CHALLENGES OF INCREASING THE ECONOMIC AND SOCIAL RELEVANCE OF ROMANIAN R&D AND INNOVATION.

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Abstract

The topic of this paper is of special importance in the current context, when Romania has to cope not only with the effects of the economic and financial crisis but also with the EU Lisbon Agenda 2020 challenges, presented by the European Commission on the 3rd of March 2010 and recently adopted by heads of state and government leaders. Improving research-development and innovation activities is a central issue in reaching the Agenda 2020 objectives. The present situation is different from the one ten years ago when the previous Lisbon Strategy 2010 was launched. This new global landscape is to try not only the 2020 Europe Strategy, with its central point research-development and innovation but also the functioning of the economy in various member states, including Romania. Therefore, it is a dire need nowadays that the research, development and innovation activities at all levels be understood as instruments able to design solutions to economic and social challenges, even for recovery the economic growth. Based on the studying a vast specialized literature, the present paper asserts that the congruence between scientific activity's results and their ability to specifically address the needs of the society it serves, depends on various factors concerning the scientific knowledge providers, knowledge potential users, knowledge infrastructure and environment. The purpose of this paper is to analyse and assess how challenges related to the provision of inputs for research activities are addressed by the national research system, especially in the new condition of economic crisis. Its actors have to ensure and justify that adequate financial and human resources are most appropriately mobilised for an efficient R&D operational system, having in view the time horizon required until the effects of the R&D investment become visible by increasing R&D system performance and, also, for transferring the knowledge results into economy. Another aim of the paper is to analyse and assess specific barriers faced the circulation of the financial flows and research results: weak relation between university and industry, financing and barriers that must be overcome by business sectors, low absorptive capacity of knowledge users etc. Depicting the current strengthens and weaknesses of R&D mechanisms the authors intended to offer a scientific basis for decision-makers answers to the major challenges of 2020 Lisbon Agenda.

Keywords: *R&D financing, crisis an opportunity for innovation, academy-industry relations, absorption capacity, responsibility of researchers.*

Introduction

The Lisbon Strategy 2000 has had some positive effects on the EU economy but one of its main targets, i.e. 3% of GDP spent on R&D are not being reached. Total R&D expenditure in the EU, expressed as a percentage of GDP, only improved marginally (from 1.82% in 2000 to 1.9% in 2008).

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According to the evaluation documents[1] of the Lisbon Strategy's objective, the EU to become a knowledge economy was centered on an ambitious research and innovation agenda. The introduction of a 3% EU of GDP spending target for research and development (R&D) represented a gradual change in the importance and visibility of research and innovation policy at the EU level. There is evidence that many

Member States have prioritized public R&D investments.

The EU's key challenge remains making it more attractive for the private sector to invest in R&D in Europe rather than in other parts of the world.

European Research Area represents a shift towards a more holistic policy approach, promoting greater co-operation between Member States and industry, a stronger emphasis on excellence and smart specialization and removal of obstacles to researchers' mobility.

Lisbon Strategy included research policy (CREST[2]) began in 2001 to support the implementation of the policy frameworks on researcher mobility and careers, and which gave rise to the headline Lisbon target of spending 3% of EU GDP on research and development in 2002 at the Barcelona European Council. A 2008 evaluation concluded that the open method of coordination in research policy had proven to be a useful tool to support policy learning, but that it had only given rise to a limited amount of policy coordination.

Starting from these insufficiencies of the 2000 Lisbon Strategy implementation in the field of the R&D and innovation, the majority of the European Commission recommendations refer to the speeding up of the improvement of the situation in this field. The objective of reaching 3% of the GDP till the year 2020 ranks among the priority objectives, taking into account that a large majority of member states (19) still considers investment in R&D and innovation as a key challenge for the future. The achieving of this objective is quite difficult if we take into account that, according to statistical data during the 2000-2008 period, the public spending in these fields does not represent any actual increase in EU.

In this context, the challenge to reach the objective " 3% of GDP to research and development" is all the more difficult for Romania. In 2008, the share of R&D in GDP was only 0.58% in comparison with the EU average of 1,9%. The participation of the private sector, which ought to reach 2% of the GDP by 2020, is of only 0.13%, in decreasing compared to 2003, when it represented 0.18 % of the GDP.

1. Challenge of increasing the RD expenditure to 3% of the GDP

1.1. The Current Economic-Financial Crisis-Opportunity or Risk for the financing research, development and innovation?

When Joseph Schumpeter lectured on the economy at Harvard in the midst of the depression, he would stride into the lecture hall, and divesting himself of his European cloak, announce to the startled class in his Viennese accent, "Gentleman, you are worried about the depression. You should not be. For capitalism, a depression is a good cold shower."[3]. The present crisis can be also for the economic system like a cold shower, having positive effects, urging companies to come up with the best solutions for the enhancement of efficiency, by means of cutting waste and reshaping action directions.

[1] European Commission: SEC(2010) 114 final, COMMISSION STAFF WORKING DOCUMENT, Lisbon Strategy evaluation document, Brussels, 2.2.2010

[2] Commite de la Recherche Scientifique et Technique

[3] Robert Heilbroner : *The Worldly Philosophers* :The Lives, Times and Ideas of the Great Economic Thinkers, Penguin 2000

Under crisis circumstances, is a natural tendency to cut company costs, but the distinction between the types of expenditure that needs to be kept and the ones that can be done away with, constitutes a great challenge for decision-makers[1].

One of the victims most likely to occur when it comes to cutting expenses be they private or public, especially in economic and financial crises, is the field of research and innovation.

The practice of countries that managed to overcome economic crises successfully has proved that the stimulation of innovation is the most important condition to turn the crisis into opportunity. When private companies cannot invest in innovation anymore, governs should do this, having in view that innovation systems, with all its components (academic, industrial and public), are strategic national assets that need to be protected as much as the financial or the building sector.

The government of some EU countries have taken important measures in order to prevent the knowledge base contraction. In Germany, the Mittelstand Innovation Program (ZIM)[2], initially designed only for small enterprises, was expanded, under the current crisis circumstances, to December 31st, 2010, including enterprises of up to 1000 employees, supplementing the budget with 900 million Euros. The European Commission has appreciated Germany's initiative, considering that, even though research projects run a considerable degree of risk, it is necessary to sustain a level of industrial research that would maintain competitiveness during crises.

The experts in the field [3] present a series of recommendations for the R&D&I policies so that national economies may get out of the crisis as "winners" not as "losers":

1. Reshaping of priorities and allotting investments in strategic fields of science and technology, such as: nano-technologies, alternative energy, health, and life sciences;
2. Global thinking, that would encourage international investments in R&D programs, especially of countries that are not profoundly affected by the crisis, such as China, the Golf countries or Japan. These programs can become in the long run new platforms for complex cooperation;
3. Focussing on public programs, with the view to maintain and develop the knowledge basis of any economy, as a support for the launching of economic growth.
4. Supporting of performance, by means of the education system and the allotment of funds for research, development and innovation according to this criterion.

Unfortunately, in Romania after an increasing of the public RD expenditures starting with 2005, the share of RD in GDP is in a sharp decreasing since the last year if it will continue, many of strategic objectives should be compromised.

1.2. Relation between public and private financing

The most sensitive aspect of the financing R&D in Romania is stimulating the private sector to increase its contribution to total expenditures, taking into account the objective of raising its contribution to 2% of the GDP in 2020 and the fact that during the 2000-2008 period, the weight of the business sector significantly dropped, especially after 2003.

The issue of the measure in which the public support complement or substitute the private R&D expenditures is fundamental for the elaboration of consistent policies. From a theoretical point of view, there are pros for both hypotheses. Public support can constitute an incentive for companies with a view to launching or increasing the resources designed for R&D, since public

[1] Roger Smith : "R&D in the Financial Crisis", in *Research Technology Management,* May-June 2009

[2] EUROPEAN COMMISSION Brussels, 13.2.2009 C(2009) 1073 final, Subject: State aid No N 65/2009 − Germany, Temporary budget increase and extension of the R&D&I-scheme

[3] Sami Mashrom : "Innovate out of the economic downturn", Business Time, 30 December 2008

subsidies cut marginal costs and raise the profitability of research and development projects (complementarity effect). On the other hand, public support can reduce the private effort for this field so as the company may substitute its own financing of projects by means of public funds (substitution effect).

During the past decades, the literature [4]enriched with a series of studies that approach from various points of view and using specific methodologies, the issue of the relation between public and private financing of research and development and the impact of the subsidies over the dynamics of the private sector investments in this field. As a consequence of the general positive perception over the role of research and development in the economic growth, in all the developed countries the public support is strongly promoted. Governments encouraged in various ways the research and development activities from their own laboratories and institutes, financed university research and the research of non-profit organizations, offering contracts to public and private institutions and even grant subsidies to various private companies, being it directly or by means of fiscal incentives.

Governments are, also, concerned with the transfer and dissemination of technologies and the promotion of innovating companies, based on new technologies or products. Economic theory[5] has contributed to the gaining of consensus regarding the necessity of public support for the private R&D, claiming that research and development activities are, generally, more difficult to finance on a competitive market.

The need to correct the market failures that affect R&D field, the distinction between the private benefits gained from the R&D activities (impossible to be acquired on the whole) and the social activities, due to the nature as public goods of the R&D results, the appearance of the dissemination effects as well as the sub-optimum level, from the social point of view, of the private investments in R&D constitute powerful arguments, both in theory, as in practice, for the necessity of the subsidies from the public sector, that would supplement the private resources for the research and development field.

Even if the existence of market failures is accepted as a justification of the public support granted to R&D, including for the private sector, it is necessary to prove that the public R&D programs financed by public resources are efficient. That means that the principle of additionality is obeyed, namely the public subsidies are transformed into increases of "in- house" R&D resources but not to substitute the private expenditure, which at any rate ought to have been made by the companies.

The public support granted to the research and development performed by the business sector has to meet the criterion of economic and social efficiency, namely their research results have technological, economic, social and environmental impact.

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[4] OECD, 2001, Changing Patterns of Public and Private Financing of R&D; TIP, (2004), Input Additionality Effects of R&D Subsidies in Austria; Klette J., J. Moen, Z. Griliches, (2000) Do subsidies to commercial R&D reduce market failures? Microeconomic evaluation studies, "Research Policy", 29, p. 471-495; David P., B. Hall, A. Toole (2000): Is public R&D a complement or substitute for private R&D? A review of the econometric evidence, "Research Policy", 29, pag. 497-529; European Commission, ProInno Europe, INNO Metrics, European Innovation Scoreboard 2006, Comparative Analysis of Innovation Performance, p.8 şi 12; European Commission, European research Area: A More Research Intensive and Integrated European Research Area, Science, Technology and Competitiveness, Key Figures report 2008/2009, p.22, p.33, p.63, p.71.

[5] European Commission: ProInno Europe, INNO Metrics, European Innovation Scoreboard 2006, Comparative Analysis of Innovation Performance, p.8 şi 12; European Commission, European research Area: A More Research Intensive and Integrated European Research Area, Science, Technology and Competitiveness, Key Figures report 2008-2009, p.22, p.33, p.63, p.71.

If public funds are directed to projects that the company would have executed anyway, a faulty allotment of public R&D resources occurs. Only a relation of **complementarity** between the public and private financing that would legitimate the public intervention.[6]

The majority of EU member states decided to focus on the consolidation of a portfolio of mechanisms of maintaining the level of direct financing, simultaneously expanding and perfecting fiscal incentives. In countries like Spain, Portugal and Great Britain, this extension of fiscal incentives was mixed with a growth of direct subsidies. Even if there is currently no convergence towards an optimum level of fiscal treatments concerning R&D in EU countries, governments are acknowledging more and more the importance of fiscal incentives as a complementary mechanism of direct allotments for R&D.

In November 2006, the European Commission, in the paper "Towards a more effective use of tax incentives in favor of R&D" has underlined the necessity of new tax instruments that would encourage investments in R&D as well as the substantial improvement of the existing ones. There were defined the major components of a fiscal instruments, more efficient, stable and oriented to the European research and development. Tax incentives are considered as an important part of the general public effort that supports the research and development from the business sector in the European Union member states.

These orientations are more important for Romania as the experience regarding tax incentives granted to companies in order to supplement the R&D investment is reduced. The identification and dissemination of good practices can improve the situation of private R&D financing in Romania, even by efficiency of tax systems.

Is there a substitution or a complement effect of public funds over the private financing of research and development in Romania? To what extent can the supplementing of public funds have positive effects on the increase of R&D expenditures of the private sector? The answer to this important question needs a clarification over the specific features of private RD sector in Romania.

In Romania, the largest number of research and development organizations (approximately 63 % in 2006, according to the data of INSEE) can be found exactly in the « business sector », which features a very diversified structure, both from the organizational and the property rights point of view. Financed in a centralized manner before 1989 and left without any financing perspectives after 1990, at the mercy of an almost non-existent research and development market, the large institutes chose, under the pressure of a vague legislation, organizational forms of the most varied structures, some of which were straightforwardly strange. By means of joined pressures on the government, the R&D unions as well as on the professional researchers' societies, in 1994-1995, there came a financing at survival level, from a Special Fund, constituted from the compulsory legal prelevation of 1% of the turnover of private and public companies, under the claim that the research results were addressed to them.

Actually the inclination to invest in research was non-existent during that period of profound restructuring which led to the lack of desire to feed the special fund and therefore it was cancelled.

The dependency on public financing of the institutes from the business sector became manifest during the following period as well, although competitive financing, on the basis of programs, had as its consequence a relatively unimportant effect of « behavioral additionality »

Unfortunately, the manner of appointing evaluating committees, part of which were the managers of the institutes who applied for financing, the majority being from institutes from the

[6] In his presentation to the Berlin Conference in October 2007, Markus Koskenlinna, general manager of Tekes mentioned that, according to the research results, one euro of public R&D funding increases private R&D investments by 0.40-0.93 euros . In other words, the overall additionality of public R&D funding is 1.40-1.93 euros. One euro adds 0.93 euro.One euro adds 0.62-0.86 euro in Finland, 0.40 euro in Austria, 0.70 euro in OECD countries, 0.41 euro in Israel.

industrial sector, often transformed the evaluation in negotiation, according to vague and unclear criteria, of the crumbling of public funds, allotted in extremely reduced amounts, to a multitude of beneficiaries of public funds. The progressive improvement, both of competition financing on national programs within the National Plan for Research, Development and Innovation, 1999-2006, of the evaluation system, which established clearer and clearer criteria, more and more focused on the scientific value of the project, on its applicability and the competence of the team that sets up the research consortium, has done away with a series of drawbacks from the system of R&D public funds allocation.

Nevertheless, due to the way in which the proposal of projects have been evaluated in the framework of the National Plan for Research, Development and Innovation 1999-2006 programs, the largest part of the public funds was allotted to the technological institutes from the business sector, namely 60% in 2001 and 42 % in 2006 (INSEE, 2006).

Another important barrier in the way of research and development investment by the private sector has been, also, the low level of innovation culture, un- sustained by a system of technological transfer policy (institutes, transfer mechanisms, adequate legislation) or by risk capital policy.

The Research Program of Excellency, launched in 2005, with the purpose of it being an incentive for the growth of private research and development expenditure, failed to have visible effects in this respect. At the same time, the lack, up until now, of serious tax incentives for the investors in this field as well as of financial services and instruments that would diminish risks, as well as their inability to make up for the financial and commercial risk, has led to a reduced level of company research. The risk capital, in its incipient phase in Romania, had no visible contribution to the stimulation of the research and development activity.

All this triggered a contradictory evolution of the GDP weight for the R&D expenditures of the public and private sector in Romania. On the background of the increase of the R&D public expenditure, one can notice a decrease of the weight of the business sector, especially after 2005, when the total amount of R&D expenses represented 0.46% of the GDP in 2006, compared to 0.39% in 2001.

International or European institutions' reports regarding Research-Development-Innovation (R&D&I) either mention Romania as ranking last or last but one as far as performance is concerned, or include it in the "losing ground" countries[7].

The reconfiguration of the national R&D&I system in keeping with the international and European requirements called for substantial efforts in order to transform the Romanian R&D&I system into one whose institutions, mechanisms and instruments be compatible to international and especially European standards. The current stage of Romanian R&D system is the result of progressive improvements regarding institutional structure, mechanisms of financing, evaluating and monitoring, through the refining of R&D policies and their adaptation to the requirements of integration into the European Research Area.

The adoption of competitive financing, within the various R&D national programs that were run up to the present, starting with Horizont 2000, has been a expression of a new vision in the R&D funds allocation even if inevitable difficulties and sometimes unavoidable or avoidable errors have arisen. As a result of the extremely small amount of funds as compared to the demands, it was difficult for the evaluators, also involved in projects themselves, to select out of the thousands of project proposals applied within the national R&D programs the ones that would be given financing priority.

[7] European Commission, trend Chart, Innovation Policy in Europe, European Trend Chart on Innovation, European Innovation Scoreboard 2005, Comparative Analysis of Innovation Performance, p10.

The changes that occurred after 2005, with the set uo of the Excellence Research Program, have considerably reduced the tension between the R&D resources and the needs for funds. According to official statistics, the R&D investments grew significantly from 0.38% in the GDP in 2002 to 0.41% in 2005, 0.46 % in 2006, 0.53 % in 2007 and 0.59 in 2008. However, there is still much more to recover in order to reach the medium financing level of EU27.

A special challenge for Romania is reaching the innovation performance of the EU average level. It could be encouraging to mention the notice of European evaluators regarding the dynamics of the indicators that make up the Summary Innovation Index, which contributed to the increase of its value from 0.209 in 2004 to 0.277 in 2008[8].

During the past years however, Romania has lagged in the cluster of the ”catching-up” countries from the innovation performances' point of view. If the situation should not be changed in the future, especially concerning certain indicators where Romania ranks among the last (for instance ”publications per one million inhabitants” or ”demands for licences per one million inhabitants”) then it would be possible that European evaluators' estimations regarding the number of years that Romania needs to reach the average of European performances to come true, that is 22 years or more[9].

Innovation is also a major component of competitiveness. The Global Competitiveness Indicator, annually published by the World Economic Forum, offers a general image on the place of innovation with a view to increase competitiveness. If in the 2004-2005 report, Romania was mentioned as one of the countries that took a spectacular step in 2004, going from ranking 78 to 56 in the countries' top according to the Global Innovation Indicator[10], the latest 2009 Report[11], mention Romania on the 64 position, with a less favourable position concerning the Innovation indicator, namely ranking 75. Sub-indicators regarding the ”innovation capacity” and the ”availability of the workforce (scientists and engineers) necessary to innovation activity make it rank more favourably (64 and 56), but the ”quality of research institutes” and the ”cooperation between universities and the industry” are the most important weaknesses of the system (ranking 82 and respectively 73).

In the hierarchy of countries according to the type of economic competitiveness, Romania is included in the group of countries undergoing the transition from the ”efficiency driven” stage to the ”innovation driven” one. In our opinion it is of special importance that duration of this transition towards the group of innovation competitive countries to be as short as possible.

Beyond the responsibility of political decision-makers to raise the budgetary allotment for the R&D&I field which is totally unsatisfying for 2009 and 2010, or to pass incentive legislation for private investment in the field, beyond the responsibility of managers of institutes, research laboratories or university research centres for the efficient management of funds and the stimulation of researchers, there are aspects that pertain to the raising of awareness of each researcher with a view to raise the performance of the R&D&I system.

Even if the majority of studies[12] referring to the scientist's responsibility mostly deal with ethical and social issues, with the concern to avoid the noxious effects of the implementation of the

[8] ProInnoEurope, INNOMETRICS, European Innovation Scoreboard 2008.Comparative Analysis of Innovation performance, January 2009,p.58.

[9] See : ProInnoEurope, INNOMETRICS, European Innovation Scoreboard 2007. Comparative Analysis of Innovation performance, ; Steliana Sandu, Cristian Paun, “The Evaluation of the Possibilities to Recuperate the Discrepancies between Romania and the EU in the R&D&I Field, Working Papers Series, no.19/ 2008,The Romanian Academy

[10] 2005 World Economic Forum: The Global Competitiveness Report 2004-2005, Executive Summary, pdf. Version, p.18.

[11] 2009 World Economic Forum: The Global Competitiveness Report 2009-2010, p267

[12] European Commission: Responsible Science at the heart of policy making” in : Science and Society. Action Plan, Brussels, 2002, p.21; Michael C.Loui: “Ethics and Social Responsibility for Scientists and Engineers” in Friday Forum, University YMCA, Illinois, February 2009

research results into the society and the economy, with scientific rigor and cautiousness in the collection and usage of data and information, the individual responsibility is very important for increasing the scientific prestige of the R&D field embraced by each researcher.

As highlighted by Janez Potocnic, the European Commissioner for Science and Research [13]," "the opportunities offered by the research field also imply responsibility and obligation while ethics is a vital part of the research, from draft to publishing." The turning of research results into publications in international recognised journal or patents- one of the weak points of the Romanian R&D&I performance system- must become a personal concern, having in view, also, the higher demands regarding the periodical evaluation of researchers and professors.

Statistical data regarding the evolution of the demands for invention patents, as well as for granted and published patents, reveal an unfavourable situation. According to the Romanian Statistical Yearbook for 2010, the published and granted patents dropped from 876 in 2003 to 489 in 2008. The demands for submitted invention patents dropped from 1046 in 2003 to 1031 in 2008. Despite of these, only 230 come from research institutes and 178 from universities, individuals being the ones the most concerned with the patenting activity (466)[14]

Another major challenge is increasing the capacity of R&D&I European funds absorption, especially from Framework- Program 7. The increasing the absorption rate could supplement the current insufficient R&D&I investments. According to the European Commission data referring to the Framework Programme 6, the success rate from the point of view of the number of submitted projects is of 11.5%. As to the financing success rate, the figures are even smaller: 7.75%. If we compare it to the Romanian contribution to the FP 6 during the 2003-2005 period, there results a recovery rate of 66% of total funds. However, these amounts also take into account the support received by Romania by means of the PHARE program, which covers half of the Romanian contribution to FP 6. Without this money, only a third of the funds paid from the state budget would have been recovered.

The rate of success of Romania's participants in FP7 is only 14.18% compared to 15.98% Bulgaria, 23.20 % France, 15.42 % Greece, 17.94 % Poland, 18.19% Portugal, 18.74 % Hungary and 21.59% EU.

2. Strengthening research - industry relations and increasing the absorption capacity of research results

A critical problem for Romania is the still weak cooperation between the different types of research institutes and the industry. Public instruments seem insufficient to enhance the collaboration between the research sector and industry. At present, the main cooperation framework between research and the productive sector consists of the national RDI programmes and direct orders (RDI procurement). The legal framework and the financial instruments to stimulate research activity and the application of research results in the economy (i.e. risk capital funds for high-tech start-ups, and spin-offs) are weak, as are tax incentives to foster innovation activities in enterprises. There is a strong need for a friendly environment (legal, institutional) with respect to innovation in the private sector and for a coherent and attractive package of incentives for clustering and networking[15].

[13] European Commission: Ethics for researchers, Facilitates research excellence in FP7, 2007, p.5

[14] The National Institute for Statistics, The Statistical Yearbook , Romania 2010, p.54.

[15] Sandu S., Zaman Gh,Gheorghiu R, Modoran C (2009): JRC Scientific and technical Reports, ERAWTCH Coountruy Report 2008, An assessment of research system and policies, ROMANIA, JRC-European Commision, IPTS, EUR 23766EN/2, 2009

R&D projects achieved within national programmes exhibit a serious weakness in the exploitability of results. This is partially due to the fact that the projects are not sufficiently market-oriented, but also to a lack of consistent ex-post evaluation and monitoring of research results, which reduces the incentives for researchers to produce high quality, exploitable research outcomes. The intensity of patents, as one of the central indicators of the quality of knowledge production, is at a very low level in Romania, representing only about one percent of the EU average patents registered with both EPO and USPTO. Romania also ranks low among EU countries regarding the number of publications.

The technology-transfer and innovation infrastructure, namely the organisations specialised in the dissemination, transfer and valorisation of R&D results is still in its early development stages. The future development and consolidation of TTI infrastructure by the new specialised programmes might ensure a favourable framework to strengthen the partnership between enterprises, universities and R&D institution.

The focus on R&D mechanisms to stimulate an increase in the quality of human resources and of the research results, on intensification of knowledge transfer through closer relations between academy and industry are an important concern for different government bodies, NGOs and R&D institutes. The new instruments of financing, put in place since 2005 and improved with the new National Research, Development and Innovation Strategy and Plan 2007-2013, allow access of all R&D system actors to public funds, promote multi-annual funding and stimulate collaborative and multidisciplinary research and co-funding from a variety of funding sources.

Despite these good developments, the R&D system is still confronted with serious weaknesses regarding its performance and the governance of research activity. While the public financing system is gradually being transformed into a competitive one, the dynamics of business R&D funding are not positive. The contribution of the business sector to R&D financing has decreased starting in 2004 from 0.18 % of GDP to 0.14% in 2006, which is far from reaching the recent Lisboan Agenda target till 2020. The recent R&D and Innovation strategies and policy instruments aim to correct this situation. They include measures focused on stimulating the role of the business sector in R&D by means of fiscal incentives and venture capital for the development of innovative industries[16].

The results of the research performed in universities and laboratories of public scientific research, having a mainly fundamental and investigational nature, make up a research input important for many economic sectors (pharmaceutical, biotechnologies, etc).

Universities generate scientific knowledge, often lacking specific orientation towards a certain type of users, whose value can be considered as directly dependant on the capacity of the potential receivers to evaluate, assimilate and turn them into account. That is why, regardless of the external knowledge source, public or private, scientific or industrial, its absorption and assimilation at the level of the company cannot be achieved without effort, expertise and pro-active actions on the part of the researchers within the company.

A series of studies [17]have reached the conclusion that companies featuring a high level of absorption capacity have developed more numerous and sustained relations with research institutes than companies having a low absorption capacity. At the same time, their high absorption capacity increases the ability of the company to turn into account new scientific knowledge, of basic nature.

[16] Sandu S, Dinges M (2007):Impact of policies and public financing instruments on R&D investments, in Romanian Journal of economics, nr.1/2007, p.47

[17] Criscuolo P., Narula R (2002): A novel approach to national technological accumulation and absorptive capacity: Aggregating Cohen and Levinthal,., MERIT, 2002; Narula R.(2004): Understanding absorptive capacities in an "innovation systems" context: consequences for economic and employment growth, MERIT – Infonomics Research Memorandum series, cod 2004-00

The economic importance of the transfer of research results achieved in public research institutes or universities into the economic sectors represents a topic of special significance, especially under the circumstances of the current economic crisis.

The need for an ever more efficient cooperation between research and industry has made its mark into the consciousness of the governments of the European countries as well as of the United States throughout the ninth decade, being mirrored by the strategies and policies focusing on the diversification and strengthening of these relations that radically altered the theoretical models and enriched the practice from the field of innovation and technological transfer. The multitude of books and articles written on this topic during the latest years reveal that the issue of the relations between research and industry rose in the literature as a major topic[18].

In the case of knowledge transfer from the research undertaken in universities and research institutes, certain determinants of the receiver's absorption capacity have supplementary: the weight of higher education personnel, of the individuals functioning as an interface between the source of scientific knowledge and the business organization, research– mainly fundamental – having a ongoing, sustained nature, the existing specialized knowledge stock, similar to the ones already absorbed, etc.

There also arises the need to set up a shared platform of internal and external research in order to foster an efficient transfer of knowledge. This basis for shared scientific knowledge supports researchers in the company to identify and turn into account the results of the research undertaken in universities, allowing at the same time a more efficient communication process between the personnel of the knowledge source and the staff of the receiver.

A company having an high intensity for the fundamental research there will be able to turn into account, innovating, more efficient and promptly, the results of the scientific research from universities or research institutes.

When knowledge is mainly of mutual nature it is of vital importance to achieve direct interaction between the parties in order to establish an optimum transfer of knowledge. The more intense the relations between companies and scientists, researchers from universities and research units, the more capable a company will be to turn into account the results of public research in its innovating activity.

In the specific context of the relation between the public sector and the industry there can be noticed the need for the creation of certain support institutions – structures that would facilitate the link between knowledge creators and receivers, maintaining the absorption effort at the level of the company. In this respect, numerous authors have underlined the importance of clusters, of technological platforms, of transfer networks, of partnerships between universities and public research units, on the one hand and potential users, business organizations, on the other hand.

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[18] Mansfield, E.(1991): Academic research and industrial innovation, in Research Policy, 20, 1–12; Mansfield, E. (1995): Academic research underlying industrial innovations: Sources, characteristics, and financing, in The Review of Economics and Statistics, nr. 77, p 55–65; Mansfield, E.(1998): Academic research and industrial innovation: An update of empirical findings, in Research Policy, nr .26, p.773–76; Mansfield, E. and Y. Lee (1996): The modern university: Contributor to industrial innovation and recipient of industrial R&D support, in:Research Policy, nr. 25, p 1047–1058; Grossman, J. H., P. P. Reid, and R. P. Morgan (2001): Contributions of academic research to industrial performance in five sectors, in Journal of Technology Transfer nr.26, p. 143–152; F. Narin, and D. L. Deeds (2000): An analysis of the critical role of public science in innovation: the case of biotechnology, in Research Policy,nr.29,p 1–8; Narin, F. and D. Olivastro (1992): Status *report:* Linkage between technology and scienc, in. Research Policy, nr.21 p.237–249, Henderson R.Jaffe A.and Tratjtenberg M (1998) : Universities as a source of commercial technology: a detailed analysis of university patenting, 1956-1998, în Review of Economics and Statistics, nr.80, p.119-127.

The literature in the field comes up with the notion of ***connectivity,*** arguing that it is the most important ingredient in the making up of the absorption capacity. Internal research and development also constitutes a mechanism that can stimulate connectivity and can also generate the absorption capacity.

The authors identify three additional mechanisms for the stimulation of the connectivity as follows: the nurturing of relations between companies and universities by means of research sponsorship, cooperation with colleges and graduates recruitment; research consortiums participation; teaming up with other companies that work on complementary research.

On the background of efforts on the part of developed countries governments with a view to improve fundamental research after 1990, the relations between the industry and the research organizations intensified, acquiring new characteristics, both theoretically and practically.

The new concepts of "strategic research" or "mission oriented" or " applied oriented" were considered as much more relevant for the description of nature transformation that occurred in the approach of the issue of innovation, where the borderline between fundamental and applied research is getting more and more blurred while basic research is preferred stimulated in those fields that have an applicability potential based on new principles or discoveries.

At present in Europe there are approximately 1,400 technological transfer units[19]. These started out as « industrial relations units » that would encourage the trading of research results. In time, many of these developed authorized personnel and services for the evaluation of inventions, patenting, licensing, and the spin-off and start-up development and financing, but also for an active approach of companies with a view to contracting based on arrangements. Based on a legislation of the Bayh-Dole type, implemented in many countries, universities were called to practice a policy of industrial property rights based on patenting and licensing, which led to the growth of the number of technological transfer offices.

The direct transfer of knowledge from higher education and research into the industry can be practically achieved in various ways, depending on a series of factors, among which the most important are the degree of transferability of the research results and the capacity of the industrial unit to absorb or use the new technologies.

It is generally considered that there are four **possible knowledge transfer methods** :

a) The direct transfer of the knowledge and technologies towards existing companies;

b) The offering by researchers of certain specialized services based on the know-how generated in the academic environment. These sometimes lead to the appearance of small companies that often (but not necessarily) live in symbiosis with universities;

c) "Spin offs, namely companies that spin off from an institute and have a well-defined market profile as well as a good start-up potential. Some of these need an incubation period within the university;

d) "Proto-companies", that are, generally, of high technological intensity, but which have got insufficient knowledge regarding marketing, production or management.

Universities could develop R&D strategies that would transform the above-mentioned centers in "excellency centers" on certain technology fields. Scientific parks can also constitute natural environments for many R&D and educational activities and they can be transformed into strategic instruments of universities for the increase of the degree of technological concentration of the area where they are placed.

[19] Hermans J and Castiaux A (2007) “Knowledge Creation through University-Industry Collaborative Research Projects” inThe Electronic Journal of Knowledge Management Volume 5 Issue 1, pp 43 - 54, available online at www.ejkm.com

The major benefits ensured by the incubators, technological transfer centers or industrial relations units, that would be difficult to obtain under different circumstances, especially by the new spin-off and start-up companies, are the following[20]:

a) Increasing of credibility;

b) Shortening of the training period;

c) Quicker solving of technological, organizational and financial problems;

d) Ensuring the access to an entrepreneurial network.

In many countries where there has been conducted a serious policy of development of all means of mediating the relations between research and industry, they proved to be viable sustaining mechanisms, by means of various methods, both of new companies, and of the ones already existing. That is why, it is considered that these relations offer an alternative of economic development stimulation by means of the implementation of new products and technologies generated by the research and development activity and of the encouraging of the entrepreneurial initiative that lies at the basis of the creation and development of small and medium innovating enterprises.

In Romania, at the beginning of the 90's, there have been adopted some models from developed European countries, that functioned well in these countries. In Romania, due to a improper conjecture and bad management they stopped functioning one by one, only surviving those that featured intelligent management, able to adapt to the specific local circumstances.

There is currently a concern of the National Agency for Scientific Research to intensify the links between the research institutes and the industry, links that are more and more difficult to establish under the circumstances of the current economic crisis. It ought to be taken into consideration that, also during crisis situations, countries like Netherlands, Germany, France, witnessed an economic revigoration of those regions where the scientific research results were transferred onto spin- offs. Naturally, a vital condition for successful steps in this direction is for scientific research to meet the needs of business organizations.

Conclusions

In this paper we provide an expert assessment of the convergence between the R&D challenges of Lisbon Agenda 2010 and polices and instruments in place in Romania, analyzing how the research system fulfils its fundamental role to create and develop excellent and useful scientific and technological knowledge.

A response to economic and social demand has to balance two main challenges. On the one hand, ensuring knowledge quality and excellence as the basis for scientific and technological advance, requires considerable prior knowledge accumulation and specialisation as well as openness to new scientific opportunities, which often emerge at the frontiers of scientific disciplines. Quality assurance processes are mainly the task of scientific researchers due to the expertise required, but it is also the subject of institutional rigidities.

On the other hand there is a high interest in producing new knowledge, which is useful for economic and other problem solving purposes. The low R&D financing in the last two years, lack

[20] Sandu S (2002): Transferul de cunostinte si tehnologie de la cercetare la industrie(The transfer of knowledge and technology from research to industry , in the book : Inovare, competenta tehnologica si crestere economica (Innovation,technological competence and economic growth), Editura Expert, Bucuresti, p.168

of incentives for scientific actors to link their research to economic and societal demands, lead to a corresponding weak exploitability challenge.

If "improving scientific research is part of the crisis's solutions"- as recently the minister of Education, Research, Youth and Sport stated, than a deep analysis of the strengths and weaknesses of Romanian R&D system is a basic point for the future architecture of the R&D system. Despite the good developments, the R&D system is still confronted with serious weaknesses regarding its performance and the governance of research activity.

A first conclusion of the paper is that the policy makers did not mange well in order to transform the crisis into an opportunity for the R&D. Instead of increasing the investment in this field, as a solution for crisis recovery, in Romania, after an increasing of the public RD expenditures starting with 2005, the share of RD in GDP is in a sharp decreasing since the last year. If this trend will continue, many of strategic objectives derived from the Lisbon Agenda 2020 should be compromised.

The medium and long-term impact of research scarce financing would deepen the economic crisis, as well as narrowing of the solutions for it's solving. The deliberate reduction of the competences level in the economy by marginalizing scientific activities is hostile to any feasible strategy of economic recovery.

Contrary to the best practice of developed European countries and of experts opinions, in Romania, due to specificity of R&D system, still past dependent, the public financing has not an effect of complement the private funding but an effect of their substitution. Consequently, starting with 2003 there is a decreasing trend of private R&D financing. While the public financing system is gradually being transformed into a competitive one, the dynamics of business R&D funding are not positive. The contribution of the business sector to R&D financing has decreased starting with 2004 from 0.18 % of GDP to 0.13% in 2008, which is far from reaching the Agenda Lisabona 2020.

The recent R&D and Innovation strategies and policy instruments aim to correct this situation by including measures focused on stimulating the role of the business sector in R&D by means of fiscal incentives and venture capital for the development of innovative industries. Unfortunately, the effects are still less visible than expectations.

There also a need for avoiding the future waste of funds allotted to research by rethinking the manner of evaluation of the granting projects, by selection those that respond to economic and social priorities, imposing certain minimal quantitative and qualitative indicators of international relevance for the project managers, improving the project management system and to handle more transparently the public money allotted to research activity.

A critical problem for Romania is still weak cooperation between the different types of research institutes and the industry. Public instruments seem insufficient to enhance the collaboration between the researchers from universities, research institutes and industry, on one hand and between researchers and users of output, on the other hand. At present, the main cooperation framework between research and the productive sector consists of the national RDI programmes and direct orders (RDI procurement). The legal framework and the financial instruments to stimulate research activity and the application of research results in the economy (i.e. risk capital funds for high-tech start-ups, and spin-offs, tax incentives to foster innovation activities in enterprises) are weak.

There is a strong need for a friendly environment (legal, institutional) with respect to innovation in the private sector and for a coherent and attractive package of incentives for clustering and networking.

R&D projects realised within national programmes exhibit a serious weakness in the exploitability of results. This is partially due to the fact that the projects are not sufficiently market-oriented, but also to a lack of consistent ex-post evaluation and monitoring of research results, which reduces the incentives for researchers to produce high quality, exploitable research outcomes.

The intensity of patents, as one of the central indicators of the quality of knowledge production, is at a very low level in Romania, representing only about one percent of the EU average patents registered with both EPO and USPTO.

The technology-transfer and innovation infrastructure, namely the organisations specialised in the dissemination, transfer and valorisation of R&D results is still in its early development stages. The future development and consolidation of TTI infrastructure by the new specialised programmes might ensure a favourable framework to strengthen the partnership between enterprises, universities and R&D institutions. The strengthening of the absorption capacity of the firms depends both, of the macro end micro economic factors. The quality of research production and its relevance for the firms is important but the firm decision is crucial in transferring research results to the industry.

Romania could more easily surpass the economic crisis if the R&D system should have adequate programs and funds for stimulating that scientific research projects able to offer innovating technologies and products, which would meet the market requirements.

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