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Innovation Economy and the Importance of Human Capital in the Developed Countries

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Abstract: The new worldwide sustainable development tendencies have made us believe that innovation plays a primary role, being capable of ensuring the renewal of the technical and technological production basis, achieving competitive production, developing the service industry, and leading to the shaping of the innovation economy.

Based on this scientific approach, an analysis of the innovation phenomenon and infrastructure has been carried out for the purpose of achieving a relationship between sustainable economic development and innovation. The link between these two concepts is human capital, through its innovation component.

***Key words*:** human capital, innovation economy, innovation, national innovation system, regional innovation system.

I. INTRODUCTION.

THE primary role in finding the way out of the economic crisis and in ensuring the dynamics of sustainable economic growth, *which involves the management and maintenance of the resource stocks with a sense of equity between generations* [5], pertains to ***innovation, to the innovation activity***, as capable of ensuring the renewal of the technical and technological production basis, achieving competitive production and efficiently entering the world markets.

By the end of the 20th century, mankind entered a new stage of its development, namely the stage of the post-industrial society, which is actually the result of the social-economic revolution of contemporary society.

II. THEORETICAL BACKGROUND

At the basis of the post-industrial society social and economic revolution lie the information technologies and the computerized systems, the advanced production technologies and innovation technologies, respectively, the innovation systems and the innovation organization of the various fields of human activity. The various historical time periods and industrial stages have been characterized by major features of the innovation process and a lot of models meant to prove the key role played by innovation in the economic process (Nelson and Winter, 1977; Dosi, 1982; Freeman et alia 1982; Pavitt, 1984)[3].

Considering that the entire economic system is based on production and consumption, the manual labor and the intellectual one differentiate between consumption and production and deepen the social difference within society. Consumption is the decisive factor for the innovation function. The capital increase in the structure and dynamics of the lifestyle entails essential changes related to the technical and technological evolution, thus leading to higher economic profitability.

Technology influences the labor sector, the role and the importance of humans in the economic development of society. The modification of the production technological structure has led to crucial changes in the role played by humans in production.

The final outcome, in our vision, shall be the birth of a new form of economic organization, namely the innovation economics.

Our visions related to the concept of innovation economics rely on the analysis of the contemporary economic development trends, according to which innovation economics is the society economics based on knowledge, innovation, the positive acceptance of the new ideas, systems and technologies, as well as their implementation in various fields of the economic activity.

Innovation economics is a type of economics based on the innovation flow, the continuous technological improvement, the production and export of highly technical and value-added products, and the export of technologies. Throughout the years, ***the innovation process*** has given rise to numerous reflections. Thus, Austrian economist ***J. Schumpeter*** has approached for the first time the mechanisms and factors of ***the innovation process*** and argued that *entrepreneurship and the possibility of obtaining a temporary monopoly profit might stimulate the introduction of new products to the market or the production cost reduction*. This phenomenon has been called - ***creative destruction*** -, by means of which the old market structure was destroyed in order to make room for ***a successful innovator***. We can thus state that, nowadays, ***J. Schumpeter***'s contribution to ***the innovation theory*** is topical and that the concepts of "***innovation***" and "***technological development***", which

are the core of his work, *have contributed to and influenced* ***the economic theory of innovation***.

Based on the concepts put forward by ***J. Schumpeter***, certain authors of the neoclassical theory have started to efficiently *incorporate the elements of the creative destruction into the model of the economic growth*. Among the promoters of this incorporation, mention must be made of the economists ***Ph. Aghion*** and ***P. Howitt [1]*** who have developed a model in which ***economic growth is generated by a random sequence of an innovation that results from the research activity***. This model accepts *the natural attribute of the new inventions of morally consuming the old ones*, a process which actually defines "*the creative destruction*".

In the past years, the development of the service industry and of the growth rate of certain innovations in the case of certain service suppliers has made specialists turn their attention to this branch of the innovation system as well (Drejer, 2004; Miles, 2005).[2] Researches performed by Evanghelista, 2000; Miozzo and Soete, 2001; Guerrieri and Meliciani, 2005 underlined important features which make the service innovation process significantly different from the production innovation process, as well as the interdependence between the branches of the processing and service industries in economy.

It is believed that the intellect of the scholars and innovators, that is the information field, is the one that brings the profit, not the material (industrial) production and the high financial allocation.

The modern innovation theory is founded on the hypothesis that all companies operate with the same knowledge ground, which is not unitary, but structured according to several degrees of specificity. There are researchers (A. Tofler, F. Fukuyama, D. Bell) who think that, for most of the developed countries in the contemporary world, innovation economics gives the country priority at the world level.

In our vision, the economics is innovative if in the society:

- Any individual, or group of people, companies, organizations, from every corner of the country and at any time, can have access to the recent knowledge advances from the field of science, to the new innovations, to the innovation activity and the innovation processes;
- The production, creation and access of each individual, group of persons and organizations to information are achieved via the contemporary information technologies and the computerized system;
- A developed infrastructure is ensured, which allows for the shaping of the national information resources, needed to constantly maintain the technical-scientific progress and the innovation development, capable of developing the information on the long run and thus ensuring a dynamic stability of the society social-economic development and of the scientific information;
- The activation of the automation and computerization of all the production and management branches and fields takes place as a result of the radical changes in the social structure, the expansion and activation of the innovation activity;
- There is receptivity to new ideas, knowledge and technologies, if the society members are ready to create and practically implement the innovations;
- There is development of the innovation infrastructure, capable - in an operational and flexible way - of ensuring the innovation activity against the background of competition, by imposing the creation of any kind of innovation and the development of any kind of production field.

The fundamentals of innovation economics can be summarized as follows: high level of economic freedom, high level of education and science, high and, at the same time, competitive living standards, high quality of the human capital in its broad sense, high rate of innovation companies (over 60%-80% of the total number of companies) and innovative products, capital substitution, competition and high demand for innovation, excess innovation and, consequently, ensuring their efficiency based on competition, the initiation of new markets, the market diversity principle.

The innovation economics emerges as a result of the creation of new markets of ideas, developments, intellectual property or innovative products (the market of the consumers and producers' predictions and expectations, the intellectual property market, the market of knowledge and ideas). The old technological structures are thus being destroyed and gain a new look. The market focusing on the elaboration of the new forms of organization for the companies and structures of the innovation economics (techno parks near universities, corporate centers, clusters, technology transfer centers, etc.) is also being created as a special market.

The basic knowledge of innovation economics is innovation, the innovation activity and the innovation infrastructure [7]. The coining of the new term "innovation" used to refer to a new economic category triggered the emergence of a new scientific trend "the innovatics", which studies the creation of new, its diffusion, as well as the adaptation and elaboration of the innovation policies' decisions.

Each innovation begins with a creative idea. [8] Creativity and innovation function as a whole, both having as their ultimate goal a finality by means of which new technologies come to light, thus entailing an innovation-based economic growth. In the context of society based on knowledge and on a creative economy, the intellectual capital, the creativity and innovation are the key driving forces for development, both on the macro- and micro-levels, for individuals, organizations, regions and good practice communities. [13]

Creativity and innovation are possible through people; they are achieved with the implication of people and for people.

The innovation economics, in our opinion, is a type of economics in which the main principle is different from the industrialization of the society. In this case, the focus is on the development of all the production and service fields, in the context of sustainable economic development. The main, radical role in this process of changes is assigned to science and education, as well as to the dynamics of the learning process as the essential factor of innovation.

The technical and scientific progresses have functioned in parallel for a long time in the field of innovation economics; however the crucial role belongs to science, as spring of knowledge, of invention, of openness. In this way, the "old" gives place to the "new". The fields that developed and implemented information and knowledge in the USA counted in 1955 for 25% of the gross domestic product (GDP). In 1965, they were 33%, in 1980, more than 60%, and by mid-'90s, 70% of the GDP.

Another factor which triggers innovation is the company size. The contribution of the small and big companies to innovation must be differentiated according to field. Empirical studies carried out in France in the year 1990 have shown that the contribution of the innovation companies increases with their dimension. Big companies are more prone to the research & development activity due to the lower financial risks of introducing new technologies, but also to the numerous opportunities to perform scientific research arising from their vast portfolio of technological activities [6].

In the mid-'70s USA, the number of small companies set up annually was of 300 thousands, in the '80s it increased to 700 thousands, while the years '90s registered more than 1,600 thousands. In the year 1994, the share of sole proprietorships, in the USA economic context, was of approximately 74% as compared to the 59% from 1939, but in the same time the economic activity carried out by these individual businesses left room for corporations. The share of the small and medium enterprises from the business field only covers 5.5%, while the share from the gross profit is of 20.6%. On the other hand, the share of the corporations is of 89.5% from the business sector and 70% from the gross profit. In the same time, corporations are the fifth part from the total number of enterprises. At the beginning of the year 2000, 7% of all corporations had an annual turnover of less than 500 thousand $; however, 92.6% of the small and medium enterprises (SMEs) registered a turnover of approximately 500 thousand $. Of the total 5 million companies at the beginning of the year 2000 in the USA, 22 had between 1 and 4 employees, and more than 25 million persons worked for companies with an average number of employees between 4 and 20. Presently, at the world level, small and medium-sized enterprises (SMEs) cover 99% of the total number of enterprises;

The setting up and development of many SMEs are based on corporation technologies, and the loss of a job in a corporation means the cut off of several jobs in the small business. SMEs play an important role in economic life, having characteristics which allow for an easier adaptation to the knowledge-based economy [11]. Economic realities prove the existence of strong complementarity relationships with the big companies, on the one hand, and with SMEs, on the other hand. The more an economy has a balanced structure both at the sector and dimension levels, the "healthier" and more competitive it is, thus achieving higher synergy effects.[4]

An important volume of research & development is carried out in the European sector of small and medium enterprises.

III. PROBLEM SOLUTION

1. Hypotheses of the research

To establish the contribution of the SMEs to the research & development sector, we have used the information concerning the percentage of the SME expenditure on R&D from the total expenditure on R&D, as well as the percentage of people working in the R&D sector from the total number of people working in a company, during 2005-2007 (table no. 1).

In order to establish innovation abilities we used data the number of professionals involved in the research & development activity, the number of patents, the number of the personnel from the research-development-innovation activity, the annual growth rate of GDP per capita, the rate of expenditure from GDP for this sector, all of them being tightly connected to economic growth (table no. 2).

2. Means and tools of research

The methodological basis of research knowledge is dialectical method, device and philosophical categorical general systems theory, comparative analysis method.

Table 1. The SME contribution to the research & development sector during 2005-2007

Country	% of SME internal expenditure on R&D from the total expenditure on R&D			% jobs in the SME R&D sector from total jobs in the company		
	2007	2006	2005	2007	2006	2005
Great Britain	16.4	16.20	20.61	26.4	26.58	26.58
France	18.30	19.86	15.7	*	*	*
Finland	20.03	20.96	20.29	26.8	24.24	24.95
Hungary	27.76	26.58	18.82	47.56	47.11	38.31
Romania	39.68	48	48.64	44.8	47.92	56.6
Estonia	46.31	67.68	60.45	64.65	73.32	76.44
Bulgaria	47.36	57.5	41.37	65.87	59.36	45.79
Spain	54.35	48.79	45.21	61.22	58.23	54.82
Cyprus	71.49	61.08	59.25	66.32	61.41	60.15

Credit: calculations performed based on Eurostat2009 data;
(http://epp.eurostat.ec.europa.eu/portal/page/portal/science_technology_innovation/data/database):
* missing data

3. Research results and interpretation

The figures above show that in countries such as France, Hungary, Bulgaria, Spain and Cyprus, the percentage of the SME expenditure on R&D from the total expenditure on R&D increased in 2007 as compared to 2005, the highest value being registered in Cyprus with 12.24, while the rest of the countries registered decreases, the highest value being of 14.14% in Estonia.

As far as the percentage of jobs in the SME R&D sector from the total number of jobs in a company is concerned, countries such as Finland (1.85%), Hungary (9.25%), Bulgaria (20.08%) and Cyprus (6.17%) registered increases in 2007 as compared to 2005. The

biggest decrease was registered in Romania, respectively of 20.80%. This situation can be explained by looking at the socio-economic situation from each of these countries, and especially at the way in which companies have anticipated to shift focus on the innovation activity as future solution for development.

In Europe, small and medium enterprises count among the most innovative from the technological viewpoint of all processing industries [12]. According to the 2009 Eurobarometer, one of ten small companies have not reported innovations, while only 2% of the big companies have registered innovation activities in the year 2009. In the EU, 30% of the Hungarian companies have not reported innovation activities during 2009, which places this country on the last place, while in Finland and Cyprus one of five companies depends on innovation. In Europe, one of ten companies (with more than 20 employees) involved in the innovation sector registers 9% income from innovation.

In ***Romania***, during 2006-2008, there were 5907 companies with technological innovation, of which 3751 in industry (63.50%) and 2156 in the service sector (36.49%). Of these, 3787, i.e. a percentage of 64.11%, were small companies, 25.73% were medium companies and only 10.15% were big companies. It is to be noted that the highest rate pertains to SMEs from the processing industry, i.e. 87.49% of the total companies from the field, and that SMEs cover 93.92% of the service sector.

The data presented here above reflect the results of the empirical studies carried out in the years '90s in France, where it was said that big companies register the highest innovation activity.

The actual innovation process is characterized by a series of differences:

1. The main role is assigned to the completion of the innovation. Innovation is a process that can maintain one or more development stages in the scientific-innovation field which includes primarily the most fundamental scientific theorizations and whose clear purpose is to obtain a result that is essential for its practical implementation.
2. The same degree of importance is attached to the rapid development of the renewal process and its implementation for the purpose of developing the living standards of mankind and society. The marketing of the new technologies marks a new step which tends to bring radical changes for production and consumption, being represented by a wide range of merchandise, services, types of technique and contributing to the development of the current living standards for the individual. Up to 40% of the USA companies are supplied with new products, services and ideas.
3. The innovation process is a continuous and qualitative process to be implemented in production and consumption fields.
4. The social development of society is based on the massive growth of the scientific-innovation field, which appears in literature as the transfer towards the "knowledge"-based economy.

The vitality experienced by the USA economy in the '90s can be explained by the capacity of the North American companies to innovate in key sectors and to rapidly appropriate the new technological findings that shall lead to the transformation of the new markets from all over the world. In contrast, *Europe* in the '90s, too busy solving the problems of the financial convergence needed to adopt the single currency "euro, has kind of neglected the subject of the innovation, which would have contributed to a more rapid economic development.

In another context, the development of the new forms of activity, which have completely changed the living standards after the thorough industrialization of society, requires increasing knowledge and capacity to process the information, as well as the constant upgrade of the personnel and the gaining of new knowledge and skills.

The innovation process currently in place in the developed countries needs, on the one hand, extremely well trained and active professionals capable of taking initiative and adopting capital decisions in the activity process, and, on the other hand, the participation of the employees to the reformation, mobilization of the innovative potential which triggers a high motivation level and the stimulation of competition between companies.

In any process of renewal, any economic innovation, irrespective of its place and time - "consumption or production", in our opinion means an increase in consumption and needs, which shall eventually lead to the increase of the human capital. That is why innovation means for us the positive changes in the production and consumption fields against the background of sustainable economic development.

The evolution of society has allowed the passage from the simple manual labor to a labor which involves the intellect to a higher degree (the technological development process). The technological process has evolved due to the modifications in the structure of the manual labor. The intellectual function of labor has brought more balance to the labor organization process since it springs from the intellectual abilities of each individual. The differentiation between intellectual activity and manual labor, between consumption and production, between needs and possibilities which ensure the way to solve the organizational problems in the work field, has resulted from the differentiation of the process between science and production. Now, labor is being performed as "labor", and the worker becomes a "tool". The labor focused on processing the information, on measuring, controlling and analyzing targets, to the greatest extent, the intellectual labor. If the purpose of the manual labor was to produce standardized goods and

services, then the main form for the intellectual labor is "innovation".

The human capital of the individual is an important factor for the innovation activity, while the representation of the human capital at the level of a nation can be an expression of the innovation-relevant skills.

The innovation component of the human capital stands as the total intellectual abilities of the worker needed to generate and compile the new knowledge.

An important characteristic of the human capital innovation component is the worker's innovation activity, which stands as a source of generating new knowledge. This component may refer to: the reproduction capacity of the human capital, the working capacity, the capacity to adapt to innovations, or the capacity to receive the new knowledge (fig. 1).

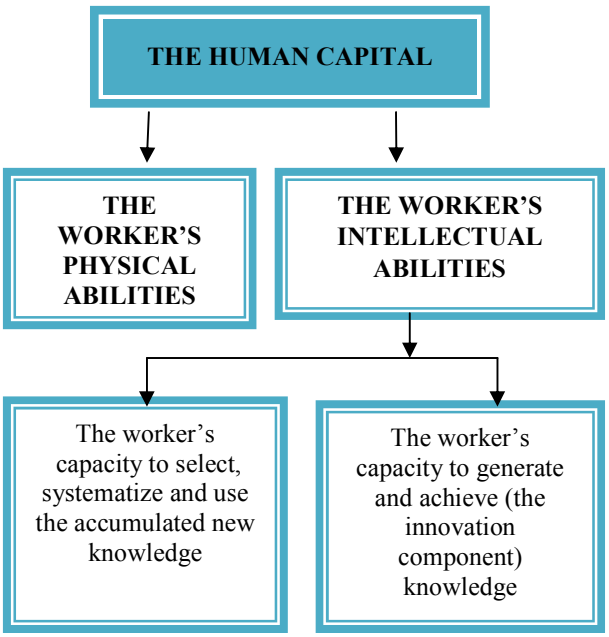

Fig. 1 The innovation component of human capital

The relationship between the human capital and the technological progress - economic growth is supported by nations' human capital stock with its two aspects, namely its use and productivity, two of the four components of the European Human Capital Index elaborated by the Lisbon Council European Association together with the management consulting company "Accenture".

The interaction between the use of the human capital and its productivity can favor or not the passage from the economic growth based on the classical production factors to the one based on efficiency and, then, on reaching the stage of innovation-based economy. The achievement of economic growth based on innovation is directly proportional to the capacity of the human capital to generate modern technology. The depth of this idea reveals the major role played by investments in technological education and training. Dirck de Clerq develops a demonstration of the relationship between the human capital and innovation and states the following: "the higher the level of human capital inside a country, the higher the level of the innovation in that respective country".

Thus, on a global level, during 1990-2007, the annual growth rate of the GDP per capita, in the countries with high human development was of 2.1% (the highest values were recorded in Bosnia and Herzegovina 11.2%, Ireland 5.8%, Singapore 3.8%, Slovenia 3.5%, and the lowest values were in Brunei Darussalam with -0.3%, Venezuela with -0.2% and the Arab Emirates with -0.1%). In the countries with medium human development, the annual growth rate of the GDP per capita was of 4.8% on the global level (Equatorial Guinea 21.1%, Vietnam 6%, Armenia 5.8%, Tajikistan -2.2%, followed by Haiti and Djibouti, each with -2,1%). In the case of the countries with low human development, this indicator was of 0.0% (Mozambique 4.2%, Burkina Faso 2.5%, Chad 2.4%, Congo -4.3%, The Central African Republic -0.8% and Niger -0.6%). (table no. 2).

Tabel 2 the annual growth rate of GDP per capita,.

Nr. Crt.	Rankings by IDH (Human Development Index)	Annual rate of GDP/capita.%(1 990-2007)
1	**Country with high human development level**	**2,1**
	Bosnia Hertegovina	11,2
	Irlanda	5,8
	Singapore	3,8
	Slovenia	3,5
	Brunei Darussalan	-0,3
	Venezuela	-0,2
	Emiratele Araba	-0,1
2	**Country with medium human development level**	**4,8**
	Guineea Ecuatorială	21,1
	Vietnam	6,0
	Armenia	5,8
	Tadjikistan	-2,2
	Haiti	-2,1
	Djibouti	-2,1
3	**Country with low human development level**	**0,0**
	Mozambic	4,2
	Burkina Faso	2,5
	Tchad	2,4
	Congo	-4,3
	Republica Centraficană	-0,8
	Niger	-0,6

Source: calculations based on OECD data, 2009[5]

The research & development expenditure in 2007 (% from GDP) for the countries with high human development level was of 2.4% (Sweden 3.60%, Iceland 2.75%, USA 2.67%, Slovakia 0.46%, Bulgaria 0.48% and Romania 0.53%). In the countries with medium human development, this expenditure was of 0.8% (Belize 1.4%, Ukraine 1.2%, Indonesia 0.1%, Pakistan 0.2%).

The number of patents registered for 1 million inhabitants during 2000-2005 was of 189 in the countries with high human development level (Korea 1113, Japan 857, Sweden 166, Romania 24, Chile 1, Bosnia and Herzegovina 3).

The number of the personnel involved in the research-development-innovation activity (per one million inhabitants) during 1990-2007 on a global level in the countries with high human development was of 3035 (Tonga 45454, Finland 7832, Iceland 6807, Paraguay 79, El Salvador 47 and Seychelles 19).

Sweden can pride on an average of 175 thousand euro of human capital per employee, while in Portugal this figure is of only 7.3 thousand euro. The Low Countries use 64% of their human capital, while Italy only 52%.

In Sweden, Great Britain and Finland, the productivity of the human capital is stable, while it tends to decrease in all the other countries down to a rate of up to 1.5% per year in the Mediterranean countries. ***The number of patents registered for 1 million inhabitants during 2000-2005 was of 189 in the countries with high human development level*** (Korea 1113, Japan 857, Sweden 166, Romania 24, Chile 1, Bosnia-Herzegovina 3). The result of our evaluation leads us to the conclusion that the performance of the human capital varies to a large degree worldwide.

The emergence of a new technical or organizational idea and its achievement usually requires an entire body of knowledge, expertise and skills that cannot jointly pertain to a unique actor. The private management of the R&D and innovation, as well as the public technological policies prove the logic of the systems instead of a linear process, thus justifying the existence and role of the innovation economics infrastructure [10].

The development of ***the innovation economy*** requires the creation of a special ***infrastructure*** and of institutions whose purpose is to support the innovation process:

1. *The independent expertise of the research projects* developed by scientific and engineering teams;
2. *The legislation* which regulates the relationships from the innovation economy field;
3. Force-said, *the creation of guide books (navigator)* which contribute to diminishing the risks of creating new products, as well as to the coordination of the inventor team efforts;
4. Various communities and *networks of experts and futurologists*, which allow to create a vision of the future;
5. *Education centers* (institutions and schools which train not only scholars and engineers, but also entrepreneurs capable of promoting their innovation projects);
6. *Centers for the trading of technologies and developments*.

The innovation economic theory focuses, above all, on ***the key role played by the network of actors involved in the innovation process***. History studies have shown the scarcity of innovation examples completely controlled internally by a single organization - technical inventions for industrial development and the trading of innovative products, thus underlying the innovation systems.

The syntagm - ***national innovation system*** - became a subject of international theoretic debate only in the year 1988. Although we are in an extensive globalization and Europeanization process, this concept becomes increasingly deeply rooted, despite ideas launched in the specialized economic literature, according to which ***the national innovation systems (NIS)*** shall be replaced by ***supra-national innovation systems***. In this respect, some studies on the European innovation policy have already begun using the syntagm ***post-national innovation system (Luc Soete, Well***, 2000), a fact that might suggest that the ***NIS*** is already outdated or it has lost its pertinence and its active role compared to the one of the EU and to the global one [6]. Nevertheless, reality contradicts these statements by the fact that *the national innovation systems are in full development and consolidation process*. The innovation systems are the basis for the evaluation of the development level of ***the knowledge-based economy (KAM)***. The innovation system is one of the central pillars of this concept, together with education, the economic configuration and ICT, according to ***Q. Chen and E. Dahlman*** (2005). At the EU level, the first actions meant to promote the Research-Development-Innovation date back to 1975 when the European Cooperation in Science and Technology Program ***(COST)*** was implemented, which marked the first step towards the creation of the international innovation system (IIS). ***The European Community Innovation System*** *does not appear as a sum of the national innovation systems or as a supra-national system*; it is designed so as to observe both the subsidiarity principle and the cohesion principle.

During the '90s, the idea according to which the innovation networks often spread in certain regions equally distinguishes itself, resulting in emergence of the additional concept of ***Regional Innovation System (RIS)***. *EU places special emphasis on the regional innovation policies, in the context of a knowledge-based Europe (European Commission, 2001)*. Regions are not seen as simple entities which integrate a level of administration and political authority, but as spatial manifestation of the interactive learning processes which develop around clusters and other forms of localized systems (***B.T. Asheim, A. Isaksen 2002, P. Cooke 2001, 2002, 2003***).

Within the European Research Space, many regions involve in real competition to attract public funds, innovative undertakings and human capital.

The regionalization of the research and innovation policy also contributes to the development of new forms of dialogue between the governing levels and the processes for the creation of new knowledge. On the one hand, regions appear as a space dimension in which the actors of innovation (companies, research institutes) form

their own network and then try to develop coalitions. On the other hand, regional authorities constitute themselves as actors of the processes - except for those who are capable of orchestrating innovation for their own development policy (for instance, in France, governing at several research and innovation levels especially translates into the negotiation process of the State Regional Contracts Plan). Most of the regions have an innovation and technological transfer policy or, at least, regionalized national instruments that correspond to this role. Overall, regional discrepancies are huge, especially in the field of science and technology. In France, 48% of the research personnel (private and public) is to be found in Ile de France, while in Great Britain, 40% of the researchers live in London, and in Italy, 32% of them are in Lombardia.

A region may be rich and dynamic without the capacity of achieving the entire innovation process by itself. However, a minimum of consistency between the characteristics and positions of the research and innovation actors present in the region may be seen as an asset. The role of the regional authorities in the field is to elaborate a minimum of overall strategic views. According to Romeo V. Ionescu, Liliana M. Moga, the solution could be the introduction of a partnership between the RIS, learning and innovation as a subsystem of national partnerships.[9] The design of an efficient R&D policy is advisable for all regions which can aspire to a knowledge-based development, taking into account the numerous actors in the system.

Eurostat results from 2009 on the regional statistics show that ***the geographical distribution of innovation is uneven***. They confirm that the highly innovative regions tend to regroup, this geographical correlation entailing, after a certain period of time, the economic growth.

In the year 2007, ***EU27*** invested 229 billion Euros in research and development. The R&D expenditure as percentage from the GDP, which amounted to 1.85% in 2007, remained stable as compared to 2006. ***The highest R&D rate was registered in the northern states, as well as in Austria and Germany.*** Thus, in 2007, the R&D expenditure as percentage from the GDP (R&D rate) was the biggest in Sweden (3.6% of the GDP) and in Finland (3.47%), followed by Austria (2.56%), Denmark (2.55%) and Germany (2.54%), while the lowest values were recorded in Cyprus (0.45%), Slovakia (0.46%), Bulgaria (0.48%) and Romania (0.53%). The period 2001-2007 recorded the highest rates of the R&D expenditure in Austria (from 2.07 of the GDP to 2.56%), Estonia (from 0.71% to 1.14%) and Portugal (from 0.80% to 1.18%). It is to be noted that, in the year 2008, the percentages of the R&D expenditure changed, in the sense of their decrease as compared to the year 2007.

Also, ***the employment rate in the R&D field in the year 2007*** was the equivalent of ***2.3 mil.*** persons working full time in the ***EU27***. The R&D personnel represented 1.6% of the total personnel employed, the highest rate being recorded in Finland (3.25 of the total jobs), in Sweden (2.7% in 2005), Luxembourg (2.6% in 2006), Denmark (82.4% in 2006) and Austria (2.1% in 2006), while, at the opposite end of the scale, there is Romania (0.5%), Bulgaria (0.6%), Cyprus (0.7% in 2006), Poland (0.8%) and Portugal (0.9% in 2006). Researchers represented 0.9% of the total EU27 workforce in 2007, this percentage being of around 2.1% in Romania and Finland in 2005. For the year 2008, the data are only available for a few states, respectively 0.09% in the Czech Republic, 0.03% in Slovakia and 0.4% in Iceland.

With respect to companies that carried out innovation activity in the EU27 between 2004 and 2006, 39% of these pertained to the industry and service fields with less than 10 employees. The highest rate of companies having been involved in innovation activities during this period is to be found in Germany (63%), followed by Belgium (52%), Austria and Finland (each with 51.9%), as well as Luxembourg (0.49%). The lowest percentage was recorded in Latvia (16%), Bulgaria and Hungary (20% each), Romania (21%) and Lithuania (22%).

The results of our research, as well as the analysis of the ones performed by foreign and local specialists have led us to the conclusion that the birth of the innovation economics is the strategic direction of the Romanian development in the first half of the 21st century.

4. CONCLUSIONS

Innovation economics, much as any developing system, in its quality as development source, also implies contradictions. The innovation economics contradictions related to the development of the human capital can be resumed as:

1. The high quality of the human capital, the new information technologies and lower rates of productivity growth.
2. Access to information and the need to protect it.
3. Rate of participation to the development of the virtual sector, on the one hand, and of the real sector, on the other hand.
4. The development of the information technologies has made it possible to expand the Stock Exchange speculative games.

As far as Romania is concerned, the solution to find its way out of the crisis lies in the development of the human capital and of the investments in the human capital by means of innovation economics. What is needed is to build a special infrastructure and institutions meant to support the innovation process, so as to promote a culture of competition based on flexibility and productivity.

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