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European Union: Innovation Activity and Competitiveness. Realities and Perspectives

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Abstract: This article tries to capture some relevant aspects of the research - development and innovation (RD&I) sector in the European Union and some Member States and the current EU political commitments in this field, with a special focus on the „Innovation Union”, the consolidation of the European Research Area, the European re-industrialization and the action plan „Horizon 2020”. According to the most recent and relevant documents in the field, the EU is in an industrial revival process, which implies a fruitful activity in research and technological innovation of products, processes and adjacent services. The author envisages evaluating the RDI sector development in some EU member states - both developed and less developed Central and Eastern Europe (including Romania) - and the contribution of this sector to the development and competitiveness of the respective countries on international market (the parallel study between international competitiveness and innovation level of the EU and its Member States being an important point in this paper). The findings of this article highlight the demonstrated importance of innovation for a good EU international competitiveness and the measures (imposed by the reality) that can be taken for its increase at EU and national level (especially for those countries with a less intensive innovative activity).

Key-Words: research, development and innovation, EU innovation policy, international competitiveness, EU Member States, Romania, EU re-industrialisation.

JEL Classification: O1, O2, O3, O5

1. Introduction

Analysts define competitiveness through productivity in an economy, which entails the prosperity degree of the entire society. Among the determinant factors of productivity (and thus of competitiveness) there are education and training, infrastructure, macroeconomic stability, complexity of business environment, markets efficiency, scientific and technological progress, which may be achieved nationally or internationally (by trade, cooperation and Foreign Direct Investments - FDI). As it is stated in a document of the World Economic Forum (WEF 2013-2014), it is obsolete today to talk further about traditional distinction between countries as “developed” or “developing”, being more appropriate to speak about „rich in innovation” and „poor in innovation” states, that is a recognition of the innovation role in the economy and, hence, in the economy competitiveness on the global market. While the overall economic situation of a country can not be changed easily, at least in the short term, technology appears to be an important factor supporting the country's hopes for the future of its development. What it is, however, decisive is the practical application of knowledge and innovation, generally speaking, and the proximity to the frontiers of knowledge, a process that can generate more value.

Appealing to the main documents of the European Commission, the World Economic Forum (WEF), the European Patent Office (EPO), the World Intellectual Property Organisation (WIPO) and Romania's authorities, the analysis tries to highlight the link between innovation and competitiveness (link denied by some economists regarding the state role and believed to exist only in relation with companies) of EU countries (and Romania's too), for better understanding the strengths and weaknesses of the respective states and the drivers that may contribute to adopting public policies for improving their position on the international markets.

In the EU, relatively low investments in intangible assets (research and development, human capital, including specialists in information and communication technology, etc.) may explain a part of the productivity gap between the EU and the USA, its main competitor on the international market. Also, lower capacity to absorb scientific and technological achievements obtained worldwide (international transfers), contributes to the gap recalled. Overall, one can say that the EU has managed to defend its competitive position on the international markets, by improving the quality of the products and services, thanks to outcomes in R&D&I. However, the EU manufacturing industry has a less intensive RD&I activity than the USA and Japan.

2. The current performance of EU and Member States in the field of innovation

According to the European Commission “Innovation Union Scoreboard (IUS) 2014” (EC 2014-1), during 2006-2013 average annual growth in EU innovation sector was 1.7%, the responsible community officials considering this rate as an unsatisfactory one. Within the EU, the Member States performance in innovation (measured by a composite indicator made up of 25 simple indicators grouped into three sub-categories: enablers, market activity and outputs) has not changed much compared to the situation described in the previous report, that of 2013. In accordance with the mentioned document, EU Member States were divided into four groups. The first group, the “innovation leaders”, includes only four countries, Sweden, Denmark, Germany and Finland. The group of “innovation followers” includes Luxembourg, the Netherlands, Belgium, UK, Ireland, Austria, France, Slovakia, Estonia and Cyprus. Between the second and the fourth group (the “modest innovators”), composed of Romania, Latvia and Bulgaria, and the “followers” group, there is a third group of the “moderate innovators” formed by the remaining EU Member States.

Best overall performance of the innovation leaders is the result of a national research and innovation balanced system, which means that innovation leaders have the slightest variations of innovation outputs, in all aspects of their performance indicators.

Regarding the former socialist states, although the performance is poorer (Slovenia, Czech Republic, Hungary and Slovakia are the best ranked in IUS 2014), the success is ensured by the same factors as in developed countries. But some of the success factors lack, such as the countries’ general development and the RD&I sector development, the latter having a weak heritage from the socialist period. **Romania, ranked 26th (out of 28) in the top IUS 2014, has greatly to recover in the analyzed area, a special role being given to the funding, at national and Community level.** During 2006-2013, Portugal, Estonia and Lithuania had the highest growth rates in the field, while Sweden, Great Britain and Croatia had the weakest. In the innovation leaders group, a visible growth was recorded by Germany, while Sweden had the lowest rate of development. In the category of innovation followers, Estonia recorded the highest growth rate, while the UK, the lowest one. Portugal performed best from the moderate innovators, while Croatia was the weakest.

If we refer to another document, which radiographs the national situation worldwide, the Global Innovation Index Report, 2013 (GII 2013), the EU Member States ranking is quite different, because of the use of a composite indicator - GII (consisting of 21 sub-indicators), built in a more general way and having some different components, or even in minus, relatively to the indicator of the European report. The 21 sub-indicators make up two groups: a) inputs in innovation and b) outputs in innovation. The most striking difference between the two indicators is related to the presence in the European indicator of several sub-indicators missing in the indicator GII, mainly the level of general education, innovation activity of Small and Medium Size Enterprises (SMEs) and some results of innovation such as scientific publications, that EU forums attach a greater emphasis than the international bodies. At the same time, important indicators as the regulatory environment or infrastructure, absent in the European composite indicator are present in GII. As a result of these differences, in the GII 2013, states like Great Britain, Ireland or the Netherlands occupy world leading places on innovation activity in the squad top 10 nations in the world, while in the European rankings they are included among follower innovators. At the same time, Germany, which belongs to the top four innovative European nations, in the Global Innovation classification, is only on the 15th place.

The innovation performance of the EU Member States is reflected also in the patent activity, i.e. the number of patent applications to the European Patent Office - EPO (EPO - 2014). In 2013, there were 147,869 EPO patent applications, 0.5% less than in 2012 (148,562). Patents granted by the EPO in 2013 totalled 52,446, with 21.4% fewer than in 2012. Compared with 2007, the year of Romania's EU accession, in 2013 EPO applications for patents of European countries were 6.7% more numerous (68,527 towards 73,097). According to the data presented in table 1, in 2013, between European states, the most numerous patents applications were

registered by Germany, France, Netherlands, UK, Italy, Sweden, Denmark, Austria, Finland, Belgium and Spain, i.e. those countries that lead also in IUS 2014, only in a slightly different order. Of these countries, most marked increases in the number of applications during the considered period were registered by Netherlands, UK and Italy. Finland and Belgium have marked declines. Among the former socialist countries, most patent applications were made by Poland, Slovenia, Czech Republic and Hungary, all with increases rates in the period 2007-2013. Romania has made only 30 patent applications (versus 16 in 2007).

Table 1: EU Member States patent applications to the European Patent Office, during 2007-2013

Country	2007	2013	2013/2007, %
Germany	25,176	26,645	+5.8
France	8,328	9,754	+17.1
Netherlands	6,999	5,826	-16.7
Great Britain	4,979	4,567	-8.3
Italy	4,392	3,704	-15.7
Sweden	2,733	3,668	+34.2
Denmark	1,408	1,929	+37.0
Austria	1,379	1,995	+44.7
Finland	2,045	1,895	-7.3
Belgium	1,900	1,885	-0.8
Spain	1,283	1,504	+17.2
Poland	105	371	3.5 time
Slovenia	115	135	+17.4
Czech R.	96	103	+7.3
Hungary	93	103	1+0.8
Latvia	20	80	4 time
Romania	16	30	+87.5

Source: European Patent Office, 2014 (EPO 2014)

3. Recent developments in EU and its Member States RD&I policies

In the past 3 or 4 years, because of the financial and economic crisis, the European Union has been at an economic crossroads and the leaders of the European institutions are aware that only decisive policy actions will ensure the right path towards long-term growth and prosperity.

Innovation performance has changed since the launch of the “Europe 2020” Strategy, in 2010 (EC 2010). “Innovation Union” (EC 2013-1), the central initiative of the Strategy, with the objective of improving the EU innovation performance, pursues “creating a friendly environment for innovation and for the important ideas that can be turned into products and services needed for growing European economy and jobs and ensuring the global competitiveness of Europe”. The largest EU program of research, development and innovation is “Horizon 2020” (instrument for funding RD&I in the EU, in 2014-2020) (EC 2014-2). This program, which brings a huge financing, worth 80 billion euro, develop a broader and more pragmatic vision, compared with the previous Framework Programmes RD&I (seven in number), and supports the objectives of the “European Research Area” (ERA) (EC 2012).

The RD&I solid performance obtained by the Member States in the EU top echelon is due to more general factors or to the policies implemented in this area, like the follow ones:

- a) First, the high level of overall economic and industry development-large transnational corporations that are located in these states have substantial resources to operate RD&I (SMEs are also involved in programs on Community or national level);
- b) High expenses allocated by the state to the RD&I sector (e.g. Sweden 3.4% of GDP, the target investment by 2020 being 4%, Finland 3.87% of GDP, target by 2020 being 4%);
- c) R&D&I infrastructure completed in the last 20-30 years by creating platforms and performance clusters;
- d) Favourable legal framework for both research and development and for the protection of research results and their application, or patent and intellectual property rights, in general;

e) Academic-industrial partnership; very strong participation in the RD&I Union programs (Germany - 13.81% of total applications to the 7th Framework Programme, in the period 2007-2014, with a success rate of 23.4%; Sweden - 3.56% of total applications and success rate of 23.1%; Finland - 2.29% of the applications, success rate of 20.9%);

f) RD&I international partnership and technology transfer;

g) Financing received from EU Structural Funds or the new founded institutions, like European Research Council, etc.

The European Research Council (ERC) is an institution founded in February 2007 by the European Commission whose role is to manage the Specific Programme „Ideas” of the 7th Framework Programme for Research and Development, continued under the 'Horizon 2020' program.

4. The international competitiveness of EU Member States according to the undertaken innovation activity

Furthermore, the World Economic Forum has provided a competitiveness evaluation of the world states in its Global Competitiveness Report 2013-2014 (WEF, 2014-2015), using an index composed of 12 indicators (or pillars) grouped into three sub-indices: basic requirements, efficiency and innovation factors, incentives and complexity, which capture all the different aspects of competitiveness. According to the study, states/economies of the world are divided into three stages: stage 1 - economic development is based mainly on the production factors, stage 2 - the economy is based on efficiency and stage 3 - the economy is based on innovation. There are, also, countries located into the intermediate categories, between 1 and 2 and between 2 and 3.

European economies that are part of stage 3 (the most developed) are Sweden, Germany, Denmark, Finland, Luxembourg, the Netherlands, Belgium, UK, Ireland, Austria, France, Cyprus, Czech Republic, Italy, Slovenia, Malta, Portugal, Greece and Spain (first 13 states are of first or second innovation degree, in descending order). The others are part of moderate innovation group. Croatia, Estonia, Latvia, Lithuania, Poland, Slovakia and Hungary, are classified in the intermediate stage 2 to 3. These countries are also moderate innovators (only Latvia is a modest innovator). Romania and Bulgaria are placed in the stage 2 (economy based on efficiency) and they are modest innovators. EU Member States placed in the top 20 most competitive states of the world are: Finland (3rd place), Germany (4th), Sweden (6th), Netherlands (8th), Great Britain (10th), Denmark (15th), Austria (16th) and Belgium (17th).

One can remark the forefront positioning of these countries among the most innovative countries in the EU, the conclusion being that the situation described for developed countries, which have a good or very good progress in terms of competitiveness on the global market, is largely a result of their innovation activity, as we showed in the first chapter of the present paper. Countries with weaker innovation activity falls within the category of those with a lower degree of competitiveness [of the Central and Eastern European, best positions in the world ranking of competitiveness are occupied by Poland, 42nd place, Czech Republic (46th), Lithuania (48th) and Latvia (52nd)]. Romania ranks 76th position, behind Croatia (75th).

To support the competitiveness of the EU, the European Commission in its Communication “For a European industrial renaissance” (EC 2014-3), considers extremely important some requirements:

a) Further deepening the interdependence between industrial policy and other Community policies in order to support the overall competitiveness of the EU economy;

b) Maximizing the potential of the Internal Market by providing a predictable and simplified regulatory framework for entrepreneurship and innovation;

c) Decisive implementation of regional development instruments in accordance with the other instruments of Community and national policies to support innovation, human skills and entrepreneurship;

d) Integration of EU firms in global value chains, improvement of competitiveness and access to international markets in more favourable terms.

To illustrate the correlation between innovation and competitiveness hereinafter one may use some case studies of EU Member States (EC 2014-1 and 2013-2).

Sweden is, according to Innovation Union Scoreboard (IUS) 2014, the best leading innovator in the EU (1st place). His innovative performance increased until 2012 and decreased slightly in 2013, mainly due to the decline in venture capital investment. Performance relative to the EU average decreased from 148% in 2006 to 135% in 2013. Despite fairly stable competitiveness, in 2013, Sweden dropped four places to the position 10 in

the Global Competitiveness Report (GCR) 2014-2015. The country has powerful institutions, a very good infrastructure and stable macroeconomic conditions.

Denmark is the second major innovator among EU Member States. Innovation performance of the country has decreased significantly in 2008, but, since, has continuously increased. Compared to the EU average, Denmark's performance fell from 140% in 2009 to 132% in 2013. Strengths in relation to the EU average are recorded at international scientific co-publications, co-scientific public-private publications, the Community design, the RD&I cost in the business sector. Denmark has improved its position in the GCR 2014-15, peaking at number 13. Like its Nordic neighbours, Denmark continues to benefit from a functional and highly transparent institutional framework (16th place in the world), a very good rating education and training system (10), providing workforce able to cope with high-level technology adoption and innovation.

Germany is part of the leading innovators (3rd place in IUS 2014), increasing its performance during 2006-2013, with only a temporary decline in 2011. In terms of comparison to the EU average, the performance of Germany fell from 33% above average in 2008 and 2009 to 28% above average in 2013. Germany dropped one place in 2014-15 GCR ranking. This decrease is the result of concerns about institutions and infrastructure and is only partially offset by the improved macroeconomic environment and good developments in the financial market. Overall, Germany has relatively easily overcome the global economic crisis in recent years, due to, at least in part, its strong competitiveness, which includes complex business environment (No. 3 worldwide from this point of view), and innovative system (6).

Among the Central and Eastern European the **Czech Republic** appears to be best suited to demonstrate the link between innovation and competitiveness. Czech Republic is a moderate innovator (16th place in IUS 2014). His innovative performance was quite volatile in the last 8 years, but throughout the period, it improved the innovation index. Reported to the EU average innovative performance, it followed the same pattern of volatility, the highest level being recorded in 2011 (78%), in 2013 reaching 76%. In terms of the global competitiveness, the Czech Republic advanced nine places, reaching the 37th position. The indicator relative to "institutions" improved its position with 10 seats (76) and the economic recovery is reflected in a healthy macroeconomic environment, budget deficit below 3% of GDP and improvement of access to loans (40) on the financial market.

Romania is a modest innovator. According to IUS 2014, its performance has increased by 2009 and afterwards, it always fluctuated. Relatively to the EU average performance ratio, its performance worsened from 50% in 2009 to 43% in 2013. Romania is well below the EU average to almost all innovation indicators. In GCR 2013-14 hierarchy, Romania ranks 59, a remarkable result compared to the previous year when it placed on 76th position. According to GCR analysts, the most problematic factors for the competitiveness of our country are related to the access to finance, high rates of taxes, inappropriate infrastructure, corruption, bureaucracy and government inefficiency, the fees regulations, the inefficient labour market, and the political instability. To meet these challenges, it has been developed the "National Strategy for Research, Development and Innovation 2014-2020" (NS 2014-2020) that encourages the creation of an ecosystem for innovation through public-private and public-public partnerships.

5. Conclusions

The undertaken analysis of this article can draw up some important conclusions for the innovative activity and competitiveness of the EU and its Member States. Thus, a first conclusion would be that the causal link between innovative work (that includes the absorption capacity and application of innovations) in an economy and the economy's competitiveness on the international market can not be put in question.

The European Union has still much to do in the innovation field to occupy the deserved place in the international ranking, given the recognized existing potential. During 2010-2012, most Member States and the Union as a whole, have improved their innovation performance, especially leading innovators (innovation leaders) and those from the second category. The process of innovation convergence between Member States, which had started to strengthen until 2011, was followed by a slight increase of gap in 2012. The growing gap is the result of the fact that the innovation performance dropped to almost half of the moderate and modest innovators, increasing only to leaders and followers classes.

EU concerns itself about the continuously increasing of its capacity to produce advanced technology and absorbing this technology, a major role in this process coming to Community policy in the field, with reference to the "Innovation Union", the "European Research Area" and many programs and projects dedicated

to this subject, the most important being the Framework Programmes for Research and Development (The 7th Programme completed in July 2014) and “Horizon 2020” for the period 2014-2020. The monitoring policy of programs is very good (a little too bureaucratic) and there is hope that in the near future EU innovation situation will improve substantially, and the EU will manage to reduce the gap that separates itself from the USA and Japan.

Also, national RD&I sector policies, particularly investment, training, RD&I infrastructure, intra- and extra-EU cooperation, transfer and absorption of world scientific and technological progress, all have a key role in the development degree of this area in the EU Member States. The EU developed countries have a privileged position both in innovation and in the international competitiveness, while less developed countries (mainly countries of Central and Eastern Europe, but also in Southern Europe) are less competitive on the international market. The latter must intensify their efforts to reduce the gap to the developed countries in the EU and worldwide. Re-industrialization process that has unfolded in the European Union is meant to spur more research-development and innovation in the EU and the Member States, for the period 2014-2020.

Among the measures that may improve innovative activity in the less developed EU countries (including Romania) we could mention an increase in state funding of the sector, improvement of the regulatory framework, substantially enhancing RDI infrastructure, including the creation of innovative clusters and platforms, the education and training of a large number of researchers and specialists in information and communication technology, strengthening the link between academia and business, supporting businesses (especially SMEs) in their efforts to invest in RD and innovation, boosting external associations with institutions active in innovation, supporting innovators in patent application process, enforcing the EU institutions efforts for stimulating the international uptake of innovation results.

Romania has greatly to recover both in terms of innovative activity and in its competitive position on the international market. However, in the last years there has been a remarkable progress in terms of competitiveness and according to the “National Strategy for Research, Development and Innovation 2014-2020” it will be recorded a further improvement in the innovation activity.

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