

ПРОБЛЕМЫ МИРОХОЗЯЙСТВЕННОГО РАЗВИТИЯ

BRICS COUNTRIES IN INTERNATIONAL INNOVATION RANKINGS

I. Rodionova, A. Massarova, A. Epifantseva

Peoples' Friendship University of Russia
Miklukho-Maklaya str., 6, Moscow, Russia, 117198

The BRICS countries (China, Russia, Brazil, India and South Africa) are the largest emerging markets which are undergoing the processes of economic modernization and restructuring and taking the leading positions on many indicators on the global arena, extending beyond the regional scale. In the article, the positions of the BRICS countries in the international rankings of innovation capabilities will be considered in comparison with the leaders of the global economy. The recommendations for the best results of the BRICS were presented in the article.

Key words: BRICS, R&D, information and communication technology (ICT), innovative economy, emerging markets, international rankings, university.

Formulation of the problem and the method of research. The BRICS vary on many aspects: their political structures are markedly different, the cultures of multiethnic population, living in each of them, are diverse and they are different in demographic terms. There are two countries with more than a billion people in the BRICS group — China and India. They are hardly comparable by territory size and existing natural resources potential, although the resource potential of the rest of the BRICS is also very considerable for the world economy. But, yet, among the key features, which unite BRICS countries, the following should be noted: significant economic growth rates, huge human capital (population and intellectual resources), absolute leadership in each of their geographic region, and, the most important, the ability to make a profound impact on the world economy in the next 20—30 years. All BRICS countries are actively transforming, modernizing and rebuilding, becoming from the regional leaders into the largest players in the global arena. The BRICS countries (China, Russia, Brazil and India) are the largest emerging markets in the world. The comparison of the positions of the leading countries of the world economy and the BRICS countries in international rankings of the innovation development (Knowledge Economy Index (KEI), Networked Readiness Index (NRI), Informational Society Index (ISI), Global Innovation Index (GII)) was held. Theoretical basis consists of the numerous research papers on the analysis of R&D and the BRICS

problems and development trends of domestic and foreign authors, including the author's own results of the research [1; 2; 3; 4; 5].

The aim of the research is to evaluate the position of BRICS countries in international rankings of innovation development; to show that technological development and introduction of ICT are the long-term driving forces for the countries' economic growth in the context of globalization; to identify the problem sides of modernization process of the BRICS countries during the transformation to innovative development. In this context, it is relevant to choose the focus on characterizing the position of the BRICS universities in international rankings. It is assumed that a strong system of higher education with a solid structure of respectable universities greatly contributes to the promotion towards innovation and economic progress.

While analyzing the positions of the BRICS countries and their universities in international rankings, it is important to reveal what actions should be taken by them for being among the leaders of the world economy. Foremost, it must be done through the development of their innovative paradigm of national development.

The Global Competitiveness Index (GCI). The World Economic Forum defines competitiveness as “the set of institutions, policies and factors that determine the level of productivity of a country”, which in turn determines the level of prosperity an economy can reach. Obviously, the more competitive countries are able to provide the higher level of income for their citizens. To compile the GCI, the World Economic Forum takes into account many aspects, grouped into 12 “pillars of competitiveness” and the higher education and professional training are on the fifth “pillar”.

Integral index determines three main positions: basic conditions, factors of efficiency and factors of innovation. Information about all the components of the index is very important for the comparison. Competitiveness Index is calculated for 139 countries and includes 113 variables, that ranges from 1 to 7, and describes in detail the competitiveness of countries in the global economy [6]. It is important to note that one factor (a variable) alone is not able to improve or provide a high level of competitiveness of a national economy. Thus, the effect of increasing cost of education can be reduced, for example, because of inefficiency of the labor market; or the high results will not be demonstrated if graduates do not have any opportunities to be appropriately employed. Besides, the attempts to optimize the control of the public finances may be successful only in the conditions of transparency, financial management and absence of corruption. It is necessary to take into account the fact that employers will invest in R&D and implement new technologies into production, only if the potential profits exceed the necessary investments.

China has the best position, among the BRICS countries, in this ranking — 29th position in 2014. South Africa, Brazil and India are ahead of Russia. In the ranking of 2010—2011, Russia ranked 63rd place (in the ranking of 2011—2012 — 67th), and in 2014 — 64th. It should be pointed out that our country lags behind OECD countries on the average value of the Global Competitiveness Index (the average rate of the index of OECD countries is 4.9 on a 7-point scale, while Russia's — 4.25). In other words BRICS seriously lagging behind many countries in the world (and not only highly developed). At the beginning of the rating table, i.e. in the group leaders, are: Switzerland, Singapore, Finland, Germany, the USA, Sweden, Hong Kong, Japan, Netherlands, United Kingdom

and other developed countries. It is important to notice that China has moved already to 29th place, up close to the Republic of Korea, and both states are far ahead of Russia in many respects [6].

And detailed analysis of countries' positions on every component of the Index shows what factors have the most significant impact on the development of the BRICS countries in recent years, and what reasons lie behind the great difference of countries' positions in the international ranking.

The factors include: 1) basic conditions: institutions, infrastructure, macroeconomic environment, healthcare and primary education; 2) factors increasing efficiency: higher education and professional training, goods and services market efficiency, labor market efficiency, level of financial market development, technological level, size of the market; 3) factors of innovation: "advancement" of business: companies' competitiveness, innovation potential.

The world competitiveness ranking (The Global Competitiveness Report, 2014—2015) shows that the development stage of the BRICS countries is different: Brazil and Russia are in the process of transition to a higher, third stage: towards an economy based on innovation. India is still on the first stage: the country's economy is based on the basic conditions (factors of production) and its competitiveness depends on them. China and South Africa are on the second stage and their economy based on efficiency. In this ranking, among the BRICS, Russia has the highest position by the level higher education and professional training (in this section — 39th place out of 148; 47th — in 2013), followed by Brazil — 41st (72nd in 2013), China — 65th place (70 in 2013), South Africa — 86th (89th in 2013) and India — 93rd (91st in 2013) [6].

BRICS positions in international rankings. At present, there are several complex indicators (integral indices) characterizing the development level of knowledge-based economy. They show the differences between countries by a degree of innovation and information technologies usage.

Countries with high prevalence of ICT achieve significant results in the prosperity of the population (GDP per capita growth). However, this effect works only when a country reaches a certain threshold of ICT usage through the governance of socio-economic development. The countries with a high share of illiterate population are not able to attain this effect (India with its 109th position in Knowledge Economy Index is an example).

Knowledge Economy Index (KEI). "The Knowledge Assessment Methodology" proposed by the World Bank for characterizing the countries' capacity to create, receive and spread knowledge, is the basis for calculation of Knowledge Economy Index [7].

Analysis of the data of the World Bank publication allows to estimate the positions of the BRICS in the world ranking and to identify their positions in comparison with other countries by the components of integral indices (including institutional regime, innovation, education, ICT usage).

Leading positions in the ranking are occupied by Western European countries (Sweden, Finland, Denmark, the Netherlands, Norway) with high rates of innovative economic development. Russia's position in this ranking is not high: 55 place out of 145 by Knowledge Economy Index. But positions of the other BRICS countries are even lower: Brazil has the 60th position, South Africa — the 67th, China — the 84th position and India — the 109th).

Many countries of Central and Eastern Europe — Czech Republic, Poland, Slovakia, Croatia, Romania, Bulgaria and Serbia are ahead of Russia. At the same time, many CIS countries are on the lower positions than Russia (from 56th of Ukraine to 106th of Tajikistan) [2].

Russia has particularly low figures on one of the Index components — institutional regime. China and India also have significantly low index values on the following elements: institutional regime, education, informational technologies usage; South Africa — on ICT usage.

Global Innovation Index (GII). As in previous years, the GII relies on two sub-indices — the Innovation Input Sub-Index and the Innovation Output Sub-Index. As a result, four overall measures are calculated: the overall GII, the Input and Output Sub-Indices, and the Innovation Efficiency Ratio. The 143 economies and 81 indicators, presented in the GII 2014, cover a range of themes, providing a comprehensive dataset to analyze global innovation trends. However, it is important to note that the GII model has changed over the last editions. So, in ranking table of GII in 2014, the following must be marked: China has the 29th (35th — in 2013) place, Russia — 49th (62nd — in 2013), South Africa — 53th (58th — in 2013), Brazil — 61st (64th — in 2013), India — 76th [8]. The leading countries in the ranking are Switzerland, UK, Sweden, Finland, Netherlands, the USA, Singapore, Denmark, Luxembourg, Hong Kong, Ireland. Japan is on the 21st line among 143 countries in the rating.

Networked Readiness Index (NRI). The Networked Readiness Index (NRI), part of the 2014 Global Information Technology Report: The Risks and Rewards of Big Data ranks 148 countries by quality of their digital infrastructure and ability to use ICTs to generate economic growth, foster innovation and improve the well-being of their citizens [9]. The Networked Readiness Index is measured on a scale from 1 (the worst) to 7 (the best). NRI is calculated on the base of three data sets: 1) availability of network infrastructure; 2) readiness to usage it in the civil society, business sphere and government structures; 3) the real level of ICT usage. Index components reflect the key factors that influence the information technology development. So, characteristics of the positions of leading economies and rapidly emerging BRICS countries are the important stage for the research.

It should be noted that there have been some changes in the ranking on Networked Readiness Index — compared with the rating in 2009. The number of analyzed countries increased from 134 to 148. Though there were insignificant rearrangements in the group of leaders, the first places in 2014 were taken by: Finland, Singapore, Sweden, Netherlands, Norway. It is important to notice that Russia is just on 50th place in the rating table in 2014, and it is followed by China (62nd), Brazil (69th), South Africa (97th) and India (83rd) [9].

But the most important stage of the research is a detailed analysis of countries' positions on the individual components of the Index, which characterize not only the level of network structures usage (number of Internet users, mobile phones, personal computers, access to the Internet, etc.) but also factors that contribute to this process. They are: a) level of access to network technologies from the position of infrastructure development, equipment availability, etc.; b) policy in the field of network technologies: ICT policy, business and economic environment); c) level of the development of network society:

education process supported by network technologies, ICT possibilities, social capital); d) level of the development of network economy: e-commerce, e-government, general infrastructure). There are great differences between the leaders and the BRICS countries exactly by these positions, so, it illustrates their low positions in the ranking.

Our deep conviction is that the high position in the innovation rankings is achieved, primarily, due to developed higher education system, and that is an extra aspect, which should be considered in this context.

Positions of the BRICS universities in international rankings. History of the educational rankings begins with the US Magazine «US News & World Report», which published the first ranking of colleges in 1983. The process of developing globalization of higher education was identified in that ranking. In 2003, the Institute of Higher Education of Shanghai (Shanghai Jiao Tong University) has published the first list of 500 leading universities in the world called Academic Ranking of World Universities (ARWU-500). [10]. Subsequently, the Shanghai ranking began to be used worldwide for determining the results of the actions of the governance of the states in the sphere of science and knowledge. In 2014, 8 American and 2 British university took the leading positions: Harvard, Stanford University, Massachusetts Institute of Technology, University of California at Berkeley, Cambridge, Princeton University, California Institute of Technology, Columbia University, the University of Chicago and Oxford. Noteworthy there are two Russian university — Moscow State University (84th position) and Saint Petersburg State University (below 300th position) in the rating.

In 2004, the Institute of Higher Education of Shanghai presented the first ranking of the best universities in the world called QS World University Rankings. In the latest rating top-400, there were 5 universities from Russia and 5 — from India; 3 universities were from Brazil and South Africa (from each country), 11 — from China. In the top 10 universities of the BRICS are 7 — from China and by one from Russia, Brazil and South Africa. The Beijing University was on the 46th (Tsinghua University — 48th and Fudan University — 88th; Lomonosov Moscow State University — 120th place).

Analysis of tables of international such ratings as ARWU-500, QS World University Rankings, Ranking Web of Universities showed that the most famous Russian universities are presented there, but they are not among the leaders. On the Russian market of educational services, Lomonosov Moscow State University and Saint Petersburg State University keep the competitiveness in the Russian market of educational services.

The British edition “Times Higher Education” published a ranking of the best universities in emerging economies in 2014—2015 (Times Higher Education BRICS & Emerging Economies 2014—2015) [13]. The rating included 22 universities: 5 of them are in the BRICS group, as well as 17 — in the other developing economies (Chile, Colombia, Czech Republic, Egypt, Hungary, Indonesia, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Poland, Taiwan, Thailand Turkey and the UAE).

The basis of the method to determine the best universities in the world has the “Times Higher Education”, which is considered one of the most influential global research edition in this field. The top universities ranking uses a similar methodology as the “Times Higher Education”, covering all core missions of the world-class university — teaching, research, knowledge transfer and international outlook — using 13 carefully selected indicators of efficiency. Therefore, from the BRICS countries, China and Russia stand out and show imposing potential but the other economies are also gaining strength.

China has reinforced its dominance in the “Times Higher Education BRICS & Emerging Economies Rankings”. In 2015, in the ranking of the leading research universities in economies, China took 27 of the top 100 places.

India has 11 universities in the top 100, beginning from the Indian Institute of Science in 25th place. It is followed by Russia, which has shown the huge improvement with seven institutions making the top-100. Brazil has 4 institutions in the top-100, including the University of Sao Paulo (10th place). South Africa has five universities in the top-100, led by the University of Cape Town in 4th place [13].

China has moved ahead impressively: during two decades, it had a coherent plan to build up its research universities to ‘world-class’ quality and it required considerable resources. Indian universities lack the autonomy needed to reach high class. They are strongly controlled by regulators and government; also they miss an adequate funding. Russia has a great potential of the BRICS countries: Lomonosov Moscow State University has risen from 10th in 2014 to 5th in 2015, Novosibirsk State University has rocketed straight into 34th place, from outside the top-100 in 2014. Saint Petersburg State University has risen 4 points to 64th position.

Conclusions. Thus, education and innovation play the crucial role in creation and implementation of new technologies, productivity and competitiveness increase and contribute economic diversification and business activity. And the challenge is to consolidate a model of technological diffusion and innovation for changing the production structure which integrates knowledge and production based on the specific economic and institutional characteristics of each country.

The process of innovation implementation and structural change is not spontaneous, but it is generated in institutional contexts that are conducive to innovation, which, in turn, promote the development of ICT sectors. The differences between the BRICS in productivity are explained not only by access to and distribution diffusion of new technologies, but also by complementary factors at the enterprises, industry and institutional levels. These factors create positive externalities, technological spillovers and increases in productivity throughout the economy. Higher education and professional training are also of a great value in countries at stages of development based on efficiency and innovation. The emphasis of the policy must be made on research and development as well as on cooperation of universities with business and industries.

Despite impressive success of China, Russia and India, in the BRICS as a whole, the information technology development still lags behind the level of ICT usage in developed economies, and it is reflected in the positions of these countries in the international innovation rankings.

In our deep conviction, Russia and other BRICS countries have significant potential for transformation and innovation development. Supporting the high level of human capital is urgent for their integration into the community of developed countries.

It is necessary to have a solid foundation for the formation of scientific and technological capacity for creating knowledge and technology with the usage of all available BRICS opportunities. ICT penetration in all economic sectors and spheres of life is a key factor of scientific, technical and economic progress in the context of globalization. Elaborated policies should act on critical factors that condition the deployment of the knowledge-based economy. It should be established an institutionality for the innovative economy

that integrates ICT policies for structural change and ICT policies for equality and social inclusion. The main components of the former are national broadband policies and industrial policies for the innovative economy.

REFERENCES

- [1] *Rodionova I., Gordeeva A.*, 2010. Human development index and informatization of society in CIS. *Bulletin of Geography, Socio-Economic Series*, 13: 79-87, DOI: 10.2478/v10089-010-0006-1. [DoA: 10.08.2014]. URL: http://www.bulletinofgeography.umk.pl/13_2010/06_rodionowa.html
- [2] *Rodionova I.*, 2013. Competitiveness of countries in the world innovation economy: East-Central Europe and Russia. *Quaestiones Geographicae* 32(2): 15-24, DOI: 10.2478/quageo-2013-0010. [DoA: 10.08.2014]. URL: www.degruyter.com/view/j/quageo.2013.32.issue-2/quageo-2013-0010/quageo-2013-0010.xml?format
- [3] *Галкин М.А., Родионова И.А.* Национальные инновационные системы в условиях интернационализации научно-исследовательской деятельности: монография / под ред. И.А. Родионовой. — М.: Экон-информ, 2013.
- [4] *Антипова Е.А., Родионова И.А.* География научной сферы в условиях глобализации мировой экономики // Вестник БГУ. Серия 2: Химия, Биология, География. 2014. № 1. С. 71—77.
- [5] Феномен БРИКС: от глобального объекта к глобальному игроку / Фролова и др. / Под ред. Е.Д. Фроловой. — Екатеринбург: Изд-во УрФУ, 2011.
- [6] The Global Competitiveness Report, 2014—2015. World Economic Forum, 2014. [DoA: 1.02.2015]. URL: <http://www.weforum.org/reports/global-competitiveness-report-2014-2015>
- [7] Knowledge for Development: Knowledge Economy Index, 2012. [DoA: 07.05.2014]. World Bank, 2012. URL: http://info.worldbank.org/etools/kam2/KAM_page5.asp
- [8] The Global Innovation Index 2014: The Human Factor In innovation, Fontainebleau, Ithaca, and Geneva: INSEAD (The Business School for the World) & The World Intellectual Property Organization (WIPO). [DoA: 29.08.2014]. URL: <https://www.globalinnovationindex.org/userfiles/file/reportpdf/GII-2014-v5.pdf>
- [9] The Global Information Technology Report: Rewards and Risks of Big Data. World Economic Forum, 2014. [DoA: 27.05.2014]. URL: http://www3.weforum.org/docs/WEF_GlobalInformationTechnology_Report_2014.pdf
- [10] 2014 World University Ranking. Academic Ranking of World Universities — ARWU-500. [DoA: 05.10.2014]. URL: <http://www.shanghai ranking.com>
- [11] University Rankings. QS TOP Universities. [DoA: 05.10.2014]. URL: <http://www.topuniversities.com/university-rankings>
- [12] Ranking Web of Universities. [DoA: 05.10.2014]. URL: webometrics.info
- [13] Times Higher Education BRICS & Emerging Economies 2014—2015. [DoA: 02.02.2015]. URL: <http://www.timeshighereducation.co.uk/world-university-rankings/2015/brics-and-emerging-economies> (дата обращения: 02.02.2015)

REFERENCES

- [1] *Rodionova I., Gordeeva, A.*, 2010. Human development index and informatisation of society in CIS. *Bulletin of Geography, Socio-Economic Series*, 13: 79-87, DOI: 10.2478/v10089-010-0006-1. [DoA: 10.08.2014]. URL: http://www.bulletinofgeography.umk.pl/13_2010/06_rodionowa.html
- [2] *Rodionova I.*, 2013. Competitiveness of countries in the world innovation economy: East-Central Europe and Russia. *Quaestiones Geographicae* 32(2): 15-24, DOI: 10.2478/quageo-2013-0010. [DoA: 10.08.2014]. URL: <http://www.degruyter.com/view/j/quageo.2013.32.issue-2/quageo-2013-0010/quageo-2013-0010.xml?format>

- [3] *Galkin M., Rodionova I.* Natsionalnye innovatsionnye sistemy v usloviyakh internatsionalizatsii nauchno-issledovatel'skoy deyatel'nosti. (National innovation systems in the context of the internationalization of research activities). Monografiya / Pod red. Prof. I.A. Rodionovoy. — M.: *Econ-inform*, 2013.
- [4] *Antipova E.A., Rodionova I.A.* Geografiya nauchnoy sfery v usloviyakh globalizatsii mirovoy ekonomiki (Geography of scientific sphere in the context of globalization of the world economy) // *Vestnik BGU. Seriya 2: Khimiya, Biologiya, Geografiya*. 2014, № 1. S. 71—77.
- [5] *Frolova E.D., Kannen A., Ching C.* Fenomen BRIKS: ot global'nogo obekta k global'nomu igroku (BRIC phenomenon: the global object to a global player) / Pod red. E.D. Frolovoy. — Ekaterinburg: Izd-vo UrFU, 2011.
- [6] *The Global Competitiveness Report, 2014—2015*. World Economic Forum, 2014. [DoA: 1.02.2015]. URL: <http://www.weforum.org/reports/global-competitiveness-report-2014-2015>
- [7] *Knowledge for Development: Knowledge Economy Index*, 2012. [DoA: 07.05.2014]. World Bank, 2012. URL: http://info.worldbank.org/etools/kam2/KAM_page5.asp
- [8] *The Global Innovation Index 2014: The Human Factor In innovation*, Fontainebleau, Ithaca, and Geneva: INSEAD (The Business School for the World) & The World Intellectual Property Organization (WIPO). [DoA: 29.08.2014]. URL: <https://www.globalinnovationindex.org/userfiles/file/reportpdf/GII-2014-v5.pdf>
- [9] *The Global Information Technology Report: Rewards and Risks of Big Data*. World Economic Forum, 2014. [DoA: 27.05.2014]. URL: http://www3.weforum.org/docs/WEF_GlobalInformationTechnology_Report_2014.pdf
- [10] 2014 World University Ranking. Academic Ranking of World Universities — ARWU-500. [DoA: 05.10.2014]. URL: <http://www.shanghai ranking.com>
- [11] University Rankings. QS TOP Universities. [DoA: 05.10.2014]. URL: <http://www.topuniversities.com/university-rankings>
- [12] Ranking Web of Universities. [DoA: 05.10.2014]. URL: <http://webometrics.info>
- [13] Times Higher Education BRICS & Emerging Economies 2014—2015. [DoA: 02.02.2015]. URL: <http://www.timeshighereducation.co.uk/world-university-rankings/2015/brics-and-emerging-economies>

СТРАНЫ БРИКС В МЕЖДУНАРОДНЫХ ИННОВАЦИОННЫХ РЕЙТИНГАХ

И.А. Родионова, А.Р. Массарова, А.С. Епифанцева

Российский университет дружбы народов
ул. Миклухо-Маклая, 6, Москва, Россия, 117198

Страны БРИКС (Китай, Россия, Бразилия, Индия и ЮАР) являются крупнейшими странами с быстроразвивающейся экономикой, которые переживают период активной трансформации, модернизации и реконструируются, превращаясь из региональных лидеров в крупнейших игроков на мировой арене. Позиции стран БРИКС и их университетов в международных рейтингах инновационного развития охарактеризованы в сравнении с положениями лидеров мировой экономики в них. Отмечается, что Китай занимает более высокую позицию в международных рейтингах, по сравнению с остальными странами БРИКС. Представлены рекомендации по улучшению позиций БРИКС в мировой экономике и международных рейтингах.

Ключевые слова: БРИКС, НИОКР, информационные и коммуникационные технологии (ИКТ), инновационная экономика, развивающиеся рынки, международные рейтинги, университет.