

Valieva O.V.  
Institute of Economic and Industrial  
Engineering Siberian Branch of The Russian  
Academy of Sciences (IEIE SB RAS),  
Novosibirsk State University,  
Novosibirsk State Technical University,  
Novosibirsk, Russia  
O\_valieva@mail.ru

## **Global value chains in the biotechnology market: an assessment of Russian companies**

### *Annotation*

The study examines the creation of global value chains in the biopharmaceutical sector of Russia in general and in Siberian companies in particular. Problems are studied at all stages of research, production and sales cycles. The degree of incorporation of Siberian biotechnology companies into global value chains is analyzed. Survey results showed that domestic companies are poorly embedded in global value chains. As a rule, in the markets of “red” biotechnologies it is the import of primary highly purified / low-purified substances, depending on the sphere of use in the final product and the export of high-tech services in the field of R & D. The weak link of our market in GVC is engineering and distribution. In the markets of "green" biotechnology, in which one can identify segments of genetic engineering (breeding new plant varieties, GM crops), biotechnologies for livestock and plant growing, high competitiveness and export potential have so far formed only in the market of biological plant protection products. However, the pace of growth is far behind the world. This gap is due to several factors: high supply of plant protection chemicals from global corporations, difficulties in registering their own developed drugs, limited financial resources, lack of government funding and support measures.

*Keywords:* Global value chains (GVC), biotechnologies, competitive advantages, biotechnology companies, barriers of scientific and technological development

### *Formulation of the problem*

The development of the biotechnology market is one of the important tasks of the economic development of the country. Companies of the biotechnology sector are setting their priorities on the development of new drugs and medicines, the creation of advanced diagnostic technologies and the antivirus industry, plant and animal protection products, and new technologies for

agriculture. To assign these or other biotechnologies to different areas of the application, a “color code” was created. “Red biotechnologies” is biomedicine (therapy, diagnostics) and biopharmaceutics (production of proteins, enzymes, antibodies), “green biotechnologies” - biotechnologies for the agro-industrial complex (genetic engineering, production of feed and food, animal health, plant protection products, etc. .), “White biotechnologies” - development and production of biofuels, bioremediation, as well as industrial biotechnologies for the chemical, food, oil industries (enzymes, chemicals, cellulose, food), “blue biotechnologies” - biotechnologies created on the basis of the marine and aquatic environment (Amarakoon, 2017). The development of modern biotechnology is one of the priorities in the national strategies of all developed countries. The Russian biotechnology market is developing at a significantly slower pace than global markets and technologies, and identifying growth reserves ensuring widespread use and introduction of competitive domestic biological products and technologies is an important and urgent task for the development of the country<sup>1</sup>.

#### *Approaches*

One way to analyze the degree to which domestic companies are involved in international markets is to analyze Global value chains (GVC). Approaches to exploring global value chains are based on studies of the structure and dynamics of global industries, to understand where how and by whom economic, social, and environmental values are created and distributed (Duke University, 2016). In practice, GVC research questions focus on the problems of developing companies, competitiveness business, industries, cities and states. Identifying potential problems affecting suppliers and partners and finding bottlenecks in the value chain. GVC analysis is also important at the stages of developing industrial policy and strategic development plans for individual companies, industries, regions and for government and intergovernmental interaction programs.

The global economy is increasingly structured and concentrates around global value chains, which in turn affect the growth in the share of international trade, global GDP and employment. GVCs bind companies and consumers around the world and save on production and promotion costs. For many countries, the ability to effectively participate in global value chains is a vital condition for development (Gary Gereffi, Karina Fernandez-Stark, 2016).

GVC analysis is based on two phases. The first is the mapping of the value chain (determining the geographic location, key figures, logistics, input-output steps). The second is

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defining the role of dynamic factors (management, institutions, and interfirm relations) that affect the location, development, and competitiveness of an individual company, country, or even a city (within the concept of a gateway city). As an example, the role of Singapore in strategic cooperation with Vietnam and Indonesia. The analysis of cross-country interactions within the Global Production Network (GPN) concept can complement the GVC and is also important for choosing a strategic development vector (Breul M., Revilla Diez J., Sambodo T. S., 2018). However, today Russia is involved in GVC mainly as a supplier of energy resources, which ensures “high profitability of the fuel and energy companies participating in them” (E. Sidorova, 2018).

At the macro level, many researchers show the importance for the innovative development of a country, the involvement of national companies in global markets through cooperation with transnational corporations. Jiali Gea et al., analyzing the data on 249,357 industrial enterprises in China from 2000–2007, note that after reform and opening up, China’s economy gradually merged into the global value chain. The formation of GVC not only motivated the integration of economic factors around the world, but also brought tremendous opportunities for economic growth in China (Jiali Gea, 2018).

Loecker (Loecker, 2007) argues that in the process of participation in GCC, enterprises from developing countries are more quickly integrated into technological progress through the “Learning effect”.

Baldwin and Jan (Baldwin J., Yan B., 2014), analyzing data from Canadian companies, have shown that high-tech companies are getting the most benefit from using GVC. Quite a significant part of the research shows the positive impact of GVC on the growth of productivity and inclusion of both countries and individual companies in technological progress.

### *Methodology*

Researchers at the Joint Research Center of the European Commission on Global Value Chains in 2016 proposed a new methodological approach for mapping GVC using a set of data from innovative biopharmaceutical companies. The study provides an example of the global value chain of the biopharmaceutical sector and describes a step-by-step procedure for displaying interconnected opportunities on a global scale. The proposed methodology contains two fundamentally different approaches - for downward global mapping of the value chain from top to bottom, as well as for bottom-up mapping. This methodology can be applied to the analysis of the GVC in the field of new technologies, as well as at the level of individual countries and regions. New methodology and methods for collecting and visualizing data demonstrate the relationship between segments of biopharmaceutical chains and the position of firms in the field of research and development; pharmaceutical manufacturing; managing a

complex network of outsourcing, insourcing and procurement relationships through subsidiaries around the world (E. Todeva, R. Rakhmatullin, 2016). In further research, we will build on this concept.

The goal of our research is to identify the degree of incorporation of Russian biotechnology companies into global value chains. The research methodology was based on:

- Adaptation of various GVC concepts to the analysis of the “red” and “green” biotechnology markets;
- Identification of key Siberian companies with export potential and built into the full cycle of creating innovative biotechnological products;
- Surveys of top managers or owners of companies from the list of key agents in the biotechnological market;
- Processing survey results and building GVC matrices.

Surveys were conducted and conducted by focused interviews of managers of companies that are members of the Biopharm Biopharmaceutical Technologies Association “BioPharm”<sup>2</sup>. At the moment, 15 senior executives and owners of companies have been interviewed.

The questionnaire form contained the following questions:

1. How companies are involved in interaction with foreign partners, on what conditions, on what markets, on what stages of GVC;
2. What are the competitive advantages of Russian biotechnology companies in the domestic and foreign markets;
3. What problems and barriers of technical development (organizational, institutional, personnel, tax, infrastructural) have to face at all stages of the scientific and production cycle, the implementation of supplies and sales;
4. To what extent has the policy of sanctions weakened / strengthened the position of biotechnological and biopharmaceutical companies in domestic and foreign markets;
5. How did this affect the availability of dosage forms, reagents, raw materials, materials and equipment for production and research activities;
6. How much the import substitution programs have contributed to the growth of domestic demand;
7. What should be the measures of state incentives and regulation of the biotechnology market.

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<sup>2</sup> Association for the Development of the Innovative Territorial Cluster of the Novosibirsk Region in the Field of Biopharmaceutical Technologies "Biopharm" // <https://npbio.ru/>

## Results

Preliminary survey results showed that domestic companies are poorly integrated into global value chains. As a rule, in the markets of “red” biotechnologies it is the import of primary highly purified / low-purified substances, depending on the sphere of use in the final product and the export of high-tech services in the field of R & D. The weak link of our market in GVC is engineering and distribution.

In the markets of "green" biotechnology, in which one can identify segments of genetic engineering (breeding new plant varieties, GM crops), biotechnologies for livestock and plant growing, high competitiveness and export potential have so far formed only in the market of biological plant protection products. However, the pace of growth is far behind the world. This gap is due to several factors: high supply of plant protection chemicals from global corporations, difficulties in registering their own developed drugs, limited financial resources, lack of government funding and support measures.

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