THE TRANSFER OF KNOWLEDGE AS A SOURCE OF FUTURE DEVELOPMENT

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Abstract:

In all developed countries, innovative enterprises are part of the economic environment, contributing actively to increasing employment, supporting competitiveness in global, European and regional markets, improving the quality of life. This is possible because innovation was based on the main mechanisms of knowledge transfer (TCS) represented by: the development of the network system; enhancing education and continuing education efforts; consulting practice; supporting partnerships in the field of scientific research; developing licensing practices; encouraging entrepreneurial actions, etc.

The present paper addresses the factors and mechanisms of knowledge transfer, trying to advocate the initiation of coherent actions to overcome the present state of Romania as a modest innovative country compared to other EU member states. Also, it is not to be neglected that Romania is competitive from the point of view of the low costs of production, the capacity of the use of communication and computing technology, but in the absence of targeted, financially supported and constantly updated actions, this advantage will be diluted.

Keywords: innovation; transfer of knowledge; the global innovation index; Common Agricultural Policy.

1. Common Agricultural Policy in adapting to innovation

From 2003, and then in 2013, to the Cork Conference on Common Agricultural Policy (CAP), the European Commission underlined the importance of rural development, which was considered a European priority. Today, as a result of the creation of the European Innovation Partnership on Productivity and Sustainability of Agriculture (PEI-AGRI), a new impetus was created for the creation and sharing of knowledge. However, further efforts are still needed to facilitate farmers' access to knowledge in order to support the main axes of the CAP: diversification of economic and social activities; supporting environmental protection; landscape conservation and natural and cultural heritage; diversification of financial instruments used; increasing the efficiency and administrative capacity of the European Union (EU) Member States; reducing agricultural subsidies in the face of the global market; enhancing farmers' proscriptions to meet the demands of a variety of consumers (and hence emphasizing the importance of standardization, including organic products); reducing production costs; intensifying access to local or niche markets. These constant concerns in the CAP policy are complemented by those of stepping up and identifying new ways of diversifying land use, precisely in order to create additional sources of income for agricultural producers.

The Structural Analysis At the same time, a new knowledge-based economy that integrates sustainable development objectives and represents a new stage of human civilization that allows widespread access to information will also induce a new way of working in the European rural area - and each EU Member State and knowledge, speeding up economic globalization and increasing social cohesion. The support of the new knowledge-based society is the result of the development of RDI activities on the support of information technology, communications, as well as the production of digital content (applications), which through conception and diversity not only generated new areas of study, but also beyond physical / territorial boundaries of use.

In this context, the priorities of the European Commission for Innovation¹ are, in fact, the synthetic expression of the needs expressed in the documents of the EU Member States, so also of Romania, and refers to:

- Support the development of innovation in priority areas and SMEs, mainly through the Horizon 2020 Program;
- Fostering the widening of the marketing of innovation in the EU, including through: public procurement for innovation; implementing innovation projects; developing appropriate policies to stimulate demand for innovation; expanding innovation in the public sector; the development of social innovation;
- Developing and implementing public socio-economic policies for goods and services as well as social innovation policies both for the purpose of modernizing Europe and accelerating the market penetration of essential generic technologies;
- Establishing "key methodologies" that take into account the results of specialized surveys and the recommendations of the specialized institutions the European Innovation Observatory on: the innovation process; access to finance; the socio-economic transformations induced by digitization; the existence of the European single market; intellectual property; standards;
- Supporting cluster development and cooperation to stimulate innovation across all business categories.

The effects expected from the EC are those specific to any modern economy where innovations are applied and disseminated, both in terms of committed workforce and outputs. Thus, at the EU and EU level, the attributes of a modern economy can be materialized, referring to: a stronger connection with the service sector; generalization of network economics (Internet, computers, telecommunications - ICT); the predominance of highly qualified workforce in society; targeting policies of any kind towards innovation and productivity; Stronger support for entrepreneurs and SMEs to create the most jobs.

Generally speaking, the understanding of how innovation can support the modernization of the rural economy has a special role to play in avoiding obstacles. Thus, the OECD Study² on Regional Innovation Capacity and Shock Resistance emphasizes the role of human capital quality "... it is hard to imagine a region committed to a sustainable technological development without an abundant supply of skills (labor – nn)". For rural areas, it is crucial: to bring in the force of innovation and entrepreneurship; the existence of a critical mass of people and financial capital, by entrepreneurs to stimulate innovation.

¹ In June 2014 the Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG Internal Market, Industry, Entrepreneurship and SMEs).

² OECD (2014), Innovation and Modernising the Rural Economy, OECD Rural Policy Reviews, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264205390-en.

Innovation models	Thematic areas of innovation models	Economic Growth Factors Score	Obstacle score
1.	Policies	13	13
2.	Human capital	12	11
3.	Innovation	7	13
4.	Infrastructure connectivity	11	8
5.	Institutions	8	9

Table 1. Scores for factors and obstacles to economic growth in 2014. Percentage

Source: OECD (2014), Innovation and Modernising the Rural Economy, OECD Rural Policy Reviews, OECD Publishing, Paris,

http://dx.doi.org/10.1787/9789264205390-en; pg.50

At the same time, the OECD study³ points to innovation models based on the underlying factors of their constitution – five models are identified (Table 1) which can allow deciding evaluations of their own development policies.

The "OECD Innovation Strategy: Getting a Hard Start on Tomarrow" study³ is also in support of decision-makers interested in or transferring knowledge, which analyzes possible innovation models as follows: (i) new forms of innovation in the market related to the old generation of technologies (RDI and internal / in-house patenting); (ii) innovative products with market launch costs; (iii) upgrading processes through equipment expenses, sometimes through the development of external partnerships to the enterprise; (iv) major innovations that have been generated as a result of the existence of organizational and market innovation strategies; (v) Network innovation where companies seek to attract external sources of knowledge, sometimes from public knowledge bases and from official collaborations. Each of these innovation models represents as many possibilities for development, absorption of the new.

At present, the challenges facing the rural area – from the development of commercial operations, knowledge transfer management, cultural heritage conservation, environmental and climate resources to local community action - have the role of "homogenizing" the interests of those who have a tangency with these areas of Europe in general and of Romania in particular. This state is, in fact, reflected in the programs and policies at European level for the current programming period. In addition, innovation is introduced in the 2014-2020 National Rural Development Program (NRDP) as a cross-cutting theme – giving priority to the innovative contributions to be made in measures that finance cooperation and advice and animation. Thus, in the 2014-2020 NRDP, a special measure -M.16 - "Cooperation"³, which aims at strengthening the links between agriculture, food production and forestry, on the one hand, and research and innovation, on the other hand, in order to better manage the environment and / or achieve improved environmental performance. Developing pilot projects, innovative products, practices, processes and technologies – in the agricultural, food and forestry sectors, creating and strengthening interactions between researchers, farmers, forest owners and processors - will be directly supported through Sub-measure 16. 1. - "Support for the establishment and operation of

³ M.16- "Cooperare" (Art. 35 din Regulamentul (UE) nr. 1305/2013 al Parlamentului European și al Consiliului din 17 decembrie 2013 privind sprijinul pentru dezvoltare rurală acordat din Fondul European agricol și pentru dezvoltare rurală (FEADR) și de abrogare a Regulamentului (CE) nr. 1698/2005 al Consiliului) din PNDR 2014-2020) dedicată cooperării

operational groups, for the development of pilot projects, new products, practices, processes and technologies in the agricultural, food and forestry sectors".

Europe-wide knowledge transfer programs and policies for the current programming period were based on the EC Innovation Survey (CIS), which aimed at identifying the innovation model of the EU MS, implicitly of that in Romania. The Innovation Survey (CIS) included three major categories of enterprises (innovative enterprises, enterprises with incomplete or abandoned innovations, non-innovative enterprises) and on the basis of a wide variety of collected information, the types of innovations implemented (Table 2) while allowing EU MS to know their stage of development.

	Innovative businesses (including abandoned / suspended or in-service	Enterprises with innovative products	Enterprises with innovative processes	Enterprises with innovative organization al structures	Enterprises with innovative marketing
	innovation activities)			ai structures	
UE-28	48,9	23,7	21,4	27,5	24,3
Belgium	55,6	31,5	31,1	29,3	21,9
Bulgaria	27,4	10,8	9,3	12,4	14,2
Czech Rep.	43,9	25,3	24,0	20,5	22,4
Danemark	51,1	24,8	22,9	32,2	29,4
Germany	66,9	35,8	25,5	32,2	34,4
Estonia	47,6	20,7	23,8	21,7	21,9
Ireland	58,7	27,8	25,9	21,8	35,7
Greece	52,3	19,5	25,6	30,2	36,8
Spain	33,6	10,5	15,1	19,4	13,2
France	53,4	24,2	24,1	34,2	25,4
Croatia	37,9	16,4	19,0	22,9	23,5
Italy	56,1	29,1	30,4	33,5	31,0
Cyprus	42,1	20,9	28,2	26,2	29,5
Latvia	30,4	10,4	12,7	16,9	16,5
Lithuania	32,9	11,6	13,1	17,5	19,3
Luxemburg	66,1	30,3	32,8	46,8	32,4
Hungary	32,5	10,6	8,3	16,5	19,7
Malta	51,1	23,9	26,4	34,7	32,6
Holland	51,4	31,9	25,9	27,3	23,2
Austria	54,4	26,6	28,7	36,4	29,5
Poland	23,0	9,4	11,0	10,4	10,6
Portugal	54,6	26,0	33,5	32,8	32,8
Romania	20,7	3,4	4,6	14,1	13,8
Slovenia	46,5	23,6	22,5	26,3	28,5
Slovakia	34,0	14,4	13,5	18,6	19,3
Finland	52,6	31,0	29,3	29,7	26,5
Sweden	55,9	31,5	23,9	25,3	30,4
Great Britain	50,3	24,0	14,1	34,2	16,8

Table 2. Types of innovative enterprises in the European Union *)

*) The survey covers the period 2010-2012.

Source: Eurostat (online data code: inn_cis8_type);

http://ec.europa.eu/eurostat/web/science-technology-innovation/data/database

A brief analysis of the innovation situation in 2010-2012 at the EU-28 level reveals that out of the total of the existing enterprises, almost half (48.9%) were innovative entities (including abandoned / suspended or innovation – but the number of them was 3.9 pp below the 2008-2010 level – a phenomenon due to the economic and financial crisis of 2008. Most innovative enterprises were in Germany (66.9% of the total) Luxembourg (66.1%), Ireland (58.7%) and Italy (56.1%). The number of innovative enterprises in Romania, between 2010-2012, was the smallest of EU-28 MS respectively 20.7% of the total, 6.7 percentage points (pp) below the level of Bulgaria (which had 27, 4% innovative enterprises in total) and 2.7 percentage points below that of Poland (23.0%)⁴.

At EU-28, on average, enterprises with innovative products accounted for 23.7% of the total. The Member States with the largest number of enterprises with innovative products were: Luxembourg (30.3% and 6.6% above the EU-28 average respectively); Finland (31.0%, 7.3 percentage points above the EU-28 average); Sweden and Belgium (31.5% each MS, respectively 7.8pp above the EU-28 average); Netherlands (31.9%, 8.2 pp); Germany (35.8%, with 12.1pp compared to the EU-28 average).

Romania with 3.4% enterprises with innovative products out of the total held the weakest place in EU-28. Immediately after our country was Poland (with 9.4% of all investigated enterprises).

Enterprises with innovative EU-28 processes held 21.4% of all surveyed enterprises – the first places were Italy (30.4%), Belgium (31.1%), Luxembourg (32.8%) and Portugal (33.5%). Romania holds the last place in the number of enterprises with innovative processes (4.6% of all investigated enterprises). Also, low weights for enterprises with innovative processes are Hungary (8.3%) and Bulgaria (9.3%).

Innovative enterprises in the EU-28 accounted for 27.5% of all surveyed enterprises. Most enterprises with innovative organization are in France and the UK (34.2% in each MS), Malta (34.7%), Austria (36.4%) and Luxembourg (46.8%). Romania has an antepenultimate place in the number of enterprises with innovative processes (14.1% of all investigated enterprises); under our country were Bulgaria (12.4%) and Poland (10.4%).

Innovative enterprises in the EU-28 hold 24.3% of all surveyed enterprises. Most companies with innovative marketing activities are in Luxembourg (32.4%), Malta (32.6%), Portugal (32.8%), Germany (34.4%), Ireland (35.7%), as well as in Greece (36.8%). In the EU-28, are Poland (10.6% of total surveyed enterprises), Spain (13.2%), Romania (13.8%) and Bulgaria (14.2%).

At the main indicators that characterize innovation, innovative enterprises, Romania's place in the EU is modest. At the EU level, the overall ranking shows that performers in this area – Sweden, Denmark, Germany, Finland – are recognized not only at European level but also internationally, with the countries concerned having the best and most balanced living conditions. So, it can be said that indirectly a high level of innovation also generates the well-being of a society.

⁴ Results of the Community Innovation Survey, 2012 (CIS 2012)

Depending on the degree of innovation achieved, the *European Commission's Innovation Report of 2015 divides the EU-28 Member States* into four categories: Leaders of Innovation / Innovation Leaders; innovation experts; moderate / moderate innovators; modest innovators / modest innovators⁵.



Chart 1. Global Innovation Scoreboard in EU-28, 2017 / European Innovation Scoreboard 2017. Percentage. EU-28 = 100

Source: Processing by: European Innovation Scoreboard 2017 Database – Relative performance compared to EU in 2016 + performance groups

The pace of innovation pace in EU MS over the period 2008-2012 on the four categories of the European Commission's Innovation Report 2015 can be correlated with the countries' economic growth categories as follows: sustained growth; with moderate rhythm; with slow growth (Table 3).

⁵ EU-28 Member States on the four distinct categories according to the degree of innovation: (i) Leaders of Innovation – Sweden, Germany Denmark, Finland; (ii) Inovation followers – the Netherlands, Luxembourg, Belgium, Great Britain, Austria, Ireland and France – above the EU average – Slovenia, Cyprus, Estonia – under EU average; (iii) With moderate innovation – Italy, Spain, Portugal, Czech Republic, Greece, Slovakia, Hungary, Malta, Lithuania; (iv) With modest degree of innovation – Poland, Latvia, Romania, Bulgaria

The degree of innovation achieved by the EU MS		Sustained innovation pace	Sustained Moderate innovation pace pace	
Innovation Leaders	1.8%	Denmark (2.7%)	Finland (1.9%) Germany (1.8%)	Sweden (0.6%)
Innovation Experts/ Followers	1.9%	Estonia (7.1%) Slovenia (4.1%)	Holland (2.7%) France (1.8%) Great Britain (1.2%) Belgium (1.1%) Luxemburg (0.7%) Austria (0.7%) Ireland (0.7%)	Cyprus (-0.7%)
Moderate Innovators	2.1%	Lithuania (5.0%)	Malta (3.3%) Slovakia (3.3%) Italy (2.7%) Czech Rep. (2.6%) Portugal (1.7%) Hungary (1.4%) Spain (0.9%)	Greece (-1.7%)
Modest Innovators	1.7%	Latvia (4.4%)	Romania (1.2%) Bulgaria (0.6%)	Poland (0.4%)

Table 3. Innovation rate in the EU-27, 2008-2012. Percentages

Source: EC, Dashboard of Innovation in the European Union, 2008-2012; Taken from http://cursdeguvernare.ro/tabloul-de-bord-al-inovarii-in-unea-europeana-2014-romania-pe-locul-26-din-28.html

Romania is in the group of countries with a modest level of innovation; although after 2011 the innovation capacity has increased, after which it has declined. The level of the innovation index, the expression of relative performance in 2007 compared to 2014, decreased from 46% to 37%.

Table 4. Relative performances of the main variables of the EU-28 Global Innovation
Index and Romania in 2015. EU = 100

Pillars and main variables of the Global Innovation Index ¹⁾	Romania's relative performance in 2015 compared to EU-28, %	The rate of increase in Romania's performance in 2015 compared to 2014,%	
Pillar: Human resources	79	5.1	
New PhD graduate	100	6.0	
Population with full university education	62	9.1	
Young people with full secondary education	98	0.5	
Pillar: Excellence research systems, open	21	3.0	
International scientific co-publishing	52	12.0	
The most coveted scientific publications	32	3.2	
Non-EU doctoral students	8	-5.1	

Pillars and main variables of the Global Innovation Index ¹⁾	Romania's relative performance in 2015 compared to EU-28, %	The rate of increase in Romania's performance in 2015 compared to 2014,%
Pillar: Funding and support	26	-12.0
Expenditure on CDs in the public sector	38	-2.0
Risk capital investments	13	-20.0
Pillar: Enterprise Investments	18	-11.0
Expenditure on R & D in the private sector	9	-5.6
Expenses for investments in non-innovative CDs	43	-17.0
Pillar: Relationships and Entrepreneurship	9	14.0
Innovative SMEs in the interior	37	-7.3
Innovative SMEs in collaboration with other entities	12	-12.0
Co-publications scientific public-private	13	14.0
Pillar: Intellectual assets	27	12.0
Patent Cooperation Treaty (PCT) patent applications	5	1.5
Patent Cooperation Treaty (PCT) patent applications in the field of societal change	5	-1.1
Community Trademarks	32	22.0
Community Design	17	29.0
Pillar: Innovators	31	-8.8
SMEs with product / process innovation	17	-17.0
SMEs with innovations in marketing / organization	50	-9.1
Enterprises in rapidly growing innovative sectors in the number of employees	89	0.7
Pillar: Economic effects	54	-0.9
Intensive knowledge activities for employees	47	2.2
Medium and high-end export	96	4.5
Export of intensive knowledge services	99	2.1
Share of sales of new innovations	30	-21.0
Abroad revenues from the sale of licenses and patents	10	10.0

¹⁾ The Global Innovation Index (GII) reflects the degree to which nations or regions respond to the challenges of innovation. This indicator was developed by INSEAD – The Business School for the World as well as World Business in 2007. The Global Innovation Index is comprised of 84 variables that are grouped into eight pillars; these, in turn, are divided into five input pillars and three pillars of outputs. as follows: (i) input pillars – are factors that improve innovation capacity: institutions and policies; human capacity; infrastructure; technological complexity; business and capital markets; (ii) output pillars – are the results of successful innovations: knowledge; competitiveness; the wealth generated by innovation (Editing by: Jean-Eric Aubert (editor) (2010), Innovation Policy: A Guide for Developing Countries.

- Note: The total number of enterprises in the EU-28 in 2015 was 27,832,293 entities, of which 13,117 units (0.05% of the total) participated in the Innobarometer 2015; The total number of enterprises in Romania in 2015 was 516,314 entities, of which 500 units (0,10% of the total) participated in "Innobarometer 2015";
- Source: European Union, Innovation Union Scoreboard 2015; Flash Eurobarometer 415 "Innobarometer 2015 – The innovation trends in EU enterprises", ISBN 978-92-79-47769-0, 2015.

The level of the innovation index, the expression of relative performance, places Romania below the EU average for all indicators considered. The worst performance was recorded in the size and entrepreneurship indicator. Also, poor relative performance was also seen in the PCT Patent Applications as well as the PCT Patent Claims Indicator on Societal Challenges⁶.

At European level, Romania is still competitive in terms of low production costs. It should also be mentioned that in some areas – such as IT and IT (ITC) – this advantage has begun to be diluted, with foreign investors preferring new investments to new zone (Table 3). In this context, a sustained national effort is needed to bring together both public institutions and private companies to make innovation a national interest objective in order to preserve and / or even increase the competitive advantage.

In 2015, Romania is at a similar level to the EU-28 average for a series of indicators, in particular, for the new PhD graduates⁷/variables, Exports of Intensive Knowledge Services⁸, and for Youth with Higher-level Studies secondary (license)⁹.

In 2015 as compared to 2014, about half of the indicators used to characterize the innovation dimension show that the performances of the Romanian enterprises have increased; in particular, the "Relation and Entrepreneurship" pillar, as well as the "Intellectual Assets" pillar, have been noted. Also significant increases are found in the "Community Design" (29%) and the "Community Brand" (22%) indicators under the "Intellectual Assets" pillar.

The strongest declines in innovation performance of enterprises in Romania in 2015 compared to 2014 were recorded in the "Share of new innovation sales" ratio (-21%) in the "Economic Effects" pillar, as well as the "Investment with risk capital "(-20%) from the" Financing and support "pillar.

2. Research-development-innovation expenditures in Romania

One of the explanations for the relatively low performance of the main variables of the Global Innovation Index in Romania is also explained by the low level of R & D expenditures (RDI). In 2016, RDI spending was EUR 24.055 million, representing 21.4% of the EU-28 average. In terms of the share of GDP in RDI in Romania in 2016, they represented 0.48% compared to 2.03% in EU-28 (Table 5).

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
A. Public spending on research, millions of euros										
UE-28	3159, 914	3281, 868	3199,861	3252, 730	3338, 540	2996, 441	3088, 769	2996, 962	3136, 486	3146, 628
Returns on average on SM	112, 854	117, 210	114,281	116, 169	119, 234	107, 016	110, 313	107, 034	112, 017	112, 380
Romania	29, 743	50, 016	27,737	59, 518	38, 822	30, 005	14, 573	16, 244	22, 978	24, 055

Table 5. RDI expenditures in Romania and EU-28, between 2007 and 2016

⁶ Patent Cooperation Treaty

⁷ Patent Cooperation Treaty

⁸ From the Economic effects pillar

⁹ From the Human resources pillar

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
% RO din UE	0,94	1,52	0,87	1,83	1,16	1,00	0,47	0,54	0,73	0,76
RO/Avera ge UE-28 Report	26,4	42,7	24,3	51,2	32,6	28,0	13,2	15,2	20,5	21,4
B. Public spending on research,% of GDP										
UE-28	1,77	1,84	1,93	1,93	1,97	2,01	2,02	2,03	2,04	2,03
Romania	0,51	0,55	0,45	0,46	0,50	0,48	0,39	0,38	0,49	0,48
Public expend	diture on	research	by sector of ac	tivity,% c	of GDP					
B.1. Business	sector									
UE-28	1,12	1,16	1,19	1,20	1,24	1,27	1,28	1,3	1,31	1,31
Romania	0,21	0,17	0,18	0,18	0,18	0,18	0,12	0,16	0,21	
B.2. Gvernme	B.2. Gvernmental/ public sector									0,27
		ne secior								0,27
UE-28	0,23	0,24	0,26	0,25	0,25	0,25	0,25	0,24	0,24	0,27
UE-28 Romania	0,23 0,17	0,24 0,22	0,26 0,16	0,25 0,17	0,25 0,21	0,25 0,20	0,25 0,19	0,24 0,16	0,24 0,19	0,27 0,23 0,16
UE-28 Romania B.3. Universia	0,23 0,17 ty researc	0,24 0,22 ch sector	0,26 0,16	0,25 0,17	0,25 0,21	0,25 0,20	0,25 0,19	0,24 0,16	0,24 0,19	0,27 0,23 0,16
UE-28 Romania B.3. Universit UE-28	0,23 0,17 <i>ty researc</i> 0,4	0,24 0,22 <i>ch sector</i> 0,42	0,26 0,16 0,46	0,25 0,17 0,47	0,25 0,21 0,46	0,25 0,20 0,47	0,25 0,19 0,47	0,24 0,16 0,47	0,24 0,19 0,47	0,27 0,23 0,16 0,47
UE-28 Romania <i>B.3. Universit</i> UE-28 Romania	0,23 0,17 <i>ty researc</i> 0,4 0,12	0,24 0,22 <i>ch sector</i> 0,42 0,16	0,26 0,16 0,46 0,11	0,25 0,17 0,47 0,11	0,25 0,21 0,46 0,11	0,25 0,20 0,47 0,10	0,25 0,19 0,47 0,08	0,24 0,16 0,47 0,06	0,24 0,19 0,47 0,09	0,27 0,23 0,16 0,47 0,05
UE-28 Romania B.3. Universit UE-28 Romania B.4. Non-pub	0,23 0,17 <i>ty researc</i> 0,4 0,12 <i>lic private</i>	0,24 0,22 ch sector 0,42 0,16 e research	0,26 0,16 0,46 0,11 h sector	0,25 0,17 0,47 0,11	0,25 0,21 0,46 0,11	0,25 0,20 0,47 0,10	0,25 0,19 0,47 0,08	0,24 0,16 0,47 0,06	0,24 0,19 0,47 0,09	0,27 0,23 0,16 0,47 0,05
UE-28 Romania B.3. Universit UE-28 Romania B.4. Non-pub UE-28	0,23 0,17 <i>ty researc</i> 0,4 0,12 <i>lic private</i> 0,02	0,24 0,22 0,22 0,42 0,16 e researc. 0,02	0,26 0,16 0,46 0,11 h sector 0,02	0,25 0,17 0,47 0,11 0,02	0,25 0,21 0,46 0,11 0,02	0,25 0,20 0,47 0,10 0,02	0,25 0,19 0,47 0,08 0,02	0,24 0,16 0,47 0,06 0,02	0,24 0,19 0,47 0,09 0,02	0,27 0,23 0,16 0,47 0,05 0,02

Source: Eurostat

In the main sectors of activity in Romania, compared with the EU-28 average, the level of expenditures for RDI in 2016 was significantly lower (Table 5), as follows:

- the business community (private sector) held in the EU-28 a share of RDI spending in GDP of 1.31% compared to 0.27% of GDP for Romania;
- the public sector of research received funds of 0.23% of GDP on average at EU-28 level and in Romania only 0.16%;
- Universities and scientific research units in the public and private sectors have averaged 0.47% of GDP in the EU-28 and only 0.05% in Romania.

We appreciate that the size and evolution of the financing of RDI activities in Romania is not such as to increase their importance and role, human capital or intangible (intangible) assets needed in the process of accelerating globalization and, ultimately, welfare, in general, and that of rural space in particular. Given Romania's level of economic development as well as its position on R & D spending, we believe that priority should be given to promoting effectively the transfer of scientific and technological knowledge from the outside, as decades ago "Asiatic Tigers" (Japan, China and India), which have created a basis for further development of original creativity.

3. Factors supporting the process of knowledge transfer

The entire knowledge transfer process (TCS) is supported by a series of factors such as: the level of involvement of the business sector; facilitating the marketing and transformation of TCS into revenue for those who have produced them; the modalities adopted and practiced by targeting know-how between institutions, sectors and individuals; the adequacy of sources of public, private, domestic and foreign funding; identifying and matching the needs of rural space (including agriculture, forestry, the environment, and cultural heritage) with existing and prospective academic research and policies. It is also important to note that there are a number of obstacles in the TWS process, which may be: (i) general obstacles (eg lack of adequate networks and inadequate level of complexity); (ii) Obstacles related to the state of rural infrastructure (eg: poorly available technology, institutional systems that are reluctant to transfer technology, lack of adequate work space, state of road infrastructure, degree of isolation of some of the rural localities, etc.) (iii) Organizational-institutional obstacles (such as lack of adequate TSS assessment methods, incentives and prizes, Managerial environment, Poor direction of knowledge specific to rural areas, Costs of achieving TSS, protection of intellectual property, etc.); (iv) the level of workforce qualification addressed to TCS (eg self-motivation, lack of confidence, etc.). These obstacles ultimately affect the effectiveness of the deployment of TCS mechanisms, which are often based on the development of joint public-private partnerships.

Mechanism of TCS	Quantitatively measurement instruments of TSC	Qualitatively measurement instruments of TSC
Networks	Number of people participating in events generating TCS activities.	Share in total communication events of those who watched TCS.
Continuing professional development, continuing education	Income from courses held to raise the professional level. Number of people and participating businesses.	Share of returning companies and customer feedback.
Consultancy	Value / Income from consultancy contracts - as a share of total RDI revenues, market share of the counseling institution, duration of the relationship with the client.	Share of returning firms, client feedback from the consulting company, customer importance for the entity.
Partnerships and collaborations in the field of research	Value of contracts, market share, share of revenues from collaborations in total revenues, duration of relationship with the client.	The share of companies in partnerships and collaborations in the field of research, customer feedback, the share of successful products achieved in such activities.
License activities	License Income, Licensed Products.	Customer feedback, the quality of the business from which the license was purchased, the share of licenses that generate revenue.
Spin-off*)	Number of spin-outs, generated revenue, induced external investments, outgoing market value (Initial Public Offer)	Survival rate of created spin-outs, investor quality, investor or customer satisfaction, economic growth rate of the new entity.

Table 6. Transfer of knowledge and measuring instruments

Mechanism of TCS	Quantitatively measurement instruments of TSC	Qualitatively measurement instruments of TSC
Specific university education	The share of graduates in total students, the employment rate registered among graduates.	Student satisfaction (after employment), the employer's satisfaction with the quality of the student employed.
Other TCS mechanisms	Migration of students with specific training to other fields, publications made – as a measure of research	Enrollment in specialized databases

*) A spin-off is a type of corporate restructuring. Spin-cars occur when a corporation unwinds parts or divisions to form a new corporation. The new company, which is estranged, brings with it some of the assets and equipment of the parent company. The European System of Accounts (ESA) defines an entity as a spin-out when the parent company participates in the capital of the newly formed enterprise.

Source: Processing-https://www.investopedia.com/terms/s/spinout.asp#ixzz53FRzf0pZ

4. Mechanisms for the transfer of knowledge

We appreciate that today, in Romania, the efficiency of public-private partnership is often hindered, sometimes even stopped, by a series of failures in the functioning of market mechanisms such as:

- *inability of the market to internalize externalities* (positive and negative) generated by the still low number of rural-specific financial instruments (eg subsidies, taxes, micro-credits, etc.);
- the complexity of intellectual property rights, which exceeds the ability to effectively resolve TCS, which also has a good public-quality character to be recognized sooner or later;
- the informational asymmetry to which the inhabitants of the rural area are subjected, implicitly to small agricultural producers, and which could be mitigated by public intervention; in this context, we mention as a positive fact the inclusion in the two National Rural Development Programs of measures and conditionalities aiming to improve the general and specific degree of knowledge transfer, information of different categories of households / stakeholders;
- the inability of market mechanisms to: (i) develop an overall view that allows for the formation of a "critical mass" for the development of a knowledge-based economy; (ii) Induce an impact on potential entrepreneurs through public intervention considered by specialists as a sine qua non factor to avoid suboptimal use of the determinant mechanisms of TCS.

Among the main mechanisms for ensuring the transfer of knowledge (TCS) – which are also practiced in Romania but on a small scale – are the development of the network system; enhancing vocational education and continuing education efforts; consulting practice; intensifying partnerships in the field of scientific research; developing licensing practices; encouraging entrepreneurial actions, including the development of spin-outs, etc. (Table 6).

The EU Innovation Status Survey of 2017 is developed on the mechanisms of knowledge transfer. For Romania, the latest evaluations (2016 according to the European Innovation Scoreboard 2017) are presented in Table 7.

	Performance r	elative to EU/	Change 2010 201(/	
	2010	2016	Change 2010-2016/. pp	
Summary Innovation Index	47.9	33.8	-14.1	
Human resources	42.3	49.8	7.4	
New doctorate graduates	100.0	44.1	27.0	
Population with tertiary education	17.1	44.1	27.0	
Lifelong learning	2.1	0.0	-2.1	
Attractive research systems	23.4	30.0	6.5	
International scientific co-publications	23.4	47.6	24.2	
Most cited publications	31.1	40.1	9.0	
Foreign doctorate students	12.3	9.0	-3.4	
Innovation-friendly environment	74.9	89.8	14.9	
Broadbrand penetration	122.2	144.4	22.2	
Opportunuty-driven entrepreneurship	41.5	51.2	9.7	
Finance and support	52.6	18.1	-34.6	
R&D expenditurein the public sector	27.1	21.8	-5.3	
Venture capital expenditures	84.8	13.3	-71.5	
Firm investments	64.4	11.9	-52.5	
R&D expenditurein thebusiness sector	13.3	15.9	2.6	
Non-R&D innovation expenditures	209.4	21.3	-188.1	
Entreprises providing ICT training	0.0	0.0	0.0	

 Table 7. Global Innovation Scoreboard for Romania / European Innovation

 Scoreboard 2017*)

Innovators	38.5	0.0	-38.5
SMEs product/process innovators	26.4	0.0	-26.4
SMEs marketin/organizational innovators	50.8	0.0	-50.8
SMEs innovating in house	38.0	0.0	-38.0
Linkages	52.3	29.4	-22.9
Innovative SMSs collaborating with others	10.7	5.8	-4.9
Public-private co-publications	39.3	15.0	-24.3
Private co-funding of public R&D exp.	97.5	61.1	-36.4
Intellectual assets	15.9	24.9	9.0
PCT patent applications	21.1	26.7	5.6
Trademark applications	16.6	31.3	14.8
Design applications	8.5	17.5	9.0
Employment impacts	21.0	37.0	16.0
Employment in knowledge-intensive activites	3.8	19.2	15.4
Employment fast-growing enterprises	33.6	50.0	16.4
Sales impacts	84.8	62.2	-22.7
Medium and high tech product exports	87.1	93.4	6.4
Knowledge-intensive services exports	56.0	34.7	-1.3
Sales of new-to-market/firm innovations	115.9	33.2	-82.7

*) Note: This table shows minor differences in the structure of indicators used to determine the Global Innovation Index used in Table 4. The relative performance of the main variables of the EU-28 Global Innovation Index and Romania in 2015. EU = 100.

Source: http://ec.europa.eu/docsroom/documents/23936



Chart 2. Global Innovation Scoreboard for Romania / European Innovation Scoreboard 2017

Source: Processing by: http://ec.europa.eu/docsroom/documents/23936

Coming to the level of the main indicators, 2016 by 2010, the overall innovation index decreased by 14.7 percentage points (from 47.9% in 2010^{10} to 33.8% in 2016^{13}). The largest reductions were recorded for the following indicators: -52.5 pp for investments in firms (from 64.4% in 2010 to 11.9% in 2016); with -38.5 pp on the number of innovators (from 64.4% to 11.9%); with -34.6 pp on funding and support (from 52.6% to 18.1%); with -22.9 pp at links / partnerships / partnerships (from 52.3% to 29.4%); with -22.7 pp on sales impact (from 84.8% to 62.2%).

There were positive developments in four indicators, but they could not compensate for the losses. The innovation index has increased for the following indicators: the employment impact increased by 16.0 pp (from 21.0% in 2010 to 37.0% in 2016); with 14.9 pp on the existence of a friendly innovation environment (from 74.9% to 89.9%); with 9.0pp on intellectual assets owned by enterprises (from 15.9% to 24.9%); with 6.5pp in attractive research systems (from 23.4% to 30.0%).

These results registered by Romania at the global index of innovation continue to keep it in the category of "modest innovators". Changing the status of agricultural and forestry research and knowledge transfer in the coming period are the main groves our country faces. At the same time, the CAP – through the NRDP – has to take on the role of "engine" in the modernization of TSC, changing the country's current position in the Commission's assessments.

¹⁰ UE=100

5. Conclusions

- A. In the future, as the globalization process becomes stronger, society will be under pressure from growing demand for agri-food products, climate change, environmental protection and cultural heritage, and improving the knowledge transfer situation.
- B. The key to farming performance is how the knowledge transfer market is configured on all its components, namely: offer; application; vectors or mechanisms linking supply and demand for scientific knowledge. In essence, TCS vectors / mechanisms are the ones that convey the process of transmitting information from the producer (the research, university and company / firm environment) to the beneficiaries (agricultural workers, regardless of their professional or legal status, the other inhabitants of rural areas).
- C. In increasing the effectiveness of TCS, different RDI policies, as well as the modality, constancy and intensity of public and private interventions designed to remove / reduce obstacles to TCS through measures such as training, facilitating the placement of graduates with higher education on the labor market; providing start-up support and spin-offs created; supporting the emergence and development of investment funds; developing incubator systems and creating centers of excellence and research networks; implementing TCP actions through partnerships based on standards and protocols; the creation of product and equipment presentations and technologies, and venture capital firms.
- D. In Romania, the links between academia (including academia) and business in R & D & I (RDI) and TCS are very weak, sometimes non-existent, except for large private companies. Some of the effects of this reality are felt, directly and / or indirectly, in the current work as well as in the EC's periodic evaluations, such as:
 - It is almost impossible to validate the assumptions of academic research results on the markets in the absence of the functionality of adequate institutional structures;
 - The speed of implementation of innovations is delayed;
 - As a result of the absence or weak link between academic RDI and the business environment, the cost of RDI activities decreases from year to year;
 - There are many cases where the prototypes provided by the academic RDI sector no longer correspond to the technology imports / acquisitions, including IT, made by the business sector;
 - Mentality and attitude towards innovation in the public and private sectors is different;
 - It is noted that in the Romanian environment, although there is no general strategy for RDI, it is still lacking in regular evaluations and updates. The need to periodically update the "General Strategy for RDI" is explained by the very high speed of putting into practice the achievements in the field of IT technology. It should also be stressed that large companies have their own RDI strategies and

they are currently practicing the system of assessing and updating their own strategic objectives;

- There is a need for a change in the management system of innovation, the transfer of knowledge and the general attitude towards it, which could induce the acceleration of the added value creation in the RDI system, in enterprises, as well as the emergence of some positive effects;
- The lack of practicing methods of assessing the efficiency of TCS (evaluation of knowledge transfer) has not only a theoretical-methodological importance but, above all, practical. Thus, in assessing the effectiveness of TCS, the strong point is to establish the quantitative and qualitative impact, and in turn it is the one that provides decision makers with real / credible arguments for future actions;
- The lack of consensus among experts on the evaluation of the effectiveness of TCS should be transformed into research direction for establishing standardized (quantitative and qualitative) instruments as well as institutionalization procedures.
- E. At European level, Romania is still competitive in terms of low production costs, as there are still areas with such an advantage (for example, ICT / Information and Communications Technology (ITC)), but in the absence of concerted actions to increase the effectiveness of TCS, this temporary advantage will be diluted.

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