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THE INNOVATIVE ASPECT OF UKRAINE'S INTEGRATION INTO INTERNATIONAL PRODUCTION NETWORKS

The research of possible variants of integration of national companies into international production networks was conducted. The modern tendencies of their development with the consideration of innovations as a basis for creation of the greater added value by the country-participant of this network are analyzed. The dependence of effects on the volumes of created added value in different parts of international production networks is substantiated. On the basis of research of indicators of innovative development of Ukraine it is proved that the country possesses sufficient and perspective innovative potential. The implementation of a balanced set of measures of selective sectoral stimulation and improvement of «horizontal» institutional support of innovation activity within the framework of the «triple spiral» model is proposed.

Keywords: international production networks, fragmentation of production, innovation development, added value.

Дугинец А. Интеграция Украины в международные производственные сети: инновационный аспект*. Проведено исследование возможных вариантов интеграции национальных компаний в международные производственные сети. Проанализированы современные тенденции их развития с учетом инноваций в качестве базиса для создания большей добавленной стоимости страной-участником сети. Обоснованно зависимость эффектов от объемов созданной добавленной стоимости в различных звеньях международных производственных сетей. На основе исследования показателей инновационного развития Украины доказано, что страна обладает достаточным и перспективным инновационным потенциалом. Предложено реализацию сбалансированного комплекса мероприятий выборочного отраслевого стимулирования и совершенствования «горизонтальной» институциональной поддержки инновационной активности в рамках модели «тройной спирали».*

Ключевые слова: международные производственные сети, фрагментация производства, инновационное развитие, добавленная стоимость.

Background. Statement of the problem. Since the beginning of the 1990s, the global structure of production and international trade has been undergoing major changes. The sharp decline in costs of trade due to technological progress and widespread trade liberalization has led to

a significant increase in the degree of production fragmentation worldwide over the last three decades. Furthermore, the reduction of barriers in the sectors that ensure the functioning of global logistics chains (transport, finance, telecommunications etc.) has led to increasing internationalization of supply chains of goods and services [1]. This, in turn, means that countries increasingly trade in intermediate goods in order to subsequently export end-products produced from them – both to third countries and to the countries participating in the production process. This fact adds relevance to the research of deepening the integration of national companies into existing and emerging international production networks. Moreover, the stimulation of integration must take into account the development of science-intensive production to expand the range of products with high added value, as opposed to increasing the country's involvement in production networks by means of raw materials.

Analysis of recent research and publications. The theoretical and methodological foundations of the study of the formation and development of international production networks are reflected in the studies of foreign and domestic scientists, namely: R. Baldwin, D. Taglioni, D. Hummels, J. Ishi, K. M. Yi, G. Gereffi, R. Kaplinsky, M. Morris, A. Obashi, F. Kimura, I. Gladij, I. Zvarych, S. Berenda, G. Duginets, E. Krikavskiy [2–11] and others. The theoretical foundations of the international division of labor, vertical integration and transnationalization of the economy, as well as the possibility of Ukraine's participation in international industrial-investment cooperation are highlighted in the works of A. Mazaraki, V. Lagutin, V. Sidenko, A. Filippenko [12–14] and others.

Unsolved aspects of the problem that the article is devoted to the practical significance of the research lies in the need to formulate directions of state policy in the innovation sphere that would allow to increase the share of goods with high added value in the country's exports by increasing the involvement of Ukrainian enterprises in international production networks. Therefore, respecting the undeniable achievements of domestic and foreign economic thought, it is to be noted that, in Ukrainian periodicals, only a small number of articles are devoted to the study of the problems and prospects of the integration of national enterprises into IPNs, while considering the innovative component of this process.

The **aim** of this work is based on a comprehensive theoretical and analytical study of the peculiarities of the formation and development of international production networks, and the substantiation of proposed ways of increasing the level of involvement of Ukrainian enterprises in them.

Materials and methods. The works of domestic and foreign scientists, materials by international organizations, and the results of the author's own observations became the study's main sources of information. The methodological base of the research is the combination of theoretical and quantitative analysis, comparison, and systematization aimed at identifying trends in Ukraine's integration into international production networks.

The results of the research. Currently, the economic literature uses a large number of similar in sound and meaning terms and concepts that describe the modern processes of fragmentation in the world economy. Among them, three concepts can be distinguished. *Firstly*, the global commodity chain, proposed by G. Gerreffi [3; 15]. *The second* – the global value chain – appeared as a logical development of the first concept [16], but in reality the notion of a value chain was suggested by M. Porter in the 1980 s. [17]. *The third* – global (international) production network – was introduced into the literature independently by D. Ernst [18–19] and by a group of authors – P. Dicken [20], N. M. Coe, M. Hess and others [21].

Given the specifics of this study, it should be noted that not all publications reflect the differences between the concept of a «chain» and of a «network». Often the notion of a «global value chain» is replaced by the definition of an international production network. It should, however, be noted that a chain is a vertical sequence of stages in the process of supply, consumption and maintenance of a product, while a network combines both a vertical and a horizontal sequence of economic activities. Both a network and a chain can include several countries at once. In practice, there are two principal differences between a commodity chain and a value chain, on the one hand, and a production network, on the other. Firstly, commodity and value chains are essentially linear structures, whereas a production network tends to go beyond such linearity to include all kinds of network configuration. Secondly, the concepts of a commodity chain and a value chain are focused mainly on the management of inter-firm transactions, while the concept of a production network attempts to cover all groups of participants and the relationships between them. Thus, an international production network is a network distributed across national borders that unites complete segments or separate elements of value chains located in different national territories.

This concept reflects the fundamental structural and relational nature of the organization of production, distribution and consumption of goods and services. Despite the fact that international production networks have become much more complex in terms of organization and much more extensive geographically, they represent a universal form of economic organization. In a production network of any scale, linear structures (vertical or horizontal links) are inevitable, for the analysis of which, chain structures such as commodity chains, supply chains, value chains, etc. are used.

Modern international production networks were formed under the influence of several factors: first, the complication of the processes of international division of labor, which has become intra-industry international division of labor due to the production processes' fragmentation's expanding beyond national economies, and second, the acceleration of the scientific and technological progress and of the technological changes, which today form the basis of international production and the driving force of world trade.

This tendency manifested, first of all, in the economies of economically leading countries, thus having led to the creation of a segment of innovation-information, or, «new» economy, in developed countries and to the beginning of a new (sixth) technological mode's formation. It was this rapid development of the «new economy» that has led to the United States' success in the past 10 years in comparison with stagnation in Japan and a decline in economic growth in Western Europe (*Table 1*). Alongside that, the processes of internationalization of economic activity take place, caused by a lack of resources in the conditions of accelerated technological and technical updating of all factors and means of production.

Many countries thus see their future part in the international division of labor as being dependent on the advancement of technological development by means of investing in human capital and improving innovation systems through participation in international production networks (IPNs).

Table 1

Annual change in real GDP in some countries of the world economy, %

	USA	Germany	France	Italy	Spain	United Kingdom	Belgium	Japan	Ukraine**
2008	–0,3	0,8	0,2	–1,1	1,1	–0,5	0,7	–1,0	2,2
2009	–2,8	–5,6	–2,9	–5,5	–3,6	–4,2	–2,3	–5,5	–15,1
2010	1,6	3,9	2,0	1,7	0,0	1,5	2,7	4,7	0,3
2011	1,6	3,7	2,1	0,6	–1,0	2,0	1,8	–0,5	5,5
2012	2,2	0,6	0,2	–2,8	–2,6	1,2	0,2	1,7	0,2
2013	1,5	0,4	0,7	–1,7	–1,7	2,2	0,0	1,4	0,0
2014	2,4	1,6	0,2	–0,3	1,4	2,9	1,3	0,0	–6,6
2015	2,4	1,5	1,1	0,8	3,2	2,2	1,4	0,5	–9,9
2016	2,4	1,6	1,1	1,0	2,6	1,9	1,2	0,5	1,5
2017*	2,5	1,5	1,3	1,1	2,3	2,2	1,4	–0,1	2,5
2021*	2,0	1,2	1,9	0,8	1,6	2,1	1,4	0,7	4,0

* Forecast.

** The data is based on the 2008 System of National Accounts. The revised national accounts data has been available since 2000; since 2010, it does not include the Crimea and Sevastopol.

Source: compiled by the author [15].

So, instead of developing new technologies on their own, developing countries can use technologies from abroad and provide for growth with their help. That is, a competitive struggle arises not only in the field of product sales, but also in the stages of creating a new product, where the main parameters of an enterprise's future competitiveness are formed. Amidst the complex of decisive factors of competitiveness, the index of its quality stands out, in particular, the scientific and technical level of the provided product or service, being the result of implementing scientific and technological progress and a strategic means of entering new markets and reducing production costs.

The significance of IPNs is supported by the fact that, for example, in 2012, more than 60 % of world trade (which amounted to about $ 22 trillion) fell on the sale of intermediate goods or services used at various stages of the production process of goods and services intended for final consumption. Over just one decade (1995–2005), the share of imported components in the cost of export products has increased significantly in many countries; for example, in Israel, the Czech Republic, Luxembourg – by about 20 %; in China, Taiwan, Poland, Slovakia, Greece – by 10–15 %; in Germany, France, Japan, India, Turkey – by 7–8 % [22].

Countries and companies can be located at the initial, intermediate or final stages in the IPNs, depending on their specialization, and their position may change over time. The former extract natural resources, produce raw materials or intellectual assets (R&D, design), the intermediate stage elements produce parts, components and assemblies, and the latter specialize in the assembly and / or distribution, marketing and branding of products, as well as work with clients [23, p. 29]. At the same time, the creation of value in IPNs is unevenly distributed between the different stages. It should be noted that the greatest added value is usually created in the production of key components or in the service sector (R&D, design, marketing, branding, product marketing, customer service) [23, p. 216].

IPNs are inhomogeneous in terms of various industries, enterprises, goods or services. Some parts of an IPN adhere to the classical pipeline structure, when a product or service undergoes subsequent processing stages (snake value chains), while others perform the final assembly of several intermediate goods or services (spider value chains) [8, p. 2].

Accordingly, a company or a country should strive to be present in those parts of IPNs where greater added value is generated. The task of cooperation is simplified if the country has free trade and mutual protection of investments agreements with a large number of other states. It is important to take into account that, at the stage of preproduction, there is a global competition, and at the stage of postproduction – to a greater extent local one.

Thus, for developing industrial economies (to which Ukraine belongs), it is today particularly important to find a place on the markets of developed countries, but this becomes more and more difficult as competition grows. Perhaps the most successful example is Slovakia, which, through entering the developed markets and gathering large-scale foreign investments, primarily in the production of electrical equipment, automotive, electronic and optical equipment, has become one of the major exporters of the region.

Foreign economic activity data account for 52,5 % of the total value of exports of Slovakian goods, calculated on the principle of value added. At the same time, foreign economic activity data accounts for 57,9 % of all foreign value added in Slovakia exports [24].

It should be noted that the economy of Ukraine is characterized by technological multimodality, since its individual components correspond to different, from the second to the fifth, waves of innovation, which adversely

affects its efficiency because of the fact that cooperation of enterprises with different technological modes leads to significant resource losses. The higher the degree of technological multimodality of an economy, the lower its efficiency.

If Ukraine continues to try to increase its exports of lower-end goods, it is threatened with the effect of «dampening growth», described by the well-known international trade theorist J. Bhagwati [25]. In addition, the Ukrainian economy has certain conditions for the implementation of innovation potential, but there are problems with the creation of the conditions necessary for the efficient use of resources. This thesis is confirmed by the place of Ukraine in the Global Index of Innovation, which has been at a rather low level in recent years (*Table 2*).

The Global Innovation Index is an objective indicator of the success of a country's innovation policy. It is published annually since 2007 as the main tool for assessing the state of innovation and represents the relation of costs to the effect, and thus contributes to the objectivity of assessing the effectiveness of a country's efforts to promote innovation.

Table 2

Ukraine's ranking in the main components of the Global Index of Innovation, 2011–2017

	2011	2012	2013	2014	2015	2016	2017
Sub-index Innovation resources	7	8	3	8	4	6	7
Sub-index results of innovations	2	7	8	6	7	0	0
Coefficient of innovation efficiency	0	4	2	4	5	2	1
Place on the Global Index of Innovation	0 of 125	3 of 141	1 of 142	3 of 143	4 of 141	6 of 128	0 of 127

Source: compiled by the author on [26].

The final ranking is calculated as the average of two sub-indices:

- innovation resources (institutes, human capital and science, infrastructure, development of the internal market and business);
- results of innovations (achieved practical results of innovation: development of technology and knowledge economy, development of creative activity).

It is these components that show that the achieved scientific and practical results of innovations (the coefficient of innovation efficiency) in Ukraine are rather small, despite a rather high level of results from innovation activity, which may be largely due to the low value of the innovation resources sub-index (*see Table 2*).

A low level of innovation resources is due to insufficient stimulation of innovative development within the country. According to statistics on

recent years, there is a negative dynamics in state support for this sphere (*Fig. 1*). In 2016, the total expenditures of Ukrainian institutions on research and development (hereinafter – R&D) amounted to 11530,7 million UAH, of which 49,9 % were labor costs; the share of financing for carrying out R&D provided from the state budget constituted 32,1 %, whereas in 2015 it was as high as 35,6 % [27].

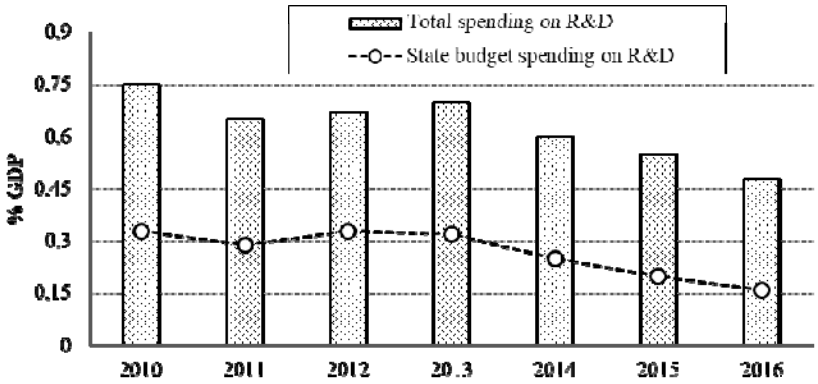

Fig. 1. Share of expenditures on R&D in GDP, %

Source: compiled by the author according to [5].

In Ukraine's economy, there is also little innovative activity of industrial enterprises, which results in a low share of realized innovative products in the volume of industrial produce (*Fig. 2*).

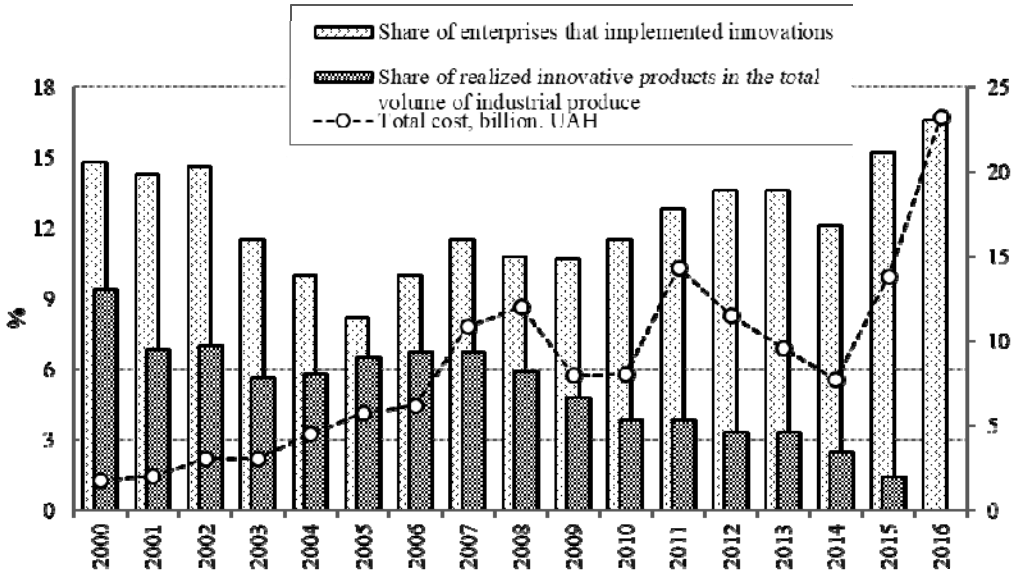

Fig. 2. Innovative activity in Ukraine's industrial enterprises, 2000–2016

Source: compiled by the author on [27].

But it is the knowledge-intensive industries that are important for the development of a country's economy and create the potential for entry into IPNs. The characteristic features of knowledge-intensive industries are:

growth rates, which are 3–4 times greater than in other industries; a large share of value added in the final product, significant export volumes and a high innovative potential capable of supporting not only that industry itself, but also related ones [28]. The functioning of such industries results in a synergistic effect from spreading innovations in the national and global economy. These key qualities of high-tech industries make them a priority field for innovation activity, as well as the main target of capital investments.

Therefore, focusing primarily on the formation and development of a model for innovative development is necessary for developing measures for supporting the entrance of Ukrainian enterprises into IPNs. Such a model considers the active interaction of the innovation process's three sectors: business, state and science, especially universities. According to the well-known model of the «triple helix» [29], a productive conceptualization of relations between state, science and industry takes place, being aimed at creating innovations and implementing them in the economy. The theory and practice of the «triple helix» show that joint efforts of the participants provide more benefit than attempts to alone solve the problems faced by them.

A combination of selective sectoral incentives and the improvement of «horizontal» institutional support for innovation activity should be considered as an option. In particular:

- targeted support for industries that have lost competitive positions as a result of de-industrialization processes or that provide new goals for economic growth (ecology, sustainability, inclusiveness);
- selective support for priority areas of innovation development on the frontiers of technological progress;
- strengthening the regional component, creating innovative clusters based on the principles of «smart specialization» and support for small and medium-sized enterprises (SMEs);
- prioritizing socioeconomic development of Ukraine's economy (addressing issues of security, health, ecology, energy dependence);
- tax incentives and assistance to small businesses, a «roadmap» for long-term changes, implementation efficiency indicators and proposals for implementing a new innovation policy in state, regional and corporate policy documents, laws and by-laws.

Conclusion. As a result of the study, it can be concluded that participation in international production networks brings the participants non-equivalent effects, depending on the amount of added value created in particular segments of the chain. The greatest value is created at the initial and final stages of the production process, e.g. in R&D. Thus, a company or country, which seeks to be present in those parts of IPNs that generate higher added value, should have an innovative development model. In the context of reaching the objective of the research, the main indicators of innovation activity were analyzed both at the international level (Global Innovation Index) and at the national level. The study of indicators of Ukraine's innovation development and position in comparison with other

countries makes it possible to state that Ukraine possesses sufficient and promising innovative potential. However, this capacity is not used extensively enough. In addition, the main restricting factor is the lack of a consistent mechanism for managing innovation activity. In order to integrate Ukrainian enterprises, the implementation of a balanced set of measures for selective sectoral stimulation and improvement of «horizontal» institutional support of innovation activity within the framework of the «triple helix» model was proposed. However, to justify the step-by-step strategy for integrating Ukrainian enterprises into IPNs, it is necessary to conduct an examination of existing IPNs in the region on the basis of analyzing flows of foreign investment and foreign trade. This will allow to analyze the flows of vertical intra-industry trade (intermediate goods trade) and to highlight the industries gravitating to IPNs.

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Дугінець Г. Інтеграція України у міжнародні виробничі мережі: інноваційний аспект.

Постановка проблеми. *Різке зниження витрат торгівлі, яке стало можливе завдяки технологічному прогресу і повсюдної торговельної лібералізації, призвело до того, що в останні три десятиліття істотно зростає ступінь фрагментації виробництва по всьому світу. Країни все більше торгують проміжними товарами для того, щоб потім експортувати вироблені з їх допомогою кінцеві товари – як в треті країни, так і в країни-учасниці відповідного виробничого процесу. Це актуалізує дослідження поглиблення інтеграції національних*

компаній у міжнародні виробничі мережі. При цьому цей процес повинен відбуватися насамперед за рахунок збільшення частки наукомістких товарів і послуг.

Аналіз останніх досліджень і публікацій. *Обрана тема є предметом уваги широкого кола зарубіжних та українських науковців. Але варто зазначити, що у вітчизняній періодиці лише незначну кількість статей присвячено дослідженню проблем та перспектив інтеграції національних підприємств у міжнародні виробничі мережі з урахуванням інноваційної складової цього процесу.*

Мета *роботи базується на комплексному теоретичному й аналітичному дослідженні особливостей формування та розвитку міжнародних виробничих мереж, обґрунтуванні напрямів підвищення рівня залучення до них українських підприємств.*

Матеріали та методи. *Методологічною базою дослідження є поєднання теоретичного та кількісного аналізу, порівняння та систематизації, спрямованої на виявлення тенденцій інтеграції України в міжнародні виробничі мережі.*

Результати дослідження. *У статті проведено аналіз сучасних тенденцій розвитку МВМ з урахуванням інноваційного розвитку, як базису для створення більшої доданої вартості країною-учасником цієї мережі. Обґрунтовано, що участь у міжнародних виробничих мережах приносить учасникам не рівнозначні ефекти, в залежності від обсягів створеної доданої вартості в різних ланках мережі. Найбільша вартість створюється на початкових і кінцевих етапах відтворювального процесу, наприклад НДКР. На основі дослідження показників інноваційного розвитку України її позиції в порівнянні з іншими країнами обґрунтовано, що країна володіє достатнім і перспективним інноваційним потенціалом. Проте він використовується не в повному обсязі. Крім того, основним стримуючим фактором є відсутність цілісного механізму управління інноваційною діяльністю в країні.*

Висновки. *З метою інтеграції українських підприємств було запропоновано: по-перше, реалізувати збалансований комплекс мір вибіркового галузевого стимулювання і вдосконалення «горизонтальної» інституційної підтримки інноваційної активності в рамках моделі «потрійної спіралі»; по-друге, здійснити дослідження вже існуючих міжнародних виробничих мереж у регіоні на основі аналізу потоків іноземних інвестицій і зовнішньої торгівлі. Це дозволить проаналізувати потоки вертикальної внутрішньогалузевої торгівлі (торгівлі проміжними товарами) та виділити галузі, які тяжіють до МВМ.*

Ключові слова: міжнародні виробничі мережі, фрагментація виробництва, інноваційний розвиток, додана вартість.