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The modern stage of the knowledge economy formation in Ukraine

The preconditions for the formation of the knowledge economy by indicators, which reflect the development of the sector of increased demand for knowledge in Ukraine, are studied. The peculiarities of attracting knowledge factors into the Ukrainian economy are drawn in the context of separate indicators of the development level of the increased demand for knowledge sector (development of high-tech sector, investment in the knowledge sector, employment in the field of science and high technologies, volume and structure of venture capital, participation of private capital in R & D funding, R & D expenditure structure according to the stages of scientific research, cross-country flows of knowledge, as well as international cooperation in the field of science and innovations, strengthening of cooperation between firms we research organizations and universities, the mobility of scientists and engineers, especially students who go to study in other countries, etc.). The analysis of the attraction and use of knowledge factors in the Ukrainian economy (based on certain indicators of the level of development of the sector of increased demand for knowledge) showed a multifaceted and, in some cases, a disappointing picture of processes and phenomena in the field of innovative development of the country in recent years. The analysis of the calculated parameters of economic and statistical models of the knowledge factors' influence on labor productivity in the period after 2008 with its complex political and socio-economic problems and events is made. The results of calculations provide that the best model of economic development of Ukraine is uncertain today. There is no clear strategy for using and developing the country's scientific and technical potential; unformed legislative field for the effective functioning of national and regional innovation systems. Solving problems requires the following subsystems of the national innovation system: generation of new knowledge (academic, higher education); education and training; production of products and services; innovation infrastructure.

Keywords: *knowledge economy, factors of knowledge, OECD indicators, economic and statistical models, labour productivity, national innovative system.*

Problem statement. The interests of scientists and practitioners to such an important modern mechanism of innovational development as the national innovation system (NIC), which provides the development of high-tech and science-intensive industries, and development of the knowledge economy in general in economically developed countries, is, of course, very promising in Ukraine. The problem of NIS implementation in Ukraine is also relevant according to the UNESCO science report, towards 2030 [1]. It outlines a panorama of changes after 2010, which took place under the influence of socio-economic, geopolitical and environmental trends and contributed to the formation of modern policies in the field of science, technology and innovation. It is stated that in several countries the creation of knowledge economy is the best way of effective growth, therefore, the intentions of governments do not change: to increase the share of R & D funding in GDP, to increase academic mobility, international scientific relations, the mobility of skilled personnel, the role of university science, the creation of the new world knowledge centers.

In 2010, the European continent adopted the Strategy «Europe 2020», which supposed to help overcoming the financial and economic crisis by increasing the level of R & D expenditures, abolishing market barriers and making the most of the use of information and communication technologies. The UNESCO document has shown that there are common problems for many countries, including the search for a balance between «local and international participation in research, between fundamental and applied research, between the generation of new knowledge and the production of

knowledge for the needs of the market, between the science as a public good and as a driving force commercial activity» [1, p.4].

In February 2018, parliamentary hearings entitled «National Innovation System: Status and Legislative Provision of Development» were held in Ukraine, which showed the existence of acute problems in implementing the NIS model in Ukraine.

Analysis of recent research. Created in the works of J. Schumpeter, the concept of the knowledge economy has gained a rapid development in the works of world-known scholars (E. Toffler, D. Bell, P. Sorokin, F. Mahlup, D. Stiegler, P. Drucker, M. Castells, J. Masuda, Inozemtsev etc.) since the mid-60s of XX century. Their scientific ideas were in the basis of the concept of a post-industrial society, the cornerstone of which is the free access to scientific knowledge, their domination in creative work, the acquisition by the knowledge of the status of the key factor of production, and transformation of science and education into the main productive force of social development.

The above quoted scientific researches have become the impetus for the emergence of new models of the economy (since the mid-1990s of the last century): «informational», «network», «Internet economics», «knowledge-based economics», «economics of education», «creative economics» [2].

Ukrainian researchers from various scientific schools has made a significant contribution to the concept of knowledge economy (S. Y. Vovkanych, A. C. Halchynsky, V. M. Heyets, S. A. Davymuka, B. Kvasnyuk, O. Lapko, B. Malytsky, V. P. Semynozhenko, A. A. Chukhno, L. Fedulova etc.). The following documents were created with the efforts of leading institutes: the Strategy of economic and social development of Ukraine «On the way to European integration» for 2004-2015 (2004), the Strategy of innovative development of Ukraine for 2010-2020 in the context of globalization challenges (2009). In those documents the scientifically proven system of strategic aims of innovational development were declared. In this case, on the one hand, the scientific innovations and scientific knowledge are the «core» of the knowledge economy – we are talking about the model of a national economy that can solve social, economical, technological problems of modern society.

On the other hand, knowledge, innovations receive the status of the modern human values that strengthen their motivational influence in the innovative work activity with such values as learning, creativity, knowledge of innovative culture, information and knowledge acquired. [3] Awareness of these values allows the search, production, processing, transformation, dissemination and use of information for the purpose of obtaining and applying knowledge, and, therefore, producing the innovative products and services.

Previously unresolved issues. While highly appreciating the previous scientific researches of domestic and foreign economists in the field of the theory and methodology of post-industrialism, knowledge economy, it should be noted that the topic of this article requires to study a number of aspects of methodological and applied nature, which determines the relevance of the research topic. Therefore, it is necessary: to study the preconditions for the formation of the knowledge economy by indicators, which reflect the development of the sector of increased demand for knowledge in Ukraine; to make an analysis according to the calculated parameters of economic and statistical models influencing the knowledge factors on labor productivity in the period after 2008 with its complex political and social problems and events; to identify the urgent issues that need to be resolved on the way of the real formation of the national innovation system in Ukraine. The aim of the article is: studying the peculiarities of the knowledge economy formation by indicators that reflect the development of the sector of increased demand for knowledge in Ukraine and in the world; make a comparative assessment of the influence of knowledge factors on labor productivity on the basis of the parameters of economic-statistical models;

identify the problems, the solution of which is necessary for the development of NIS as a comprehensive system for the development of the innovation process in Ukraine.

Major research findings. The main idea stated in the world concepts and theories of post-industrialism and Ukrainian program documents of the state level is that knowledge, intelligence become the determining factors in the progressive development of societies. This requires the implementation of three priority activities: science, education and science-intensive production.

Essentially, it is about building a national innovation system (NIS) as a set of legislative, structural and functional components (institutions) that are involved in the process of creating and applying scientific knowledge and technologies and defining legal, economic, organizational and social conditions for the provision of the innovation process [4].

As for NIS, the history of its institutionalization in Ukraine over the past 10 years has at least four attempts (stages). The problem of the NIS formation was first considered at the parliamentary hearings on the subject «National Innovation System of Ukraine: Problems of Formation and Implementation» in 2007. Their recommendations were: to create a Concept for the development of national innovation systems; introduce mechanisms for conducting foresight research, formulation and implementation of innovative programs and state orders for their monitoring, support and attract extrabudgetary funds at state level.

In 2009, the problem of NIS was discussed at the parliamentary hearings «Strategy of Innovation Development of Ukraine for 2010-2020 in the conditions of globalization». Then the Cabinet of Ministers of Ukraine approved the Concept of development of the national innovation system for 2009 – 2013.

The recommendations of the parliamentary hearings (February 2015) on the topic «On the Status and Legislative Provision of the Development of Science and the Scientific and Technical Spheres of the State» indicated that there was no plan of action for the implementation of the Concept of the NIS development. Unfortunately, a significant part of the provisions of this document concerning the country's innovation development are not being implemented, resulting in the lowest level of scientific and technical potential of the country during the entire period of independence, the decline of NIS, the loss of Ukrainian scientific schools, the destruction of the material and technical base of scientific institutions, the brains outflow.

February 2018 – parliamentary hearings on the theme: «National Innovation System: State and Legislative Provision of Development», where once again the public broadly discussed the state and strategic directions of Ukraine's innovation development, legislative support for the formation of Ukraine's national innovation system. The key elements of NIS are science, education and science-intensive production, and their legislative support is still monitored by the scientists and practitioners. What changes in innovation development can make this public discussion? It is worth hoping that the new mechanisms of innovation development, improving their legislative support, will be able to suspend the stagnation processes in this sphere, because it is not just about the NIS, but in general about the principles of functioning of a knowledge economy.

For the study of new processes and phenomena that are inherent to a knowledge economy, world practice has developed a system of indicators that reflect the level of development of the sector of increased demand for knowledge and in general of the knowledge economy. The system of indicators includes the following determinants: quality education, lifelong learning, institutional conditions for innovation, national innovation system, information infrastructure, innovation production, intellectual property, research and innovation, and so on. [5] The indicated determinants (components) form links of the knowledge market with the national innovation system through the subsystem of generation of knowledge (scientific, scientific and educational, research institutions, venture companies and other institutions that

carry out research and development of new knowledge) and subsystem of application and commercialization of knowledge (introduction of innovations, manufacturing of high-tech products) [6].

The practice of using such indicators shows that they are constantly improving and developing. International organizations (UNESCO Institute for Statistics, Eurostat, World Bank Institute, OECD, International Telecommunication Union, etc.) carry out methodological and analytical work on the development of special composite indexes such as: knowledge economy index (World Bank), index of knowledge society (Department of Economic and social development of the UN Secretariat) and the global index of knowledge economy (European eca UN Homeland Union) [5].

For example, the World Bank's approach to assessing the knowledge economy defines the development of long-term strategies, which should be based on four components: economic incentives and institutional regime; educated and skilled workers; effective innovation system; modern information infrastructure [7]. The implementation of these strategies will create legal, economic, organizational and social conditions for the implementation of the innovation process.

The OECD (Organization for Economic Cooperation and Development) proposes a system of indicators [8] that form the basis for comparing levels and dynamics of innovation development of countries and confirm a certain level of attraction and implementation of knowledge factors in national economies. It should be noted that Ukraine during the period of its independence has been actively conducting the development and implementation of innovative development mechanisms with the help of state, private, public, international, and others Institutions, as reflected in a number of Strategies of different years, parliamentary hearings, adoption of concepts, etc.

But how did the situation in attracting knowledge factors to the Ukrainian economy look like in the last 5-7 years? The answer to this question is obtained by considering the peculiarities of attracting knowledge factors into the Ukrainian economy in the context of separate indicators of the level of development of the sector of increased demand for knowledge of the field (Table 1).

Analysis of the attraction and use of knowledge factors in the Ukrainian economy (according to some indicators of the level of development of the sector of high demand on knowledge) showed a multifaceted, but not always attractive, and in some cases a disappointing picture of processes and phenomena, which today reflect the state and main trends of the country's innovation development in recent years. The analytical assessment in the context of each indicator can be considered as a description of the individual parties and the main trends in the development of the knowledge components of the national economy and the Ukrainian model of the national innovation system.

Undoubtedly, the tendencies of the Ukrainian sector's increased demand for knowledge are indirectly reflected in the change of the labor productivity rate at the macro level – the index, which characterizes the ability of the economic system to function properly in the current economic conditions. The paper [20] evaluates the influence of knowledge factors (in terms of reproduction of knowledge) on the gross regional product per person, UAH (according to 2008). According to calculations, this influence was: more expressive at the stage of production of knowledge and the dissemination of knowledge in terms of providing educational and scientific and technical services; almost inconceivable at the stage of transfer of knowledge and their use in the national economy (volume of fundamental, applied, scientific and technical researches and services).

In order to quantitatively characterize the change in the institutional, technological and economic conditions in the country that have contributed, slowed down or, on the contrary, prevented innovative development, we will build new economic and statistical models of the influence of knowledge factors on labor productivity. Their

Table 1

Current trends in the sector of increased demand for knowledge in Ukraine according to separate indicators OECD

OECD Indicators	Main trends in development
Development of the high-tech sector, its share in products manufacturing industry and services; innovative activity	In the developed countries (USA, Canada, Japan, EU countries, except Portugal and Greece), the share of high-tech industries is 25% – 40%. In developing countries, this figure is less than 10%, with the exception of the Republic of Korea, Malaysia and Singapore, where they account for 20% –50%. During 2011-2016, the share of high-tech industries in the Ukrainian industry decreased from 13% to 9%; about 18% of industrial production in the country was lost [9]. During 2014-2016, the share of enterprises engaged in innovation activity in the recommended types of economic activity was 18.4%, incl. enterprises which carried out technological innovations – 11,8%, non-technological – 13,4% [10]. In 2016, 56% of all small and medium-sized enterprises in the European Union were innovative. Among the European countries, the largest number of innovative small and medium-sized enterprises is in Finland (72%), the smallest – in Hungary (44%) [11].
The size of investment in the sector of knowledge (public and private), including higher education, research and research –study developments and software development	In order to stimulate EU competitiveness in the world, one of the five objectives of the Europe 2020 strategy is to increase the science-intensive GDP by 3% by 2020. In 2014 EU member states spent about 283 billion euro on the implementation of the DIR, whose share in GDP was 2.03%, which is much higher than in 2004. (1.76%). As for other advanced economies, the GDP science intensity in the EU was significantly lower than in South Korea (4.15% in 2013) and Japan (3.47% in 2013), lower than in the United States (2.81 % in 2012) and almost at the level of China (2.08% in 2013). For Ukraine, the share of spending on research and development in GDP (according to Eurostat) in 2016 was 0.48% (in 2010 – 0.75%), which indicates the loss of the ability for science to perform an economic function. While in the EU: in 2010 it was 1.93%, in 2015 – 2.03% [10]. The state should provide budgetary funding for scientific and scientific and technical activities (other than defense expenditures) at a rate not less than 1.7% of GDP. For Ukraine, in 2010 – 2016 the share of financing expenditures for carrying out scientific and technical works at the expense of organizations from the business sector, the public sector, the higher education sector, the private nonprofit sector and from foreign sources in total expenditures confirms: the growth of the share of the business sector from 23.8% to 36.9%; reduction of the public sector from 49.5% to 39.3%; maintaining the sector of higher education at a constant level – 0.2% of expenses; private non-profit sector – zero; reduction of funds from foreign sources from 25.8% to 22.1% [10]. The expenditure share in 2010-2015 for the implementation of scientific and scientific works at the expense of organizations of entrepreneurship, public sector, higher education sector, private nonprofit sector, foreign sources in the total expenditure for Ukraine shows: the growth of the share of the entrepreneurial sector from 55.4% to 61.9%; the reduction of the public sector from 38.1% to 31.8%; reduction of the sector of higher education – 6.5% to 6.3%; Private non-profit sector is zero [10]. The share of enterprises engaged in innovation activities and spending money on the purchase of machinery, equipment and software in 2015 was 56.7%, in 2016 – 70.7% [10].
Number of employees in the field of Science and Technology	During 2010-2016 the number of employees engaged in research and development decreased from 182.5 to 122.5 thousand people, or by 49.0%, incl. researchers – by 32.6%. In 2016, the share of the research workers (researchers, technicians and auxiliaries) in the total number of the employed population of Ukraine was 0.60%, including researchers – 0.39%. According to Eurostat, in 2014, the highest share was in Denmark (3.07% and 2.09%), Finland (2.95% and 2.12%), Norway (2.73% and 1.90%), The Netherlands (2.18% and 1.29%) and Slovenia (2.12% and 1.23% respectively); the lowest was in Romania (0.48% and 0.31%), Cyprus (0.69% and 0.50%), Turkey (0.76% and 0.65%) and Bulgaria (0.77% and 0, 54%). During 2010-2016 the number of employees involved in the implementation of research and development has

Continuation of Table 1

Mobility of scientists and engineers, especially students who go to study in other countries	In 2014-2015 the share of scientific workers who traveled abroad from Ukraine was reduced by 3.3% (from 7316 to 7077 people). According to the sectors of activity, the mobility of researchers from the higher education sector is dominated by 55.6% and 48.0% respectively. [10] As of the 2015/2016 academic year, the number of Ukrainian students enrolled abroad was 66,668. Poland, Germany, Russia, Canada, Italy, Czech Republic, the USA, Spain, Austria, France and Hungary remain the most attractive places to study. The dynamics growth from 2009 to 2016 amounted to 176%. The number of Ukrainian citizens studying abroad in PhD programs was more than 1,600 Ukrainians according to data from 14 countries as of 2015/2016 (with no data on the training of Ukrainian students in the US, Canada, and the UK, which hypothetically attracts young Ukrainian scholars no less than France or even Germany). Unfortunately, accounting for students who return after studying abroad is not carried out [15].
The increase in the volume of financial transactions, including direct investment in Ukraine	During 2010-2017 direct investment increased from $ 38,992.9 million to $ 39144.0 million. During this period, the largest inflow of foreign investment was in 2013-2014, $ 51,705.3 million and $ 53,704.0 million respectively. In subsequent years, there was a decline in direct investment (2015 – $40 725.4 and 2016 – 36 154.5 million) and a gradual increase in their volume – from 2017 [16]
ICT proliferation, widespread use of personal computers	In 2013, the number of Internet users per 100 inhabitants in Ukraine was 41.8, but the levels in European countries were: 80.62 – Austria, 82.17 – Belgium, 90.63 – Germany, 91,51_- Finland, 94,78_- Sweden. The number of mobile phones per 100 Ukrainian residents is 138.6, while in Austria 156.23, Belgium –145.19, Germany 127.12, Finland 171.57, Sweden 124.4, Latvia 228.4 [1, p. 745]
The share of hi-tech logistic industries and high-tech services	The EU Statistical Service (Eurostat) identifies four main groups of high-tech services: 1. High-tech services (in the field of information and services in the field of research and development); 2. Knowledge-based market (services in the field of aviation and water transport, services related to real estate and rental services); 3.Scientific financial services (financial intermediation services, insurance services, etc.); 4. Other knowledge-intensive ones (educational services, health services, social services, recreation and entertainment, culture and sports) [17]. The main high-tech areas for Ukraine are: the development of an innovative ecosystem; development of ICT; application of ICT in agroindustrial complex, energy, transport and industry; high-tech machine building; creation of new materials; development of the pharmaceutical and bioengineering industry; the aerospace industry as a separate direction. The current model of functioning and state regulation of the economy does not provide adequate incentives for the creation and development of high-tech industries in Ukraine. High-tech industries form: 6% of GDP and 5.5% of exports. The scientific intensity of GDP (the cost of research as a share of GDP in Ukraine) is 0.77% [18]
Growth of the share of high-tech products in the exchange of goods between countries, the positive balance of leading countries in trade in high-tech products	Today, the export potential of Ukraine has a raw material limitation that restricts opportunities to use their own competitive advantages. In the structure of foreign trade of Ukraine, the largest share of high-tech products belongs to machine building (a negative balance of trade balance). The export of high-tech services is dominated by the development of the ICT sector. In 2016, the volume of services to the ICT sector amounted to 16.7% of the total exports and significantly exceeded the share of imports of the same type of service. In 2017, IT service exports ranked third in terms of export revenues and amounted to 16.3%. Other types of high-tech services in the structure of foreign trade in services: research and development services – 1.2%, scientific and technical services – 1.9% [19]

statistical parameters can be interpreted as indicators of the dynamics of innovation in the country in the period after the financial and economic crisis (Table 2).

The results of the calculations allow us to draw the following conclusions: 1. In Ukraine, after 2008, the preconditions for multi-vector influence were formed in the process of overcoming the effects of the global financial and economic crisis, the

Table 2

Comparative characteristic of parameters of statistical models describing the influence of individual factors that characterize different aspects of the knowledge reproduction process on the labor productivity (2008 and 2015) [21] *

#	Name of indicators	factor	Statistic models and statistical estimation	
			2008	2015
1	The number of employees of scientific organizations, thousand people (stage of knowledge production)	X4	Y = 1470,9*x4 + 13625 R^2 = 0,8315	У=3,036*x4+37081 R^2 = 0,8
2	Financing of scientific and science and technical researches at the expense of the state budget, enterprises, organizations of Ukraine and foreign countries, thousand UAH (stage of production of knowledge)	X11	Y = 0,0449*x11 + 13081,0 R^2 = 0,7393	У=0,023*x11+38727,5 R^2 = 0,806
3	Number of trips of scientists outside Ukraine (internship, training, qualification improvement, teaching work, conducting research, individuals) (stage of knowledge dissemination)	X12	Y = 11,639*x12 + 12715 R^2 = 0,7656	У=59,31*x12+33366,73 R^2 = 0,64
4	Number of scholars, who used the grant, persons (dissemination of knowledge)	X14	Y1 = 23,851*x14 + 14057 R^2 = 0,6215	У=74,611*x14+37322,74 R^2 =0,39
5	Volume of foreign direct investment per person, USD. (stage of knowledge use)	X17	Y = 10,22*x17 + 12993 R^2 = 0,8464	У=20,78 *x17 + 37345,72 R^2 = 0,858
6	Number of industrial enterprises engaged in innovative activity, units (stage of knowledge use)	X19	У = 702,29*x19 + 8341,4, R^2 = 0,1334	У = 811,56*x19 +23406,29 R^2 = 0,387
7	Number of industrial enterprises introducing innovations, unit (knowledge use stage)	X20	Y = 1060,6*x20 + 6066,5, R^2 = 0,2149	У=993,0*x20 +21438,27 R^2 = 0,42

* Estimates of the coefficients of multiple determination (R2) indicate that the investigated influence of the factors on the variable U is statistically significant or statistically not significant. Their interpretation is as follows: the factor sign ensures that the resultant function is changed only by the value of R2. The influence of all other signs is √1- R2. Under such conditions, the calculated regression coefficients can be used to analyze the influence of knowledge factors on productivity. The coefficients of the constructed equations of pair regression are statistically significant under the Student's criterion.

aggravation of the political and economic situation in the country, the intensification of hostilities in the East of Ukraine, the growth of economic disproportions in the development of individual regions, the adoption of the European vector of the country's development.

Knowledge factors on labor productivity. 2. Factors that reflect the stage of knowledge dissemination, in particular, describe the processes of mobility of scientific personnel, grant activities of scientists, have an increased influence on labor productivity (GRP per 1 person).

3. At the stage of using knowledge, the growth of direct investment in the Ukrainian economy, as well as an increase in the number of industrial enterprises engaged in innovation activities objectively increases GRP.

4. At the stage of production of knowledge, the value of indicators of the corresponding regression equations confirms the existence and deepening of the crisis

in the field of innovation development. While even as of 2008 (beginning of the financial and economic crisis), the change of the GRP (per capita) under the influence of knowledge factors was more significant. Today, it is necessary the talk about the state of the scientific sphere of Ukraine, namely: the reduction of the quantitative composition of scientists of scientific and educational institutions and catastrophic reduction of financing of scientific and scientific and technical works from all sources (funds of enterprises, organizations of Ukraine and foreign countries).

5. The obtained results of calculations on individual factors of innovation development prove once again: the best model of economic development of Ukraine is uncertain today (the current model is false); there is no clear strategy for using and developing the scientific and technical potential of a country that should conform to European principles; the legislative field for the effective functioning of national and regional innovation systems is unformed.

So, the following logically stems from the above analysis:

1. The need to understand the innovation process as a system with its inherent nonlinear ties between entities in the process of innovation at all levels, and on the intersectoral level (education – science – production (industry)) [22];

2. the need to find ways to solve problems in such NSI subsystems as: generation of new knowledge (first and foremost, academic science); education and training; production of products and services; Innovative infrastructure, including financial support.

Conclusions. Many of the abovementioned NIS development issues were discussed during parliamentary hearings on the topic: «National Innovation System: Status and Legislative Provision of Development» that was carried out in pursuance of the Resolution of the Supreme Council of Ukraine dated February 8, 2018, No. 2291-VIII. As a result of discussions with participation of state, educational, scientific, public representatives, representatives of business and mass media, the urgent issues of the development of the NIS and the key tasks for the state authorities of Ukraine, local self-government and civil society were drawn, which correspond to the current Ukrainian realities and are a priority in state support of innovations in Ukraine.

The state approach requires solving such crucial problems as: creation of a clear strategy of innovation development, harmonization of scientific research with the needs of practical activity of economic entities of different ownership forms, continuous coordination of qualitative training of specialists at higher educational institutions with the requests of Ukrainian employers, development of innovation infrastructure, implementation of state policy in the field of innovations and technologies, etc. Business incubators, scientific parks, centers of entrepreneurship, centers of expertise at universities should be established, as they are the necessary institutions that should intensify the mechanisms of combining innovation and business components for the development of innovative products. At the same time, the participants of the Parliamentary hearings briefly considered such Ukrainian realities, which are inseparable from the development of the NIS, namely: large-scale reduction of the quantity of scientists, scientific and pedagogical workers; shrinking the activities of scientific institutions and educational units; catastrophic reduction of financing of scientific and scientific and technical researches financed from all sources; intensification of academic mobility of students, teachers, researchers; brain drain; large-scale labor migration of the economically active population, a significant part of which worked in in innovative activities in the previous work in Ukraine, etc.

According to the authors, the necessity of the synergy of efforts for the development of innovations proclaimed at the parliamentary hearings (in the report of the Minister of Education and Science Hrynevych L.) will not provide the desired outcome if the intellectual capital that is capable of generating scientific ideas is reduced, if staff and resources for innovation development continue disappearing,

and the state continues to only declare the basic principles of the EU in the field of science and innovation and eliminate state regulation of innovation processes. After all, the desirable employment of Ukrainian students to a western employer and their inclusion in social and labor relations in the foreign labor market today is becoming a threat to national security as a part of the irreversible loss of human capital of Ukrainian youth. The labor market, which will gradually lose its competitive specialists, will experience the effects of irreversible negative consequences and will lose the opportunity for promising innovative structural changes in accordance with the global and all-Ukrainian trends of socio-economic development.

This conclusion follows from the interpretation of the innovation process, in particular, the NIS as a system. The weakening of one of the system's links will inevitably negatively affect the functioning of other equally important components of the NIC.

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Семів Л.К., Семів А.Р. Сучасний етап формування економіки знань в Україні.

Досліджено передумови формування економіки знань за індикаторами, що відображають розвиток сектору підвищеного попиту на знання в Україні. Розглянуто особливості залучення знаннєвих факторів в економіку України в розрізі окремих індикаторів рівня розвитку сектору підвищеного попиту на знання (розвиток високотехнологічного сектору, розмір інвестицій, зайнятість, об'єм і структура венчурного капіталу, участь приватного капіталу у фінансуванні НДКР, структура витрат на НДДКР за стадіями наукових досліджень, міждержавні потоки знань, а також міжнародна співпраця в галузі науки та інновацій, посилення кооперації між фірмами, науково-дослідними організаціями й університетами, мобільність учених та інженерів, особливо студентів, які виїжджають вчитися в інші країни тощо). Аналіз залучення та використання знаннєвих факторів в економіку України (за окремими індикаторами рівня розвитку сектору підвищеного попиту на знання) показав багатоаспектну та в окремих випадках невтішну картину процесів і явищ у сфері інноваційного розвитку країни упродовж останніх років. Зроблено аналіз за розрахунковими параметрами економіко-статистичних моделей впливу знаннєвих факторів на продуктивність праці в період після 2008 р. з його складними політичними та соціально-економічними проблемами й подіями. З результатів розрахунків випливає, що найкраща модель економічного розвитку України на сьогодні є невизначеною; відсутня чітка стратегія використання та розвитку науково-технічного потенціалу країни; несформоване законодавче поле для ефективного функціонування національної та регіональної інноваційних систем. Вирішення проблем потребують такі підсистеми національної інноваційної системи: генерування нових знань (академічна, вузівська наука); освіта і професійна підготовка; виробництво продукції та послуг; інноваційна інфраструктура. Зроблено висновок, що необхідність задекларованої на парламентських слуханнях (лютий 2018 р.) синергії зусиль для розвитку інновацій не досягне бажаного результату, якщо буде скорочуватися інтелектуальний капітал, будуть скорочуватися кадрові та ресурсні можливості для інноваційного розвитку, а держава і надалі буде лише декларувати основні принципи ЄС у сфері науки та інновацій й усуватися від державного регулювання інноваційними процесами.

Ключові слова: *економіка знань, знаннєві фактори, індикатори OECD, економіко-статистичні моделі, продуктивність праці, національна інноваційна система.*

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