



# Technology Transfer in NE Romania: An Assessment of the Supply-Side

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Strengthening Technology Transfer Capabilities in Smart  
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# Outline

## Key regional statistics

How does technology transfer work within an innovation ecosystem?

Enablers, inputs, channels and outcomes

How should we measure technology transfer?

Core and non-core indicators

What did we measure in North-East Romania?

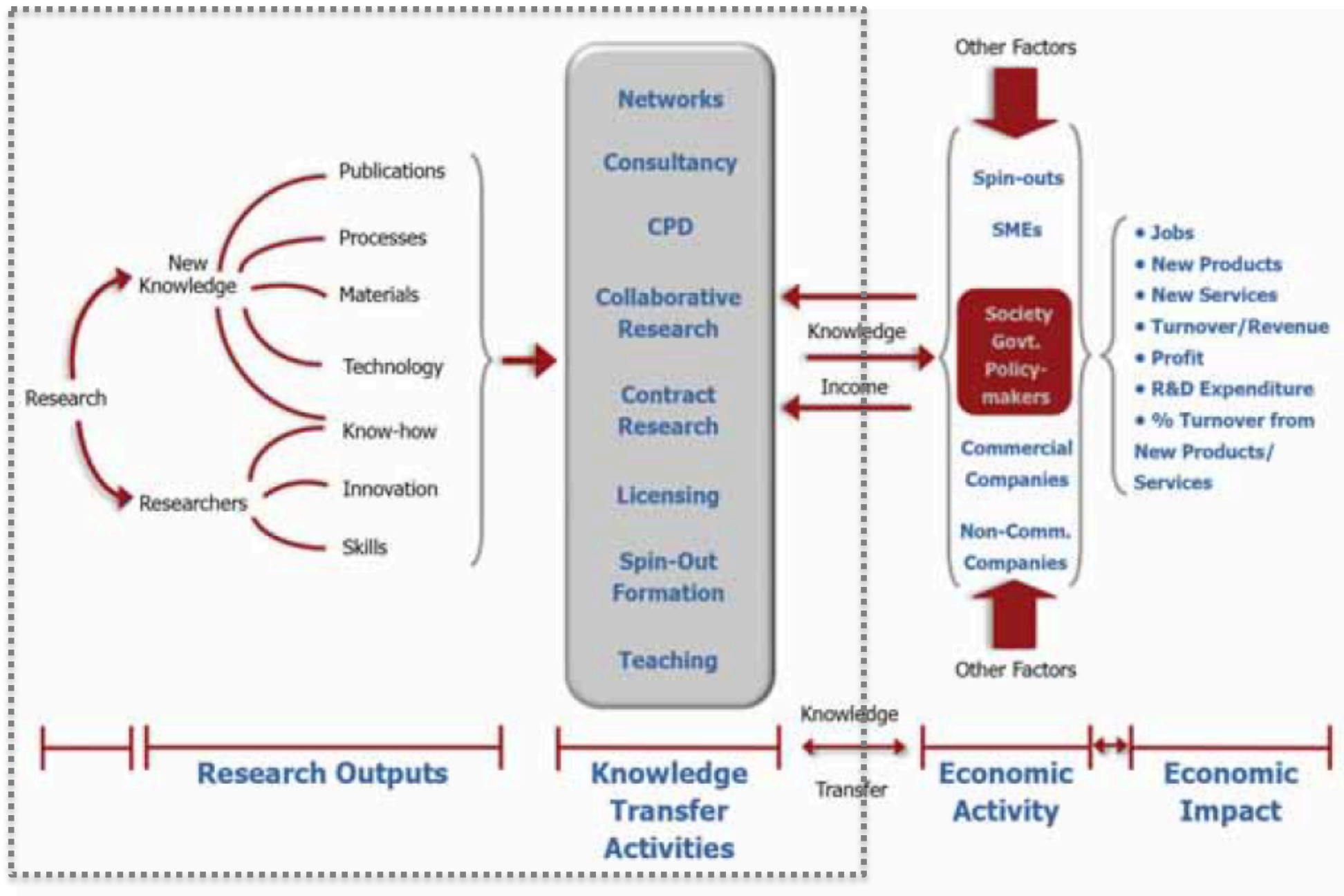
What is the interpretation of the results?

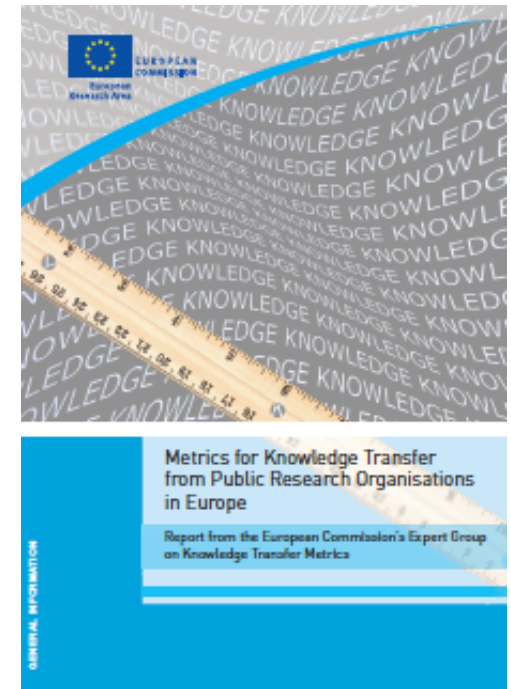
# RO21 vs RO vs EU28

(Source: EUROSTAT and INSEE)

Indicator-Year	NE Romania	Romania	EU28
Tertiary Education (2013-14)			
Institutions	14	103	
Faculties	70	590	
Teaching Staff	5 092	28 211	
Enrolled Students	56 175	433 234	
Graduates (2012-13)	13 169	111 028	
Human Resources in Science and Technology - 2015			
Persons with tertiary education, % of active population	11.10	19.60	32.00
Total R&D personnel by sectors of performance; Researchers (Headcount) – 2015			
All Sectors	3 372	27 535	2 706 928
Higher Education	2 585	14 743	1 407 020
Business	237	5 848	1 048 575
Government	510	6 799	264 483
Patent applications to the EPO by priority year;			
Number – 2012	4.93	60.33	56 600.00
Per million inhabitants – 2012	1.50	3.00	111.90
Patent applications to the National Office by residents;			
Number – 2013	180.00	995.00	n)a
Per million inhabitants – 2013	55.05	50.07	n)a
Total intramural R&D expenditure (GERD);			
EUR per inhabitant – 2015	13.20	28.80	564.40
Percentage of GDP – 2014	0.28	0.38	2.04
Higher Education	0.10	0.06	0.48
Business Sector	0.06	0.16	1.30
Government Sector	0.12	0.16	0.25

# A model of technology transfer





## Part I

# HOW DO YOU MEASURE TECHNOLOGY TRANSFER FROM PUBLIC RESEARCH ORGANISATIONS?

# Recommended Core Indicators

## Lead Indicators

1. Research Agreements ✓  
Optional: breakdown by type (contract/collaborative, consulting), financial value, share of total research expenditure funded by the private sector ✓
2. Invention Disclosures ✓
3. Patent Applications ✓  
Optional: breakdown by EPO, USPTO ✓
4. Patents Granted ✓  
Optional: Breakdown by EPO, USPTO ✓

## Lag Indicators

5. Licenses executed ✓
6. License income earned ✓
7. Spin-offs established ✓

# Supplementary Indicators

1. Activities of SMEs (i.e., SME vs non SME breakdown for all indicators)
2. Activities of Domestic Firms
3. Exclusive Licenses ✓
4. Share of valid patent portfolio that has been licensed ✓
5. Patent share of license income ✓
6. Regional indicators ✓
7. Technological field (of patents) ✓

# Basic data to calculate standardised perf. indicators

## Background Variables

A1. The number of institutions served by a KTO ✓

A2. Types of institutions served (i.e., University, Hospital, etc) ✓

A3. KTO size (staff, in FTEs) ✓

A4. Outsourcing (ie, legal work)

A5. Total KTO cost (excl. patents)

A6. Reference year (calendar or academic) ✓

## Denominators

B1. Research expenditures in the reference year

B2. Research personnel in the reference year



# Additional topics covered in this survey

## Legislation

Is the “third mission” formally embedded in the HEI/PROs charters?

Are there any legal barriers that inhibit aspects of TT?

## Institutional Policies in HEI/PROs

Written policies on Technology Transfer;

Process descriptions;

Measurement and review of past performance;

Organisational units responsible for TT processes;

## Knowledge profiling of the region

## Opportunities for spillovers

## Intermediaries in Technology Transfer

Part II

## RESULTS

# Lead Indicators

Indicator (5xHEI, 3xPRO)	2014	2015	2016
1.1 Number of research agreements with firms in NE Romania	<u>62</u> 59	<u>57</u> 55	<u>76</u> 74
1.2 Number of collaborative research agreements with firms in NE Romania	<u>37</u> 35	<u>20</u> 18	<u>36</u> 34
1.3 Number of contract research agreements with firms in NE Romania	<u>24</u> 24	<u>37</u> 37	<u>40</u> 40
1.4 Number of consultancy agreements with firms in NE Romania	<u>34</u> 34	<u>49</u> 49	<u>53</u> 53
1.5 Average share of total research expenditure funded by the private sector (%) min/max	5.05 1.6 / 11.86	16.35 0.056 / 46.9	3.18 0 / 6.9
1.6 Financial value of all research agreements (in RON) with firms in NE Romania	<u>4 859 699</u> 4 738 210	<u>3 690 758</u> 3 506 658	<u>6 010 680</u> 5 894 530
2. Number of invention disclosures received during the year	79	39	37
3. Total patent applications filed during the year to the National Office to the European Patent Office to the USPTO	<u>42</u> 41 1 0	<u>49</u> 49 0 0	<u>56</u> 56 0 0
4. Total number of new patents granted during the year by the National Office by the European Patent Office by the USPTO	<u>33</u> 33 0 0	<u>23</u> 23 0 0	<u>54</u> 54 0 0

# Lag Indicators

<b>Indicator (5xHEI, 3xPRO)</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
5. Total number of licences executed	0	0	0
6. Total license income earned (in RON)	0	0	0
7.1 Number of spin-offs established during the year	0	0	1
7.2 Number of active spin-offs at the end of the year	1	1	2
7.3 Revenues generated from spin-off royalties/profits/equity sales	0	0	0

# KTO size and activities

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## TTOs in HEI/PROs

Number of active TTOs	3
Avg (min/max) year of establishment	2003 (1992/2012)
Total / Average number of all TTO staff in FTEs	5.50 / 1.83

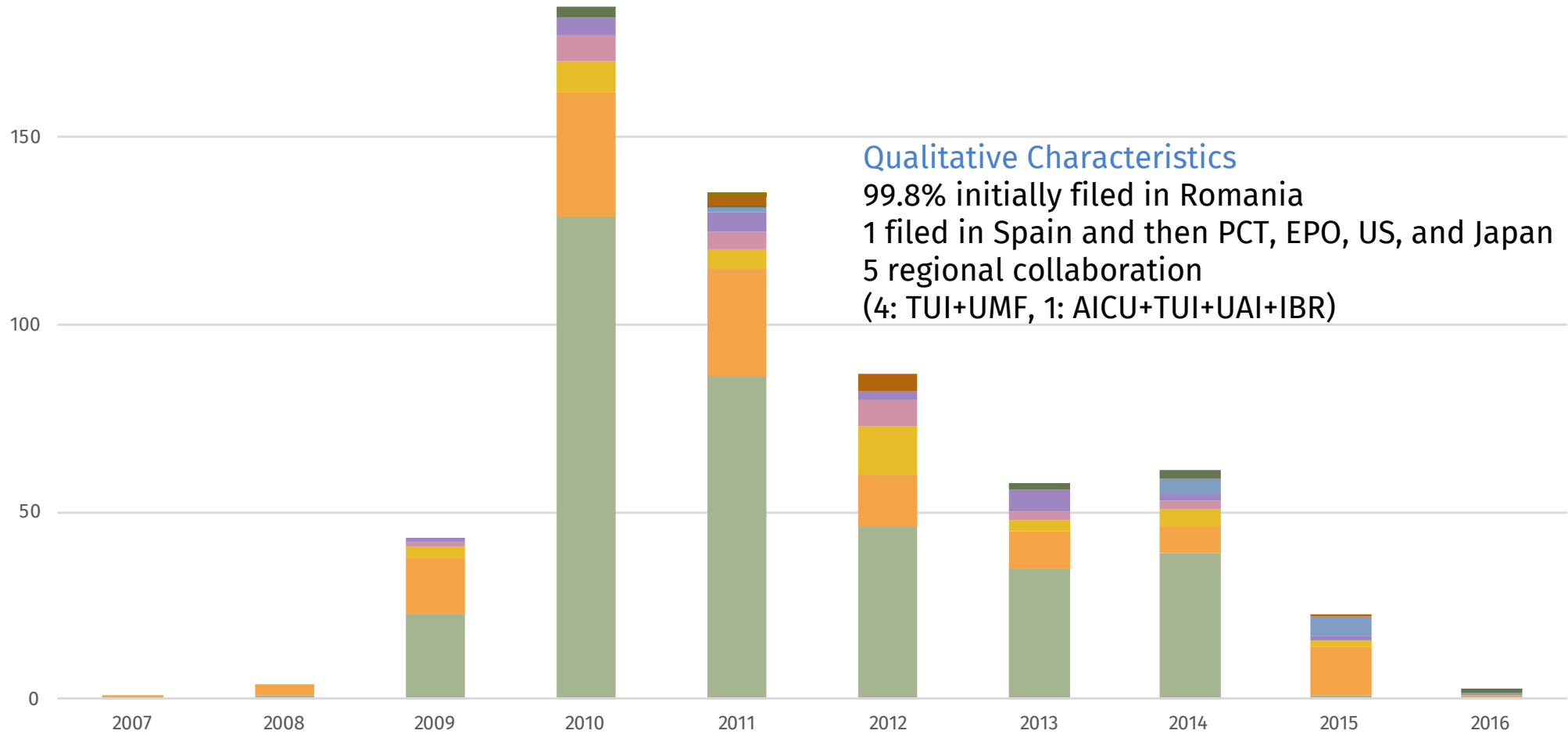
## TTO Activities

Seeking and/or managing research contracts from government	2 (67%)
Seeking and/or managing research contracts with industry	3 (100%)
Selling expertise/consultancy/services to the industry	3 (100%)
Managing the patent portfolio	3 (100%)
Scouting for new IP/technology	1 (33%)
Licensing	3 (100%)
Creation of spin-off companies	2 (67%)
Continuous Professional Development	2 (67%)
Management of Science or/and Technology Parks	1 (33%)
Agreements with seed capital funds or business angel networks	0 (0%)

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# Patenting Activity: Applications by Priority Year

(Source: EPO; Data accessed on 3.3.2017)



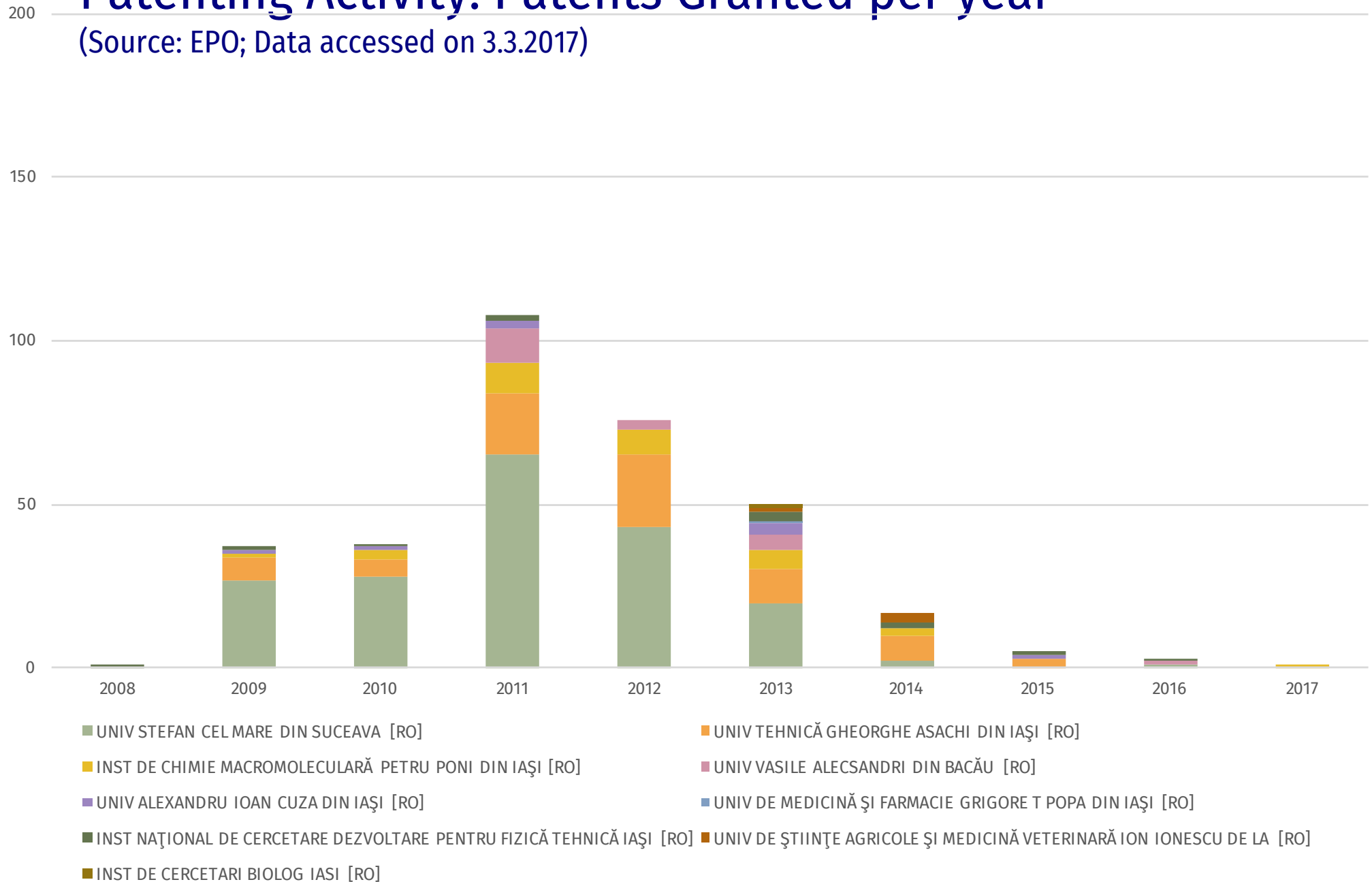
## Qualitative Characteristics

99.8% initially filed in Romania  
 1 filed in Spain and then PCT, EPO, US, and Japan  
 5 regional collaboration  
 (4: TUI+UMF, 1: AICU+TUI+UAI+IBR)

- UNIV STEFAN CEL MARE DIN SUCEAVA [RO]
- UNIV TEHNICĂ GHEORGHE ASACHI DIN IAȘI [RO]
- INST DE CHIMIE MACROMOLECULARĂ PETRU PONI DIN IAȘI [RO]
- UNIV VASILE ALECSANDRI DIN BACĂU [RO]
- UNIV ALEXANDRU IOAN CUZA DIN IAȘI [RO]
- UNIV DE MEDICINĂ ȘI FARMACIE GRIGORE T POPA DIN IAȘI [RO]
- INST NAȚIONAL DE CERCETARE DEZVOLTARE PENTRU FIZICĂ TEHNICĂ IAȘI [RO]
- UNIV DE ȘTIINȚE AGRICOLE ȘI MEDICINĂ VETERINARĂ ION IONESCU DE LA [RO]
- INST DE CERCETARI BIOLOG IASI [RO]

# Patenting Activity: Patents Granted per year

(Source: EPO; Data accessed on 3.3.2017)



**Cereri de brevet de invenție înregistrate de universități la OSIM  
în perioada 2007-2015\***

- ordonare numerică număr de cereri -

Nr. crt.	Denumire universitate	Oraș	Cod Județ	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total	
1	<b>UNIVERSITATEA "ȘTEFAN CEL MARE" DIN SUCEAVA</b>	<b>SUCEAVA</b>	<b>SV</b>	<b>36</b>	<b>68</b>	<b>46</b>	<b>130</b>	<b>88</b>	<b>46</b>	<b>35</b>	<b>42</b>	<b>5</b>	<b>496</b>	
2	UNIVERSITATEA "TRANSILVANIA" DIN BRAȘOV	BRAȘOV	BV		29	13	22	31	23	37	19	7	181	
3	<b>UNIVERSITATEA TEHNICĂ "GHEORGHE ASACHI" DIN IAȘI</b>	<b>IAȘI</b>	<b>IS</b>	<b>14</b>	<b>21</b>	<b>19</b>	<b>32</b>	<b>26</b>	<b>21</b>	<b>11</b>	<b>7</b>	<b>12</b>	<b>163</b>	
4	UNIVERSITATEA POLITEHNICA DIN BUCUREȘTI	BUCUREȘTI	B	6	16	10	31	28	9	19	14	7	140	
5	UNIVERSITATEA TEHNICĂ DIN CLUJ-NAPOCA	CLUJ-NAPOCA	CJ	6	8	8	25	29	18	14	12	10	130	
6	UNIVERSITATEA "DUNĂREA DE JOS" DIN GALAȚI	GALAȚI	GL	10	3	9	16	13	2	2	5	6	66	
7	UNIVERSITATEA "PETRU MAIOR" DIN TÂRGU MUREȘ	TÂRGU MUREȘ	MS		3		2	1	35	12	2	2	57	
8	UNIVERSITATEA "BABEȘ BOLYAI" DIN CLUJ-NAPOCA	CLUJ-NAPOCA	CJ	2	9	3	8	9	7	4	4	1	47	
9	UNIVERSITATEA "POLITEHNICA" DIN TIMIȘOARA	TIMIȘOARA	TM	4	2	1	9	3	7	8	2	8	44	
10	<b>UNIVERSITATEA "VASILE ALECSANDRI" DIN BACĂU</b>	<b>BACĂU</b>	<b>BC</b>		<b>1</b>	<b>7</b>	<b>7</b>	<b>5</b>	<b>8</b>	<b>3</b>	<b>2</b>		<b>33</b>	
11	UNIVERSITATEA "LUCIAN BLAGA" DIN SIBIU	SIBIU	SB		1	5	3	2	3	19		5	38	
12	UNIVERSITATEA DE MEDICINĂ ȘI FARMACIE "CAROL DAVILA" DIN BUCUREȘTI	BUCUREȘTI	B		3	2	9	5	3	4	1	1	28	
13	<b>UNIVERSITATEA "ALEXANDRU IOAN CUZA" DIN IAȘI</b>	<b>IAȘI</b>	<b>IS</b>	<b>1</b>	<b>5</b>	<b>1</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>6</b>	<b>2</b>	<b>1</b>	<b>25</b>	
14	UNIVERSITATEA PETROL - GAZE DIN PLOIEȘTI	PLOIEȘTI	PH				4	2	3	1	9	5	1	25
15	UNIVERSITATEA DIN PITEȘTI	PITEȘTI	AG				5	5	2	5	3	1	21	
16	UNIVERSITATEA DIN CRAIOVA	CRAIOVA	DJ	1		3	9	1	2	1	1	2	20	
17	UNIVERSITATEA DE VEST "VASILE GOLDIȘ" DIN ARAD	ARAD	AR					4	4	5	3		16	
18	UNIVERSITATEA DIN BUCUREȘTI	BUCUREȘTI	B	2	1		3	3	3	4		1	17	
19	UNIVERSITATEA DE ȘTIINȚE AGRONOMICЕ ȘI MEDICINĂ VETERINARĂ DIN BUCUREȘTI	BUCUREȘTI	B		2		2	6	4	1		4	19	
20	UNIVERSITATEA DIN ORADEA	ORADEA	BH		2	1	5	2	3		1	1	15	
21	UNIVERSITATEA DE MEDICINĂ ȘI FARMACIE "IULIU HAȚIEGANU" DIN CLUJ-NAPOCA	CLUJ-NAPOCA	CJ		1		4	1	2	3	3	4	18	
22	UNIVERSITATEA DE ȘTIINȚE AGRICOLE ȘI MEDICINĂ VETERINARĂ DIN CLUJ-NAPOCA	CLUJ-NAPOCA	CJ	2	1	1	1	1	5		2	2	15	
23	UNIVERSITATEA "OVIDIUS" DIN CONSTANȚA	CONSTANȚA	CT				6	5	1	1		1	14	
24	UNIVERSITATEA DE ȘTIINȚE AGRICOLE ȘI MEDICINĂ VETERINARĂ A BANATULUI TIMIȘOARA	TIMIȘOARA	TM	4	1	1	3	3			1	2	15	
25	FUNDAȚIA SAPIENTIA - UNIVERSITATEA SAPIENTIA	CLUJ NAPOCA	CJ				1	1	5		1	1	9	
26	UNIVERSITATEA DE MEDICINĂ ȘI FARMACIE "VICTOR BABEȘ" DIN TIMIȘOARA	TIMIȘOARA	TM			2	4		1			3	10	
27	UNIVERSITATEA "AUREL VLAICU" DIN ARAD	ARAD	AR	2			1	1	1	1			6	
28	<b>UNIVERSITATEA DE ȘTIINȚE AGRICOLE ȘI MEDICINĂ VETERINARĂ "ION IONESCU DE LA BRAD" IAȘI</b>	<b>IAȘI</b>	<b>IS</b>					<b>1</b>	<b>5</b>				<b>7</b>	
29	UNIVERSITATEA "VALAHIA" DIN TÂRGOVIȘTE	TÂRGOVIȘTE	DB						1		4	1	6	
30	UNIVERSITATEA "CONSTANTIN BRÂNCUȘI" DIN TÂRGU-JIU	TÂRGU-JIU	GJ					2			3	2	7	
31	UNIVERSITATEA DE NORD DIN BAIA MARE	BAIA MARE	MM			2	1	2					5	
32	UNIVERSITATEA TEHNICĂ DE CONSTRUCȚII DIN BUCUREȘTI	BUCUREȘTI	B	1	1			1		1			4	
33	UNIVERSITATEA DE MEDICINĂ ȘI FARMACIE "GRIGORE T. POPA" DIN IAȘI	IAȘI	IS				1	1			1	1	4	
34	UNIVERSITATEA DE MEDICINĂ ȘI FARMACIE DIN CRAIOVA	CRAIOVA	DJ					1					1	
35	UNIVERSITATEA DE MEDICINĂ ȘI FARMACIE TÂRGU MUREȘ	TÂRGU MUREȘ	MS				1						1	
36	ACADEMIA FORȚELOR TERESTRE "NICOLAE BĂLCESCU"	SIBIU	SB							1			1	
	<b>TOTAL</b>	<b>RO61</b>		<b>51</b>	<b>95</b>	<b>73</b>	<b>173</b>	<b>123</b>	<b>82</b>	<b>55</b>	<b>53</b>	<b>19</b>	<b>724</b>	
		RO		55	110	92	217	199	178	171	98	88	1704	
		%		93%	86%	79%	80%	62%	46%	32%	54%	22%	42%	

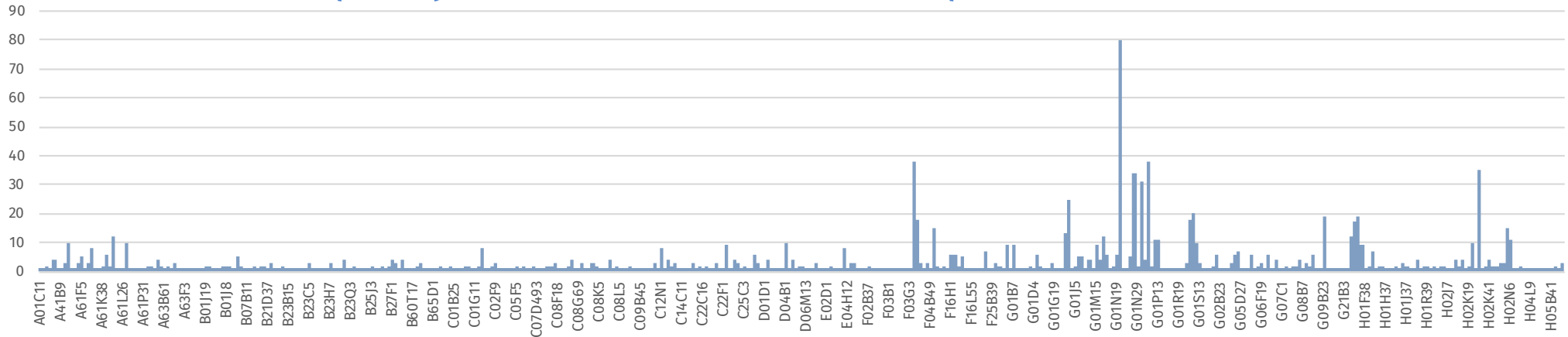
\* NOTĂ - Statistica a avut în vedere primul solicitant din cererile de brevet de invenție



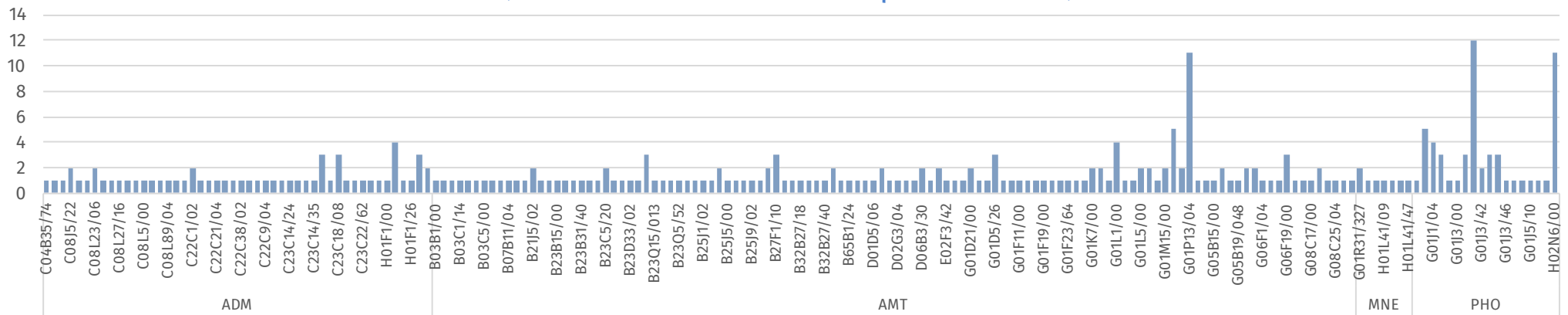
# Technological Fields

All patent families with priority date  $\geq 2007$  in the EPO dataset

## Frequency distribution of the 442 unique 4-level IPC codes



## Frequency distribution of the 187 unique IPC codes associated with KETs by JRC (dataset contained 775 unique IPC codes)



# Most frequent IPC 4-level codes

IPC Code	Num. Records	Description
G01N21	80	Investigating or analysing materials by the use of optical means, i.e. using infra-red, visible or ultra-violet light
F03G6	38	Devices for producing mechanical power from solar energy
G01N33	38	Investigating or analysing materials by specific methods not covered by the preceding groups
H02K33	35	Motors with reciprocating, oscillating, or vibrating magnet, armature, or coil system
G01N27	34	Investigating or analysing materials by the use of electric, electro-chemical, or magnetic means
G01N3	31	Investigating strength properties of solid materials by application of mechanical stress
G01J3	25	Spectrometry; Spectrophotometry; Monochromators; Measuring colours
G01R31	20	Arrangements for testing electric properties; Arrangements for locating electric faults; Arrangements for electrical testing characterised by what is being tested not provided for elsewhere
H01F29	19	Variable transformers or inductances not covered by group H01F21
G09B23	19	Models for scientific, medical, or mathematical purposes, e.g. full-sized device for demonstration purposes
F03G7	18	Mechanical-power-producing mechanisms, not otherwise provided for or using energy sources not otherwise provided for
G01R29	18	Arrangements for measuring or indicating electric quantities not covered by groups G01R 19/00-G01R 27/00
H01F27	17	Details of transformers or inductances, in general
H02N2	15	Electric machines in general using piezo-electric effect, electrostriction or magnetostriction
F04B9	15	Piston machines or pumps characterised by the driving or driven means to or from their working members

# Main indicators of patent value

(Source: Table 8.1 in OECD Patent Statistics Manual, 2009)

<i>Indicator</i>	<i>Rationale</i>
<b>Granted</b>	Limited legal protection if not granted; check by examiners
<b>Forward citations</b>	Technological importance of inventions; impact of further technology developments
<b>Family size</b>	Costly to have protection in different jurisdictions; sign of market potential
<b>Number of inventors</b>	Proxy the cost of an invention (cost of research)
<b>Renewals</b>	Cost of maintaining a patent; allows estimation of the distribution of value
<b>Opposition</b>	Market value of a patent; costs and risks associated with legal disputes
<b>Litigation</b>	Costs and risks associated with legal disputes
<b>Firm market value, spin-offs, etc</b>	Patent value embedded as intangible asset
<b>Surveyed economic value</b>	Patent value known by inventors or managers



Source:

[http://www.cernomazu.ro/index.php?option=com\\_content&task=view&id=19&Itemid=37](http://www.cernomazu.ro/index.php?option=com_content&task=view&id=19&Itemid=37)

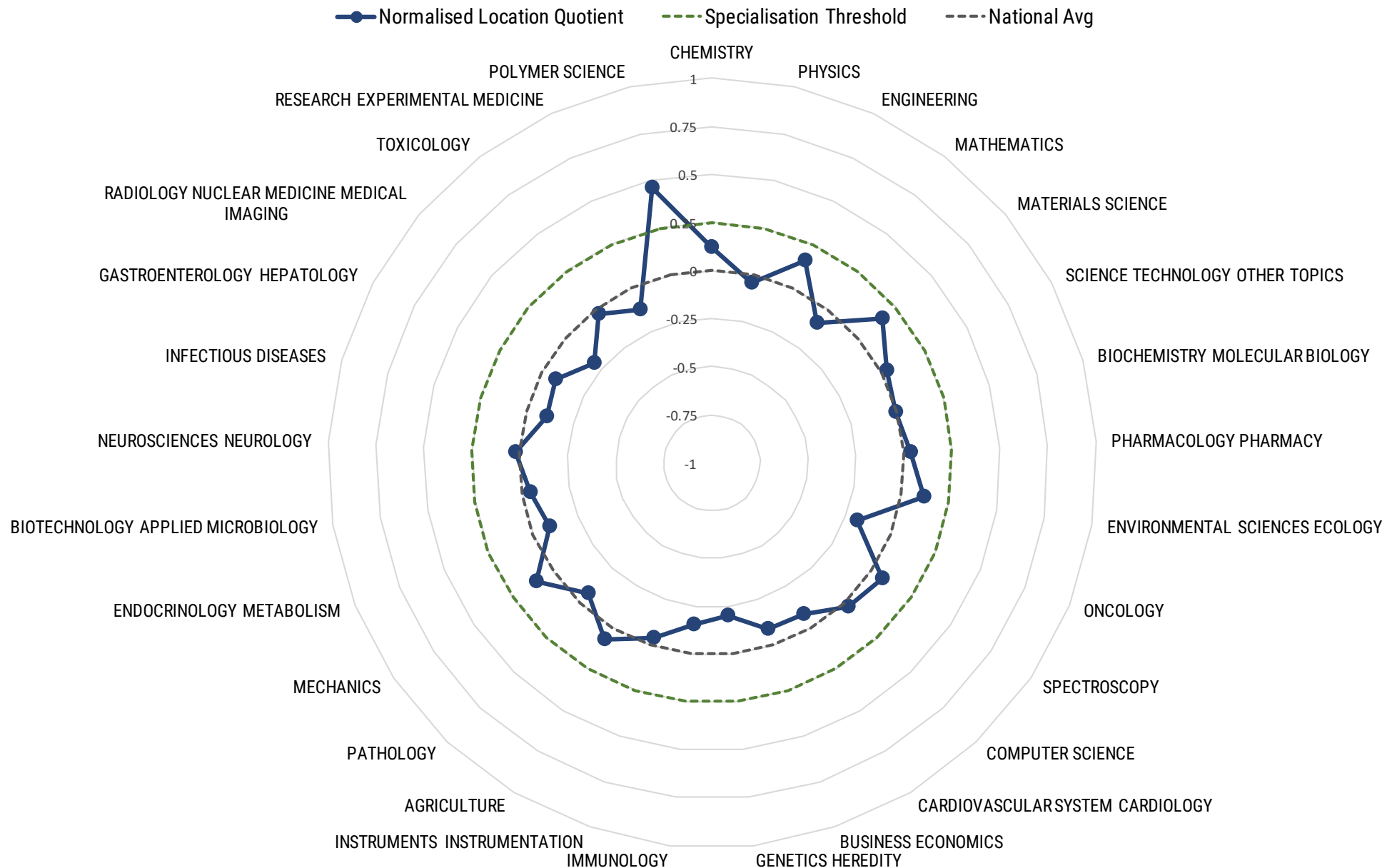
# Opportunities for spillovers

Graduates in Tertiary Education, NE Romania, 2014 (Source: INSEE Tempo Database)

<b>International Classification of Educational Standards (ISCED-F 2013)</b>	<b>Bachelor</b>	<b>Master</b>	<b>PhD</b>	<b>Total</b>	
Education science	350	129	0	<b>479</b>	
Arts and humanities	1 006	517	132	<b>1 655</b>	
Social sciences, journalism and information	593	354	28	<b>975</b>	
Business, Management and Law	2 690	1 222	91	<b>4 003</b>	
Natural Sciences, Mathematics and Statistics	846	449	89	<b>1 384</b>	
Information and communication technologies (ICTs)	600	153	10	<b>763</b>	
Engineering, processing and construction	2 147	1 337	64	<b>3 548</b>	
Agriculture, forestry, fishery and veterinary science	647	172	57	<b>876</b>	
Health and social care	1 898	1 585	126	<b>3 609</b>	
Services (includes environmental protection)	378	230	0	<b>608</b>	
	<b>Totals:</b>	<b>11 155</b>	<b>6 148</b>	<b>597</b>	<b>17 900</b>
	<b>% STEM:</b>	<b>32.2</b>	<b>31.5</b>	<b>27.3</b>	<b>31.8</b>

# Scientific Specialisation

(Source: Web of Science, all scientific publications between 2013 and 2016)



# Fit of Knowledge Supply to RIS3 Priority Sectors

Priority Sector	Fundamental Field	Relevant Research Areas	Degree of Fit
Agrofood	Agronomy	<u>Agriculture</u> ;	Good
	Horticulture	<u>Plant Sciences</u> ; Food Science Technology	Good
	Zootechnics	Zoology; Veterinary Sciences; <u>Fisheries</u> ; Marine Freshwater Biology;	Average
	Food Engineering	Food Science Technology; Toxicology; Biotechnology Applied Microbiology; Biochemistry Molecular Biology	Average
	Forestry and Wood Engineering	<u>Forestry</u> ; Energy Fuels, Thermodynamics	Good
Biotechnology	Chemical and technologic engineering	<u>Engineering</u> ; <u>Chemistry</u> ; <u>Pharmacology-Pharmacy</u> ; Biotechnology Applied Microbiology; Biochemistry Molecular Biology.	Good
	Biology and micro-biology	<u>Microbiology</u> ; Medical Informatics; Imaging Science Photographic Technology; Medical Imaging;	Average
	Food engineering	Food Science Technology; Toxicology; Biotechnology Applied Microbiology; Biochemistry Molecular Biology	Average
Textiles and new materials	Chemical Engineering	<u>Engineering</u> ; <u>Chemistry</u> ; <u>Polymer Science</u>	Good
	Technology of Textile Products	<u>Engineering</u> ;	Average
	Engineering of knitted fabrics and clothing	<u>Engineering</u> ;	Average
	Industrial Management	<u>Water Resources</u> ; <u>Environmental Sciences Ecology</u> ; Business Economics;	Good
ICT	Computers & Information Technology	<u>Computer Science</u> ; Robotics;	Good
	New Media	<u>Computer Science</u> ;	Average
	Public Health	<u>Computer Science</u> ; Telecommunications; Medical Imaging; <u>Biomedical Social Sciences</u> ; Instruments Instrumentation;	Good
	Electronic Engineering & Telecoms	<u>Engineering</u> ; Optics; Telecommunications; <u>Computer Science</u> ; <u>Science Technology Other Topics</u>	Average
Environment	Agricultural Sciences	<u>Plant Sciences</u> ; Biochemistry Molecular Biology; <u>Engineering</u> ; <u>Agriculture</u>	Good
	Environment Engineering	<u>Engineering</u> ; <u>Chemistry</u> ; <u>Water Resources</u> ; <u>Environmental Sciences Ecology</u> ;	Good
	Industrial management	<u>Energy and Fuels</u> ; <u>Water Resources</u> ; <u>Environmental Sciences Ecology</u> ;	Good

## No data found!

The *current* size of the HEI/PRO patents portfolio;

>> OSIM

The number of graduates staying in the region or their career paths;

>> HEIs

The distribution of teaching personnel in higher education per scientific discipline;

>> INSEE

Regional data on the quality of the research performed in HEI/PROs;

>> ARACIS? Ministry of Education and Research?



Part III

## INTERPRETATION OF THE RESULTS

## Summary – Key points (1)

The 3095 researchers (headcount) in HES+GOV are the key input for supplying and disseminating new knowledge in the Region:

**High inventiveness needs to become innovativeness;**

The overall number of research and consultancy agreements is very low when compared to the regional population of firms having more than 10 employees (~6690); average contract value of less than €10k suggests short-term interactions:

**Opportunities for more and longer interactions in collaborative applied research projects need to be created;**

**Opportunities for more first-time interactions between research and industry need to be created;**

## Summary – Key points (2)

The pool of ~6500 graduates/year with RIS3-related degrees needs motives to remain in the Region and become employable; intersectoral mobility is part of the answer:

*Undergraduates:* summer internships, placements;

*Masters:* Industrial MSCs, a Romanian version of KtPs;

*PhD:* Industrial PhDs, motivation to firms in hiring PhDs, work opportunities in collaborative research projects.

The existing portfolio of HEI/PRO IPRs is underexploited:

Accreditation, evaluation and institutional funding criteria should gradually shift to the lag indicators of Technology Transfer

Additional pathways to exploitation of IPR need to open (spin-offs, technology brokers)

## Summary – Key points (3)

The impact of recent initiatives is not recorded in the statistics:

ERRIN.RO & ROINNO are excellent platforms that should be further developed (and merged?) to facilitate all types of interaction between research and industry including licensing;

The Entrepreneurial Discovery Process is an excellent opportunity to create informal networks.

Short term actions by regional HEI/PROs:

Improve TT processes by acquiring know-how from peers in the Region (i.e., TUIASI)

Formally monitor (and report) their TT activity which is a part of their mission.

## Part IV

# PROBING DEEPER INTO THE KNOWLEDGE SUPPLY AT THE REGIONAL LEVEL

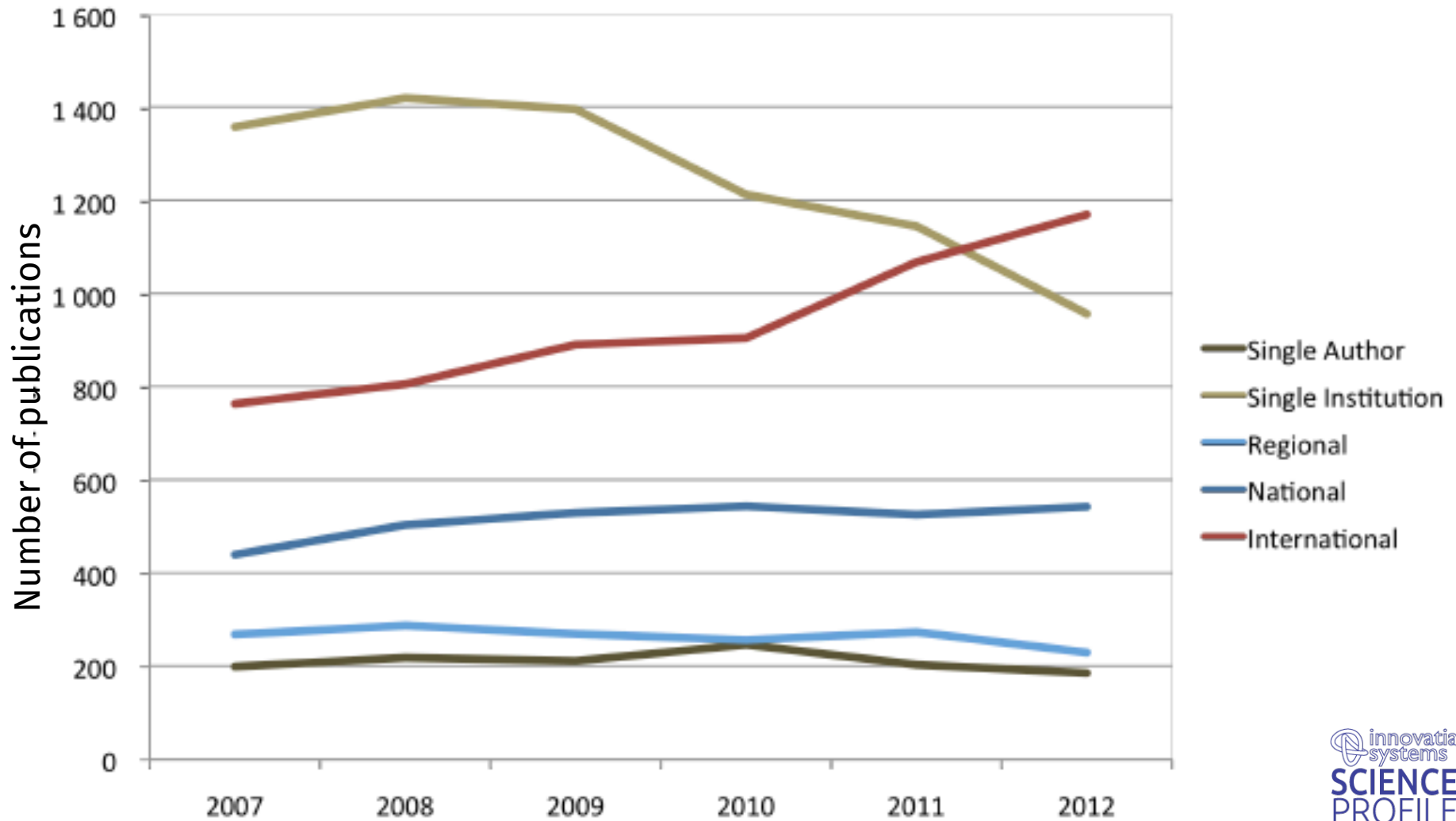
# Who does what?

(Region of Crete, GR)

Επιστημονική Περιοχή	Σύνολο Κρήτης	FORTH	HCMR	MAIC	TEIC	TUC	UGHH	UoC	VGHH
Φυσική	1247	631	2		117	77		911	
Τεχνολογία	1197	166	2	2	104	747	7	227	
Επιστήμη Υπολογιστών	940	218	2	1	74	447	3	281	
Χημεία	843	199	2	12	31	138		577	
Βιοχημεία-Μοριακή Βιολογία	582	178	15	2		11	21	493	1
Περιβαλλοντικές Επιστήμες-Οικολογία	515	9	43	8	47	244	2	198	
Ογκολογία	457	12			3	2	209	319	1
Επιστήμη Υλικών	449	231			44	60		294	
Μαθηματικά	422	90	1		24	127		264	
Νευροεπιστήμες & Νευροχειρουργική	322	39			6	7	27	285	4
Αστρονομία & Αστροφυσική	308	105	1		8			289	
Οπτική	275	166			28	28		148	
Καρδιολογία	260	15			2		134	141	2
Χειρουργική	258	5					68	185	5
Οικονομικά των Επιχειρήσεων	255	17		1	18	79	1	146	
Επιστήμη-Τεχνολογία μη αλλού κατατασσόμενη.	235	105	2	1	13	14	1	173	
Κυτταρική Βιολογία	230	70	3		1	2	27	182	1
Φαρμακολογία	229	9		2	6		38	177	6
Ραδιολογία, Πυρηνική Ιατρική και Ιατρικές Απεικονίσεις	214	12			11	4	79	131	14
Αιματολογία	209	6			1		76	146	7

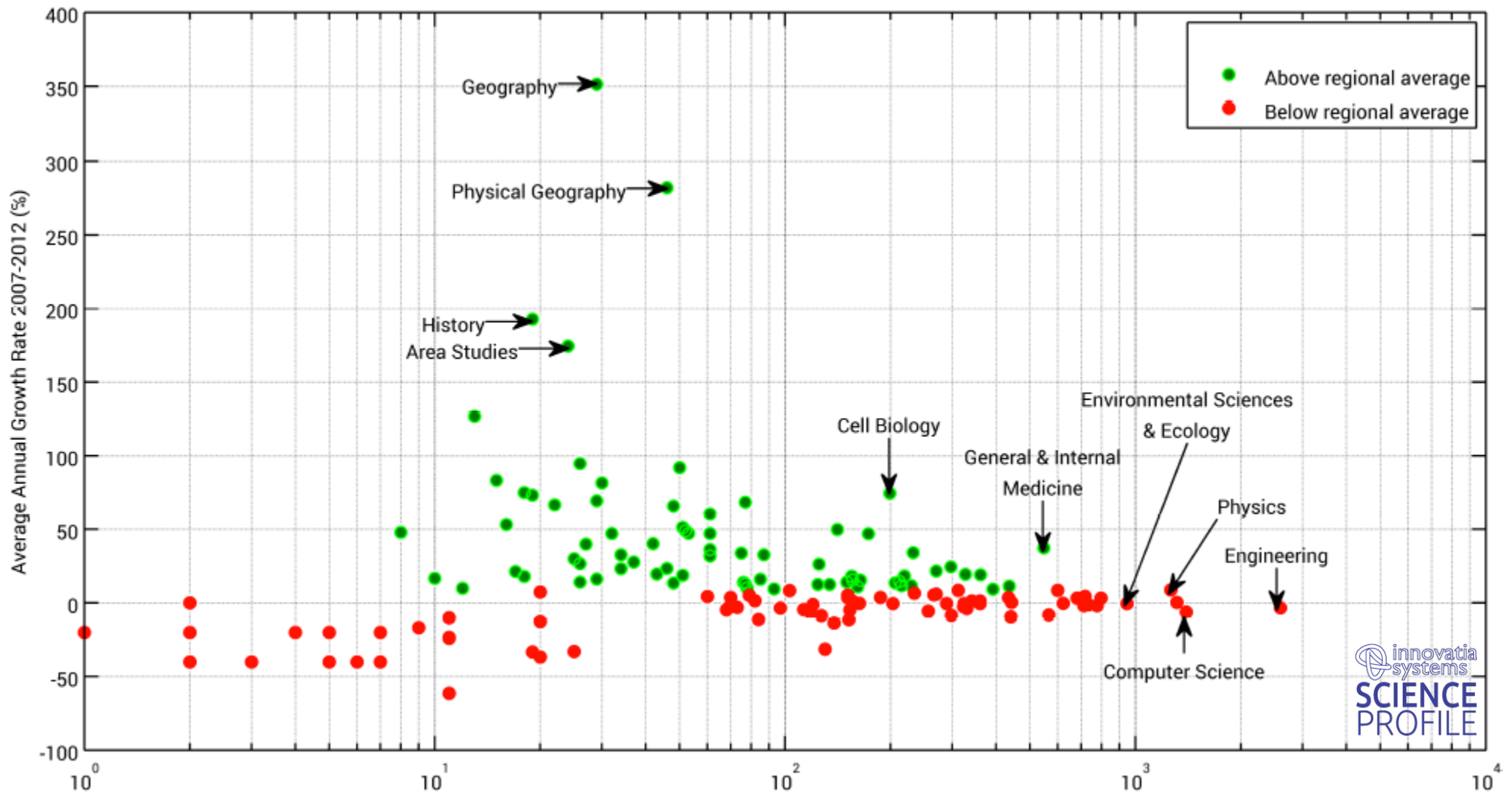
# Who writes with whom?

(Region of Kentriki Makedonia, GR)



# Emerging research areas

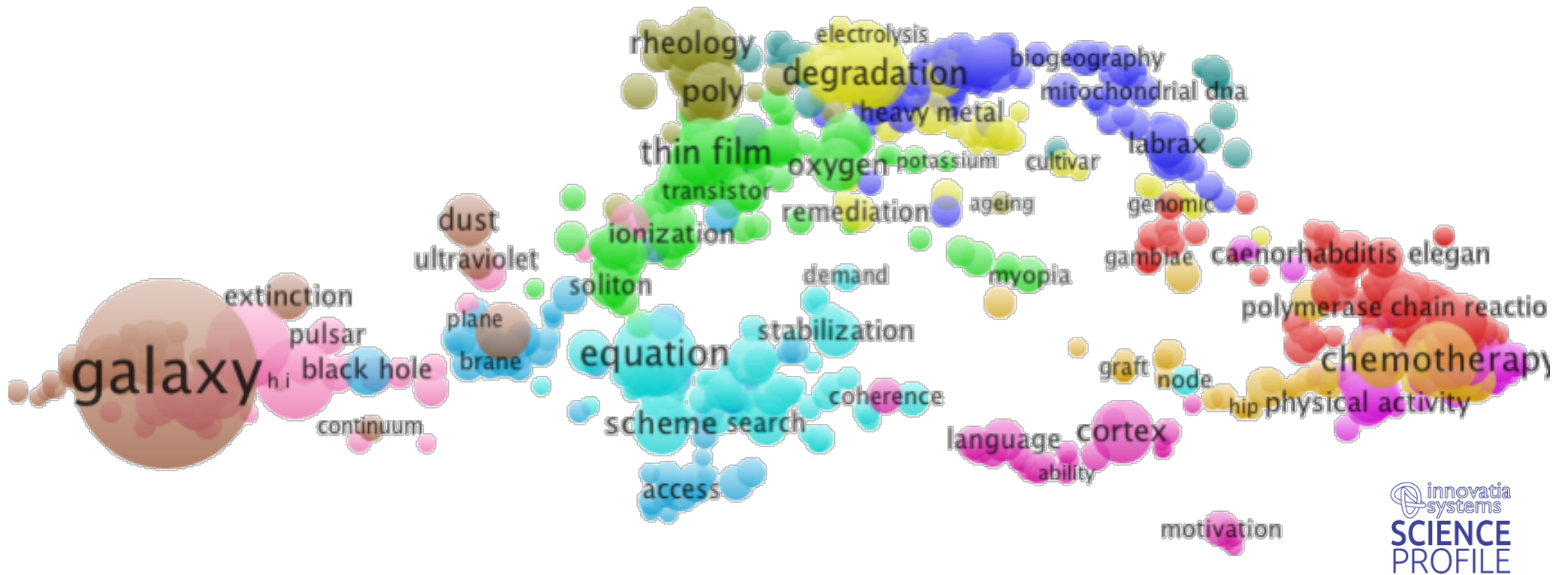
(Region of Kentriki Makedonia, GR)



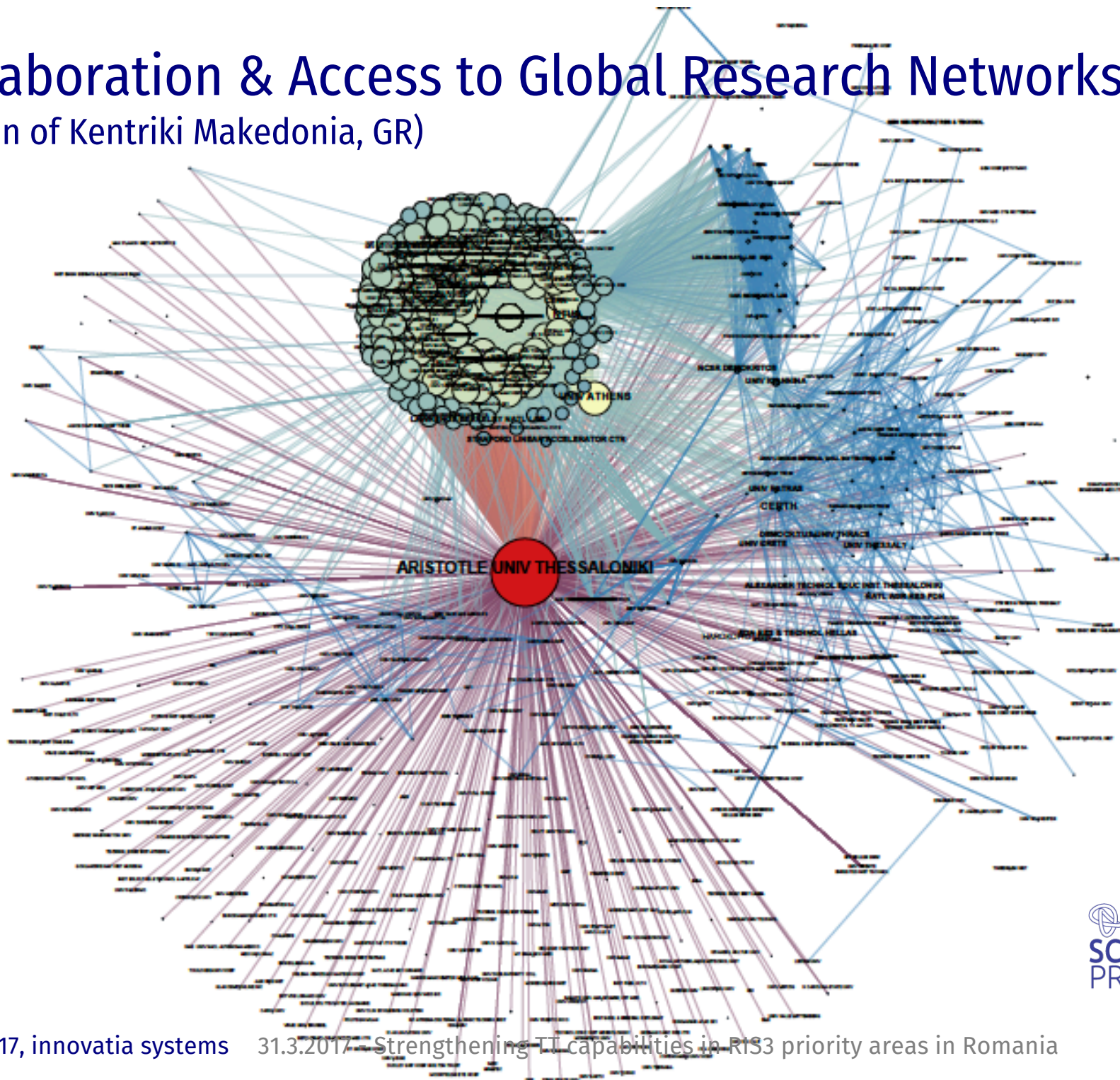


# Keyword Analysis

(Region of Crete, GR)

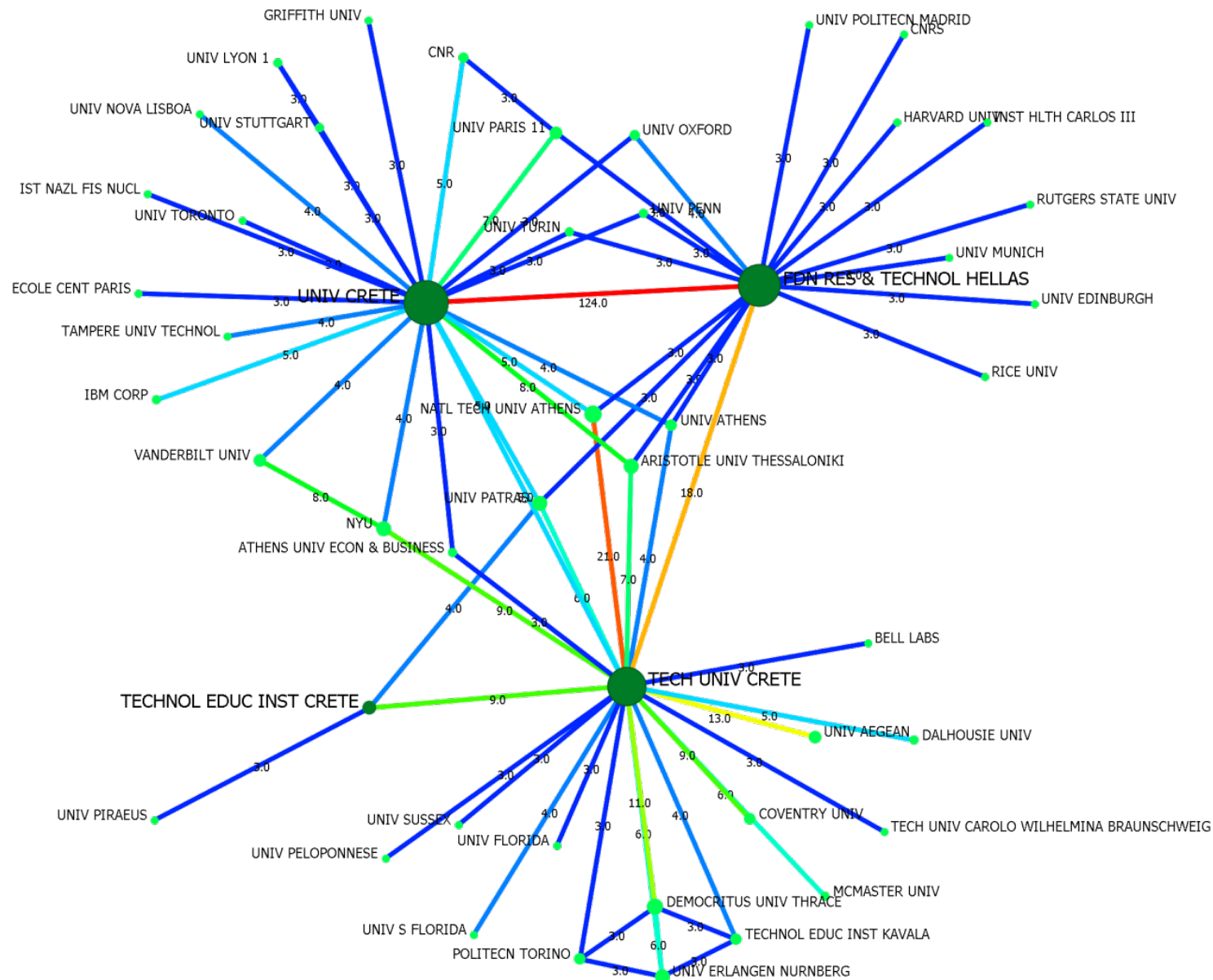


# Collaboration & Access to Global Research Networks (Region of Kentriki Makedonia, GR)



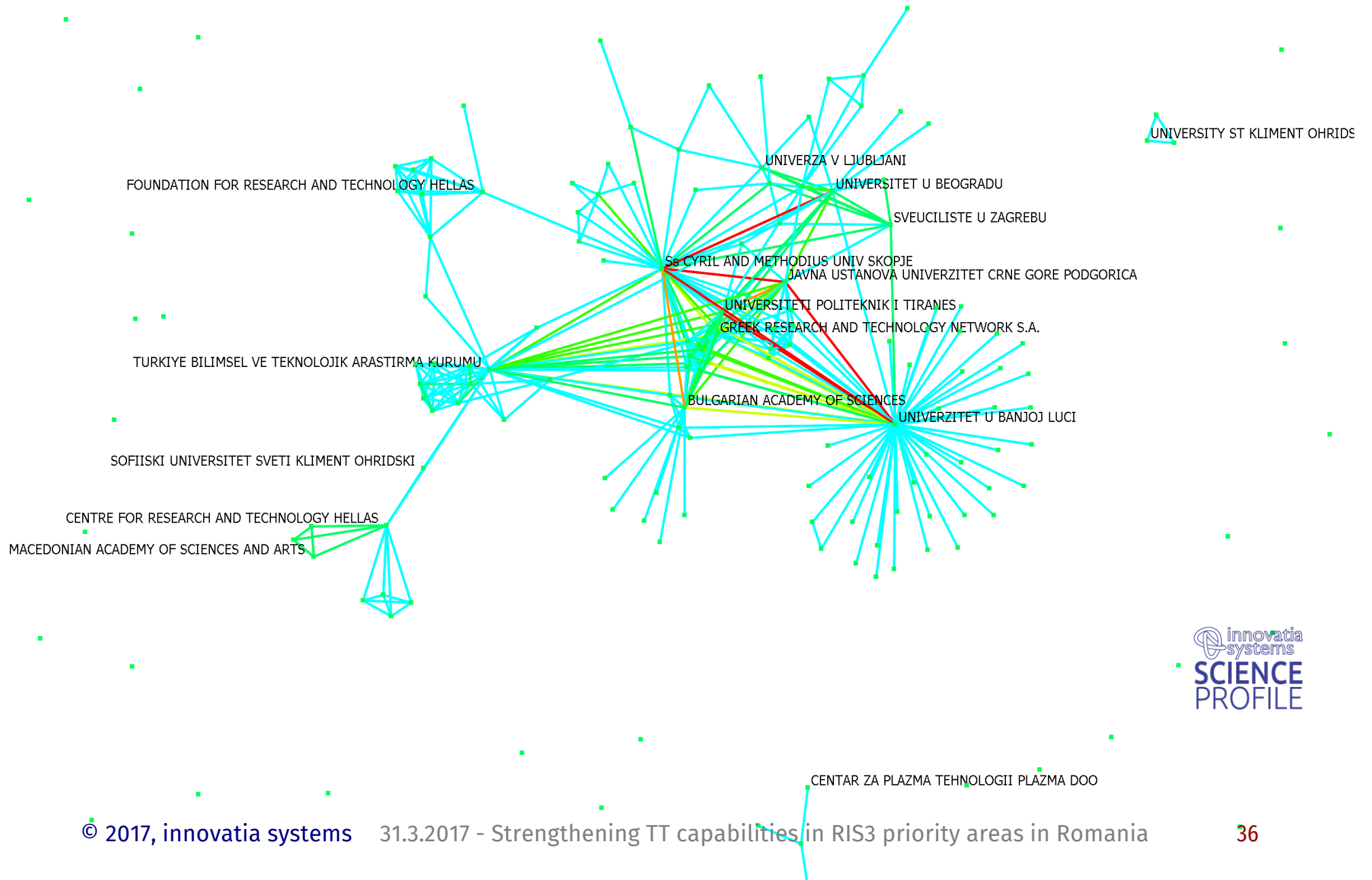
# Collaboration & Access to Global Research Networks (Computer Science, Region of Crete, GR)

UTxIN-CS



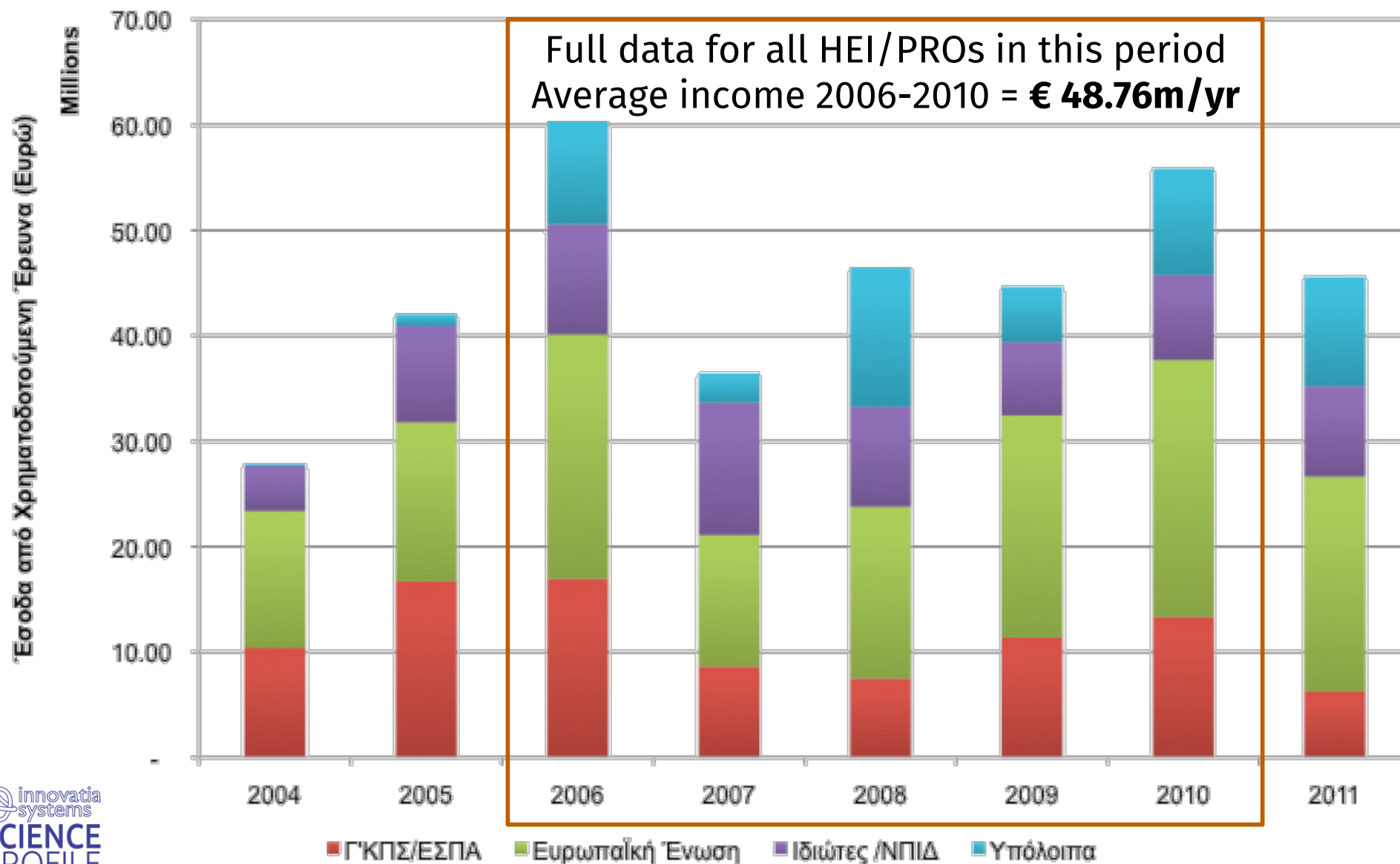
# FP7 Partnerships

(The former Yugoslav Republic of Macedonia)



# Co-funded research revenues (in mil EUR) by source

(Region of Crete, GR)



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