

State Support of the High-Tech Exports: Comparative Analysis and Lessons for Ukraine

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ABSTRACT. The nature of the natural increase in the share of high-tech exports in the overall world exports and trade in general is revealed. The trends in geographical and industrial developments of a high-tech exports in 2004-2015 are shown in the world, developed countries and the EU. Based on the study of dynamics of the high-tech exports of the leading countries in general, as well as engineering products segment, the basic models of state regulation in this sphere are identified i.e. active dirigisme, moderate dirigisme and liberalism. The experience of maintaining a high-tech exports to the US, Germany, Britain, Japan, South Korea and China is summarized. The tendencies of high-tech exports of Ukrainian enterprises in industries such as aerospace engineering, electronics and telecommunications, scientific instruments, computer and office appliances, as well as military industrial products were analyzed. The directions of forming the state support of domestic exporters of high-tech products were identified.

KEYWORDS. Export, hi-tech export, high-tech import, high-tech products, high-tech export models, export regulation models, governmental support for exports, Ukraine's high-tech export, export-credit agencies, the Washington Consensus.

Introduction

The problem of state regulation of certain sectors of production and trade, including the high-tech products, has always been important. In different countries, in different periods the relationship between liberalism and protectionism changed. The national governments often were forced to resign when their economies suffered from inefficient combination of the market and state regulatory mechanisms. However, the global financial crisis of 2008-2009 has made most states to strengthen the administrative and economic impact on economic development. This fact was noted by the head of one of the world's

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most influential business organizations APCAC², D. Makarti, at the US-Asian international conference held in March 2012 in Washington. According to her, the "State capitalism becomes a new challenge to the modern economy, as it employs the advantage of open free markets, while protecting the key sectors of the national industry, mobilizes the state resources, and encourages the creation of joint ventures with foreign companies to transfer the knowledge and technology. It has control of the key enterprises, subsidizing their development and expansion abroad."³ The high-tech production and export falls within the core businesses, primarily because they are the basis of the military-industrial complex and other priority sectors of the national economies of the leading players in the global markets.

The problem of state support of the high-tech exports is also extremely relevant for Ukraine. The matter is not only that our country ranks far from the leading positions in the global market of high-tech products with a consistently low share of 0.03% in 2004-2015. The share of high-tech exports in the total exports of Ukraine for this period remains insignificant too, namely 2-3%. To a large extent, this is due to excessive liberalization of foreign economic activity since independence, elimination of state regulation of activities in general and in the high-tech segment in particular. Therefore, the significant potential of high-tech exports of Ukraine in the early 1990s' was subsequently lost. Now we have to take urgent measures to gradually overcome the raw material orientation of Ukrainian exports in favor of high-tech products. The establishment of a modern system of state support of high-tech exports in Ukraine from the experience of developed countries should play an important role in this process.

A significant number of domestic and foreign scientists conducted investigation of mechanisms of state regulation of high-tech exports. They include Badrak I.,⁴ Begma V.,⁵ Belov V.,⁶ Veselovskyi A.,⁷ Zuyev V.,⁸

² APCAC — Asia — Pacific council of American Chambers of Commerce. Combines more than 50 thousand business leaders, 20 thousand companies from 20 countries of the Asia-Pacific region.

³ Kondrat'ev, V. "The second state capitalism breath." *World Economy and International Relations* 6 (2013): 3. [In Russian].

⁴ Badrak, V. "Private military industrial complex of Ukraine: reliance "defense industry" or outcasts." *Zerkalo Nedeli* 40 (2016): 2. [In Ukrainian].

⁵ Behma, V.M. *Market Arms: problems of marketing products in the military-technical: monograph*. K.: NIMB, 2001. [In Ukrainian].

⁶ Belov, V.B. "Germany: export promotion." *M.: Institute of Europe — RAS "Modern Europe"* 4 (2003): 38-48. [In Russian].

⁷ Veselovskyy, A. "The export potential of Ukraine: the path to revival." *Zerkalo Nedeli* 28 (2015): 5. [In Ukrainian].

⁸ Zuev, V.N., ed. *Global economic regulation*. M.: Masters, 2009. [In Russian].

D'Aveni R.,⁹ Kizim M.,¹⁰ Kondratiev V.,¹¹ Kotler F.,¹² Lukyanenko D.,¹³ Matiushenko I.,¹⁴ Melnyk T.,¹⁵ Portanskyi A.,¹⁶ Salikhova A.,¹⁷ Sokolov V.,¹⁸ Tolstaya N.,¹⁹ Tsyhankova T.²⁰ and many others.

In view of the above, the purpose of our study is to identify the current trends of high-tech exports, generalization of high-tech products export patterns, comparison of the business practices of export support in developed countries, identification of prospects of strengthening the competitive positions of Ukrainian producers in the global high-tech markets, and justification of urgent measures for state support of domestic exporters of high-tech products.

Modern Trends in High-Tech Exports

The overreaching development of high-tech export in comparison with the growth of the world gross product is one of the most important principles of the international economy. This is primarily due to the fact that effective export activities of domestic producers of high-tech products allows optimizing the structure of domestic consumption, ensuring the balance of payments, taking advantage of the international division of labor, and ultimately increasing the international competitiveness of the national economy. According to the World Trade Organization, the annual growth of the world gross domestic product amounted to 2%, total export – 4%, manufacturing export – 7.5%, while the export of high-tech products – 12% in 1990-2000. Over the next period of 2001-2014, given the global crisis of 2008-2010, these

⁹ D'Aveni, R.A. *Hypercompetition: Managing the Dynamics of Strategic Maneuvering*. R.A.D'Aveni. New York: Free Press, 1994.

¹⁰ Kyzym, N.A. "High-tech industries as the basis for the competitiveness of countries." Edited by N.A. Kyzym and N.Yu. Matyushenko. In *Competitiveness: Problems of Science and Practice 2007: monograph*, 81-101. Kh.: VD «INZhEK», 2007. [In Russian].

¹¹ Kondrat'ev, V. "The second state capitalism breath." *World Economy and International Relations* 6 (2013): 3-18. [In Russian].

¹² Kotler, F., and Dzh. A. Kaslione. *Haotyka: management and marketing in an era of turbulence*. Translated by T.V. Spivakovs'ka and S.V. Spivakovs'kyi. K.: Khimdzhest, PLASKE, 2009. [In Ukrainian].

¹³ Lukianenko, D., and O. Titova. "Global market competitive mechanisms modification." *International Economic Policy* 2 (2010): 5-21. [In Ukrainian].

¹⁴ Matyushenko, I.Yu., and D.M. Kostenko. "Prospects for trade high-tech products in the world and Ukraine." *Business Inform* 8 (2012): 103-14. [In Ukrainian].

¹⁵ Melnyk, T.M., and O.V. Zubko. "Foreign trade of high-tech products: the institutional dimension." *Marketing and Innovation Management* 2 (2012): 181-90. [In Ukrainian].

¹⁶ Portanskyi, A.P. "Washington is reviewing its trade priorities." *US and Canada: Economics, Politics, Culture* 12 (2010): 27-40. [In Russian].

¹⁷ Salikhova, O.B. "Targeted government support as a factor stimulating the development of high-tech industries in Ukraine." *Industrial Economy* 9 (2011): 9-23. [In Ukrainian].

¹⁸ Sokolov, V. "Trends in the development of world merchandise trade in 1990-2008." *World Economy and International Relations* 2 (2011): 36-47. [In Russian].

¹⁹ Tolstaya, N.M. "Prospects for the exchange of high-tech products between Ukraine and the European Union." *International relations* 31-32 (2005): 53-56. [In Ukrainian].

²⁰ Tsyhankova, T.M. *International marketing: theoretical model and business technologies: monograph*. K.: KNEU, 2004. [In Ukrainian].

indicators were 0.8%, 2%, 3.2% and 6%, respectively.²¹ Thus, despite the slowdown in the global economy, the tendency towards consolidation of high-tech product position in exports is maintained.

From the methodological point of view, an accelerated growth of high-tech exports with paradigmatic technological innovation (technological imperative) is the basis of the so-called neoschumpeterian concept replacing the orthodox neoliberal doctrine. This concept, combined with the theory of "long waves" by M. Kondratiev, believes that the most important factor in the evolution of human civilization is the dynamics of technological change and related industrial and structural changes forming the latest technological modes and becoming a generator of "constructive destruction", which, in turn, create the new flagship industries of the overall economic development.²² It is quite natural that the high-tech products of these flagship industries prevail in the export-import operations. It should be stressed that the theoretical basis of this conception is J.Schumpeter's idea about the difference between an ordinary businessman, simply "a master" and an "entrepreneur-innovator." "It is objectively more difficult to make something different, new, than usual, proven, says J.Schumpeter. Here one must take into account the fact that the business entity strongly opposes this and would oppose even in the absence of objective difficulties. This behavior is characteristic of all human activities".²³ This provision generated the conclusion on the dual nature of innovation of entrepreneurs exporting the high-tech products. First, innovation is inherent in the process of creating such products. Second, the exporters must be no less innovative to launch the high-tech products in the world markets, which are characterized by a fundamentally different in nature and higher by magnitude, the so-called "hypercompetition", according to the terminology of one of the classics of the modern international management R. D'Aveni, which requires a special high-tech export marketing.

From a practical point of view of international trade, the increase in the share of high-tech exports in the total world trade is due to implementation of the most effective resource of economic development, i.e. innovation. According to the world statistics in the economically developed countries with technological innovations, new approaches in production of goods and services ensure a 80% increment of GDP.²⁴ At

²¹ Sokolov, V. "Trends in the development of world merchandise trade in 1990-2008." *World Economy and International Relations* 2 (2011): 36. [In Russian].

²² Fedulova, L. I., ed. *The technological imperative of socio-economic development of Ukraine: Monograph*. 2011: 208-209. [In Ukrainian].

²³ Shumpeter, Y.A. *The theory of economic development. Capitalism, Socialism and Democracy*. Eksmo, 2007: 181. [In Russian].

²⁴ Verhun, V.A., ed. *International Business: textbook*. K.: VAD EKS, 2014: 771. [In Russian].

the same time, it allows avoiding the temporary disequilibrium of the balance of payments with a high proportion of high-tech exports, which was conclusively proven by experts of the European Central Bank, B. Algieri and T. Brecka.²⁵

Analyzing the national motivations of the countries to build a high-tech industrial export, its environmental component must be noted. It implies that the leading countries of high-tech development gradually improve environmental conditions in their territories. The natural resources still in the "shadows" will acquire priority. One of these key resources can be considered the water resources, which are currently considered both as an alternative source of energy and as a foundation for sustainable development in general. This is the connection between the high-tech exports and the water supply.

The modern civilization is seriously concerned about deterioration of water supply to the global community. As stated in the UN report on development of the global water resources in 2015, the modern use of the water component by scale and pace of the operation exceeds all the most intensive processes of natural resource utilization. In particular, the worldwide consumption of fresh water exceeds the utilization of all types of industrial raw materials a thousand times. In recent times, every 20 years, the volume of fresh water consumed has doubled and reached about 4 thousand cubic kilometers. If the trends in this area are maintained, in 2030, the water scarcity will reach 40%. According to the estimates of the Stockholm Environment Institute leading in this area, about 42% jobs of the working population of the world will be determined by a large water dependence. Even Ukraine is characterized by low water availability in comparison, for example, to the EU. It is 1,096 cubic meters per capita annually, while in France it is 2,956, in Greece — 5,246, and in Norway — 83,735 cubic meters.²⁶

High-Tech Export Regulation Patterns

In today's world with the market economy, there is a variety of business regulation systems, a part of which is the state influence on foreign economic activity, including the exports of high technology products and services. For example, the Economic Code of Ukraine dated January 16, 2003 indicates that the "State regulation of foreign trade activities directed at protecting the economic interests of Ukraine, as well as the rights and legitimate interests of economic operators,

²⁵ Lukianenko, D., V. Kolesov, A. Kolot, Ya. Stolyarchuk, etc. *Global economic development: trends, asymmetries, regulation: Monograph*. Edited by D. Luk'yanenko, V. Kolesov, and A. Poruchnyk. K.: KNEU, 2013: 295. [In Russian].

²⁶ Khvesyk, M., and A. Sunduk. "Virtual water: myth or reality?." *Zerkalo Nedeli* 25 (2016): 11. [In Ukrainian].

creation of equal conditions for all kinds of business in foreign economic relations and the use of income and investment by business entities, encouragement of the competition and restriction of monopoly of the business entities in foreign economic activity [Art. 308.1]. Similar regulations exist in all countries, in each of which they acquire relevant features. To compile and organize these features, the economics widely uses various methods of simulation. According to the definition of a popular economic dictionary edited by O.M. Azrilian, "Simulation is a study of any phenomenon, process or system by building and studying their models; the use of models to determine the behavior and characteristics of real systems."²⁷ The favorable conditions of modeling use for the synthesis of high-tech export regulation systems is related to availability of the relevant modeling systems in literature. These systems can be subdivided into three categories, geographic, corporate and industrial.

The most popular are the geographical model, which are based on similarity of the countries by links of the economic mechanism, in a broad sense in this category, the implementation of high-tech exports. For example, in the famous concept of V.M. Kudrov, the said mechanism includes property relations, business traditions and its infrastructure, a set of institutions and mechanisms determining the nature of exports, forms and methods of cooperation between the state and exporters in the interests of efficiency and competitiveness of the export-oriented production. Based on comparative analysis of various countries, the said researcher identifies six modern models of social and economic development, each of which is characterized by certain features of high-tech development, i.e. American, West European, South European, Asian, Latin American and African.²⁸

Despite some interest in this work, including the numerous details of exporting the high-tech products and services in various countries, the use of the said concept in our study is impractical. First, the Latin American and African model does not represent proper interest, since these countries do not hold a significant share of the global high-tech market. Second, the distinction between the Western and South European model is useful to study the characteristics of social development, but not the high-tech export. Finally, third, the model name does not contain characteristics of the fundamental features of state influence on the activity of high-tech product exporters.

The corporate management models for high-tech export, including the direct and indirect, reactive and proactive,²⁹ as well as spot export,

²⁷ Azrilian, A.N., ed. *A large economic dictionary*. 3rd ed. M.: Institute of New Economy, 1998. [In Russian].

²⁸ Kudrov, V.M. *World economy: the socio-economic development model*. M.: Masters, 2009: 11. [In Russian].

²⁹ Solodkovskyy, Yu.M. *Competitive model export: Author. Dis. on competition sciences. degree candidate. Econ. Sciences specials. 08.05.01 «World Economy and International Economic Relations»*. K., 2005: 6-7. [In Ukrainian].

limited expansion, global network and global partnership are interesting and useful for managers of international companies.³⁰ However, these models do not reflect the mechanisms of state influence on the export of high-tech products, and therefore cannot serve as a basis for further research.

Industrial models differ in that the state regulation systems are associated with specific segments of high-tech exports. For example, in 1995, the EU Council made a decision obliging the governments of the member states to control the export of high-tech dual-use goods.³¹ Another example of this kind of action could be the UK government to expand the geography of deliveries of the British high-tech weapons. The result of the joint activities of the UK Ministry of Defense and Ministry of Foreign Affairs has recently become the signing of a series of military contracts with Saudi Arabia and Qatar worth about GBP 3 billion. They implied the delivery of the training aircrafts "Hawk", patrol boats "Vosper", armored cars "Piranha"³² etc.

To identify the sectoral models of high-tech export regulation, let's analyze the structure of suppliers of certain types of products to foreign markets, such as machine-building. The choice of this sector for analysis is based on the following arguments. First, the latest scientific and technological progress achievements are primarily materialized in the machine-building products. Second, the machine building retains its main capital-forming role in the national economies. That is why it crucially determines the level, the pace and extent of the technical and technological re-equipment of economy, and contributes to the further increase of its efficiency. Third, the machine building plays an important role in meeting the demand for a variety of hardware, and here its role is also growing steadily. In this regard, we should agree with the conclusion of V. Sokolov that "from all branches of material production, machine building contains the greatest potential for intra-segment division of labor, since the development of new technologies leads to sophistication of the fabricated equipment and allows splitting the production of its individual parts and components between different companies. Accordingly, the development of machine building industries creates enormous opportunities to generate the high-tech export-oriented clusters".³³

³⁰ Panchenko, Ye., and M. Voychak. "Formation and development of high-tech export potential corporate." *International Economic Policy* 1 (2015): 40. [In Ukrainian].

³¹ Behma, V.M. *Market Arms: problems of marketing products in the military-technical: monograph*. K.: NIMB, 2001: 114. [In Ukrainian].

³² *Ibid.*, p. 96.

³³ Sokolov, V. "Machine-building clusters in the international division of labor." *World Economy and International Relations* 5 (2013): 31. [In Russian].

Table 1 The Share of 20 Largest Exporters of Cars in the World Export in 1990-2015, %

Country	1990		2000		2010		2015	
	%	position	%	position	%	position	%	position
Germany	17,2	1	11,0	3	11,9	2	11,8	2
Japan	16,7	2	12,5	2	10,3	3	8,9	4
USA	15,1	3	15,6	1	10,3	4	9,2	3
France	6,5	4	6,1	4	3,9	7	3,5	9
UK	6,2	5	5,1	5	2,8	12	2,5	13
Italy	5,2	6	3,5	9	3,1	11	3,0	12
Canada	3,9	7	4,2	6	2,0	14	1,8	16
Belgium	2,7	8	2,1	17	1,7	15	1,5	18
Netherlands	2,5	9	3,1	12	3,5	8	3,5	10
Singapore	2,2	10	3,5	10	3,5	9	3,8	7
Taiwan	2,2	11	3,3	11	2,5	13	3,5	8
Korea	2,1	12	3,8	7	5,2	5	6,0	5
Sweden	2,0	13	1,6	15	–	–	–	–
Spain	1,8	14	1,8	16	1,6	17	1,5	19
Hong Kong	1,7	15	3,0	14	4,6	6	5,2	6
Switzerland	1,7	16	–	–	–	–	–	–
Mexico	1,3	17	3,7	8	3,3	10	3,2	11
Austria	1,3	18	–	–	–	–	–	–
China	0,9	19	3,1	13	15,4	1	23,5	1
Malaysia	0,9	20	2,3	18	1,7	16	2,2	4
Ireland	–	–	1,2	19	–	–	–	–
Thailand	–	–	1,1	20	1,6	18	2,0	15
Czech Republic	–	–	–	–	1,3	19	1,5	20
Poland	–	–	–	–	1,3	20	1,8	17
Total	94,0		91,6		90,2		89	

Source: Sokolov, V. "Machine-building clusters in the international division of labor." *World Economy and International Relations* 5 (2013): 32. [In Russian]; Rigby, D.L. "Technological Relatedness and Knowledge Space: Entry and Exit of US Cities from Patent Classes". *Regional Studies* 49 (2015): 1930.

Analyzing the materials of Table 1, we can draw an overall conclusion that over the past two decades, the leader in exporting the machine building products yet in the pre-crisis year of 2006 was China, which moved consistently from 19th place in 1990 to the 13th place in

2000 and, without any doubt, became a leading exporter in the high-tech businesses with an ever-increasing separation from Germany, USA and Japan. While this gap in engineering totaled 3.5% in 2010, in 2015 it increased to 11.7%, or three times. Meanwhile, the South Korea ranked 5th, Hong Kong – 6th, Singapore – 7th, Taiwan – 8th, and France – 9th. These countries are known to maintain the policy of active dirigisme of the state in their economic policy, which allowed these countries to gain the leading positions in the global high-tech industrial export.

Summarizing the change in export positions of the leading manufacturers of the machine building products in the table, we can draw the following conclusion about the models of state regulation of a high-tech export. The first group of countries (China, Germany, USA, Japan, Korea and Hong Kong), the share of which in the global export of machine building products exceeds 5%, follow an active dirigisme model. The second group of countries (Singapore, Taiwan, France, the Netherlands, Mexico, Italy, UK, Malaysia) with a share of 3.8% to 2.2%, ranked 7 to 14, using a moderate dirigisme model. Finally, the rest of the countries from the table, and other countries outside of the top 20 manufacturers of machine building products have resorted to the liberal model of machine building export regulation.

Recognition of importance of the state support for high-tech manufacturing exports and the need to generalize the international experience in this sector does not simplify the problem solution in any manner. The fact is that this experience is well known, and many interesting publications are published on this subject. For example, in the most recent periodic OESD review "Science, Technology and Industry" for 2014, summarizes the experience of more than 40 countries. They use many models of economic development according to the modern concepts. In particular, S. Afontsyev highlights twelve such models, from the Soviet and Chinese models of 1980 to "corrupt capitalism" of Latin America and the "Washington consensus" of the 1990s.³⁴

Outwardly, it appears that among these models one should choose a quite popular in the 1990s model of "Washington Consensus", based on a liberal role of the government, which used to claim the status of a universal, and is suitable for use in all countries with emerging markets. Meanwhile the International Monetary Fund, which issued loans to various CEE and CIS countries, relied on this model as the official doctrine. The policy of state regulation, including in the high-tech business sector, at the turn of the century corresponded to the so-called

³⁴ Afontsev, S. "Economic policies and models of economic development ." *World Economy and International Relations* 4 (2002): 41. [In Russian]

10 commandments of the "Washington consensus."³⁵ However, the real experience of this model showed that by nature it proved unable to put into practice the ideal of "independently operating government of "technocrats." Even a seemingly favorable so-called "window of opportunity" in CEE did not exceed a year. The further evolution of the "Washington consensus" model led to the formation of a broad public consensus on reforms, including the shock therapy, like in Poland, or to conquering the governments by interests of the pressure groups, especially oligarchic clans in most countries of the former USSR. Thus the "model test", including the "Washington consensus", cannot serve as an instrument of choosing the countries as objects of analyzing the experience of state regulation of production and export of the high-tech industrial products.

In the context of the above reasons, it is expedient to note that there is no clear universal integrated control system of the high-tech sector in its pure form in any country. First, this regulation is related to the other business sectors, namely innovation on the one hand, since the basis for high-tech products is the use of globally competitive scientific and technological developments, and exports as a whole on the other hand, including the ordinary non-high-tech goods (Fig. 1).

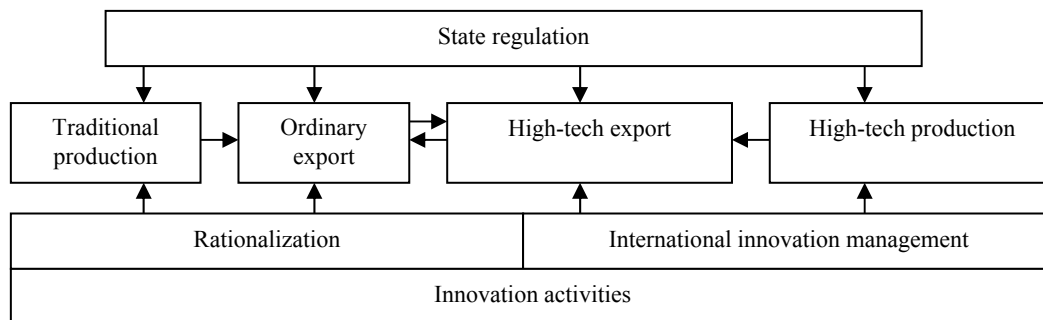


Fig. 1. High-Tech Export Environment

Source: author's development.

Second, each country has a specific sequence of strengthening the competitive positions in the global high-tech markets. For the purposes of our study, we can use a four-stage concept of building a system of state regulation of the high-tech sector, namely the initial stage of

³⁵ Recommendations "Washington Consensus" include the following: implementation of tough fiscal policy, redistribution of budgetary resources from productive to social services, tax reform, financial liberalization, the introduction of the single market exchange rate, trade liberalization, removing barriers to foreign direct investment, privatization, reduction of government regulation on the sectoral level, the policy on protection of property rights.

production modernization, the stage of initiating an export-oriented growth, the stage of stimulating an accelerated development of the high-tech sector, as well as the stage of a developed national high-tech market.

The Practice of Government Support of the High-Tech Export in Major Countries

As regards the state support of export in general, and high-tech export in particular, it is important to note that in developed countries there is a quite extensive network of various organizational and structural parts:

- state agencies and departments (ministries and departments of foreign trade and various advisory bodies, scientific and auxiliary teams on structural issues etc.).

- parastatal, private and non-governmental organizations (industrial unions, industrial associations, chambers of commerce and industry, cross-industrial associations, information and communication centers, exhibition and fairs structures etc.)

- local public and self-administration authorities affecting the foreign trade, including the export activities of participants of such activity located in the relevant territory (units of central foreign economic departments, territorial chambers of commerce and industry, local associations and NGOs etc.);

- foreign units of central governments, enterprises and organizations (embassies, trade missions, branches of various chambers of commerce and industry etc.).

These formal organizational segments, well represented in numerous regulations (laws, statutes, agreements, etc.) should be supplemented with economic diplomacy, which is defined as the purposeful activity of state and economic agents, defined as a special tool for implementation of national interest and as a separate relatively independent science.³⁶ Unfortunately, this component of the export business has been neglected not only in the domestic literature, but also in foreign publications. Moreover, the international practice worked out the mechanism of economic diplomacy.

Certainly, in the presence of common organizational forms of export support, the content of this state activity acquires significant peculiarities in each country. This primarily refers to the US as a key player in the global market. Despite the most liberal nature of exports in the world, over the past decade, state support for exporters

³⁶ Verhun, V.A., ed. *International Business: textbook*. K.: VAD EKS, 2014: 778. [In Russian].

significantly strengthened in this country. There is no official document "State support of high-tech exports" or "State industrial policy" in the US. The bodies responsible for its implementation are missing, too. However, in practice, there are such segments of the high-tech industrial policy as military and industrial, scientific and technical (national innovation system), energy policy, policy on small and medium innovative businesses, procurement policy for high-tech products of domestic and foreign origin for branched federal services, investment policy, including the federal programs of funding the research and development activities, which, in turn, are addressed by basic ministries.

After coming of the Clinton administration to power, in 1993-1998 and in the following years the state influence on the US economy increased significantly. In this regard, we can agree with the opinion of V. Polterovych and V. Popov that the arguments in favor of protectionism as a strategy of the catch-up development was first suggested in 1891 by the then US Treasury to support the young branches. This view was developed and consistently implemented by US politicians and economists over the next two centuries. Therefore, a famous American historian P. Beiroch rightly called the US "the homeland and bastion of modern protectionism."³⁷

In the US, a developed system of state stimulation of export activities of the US companies has been operated successfully. The exporters are provided with financial and technical support, marketing and information services to the real and potential exporters. For example, the Advocacy Center coordinates the activities of 20 government departments, and helps the American firms to participate in various international projects. The Center organizes trips of the US senior officials to the countries where the American companies face problems with promotion of their products.

Another measure of supporting the American exporters is financing of international exhibitions, fairs, conferences and seminars, as well as implementation of advertising campaigns abroad. In particular, every monthly there is an hour-long satellite TV program representing the new high-tech American products. Empirically, a link between the increased costs for export promotion during the 1990s' up to USD 250 mln annually and the expansion of exports each year by 12% was found. During the period from 1987 to 2015, a sharp increase in export supplies of high-tech products was achieved, which allowed reduced the negative trade balance twice. Similar trends are inherent in the regional economy too. The direct financial support of US exporters at the state level

³⁷Polterovych, V., and V. Popov. "Evolutionary theory of economic policy. Part I. Hôpitaux rapid development". *Economics Questions* 7 (2006): 16. [In Russian].

increased from USD 21 mln in 1990 to USD 100 mln in 2000 and about USD 800 mln in 2014.³⁸

Since Germany maintains a pronounced model of the social economy, the state support of export by administrative and economic instruments has always been active. The German model is implemented at five levels, i.e. macroeconomic, sectoral, technological, regional and interstate. Given the federal political and administrative structure, there are hundreds of different types of organizations in Germany. One of these organizations, such as the Association of German Machine-Building companies (FDMA) was established in 1949 in Frankfurt am Main. It consists of more than 3 thousand general machine-building firms with an annual turnover of about EUR 100 bln and employing about 1 million people. Thanks to the association operations, the high-tech product export share exceeds 50%, since the said association is working closely with EU structures, machine-building industry association of Germany and other countries, not only the EU but also the US, China, Japan and others in the international arena. FDMA interests in the EU are represented by the Brussels Office for International Relations and by the relevant departments in other countries.

The success of the Federal Union of German Wholesale and Foreign Trade (BHA) should be noted. It consists of 56 federal sectoral unions and 12 land unions of employers. The union consolidates the interests of over 110,000 companies-stakeholders employing 1.5 million people. BHA annual turnover exceeds EUR \$ 1 trillion, i.e. a quarter of industry sales in Germany. On the average, one wholesale and foreign trade company has business relationships with 3,000 partners, a half of which are foreign, 10% of which are suppliers, and the rest are the customers of goods, especially high-tech, the export of which is about one third of the total.³⁹

In view of UK's withdrawal from the EU, its experience of export support, which traditionally relies on a combination of social values of the "old" laborism with market mechanisms, is noteworthy. The official aims of promoting the industrial exports in the UK are chosen to be "the country's competitiveness and development of scientific and technological potential in order to achieve the sustainable rates of economic growth and productivity." Based on these objectives, the Ministry of Trade and Industry, which is responsible for the export policy implementation, proclaimed the high-tech sector as a priority. The Ministry monitors the competitive position of the national products

³⁸ Innovations in Export Strategy: Competitiveness through export clustering, *ITC, Geneva*, 2005.

³⁹ Belov, V.B. "Germany: export promotion." *M.: Institute of Europe — RAS "Modern Europe" 4* (2003): 38-48. [In Russian].

in the global high-tech markets and identifies the prospective exports participants, which subsequently become the focus of the state support. State support of high-tech export is usually provided on a competitive basis for eligible projects. In the event of state support, the efficiency of spending the provided funds is closely monitored by sample surveys of the project implementation and their economic results involving the consulting firms. The results of these surveys are displayed in the special "White Books", ensuring openness and transparency of the state support.⁴⁰

As was noted above, the trends in the high-tech export of Japan and Korea are determined by the multi-branch conglomerates, the number of which in each country does not exceed ten. In this regard, the state support in this area may seem passive, especially given the fact that in Japan the export has been regulated by foreign trade since 1980, which is the basic standard in regulation of all kinds of foreign trade. Unlike the Law 1949, it is much more liberal and generally quite comparable to the current foreign trade laws of the most developed countries maintaining (at least officially) the principles of free trade. Besides, in the late 1990s', the Japanese government approved a plan to liberalize the national economy, consisting of 917 positions in 15 sectors of the economy, in respect of which it was planned to reduce or completely remove the existing regulations.

However, the liberal export policy of the Japanese and South Korean government is exposed to various criticism, regarded by the opposition circles as an unreasonable concession to the US pressure, which do not reject protectionism. Therefore, the state support of export in both countries is still in place. First, the export credits with rates 4 points below the market ones are used. A significant benefit for the high-tech export is an insurance system, which allows banks and the Japanese government to guarantee the coverage of 67-90% of exporter's possible losses in certain cases. Special government agencies compensate the force majeure (up to 95% of total expenses) and credit (60-80%) risks arising from the buyer's default to the Japanese exporter.⁴¹

Especially interesting is the Chinese experience in supporting the high-tech export, in which China occupies the leading positions since 2006. The basis for this success were, on the one hand, the dramatic changes in management of the powerful Chinese high-tech corporations. On the other hand, in 1980, China had eliminated the monopoly of foreign trade represented by the China's Ministry of Foreign Trade and

⁴⁰ Analytical review of the measures taken in the UK to protect the domestic market and for state support of local producers and exporters. *Trade Representation of Russia in the United Kingdom*, 2009: 10-11. [In Russian].

⁴¹ Analytical review of state support to exporters in Japan, the Russian trade mission in Japan, 2009: 9. [In Russian].

foreign companies subordinate to it with numerous field offices. Decentralization was conducted both horizontally (elimination of the monopoly of foreign trade) and vertically (reduced range of exports, which is exclusively the responsibility of the Ministry). Consequently, there was formed an extensive network of different organizational units. On top of the pyramid, there is a newly established Ministry of Foreign Affairs and Foreign Trade of China developing and coordinating the foreign policy, a key element of which is the high-tech export and a positive trade balance in this sector, which grew from USD 126 bln in 2010 to USD 480 bln in 2015.⁴²

The said Ministry has control of 15 large specialized state export-import companies (including the All-China Corporation for Export and Import of Machine Equipment – "Mashimpex") and infrastructural sections in the form of various centers, transport corporations, and government offices in Hong Kong and abroad.

The foreign trade companies have been established by the other ministries and departments, leading enterprises, private trading companies etc. To attract the authorities, a system of differential allocations from the foreign exchange earnings of the companies to the respective budgets depending on the type of exported products has been introduced. When, for example, a local authority exercised its right to create its own regional foreign company, in the case of export of the high-tech products, the local budget receives a half of foreign exchange earnings, while in the case export of weapons – only 4%. Also, the local governments received a share of authority of the Ministry of Foreign Affairs and Foreign Trade of China to establish the government export targets for foreign trade companies located in their territory.

The other organizations providing the state support for export include the State Exchange Control Department of China, ensuring the circulation of foreign currency in the country; Chinese International Credit and Investment Corporation with offices in Hong Kong, Japan, the United States and other countries; Board for Promotion of International Trade of China, directing the activities of the Chinese International Exhibition Centre, a Chinese consulting firm on international economic and technological cooperation.

Trends and Prospects of the Ukrainian High-Tech Export

The domestic researchers pay an adequate and continuous attention to the problems of intensifying the export of Ukraine in general and its high-tech segment in particular. They note the growing role of trade

⁴² Sall, D.N., and Van Yun. *Made in China: Чем западные менеджеры могут научиться у ведущих китайских предпринимателей*. Translated from English, 2006:108, 110. [In Russian].

operations in increased competitiveness of the national economies in terms of globalization, organically linked to the deepening international division of social work and intensification of exchange of its results between the countries. In this regard, the authors of the textbook in "International Economics" recently published by professors of SHEE "Kyiv National Economic University Named after Vadym Hetman" rightly noted, "Historically, the first form of international economic relations was international trade, which, having originated in ancient times and having passed a long way of its evolution, now turned into the most developed area of the world's economy and covers over 80% of all international business transactions. Although currently the international trade cost volumes and change pace is inferior to the global capital export and international investment and industrial activity, it still plays a leading role in international economic relations. The active participation of countries in foreign trade relations gives them a significant competitive advantage in the global markets through efficient use of the national resource base, involvement in the global achievements of science and technology and capabilities of restructuring the national economies."⁴³ In this case, the international context of trends in the high-tech exports must be taken into account. First, after the decline of its share in the global trade, which started in 2000, over the past five years it stabilized at 10%, although in 2000 it was about 20%, and in some countries even higher. Secondly, this share is significantly different in various countries. In the US, the said share declined from 35% in 2000 to 12% in 2015, in Japan from 27% to 11%, and in Germany from 16% to 11%. Third, the share of high-tech export in the total export of Ukraine is significantly lower than in developed countries and is variously estimated at 2-3%.⁴⁴

Let's consider the change of high-tech export of Ukrainian enterprises in this context.

The analysis of these tables allows us to draw some conclusions. First, during the period of 2002-2015, there is a "wavy" trend of the high-tech export growth from USD 412.1 mln to USD 1.7 bln with an intermediate peak in 2004 as USD 1.13 bln. Second, such an unsustainable growth is also inherent in certain product groups. Third, a leading role in the structure of high-tech export is played by aviation and space equipment, the share of which is about a half, despite some declines in 2004 and 2008. The second position is occupied by electronics and telecommunications.

⁴³Lukianenko, D.H., A.M. Poruchnyk, and Ya.M. Stolyarchuk. *International economy: textbook*. K.: KNEU, 2014. [In Ukrainian].

⁴⁴Oleynikov, O.O. "Areas of the global high-tech market and ways to increase its presence in Ukraine." <http://www.alexstar.com.ua/security/article/invest/hightech.htm>. [In Ukrainian]; Matyushenko, I.Yu., and D.M. Kostenko. "Prospects for trade high-tech products in the world and Ukraine." *Business Inform* 8 (2012): 103-14. [In Ukrainian].

Table 2 Change of Export of He High-Tech Products in Ukraine in 2002-2020 (USD mln)

Product groups	2002	2004	2005	2008	2010	2015	2020, forecast
Pharmaceutics	5.8	11.4	17.5	38.4	46.8	87.0	99.8
Aviation and aerospace appliances	177,7	196,4	245.3	387.0	547.8	798.0	888.6
Computer and office equipment	5.3	82.9	17.6	32.1	36.6	98.0	114.9
Electronics and telecommunications	93.4	325.7	87.3	523.4	249.1	469.9	493.3
Scientific tools	129.9	519.8	100.9	136.6	149.7	252.4	286.2
Total	412.1	1136.2	468.6	1117.5	1025.0	1705.3	1882.8

Table 3 Structural Change of High-Tech Product Export in Ukraine in 2002-2020

Product groups	2002	2004	2005	2008	2010	2015	2020, forecast
Pharmaceutics	1.4	1.0	3.7	3.4	4.6	5.1	5.3
Aviation and aerospace appliances	43.1	17.3	52.3	34.6	53.0	46.8	47.2
Computer and office equipment	1.3	7.3	3.8	2.9	3.5	5.8	6.1
Electronics and telecommunications	22.7	28.7	18.6	46.9	24.3	27.5	26.2
Scientific tools	31.5	45.7	21.6	12.2	14.6	14.8	15.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: authors' calculations

Certainly, one might challenge the rather optimistic projections for 2020. We connect them with the results of study of "Foresight Economy of Ukraine" and generalization of estimates shown in Table 4.

In view of the prospects of development of the military-industrial complex of Ukraine (13% growth in 2015-2020 and 15% in 2020-2030.), we must expect a high-tech export of this sector, the annual volume of which exceeds USD 1.2 bln.⁴⁵

⁴⁵ Matyushenko, I.Yu., and D.M. Kostenko. "Prospects for trade high-tech products in the world and Ukraine." *Business Inform* 8 (2012): 108. [In Ukrainian].

Table 4 Projected Figures of the Long-term Economic Development of Ukraine for 2015-1030, %

Industry sectors	2015-2020	2020-2030
1. Areas with a high contribution to economic growth		
1.1. Agricultural sector	14	17
1.2. Defense and industrial complex	13	15
2. Areas with an average contribution to economic growth		
2.1. ICT	8	12
2.2. New materials and nanotechnology	7	12
2.3. Energetics	7	11
2.4. High-tech machine building	6	8
3. Areas with a low contribution to economic growth		
3.1. Biomedical engineering and pharmaceuticals	1	5
3.2. Transit infrastructure	2	5
3.3. Tourism	2	5

Unfortunately, the domestic statistics does not include the products of the military industrial complex into the high-tech export in line with traditions of the "Soviet secrecy." Incidentally, the data on the arms exports in developed countries are open and show their large scale. The leader in this market is the US with an annual capacity of more than USD 15 bln according to the Agency for Arms Control and Disarmament, or 44% of the global supply. The second position is held by Great Britain (about USD 5 bln annually). Russia with USD 3 bln ranks third. Overall, the share of the three largest exporters of weapons is about 72% of all supplies.⁴⁶ Certainly, the said scale of weapons exports dropped by half after collapse of the Soviet Union, but this market is very significant and promising for Ukraine, given its potential and experience gained.

Ways of High-Tech Export Potential Revival in Ukraine

In acute and long scientific debate about the prospects of the domestic high-tech export, we maintain an optimistic position. However, the implementation of positive expectations requires certain measures to be taken immediately to create favorable conditions for Ukrainian exporters of high-tech products in the context of Ukraine-EU FTA agreement.

⁴⁶ Behma, V.M. *Market Arms: problems of marketing products in the military-technical: monograph*. K.: NIMB, 2001: 70-71. [In Ukrainian].

These measures should be considered in two dimensions, wide and narrow. In the general plane, the high-tech exports should be considered not as a separate sector of the national economy, albeit important, as well as its organic component. Therefore, to revive its potential, it is important to take care of the qualitative transformation of the entire economy. As for the narrow, or rather special approach to the development of high-tech export of Ukraine, it is about the development and use of the instruments to stimulate the same known in developed countries. They proved themselves over many decades and are quite noteworthy for the government of Ukraine.

In the broader context, it is important to note the following three areas:

- justification and implementation of Ukraine's own path of economic transformation;
- industry reindustrialization;
- creation of a modern innovation system.

Without resolving these key issues, the optimistic prospect of high-tech export of Ukraine looks unlikely, so let's consider these areas in greater detail.

The transformation of the national economy is mentioned in many publications. We want to draw your attention to only one of them, namely the article of V. Vlasiuk.⁴⁷ The author of this article quite reasonably suggests adopting a real economic doctrine, which must take into account the international experience, but proceed from the Ukrainian peculiarities and opportunities, including the values of society system.

In this regard, the author proposes a dynamic model of economic development including several activities with the greatest growth potential and mutual synergies, on which we should concentrate the efforts and resources. These include the industrial policy; infrastructure; energy efficiency; agriculture; IT industry; recycling of industrial and household waste.

When addressing the issue of industry reindustrialization, we should benefit from the experience of France, which created a new state structure, i.e. the Ministry of Industrial Revival, which has developed and successfully implemented the strategy called a "New Industrial France." This policy document contains 34 specific industry reform programs on innovation basis. Most of the projects (80%) are designed for 2015-2025, and were selected based on proposals industrialists, primarily with a view to return the country to the leading exporters of

⁴⁷ Vlasyuk, V. "Own Way Transformation." *Zerkalo Nedeli* 37 (2016): 1, 9. [In Ukrainian].

high-tech products and services.⁴⁸ The development of such a program is extremely relevant for Ukraine.

Establishment of a modern innovation system is also associated with increased volumes of high-tech export. Discussions on this issue have been going on for many years. However, this topic fails to be transformed into practical transformations. In this regard, it is advisable to use a matrix model of the Institute of Economics and Forecasting of the NAS of Ukraine, which brings together, on one side, the innovation (research foundations, universities and research institutions, venture capital and banks, large and small business, startups), and various mechanisms of using the innovation to improve the welfare, increase the high-tech export and create modern jobs requiring high skills on the other hand.⁴⁹

As for stimulation of the high-tech export, the scientific publications suggested a number of important measures in this regard. Let's note the proposals of V. Badrak,⁵⁰ A. Veselovskiy,⁵¹ O. Salikhova⁵² and others. We suggest supplementing these instruments with two measures. First, to strengthen the state influence on the increase of high-tech exports, it is high time to flesh out this impact through the development, adoption and implementation of a special state solution, the "road map" with relevant statistics. The objectives of the "road map" are:

- reduction of terms to obtain the permits to export the non-commodity goods and reduction of the number of permits;
- increase of the number of exporters, especially due to SMEs, which are export beginners;
- increase in non-commodity export, especially the supply of innovative products to conventional and new markets;
- expansion of the range of tools and measures to support the export;
- increased availability of measures to support the export and increase the number of organizations receiving the same.

Second, let's note one of the most important features of the present stage of high-tech export support associated with its institutional maintenance. It is primarily about activities of export credit agencies in different countries not only issuing loans to exporters but also insuring

⁴⁸ Heyets', V.M., ed. *Ukraine Innovation 2020: National Report*. Report. K.: NAN Ukrayiny, 2015: 135. [In Ukrainian].

⁴⁹ Pydorycheva, I. "Innovative economy — this economy innovative solutions." *Zerkalo Nedeli* 42 (2015): 8. [In Ukrainian].

⁵⁰ Badrak, V. "Private military industrial complex of Ukraine: reliance "defense industry" or outcasts." *Zerkalo Nedeli* 40 (2016): 2. [In Ukrainian].

⁵¹ Veselovskiy, A. "The export potential of Ukraine: the path to revival." *Zerkalo Nedeli* 28 (2015): 5. [In Ukrainian].

⁵² Salikhova, O.B. "Targeted government support as a factor stimulating the development of high-tech industries in Ukraine." *Industrial Economy* 9 (2011): 9-23. [In Ukrainian].

the foreign economic contracts. In this case insurance, on the one hand, and provision of banking services on the other are usually mutually exclusive activities, not carried out by one organization. Therefore, as a rule, there are several complementary institutions of credit and export insurance, as is evident from the table.

Table 5 Types and Examples of World Export Credit Agencies

ECA type	Example
Governmental	Export-Import Bank (Eximbank), USA Japanese Export and Investment Insurance Company (NEXI) Export Credit Guarantee Department (ECGD), UK Chinese export insurance agency Sinosure
Private	EulerHermes, Germany Atradius, Netherlands Foreign Trade Insurance Company (Coface), France
Mixed	SBCE (Brazil), CESCE (Spain), SEK (Sweden), ECGE (Egypt)

The role of ECA in development of international trade all over the world is growing, as evidenced by an active expansion of products and scale of business of the relevant institutions. Thus, Euler Hermes covers the risk management processes across five continents. This ECA has branches and representatives in 54 countries. Today the credit risk insurance contracts ensure the coverage of delivery of goods and services in 245 countries. The company has more than 6 thousand employees, serving about 52 thousand customers. Its net income is growing and currently reaches about EUR 500 mln a year, and equity is EUR 2.5 bln. The successful experience of foreign ECAs clearly shows that they are an "inexpensive" export promotion tool and do not require regular financial injections. Instead, they can be entirely self-supporting and even profitable. Therefore, the fears that the creation of ECAs in Ukraine will become a significant burden on the state budget are exaggerated.

The common feature of all ECAs is that they are governed by international rules and principles. The main of them are enshrined in the so-called consensus (recommendations on provision/insurance of export credits, which are officially supported by the state) of OECD member countries and the Berne Union memoranda of understanding. The international rules of state support of the export credit and insurance based on attracting the budgetary funds are formally recognized by the World Trade Organization, therefore ECAs belong to a completely legitimate forms of export support, unlike direct export subsidies, by the way.

The important role of ECAs in support of export activities of the enterprises, according to the International Union of Credit and Investment

Insurers (Berne Union), which brings together all major ECAs in the world. According to them, during the global economic crisis in 2009, only because of default of Ukrainian buyers, the members of the Berne Union paid USD 128 mln insurance claims to foreign companies.⁵³

The increase in payment of insurance compensations was enormous, given that in previous years the claims for Ukraine remained within USD 1 mln. Thus, the Ukrainian exporters remained vulnerable to risks. Unfortunately, the Berne Union does not keep statistics on export insurance from Ukraine. Because of the absence of its own ECA, our country is not a member of this organization. Therefore, the loss of Ukrainian exporters because of default of the foreign partners can only be imagined, considering that the crisis that has affected every region and every country in the world, so many companies were unable to pay for the goods ordered.

Conclusions

Based on a significant amount of theoretical and analytical studies of domestic and foreign scientists, scientific developments of the relevant institutions and research institutes, the experience of regulation of the high-tech export in developed countries, as well as our own projections of the volume and structure of the high-tech product export in the future until 2020, we drew the following conclusions:

1. The development of the world economy is accompanied by a rapid growth not only in international trade volumes in general, but especially in high-tech exports characterized by a great value added share, the use of the latest innovations, and high competition among manufacturers of these products. The leading exporters of high-tech products get additional benefits in expansion of their competitiveness. At the same time, these countries improve the environmental conditions of their development as a result of a more efficient use of their natural resources in the manufacture of high-tech products, and a broader use of the imported low-tech products, requiring a relatively large amount of natural resources in the course of production.

2. The analysis of high-tech export changes and trends in the world in 2004-2015 revealed, on the one hand, a stable consolidation of China's position in this market, which became a leader in 2006, the stable positions of the US, EU and Japan, and a gradual weakening of position of the rest countries of the world. The developed countries maintain their positions by increasing innovation activity in their countries, and effective state support for exporters. China is increasing

⁵³ Huzhva, I. "Credit or insure, or how to support the Ukrainian exporter." *Zerkalo Nedeli* 26 (2016): 6. [In Ukrainian].

its capacity through primary attraction of high-tech corporations to its territory, which create their branches there and subsequently export their products. The structure of the world exports of non-military high-tech products, a leading position is occupied by machine-building, communications equipment, office appliances and pharmaceuticals.

3. In the current conditions, the leading countries in the market of high-tech export accumulated a considerable and diverse experience of regulation and support of high-tech export. This experience is based on the use of three basic models, i.e. active dirigisme, moderate dirigisme and liberalism. The active dirigisme model is used by China, Germany, USA, Japan and Hong Kong. The key features of this model are the formal and informal activities of all branches of government in promotion of high-tech products of domestic producers in the foreign markets, and active assistance to them in the fight against foreign competitors. In this case, the support and protection of high-tech exports is raised to the level of the most important tasks of the state, one of the priorities of national security. Moderate dirigisme is inherent in the export policy of countries such as France, Britain, Italy, the Netherlands, Taiwan, Mexico, and Malaysia. The emphasis in support of a high-tech business is made on improvement of regulations on the one hand, and on revitalization of the non-governmental organizations and agencies, chambers of commerce and industry, business associations, economic unions, trade unions and associations, regional and inter-regional national and international structures on the other hand. The liberal model of high-tech export support is maintained by the countries such as Thailand, Poland, Canada, Belgium, Czech Republic, and Spain. These countries do not apply biased measures to support the domestic exporters of high-tech products and rely on the competitiveness of their enterprises in the market, and resorted to help only in the event of pressure by exporters.

4. In order to strengthen the positions of Ukrainian high-tech companies in the world markets, it is feasible to implement a system of immediate action in two areas, macroeconomic and sectoral. At the level of national economy, it is essential to develop and implement a modern doctrine of transforming the economy of Ukraine, to conduct the industry reindustrialization using the experience of developed EU countries and accelerate the formation of a national innovation system. To encourage the high-tech export, it is advisable to take a number of structural, organizational, financial and economic measures. First, it is essential to establish cooperation between the public and the private component of the defense industry in order to strengthen the positions in the world high-tech markets. Also, to specify the state's influence on the process of increasing the high-tech export, it is expedient to develop an appropriate "road map" and introduce an export credit agency system.

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