The Evolution of the Research - Development Services at the Regional Level in Romania

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Abstract

Research and Development services are the first of the services that support the process of innovation, innovation, and eco-innovation, with a special attention from developing countries that invest a significant percentage of GDP in these type of services. Studying the evolution of R & D services in the territorial profile is a major issue in the current context because these services are the first step in any stage of innovation, development, competitiveness, raising the standard of living of the population, increasing the economic well-being and social issues of a country. The purpose of this paper is to review the literature in the field and to analyze the evolution of the main relevant indicators in describing the level at which R & D services in Romania, and at the regional level, indicators for which there are publicly available statistical data in the official databases. The study, based on fundamental research in the field and the results of numerous bibliographic sources on this topic, uses specific statistical methods of territorial analysis. The obtained results outline an overview of the research and development services in Romania, but also at the level of the NUTS2 regions highlighting the gaps between them.

Keywords: services, R&D, expenditure, researchers, regions, territorial analysis

1. Introduction

Scientific research contributes both quantitatively and especially qualitatively to the social and economic development of a country. In a globalized world based on knowledge, research and education are the main drivers of the country's competitiveness. Not by chance, the most developed countries in the world attach great importance to research. (David, 2016)

In his paper 'The Scientific Research in Romania, between to be or not to be', Țopa considers almost unanimous was accepted the statement: ”In the near future, determinants as training, training and professionalism of the citizens of a country, or their ability to create, discover and develop will be increasingly used in dividing the countries into: rich and poor, strong and weak rather than the natural resources, the size of the territory or the size of the population”. At the 'National Forum on Strategies and Policies in Scientific Research in Romania', in the year 1999, the Academician I. Haiduc, Vice-President of the Romanian Academy, attracted attention in his speech titled 'Romanian Academy in the Perspective of 21st Century Science' about the situation of the Romanian science. He

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emphasized that "the scientific research is of vital importance for the future development of the country and spending on science is not a subsidy, but an investment. Romania has to decide, what and how much research it can sustain." In the same forum, Professor A. Marga accented that "all countries are undertaking reforms of scientific research and even reforms in the context of reforms already made and that educational reform and scientific research reform are of crucial importance, and they are best suited to reducing the distances and compressing the time" (cited by Țopa, 2005, p. 3). Research means: learning and knowledge, and knowing is the key to open the door to the future, it is our value. Scientific research is where questions are asked and answers are sought for the most difficult and important issues in science and technology, with a direct impact on human well-being in the medium and long-term. The discoveries and scientific inventions play a crucial role in improving the quality of life in all aspects, from medicine to entertainment. They also secure the future of the seven billion people sharing the same planet, with limited resources (Leordeanu, 2013).

As far as the financing of the R&D activity in Romania is concerned, we also notice very large discrepancies, and the failure to meet our own commitments towards the EU on different occasions as long as, at the level of the year 2015, 0.39% of GDP was allocated for research and development compared to the 3% commitment for 2010. Therefore, the allocated financial resources were less than ten times that were had committed to the EU for 2015, or even those were allocated in the year 1989. (Millea, 2017, p. 288) Moreover, the Research in Romania is not only the country with the lowest-funded per capita from the EU countries: the level of funding declined in real terms, year on year, in contrast to the sustained increases of these levels for the other new EU states member. Although the allocations for the year 2016 were 33% higher than those for 2015, allowing for the finished of old, postponed contracts, and the launch of new competitions, the Ministry of Finance's projections are negative, with the 2016 State Budget Law anticipating the gradual reduction of research spending in the coming years. Convergence with the EU average, formally set as a general objective of the RDI National Strategy 2014-2020, seems, in these circumstances, to be an increasingly remote issue, which could be envisaged - at least theoretically - only in a longer-term project. (Corlan, David, and Frangopol, 2016, p.86) In this context, we present the targets of the National Strategy for RDI 2014 – 2020, which were established based on the convergence of Romania with the EU average. Challenging but realistic, the targets below are based on the assumption that by 2020 public spending on research will gradually increase to 1% of GDP, plus fiscal facilities - indirect aid - for private firms.

Table 1. The objectives of the National RDI Strategy 2014 - 2020

Premise	Last value	Target 2017	Target 2020
Public expenditure on R & D (% of GDP)	0,31%	0,63%	1%
Number of PhD graduates (ISCED 6) per 1,000 inhabitants aged 25-34	1,4	1,5	1,5
Number of researchers in the public sector (full-time equivalent)	12.409	15.000	17.000
Scientific publications in the top 10% of the most cited publications in the world (% of total scientific publications in the country)	3,8	5	7
International scientific co-publications to 1 million inhabitants	148	200	300

Source: https://www.edu.ro/sites/default/files/_fi%C8%99iere/Minister/2016/strategii/strategia-cdi-2020_-proiect-hg.pdf

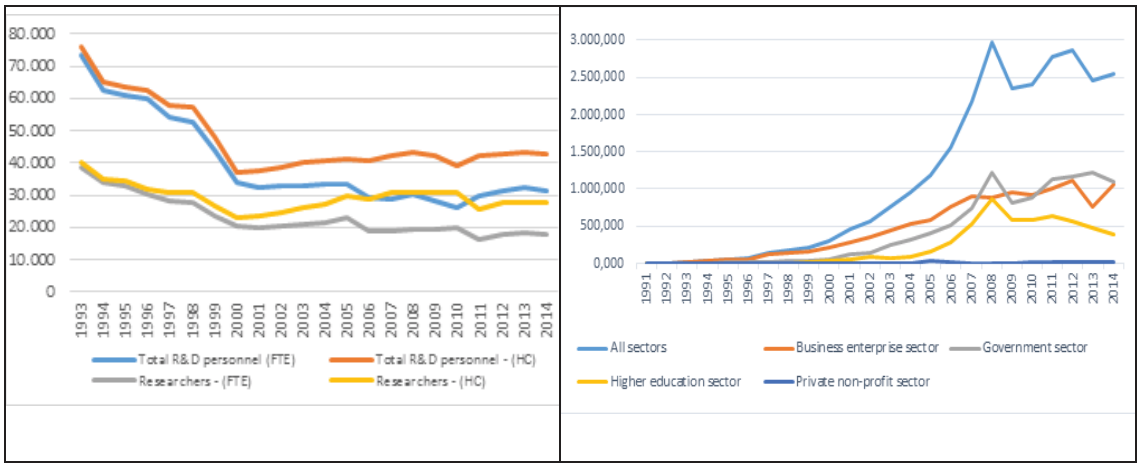
These targets are also set against the backdrop of excessive fragmentation of the national RDI system that has led to the dissipation of the critical mass needed for high-quality research work, with greater applicability in the industry and the economy. The economy relies on innovation as the dominant source of competitive advantage, i.e. on the ability to deliver innovative products and services at the highest global technology level, using the most advanced methods. Research and development have been considered either as an initiator or as a decisive factor in the innovation process. (Vişan and Botez, 2012). The low intensity of national research within the units and a low interest for research and development from the private sector, dominated by foreign companies, for using the results provided by national research institutions - especially public ones - are other issues that characterize the RDI sector. Therefore, the innovative businesses search for other sources of knowledge. In addition, the lack of incentives to increase demand for Romanian research results, in the context of deindustrialization and domination of foreign capital, makes uninteresting research within the branches in Romania. The relationships between science providers and users are still low, as suggested by the small number of public-private co-publications. Taking into account the lack of public policies for eliminating the above-mentioned disadvantages oriented, there will also be an acute imbalance, with a negative impact on the Romanian research and development potential. (Sandu S., 2013)

2. The evolution of the R&D services in Romania

Before the 1989 revolution, Romania had a functional research infrastructure, with research centers developed in the important university cities, to supporting the industry especially. After the year 1990, affected by the Romanian industry privatizations, most of this research centers were disintegrate, following the loss in state funding and an investor interest, which implicitly led to the dismissal of the research staff. Major negative effects had also the free circulation in Europe since 2001, the migration of brains as Romania joined the EU, the effects of the 2008 crisis. (See Figure 1, a) Only in the last years, in Romania, some important companies have organized R&D centers, at their own level or in partnership with universities. As regards the R&D expenditure, after a period when

development research activities did not represent a priority for the Romanian economy and society since 2000's years can note significantly increase of the volume of total expenditures with research development. Another significant increase being registered starting with 2006 when Romania was preparing to join the EU. Recording a peak in 2008, the economic boom year, after which the economic crisis spoke its word, reducing the pace of spending on total, but also on each sector. (See Figure 1, b) Some positive effects could have at the same time, the increased funds from foreign sources founded in the Structural Funds. Even so, ”the shy increase in R&D developments in the private sector has been affected by a severe talent shortage, as numerous young researchers prefer the option of working abroad - statistically, Romanian researchers have one of the lowest income levels in the EU”. (Buciuman, Tapai, and Grigore, 2017, p.1).

Figure 1. Evolution of the Romanian R&D sector since 90's years



a) Total R&D personnel and researchers

b) Total intramural R&D expenditure (GERD) by sectors of performance (Million Euro)

Source: Elaborated by author based on Eurostat database, [rd_e_gerdreg] and [rd_p_persocc], [visited on 15.08.2017]

The table 2 shows the evolution of the number of R&D units by performance sector starting with 2011, the year when were repositioned in public or private sectors. There is a continuous decline in the number of research units. This was an alarm signal. Considered as the main activities for a country development, the Romanian government initiated recently a number of facilities to stimulate the sector, like labor incentives, fiscal incentives, reinvested profit, and state aid for R&D or intellectual property. Noteworthy that private sector gains strength at the expense of the public sector accounting for over 60% of units. Growth tendencies appear in the government sector and the non-profit private sector, too. Slowly increases recorded the public sector, both in the governmental and university sectors. The nonprofit sector is courageous; the number of units here is steadily rising even if they are still insufficient, these being those units that can contribute disinterestedly to the development of an innovative and sustainable economy. Nevertheless, business enterprise sector has a great problem.

Table 2. Number of R & D units by performance sector, at the end of the year

Performance sector:	2011	2012	2013	2014
Total, of which:	1166	970	920	773
Public Sector	268	269	273	286
- Government sector	177	174	186	192
- Higher education sector	91	95	87	94
Private Sector	898	701	647	487
- Business enterprise sector	884	683	623	460
- Private non-profit sector	14	18	24	27

Source: http://statistici.insse.ro/shop/index.jsp?page=tempo3&lang=ro&ind=CDP101B [visited on 15.08.2017]

For a better picture of the dynamics of R&D activities from the perspective of human and financial resources in Romania in post-EU accession period, note the data in Table 3. Romania's total expenditures on R&D recorded the highest value in the year 2008, the year corresponding to the "economic boom" recovered in the analyzed field and the lowest value in the year 2009, the year when Romanian economy felt the economic crisis. The average annual value in the analyzed period was 628,20 million euros. Compared to GDP, spending on research development peaked in 2008 and a minimum in 2014, the year in which state budget resources were directed to other sectors considered more productive.

It is a certitude R&D services should also enjoy in Romania a special attention as it happens from developed countries that invest a significant percentage of GDP in these services. According to the European Statistics Office, Eurostat, Romania was in the year 2014 in the last place in the European Union regarding the share of spending on research and development in GDP, with only 0,38%, values below 1% being recorded in countries like Greece, Bulgaria, and Poland. Given that the 2020 target of R&D expenditure under the strategy is 1%, we find that 0.38% in 2014 is still far away, the effort that the state has to make in this respect is considerable.

The changes in the structure of the total intramural R&D expenditure by sources of funds emphasizes that in the year 2007 the most important shares come from the government sector 67,1 % and business enterprise sector, 26,9 %, but only 4,5 % from the abroad, 1,4% from higher education, and no funds from non-private sector. In the year 2014, government funds were only 48 % followed by the business sector with 32,9 %, only 0,1 % from the non-profit sector, but a higher share from abroad 17 %. (See Table 4)

Table 3. Evolution of the human and financial resources in Romanian R&D services in the post-EU accession period

Year	Total intramural R&D expenditure (GERD)			Total R&D personnel and researchers							
				Full-time equivalent (FTE)		% of total employment - numerator in (FTE)		Head count (HC)		% of total employment - numerator in (HC)	
	Million Euro	Euro per inhabitant	% of GDP	Total personnel	Researchers	Total personnel	Researchers	Total personnel	Researchers	Total personnel	Researchers
2007	652,815	30,9	0,52	28.977	18.808	0,3277	0,2127	42.484	30.740	0,4805	0,3477
2008	809,401	39,2	0,57	30.390	19.394	0,3422	0,2184	43.502	30.864	0,4898	0,3475
2009	555,887	27,2	0,46	28.398	19.271	0,3225	0,2189	42.420	30.645	0,4818	0,3480
2010	572,971	28,2	0,45	26.171	19.780	0,315	0,2381	39.065	30.707	0,4703	0,3697
2011	657,411	32,5	0,49	29.749	16.080	0,3655	0,1976	42.363	25.489	0,5205	0,3132
2012	644,211	32,1	0,48	31.135	18.016	0,3787	0,2191	42.674	27.838	0,5190	0,3386
2013	557,769	27,9	0,39	32.507	18.576	0,3974	0,2271	43.375	27.600	0,5303	0,3374
2014	575,120	28,8	0,38	31.391	18.109	0,3803	0,2194	42.963	27.535	0,5205	0,3336
max	809,401	39,2	0,57	32507	19780	0,3974	0,2381	43502	30864	0,5303	0,3697
min	555,887	27,2	0,38	26171	16080	0,315	0,1976	39065	25489	0,4703	0,3132
$\bar{x}$	628,198	30,85	0,47	29839,75	18504,25	0,35	0,22	42355,75	28927,25	0,50	0,34
$\bar{\Delta}$	-11,10	-0,30	-0,02	344,86	-99,86	0,01	0,00	68,43	-457,86	0,01	0,00
$\bar{I}$	0,98	0,99	0,96	1,011	0,995	1,021	1,004	1,002	0,984	1,011	0,994
$\bar{R}$	-0,02	-0,01	-0,04	0,011	-0,005	0,021	0,004	0,002	-0,016	0,011	-0,006

Source: Calculated by the authors based on Eurostat database [rd_e_gerdreg] and [rd_p_persreg], [visited on 15.08.2017]

Table 4. Evolution of the total intramural R&D expenditure GERD by source of funds (%)

Year	Business enterprise sector	Government sector	Higher education sector	Private non-profit sector	Abroad
2007	26,9	67,1	1,4	0	4,5
2008	23,3	70,1	2,6	0	4
2009	34,8	54,9	1,9	0,1	8,3
2010	32,3	54,4	2,2	0	11,1
2011	37,4	49,1	1,2	0,2	12,1
2012	34,4	49,9	1	0,2	14,4
2013	31	52,3	1,1	0	15,5
2014	32,9	48,5	1,4	0,1	17

Source: Eurostat database: [rd_e_fundgerd] [visited on 15.08.2017]

The structure of R & D funds sources have changed over the review period. The research in Romania becoming able to attract more and more funds from abroad, as shown in figure 2.

Figure 2. Total intramural R&D expenditure GERD by source of funds (%)

Source: Elaborated by authors based on Eurostat database: [rd_e_fundgerd] [visited on 15.08.2017]

3. Evolution of the R&D services at the Regional Level in Romania

As the national stage of R&D sector, the territorial component of the national R&D sector is still underdeveloped, and more than that there are significant disparities between Romanian regions. Major technological disparities among Romanian regions and counties have been recognized as a constraint in building an efficient national innovation system. It is still lacking a strong regional R&D policy to address such disparities (Goschin, Sandu, and Goschin, 2016, p.2).

Such disparities regard both the human and financial resources in Romanian R&D services have been maintained throughout all the post-EU accession period, at the level of the eighth Romania's NUTS 2 regions, too.

Two important indicators, which describe the level of regional R&D services

development, from the perspective of resources, were considered:

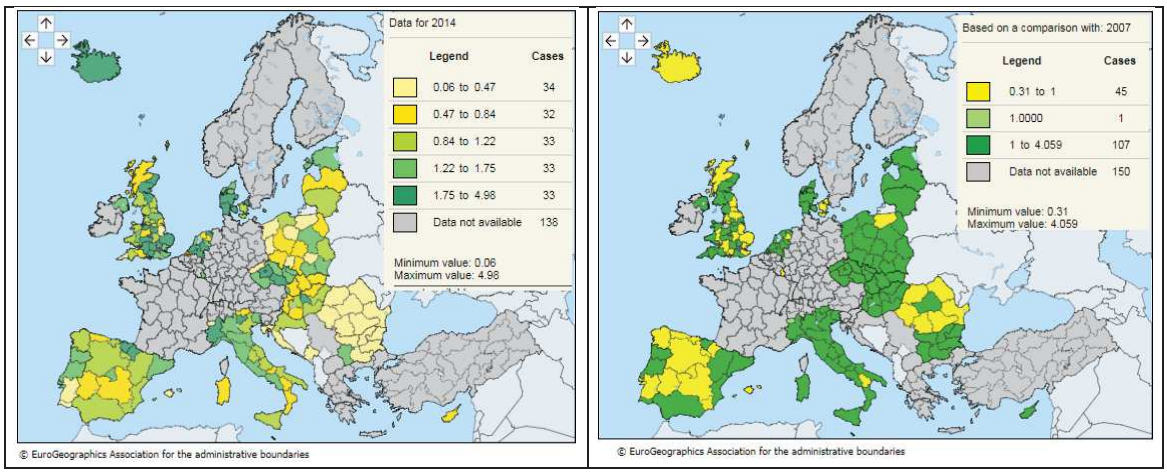
- *IND_1 - Total intramural R&D expenditure* (GERD), as percentage of GDP – named ”R intensity” by NUTS 2 regions. R (expenditures as a percentage of GDP) is an indicator of high political importance at the EU, national and regional levels;
- *IND_2 - R&D Researchers*, as percentage of total employment by NUTS 2 regions. As the Eurostat definition: ”Researchers are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the management of the projects concerned”. (The measure shown in the table is researchers in full-time equivalents divided by the total annual average employed population).

A global picture of Romania's R&D sector changes at the regional level over the period 2007-2014, compared to the other NUTS2 regions of the EU in terms of the two indicators considered can be made using Eurostat's online map tools.

Although at the level of all the development regions, NUTS 2, Romania was in 2014 in the group of the weakest countries in the European Union, in terms of both R intensity, but also the number of researchers in terms of the total number of employees, development at the regional level I highlight the major differences between them.

If with regard to R intensity, the only region that succeeded in 2014 in comparison to 2007 to being placed in the group of the 107 regions in Europe with the highest growth is the Centru Region; all the others were still part of the group of the 45 regions with the weakest development. (See Figure 3)

Figure 3. Total intramural R&D expenditure (GERD) by NUTS 2 Regions, % of GDP



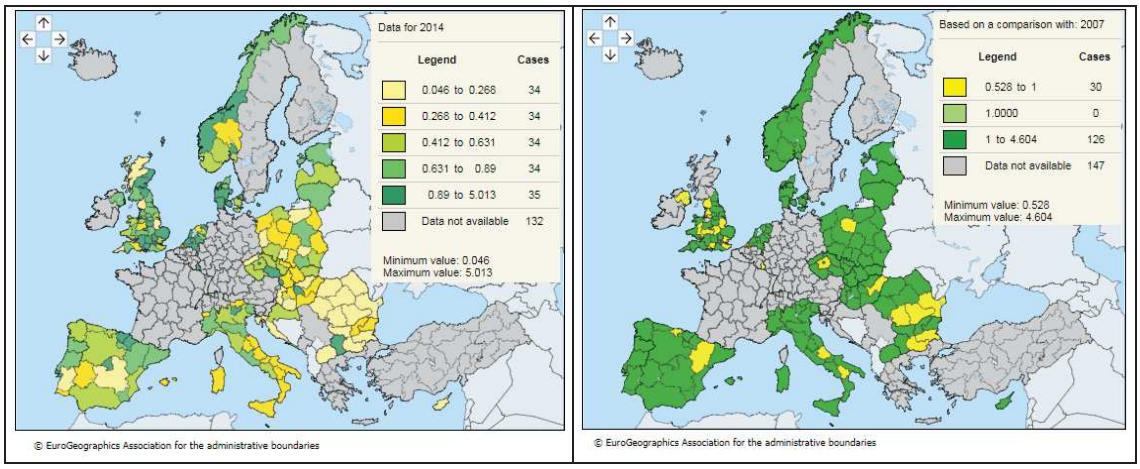
a) year 2014 b) year 2014 compared with 2007

Source: http://ec.europa.eu/eurostat/tgm/mapToolClosed.do?tab=map&init=1&plugin=1&language=en&pcode=tgs00042&toolbox=types, [visited on 15.08.2017]

Regarding changes in the structure of the number of researchers relative to the employed population of the region, the regions Vest, Center, Nord, and Nord-Est recorded the highest increases, similar to the group of the most performing regions. In the same

time, regions Sud-Vest Oltenia, Sud-Muntenia, București-Ilfov, and Sud-Est are in the last class, similar to other NUTS 2 regions in the EU with the weakest evolution. (Figure 4)

Figure 4. Researchers, all sectors by NUTS 2 regions, % of total employment

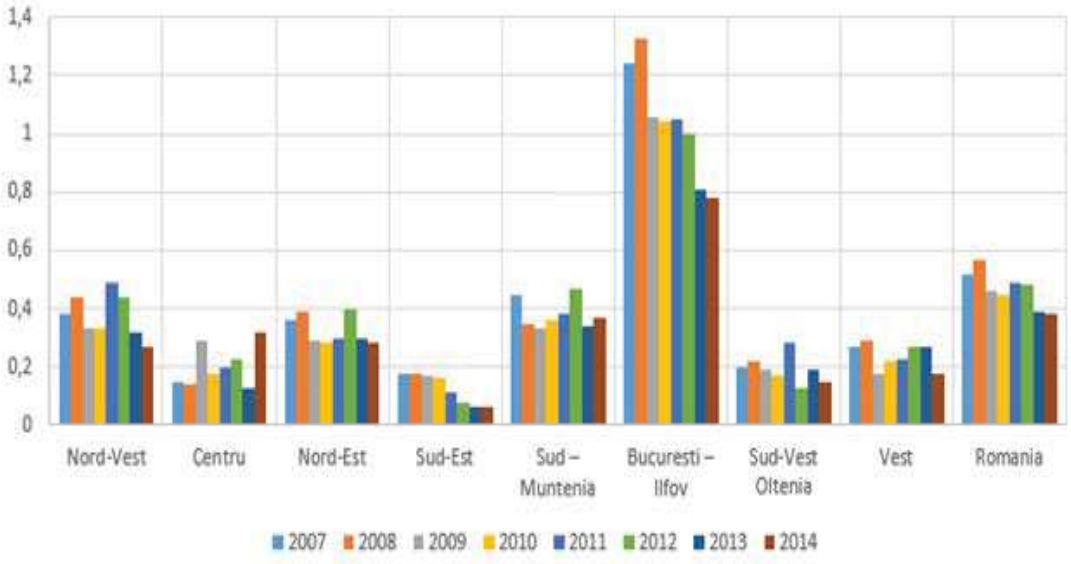


a) year 2014 b) year 2014 compared with 2007

Source: http://ec.europa.eu/eurostat/tgm/mapToolClosed.do?tab=map&init=1&plugin=1&language=en&pcode=tgs00043&toolbox=types**,** [visited on 15.08.2017]

Data confirm the ”best performances”, well above the national average, during the entire considered period for București-Ilfov Region, which includes the capital of Romania, for both indicators, but in an accented decline. On the other hand, the Sud-Est Region has the worst performance, with a steady evolution on the share of researchers in total employees, but on a constant decline over the whole period with respect to R intensity. (See Figure 5 and 6)

Figure 5. Evolution of R intensity by NUTS 2 Regions, % of GDP



Source: Elaborated by the authors based on Eurostat database [rd_e_gerdreg], [visited on 15.08.2017]

To compare the evolution of the two main indicators in the period considered for the eight Romania's NUTS2 regions, we considered data from the table below.

Table 5. R&D expenditure (GERD) and R&D Researchers by NUTS 2 regions

NUTS2 Region	Indicator (%)	Year								Changes 2014/2007	
		2007	2008	2009	2010	2011	2012	2013	2014	$\bar{I}$ (%)	$\bar{R}$(%)
Nord-Vest	IND_1	0,38	0,44	0,33	0,33	0,49	0,44	0,32	0,27	95,24	-4,76
	IND_2	0,2023	0,2469	0,2602	0,2622	0,2193	0,2008	0,1696	0,1948	96,29	-3,71
Centru	IND_1	0,15	0,14	0,29	0,18	0,2	0,23	0,13	0,32	111,43	11,43
	IND_2	0,2242	0,2437	0,2833	0,3183	0,2343	0,2094	0,1823	0,2072	92,42	-7,58
Nord-Est	IND_1	0,36	0,39	0,29	0,28	0,3	0,4	0,3	0,28	96,47	-3,53
	IND_2	0,1928	0,2024	0,1947	0,1957	0,2105	0,2145	0,2201	0,2155	111,77	11,77
Sud-Est	IND_1	0,18	0,18	0,17	0,16	0,11	0,08	0,06	0,06	85,48	-14,52
	IND_2	0,1538	0,1096	0,116	0,1263	0,1102	0,1133	0,1119	0,128	83,22	-16,78
Sud – Muntenia	IND_1	0,45	0,35	0,33	0,36	0,38	0,47	0,34	0,37	97,24	-2,76
	IND_2	0,1855	0,1901	0,1641	0,1709	0,1056	0,1422	0,1821	0,1635	88,14	-11,86
Bucuresti – Ilfov	IND_1	1,24	1,33	1,06	1,04	1,05	1	0,81	0,78	93,59	-6,41
	IND_2	1,4103	1,3897	1,2866	1,2418	1,061	1,2383	1,2171	1,1741	83,25	-16,75
Sud-Vest Oltenia	IND_1	0,2	0,22	0,19	0,17	0,28	0,13	0,19	0,15	95,97	-4,03
	IND_2	0,2116	0,1992	0,2018	0,2253	0,1797	0,1702	0,1796	0,1771	83,70	-16,30
Vest	IND_1	0,27	0,29	0,18	0,22	0,23	0,27	0,27	0,18	94,37	-5,63
	IND_2	0,2223	0,2032	0,3104	0,3843	0,302	0,3572	0,3842	0,3424	154,03	54,03
Romania	IND_1	0,52	0,57	0,46	0,45	0,49	0,48	0,39	0,38	95,62	-4,38
	IND_2	0,3477	0,3475	0,348	0,3697	0,3132	0,3386	0,3374	0,3336	95,94	-4,06

Source: Based on Eurostat, http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=rd_e_gerdreg&lang=en and http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=rd_p_persreg&lang=en, [visited on 15.08.2017]

It should note that the Bucharest-Ilfov region is well above the national average level, while all other regions are below the average level for IND_1, R intensity. The only region that has seen an increasing trend over the period is the Centru Region. (See Figure 5) Even if București-Ilfov decreased its R intensity evolution during the considered period, it remained the "best performer".

To describe differences in the territorial evolution of IND_1 - R intensity during the period 2007-2014 at the level of NUTS 2 regions compared with Bucuresti-Ilfov, the region with the best performances, main territorial indicators like gaps, territorial indices, and rates of gap both for the year 2007 and 2014. In the table 6 are presented main territorial indicators (gaps to the best performer, București-Ilfov Region. There is a slight reduction in regional disparities. The region, which increased its gap relative to Bucuresti-Ilfov Region, is Sud-Est Region, in time that the highest reduction in the gap was for

Centru Region.

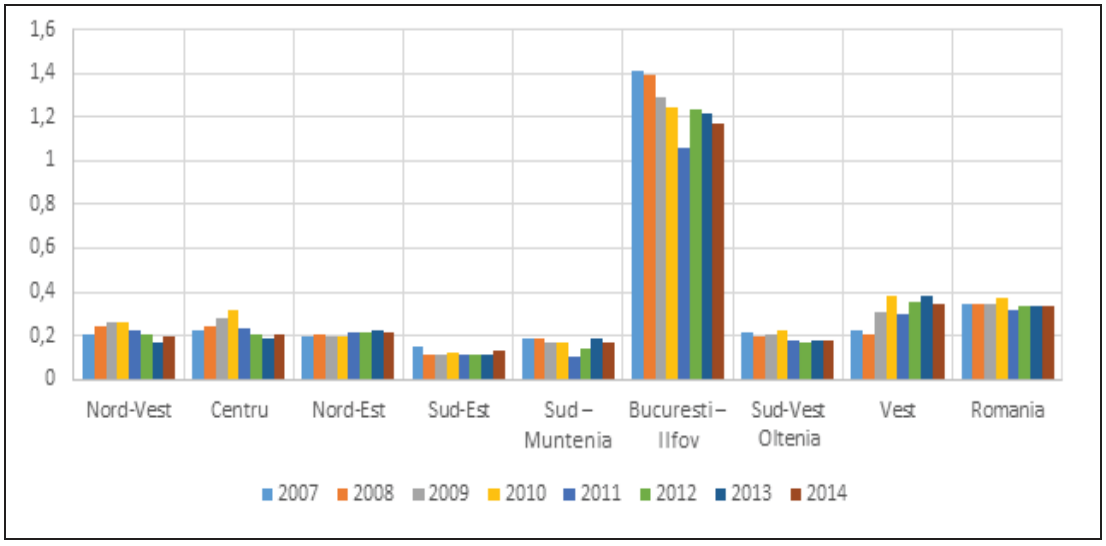
Table 6. R intensity evolution by NUTS 2 regions – territorial indicators

NUTS2 Region	2007				2014			
	R intensity	Gaps	Territorial indices	Rates of gaps	R intensity	Gaps	Territorial indices	Rates of gaps
	IND_1	$\Delta_{A/B}^{IND_1}$	$i_{A/B}^{IND\_1}$	$\Delta_{A/B}^{IND\_1(\%}$	IND_1	$\Delta_{A/B}^{IND_1}$	$i_{A/B}^{IND\_1}$	$\Delta_{A/B}^{IND\_1(\%}$
Nord-Vest	0,38	-0,86	0,31	-69,35	0,27	-0,51	0,35	-65,38
Centru	0,15	-1,09	0,12	-87,90	0,32	-0,46	0,41	-58,97
Nord-Est	0,36	-0,88	0,29	-70,97	0,28	-0,5	0,36	-64,10
Sud-Est	0,18	-1,06	0,15	-85,48	0,06	-0,72	0,08	-92,31
Sud – Muntenia	0,45	-0,79	0,36	-63,71	0,37	-0,41	0,47	-52,56
Bucuresti – Ilfov	1,24	0	1,00	0,00	0,78	0	1,00	0,00
Sud-Vest Oltenia	0,2	-1,04	0,16	-83,87	0,15	-0,63	0,19	-80,77
Vest	0,27	-0,97	0,22	-78,23	0,18	-0,6	0,23	-76,92

Source: Calculated by the authors

As for the evolution of the IND_2 indicator, researchers, the situation is similar, but the region where the share of researchers in total employees exceeds the national average is the Vest Region. (See Figure 6)

Figure 6. Evolution of the researchers, all sectors by NUTS 2 regions, % of total employment



Source: Elaborated by the authors based on Eurostat database [rd_p_persreg], [visited on 15.08.2017]

Regarding the other relevant indicator considered, IND_2, researchers as percentage of total employment, it should note that the Bucharest-Ilfov Region is well above the national average level, too. All other regions are below the average level, except Vest Region started to the year 2010, when has seen an increasing trend over the period. (See Figure 6) Even if București-Ilfov decreased its researcher's evolution during the considered period, it remained the ”best performer”. To describe differences in territorial evolution of IND_2 – Researchers as percentage of total employment during the period 2007-2014 at the level of NUTS 2 regions compared with Bucuresti-Ilfov, the region with the ”best performances”, main territorial indicators like gaps, territorial indices, and rates of gap both for the year 2007 and 2014 were calculated. In the table 7 are presented this territorial indicators. Even there is a very slight reduction in regional disparities; all the regions decreased its gaps relative to Bucuresti-Ilfov Region. Sud-Est Region remained with the highest gap.

Starting from the differential dynamics of the two indicators in the regional profile, a particular interest is a rhythm that should impose to reaches a certain level. The overtaking coefficients, which are calculated for two territorial units based on the dynamic indices to analyzing their evolution over time, can answer many questions about the forecast of the two indicators registered at the territorial level. An overtaking coefficient shows how many times increases the level of the unit reported relative to the evolution of the unit level considered as a basis for reporting. In the table below there are the overtaking coefficients calculated with the level of București-Ilfov as the basis of reporting for the period 2007-2014 both for total intramural R&D expenditure as % of GDP, R intensity, and researchers as % of employment, too.

Table 7. Researchers (% of total employment) by NUTS 2 regions – territorial indicators

NUTS2 Region	2007				2014			
	R intensity	Gaps	Territorial indices	Rates of gaps	R intensity	Gaps	Territorial indices	Rates of gaps
	IND_2	$\Delta_{A/B}^{IND_2}$	$i_{A/B}^{IND\_2}$	$\Delta_{A/B}^{IND\_2(\%)}$	IND_2	$\Delta_{A/B}^{IND_2}$	$i_{A/B}^{IND\_2}$	$\Delta_{A/B}^{IND\_2(\%)}$
Nord-Vest	0,2023	-1,208	0,1434	-86,21	0,1948	-0,9793	0,1659	-83,41
Centru	0,2242	-1,1861	0,1589	-84,64	0,2072	-0,9669	0,1764	-82,35
Nord-Est	0,1928	-1,2175	0,1367	-86,88	0,2155	-0,9586	0,1835	-81,65
Sud-Est	0,1538	-1,2565	0,1090	-89,67	0,128	-1,0461	0,1090	-89,10
Sud – Muntenia	0,1855	-1,2248	0,1315	-87,40	0,1635	-1,0106	0,1392	-86,07
Bucuresti – Ilfov	1,4103	0	1	0,00	1,1741	0	1	0,00
Sud-Vest Oltenia	0,2116	-1,1987	0,1500	-85,54	0,1771	-0,997	0,1508	-84,92
Vest	0,2223	-1,188	0,1576	-84,78	0,3424	-0,8317	0,2916	-70,84

Source: Calculated by the authors

Table 8. The overtaking coefficients for the period 2007-2014

NUTS2 Region	R intensity (Total intramural R&D expenditure as % of GDP)		Researchers (% of employment)	
	Indices of dynamic	Overtaking coefficients	Indices of dynamic	Overtaking coefficients
	$I_A = \frac{IND\_1_{2014}}{IND\_1_{2007}}$	$I_{A/B}^{IND\_1} = \frac{I_A}{I_{Buc-Ilfov}}$	$I_{A/B}^{IND\_2} = \frac{I_A}{I_{Buc-Ilfov}}$	$I_A = \frac{IND\_2_{2014}}{IND\_2_{2007}}$
Nord-Vest	0,71	1,13	0,96	1,16
Centru	2,13	3,39	0,92	1,11
Nord-Est	0,78	1,23	1,12	1,35
Sud-Est	0,33	0,53	0,83	1,00
Sud – Muntenia	0,82	1,31	0,88	1,06
Bucuresti – Ilfov	0,63	1,00	0,83	1,00
Sud-Vest Oltenia	0,75	1,19	0,84	1,01
Vest	0,67	1,06	1,54	1,86

Source: Calculated by the authors

Even București-Ilfov has the best performances for both indicators, much over than the national level, should remark that except Sud-Est Region, all the other regions overtake the București-Ilfov as regard the development rhythm. Note here Centru Region for R intensity indicator, and Vest and Nord-Est Regions for researchers, which present the highest values. Even though București-Ilfov has slowed down its development of the R&D sector, it is expected that the rhythm of development of R & D services will accelerate, especially in Centru, Vest and Nord-Est regions. We have in attention the number of facilities have been thought, of lately to stimulate the sector, like labor incentives, fiscal incentives, reinvested profit, and state aid for R & D or intellectual property (Buciuman, Tapai, and Grigore, 2017, p.2).

4. Conclusions

The scientific research activity, considered the initiator of economic and social progress, largely influences the economic and social development of a country, the sustainable and sustainable development of any field of activity. The study confirms that in Romania the R&D activity has not been sufficiently supported by investments and financing related to this sector, a situation which characterizes this sector of activity both at the national and at the regional level. Only the Bucharest-Ilfov Region, the most developed region of Romania, located above the European average, recorded a favorable position, while all other regions registered significant development gaps. Possible causes of this evolution may be the historical ones, such as the closure of research institutes after

90, and evident the dismissal of staff, the influence of free movement in Europe since 2001, the migration of brains with Romania's accession to the EU, the effects of the 2008 crisis, inappropriate salaries of researchers, lack of a performer research infrastructure. The increased funds from foreign sources and the fiscal facilities for this area can boost activity in the future at least three other regions, West, Centru, and Nord-Est Regions whose capitals are very strong university centers in Romania, significant and at a European level that can support R & D activities at a high level, but probably, the regional disparities remained.

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