Tetiana Busarieva, PhD in Economics
SHEE Kyiv National Economic University named after Vadym Hetman, Ukraine

PATTERNS OF DEVELOPMENT AND OPERATION OF WORLD SCIENTIFIC AND TECHNOLOGICAL MARKET

Scientific and technological potential is a determining factor in ensuring the country's overall competitiveness, since it is the NTP that directly influences the formation and maintenance of a high level of technical and technological support of the national economy, directly shaping and ensuring the continuous growth of productivity of social labor. Owing to the processes of the formation of a global world economy, international innovation and technology cooperation, which is an international scientific and technological innovation, production and marketing activity, focuses primarily on the technological development of developing countries and countries in transition to the market period in order to accelerate their development and formation of the foundations of a developed market economy. The article deals with the problems and prospects of the development of the world scientific and technological market.The publication focuses on the analyzes of the specific characteristics of the European, American and Asian scientific and technological market.

Keywords: scientific and technological potential, progress, development, patterns.

Introduction. Scientific and technological potential is the determining factor that ensures competitiveness of the national economy. Today the growth of GDP in most developed countries by 75-80% determined by innovative achievements precisely because the relevance of this issue is to identify the shortcomings of the priority areas and possible ways to improve and improve. Scientific and technical progress is always made in the interconnected evolutionary and revolutionary forms, is dominant (determining factor) development of productive forces, the relentless increase of production efficiency. It directly affects primarily the formation and maintenance of a high level of technical and technological base of production, ensuring steady growth of labor productivity.

Analysis of recent research and publications. Problems and patterns of the development of the world scientific and technological potential are analyzed by a lot of scientists. Therefore, it is necessary to note the work of domestic and foreign scientists, such as D. Ashvorz, Yu. Bayrachniy, L. Barbone, J. Berger, I. Burakovsky, I. Blahun, N. Vdovichenko, M. Wysocki, I. Volkov, M. Hrydchyna, M. Carlin, J. Kozak, P. Lindert, D. Lukyanenko, S. Lutsyshyn, J. Mackie-Mason, J. Makogon, N. Stukalo, A. Tolkushkin and others. Despite the considerable numbers of scientific papers on the subject of the patterns of development and operation of world scientific and technological market**,** at the beginning of the XXI century it is very important to come up with the specific characteristics of the European, American and Asian scientific and technological market.

The aim. The aim of this article is the analysis of the specific characteristics of the European, American and Asian scientific and technological market.

Results and their discussions. Western Europe – one of the world's most influential scientific centers. The total number of researchers exceeds 700 thousand. People which must be added to the researchers in Central and Eastern Europe – 300 thousand. Leading countries in the region spend on scientific and technical research for more than 2% of GDP (primarily Italy). For a long time, Western Europe was significantly behind the US and Japan, primarily in research in the field of high technology. This gap, though reduced, still persists today. Scientific and technological expenditure per capita in Western Europe are generally lower than in the US and Japan, Germany in 2015 therefore 710 dollars per capita; Japan – 870; USA – 1000.

In this region of the world is not as widespread flagship advanced technologies (used computer, equipment). A distinctive feature of scientific and technological capacity in Western Europe is a relatively small number of military and space research than the United States do. Scientific and technical potential of Western Europe largely focused on basic research. Countries in the region take the forefront in the construction of nuclear power plants, pharmaceutical manufacturing, communications technology, in some areas of transport engineering. At the same time, Western Europe is lagging behind in areas such as the production of integrated circuits and semiconductor manufacturing microprocessors, biomaterials. New Directions Strategy of the European Union in the field of innovation policy developed in its sixth scientific and technological Framework Programme 2015. This program with a budget of 17, 5 billion euros (an increase of 17% compared with the Fifth Framework Programme) provides for the establishment of a single European research area (European Research Area – ERA), which would combine the resources of all European states, including candidate countries for accession to the EU and CIS countries and other third countries. ERA concept implies: a scientific area without national boundaries, which will enable to smooth differences in scientific and innovative development of participating countries, to raise the competitiveness of the EU to increase the number of new job 13 seats; efficient use of financial resources for investment in innovation sphere; expanding mobility of scientific and technical personnel, especially young researchers and women, the more active involvement of experts from third countries[1].

Sixth scientific and technological Framework Programme has two main cost items: the creation of the EU ERA (16,27 billion) and the Euratom program of nuclear energy (1.23 billion euros). Work on the Framework Programme will be used in three areas: EU integration studies (13.345 billion euros), structuring the ERA (2,605 billion euros), strengthening the foundations of ERA (0,32 billion euros). The program integrating the research highlighted seven priorities, which are expected to spend 11.285 billion euros. Among the main priorities award program takes place an information society (35% of total funding case studies), followed by application of biotechnological research and work in genomic, nanotechnology and new materials, global change ecology. Special programs are provided for small and medium enterprises (expected to increase their degree of participation in the project from 10 to 15%). A separate program dedicated to stimulating innovation. It aims to assist the business sector and scientists in the implementation of research results, transforming them into new investment and jobs. Special measures are provided in areas such as intellectual property, access to risk capital and finding partners in other Member States.

Analyzing the USA, it is necessary to mention that the States have the world's largest scientific-technical potential. Funds are allocated annually to them annually on Scientific and technological researches (312.5 billion USD in 2014) higher than costs in other leading scientific and technical terms of the combined. In the early 90's. The total number of employees in science and scientific services in the United States is close to 7 million. people, including scientists – to 1 mln. people (14 full-time). In 2015 the number of researchers in full-time totaled 1.3 mln. people. The combination of high-level skills of scientists and technical equipment of research centers to fully ensure the leading role of the US in world science. Fundamental research as part of research and development by 60% concentrated in the universities, which generally has about 4 thousand. A special role among US universities played 156 universities; most of them have modern technical facilities and highly qualified personnel. In turn, among them are the top 20 universities with the largest volume of research (MIT, Stanford, Harvard, Princeton and others)[2].

Unlike fundamental and applied research (developed- design work as part of scientific and technological researches) carried out mainly in the industrial sector. Research and development activities are carried out mainly by private firms in special research institutes and laboratories. The main form of state participation in R & D contract is concluded on a competitive basis or with universities and their research centers or companies. Of great importance is an innovative business that is developing extremely rapidly, connecting science and business. Its centers are territorial research and production facilities (parks, techno). In Technopolis carried out development of innovative products and technologies, materials and products, as well as experimental, small-scale production of high technology products. In 1997, the US had about 105 techno. Expenditure on scientific and technological researches in the US mid-90s to mid-2000s increased from 1.5% of GDP to around 2.9% of GDP (record, no further progress level).

During this period the share of federal government allocations for science in public spending on research and development reached its peak – around 2% of GDP. The share of federal appropriations for scientific and technological researches for the first time fell below 50% of total expenditures in 2015, reaching a minimum level of 24.9% in 2014, '15 simultaneously rapidly growing scientific and technological researches expenditures of the private sector (75%). In the first decade of the 21st century the share of federal spending began to rise again, reaching a rate of 30%. Such dynamics allocations for science

[1] Кістанова, В.В., Копилова, Н.В. (1994). Розміщення продуктивних сил. *Економіка*, *4,* 574.
[2] Козик, В.В., Панкова, Л.А., Даниленко, Н.Б. (2015). *Міжнародні економічні відносини*. Київ: Знання, *ч.5*, 406.

in general and the role of the state they were due to several reasons. The main, appears to have been the desire to ensure US strategic advantages in key areas of scientific and technological revolution in the face of the deteriorating international economic and scientific-technical competition and, to a large extent, the task of military confrontation with the USSR. The US government has managed in the second half of the 20th century to create the world's most powerful scientific and technical potential, which provided American economic leadership for decades to come. Reducing the share of state appropriations after 2015 favor the private sector due to the achievement of the main tasks of military-strategic nature of the subsequent end of the Cold War and the need to commercialize many scientific handling in practice[1].

The latter is primarily led to a marked increase in the role of the private sector in research and development, most of which focused on applied research and development (70% of total expenditures or 2% of GDP). They are the world's largest manufacturer of high technology products: their share in world production of these products was in the mid 90's. 40%. The absolute magnitude of allocations for research and development in 2015 in the US reached astronomical proportions – 496800000000. Dol., representing 26.4% of global spending on research purposes. According to the existing forecasts of these costs in 2016 will amount to 514 billion. dollars. (An increase of 3.4%; 26.4% of global spending). Of these, 16% (75 billion. Dollars.) Attributable to fundamental research, 20% (87 billion. Dollars.) – On the application, 64% (291 billion. Dollars.) – The development (D resources). Thus 56% of all appropriations for basic research were used by American academic science sector, universities. Most of these were state appropriations allocated and 16 different federal agencies, including the key role played by the Ministry of Defence, Ministry of Health and Social Services, the National Science Foundation, Department of Energy, Ministry of Agriculture (collectively, the leading federal agencies earmarked for academic study of more 38 billion. dollars. in 2015). More than 328 billion. of appropriated funds for the science used in the private sector (64%). This civilian scientific and technological research amounted to 2.1% of GDP, one of the highest performance in its history

Currently, the global market licenses and patents are the leading industrialized countries, the undisputed leader among which are the United States. The Boston Consulting Group (BCG) represents the tenth annual ranking of the 50 most innovative companies – Apple and Google retained the first and second places respectively as attach great importance to technological platforms. In this case, Apple ranked first every year since 2005, and Google – the second year since 2006, Tesla Motors climbed from seventh to third place, Microsoft and Samsung have locked the top five. Apple and Google hold first and second place in the ranking for the past decade. Newcomers are in the top three became Tesla Motors, a year climbed from seventh to third place. Also on the list of best development and introduction of various innovations in 2015 were, for example, Netflix (21), Facebook (28), Renault (33), Volkswagen (35), Nike (46) and Lenovo (50). So at the moment the American scientific and technical complex is a leader and heads the nucleus major players in the technology market innovation. US remains the world's largest manufacturer of high technology products: the share of these products in global production is up 40%. America managed to create the world's most powerful scientific and technical potential, providing American economic leadership now. United States lead the world in the following areas of scientific and technological progress as the production of supercomputers for military and industrial purpose 17 and their software, production of aviation and space technology, lasers and biotechnology.

If to analyze the Asian market, it is necessary to mention, that since the main channel for the movement of technology from developed countries to developing countries were and still complete the purchase of expensive equipment or disparate industries and vehicles, were quite naturally try copying and reproduction of this technology. The practice of "reverse engineering" is successfully used by Japan and the NIEs, China and India. North Korean "Samsung" started its activities in the 30s of XX century. as a trading company in 50-60 years engaged in the production of sugar, textiles, petrochemical products. The work in the electronics industry company started in the 70's with the role of provider for Japanese companies ("Sony", "Toshiba") schemes OEM, then ODM. Gradually the company developed scientific base and promoting its own brand. As a result, in 90 years, "Samsung Electronics" has become a strong competitor to Japanese corporations, often ahead of them in the implementation of technological innovations. In 2014, about 10% of sales spent on scientific and technological researches. Similarly,

[1] Щедріна, Т.І. (2013). Перспективи міжнародного трансферу технологій в реалізації інноваційної моделі розвитку. *Стратегія економічного розвитку України*, *6*, 281–291.

"Samsung" went through many Taiwanese, Singaporean and Chinese companies. Clearly, the success is largely dependent on the ability to acquire foreign technology, get adjust to them. Copying and imitation, as well as the acquisition of patents and licenses were important not only in itself but as a step in the creation of its own innovation capabilities.

Over time, the proportion of industrial equipment manufactured independently in developing countries increased. In India, for example, the share of imported machinery and equipment in their total consumption declined from 45% in 2000 to 15% in 2015. Newly industrialized economies (NIEs) and China early 90s declared itself as a large seller of capital goods in the world market, which contributed to lower relative prices. 18 With the development of its own scientific and technological potential and strengthen international rules on intellectual property protection Asian countries expanded technology acquisition by purchasing patents and licenses. In 60 years Japan became the first Asian country has become a major buyer of patented technologies in the 70 years before it joined the newly industrialized countries (NICs). Currently the leader in this field of China: its annual spending on patents and licenses, up more than 6 billion. Dollars. The most important trend in the movement for independence in the field of science and technology was to organize special and higher education, and research and development. Expenditure on scientific and technological researches (research and development work), many economists believe the kind of investment. One might add that it is – one of the "most effective forms of accumulation.

The share of scientific and technological researches spending in Asia in 2015 was the highest in Japan (3.0%) and in the newly industrialized countries (NICs) (an average of 2.2% of GDP). In China the figure was 1.3% in India – one in Malaysia – 0.7 Philippines – 0.1, Thailand – 0.2%. In absolute terms (in calculating purchasing power parity) expenditure on R & D in Asia leading China – more than 130 bln. Dollars. (About 12% of global spending). About the same number had to Japan, followed by India (3%), South Korea (2.5%) and Taiwan (1.5%). In general, Asian countries accounted for about a third of global spending on research and development. In general, Asia (excluding China) about 60% of R & D funding accounts for much, and in recent years, and small business. This is more than in developed countries, where the share of public sector in funding research reaches one-third. In Indonesia, the state's share of R & D expenditure is 80%. Over 50% of R & D expenditure accounted for by the state in India. The special situation in this field in China: the research and development conducted mainly government agencies, including large corporations. China registers annually in the United States about 600 patents (Russia – 200). In China itself there are nearly 500 thousand. Patent applications per year, about 80% are accounted for by local inventors.

"brain drain" (emigration from the country of skilled personnel) – an acute problem faced by many Asian countries. Significant economic losses as a result of this phenomenon were forced to take various urgent measures. Thus, in 1958, India has created a special organization "pool of scientists." For the first 20 years of it repatriated from abroad more than 6 thousand experts. In 80 years of significant activity in the country to attract foreign scientists of Chinese origin opened Beijing. By 2014, about 20% of scientists in the country have been trained abroad. In 90 years of training took massive Chinese citizens in foreign universities, some of them have opened their branches in China. In the universities of China jointly with foreign partners launched more than 600 educational programs. Examples of countries that a few decades were able to rebuild the national economy are numerous. Impressive rates of South Korea showed that for 50 years has evolved from a poor agrarian country that has experienced war, one of the richest and most high-tech countries. At the heart of these changes and unprecedented rates of growth – innovation and high technology. The country is investing in R & D over 4% of GDP. NTP incredible impact caused a huge leap in the economic development of Asian countries. This trend could well reflect on the example of Singapore. The country, which was not only natural resources, but even drinking water, is now in sixth place in terms of GDP per capita and the first – in the ranking of Doing Business. In early 2016 the first Singapore government approved the development plan research by 2020, according to which the development of the next five years will invest $ 13.2 billion, which is 18% more than the previous five-year cycle. More ambitious plans to become India's economic and scientific and technological development. This is justified due to the current state of human capital in the modern sector. The country has a large number of professionals and skilled engineers and technicians of various specialties who are fluent in English[1].

[1] Сухоруков, А.І. (2013). Пріоритети інвестування національного технологічного розвитку. *Стратегічна панорама, 1,* 45-49.

India currently has about 20 thousand researches. Research institutes and 380 universities annually produce about 200 thousand. Engineers, 300 thousand. Technicians and 9-th graduate students. By some estimates, India is in first place in the world in terms of engineering capacity and the fourth – the number of skilled workers. So Asia is characterized as perspective player in the global technology arena. Backwardness in science, technology and education Asian countries broke even faster than poverty. Already in the 80s of the last century the general fund of the Asian countries, with investment in fixed capital and current expenditure on education, health and research and development, reached around 40% of GDP. In this case, at least half of the fund allocated to the most efficient components: investment in new machinery and equipment, as well as the human factor. Now the general fund of the Asian countries is growing and currently stands at 45-50% of GDP. 2.4 The genesis of the formation of complex scientific and technical potential of Ukraine. Innovative formed during the second half of the twentieth century. during the deployment of the world's scientific and technological revolution and is characterized by a relatively high quality performance.

Conclusion. To achieve national and global scientific and technological objectives leading countries combine efforts and resources, as well as growth of the world economy and the pace of technological development depends on the effective use of scientific and technological potential and its development. And in science and technology fields appears internationalization and globalization. Scientific and technological progress is accompanied by growth of scale economy, further development of social and international division of labor, specialization and cooperation processes. Global international integration in science and technology, which is a different set of relationships that occur at various levels from small scientific organizations, enterprises and the level of states and international organizations. This association is the purpose of growing scientific and technological potential in different taps. This has contributed to the emergence of the international technology market.

References:

1. Kistanova, V.V., Kopylova, N.V. (1994). Rozmishhennya produktyvnyx syl [Distribution of productive forces]. *Ekonomika* [Economy], *no. 4,* 156. [in Ukrainian].
2. Kozyk, V.V., Pankova, L.A., Danylenko, N.B. (2015). *Mizhnarodni ekonomichni vidnosyny* [The International Economic Relations]. Kyiv: Znannya, *p.5*, 406. [in Ukrainian].
3. Shhedrina, T.I. (2013). Perspektyvy mizhnarodnogo transferu texnologij v realizaciyi innovacijnoyi modeli rozvytku [Prospects of international transfer of the technology in implementation of innovative model of development]. *Strategiya ekonomichnogo rozvytku Ukrayiny* [Strategy of economic development of Ukraine], *no. 6,* 281–291. [in Ukrainian].
4. Suxorukov, A.I. (2013). Priorytety investuvannya nacionalnogo texnologichnogo rozvytku [Priorities of investing of the national technological development]. *Strategichna panorama* [Strategic Panorama], *no. 1,* 45-49. [in Ukrainian].