital investment and depreciation of capital) and involving it directly in the model of the capital accumulation process. This made it possible to significantly improve the fit of the model to real data relative to the initial version of the model [11].

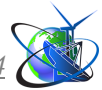
The neoclassical analysis of economic growth gave an impetus to understanding the significance of the factors of technological change. Harrod-Domar's Keynesian model was based on the fact that the decisive factor of economic growth is the accumulation of capital under conditions of constancy and marginal productivity of capital. And technological changes, in turn, were considered insignificant [2].

This model was in many ways imperfect and its use for the analysis of developing countries created many difficulties, mainly due to problems with collecting relevant statistical data and indicators. Some of these shortcomings are taken into account in the work of R. Solow [14] (model of exogenous growth). The most important changes to the Harrod-Domar concept were the introduction of labor as a factor of production. It reflects the law of diminishing returns and economies of scale, as well as the introduction of a variable that would show the level of technology production over time [5].

The idea that inventions and modernization of production are the source of progress was also expressed by Y. Schumpeter. In its model of endogenous innovative development, the rational search for profit and modernization of technology is the main driving force of economic growth. Innovations make an indirect contribution to the products of enterprises and in this way determine further growth.

In J. Schumpeter's model, growth is determined by the benefits of research (returns to research), which appear as a result of the means intended to create innovations and the size of the market where innovations are sold [13].

Rejecting the claims about the exogenous nature of technical progress, the new theory of economic growth (the theory of endogenous growth) intensified research on innovation. Among the attempts aimed at giving endogeneity to technological progress, there is K. Arrow's concept of acquiring knowledge in practice (Learning by doing), R. Lucas's model [9] (human capital as a separate factor of production). And also P. Romer's model, which, as a factor of production, indicated scientific



research and development.

For the first time, R. Lucas endowed technical progress with an endogenous character by adding to the model human capital, which he understood as the "general level of qualification" of a person. According to R. Lucas, human capital was a separate factor of economic growth, next to physical labor and capital [9].

Another factor that was supposed to explain the factors responsible for economic growth was the study of the development of the research sector by P. Romer. P. Romer considered technical progress as the result of intentional actions that occurred as a result of economic incentives coming from the market (for example, profit from innovations).

Unlike R. Solow's model [14], which assumed that scientific and technical knowledge (technology) is public (available to everyone without restrictions), P. Romer's model of endogenous growth rejected this assumption. Since the public good is characterized by the lack of competitiveness of consumption (the use of one object does not limit its availability to others), and cannot exclude anyone from its use.

According to P. Romer [11], technology is a boon for non-competitive consumption. Thus, this good can be exclusive, for example, with the help of patents.

According to P. Romer, the most desirable conditions for technical progress and the main factor of long-term economic growth would be the possibility to patent the generated knowledge in order to fix the profit as a result of the innovations of their authors. However, this prevention of the spread of knowledge slows down further technological change and, in addition, hinders long-term growth.

Given the analyzed models of economic growth, we can propose a model of interdependence between economic indicators that influence the creation of innovations (Fig. 2).

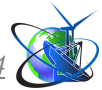
The proposed model shows how the introduction of new knowledge affects the economy, including by influencing productivity growth, economic growth and economic development. Economic development in general affects the improvement of the welfare of the population and the quality of human capital, which is a generator of new knowledge.

Accordingly, the innovativeness of the economy is the result of the growth of internal resources, the knowledge of the innovativeness of the country, as well as the increase in the international transfer of technologies. Technology transfer tools are an integral part of innovative change.

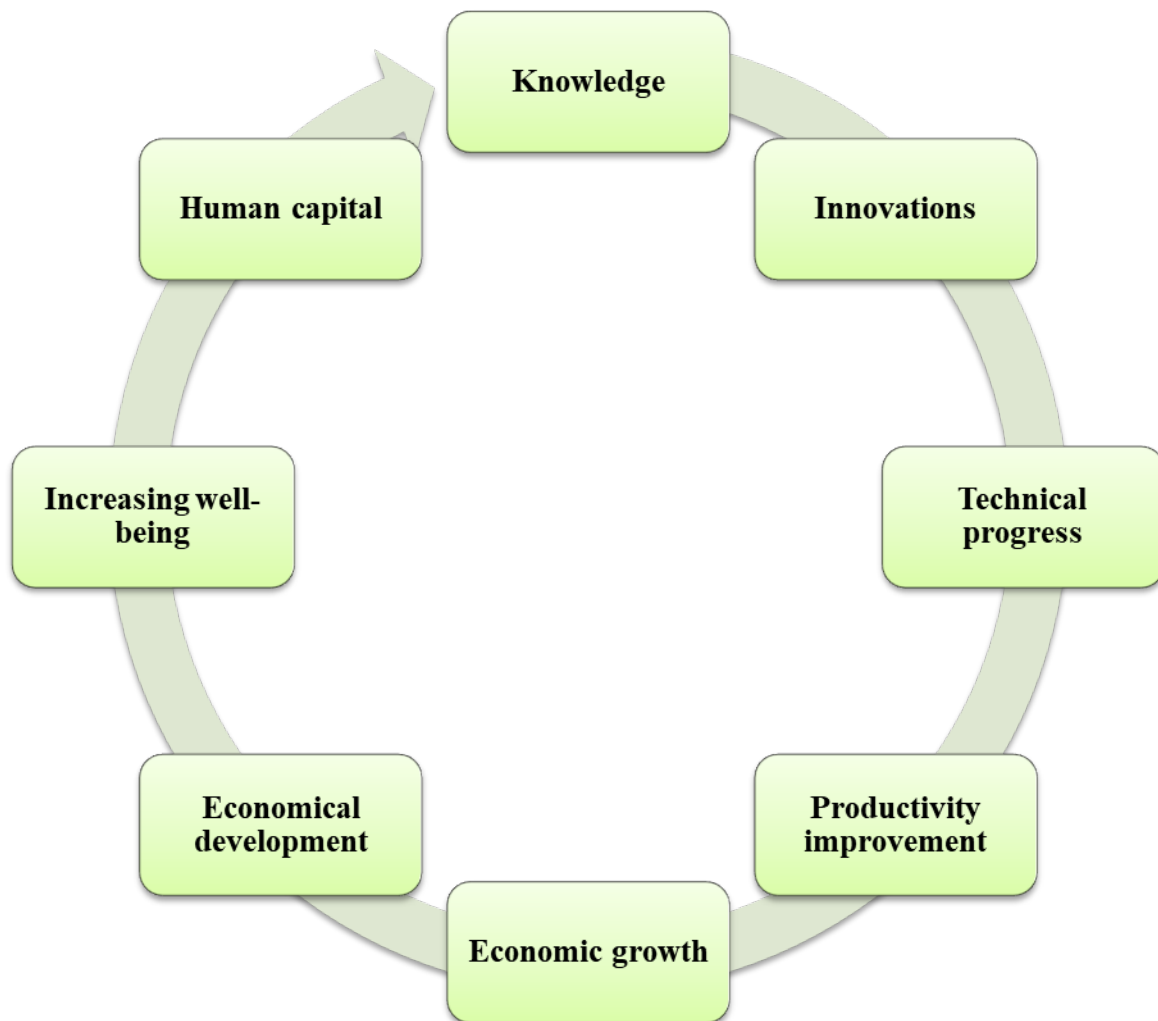
The development of endogenous innovations, or strategies to support technical progress through technology transfer, cannot be implemented independently of each other. Parallel measures in both these areas are important in the process of improving the efficiency of innovation processes.

The growth of the innovative level of the economy, using both internal and external technologies, requires scientific and research foundations and is the result of the interaction of two sources of knowledge. The process of creating and implementing new knowledge is considered expensive and risky.

Developing countries with a low level of capital accumulation, in the process of increasing the technological level, use, first of all, external sources, that is, technologies developed in developed countries. The claim that international



cooperation with partners with more advanced technologies positively affects the technological level of less technologically developed partners is confirmed in the literature.



**Fig. 2. A model of interdependence between economic indicators affecting the creation of innovations**

*Source: built by the author.*

Innovation is a driver of primarily endogenous growth, leading to positive R&D externalities that increase the pool of public knowledge and contribute to the growth of incomes along with the scale of production in the R&D sector. They enable enterprises to gain competitive advantages in the market, and existing technological progress is an important factor in economic growth. Namely, by increasing productivity and increasing income. This is especially true of high-tech goods.

**Conclusions.** Therefore, the goal of technology transfer, often associated with the spread of innovations, is economic growth and improvement of the welfare of subjects.

Technology transfer should implement a long-term strategy of sustainable technological change. From the point of view of the economy, the short-term effect is less important. Possession of modern technologies is the main factor that determines competitiveness on an international scale. Technology transfer has not only financial





benefits, but also strategic ones, namely, obtaining comparative advantages. Technology transfer enables countries to rise to a higher level of technological development, which leads to the so-called leap frog effect. In the long run, a technology follower country can become an innovator and technology exporter.

### References:

1. Bezugla V. O. The paradigm of economic growth in the conditions of an open economy / V. O. Bezugla // *Moderntrends in scientific thought development: Materials Digest of the 2nd International Scientific and Practical Conference Economic Sciences.* – Odessa: InPress, 2011. – P. 160–163.
2. Domar E. D. Capital Expansion, Rate of Growth, and Employment / E. D. Domar // *Econometrica.* – 1946. – nr 14.
3. Dunning J. H. Regions, Globalization, and the Knowledge Economy: Issues Stated / J. H. Dunning // *Regions, Globalization and the Knowledge-Based Economy/* J. H. Dunning (ed.). – Oxford University Press, Oxford, 2000. – S. 8.
4. Gluha H. Ya. Economic growth: evolutionary and substantive analysis / G. Ya. Gluha // *Academic Review.* – 2013. – No. 1. – P. 32–38.
5. Harrod R. F. An Essay in Dynamic Theory / R. F. Harrod // *Economic Journal.* – 1939. – nr 49 (March).
6. Kohut M.V. Theoretical and methodological basis of the analysis of international technology transfer / M.V. Kohut // *Bulletin of the Volyn Institute of Economics and Management: coll. of science works* – 2015. – Issue 13. – pp. 161–166.
7. Kuznets S. Measurement: Measurement of Economic Growth / S. Kuznets // *The Journal of Economic History.* – 1947. – Vol. 7, Supplement : Economic Growth : A Symposium. – P. 10–34.
8. Lee G. Do Stronger Intellectual Property Rights Increase International Technology Transfer? Empirical Evidence from U. S. Firm-Level Panel Data / Lee G. Branstetter, Raymond Fisman and C. Fritz Foley // *The Quarterly Journal of Economics.* – 2006. – Vol. 121, No. 1 (Feb.). – P. 321–349.
9. Lucas R. On the Mechanics of Economic Development / R. Lucas // *Journal of Monetary Economics.* – 1988. – nr 22.
10. Mochernyy S. V. Political economy / S. V. Mochernyy. – [2nd ed.]. - Kyiv: Vikar, 2005. - 386 p. – (Higher education of the 21st century).
11. Romer P. The Origins of Endogenous Growth / P. Romer // *Journal of Economic Perspectives.* – 1994. – Vol. 8. – Issue 1
12. Samuelson A. P. Economics / A. P. Samuelson, D. W. Nordhaus. – McGraw-Hill, 1998. – 688 p.
13. Schumpeter Y. A. Theory of economic development: Research of profits, capital, credit, interest and the economic cycle / Y. A. Schumpeter; trans. from English V. Stark. - K.: Ed. house "Kyiv-Mohyl. Acad.", 2011. - 242 p. Samuelson A. P. Economics / A. P. Samuelson, D. W. Nordhaus. – McGraw-Hill, 1998. – 688 p.
14. Solow R. M. A Contribution to the Theory of Economic Growth / R. M. Solow // *The Quarterly Journal of Economics.* – 1956. – Vol. 70. – P. 65–94.
15. Swan T. W. Economic Growth and Capital Accumulation / T. W. Swan //



Economic Recommendations. – 1956. – Vol. 32. – P. 334–361.

16. Uzawa H. Optimum Technological Change in an Aggregative Models of Economic Growth / H. Uzawa // International Economic Review. – 1965. – Vol. 6. – P. 18–31.

17. Vysotska I. B. Factors of economic growth / I. B. Vysotska // Factors of economic growth: coll. of science Proceedings of the Institute of Economics of the National Academy of Sciences of Ukraine. – Kyiv, 2001. – P. 4–11.

*У статті узагальнено та систематизовано теоретичні підходи представників економічної науки до міжнародного трансферу технологій та економічного зростання. Проаналізовано еволюцію та визначальні положення основних теорій економічного зростання. Це дало можливість оцінити роль та значення міжнародного трансферу технологій з погляду кожної з розглянутих концепцій. На основі проведеного аналізу теоретичних концепцій економічного зростання запропоновано класифікацію чинників, що впливають на економічне зростання. Класифікацію проведено по групах, зокрема: інвестиційні, інноваційні, економічні, демографічні, природні, психологічні та форс-мажорні. Також окреслено роль та значення інноваційної діяльності та міжнародного трансферу технологій для економічного зростання в умовах глобалізованої економіки.*

**Ключові слова:** інновації, міжнародний трансфер технологій, світове господарство, глобалізація.

© Когут М.В.