

## IMPROVING COLLABORATION BETWEEN UNIVERSITIES AND INDUSTRY, A MAJOR CHALLENGE FOR ROMANIA

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**ABSTRACT:** *The new economic and technological trajectories, derived from knowledge economy, added new functions („ Third mission”) to those universities have had for a long time and have called them to interact with industry, for reviving and multiplying their creative and innovation forces, for a better addressing to economic and social challenges, and, also, for multiplying their support from business sector. Consequently, different type of direct and indirect, personal and non-personal interactions between universities and business, for reciprocal and mutual benefit, has been set up. The university-industry collaboration is, also, an important element of the strategies and policies at the national and EU levels, contributing to the strengthening of European Research Area and also, to accomplishment of Europe 2020 Strategy goals. Romania has a relative small experience in this area, despite in different strategies have been inserted objectives of increasing intensity of relations between universities and industry. Considering the literature review focused on theoretical and methodological issues and the best European practices, present paper aims to offer a picture of university-industry relations in Romania, the drivers and barriers of their future developing, as well as to depict the main challenges faced to Romanian innovation system in order to accomplish the requirements of EU convergence in research and development.*

**Key words:** university-industry cooperation, knowledge transfer, bridging infrastructure

JEL: O30, O54

### Introduction

In the last three-decade, the literature has been enriched with many theoretical, methodological and practical issues about research-industry collaboration, acknowledged, as this subject is important both, for the academics and practitioners, as well.

At national policy level there is, also, a new orientation in order to stimulate universities-industry collaboration. The strategies and national policies have been oriented to the increasing effective cooperation between research and industry; policy makers were focused on the diversification, consistency and consolidation of the linkages between academia and business. The ”Triple Helix “ model, of interaction between university, industry and government has been more and more accepted. National Innovation Systems, Knowledge Transfer infrastructures and legal regulations underwent significant adjustment also, in order to support different types of academy –industry relations.

The cooperation between universities and industry has proved its benefit in practice, as it stimulates radical innovation, the generation of new companies around universities, the consolidation of knowledge-based economy and the economic competitiveness. At present, the strengthening cooperation between university and industry can contributes to reaching, at least, one of Europe 2020 Strategy target, that is raising the share of RD expenditure in GDP in each Member State and the increasing private sector contribution in R&D financing (European Commission, 2007).

### 1. Theoretical background

A rich literature emphasized different aspects regarding the “new function” of the universities, which complements the other traditional ones, educational function and research function (Hagen S,2007, Etzkowiz, 2012). The new concepts introduced in the literature, especially in the last decades, such as “entrepreneurial university”, “innovative university”, “spin-off companies”, “technologic transfer centers”, “incubator”, “industrial liaison-offices”, “triple helix ” etc. are reflection of the enhancing the relationship between research and industry, of a shared responsibility for impelling the innovation process and, consequently, for boosting up economic competitiveness ( European Commission 2011, Etzkowitz et al,2000 , Tijssen , 2012 ,).

Academic debates are still focused on conceptual clarifications ( advantages and risks of university-industry collaborations-UIC, on finding the most appropriate set of indicators for measuring intensity and trends of university-

industry relations, drivers and obstacles of UIC, sources of gathering statistical data, results of implemented surveys or case studies etc

( Technopolis, 2011, European Commission, 2007, European Commission 2011, Mainardes E .W.et al, 2011, AISBL, 2012 ; Hagen, 2008).

Some studies are dedicated to analysis of drivers; barriers or stimuli of different initiatives that have taken place locally or regionally and, also, of role of public authorities in sustaining these initiatives (Technopolis, 2011, OECD, 2011). The Triple Helix of university-industry-government relation's concept and practical model, a revolutionary theory, different of previous models of institutional relationships because it take into consideration a new configuration of institutional forces emerging within innovation system, has been promoted and many countries have adopted it. (Etzkowitz et al, 2000: The future of university and university of the future: evolution of ivory tower to entrepreneurial paradigm, in Research Policy, 29, p313-330, Leidesdorff L, 2012).

Mental, managerial and behavioral changes took place, pushed by the need of effective channeling RDI output from universities to economy and society ( Hagen S, 2008, Wong .P.K, 2011).

Due to their high level of complexity, the university - industry relations should be based on a real partnership, whose success depends on the level of institutional integration, on the openness for cooperation of actors involved, on the adequate governmental support, as well as for many economic, social or behavioral drivers ( European Commission, 2007 and 2011, Tijssen, 2012).

The expectations of the economy and society from the scientific community are more and more increasing. Scientific research must be involved in solving the economic, social and environmental problems, offering viable solutions. This is a big challenge that guides the objectives, methods and attitude of universities, moving their interests from the "scientific curiosity" to applicable and useful results, with industrial applicability. These new orientation gave way to the necessity of a tight connection of university with, and it deep involvement into, the economic and social reality (Tijssen, 2012 ).

At present, in the context of globalization and strengthening of European Research Area, European universities should be allowed to develop partnerships with the business community based on the long terms and "win-win" strategies. The universities can benefit from complementary funding sources, coming from the private sector and business sector can find easier viable solution for increasing innovation and competitiveness.

The EU organizations calls the Member States to facilitate, in line with national practices, universities' access to complementary sources of funding, including private ones, and to remove barriers to public-private partnerships with business (European Commision, 2007).

The linkages of this university with the business environment take various shapes, such as: partnership in research activity, consultancy, training, technologic transfer, co-ownership of industrial parks, incubators, transfer centers etc. In this way, university should undertake responsibility for the local development, should be involved in a developing a regional and local entrepreneurial culture, should search for opportunities to exploit and apply its ideas, research results and patents. The services that universities provide for industry are usually related to supporting specialized courses, long life learning, spin-off establishments and joint research projects. Joint research projects have proved to be an important form of collaboration between university and industry, which represent also a valuable extra-budgetary income sources for universities. Entrepreneurship becomes an important component of the university strategy ( Gulbrandsen M, Nerdrum L, 2007).

Formal and informal relationships with the outer economic environment should be integrated into the organizational learning strategy. Building scientific parks, incubators, technologic transfer offices, IPR arrangements for industrial property should not be perceived for universities as a goal per se, but a requisite demanded by the formal and informal linkages with the relevant collaborators from economy and society. This involves encouraging a wide range of interdisciplinary activities, creating specific entrepreneurial centers, acknowledging and assuming the responsibility for entrepreneurial culture development among students and teaching staff, identifying and stimulate the potential entrepreneurial leaders. The concept of "entrepreneurial education" has to be inserted in the faculty's curricula, accepted and promoted by all means available. This would require, also, an adequate and effective reward systems ( Tijssen, 2012).

The interdependent research relationships between universities and companies enable both of them to sustain the growth of performance in their areas. Just as industry needs innovative ideas coming from universities to increase profits, researchers need additional funds to sustain their activity.

The quality and efficiency of university-industry cooperation depend, among others factors, on the collaboration type, on transfer mechanisms and infrastructure and, not the least, on the technologic transfer institutional background, that is – the institutions that systematically and continuously provide services to research units for their results commercialization and for their intellectual assets identification, enhancement and exploitation. (OECD, 2003). The effectiveness of a university-industry collaboration entity, its organizational model, services portfolio, its specialization on a given scientific field are determined, on one hand, by the purpose, content and quality of the scientific base. On the other hand, it is influenced by the size of the particular demand, the availability of the human resources, the legal stipulations governing the university –industry collaboration, the traditions and the specific public policies.

The institutional entities, in order to facilitate the multi-facets relationships between research and industry have, have an important role. There is a wide variety of transfer institutions around Europe, as a result of the national policies focused on stimulation the interest and motivation of universities, companies, consultancy firms and public

authorities to interact each other, in formal and informal ways, for enhancing knowledge transfer (European Commission, 2007).

An important issue regarding the relation between university and industry is the restructuring of universities and transforming them into entrepreneurial universities. The literature in USA as well as Europe, underlines that a university can be considered entrepreneurial when it is not afraid to maximize the commercialization potential of its ideas and to create value within society, because it doesn't perceive this as a threat to its academic values; it also admits the need for a diversified funding sources portfolio, increasingly involving private sources. The entrepreneurial university earns its reputation not only through publications and educational activity, but also through drawing a large number of stakeholders, through deep involvement in economic and social development of its proximity environment (Loet Leydesdorff, 2012; Shattock, M. 2010; OECD, 2005; Gibb A, 2011; Farsi J.Y et al 2012 ).

In Europe, the modernization of university education, the Bologna process have been catalysts for the need for change regarding the relationship between university and firm, for transforming the relations with companies into a strategic elements of university development. The Lisbon Agenda acknowledged that universities are a key factor for raising competitiveness and innovation performance of the European economy. Research and Innovation have been placed at the center of the Europe 2020 Strategy, and one of the pillars is increasing innovation even by universities and business collaboration. One of the key priorities of the Horizon 2020 program is to fund collaborative research open up new and promising fields of research and innovation through support for future and emerging technologies (European Commission 2011). Therefore, in increasingly more countries, the universities are considered as a crucial economic factor for the transfer of knowledge towards commercial markets, as a major agent for the development of an industrial society. They are called to educate, to form up attitudes, cultures and entrepreneurial education among students in order to enable them to properly answer to local needs and demands. (European Commission 2007, Hagen S, 2008, Technopolis, 2011)

Nevertheless, there are still a few European universities, especially in new entrants in UE countries, which effectively promote entrepreneurship due to, either, sticking to the traditional narrow educational mission or, to a rejection attitude for adapting new functions and missions (Hagen, 2008). According to the results of a recent study, the most academics are not engaged at all in university-business cooperation or only to a low extent whereas at the institutional level. Approximately, 40% of academics are not involved in collaborative relations with business at all, 20% undertake only a low extent, whilst only 40% of academics undertake a medium or high extent (Davey T et al, 2011)

In practice, there are significant differences among the various structures and patterns of entrepreneurial universities, be they in US or Europe. Referring to the indicators commonly used for assessing performance of universities, such as research capacity, research quality, research applicability, knowledge transfer infrastructure, one may notice that American universities have traditionally built much tighter linkages with industry than the European ones. (Hagen S, 2008). The US business environment is far more involved in the university life, as it collaborates with the universities in establishing the educational plans and curricula, the teaching methods and the means and instruments for transferring the knowledge and competences that students need on graduation. The considerable share of their income drawn from private sources, their higher competitiveness and good cooperation with industry explain their attractiveness towards students, scholars and researchers. In US the funding contribution of business sector occurs through grants, contracts (such as consulting agreements), and collaborative training programs. The areas most likely to benefit commercially from these relationships are agriculture, biotechnology, chemistry, computer science, engineering, and medicine. Furthermore, about half of the biotechnology firms have collaborative agreements with universities and account for nearly one-fourth of all funding for biotechnology research. Contrary, the European universities, having a poor experience in promoting liaisons between businesses and university attract, on average, fewer clients than their American counterparts. In many European countries, the researchers within universities have difficulties in meeting the challenge to harmoniously undertake all the three functions – teaching, research and knowledge transfer. Therefore, distinct establishments responsible for transferring the research results are most welcome. The desire for cooperation, for providing applied research results as well as consistent demand from potential users are still very important requisites for a smooth knowledge and technology transfer ( Davey T et al, 2011).

## **2. Matrix of the universities –industry relations in Romania.**

Measuring such a complex system of relationships between industry and the high education sector through a relevant set of indicators is almost beyond possibility. (Arundel, 2007, Tijssen, 2009). As an author has noted, “despite that many studies are focused on university –industry relations, the issue regarding the metrics of these relations is, surprisingly, marginally approached” (Tijssen, 2012).

The papers concerning the university – industry metrics are rather based on survey studies in order to surpass the lack of statistical data from national or international database and their low level of comparability.

For overcoming the data shortage, the different studies on this issue usually rely on the proxy indicators for which data in international or national statistics is available, at macro or micro level. ( Fraunhofer et al, 2009, Tijssen, 2009). That is why, especially for international analysis, the main indicators used are co-publications or co-patents, the number of spin-offs or other performance indicators of different institutional entities, which facilitate the

knowledge transfer from universities to industry. In 2009, under European Commission has been elaborated an expert group Report on metrics for knowledge transfer from public organizations in Europe, aiming to improve coherence and convergence between existing surveys on knowledge transfer from public organizations to business companies. The experts recommended a set of core performance indicators comprising: research agreements, invention disclosure, patent applications, patent grants, licenses executed, licenses income earned, spin-off established ( European Commission ,2009).

Among other complementary indicators we mention: the number of contracts between university and industry, the number of researchers engaged in mobility programs, the number of training or long-life learning programs organized for the benefit of enterprises by and within universities, the number of graduates employed by various companies. Some authors still refer to the performance indicators of technologic-transfer organizations, which play an important role in facilitating the patenting, in consolidating the relationship between research and industry.

The main difficulty to elaborate a relevant and consistent system of indicators expressing the cooperation between university and industry (UIR) comes from the complexity of the linkages network itself ( Arundel, 2007). This networks involves not only formal relationships, which are relatively easier to be identified and measured, but also informal interactions which are, often, more numerous, even more effective, but much harder to detect and measure ( Gulbrandsen, 2007). Further on, the high diversity among the national and international higher education systems makes it difficult to meet the comparability standard for the indicators used (OECD, 2012, Hagen, 2008). Only within European Union, for example, universities are very different from one another considering their size, history, organizational pattern, funding, specialization, etc. Some of them are still quasi-exclusively focused on and specialized in teaching; others on research while still others manage to combine the two roles ( European Commission, 2007, Technopolis, 2011).

It is very likely that the European universities with the longer history behind, be among the first places in most of the rankings which use, as criteria, teaching, research and knowledge / technology transfer performance. It is also expected that technical universities may be much more involved in co-patenting, together with industry, rather than the universities of basic research, natural sciences or humanities. There is also a big gap between developed countries and newly entrant countries, concerning intensity of this phenomenon, diversity of ways, drivers, infrastructures and policies.

The diversity of the of European universities landscape, their particularities raise some methodological problems of statistical evaluation, especially when we should internationally compare the universities’ performance.

For Romania, data availability was a restrictive factor in selecting useful indicators for measure UIR. Therefore, most analyses employ data from existent international statistics, such as those provided by OECD, Eurostat, even though their relevance is questionable. Thus, *co-publications*, an indicator easy to obtain from the Web of Science database, and also *co-patenting* need to be cautiously used especially in international comparisons, as they are influenced by various factors referring to the different scientific and technologic specialization level of the university and its correspondent industrial partner (Tijssen, 2012).

We should, also, to take into consideration, that there are big differences between universities regarding their experience in publications in international review that are in Web of science. For instance, in Romania, co-publishing represents a marginal activity for universities and bibliometric studies are in an incipient state. Despite a high interest of academic professors for publishing, because they are systematically evaluated having in view the bibliometric indicators, there are some objective and subjective causes that have a strong influence of the poor performance of universities in publishing and, also, in co publishing.

First of all, before 1990, for political reasons, it was very difficult for a Romanian researcher to publish in foreign journal. After 1990, till at present, a few number of Romanian review were included in Web of science, especially in economic and social field. On the other hand, many researchers or professors have not enough experience for publishing in international reviews; the publishing is too costly in money or time of waiting; the reviewers are very exigent regarding the English translation (sometimes the English version of the paper is not so fluently or the English language is a poor one). On their part, the companies are much less interested in co-publishing even if they may be actively involved in research projects together with universities. There are, also, few data available in databases that allow a cross section analysis of university –industry relation and to organize a survey is a very costly activity (Wong, 2011).

The differences between European universities regarding *co-publication* indicator is due, also, to the differences of size, specialization, technology degree of universities which universities collaborate. But, the most important driver of collaboration intensity is existence or not of research lab within companies (research activity in house) or if they are able to buy different universities output. The big companies, with strong laboratories, are more open to undertake common research projects together with universities, displaying thus, a more obvious and visible co-publishing activity ( Fraunhofer, 2009, Tijssen, 2009 and 2012).

Moreover, it is very likely that a partnership between industry and university may not be captured through the aforementioned indicators as the industrial entity involved in a research partnership with an university is not interested in publication, itself or as co-author. Often, the person representing the firm cooperating with the university co-publishes in owns name, not mentioning the name of the company. In such case it is difficult to state if this partnership involves co-publishing or not.

Therefore, the “co-publications” indicator may sometimes express only a small fraction of the cooperation relationships between university and industry. It is most often restrained to the collaboration involved by the national programmes, specially designed for intensifying the university-industry-relations, such as the Romanian Programme for Partnership in Priority Areas. Especially regarding these programmes, co-publishing should be a mandatory outcome indicator for their final assessment, especially because they are publicly funded and the research results are public goods that need disseminated.

The politics and strategies regarding the Intellectual Property Rights, the public or private R&D funding, the fiscal incentives for private R&D as well as the industrial strategies play also an important role in sustaining co-publications.

Co-patenting may be a very relevant indicator for the university-industry cooperation that is materialized in tradable results useful for industry. Yet, the international available data is scarce and the literature usually considers the university patenting as relevant for in-house research results, for the quality of academic performance. It very seldom approaches co-patenting between university and industry. As with co-publications, it often happens that patent registration does not mention the affiliation of the both partners – from industry and university (OECD, 2003).

Tijssen R.W ( Tijssen, 2012)) shows that the high gaps between countries regarding the intensity of co-patenting is due to different technologic specialization, as well as to other factors, such as: the local policies and legislation regarding the IPR; local specialized institutions in facilitating the technologic transfer; technology and patent transfer funding patterns; experience and background in patenting; patenting costs; the opportunities for patent exploitation.

For the new EU member states, the affiliation to the European Office for Patenting and the strengthening of university autonomy have been strong incentives for university patenting.

Beyond the many hindrances and limitations mentioned above, indicators such co-patenting, co-publications are proxy-indicators employed in most of the research papers. Empirical research, which sometimes provides complementary data considered more relevant and veridical, has often confirmed the validity of these proxy-indicators. Yet, prudence is required especially when using and comparing international data. Unfortunately, such data is not available for Romania, so far.

Another useful tool for the metrics of UIR in international comparative analyses is the Community Innovation Survey (CIS), which provides data for the EU member states, especially regarding the collaboration between innovative companies and their outer environment, including the business sector. One may analyze the intensity of these relationships considering also the firm size, their specific activity field, how important UIR are among the company’s innovativeness sources.

The CIS (Community Innovation Survey) is considered a relevant tool for the evidence on the dynamics of knowledge transfer from universities to industry. But it requires caution in data processing and analysis because the concept of innovation used in the survey covers a wide range of activities under the same umbrella. On the other hand, as it is not a mandatory survey, CIS does not provide data for all countries.

Regarding Romania, the employment of the aforementioned indicators for analyzing the UIR in comparison with other EU countries is a challenging task given the high differences between Romania and other countries regarding the cooperation between university and industry as well as the experience in gathering and using the statistical data for these relationships. Therefore, the main data sources further employed are Eurostat, OECD (which provides data on Romania even if not member of OECD) and other national data sources. There are, thus, available dynamic data series on the share of university research expenditure in GDP, the contribution of industry for funding university research, the percentage of innovative enterprises involved in cooperation with the high-education sector, public-private scientific co-publications.

### **3. University –Industry Relations in Romania**

Before 2000 year, university –industry relations were slowly reintroduced in Romania because of difficulties inherent in the transition to a market economy and a lack of coherent governance. In terms of UIC, the market for R&D was very small and the output of universities was, also, very poor.

In order to improve the intensity of university-industry relations in Romania, R&D policies that have been elaborated since 1993-1994 aimed to create the institutional frame for the technology transfer from research institutes to industry. The top-down interface entities intended to connect the universities and research institutions were set up. A network of business incubators was built, together with liaison-offices and other likewise centers that were supposed to effectively transfer the research results to the economic environment. Unfortunately, the outcome was not as effective as expected given the insufficient consolidation of the market economy and of the RDI system, which was going through a deep transformation process, from a centralized publicly funded system to a de-centralized system, with multiple funding sources, which allots financial resources based on competition (Sandu, 1995).

The private sector was, at that time, insufficiently consolidated and its demand for R&D output was very poor. On the other hand, the R&D system was extremely vulnerable and less reliable, given the frequent reformation initiatives. The public policies were less experienced in order to promote relations between universities and industry. These characteristics led to the failure of the good policy intentions of establishing a network of liaisons offices in Romania (Sandu, 1996).

Starting with 2000 year, when Romania began preparation for accession into European Union, and especially after 2005, the strategies aiming to strengthen the connection between universities, research institutes and industry have become more consistent with the local context, with each-other and have been supported through specially designed programmes and funding instruments. The present Romanian institutional system for technology transfer enfolds scientific and technology parks, business and technology incubators, centers for technologic information and centers for technology and innovation transfer.

Still, the partnership between universities and industry in Romania is, yet, weak, despite some good examples of cooperation within the National Programme for Research and Development, different other SOP programs, or programs supported by local or foreign companies. Therefore, developing and consolidating the infrastructure for technology transfer represent important objectives for the governmental policy, as this may provide a favorable framework for strengthening the partnership between companies, universities and research institutes, for stimulating the demand for research and the development of RD departments within companies (especially high-tech)

The National Authority for Scientific Research (NASR) directly supports the Government Programme elaborated for 2011-2013 regarding tighter cooperation between research and industry by establishing a favorable framework for RDI development and for the improvement of research results dissipation and absorptive capacities.

In the EU landscape, of a great diversity regarding specific infrastructure, typology, strategies and performance of university –industry relations, Romania performs weak regarding many indicators that characterized university –industry relations. Our analysis is limited to the data available in EUROSTAT database, in Union Innovation Scoreboard 2011 or in some national database (European Commission, 2011b).

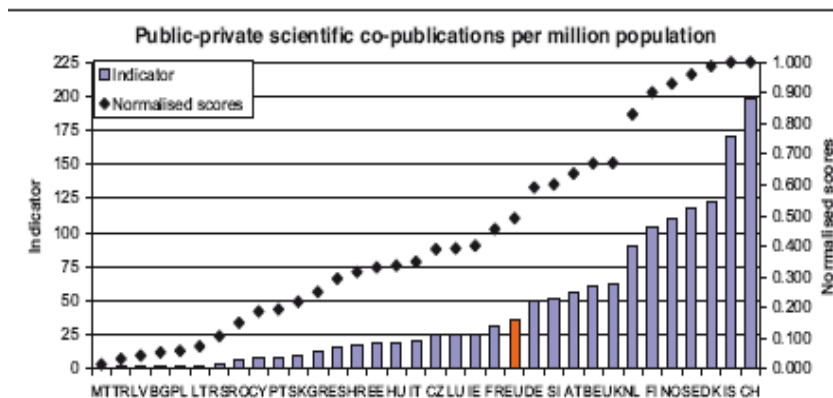
The correlation between the quality of university research and the intensity of its collaboration with business sector has been emphasized in the literature (Parente,2011). Referring to the university research performance in Romania, one may expect a very low intensity of UIR.

According to the New Education Law no. 1/January 2011, universities have been classified into three categories, having in view mostly their performance in education and research. Only 12 universities are classified in the first category, comprising universities that perform high quality research and education. They are located in four main university centers: Bucharest (4), Cluj Napoca (4), Iasi (3) and Timisoara (1) and are focused on the following research fields: medicine and pharmacy (3), technical field (4), agricultural science (1), economics (1), mix of sciences (3).

In the second category, namely universities focused on education and research, have been included 22 universities plus 8 art universities, located in 10 university centers. The last category, referring to the universities focused only on education, includes most of the universities (48). All private universities are in this last category.

That is why the number of public private co-publications in Romania is so small in comparisons with other European countries.

Fig.nr.1



Source: Innovation Union Scoreboard, 2011, p.86

In the CWTS, University-Industry Research Cooperation Scoreboard 2011, that ranked universities according to the size of their internationally visible research output in terms of their WoS-indexed publication output during the time-period 2006-2008, Romania is missing (CWTS, 2011). The international research performance of Romanian universities is modest, as we can see from different others international universities ranking systems. Only one Romanian university is included in a single one World University Rankings

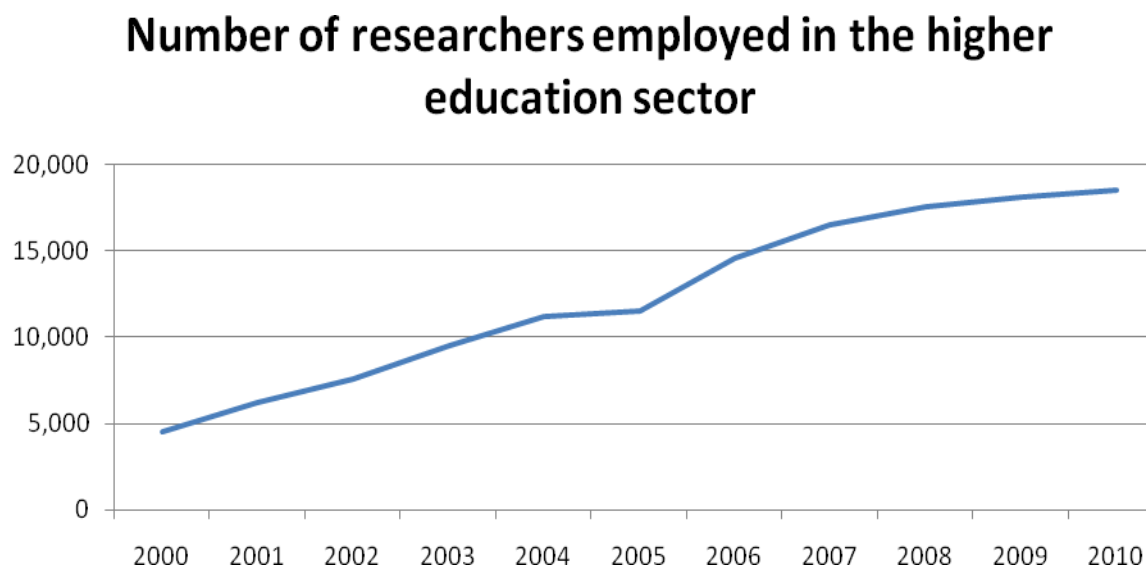
The heritage of the past and the profound changes after 1990 are important causes for this situation. Romanian universities have been traditionally focused on the teaching role while research activities have always accounted for only a small share, non-being performed on a systematic basis before 1990. Recently, in the official policy and in the universities strategies, the mission of universities has been revised, taken into consideration their involving in relations with business companies, for a direct contribution to regional development. Unfortunately, the third mission is in a very incipient stage for the most of Romanian universities. Concepts like 'entrepreneurial

university' or 'university-industry consortia' have only recently emerged in the public debate and some support measures have been adopted, but their effectiveness is yet difficult to assess ( Marina Ranga, 2010).

Starting with 2011, the research performance of HEIs is monitored within a national system of academic/research quality assurance mechanisms. The quality assurance (QA) of national HE and research is considered by the new Education Law no.1/2011 as an obligation of the HEIs and a fundamental responsibility of several institutions that are involved in this activity.

Nevertheless, recent statistical data shows an upward trend for the intensity of university research in Romania. Before 1989, the university research was performed solely within national research institutes to which the university personnel were affiliated. Profound transformation occurred ever since, and especially after 2000, when Romania started to prepare for accession. If in 2000, university R&D personnel represented only 0,03% of total employment, in 2011 the percentage raised up to 0,9% - which, unfortunately, is still among the lowest figures in EU.

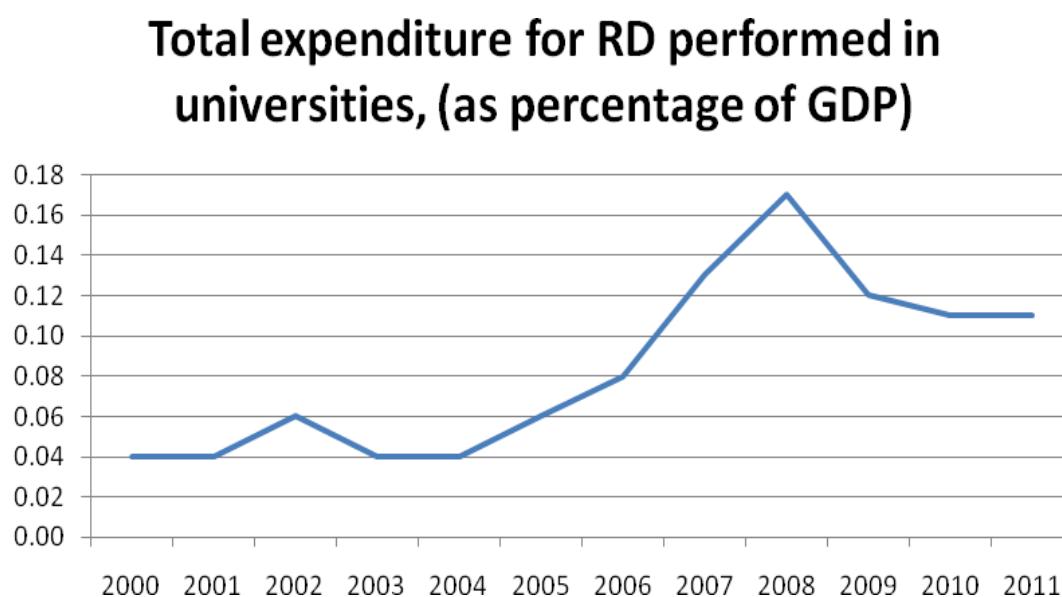
Fig.nr.2



Source: Based on Eurostat database

The upward tendency is reflected also by the dynamic of other indicators, such as “the share of university research expenditure in GDP”. It rose from 0,04%, in 2000, up to 0,17% in 2008. The economic crisis changed the slope and, in 2011, it dropped to 0,11%.

Fig. nr.3

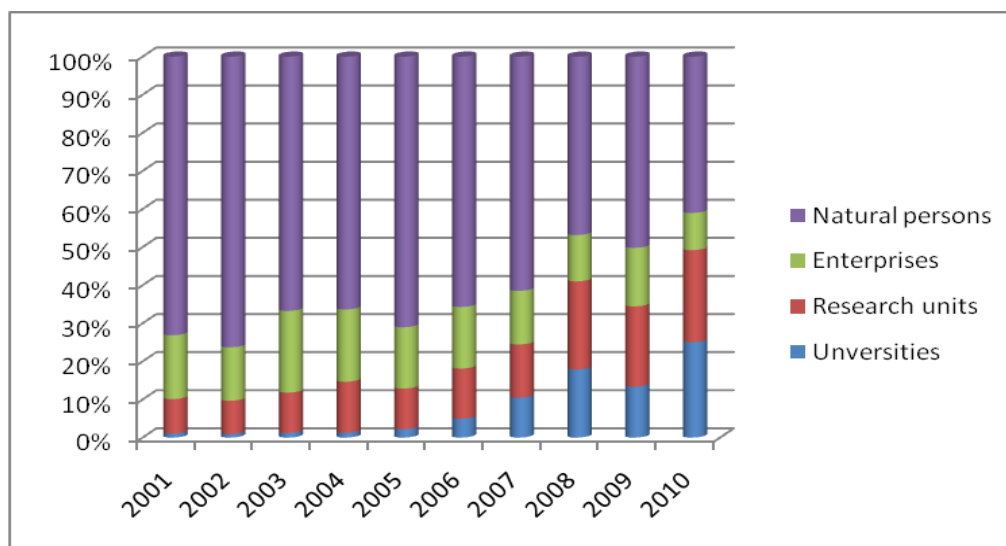


Sorce: Based on Eurostat database

Universities are involved in many research projects in cooperation with business sector, providing publications and patents as final results. Yet, according to statistics, the share of patent requests filed by universities is very low

Fig. nr.4

#### Patenting requests filed to OSIM between 2001-2010, by solicitor type.



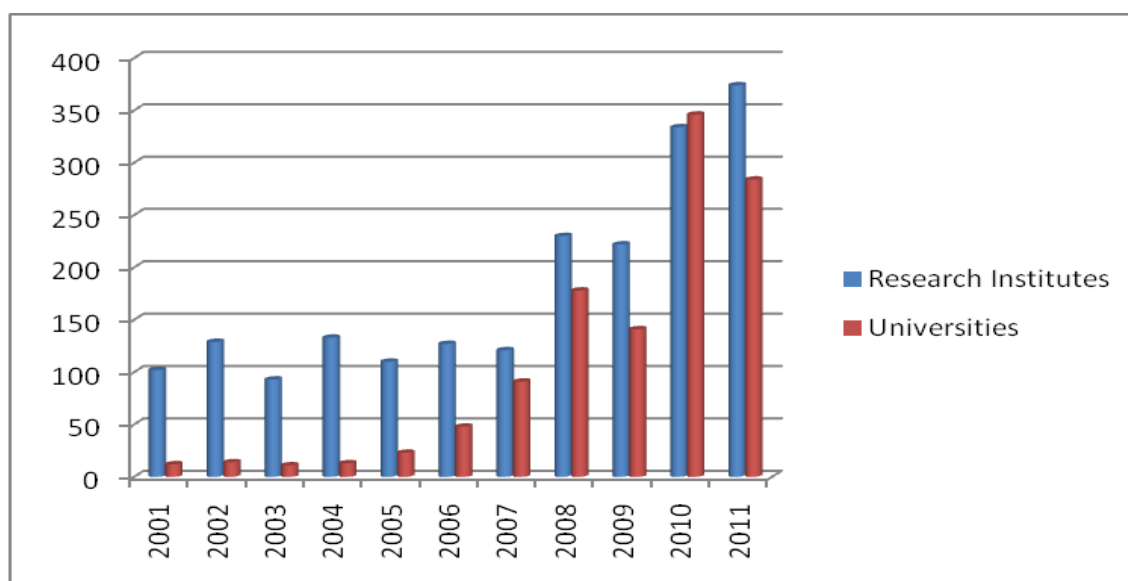
Source: Based on OSIM data base

According to the figure no.3, it is apparent that the highest share in the total patent request belongs to natural persons which filed for 70,72% of requests, on average, between 2001 and 2005 and 53,05% for 2006-2010. The inventing activity for companies is on an upward trend. In 2008 and 2010, the patent requests filed by juridical persons exceeded the number of the patent requests filed by individuals.

Higher propensity for patenting is evident for universities, also. If, on average, during 2001 and 2005 universities filed for 15 patents per year, in 2006-2010 this figure raised to 160 and, in 2010, the number of patent requests filed by universities reached a peak of 346. Among universities, this number varies according to the research profile, research performance and patenting propensity. The first position belongs to the University "Stefan cel Mare" from Suceava (368) which is followed by Technical University "Gheorghe Asachi" from Iasi (112 requests), Polytechnic University Bucharest (96), "Transilvania" University Braşov (95), Technical University from Cluj-Napoca (74), "Dunărea De Jos" University from Galaţi (51) and Babeş Bolyai University- Cluj-Napoca (33).

Fig. nr. 5

#### The dynamics of patent requests filed by research institutes and universities between 2001-2011



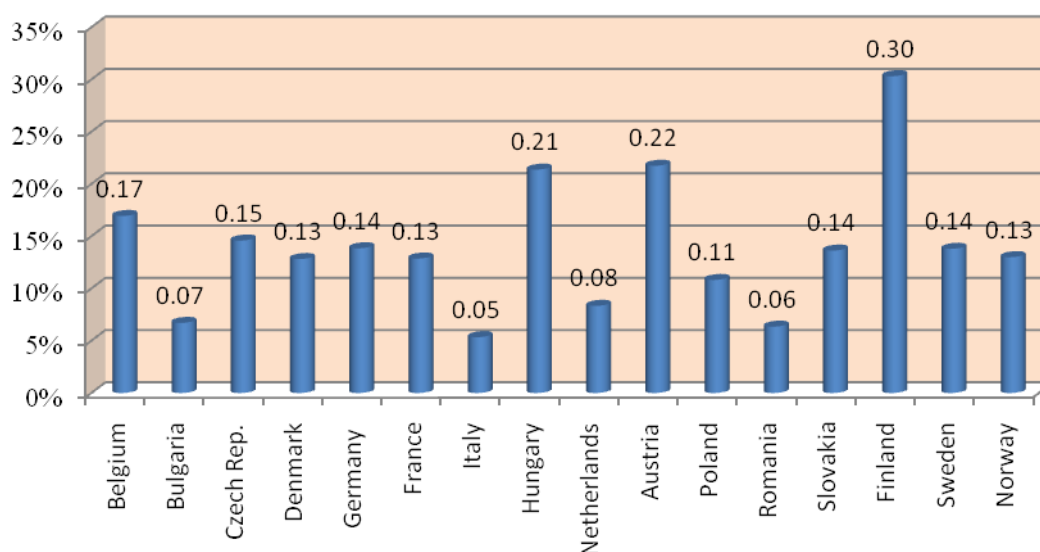
Source: Based on the OSIM database

We find even more relevant the indicator regarding the number of patents granted to universities. Considering this indicator against the number of patent requests, the best positioned is still Universitatea Ștefan cel mare from Suceava, but followed by the Universitatea Babeș Bolyai, with about 24%, Universitatea Politehnică from Bucharest (18,7%), Universitatea "Dunărea De Jos" from Galați (17,6%), Universitatea Tehnică "Gheorghe Asachi" from Iași (16%), Universitatea Tehnică from Cluj-Napoca and Universitatea Transilvania from Brașov (9.5%).

Despite improvement for the two main indicators presented above, the high education sector lags behind regarding the capacity to capitalize on inventions and patents, to commercially exploit its innovative capacity as it is evident from a quick analysis of the license / granting contracts published in the Industrial Property Bulletins.

On the other hand, the propensity for cooperation with universities of the Romanian innovative enterprises is considerably low, compared to other EU countries, as we can see from the figure number 5.

**Fig. nr.6. The percentage of total innovative enterprises engaged in cooperation with universities and higher education institutions**



Source: Based on Eurostat database

One of the important causes are: low level of venture capital in Romania, about half from the EU average, share of SMEs innovating in house, also about half of the average EU level, innovative SMEs collaborating with others that is only fifth part of the EU average level. The Innovation Union European Competitiveness Report, 2011(European Commission, 2011a) mentioned the most important weaknesses of the Romanian innovation system, that hinder, also, the university-industry collaboration: its overall fragmentation combined with a lack of critical mass of the quality of research results; low level of the scientific publications and patent applications impact; the weak scientific and technological performance and rather unfavorable framework conditions for business R&D, low level of business enterprise expenditure on R&D, the employment in knowledge intensive activities is one of the lowest in the EU

Technology transfer in universities is a relatively recent activity and only a few universities (the major universities of the country) have developed their own knowledge or technology transfer units. Mechanisms to facilitate partnerships and productive interactions between research institutions and the private sector are still in an early stage. Public private partnerships for innovation are generally very limited, due to the lack of communication, common purposes and converging interests of both, universities and private partners, unclear regulations on public-private partnerships. Technology transfer from universities to business firms is limited, due also, to a low demand from industry and to a relatively inadequate offer from universities, despite many universities are currently strengthening their technology transfer capacity, being partners with business in establishing science and technology parks, incubators or technology transfer centres. University spin-off creation based on recent research results, patents or licenses is a slow process, which has been further hindered by the lack of capital and difficult access to bank financing determined by the economic crisis.

In the last time some supporting regulations, institutions and programmes have been set-up, as: the National Programme „Partnerships in priority domains” of the 2007-2013 National RDI Plan supports public-private partnerships for solving complex problems and enhancing technology transfer, the network of institutions specialised in technology transfer and innovation ReNITT, financial support for innovative start-ups and spin-offs establishments etc. The structure for knowledge and technology transfer in Romania aims to provide various services of technology

information, counselling, training and technical assistance to public RDI units and private firms, especially innovative SMEs has been set up also. The efficiency of their activity has to be proved in the future.

## Conclusions

Knowledge economy has intensified, along the last decades, the need for strategic partnerships between universities and industry. Universities have gone beyond the traditional activities, searching for extra budgetary funds and looking farther ahead to find the best ways for increasing their contribution to improving the innovativeness and competitiveness of companies, regions and countries. Universities are assuming their „third role” and they are strong involved in economy and society, offering useful answer to the needs of society and people.

Following the Bologna Strategy and the modernization agenda of universities, Romania has recognized the importance of the role of HEIs (through education, research and innovation) in the transfer of knowledge to society and their vital contribution to Europe’s economic competitiveness. Given the numerous advantages and benefits for universities, students, business and society alike, there is a dire need for closer cooperation between academia and the business world. In the Romanian governmental documents, the universities are seen as an important factor for improving the knowledge transfer towards business partners, playing a major role in developing an industrial society, as they are responsible to create and promote the entrepreneurial attitude, culture and education among students. In the National Reform Program 2011-2013, Implementation Report, published in March 2012, is mentioned that private sector will be stimulated by partnership between universities and industry. Some projects for supporting innovative start-up and spin -off are now in progress in the framework of Increasing Competitiveness Structural Operational Program.

Still, the partnership between universities and industry in Romania is, yet, weak, despite some good examples of cooperation. Romania, lie at the bottom of ranking list of the most proximi indicators measuring the state of UIC in Romania. There is a big gap between Romania and other EU countries regarding co-publishing, university patenting, the share of innovative SMEs cooperating with universities, venture capital and other type of financial support for innovative SMEs, that are less innovative in Romania in comparison with big companies.

Stimulating all forms of collaborations between universities and business is a key factor for increasing Romanian competitiveness in the global knowledge economy. The goal to improve the knowledge transfer between companies and the universities in the innovative process has to be approached considering the best practices and models at European, national and regional level. The outstanding success of some universities in USA and Europe, that is the outcome of decades of consistent efforts, has proved that there are considerable opportunities and challenges for Romania, not only regarding the implementation of the entrepreneurial education into the university environment but also the diversification and improvement of the university-industry collaboration in the framework of win-win strategies.

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