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ASSESSMENT OF PARTNERSHIP DEVELOPMENT IN CROSS-BORDER REGIONS' INNOVATION SYSTEMS (LATVIA-LITHUANIA-BELARUS)

Olga Lavrinenko[1], Alina Ohotina[2], Vladas Tumalavičius[3], Olga V. Pidlisna[4]

[1,2] Institute of Humanities and Social Sciences, Daugavpils University
Parades Street 1, 421, Daugavpils, LV-5401, Latvia
[3] Department of Management, The General Jonas Žemaitis Military Academy of Lithuania
Šilo Street 5A, Vilnius, LT-10322, Lithuania
[4]Kyiv National Trade and Economic University, Kyiv, Ukraine
19, Kioto str, 02000, Kyiv, Ukraine

E-mails: [1]olga.lavrinenko@du.lv, [2]alina.ohotina@du.lv, [3]vladas.tumalavicius@lka.lt, [4]knteu@knteu.kiev

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Abstract. The article is devoted to the research and assessment of the development of the triple partnership between the participants of innovation systems – universities, business, and government in the Latvia-Lithuania-Belarus cross-border region which consists of Latvia's regions (Latgale region), Lithuania's regions (Vilnius region, Alytus region, Utena region, Panevezys region, Kaunas region), Belarus's regions (Vitebsk region, Grodno region, Minsk region, Mogilev region). The lack of attention to the above problems typical of this cross-border region determined the relevance of the research. Innovations are one of the key factors both on the macro-level and on the micro-level that influence the sustainable economic development of the region as well as the innovation potential of the enterprise. The stable development and efficient function of the territorial innovation system is the main condition for this. The study is based on a survey of 620 entrepreneurs from small and medium-sized businesses in the cross-border region.

Keywords: innovations, Triple Helix Model, cross-border region, sustainable development

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JEL Classification: O30; O43; R11.

1. Introduction

Scientific and technological progress plays a leading role in a region's transition to sustainable development, as the economy of any region is a system which is open to the penetration of technological, scientific, and information resources. The advances of scientific and technological progress encourage sustainable development as well as a qualitative change in the region's economy, which result in the changes in the production structure, whereas not all scientific and technological innovations are in demand.

According to the classification of development stages in economy provided by the World Economic Forum's methodology, it is social innovation which plays a significant role in the countries with the "efficient" stage of their economy development where the labour productivity and efficiency of the use of all types of resources are the main factors for sustainable development (World Economic Forum 2015). Social innovation contributes

to the improvement of the quality of life of citizens and national competitiveness (Dobele, Grinberga-Zalite, Kelle 2015). Social agents such as government, the market, universities and organizations are interested in the creation of social innovation (Phills, Deiglmeier & Miller 2008; Balkiene 2013). For the countries at a higher "innovation" stage of development, the role of technological innovation increases (Boronenko *et al*. 2011; Oganisjana, Surikova 2015; Tvaronavičienė, Černevičiūtė 2015).

For the first time scientists started studying the influence of scientific and technological progress on the process of production and economy in the 18th century during the first industrial revolution, when the invention of a steam engine and textile worktable promoted the development of cloth manufacture. According to W. Miller and L. Morris's classification, the interaction between the theory of innovation and practice in the 20th century is divided into 4 R&D generation schemes depending on the number of participants of a partnership. The first generation schemes (1900 – 1950) are based on the work of scientists and researchers, in the second generation schemes (1950 – 1970) industrial enterprises appear alongside with the partners from the academic environment, in the third generation schemes (1970 – 1990) market researchers who forecast the demand in the future are involved, and, finally, in the fourth generation schemes (1990 – nowadays) a wider range of partners are involved – state institutions, universities, consumers, customers (Miller, Langdon, 1999). A triple partnership between universities, enterprises and government – the so called Triple Helix Model is the most popular in the fourth generation schemes (Etzkowitz 2008). In the last decades there has increased a scientific interest in the problem of cooperation between these social agents, which is proved by an increasing level of research in this field. For example, according to the outcomes of the research "High Schools in the Regions: Interaction between Knowledge and Practice", the lack of communication between social agents, the lack of common interests, motivation, and common suggestions for the regional development were mentioned as the reasons for the low efficiency of cooperation between Daugavpils University, entrepreneurs and municipalities in Latgale region (Daugavpils University 2011). Recently, the EU-funded projects or projects supported by other funds have become a relatively popular type of university-industry-government relations, as well as university-industry relations or university-government relations (Boronenko *et al*. 2011; Branten, Purju 2015).

Sustainable development is a model of forward movement which enables the satisfaction of subsistence needs for the present generation without depriving future generations of this opportunity (Miller, Langdon 1999). Nowadays, innovations are a key element of the regional sustainable development (Tvaronavičienė 2014; Volkova 2014; Rosha, Lace 2015, Travkina, Tvaronavičienė 2015), as well as a significant factor of enterprises' innovation potential (Lavrinenko, Ruža, Ohotina 2015; Raisiene 2012). In the EU development strategy "Europe 2020" sustainable development is one of the goals alongside with the smart, and inclusive growth. The tasks which are potentially related to innovation are mentioned among the tasks for the achievement of these goals – the flagship initiatives on the innovation union, on resource efficiency, and on industrial policy (European Commission 2010). The introduction of innovations promotes accelerating the processes of economic growth as well as more efficiently using already existing resources, which has a positive influence on ecological situation in the country and allows decreasing the load on environment without losses in the volumes of national production (Gjoski 2011).

The aim of the article is to assess the development of partnership in innovation systems in the Latvia-Lithuania-Belarus cross-border region. The research was carried out within the framework of the 2014 project "The Establishment of the United Entrepreneurship Support and Networking System for the Sustainable Latvia, Lithuania and Belarus Cross Border Cooperation" (B2B) funded by the cross-border cooperation programme Latvia-Lithuania-Belarus "European Neighbourhood and Partnership Instrument 2007–2013".

2. Methodology

The main concept of innovations in post-industrial society is the Triple Helix Model. The concept of the Triple Helix Model or triple relationship (universities-industry-government) was developed in the 1990s by Henry Etzkowitz (Stanford University) and Loet Leydesdorff (Amsterdam University). This partnership is a hybrid social construction, an apposition of spiral structures, similar to DNA molecules. The triple partnership adapts

well to changes in the external environment (Etzkowitz and Leydesdorff, 1995). In the 2000s this theory was used as a basis for national innovation systems in a number of countries from Scandinavia to Japan (OECD, 2007). It has also been mentioned in the EU strategic documents as a new approach to integration processes and creation of a common knowledge market. The Triple Helix Model adequately identifies and measures the relationships of the participants of an innovation system – government, business and universities. There is no example in the world where the national innovation system would function effectively beyond the principles of the triple helix, where universities would not be in the centre of these events (Lavrinenko *et al.* 2015).

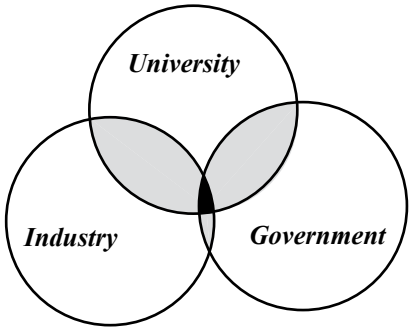
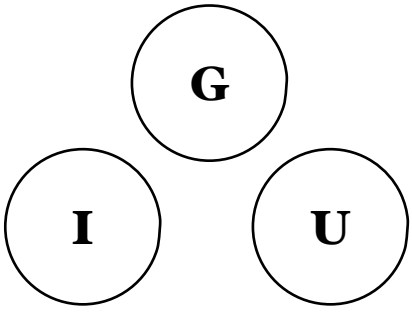


Fig. 1. Triple Helix Model

Source: Inzelt, 2004; Katz, J.S., Martin, B.R. 1997.

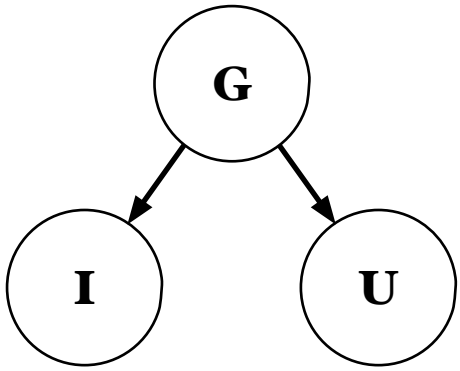
The levels and ways of relationships between universities, government and industries can be as following (Inzelt, 2004):

1. The individual level, the way of relationships - isolated



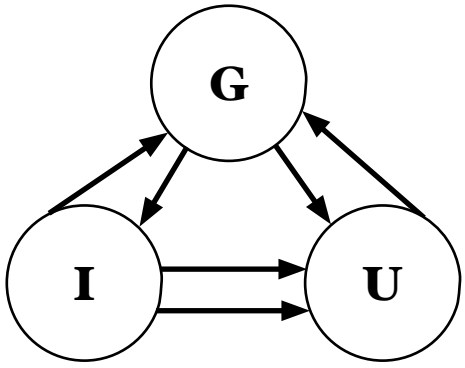
The individual level of relationships between universities, government and industries with an isolated way of relationships can be characterized by the presence of special consultations of companies' specialists at local authorities, regular (informal) contacts between companies' employees and representatives of local authorities within professional associations, conferences and seminars, forums, training provided by specialists from municipalities for companies' employees, special consultations for companies' specialists at universities, lectures for companies' employees at universities, lectures for university researchers at companies, regular (informal) contacts between companies' employees and science community within professional associations, conferences and seminars, purchases of results of science research (patents). The assessment of individual level of a company's cooperation with an isolated way of relationships was carried out on the basis of median values of the answers on the abovementioned questions according to the Likert scale where 1denoted the cooperation not developed at all, but 5 corresponded to a well-developed cooperation.

2. The individual/institutional level, the way of relationships – vertical at a long distance



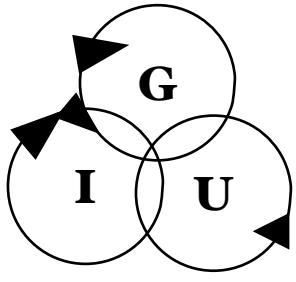
The individual/institutional level of relationships between universities, government and industries with a vertical way of relationships with a long distance can be characterized by the realization of invitations for university specialists to work part-time at companies, master-classes for companies' employees at universities, training for companies' employees run by university professors. The assessment of individual/institutional level of cooperation with a vertical way of relationships with a long distance was also carried out on the basis of median values of the answers on the abovementioned questions according to the Likert scale where 1denoted the cooperation not developed at all, but 5 corresponded to a well-developed cooperation.

3. The individual/institutional level, the way of relationships – partnership where there is competition



The individual/institutional level of partnership between universities, government and industries based on the partnerships where there is competition can be characterized by the presence of joint discussions on strategic plans in the process of their elaboration, joint publications, joint debates on dissertations and theses at conferences, organization of joint publication services (journals). The assessment of individual/institutional level of cooperation based on the partnership where there is competition was also carried out on the basis of median values of the answers on the abovementioned questions according to the Likert scale where 1denoted the cooperation not developed at all, but 5 corresponded to a well-developed cooperation.

4. The institutional level, the way of relationships – horizontal triple helices



The institutional level of relationships between universities, government and industries which is based on horizontal triple helices can be characterized by the G I U G I U Research "Promotion of Cross Border Co-operation between Latvia-Lithuania-Belarus Small and Medium-Sized Businesses: Problems, Opportunities, Prospects", Project N LLB-2-256 85 presence of the access to special equipment at a company or university, by the investment of funds into provision of universities, regular purchases of results of university research, formal cooperation on the contract basis (e.g. agreement on apprenticeship, cooperation, etc.), joint implementation of projects, permanent or temporary mobility of personnel between companies and universities, setting up new joint companies, a system of incentives for certain taxes established by a municipality. The assessment of institutional level of cooperation which is based on horizontal triple helices was also carried out on the basis of median values of the answers on the abovementioned questions according to the Likert scale where 1denoted the cooperation not developed at all, but 5 corresponded to a well-developed cooperation. Only options 2,3 and 4 can be considered as a real cooperation, but option 1 – as a basis or pre-requisite.

The main data for analysis in the regions under research was obtained from the survey of 620 small and medium-sized business entrepreneurs in the cross- border regions in Latvia (Latgale region), Lithuania (Vilnius county, Alytus county, Utena county, Panevezys county, Kaunas county), Belarus (Vitebsk oblast, Grodno oblast, Minsk oblast, Mogilev oblast) in the period April-June, 2014. The survey was carried out in the main communication languages in the regions: Latvian and Russian in Latgale, Lithuanian in Lithuania, Russian in Belarus. The sample design by the type of selection – combined, by the method – non-repeated sampling, by the way of selection – stratified by the main directions of the research. The survey was carried out by means of a questionnaire available both in paper version and online to be completed on the Internet (Daugavpils University 2015).

In the process of work on the base in the SPSS programme, the survey data were subjected to weighting on the main directions of stratification, as a result the deviations of the parameters of the sample from the parameters of the general population comprised less than 3%. One of the limitations of empirical research is different methodological approaches to identifying the size of business in the EU and Belarus. Therefore, for the weighting the sampling of Latvian and Lithuanian companies, the EU criteria were applied (Department of Trade and Industry 2015), but in Belarus regions – the criteria defined by the law of the Republic of Belarus, as the weighting is based on the statistical data, but the further analysis of the obtained survey data is based on the EU methodology. The results of the frequency-response analysis as well as other methods of mathematical statistics were applied for the data analysis (Lavrinenko et al. 2015).

3. Results and discussion

Innovation activity means the completion of work and provision of services which are aimed at: creation and organization of production of a fundamentally new product or a product with new consumer features; creation and application of new ways or modernization of the existing ways (technologies) of its production, distribution and use; application of structural, financial- economic, personnel, information and other innovations for the output and distribution of product (goods, work, services), which provide the cost saving or create conditions for it. Innovation product is the result of innovation activity (goods, work, services) meant for realization. Innovation system is a total of subjects and objects of innovation activity which interact in the process of creation and distribution of innovation product and they perform their activity within the framework of the state policy in the field of the development of innovation system. Within the context of the above-mentioned concepts, innovation can be defined as a final result of innovation activity which is realized as a new or improved product that is distributed at the market, or a new or improved technological process that is applied to practical activity.

According to the assessment provided by the cross-border region's entrepreneurs, the biggest share of innovation product in a company's profit – 50.7% - is in the sector "Electric energy, gas industry, heat supply and air conditioning", 38.2% of innovation product is in the sector "Water supply; upkeep and rehabilitation of waste water and waste", 32.2% of innovation product is in the sector "Finance and insurance activity", 30% of innovation product is in the sectors "Professional, scientific and technical services" and "Information and com-

munication services". The least amount of innovation product in a company's profit (from 0% to 10%) is in the sectors "Education", "Administration and servicing offices", "State government and security; social insurance", "Construction", "Wholesaling and retailing; automobile and motorbikes repair", "Agriculture, forestry, fish industry", "Manufacturing industry", and "Transport and storage".

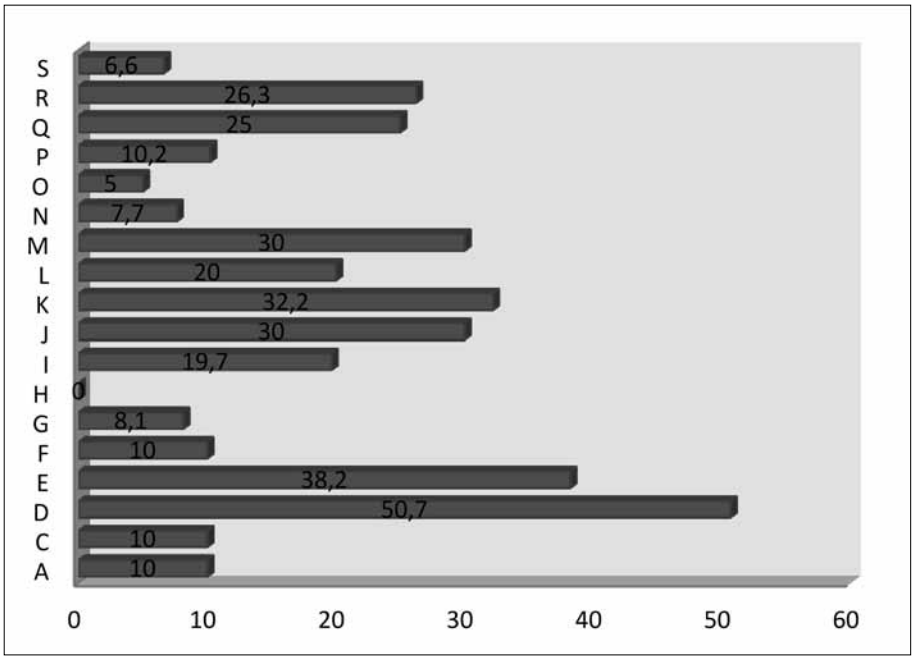


Fig.2. Assessment of Innovation Product in the Company's Profit (%)

Source: authors calculations in SPSS according to the survey data in 2014 within the project "The Establishment of the United Entrepreneurship Support and Networking System for the Sustainable Latvia, Lithuania and Belarus Cross Border Cooperation" (B2B) funded by the cross-border cooperation programme Latvia-Lithuania-Belarus "European Neighbourhood and Partnership Instrument 2007-2013"

Note: (A) Agriculture, forestry, fish industry, (B) Mining industry and quarrying, (C) Manufacturing industry, (D) Electric energy, gas industry, heat supply and air conditioning, (E) Water supply; upkeep and rehabilitation of waste water and waste, (F) Construction, (G) Wholesaling and retailing; automobile and motorbikes repair, (H) Transport and storage, (I) Accommodation and catering services (hotels, etc.), (J) Information and communication services, (K) Finance and insurance activity, (L) Real estate, (M) Professional, scientific and technical services, (N) Administration and servicing offices, (O) State government and security; social insurance, (P) Education, (Q) Health and social service, (R) Art, entertainment and leisure, (S) Other services

While assessing the development of partnership between enterprises and local municipalities in different sectors, it has been determined that its development *at the institutional level with the way of relationships – horizontal triple helices* is poor or very poor in all sectors, except for the sector "Water supply; upkeep and rehabilitation of waste water and waste" with the median value of 3.5 (higher than average). *The individual/ institutional level with the way of relationships – partnership where there is competition* is developed higher than average in the sector "Electric energy, gas industry, heat supply and air conditioning" with the median value 3.4; a little higher than the average (the median value 3.9) – in the sector "Water supply; upkeep and rehabilitation of waste water and waste", the average (the median value 3) in the sector "Education". In other sectors this type of partnership is developed poorly or very poorly (the median values from 1 to 2). *The individual/institutional level of relationships with a long distance* is very well-developed in the sector "State government and security; social insurance" (the median value 5), developed in the sectors "Education" the median value 3) and "Water supply; upkeep and rehabilitation of waste water and waste" (the median value 3.6). *The individual level with the way of relationships – isolated* has a high value in the sector "State government and security; social insurance" (the median value 4), higher than the average in the sectors "Electric energy, gas industry, heat supply and air conditioning" (the median value 3.5), "Water supply; upkeep and rehabilitation

of waste water and waste" (the median value 3.4), "Finance and insurance activity" (the median value 3.6), the average development in the sectors "Education", " Health and social service" (the median value 3). In general, the sectors "Water supply; upkeep and rehabilitation of waste water and waste", "Electric energy, gas industry, heat supply and air conditioning", "State government and security; social insurance", and "Education" are the leaders in the partnership between the enterprises and local municipalities (see Fig. 3).

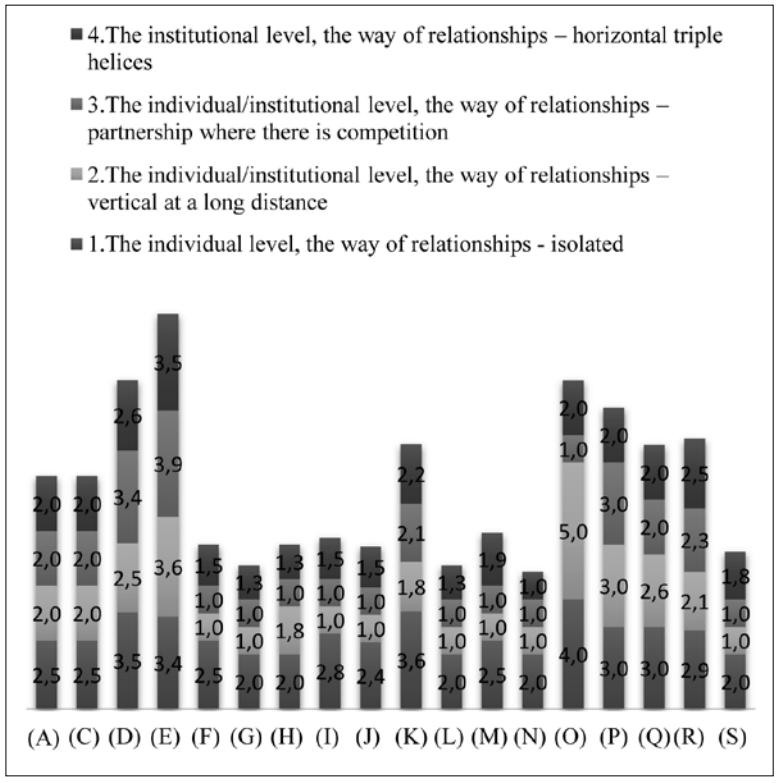


Fig.3. Cooperation between the enterprises and local municipalities (the median values) (1- not developed at all, 5 – develop well)

Source: authors calculations in SPSS according to the survey data in 2014 within the project "The Establishment of the United Entrepreneurship Support and Networking System for the Sustainable Latvia, Lithuania and Belarus Cross Border Cooperation" (B2B) funded by the cross-border cooperation programme Latvia-Lithuania-Belarus "European Neighbourhood and Partnership Instrument 2007-2013"

Note: (A) Agriculture, forestry, fish industry, (B) Mining industry and quarrying, (C) Manufacturing industry, (D) Electric energy, gas industry, heat supply and air conditioning, (E) Water supply; upkeep and rehabilitation of waste water and waste, (F) Construction, (G) Wholesaling and retailing; automobile and motorbikes repair, (H) Transport and storage, (I) Accommodation and catering services (hotels, etc.), (J) Information and communication services, (K) Finance and insurance activity, (L) Real estate, (M) Professional, scientific and technical services, (N) Administration and servicing offices, (O) State government and security; social insurance, (P) Education, (Q) Health and social service, (R) Art, entertainment and leisure, (S) Other services, (T) Households as employers; manufacturing goods for own needs and provision of services by individual households.

While assessing the partnership between the enterprises and research institutions in the cross-border region in general, its poor development should be mentioned. The sectors "Education", "Electric energy, gas industry, heat supply and air conditioning", "Water supply; upkeep and rehabilitation of waste water and waste" are the leaders, although the median values in all of the four assessed levels are lower than average.

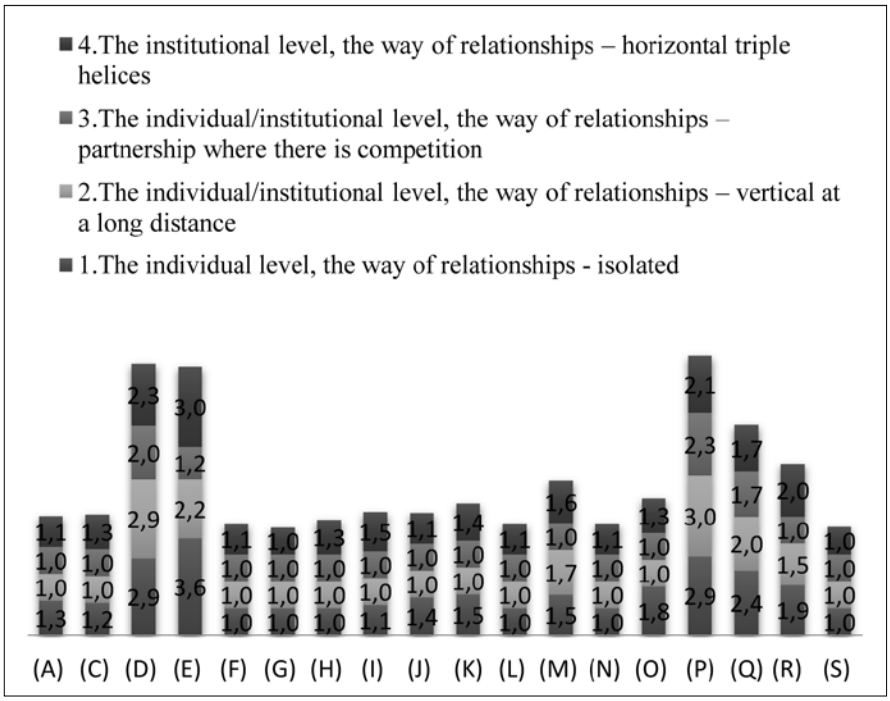


Fig.4. Cooperation between the enterprises and research institutions (the median values)
(1 – not developed at all, 5 – develop well)

Source: authors calculations in SPSS according to the survey data in 2014 within the project "The Establishment of the United Entrepreneurship Support and Networking System for the Sustainable Latvia, Lithuania and Belarus Cross Border Cooperation" (B2B) funded by the cross-border cooperation programme Latvia-Lithuania-Belarus "European Neighbourhood and Partnership Instrument 2007-2013"

Note: (A) Agriculture, forestry, fish industry, (B) Mining industry and quarrying, (C) Manufacturing industry, (D) Electric energy, gas industry, heat supply and air conditioning, (E) Water supply; upkeep and rehabilitation of waste water and waste, (F) Construction, (G) Wholesaling and retailing; automobile and motorbikes repair, (H) Transport and storage, (I) Accommodation and catering services (hotels, etc.), (J) Information and communication services, (K) Finance and insurance activity, (L) Real estate, (M) Professional, scientific and technical services, (N) Administration and servicing offices, (O) State government and security; social insurance, (P) Education, (Q) Health and social service, (R) Art, entertainment and leisure, (S) Other services, (T) Households as employers; manufacturing goods for own needs and provision of services by individual households.

There is a large number of science and research centres on the territory under research: in Latvia cross-border region – 3 centres (The Central Statistical Bureau of the Republic of Latvia 2015), in Lithuania cross-border region – 55 centres (Statistical Department of Lithuania. Data of Statistical Department of Lithuania 2015), in Belarus cross-border region – 322 centres (National Statistical Committee of the Republic of Belarus 2015).

Introduction of innovations in business activity also goes very slowly on the territory, although, there are a few positive trends: the innovation performance index in Latvia in 2006 comprised 0.20, but in 2013 it was already 0.24 (20% increase), in Lithuania – 0.27 and 0.31 respectively (15% increase). The indicators in Latvia and Lithuania are considerably lower than the average EU index - 28. According to this index for 2013 Lithuania occupies 19th place, Latvia is on 24th place among the EU group-28 (Innovation Union Scoreboard 2013). In Belarus the methods of statistics on research and innovation activity harmonized with the international practice are not applied. In order to provide the international comparativeness of the indicators of innovation activity, the research on the indicators of innovation activity in Belarus was carried out in accordance with the methodology of European scale of innovations which is applied in the EU states. In 2010 the value of the Innovation Development Index in Belarus was significantly lower than the average in the 27 EU states and comprised 0.26 (Bogdan 2010).

In the period 2006 - 2013 the expenditure on science and technologies increased from 0.79 to 0.95% of GDP,

in Latvia it decreased from 0.65 to 0.60% of GDP. Both indicators are much lower than the average indicator in the EU- 1.78% in 2006, and 2.01% in 2013 (Eurostat data base 2015).

Summarizing the median values of cooperation between universities, business and government by finding the average, the following sectors-leaders have been identified: "Electric energy, gas industry, heat supply and air conditioning", "Water supply; upkeep and rehabilitation of waste water and waste", and "Education". However, the development in every four partnership levels is on the average level or lower (see Fig. 5)

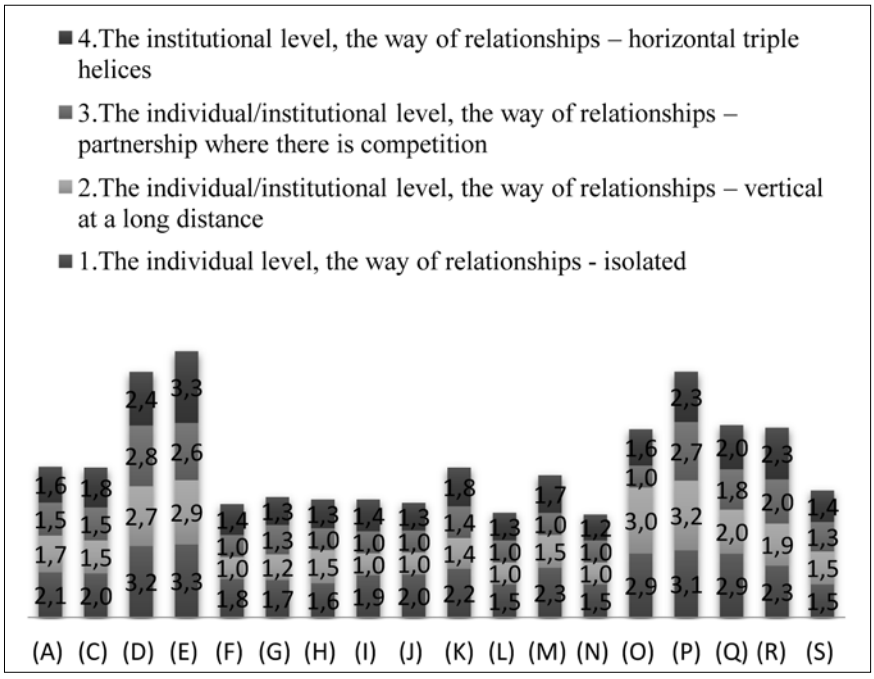


Fig.5. Cooperation between universities, business and government (the median values)
(1 – not develop, 5 – develop well)

Source: authors calculations in SPSS according to the survey data in 2014 within the project "The Establishment of the United Entrepreneurship Support and Networking System for the Sustainable Latvia, Lithuania and Belarus Cross Border Cooperation" (B2B) funded by the cross-border cooperation programme Latvia-Lithuania-Belarus "European Neighbourhood and Partnership Instrument 2007-2013"

Note: (A) Agriculture, forestry, fish industry, (B) Mining industry and quarrying, (C) Manufacturing industry, (D) Electric energy, gas industry, heat supply and air conditioning, (E) Water supply; upkeep and rehabilitation of waste water and waste, (F) Construction, (G) Wholesaling and retailing; automobile and motorbikes repair, (H) Transport and storage, (I) Accommodation and catering services (hotels, etc.), (J) Information and communication services, (K) Finance and insurance activity, (L) Real estate, (M) Professional, scientific and technical services, (N) Administration and servicing offices, (O) State government and security; social insurance, (P) Education, (Q) Health and social service, (R) Art, entertainment and leisure, (S) Other services, (T) Households as employers; manufacturing goods for own needs and provision of services by individual households.

In the survey the managers of the enterprises mentioned the main hurdles and limitations for cooperation between business and government, government and research institutions, research institutions and business. The Latvian respondents mentioned a high level of bureaucracy in the government institutions, the lack of both motivation and trust as the limitations for cooperation between business and government; the lack of information, the absence of dialogue, the underestimation of science by government, and the lack of common interests were mentioned as the limitations for cooperation between government and research institutions; the lack of motivation and bureaucracy were mentioned as the limitations for cooperation between business and research institutions.

The Lithuanian respondents mentioned the following hurdles for cooperation between business and govern-

ment: the fiscal policy, the lack of transparency in cooperation, rules and regulations, corruption, distrust, the lack of both information and common aims, the complex legislation, the tax system, bureaucracy; they mentioned the following limitations for cooperation between government and research institutions: the lack of common goals and motivation for cooperation, the underestimation of science, the lack of motivation, the lack of cooperation strategy, the lack of common interests and activities; the lack of motivation and bureaucracy, entrepreneurs do not use the researchers' potential, the lack of ties between theory and practice, the lack of initiative were mentioned as the limitations for cooperation between business and research institutions.

The Belarus respondents mentioned the following limitations for cooperation between business and government: the imperfect legislation, bureaucracy, corruption, the conservatism of laws, distrust, the instability of economy and currency, the absence or lack of information, the tax system, the lack of finance; the following limitations for cooperation between government and research institutions were mentioned: the lack of interest in cooperation, low pay for the researchers, bureaucracy, corruption, the absence or lack of information, distrust, the lack of finance and investments; the following limitations for cooperation between business and research institutions were mentioned: the lack of interest, the desire to receive an immediate outcome with minimal investment into research, high cost of research and development, the difference in the realized goals and approaches to them, the absence or lack of information, distrust, the lack of expertise.

Conclusions

The most preferable development of regional innovation systems is the development towards the enhancement of horizontal interactions between government, science and business by forming the so-called triple helix. The research activity of universities interacts with government and business representatives mutually influencing each other and promoting the economic development of the regions. Universities encourage the development of innovation activity both by discovering new phenomena, etc. and commercializing technologies and setting up small businesses. However, according to the received assessment the partnership between universities and business enterprises leaves much to be desired. The interaction between science and business is very poor, and it cannot be considered as a coordinated development helix. Traditions of the planned Soviet economy are still rather strong, as the form of interaction which used to be typical of the Soviet planned economy stipulated the dependency of any kind of activity (research, educational, or innovation) on the state and all these kinds of activities used to be financed by the state. The administrative-command system provided too little space for the initiative from "below" and therefore it discredited itself as a model for development. The market model is based on a dominant role of the market, but the state sets social and political goals which require science and innovations in order to achieve them, and it decreases the amount of finance with a view to the increase in intensity of innovation activity and companies' innovation activity. However, because of the gaps at the market, the triple helix model, which is based on the coordination of activity of the actors of an innovation process who create mixed organizational forms and perform new to them functions which allow filling these gaps, is much more effective.

Therefore, science should transform from the sector which produces new knowledge into an integral part of the innovation regional system. The role of the state in the innovation development should decrease at the same time. On the basis of the assessment of partnership between government, science and business, it is possible to draw a conclusion that the innovation system of triple helix on the Latvia-Lithuania-Belarus cross-border territory is not highly developed. It has been determined that the development of individual partnership with an isolated way of relations at the average level is already a prerequisite for the further development of the partnership at the institutional level, and therefore, for the development of the triple helix partnership between government, science and business.

In order to improve the interaction between science and business it is necessary to create and support the emergence of research groups within the structure of a university or research organization which act in the direction of search for alternative sources of financing, to encourage researchers' participation in the transfer of technologies to businesses via mediating mechanisms, to involve academic organizations into entrepreneurial activities and to set up businesses. It is necessary to gradually intensify the communication networks between govern-

ment, business and science. Besides that, network structures provide both the economy of scale of production and the use of new technologies, as well as additional income. The implementation of the gradual transition of the cross-border region into the innovation way of development on the basis of the triple partnership should promote its sustainable development and function.

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Olga LAVRINENKO, Dr.oec, leading researcher at the Institute of Humanities and Social Sciences of Daugavpils University, Latvia. Research interests: regional economics.

Alina OHOTINA, Doctoral candidate in Economics, researcher at the Institute of Humanities and Social Sciences of Daugavpils University, Latvia. Research interests: regional economics, investments, investment climate, cooperation of cross border regions.

Vladas TUMALAVIČIUS, Doctoral candidate in Law, lecturer at The General Jonas Žemaitis Military Academy of Lithuania, Department of management. Research interests: public servants activity, legal regulation of public safety; issues of national and regional security.

Olga V. PIDLISNA (Підлісна Ольга Василівна) Candidate of Economic Sciences, Associate Proffesor, Department of Marketing and Advertising, Kyiv National Trade and Economic University, Kyiv, Ukraine