Integration potential for technological cooperation of the EAEU countries

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Abstract—The study presented in this paper analyzes the scientific and technological cooperation of the member states of the Eurasian Economic Union (EAEU or EEC). There is given the capacity assessment for technological cooperation of EAEU member states. Our research reveals the specific role of technological cooperation in the EAEU as a facilitator of regional integration and new industrialization processes. The study also examines the factors that increase the potential for cooperation in the technological sectors of the economy, as well as the obstacles to its development.

Keywords – EAEU; scientific and technological cooperation, international collaboration; integration; global commodity chains (GCC); innovations, new industrialization

I. INTRODUCTION

The most important characteristics of modernity is globalization, it creates basis and forms the processes of international integration, partnership and mutual collaboration in various sectors of the economy. The emergence of regional economic unions becomes natural with the gradual liberalization of foreign economic activity of member countries, which, in turn, contributes to the development of regional trade and investment activities and deepens transnational integration. An important form of international regional cooperation is scientific and technological cooperation, it provides a wide range of expertise, resources, capacity building for pooling the resources of countries participating in integration alliances, ensures the effective development of innovative processes and, as a result, countries' competitiveness.

The development of the Eurasian Economic Union (EAEU, the Union) aims to achieve a synergistic effect based on the integrated use of scientific, technical and resource potential of the participating countries in various areas of the economy. The creation and development of the institutional basis of the Union, a favorable investment and business environment contribute to the realization of the benefits of economic integration.

However, despite high expectations, the development of integration processes is rather slow and fragmentary. There are many contradictions in certain areas of regional trade and economic policy. According to the monitoring study "Integration Barometer", the EAEU still enjoys a significant level of trust and support from the public (from 50% to 83%) [1]. At the same time, a positive attitude towards Eurasian integration is gradually decreasing.

The benefits from integration implies reinforcement of intra-industry trade and cooperation in technological areas of the economy, institutionalizing formal and informal rules, etc., allowing them to actualize their competitive advantages. The trade in commodities and low-tech goods does not provide synergistic effects, but only forms an inefficient market and deepens the contradictions between the Union members.

In this regard, the question arises about the key areas of scientific and technological cooperation, which, on the one hand, would be economically viable for all participants of the EAEU, and on the other hand - would be a driver for the development of integration "from the bottom."

Such key areas, as evidenced by the experience of many countries of the world, are the expansion of partnership and strategic cooperation in the technological sectors that form long-term production relations and ensure harmonization of standards, reduction of tariffs and increase in the competitiveness of a product.

II. LITERATURE REVIEW

The review of academic literature emphasizes mainly the positive effect of regional integration on the development of technological cooperation between the countries participating in regional unions.

Thus, some scientists provide convincing evidence that the harmonization of European standards has a positive effect on the development of intra-industry trade in terms of value added and plays a significant role in the integration of global commodity chains (GCC) [2, 3].

Studies by G. Orefice and N. Rocha show that regional trade agreements (RTAs) do not have the same effect on cooperation progress and GCC in different industries. Further deepening of integration primarily promotes cooperation in the field of mechanical engineering,
information technology, etc. In certain industries, such as textiles, for example, the positive influence of integration progress is not visible [4]. The reports of the World Economic Forum and the Asian Development Bank emphasize the prospects for the development of cooperative relations associated with advanced scientific and technological developments in the context of regional integration [5].

Several studies point out that, like the gravity models of international trade, technological cooperation is developing strongly between neighboring countries, which are often regional partners. So, M. Schiff and Y. Wang, using data at the industry level, demonstrate that the spread of technology and increased productivity, as a rule, occurs between "natural trading partners" - neighbors [6].

At the same time, some authors reveal the ambiguous impact of integration on trade ties and the development of GCC. So, D. Bruhn emphasizes that on the one hand there is a decrease in trade barriers, on the other - trade policy loses flexibility, management autonomy and the state loses leverage, that stimulates the development of international cooperation [7].

Some experts highlight the presence of risks and side effects of technology transfer in regional unions, which is generally related to the inadequate regulation of technological exchange, patent policy, etc. [8].

The examples of mutual collaboration in the field of technological cooperation, the development of partnership between EAEU countries and other countries, as well as the assessment of their integration potential are presented in many papers [9, 10]. Some studies analyze the development of the Union member countries in terms of improving production efficiency, improving the quality in the international division of labor [11], analyze challenges for further integration and strengthening economic relations within the EAEU [12].

In general, experts underline the importance of transnationalization processes in the EAEU, highlight features of evolution of transnational corporations, and draw conclusions in the context of the most likely prospects for their development and influence on the further regionalization of the Union member states [13]. The influence of factors contributing to partnership in the region in the area of technologies is also touched upon [14, 15]. It is argued that the main factor of such interaction is the compatibility of the Eurasian type economies, the availability of infrastructure capacities of Greater Eurasia, which in a certain way will contribute to the scientific and technological cooperation of countries in the EAEU [14].

The influence of the economic integration of the EAEU countries on the mutual trade of countries from the standpoint of assessing their competitive advantages is reflected in the study of the export structure, which is also an substantial component for the development of scientific and technical partnership and promotion of hi-tech goods both on the domestic market of the Union and beyond [16, 17].

Scientists also remind the existing problems in the EAEU related to the low efficiency of the commercialization of innovative engineering and their subsequent promotion, which create obstacles for carrying the existing national innovation and technological potential of countries into life [18, 19].

In this regard, it is important to assess the integration potential for technological cooperation of the countries participating in the EAEU for the prospects of their further economic growth.

III. RESEARCH METHODOLOGY

This study deals with the basic science methods and fundamental principles of the economic theory of regional integration, the practice of developing economic processes in general, and the development of scientific and technological cooperation between the EAEU member states in particular.

We used general scientific and special research techniques, methods of scientific abstraction, analysis and synthesis, systematic approach in data compilation, statistical analysis, index methods for estimating the parameters of mutual trade volume of the countries. We calculated the complementarity index of mutual trade among the countries of the Union, characterizing the synergy degree of the economies. The index considered as a barometer of competitive intensity reduction among the partners of the integration group, because it provides an assessment basis to what extent the commodity and industry differentiation of national producers allows to organize technological and production ties complementing each other and to determine the reserve of their optimization.

The complementarity index is calculated by the formula:

\[ S_{ij}m_k = 1 - \frac{1}{2} \sum |E_{ij} - M_{ik}| \]  

(1)

where: \( j \) – exporter; \( k \) – importer; \( i \) – commodities up to 3 digits in the Standard International Trade Classification Revision 3 (SITC 3); \( E_{ij} \) – the share of good \( i \) in global exports of country \( j \) on global market; \( M_{ik} \) – the share of good \( i \) in all imports of country \( k \) from global market.

Evaluation of trends in the development of intra-industry trade was carried out by calculating the share of the indicator of intra-industry trade (\( GL_{index} \)), according to the formula proposed by G. Grubel and P. Lloyd.

\[ GL_{index} = \frac{(X_{ij} + M_{ij}) - |X_{ij} - M_{ij}|}{(X_{ij} + M_{ij})} \times 100 \]  

(2)

where: \( X_{ij} \), \( M_{ij} \) – export, import of country \( i \), related to good \( j \).

As information resource we used the statistics of the Eurasian Economic Commission (EEC) (indicators of mutual trade within the EAEU by sections and groups of TN VED), as well as the data of mutual trade of the countries of the statistical base of UNCTAD.

IV. RESEARCH RESULT

Having strong ties in the field of production and
science, the countries of the EAEU have all the prerequisites for the creation of a common production and technological infrastructure. The development of multi-level technological cooperation, including financial, technological and scientific convergence, the GCC and global production network can contribute to increasing the sustainability and efficiency of the Union under conditions of new industrialization. Integration only in the field of commodity trade creates an inefficient intra-regional market and leads to significant difficulties in trading with countries outside the union, which leads to the conflict of interests among the countries of the EAEU in an attempt to gain additional profit due to the difference in the commodity costs within the Union and overseas market.

There are many key success factors that can contribute to the development of technological cooperation today. This is, first of all, a high level of science and education and the presence of highly skilled workforce from the countries of the Union. The countries occupy top positions in world rankings on these parameters. Leading positions are also noticeable in the number of patents received.

Nevertheless, there are big challenges in the innovation area of the member States of the Eurasian economic Union, which do not allow these countries to take top levels in the ranking of the most innovative countries in the world. So according to the Global Innovation Index, version of the international business school INSEAD, Russia occupies only 45, Armenia 59, Kazakhstan 78, Belarus 88, and Kyrgyzstan 95 places in the ranking of 127 innovative countries. At the same time, too little attention is paid to the financing of R & D. Domestic spending on research and development in Russia (2016 Rosstat data) amounted to only 943 billion rubles, which is 1% of annual GDP. In Kazakhstan, the figure is much lower, according to Forbes Kazakhstan, only 0.14% of annual GDP, in Belarus - 0.5%. R&D domestic spending does not exceed 0.1% in Kyrgyzstan, and in Armenia - 0.3% (according to World Data Atlas). For comparison, in developed countries this figure is above 3%.

The position of the member states of the Union has significantly improved in terms of the World Bank’s national Doing Business regulation indicators, which characterize the investment climate and the quality of the macroenvironment. Thus, in World Bank's Doing Business 2012 ranking, the Russian Federation took 124th place out of 190 countries and moved up to 35th place in Rank 2018. According to Rank 2018 the places of the rest of the EAEU countries (out of the list of 190) are: Kazakhstan - 36, Belarus - 38, Armenia and Kyrgyzstan, respectively, 47 and 77. Despite the above-mentioned positive trends, the situation is far from progress and require significant reforms in terms of improving the investment climate. The lowest values in the aggregated rating for all the countries of the Union are the indicators of “international trade” and “investor protection”, which negatively affects the investment attraction in various projects and inhibits the promotion of goods to the markets.

High level of education, science and technology, the availability of highly skilled workforce contribute to increasing potential of innovative activity. Innovative potential is measured by indicators of the development of leading-edge technologies and by matching the number of high technologies which are developed in the country with the number of used, including the imported ones. The dynamics of these indicators for Russia, which is the technological core of the Union, are presented in the table (“Table 1”).

### TABLE 1. DEVELOPED VS. USED HIGH TECHNOLOGIES IN RUSSIA, UNITS.

<table>
<thead>
<tr>
<th>type/year</th>
<th>2005</th>
<th>2010</th>
<th>2015</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>developed</td>
<td>637</td>
<td>864</td>
<td>1398</td>
<td>1402</td>
</tr>
<tr>
<td>used</td>
<td>140983</td>
<td>203330</td>
<td>218018</td>
<td>240054</td>
</tr>
</tbody>
</table>

According to the data (“Table 1”), the number of advanced technologies in the country is significantly lower than that used ones. The situation is similar in other countries of the Union, which demonstrates a low level of implementation of their own technologies.

It is important to underline that the current investment climate at intra-national and international levels in technological area proves the urgency in the development of joint projects in the field of innovative technologies and the subsequent promotion of their results.

Each EAEU country has a certain potential for scientific and technological development essential for innovative growth. Russia has achieved significant results in the field of nano-biotechnology, nuclear energy, aerospace technology, communications and information technology. The potential of Kazakhstan ensures the appropriate conditions for sound development of innovative entrepreneurial activity, there are qualified personnel and considerable interest in improving technological and innovative performance. Belarus has vast transport, communications and transit potential, has at its disposal high-tech production facilities, especially in the petrochemical industry and mechanical engineering, provided with skilled manpower; the country has developed valuable scientific and human resources in the field of high technologies. Biotechnology, information technology, computer science, software and hardware are vigorously developing. Preconditions for the innovation processes development across national economies and their integration within the single economic space also exist in Armenia and Kyrgyzstan.

However, the largest share in the commodity structure of mutual trade of the EAEU member States is mineral products (27% of the volume of mutual trade), of which 84.8% is supplied to the Union from Russia (EEC statistics). Significant supplies of machinery, equipment and vehicles to the EAEU market (17.9% of the volume of mutual trade) come from Russia (55%) and Belarus (41.3%). Moreover, it is necessary to emphasize that the market of the EAEU countries for the sale of engineering products is the main for Belarus (on average 76% of exports of engineering products of Belarus in 2010-2016 belonged to the EAEU market).
According to the analysis, there is an active development of trade and economic cooperation between Russia and the EAEU on machinery and engineering products, both in terms of increasing exports, and in terms of the deepening of cooperative ties. The indicator had a positive trend (increased from 11% in 2010 to 18% in 2016).

The study calculated trade complementarity index and intra-industry trade indexes for the capacity assessment of the cooperation in mechanical engineering.

The value of the trade complementarity index of Russia and the Union countries was 85% in 2016 and increased by 2% compared to 2010 (EEC statistics), which shows a high cooperation potential. However, it should be noted that the value of this index for Russia and the EU is even high – 86.5% (UNCTAD statistics), which also indicates a wide range of possibilities for technological cooperation.

The analysis of mutual trade between the EAEU countries in engineering products is presented in the “Fig. 1".

![Mutual trade of the EAEU countries in engineering products (%)](image)

According to the presented dynamics, the volume of mutual trade in engineering products is much higher within the EAEU, as compared with other countries, it also shows growth in the period from 2015 to 2018 for Armenia, Belarus, and a slight slowdown in the last year for Kazakhstan, Russia and Kyrgyzstan.

The capacity assessment of cooperation in the mechanical engineering by means of the Grubel-Lloyd Index (GLI) (“Table2”) shows relatively high values of this indicator within the Union compared to third countries.

In conclusion, the EAEU countries are practically not involved in the global processes of cooperation, but they have solid basis for value chain development and upgrading in the industry within the Union, using all the advantages of regional integration.

<table>
<thead>
<tr>
<th>Country</th>
<th>GLI, within the EAEU</th>
<th>GLI, global trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armenia</td>
<td>60</td>
<td>11</td>
</tr>
<tr>
<td>Belarus</td>
<td>82</td>
<td>43</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>59</td>
<td>6</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>45</td>
<td>24</td>
</tr>
<tr>
<td>Russia</td>
<td>69</td>
<td>24</td>
</tr>
</tbody>
</table>

The development of technological cooperation in the countries of the Union is enhanced by the presence of similar or even identical priorities in scientific and technical areas: new materials, IT, bio- and nanotechnologies, renewable energy, space technologies, etc. The coherence of science and technology policy will release smoothly the integration of national innovative systems, unite the scientific resources of all the countries. The implementation of the tasks contributes to the development of joint infrastructure. According to the Decision of the Supreme Eurasian Economic Council "On the Main Directions of Industrial Cooperation within the framework of the EAEU" dated September 8, 2015 Decision No. 9, the development of special economic zones, business incubators, technological parks, innovative industrial clusters and technology platforms is envisaged.

According to the Association of Clusters and Technoparks (Russia), more than 1,150 various infrastructural facilities in the field of industry and innovations have been created in the EAEU states, namely: 50 free economic zones, 100 industrial parks, 100 different clusters and development zones, 200 technology parks, 300 business incubators, 400 centers for the development of science and innovation.

Within the framework of the created Eurasian technology platforms (ETP), a list of about 130 projects in various industries (in the field of transport engineering, innovative building materials, digital design technologies, space communication technologies, lighting, control automation and information and communication technologies, etc.) is planned.

An important trigger to accelerate the development of technological cooperation can be the formation of Greater Eurasia with numerous infrastructure projects being implemented (transport corridors of supply “West-East” with the support of the PRC, North-South, including the participation of Russia, India, Iran, Azerbaijan, Turkmenistan and Kazakhstan, the development of transcontinental rail network, Silk Road Economic Belt, etc.). Such infrastructure initiatives will permit to set up free trade zone in the future, will create additional opportunities to expand markets and promote innovative products and technologies.

An important factor contributing to technological cooperation is the presence of a similar cross-cultural environment, which greatly facilitates business communications in the Union. In this context, it is necessary to highlight such an important element of integration processes as the creation of a single educational space. According to experts [21], a common labor market in the EAEU has been created, but there is not yet a single educational space. This process should be accompanied by a process of harmonization in legislation of the countries, both
in the field of awarding academic degrees and titles, and in the field of intellectual property. That will help to increase the intensity of intellectual, professional exchanges, build the platform for interaction of scientists and the exchange of new, advanced technologies.

At the same time, the obstacles that hinder the technological cooperation among the Union states should be highlighted. For historical reasons, countries have similar production structure in some industries and compete against each other. This leads to attempts at lobbying interests, imposing various kinds of restrictions, and other discriminatory measures that are incompatible with the free trade regime.

The current specifics of the sectoral structure of the member countries and the insufficient level of engineering do not contribute to regional transnationalization and building the effective commodity network. Large transnational corporations (TNCs) in the EAEU work mainly in fuel and energy, financial sector and metallurgy. Moreover, such external-market-oriented TNCs are not interested in preferential prices within the Union, especially for energy. The corporations which largely determine the foreign economic policy of the state support a unified approach to pricing for all countries, and preferential prices in this case are the subject of nonmarket political bargaining.

The contradictory approaches to the scientific and technical policy of the Union can be noticed in the program documents of the EAEU and Russia. Thus, the strategy for innovative development of Russia for the period up to 2020 does not give any significant role to innovative cooperation of Russia with the member states of the Union, moreover, it is emphasized that Russia's real competitors in the field of innovation are not only the leading countries but also some members of the Union. The principles of forming a single innovation policy within the EAEU raise questions, while the directions and priorities for joint scientific and technological cooperation in some program documents are indicated, and many clusters and scientific platforms are formed, such countries as Belarus and Kazakhstan are called competitors.

If we take another program document “Strategy 2020: new growth model - new social policy”, we notice that on one hand, the importance of integration of member states of the Union is noted, on the other hand, it is mentioned that their current technological level is insufficient for considering such cooperation as the main driver of modernization processes in Russia. In addition, the importance of providing integration mechanisms for promotion of Russian technologically complicated products is noted, which does not really mean technological cooperation. At the same time, technological and investment cooperation development with the EU countries considered as a priority.

The existing technological links of the countries were mostly formed in Soviet times. The new technological cooperation, the joint use of cutting edge technologies and the production of high-tech competitive products, in many respects, is associated with the risk of leakage of secrets to third countries, mainly to China. This challenge is typical for many regional unions, and its solution requires special legal regulation of technological transfer [8]. Risk reduction is possible within the framework of large TNCs in the case when hi-tech objects are internationalized, but remain in the ownership and under the control of one company, though this is problematic due to small number of such companies.

V. CONCLUSION

Technological cooperation is of fundamental importance for the sustainable development of the Eurasian economic integration and the implementation of the scientific and technological potential of the EAEU member States. Joint achievements in the field of science and technology and their implementation by means of advanced forms of cooperation will determine the dynamics of economic growth and the level of competitiveness of countries in promotion of regional corporate transnationalization processes.

Analysis of the potential for technological cooperation of the member states of the Union showed the presence of many factors for its successful development. They are a high level of science development and education, the presence of highly skilled workforce, a high potential for innovative activity, improvements in the institutional environment for business. Some countries of the Union have advanced cutting-edge technologies in various industries, which enable them to produce highly competitive goods comparable by technical characteristics to the best world analogues.

Evaluation of the cooperation potential in mechanical engineering with the help of the complementarity index for the economies of the Russian Federation and the countries of the Union shows a high value of the indicator and its growth, which indicates a high cooperation potential. At the same time, the value of this index for the Russian Federation and the EU countries is somewhat higher, which also testifies to the wide possibilities of cooperation.

The volumes of mutual trade in the field of machine-building within the Union far exceed its volumes with third countries and have a steady growth trend. For the Republic of Belarus, the Union’s market is the main market for its engineering products.

Evaluation of the cooperation potential in the engineering industry of the EAEU countries by means of the Grubel-Lloyd index demonstrates relatively high values of the indicator within the Union compared to third countries, which indicates the presence of preconditions for the development of value creation network in the industry within the Union.

The development of technological cooperation among the states of the Union is supported by the presence of similar or even the same priorities in the scientific and technological areas, the coordination of science development, standartization in technology policies and common infrastructure. The formation of
Greater Eurasia with numerous infrastructure projects can contribute to a significant impetus to the development of technological cooperation. A factor contributing to technological cooperation is the presence of a similar cross-cultural environment, which greatly facilitates business communications in the Union, as well as the processes of forming a single educational space.

However, it should be noted there are challenges and obstacles that hinder the development of technological cooperation within the Union. Here we should mention the low innovative adsorption and reduced funding of R&D.

The current specificity of the sectoral structure and the low level of engineering development constrain regional transnationalization and the creation of global commodity networks. For a number of commodities, the Union countries still compete against each other, and this leads to the introduction of various types of restrictions and other discriminatory measures.

We should also highlight the contradictory nature of the approaches to scientific and technological policy, which are set out in the program documents concerning the development of the EAEU and Russia. Thus, it is necessary to adjust the approaches and update the main documents in the light of the changed economic environment.

The integration processes in the EAEU countries, in general, contribute to the development of cooperation ties in the hi-tech sectors of the Union and currently have the necessary resources for further development of technological cooperation. However, the increasing competitiveness of the economies of the member states is closely linked with a change in the economic strategy and policy of the Union as a subject of global competition.

VI. DISCUSSION

The intensification of Eurasian economic integration coincided in time with complex geo-economic processes. The significant increase in economic pressure on Russia, the largest member of the EEU, led to restrictions on global markets for goods, capital and technology. Under the constraint on external financing for Russia and the technological and trade restrictions from the developed countries, the possibilities for modernization in all the countries of the Union are limited, and technological cooperation within the Union is an essential and an absolute necessity.

The implementation of import substitution policy in Russia as result of the above processes, has led to structural changes in all forms of its foreign trade, including the changes in cooperation, the search for new markets will stimulate the localization of production in the Union.

In such conditions, the common scientific, technical, and industrial policy within the framework of the EAEU could be a powerful lever for restructuring the economy, increasing labor productivity, and saturating the common market with competitive products. This should be a priority development policy based on concentration of the resources of the partner countries in the Eurasian integration process on the key components of the new technological stage. At the same time, Russia must also act as a driver of the EAEU cooperation processes, effectively coordinating national and integration interests.

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