

National innovative systems: the level of activity among countries

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Abstract. The article explores the level of development of national innovative systems among countries. Specifically, the statistics is presented and it proves that the leaders in the formation of NIS are Switzerland and Sweden. The article highlights the main factors of the level of the innovative activity: the level of education (the higher the educational culture is, the more the probability of the innovative activity for the given society is), the availability of the financial capital, the level of economic transparency.

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Introduction

Austrian economist Joseph Alois Schumpeter is considered to be the founder of the theory of innovative development. In fact he concentrated on the economic innovations and stated the value of the role of the entrepreneur-innovator in the economic process.

In the beginning of the XX century he was able to show that technical innovation is the means of reaching high profits [1]. That discovery was opposite to the theory of economic growth by J. Nanmann [2] that did not mention the impact of technological progress.

G. Mensch established the regulations about basic, improving and pseudo innovations, the relationship among long-term cycles in the field of inventions, innovations and economy. The process of innovative development, as G. Mensch stated, occurs after the stage of depression [3].

There are approaches to the innovations that are developed today. The approaches deal with system-oriented conditions and factors of innovative development (structural and institutional). Innovations are viewed from the system-oriented approach and as an application to the concrete economic policy that involves building innovative systems on the state level [4].

The most contemporary concepts consider innovations through the lens of management goal that forms the general system-synergetic paradigm for all theories of innovations [5].

In 2005 G. J. Hospers analyzed the results of Schumpeter's heritage through the lens of modern orientations of economic science that broach a subject of innovations in neoclassic theory, evolutionary economic theory and political science [6]. M. Laranjaa, E. Uyarrab, K. Flanaganb gathered

theoretical reasons for the innovative economic policy [7].

R. Rothwell singled out five stages or phases of innovative development. In fact he found out that every new level of development was a reaction to considerable modifications in the market. For example: economic growth, industrial expansion, growing intensity of competition, inflation, stagnation, reconstruction of economy, unemployment, scarcity of resources [8]. Consequently, his model is multilevel in its essence.

So that, these cumulative researches state that the theory of innovations produces a conglomeration of distinct theories of innovations which are formed in the range of different directions of economic thought.

The concept of formation of national innovative systems was developed in 80-90 years of the XX century. R.Nelson [4], C. Freeman [9, 10] and B.-Å. Lundvall [11] are known as the main researchers of NIS.

National innovation system as an economic category is a product of combination of globalization processes and differentiation. "National Innovative system, - C. Freeman says, - is a complex system of economic subjects and public institutions that take part in production, storage, distribution and transformation of knowledge into new technologies, goods and services consumed by society [12].

According to the classical definition by R. Nelson: the set of institutions and interactions among them that defines innovative productivity of national companies [4]; B.-Å. Lundvall's: the set of elements and networks that interact in the process of production, distribution and usage of the new profitable knowledge and are arranged in one nation [11]; S. Metcalfe's: the set of appointed institutions that contribute to the development and distribution of new technologies, create new environment, where

governments form policy that influences an innovative process. It is a system of interrelated institutions which includes creation, storage and transmission of knowledge, experience, skills and products that contain new technologies [13].

Monograph «Technical Change and Economic Theory» became a basic scientific study that summed up a collective research of the group of the scientists from different countries [14]. The group of authors, that included B.-Å. Lundvall. C. Freeman

and R. Nelson, formulated main ideas of the concept of national innovative system:

1) First, the idea about innovations and scientific research as the main factors of economic development and competition

2) Second, idea that institutional structure is a factor that influences the contents and structure of innovative activity.

3) Third, the idea that scientific knowledge plays considerable role in the development of the economy.

Table 1. The list of programs of innovative policies in different countries

Countries	Programs	Contents of a program
Great Britain	«Innovative nation», 2008	Program deals with creating the most attractive conditions for innovative business and government service in the world
	Small Business Research Initiative	Program deals with financing of products from the critical stages of development
	Train to Gain, 2006 r	Program helps employers to define what level of specialists they need. By the December of 2007 more than 72 000 employers entered the program.
Ireland	Leadership and Management programme	Program for raising the level of managers' skills sponsored by government.
	START	Program for providing access to the information and learning for start-ups.
	Skillnets	Program that ensures raising the professional level of management of small and medium enterprises.
Switzerland	Industry-Led Networks Pilot programme	Program that presents a support for industrial networks that ensure cooperation in different industries.
	Program of innovative checks in the crisis periods.	Support of innovative research that have small budget, support of small and medium enterprises. Moreover program includes special grants for researchers equal to 7500 Swiss francs, the grants are given for those who have initial designs of innovations.
Norway	Program OG21 (Oil and Gas in the 21st Century)	The priority branches of the program include sustainable development, increase of the coefficient of oil extraction, development of effective programs and technologies that deal with development of shelf. Program is addressed to representatives of universities, research institutions, oil companies and members of government.
Netherlands	Cluster program: "Point one: nanotechnologies and implemented systems"	Mission of program is to realize the potential of the country in the field of creation an ecosystem of nanoelectronics that will exceed best world analogues.
Spain	Government strategy for innovations.	1 stage (2010-2015) – solution for the current objectives to innovative development. 2 stage (2016-2020) – convergence with other countries in the field of innovations
	INNPACTO	Cooperation of government and business in financing of the innovative projects
	INNPLANTA INNOCAMPUS	Creation and improvement of the infrastructure of technological pools and universities and assistance in the transfer of knowledge.
Israel	Program of support and stimulating of the activity in the field of research, development and innovations «Ingenio 2010»	Activation and unification of government institutions, private companies, universities and other structures that have relation to the research and development.
	Program Yozma	Creation of the own venture industry
	Policy of horizontal technological development	Maximization and institutionalization of R&D among the companies of the private sector
China	Program «863»	Development of the scientific and technological potential of the country as a base for sustainable economic growth in the midterm perspective. Priority is given for eight directions: bioengineering, space engineering, information science, laser techniques, power engineering, and technique of the exploration of the ocean.
	Program «Spark»	Development of farming on the base of implementation of scientific and technical achievements.
	Program «Torch»	Activation of the implementation in the production process of the best foreign and national achievements.
	Program «973»	Development of the fundamental research in the system of the Chinese Academy of science.
	Program «Creation of new knowledge»	Creation of the network of "international centers of knowledge" for the development of intellectual innovations.
	Fund of small and medium enterprises of scientific field.	Creation of the mechanism of venture investments and making profit from the achievements of the research and development of small and medium enterprises.
South Korea	Midterm and long-term government programs for R&D activity.	Defines relevant directions of innovation policy of the country until 2020.
	Program "On the edge of XXI century"	Development of the basic technologies and key technologies in the priority industries.
Brazil	KOSBIR - Korea Small Business Innovation Research	Support of the small and medium innovation business
	Policy of the development of productivity	Defines target volumes of financing and tax concessions in key industries (information technologies, biotechnologies, power engineering)
USA	Program of the rapid development of the science, technology and innovations.	National plan of the measures in the field of science and technology.
	Small Business Innovation Research Program - SBIR	Financial and consultative aid for the innovative companies.
	Small Business Technology Transfer Program - STTR	
Thailand	Small business investment company – SBIC.	Support of the small and medium enterprises in R&D.
	Project «Industrial and technical clinic»	
Indonesia	Projects for the creation of the technoparks	Formation of the national network of the technoparks.
Belgium	High Level Group 3% / Haut conseil 3%	Support of the development of innovation system on the federal level
	FFG The Austrian Research Promotion Agency	Financing of the innovation projects
	AWS The Austria Wirtschaftsservice Gesellschaft	Creation of the competence centers in the high technology industries.
	Competence Centers for Excellent Technologies	
	Program Aplusb (Academia + Business)	Forming of consortiums of scientific and industrial companies, supporting of the new high technological companies
	Program FHplus	Creation of centers of competence in technological schools
	Program JITU (Förderung von Gründung und Aufbau junger innovativer technologieorientierter Unternehmen)	Financial support for establishment of new technological companies.
Finland	Program COIN (Cooperation and Innovation)	Stimulating the innovation activity among companies
	Program OSKE (The Centre Expertise Program)	Creation of management system of innovation processes and development of regional specialization.
France	Fund "Sitra"	Investment in new technologies.
	Government plan for stimulation the patenting of inventions by local companies.	Improvement of the patenting system, lowering of patenting fees, support for local companies in patenting procedures.
Japan	Program PME	Stimulation of private investment in science, improvement of interactions among members of innovation process, support of small and medium enterprises.
	Basic plans of development of science and technology.	Scientific and technological development of economy.
Sweden	Program "The Innovation Bridge"	Support of making profits from the results of scientific research.
	ALMI Business Partner	Support of creation of innovation companies.
Germany	Program of promotion of qualification of specialists.	Support in training provision for small innovation companies.
	Programs of private-public partnership in scientific industry.	Promotion of investment in R&D.
India	Provision of tax discounts.	Deduction of R&D spending from revenues.
	Creation of scientific and technological parks.	Stimulating of production of export software
Canada	Strategy "Mobilization of science and technology for reaching the market advantages for Canada"	Development of priority industries: power energetic, ecology, medicine.
	Program for creation of research departments.	Attraction of specialists and activation of the process of scientific research.

The level of innovative activity among countries

In the end of XX – beginning of the XXI century the growth of importance and the scale of the innovative activity of companies of all industries

became a universal global tendency. During the 1995-2003 the share of entrepreneurial branch in global national expenditures for Research and Development in the USA increased from 71,8 to 75%, Sweden from

74,3 to 76,1; Japan – from 70,3 to 72,7%; Germany – from 66,5 to 71,3%; France – from 61,0 to 67%; Great Britain from 65 to 66%; South Korea – from 73,7 to 74,5%; China – from 18 to 39%. In prospect this tendency will remain and spread on those countries which R&D is sponsored by government. In Russia private companies spend 10% of investments on R&D, however in European countries the analogous rate starts from 50% and higher.

Today we can give many examples of innovative projects [see table 1].

By the beginning of the second decade of XXI century the USA continued to take the lead over other countries in gross financial support for R&D and government spending on R&D in comparison to GDP.

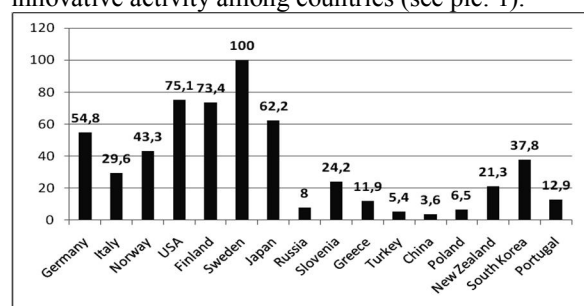
However, annual reports of INSEAD and World Intellectual Property Organization (WIPO) show that Switzerland and Sweden are the current leaders [15].

Table 2. Global Innovation Index of leading countries of 2008 - 2013[16]

The Innovation Index 2008-2009	The Global Innovation Index 2009-2010	The Global Innovation Index 2011 Accelerating Growth and Development	The Innovation Index 2012 Stronger Innovation Linkages for Global Growth	The Global Innovation Index 2013 The Local Dynamics of Innovation
USA	Iceland	Switzerland	Switzerland	Switzerland
Germany	Sweden	Sweden	Sweden	Sweden
Sweden	Hong Kong	Singapore	Singapore	Great Britain
Great Britain	Switzerland	Hong Kong	Finland	Netherlands
Singapore	Denmark	Finland	Great Britain	USA
South Korea	Finland	Denmark	Netherlands	Finland
Switzerland	Singapore	USA	Denmark	Hong Kong
Germany	Netherlands	Kazusa	Hong Kong	Singapore
Japan	New Zealand	Ireland	Germany	USA
Netherlands	Norway	Great Britain	USA	Ireland
...
68. Russia	64. Russia	56. Russia	51. Russia	62. Russia
...

There is an index of innovative activity accepted in world practice (IAK). The index shows gross investment in innovations in all industries of national economy.

According to the analysis of the index, we introduce rough diagram that shows aggregate level of innovative activity among countries (see pic. 1).



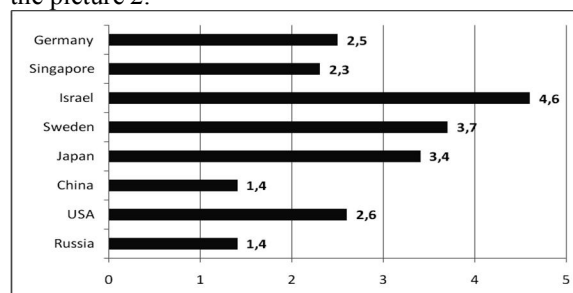
Picture 1– Innovative activity among countries, 2011 [17]

The diagram is based on the index of the educational level among the countries. The index of United Nations Development Program represents complex value from 0 (minimum) to 1 (maximum).

The diagram includes information only about countries with the high value of index. Consequently, the leader of this index is Sweden.

It can be implied that the higher the level of education is the more the probability of the innovation activity is. Sweden is among top-ten countries with the highest level of education according to the Index of UN.

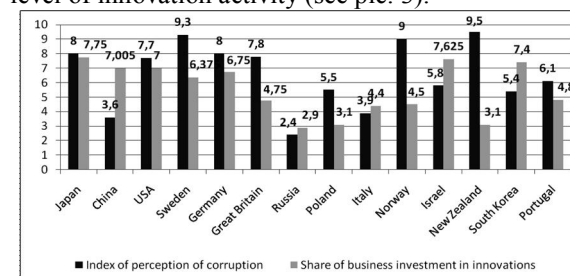
The second factor that influences the level of innovation activity is the amount of investment capital. The level of investments determines the innovation potential of the country. The most vivid example of the correlation between government expenditures on innovations and GDP is presented on the picture 2.



Picture 2. Investment in innovations in comparison to GDP, 2011 (%)

The level of investment that equals 2 percent is more typical for active countries in relation to their innovation work and shows serious government approach to innovations.

The third factor that shows innovation activity among countries is the level of economic transparency. This category determines the main problem for any country's economy – corruption. It can be stated that there is a very interesting regularity: the level of corruption in a country influences the level of innovation activity (see pic. 3).



Picture 3 – Index of perception of corruption in countries in comparison to investment in business innovations 2011[17]

This picture is based on the index of perception of corruption in countries in comparison to investment in business innovations 2011.

As it can be implied from the picture 3 the most innovative and developed countries are those who have the smallest level of corruption.

Conclusion

It can be highlighted that there is an intense concentration of innovation activity in some countries and leading companies. Thus, companies of three countries – USA, Japan and Germany – make up 73% of 700 largest technological countries in the world. Admittedly, the share of the USA is 40%. Three leading technological industries – information technologies, motor-car construction and pharmaceuticals – involve 57% of R&D in 25 largest companies. In Great Britain this concentration is much higher, companies spend 56% of R&D on pharmaceuticals and aerospace production. Concept of R&D gained wide development in the countries – members of EU, USA and Japan.

Analysis of government policy in different countries allows picking out some components of state innovation policy:

- Creation of specific organizations and agencies that are responsible for determination and realization of innovation policy (all countries);
- Active cooperation with other countries in the field of exchange of technologies (practically all countries);
- Creation of innovation clusters (France and Germany);
- Realization of basic innovations in large transnational corporations (Sweden, France, Netherlands, India, Norway, Japan);
- Provision of free education (Germany, Norway);
- Usage of innovation vouchers (Netherlands, Great Britain, Germany);
- Significant financing of R&D in different forms.

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