Knowledge spillovers through R&D networking in high-tech industries in CEE

Dr Małgorzata Runiewicz-Wardyn

Transformation, Integration and Globalization Economic Research (TIGER)
www.tiger.edu.pl

Aim and method applied

The aim of the research *was* empirically test the patterns of knowledge spillovers and networking in technical universities in CEE countries (EU10).

The methods of this research *include* the analysis of scientific literature, and a qualitative survey research based on interviews with Heads of the R&D labs in major technical universities in CEE countries.

Research questions:

- What are the patterns of knowledge spillovers amongs the major universities R&D labs?

- What is the role of space in explaining knowledge spillovers and R&D networking?

Main conceptual assumptions:

- **Knowledge spillovers** refer to the „involuntary leakage, as well as, the voluntary exchange of useful technological information" (Steurs, 1994: p. 2)

- **Mapping of R&D collaboration** can complement or readjust the picture of knowledge spillovers and innovative networking

Conceptual framework and methodology

- Interviews with 35 in-depth interviews (20 (EU10); 15 (EU15)) with Heads of R&D labs (usually doctors or professors) in major technical universities in one of the six high-tech industries (Aerospace, Biotechnology, Communication, Computers, Semiconductors, and Medical Devices and Lasers) (EE,LV,LT,PL,CZ,HU,BE,FR,GE,FI) in 2011-2012;

The purpose of the interviewing was to answer:

- What is the role of geographical space in knowledge spillovers and R&D networks?
- What are the major channels of sourcing and diffusing knowledge ?
- What is the role of social networking and collaboration with other universities and business in knowledge spillovers?
- What is the attitude of researchers towards the open science and research results sharing?

Survey questionnaire consisted of five sections denoted as A, B, C, D and E.

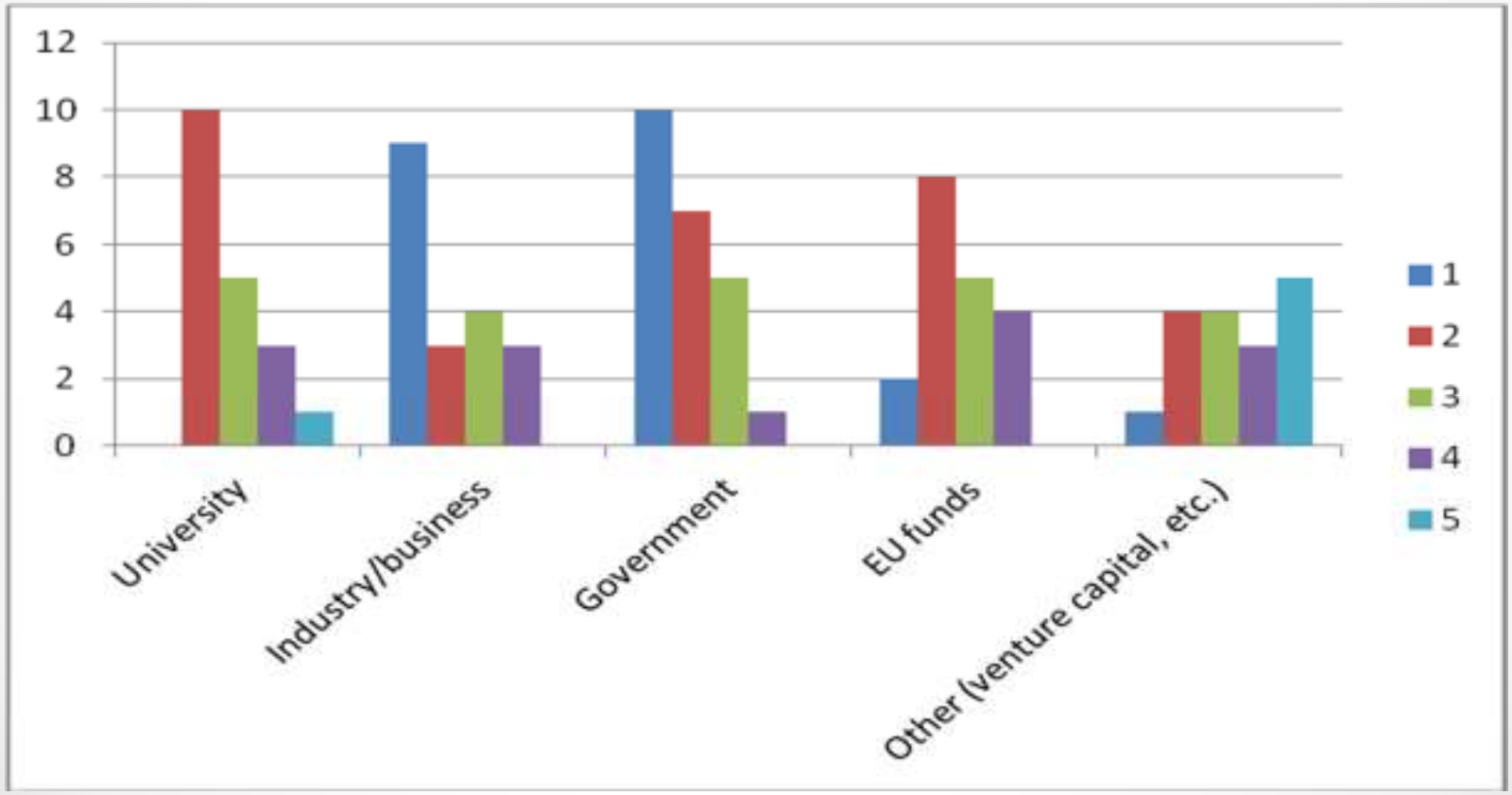
- (A) contained the general information about the respondent (names, scientific title), their S&T field as well as their major source of R&D funding.
- (B) aimed to capture the main channels of knowledge diffusion (Seminars, conferences, workshops, collaboration with business sector, publishing activity, patents and informal (face to face) contact).
- (C) covered questions related to geographically and technologically mediated knowledge spillovers, such as the significance of intra - (local), inter- , extra- (European) and global source of knowledge and asks about the type of knowledge:

Survey questionnaire consisted of five sections denoted as A, B, C, D and E

- (D) assessed the participation of the respondent in an R&D unit/lab in the knowledge and technological networks within the home institution and in the home region institutions, other institutions within its national boundaries, other institutions in the EU and also in other countries.
- (E) treated the issues related to secrecy in university research, such as access and sharing the research results or materials (software, genetic sequences, data) with the other scientists. The brief overview of the survey results for each technological field is discussed below.

The results of questionnaire survey for EU-10 knowledge spillovers and social networking

Figure 1. Major source of R&D funding (scale of significance from 1 to 5, where 1 - very significant and 5 - least significant)

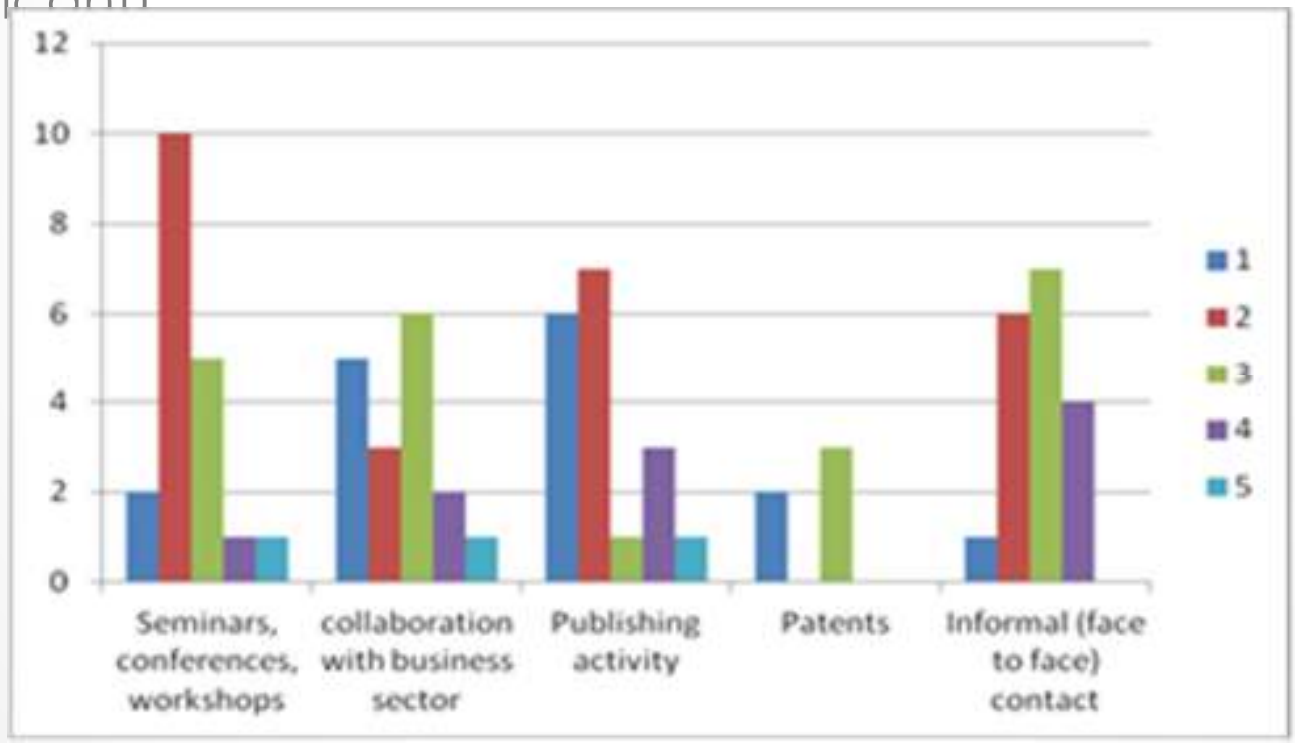


Major source of R&D funding

- *Space* and *aviation :* government/public funds (including EU funding)
- *Computer and communication:* public, the EU FP (in telecommunication field) and private business/industry.
- *Biotechnology* : public funds and industry financing
- *Semiconductor and laser fields:* public sector, industry private, EU funds.

Major channels of knowledge diffusion

Figure 2. Most common forms of knowledge diffusion (scale of significance from 1 to 5, where 1 - very significant and 5 - least significant)



Source: based on the author`s interview survey.

Major channels of knowledge diffusion

Communication: university-business R&D collaoration, social networking (both formal and informal) and publishing activity

Aerospace: publishing and informal networks (contacts): A*viation:* collaboration with industry, workshops.

Biotechnology: university-business R&D partnerships (social networking and informal contacts seem to be a more important process at the beginning the R&D collaboration, (to build credibility between potential partners), but does not always lead to common research projects.

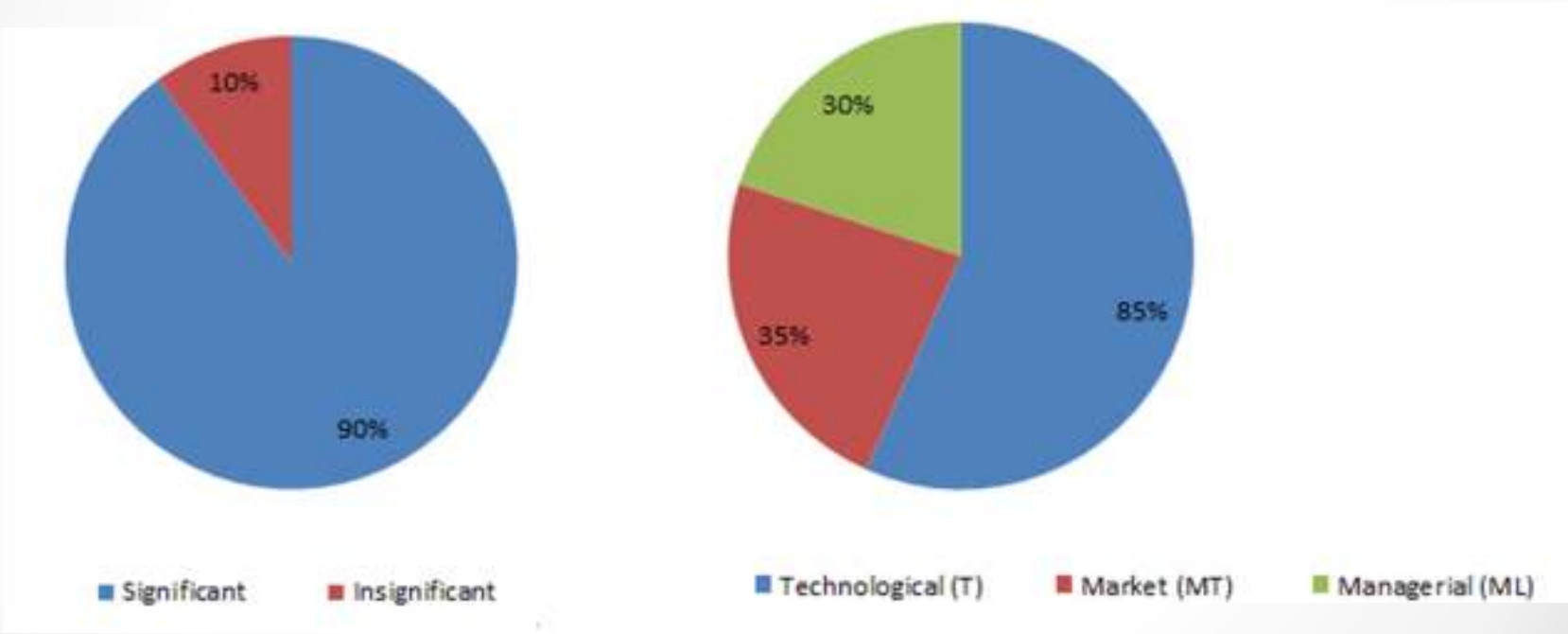
Major channels of knowledge diffusion

- *Computer:* social networking (informal contacts) between engineers in private firms and university researchers (platform to exchange views and opinions with regards to the major developments and innovations taking place in the industry, major challenges, etc).

- S*emiconductor* and *laser* technology: publishing, collaboration with the business sector and lesser extent informal face to face contacts.

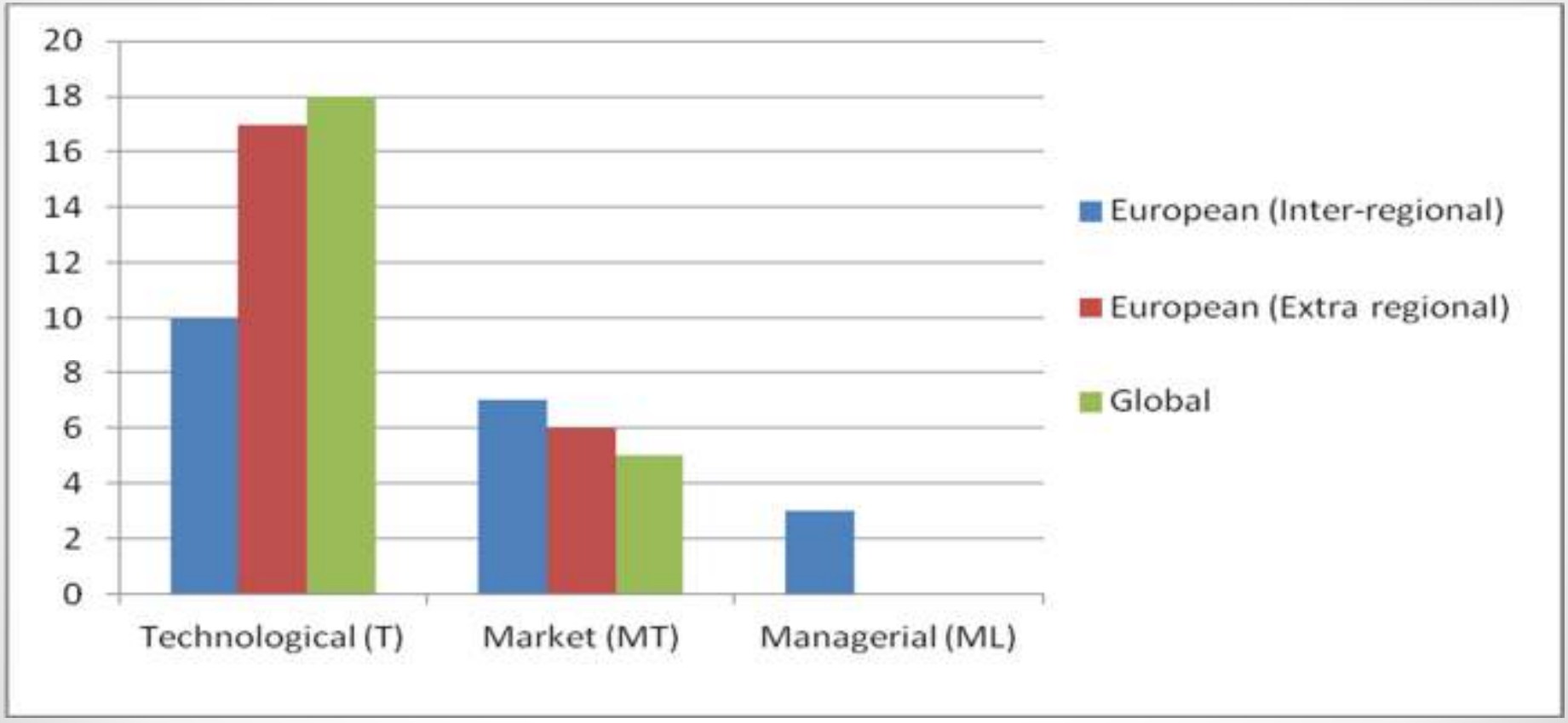
Geographically and technologically mediated knowledge spillovers

Is the local (intra-regional) source of knowledge important for your R&D activity? What type of knowledge ?



Source: based on the author`s interview survey.

What is the role of European (inter- and extra- regional) and global sources of knowledge?



Source: based on the author`s interview survey.

Geographically and technologically mediated knowledge spillovers

- S*pace* and *aviation*: both local and global sources of technological and scientific knowledge. In collaborative relationships with the industry technological knowledge was exchanged together with market and managerial knowledge.
- *Biotechnology*: local technological knowledge was found to be a major source of knowledge. Additionally, market and managerial types of knowledge turned out to be equally important, for those R&D labs located near biotech/pharmaceutical firms/clusters.

Geographically and technologically mediated knowledge spillovers

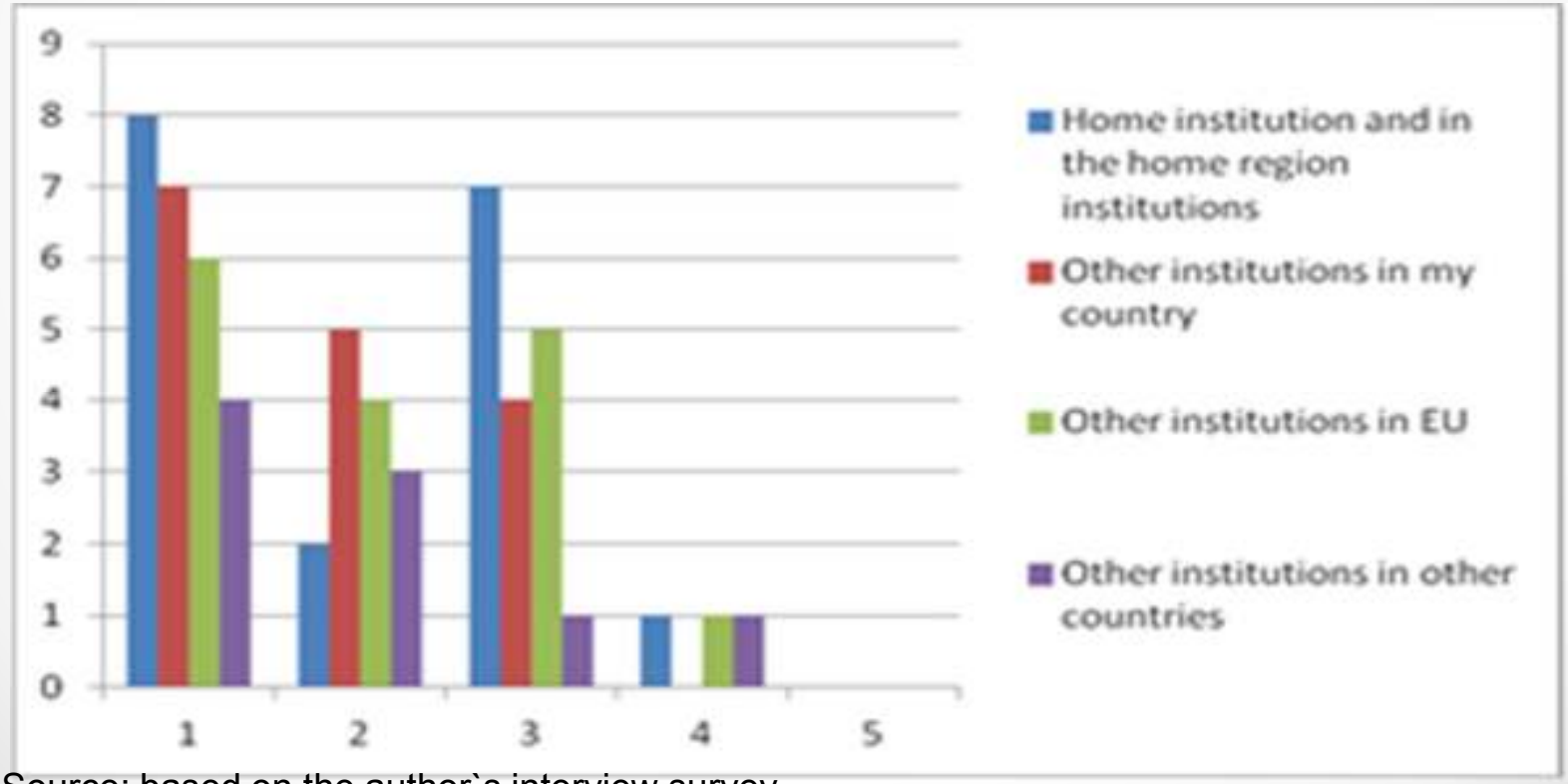
- C*ommunication* and *computer:* local (companies and R&D institutions; especially in case of tacit (informal) nature of technical and scientific knowledge), extra-regional (European) and global technological and scientific knowledge flows;
- The exception was Tallinn University of Technology (TUT), who considered inter-regional knowledge flows as important source of R&D (research for Nokia and Fincitec that provide the university with relevant technological knowledge).

Geographically and technologically mediated knowledge spillovers

- *Computer fields*: managerial knowledge (relatively important) had a more local character (innovation activities rely more on synthetic/customers' based rather than analytic knowledge
- *Semiconductors :* technical knowledge is localised around universities, whereas the market and managerial knowledge has a more global character.
- *Laser technologies*: extra-regional (European) and global sources of knowledge flows.

The R&D networks and knowledge sharing

Significance of knowledge and R&D networks (scale of significance from to 5, where 1 - very significant and 5 - least significant)



Source: based on the author`s interview survey.

The important role of local R&D networks

Space engineering and aviation: home R&D institutions, followed by other national and EU based R&D institutions (AERA-Pro Project, ECARE and ECARE+)

Biotechnology and *communications*: home R&D and other home region and nationally based R&D institutions/business entities more significant than EU institutions (EU ERA-NET based R&D funding only played a secondary role).

Computer science: non-national R&D institutions (from UE and other non-EU countries) were the major partners in R&D collaboration and networking.

The important role of local R&D networks

Semiconductors: national R&D networks, followed by research networks with the EU.

Laser technologies: European-funded R&D projects were the major technological platforms and mechanisms for R&D networks.

What is the attitude of researchers towards the open science and research results sharing?

- When asked if they have requested from or denied other scientists any research results or materials most of respondents said no.
- However, they were also more willing to share the information with the agents they previously worked with (since trust already existed).
- The exception is in the field of *biotechnology* where Heads of R&D units emphasised the importance of IP protection and secrecy in the undergoing R&D projects and suggested, that all the results are to be published,
- prior to be discussed in public or in an informal way.

Summary and conclusions

- CEE R&D labs have not developed the endogenous power to generate business-university-industry interactions and their knowledge flows are conditional on public R&D support.
- Knowledge linkages at multiple spatial scales are important and simultaneous, and determined by type of knowledge and scientific field to another.
- For 85% of respondents local institutions, companies and social networks were considered to be the major source of technological knowledge flows*.
- Formal and informal (face to face) contacts in the knowledge networks are important especially on local basis**.
- R&D networks are locally or nationally determined.
- Poor participation in EU funded R&D projects: lack of a competitive research environment (in all thematic fields of the FP, especially in smaller countries).

Policy related questions:

- How to enhance the university-industry interaction? Does the established infrastructure supporting innovation (scientific parks, scientific incubators) or intermediaries (mostly TTOs or R&D services) work efficiently enhance the ties with industry?
- How to increase R&D financing and networking based on the EU FP funds (avoiding any quotas or other direct forms of positive discrimination)?
- What is the role of researchers initially trained in many of these countries gravitating to the favoured Member States in north-west Europe in knowledge spillovers and knowledge networking within their home regions? Will it aggravate greater imbalances between EU regions in future knowledge creation?

Dr.Małgorzata Runiewicz-Wardyn
mruniewi@tiger.edu.pl

TIGER
Kozminski University

Annex:

List of interviewees:

Prof. József Rohács (Budapest University of Technology and Economics), Dr. Daniel Hanus, (Czech Technical University in Prague), Prof. Romana Śliwa (Rzeszow University of Technology), Prof. Vladimir Marik (Czech Technical University), Prof. Jüri Vain (Talin Technical University), Dr. János Levendovszky (Budapest University of Technology and Economics), Prof. Indrikis Muiznieks (University of Latvia), Prof. Mr. Károly Marialigeti (Eötvös Lóránd University), Prof. George Szekeres (Pécs Industrial Park), Prof. dr hab. Wanda Dobryszycka (Wroclaw Medical University), prof. dr hab. Grażyna Lewandowicz (Poznan University of Life Science), Prof. dr hab. Krzysztof Staroń (Warsaw University), Prof. Eerik Lossmann (Tallin University of Technology), prof. Józef Lubacz (Warsaw Technical University), Prof. Szczepanski Stanislaw (Gdansk Technical University), Prof. Enn Mellikov (Tallinn University of Technology), Prof. Désiré Dauphin Rasolomampionona (Warsaw University of technology) , Prof Zbigniew Lisik (Lodz technology University), Prof. Krzysztof Kubiak (Rzeszow University of Technology), Prof. Rimantas Kanapenas (Vilnius Laser Technology Center).