UDC 339.9

Regional Dimensions of International Scientific and Technical Cooperation*

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ABSTRACT. The article has examined a phenomenon of international scientific and technical cooperation within individual regions, conditions and factors of its formation. It has been analyzed the evolution, basic essential features, models and trends of development of local innovation alliances, their participation in international scientific and technical cooperation. It has been proposed the priorities of formation of a quality mechanism to improve this form of cooperation in Ukraine and establishment of prerequisites for its expansion with European organizational structures that operate in innovation field (technology parks, technology clusters, innovation centers, etc.).

KEY WORDS: International scientific and technical cooperation, local innovation alliances, technology parks, science parks, business incubators, technology clusters, innovation strategy, regionalization, regional dimensions.

Introduction

The current stage of development of the world community is characterized by a concurrent flow of two powerful dominant processes in the system of interregional relations, where there is permanent strengthening of globalization, on the one hand, and steady growth of regionalization, on the other. That is to say, rather intensive processes of regionalization (especially internal regionalization) the driving impetus to which is primarily given by the decentralization of management and control occur along with increasing the interpenetration and interdependence of states and erasing of national borders. In addition, it should be noted that the regionalization is a form of protection of the interests of a certain region from the ravages of global processes. Transformation of some areas — regions, cities and localities — into strategic players of global markets requires the development and implementation of effective innovation strategies as the imperative of their competitiveness in the geo-economic space. Regional factors play an increasingly important role in the system of factors of international competitiveness of national economies, which manifests as a high competitive status, high-tech clusters, techno-poles, which do determine the dispositions of countries in the hierarchy of global competitive relations.

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* This article was translated from its original in Ukrainian

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IEP, № 18, (2013) pp. 100—121

ISSN 1811-9832/2013/№ 1 (18)

It is worth to mention, among the scientific works which study the theoretical foundations of regional integration, interregional competition, international competitiveness of regions, models of local innovation alliances, the works of such foreign researchers as A. Vylyams[1], R. Guo[2], B. Gardiner, M. Porter[3], V. Price[4], K. Sorensen[5], Sh. Tatsuno[6], Ye. Fedina[7], R. Hadson[8], as well as domestic scholars as L. Antoniuk[9], A. Halchynskyi[10], V. Heyets[11], A. Poruchnyk[12], A. Filipenko[13], V. Chuzhykov[14] and others.

Innovations are one of the determinants of the efficiency of production of goods and services, of their quality and therefore, of increase in competitiveness in the market. Increased spending on R&D, a shift of their significant part from the military purposes to the civilian ones, the need to reduce a negative impact of industrial development on a global scale (environmental problems) and at national level (growth of unemployment, worsening of social problems), economic expansion of TNC and aggravation of competition lead to activation and spread of international scientific and technical cooperation which is one of the distinctive features of today. Regions of many countries strive to find their place among the participants in this process. Therefore, research of processes of regionalization under the globalization in terms of formation of a regional innovation strategy becomes more urgent. One of the unsolved problems in the field of scientific and technical integration is, in our opinion, a problem of development of international scientific and technical cooperation at regional level and involvement of Ukraine's regions in integration processes in R&D sphere.

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[1] Hudson Ray, Williams Allan, *Divided Europe, Society and Territory* (L.: Sage, 1999), 342 p.

[2] Rongxing Guo, *Border-Regional Economics: Contribution to Economics* (Heidelberg: Physica Verlag, 1996), 231 p.

[3] Porter M.E., *Competition,* trans. from English, textbook (M.: Williams, 2001), 495 pp.

[4] Price Wolfgang, «The role of non-governmental organizations as an engine of change,» *Perspectives of study* No. 2 (1999): P. 24—36.

[5] Karan J. Sorensen., «Firm Characteristics: Collaborative Culture and Perceived Issues with University-to-Industry Knowledge Transfer,» *Stevens Institute of Technology*, Wesley J., Howe School of Technology Management, Castle Point on Hudson, Hoboken, NJ 07030 (Oct. 2006): 457 p.

[6] Tatsuno Sh., *Strategy — techno-pole,* trans. from English by Tatsuno Sh (Moscow: Progress, 1989), 227 pp.

[7] Fedina E.V., «Modern directions for the development of a region, based on cluster formation,» E.V.Fedina, K.V. Ekimova, *Development of the economy in the context of finance crisis: problems and prospects*: coll.works of participants in Internat. scien.& practc. conf. (St. Petersburg: Polytechnic University, 2009), P. 53-60.

[8] Hudson Ray, Williams Allan, *Divided Europe, Society and Territory* (L.: Sage, 1999), 342 p.

[9] Antoniuk L.L., Poruchnyk A.M., Savchuk V.S., *Innovation: theory, mechanism of development and commercialization*: monograph (K.: KNEU, 2003), 211 pp.

[10] Halchynskyi A.S., Heyets V.M., Kinah A.K., Seminozhenko V.P., *Innovation strategy of Ukrainian reforms* (K.: Knowledge of Ukraine, 2002), 326 pp.

[11] Ibid.

[12] Poruchnyk A.M., Antoniuk L.L., *Venture Capital: International Experience and Problems of Development in Ukraine*: monograph (K.: KNEU, 2000), 356 pp.

[13] Filipenko A.S., *Global forms of economic development: History and Modernity*, monograph (K.: Knowledge, 2007), 670 pp.

[14] Chuzhykov V.I., *Regional integration strategies of post-socialist countries of Europe* monograph (K.: LLC «Kadry», 2003), 297 pp.

Theoretical principles of operation of local innovation alliances

Under the current conditions, there is a very common situation with the lack of a possibility to use the scientific and technical factor of development with maximum efficiency due to its limitation by international borders, which is an additional incentive for international scientific and technical cooperation at regional level. The following Western European technology programs: «EUREKA», «ARIAN», «EUROBIO», «EUROROBOT» and a number of Framework Programs may serve as an example of its impact. The typical manifestation of process of globalization of scientific and technical development is the formation of regional and local innovation networks. Their key driving force is the common economic, financial, social and environmental interests of regions and neighboring states. This may be most clearly seen on the example of the European Union countries, where scientific and technical cooperation is carried out on a «multi-level» basis. Three main levels may be distinguished:

- *pan-European* — in the framework of the EU programs: «EUREKA» (international scientific and technical cooperation on the basis of forming the strategic alliances), «COST» (cooperation in the field of research and technological development), «CERN» (the European Center for Nuclear Research), the European Space Agency, the European Bimolecular Laboratory, etc.;
- *sub-regional* — the border cooperation of administrative regions of different countries and the extraterritorial cooperation of the regions of states that do not have common borders;
- *local* — cooperation of territories within the same country.

Changes in the methods of economy coordination, the rejection of strict control and command relationships lead to increased importance of territorial cooperation. In this regard, the role of local scientific and technical clusters (local areas of new technology development) which are formed on the basis of technology parks, small business incubators, technopoles, technology clusters and other regional (formed within national borders) alliances strengthens. Local innovation alliances are widely-spread in the United States, United Kingdom and Germany.

Technological parks are the core of scientific and technological activities

In the world practice, a variety of terms to refer to high-tech parks such as a science park, a technology park, a research park, etc. is introduced. There is a number of researchers who tend to isolate certain features of certain local innovation alliances. However, the common approach is to identify such groups as equal, and the use of different symbols depends primarily on a region. For example, in Germany this is a Technology Park,

in the United Kingdom — a Science Park, in the United States — a Research Park, in France and Japan — a Technopole. Existing differences in approaches to define technology parks cause in turn certain difficulties in counting their total number in the world.

Fundamentally, technology parks are the core of scientific and technological activities, performing the function of locomotive of a region's innovation development. The main purpose of technoparks is to increase the well-being of a region through creation of conditions for the commercialization of knowledge and technology by combining in its territory large technology companies and start-ups, universities and innovation companies, as well as by formation of an active business environment and creating the platforms and infrastructure for innovation activities. Thus, technology parks facilitate technology transfer, creation of jobs for highly qualified personnel with good salary, develop a culture of innovation and entrepreneurship. To achieve the above objectives, technoparks perform the following functions:

- manage the flows of knowledge and technology between universities, developers, innovation companies and markets;
- ensure that innovative companies are formed through the process of incubation (start-ups, spin-offs, etc.);
- provide the full servicing of innovation activities (including adequate facilities and workplaces).

It is worth to distinguish, among the distinctive features of technoparks, those which are crucial for innovation development: much larger return on investment in designs (lower cost, higher efficiency); satisfaction by an infrastructure of specific needs of technology companies; maximum research activity, concentration of developers and services.

In those innovation alliances, the competition shifts from the rivalry of individual companies towards formal and informal inter-firm unions. The first experiment of scientific and technology park creation was the Silicon Valley on the basis of the science park of Stanford University in the early 50s of last century. France was next in creating technoparks, which was the first in Europe when established the science park «Sophia Antipolis». This process came to Asia in the early 70s, Japan established the first Tsukuba Science City. The specified science parks are among the most famous ones in the world.

It is worth to note that at the dawn of emergence of technoparks in the Soviet Union in 1956 it was created the Novosibirsk Scientific City — Akademgorodok, which innovation infrastructure was consistent with the current principles. It was after visiting by American journalists in 1971 the so-called «Golden Valley» in Akademgorodok that the Stanford University-based science park was named as «Silicon Valley».

A striking example of a successful technology park can be the world-renowned Cambridge Science Park in the United Kingdom, which was founded in 1970 and started functioning in 1975. This park was created in

response to the government's intention to strengthen the relations between the academic research and innovation industry. The Trinity College presented in the history of science by the world-famous names of Newton, Maxwell, Rayleigh, Thompson, Breggoff, Rutherford and many other eminent scientists directly performed work on implementation of the science park project. In the park, there are more than 60 companies, some of which are small high-tech businesses established by employees of the Cambridge University or those originating from it. The rest of them represent the branches of large industrial companies, including the foreign ones. Their interest is dictated by the desire to «have a keen sense of the pulse» of scientific and technology development, thereby cutting down the way for new ideas from laboratories to production.

Experience of the Cambridge Science Park was quickly adopted by other university centers and regions of the United Kingdom. As early as in 1984, the first eight science parks established the UK Science Parks Association. Today the association includes more than 50 science parks, most of which have a narrow specialization. The most common areas of specialization, according to the Association, are to conduct scientific research and to develop new products as well as to render consultation services.

The global process of creating technoparks reached the most rapid development in the second half of 80s of last century. At that time, according to data of the International Association of Science Parks (IASP), it was created 23.38 per cent of all technology parks. The idea of science park formation quickly spread around the world: technoparks began to form in Canada, Japan, Singapore, Australia, Brazil, India, Malaysia, China[1].

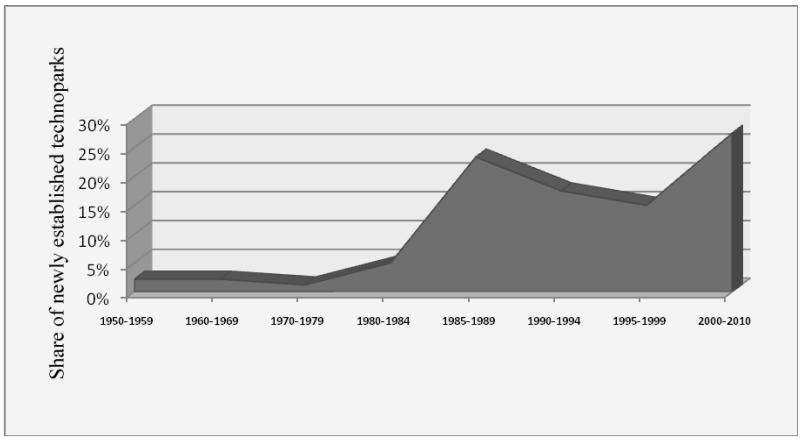

Fig. 1. Dynamics of share of the newly established technoparks in the total number of technoparks in the world [2]

[1] IASP worldwide statistics on STPs, 2006 — 2010. [Electronic resourse]. — Access mode: http://www.aisp.ws/publico/jsp/herramientas/lstStatistics.jsp?cp=...

[2] Built by the author on the basis of IASP worldwide statistics on STPs, 2006 — 2010. [Electronic resource]. Access mode: http://www.aisp.ws/publico/jsp/herramientas/lstStatistics.jsp?cp=...

At the beginning of XXIst century, a new wave of establishing scientific and technology parks rose. During the first decade, it was created about 27 per cent of technoparks (Fig. 1). By 2012 there were more than 1,500 technoparks and about 1,000 innovation centers in 76 countries of the world. Over 350,000 companies[1] are residents of those high-tech associations. The United States is a leader in this segment, where the number of science parks exceeds 150; the second position is occupied by Japan having 111 science parks. China began to found technoparks in 80s of XXth century, and today there are over 100 organizations of the specified type, 52 of which were approved by the national government, and the rest, by local self-government bodies[2].

Therefore, given the results of a study of the evolution of technoparks as well as the fact that the current stage of development of the world economy is characterized by a change in trends of global technology development, it would be appropriate to distinguish 3 main phases of technoparks development in the world. At each of the evolutionary phases distinguished, the formats of technology parks change due to changes in the trends of development of markets, the economy and transformation of society as a whole (Table 1). It is also necessary to emphasize that not only formats of technoparks themselves change, but their role in the development of society and economy also does. The competitiveness and profitability of technoparks of old generation rapidly reduce, yielding to innovation alliances of new formats.

The model of technoparks, throughout its existence, has undergone some evolution. The early model of science parks was featured by existence of the only founder and the main activity was to let out the own lands to innovation companies. The modern model of science and technology parks provides for several founders, which complicates a management mechanism, but is more efficient, especially in raising capital. Another distinctive feature of the new model is the availability of conditions at a technopark to place on its territory a large number of small businesses, which contributes to the formation of a large number of small and medium-sized companies engaged in scientific and technical activities and have access to using the system of collective services and communication with a local university or research center. Thus, according to data of the International Association of Science Parks, close relations between client companies and universities with the establishment of scientific and technical groups exist in most technoparks in the world — 72 per cent[3].

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[1] WAINOVA Atlas of Innovation. [Electronic resource]. Access mode: www.wainova.com.

[2] IASP worldwide statistics on STPs, 2010. [Electronic resource]. Access mode: http://www.aisp.ws/publico/jsp/herramientas/lstStatistics.jsp?cp=...

[3] Built by the author on the basis of IASP worldwide statistics on STPs, 2006 — 2010. [Electronic resource]. Access mode: http://www.aisp.ws/publico/jsp/herramientas/lstStatistics.jsp?cp=...

Table 1 **Characteristics of the main phases of development of technoparks in the world**[1]

Distinctive feature of a phase	Phases of technopark development		
	1st phase (1947—1970)	*2nd phase (1971—1985)*	*3rd phase (1986—2011)*
The dominant form of technopark	University technopark, regional, sectoral technopark, science city	Megatechnopark (technopole), technology incubators, specialized technopark, technology transfer centers	Network technopark, technopark alliances
Main characteristics of the dominant form of a technopark	Establsihed at universities	Established as regional structures oriented by industry	Established as platforms for communications
Basic process	Conducting research and development	Commercialization of research and development	Creating a space for exchange of information, joint projects
Core	University laboratories, integrated design and research bureaus of transnational corporations	Office systems of technology business-incubators	Virtual networks, network departments of technoparks
Owners of a park	Universities, transnational companies	Governments of countries, regions, municipalities	Innovation brokers and agents, venture companies, investment pools
Product of technopark	Innovation product	Technological solutions and technologies	Research potential
Main service of technopark	Access to a knowledge source (higher education establishment) or practical problem source (company)	Favorable conditions (realtor business), broadened related services	Access to the professional community
Leading countries	United States, United Kingdom	Europe, Asia	United States

The phenomenon described above is called a «business incubator» and «technology business incubator». Besides business incubators, science and technology parks include technology and university centers and residential complex. As shown in Fig. 2, a business incubator is one of the main structural units, which is present in 88 per cent of technoparks, the second largest component is a technology center, its presence is noted in 83 per cent of technoparks. While analyzing the activities of science and technology parks, it should be noted the fact that they are predominantly an urban (or semi-urban) phenomenon. Thus, 66 per cent of technoparks are within cities, and another 27 per cent — at a distance less than 25 km.

[1] Prepared by the author based on: Results of the study. Center of Strategic Research «North-West» (St. Petersburg: 2010).

Moreover, 40 per cent of technoparks are located in large cities (with a population of over 1 million people.), 39 per cent — in small towns (less than 0.5 million people.), and 18 per cent — in medium towns (0.5 — 1 million people).

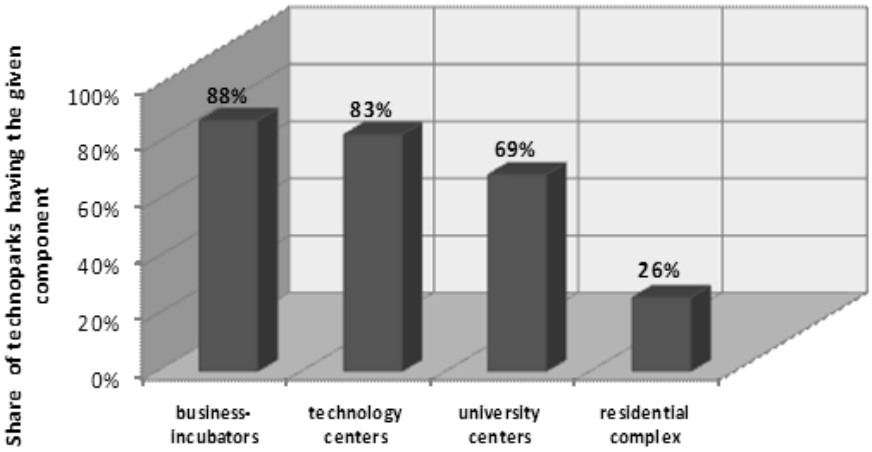

Fig. 2. The basic structural components of technology parks [1]

The majority of science and technology parks is concentrated in dense university regions, many of which have more than five higher education establishments or research institutes in the fifty kilometer zone, and 21 per cent — more than twenty universities. Technology parks and university structures have quite close cooperation relations, including the sharing of university funds and faculty laboratories (54 per cent), diversified services (65 per cent).

Technoparks, with regard to their structure, can be public, private, and have mixed form of ownership. According to the most recent data of the International Association of Science Parks there are 26 per cent of technoparks in the state ownership, 12 per cent are privately owned, and 22 per cent are of mixed ownership. However, these indicators are unable to provide a complete picture of the distribution of property rights, as there are no data up to 26 per cent of the technoparks in the world. But in general, it is possible to say that the current ownership structure is quite proportionate, and it is not threatened by imbalance.

Technology parks, in support of their activities, get as a rule some support, which, as to its origin, may be both public and private. The most common forms of support to technoparks in the world are grants and subsidies. Fig. 3 shows the number of technoparks (per cent of the total number) which use some or other form of support.

[1] Built by the author on the basis of IASP worldwide statistics on STPs, 2006 — 2010. [Electronic resource]. Access mode: http://www.aisp.ws/publico/jsp/herramientas/lstStatistics.jsp?cp=...

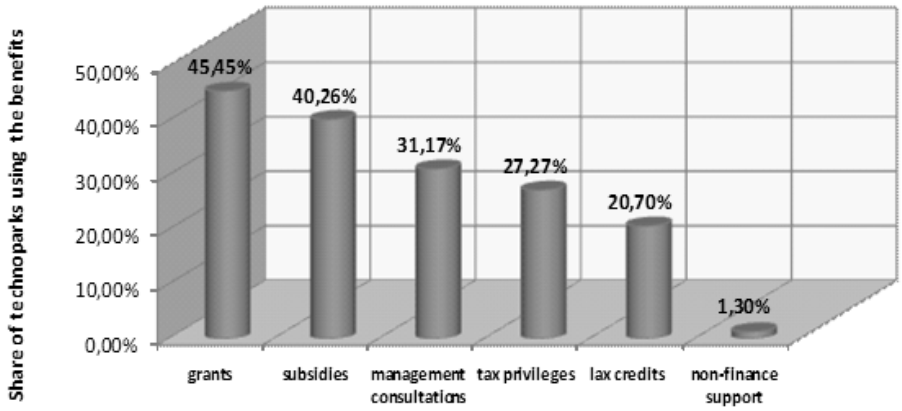

Fig. 3. Categories of public support to technoparks[1]

When analyzing the scope of activities of science and technology parks, it can be noted that 50 per cent comprise from 50 to 100 innovation companies in their structure, while 16 per cent of technoparks (101 — 200 companies) have the average size, and large technoparks (over 200 companies) are 20 per cent of the total number.

Technology parks are divided into three groups as to the scope of activities:

✓ «Universal» — technoparks, client companies of which may be employed in various technology sectors (36 per cent of all technoparks);

✓ «Specialized» — technoparks, which specialize in a particular technology sector or a small group of sectors (16 per cent of the total number of parks);

✓ «Semi-specialized» — technoparks, which prefer specific sectors of technology, but they may include companies from other sectors being outside the range of technopark priorities (40 per cent).

The scientific and technical cooperation of technology parks with industrial clusters is rather promising area of economic activity for both participants in the co-operation and a region as a whole. This statement is supported by location and specialization of technoparks and industrial clusters. Thus, according to data of the International Association of Science Parks, the vast majority of technoparks in the world (65 per cent) is located near business clusters, and in 44 per cent of cases both tehcnoparks and clusters specialize in the same technology sector.

In general, science and technology parks are the main driving force in the development of regions; they have proven their ability to attract and retain intellectual resources, which in turn, leads, by creating a critical

[1] Built by the author on the basis of IASP worldwide statistics on STPs, 2006 — 2010. [Electronic resource]. Access mode: http://www.aisp.ws/publico/jsp/herramientas/lstStatistics.jsp?cp=...

mass, to enhanced technology and innovation competitiveness of a region. It is worth to distinguish a particularly important factor in the success of scientific and technological development of the region, that is leadership of academic research and development of industrial technology clusters, which would make it possible to create a favorable environment for the development of cooperation in innovation activities and thus, would contribute to technology transfer and commercialization.

The scientific and technical cooperation within the North American region is mainly represented by the activities of technology parks. Today, in this region there are almost two hundred technoparks. It is possible, on the basis of studies of the North American Association of University Research Parks (AURP)[1], to draw some conclusions about the development of this form of scientific and technical activities. AURP carried out the monitoring of 134 technoparks, accounting for 77 per cent of the total number in the specified region. The fact that the vast majority (81 per cent) of research parks are located in the United States, another 19 per cent — in Canada, becomes quite clear. Technology parks of North America are mostly located in the suburbs and small towns.

An important indicator of the effectiveness of a park's activity, as on the global scale, is the creation of new jobs, which there are about 750 in a typical technopark. In general, the North American research parks provide more than 300 thousand jobs, where each staffing position generates 2.57 new vacancies for the region's economy as a whole[2]. Thus, over 750,000 jobs were created under the influence of university research parks in North America.

Those having the overwhelming proportion as 72 per cent in the internal structure of analyzed parks of the region are commercial firms, university departments account for 14 per cent and government agencies account for 5 per cent only. The main sectors of scientific and technological activities are represented, as worldwide, by information technologies, pharmaceuticals and provision of scientific and technical services. A list of support services of parks on business and commercialization of innovations includes assistance in participation in state or other public scientific and technical programs, assistance in raising capital resources, business planning, assistance in creating the marketing and business strategies, performance of marketing and technology assessment.

An analysis of the structure of funding the university research parks in North America showed that the main source of funding the parks is their own resources, i.e. the parks receive 61.2 per cent of the funding from their activities. The second large proportion belongs to university resources — 14.7 per cent, 10.5 per cent of proceeds received by a park

[1] AURP-Battelle Study on Characteristics and Trends in North American Research Parks: 21st Century Directions. [Electronic resource]. Access mode: http://www.aurp.net/battelle-report.

[2] IASP worldwide statistics on STPs, 2006 — 2010. [Electronic resource]. Access mode: http://www.aisp.ws/publico/jsp/herramientas/lstStatistics.jsp?cp=...

are provided by the state and local governments, 4.3 per cent are federal resources, 3.9 per cent are of corporate origin and 5.4 per cent of financing are provided from other sources. It is also worth to note that the vast majority of technoparks has at its disposal an annual operating budget of up to USD 1 million[1].

Modern regional dimensions of international scientific and technical cooperation of the EU countries

Active development of regionalization processes in Europe is supported both «top-down» (through the European Commission and national governments) and «bottom-up» (on initiatives of regions themselves). A growing trend toward centralization as well as deepening of European integration has contributed to enhancement of the role of regions in Western Europe and, with the elimination of many intergovernmental barriers during creation of the EU common market, expanding their cooperation, particularly in the field of science and technology. Thus, industrial clusters, in our opinion, play a significant role in the scientific and technical cooperation of regions.

When analyzing the innovation activities of companies in the member countries of the European Union during 2008-2010, it should be noted the highest level of innovation activities in Germany where innovatively active enterprises account for 79.3 per cent, the second position belongs to Luxembourg (68.1 per cent), and the third one — to Belgian companies (60.9 per cent). On average, in the European Union (excluding Greece) 52.9 per cent of enterprises were engaged in innovation activities. The lowest level of innovation activity was registered in Bulgaria (27.1 per cent), Poland (28.1 per cent) and Latvia (29.9 per cent).[2]

As far as the types of implemented innovations are concerned, the companies in the European Union are represented by three categories: 1) those that implemented an innovation product and/or innovation process; 2) those that introduced organizational and marketing innovations; and 3) companies that were involved in the simultaneous implementation of the above two types of innovations. Recent studies have revealed regular dependence: companies with innovation activities of high intensity are engaged in implementation of different types of innovations, that is they belong to the third category, and vice versa, companies with innovation activity of low intensity belong to categories 1 and 2. Thus, the share of the third category companies in Germany, Luxembourg and Belgium, where innovation activities of the highest intensity were observed, is 58.7 per cent, 61.5 per cent and 55.4 per cent, respectively. In the countries where during 2008-2010, it was observed innovation activities of

[1] IASP worldwide statistics on STPs, 2006 — 2010. [Electronic resource]. Access mode: http://www.aisp.ws/publico/jsp/herramientas/lstStatistics.jsp?cp=...

[2] Innovation Union Scoreboard 2013. [Electronic resource]. Access mode: http://ec.europa.eu/enterprise/policies/innovation/facts-figures-analysis/innovation-scoreboard/index_en.htm

significantly lower intensity, the number of the third category enterprises was also proportionally lower: in Bulgaria — only 29.5 per cent, in Romania — 32.3 per cent, in Poland — 33.3 per cent and in Latvia — 34.5 per cent [1].

Today, the fact of efficiency of international scientific and technical cooperation, particularly in the context of strengthening the competitive positions in the global market is obvious and does not need a separate proof. Studies of innovation activities of enterprises in the European Union suggest that a quarter of them (25.5 per cent) were involved in the scientific and technical cooperation. These cooperation relations were established by companies with other enterprises in a sector, with suppliers, commercial laboratories, universities and research institutes. Among the most active cooperators, it is worth to note the enterprises of Cyprus (62.3 per cent of all innovatively active companies), Austria (51 per cent), Slovenia (44.7 per cent), Lithuania (43.3 per cent), Hungary (43.2 per cent). The lowest level of scientific and technical cooperation was observed among the companies in Italy (12.1 per cent), the United Kingdom (13.7 per cent), Malta (18.5 per cent), Portugal (19.5 per cent), Spain (22.3 per cent) and Bulgaria (22.4 per cent)[2].

Taking advantages of new organizational forms, according to the experience of developed countries, becomes possible due to the emergence of corresponding clusters at regional level[3]. A vision of a cluster operation was presented by Wolfgang Price, an American economist, who stated that «The creation of clusters and introduction of the cluster model of company behavior is a way to restore trust between the government and business and to transform isolated firms in the

business community».[4] This provision focuses on the importance of creation and development of clusters for innovation activities.

The world practice shows that the clustering process is extremely important for regional development, especially in the context of international scientific and technical cooperation. Thus, in 2006, the «Manifesto of Clustering in the Countries of the European Union» was approved, and later in 2008 it was adopted the «European Cluster Memorandum», whereby the coordination of innovation development of the EU Member States is carried out on the basis of cluster associations. At the beginning of 2012, it was clusters with a high level of concentration and specialization that provided the highest performance of innovation activities. To maintain and enhance high-tech development, many countries have already adopted the national cluster strategies. The

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[1] Innovation Union Scoreboard 2013. [Electronic resource]. Access mode: http://ec.europa.eu/enterprise/policies/innovation/facts-figures-analysis/innovation-scoreboard/index_en.htm

[2] Innovative Regions in Europe Network. [Electronic resource]. Access mode: http://cordis.europa.eu/innovation/en/policy/home.html

[3] Porter M.E., *Competition*, trans. from English, textbook (M.: Williams, 2001), 495 pp.

[4] Price Wolfgang, «The role of non-governmental organizations as an engine of change,» Perspectives of study No. 2 (1999): p.24-36.

following countries may serve as an example: Luxembourg, France, Latvia, Lithuania and Slovenia. The regional cluster strategies have been introduced in Spain and Belgium. The cluster associations are rather popular in Denmark, Norway, Netherlands, Portugal, Ireland, Iceland, Israel and Greece as well, although these countries currently have no clearly articulated cluster strategy. In these countries, there were conducted a study of the impact of clusters on initiation of scientific and technical activities on the basis of an analysis of over 3,500 companies, most of which noted stimulating influence of joining the cluster network on expansion of business and enhancement of innovation activities[1].

Partnerships within clusters are determined primarily by geographic proximity and depend on the nature and frequency of interaction between the participants in a particular activity area. When analyzing the activities of companies in the European Union clusters, one may conclude that the vast majority of them (50 per cent) actively cooperate with each other within the same network, and almost 23 per cent are involved in several cooperative relations. At the same time, still a quarter of companies (26 per cent) which do not participate in partnership networks. It is worth to note, looking at individual countries in the region, that Scandinavian countries (Finland, Sweden, Denmark, Norway) most actively cooperate. In this region, the majority of companies is involved in two or more partnership networks (44 per cent), with only one company of ten not involved in such networks. However, it should be noted that in some countries of the European region there is rather low intensity interaction between the companies of a cluster. Thus, only 51 per cent of companies in the Czech Republic participate in the cluster partnership network, in Italy this indicator is 49 per cent, in Hungary — 48 per cent, in Slovakia — 41 per cent, and in Belgium, Portugal and Slovenia — 39 per cent [2].

A study of cluster companies' activity in Europe shows a tendency to team up in cooperative networks of companies which are rather engaged in providing high-tech services than employed in manufacturing of companies. And it is worth to emphasize the importance of high technology in such associations as low-tech products and low knowledge are not likely to act in partnership networks. To evaluate the performance of a cluster, it is important to distinguish the effects of its operation. A cluster as a stable partner association has the potential that exceeds the simple sum of potentials of its individual parts and is the result of effective combination of competition and cooperation, which creates the cluster's synergy effect. Thus, the effects arising from the cluster activities are associated with the synergy that manifests itself in the actions of its members, namely, economies of scale, effect of coverage, effect of

[1] Ukraine: Services on support to SMEs in priority regions EuropeAid/121495/C/SV/UA. [Electronic resource]. Access mode: http://economy-mk.gov.ua/ books/ClusterHandbookUkr.pdf

[2] Calculated by the author according to: Innobarometer on cluster's role in facilitating innovation in Europe: Analytical Report, July 2006 (Innobarometer, 2011). [Electronic resource]. Access mode: http://cordis.europa.eu/ innovation/en/policy/innobarometer.htm.

reduction in transaction costs, effect of spillover of knowledge and innovation, anti-trigger effect[1], effect of investment benefits and risk sharing, effect of sharing the infrastructure facilities.

When considering the structure of partnership networks existing in the European Union, it should be noted that 70 per cent are SMEs, 64 per cent — public institutions, 61 per cent — financial institutions, 60 per cent — large companies, universities and other educational institutions — 55 per cent, newly incorporated companies — 40 per cent, scientific laboratories and research centers — 36 per cent. The fact that 21 per cent of companies in the United Kingdom considers cooperation with public institutions extremely important is quite interesting, while the average percentage of other EU countries, which gave a similar assessment is 5 per cent only. However, it should be noted that the most diverse relations between cluster members exist in the countries being new EU members — an average of 4.84, while in the European Union — 4.23 (out of 7 possible types of cooperation). For example, this index in Lithuania is registered at 5.24, in Slovenia — 5.13 in Latvia — 5.05, in Poland — 5.04, in Cyprus — 5.00, and in the applicant's country of Croatia, this index is the highest and amounts to 5.42. The countries with the lowest index of cooperation relations diversity in the European Union are Hungary (3.71), the Netherlands (3.82), Italy (4.0), the Czech Republic (4.0) and Switzerland (4.0)[2].

The cooperation of companies within clusters may be characterized not only by the intensity and variety of relations. Quite an important indicator of this interaction is the benefits that companies gain from the cooperation with other members of a cluster. One of the most common forms of cooperation studied is information transfer, which is considered a «mild form». Companies see the largest advantage of interaction in a cluster the availability of skilled personnel (64 per cent), almost as many (62 per cent) note the importance of transfer of reliable and high-quality market information. 61 per cent of companies noted the importance of forming within the cluster of business incentives, while 59 per cent pointed to the efficiency of cooperation in the framework of joint innovation projects.

The cluster paradigm argues that competition within a cluster is more intensive than the external one. However, the results of a survey of Innobarometer confirm this hypothesis only partially[3]. Thus, 43 per cent of companies in the EU clusters argue that the competition is normal, but another 44 per cent say about more intensive competition within a cluster.

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[1] Trigger effect occurs when for implementation of a primary innovation (production) it is necessary to make a lot of expensive secondary changes, due to which a profit from the basic innovation (production) may be even less than the cost of forced reorganization. Cluster allows minimizing the cost of such changes by implementing a variety of technologies.

[2] Innobarometer on cluster's role in facilitating innovation in Europe: Analytical Report, July 2006 (Innobarometer, 2011). [Electronic resource]. Access mode: http://cordis.europa.eu/innovation/en/policy/innobarometer.htm.

[3] Innobarometer on cluster's role in facilitating innovation in Europe: Analytical Report, July 2006 (Innobarometer, 2011). [Electronic resource]. Access mode: http://cordis.europa.eu/innovation/en/policy/innobarometer.htm

It is worth to note a lower level of competition in the clusters of Scandinavian countries, where 61 per cent of companies in Finland say about this fact; they are joined by Denmark (52 per cent) and the Netherlands (56 per cent). The companies in Turkey (80 per cent), in Spain (69 per cent), in Slovenia (66 per cent) and in Ireland (63 per cent) speak about tighter competition in clusters,.

It is worth to note that the innovation activities of companies included in clusters are more intensive than the innovative activities of other companies in Europe. According to a study, 78 per cent of clusters of innovation companies have recently introduced new or significantly improved products, if to compare throughout the region, 74 per cent of companies were engaged in the respective activities. In addition, 63 per cent of innovation companies in clusters have introduced new production technologies (56 per cent in the region). The companies studied more effectively carry out market research (53 per cent v. 33 per cent). However, the most essential difference between the innovation companies in clusters is the intensity of cooperation with other members of a cluster, including with research centers, universities and laboratories. This indicator is more than twice higher than the analogous one in European innovation companies.

Another important indicator of innovation nature of companies within the European clusters is patents and trademarks. During 2004 — 2010, these companies noticeably improved their performance in the patent activity. For example, in 2004 only 12 per cent of companies applied for the registration of patents, and in 2006 the share of innovation companies willing to register their patents increased to 29 per cent and in the post-crisis 2010, the indicator was close to 30 per cent[1].

The creation of a common European market, narrowing of national market niches stimulates the formation of trans-regional (such that cross national boundaries) network structures, the initiative of which creation belongs to those regions that are interested in restructuring the local economy and supporting the industries that dynamically develop. These formations created by the efforts of regions of two or more countries may be of different types (unions, associations, co-operation in solving specific scientific and technical problems of a region) and of territorial or extraterritorial nature. Thus, the association of border regions of France, Belgium and Luxembourg was created for overcoming the steel industry crisis. To restructure the coal and steel industries of North Moravia and Silesia, the enterprises and research institutes of the Czech Republic, Austria, Slovakia and Poland cooperate in the framework of the program «EUREKA».

Along with the border cooperation, the regions which have no common borders, but pursue common interests develop their cooperation. Examples of such associations may serve groups of regions Baden-Wurttemberg (Germany), Lombardy (Italy), Catalonia (Spain) and Wales (United

[1] Ibid.

Kingdom) for the purpose of long-term economic and scientific-technical cooperation. Thus, in the United Kingdom there is a network of 12 areas of advanced aerospace and automotive industries with the common center at Warwick University, which aim is to establish relations with prospective partners in Europe.

Other examples of successful international scientific and technical cooperation are such regional organizations as: the association of Nord-Pas de Calais (France) and the province Walloon Brabant (Belgium), which activities focused on growth of innovative technological capacity of small business through technology changes and implementation of intergovernmental economic development projects, and also the network CAR (cities and regions of the automotive industry), which was established at the initiative of the European Commission, it is composed of Antwerp (Belgium), Coventry (United Kingdom), Stuttgart (Germany), Piedmont (Italy) and Valladolid (Spain), the purpose of creation is to solve the problem of restructuring the automobile industry, sharing of organizational and production experience, promotion of technology modernization of small enterprises and development of small and medium businesses.

One of the goals of international scientific and technical cooperation is to create a cross-border cooperation system by both the member countries of an integration group and its individual regions with other countries. Rongxing Guo, a Chinese scholar, summarized the global experience in this approach at rather high level[1]. In his opinion, Mexican-American and Canadian-American cross-border associations, besides the European ones, should be mentioned as an example of successful cross-border cooperation. The Israeli-Palestinian associations were less successful that was later proven by life.

The strengthening of intra-European central trends that shape a new global region will always lead to the emergence of new regional formations with which the European Union will have close economic and political ties. Ray Hudson and Allan Williams, British researchers, perceive two major directions of expansion of the global European region. One of them is to move to the south (Mediterranean), the other, to the east (Central European)[2].

Reference points for Ukraine

At the present stage of development of the world economy, much of the countries are at the stage of transition to the sixth technological structure that is primarily characterized by continuous innovation process. According to various expert appraisals, from 50 per cent to 90 per cent of GDP growth in developed countries is formed by high technology. However, in Ukraine,

[1] Rongxing Guo, *Border-Regional Economics: Contribution to Economics* (Heidelberg: Physica Verlag, 1996), 231 pp.

[2] Hudson Ray, Williams Allan, *Divided Europe, Society and Territory* (L.: Sage, 1999), 342 p.

despite some efforts, innovation breakthrough has not yet occurred; the country continues to be on the periphery of the world economy. In recent years the share of domestic innovatively active enterprises in the total number of industrial enterprises has noticeably increased and at the end of 2012 it was 17.4 per cent[1], but this figure is several times lower than the one in developed countries. The share of innovation products in the total volume of industrial sales is only3,3 per cent[2], and with regard to the share of Ukraine in the global high-tech exports, this figure is very low at all — about 0.18 per cent, which equals an average of USD 4.1 billion per year. Thus, a potential of domestic exports of high-tech products is higher and is estimated at USD 10-15 billion or 0.3-0.5 per cent of the world exports[3]. But to have it effectively realized, it is critically needed the creation and promotion of an innovation model of national economic development, in particular through the formation of local innovation alliances.

Years of experience in leading countries development demonstrate the failure of market mechanisms to independently ensure an adequate level of efficiency of national economy and its international competitiveness. The formation of an appropriate mechanism of state regulation of economic processes is crucial in this regard. So today, there is no country with a highly developed economy in the world, where the state would evade the regulation and promotion of innovation activities. The state authorities and local self-government bodies in Ukraine will be really able to influence the process of regional economy clustering if necessary clear objective criteria of clusters performance and relevant authorizations to set preferences are available. Thus, establishment of clusters on the basis of scientific institutions in a region will have the primary positive impact on the economy development.

The factors that generate a positive result with regard to the cluster formation in regional innovation systems may include:

- ✓ expansion of science and technology and information infrastructure in the region;
- ✓ willingness of business entities to cooperate;
- ✓ mobility to use regional resources;
- ✓ ensuring the stability of inter-regional relations;
- ✓ strengthening of partnership relations in international scientific and technical and foreign economic cooperation, etc.

On the other hand, there is a number of organizational and economic factors that hinder the development of clusters in Ukraine, namely:

- ✓ low level of quality of joint business management in certain sectors the economic structures conduct activities both within a region and at interregional level;

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[1] *Innovation activities, Scientific and innovation activities* (1990-2012), State Statistics Service of Ukraine [Electronic resource]. Access mode: http://www.ukrstat.gov.ua/.

[2] *Introduction of innovations at industrial enterprises*, Scientific and innovation activities (1990-2012), State Statistics Service of Ukraine [Electronic resource]. Access mode: http://www.ukrstat.gov.ua/.

[3] Breus S.V., «Analysis of the status and prospects of export of high-tech products of industry in Ukraine,» *Strategic Priorities* № 1(2010), P.16-22.

✓ insufficient level of development of cross-border relations between cooperation entities, which usually are not ready to independently shape the priorities for realization of regional business interests;

✓ unsatisfactory level of collective planned and programmed decisions on regional economic development;

✓ considerable time limits to achieve the expected results (which are usually a few years after the creation of a cluster), etc.

The scientific and technical potential available in Ukraine, including the number and qualifications of staff who has relevant scientific knowledge and also creates the conditions for development of innovations, innovation infrastructure, provides an opportunity to conduct the innovation activities within regions not only at a particular enterprise, but also in collaboration of enterprises in a cluster. Moreover, the functioning of sufficient number of scientific institutions (higher education establishments, research institutes, etc.) with the appropriate base for scientific research provides an opportunity to conduct, jointly with industrial enterprises, research, to develop new technologies and equipment for manufacturing products and rendering services. Thus, given the sectoral specialization of each particular region as well as the availability of scientific organizations, it is necessary not only to create regional clusters, but also organize their cooperation with other industrial enterprises and scientific organizations in other regions for further development. This is especially true for domestic regions and Euro-regions with involvement of Ukraine.

It is this Central European vector that is important for Ukraine in terms of international scientific and technical cooperation. With the accession of new members to the European Union, the total boundary line with the European Union increased significantly for Ukraine (Poland → Slovakia → Hungary → Romania). The expected increase in FDI in the above countries may change the current tendency to their concentration in the capital and lead to gradual move eastward. Thus, venture capital, because of its high risk, may be concentrated in those spaces that will form Euro-regions (technozones), technology parks and clusters. And so it is crucial for Ukraine is to restore the practice of establishment and operation of local innovation alliances and their integration into international scientific and technical cooperation. At the first stage, science and technology parks (according to classification of A. Poruchnyk and L. Antoniuk)[1] will be likely represented by promotion and clusters will be small in size, but numerous and quite mobile mono-specialized formations. International scientific and technical cooperation in these new formations can be quite productive at the account of its stimulation by two (or many) parties, which would ensure, as the experience of the leading countries in the world proves, economic growth and enhancement of national competitiveness of regions, and hence of the country as a whole.

[1] Poruchnyk A.M., Antoniuk L.L., *Venture Capital: International Experience and Problems of Development in Ukraine*: monograph (K.: KNEU, 2000), 356 pp.

Conclusions

To summarize, it is safe to state with certainty that technology parks are an important tool of public policy (especially, the economic, scientific and technical one) aimed at faster growth of high-tech sector of production. It is the state, not a business that determines orientation of economic development in any country of the world, so the development and implementation of effective macro-innovation strategy is extremely important for Ukraine. One of the priorities of this strategy should be the intensive development of high technologies through the creation and activation of technoparks that would provide targeted government support to own designs and production arrangement on the base of these designs. Thus, technoparks, along with other local innovation alliances should have become the efficient for Ukraine in building the economy based on knowledge.

Therefore, one of the priority objectives, given orientation to the activation of innovation development, is the training of qualified personnel with a certain level of knowledge for further work in appropriate scientific and technical institutions. In addition, it is urgently needed appropriate allocation both of scientific personnel and scientific organizations according to the needs of the economy of regions for innovation growth of the country's national complex as a whole. Using high technologies, as a result of achieving the goals set, will rise the technical level and quality of products manufactured, will better meet the needs and, what is most importantly, result in production efficiency by reducing labor and resources inputs per unit of output, thus freeing the resources for use in areas which development enhances the quality of population life in general.

It is eventually worth to note that enhancement of technology regionalization may lead to the formation of new models of science and technology policy, including its local, regional and global components. A gap between developed and economically weak regions is unlikely to be offset without appropriate measures. Therefore, further research should be reasonably aimed at the development of specific regional innovation strategies with taking into account the national specificities.

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The article was received by editorial board on 18.02.2013