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STRUCTURAL RISKS AND SYSTEMIC DYNAMICS OF SOCIO-ECONOMIC DEVELOPMENT OF THE NATIONAL ECONOMY

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FINANCIAL INSTRUMENTS OF INTERNATIONAL SCIENTIFIC AND TECHNICAL COOPERATION

Abstract. *In the scientific article, the modern state of international technical and scientific cooperation on the basis of financial instruments in Ukraine is analyzed. The dynamics of the research-intensity of GDP, the dynamics and structure of financing scientific and technical and research activities by attracting foreign resources are presented. Basic financial instruments of promoting international technical and scientific cooperation are systematized. Key elements of financial, international technical and scientific cooperation with the EU countries, the USA, Canada, international financial funds are outlined. Key reasons for the low development of international scientific and technical cooperation are summarized. It is proved that only the promotion of international cooperation by the state is the key to the successful solution for problems of bilateral and interstate relations of Ukraine. The recommendations of scientists are summarized and variants of financial instruments for the promotion and expansion of international activity of scientific and technical institutions are proposed.*

JEL Classification System: F 360, O 190, O 330
Key words: financial instruments, international scientific and technical cooperation, research-intensity of GDP.

Introduction. International scientific and technical cooperation is a component of cooperation of countries in the scientific and technical sector, including in the financial sphere. Within the framework of international cooperation, the trade in licenses, implementation of technical projects, construction of factories and other facilities are carried out, joint researches and development and the training of national personnel are conducted, the exchange of general scientific and technical information takes place etc. Diversification of forms of international scientific and technical cooperation of Ukraine promotes development of international cooperation in the sphere of science, education and production and it is the key to innovative development of the economy. In Ukraine, today there is a decrease in the volume of

financing for science from the state. This situation makes the development of international scientific and technical cooperation and the use of modern financial instruments for its support, especially given Ukraine's ambitions to join the EU, extremely important.

The analysis of recent researches and publications suggests the relevance and importance of the issue of financial support for scientific research and development. A significant number of works of both domestic and foreign authors are devoted to the problems of financing for scientific, scientific and technical activities. Scientists have attempted to identify a quantitative benchmark of budget financing of scientific and technical activity in Ukraine. Considerable attention is given to stimulating private investment in the innovation process[220].

Some aspects of international cooperation of Ukraine in the scientific and technical sphere were the subject of such domestic and foreign lawyers and scientists as O. Hashutina[221], L. Fedulova [222]. and others. While acknowledging existing developments, we believe, it is necessary to pay attention to the study of international cooperation of Ukraine with the EU and NATO in the scientific and technical field in more detail. The aim of our study is to summarize the views of scientists on financial instruments of international scientific and technical cooperation.

The current level of the inclusion of Ukraine in international scientific and technical cooperation is extremely low, the extent of cooperation does not correspond fully to scientific and technical and economic potential of our state, and the participation of Ukraine in innovative cooperation with other states is poorly diversified[223].

This is evidenced by the indicators of the research-intensity of GDP of the state (spending on science by all sources in percent to GDP), which in 2015 amounted to 0,62%. Thus, according to 2014, the share of expenditure on research and development in the GDP of the EU-28 on average was 2.03%. The shares of expenditure on research and development were more than the average in such

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[220] Bulkin I. O. To the question of determining the quantitative benchmark of the volume of budget financing for scientific and technical activity in Ukraine / I. O. Bulkin / / Problems of science. – 2011. – No. 6. – P. 2-10.

[221] Hashutina O. E. Actual problems of integration of the scientific and technical sphere of Ukraine into the world and European scientific and technical space / O. E. Hashutina II Theory and practice of public administration. – 2013. – Vol. 4 (43). – P 262-266.

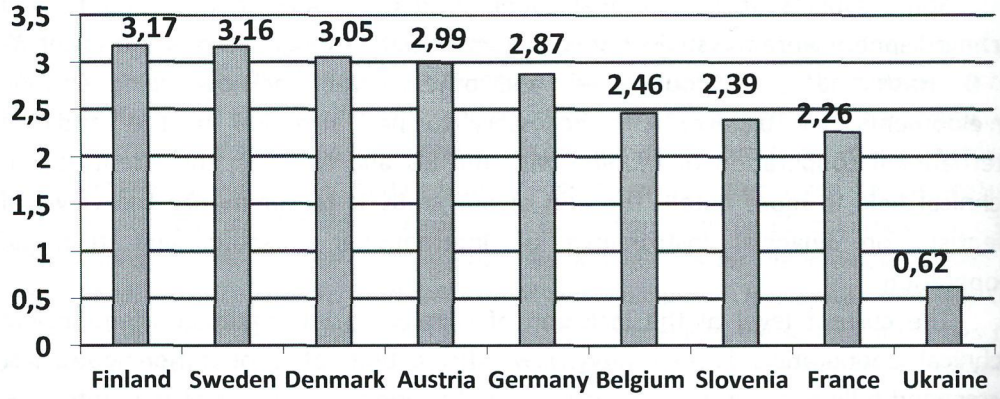
[222] Fedulova, L.I. (2008) Strategy of technological development: microeconomic approach. Bulletin Nat. Univ. "Lviv Polytechnic". Series "Problems of Economics and Management", no. 628, pp. 674-681 (In Ukrainian).

[223] Poruchnyk A. Innovative potential of Ukraine and its implementation in international scientific and technical cooperation / A. Poruchnyk // International economic policy. – 2004. –No. 1.–P. 94-121.

countries as Finland – 3,17%, Sweden – 3,16%, Denmark -3,05%, Austria – 2,99%, Germany – 2,87%, Belgium – 2,46%, Slovenia – 2,39%, France – 2.26% (see Fig. 1.)[224]

In addition, there is a low total amount of financing of scientific, scientific and technical activity in Ukraine at the expense of all sources (in 2015, this amount was 12223,16 mln. including at the expense of foreign states – 2224,165 million UAH.), in comparison with the EU countries.

Figure. 1. Research-intensity of GDP in Europe and in Ukraine in 2014.

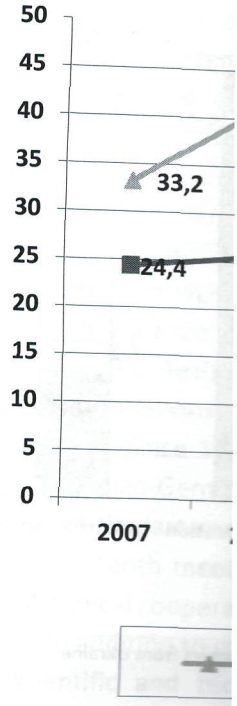


Source: compiled by the author based on [212]

Low levels of scientific and technical cooperation can be shown by the indicators of the financial participation of foreign countries in scientific and technical activities, particularly, the share of funds of foreign states in the total amount of financing has been fluctuating in different years, from 25.8% to 18.2% (in 2015) (See Fig. 2.).

[224] Gross domestic expenditure on R&D (GERD)% of GDP [Electronic resource]. – Retrieved from: http://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugm=1&pcode=t2020_20&language=en

Figure. 2. Dynamics o
activities by sources, %

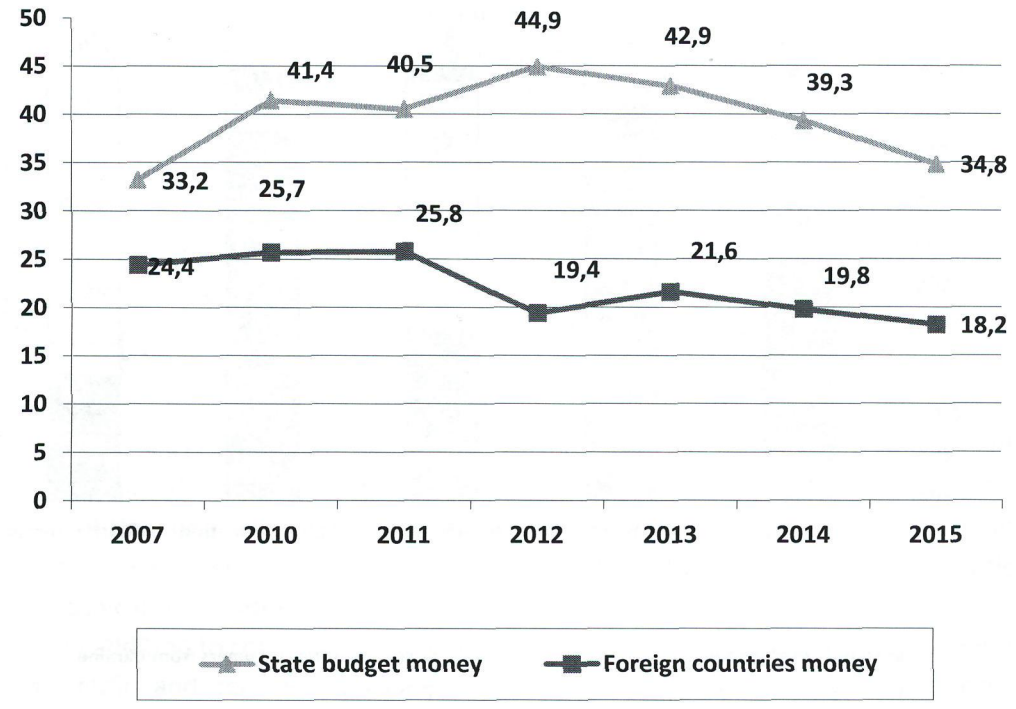


Source: compiled by the au

Besides, in rece
foreign investments i
activities. The largest
industry directions –
7.1% of foreign capit
63.7% (see Fig. 3.).

[225]Scientific and innovative
Ukraine, 2012. – 305 p.

Figure. 2. Dynamics of the structure of financing for scientific and technical and research activities by sources, %

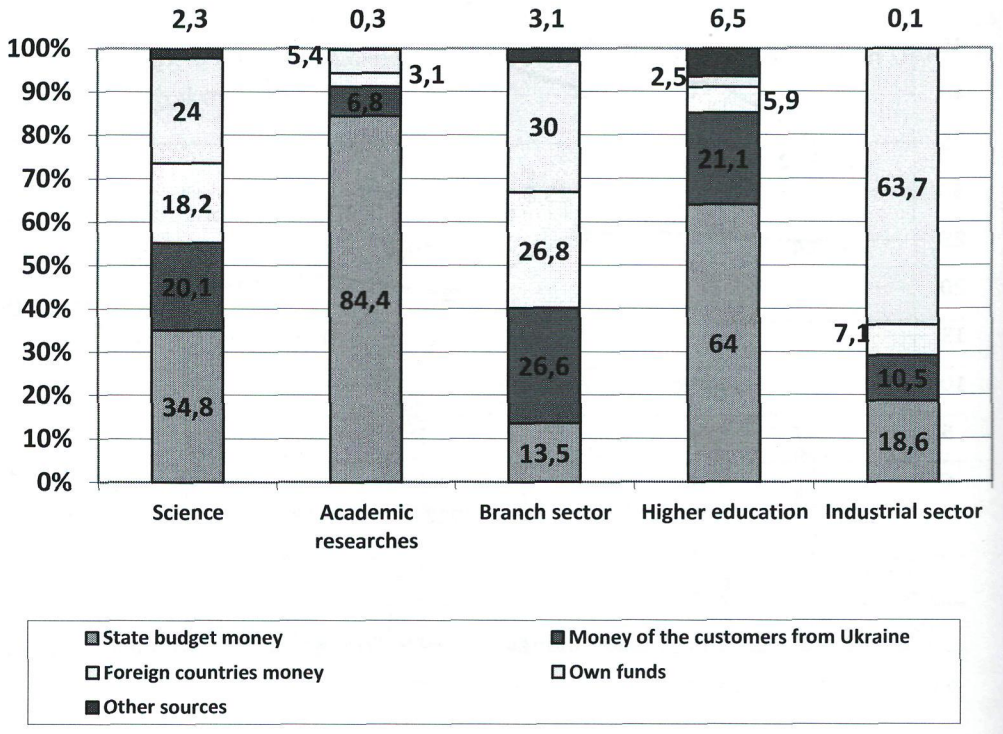


Source: compiled by the author based on [225]

Besides, in recent years, there has been a marked decline in the share of foreign investments in the total amount of financing for scientific and technical activities. The largest share of funding at the expense of foreign states belongs to industry directions – 26.8% and to science – 18.2%. The production acquired only 7.1% of foreign capital. The factory sector was mostly financed by own funds for 63.7% (see Fig. 3.).

[225]Scientific and innovative activity in Ukraine: Statistical compendium – K.: State statistics service of Ukraine, 2012. – 305 p.

Fig. 3. The structure of financing for scientific, scientific and technical activity by the sources and sectors of science in 2015,%



Source: compiled by the author based on [213]

In general, if we analyze international scientific and technological connections of Ukraine, today the closest ties in scientific and technical and educational cooperation of Ukraine are established with the United States, the European Union and CIS countries, with which Ukraine signed more than thirty intergovernmental deals, defining the principles of such cooperation. Thus, in Ukraine, the EU initiatives in the field of scientific and technical development of the programmes TACIS, Copernicus, etc. have been implemented[226].

Ukraine maintains international scientific and technical cooperation within the framework of numerous international organizations, both universal and regional in

[226] Malitskyi B. A., Popovich A. S., Soloviov V. P., etc. Rational financing of science as a prerequisite for the development of a knowledgeable society in Ukraine / Malitskyi B. A., Popovich A. S., Soloviov V. P. – K.: Fenix, 2004

nature (the UNO, UNESCO, the Council of Europe etc.). However, the corresponding cooperation with the EU and NATO is the most continuous and comprehensive. We can distinguish several forms of scientific and technical cooperation of Ukraine with the EU, which are successfully implemented in practice. It is cooperation, which is realized by implementing this collaboration through bilateral agreements on cooperation, and coordination, which takes place during the involvement in the Framework programme for research and innovation Horizon 2020, EUREKA, ERASMUS+ and other programmes, the coordinator of which is the EU[227].

Between Ukraine and the European Community in 2014, the Agreement on scientific and technological cooperation was signed. Scientific and technological cooperation between Ukraine and Germany is based on the Joint Declaration of the Ukrainian State Committee for science and technology and the Federal Ministry of Research and Technology of the Federal Republic of Germany on Scientific and Technical Relations from June 10, 1993, which has the status of an interagency agreement. Since 1997, with the support of the Ukrainian and German sides about 160 Ukrainian-German research projects have been carried out. According to the results of the last contest, 12 joint projects were implemented. On June 11, 2014, in Kiev, the Tenth meeting of the joint Ukrainian-German working group on scientific and technical cooperation was held.

In addition to considering questions regarding the current state of development of scientific and technical cooperation between Ukraine and Germany, special attention was paid to the discussion of existing and possible cooperation mechanisms with attracting investment of public and private sectors. With the purpose of their further use, the most acceptable for both parties cooperation instruments were determined and competition of joint Ukrainian-German scientific and technical projects was announced[228].

One of the world leaders in some of the most research-intensive and technologically sophisticated industries in the field of nuclear energy, the production of aviation and space technology and modern telecommunication systems, in the fields of biotechnology and pharmacy, is Canada. Canadian investments account for about 1.3% of the total volume of foreign investments in Ukraine, among the priority directions is industry - 72.9%, including engineering – only 8.8%.

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[227] On the implementation of the Association Agreement between Ukraine, of the one part, and the European Union, the European Atomic Energy Community and their Member States, of the other part: the Order of the Cabinet of Ministers of Ukraine dated 17 September 2014, [Electronic resource]. – Retrieved from: http://zakon2.rada.gov.ua/laws/show/847-2014-%D1%80.

[228] Scientific and technical cooperation between Ukraine and Germany, the Embassy of Ukraine in the Federal Republic of Germany http://germany.mfa.gov.ua/ua/ukraine–de/science

The key governmental body of Canada, which is responsible for the implementation of technical cooperation with other countries is the Canadian international development Agency (CIDA). Cooperation with CIDA played a vital role in the formation and development of Ukrainian-Canadian scientific and technical cooperation, interaction in the legal sphere; it facilitated the establishment of contacts between many government agencies, scientific and educational institutions of Ukraine and Canada. As of today, CIDA (together with other donors) coordinates fully or partially 35 active projects of international assistance to Ukraine. According to the latest Canadian data, the total amount of Canadian technical assistance to Ukraine since 1991, is more than $383 million[229].

Regarding cooperation with the United States, it is mainly carried out through the American international funds, through the NATO science programmes, etc. According to such programmes, Ukraine regularly receives financial support for the development of domestic science: the implementation of the programmes of cooperation with NATO allowed Ukrainian scientists to draw more than 480 grants, in addition, the participation of 300 scholars of Ukraine in scientific forums of NATO has been funded. However, the total amount of financing for international scientific and technical activity of Ukraine is insufficient and that is why it cannot have a positive impact on the socio-economic development of our country. On July 9, 1997 Ukraine and NATO signed a Charter on a distinctive partnership, one of the spheres of consultation and/or cooperation of which, is scientific and technological issues. For further implementation of the provisions of the Charter between NATO and Ukraine, the National programmes of cooperation were created; according to these programmes separate measures concerning technical and scientific cooperation were taken. Today there is the Annual national cooperation program NATO – Ukraine for 2016 (hereinafter – the Programme) [230]. According to the Programme, "taking into account the long-term goal of joining the European security system, which is based on NATO, Ukraine will deepen its cooperation with NATO with the aim of achieving the criteria necessary for acquiring membership in this organization" in the direction of cooperation in the field of science and technology[231].

[229] Scientific and technical cooperation between Ukraine and Canada, the Embassy of Ukraine in Canada http://canada.mfa.gov.ua/ua/ukraine–%D1%81%D0%B0/science.

[230] On approving the Annual national cooperation program NATO – Ukraine for 2016: the Decree of the President of Ukraine from 12 February 2016 No.45/2016 [Electronic resource]. – Retrieved from: http://zakon3.rada.gov.ua/laws/show/45/2016

[231] Fetisenko V. O. International cooperation of Ukraine with the European Union and the North Atlantic Treaty Organization in the scientific and technical sphere: legal issues / V. O. Fetisenko // Comparative and analytical law No4, 2016, p. 277-280

Unfortunately, the current level of Ukraine's participation in international scientific and technical cooperation is low, especially in the field of science and technology in the creation, modernization and operation of industrial enterprises and social infrastructure; exchange of technologies, licenses, design and project materials, etc. At the same time, one of the main forms of international scientific and technical cooperation of our state is the fact that scientific workers go abroad, international conferences are held and grants are given from foreign foundations[232].

According to the OECD, among the top 50 largest recipients of international aid in the world, Ukraine occupies the 45th place. Among the developing countries of the European region, Ukraine ranks second after Turkey. In 2014, we received $1.4 billion or 16% of all the aid, allocated to the region. This is two times more than in 2013. Unfortunately, the Ministry of economy now does not collect official statistics for loans from international financial institutions. And not all grants are recorded in the Ministry of economy. Usually, large grants and those, which need benefits from paying VAT and customs fees, are recorded. Therefore, about 30-40% of the projects are not registered with the MEDT (Ministry of economic development and trade of Ukraine). Furthermore, Ukraine has no unified database on international assistance projects[233].

Recently, in scientific, scientific and technical policy of Ukraine, there have been some targeted changes, but the decline of the scientific and technical branch of social production continues, and the production itself remains the one, which adopts little innovation. This, in particular, is shown by the following trends: 1) a sharp decrease in demand of the manufacturing sector for scientific and technical developments; 2) the decrease of state support for science in all economic programmes; 3) the destruction of the system of logistic support for scientific research; 4) the difficulty of forming the national systems of science and technology control; 5) a sharp decline in the prestige of scientific work; 6) weak social protection of scientific workers, which is accompanied by the "drain" of intellectual potential of the country, staff reductions, previously existing and new "technological" delays and obstacles to scientific research and career development.[234]

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[232]Hashutina O. E. Actual problems of integration of the scientific and technical sphere of Ukraine into the world and European scientific and technical space / O. E. Hashutina II Theory and practice of public administration. – 2013. – Vol. 4 (43). – P 262-266.

[233] Shkarpova O., Ostapchuk, D. Free of charge, but not free. What is wrong with international aid to Ukraine? [Electronic resource]. – Retrieved from: http://voxukraine.org/2016/05/13/bezoplatno-ale-na-zadarma-ua/

[234] On the implementation of the Association Agreement between Ukraine, of the one part, and the European Union, the European Atomic Energy Community and their Member States, of the other part:

In our opinion, the government should encourage all kinds of involvement in international technical and scientific cooperation of not only academic institutions but also the productive sector in all its diversity. We have summarized the recommendations of scientists and we want to offer the following financial instruments for the promotion and expansion of international activities of scientific and technical structures[235][236]:

- the system of grants as a funding tool on an irrevocable basis;
- development and implementation of the system of stimulating foreign investments in the industrial sector depending on the priority of investment objects of innovation, the volume of investment, and their duration;
- improvement in the tax policy towards providing innovative development, which is associated with the improvement of the appropriate legal framework; the introduction of the preferential taxation system depending on the volume and duration of foreign investment, because the current system takes this into account not enough; tax benefits to companies and organizations that introduce the latest techniques and technologies, carry out the transfer of the research-intensity products;
- exempting the import of scientific equipment, devices and materials from customs and other obligatory payments;
- specifying the solution to the problem of financing for research and innovation activity – to shift from science financing based on the residual principle to providing an economically viable level of funding for the entire cycle of the innovation process, from basic researches to implementation of innovations in production. All the stimulating incentives – tax, customs, credit, etc. should be allocated for this cycle;
- leasing of expensive equipment;
- financial support through the mechanisms of venture financing;

the Order of the Cabinet of Ministers of Ukraine dated 17 September 2014, [Electronic resource]. – Retrieved from: http://zakon2.rada.gov.ua/laws/show/847–2014–%D1%80

[235]Kryvutsa A.V. Internal preconditions and problems of inclusion of Ukraine in the international technology exchange / Kryvutsa A. V. // Economics, management, business. No. 1-2, 2011, pp. 46-51. http://www.nbuv.gov.ua/old_jrn/Soc_Gum/Emb/2011_1-2/krivuza.pdf.

[236] Chumachenko H. Topical issues of international economic cooperation of Ukraine in the scientific and technical sphere / H. Chumachenko// Journal of Law #7/2004. [Electronic resource]. – Retrieved from: http://justinian.com.ua/print.php?id=1303

- the exemption from the mandatory sale on the interbank currency market of Ukraine of proceeds in the foreign currency according to international technical programmes and projects;
- primary, urgent payment of expenses, connected with implementation of international technical programmes and projects that are carried out by state research institutions and higher educational institutions.

The multi-sorced mechanism of funding the scientific and innovation sphere requires the independence of support funds (Innovation Fund, Foundation for fundamental research, etc.) from departmental interests. For mastering domestic and international technology markets, it is necessary to promote the commercialization of the R&D results, create and revitalize the activity of domestic financial and industrial groups and transnational corporations and stimulate innovative entrepreneurship, venture business and the leasing of expensive modern equipment[237].

It is reasonable to introduce the state register of innovative projects and the state register of innovative structures. It is also advisable to provide a business entity with tax percentage (e.g. 30% of the value added tax and income tax) that will be used exclusively for innovative, scientific and technical activity and development of own scientific and technological, research and experimental bases[238]. It is necessary to learn how to distribute a certain amount of money according to the system of grants[239].

Conclusions. Analyzing the state of scientific and technical cooperation, we can talk about the reduction of financing for scientific, scientific and technical works at the expense of foreign countries. This indicates that Ukraine lags behind significantly in innovative development. Only the promotion of international cooperation by the state is the key to the successful solution for problems of bilateral and interstate relations of Ukraine. An important component should be the normatively set financial tools of promoting international technical and scientific cooperation. Thus, for the further development of international scientific and technical cooperation, Ukraine should develop the state mechanism for supporting innovation and facilitating the entry of foreign capital to the markets of Ukraine,

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[237] Bulkin I. O. To the question of determining the quantitative benchmark of the volume of budget financing for scientific and technical activity in Ukraine / I. O. Bulkin / / Problems of science. – 2011. – No. 6. – pp. 2-10.

[238] Kryvutsa A.V. Internal preconditions and problems of inclusion of Ukraine in the international technology exchange / Kryvutsa A. V. // Economics, management, business. No. 1-2, 2011, pp. 46-51. http://www.nbuv.gov.ua/old_jrn/Soc_Gum/Emb/2011_1-2/krivuza.pdf.

[239] Chumachenko H. Topical issues of international economic cooperation of Ukraine in the scientific and technical sphere / H. Chumachenko// Journal of Law #7/2004. [Electronic resource]. – Retrieved from: http://justinian.com.ua/print.php?id=1303

because the underestimation of the role of scientific research hinders the economic development of Ukraine. From the point of view of further research, we consider the analysis of projection data regarding future financial, technical and scientific cooperation and possibilities of its expansion in subsequent years, to be promising.