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THE CAPACITY OF URBAN CENTRES TO CONTRIBUTE TO THE RURAL DEVELOPMENT IN ROMANIA. AN INQUIRY FROM R&D AND INNOVATION PERSPECTIVE

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THE CAPACITY OF URBAN CENTRES TO CONTRIBUTE TO THE RURAL DEVELOPMENT IN ROMANIA. AN INQUIRY FROM R&D AND INNOVATION PERSPECTIVE

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Abstract. *Among the EU countries, Romania displays the highest share of rural population (45%), most of it employed in agriculture. Moreover, there is a significant variation between the eight NUTS 2 regions with regards to the urban distribution and dynamics, with important intra-regional differences between the constituent counties. This paper proposes an inquiry into the capacity of urban centres to contribute to rural development in Romania from R&D and innovation perspective. First, the rural-urban gap is discussed, pointing at the consequences of the delay in implementing the reform of the production system in agriculture in terms of employment and income. Then, the positive influence of towns and cities on raising the share of employment in non-agricultural activities in rural areas is demonstrated by means of the available statistical data. Further on, the analysis of the regional dimension of R&D and innovation shows an increasing polarisation both between and within the eight development regions. The main conclusion is that the regions or counties with predominantly agricultural activities developed in subsistence households are not enough prepared to access R&D and innovation results. This conclusion is also confirmed by a regression model that analyses the influence of rural areas on regional growth. The above findings are examined in correlation with the expected positive contribution of the current rural development programme as well as of the regional operational programme and competitiveness sectorial programme funded by the EU.*
Keywords: *rural-urban gap, activity diversification, R&D and innovation, EU funding*

1. Introduction

The regional scale for the generation of new knowledge and its economic exploitation have become more and more important and policy actions have been adopted by central and regional authorities towards promoting integrative processes and innovation in regions (European Commission, 2007). The formation of regional clusters and the develoment of partnerships between actors involved in production, R&D and innovation increase the regions' development potential. This issue is of a particular concern when the lagging regions are considered, the main question which arises in such case referring to the capacity of regional policy to support the creation of factors able to foster technological innovation in these regions (Frenkel, 2000). The effectiveness of regional policy in this respect is closely related to the regional innovation potential and innovativeness, which may dispaly significant variations.

Both theory and empirical observations point out that in many cases the results are in close relationship with the presence and the quality of economic linkages between urban centres and surrounding rural areas (Scottish Government, 2005), considering the higher share of rural population in most of lagging regions. According to the current viewpoints on the integrated and sustainable rural development, a living rurality requires a new policy based on packages of measures aiming to encourage the immigration of new populations and activities and to provide a stronger support for the improvement of competitiveness and attractiveness of rural areas by developing essential services, infrastructure and technologies. Thus, synergies between territories based on solidarity and cooperation is encouraged (RURAN (2007), Gurria(2007)).

In European Union rural areas benefit from increased support to research and innovation as a result of complementarities established between rural development policy and cohesion policy. At regional level a better territorial cohesion can be ensured via rural-urban synergies created by an integrated governance (Ruract, 2008). The urban centres located in predominantly rural areas are very attractive for rural development initiatives as a result of their institutional capacity necessary to manage regional, national or European initiatives in a reliable and accountable manner. Also, the concentration of rural development initiatives in small towns may allow the benefits to spread out in the surrounding countryside (Scottish Government, 2005).

For Romania these potential benefits are of a special interest, given the important allocations from the EU funds via cohesion and common agricultural policy. Romania still has a big share of rural population and the increase of the quality of life in rural areas is a must. This requirement is strongly related to the development of non-agricultural activities while the cooperation with the urban centres can be extremely helpful.

Our paper proposes an inquiry into the capacity of urban centres to contribute to rural development in Romania from R&D and innovation perspective. First, the rural-urban gap is discussed, pointing at the consequences of the delay in implementing the reform of the production system in agriculture in terms of employment and income. Then, the positive influence of towns and cities on raising the share of employment in non-agricultural activities in rural areas is demonstrated by means of the available statistical data. Further on, the analysis of the regional dimension of R&D and innovation shows an increasing polarisation both between and within the eight development regions. The main conclusion is that the regions or counties with

predominantly agricultural activities developed in subsistence households are not enough prepared to access R&D and innovation results. This conclusion is also confirmed by the regression model presented in the next section, which analyses the influence of rural areas on regional growth. The above findings are examined in correlation with the expected positive contribution of the current rural development programme as well as of the regional operational programme and competitiveness sectorial programme funded by the EU.

2. The rural-urban gap in Romania

Among the EU countries, Romania displays the highest share of rural population (45%) and most of it is employed in agriculture. The Romanian agriculture has radically changed the ownership structures. The private ownership has become dominant and has created the conditions for market competition. But the agricultural structures which can give an impulse to economic expansion by an efficient use of human, natural and financial resources still do not allow the normal functioning of the market.

In Romania the sector of small family subsistence production units in agriculture is very resistant and it has survived after 1990, based on the structure of the old rural households. The total number of agricultural holdings at the end of the year 2007 was 3.93 million, compared to 4.26 million in 2005 and 4.48 million in 2002 (NIS, 2007). In 2007 the share of holdings up to 5 hectares reprezented 89.6% of the total number and 35.1% of the total utilised agricultural area. In order to reach the competitive average size of 10 hectares per holding, the number of subsistence holdings should decrease by 2.4 million until 2013.

The delay in implementing a real reform of the production system in agriculture keeps a high level of employment in this branch. In the period 2002-2008 there was a significant reduction of employment in the rural area, while in the urban area the trend shows the opposite situation (Table 1).

Table 1. Employment by area of residence, 2002-2007

Year	Urban		Rural	
	Employment (thou persons)	Employment rate[1)] (%)	Employment (thou persons)	Employment rate[1)] (%)
2002	4607	53.7	4627	63.7
2003	4662	54.0	4561	62.9
2004	4906	55.9	4252	60.6
2005	4889	55.0	4258	61.6
2006	5115	57.2	4198	61.1
2007	5072	56.8	4281	61.5

[1)] calculated for working age population (15-64 years)

Source: *Romanian Statistical Yearbooks Time Series1990-2007 and 2008*, National Institute for Statistics

The employment rate in Romania is higher in the rural area compared to the urban area for the working age population (15-64 years). In addition, in 2007 about 19% of the farmers and skilled workers employed in agriculture, forestry and fishery were elderly people of 64 years and over.

In Romania the labour force employed in agriculture, hunting and forestry reached the peak of 41.4% of the total employment in the year 2000. This process extended the subsistence economy. After 2000, the sustained economic growth created favourable conditions for the development of non-agricultural activities and determined the reduction of employment in agriculture to 28.2% in 2007. During the economic growth period (2000-2008) agriculture has gradually lost its status of employment buffer specific to the transition period (Toma et al., 2009). This demonstrates the unsustainable economic development in the rural areas. However, it is expected that a prolonged period of the economic crisis occurring in 2009 could result into higher net migration flows from urban to rural areas.

Since the subsistence agriculture is still a major option for people living in the rural areas, the rural households depend highly on the agricultural income. In 2008 the the total income of households in the rural areas consisted of gross salaries (29.5%), the equivalent value of consumption of agricultural products from own resources (28.5%), income from social provisions (24.4%), money income from agriculture (6.3%) and income from non-agricultural independent activities (3.8%). This structure shows that most households are not connected to the labour market and are less prepared to develop market oriented farms or other production units.

The rural population has lower income than the urban population because of the dominant employment in agriculture, which has low productivity. In 2008 the average income per household in the rural area was only about 72.3% of the average urban income. The expected increase of the agricultural income as a result of the application of the Common Agricultural Policy could diminish these differences.

The potential of multifunctional agriculture and of the rural areas as a whole is a starting point for the development of non-agricultural activities. In the last years the share of gross salaries has increased in the rural areas, from 21% in 2002 to 29.5% in 2008. The alternative non-agricultural activities are attractive for the younger rural population. The possibility to work for a salary in a non-agricultural activity is a good reason for them to give up self-employment. The gradual increase of the total income on base of a higher share of salaries is already a trend in the rural areas that will continue after the recovery from the economic crisis.

3. The role of urban centres in rural areas

The unequal distribution of rural population by region is correlated with the employment rates and the development disparities by region (Table 2). In the regions with the highest share of rural population the main activity is agriculture, while the GDP per capita is the lowest.

Table 2. Population, employment and development indicators in Romania, by NUTS2 region

Development regions	Rural population 2007 (%)	Employment rate[1)] 2007 (%)	Employment in agriculture[2)], 2007 (% of civil employment)	GDP per capita 2006 (Eurostat estimation in PPS)
Romania	**44.9**	**56.1**	**28.2**	**8800**

North-West	46.6	57.0	31.1	8500
Center	40.4	55.1	23.5	9100
North-East	56.6	61.3	39.5	5800
South-East	44.7	54.7	31.5	7700
Bucharest-Ilfov	7.6	62.4	3.5	19800
South – Muntenia	58.4	60.5	35.8	7600
South-West Oltenia	52.3	59.3	38.0	7200
West	36.6	59.6	23.7	10600

1) calculated for working age population (15-64 years)
2) includes hunting and forestry
Source: *Economic and Social Regional References: Territorial Statistics 2009*, National Institute of Statistics (NIS) Romania and EUROSTAT

Rural areas with higher employment in non-agricultural activities are under the influence of cities. The distribution of municipalities and towns in Romania has been determined by historical and geographical conditions, industrial development, as well as the territorial policy aiming at balanced urban-rural development.

Towns are urban agglomerations with an administrative function and a lifestyle specific to the urban areas, where people are employed mainly in non-agricultural activities. Municipalities are towns with an important economic, social, political and cultural role, which usually have also an administrative function.

Most counties having the employment in agriculture under the national average of 28.2% are in the influence area of major municipalities, such as Bucharest for Ilfov county, Braşov for Braşov county and Covasna county, Sibiu for Sibiu county, Constanţa for Constanţa county, Ploieşti for Prahova county, Timişoara for Timiş county, Cluj for Cluj county, Arad for Arad county, Piteşti for Argeş county (Table 3). Hunedoara county has an industrial profile, dominated by activities in mining and metallurgy, while urban life is dispersed in several smaller municipalities (cities) and towns.

Table 3 . Rural population and urban centers in Romania in 2007, by county

	Employment in agriculture (%)	Rural population (%)	Number of towns	Number of municipalities
Teleorman	54.9	66.3	2	2
Giurgiu	53.1	68.8	2	1
Botoşani	48.8	58.3	5	2
Călăraşi	48.0	61.4	3	2
Vaslui	47.6	58.8	2	3
Ialomiţa	44.8	54.2	4	3
Olt	44.7	59.4	6	2
Suceava	44.3	57.1	11	5
Vrancea	43.7	62.2	3	2
Mehedinţi	43.7	51.4	3	2
Neamţ	42.7	61.8	3	2
Buzău	40.7	58.6	3	2
Dolj	39.4	46.3	4	3
Satu Mare	37.3	52.3	4	2

Maramureş	37.2	41.2	11	2
Dâmboviţa	35.0	68.8	5	2
Tulcea	35.0	50.7	4	1
Bistriţa-Năsăud	34.7	63.3	3	1
Sălaj	34.5	59.1	3	1
Caraş-Severin	34.3	43.6	6	2
Vâlcea	33.0	54.6	9	2
Harghita	31.9	55.9	5	4
Iaşi	31.8	52.3	3	2
Bihor	31.2	49.7	6	4
Bacău	29.9	54.3	5	3
Mureş	29.7	47.5	7	4
Brăila	29.7	34.9	3	1
Galaţi	29.2	43.5	2	2
Alba	28.8	41.7	7	4
Gorj	28.4	53.0	7	2
Covasna	27.6	49.9	3	2
Argeş	27.3	52.1	4	3
Ilfov	22.9	57.8	8	0
Arad	22.4	44.6	9	1
Cluj	22.2	32.9	1	5
Timiş	22.1	37.2	8	2
Prahova	21.6	49.5	12	2
Constanţa	21.4	29.6	9	3
Hunedoara	21.2	23.2	7	7
Sibiu	15.7	32.6	9	2
Braşov	13.1	25.8	6	4

Source: *Economic and Social Regional References: Territorial Statistics 2009*, National Institute of Statistics (NIS) Romania

The most obvious forms of relationship between towns and rural areas are trade, employment opportunities, migration and remittances, exchange of population and services to the rural area.

The rural areas around towns are source for fresh food that farmers sell in the urban markets. Improvement in transport and the development of intermediate markets provide additional opportunities, since small shops develop in villages, based on trade relations with towns. Many farm families are diversifying their sources of income by involvment in transport and commerce services.

The income gap between rural and urban areas determine people to look to the cities for a livelihood. Employment opportunities in small towns are most often in traditional industries, commerce and services. Younger people are more inclined to move to towns, while they still rely on social networks based on their place of origin. Part of these urban migrants support their extended rural family by remittances. At the same time, the rural family provides food. In Romania, the equivalent value of consumption of agricultural products from own resources in urban families was about 6.4% of the average total income per person in 2007. This share is much higher in small towns situated in predominantly rural areas.

In Romania after 1990 there was a trend of urban-rural migration. Since 1996 there was a positive net migration flow in the rural area, but this did not change the share of rural population. In 2007 the net migration flow to the rural areas was +38002 persons representing only 0.39% of the rural population. The migration trend shows rather an exchange of population, meaning that younger people move to town and elderly people move to villages, especially after the retirement. Emigration is more and more selective in terms of age and level of education.

The international emigration of rural population has intensified in the last decade. Initially migrants came mainly from more developed western regions, but recently the growing emigration flow is from the eastern and poorer regions. Many rural emigrants work only temporary abroad. International migration from the rural area has some particularities (UNDP, 2003-2005). On one hand, some of the migrants for work living in villages have had a long experience of mobility even before 1990, through commuting to large urban plants. That is why communities with large flows of migration are around major cities of Romania, especially in Western and Eastern regions. On the other hand, villages with low international migration are concentrated in regions where there is a strong attraction of an urban center (like Bucharest).

Urban centers, including small towns, extend their influence on the surrounding rural areas also by means of services. Firstly are the educational services. Village people prefer to send their children to school in town, even for the primary school if the town is close enough and provides good transport connections. Secondly are the communication services. In the last two decades in the rural area was a dramatic expansion of mass media, especially television, and telecommunication services, especially mobile phones. The access to the specific services depends also on the proximity of towns. These systems induce the urban lifestyle and values in the rural areas.

The influence of small towns depends however on their economic, social and cultural strengths. Some counties in Romania have many urban centers, but with little polarisation capacities. Examples are the region North-East, including the county Suceava (5 municipalities and 11 towns) and the county Botoşani (2 municipalities and 5 towns). These counties have a very high rural population which is employed 44-49% in agriculture. In a similar situation is the region South-West Oltenia, with the counties Olt (2 municipalities and 6 towns) and Valcea (2 municipalities and 9 towns). Actually some of the towns are rural-type localities with additional functions in public services. They may gain the capacity to stimulate the rural settlements and stabilize the skilled labour force in the long run if they engage more in production activities by developing companies able to use the resources provided by the rural area.

Rural development is a key concept of the EU Common Agricultural Policy and refers to the restructuring of agriculture, diversification of activities and innovation in rural areas. Besides agriculture, the environment and associated tourism are major opportunities for employment in rural areas, as well as potential fields of innovation. Small towns could play a complementary role, by extending the ICT infrastructure, developing the agro-food chain, cooperation in research and development in specific fields (agriculture, natural environment) etc.

3. The regional dimension of R&D and innovation in Romania

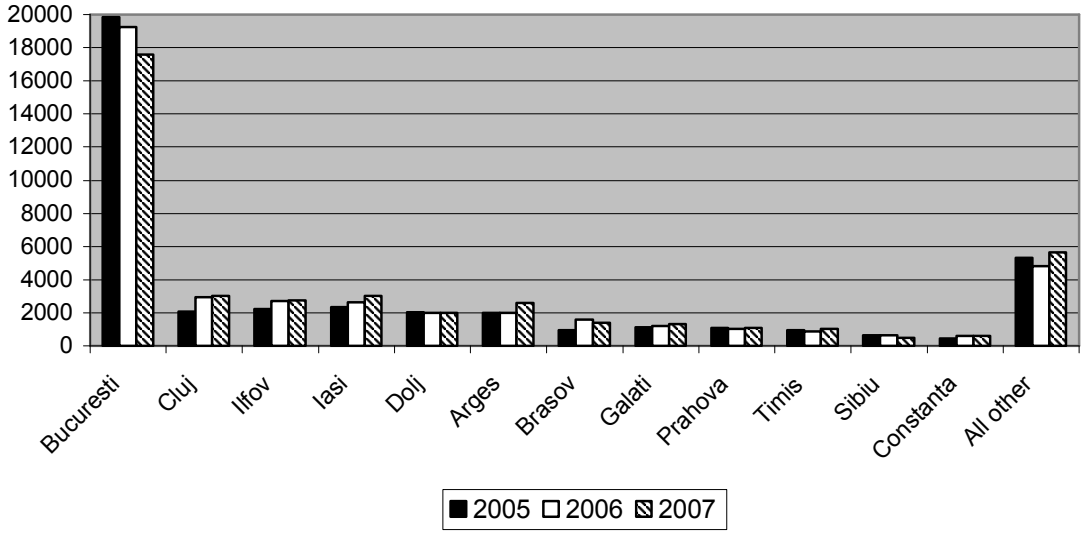
In Romania, the research and experimental development potential is concentrated mainly in the Bucharest-Ilfov region and in other 12 counties from the total of 42 counties (including Bucharest) established at NUTS 3 level (Table 2). The R&D activities in the selected counties developed actually around large urban agglomerations which are also important higher education centers.

After 2000 the industrial restructuration in the context of economic growth, the increasing foreign direct investment and the integration of Romanian research units in the European research networks resulted into an increasing *R&D polarisation within regions*. Bucharest has the outstanding position regarding the R&D personnel (Figure 1). In the period 2000-2007 the most dynamic counties were Iaşi, Cluj and Ilfov, while Bucharest moved part of its R&D activity to Ilfov county. Also the county Argeş had a good dynamics, mainly connected to the inflow of foreign investment in the automobile industry. In the same period all other counties relevant for R&D activities had a decline in R&D.

The analysis of R&D expenditures as a synthetic indicator reveals about the same territorial distribution. The selected 13 counties and Bucharest cover together about 92% from the total R&D expenditures in Romania. The largest share (57.6%) is attracted to the Bucharest-Ilfov region (Figure 2). The capital city, which is the largest development pole in Romania, has an important influence on the county Ilfov, which has alone R&D activity even higher than Cluj and Iasi.

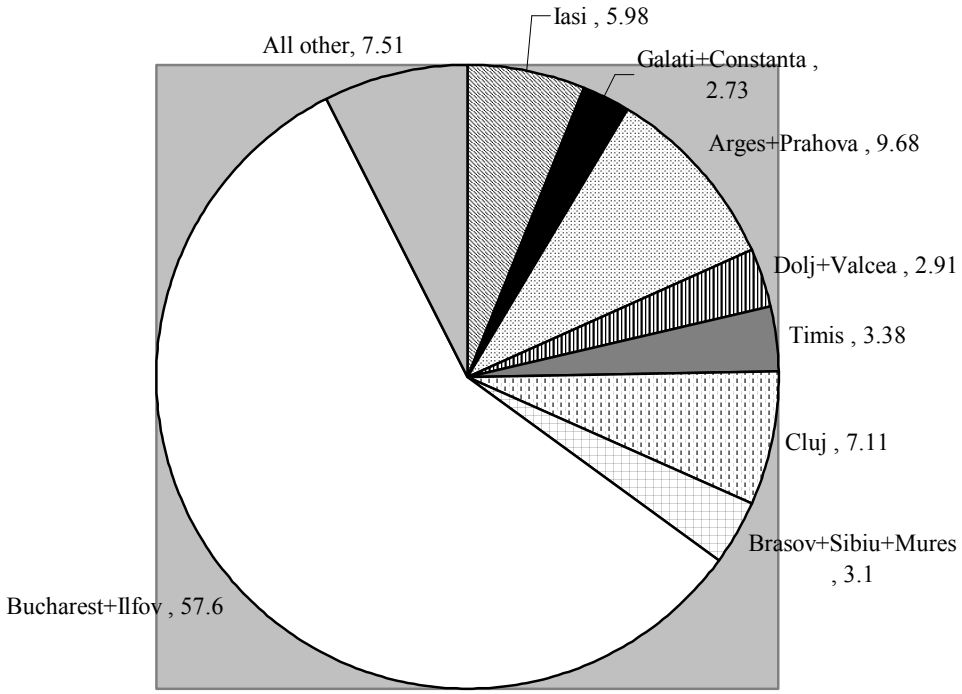
These significant territorial R&D disparities are also connected to the uneven distribution of income measured by regional GDP per capita. This makes Bucharest the only region in Romania that is less vulnerable to globalisation, according to the assessment of the European Commision over the medium term 2020 (EC, 2008).

Figure 1. Number of employed in R&D (persons at the end of year) in selected counties of Romania, 2005-2007



Source: *Territorial Statistics 2009*, National Institute of Statistics (NIS) Romania

Figure 2. R&D expenditures in Romania, by selected counties, 2007
(% of total)



Source: Data from *Territorial Statistics 2009*, National Institute of Statistics (NIS) Romania

The economic development of some urban areas has contributed and also benefited from R&D. Only in a few comparatively developed areas the R&D expenditures as percentage of regional GDP have exceedeed the national average in 2006: Bucharest and Ilfov (1.23%), Argeş (0.88%), Cluj (0.78) and Iaşi (0.79%) (Table 4). Even if Iasi is located in the North East region, which is the poorest region in Romania and in the EU27, it has a strong dynamic due to its position of higher education and research center.

It is obvious that the national average is hiding important regional disparities, even if the absolute R&D input effort is rather low.

Table 4. R&D input indicators in Romania, by region and by selected county

Development regions/ counties	Employed in R&D / 10000 civil employed		R&D expenditures / regional GDP (in %)
	2006	2007	2006

Romania	**49.9**	**48.7**	**0.63**
North-West	**30.2**	**33.1**	**0.28**
Cluj	92.7	91.2	0.78
Center	**28.0**	**25.2**	**0.15**
Braşov	68.2	58.1	0.23
Sibiu	37.6	26.8	0.21
Mureş	19.0	18.7	0.15
North-East	**31.9**	**32.9**	**0.28**
Iaşi	90.9	101.2	0.79
South-East	**20.1**	**20.8**	**0.14**
Galaţi	59.3	63.3	0.36
Constanţa	20.4	20.5	0.10
Bucharest-Ilfov	**194.1**	**168.0**	**1.23**
Bucharest, capital city	194.2	165.7	1.06
Ilfov	193.6	184.7	2.58
South – Muntenia	**32.0**	**36.0**	**0.33**
Argeş	79.8	100.4	0.88
Prahova	34.6	35.8	0.18
South-West Oltenia	**29.2**	**28.6**	**0.19**
Dolj	74.0	71.6	0.35
Vâlcea	12.1	12.9	0.31
West	**18.9**	**26.7**	**0.19**
Timiş	27.2	30.0	0.33

Source: *Territorial Statistics 2009*, National Institute of Statistics (NIS) Romania

The innovation process is also strongly connected to the level of GDP/capita. Again Bucharest has the best position, far from the rest of the regions. The Innovation Score (IRECSON, 2008) for Romania, based on 64 criteria of analysis (including indicators from the European Innovation Scoreboard - EIS), shows the regional differences (Table 5). Considering the general score per region, there is a little difference between seven regions NUTS2, while region Bucharest-Ilfov has a double value. However, some examples are relevant:

- The South-East region (including Galaţi – Constanţa) has the lowest potential for knowledge creation, also in connection with a comparatively low R&D efforts, but a good score after Bucharest regarding the potential for innovation management and the efficiency of innovative activities.
- The North-West region (including Cluj) has a good potential for innovation and integration in a network system, considering also that the R&D expenditures /regional GDP in Cluj county reached 0.78 %, higher than the national average.
- The North-East region (including Iasi) tries to overcome the economic disadvantages by inclusion of people in permanent education programs and by comparatively high efforts for marketing, promotion and R&D efforts. In Iasi county the number of companies with R&D and high-tech profile had the highest dynamics in the business sector in the period 2000-2006.

The three examples from above show that a similar innovation score may be reached starting from various situations.

Table 5. Innovation indicators in Romania, by region

Development regions	Number of companies 2004-2006	Innovative enterprises, % of total 2004-2006 %	Innovation expenditures (lei)/ 1000 lei regional GDP in 2004	Innovation score
Romania	**28488**	**21.1**	**18.6**	**-**
North-West	4288	21.2	18.4	29.56
Center	4026	20.1	19.7	28.90
North-East	3226	26.7	9.1	29.44
South-East	3026	43.2	25.0	31.73
Bucharest-Ilfov	6394	15.5	20.5	72.49
South – Muntenia	2883	19.9	25.4	28.04
South-West Oltenia	1686	13.9	23.7	21.35
West	2959	11.1	4.8	26.05

Source: *Economic and Social Regional References: Territorial Statistics 2008*, National Institute of Statistics (NIS) Romania, Eurostat and Inobarometru 2008 and own calculations

The need for permanent links between the R&D system and business was the reason for the construction of the National Innovation Network and Technology Transfer (ReNITT, 2008) in Romania. This institutional building is strongly supported from public financial sources and encourages the partnership in this field. The network is composed of centers for technological information, centers for technological transfer, technological and business incubators and scientific and technological parks.

The distribution of the network shows the institutional efforts of the national authorities to construct a network for technological information centers covering all regions. All other forms of technological transfer need a strong partnership with the business sector and these links could be established mainly in Bucharest- Ilfov region and in a limited number of cities with universities and important industrial activity.

The creation of a stimulative environment for innovation based development highly depends on the geographical proximity to industrial agglomerations, as well as on the R&D institutional structures. Regions or counties with predominantly agricultural activity in subsistence households are not prepared to access R&D results or to innovate. This conclusion is confirmed by the model presented in th next section, which analyses the influence of rural areas on regional growth.

5. The determinants of economic growth from a spatial perspective

5.1. The model

This section aims to explore, by means of a regression model, the driving forces of Romanian economic growth from a spatial perspective, focusing on the influence of rural areas. Using the available territorial data regarding Romania's economy in 2007, we have build up corresponding spatial data series (Table 6) for performing an analysis based on the linear multiple regression model. Our analysis can shed important light on critical dilemmas of development that are specific to rural areas in Romania.

Table 6. Main economic indicators by county, 2007

Regions Counties	Gross domestic product (lei million current prices) 2007	Gross fixed capital formation (lei million current prices) 2007	Employed population (persons) 2007	R&D total expenditures (lei million current prices) 2007	R&D employees (persons) 2007	% rural population 2007	CDI* 2006
North - West							
Bihor	11355.36	2618.703	277901	6.757	503	49.704	0.359554
Bistriţa-Năsăud	4897.038	988.1226	126712	27.315	185	63.327	0.317787
Cluj	16248.68	5184.089	329825	154.812	3008	32.924	0.555759
Maramureş	7109.172	1235.153	198889	3.413	179	41.180	0.305956
Satu Mare	5632.139	918.8119	150000	1.161	48	52.307	0.287961
Sălaj	3659.926	632.6828	100000	1.415	17	59.140	0.307995
Center							
Alba	7159.385	1484.85	173826	3.801	259	41.734	0.344617
Braşov	13495.59	5516.426	237177	48.653	1378	25.825	0.375229
Covasna	3331.204	445.1883	87179	2.398	34	49.872	0.284523

Harghita	5350.275	1073.428	131250	0.392	42	55.924	0.280716
Mureş	9795.874	1998.46	238503	12.635	446	47.518	0.383864
Sibiu	9152.811	3363.349	179851	6.377	482	32.655	0.413467
North - East							
Bacău	10193.62	2016.232	225641	5.925	352	54.278	0.314137
Botoşani	4267.876	510.0561	154348	2.871	71	58.300	0.200203
Iaşi	12032.7	3697.462	297727	130.298	3013	52.322	0.369709
Neamţ	7013.899	1323.125	196721	5.704	120	61.850	0.26486
Suceava	8454.141	1875.833	243810	14.199	512	57.089	0.288155
Vaslui	4092.31	446.0769	146667	4.564	88	58.781	0.118712
South - East							
Brăila	4980.567	868.1617	131429	3.305	92	34.928	0.302739
Buzău	6392.527	1572.821	182759	1.945	53	58.653	0.260105
Constanţa	17560.57	4253.726	302439	19.764	620	29.568	0.422238
Galaţi	8579.734	2189.509	206477	39.678	1307	43.478	0.3006
Tulcea	3627.928	485.1753	88060	15.12	118	50.738	0.265761
Vrancea	5007.651	598.0274	137500	0.818	11	62.242	0.284095
Bucharest - Ilfov							
Ilfov	10422.04	6314.388	149432	288.781	2760	57.842	0.511339
Bucharest Municipality	82706.53	43877.26	1062161	965.503	17600	0.000	0.930337
South - Muntenia							
Argeş	14106.29	4355.915	259661	167.737	2607	52.083	0.397657
Călăraşi	3219.872	757.9754	101534	8.684	331	61.452	0.143224
Dâmboviţa	7672.782	1353.337	202532	11.366	320	68.831	0.31466
Giurgiu	2969.166	579.3669	87500	0.178	7	68.827	0.244634
Ialomiţa	4004.227	507.3903	100000	0.056	1	54.162	0.234728
Prahova	16508.37	4270.609	303631	43.073	1087	49.468	0.392827
Teleorman	4610.26	516.2763	164286	0.676	23	66.356	0.205904
South - West Oltenia							
Dolj	10593.17	2496.076	276397	38.517	1979	46.347	0.345515
Gorj	7171.369	1052.102	139506	2.397	226	52.963	0.352766
Mehedinţi	3890.738	796.1851	113208	1.089	60	51.394	0.252298
Olt	5465.202	1157.845	172727	0.941	19	59.457	0.241774
Vâlcea	7140.93	1257.368	172093	24.849	222	54.604	0.372167
West							
Arad	10074.62	1973.579	211315	21.083	691	44.630	0.385476
Caraş-Severin	5327.146	1073.428	122857	2.579	129	43.619	0.255169
Hunedoara	8229.56	1692.782	199194	14.413	494	23.196	0.341769
Timiş	19258.23	6317.942	335667	73.508	1007	37.238	0.534898

*Composite Development Index

Source: authors' processing based on data provided by the *Statistical Yearbook of Romania and Territorial Statistics Yearbook.*

Variables of the linear multiple regression model. The following statistical data were used at the county level:

- The dependant variable is Gross Domestic Product - GDP as expression of output

- Gross fixed capital formation - K as approximation of the capital production factor; even if these data do not reflect entirely the production factor capital, they represent currently the best available information in the Romanian official statistics
- Employed population - L as the labour factor
- R&D total expenditures - Kr; are used in this model as a measure of total investments (material and intangible) in the R&D sector
- R&D employees - Lr
- Percentage of rural population R
- Composite territorial index of development CDI (ranging from 0 - lowest performance to 1- top position) computed as an weighted average of various indicators grouped in four blocks: economy, health, education, infrastructure and standard of living.

The model is specified by the following equation:

$$GDP_{ti} = aK_{ti} + bL_{ti} + cKr_{ti}, + dLr_{ti} + eR_{ti} + fCDI_{t-1,i} + \varepsilon_{ti},\ i=1,...,42,\ t=2007 \qquad (1)$$

The hypothesis to be tested is that territorial variation in GDP can be explained partly by the magnitude of rural areas. To allow for other influences, the capital and labour production factors were included in the model, together with the number of R&D employees and the R&D total expenditures as a proxy for research and development investments. The estimation model in this paper uses only information on R&D expenditure, not R&D stock, which brings about the advantage that there is no need for strong assumptions with regard to the R&D activity, such as a fixed rate of depreciation and the linear and certain accumulation of knowledge.

The economic and social development of the counties was also included by means of a composite territorial index CDI, which is one-year lagged to capture persistence of development level. The composite index had been computed as a weighted average of various indicators grouped in the following blocks: economy, health, education, infrastructure and standard of living (Box 1). The value of the index is at least 0 (if the same county has the lowest performance for all variables included in the index) and at most 1 (if one county is on top position for all variables). The computations undertaken for the year 2006 showed that the values of the composite index of development range from 0.930 for the capital city Bucharest to 0.119 for the least developed county – Vaslui, but most of the counties belong to the 0.2-0.4 interval.

Box 1

Methodology for the Composite Territorial Index of Development

The economic and social development of the counties and regions was estimated by means of a Composite Territorial Index of Development computed as an weighted average of various indicators grouped in the following blocks: economy, health, education, infrastructure and standard of living.

The components of the Composite Index of Development

	Indicators	Unit of measurement	Coefficient of variation (%)
Economy	*1.GDP per capita* *2.average net monthly earnings* *3.unemployment rate*	thou RON/ inhabitant RON/employee %	35.10 11.98 36.14
Health	*4.hospital beds/ 1000 inhabitants* *5.number of physicians/ 1000 inhabitants* *6.infant deaths* 7.*life expectancy*	beds/1000 inhabitants physicians/1000inhabitants Death under 1 year of age per 1000 new-borns years	26.32 55.35 23.43 1.28
Education	*8.abandon rate in primary and secondary education* *9.number of students per 1000 inhabitants*	% students/1000 inhabitants	33.70 141.66
Infrastructure	*10. density of town streets* *11. density of public sewerage* *12 density of verdure spots in municipalities and towns*	km/100 skm km/100 skm %	406.11 467.6 556.5
Standard of living	*13. living floor* *14.volume of natural gas distribution* *15.volume of drinking water supplied to consumers* *16. criminality rate*	sqm/inhabitant cm/ inhabitant cm/ inhabitant Persons convicted / 100000 inhabitants	9.23 225.49 47.56 24.21

Source: *authors*

The values of this composite index is at least 0 (if the same county has the lowest performance for all variables included in the index) and at most 1 (if one county is on top position for all variables).

5.2. The results

We run the regression specified in the equation (1). The parameters of the regression model were estimated using Ordinary Least Squares (OLS) and the regression coefficients are shown in Table 7.

The regression results indicate that regional GDP is positively related to changes in capital and labour production factors. As expected the lagged development level CDI is also positively linked to GDP territorial variation, while the percentage of rural area seems to negatively influence the GDP level, although the high standard error does not allow for definite results. The number of R&D employees and the R&D total expenditures also give inconclusive results due to the unexpected sign indicating a lack of linkage to the GDP level. This territorial dissimilarity between R&D and GDP is consistent with their time-series dissimilarity: the persistent decline of R&D activity in Romania, opposite to the last years strong economic growth in Romania may be indicative of lower contribution of national research to this economic growth, as most foreign companies investing in Romania rely on the research activities performed in their own countries.

Table 7. Determinants of territorial Gross Domestic Product, 2007

Coefficient/ Statistics	Estimate
K (coefficient) t-Statistic	1.318787 (10.25227)*
L (coeficient) t-Statistic	0.031496 (8.311334)*
Kr (coeficient) t-Statistic	-6.4763 (-0.86494)
Lr (coeficient) t-Statistic	-0.36704 (-0.8215)
R (coeficient) t-Statistic	-6.17816 (-0.37955)
CDI (coeficient) t-Statistic	6222.328 (2.413376)**
R-squared	0.9960
F-statistic and Prob (F)	1497.267 (0.0000)

*significant at 99% **significant at 95%

The *R*-squared and F-statistic are both very high indicating the good quality of the model. The correlation matrix is presented in Appendix 1.

6. Concluding remarks

In Romania the rural population is partly employed in small family subsistence households and highly depends on the low productivity agriculture. The delay in implementing a real reform of the production system keeps the employment in agriculture at 28.2% in 2007, which is an extreme share compared to other EU27 countries. The low performance in agriculture, connected to a less educated and ageing labour force, as well

as the insufficient opportunities for non-agricultural activities are main causes for the rural-urban income gap.

In the regions with the highest share of rural population the main activity is agriculture, while the GDP per capita is the lowest. Most counties having the employment in agriculture under the national average of 28.2% are in the influence area of major municipalities. The towns, which are smaller urban agglomerations with an administrative function and a lifestyle specific to the urban areas, develop a relationship with rural areas mainly regarding trade, employment opportunities, migration and remittances, exchange of population and services to the rural area.

The influence of small towns depends however on their economic, social and cultural strengths. Some counties in Romania have many urban centers, but with little polarisation capacities. Actually some of the towns are rural-type localities with additional functions in public services. They may gain the capacity to stimulate the rural settlements and stabilize the skilled labour force in the long run if they engage more in production activities by developing companies able to use the resources provided by the rural area. Small towns could play a complementary role, by extending the ICT infrastructure, developing the agro-food chain, cooperation in research and development in specific fields (agriculture, natural environment) etc.

Romania is lagging behind most EU countries and other developed countries regarding the research potential and innovation performance, due to low input efforts for R&D and innovation, as well as to rather low co-operation capacity of firms with knowledge creating partners.

In Romania there is an increasing R&D polarisation within regions, while the innovation based development depends highly on the geographical proximity to industrial agglomerations, as well as to the R&D institutional structures. The involvement of small towns in the innovation process is rather low, but the situation may change as a result of stimulative programmes for rural development, as well as for the increase of SMEs competitiveness, supported by the EU funds.Thus, the current measures of the National Programme for Rural Development envisage the support to young farmers' settling, producer groups' establishment, food industry development, improvement and development of agriculture and forestry infrastructure, micro-firms establishment and development, villages development – the improvement of basic services for rural economy, etc. (MAPDR, 2009). The operational programmes can enhace the results of the rural development programme implementation since they can contribute to overall regional development, improving the business environment, the social and transportation infrastructure, the quality of labour force, economic competitiveness, etc. In this way the coherence and complementarity of common agricultural policy-derived measures with those supported via Structural Instruments can be ensured and, on this basis, the pre-requisites for a significant presence of R&D and innovation in the predominantly rural areas as well.

The analysis of driving forces of Romanian economic growth in 2007, based on a linear multiple regression model, shows that the regional GDP is postively related to changes in capital and labour production factors. The lagged development level Composite Development Index is also positively linked to GDP territorial variation, while the percentage of rural area seems to negatively influence the GDP level.

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Appendix 1. The results from the multiple regression model

Correlation matrix*

	GDP	*K*	*L*	*KR*	*LR*	*R*	*CDI*
GDP	1						
K	0,986553	1					
L	0,979816	0,945945	1				
KR	0,938835	0,969402	0,890284	1			
LR	0,964198	0,981223	0,933774	0,984511	1		
R	-0,68619	-0,65134	-0,67022	-0,56186	-0,61342	1	
CDI	0,871108	0,843122	0,84971	0,833364	0,826794	-0,71122	1

*Variables: Gross domestic product GDP; Gross fixed capital formation K; Employed population L; R&D total expenditures KR; R&D employees LR; Percentage of rural population R; Composite territorial index of development CDI