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The International Competitiveness of Nations: the Regional Aspect*

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ABSTRACT. This article examines the theoretical principles of the international competitiveness of nations as well as the main methodological principles of modern models of the international competitiveness of nations and regions. On the basis of quantitative and qualitative indicators the author analyzes the innovation competitiveness of Ukraine's regions and suggests what principles can be applied to enhance the competitiveness of Ukraine's economy. According to these principles, a state strategy of enhancing international competitiveness should be designed on the basis of the National Innovation System and operate at the regional and sectoral levels.

KEY WORDS. international competitiveness of nations, National Innovation System, competitive advantages, competitive status, innovative capacity, innovative productivity.

Intense competition at the turn of the twenty-first century caused uneven economic and social development, which is expressed in the disproportionate development not only of individual countries, but also of regions and sectors due to the irregular rate of capital accumulation. Under these conditions, the formulation and implementation of effective competition strategies by international companies and nations to ensure their high competitive status is the priority objective in the international policy of practically all developed countries of the world. Competitiveness is a decisive efficiency criterion of

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any economic entity. Competitive advantages of a country's economy, its individual sectors, enterprises and regions on the global markets also determine production growth and national security. A nation's level of competitiveness affects its position in the global economy.

The concept of a national economy's competitiveness is of great practical and long-term importance for the national and regional levels in order to design programs that improve a country's competitive advantages and develop its export base. Yet the position Ukraine holds in the ratings of prestigious international organizations convincingly proves that it is not competitive. A necessary condition for our country to weather this crisis situation, integrate into the European Union (EU) and address national security issues is the design and implementation of the global strategic architecture in a way that raises its international competitiveness. Only a highly competitive national economy both in the domestic and world markets can lay down the foundation for the growth of the citizens' living standards.

Among the scholarly works that examine the theoretical foundations of competition, its modern forms and the international competition environment as well as analyze the causes and conditions of emerging competitive advantages as well as the issues of higher competitiveness of individual countries and their search of new forms to achieve it, we should single out the studies by such scholars as A. Brandenburg, R. Vernon, H. Hruber, C. Johnson. R. Kanter, P. Katzenstein, I. Kirzner, S. Cohen, P. Krugman, V. Leontiev, S. Linder, F. List, A. Marshall, J. Mill, J. Moor. P. Nelson, B. Oline, M. Pozner, D. Ricardo, J. Robinson, J. Sachs, P. Samuelson, A. Sliwotski, A. Smith, R. Solow, S. Winter, E. Chamberlain, J. Schumpeter, F. Haiek, H. Chamel, E. Hekscher, and J. Hicks, as well as the studies by Russian scholars such as G. Azoyev, M. Halvanovsky. S. Yemelianov, O. Mikhailov, A. Slezniov, I. Spiridonov, R. Fatkhutdinov and O. Yudanov and Ukrainian scholars O. Bilorus, B. Hubsky, D. Lukianenko, Y. Pakhomov and A. Poruchnyk. The American researcher M. Porter authored the most important studies of international competition and the theory of competitive advantages of coun-

tries, including factors that determine competitiveness at the micro- and meso-levels.[1]

Nonetheless, many aspects of this research area remains insufficiently exposed and substantiated. There is still a need for the study of the theoretical and methodological principles of competitiveness in the global environment.

Methodological Principles of Research on the International Competitiveness of Nations

Ukrainian and foreign scholars are at variance about the notion of international competitiveness of nations and its relationship with a series of other associated topics, such as competition, competitive advantages, competitive positions and competitive status.[2] Some even argue that corporations, not countries, compete on the world market, while under conditions of globalization competition does not exist at all and, therefore, there is no sense in studying the competitiveness of nations. But even given the growing trends of regionalization, integration and globalization in the world economy, competitive struggle does not disappear at all but, on the contrary, becomes ever more intense and gains new forms in the process.

It is common knowledge that competitiveness in its general meaning is a subject's possession of certain properties that enable him to develop on an innovative basis and win in the competitive struggle. If the subject lacks these properties, he is not in a position to engage in a lengthy competitive struggle on a respective market. The main factor affecting the high competitiveness of subjects of international economic relations is their receptivity to innovations. In other words, all competitive subjects adhere to an innovative behavior. This is true

[1] M. Porter, *Konkurentsia* [*Competition*], translated from English (Moscow: Williams Publishing House, 1993), pp. 85—108, 161—205.

[2] O. Bilorus, Y. Matsenko, «Konkurentospromozhnisk u suchasnomy globalnomu sviti [Competitive Capacity in the Modern Global World],» *Economic Magazine* 21:9 (2002): pp.7-13; M. Halvanovsky, V. Zhukovskaya, I. Trofimova, «Konkuretosposobnosk v mikro-, mezo- i makrourovnevom izmereniakh [Competitiveness in the Micro- Meso- and Macro-Level Dimensions], *Russian Economic Journal* No. 3 (1998): pp. 67-77; A. Halchynsky, V. Heyets, A. Kinakh, V. Semynozhenko, *Innovatsiyna stratehia ukrainskykyh reform* [*Innovation Strategy of Ukrainian Reforms*] (Kyiv: Znannia Ukrainy Publishers, 2002), p. 324.

at the national level as well. It is precisely their significant economic potential that makes successful competition on the world markets possible for nations and their companies. A country's competitiveness turns into a dynamic process of constant change and renewal that encourage evolutionary development and additional competitive advantages.[3]

Another important sign of the competitiveness of a country is the ability of its subjects to promptly respond to the changes in world demand and the production structure. For this purpose the country must have a favorable investment and innovation climate and it must modify as well as support a national environment for the efficient operation of economic subjects. Highly competitive countries have mechanisms available to create the conditions for as well as promote the achievement of their objectives of national security, economic development and higher living standards. A country with an inefficient economy and economically inadequate institutions — when judged by their impact on the economic processes within the country — still may be considered competitive and have substantial potential not only in competitive advantages, but also in the advantages related to the specific features of its political, cultural and social system.

We should draw a line between *competitive economy* and such broader notions as *competitive country, competitive nation, competitive state* as well as *competitive region*, because in many studies these notions are synonymous. As understood here, the international competitiveness of a country means that it has: the ability to create a national business environment in which, given a free and fair market, national commodity producers can constantly develop their competitive advantages and hold and retain stable positions in certain segments of the world market owing to a significant economic potential that ensures economic growth on the basis of innovation; a developed system of market institutions; substantial intellectual capital and investment resources; flexible responses to changes in the world

[3] A. Sliwotski, *Mihratsia kapitalu* [*Migration of Capital*], translated from English (Kyiv: Pulsary Publishers, 2001), pp. 7—19.

markets situation and, accordingly, diversification of production, while standing as much as possible for national interests to attain economic security and high living standards.

It is commonly known that high international competitiveness can also by achieved by the active intervention of governments through subsidies, but in the final analysis living standards go down and such competitiveness is nominal. Real competitiveness is possible only when national companies are capable of producing high quality commodities and successfully marketing them at prices acceptable to foreign and domestic consumers — without advancing direct subsidies or restraining wages and unemployment.

It is also proper to use the term, «competitiveness of a nation.» In the opinion of Ukrainian scholars, it refers to the growing strength and importance in the world community of the intellectual potential of a nation which ensures a high rate of economic growth on the basis of innovations. In the theory of international economics, a clear substantiation of such a category as *competitive status of a state* does not exist, although the term *competitive status of a company*[4] has been used in strategic management since the 1980s. In our understanding, *competitive status of a state* refers to the world community's recognition of a state's brand under universal standards, such as human development, political and economic stability, and economic security. We consider the competitive status of a country to be high when the competitive positions of its subjects on the international market grow, while the domestic environment remains attractive for investors.

Lately, the study of the competitiveness of regions has become extremely important within the context of state regional policy. After all, changes both in developed and transition countries are accompanied by a territorial concentration of economic activity. The experience of these countries calls in question the hypothesis of shrinking regional disproportions resulting from economic growth, and this is especially true as far as innovative processes are concerned.

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[4] I. Ansoff, *Strategicheskoye upravlenie* [*Strategic Management*] (Moscow: Ekonomika Publishers, 1989), pp. 9—20.

Thus, a regional «innovation paradox» appears, which consists of the need to increase spending on innovation in depressed regions at the same time that there are fewer possibilities to draw budgetary and private sources of financing to these regions compared with economically developed regions. The main reason for the paradox is not only the smaller availability of sources of financing, but also the nature of the national and regional innovation systems determining the innovation competitiveness of countries and their regions.

The experience of highly developed countries, such as the US and the EU, shows that building a post-industrial society and raising international competitiveness are possible only on the basis of innovation and by using as much as possible the innovation potential of regions while taking into account the specifics of each of them. The development and marketing of fundamentally new products plays a decisive role in strengthening the competitive positions of commodity producers on the world markets. And this, as we know, is possible only in an efficient National Innovation System (NIS), which is set up individually in every country and includes such subsystems as research and research-and-development (R&D); education and professional training; innovation infrastructure; the manufacturing of competitive goods and provision of competitive services; as well as legal, social and financial institutions.[5] The decisive role in this system is played by the regional innovation systems.

By innovation competitiveness we mean the capacity of a region's subjects to pursue active innovation and thereby impact on the area's economic growth and raise the competitiveness of the country as a whole. Unlike the competitiveness of the national economy, the competitiveness of a region is distinguished for indirect competition of regions within the boundaries of a single economic system.

We consider a region to be competitive if the share of its companies in raising the country's international competitiveness is substantial. That is, a regional economy, in which the primary structure

[5] *Benchmarking Enterprise Policy* (Brussels: European Commission, 2003), pp. 7-10.

of industry prevails, is competitive if it is a required resource base for the industrially developed regions. Decisive in this case is the innovation component of their competitive capacity and dynamics of sectoral structure that outpaces the development of the national economy's technological sector.

The theory of competitiveness attaches great importance to clusters that are formed out of geographically-concentrated groups of interrelated companies, specialized suppliers, providers of services and companies in respective sectors, as well as associated companies that compete and at the same time are engaged in joint work.[6]

High competitiveness and economic growth are influenced by factors that stimulate prompt dissemination of technologies. In this respect, the nature and structure of the interaction among science, education, financing, state policy and industry gain special importance. The underlying foundation of such clusters is a stable system for transferring new knowledge, technologies and products, i.e. a technological network. Cluster-based businesses have the opportunity to gain additional competitive advantages, as they are engaged in domestic specialization and standardization, thus minimizing expenditures and introducing innovations.

A distinguishing feature of clusters is the presence of flexible, small and innovative businesses within them, especially venture enterprises that can establish innovation «growth points» and achieve synergetic effects.

Most scholars studying the advantages of clusters single out innovations first and foremost. The participants of a cluster have access to new technologies, techniques, and the like. What distinguishes them most of all is the venture capital that finances innovations. Notably, over 50 per cent of biotechnological companies in the US have been financed by venture capital in clusters at the startup.[7]

However, M. Porter cautions that under certain conditions participation in a cluster may also slow

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[6] M. Porter, *Konkurentsia* [*Competition*], translated from English (Moscow: Williams Publishing House, 1993), p. 205.

[7] W. Powell, «The Spatial Clustering of Science and Capital: Accounting for Biotech Film,» *Regional Studies Association* No. 36 (2002): p. 295.

down the processes of innovation, especially if a cluster applies one approach to competition. A cluster's businesses may not agree to support the introduction of radical innovations that change the old pattern of behavior. But regardless of some negative factors, clusters nonetheless play an important role in competitive struggle that leads to clearer competitive advantages for a cluster's subjects.

Tools for Evaluating the International Competitiveness of Countries and Regions

By applying large databases of world development, modern international statistics develops and constantly improves on the techniques for measuring the international competitiveness of countries and thereby reflecting their potential and comparative advantages. What merits special attention is the *growth competitiveness index* (GCI), which is determined annually by the World Economic Forum (WEF) and reflects the capacity of national economies within a medium-term period to achieve sustainable development on the basis of new knowledge and technologies. Therefore, it is also labeled as the index of innovation receptiveness of nations.[8] With the assistance of new technologies and on their basis the manufacture of new types of commodities, stable economic growth rates can be ensured as well as higher living standards.

The first cluster includes the highly developed countries that are among the key innovators — the US, Finland, Singapore, Taiwan, Australia, Sweden, Switzerland and Canada. The average rating of their overall competitive index is 5.46, social institution index — 5.98, and macroeconomic environment index — 4.98. The second cluster is the largest among the highly developed countries and includes such post-socialist newcomers as Estonia, Slovenia and Hungary. In the seventh and eighth clusters are noncompetitive countries (a number of South African and

[8] *The World Economic Forum Report, 2003-2004*, www.weforum.org.

Latin American countries as well as Ukraine).[9]

Yet it is also important to take into account the business environment in which companies can enhance their competitive advantages by using effective strategies and fulfill their production on the global markets. These aspects are covered by the *business competitive index.*

What also merits attention is the technique of gauging the international competitiveness of the European Union. To determine international competitiveness, the *European Competitiveness Report 2003* uses a new indicator — labor productivity computed per one hour of work and determined at the macro, micro, meso and mega levels.

The multiplicative model of regional competitiveness is expressed as

$$ó = à \times â \times ñ \times d,$$

where $ó — \frac{\text{GDP}}{\text{Population}}$;

$à — \frac{\text{GDP}}{\text{Worked time}}$, — labor productivity per hour;

$â — \frac{\text{Worked time}}{\text{Employment}}$, — «leisure-work» ratio;

$ñ — \frac{\text{Employment}}{\text{Able - bodied population}}$, — employment coefficient;

$d — \frac{\text{Able - bodied population}}{\text{Population}}$, — share of the employed in the country.

Labor productivity is measured for regions (NUTS-2, see Table 1). The labor productivity level and, accordingly, competitiveness was the highest in Luxembourg — 71.29. Computed at the same time is average labor productivity growth by which the regions are ranked according to their international competitiveness.

[9] L. Antoniuk, *Mizhnarodna konkurentospromozhnist krain: teoria ta mekhanizm realizatsii* [*International Competitive Capacity of Nations: Theory and Mechanism of Implementation*] (Kyiv: Kyiv National University of Economy, 2004), pp.104-105.

Table 1. Ratings of EU regions by labor productivity

¹	Regions	Regional code	Productivity level	1995–2000 Average productivity growth, per cent	1998–1999 R&D/GDP, per cent	Employment in high-tech sector, rate	Number of post-graduate and doctoral students, per cent	Productivity index
Regions-leaders								
1	Luxembourg	lu	71.29	4.08	í/à	0.32	0.56	0.62
2	Vlaams Brabant	be24	71.24	2.81	í/à	1.50	3.42	1.06
3	Ile-de-France	fr1	69.83	3.22	3.37	1.21	4.80	0.44
Regions-outsiders								
18	Açores (PT)	pt2	25.09	2.01	í/à	0.00	1.11	0.07
19	Norte (PT)	pt11	24.23	1.77	1.30	0.40	2.70	0.18
20	Centro (PT)	pt12	23.13	1.57	1.89	0.56	3.19	0.17

Source: *European Competitiveness Report 2003*, European Commission, Commission Staff Working Document, SEC (2003) 1299, Luxembourg, 2003, p. 107

In our opinion, labor productivity levels demonstrated the most accurate results, since a high pace of growth can also occur in non-competitive regions. The analysis of the more detailed study of five competitive regions — Oberbayern and Darmstadt in Germany, Sterea Ellada in Greece, Ile-de-France in France and Niederősterreich in Austria — makes it possible to detect factors that impacted on labor productivity growth, namely: proper transportation networks, especially access to international airports and telecommunication; a high entrepreneurial culture that ensured the link between academic research and innovative business; the existence of high-tech clusters in such sectors as biotechnology; and, a pro-action policy that created a favorable innovation climate and regional innovation systems.

In addition, by the decisions of the Lisbon Summit,[10] a system of indicators characterizing innovative productivity — «European Innovation Scoreboard» — was developed in the EU. As part of the European Commission documentation, along with the «Enterprise Scoreboard» of the CORDIS electronic information service, these indicators are used to evaluate innovation competitiveness as a general *summary innovation index*, which combines four groups of indicators, namely:

1. Human resources: the proportion of university graduates engaged in science and technologies (percentage of graduates 20 to 29 years of age); the proportion of employees with science degrees and certified engineers (percentage of total number of employees 25 to 26 years of age); training in the process of work to improve qualifications (lifelong learning, percentage of total number of employees 24 to 26 years of age); the proportion of employed in medium- and high-tech enterprises (percentage of total number of employees); proportion of employed in high-tech services (percentage of the total number of employed).

2. Knowledge generation: difference between budgetary financing of R&D and private financing of this area (percentage of GDP); financing of R&D by private business (percentage of GDP); number of patents used in high-tech sectors and registered in the EU (European Patent Office) per 1 million of population; number of patents used in high-tech sectors and registered in the US (US Patent and Trademark Office) per 1 million of population; number of patents used in the EU (EPO) per 1 million of population; number of patents registered in the US (USPTO) per 1 million of population.

3. Knowledge transfer and application: proportion of small and medium-sized enterprises (SMEs) working in the innovation sphere at home; proportion of SMEs pursuing innovative activity in cooperatives; ratio of innovation expenditures in the manufacturing sector to total turnover.

[10] Presidency Conclusions, Lisbon European Council, 23-24 March 2000, www.europa.eu.int/comm/off/index

4. Financing of innovation, output and markets: venture capital in high-tech areas; proportion of venture capital in GDP at early stages of financing; proportion of sales of new products on the general market of the manufacturing and non-manufacturing sectors; proportion of new firms, but not new products in percentage of the total manufacturing and non-manufacturing sectors; numbers of Internet users; market capacity of information and communication technologies (percentage of GDP); change of the proportion of high-tech products output in the overall industrial output.

The assessments showed that the innovation competitiveness index was the highest in Finland (0.72), Sweden (0.70) and Switzerland (estimated for 32 countries). Greece, Portugal and Spain were outsiders with an index of 0.17.[11]

Regional Aspects of Innovative Competitiveness

The most important stage in establishing a National Innovation System is its primary level — the regional innovation component. Regional innovation systems are created to consolidate the region's assets and to use its potential as much as possible — first, to increase local budget revenues; second, to engage and retain highly skilled personnel; and, third, to enhance the economy's competitiveness.

The efficient operation of such systems requires not only enormous expenditures for science and education, but also institutional conditions, among which scientists mostly single out the following:

- a competitive entrepreneurial sector;
- integration in the global innovation system.

The governments of the US, Japan and the EU countries promote innovations by using the instruments of economic, investment and credit policy, as well as by creating conditions for the prompt commercialization of the novelties (extensive application of tax and depreciation benefits, legal protection of intellectual property, facilitation of international scientific and technical cooperation, support of innovation projects, and the like).

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[11] *European Innovation Scoreboard 2003*, European Commission, Commission Staff Working Document, SEC (2003)1255, Luxembourg, 2003, p.10.

But if a country and its regions try to gain global competitive advantages in a «new economy,» a corresponding strategy should be in place both at the national and local levels in order to effectively attract investment in research and infrastructure to develop and commercialize new products or processes. A regional innovation strategy is a necessary instrument for the successful development of the local economy, and it is especially effective for regions with a high innovation potential.

A country's international competitiveness determines, first of all, the innovative regional environment. By WEF estimates, the US has been the key innovator throughout the past ten years, although in this country half of R&D is carried out in six of fifty states, while twenty states account only for five per cent of all research and development. However, the governments of states with less developed regions also try to be involved in the innovative processes and create proper conditions for industrial research and regard financing R&D as strategic investment.[12]

In most regions of Europe innovation systems are developed and corresponding strategies framed to support economic growth, thereby confirming the thesis that innovation activity today is necessary not only for highly developed regions, but for all regions of the world. Since the mid-1990s the European Commission has been stimulating and supporting the design of regional innovation strategies through special RITTS and RIS programs. With the assistance of the latter more than 120 European regions received the support of experienced consultants for analyzing their innovation potential and designing regional innovation strategies. Regular European competitions have been financing regional innovation projects, and the depressed territories received seventy-five per cent of the financial resources. Besides, the EU is expending a considerable amount of effort to set up networks for the exchange of information between regions. One example is the Inno-

[12] W. Powell, «The Spatial Clustering of Science and Capital: Accounting for Biotech Film,» *Regional Studies Association* No. 36 (2002): p. 294.

vative Region in Europe (IRE) that includes different regions of the EU.[13]

Therefore, it is necessary to set up in the regions proper infrastructures for innovation to embrace the organization and types of activity related to computerization, the establishment of networks and technology transfer (small business incubators included), support of venture enterprises, as well as institutions for partnerships and cooperation among researchers of universities, commercial companies and governments.

The practice of highly developed countries shows that depressed regions are also very much prepared to introduce innovation strategies for dealing with their crises with the assistance of new technological solutions.[14] In this respect Hungary might serve as a good example. The majority of its high-tech companies are concentrated in several eastern industrial regions. In 1998 these were depressed; however, the creation of conditions to attract investment mostly in the «new economy» contributed to reducing the gap in the development rates of this country's regions. For Ukraine, the building of its own National Innovation System and a pro-active regional policy would be an important step on the way of integrating into the world innovation environment.

Innovative Competitiveness of Ukraine's Regions

The growing competitiveness of Ukraine's economy will depend on how the regions will pursue an active innovation policy and stimulate the innovation activity of economic entities. Although the innovative processes in the regions have been extensively researched, there are still many issues to address. For instance, the gross regional product is not assessed at all and this is also true for the corresponding regional competitiveness index. Moreover, all indicators of Ukraine's innovative capacity do not comply with world techniques and the latest in-

[13] *European Innovation Scoreboard 2003*, European Commission, Commission Staff Working Document, SEC (2003)1255, Luxembourg, 2003, p.10.

[14] I. Ivanov, «Natsionalnye innovatsionnye sistemy: opyt formirovania i perspektivy razvitia [National Innovation Systems: Experience in Establishment and Prospects of Development],» *Innovations* No. 4 (2002): pp. 17—18.

dicators of innovative productivity such as human resources, knowledge generation, knowledge transfer and application, and the financing of innovations.

The competitiveness of Ukraine's regions is computed according to the EU technique (see Table 2). The most competitive regions are the city of Kyiv, Donetsk oblast, Odessa oblast, Dnipropetrovsk oblast, Ivano-Frankivsk oblast, and the city of Sevastopol. However, the labor productivity levels of these regions are only about one-third of the labor productivity of Europe's outsiders. In terms of competitiveness, only the Kyiv region corresponds to the Azores level (that holds one of the last places).

Table 2.Competitiveness of Ukraine's Regions

Regions	Gross regional product, US$ million (2001)*	GRP per capita (2001)	Working time fund, man hours worked (2001)**	Competitiveness (productivity level)	Share of innovative enterprises in overall number, per cent (2004)
1	2	3	4	5	6
Ukraine	207,060	4350	20,893,8	9,9	12,3
Autonomous Republic of Crimea	6,216	3108	807,5	7,7	17,2
Vinnytsia	5,521.6	3248	764.2	7.2	9.4
Volyn	3,433.1	3121	394.4	8.7	7.9

Regions	Gross regional product, US$ million (2001)*	GRP per capita (2001)	Working time fund, man hours worked (2001)**	Competitiveness (productivity level)	Share of innovative enterprises in overall number, per cent (2004)
1	2	3	4	5	6
Dnipropetrovsk	18,427.5	5265	1815	10.2	7.5
Donetsk	25,469.3	5419	2,317.7	11.0	12.3
Zhytomyr	3,669.4	2621	578.42	6.3	10.7
Transcarpathia	3,315	2550	350.2	9.5	14.0
Zaporizhia	9,028.8	4752	930.8	9.7	9.9
Ivano-Frankivsk	4,456.2	3183	423.1	10.5	12.1
Kyiv	7,272	4040	751.1	9.6	14.1
Kirovohrad	3,544.2	3222	472.4	7.5	25.0
Luhansk	8,375	3350	1,076.81	7.8	6.6
Lviv	8312.2	3197	970.4	8.6	5.4
Mykolaiv	4,742.4	3952	537.6	8.8	10.2
Odessa	10,653.6	4439	990.6	10.8	9.5
Poltava	7,472	4670	800.2	9.3	10.1
Rivne	3,754.8	3129	431.1	8.7	9.3
Sumy	4,728.1	3637	617.6	7.7	6.8
Ternopil	2,601.5	2365	394.5	6.6	10.9
Kharkiv	11,991.5	4135	1,314.2	9.1	18.2
Kherson	3,223	2930	477.9	6.7	10.2
Khmelnytsky	4,060	2900	620.5	6.5	6.1
Cherkassy	4,114.6	2939	627.4	6.6	9.1
Chernivtsi	2,094.3	2327	281.2	7.4	10.1
Chernihiv	3,853.2	3211	553.8	7.0	11.7
City of Kyiv	36,418.8	13 795	1,458.9	25.0	40.8
City of Sevastopol	14,57.2	3643	134.1	10.9	2.4

Computed according to: V. Chuzhykov, «Vnutrishnioregionalna dyversyfikatsia zovnishnoi torhivli Ukrainy [Regional Diversification of Ukraine's Foreign Trade],» *International Economic Policy* No. 1 (2004): pp. 53-71.

** *Statystychny shchorichnyk Ukrainy za 2003 rik* [*Statistical Yearbook of Ukraine for 2003*] (Kyiv: Tekhnika Publishers, 2003), p. 662.

Since the latest indicators of the region's innovative productivity are lacking, their innovation receptivity will be determined by grouping them according to financial expenditures and the results of innovative activity.

In our opinion, it would be advisable to determine a region's innovation receptivity by using coefficients of advance innovative development (or receptivity) at the stage of manufacturing and the stage of consumption. The coefficient of advance innovative development at the stage of manufacturing is determines as follows.

$$R_{\text{ВІР}_\text{В}} = \frac{T_{\text{ІПП}}}{T_{\text{ВІ}}},$$

where $Т_{ІПП}$ — growth rate of the share of innovative products in the overall volume of industrial products by the region's economic subjects;

$Т_{Ас}$ — growth rates of expenditures for research and development in the region's industry.

$$T_{\text{ІПП}} = \frac{\text{б}_t}{\text{б}_{t-1}},$$

where α_t, α_{t-1} — share of innovative products in the total volume of products in period t, t–1.

$$T_{\text{ВІ}} = \frac{\text{в}_t}{\text{в}_{t-1}},$$

where β_t, β_{t-1} — expenditures for research and development at the region's industrial enterprises in period t, t – 1 (UAH billion).

If the share of the innovative products grows faster than expenditures for their manufacturing from different sources, a growth of innovation receptivity occurs and the coefficient of advance innovation development is more than one ($К_{авр} > 1$).

If the growth rate of expenditures exceeds the growth rates of innovative products ($К_{авр} < 1$), it means that the efficiency of innovative activity has become worse and innovative development slows down.

This indicator can be assessed much more precisely by the ratio of growth rates in the share of fundamentally new products in the total output of products relative to the growth rates of expenditures for research and development. However, statistical data make it impossible to estimate the indicator regionally. Therefore, it is advisable to use the given indicator for individual subjects or as one of the macroeconomic indicators of innovation receptivity.

We also suggest estimating the coefficient of innovative activity results as

$$R_{\text{РІД}} = \frac{Q_{\text{Ш}}}{Q_{\text{ПДР}}}, \qquad (4.4)$$

where $Q_{\text{Ш}}$ — volume of output developed for the first time within the past three years, UAH billion;

$Q_{\text{ПДР}}$ — applied research and developments in technical works, UAH billion.

This coefficient reflects a balanced demand and supply on the innovations market. The higher the coefficient, the better the innovation climate in the region.

The coefficient of advance innovation development (at the stage of consumption) can serve as yet another indicator characterizing innovation receptivity (at the stage of consumption).

$$\text{К}_{\text{ВІД}} = \frac{T_{\text{Ш}_Q}}{T_{\text{ТІ}}},$$

where $T_{\text{Ш}_Q}$, $T_{\text{ТІ}}$ — growth rates of innovative products output and growth rates of technological innovations, respectively.

$$T_{\text{Ш}_Q} = \frac{Q_t}{Q_{t-1}},$$

where Q_t, Q_{t-1} — volume of innovative products, UAH billion

$$T_{\text{ТІ}} = \frac{t_t}{t_{t-1}},$$

where t_t, t_{t-1} — expenditures for technological innovations.

Innovation receptivity of the region grows, if the value of this coefficient is more than one $(K_{\text{BIP}_C} > 1)$.

Evaluating the innovation receptivity of Ukraine's regions, we can conclude that quantitatively our country has a strong enough R&D potential. In 2002, scientific and technological activity was pursued by 1,477 organizations, of which 26 per cent were concentrated in Kyiv, 15 per cent in Kharkiv oblast, but only 0.5 per cent in Khmelnytsky oblast, 0.8 per cent in Zhytomyr oblast, and 1.1 per cent in Transcarpathian oblast. Accordingly, we observe an uneven distribution of scientific personnel in the regions. The city of Kyiv has a 35 per cent concentration of personnel, Kharkiv oblast 17.1 per cent, Dnipropetrovsk 7.2 per cent, while in the regions several centesimal of one percent. Moreover, the largest share of specialists with a Doctor of Sciences degree (*doktor nauk*) engaged in scientific and technological work — about 63 per cent — is in Kyiv, while in Vinnytsia, Volyn, Zhytomyr, Luhansk, Rivne, Sumy, Kherson, Khmelnytsky and Cherkassy oblasts the rate is only 1.4 per cent[15].

In 2002, total funding for R&D increased by 7.4 per cent compared to the year before, but it was still unevenly distributed for the regions. Only 69 per cent of budgetary funds were allocated to the scientific institutions of Kyiv and Kharkiv, although these regions were quite well funded from local budgets — over 80 per cent of all allocations. The scope of scientific and technological work performed by the scientific organizations of Kyiv oblast and Kharkiv oblast on their own accounted for 54 per cent, while the poorest results — about 1 per cent — were registered in the scientific organizations of Khmelnytsky, Ternopil, Rivne, Kirovohrad, Transcarpathian and Zhytomyr oblasts. The share of R&D funding in GDP accounted for 1.2 per cent in 2001, and a mere 0.37 per cent was provided from the state budget, which is inadmissible, given the sharp

[15] *Naukova ta innovatsiyna diyalnist v Ukraini. Statystychny zbirnyk* [*Scientific and Innovative Activity in Ukraine. Statistical Collection*], State Committee on Statistics, Kyiv, 2003, p.16.

decline in the economic entities' innovation activity. The high concentration of finance in Kyiv did not result in any robust innovation activity in this region. Kyiv shares the seventh and eighth places among the regions by the number of introduced new technologies in 2001-2002 and sixth place by the number of wasteless technologies.[16]

Within this same period scientific organizations completed 57 per cent fewer developments than in 1991. New technological solutions embodied in inventions used in each fourth development for building new types of equipment amounted to 900 units, i.e. 87 per cent fewer than in 1991. The regional distribution of this rate confirms the downward trend in innovation activities. The low results are also explained by the inadequately equipped scientific organizations, their deteriorating material and technical support, as well as the moral ageing of scientific plant and equipment. While the average value of equipment supplied to researchers was UAH 11,400 and UAH 11,900 in 2001 and 2002 respectively, the amount supplied to the regions (Ternopil, Chernivtsi and Ivano-Frankivsk) was ten times less. Moreover, in 2001 capital investment in organizations, institutions and enterprises involved in research and development accounted for only 0.24 per cent of all investment, which is altogether insufficient, given the considerable moral and physical ageing of the scientific organizations' fixed assets.

The regional structure of innovation activity has clearly demarcated territorial boundaries, since the bulk of the scientific potential is concentrated in the Kharkiv region and Kyiv (52 per cent of the personnel of scientific organizations). Accordingly, the State Department of Intellectual Property issued 15 per cent of protection documents in Kharkiv oblast and 26 per cent in Kyiv. In 2001-2002, the share of such regions as Volyn, Zhytomyr, Kyiv, Rivne, Khmelnytsky and Chernihiv oblasts did not exceed 3 per cent.

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[16] Rozrakhovano za: *Naukova ta innovatsiyna dialnist v Ukraini. Statystychny zbirnyk* [Computed according to: *Scientific and Innovative Activity in Ukraine, Statistical collection*], State Committee on Statistics, Kyiv, 2002-2003.

International scientific and technological cooperation is an inherent feature of the activity of scientific organizations. The number of scientists working in other countries under contracts increased in 2002 by 23 per cent compared with the year before. Their largest share among the regions was in Kyiv — 41 per cent. In 2002, Ukrainian scientists received 1,673 grants from international funds. Their highest share landed again in Kyiv — 35 per cent, Kharkiv oblast and Lviv oblast — about 16 per cent, and the lowest — 0.1 per cent — in Rivne, Cherkassy, Kirovohrad and Zhytomyr oblasts. Travel of Ukrainian scientists abroad retains a similar trend at the regional level.

The irregular work of scientific organizations negatively impacts on the innovation activity of enterprises. While in 2001, 16.5 per cent of all surveyed enterprises were involved in innovations, in 2004 the rate was 12.3 per cent; those that introduced innovations accounted for 14.3 per cent in 2001, 14.6 per cent in 2002 and 10 per cent in 2004. At the regional level the highest rates of introducing innovations at industrial enterprises, as compared with the previous period, were registered in Odessa oblast (329 per cent), Cherkassy oblast (154 per cent), Chernihiv oblast (130.2 per cent), Kharkiv oblast (118 per cent) and Volyn oblast (122 per cent).

The share of shipped innovation products in the overall output of shipped products is the most important indicator of innovative activity. In 2001-2002, it was about 7 per cent, which is three percentage points less than in 2000, while in 2003 it was a mere 5 per cent — UAH 12,882.1 million, including 44 per cent (UAH 5,640.9 million)[17] of fundamentally new products. If we take a look at the indicator reflecting the ratio of fundamental products to the output of innovative products, it was the highest in 2002 in Transcarpathian oblast — 94.6 per cent, Luhansk oblast and Kirovohrad oblast — 80 per cent, and the lowest in the Autonomous Republic of Crimea and Odessa oblast.

[17] Rozrakhovano za: *Naukova ta innovatsiyna dialnist v Ukraini. Statystychny zbirnyk* [Computed according to: *Scientific and Innovative Activity in Ukraine, Statistical collection*], State Committee on Statistics, Kyiv, 2002-2003.

The main innovation expenditures in 2001-2003 were involved in the acquisition of machines, equipment, gear, and the like — about 62.0 per cent. Only 10.2 per cent of all the expenditures were allocated for research and development. Throughout the past few years this rate has been declining and amounted to UAH 312.4 billion in 2003.[18]

The poor results of innovation activity are evident in the exports of innovative products — 15.7 per cent of total exports. The rate of innovative products shipped abroad as compared to the overall volume of shipped products amounted to 30.5 per cent. Among the regions this indicator was the highest in Donetsk oblast — 63.7 per cent, Zaporizhia oblast — 48.2 per cent and Kherson oblast — 37.9 per cent, and the lowest in Cherkassy oblast — 1.8 per cent and Vinnytsia oblast — 6.7 per cent.

Financial provision of innovation activity depends on a state's investment climate and embraces a considerable number of different factors. The main sources for financing innovations in Ukraine are the funds of enterprises and organizations (over 80 per cent within the past few years), the means of the state budget and local budgets — 2.9 per cent, credits — 6 per cent, national and foreign investment — 4.8 per cent, and other sources — 2.4 per cent.

On these grounds it can be concluded that Ukraine's investment climate is unfavorable. The distribution of all innovation finance across the regions makes it possible to group all oblasts into three classification categories. Group I embraces seven regions and accounts for 72 per cent of all innovation finance. Group II embraces nine regions and accounts for 21 per cent of all finance, and Group III — 11 regions and 7 per cent of finance. The average level of finance in the groups differs markedly. While in Group I it amounts to UAH 204.8 billion, in Group III it is UAH 9.2 billion.

What can also be observed is the uneven regional financing from different sources. For instance, in 2001, 91 per cent of funds were allocated from the state budget to Group I, about 2 per cent to Group

[18] *Statystychny shchorichyk Ukrainy za 2003 rik* [*Statistical Yearbook of Ukraine for 2003*] (Kyiv: Tekhnika Publishers, 2003), p. 349.

II, and 7 per cent to Group III oblasts. Only three regions — Kharkiv oblast, the Autonomous Republic of Crimea, and the city of Kyiv– received funds for innovation activity from local budgets. Although extra-budgetary funds amounted to a mere 1.2 per cent of all finance, 91 per cent of these means were allocated to Group I regions and about 9 per cent to the other two regions. National and foreign investors — 96 per cent and 76 per cent respectively — preferred enterprises in the Group I regions.

In 2002, the results of innovation activity at the stages of manufacturing and use at the regional level also showed a low receptivity to innovations. In this respect, we can single out the following classification groups:

Group 1 — regions with high innovative capacity at the stages of manufacturing and use: Autonomous Republic of Crimea, Poltava oblast;

Group 2 — regions with high innovative capacity at the stage of manufacturing or the stage of use: Zaporizhia, Kherson and Cherkassy oblasts;

Group 3 and Group 4 — regions with a slowed-down development of innovations: Donetsk, Dnipropetrovsk, Kharkiv, Kyiv and other oblasts;

Group 5 — regions with extremely low innovative receptivity: Chernivtsi oblast[19].

Such a situation in regional receptivity to inventions undeniably proves the lack of an effective system for encouraging innovation activity at the national and local levels. A reasonable suggestion would be to stimulate innovation activity of economic entities at all levels, especially at the level of a region's regional administration. Although in some regions innovation finance was much higher than in others, there was no growth of the share of innovation products in overall output. According to the growth rates of expenditures for research and development, a number of regions can be included in Group 1, while according to the growth rates of innovative products in the overall volume of shipped products these regions can be included in the last group. In terms of the dynamics of the re-

[19] *Naukova ta innovatsiyna diyalnist v Ukraini. Statystychny zbirnyk* [*Scientific and Innovative Activity in Ukraine. Statistical Collection*], State Committee on Statistics, Kyiv, 2002, p. 625.

gions' innovation capacity, we can single out the Autonomous Republic of Crimea in Group 3, and Poltava oblast in Group 2, while innovation activity is slowing down in all oblasts of Group 1.

This indicator should be computed over a lengthier period of time (advisably for three years), but, allowing for the change of the classifier of industrial enterprises by the Ministry of Statistics, the data of the previous periods are incomparable. However, in the past few years the reduced length of time to develop new equipment increased the share of products that were manufactured in less than one year. This concerns machines, equipment and devices as well as instruments and automation hardware. In 2001, the average length of time to produce new types of machines, equipment, instruments and automation hardware in Ukraine was 1.6 years, while for some types of mechanical engineering products it was half a year. Notably, the competitiveness of goods and services on the domestic and foreign markets depends precisely on the mechanical engineering industry.

Relying on the analysis of the innovation receptivity of Ukraine's regions, we can conclude that at the regional level the forms and methods of state management of scientific and technological activity are not adequately elaborated. The described trends prove without any doubt that an effective system for encouraging innovation activity has not yet been established at the regional and national levels, and therefore a special extensive system of regulations of this process is required to invigorate it.

The negative trends that evolve in innovation require a flexible approach to formulating innovation policy and ensuring legal regulation of innovations at all stages of their life cycle and at all levels. Taking into account the country's uneven scientific and technological potential, the regional innovation systems, as a component of the National Innovation System, are an effective instrument of territorial development. In our opinion, a strategy to enhance international competitiveness cannot materialize without building up the National Innovation System, in which the absence of one subsystem can slow down or halt innovative activity.

Conclusion

This analysis can serve the purpose of confirming that for Ukraine there is no alternative to innovation progress, because international competitiveness cannot be enhanced in any other way. It is necessary to design a state strategy (to 2025) to enhance the international competitiveness of the national economy and convert Ukraine into a powerful and economically developed country with a high competitive status recognized by the world community. By 2006 it will be necessary to create the conditions for speeding up the transition to an innovative model of development. This foresees the establishment of a National Innovation System that has to be closely bound up with an intellectual property policy and operate at the regional and sectoral levels of a single system controlling the process of commercializing the results of intellectual activity integrated in modern telecommunication facilities. By 2006-2007 it will be necessary to organize constant benchmarking of the country's competitive advantages, pursue a policy that facilitates the development of technological foresight, and stimulate the creation of industrial clusters.

In our opinion, the following actions should be proposed:

- the stimulation of innovation activity of economic entities at all levels — from the government to local bodies of authority. State policy should facilitate the development of innovation activity on the basis of designed long-term scientific and technological programs as set out in the Law *On the Priority Areas of Innovative Activity in Ukraine.* Under this law Ukraine's executive bodies are bound to create a most favored regime for the performance of works aimed at realizing the respective priority areas and concentrating financial, economic and intellectual resources in them.
- the pursuit of a regional-level innovation policy by program-oriented and economic methods, since regionalization offers the opportunity to include in the economic mechanism additional factors for the development of economic entities by using more fully

and efficiently all types of resources of individual territories, taking into account the regions' territorial division of labor, the uneven development of productive forces as well as scientific potential. In compliance with the priorities, it is necessary to determine a long-term strategy of innovative development of the regions and design regional scientific and technological programs that enjoy regional support. Economic methods of management should embrace the following: direct financing, preferential crediting of innovation projects, and financial support of infrastructure.

Effective regional innovation systems can also be developed in Ukraine as well. Regional tax incentives are of special importance, since they attract financial resources for science-intensive production, promote venture business, engage entrepreneurs and highly skilled scientific personnel in depressed regions, create powerful high-tech clusters, technopolises, innovation infrastructure, and the like. Therefore, it is advisable to exempt small innovation enterprises from paying local taxes for a specific period as well as different extra-budgetary funds that invest their resources in the investment projects of a region.

- the establishment of an efficient national system of regional innovations centers. Taking into consideration the uneven distribution of the country's scientific and technological potential, specify the boundaries of the regional centers by assigned to existing centers a respective scientific servicing zone consisting of several oblasts. The Western Regional Center should comprise Lviv, Volyn, Transcarpathian, Ivano-Frankivsk, Ternopil, Khmelnytsky and Chernivtsi oblasts; the Central Regional Center should comprise Kyiv, Vinnytsia, Rivne, Zhytomyr and Cherkassy oblasts as well as the city of Kyiv; the Southern Regional Center — Odessa, Mykolaiv and Kherson oblasts, the Autonomous Republic of Crimea and the city of Sevastopol; the Northeastern Regional Center — Kharkiv, Poltava, Sumy and Chernihiv oblasts; the Dnieper Regional Center — Dnipropetrovsk, Zaporizhia and Kirovohrad oblasts; and the Eastern Regional Center — Donetsk and Luhansk oblasts.

In order to enhance the status of the regional scientific centers and their importance in implementing state scientific and technological policy (including venture business) in the regions, it is important to enlist the cooperation of all organizations and institutions that are engaged in innovative activity and have free funds. A regional scientific center performs the functions of a coordinator, chief expert and organizer of regional programs of scientific and technological development, of which venture business should be a component.

- the establishment of a powerful system of innovation finance from all possible sources, including regional venture funds, budgetary resources, means of legal entities and individuals, foreign investment, and the like. It is advisable that regional support of venture business be managed by state administrations in the oblasts with the assistance of scientific coordination councils and expert agencies. The councils are to determine the financing of the region's scientific-technological and innovation projects as well as the extent of assistance to venture business. It is also important to set up centers for the development of venture business at the bodies of the executive.

The main attention of national innovation and investment policy should be centered on evening out the regions' levels of socioeconomic development by efficiently using local conditions and resources and invigorating foreign trade. Therefore, it is necessary to create in the depressed territories favorable conditions for attracting foreign investment in high-tech production and raising the investment attractiveness of regions through the active use of special (free) economic zones. Using its regional advantages, each region should seek its own solutions.

- the support of as much as possible the development of inter-regional cooperation in scientific and technological activity. The analysis of regional specializations at specific stages of R&D showed that inter-regional exchange of the results of scientific activity is extremely import for achieving the set objectives. It is advisable to expand cooperation by setting up joint ventures in high-tech

sectors of industry and attracting the resources of foreign investors.

To make a state's economy operate globally as a technologically dynamic system and ensure its competitiveness in the future, it must build an innovation system that would combine the scientific and technological potential of regions with a set of economic measures aimed to promote quick commercialization on the domestic and foreign markets.

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