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PROVIDING OF INNOVATIVE DEVELOPMENT OF UKRAINE: ECONOMIC AND LEGAL ASPECTS

Abstract. In the conditions of the information economy development and the transition to the sixth technological order, innovative changes are occurred in the social organization of society, a network society is formed, and innovative knowledge and technologies are the key to progressive development. Innovations become a factor of economic development and ensure the transition from one technological order to another. At the same time, great importance in the development of scientific, technical and innovative activity belongs to the state, which is a key institution that forms the rules of the game on the basis of the development of regulatory legal support and funding of the science, stimulating the development of innovative entrepreneurship, creating the appropriate socio-economic conditions for highly qualified prospective scientific staff. Under such conditions, it becomes relevant to study the current state of scientific, technical and innovative activity of Ukraine based on the study of international rankings and analysis of domestic information sources, as well as analysis of existing forecasts of the evolution of the number of researchers. It is found out that there are negative tendencies of science development in Ukraine, which are caused by significant reduction of science funding, decline of prestige of scientific work in society, significant volumes of emigration of perspective highly qualified scientists due to insufficient material stimulation, physical and moral deterioration of the scientific and technical base, the lack of strategy of innovative development, the lack of support and understanding by the government, imperfect legal regulation. The modern legal and regulatory base for scientific, technical and innovative activity is investigated, which includes a number of legislative, regulatory and departmental documents, concepts and programs. It is found out that the development of science and innovation depends on the state scientific and technical policy, as well as on measures in the field of entrepreneurship support, especially the creation of favorable conditions for the development of innovative entrepreneurship.

Keywords: science, innovation, regulatory support, regulation, innovative development, human capital.

JEL Classification J24, J44, K00, O15, O33, O38

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ЗАБЕЗПЕЧЕННЯ ІННОВАЦІЙНОГО РОЗВИТКУ УКРАЇНИ: ЕКОНОМІКО-ПРАВОВІ АСПЕКТИ

Анотація. В умовах розвитку інформаційної економіки та переходу до шостого технологічного укладу відбуваються інноваційні зміни в соціальній організації суспільства, формується мережеве суспільство, а запорукою прогресивного розвитку виступають інноваційні знання та технології. Інновації є чинником економічного розвитку і саме вони забезпечують перехід від одного технологічного укладу до іншого. Водночас велике значення в розвитку науково-технічної та інноваційної діяльності належить державі, що виступає ключовим інститутом, який формує правила гри на основі розвитку нормативно-правового забезпечення та фінансування сфери науки, стимулювання розвитку інноваційного підприємництва, створення належних соціально-економічних умов для висококваліфікованих перспективних наукових кадрів. За таких умов актуальності набуває дослідження сучасного стану науково-технічної та інноваційної діяльності в Україні на основі дослідження міжнародних рейтингів та аналізу вітчизняних інформаційних джерел, а також аналізу наявних прогнозів еволюції чисельності дослідників. Установлено, що в Україні спостерігаються негативні тенденції розвитку науки, що спричинені значним скороченням фінансування науки, падінням престижності наукової праці в суспільстві, значними обсягами еміграції перспективних висококваліфікованих науковців унаслідок недостатнього матеріального стимулювання, фізичним і моральним зношенням науково-технічної бази, відсутністю стратегії інноваційного розвитку, підтримки та розуміння з боку уряду, недосконалістю нормативно-правового регулювання. Досліджено сучасну нормативно-правову базу щодо науково-технічної та інноваційної діяльності, яка включає низку законодавчих, нормативно-правових і відомчих документів, концепцій і програм. Установлено, що розвиток науки та інновацій залежить від державної науково-технічної політики, а також від заходів у сфері підтримки підприємництва, особливо створення сприятливих умов для розвитку інноваційного підприємництва.

Ключові слова: наука, інновації, нормативно-правове забезпечення, регулювання, інноваційний розвиток, людський капітал

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ОБЕСПЕЧЕНИЕ ИННОВАЦИОННОГО РАЗВИТИЯ УКРАИНЫ: ЭКОНОМИКО-ПРАВОВЫЕ АСПЕКТЫ

Аннотация. В условиях развития информационной экономики и перехода к шестому технологическому укладу происходят инновационные изменения в социальной организации общества, формируется сетевое общество, а залогом прогрессивного развития выступают инновационные знания и технологии. Инновации являются фактором экономического развития, и именно они обеспечивают переход от одного технологического уклада к другому. В то же время большое значение в развитии научно-технической и инновационной деятельности принадлежит государству, которое выступает ключевым институтом, формирует правила игры на основе развития нормативно-правового обеспечения и финансирования сферы науки, стимулирования развития инновационного предпринимательства, создания надлежащих социально-экономических условий для высококвалифицированных перспективных научных кадров.

В таких условиях актуальность приобретает исследование современного состояния научно-технической и инновационной деятельности в Украине на основе исследования международных рейтингов и анализа отечественных информационных источников, а также анализа существующих прогнозов эволюции численности исследователей. Установлено, что в Украине наблюдаются негативные тенденции развития науки, вызванные значительным сокращением финансирования науки, падением престижности научного труда в обществе, значительными объемами эмиграции перспективных высококвалифицированных ученых вследствие недостаточного материального стимулирования, физическим и моральным износом научно-технической базы, отсутствием стратегии инновационного развития, поддержки и понимания со стороны правительства, несовершенством нормативно-правового регулирования.

Исследовано современную нормативно-правовую базу по научно-технической и инновационной деятельности, включая ряд законодательных, нормативно-правовых и ведомственных документов, концепций и программ. Установлено, что развитие науки и инноваций зависит от государственной научно-технической политики, а также от мер

в сфере поддержки предпринимательства, особенно создание благоприятных условий для развития инновационного предпринимательства.

Ключевые слова: наука, инновации, нормативно-правовое обеспечение, регулирование, инновационное развитие, человеческий капитал.

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Formulation of the problem. In conditions of modern dynamic information technologies and digital economy development, innovations and science are the main keys to build a competitive economy and ensuring sustainable development.

Orientation to labor-intensive and material-intensive industries is a barrier to ensure high competitive economic and human capital development, the last one in the knowledge economy becomes a key asset capable to create added value through the production and use of knowledge in all spheres of social and economic life.

The rapid development of innovations is the factor that changes the structure of the economy, causes the emergence of new industries, their automation, including the development and use of «artificial intelligence». That is why the problem of economic and legal support of innovative development of the country is extremely important and urgent.

The purpose of the scientific article is to study the trends of development and legislative support of scientific, technical and innovative activity in Ukraine.

Main results of the study. It should be noted that recently the issues of formation and implementation of innovation policy have attracted an attention not only of scientists, but also of representatives of business and politicians, this fact is connected with the understanding of the importance of the impact of innovations and science achievements on socio-economic development, through structural changes as in the economy as well as in society, changes in the value chain from suppliers to end consumers.

At the same time, the development of innovation policy depends on a large extent on the subsystems and mechanisms of the country's socio-economic and political system, key orientations, plans and development strategies. This means that qualitative, flexible policy instruments in the field of innovations and science in general must be clearly developed in any country, such instruments should be capable of achieving the country's high competitive position in the world market and in key international rankings.

It should be noted that during the years of Ukraine's independence in the field of scientific and technical activities were accumulated many problems that have not been solved for a long time and caused stagnation of the national innovation system, a significant reduction in the number of scientists due to low levels of material support and migration, the closure of scientific schools, the decline of material, technical base of research institutions due to underfunding. Ukraine's position in the high-technology export rankings in 2018 [1] confirms the mentioned above conclusions, the country is behind China's world technology leader more than 652 times (as of 2017), Germany more than 208 times, leaders in exports of high-technology products in 2018 in addition to the following were: Korea, USA, Singapore, France, Japan and others (*Tabl. 1*).

Table 1

High Technology Export Countries Rankings 2018 (US \$)

Rank	Country	The Volume (US \$)
1	China*	654,188,000,000.00
2	Germany	209,610,000,000.00
3	Korea	192,790,000,000.00
4	USA	156,366,000,000.00
5	Singapore	155,447,000,000.00
46	Greece	1,754,802,000.00
47	Latvia	1,747,648,000.00
48	Ukraine	1,247,556,000.00
50	Croatia	1,011,940,000.00

* Data of 2017 year.

Source: [1].

The rating is based on a comparison of exports of high-tech products among 167 countries. High technology products are defined as the sum of the following products: Aerospace, Computers-office machines, Electronics-telecommunications, Pharmacy, Scientific instruments, Electrical machinery, Chemistry, Non-electrical machinery, Armament.

Structural shifts that have taken place since Ukraine's independence were spontaneous, and positive growth trends persist in industries that use extensive production factors and do not require a high level of innovation activity, as they are based on exports of raw material commodities or products [2, p. 6], as a consequence, the low level of competitiveness of the economy and the lagging behind of the country in socio-economic and innovation-investment development.

The National Report «Innovative Ukraine 2020» prepared by NAS of Ukraine states: «The lack of interest in Ukraine for innovation development at the political level, inhibition of innovation activity support, and even direct opposition to it by major ministries in conditions where Ukraine's environment (neighbor countries) is intensively developing the scientific and technical sphere ...

The main reason for the non-implementation of the legislation in the field of science and innovations in Ukraine, the complexity of its development and adoption are due to the fact that regulatory acts are adopted in the absence of an innovative directed economic strategy of Ukraine» [2, p. 239].

An analysis of the scientific, technical and innovation statistics shows that it has decreased more than 5 times since the 1990s and, as a consequence, it has been lost the link between scientific results and their implementation into production. Among the reasons for this situation are the significant reduction of science funding, decline of prestige of scientific work in society, significant volumes of emigration of perspective highly qualified scientists due to insufficient material stimulation, physical and moral deterioration of the scientific and technical base, the lack of strategy of innovative development, the lack of support and understanding by the government, imperfect legal regulation.

Despite the fact that the current regulatory framework for scientific, technical and innovative activities, there are about 200 legislative, regulatory and departmental documents, it should be noted that it is imperfect, characterized by categorical confusion, lack of clarity on the conceptual apparatus, and the absence of own state innovation policy makes it impossible to improve the existing legislative and regulatory framework in this area. In addition, the legal regulation of innovation activity should be based on keeping to key public policy principles in the fields of science and innovation, in particular: freedom of creative, scientific and technical activity; legal protection of intellectual property; competition support in science and technology; stimulation of business and scientific activity; concentration of resources on priority directions of public policy; development of international cooperation etc. [3, p. 60].

National legislation in the field of innovation includes: separate norms of the Constitution of Ukraine, in particular Art. 54 guarantees citizens the freedom of scientific and technical, as well as other kinds of creativity, protection of intellectual property, copyright. The article also states that the state contributes to the development of science, establishes scientific relations of Ukraine with the world community [4]; the Law of Ukraine «On Scientific and Scientific and Technical Activities» is one of the first laws adopted in Ukraine that defines the legal, organizational and financial principles of functioning and development of scientific and scientific and technical activities, creates conditions for its implementation, meeting the needs of society and the state in technological development through the interaction of education, science, business and government [5]; the Law of Ukraine «On Innovative Activity», as amended, defines the purpose and principles of the state innovation policy, as well as the legal, economic and organizational principles of state regulation of innovation activity [6]; the Law of Ukraine «On Investment Activity», defines innovation as one of the forms of investment, and in Art. 3 states that innovative activity as a form of investment is carried out in order to implement the achievements of scientific and technological progress in production and social sphere and includes: the production and distribution of fundamentally new technique and technologies; progressive cross-branches structural shifts; implementation of long-term scientific and technical programs; financing of basic research to

ensure qualitative changes in production facilities; development and implementation of new resource-saving technologies designed to improve social and environmental state of production [7]; the Law of Ukraine «On Priority Areas for Innovation Activity in Ukraine» defines key legislative, economic and organizational principles for the formation and implementation of priority directions for innovation activity development [8]; the Law of Ukraine «On Amendments to the Law of Ukraine» On the Special Regime of Innovation Activity of Technology Parks «defines the legal and economic principles of the introduction and operation of the special regime of investment and innovation activity of technology parks [9]; the Law of Ukraine «On Scientific Parks» regulates legal, economic, organizational relations related to the creation and operation of scientific parks, and aims to ensure the intensification of the processes of development, implementation, production of innovative products in the domestic and foreign markets [10].

In addition to the aforementioned laws, state programs and concepts in the field of development and support of scientific, technological and innovative development of Ukraine were adopted, in particular, the National Comprehensive Program for the Development of High-Tech Technologies (2004) [11], The Concept of Scientific, Technological and Innovative Development of Ukraine (1999) [12], Concept of development of national innovation system in 2009 [13], Strategy of innovative development of Ukraine for 2010—2020 under the conditions of globalization challenges [14], as well as other legal acts that determine the legal, economic and organizational bases of state regulation of innovative activity in Ukraine. In 2015, a new wording of the Law of Ukraine «On Scientific and Scientific and Technical Activities» was adopted in order to resolve a number of problems in the scientific field and ensure the revival of the country's scientific potential. The law provides: involvement of specialists in decision-making processes in the field of education and science; creation of the National Research Fund of Ukraine, which will provide grants for basic and applied research, scientific and technical development; creation of the National Council of Ukraine for the Science and Technology Development whose main task is to submit proposals for determining priorities in the field of science and scientific and technological activity.

Also in art. 47 of the Law of Ukraine «On Scientific and Scientific and Technical Activities» it is marked that the state uses financial, credit and tax instruments to create favorable economic conditions for the introduction of scientific and technical activities and ensure by 2025 increase the volume of funding for science from all sources to 3% of GDP according to the European Union (EU) Lisbon Strategy. An art. 2 of the above mentioned law provides for budgetary financing of scientific and technical activities at least 1.7% of GDP [5].

A positive fact is the cooperation of Ukraine with the EU in various programs which are implemented within the innovation community; in particular, Ukraine is a member of the following European programs: «Horizon 2020» — the EU Framework Program for Research and Innovation Financing with a total budget of 80 billion EUR for the period 2014—2020; Erasmus Mundus educational program; Tempus educational program; Poland — Belarus — Ukraine Border Cooperation Programs within the framework of the European Neighborhood & Partnership Instrument (ENPI); Hungary — Slovakia — Romania — Ukraine Border Cooperation Programs within the framework of the European Neighborhood & Partnership Instrument (ENPI); Southeastern Europe programs; Central Europe Program and some others [2, p. 319—320].

Ukraine has been identified as one of the 11 leading scientific countries in the world, identified as key EU strategic partners and funded under «Horizon 2020». It should be noted that associate EU members are involved in the projects of the program, and the financing of the participation of «the third» countries has a differentiated approach. Moreover, Ukraine is recognized as the only strategic partner of the EU in Eastern Europe; however, this status unfortunately does not provide more favorable conditions for cooperation and does not provide maximum opportunities for participation in the projects of the Framework Programs [2, p. 323].

For a better understanding of the situation regarding the state and evaluation of innovative, scientific and technical development of Ukraine, it is necessary to refer to the European Innovation Union Scoreboard (IUS), that consists of a system of evaluation of indicators of scientific, technical and innovative activity, on the base of which a Summary Innovation Index (SII) is calculated. It

should be noted that Ukraine is not listed in the IUS, but indicators of its scientific, technical and innovative activity are covered in the report. The IUS scoreboard consists of 27 key indicators, which are organized into 10 groups, for each of which a generalized value (indicator) is calculated, and the arithmetic mean of the generalized indicators forms a consolidated innovation index [15].

The results provide an opportunity to rank the countries and assign them to one of four groups: «innovation leaders», «strong innovators», «moderate innovators» and «modest innovators». The aggregate innovation index of the EU, Ukraine and potential countries-competitors in 2018 is shown in Fig. 1.

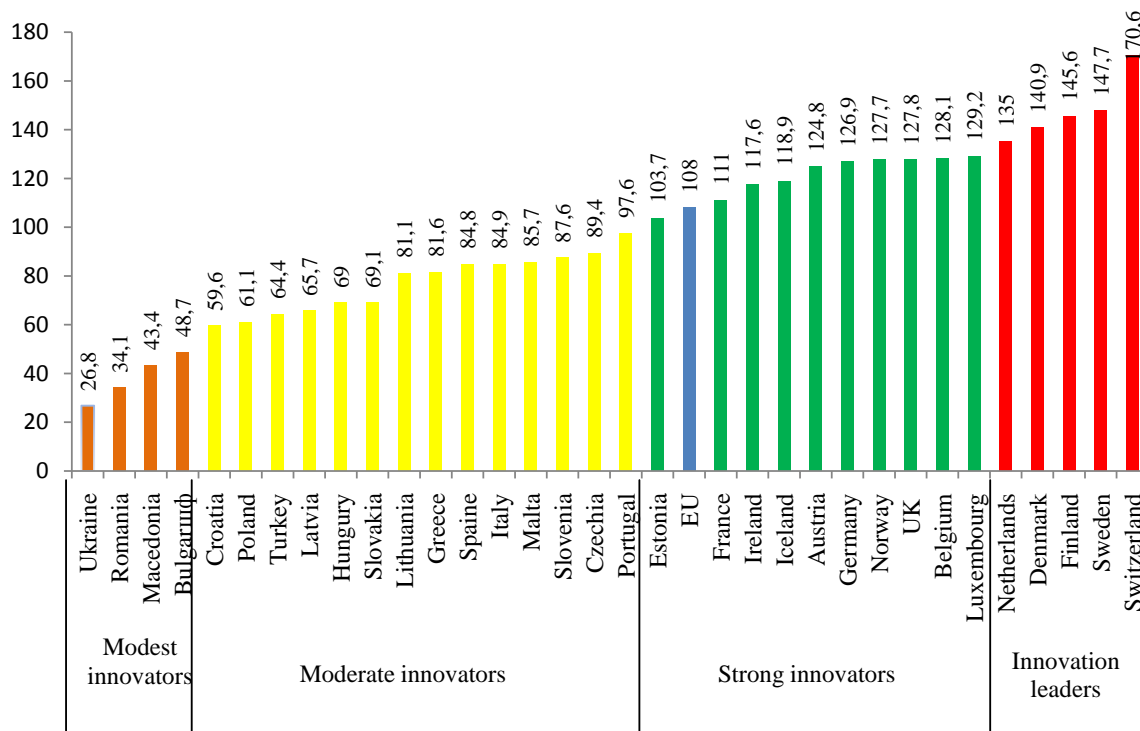


Fig. 1. The aggregate innovation index of the EU, Ukraine and potential countries-competitors in 2018

Source: [15].

Thus, from the assessment of the Summary Innovation Index, we can conclude that Ukraine belongs to the group «modest innovators» with an index value of 26.8. It should be noted that 4 years ago, Ukraine was ahead of Bulgaria by the index value and was a close competitor to Romania, but in 2018, we note the decrease of the index in comparison to the closest countries-competitors. At the same time, it should be noted that the average value of the EU Summary Innovation Index was 108 in 2018, almost three times higher than in Ukraine. The highest values of the index were obtained by the Netherlands — 135, Denmark — 140.9, Finland — 145.6, Sweden — 147.7 and Switzerland — 170.6, these countries are in the group «innovation leaders».

It is necessary to analyze the value of Ukraine in the rating of innovative development on the basis of comparison of generalized values of indicators of the main groups (Tabl. 2).

Table 2

Indicators of the main groups that form innovation rating of the EU countries and Ukraine

	Summary Innovation Index	Human Resources	Attractive Research Systems	Innovation friendly environment	Finance and Support	Firm Investments	Innovators	Linkages	Intellectual assets	Employment Impacts	Sales Impacts
Switzerland	170,7	239	234,2	232,4	147,6	208,7	142,8	164,7	168,6	117,2	119,2
Belgium	128,1	129,7	144,7	168,2	118,4	142,6	135,2	163,8	87,2	79,8	103,1
Estonia	103,7	134,2	106,3	138,9	96,8	108,0	97,7	125,9	124,3	69,3	67,6
Czechia	89,4	91,7	73,6	118,6	51,5	112,6	88,0	87,3	62,1	123,6	95,8
Latvia	65,7	77,1	46,1	143,7	106,5	55,3	36,1	49,8	52,0	98,6	55,5
Poland	61,1	70,4	34,6	197,9	39,1	87,3	15	32,4	67,4	96,5	56,1
Bulgaria	48,7	64,5	23,1	85,1	17,0	49,4	24,5	31,3	78,8	113,5	39
Ukraine	26,8	100,8	15,0	6,0	7,6	52,9	15,6	3,0	13,1	77,4	34,7

Source: [15].

Therefore, from the *Tabl. 2*, we can conclude that Ukraine is significantly behind the main indicators that form a Summary Innovation Index. The highest indicator is observed in the group «Human Resources» — 100.8, which indicates a strong staff component, while low values in the group «Attractive Research Systems» — 15.0 and «Finance and Support» — 7.6 indicate a poor operating environment of human resources.

According to the indicators of the groups «Firm Investments» — 52.9 and the «Employment Impacts» — 77.4, Ukraine can be attributed to the countries-group «moderate innovators», however, all other indicators are consistently located in the group «modest innovator». The worst situation is observed in the group «Linkages» the indicator is 3.0, while the same indicator is almost ten times higher in Poland and Bulgaria. The low value of the indicator shows the low level of innovative cooperation of small and medium-sized businesses with the subjects of research and innovation activity, the low level of start-ups support, the low level of co-financing of state research works, etc.

The indicator of the group «Innovation friendly environment» is 6.0, which indicates a low level of innovation implementation and entrepreneurial orientation, lack of state support for innovation, scientific and technical activities and favorable conditions for its results implementation.

The number of researchers plays the important role in ensure scientific, technological and innovative development. For example, the highest density of researchers in the world in Israel — 8337 people per 1 million people, in the United States — 3984, the United Kingdom — 4108, South Korea — 6533, Japan — 5195 people. 72 % of researchers worldwide live in five countries: China, EU, Japan, USA, and Russia. About 33 % of all researchers in the world live in Europe, with a population of 11.4 % of the world population [16, p. 165].

The opposite of the pan-European and global trends is the situation with scientific personnel in Ukraine. The number of researchers per 1 million population is 2.6 times lower than in the EU. The losses of intellectual potential have threatening trends, as the number of scientists in Ukraine has decreased from 313079 people to 57630 people during 1990—2018 years it is almost in five times, the same can be said about the number of scientific institutions decreased significantly from 1,344 to 950 over the same period.

According to the State Statistics Committee of Ukraine in 2018, the share of R&D performers (researchers, technicians and support staff) in the total employed population was 0.54 %, including researchers — 0.35 %. According to Eurostat, the highest share was in Denmark in 2016 (3.18 % and 2.2 %), Finland (3.04 % and 2.26 %), and the United Kingdom (2.29 % and 1.68 %) and the Netherlands (2.28 % and 1.39 %); the lowest — in Romania (0.54 % and 0.34 %), Cyprus (0.87 % and 0.62 %), Bulgaria (1.09 % and 0.71 %) and Poland (1.08 % and 0.83 %) [17].

The stagnation of science and the decline in prestige of scientific work are evidenced by data on the number of performers of research and development and researchers per 1,000 people employed. We note a decrease from 9.5 in 2010 to 6.0 in 2016, while in EU countries this figure was 17.9 in 2010 and 20.4 in 2015 [18, p. 62]. Also, in 2018, the number of persons involved in the implementation of the research and development decreased to 88,128 persons, or more than twice compared to 2010, 18,284 persons [18, p. 12].

Among the main reasons for the decline of highly qualified scientific personnel usually point out such factors as low wages, reduced prestige of scientific work in society, low level of scientific and technical base and funding for research and development, poor work of «social elevators» for young scientists and negative expectations about the further decline of the science. [16, p. 170].

It is noteworthy to analyze the research, which was conducted by experts of the Institute of Research of Scientific and Technical Potential and History of Science concerning the development of the forecasting method, which allowed calculating the further evolution of the personnel potential of domestic science for the next decades (Fig. 2).

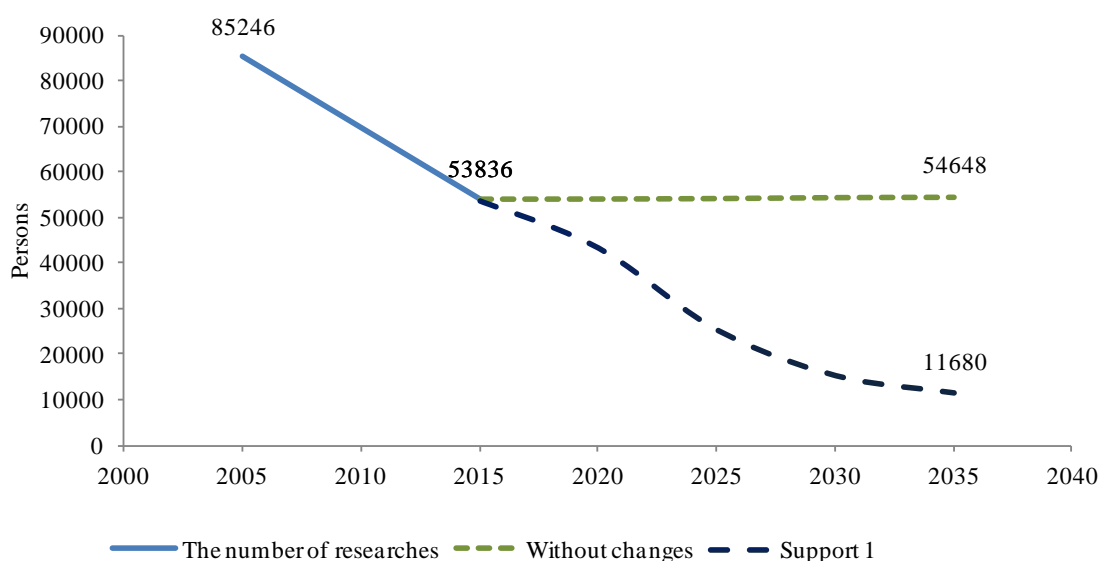


Fig. 2. The evolution of the number of researchers in Ukraine during 2005—2015 and forecast to 2035

Source: [19].

According to research that was hold by scientists, support 1 means to take a series of measures to ensure the researchers' increase in age groups up to 29 years by 25 % during each five-year period and to prevent more than 10 % loss of researchers aged from 30 to 59, and 25 % loss of researchers over the age of 60, during the same period. In the study, experts have predicted that if the current trends of reducing the number of researchers persist, in 2035 their number will be reduced more than in 4 times and will amount 11680 people, such trends can lead to a decrease in innovative opportunities of the country, innovative development and further competitiveness decrease in the world market.

At the same time the scientists of the Institute of Research of Scientific and Technical Potential and History of Science have proposed a number of measures to bring the national indicators of scientists amount closer to European standards, in particular, to ensure at least to double the amount of young people in science at least every 5 years, while avoiding annual losses of more than 1 % of age groups from 30 to 59 and about 5 % of age group more than 60 years (Fig. 3).

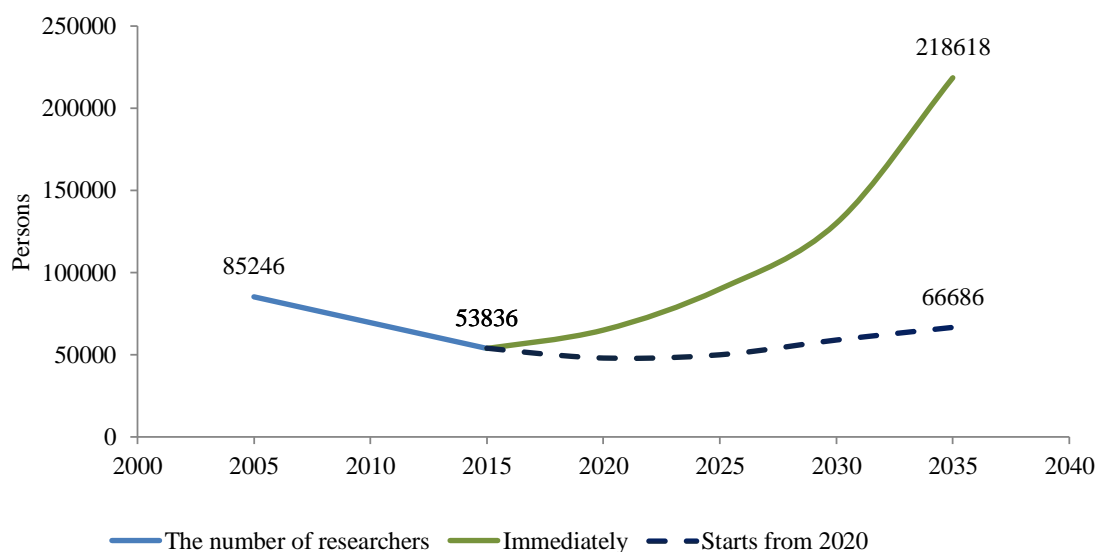


Fig. 3. Probable evolution of the number of researchers in Ukraine

Source: [19].

Thus, in the case of urgent measures, the projected number of researchers will increase to 218 thousand persons in 2035, and in the case of a delay the number of researchers will increase to only 66 thousand.

Scientists came to the conclusion that the situation in domestic science has reached a catastrophic level, and its ability to reproduce itself is scanty, «delaying the necessary changes for five years will no longer simply lead to a corresponding «shift» of the calculated curve, and will make the achievement of the desired indicators practically impossible for at least 10 years (that means, it will cost more and to achieve the desired goal will be more problematic)» [19].

Conclusions. Based on the research we can conclude that it is necessary to hold urgent extraordinary measures to support science in order to ensure its revival and not survival. And that means developing and implementing a strategy for innovative development, improving the existing regulatory and legal framework, introducing financial and tax-credit instruments for financing the scientific sphere. A good example of such measures may be India and China, which go to extraordinary measures and expenditures to become the world's leading economic leader. For example, China spends a great amount of money to bring back scientists from abroad, lure foreign scientists and students, and scientists' salaries have increased in 24 times over 15 years, and India has built an entire city for IT researchers and developers. Such examples demonstrate a clear understanding by countries of the importance of science in a promising and highly competitive future.

In addition, it is necessary not to forget and use the experience of the leading countries in the field of legal regulation of innovation and to develop one's own model of innovation policy, which will be the basis for improving the regulatory framework in this field. In particular, it is necessary to provide the increase of the production of innovative products by enterprises on the basis of applying tax incentives for enterprises engaged in creating innovative products, providing interest-free loans, compensation, stimulate the development of research and technological cooperation within public-private partnerships, stimulate the development of cooperation between enterprises of different industries using the participation of scientific institutions, the development of small and medium-sized innovative entrepreneurship. Therefore, it should be understood that the development of science and innovation depends on state scientific and technical policy, as well as on measures in the field of entrepreneurship support, especially creating favorable conditions for the development of innovative entrepreneurship, which in turn can ensure the stability of economic development, high level of competitiveness and the ability to respond to the challenges of the sixth technological order in a timely manner.

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