

# **International Co-operation in R&D**

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MINISTERSTVO ŠKOLSTVÍ,  
MLÁDEŽE A TĚLOVÝCHOVY



OP Vzdělávání  
pro konkurenceschopnost

INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ



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# List of Abbreviations

|                |   |
|----------------|---|
| ASCR           | Academy of Sciences of the Czech Republic             |
| BMBF           | German Ministry for Education and Research            |
| BMWi           | German Ministry for Economy and Technology            |
| CERN           | European Organization for Nuclear Research            |
| CNRS           | Centre national de la recherche scientifique          |
| COMECON        | Council for Mutual Economic Assistance                |
| CONACYT-Mexico | Consejo Nacional de Ciencia y Tecnología (Mexico)     |
| COST           | European Cooperation in Science and Technology        |
| CVUT           | Czech Technical University in Prague                  |
| DFG            | Deutsche Forschungsgemeinschaft                       |
| DST (India)    | Department of Science and Technology                  |
| EECA           | Eastern Europe and Central Asia                       |
| EFTA           | European Free Trade Area                              |
| EMBC           | European Molecular Biology Conference                 |
| ERC            | European Research Council                             |
| ESA            | European Space Agency                                 |
| ESO            | European Southern Observatory                         |
| EU             | European Union  |
| EURATOM        | European Atomic Energy Community                      |
| FP             | Framework Programme                                   |
| GAAV           | Grant Agency of ASCR                                  |
| GACR           | Czech Science Foundation                              |
| GDP            | Gross Domestic Product                                |
| GERD           | Gross Expenditure on R&D                              |
| HES            | Higher Education institutions                         |
| HR             | Human Resources                                       |
| ICP            | Internationally collaborated publication              |
| IKEM           | Institute for Clinical and Experimental Medicine      |
| IPR            | Intellectual property rights                          |
| ISI-WoS        | ISI-Web of Science                                    |
| IT             | Information Technology                                |
| JCU            | University of South Bohemia (USB) in České Budějovice |
| JTI            | Joint Technology Initiatives                          |
| MEYS           | Ministry of Education, Youth and Sports               |
| MIT            | Ministry of Industry and Trade                        |

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|        |   |
|--------|---|
| MU     | Masaryk University                                  |
| NCP    | Nationally Collaborated Publication                 |
| NCPs   | National Contact Points                             |
| NM     | National Museum                                     |
| NMS    | New Member States                                   |
| NSN    | National Support Network                            |
| OMS    | Old Member States                                   |
| OTH    | Other   |
| PRC    | Private sector                                      |
| R&D    | Research and Development                            |
| REC    | Non-University research organisations               |
| RTI    | Research and technological innovation               |
| S&T    | Science and Technology                              |
| SMEs   | Small and medium enterprises                        |
| SP     | Specific Programmes                                 |
| SZÚ    | Státní zdravotní ústav                              |
| TAFTIE | Association for Technology Implementation in Europe |
| UK     | Charles University                                  |
| UP     | University of Pardubice                             |
| UPOL   | Palacký university Olomouc                          |
| US     | United States                                       |
| US DOE | US Department of Energy                             |
| VAT    | Value Added Tax                                     |
| VŠCHT  | Institute of Chemical Technology Prague             |



# Executive Summary

## Purpose

In this Audit, working package (g) explored the international activity of the research community (organisations and individuals) and the relevant ministries and funding agencies. It seeks to analyse the level and breadth of international activity, establish some understanding of the benefits and pitfalls of internationalisation in research and shed light on framework conditions and governance issues around internationalisation of research and research funding. This document is the final report of this working package. It brings together the various modules within this working package, including a summary of the bibliometric part of the study, a full report of which is delivered in a separate document.

## Findings

Our bibliometric analysis of the 85,600 science, social sciences, and arts and humanities journal article records from the Web of Science published between 1980 and mid-2010 reveals that Czech international R&D collaboration is strongly European (four-fifths of the Czech Republic's international collaboration papers are with European countries although the US is also a major collaborator) and has grown during the transitions of recent decades. Internationally collaborated Czech publications are generally of higher citation quality than purely domestic papers. The Czech Republic's level of international journal co-authorship is somewhat higher than in Hungary (when normalized for population), but significantly lower than in Austria. Czech international R&D collaboration is greatest (by absolute numbers of papers) in the fields of physics and material science, chemistry and chemical engineering, basic life sciences, clinical medicine, biomedical sciences and biological sciences. International collaboration in several social science disciplines is weak compared to this subject group's national significance. Notably, there is a higher level of concentration (by scale of output) of institutions engaged in international collaboration in the Czech Republic than in Austria and Hungary. Co-authorship is dominated by two institutions, the Academy of Sciences of the Czech Republic (ASCR) and Charles University (UK). These institutions are also powerful nationally in research, but there are other Czech research institutions that collaborate less internationally than their national ranking would suggest. While international institutions are also important sponsors (especially the EU) of international publications, the fact that three Czech institutions dominantly fund international collaboration suggests that there is capability (real or latent) within the Czech research system to influence the direction and nature of future Czech international R&D collaboration.

Our survey of researchers is based on 689 respondents, 41% ASCR, 45% University, 13% other organisations (1% industry). It found that international collaboration is an important feature of the Czech researcher community and it is not seen to be a bottleneck for better research and technological innovation (RTI) activities in the Czech Republic. Two thirds of all projects that are done in collaboration have at least one international partner. The main partners are of course researchers from European countries, 92% of all researchers that collaborate internationally have done collaboration with a partner from EU 27 / EFTA, and 16% with a partner from North America.

The Czech research community appears – on the basis of the survey data – considerably mobile, 83% of all Czech researchers have been abroad in the context of their research at least once. Interestingly, more than one third of the respondents claim to have been employed by a foreign organisation, for senior staff (e.g. rectors) the share is above 50% (58%). The respondents also indicate that re-integration is not a major problem, having been abroad obviously increases attractiveness, and problems reported are of a personal rather than a systemic nature. The motivation to internationalise, in general terms, is to enlarge networks and to pursue personal research agendas, leading to a better publication profile. The researchers are, by and large, content with the achievement of the goals related to international collaboration and mobility. A reason of less importance is links to foreign firms; however those who have collaborations with foreign industry report it as being an important industry related activity. By and large, the majority of Czech researchers feel that their organisations recognise international activities and support them. Overall, for the system, the level of support and recognition for international activities is perceived to be worse, especially as for collaboration support with European and even more with non-European partners. As researchers see a future increase in

collaboration, there is a policy and support gap. Moreover, researchers regard the integration of foreign actors in national programmes as poor.

A second survey was geared towards directors of research organisations (74 respondents, 45% of which from Universities, 31% from ASCR institutes and 24% from other organisations). Less than 40% of all organisations have an explicit internationalisation strategy, but 49 % plan to have one in the next three years, indicating an overriding importance of internationalisation in the future. This corresponds very closely to the availability of dedicated funds and the plan to have those funds in the future. ASCR institutes are slightly less likely to have an explicit strategy and dedicated budgets.

International collaborations are of relatively low importance both in the project portfolio of organisations and as measured by the share of international funding in organisational budgets. There are only a few organisations that report a considerable share of projects being international, with the share in ASCR institutes being slightly higher. However, two thirds of the directors report to have strategic inter-organisational partnerships, mainly with EU 27/EFTA and the US, and this number is expected to grow further. Those partnerships are used both to provide platforms for cooperation and to enhance visibility and reputation more generally. In terms of selection of public research partners, Universities tend to liaise mainly with other Universities, while ASCR institutes display a slightly broader pattern. Collaboration with international firms is still less common.

A further measure of internationalisation in organisations is the level of foreign staff. Compared to outward mobility, this is under-developed: the vast majority of organisations report fewer than 10% foreign staff, with shares at ASCR institute being slightly higher. The share of organisations recruiting internationally is only 14%; again, ASCR institutes are more international in their recruitment than other organisations. However, across the board respondent directors reported a strong intention to recruit more internationally. When it comes to advisory board membership, the picture is different, here ASCR institutes are much less likely to have international members than Universities, most of their boards are purely national, while 70% of Universities have some international membership in their boards. On the other hand, the use of international peer reviewers in periodic reviews of ASCR institutes appears to be increasingly the norm.

The international activities in organisations are clearly driven by human resource considerations, i.e. to increase the attractiveness for Czech researchers and – more important in the future – to recruit international talent. Further, international activities are oriented towards getting additional research funds and getting access to excellence abroad. As to the latter, requiring funds, the actual importance of international funds is very low, 84% of all directors say they have zero or minimal income from international sources.

Much as the researchers did, the directors regard their organisations to be on the whole supportive towards international activities, especially ASCR directors. As regards the benefits of internationalisation, overall our respondents felt that the benefits far outweigh the costs, and the risks of international activities (knowledge loss, strengthening competitors) are perceived as being low for most organisations. The major issue of concern appears to be brain drain and the need to increase the attractiveness of the Czech system for Czech and foreign researchers alike.

In our additional interviews with research organisations, not surprisingly, we found that there is variation in the extent to which research and teaching activities are internationalised across subject areas and between but also within sectors. International collaboration and international mobility are increasingly accepted as necessary to ensure the excellence of Czech research. There is use of international assessment committees to periodically evaluate the research performance of ASCR institutes. Vacancies in leading institutes (and leading university departments) are increasingly open to international competition and we did find evidence that the international collaboration profile of applicants is considered, if not always systematically.

In the past the Czech Republic may have been a convenient “stopping off” point for researchers from Eastern Europe and the Former Soviet Union countries heading West. There is still much bottom-up research interaction with (and mobility from) these countries. However the Czech Republic is now a destination of choice in itself for these researchers, and researchers increasingly come from a wider range of countries.

Most internationalisation within both the university sector and the academy institutes sector is bottom-up rather than driven by top-down strategy, confirming the survey findings. Longstanding barriers relating to culture but also structure and incentives remain. Funding seems to remain a (and probably the) major barrier. Inward mobility of foreign researchers for visits or to take up positions is

limited by the funds available. Confirming the researcher survey, the perceived lack of openness of national grant programmes to foreign participants can also be a barrier. Finally, high teaching loads, even in leading university departments, can present a barrier to international research collaboration and medium-term mobility. There seems to remain a perception amongst many researchers that national funding is 'easier' to obtain than EU funding.

Governance of and funding of RTI internationalisation is in the hands of a number of ministries and agencies. However the key actor is the Ministry of Education, Youth and Sports (MEYS). This Ministry is responsible for policy formulation, strategy development and the implementation of almost all programmes for international R&D cooperation including those for industry.

Most policy attention and effort is focused on European initiatives. Funding for participation in international organisations such as ESA, ESO, COST, EMBC, EUREKA and CERN have the majority of the budget funding. Other major initiatives are related to several Joint Technology Initiatives (Artemis, Eniac, IMI and Eurostars). The Czech Republic also has some active bilateral co-operations with non-European countries (Russia, S-Korea, China, Japan, Israel, Argentina and the US) that includes funding for research projects on the basis of an open competition. The emphasis of S&T collaboration policies is on establishing links for the public research organisations. Industry oriented R&D collaboration through funded programmes is relatively small and focused on the Eurostars programme.

The political importance of international R&D cooperation has grown considerably in the last years and national budgets have increased. The most dramatic success story in recent years is probably that of infrastructure. The Czech Republic has worked to shift the emphasis in research infrastructure planning eastwards towards the new member states, and as a result has successfully mobilised structural funds to support the development of an Extreme Light Infrastructure presence in the Czech Republic.

Nevertheless, according to policy makers, co-ordination problems remain at the policy level and barriers remain at the organisational and individual level, notably an inward looking culture in the research community and a lack of experience with international networking (particularly for those in research management positions). Some scientific domains have a sufficient international reputation to attract foreign researchers - however this is not monitored systematically. Indeed, the evidence base as regards international activities is somewhat limited to the Framework Programme. Most analysis so far has been focused on participation in, financial return from and impact of the European Framework programmes.

Based on our comparison of the Czech governance arrangements for internationalisation of research with those seen in selected comparator countries (Ireland, Finland and Germany) we suggest that Czech policy makers should consider the development of an explicit RTI internationalisation strategy embedded in a wide range of policy domains (not just the traditional RTI arena but including policy areas such as education, economics and industry policy, diplomacy and foreign policy) which considers not just EU FP funding but also bilateral cooperation with EU and non-EU countries, the use of R&D as an element to attract foreign direct investment, as well as help for Czech companies to better link with RTI partners around the world. In so doing Czech policy makers should encourage Czech research organisations to develop more explicit international strategies and build up support for their researchers and consider seriously the benefits that might come from opening up national research programmes and organisations and from removing possible barriers for foreign partners and individual research to work with Czech partners or to locate in the Czech Republic.

Finally, European research collaboration, and especially the Framework Programme, will continue to remain of major importance, opening Czech researchers up to competitive, peer review based funding, providing crucial opportunities for international collaboration and providing a significant share of funding in itself. The Czech Republic has been a leader amongst New Member States in terms of absolute participation and relative success, and the success rate of projects with Czech participation has increased in the last 2 Framework Programmes. Interestingly, however, despite high levels of support for the system and for Czech applicants (the Czech support system offers the broadest range of support of all comparator countries) overall mobilisation is not particularly strong when compared to other NMS countries, participation per capita has not increased from FP6 to FP7, and the relative number of coordinators is low compared to other NMS countries. The relative number of coordinators in successful projects is very low indeed and the success rate of researchers from the Czech Republic is considerably lower than for all comparators except for Slovakia. Worryingly, in terms of the broader internationalisation theme of this work package, there is very poor participation in the FP schemes

that allow for extra-European collaboration, such as INCO and SICA. In terms of purely monetary return on investment, the Czech Republic does not quite get a 100% retour. For a country still trying to establish itself at the forefront of European research, the investment in co-funding and supporting arrangements appears to be more than worthwhile, but an in-depth evaluation of the various supporting and co-funding schemes would be important to establish a clearer argument for the added value of these measures. More broadly, our interviews have confirmed the findings of the earlier evaluation of FP7, namely that there is a lack both of a national strategy but also of individual institutional strategies for promoting FP participation within the context of a broader internationalisation strategy.

## 1. Introduction

Working package (g) explores the international activity of the research community (organisations and individuals) and the relevant ministries and funding agencies. It seeks to analyse the level and breadth of international activity, establish some understanding of the benefits and pitfalls of internationalisation in research and shed light on framework conditions and governance issues around internationalisation of research and research funding. This document is the final report of this working package. It brings together the various modules within this working packages, including a summary of the bibliometric part of the study, a full report of which is delivered in a separate document.

### Scope of the working package and content of this report

The research questions of working package (g) are as follows:

- How international is the staff, the research, teaching and the overall strategy of the organisation?
- What is the role played by international funding vis-à-vis national funds? What is the involvement in and benefit of the European level instruments?
- What are the benefits of international collaborations?
- What supporting structures and incentives help researchers to link internationally and reap benefits for the CZ system and for their own research from this activity?
- What gaps should be closed, and what actions might be needed?

To answer these questions, the working package has performed a set of tasks: a bibliometrical study to understand collaboration patterns, an analysis of two surveys (individual researchers and heads of research organisations), a broad interview programme with policy makers, funders and research organisations, a workshop with stakeholders to verify our results, a document based international comparison of strategies and support systems and an analysis of participation patterns in the EU Framework Programme. Wherever possible we have attempted to contextualise the findings and to compare them to other countries.

The results of the data collection and analysis are presented in this report in eight parts:

1. An executive summary of the overall highlight findings (see beginning of this document)
2. A summary of the self-standing report on the bibliometrics analysis, exploring the international cooperation patterns of Czech scientists over time and differentiated for scientific areas and institutional backgrounds based on a bibliometric study. The full report is delivered in a separate document.
3. The analysis of the activities and views of individual researchers, based on the researcher survey, focusing on scale and scope of international cooperation and mobility, the benefits and pitfalls of international activity, and the assessment of framework condition, support and funding
4. The organisational practice and views as to internationalisation, based on the survey of leaders of research organisations as well as on an interview programme in research organisations. This combines a general view (survey) with an in-depth, contextual view.
5. The practices and assessments of policy makers and funders, based on in-depth interviews in ministries and funding agencies.

This analysis of sections 4 and 5 draws on 17 interview sessions with more than 25 key representatives from ministries, funding organisations and research organisations as well as a focus group session with key representative exclusively on the topic of international involvement.

6. The international comparative analysis of internationalisation strategies of countries that have shown a high level of activity and implemented advanced strategies.

7. The analysis of the participation in the European Framework Programme. This is based on international comparison of participation data (FP6 and FP7) and an international comparison of supporting structures.
8. Conclusions and recommendations.

## 2. International collaboration patterns – results of a bibliometric analysis

The bibliometric analysis draws on a dataset of more than 85,600 science, social sciences, and arts and humanities journal article records from the Web of Science published between 1980 and mid-2010 with at least one author from the Czech Republic or the Czech part of the former Czechoslovakia.

About two-fifths of all Czech research publications are co-authored. Czech international R&D collaboration is strongly European and has grown more so during the transitions of recent decades. Four-fifths of the Czech Republic's international collaboration papers are with European countries. The US is also a major collaborator. Czech scientists co-publish extensively with German, American, French and British scientists in every subject group, while they collaborate with other countries extensively only on some of the subjects. At present, collaboration with Asia is limited.

Internationally collaborated Czech publications generally attract higher citations than purely domestic papers. Czech international R&D collaboration is greatest (by absolute numbers of papers) in the fields of physics and material science, chemistry and chemical engineering, basic life sciences, clinical medicine, biomedical sciences and biological sciences. When international science papers are compared with purely domestic papers, Czech international R&D collaboration is relatively higher in physics and materials science and in basic life sciences, but relatively lower in biomedical sciences and clinical medicine. International collaboration in several social science disciplines is weak compared to this subject group's national significance. In particular, in economics and business and in politics and public administration, there are low levels of international collaboration relative to purely domestic research outputs. In terms of the relative importance of scientific domains, there has been an increase in the relative importance of physics in Czech scientific publications. Basic life sciences, clinical medicine, and biomedical sciences have declined in relative importance, while chemistry and chemical engineering are relatively unchanged.

International research collaboration through co-authorship is dominated by two institutions: the Academy of Sciences of the Czech Republic (ASCR) and Charles University (UK). These institutions are also powerful nationally in research, but there are other Czech research institutions that collaborate less internationally than their national ranking would suggest. Three Czech organizations lead in sponsoring internationally collaborated Czech research – the Ministry of Education Youth and Sport of the Czech Republic, the Czech Science Foundation (GACR), and the Academy of Science of the Czech Republic. While international institutions are also important sponsors (especially the EU), this suggests that there is capability within the Czech research system to influence the direction and nature of future Czech international R&D collaboration.

The Czech Republic's level of international journal co-authorship is higher than in Hungary (when normalized for population), but significantly lower than in Austria. The Czech Republic and Hungary were roughly similar in international collaboration rates in the 1990s, but since then the Czech Republic has increased internationally-collaborated publications at a higher rate than Hungary. However, the gap between Austria and the Czech Republic has not closed over the past decade. Austria continues to publish more (when normalized by population) than the Czech Republic, and also produces a higher share of internationally collaborated publications. Compared with the concentration found in the Czech Republic, a more diverse set of institutions is engaged in international collaborative publishing in Hungary and Austria.

### 3. The view of the researchers – results of the researchers study

This section summarises the main results of the survey of individual researchers, including tables and figures where appropriate.

#### 3.1 The sample

In the overall survey to researchers, 689 researchers have responded. Table 1 shows the distribution of respondents across the different types of organisations and the seniority of the respondents. The analysis below will differentiate between those categories when there are significant differences between the groups.

Table 1: Responding sample

| Type of organisation        | Share % | Number |
|-----------------------------|---------|--------|
| University                  | 45      | 310    |
| ASCR                        | 41      | 282    |
| Other research organisation | 13      | 90     |
| Industry                    | 1       | 7      |
| Total                       | 100     | 689    |

| Level                                | Share % | Number |
|--------------------------------------|---------|--------|
| Top Management (Director, Dean)      | 3       | 21     |
| Management (Head of Dpt., Lab)       | 14      | 97     |
| Top Teacher (Full Prof, Assoc. Prof) | 14      | 96     |
| Teacher (Assistant Prof. Lecturer)   | 57      | 393    |
| Top Research (Senior Researcher)     | 4       | 28     |
| Research (Researcher, Post Doc)      | 4       | 28     |
| NA                                   | 4       | 28     |
| Total                                | 100     | 689    |

#### 3.2 Level and scope of collaboration and international involvement

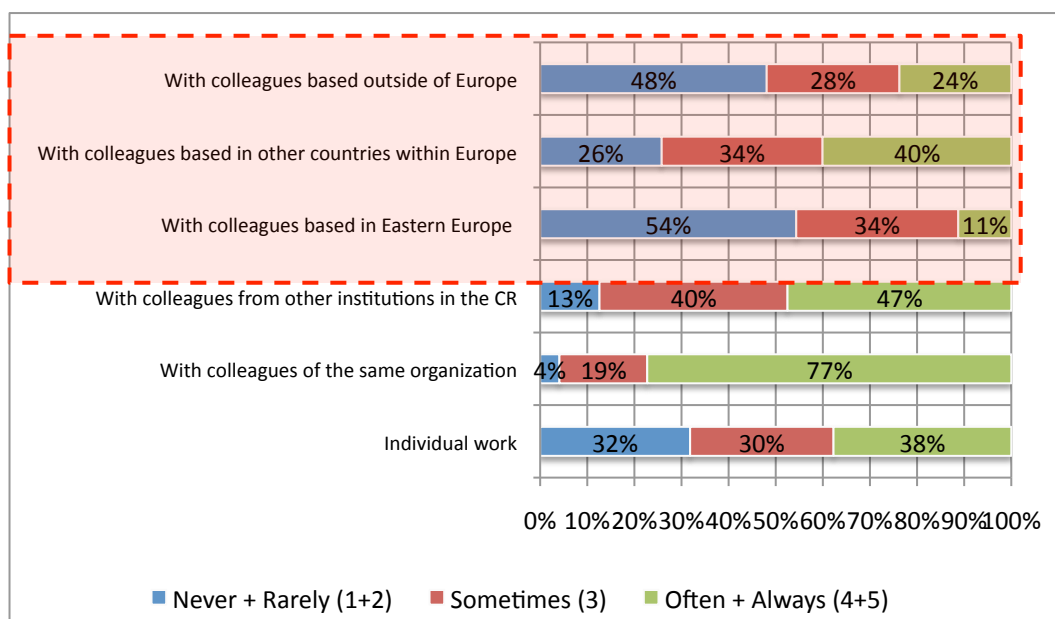
The level of international involvement is rather high. Asked for the share of projects that involved partners, on average exactly one third of all projects conducted by the researcher in our sample have at least one international partner. This figure is considerable given the fact that 46% of all projects are done without any partner at all. In other words, on average in more than two thirds of all projects that have a partner there is one international partner involved<sup>1</sup>.

The researchers were asked about their collaboration patterns in the last three years. As depicted in Figure 1, international collaboration is a common feature. 40% of all respondents cooperate often or always with partners from European countries (outside Eastern Europe). Interestingly, 24% report to cooperate often and always with partners outside Europe, while only 11% report this for partners in Eastern European countries. The cooperation intensity with partners in Europe (outside Eastern Europe) is thus almost as high as with partners within the Czech Republic (outside one's own organisation). From this data one cannot conclude a low propensity to cooperate with international partners, but the pattern points clearly to a strong bias towards (Western) European partners.

The collaboration pattern outlined above does not differ statistically significantly according to whether the researcher predominantly engages in management, teaching and research. However, it does differ in some collaboration categories according to researchers' affiliations. Researchers located in ASCR collaborates more with wider Europe and non-European countries than researcher working elsewhere while researchers working in other research institutions and industry collaborate statistically significantly less with wider Europe and non-European countries.

<sup>1</sup> International partner means any partner that is not from the Czech Republic. Therefore, it includes Slovakia as well.

Figure 1: Q9: Collaboration (Please characterize your research efforts during the last three years)  
(5 point Likert 1: Never, 5: Always)



Respondents were asked to further differentiate the geography of their international partners and how they expect this to change in the future. 92% of international collaboration includes an EU27+EFTA partner, while this figure is 16% for North America and only 2% for other regions. The future projection is interesting, as 49% of all respondents say that despite a high collaboration intensity already achieved, collaboration with EU/EFTA will further increase, and a much smaller and almost equal share expect collaboration to raise with North America (30%) and Asia (34%).

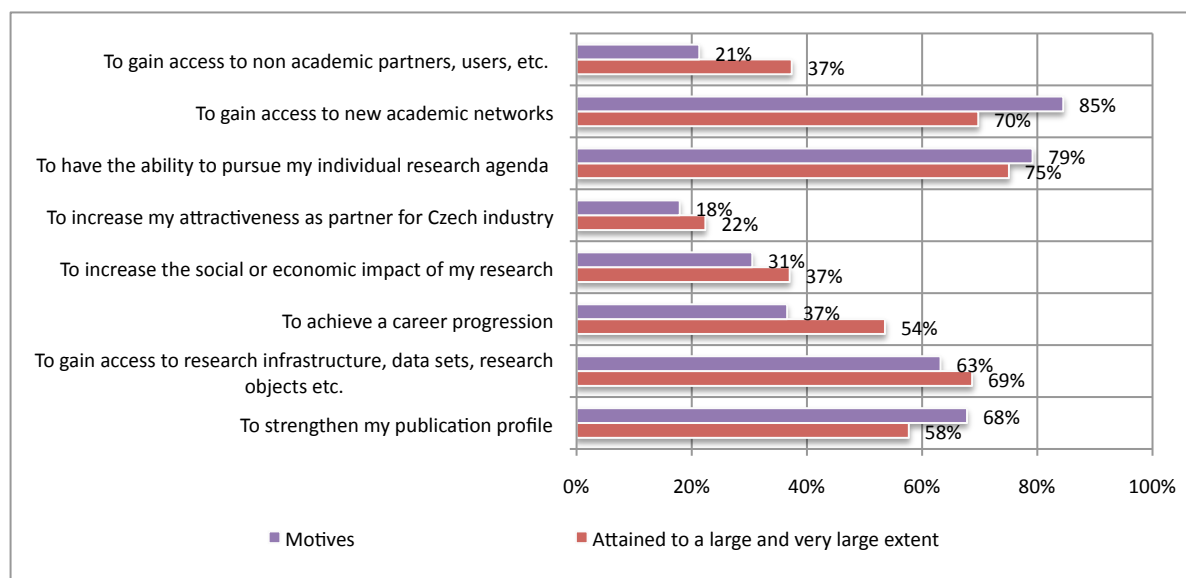
Table 2 Share of Directors expecting a decrease or increase with collaboration with partners from certain regions

|  | Increase | Stay the Same | Decrease | Total |
|--|----------|---------------|----------|-------|
| EU27/EFTA                                | 49%      | 49%           | 3%       | 100%  |
| Other European countries (Non EU27/EFTA) | 25%      | 69%           | 6%       | 100%  |
| North America                            | 30%      | 62%           | 8%       | 100%  |
| East Asia (including India and China)    | 34%      | 59%           | 7%       | 100%  |
| Rest of the world                        | 16%      | 76%           | 8%       | 100%  |

Figure 2 shows the motivations for international collaboration and, more importantly, the degree to which respondents assess the goals behind the motives have been achieved. Access to networks and the pursuit of individual research agendas in connection with improving the publication profile appear to be the most important motives. In terms of achieving those goals, it appears that expectations are met for the most important motives such as gaining access to new academic networks and research infrastructures, pursuing independent research agenda while for less important motives, attainment figures are low.



Figure 2 Motivations to collaborate internationally and the extent to which the goals behind the motives are fulfilled\*



\*Respondents could indicate three major motives

### 3.3 Mobility and foreign employment

The survey also asked about international mobility and employment abroad. 83% of all respondents have been abroad at least once, with senior people being slightly more active, with 65% of post docs, but 95% of Directors having been abroad.

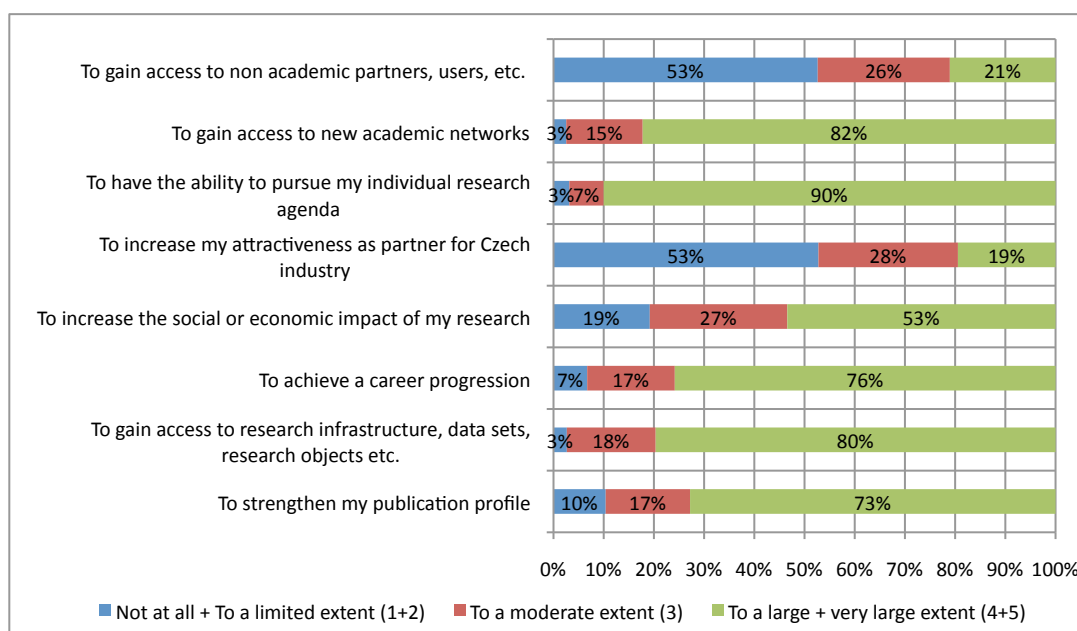
A considerable share of 39% Czech researchers report having previously been employed by an research organisation from outside the Czech Republic, with an amazing 58% of all rectors in the survey reporting international employment during their careers.

One important dimension of international employment and mobility is re-integration into the Czech system. When asked about the difficulties encountered upon return from stay abroad, the share of respondents reporting strong or very strong difficulties is low, with 4% for reintegrating into Czech networks, 6% for finding suitable post, 13 % for transferring pensions and social security rights and 17% respectively (costs of relocating). Re-integration into the system is no overriding concern; problems are rather of personal nature and lie in the general regulation of the social security system. Apparently, researchers with foreign employment are attractive for Czech organisations, which is also confirmed by the high level of top management personnel as reported above.

The major motives for international mobility are to gain access to academic networks (34% say strong or very strong motive), pursuing specific individual research agenda (32%) and individual career progression (25%). Access to other foreign partners or raising the profile for collaboration with Czech industry play an insignificant role.

In their self-assessment, the Czech researchers claim a very high level of goal achievements. However, there is one bundle of motives around access to or attractiveness to non-academic partners (e.g. industry) as well as wider economic and social impact of the research where the effects of international activities are felt to be less widespread.

Figure 3: Mobility goals: Degree of achievement



When asked about the barriers for research and development in the Czech Republic more generally, across the board of all activities and framework conditions, insufficient international collaboration is not a major barrier to research, development and innovation, in a list of 12 general barriers international collaboration ranks 8<sup>th</sup> and limited reputation in the international scientific community is 11<sup>th</sup>.

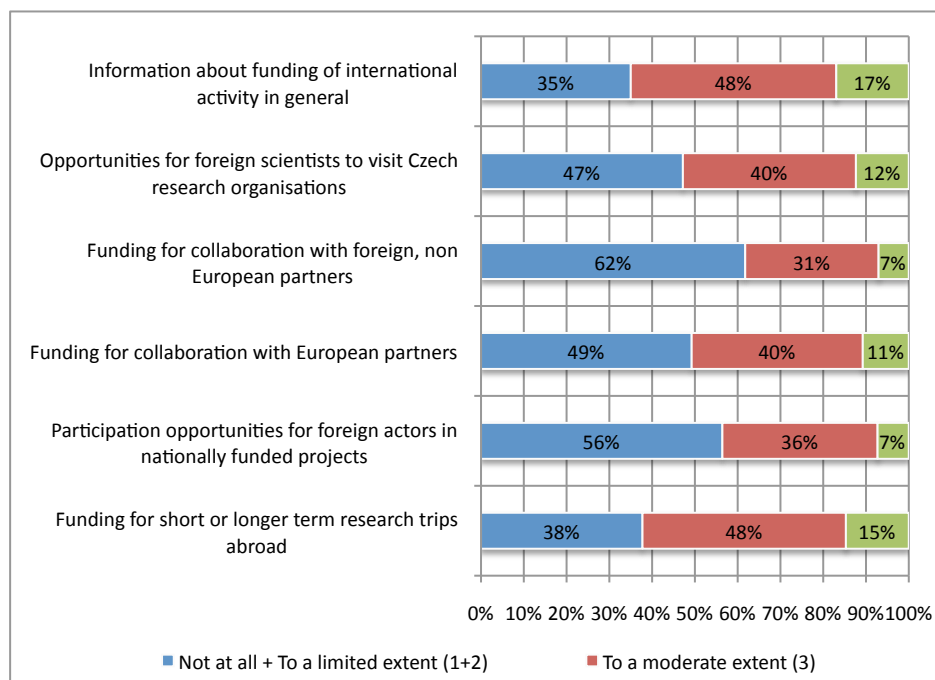
### 3.4 Assessment of Support

Finally, researchers were asked about the support available for their international collaboration activities. Here we distinguished between general support and support from the employing organisations. As for the latter, interestingly, two thirds of all researchers assess their organisations to recognise international activities for their career development and to support their international activities, even if this is mostly not embedded in an institutional strategy for internationalisation at organisational level. There are significant differences between organisational types only as regards support for foreign language editing and support for trips abroad (where “other research organisations” appear to have an advantage over ASCR and Universities).

As regards support for international R&D activities more generally, the satisfaction level is much lower, the share of researchers indicating large or very large satisfaction is low, highest for general information (17%). Least satisfaction is reported with support for collaboration with non-European actors (which contrasts with their wish to collaborate more with those partners) and the participation of foreign actors in national programmes. Interestingly, funding for collaboration with EU partners, despite the existence of the Framework Programme and an elaborate supporting structure, is still seen largely unsatisfactory. This high level of dissatisfaction is very similar across the different types of organisations and different types and levels of researchers.

Figure 4: Satisfaction rate with support for international R&D activities

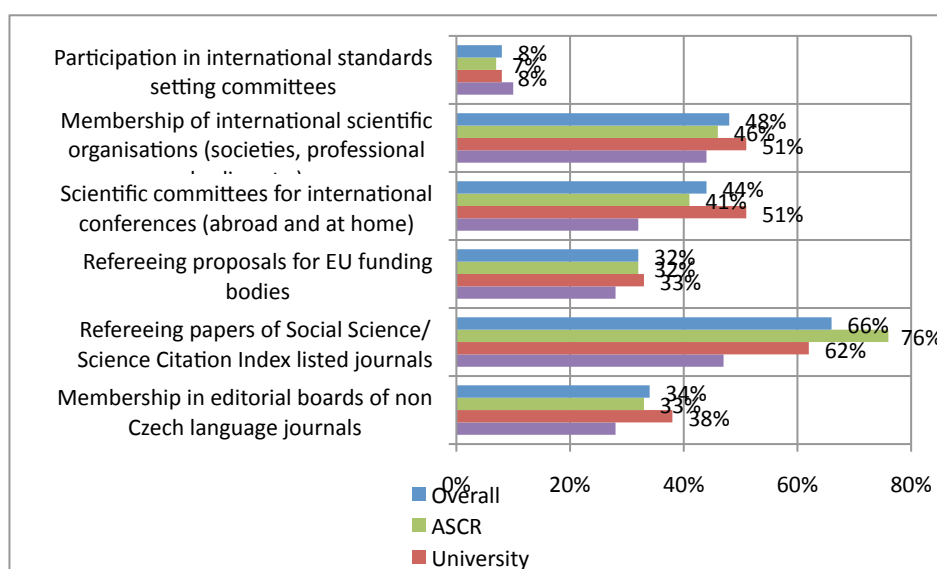
(To what extent are you satisfied with the support for pursuing international R&D activities in your country?) (5 point Likert 1: Not at all, 5: To a very large extent)



Beyond concrete collaboration researchers were asked to indicate a set of further involvements in international activity. Roughly half of the researchers have involvement in international scientific organisations, conference committees etc. The level of peer review involvement in international journal is highest, but assuming that all researchers should aspire to publish internationally and thus also be reviewers of international journals this figure should be higher.

Figure 5: Involvement in International Research related activities

(In the last three years, have you been involved in any of the following research-related activities?)

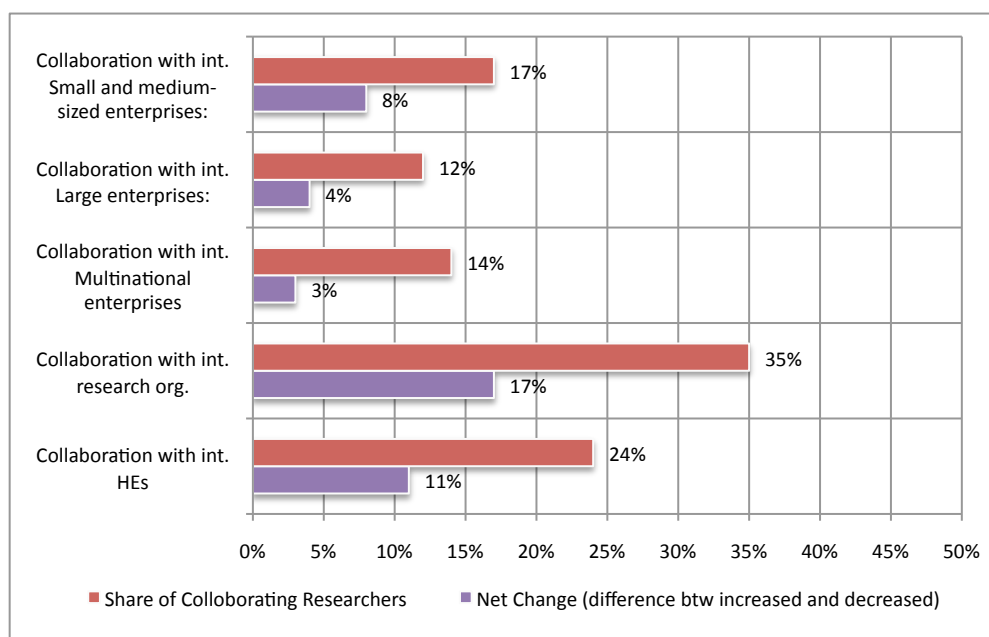


There are a few statistically meaningful differences according to the institutional affiliation: ASCR employees tend to be more active in refereeing papers in indexed journals while other research organisation employees are less active in this. University researchers are slightly more involved in scientific committees for international conferences while again this ratio is lower for other research organisation employees.

The type of organisations with which the Czech research community cooperates is shown in Figure 6 below, indicating the high importance of foreign research organisations (highest share), and the (lower) share of industry partners, both within (Multinational) and outside the country.

Figure 6: International Collaboration

(With which types of research organisation(s) did your research group collaborate? How important will these collaborations be to your future research agenda?)<sup>2</sup>



Researchers were also asked about the extent of industry related activity more broadly and the value this has for them. Cooperation with firms in the EU Framework Programme was only ranked 13 out of 16 industry related activities, however, the relative value of those cooperations was high, ranked 5<sup>th</sup> most valuable industry related activity. EU supported firm engagement appears to pay off for public researchers.

### 3.5 Funding

International funding sources are a key dimension of internationalisation, not so much as an additional funding source, but because they imply and allow for international research activities of various kinds. The relative significance of international funding is low, with only 10% of ASCR and 7% of University researchers claiming that more than one third of their research group funding was accounted for by international funds.

Finally, we asked about specific funding sources and the relative benefit of the funding from different sources for the advancement of the research. We asked specifically for three sources for international collaboration: Science Foundation international programme, Framework Programme and other EU funded programmes (not Structural Funds). The Framework Programme turns out to be the fifth most important source for Czech researchers, with ASCR researchers reporting a slightly higher significance

<sup>2</sup> Net change is defined the proportion of respondents that answered as increased less the proportion of respondents that answered as decreased.

of the Framework Programme. The Framework Programme is the sixth most beneficial funding source, slightly lower ranked than its quantitative importance. The Science Foundation international programme, interestingly, is much less important (ranked 15) as funding source, but perceived slightly more beneficial than the Framework programme.

## 4. The perspective of research organisations

### 4.1 Results of the Director's survey

#### 4.1.1 The sample

The survey to Directors of research organisations had a response of 74, as shown in Table 3.

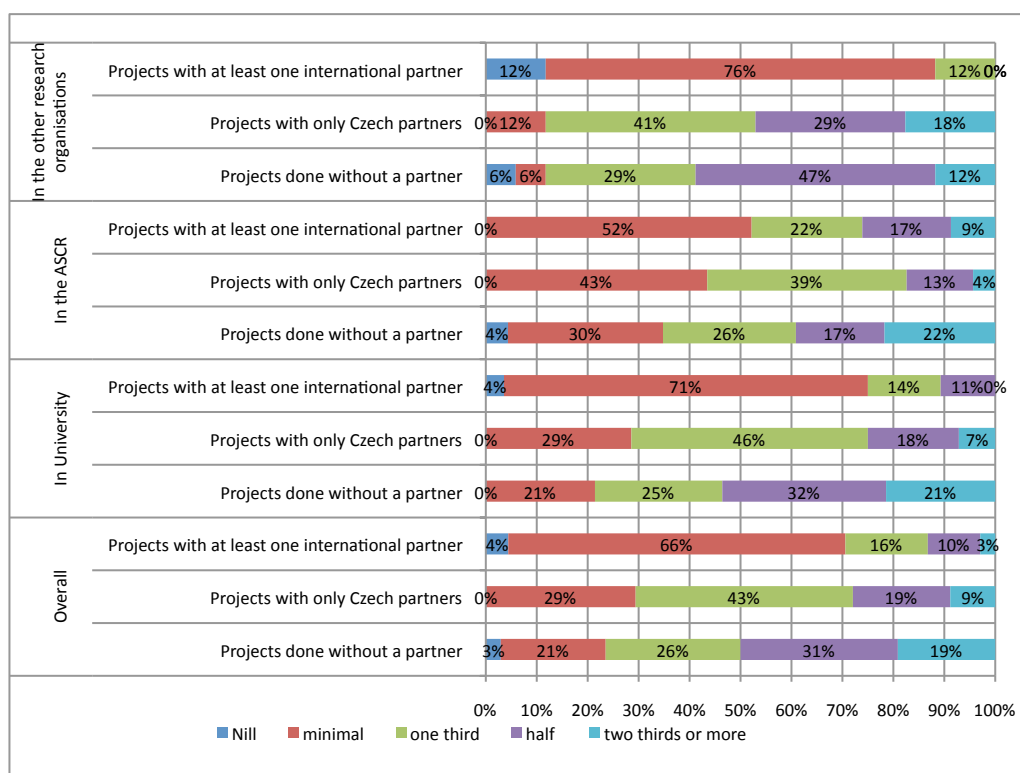
Table 3: Responding sample Directors

| Type of organisation        | Share % | Number |
|-----------------------------|---------|--------|
| University                  | 45 %    | 33     |
| ASCR                        | 31 %    | 23     |
| Other research organisation | 24 %    | 18     |
| Total                       | 100 %   | 74     |

#### 4.1.2 Scope of international activities

The scale of cooperation is measured by the share of projects that have at least one international partner. Overall, 70% of organisations have no (4%) or minimal share of projects with international partners, 13% have half or more than half of the projects with one international partner (Figure 7). ASCR institutes show a considerably higher share of projects with international partners than Universities.

Figure 7: Considering the research portfolio of your organisation over the last three years, what has been the approximate share of .....



Roughly two thirds of all organisations (again slightly more ASCR institutes (70%)) indicate that they have strategic partnerships with foreign organisations that go beyond concrete project collaborations. The strategic partnerships are strongly focused on partners from within EU 27/EFTA countries, while US partners and Asian partners are much less common as depicted below. This trend continues, as two thirds of all organisations say they will increase strategic partnerships with EU27/EFTA organisations, followed by 43% intending to increase Asian strategic partnerships (North America 34%, Other European countries 36%, Rest of the world 21%).

Figure 8: Estimated share of strategic partners from the following regions

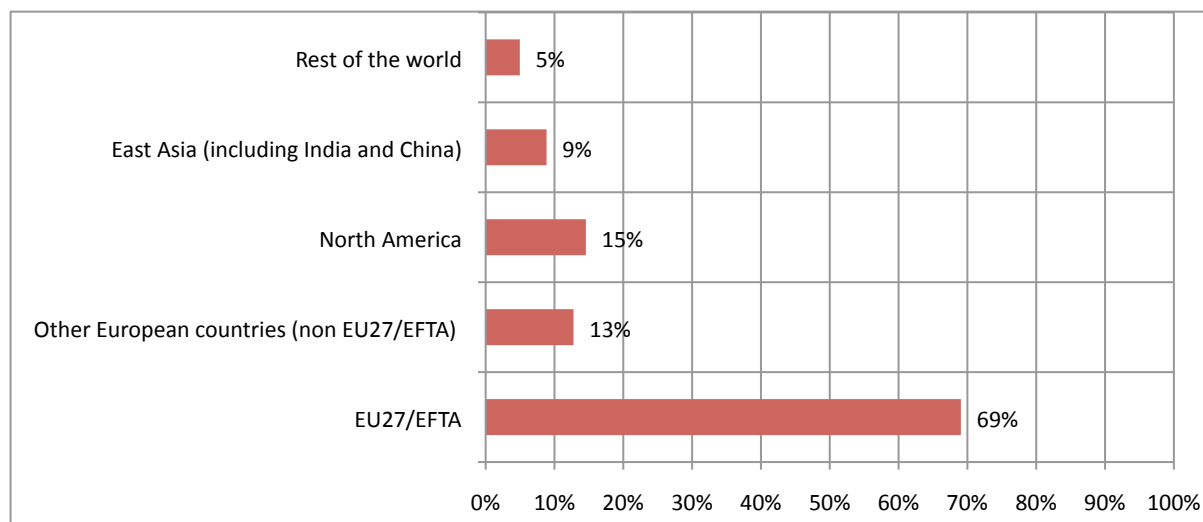
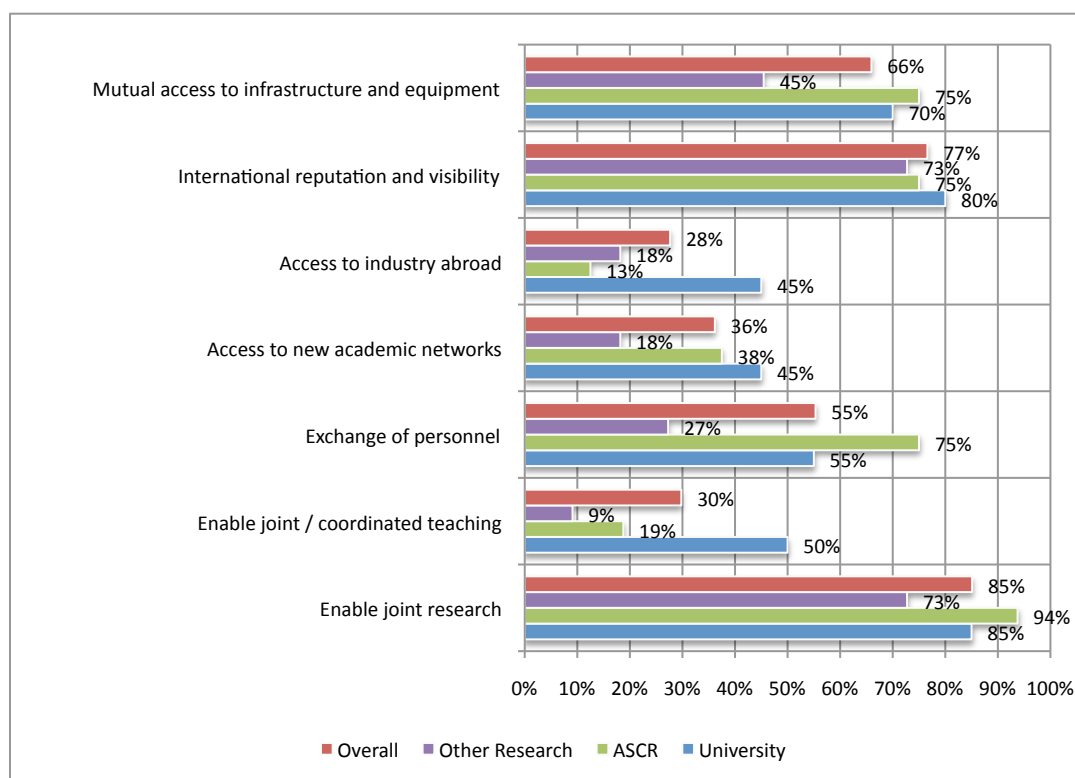


Figure 9: How important are the following motives for these strategic partnerships?

(Share of high and very high importance (4+5 in 5 point Likert))



The motives for strategic partnerships are given in the figure above. The most important motive was enabling joint research, but interestingly, respondents are almost as strongly driven by the urge to increase international visibility and reputation. Partnerships are further motivated by the desire to access to infrastructure and exchange of personnel, with more than 50% of the organisations saying that this is a strong or very strong motivation. Access to new networks, on the other hand, is not a very strong driver, strategic partnerships are apparently built not at the beginning of new collaboration, but on the basis of existing networks.

Figure 10 compares the share of organisations with cooperation with national and international partners. As to be expected, collaboration with international partners is less common than national ones, there are a significant number of organisations that have no international partners. The ASCR institutes seem to be best connected, other research organisations least. However, approximately two thirds of all organisations foresee an increase in international cooperation over the next three years. While ASCR and other research organisations do not differentiate greatly between types of international partners, Universities clearly prefer other Universities over research organisations abroad. We also note an expectation of roughly two thirds of all organisations that international cooperation both with higher education institutes and with research organisations will continue to raise (

Figure 11).

Figure 10: Collaboration with typologies of research organisations

(With which types of research organisations did your organisation collaborate in the last 3 years?)

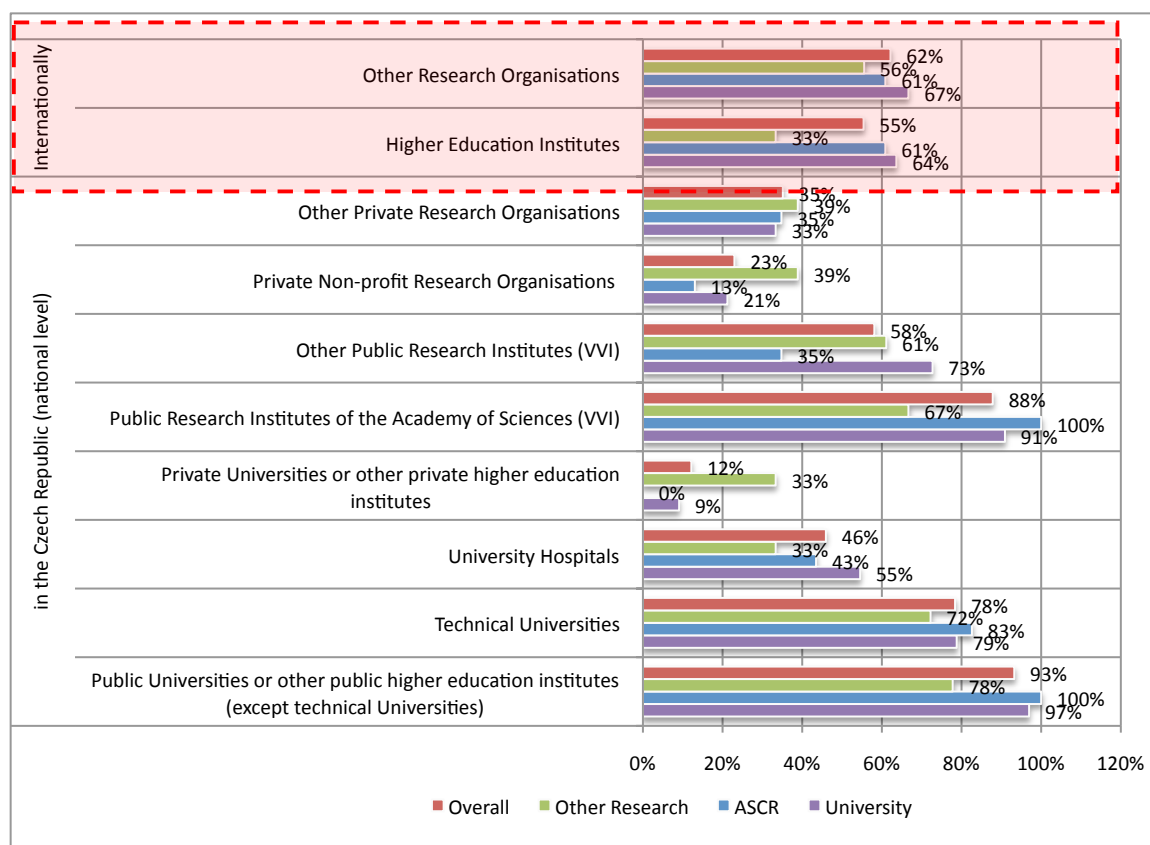
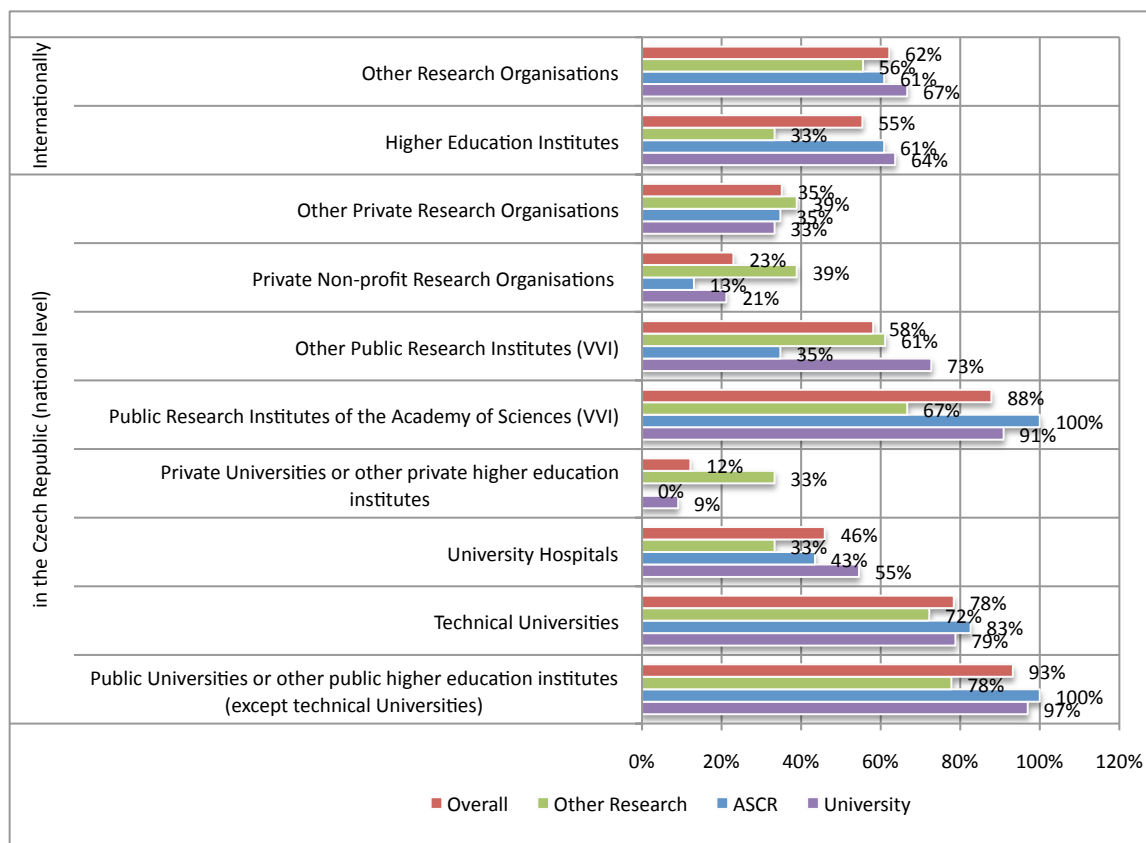




Figure 11: Collaboration with typologies of national and international research organisations and importance for future research agendas

(How important will these collaborations be to the research agenda of your organisation in the next three years?)



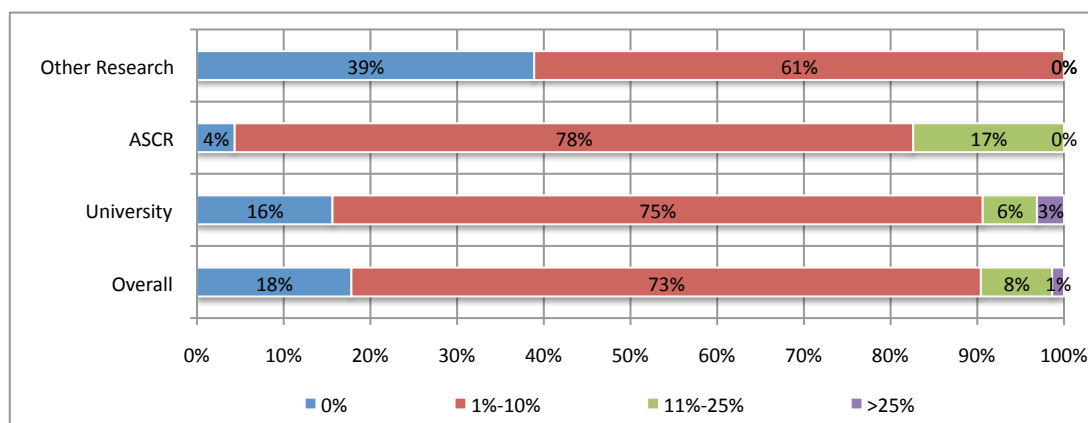
Cooperation with international firms is less common, as to be expected. Overall, one third of all organisations collaborated with foreign SMEs and one fifth with large foreign firms. Universities were considerably more active, roughly half claiming to have had collaborations with foreign firms in the last three years, with an equal share for SME and large firms, while 26% of ASCR institutes collaborated with foreign SME and 17% with foreign large enterprises. Overall, collaboration with international firms is well below collaboration with national firms, which are 72% (all sample) for SMEs and 52% (all sample) for large firms. Domestically, ASCR are collaborating as often with SMEs as Universities and other research organisations, but far less often with large firms (46% versus 76% Universities).

In a further question on activities with industry, international cooperation with firms is ranked 10 out of 14 options, and thus not a prominent activity for research organisations, but it is ranked 7<sup>th</sup> in terms of its value contribution, suggesting that international cooperation with firms pays off when it does occur.

#### 4.1.3 International staff

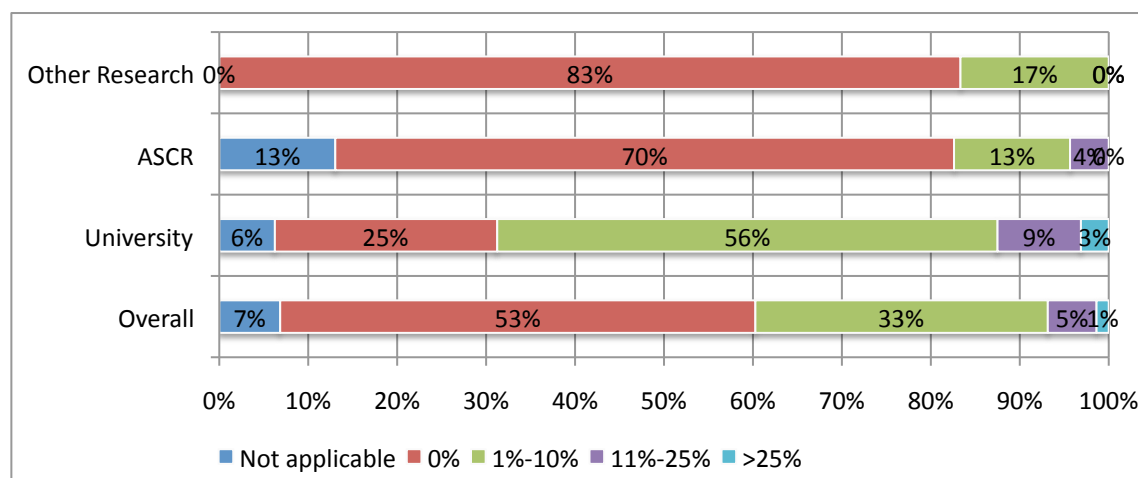
One important measure of internationalisation is the share of international staff in organisations. This is not to say that more is better, but it indicates openness towards and attractiveness for foreign researchers – and thus an important pre-condition to share knowledge internationally. The vast majority of organisations have a small share of foreign staff, below 10%, and outside ASCR and Universities a considerable number of institutions have no foreign personnel at all. ASCR institutes seem more international than Universities.

Figure 12: What is the approximate share of non-Czech R&D staff in your organisation?



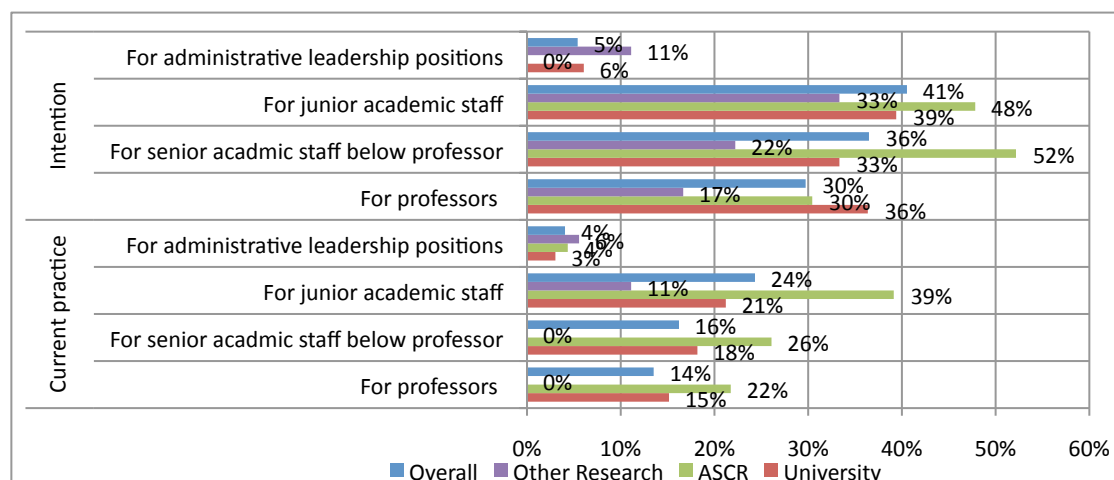
Some interesting difference are to be seen when it comes to the presence of international personalities in advisory boards of the organisations (Figure 13). This is a potential indicator of the exposure to international scrutiny and at the same time indicates the level to which organisations promote themselves through inter-personal networks. Only Universities report a meaningful presence of foreign personnel in those boards, whilst 83% of ASCR institutes and other research institutes do not report any foreign membership of such boards. This finding is probably an artefact of the survey design. Our interviewees noted that ASCR institutes are periodically peer-reviewed, increasingly by internationalised review panels, but we did not ask about this kind of oversight/advice in the survey.

Figure 13. What is the approximate share of non-Czech members in the main supervisory board of the organisation (highest level)?



A further dimension of international staffing is recruitment (Figure 14). Here we make a set of interesting observations. First, there is generally a low level of international recruitment, currently only 14% of all organisations recruit Professors internationally, and the figures are only slightly higher for junior people. Administrative leadership is almost completely recruited domestically. Second, there are strong differences between types of organisations, with ASCR institutes considerably more often recruiting internationally than other organisations. Third, there is a clear intention to broaden international recruitment, the share of organisations which intend to do that routinely in the next three years more than doubles, and according to these projections Universities catch up (and in case of Professors even overtake) ASCR. If this expressed aspiration were to be realised, this could alter the fabric of the Czech research system considerably.

Figure 14: Does your organisation routinely issue job advertisements internationally? Do you plan to do so in the next three years?



#### 4.1.4 Motivation for international activities in general

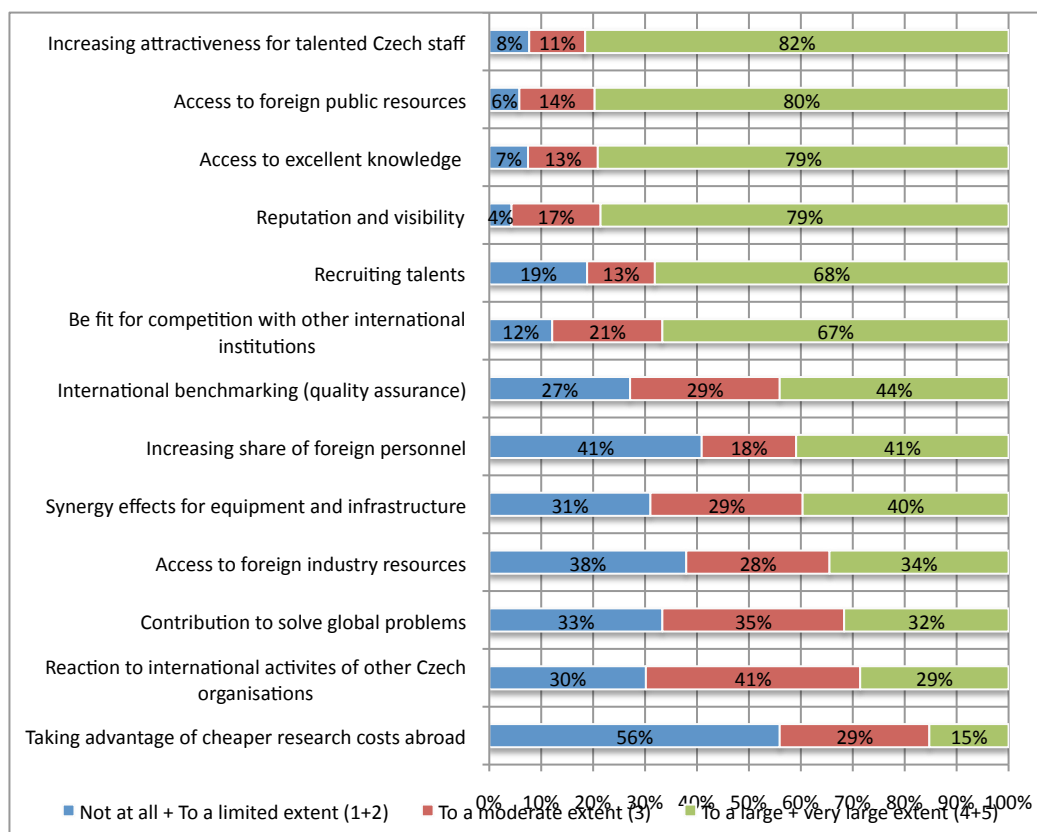
Organisations can impede or drive internationalisation, they can provide opportunity structures for personnel to exploit international opportunities or stifle international activities. Ultimately, it must be in the organisational self-interest to have a clear internationalisation strategy. Part of such a strategy is the portfolio of motives for international activities. The following figure summarises the motivations, sorted in decreasing importance. The most important motive is the attractiveness for talented Czech staff. This implies that being supportive for international activities is a key motivation in the choice of positions for Czech staff. Combined with the fifth most important reason, recruiting talent, this gives a clear signal that the organisations have understood the importance of the international dimension for HR development. The second single most important motive is to get access to international and foreign research budgets and be fit for competition (reason 6). Interestingly, costs are not an important factor – reflecting the fact that the Czech Republic itself does not have a cost disadvantage within Europe. Equally, the fact that other Czech partners internationalise is not a driver for public research organisations. (Figure 15).

When asked which reasons will be more important in the future, the picture re-enforces itself, recruiting talents is most often mentioned (42% of all organisations, accompanied by 31% who say they will want to increase the share of foreign staff), followed by increasing attractiveness for Czech staff (41%) and access to foreign (including EU) funding sources (41%).

As with our researchers, our sample of Directors do not see the scope and scale of international activities as a major barrier for RTI activities in the Czech Republic. Out of 13 barriers they were asked about, insufficient international collaboration was ranked 10<sup>th</sup>, with no significant difference by affiliation. This ratio is slightly higher than the researchers' perception. The situation is slightly different in terms of international reputation, here Directors are more concerned than researchers and see this as a significant barrier (6<sup>th</sup> out of 13).

## International Audit of R&D&I in the Czech Republic Final Report, 6 - International Co-operation in R&D

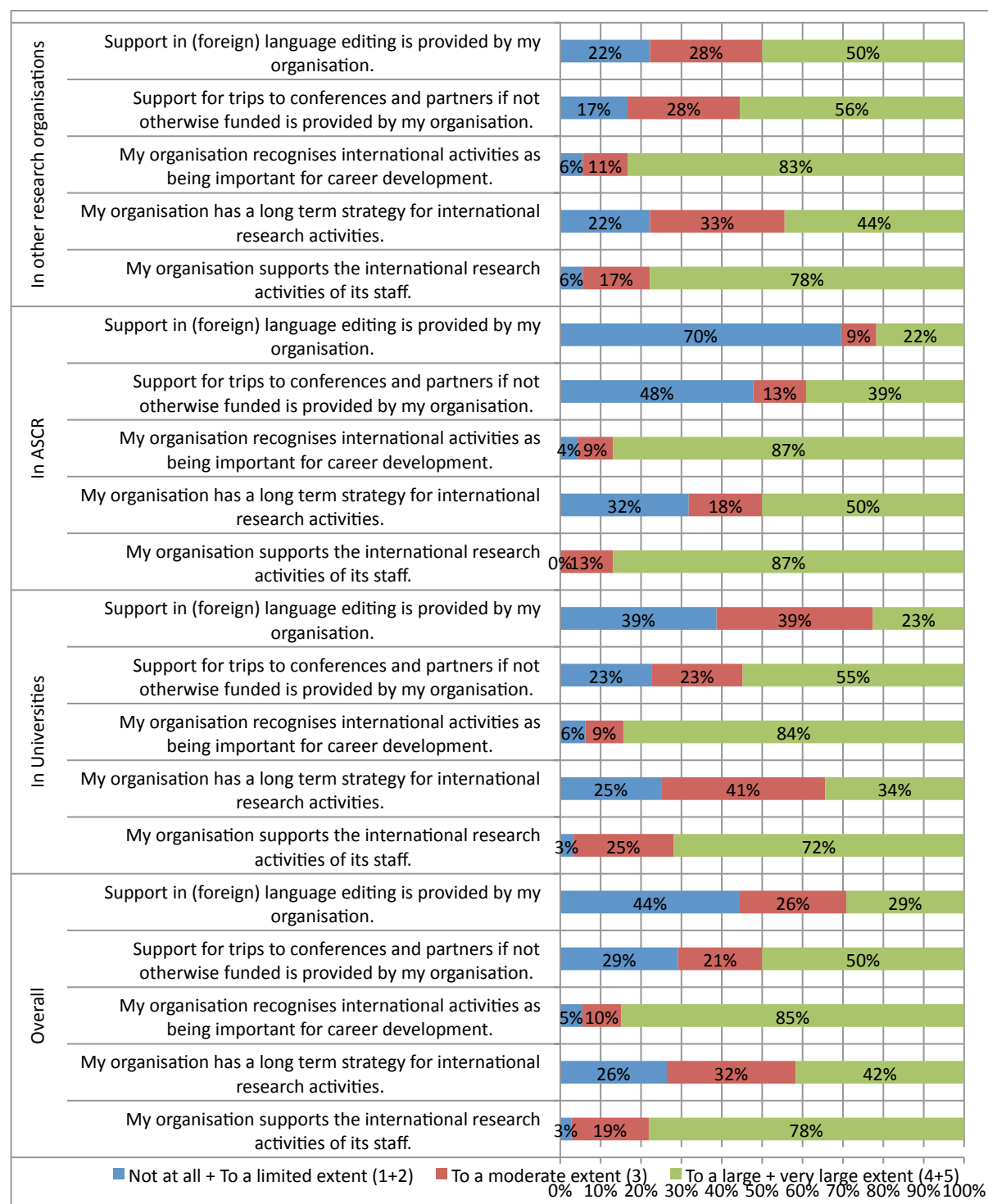
Figure 15: In general, to what extent are the following motives important for international activities in your organisation?



### 4.1.5 Support and funding

The Directors were asked to characterise the support they give for various researcher activities. These answers are consistent with the responses of individual researchers reported above. 85% of all organisations claim to recognise international activities of researchers to a large or very large extent, and 78% thus support international activities to a large or very large extent. Concrete support for trips and short-term mobility is provided by half of the organisations (see Figure 17). Around three quarters of the directors believe that their organisation support international mobility to a large and very large extent, here the share of ASCR institute claiming such support is significantly higher (87%).

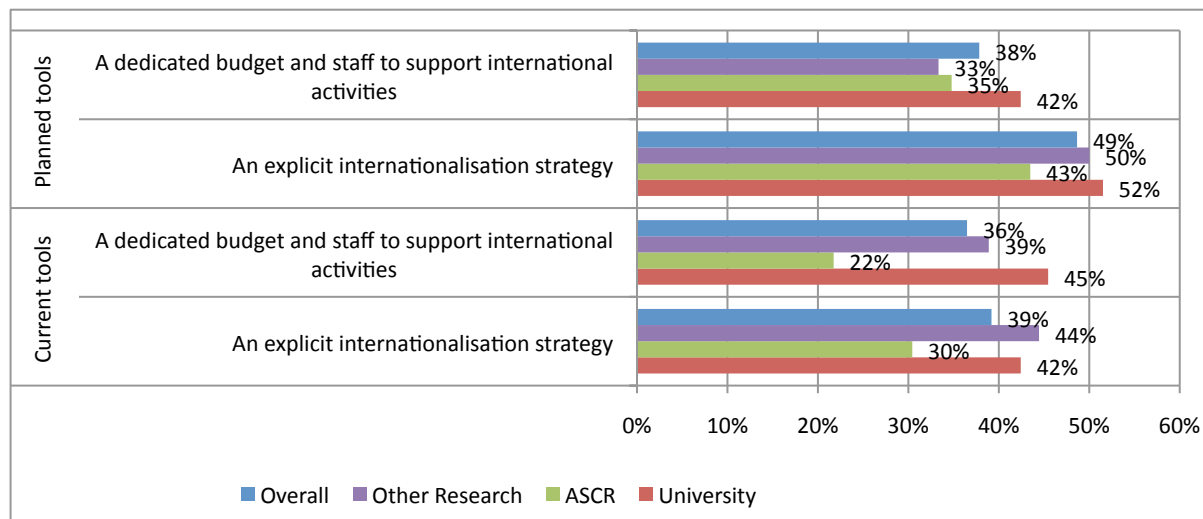
Figure 16: Support to international collaboration  
(To what extent do you agree with the following statements?)



Specific support mechanisms need to be linked to organisational strategies and need to be financed. Slightly less than 40% of the organisations have an explicit internationalisation strategy, but 49% plan to have one within three years, which means that almost all organisations in the Czech Republic have or will have such a strategy. The situation is similar with dedicated budget, albeit the numbers are a

bit lower. Individual ASCR institutes appear to be slightly less inclined to formulate a strategy and dedicate a budget (probably at least partly because they feel that such issues are taken care of at the higher ASCR level) but their plans to introduce these tools are in line with the other types of institutions.

Figure 17: Does your organisation have the following tools for the management of international relations?



International funds are yet of very low importance for research organisations. 28% of all Directors report zero income from international sources, 58% minimal. However, there is an upward trend, as 23% of Directors indicate that the share of international funding has increased in the past (7% say it has decreased).

#### 4.1.6 Overall assessment of internationalisation consequences

In a final step the questionnaire asked for assessment as to the consequences of internationalisation more generally, for the Czech system. Overall it appears that the benefits by far outweigh the costs. For example, only a minority of Directors believe that the Czech Republic loses more knowledge than it gains, very few think that international collaboration weakens domestic cooperation, while 21% say that foreign competitors are strengthened to a moderate (17%) or a large/very large (4%) extent. The only more general concern is with the loss of Czech talent, as 41% of all Directors agree to a large or very large extent that more highly skilled people leave the Czech Republic than move to it. The main issue, thus, is the attractiveness of the Czech system and the need to re-patriate Czech researchers that have gained valuable experience abroad (rather than stop Czech researchers from going abroad as this clearly would reduce overall benefits of internationalisation).

While, overall, the outlook of the ASCR institutes is more positive than for the rest of organisations, many of the other organisations, largely more application oriented, have more concerns. They fear that through internationalisation the focus of research is becoming less and less relevant to Czech industry and more often see problems with international property rights issues. 11% of those organisations even see to a large or very large extent a strengthening of foreign competitors through international activities.

# International Audit of R&D&I in the Czech Republic

## Final Report, 6 - International Co-operation in R&D

Figure 18: Assessment on international collaboration

(Based on your experience, to what extent do you agree with the following statements?)





## 4.2 Insights from research organisation interviews

### 4.2.1 Introduction

The following section draws upon telephone and face-to-face interviews conducted with representatives of research-performing organisations (drawn from the University and non-university sectors) by members of the project team. Not surprisingly we find that there is variation in the extent to which research (and teaching activities) are internationalised across subject areas (with some subject areas showing evidence of a much higher international orientation than others) and between but also within sectors. International collaboration and international mobility are increasingly accepted as necessary to ensure the excellence of Czech research. Most internationalisation within both the university sector and the academy institutes sector is bottom-up rather than driven by top-down strategy. Longstanding barriers relating to culture but also structure and incentives remain. The principal barrier remains funding. The bottom-up international activity of Czech researchers is likely to continue to grow organically. Younger researchers coming through are more likely to be exposed to internationalisation as an integral part of research and those researchers are likely to collaborate internationally as long as they are enabled to do so.

### 4.2.2 Strategy, mission and structure

At a strategic level international collaboration and international mobility are increasingly accepted as necessary to ensure the excellence of Czech research in all but a few areas of the humanities and social sciences where there is relatively little realistic scope for international research collaboration (for instance the study of the Czech language and culture). The **Academy of Sciences of the Czech Republic**, which (together with the Charles University) accounts for much of the research activity in the Czech system, emphasises internationalisation in its high-level strategies and has a division for international co-operation within its central administration to promote and support this. The ASCR, through its own expert groups, also works with policy-makers to influence the overall Czech policy stance towards internationalisation (for instance policies towards European research infrastructures<sup>3</sup>, the EU Framework Programme, cohesion policy, the ‘innovation union’ etc). The central administration provides support to Academy institutes and researchers participating in the Framework Programme and promotes active Czech membership of expert groups etc. The Czech Mobility Centre of the ASCR provides some support, both for outward mobility and for incoming researchers.

The individual **ASCR Institutes** make decisions about specific research activities and appointments. Some institutes, especially those in the area of physics, are highly internationalised in most areas of activity, with intense international collaboration, shared use of facilities, and inward and outward mobility. Others, especially in the humanities, seem less so. The ASCR does not collect routinely data about foreign researchers working within the institutes but many institutes do collect and report such data. Institutes also collect data on funding from international sources such as the FP or EURATOM. The ASCR uses international assessment committees to periodically evaluate the research performance of individual academy institutes. However there seem to be no standing scientific committees or advisory councils (at either the ASCR or institute level) with international members. We found no evidence that indicators of international profile such as international co-publications were used in decisions about staff appointments although we did find evidence that institutes do consider the broader international profile of applicants, and positions in leading academy institutes or university departments are increasingly opened internationally.

The universities are the other significant research players in the Czech system. The funding system is increasingly oriented towards enabling research in universities. The most prominent research university is the Charles University, though new institutions with aspirations to be research-intensive

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<sup>3</sup> Academy institutes send participants to sub-panels under ESFRI, and the Czech Republic has successfully used structural funds to attract infrastructure development (through the Extreme Light Infrastructure – ELI project, managed in the Czech Republic by the ASCR Institute of Physics) and, more generally, has worked to shift the axis of European research infrastructure planning to the east.



(sometimes based on an international rather than national model) are emerging. Others are likely to remain teaching-focused or very focused on applied technical problems. Most research internationalisation within the university sector is bottom-up rather than driven-by top-down strategy. At best top-down strategies, where they exist, enable or support bottom-up demand for international activity (e.g. participation in the Framework Programme). There are efforts towards teaching internationalisation (e.g. use of ERASMUS and other exchanges, joint programmes, doctoral training programmes in English, etc) but there remain barriers to such developments (see below).

Actors in the system note some changes in mobility patterns. In the past the Czech Republic may have been a convenient “stopping off” point for researchers from Eastern Europe and the Former Soviet Union countries heading West. There is still much bottom-up research interaction with (and mobility from) these countries. However the Czech Republic is now a destination of choice in itself for these researchers, and researchers increasingly come from a wider range of countries.

Finally, it was suggested to us that research-performing organisations which collaborate with firms may sometimes be more active in collaboration with foreign firms than with domestic ones. It was suggested that this could be because foreign firms have a greater absorptive capacity which makes collaboration easier and more attractive.

#### *4.2.3 Drivers, barriers and framework conditions*

The overwhelming driver of top-down internationalisation strategy at the level of research-performing organisations is the quest to improve the excellence and visibility of Czech research. Bottom-up internationalisation is driven by intrinsic research factors (the need to access advanced or complementary knowledge, skills, samples, technologies and facilities) much more than by incentives shaped by top-down strategies.

In the early years of the new Czech research evaluation system, the method used (where credit was divided between partners, including international partners) arguably incentivised against international collaboration. This problem has now been fixed. Some actors believe that the evaluation system continues to create volatility and problematic incentives for high-quality research. Some actors within the research system also observe a tendency towards paying lip service to slogans rather than concrete action, something which is now changing as a new generation of policy-makers, researchers and academics come to prominence. Having said all that, it was observed that the principal barrier to international collaboration remains funding and/or salaries. Inward mobility of foreign researchers for visits or to take up positions is limited by the funds available (salary expectations often being higher). At present many research-performing institutions are themselves stepping in to facilitate internationalisation with their own funds because the national support for internationalisation activity which does exist is seen as inflexible and bureaucratic. Practical difficulties for foreign participants in accessing national grant programmes are still felt to be a barrier. Finally, there is a perception that high teaching loads (even in leading university departments) present a barrier to research collaboration and medium-term mobility.

It was suggested to us that Czech students and researchers have relatively little motivation to become internationally mobile. And whilst Prague is a relatively popular destination there are also barriers to inward student mobility, including a legal requirement to teach in the Czech language for most purposes. This also presents a potential barrier to recruiting foreign teaching staff, whilst lack of English ability remains a barrier to outward mobility or collaboration for many (often older) researchers in the Czech system. Some institutions proactively support the learning of English in order to overcome such barriers and there is some use of incentive structures to promote take-up of English by doctoral students. At the higher (doctoral) level there seems to be a greater willingness to go abroad for short to medium-term visits.

There are longstanding barriers relating not only to organisational culture but also structure that reduce co-operation between universities and research interests. For instance it was reported to us that there are legal and institutional barriers to institutes and universities pooling their capital investment to create joint facilities or cross-fund each other's facilities. To the extent that obstacles to collaboration between the different parts of the research system remain, this could have a retarding effect on internationalisation. As for European funding, some universities and institutes are providing central support, but Czech partners seldom lead projects and there remains a perception amongst many researchers that national funding is ‘easier’ to obtain. As for policy co-ordination at the higher level, it was suggested to us that whilst there is now good programme co-ordination through the RDI

Council, the broader goals, strategies and ideas behind the programmes still do not appear to be co-ordinated.

#### *4.2.4 Effects and results of international S&T collaboration*

Whilst the systematic assessment of impacts from internationalisation is really just beginning in the research-performing organisations, there has been some effort to share experience about impacts at the system level – for instance through the Technology Centre ASCR. The most dramatic success story in recent years, in terms of internationalisation, and one that is as yet far from being finished, concerns research infrastructure. The Czech Republic has developed its own national infrastructure planning process and roadmap and has engaged (and continues to engage) actively in the European ESFRI roadmapping process. In particular the Czech Republic has worked to shift the emphasis in research infrastructure planning eastwards towards the new member states, and as a result has successfully mobilised structural funds to support the development of the Extreme Light Infrastructure presence in the Czech Republic.

#### *4.2.5 Future developments*

The openness of the Czech system is likely to remain a critical issue. Even where international collaboration is increasing Czech researchers are only rarely playing an initiating/leading role. Some of the international activity may also be following historic patterns rather than reflecting current priorities or the pursuit of excellence. Although great strides have been taken in terms of a more strategic attitude in the ASCR, in the leading academy institutes, and in the leading research universities<sup>4</sup>, a conservative and inward-looking culture and comparative lack of incentives mean that many researchers within the Czech system seem content to remain focused within the national system. It was suggested that positive incentives for international collaboration would be likely to be more effective in changing behaviour than the kind of financial penalties which can be applied through research evaluation processes.

The bottom-up international activity of Czech researchers is likely to continue to grow organically rather than in big leaps except in those fields where internationalisation is critical. In the university and research institute sectors some changes in practice (e.g. changes in funding rules) and culture could remove some small barriers to international collaboration. This is partly an issue of generational change. Younger researchers coming through the system now are likely to be less conservative and more outward-looking and are more likely to have been exposed to internationalisation as an integral part of research. These researchers are likely to be motivated to collaborate internationally as long as they are suitably supported and enabled to do so. Actors expressed a wish for well-defined and stable supporting programmes, with clear objectives. There also appears to be a need to consider opening up national funding to foreign collaborators. Stability in general was a theme – it was suggested to us by several participants that the perception of permanent reform in the Czech system was itself a barrier to attracting in good researchers from abroad.

Many of our interviewees felt that some cultural and structural barriers to collaboration between the ASCR institutes and the Czech universities remain, although it is accepted that the situation is much improved. However, whilst the two sets of institutions have both modernised over recent years, their relationship has not been explicitly modernised. Finally, it is an open question as to how open to international advice/scrutiny the strategies and management of Czech research-performing organisations will be in the future.

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<sup>4</sup> Albeit on an uneven basis, with some university departments or academy institutes believing they have no need for an explicit internationalisation strategy.

## 5. Understanding supply for and policy benefit of international R&D

### 5.1 Introduction

Internationalisation of R&D in most EU countries is implicitly integrated into a wider strategy for Science and Technology policy. As recent studies on S&T collaboration show, few European countries have explicit dedicated policy strategies for internationalisation.

In the Czech Republic the key organisation that develops and implements policy for R&D internationalisation is the Ministry of Education, Youth and Sports (MEYS). MEYS is the central authority of state administration for overall strategy, educational policy and the preparation of appropriate legislative standards and executive and operational activities. It distributes financial resources from the State budget and develops general scientific research and development policy. Amongst four other departments at the ministry, there is a **Group of European Integration and International Relations**, which is responsible for international R&D cooperation. In this group approximately 16 people are dealing with the international aspects of R&D.

The **Ministry of Foreign Affairs** is de facto a large funder of international science cooperation as they are funding the Czech Republic's memberships to the international organisations such as ESO, COST, EMBS, EUREKA and CERN due to the diplomatic status of the intergovernmental agreements. It is however MEYS who are dealing with the day-to-day operation of these programmes. The Ministry aims to use its foreign embassies better for the purpose of transferring information on R&D.

A second organisation involved is the **Ministry of Industry and Trade (MIT)**. This ministry provides direct support to private business R&D (grants, loans), indirect support to business R&D (tax incentives and guarantees), support to innovative start-ups, produces strategy policy documents (policy consultation papers, green or white papers, some Operational Programmes of Structural Funds). The Ministry is responsible for managing programmes for industrial research and the Operational Programme Enterprise and Innovation (2007-2013). The ministry does not have an explicit strategy for international collaboration.

Despite this industry-oriented mandate, MEYS is responsible for managing the industrial applied international R&D programmes such as EUREKA and in particular Eurostars, with the exception of the Community Innovation Programme (CIP). MIT does however cooperate with MEYS particularly to prepare international agreements related to R&D, to promote interest in various international bodies (e.g. ESA) and to promote Joint Technology Initiatives and Article 169 and 171 initiatives.

The **Ministry of Defence** is responsible for a number of international safety & security related S&T programmes as well as international activities done as part of its NATO task.

Agencies are also engaged supporting R&D internationalisation. The **Technology Agency** that has only recently started its operation has hardly implemented any cross-border activity. It is focusing its activities mostly on domestic programmes, which have no formal internationalisation requirement, nor are the industry oriented programmes open for foreign participation. As the MEYS is responsible for the international programmes the Agency does not have any involvement in programmes for SMEs such as Eurostars. It has become a member of TAFTIE in December 2010.

The Presidium of the **Czech Science Foundation (GACR)** has set the promotion and strengthening of international cooperation and supporting the better integration of Czech scientists into the world scientific community as one of the priorities of the GACR programme. The main objective of the international cooperation is to establish bilateral research project schemes with foreign partner funding agencies, in order to enable the better exchange of scientific information and techniques and the use of specialized equipment available in the countries involved. The GACR has bilateral cooperation agreements with the National Research Foundation of Korea, with the German Deutsche Forschungsgemeinschaft (DFG) and the National Science Council of Taiwan.

## 5.2 Internationalisation in current strategy

The National Policy for Research, Development and Innovation 2009-2015 has nine objectives, of which one is directly related to R&D internationalisation namely to 'intensify the Czech Republic's involvement in the international R&D&I co-operation'.<sup>5</sup> However one can state that other objectives such as 'creating an environment stimulating R&D and innovation' indirectly stimulate a closer interaction of the Czech research system with the international R&D as well. The better the research system functions and improves its quality the higher its reputation and ability to attract international collaborators and foreign researchers will be.

The political importance for internationalisation of R&D has grown as can be derived from the growth of national budgets for international co-operation programmes. All major programmes for internationalisation have seen their budgets grow considerably.

MEYS has initiated the development of an inter-ministerial strategy for internationalisation to 2015. The strategy mostly consists of an overview of expected policy instruments. The key rationales behind an intensified international S&T collaboration are that it:

- Supports the fast modernisation of Czech R&D environment;
- Enables access to knowledge and results otherwise inaccessible;
- Increases the effectiveness of R&D;
- Keeps an excellent level of R&D;
- Increases prestige and attractiveness of the CR;
- Broadens the capacities of Czech R&D while at the same time sparing national funds;
- Fulfils diplomatic engagements of the CR (ERA, NATO, other).

The four main goals for internationalisation are 1) to improve conditions of Czech researchers' participation in international R&D programmes 2) to increase the efficiency of the R&D cooperation that is based on bilateral intergovernmental agreements on R&D cooperation 3) to integrate the administration of existing programmes of R&D collaboration and 4) the strengthen the involvement in the jointly performed security and defence R&D.

The strategy was adopted in the summer of 2008 and an update is planned for 2012.

## 5.3 Drivers and bottlenecks for internationalisation

The drivers for S&T internationalisation in the CR are not very different than in many other countries. From a policy perspective two issues seem to have the most policy attention in documents such as the White Paper on R&D:

- The lack of international mobility of researchers both outward and inward
- The insufficient participation of Czech researchers in the European research programmes such as the Framework Programme collaborative programmes, ERC, EIT and so on;

The analysis in the policy documents is that the internal reform of the research landscape is necessary to improve the quality and reputation of Czech research in order to increase the publicity and reputation of Czech research. There is relatively little policy attention to R&D internationalisation from the perspective of innovation and industry. There are hardly any programmes for internationalisation of Czech industry and those that are focused at industry are run by MEYS rather than the ministry and agencies that are more industry oriented.

As international performance and publications are becoming a more important of assessing the quality of research an important driver for more internationalisation comes from the research community itself. There is a parallel driver at the policy level: activities such as Joint Programming and ERA-NETS have increased the international outlook of Czech policy makers.

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<sup>5</sup> Erawatch, Policy Documents, last updated 03-04-2010.

The interviews with representatives of ministries and agencies brought forward a number of observations on the key bottlenecks:

- From a policy perspective too much emphasis is put on getting a better financial return from the European FPs, as this would alleviate the Czech national budgets, while not enough strategy is developed how to improve the international collaboration in a wider sense;
- A tendency for Czech researchers to be inward looking with little eagerness in being internationally mobile. Given the history the experience with working in an international research community is still developing. According to the 2008 White Paper on R&D this is particularly the case for the middle aged research managers;
- Language skills still form a barrier, albeit less so than in the past;
- Only certain domains in the Czech research system (e.g. IT, Mathematics, Physics, Chemistry, Egyptology) really have a good international reputation and do manage to attract people from abroad.
- There is a lack of coordination between national and international R&D policy programming and planning and at the same time a lack of coordination between ministries leading to missed opportunities in the EU (e.g. in the area of Joint Programming);
- There is a shortage of staff at the Ministries who deal with the many international and cross-border activities. Too few people have to represent the Czech Republic across a large number of strategic committees and working groups;
- According to our interviewees Czech companies and SMEs in particular are not yet prepared for international collaboration or even trade. Getting into the FPs is a far too big step for them.

According to policy makers much progress has been made in decreasing the bureaucratic and administrative hurdles for inviting foreign researchers for short and long visits. The visa arrangements for scientists have been improved. According to some interviewees it is mostly a matter of perception by the research community that this is a major hurdle. Indeed some of the interviews with internationally oriented research managers stated that inviting non-Europeans to stay in the CR was not a real bottleneck, while others reported that this is a major problem, particularly for longer stays in the country.

#### 5.4 International aspects of R&D programmes

There are five types of policy initiatives that explicitly support the internationalisation of R&D in the Czech Republic:

- i. Diplomatic agreements that include mostly bilateral R&D collaboration
- ii. R&D programmes dedicated to cross-border collaboration
- iii. Membership of trans-national R&D organisations
- iv. Support and information on the European R&D Framework programme
- v. Improving the framework conditions (e.g. visa regulations for scientists)

The majority of the national Czech budget goes towards international organisations such as CERN, COST, EUREKA, etc. which is actually spent by the Foreign Ministry but is accounted for as part of the budget for R&D policy.

The second largest area of spending is on bottom-up research co-operations within the geographical framework of formal bilateral co-operations. This is implemented by MEYS.

For collaboration within Europe the main vehicle is the Commission's RTD Framework Programmes. The government supports a NCP system run by the Technology Centre ASCR that gives advice and information to potential applicants both from the public and private sector. It is a major objective for the CR to increase the Czech participation in the FPs.

Overall membership in ERA-NETS is very small and not very active. MEYS is involved in some mostly in aeronautics but it often happens that due to staff shortage tasks are outsourced to experts from the research community. MIT was involved in two SME oriented ERA-NETs but they were not very successful and their support from the European Commission will not be continued. The Ministry is

discussing whether to continue at least one of them with the most dynamic partners, outside the official ERA-NET framework.

The CR has an active involvement in ESFRI and the investment in infrastructure offers an important building block for internationalisation. As interviews showed these infrastructures investments are sometimes made with an explicit international set up, such as the investments of Czech infrastructures at the site in Trieste, Italy. Considerable funding is allocated to the Joint Technology Initiatives.

Involvement in Joint Programming is reasonably well established and a number of Ministries are involved such as the Ministry of Health and the Ministry of Agriculture. MEYS is supporting the JP activity by co-funding the transaction costs (travel, etc) of the other ministries. However there is no central strategy or prioritisation, by the Council for Research and Development, in which JP the CR should invest.

There are bilateral mobility (exchange) agreements with France, Slovakia, Hungary, Slovenia, Poland and Austria. The CR had agreements with Italy and Greece but they have not been continued, as there was no real interest from those countries. The EU-country bilateral co-operations are mostly without money crossing borders, so there is no budget attached to the agreements.

National budgets are allocated to the bilateral cooperation agreements with non-EU countries. There are official intergovernmental agreements with Russia, S-Korea, China, Japan, Israel, Argentina and the US. In preparation are Taiwan (MoU), Brazil and South Africa. There are discussions with India ongoing. Based on bilateral government agreements the countries set up joint committees and invite a long list of projects. This is mostly funded through the KONTAKT programme. This funds full research projects not simply mobility. In some country cases specific themes are defined whilst in others it is open.

The total government budget for R&D internationalisation is steadily growing. Today the annual level is at 1.6 billion CZK and in the next two years it is expected the spend will still be around 1.5 to 2 billion CZK annually. The current budget is double what it used to be in 2007. So this is an indication that its importance in policy is growing. The biggest budgets are for ESA, CERN, EMBC, COST and EUREKA and the KONTAKT programme. Only 12 million CZK goes to the mobility programmes.

Interest from industry for EUREKA is quite strong according the MEYS and supplied with a budget of 150 million CZK per year. There are currently 30-40 Eurostars projects with Czech companies. It was not generally considered a problem that industry-oriented programmes are run by MEYS and not for instance by the Ministry of Industry and Trade or the Technology Agency, which could be considered more natural partners for industry.

## 5.5 Effects and results of international S&T collaboration

The interviewees can at best give some anecdotal evidence and their general impression on the effects and results of S&T collaboration as very few studies have been conducted to assess the increased internationalisation. The interviews gave the following indications of the effects so far:

- According to research community and R&D Council some domains and institutions have better results in for instance EU projects, particularly the good and excellent groups.
- The foreign visitors have a positive effect on language use (very good stimulus to talk English).
- The specific programmes (e.g. US exchange programmes) have the effect that they require detailed research plans which has a positive learning effect for Czech research groups.
- It helps having open discussions with people from outside.
- Having more frequent foreign contacts is a further basis for networking which needs to be further developed in many parts of the Czech research system.

There is overall very little analysis and evaluation on the effectiveness of international R&D collaboration. MEYS has commissioned the Technology Centre ASCR to do an analysis of the success of CZ in domains and topics in FP7 and also to provide strategic information to people about the FPs. A second study is launched to assess the interests and possibilities of the institutions to prepare for FP8. A consultation is launched to collect the experience with the EU programmes and instruments.

What is missing according also to those involved is a good overview of the bilateral relations with non-EU countries: does it work, are there any gaps? There are still open policy questions to be tackled: do



we launch more bilateral agreement and if so where? Has the Czech research system reached saturation?

## 5.6 Future developments

The CR follows the Europe 2020 strategy at the highest level and preparing a response to the Innovation Union ready in January. A number of challenges and objectives for the future have been raised in the interviews:

- Create a better coordination across policy domains (e.g. development aid, agriculture policy) to use foreign diplomacy and relations in a more coherent manner
- To put more pressure on competence centres and other domestic R&D initiatives to incorporate internationalisation in their strategy

## 6. Internationalisation Strategies in Selected Comparison Countries

Recent comparative studies on policy strategies for internationalisation of R&D show that only few countries have an explicit policy strategy for internationalisation of R&D. We have previously noted in our Interim Report that that is also the case for the Czech Republic, although the overall Research and Innovation Policy Documents do include sections on internationalisation of R&D. The strongest focus in these strategies is on increasing the success rate of the Czech research community in the European programmes for R&I and thus ensuring more R&D funding into the system.

On behalf of the European Commission a comparative study was conducted on the rationales behind international research collaboration policies one can distinguish on the one hand the ‘narrow Science, Technology and Innovation (STI) cooperation paradigm’ and the ‘broad STI cooperation paradigm’.<sup>6</sup> While every categorisation is a simplification of reality, it can be observed in policy practice that these paradigms exist alongside each other and their degree of overlap and interaction varies considerably from country to country.

In the **narrow STI cooperation paradigm** the drivers are mainly to improve the quality, scope and critical mass in science and research by linking national (financial and human) resources and knowledge with resources and knowledge in other countries. The drivers originate from within the science community and are translated in science and research policy instruments. This can have a two-directional aim: to obtain access to state-of-the-art knowledge abroad as well to attract state-of-the-art knowledge or people to the ‘home’ country. From the view of the research community, joint research activities are conducted for scientific problem solving. In less R&D developed countries an important ‘intrinsic’ driver is to build up national STI capabilities through cooperation.

In the **broad STI cooperation paradigm** other non-science policy objectives interact with the ‘intrinsic’ science oriented objectives and STI cooperation becomes a means to reach other policy ends. What we have found in the literature and selected country studies is that alongside the ‘intrinsic research policy’ drivers the four main drivers behind STI cooperation are:

- Improving national competitiveness
- Supporting less developed countries by developing STI capabilities
- Tackling global societal challenges
- Creating good and stable diplomatic relationships (and indirectly ensuring international security)

The following Figure 19 shows the overview of drivers that are made explicit in the countries that have been reviewed in the Drivers of International R&D Collaboration. The overview shows that achieving excellence in a global world’ (the ‘narrow’ R&D paradigm) is still the core driver for STI cooperation. Nevertheless other wider policy objectives such as development aid and improving competitiveness of the domestic business sector are also important. The Czech Republic was not analysed in this report but it would be categorised as applying the ‘narrow STI paradigm’ and regarding internationalisation

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<sup>6</sup> Drivers of International Collaboration in Research, Report for DG Research, Technopolis and MIOIR, April 2009.

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mainly beneficial to raise to raise domestic STI capability and achieve excellence predominantly for the public research sector.

Figure 19: Overview of main drivers influencing national agenda's, made explicit in policy strategies in 20 reviewed countries

| Country        | Tackling global societal issues & challenges | STI capability building |          | Maintaining good and stable diplomatic climate | Achieving research excellence in a globalised world | Competition for scarce resources | Improving competitiveness |
|----------------|--|-------------------------|----------|--|---|----------------------------------|---------------------------|
|                |  | Development aid         | Domestic |  |   |                                  |                           |
| Estonia        |  |                         | XX       |  | X   |                                  | XX                        |
| Finland        |  |                         |          |  | XX  |                                  | X                         |
| France         |  | XX                      |          | X  | XX  |                                  |                           |
| Germany        | X  | X                       | X        |  | XX  | XX                               | XX                        |
| Ireland        |  |                         | X        |  | XX  |                                  | X                         |
| Poland         |  |                         | X        | X  | X   |                                  | X                         |
| Spain          |  | XX                      |          |  | XX  |                                  |                           |
| Sweden         | X  |                         | X        |  | XX  |                                  | XX                        |
| Nether-lands   |  | X                       |          |  | X   | XX                               | X                         |
| United Kingdom | X  | X                       |          | XX   | XX  |                                  | XX                        |
| Australia      | X  |                         |          |  | XX  |                                  | X                         |
| Brazil         |  |                         | XX       |  | XX  |                                  |                           |
| Canada         | X  |                         |          |  | XX  |                                  | XX                        |
| China          |  | X                       | X        |  | XX  |                                  | XX                        |
| India          |  |                         | XX       |  | XX  |                                  |                           |
| Japan          | X  | X                       |          | X  | XX  |                                  |                           |
| Mexico         |  |                         | XX       | XX   | X   |                                  |                           |
| Russia         | X  |                         | XX       |  | X   |                                  | X                         |
| South- Africa  |  | X                       | XX       | X  | XX  |                                  | XX                        |
| United States  | XX   | X                       |          |  | XX  | X                                |                           |

o = not existing or explicit

x = driver

xx = very strong driver

Of the European countries only a few countries stand out in terms of developing an explicit policy strategy for the internationalisation of science and technology. These strategies include both the outward international approaches (e.g. incentives for universities to work with foreign partners) and an inward looking approaches (making the country more attractive for foreign organisations and people to conduct research). In the following section we will describe the international R&D policy strategies of Germany, Finland and Ireland, three countries that have put a strong emphasis on internationalisation in their R&D policy.

### 6.1 Germany

After having monitored and assessed the internationalisation of the German research landscape for a couple of years, the German Federal Government in 2009 approved a new **strategy for internationalisation of S&T**. While the Ministry for Education and Research (BMBF) has been the initiator and leader, the strategy has been coordinated with other key ministries in the field, for which, however, the strategy is not integral part of their activities. As for concrete major current lines of activities, the following major policies can be distinguished.

For years, the major line of activity has been through the European Framework Programme, EUREKA and COST, for which supporting administrations have been set up. The European activities have not been linked strategically to overall internationalisation.



The cooperation activities with countries outside the EU have relied on **scientific technological cooperation agreements**. Those agreements with other countries set the frame and open opportunities for concrete research collaboration projects. These programmes have traditionally been a mixed blessing, as they had not been linked to overarching country or area strategies. While many important projects have been financed, overall there is no clear evidence as to how successful the programme was in internationalising German research landscape. While each project is evaluated ex ante by a commission, overall there has been no programme planning and priority setting for the mix of agreements or within one specific agreement. In addition, the partner countries sometimes could not meet the requirement of reciprocity.

However, in recent years, the spirit and usage of these agreements has changed, they are now used more strategically. The new strategy (BMBF 2008a, BMBF 2008b) sets out a whole range of new or intensified activities, and international framework agreement now are perceived to be much broader and integrate, and linked to national technological strategies such as the High Tech Strategy.

The cooperation with Russia is an example of an enlarged understanding. Under the co-ordination of the BMBF a broad framework agreement covers cooperation in science, technology, innovation, higher education and education of decision makers in science and industry. Thematically, the international cooperation in science is thus linked to a broader build up of structures and competencies in Russia with a view to further scientific and economic cooperation with the country. Consequently, in 2007 Germany and Russia signed a treaty that enables research and innovation cooperation between SME, i.e. more market oriented international cooperation. This is complemented by a number of bi-lateral agreements of the leading large non-University research organisations with partner organisations in Russia.

A further pillar of the strategy is to **open up much more radically thematic national programmes**. They shall, on average, aim at a participation of foreign partners up to a share of 20%. The participation of international partners in German research programmes has been rather low, and now specific activities have been in place to push for more participation. To open up national programmes more pro-actively in order to reap technological and- in the long run economic – benefits is a new policy focus in the BMBF.

One further major focus of the German internationalisation activities is **the inward attraction of students, post docs and senior researchers**. This is mainly provided by two foundations, with one (DAAD) taking care of general student exchange and scholarships, and one concentrating on elite scholars (AvH). Overall, this division of labour has proven successful, as it combines elite profiling and mass attraction and allows for specialist offers. However, the government thinks that more efforts are still needed to attract and integrate foreign academics. Thus, the new strategy puts inward and outward mobility as one of the major aims.

Further, the BMBF and its International Office are actively **monitoring** activities outside Germany – and will severely strengthen this monitoring following the new strategy. Within the new strategy, it is planned to combine the activities of attachés with the activities of the research and funding organisations as well as foundations, to provide coordinate collection and exchange of information that can be fed into the national system more quickly and more broadly – and more efficiently.

In line with monitoring, there will be an increase in institutional presence abroad, and the Ministry seeks to coordinate existing efforts by various administrations and research and funding organisations to have more efficiency and more visibility abroad.

International facilities as part of internationalisation activities are not a major feature in the national debate. However, there is a recognition that these investments within Germany need to be assessed ex ante and on a regular basis (interim) in order to justify German payments as up to now there are no systematic evaluations.

A further pillar of international ministerial activity is the firm commitment to more personal engagement in International Organisations, as Germany is not represented in international organisations relative to the size and relative importance to the country. This also signals a move towards more integration of sectoral policies (and relate organisations) and research policy.

In terms of linking research collaboration with **innovation**, the Ministry for Economy and Technology (BMWi) is an important player. While this ministry does not have an *explicit* internationalisation strategy or catalogue of goals, it has realised that beyond the participation in EU Framework Programme further opportunities especially for SME must be offered. Thus, in its major

SME innovation programme ProInno the Ministry for the first time introduced an incentive for international collaboration, as German SME cooperating with foreign partners get a financial bonus.

Finally, it must be stressed that the German Federal system and the institutional landscape in the innovation system leave ample room for bottom up and de-centralised internationalisation activities. The largest research funder, the Deutsche Forschungsgemeinschaft, has started to engage in various international collaboration with partner institutions, and leading foundations such as VW have upgraded and reformed their international funding. Further, the headquarters of the large non-University research organisations have started to draft and implement internationalisation strategies and have set up supporting structures both in Germany and outside the country. These activities are discussed with the Ministry, but there is no top down steering of the BMBF.

## 6.2 Finland

Internationalisation is a topical policy issue in Finland. One of three priorities in science policy in 2008 is “to consolidate internationalism”.<sup>7</sup> In 2008, a first draft for the new national innovation strategy was released: three quarters of the priorities address internationalisation. But also in the foregoing years internationalisation was an important issue. Every year there is a policy white paper, stressing the most important points for research policy: internationalisation is a key topic. In the strategic documents of the past decade, internationalisation plays a prominent role, which is often reflected in titles of the documents, main priorities set and the assessments of the needs of Finnish research<sup>8</sup>. The importance of internationalisation is not only reflected in the general research policy, but also in a number of strategy documents dedicated to international collaboration<sup>9</sup>. A new national strategy towards internationalisation of research policy is developed and supported by the Government<sup>10</sup>. Many of the international ambitions and efforts in Finland aim at the European level. Furthermore, the policies and strategies tend to aim for the higher (and often abstract level). There are not many clear initiatives or instruments that aim to foster international collaboration. The philosophy is rather to open up the existing system for internationalisation, than to develop a set of indigenous instruments.<sup>11</sup>

A significant part of Finnish research funding is accessible for foreign institutions. The largest R&D funding organisation TEKES, estimates that 40% of its projects are internationally networked, including the EU. The budgets of the extra-EU networked projects are: 110 M€ to the USA, 25 M€ to Japan, 10 M€ to China and 75 M€ to other countries outside the EU. The Academy of Finland spends about 10% of its research site funding on foreign institutions.

The strategy towards internationalisation is formalised at the national government level, for instance in the Science and Technology Policy Council documents and the aforementioned Finland’s National Strategy. R&D collaboration has specific attention in the research policy and the innovation policy domain. The relevant actors in these domains are the Ministry of Education with its agency Academy of Finland and the Ministry of Trade and Industry with its agency TEKES.

The ultimate objective of the Finnish strategy is to balance sustainable development in social, economic, cultural and ecological terms. Growing productivity, employment and social cohesion are key aspects of this. The focus of collaboration lies on cooperation with best practices around the world. This has its effects on the geographical scope of cooperation. Extra-EU science policy typically aims at collaboration with countries known for the quality of their research (i.e. Japan, Canada and the US) and the upcoming countries (such as China, India and Russia). In order to cooperate with the best practices often a thematic approach is taken. In the science policy this is done through the four thematically organised Research Councils.

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<sup>7</sup> Finnish Science and Technology Information Services. <http://www.research.fi/en/sciencepolicy>, visited August 2008

<sup>8</sup> Science and Technology Policy Council of Finland (STPCF), 2003: Knowledge, innovation and internationalisation. Helsinki, 2003. & STPCF, 2006: Science, Technology, Innovation. Helsinki, 2006 & Ministry of Education publications 2006:15: Education and Science in Finland. pp. 42 & Strategy of Academy of Finland; pdf available at <http://www.aka.fi/Tiedostot/Tiedostot/Asiakirjat/Suomen%20Akatemian%20strategia2006.pdf>

<sup>9</sup> See for instance: Science and Technology Policy Council of Finland, 2004: Internationalisation of Finnish Science and Technology. Helsinki 2004

<sup>10</sup> Aho, E., et al., 2008. Proposal for Finland’s National Innovation Strategy.

<sup>11</sup> TEKES, Interview Kari Komulainen, 8 September 2008: 10:00 – 11:30 CET.

### 6.3 Ireland

From the late 1980's the success of an economy increasingly characterised by high levels of external trade and foreign direct investment (FDI) arguably reinforced the perception that Ireland could 'buy in' technology and innovation from overseas. However by the late 1990's confidence had turned to concern over the possibility that fleet-of-foot international companies which account for much high-tech activity in Ireland could move out just as easily as they had moved in and that expected impacts of FDI in enhancing the indigenous innovation system had thus far failed to materialise. The Tierney Report on Science, Technology and Innovation which preceded the groundbreaking 1996 White Paper on Science, Technology and Innovation noted that Ireland had effectively failed to develop an indigenous 'national system of innovation'. The White Paper itself set out a completely new context for science, technology and innovation policy in the Republic of Ireland. The White Paper itself acknowledged that "for much of the period since the foundation of the State, Science and Technology (S&T) has been very much ignored and neglected" (White Paper, 1996, p1). Though some attempts had been made in the 1970s and 1980s to improve the co-ordination of S&T activities and to better harness these towards social and economic goals, domestically owned industry was dominated by small companies in traditional sectors and seldom either conducted or used R&D whilst Irish subsidiaries of the international companies increasingly attracted to the country obtained their technology from the parent company and thus depended on R&D done abroad. Universities were largely focused on teaching with little funding for research available: what public funds were expended were largely spent on applied agricultural research mostly conducted outside the university sector. Since the publication of the White Paper the institutional set up for the governance of science, technology and innovation in the Irish system has been transformed and indeed continues to evolve. New funds and funding bodies have been created, new advisory groups formed and systematic planning and prioritisation processes have been established. Overall R&D spending has increased three-fold during the 1990s.

The most recent statement of the R&D related policy objectives of the Irish Republic is the Science, Technology and Innovation Strategy 2006-2013. The over-riding vision outlined in the Strategy is that

*"Ireland by 2013 will be internationally renowned for the excellence of its research, and will be to the forefront in generating and using new knowledge for economic and social progress, within an innovation driven culture".*

Increasing the internationalisation of Ireland's STI is the last of the six specific policy objectives outlined in the Strategy:

1. To build a sustainable system of world class research teams across all disciplines and to double Ireland's output of PhDs
2. To better capture, protect and commercialise ideas and know how by increasing academic-industry links and by improving the management of IP in the Irish research system.
3. To better harness R&D for enterprise, innovation and growth, by translating public research results into the private sector, by changing attitudes to R&D in the private sector and strengthening the private sector R&D base by improving support and incentives for R&D, and by improving and streamlining State support for enterprise innovation in general.
4. To improve science education and raise awareness of science in society
5. To mobilise research in key policy areas such as health, agriculture and food, environment and marine and a new area of concern, energy.
6. To raise the international engagement of Irish S&T including all-island initiatives.

There is no separate internationalisation strategy for Irish science, though as already noted above the need to internationalise Irish S&T is one of six key themes in the broader national strategy for science, technology and innovation. There are however a number of voices agreeing that national science objectives should be translated into an internationalisation strategy which would try to create synergies between the various international activities and specify prioritisation by sector / technology, geography, and instrument/scheme. In practice the dominant force in the internationalisation of Irish science is the bottom up activity of research funders, research institutions, research groups and individual researchers. A new vision enshrined in the recent recommendations of the Advisory Council on Science, Technology and Innovation focuses on the need to achieve a better balance with

‘top down’ policy and to steer emerging ‘bottom up’ activity towards national priority areas whilst ensuring that the high level policy objectives reflect the demand and capacity of the S&T community. At present the rationale for the division of responsibility for funding and support of international activities is rather opaque and arguably leads to some confusion and dispersal of responsibility. Support for and promotion of internationalisation activities comes from a range of government departments, implementation agencies and research funders, each of which is currently pursuing its own priorities. This is also reflecting in the distributed advice and support structure for internationalisation (see below).

#### 6.4 What can be learned from these examples?

The above examples are each unique to their own national situation and governance structure. The important thread through these benchmarks could also be applied to the Czech Republic:

- To develop an explicit and coordinated R&D internationalisation strategy that is embedded in a wide set of policy domains (education, science and research, economics and industry policy, diplomatic and foreign policy); This involves not just seeking greater success with FP funding but also involves strategy for bilateral cooperation with EU and non-EU countries, the use of R&D as an element to attract foreign direct investment, as well as to help link domestic companies with R&D partners around the world;
- To make internationalisation a key policy objective and to make this ambition visible to the (research and business) community;
- To encourage domestic research organisations to develop more explicit international strategies and build up support for their researchers
- To open up national research programmes and organisations and remove possible barriers for foreign partners and individual research to work with domestic partners or to locate in the country

## 7. Framework Programme Participation and Supporting Structures

### 7.1 Aim and methodology

The major part of international involvement in international research is funded through the EU Framework Programme (and EURATOM). A high level of participation and successful application not only provides research income from the EU level, but offers opportunities for joint research of Czech researchers, research organisations and firms and thus contributes to knowledge creation and innovation in the Czech Republic in ways national funding programmes cannot. The EU Framework Programme also is a catalyst for further collaboration in the future and can help firms to enter into new markets. In addition, with FP6 new instruments have offered possibilities for funding agencies and ministries to engage more broadly in transnational co-ordination activities to improve the offer they can make for Czech researchers to collaborate with appropriate partners and by doing so to enhance the effectiveness of Czech funding programmes.

This section explores the participation patterns of Czech researchers in the European Framework Programme and EURATOM and then discusses the supporting mechanisms for the participation. Both parts are done in an international comparative perspective.

The first part on participation patterns starts with a historical overview of the Czech participation, then summarises the key messages of previous analyses of FP6 and FP7 participations. Subsequently, it introduces a set of performance indicators in an internationally comparative perspective before it summarises the ERA-NET participation. In the second part the supporting structures are analysed, first for the Czech Republic, followed by an international comparison of small and successful countries.

The data source for the participation is the E-CORDA database and previous reports and statistics, the data source on supporting structures in the Czech Republic and comparator countries are document search, previous studies and interviews in the Czech Republic.

## 7.2 Framework Programme Participation

This section of the report seeks to compare the Czech participation with a set of selected countries that have similar historical situations, size or aspirations. It utilises E-CORDA databases as well as a number of previous studies. The table below shows the comparator countries.

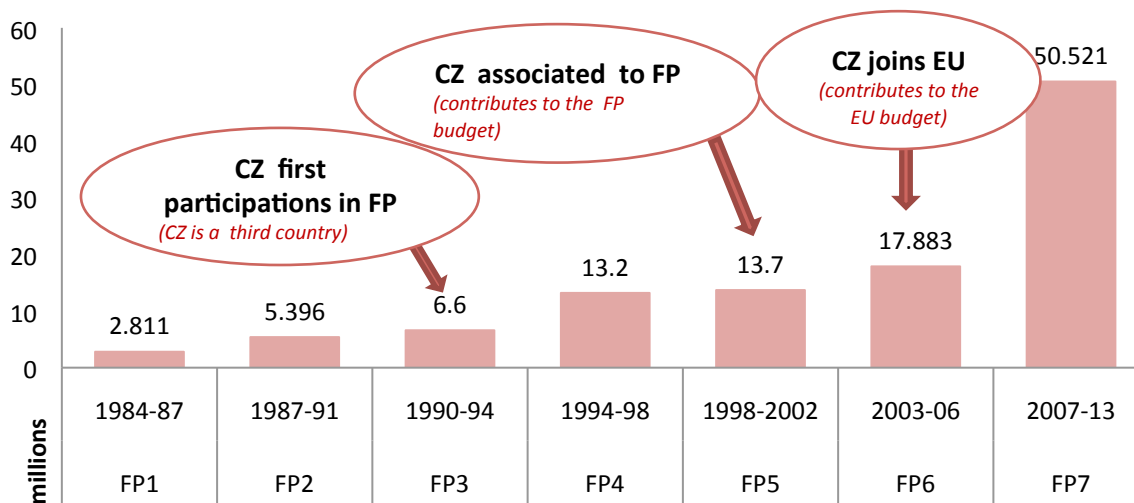
Table 4: Overview of comparator countries

| Country code | Country name   | EU member status   | EU member status code |
|--------------|----------------|--------------------|-----------------------|
| AT           | Austria        | Old member state   | OMS                   |
| CZ           | Czech Republic | New member state   | NMS                   |
| FI           | Finland        | Old member state   | OMS                   |
| HU           | Hungary        | New member state   | NMS                   |
| IE           | Ireland        | Old member state   | OMS                   |
| NL           | Netherlands    | Old member state   | OMS                   |
| SK           | Slovakia       | New member state   | NMS                   |
| SE           | Sweden         | Old member state   | OMS                   |
| CH           | Switzerland    | Associated country | ASS                   |

### 7.2.1 Historical overview of Czech participation

Before going into the comparison of current and more recent participation patterns, we can first give a historical picture. The first participation of the Czech Republic dates back to FP3 (PECO-COPERNICUS calls). Starting with FP5, the Czech Republic was a candidate country and could thus participate under almost equal conditions as the member states. Almost 900 Czech teams participated in 733 projects in FP5. During the FP6, the Czech Republic joined the EU (2004) and thus participated just like any other member country. In FP6, the Czech Republic registered 1068 participations in 876 projects. During this period, the problem of lack of co-financing firstly seriously surfaced – as Czech Republic public research institutions (i.e. including universities) did not have funds available to cover own contribution to the budget. This bottleneck was tackled by setting up the measure of matching funds (see below) in the FP7.

Figure 20 – Budget allocation for historical FPs and progress of the Czech Republic joining FPs.



Source: Chvojková, Vaňová, Vavříková (2011)

### 7.2.2 Main conclusions of FP6 and FP7 participation based on existing studies

The participation in FP6 and FP7 have been analysed in two studies<sup>12</sup>, the main results of which are summarised below.

#### FP6 key messages

This section summarises the main findings of a previous study regarding the participation of Czech researchers in FP6<sup>13</sup>:

- The Czech Republic had not formulated any target-oriented policy of its participation in the EU Framework Programmes.
- Overall, the Czech Republic was lagging behind the average results of OMS, nonetheless it is often the leading country among NMS.
- The ratio GERD/GDP clearly separated OMS and NMS. When country participation is measured by relative financial indicators (eliminating influence of the national economy size, e.g. FP6 costs per one EUR million GERD or GDP) the Czech FP6 participation is ranked among the old member states with a higher GERD/GDP level. Hence the Czech Republic “behaved” like a state with rich national structures supporting the R&D activities.
- One of the main characteristics of the Czech Republic participation’s pattern was the low share of coordinators. Not only were there few proposals led by Czech partners, those proposals with Czech coordinators were also less successful in evaluations. One of the problems reflected by Czech participants is insufficiency in the administrative support from own institution that discourages from taking up coordinatorship as well.
- The low intensity of proposals (number of proposals per capita or FTE researcher) was not only connected with coordinatorship, but was a more general pattern. Comparing i.e. with Austria, Czech teams submitted 2 times less proposals per researcher.
- The Czech Republic had quite good participation of industry sector (including SME). The importance of FP6 for SMEs and industry teams in regions with smaller density of academia teams was obvious. However, industry participation was different for different thematic priorities, while in certain priorities industry sector is very successful, in others such as Health or KBBE their participation is very low.
- The participation pattern was strongly Prague-centric. Prague, together with the 2nd largest city accumulated ¾ of participations in FP6. There, academia teams prevailed.
- The Czech FP6 report suggested as an explanation for strong participation in certain priorities the existence of “pivotal institutions”, which were able to influence behaviour of the whole sector. In thematic sectors with broadly dispersed participants the success rate and support obtained from the FP6 resources was lower than in the fields with such a pivotal organization. Pivotal institutions exist, e.g. in AaS and EURATOM.

#### FP7 key messages

This section can draw on a more recent study titled Participation in FP7 and in EURATOM programme January 2007 – January 2010 and on later data update<sup>14</sup>:

- The annual average funding contracted in FP7 stands for approximately 50% of the Czech Science Foundation that is committed to support basic research in the Czech Republic. Thus, FP7 has a significant share as a funding source for research activities. According to the newest statistics

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<sup>12</sup> Albrecht V., Vanecek, J. (2008): Assessment of Participation of the Czech Republic in the EU Framework Programmes; Prague, [http://www.fp7.cz/dokums\\_raw/eufordia-konverze\\_1236765864.pdf](http://www.fp7.cz/dokums_raw/eufordia-konverze_1236765864.pdf), Albrecht, V. Vavříková, L. Participation in FP7 and in EURATOM programme January 2007 – January 2010 (Úřad ČR v 7. rámcovém programu výzkumu a vývoje EU a v programu Euratom v období leden 2007 – leden 2010. Echo, vol. 2010, no. 4-5. URL: [http://www.tc.cz/dokums\\_raw/612echo452010prilohac\\_55.pdf](http://www.tc.cz/dokums_raw/612echo452010prilohac_55.pdf)

<sup>13</sup> Albrecht V., Vanecek, J. (2008): Assessment of Participation of the Czech Republic in the EU Framework Programmes; Prague, [http://www.fp7.cz/dokums\\_raw/eufordia-konverze\\_1236765864.pdf](http://www.fp7.cz/dokums_raw/eufordia-konverze_1236765864.pdf)

<sup>14</sup> Albrecht, V. Vavříková, L. Participation in FP7 and in EURATOM programme January 2007 – January 2010 (Úřad ČR v 7. Rámcovém programu výzkumu a vývoje EU a v programu Euratom v období leden 2007 – leden 2010. Echo, vol. 2010, no. 4-5. URL: [http://www.tc.cz/dokums\\_raw/612echo452010prilohac\\_55.pdf](http://www.tc.cz/dokums_raw/612echo452010prilohac_55.pdf)



Czech teams have contracted so far EUR 168 million of eligible cost, from which the EU contribution accounts for EUR 123 million.

- However, considering relative counts, participation per capita has not increased from FP6 to FP7. Low number of proposals per capita attaches the Czech Republic to the tail among EU countries. This may be a result of the fact that the Czech Republic invests quite high GDP percentage to R&D funding compared with other NMS; GERD is one of the highest among NMS. The Czech Republic has higher GERD than several OMS and second highest among NMS. The Czech Republic has not improved in the number of participations per EUR 1 million GERD.
- The success rate increased from FP5 to FP7 and is one of the highest among NMS (except for Baltic countries). The number of coordinators increased but still their success rate is still on a very low level.
- Teams from the Czech Republic cooperate more often with the top European institutions.
- The participation of Czech teams is low in the priorities of SP Cooperation that have large funding allocation (e.g. ICT).
- The Czech Republic has a negative “juste-retour” balance (contributes more than 1%, but gains approx. 0,7-0,8% of the FP7 budget distributed until the time of the study (2010).
- National and institutional strategies in terms of promoting FP participation are still absent.

### *7.2.3 FP6 and FP7 performance indicators*

This section builds on a new analysis performed using FP data from European Commission, existing studies<sup>15</sup> and other publicly accessible data.

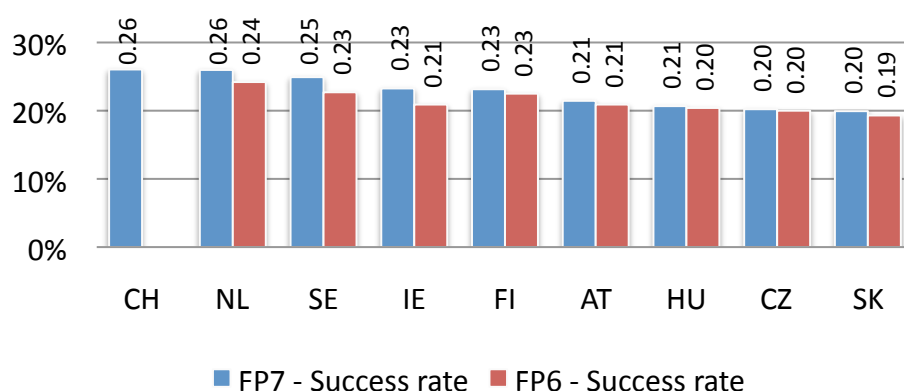
#### **Success rates**

The success rate of participation in the EU Framework Programme is a ratio of proposals that succeeded in evaluation and were retained for funding (so called mainlisted proposals) and all eligible proposals submitted in a response to the call. The success rate could be counted for number of teams submitting a proposal (participation success rate) or for the funding requested (financial success rate). Not every proposal chosen for funding is finally funded, it may happen that the consortium is no more capable to solve given research task or negotiations with EC do not lead to acceptable Grant Agreement. These changes among mainlisted proposals account for around 8%. The figure 21 shows participation success rates for comparator countries. Overall, the NMS have lower participation success rate than OMS. The financial success rate for FP7 for the Czech Republic is even significantly lower than the participation rate. From the NMS, Hungary is slightly better than the Czech Republic, whilst Slovakia's success rate slightly falls under 20%.

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<sup>15</sup> See FP7 E-Corda Grant Agreements. European Commission. March, 2011; FP7 E-Corda Proposals. European Commission. March, 2011; FP6 E- Corda Contracts. European Commission. May, 2007; Vonortas, Nicholas S. FP6 Participation. Center for International Science and Technology Policy & Department of Economics, The George Washington University. November 10, 2008. URL: [http://ec.europa.eu/research/evaluations/pdf/archive/fp6-evidence-base/expert\\_analysis/n.s.vonortas\\_-\\_fp6\\_participation.pdf#view=fit&pagemode=none](http://ec.europa.eu/research/evaluations/pdf/archive/fp6-evidence-base/expert_analysis/n.s.vonortas_-_fp6_participation.pdf#view=fit&pagemode=none). Albrecht, V. Vavříková, L. Participation in FP7 and in EURATOM programme January 2007 – January 2010 (Účast ČR v 7. Rámcovém programu výzkumu a vývoje EU a v programu Euratom v období leden 2007 – leden 2010. Echo, vol. 2010, no. 4-5. URL: [http://www.tc.cz/dokums\\_raw/612echo452010prilohac\\_55.pdf](http://www.tc.cz/dokums_raw/612echo452010prilohac_55.pdf).

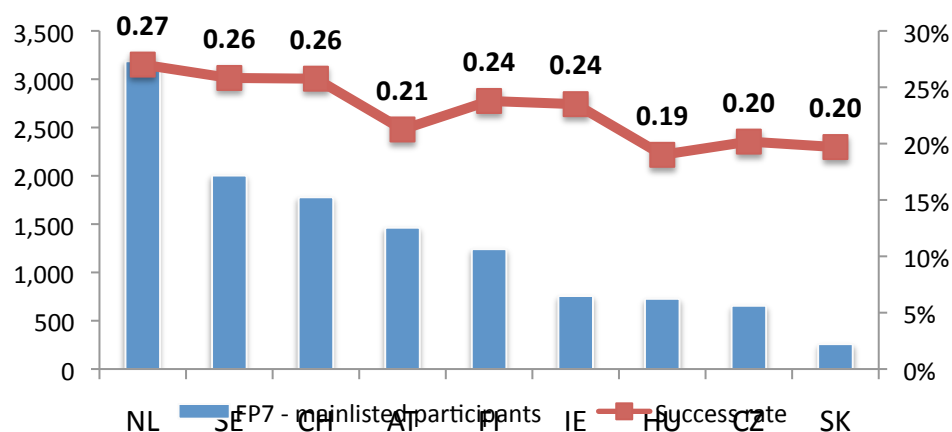
Figure 21 – Participation success rate for comparator countries – FP6 and FP7



Source: E-Corda, Vonortas (2008)

The overall success rates in FP7 could be severely influenced by two specific programmes (SP), People (MCA) and Ideas (ERC). The former one has specific patterns and it is specific by its nature aimed at improving researchers potential and therefore in many cases could not be regarded as a regular research projects. The latter one, ERC, is known for its oversubscription, particularly in the first calls. Therefore it is enriching to look on participation success rates disregarding those two SP. The figure 22 shows success rates without the proposals submitted in the SP People and Ideas. As could be seen, the success rate of some of the countries changed, e.g. the rate increased for the Netherlands, Sweden, Finland, but for the rest of the countries it stood the same, also for the Czech Republic. In the Czech Republic, the success rate for ERC is very low, whilst the MCA success rate is good. Participation success rate decreased for Austria and Hungary. Therefore in this ranking the Czech Republic stepped over Hungary. However, selected NMS are still on the very tail.

Figure 22 - FP7 basic overview of the participations and success rate without ERC and MCA



Source: E-Corda

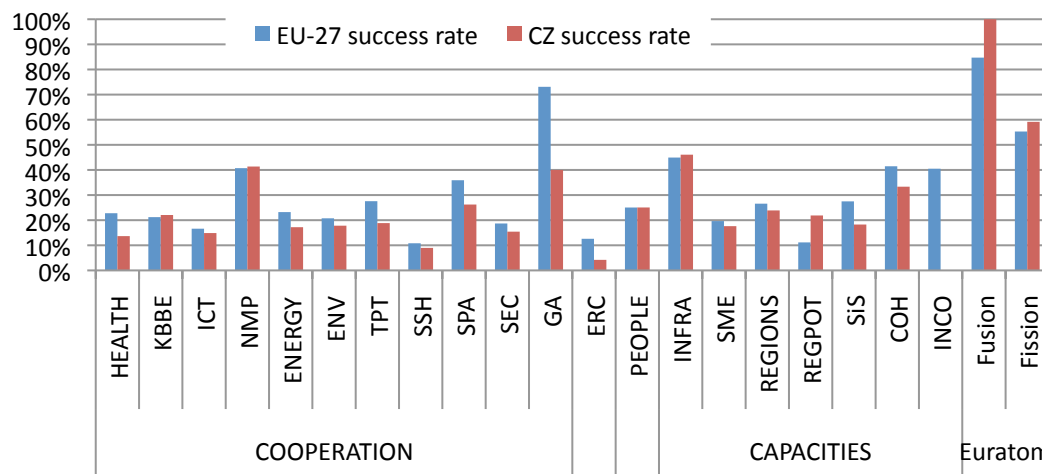
Figure 23 gives insight into the strength and weaknesses of the Czech republic in terms of priorities of SPs in the FP7. Czech teams have higher success rates in priorities KBBE, NMP, INFRA, REGPOT, and Euratom priorities Fusion and Fission. On the other hand, the Czech Republic lags behind European average in many priorities. Very low success is identified in HEALTH, ENERGY, TPT, GA (e.g. ERA-NET), ERC, SiS, and no participation in INCO. Collaboration with third countries (INCO) is not only poor in INCO, but also considering specific scheme SICA (Specific International Cooperation Actions), implemented in certain priorities. Out of 8151 total number of partners in consortia in the



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projects with Czech participation, there are 246 partners from third countries including USA, JP etc., or EECA countries such as Russia. Russia is the most prolific among the 3<sup>rd</sup> country partners of the Czech teams.

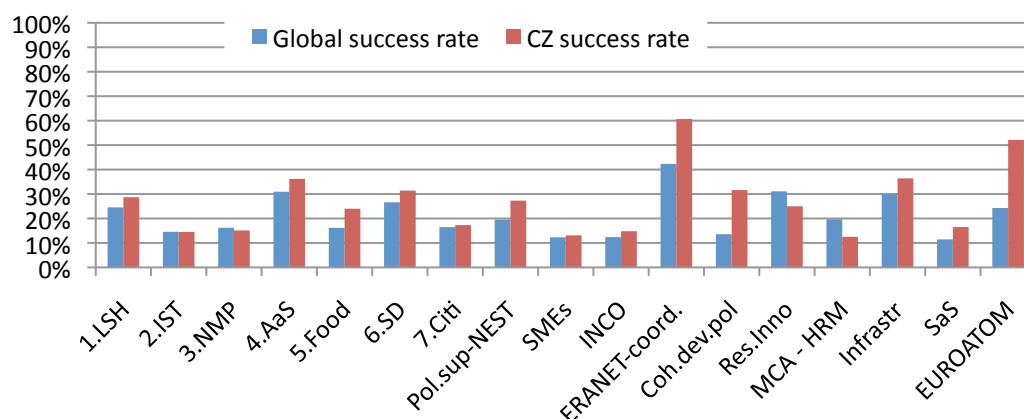
Figure 23 – FP7 participation success rate in EU-27 and in the Czech Republic



Source: E-Corda

FP6 success rates are given in figure 24. If one compares the theme specific success rates in FP6 and FP7, in FP6 we see more priority areas in which the Czech success rate was higher than the global, overall success rate. Even in the priorities such as Health having very low FP7 success rate compared to EU-27 average, in FP6 success rate of Czech teams is higher than the global average. A further slump in FP7 compared to FP6 can be seen in Sustainable Development (SD), Aeronautics and Space (AaS) and ERANET (ERANET-coord.). The SD priority used to be quite a success for Czech teams in FP6. Although it is not possible to compare the content of the priorities in FP6 and in FP7, FP7 success rates of three priorities ENV, TPT and ENERGY that could be considered as successors of SD are on a low level. This is related with the AaS priority as well; whereas in FP6 this priority is considered generally to be a strength (mainly thanks to the research of small transport airplanes), in FP7 Czech teams has lower level of participation in TPT priority that moreover includes aeronautics. Further, in FP7 the Czech participation in ERANET was less pronounced. (see below).

Figure 24 – FP6 - comparison of global proposal success rate and Czech FP6 participation success rate

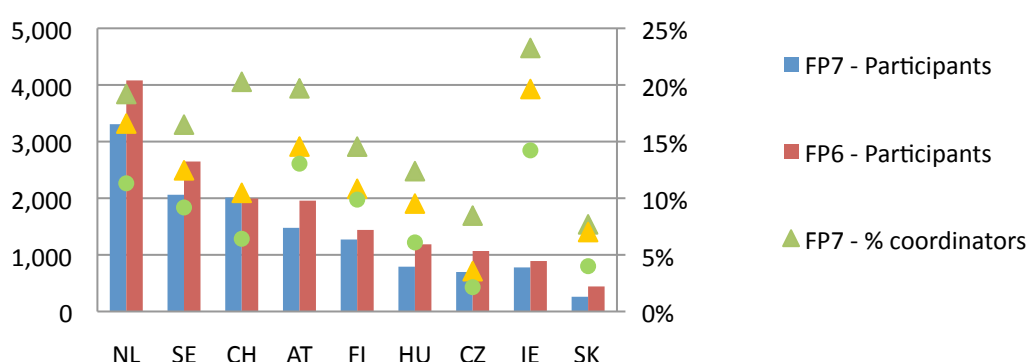


Source: E-Corda

## Participation and coordination

Figure 25 below gives the number of participations per selected country ordered by the participations in FP7. The dots indicate share of coordinators among participations of the respective country. For FP7 an additional indicator is counted, the share of coordinators among participations of the respective country excluding monocontractors. It means that it excludes project types where only one entity participates. These project types are to be found often in SP People and Ideas (ERC projects) and some projects being established on purpose mostly predefined and agreed by EC (e.g. headquarter of international organisation, organisation of a conference connected with European presidency etc.). The figure below demonstrates the low level of coordinators from the Czech Republic, the lowest of all comparator countries

Figure 25 – Number of participations and share of coordinators in FP6 and FP7.

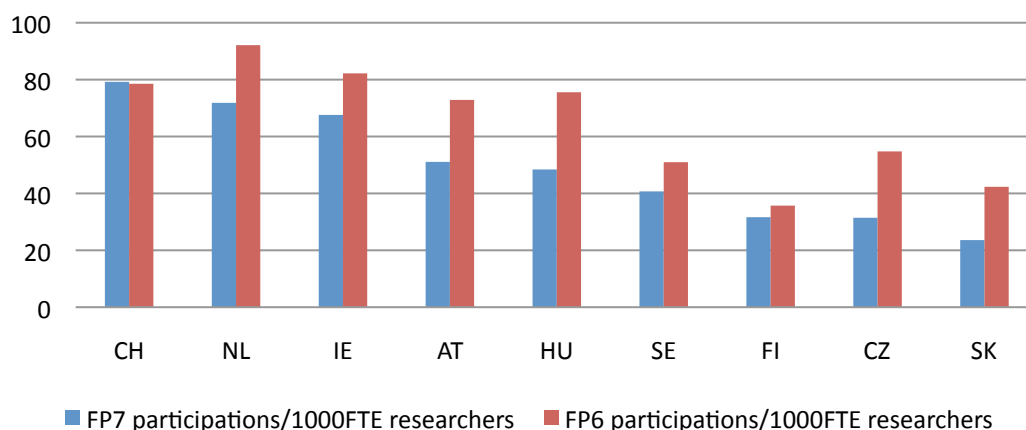


Source: E-Corda

## Participation intensity

Comparing the participation to other countries (normalised for 1000 FTE), there seems to be lower level of mobilisation in the Czech Republic in FP7. While the participation intensity in FP7 is lower for all countries (due mainly to the fact that FP7 had not run for as long a period as FP6 when the numbers were measured), the gap between FP7 and FP6 is highest for the Czech Republic.

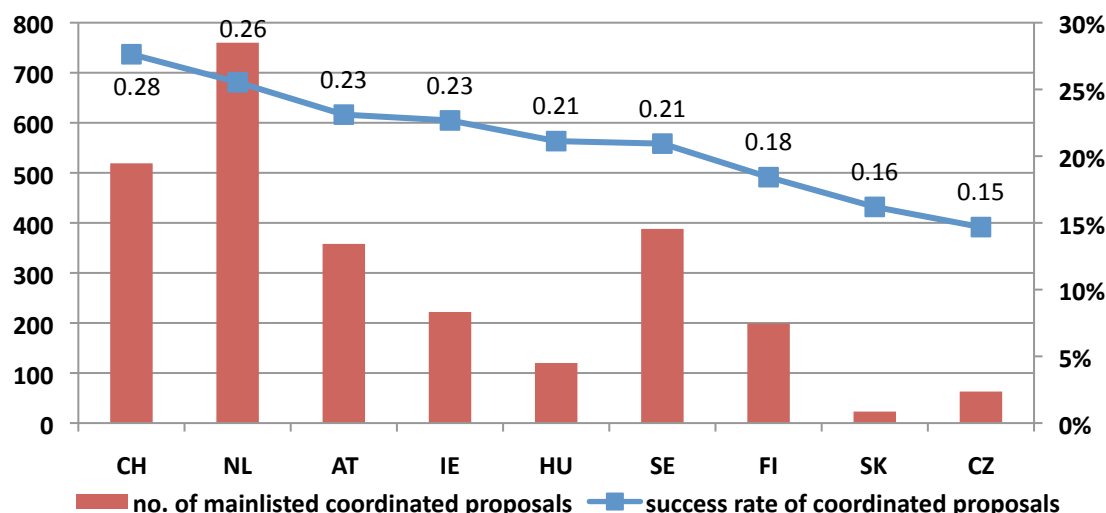
Figure 26 – Participation intensity in FP7 (number of participations per 1000 FTE researchers)



Source: E-Corda, Eurostat

One important indicator of leadership and excellence in Europe is the ability to lead successful bid. The figure below shows this figure for our comparator countries. It shows that out of the comparator countries, bids led by Czech researchers have the lowest success rate.

Figure 27 - FP7 success rate of coordinated project proposals by selected countries<sup>16</sup>

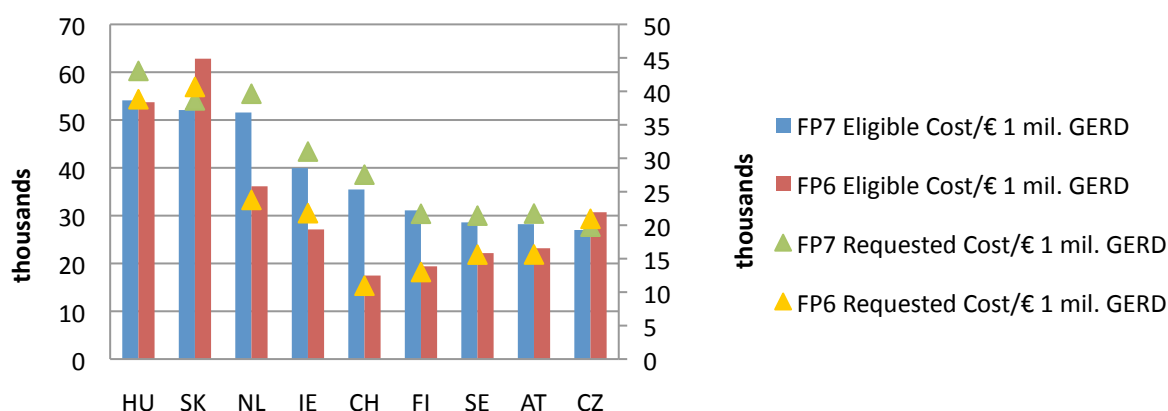


Source: E-Corda

### The relative importance of the FP: share of FP7 funding in GERD

Relative importance of the FP indicates what the share of FP funding in GERD is. Those countries having strong investments into research and development (high GERD) have rather low share of FP funding in GERD. For NMS, countries have rather low GERD and therefore the share of FP funding increases. Although the Czech Republic has one of the highest GERD among NMS, it still does not amount to the level of OMS like AT, SE and FI, or the associated CH. The GERD of the Czech Republic is quite close to NL and IE. While NL, IE and CZ could be compared in terms of GERD as a percentage in GDP, the Czech Republic has significantly lower share of FP funding in GERD in FP7. The results of the Czech Republic look rather similar to OMS like FI, SE or AT, but with significantly lower level of R&D funding.

Figure 28 – FP7 and FP6 eligible and requested cost per 1 mil. GERD



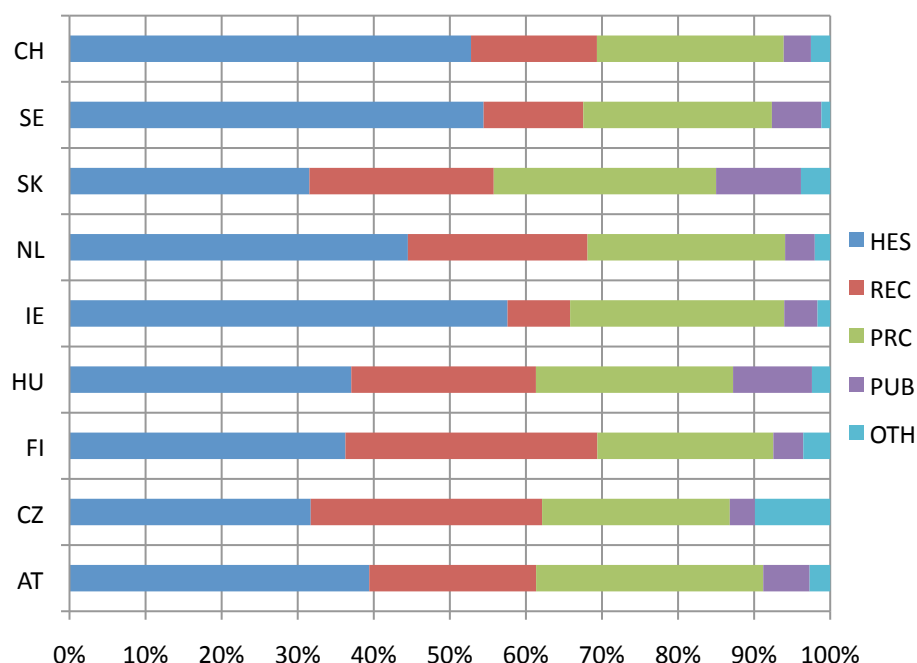
Source: E-Corda, Eurostat

<sup>16</sup> Success rate = share of mainlisted proposals coordinated by the respective country in all coordinated proposals by the team from respective country

## Sector participation

The figure below shows the participation of different kinds of actors from different sectors. The Czech Republic has the lowest share of Higher Education institutions (with SK) (HES), but a slightly above average share of non University research organisations (REC) and “other” (OTH). The share of participants from the private sector (PRC) are slightly below average of our comparator countries.

Figure 29 – Share of sectors participating in FP7

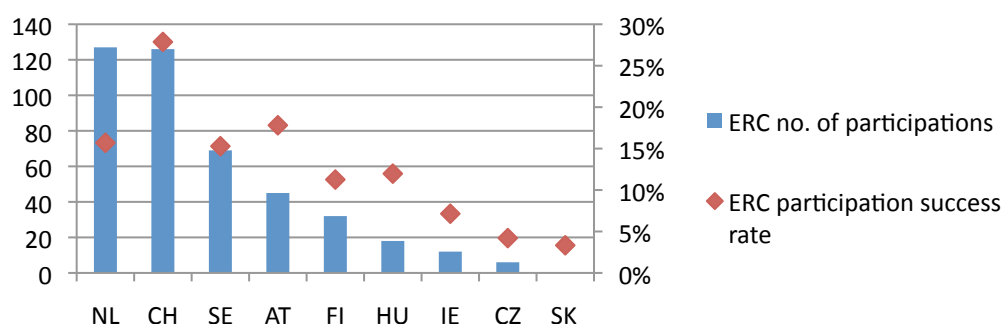


Source: E-Corda

### 7.2.4 ERC participation

The ERC is the major institutional innovation in terms of research funding in the EU. It funds frontier research of individual scientists, solely based on scientific excellence assessed by peer review. Participation and success rate in this scheme is meanwhile widely seen as a benchmark of excellence of national systems. Figure 30 compares the participation of selected countries in the ERC together with their participation success rates. The success rate of researchers from the Czech Republic is considerably lower than for all comparators except for SK.

Figure 30 – Participation and success rates of selected countries in SP Ideas (ERC grants (starting grants and advanced grants combined))



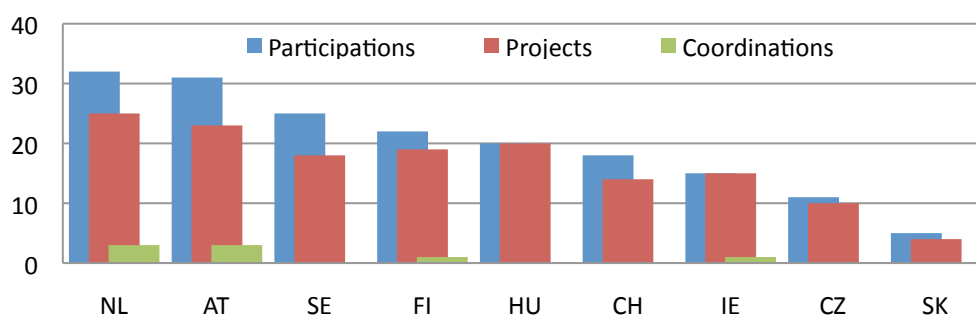
Source: E-Corda

### 7.2.5 Coordination of funders: the ERA-NET scheme

The ERA-NET scheme aims at overcoming fragmentation of European research by coordinating national research programmes and leading to joint activities. The participation in ERA-NET scheme across FP7 priorities is shown on figure 31<sup>17</sup>.

As for the other FP results with save for minor exceptions OMS have higher participation pattern than NMS, with the exception of Hungary who match the OMS participation. The participation of the Czech Republic is lower. But this needs to take into consideration the size of administrations and the number of funding agencies and departments responsible for funding in different ministries and agencies. Small countries or countries with less diversified funding structures often do not have the capacity, need or opportunity to participate. Further, as in other countries, the low participation could be a result of non-systematic approach to this scheme. In fact, in the Czech Republic it seems to be very difficult to retain sources for such a project because it depends on ad hoc negotiations with adequate public administration to get funding commitment. Our interviews have also confirmed that until now there is not a possibility or any provision how to process ERA-Net projects for those eligible to participate. The main programme owners, the Technology Agency and National Science Foundation, and the ministries participate only selectively. The Technology Agency has been established in 2009 and therefore has not had yet the possibility to join.

Figure 31 – Participation in ERA-Net scheme



Source: E-Corda, <http://netwatch.jrc.ec.europa.eu/>.

### 7.3 Czech support for FP7 participation and international benchmark

The Czech Republic has support programmes and organisations that help public and private sector research organisations to gain access to foreign R&D partners and programmes. This Chapter is aimed to provide a comparison with the Czech support system available. One of the challenges for the Czech research and innovation system is to become better integrated in international research networks. All European countries have set up support systems (in particular funding, information, and coaching) to help researchers to access international research networks such as COST, EUREKA, and the European Commission's framework programmes. The structure of these systems varies considerably and depends on the institutional context of the countries, the size of the country and its research community, the character of the industry sectors and so on. Thus there is again no 'blueprint' of how this can be best organised. In addition, only few countries have made assessments of the effectiveness of their support structures. We have chosen to describe the support structures of a number of other small European countries that have quite 'mature' FP support structures: Austria, Finland, Ireland, The Netherlands, Switzerland and Sweden.

<sup>17</sup> Havlíčková, L. Vavříková, L. ERA-NET and ERA-NET Plus schemes in the Czech Republic (Nástroje ERA-NET a ERA-NET Plus v ČR). Technology Centre ASCR, 2011

There are a number of characteristics that will be described:

- The institutional arrangement of FP support
- The types of services and programmes on offer for different target groups
- A number of strategic choices that national support structures need to tackle

### *7.3.1 Support structures in the Czech Republic<sup>18</sup>*

This section describes the availability of support for researchers from the public and private sector to engage in international cooperation. The core of the Czech support and advice system (but also in most of the reviewed benchmark countries) is geared to increasing the participation in the European Framework Programmes and today in FP7. We first provide a short description of the support network in the Czech Republic and subsequently the available grants and schemes to enter into the international programmes in order to compare this set up to those in six reviewed countries: Austria, Finland, Ireland, The Netherlands, Sweden and Switzerland.

#### **Support structure for participation in FP and other international programmes**

The support for participation in international R&D in the Czech Republic is divided between several organisations:

- The national information infrastructure for supporting FP7 are organised under a network called NINET ([www.ninet.cz](http://www.ninet.cz)). The NINET network currently consists of 1 national contact organisation, 10 regional contact organisations and 7 field contact organisations. These organisations are funded from the support programmes EUPRO and EUPRO II, administered by Ministry of Education, Youth and Sports. Programme EUPRO II aims at ensuring information infrastructure for international collaboration in R&D. Regional and field contact organisations are based within existing organisations such as research organisations, universities, innovation offices or regional support offices for R&D&I;
- The central National Contact Point for the European Framework Programme (with exception of Euratom) is delegated to Technology Centre ASCR. They also operate the Czech Liaison Office for Research and Development in Brussels and are a member of the Enterprise Europe Network;
- The Ministry of Education (MEYS) is the contact and information point for COST and Eureka and a number of remaining inter-governmental R&D initiatives such as EMBL;
- Other Ministries function as contact point for specific parts of the Competitiveness and Innovation Framework Programme (CIP), such as the Ministry of Industry and Trade (Entrepreneurship and Innovation, Intelligent Energy Europe), the Ministry of Environment (eco-innovation) and the Ministry of Interior (ICT).

The national contact points provide the information, consultation and training to all target groups who wish to take part or already participate in the European Commission's R&D programmes of which the Framework Programmes are the largest. The TC ASCR has a group of 20 people that provides the NCP service to the R&D community. This includes organization of trainings and info days and specific counsellors that are attached to specific parts of the Framework Programme including financial, legal, contractual and IPR issues. Apart from direct support to the R&D community members of TC ASCR also take part in Programme Committee meetings as experts to support the Ministry of Education, Youth and Sports. Their service includes general information, support to proposers, specialised support on legal, contractual and IPR issues, and training. Approximately 60 training sessions per year are organised by the NCP. In addition TC ASCR is

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<sup>18</sup> The information on the Czech system for this chapter has been compiled and written with help of Lucie Vavrikova from the Technology Centre ASCR and with additional information from interviews of the WP-G team.

involved also in monitoring and analysis of the Czech participation in the EU Framework Programmes.

According to an interviewee the Czech Republic takes a 'middle' position in terms of actively linking with EU R&D developments. It does have a pro-active role in for instance the areas of Environmental research, KBBE and the SME programmes but is not well positioned in for instance the health and ICT parts of the Framework programme. For the future it could be considered to refocus part of the generic information services towards themes and disciplines that are strong in the Czech Republic in terms of their science and technology position, but positioned relatively weak in European networks.

### **Funding programmes for participation in international R&D programmes<sup>19</sup>**

There are three specific funding instruments in the Czech Republic. Firstly, certain costs of project proposal preparations can be covered from national public sources. Secondly, organizations can ask for co-financing from public matching-funds and receive up to 100% of total eligible costs of FP7 project implementation. Thirdly, VAT recovery can be requested from relevant Czech Tax authorities.

While it can be hard to judge whether these instruments really result in higher participation of Czech beneficiaries in FP7 projects, it can be said with certainty that these additional public financial sources are welcomed, especially by public organizations, because they can enable them to cover costs related to the preparation and implementation of FP7 projects, which would not be easy to cover from their own limited institutional resources. Some Czech beneficiaries even argue that external sources for co-financing are essential to their participation in FP7. From our interviews we also learned that universities most often do not have any support functions to help proposers with the administrative side of proposal submission and project management. This has a particular effect on the low level of coordinators coming from the Czech Republic.

In addition to the information network the Czech Republic has a number of financial support schemes that have the objective to give an incentive to researchers to take part in particularly FP7.

The costs of project proposal preparation are not considered eligible costs in FP7, and thus cannot be covered by the EC. Activities connected with proposal preparations have to be financed by the participating organizations. However, Czech organizations can also use national public sources.

Contributions to FP project proposal preparation from public sources have been available in the Czech Republic since 2004, thus already available for FP6. The contributions are provided on the basis of a call for proposals published on a yearly basis, financed from the budget of the MEYS, and administered by the TC ASCR. In 2010, this incentive was available to any legal entity (public and private) for the preparation of collaborative projects, networks of excellence, or BRSG-SME project proposals if the indicative budget of the given partner was higher than EUR 200,000. Exceptions to this rule are possible for ERC applicants, Czech coordinators who do not have to fulfil the budget limit, and Czech coordinators participating in INCO projects in which Coordination and Supportive Action (CSA) projects could be supported as well. The possibility to obtain national financing does not depend on proposal evaluation results; however, the project proposal has to pass the eligibility check of the EC which means it has to be evaluated (or pass the 1st stage of evaluation in case of a 2-stage proposal evaluation).

Contributions can be provided to cover travel costs of Czech participants going to project proposal preparatory meetings and costs of organizing such meetings, including, e.g. the rental of premises. On the other hand, personnel costs, indirect costs, costs of durable equipment, costs related to the protection of background (IPR), or subcontracts are not eligible. According to TC ASRC analysis, this seems as a big problem for Czech participants, and it is probably one of the reasons for the low interest in this financial support from Czech beneficiaries who would especially welcome contributions to personnel costs. The maximum amount of national contribution is CZK 50,000 (i.e.

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<sup>19</sup> Chvojková, L., Vaňková, J., Vavříková, Lucie. Administrative, legal and financial management in projects of 7<sup>th</sup> framework programme : Overview of rules and principles & Czech experience. Praha : SLON, 2011..

approx. EUR 2,000) in case of a Czech beneficiary who is acting only as a partner in a consortium and CZK 100,000 (i.e. approx. EUR 4,000) for Czech coordinators. The total amount of contributions for one organization (or faculty at a university) is limited to CZK 150,000 (i.e. approx. EUR 6,000) and only two projects. In case of insufficient resources, funding will be provided primarily to ERC participants, Czech coordinators, and participants with higher indicative budgets.

Continuation of this support has been under discussion in recent years as well as some discussion points are envisaged by Czech participants. It has been decided in August 2011 to cease this type of support. Firstly, although information about this support is easily accessible and wide-spread, there is low use and awareness of this support. Secondly, participants seem to have problems administering and using this ex-post payment in the short period remaining before the end of the accounting year (as given by rules). Moreover, participants would welcome that more types of costs (e.g. personnel, IPR support etc.) are eligible.

#### Matching-funds for co-financing of FP7 projects implementation

RTD support programmes may not cover project expenses up to 100%. This is often the case in RTD international cooperation support programmes. In the FP7, the EC contributes to FP7 projects up to 50%, 75%, or 100% of eligible cost depending on the type of the project, activity and type of beneficiary.

In 2008, financial incentive called for short “co-financing” has been launched to overcome problems of Czech public research institutions to cover those eligible costs of the projects. This incentive is realised as an increase of the institutional support up to the incurred eligible costs of RTD international cooperation projects that are not reimbursed by the provider. This system is administered by the MEYS.

Any international RTD project where the primary provider does not cover the total amount of eligible project costs and which started later than 1 January 2007 is eligible for this support. Co-financing can be provided to any Czech entity defined as a research organization by the Community Framework for state aid for research and development (Community Framework).

Calls for proposals are usually published by the MEYS several times a year. The support is allocated by the principle “first-come, first-served” according to the availability of the budget. So far, overall support of co-financing has amounted to CZK 680 000 000 (i.e. approx. EUR 27,000,000). FP7 projects represent approximately 1/5 of all supported projects.

Three pinpoints of this incentive are referred. Firstly, this incentive is of the “de minimis” type of support which is limited per institution. Therefore some institutions shall consider how their “de minimis” support will be distributed. Secondly, the question whether this support shall be declared as a receipt of the project or not arises. Answers to and interpretations of this problem differs. Thirdly, as an institutional support it has to be accounted for to MEYS following calendar year deadlines given for the state budget whereas the project accounting periods differs.

The facts and figures of Czech participation in FP7 reveal that the participation is generally not improving. Therefore the question whether this instrument attracts more participation arises. However, it is provable, that in some cases this support has been essential. Czech participants confirm in several cases, that institution would not support their participation (e.g. in technology platforms) without this co-financing support.

#### VAT refund

VAT is not considered an eligible cost in FP7 projects. In general, all beneficiaries are entitled to charge only the net value of invoices to projects, and the VAT has to be paid from other sources. Therefore, since 2008, in accordance with the Value Added Tax Act No. 235/2004 Coll. [§ 81], Czech beneficiaries are entitled to claim a reimbursement for VAT (i.e. VAT refund) paid in relation to implementing EU RTD projects. This support is provided directly by responsible Czech Financial Authorities as a reimbursement of declared costs.

This support could be provided to all programmes, if a given programme can be considered an RTD programme financed from EU resources, and that the rules of the programme consider VAT as a non-eligible cost. The support is only available if a VAT deduction cannot be made. Accordingly, this option is open mainly to universities and public research institutions, and it is valid for both FP6 and FP7 projects. Reimbursement of the paid VAT can be requested at any time during the year (even retroactively), but no later than 15 months after the end of the calendar year when the tax payment occurred.



So far, 264 requests were processed and overall VAT refunds amounted to almost CZK 10,000,000 (i.e. approx. EUR 400,000). Even though the whole process involves an increase in administration, experiences with the system are generally positive as revealed in TC ASCR survey.

### 7.3.2 Benchmark countries

Is the Czech Republic's support structure very different from that in other smaller countries? The following sections will describe the benchmark countries on a number of characteristics. We will discuss the structure of the support system, the types of support provided and discuss a number of issues and how they are tackled in the benchmark countries.

#### Structure of the support systems in benchmark countries

The structure of FP and international R&D collaboration support systems across the reviewed countries varies considerably because they are embedded in national research and innovation systems, and operated by existing national organisations. However, there are a number of typical patterns. There are countries with a predominantly centralised system, where one organisation is the dominant National Contact Point. The Netherlands and Austria are predominantly centralised, although Austria does have a regional network of information points as well. Finland, Ireland, Switzerland and Sweden have a more decentralised structure. The following is a short description of how the countries have organised their support structures.

The most comprehensive support system can be found in **Austria**. At the operational support level, a substantial support system at the national and the regional level has been set up by the ministries responsible for R&D issues in Austria. The main organisations involved are:

- At the national level, FFG-EIP: the department for European and International Programmes at FFG, formerly an independent organisation known as BIT, Bureau for International Research and Technology Cooperation (Büro für internationale Forschungs- und Technologiekooperation) and a unit of FFG since its foundation in 2004; FFG-EIP hosts all National Contact Points (NCP) for FP7.
- At the regional level, five Regional Contact Points (RKS, Regionale Kontaktstellen<sup>20</sup>) which provide information services in the Austrian provinces
- At the institutional level, organisational contact points, such as research service units at Austrian universities and other research performers, which have become partners in the Austrian support network.

Moreover, the Austrian ministries have also set up a specific support system in order to continuously monitor Austrian participation in the European Framework Programmes: the PROVISIO project, which serves mainly the programme delegates and policy makers by providing data and analyses.

The **Finnish** support structure is decentralised rather than centralised and National Contact Points reside in a number of Finnish organisations.<sup>21</sup> The Finnish Secretariat for EU R&D is the key organisation responsible for promoting information about the EU Framework Programmes. In addition, the National Contact Points (NCPs) and officials at universities and research institutes are working on communication in this field.

In 2010 the total government funded Finnish support structure consisted of 80 different people, (although not full time engaged) in the FP activities:

- 30 National Contact Points, mostly in either Tekes or Academy Finland
- 30 programme delegates and advisory members
- 4 people at the Finnish Secretariat for EU R&D
- 14 people in Regional Centres advising on EU

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<sup>20</sup> The RKS are also called 'Regionale Beratungs- und Betreuungszentren, RBBZ' (Regional Consulting and Support Centres) in some documents. We stick to the term Regional Contact Point / RKS in our report.

<sup>21</sup> Evaluation of Austrian Support Structures for FP7 & Eureka and Impact analysis of EU Research Initiatives on the Austrian Research and Innovation System, Technopolis Group, 2010

The Finnish Secretariat for EU R&D, which is located at Tekes, offers services to all stakeholders in companies, universities, research institutes, governmental agencies and municipalities free of charge. It is the umbrella and coordinating organisation for all the other actors providing international support. The Secretariat has a staff of four people full time. One of these staff is a financial expert, another a legal expert at TEKES. One of their main functions is to give general information and advice on EU R&D Framework Programmes. The office also coordinates the Finnish NCP system and monitors Finnish participation in the EU R&D programmes. The network meets four times a year to coordinate activities and share experiences. The Secretariat meets every two weeks and has permanent electronic contacts with the rest of the NCP network. Two changes have been introduced recently: the establishment of regional advisors, particularly for SMEs in the regions. Another addition to the network is the Ministry of Defence dealing with the security domain.

The support structure in **Ireland** to promote and provide help in establishing involvement in the Framework Programmes is highly decentralised, consisting of a network – the National Support Network (NSN) – led by Enterprise Ireland and involving all of the national funding agencies. The National Support Network was introduced for FP7.<sup>22</sup> This new support system has been designed to overcome a number of recognised weaknesses in the old network with the organisation and management of FP6 support, including a lack of coherence as to the involvement and roles of the different national agencies, the limited amounts of training for National Contact Points, and insufficiently clear links between national research funding and Framework participation. In addition, the new NSN has sought to strengthen the range of financial supports on offer to assist both academics and industry in becoming involved in FP7 proposals and projects.

Dissemination of information and raising awareness of FP7 is achieved via a dedicated National Support Network website<sup>23</sup>, and through the work of the National Contact Points (NCPs) – dedicated professionals from the major funding bodies in Ireland who are part of the NSN and attached to specific areas of the programme. There is at least one NCP per thematic priority area, and one for each of the other parts of the programme, such as the Marie Curie Actions, Research Infrastructures, Research for the benefit of SMEs, Research Potential, Science in Society, and Activities of International Cooperation.

While more than one organisation exists for the support for international STI collaboration in **The Netherlands**, in essence the Dutch support system is centralised. Responsibility for support is located in NL Agency. The specific unit for support for the European Framework Programmes is called EG Liaison (EGL) and is part of NL Innovation, one of the five divisions of NL Agency.

The International Unit within NL Innovation has three focus areas: EG Liaison for matters concerning the European Commission (FP but also CIP), the EUREKA office and a unit for collaboration outside Europe. The EG Liaison office, which is comparable with FFG-EIP in Austria, employs approximately 29 FTEs (35 people). The Unit is mostly organised around specific FP thematic areas with 1-3 advisors per area. The advisors are domain experts who know the research communities in a particular field. In total, together with the EUREKA and the 'other countries' units, the international support division has 49 FTEs. The Netherlands has a relatively strong position in EUREKA and therefore this part of the structure is larger than many other EUREKA teams in the reviewed countries.

There is no central budget for EG Liaison Office nor the International Unit of NL Innovation. Budget information on the entire activity is not made public. EGL works on the basis of specific assignments from different ministries. For instance the FP support work it conducts in the area of Food and Food Safety research is funded by the Ministry of Agriculture, Nature and Food Quality. General tasks of EGL are funded by the Ministry of Education, Culture and Science and the Ministry of Economic Affairs. Thus EGL has to serve various 'masters' and consequently has to report to each of these separately. For some programmes such as the Marie Curie programmes, EGL works together with the Research Council NWO to manage the support actions. The NL Innovation Agency or Dutch Research Council have no office in Brussels.

Today the **Swedish** international R&D collaboration support system has a central core coordinated by Vinnova and eight other organisations that fulfil a support role: the Swedish Research Council Formas (Environment & Bio), Swedish Energy Agency, Swedish Civil Contingencies Agency (crisis

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<sup>22</sup> *ibid.*

<sup>23</sup> <http://www.fp7ireland.com/Page.aspx?SP=216>

management), Environmental Protection Agency, Swedish Defence Research Agency, Swedish Radiation Safety Authority, Swedish Agency for Economic and Regional Growth and the Swedish Research Council. While Vinnova does most of the first line support work, the representatives of the Agencies provide expertise from their fields, for instance to brief the programme delegates from the Ministries. VINNOVA has the national responsibility for providing information and advice on EU's Framework Programme for Research and Technical Development, is the national co-ordinator (NCC) for [COST](#), is the Swedish co-ordinator for both [EUREKA](#) and [Eurostars](#) and runs the national EUREKA office. In general the Vinnova NCP's are the primary contacts for the potential participants, the Agency members are secondary contacts. The Swedish programme delegates (PD) are officials from the Swedish ministries.

**Switzerland** has established a support structure under the brand of 'Euresearch'. Euresearch is organised under the legal form of an association.<sup>24</sup> Euresearch is quite a young support structure. It has been delivering support for the FP and COST since 2001<sup>25</sup> and was enacted in the current form as an association in 2004.<sup>26</sup> At the operational level, the outstanding feature of the Euresearch support structure is its organisation as a network. The organisational mode combines elements of centralisation and decentralisation. Services are provided at three geographical levels:

- **Head office:** The central component is the head office located in Berne. The head office assembles all national contact points (NCPs) in one place and provides important services centrally (such as the website/intranet, customer relation management, etc.). The NCPs are the experts for detailed questions and advice on COST and FP7. The head office hosts as well the innovation part of the EEN.
- **Regional offices:** The regional offices act as regional contact points (RCPs). For well-defined geographic areas, regional offices are to act as a first drop-in centre for advice and information for researchers. There are currently ten such regional offices.
- **SwissCore:** SwissCore is the third element of the Swiss support structure. It is the Swiss contact office of the Swiss National Science Foundation for all matters related to European research and innovation in Brussels. SwissCore offers its services also to the network Euresearch.

The following table shows the key components of the support structures in the reviewed countries.

Table 5: Overview of support structures in selected countries

|             | Mandate comes mostly from one Ministry | Mandate comes from multiple Ministries | NCP mostly centralised in one organisation | Distributed network | NCP does FP | NCP does COST | NCP does Eureka |
|-------------|--|--|--|---------------------|-------------|---------------|-----------------|
| Austria     |  | X                                      | X  | (x)                 | X           | -             | X               |
| Czech R     | X                                      |  | X  | (x)                 | X           | -             | -               |
| Finland     |  | X                                      |  | X                   | X           | X             | X               |
| Ireland     |  | X                                      |  | X                   | X           |               | (x)             |
| Netherlands |  | X                                      | X  |                     | X           |               | X               |
| Sweden      |  | X                                      |  | X                   | X           | X             | X               |
| Switzerland |  | X                                      |  | X                   | X           | X             | -               |

The table shows that in other countries, different from the Czech Republic, the main support organisation (NCP) works for more than one Ministry and receives a mandate and often funding from different policy domains and their related ministries. For instance in Austria FFG-EIP receives part of

<sup>24</sup> Interface, *Evaluation Euresearch – report to the hands of the State Secretariat for Education and Research SER*, 2010.

<sup>25</sup> Interface, *Evaluation Euresearch – report to the hands of the State Secretariat for Education and Research SER*, 2010.

<sup>26</sup> <http://www.euresearch.ch/index.php?id=300>, as of Nov, 19, 2010

their funding from six different ministries and in The Netherlands funding of the NCP comes from the various Ministries involved with science, innovation, agriculture, health, environment, transport, interior affairs and so on. The contacts (e.g. support of the NCP of PC delegates) and accountability is also organised by ministry.

In the Czech Republic this mandate and contact is concentrated with the MEYS, the Ministry of Education, Youth and Sports. Countries that have a distributed system have made a division of labour on the basis of the organisation's knowledge of the domain, their connection with the most relevant Ministry and/or their most natural link with the target group (e.g. academic researchers, companies). In Finland for instance the programmes that have a stronger academic research focus are dealt with by Academy Finland, while the programmes with a stronger business function are handled by the innovation agency Tekes. A similar divide can be found in Sweden and Ireland.

The Table also shows that (NCP) most tasks in the Czech Republic are coordinated by one core organisation, similar to Austria and The Netherlands. In many countries the support and information for COST and EUREKA are also handled by the same organisation that does the FP support. The Czech Republic differs from the examples as Eureka is handled first of all by a Ministry of Education, Youth and Sports that does not have the business sector as its core target group.

There are advantages and disadvantages of centralised support structures. The advantage of a centralised support system is that it is clear for the potential users (academic researchers, researchers from public research centres, small and large companies) where to go for help and support. All the information on the FP is kept in one organisation so it is easy for the counsellors to gather and find information within their organisation or refer customers to specialist colleagues. The disadvantage of a central organisation is that it is more difficult to have close interaction with domain related ministries and agencies who know the field very well and who have the direct relationship (e.g. through their delegate role in programmes) with the Commission services. In The Irish support system for instance the thematic NCPs, located at a domain related department or agency (e.g. the health research council), both have 'natural linkages' with the specialised target group and with the policy makers in this field. Thus the lines to policy making are more direct.

While a regionalised system has the advantage of proximity to customers who are not near to a capital city, if they are linked to specific universities or innovation centres there could be a bias in their user groups or even a conflict of interest if the organisation itself is also user of the FP. A clear mandate and targets (e.g. share of support given to actors outside the university) would be necessary. The Czech system has a strong core of NCP tasks gathered at TC ASCR which fulfil most of the support tasks. Two elements that would need rethinking in the Czech system are the fact that company oriented programmes such as large parts of Eureka are not managed by an organisation that has natural links with the business sector and the mandate and role of the 17 regional and contact centres. These two elements have not yet been reviewed by external evaluations.

### **Services and support measures provided in reviewed countries**

The services and support provided across the reviewed countries overall show similarities, i.e. each offer general information and awareness raising on the FP and its thematic areas and advice on specific calls.

In **Austria** FFG-EIP provides mailings, brochures etcetera for awareness raising, it organises events for awareness raising to group consultancy (in 2009 a good 100 events were organised or co-organised by FFG-EIP). One of the core activities of FFG-EIP is the provision of consulting services to potential applicants to the FPs and EUREKA. These could be long or short sessions, which includes proposal checks. In 2009 a good 4000 sessions were held with potential participants of which about a quarter to industry. In addition FFG-EIP provides grants for proposal preparation which varies whether proposers are coordinators or partners and whether they are from public research or from industry.

The services offered by the **Swiss** Euresearch to researchers are grouped into the two categories 'information and training' and 'advice and help'. Advice and help consist of a help line, idea check, partner search, project preparation and prescreening, advice on project management and help with contract negotiation and IPR.

In the distributed system in **Sweden** a range of services are provided to the potential participants. Financial support to write proposals is available from the various Swedish agencies. There is no central system, each agency has its own rules. The system typically helps SMEs in their proposal stage.

The **Irish NSN** provides a service to applicants by reviewing and giving advice on proposals, and offers general support in all stages of the lifecycle of a project. It also assists prospective participants who do not have prior experience of existing networks or EU projects to find suitable partners both nationally and across the EU.

The NSN network provides free of charge training (generic proposal writing and specific contract negotiations and project management). It outsources part of this training to specialised private sector consultancies. Only when some specific expertise is needed the will NCPs do part of the training session. NSN members – mostly the Brussels office - accompany coordinators when negotiating with the Commission.

The NSN has also extended and improved the range of financial supports on offer to Irish applicants. Researchers based in Irish companies, public research bodies and higher education institutions with an ambition to participate in any FP7 project are now eligible to receive financial assistance from Enterprise Ireland. These are grants that assist Irish potential participants to prepare a proposal. There are separate travel and subsistence grants available as well. The FP7 Feasibility Support Scheme is available to Enterprise Ireland clients (indigenous firms) and aims at financially assisting companies in preparing joint R&D proposals for submission to the EU.

In the distributed **Finnish** system support is more ad hoc. Both the Secretariat and the NCPs provide services and training. While there was a stronger need for practical advice at the start of FP7, today the need for advice is shifting towards more strategic questions: how to influence the work programmes, how to shape the agenda of FP8. It is the responsibility of each NCP to organize information events on each call in their era, at least two months after the call has opened. General two-day training session with information on how to write good proposals, contracts, how to make budgets and so on, are provided by the Secretariat. This has up to now been mostly done on an ad-hoc basis when there has been demand for it. The Secretariat is shortly moving to a more systematic approach – following the Austrian example – of organising these training sessions throughout the year with fixed dates. Most of the support is given ad-hoc based on bilateral relations between NCPs and the customers; this can be help with partner search or with understanding the programme.

EG Liaison in **The Netherlands** offers a number of services to researchers from the public and private sector interested in certain aspects of the Framework Programme. On offer are:

- Information events mostly connected to specific thematic calls
- Training sessions with different theme (e.g. project management, legal and finance training). In 2009 22 training sessions were held
  - Partner search
  - Publications of which the annual overview on how the Netherlands scored in the FPs by thematic area is the major publication
  - Knowledge mapping, i.e. an analysis of one multi-user organisation (e.g. a university) on the achievements/patterns of their FP actions (e.g. proposals submitted per thematic area, success rates, ..)

Thus the basic package of services is quite similar in all reviewed countries including the Czech Republic. The largest difference however relates to the provision of financial incentives for EU proposal writing or not. This is only provided in Austria, the Czech Republic, Ireland and sporadically in Sweden. The Czech Republic is the only country that also provides co-funding for taking part in FP7 and the VAT support. Given the ‘catching up’ that Czech partners have to do, there is a merit to having such support schemes. External evaluation should however establish whether these grants really make a difference for the Czech participants. The Austrian FP evaluation showed for instance that there is quite a share of ‘free riders’, i.e. organisations using the grant for applying to the FP, while they would have put in a proposal anyway without the grant. The table below summarises the availability of different kinds of FP support in the different countries.

Table 6: Availability of FP and international cooperation support services

|             | General<br>Advice<br>and<br>Info | Training<br>events | One-<br>on-one<br>propos<br>al checks<br><br>and<br>advice | Funding<br>of<br>propos<br>al<br>prepara<br>tion | Funding<br>for<br>researc<br>h costs |
|-------------|----------------------------------|--------------------|--|--|--------------------------------------|
| Austria     | X                                | X                  | X  | X  | -                                    |
| Czech R     | X                                | X                  | X  | X  | X                                    |
| Finland     | X                                | (x)                | X  | -  | -                                    |
| Ireland     | X                                | X                  | X  | X  | -                                    |
| Netherlands | X                                | X                  | X  | -  | -                                    |
| Sweden      | X                                | (x)                | (x)  | (x)  | -                                    |
| Switzerland | X                                | X                  | X  | -  | -                                    |

X= available, (x) is available on an ad hoc basis or small scale

#### 7.4 Summary and conclusion

The importance of the European level, especially the Framework Programme, for the Czech research system cannot be over-estimated: it provides

- (1) the crucial opportunity for international collaboration – with all its benefits for knowledge generation, further networking, market entry etc.,
- (2) a large portion of funds for project funded research activities per se and in doing so,
- (3) a further crucial element of competition and peer review based research funding more generally.

The Czech Republic has been one of the leaders of all New Member States in terms of absolute participation and relative success, and the success rate of projects with Czech participation increased in the last 2 Framework Programmes. Interestingly, however, despite a rather high level of support for the system and the applicants, the overall mobilisation is not particularly strong compared to other NMS countries, the participation per capita has *not* increased from FP6 to FP7, and the relative number of coordinators is low compared to other new Member State countries.

Besides the general mobilisation issue, there also appears a challenge in terms of excellence and leadership within the FP. The relative number of coordinators in successful projects is very low indeed and the success rate of researchers from the Czech Republic is considerably lower than for all comparators except for SK. Worryingly in terms of the broader internationalisation theme of this work package, there is very poor participation in the FP schemes that allow for extra-European collaboration, such as INCO and SICA.

On the operational level, the support system within the Czech Republic is elaborate. In contrast to other countries, the governance of the support structure is centralised in one Ministry, which facilitates coordination with NCP and other actors, but could hamper a coordination with other ministries who have a remit in research funding. The Czech support system offers the broadest range of support out of all comparator countries, especially the co-funding for participating in FP7 and the VAT refund stick out here. Interestingly, while the co-funding is declared of utmost importance by research organisations, some of the funds available (e.g. the proposal support) are taken up rather poorly due to low awareness and a set of eligibility restrictions. As abovementioned this type of support has been ceased recently. An in-depth evaluation of those various funding schemes would be important to establish a clearer argument for the added value of all the co-funding measures beyond the interview assessment of organisations that it is important.

In terms of purely monetary return on investment, the Czech Republic does not quite get a 100% retour. However, even if the country should strive for more success and higher return, for a country still trying to establish itself at the forefront of European research, this investment appears to be more

than worthwhile. Despite the broad support for applicants and participants, our interviews have confirmed the findings of the earlier evaluation of FP7, which is that national and institutional strategies in terms of promoting FP participation are still missing. In light of the overall importance and added benefits of the FP, such concerted strategies across ministries and funding agencies and within research organisations are called for now.

## 8. Conclusions and Recommendations

This document is the final report of working package (g), which has explored the international activity of the research community (organisations and individuals) and the relevant ministries and funding agencies. In this report we have sought to analyse the level and breadth of international activity, establish some understanding of the benefits and pitfalls of internationalisation in research and shed some light on framework conditions and governance issues around internationalisation of research and research funding.

### *International collaboration involving Czech Republic researchers*

Both our bibliometric analysis and our survey of researchers show that Czech international R&D collaboration is strongly European (four-fifths of the Czech Republic's international collaboration papers are with European countries although the US is also a major collaborator). Internationally co-authored publications are generally of higher citation quality than purely domestic authored papers.

Bibliometrics suggest that international R&D collaboration is greatest in the fields of physics and material science, chemistry and chemical engineering, basic life sciences, clinical medicine, biomedical sciences and biological sciences. International collaboration in a number of social science disciplines appears to be rather weak compared to this subject group's national significance. Co-authorship is dominated by two institutions, the Academy of Sciences of the Czech Republic (ASCR) and Charles University (UK), whilst other Czech research institutions collaborate less than their national ranking would suggest.

Our researcher survey respondents reported that the motivation to internationalise, in general terms, is to enlarge networks and to pursue personal research agendas, leading to a better publication profile. The assessment of the performance of Czech research in other parts of this Audit confirms that in the view of especially 'hard' scientists publication in international, peer reviewed, high impact factor, English language journals is the 'gold-standard' that defines quality. Thus internationalisation is strongly driven by the motivation to adhere to this quality standard. The bottom-up international activity of Czech researchers is likely to continue to grow organically. Younger researchers coming through are more likely to be exposed to internationalisation as an integral part of research and those researchers are likely to collaborate internationally as long as they are suitably supported/enabled to do so.

### *Support for international collaboration by research institutions*

International collaboration and international mobility are increasingly accepted as necessary to ensure the excellence of Czech research. However, less than 40% of all organisations have an explicit internationalisation strategy (although half plan to have one in the next three years). ASCR institutes are slightly less likely to have an explicit strategy and dedicated budgets – possibly because they feel that this is taken care of at the higher level. In the review of research management as part of this Czech audit, it is concluded that the research system suffers from fragmentation and that research groups tend to be small. This also has its impacts on internationalisation strategies and collaboration activities in the research organisations. The small size of the research groups and the lack of 'institutional intelligence' due to low levels of basic institutional funding, have prevented the development of a more strategic approach to international collaboration. This can also explain the relatively low number of Czech coordinators in EU Framework Programmes, as it requires institutional administrative support to play such a role. The small group size also means that there is not the flexibility required for people to be mobile.

There is increasing use of international peer review, for instance in the periodic reviews of ASCR institutes. Vacancies in leading institutes (and some leading university departments) are increasingly open to international competition and we did find evidence that the international collaboration profile of applicants is considered, if not always systematically.



The vast majority of organisations (that responded to our survey of directors) report that fewer than 10% of their staff are from outside the Czech Republic. Again, respondents report a strong interest in increasing this proportion and in moving towards much greater use of international competition for posts. The international activities in organisations are clearly driven by human resource considerations, i.e. to increase the attractiveness for Czech researchers and – more important in the future – to recruit international talent. However, as other parts of this Czech audit show, there is little awareness of human resource issues and academic career planning in the research system. This has led in general to a low level of mobility and a predominantly inward oriented system of recruitment and career development within the groups. This general pattern is of course not very conducive to recruitment of foreign researchers in the small research groups.

In the past the Czech Republic may have been a convenient “stopping off” point for researchers from Eastern Europe and the Former Soviet Union countries heading further West. Not surprisingly there is still much bottom-up research interaction with (and mobility from) these countries. However the Czech Republic appears to be becoming a destination of choice in itself for these researchers, and researchers increasingly come from a wider range of countries.

### *Support for international collaboration at the policy level*

The majority of Czech researchers feel that their organisations recognise international activities and support them. However, given that these researchers foresee a future increase in the level of collaboration, there is a policy and support gap here. Moreover, researchers responding to our survey regarded the integration of foreign actors in national programmes as poor. Interestingly, whilst international institutions (especially the EU) are also important sponsors of international publications, our finding suggest that Czech sources predominantly fund international collaboration. This suggests that there is a real opportunity for policy action to influence the direction and nature of future Czech international R&D collaboration. As previous paragraphs show the ability to become more active in international R&D collaboration is hampered by a number of structural issues in the research system such as fragmentation and a funding system that allows for little institutional build up at universities and research centres. Support for international R&D collaboration therefore should not considered as a ‘stand-alone’ issue to be tackled, but as an integral part of a restructuring of the Czech research (funding) system.

Policy for R&D internationalisation is in hands of a number of ministries and agencies. However the key actor is the Ministry of Education, Youth and Sports (MEYS). This Ministry is responsible for policy formulation, strategy development and the implementation of almost all programmes for international R&D cooperation including those for industry. The political importance of international R&D cooperation has grown considerably in the last years and national budgets have increased, but there is relatively little systematic monitoring of internationalisation with the exception of FP participation, financial return and impact.

The most dramatic success story in recent years is probably that of infrastructure. The Czech Republic has worked to shift the emphasis in research infrastructure planning eastwards towards the new member states, and has successfully mobilised structural funds to support the development of an Extreme Light Infrastructure presence in the Czech Republic.

The importance of the European level, especially the Framework Programme, for the Czech research system cannot be over-estimated. The Czech Republic has been a leader amongst the New Member States in terms of absolute participation and relative success. However, despite a high level of support, the overall mobilisation is not particularly strong compared to other NMS countries, participation per capita has not increased from FP6 to FP7, and the relative number of coordinators is low compared to other new Member State countries. The character of European research funding is changing, even more so with Horizon 2020. There will be increasing emphasis on problem oriented research (addressing grand challenges) that requires multidisciplinary approaches and collaborations with the private sector. The audit concludes that the Czech research system has a reluctance to do interdisciplinary or application-oriented research and that industry-academia linkages are weak. That means that if these issues are not addressed, the line up of the Czech system with the European networks will be increasingly difficult.

## Strategic Recommendations

Most internationalisation is bottom-up, driven by the motivations of individual researchers rather than driven by top-down strategies of Ministries, funding agencies or research organisations, and this will remain the case. Indeed bottom-up motivations to collaborate and internationalise will only get stronger. However, bottom up internationalisation can be facilitated or constrained by different policy choices and institutional strategies. Our surveys and interviews suggested strongly that researchers recognise the benefits of internationalisation but that longstanding barriers relating to culture but also structure and incentives remain. The inward mobility of foreign researchers for visits or to take up positions is limited by the funds available. The lack of openness of national grant programmes to foreign participants can be a barrier. There seems to remain a perception amongst many researchers that national funding is 'easier' to obtain than EU funding. This may be compounded by the persistent barriers to closer co-operation between the university and institute sectors.

A further challenge that policy makers need to consider is how best to improve the co-ordination between the various Ministries and Agencies from different policy domains as regards internationalisation. On the one hand there are highly formal divisions of responsibilities and formal arrangements for co-ordination of programmes and on the other interpersonal relationships. Co-ordination and mutual understanding of broader policy goals could usefully be improved between these two poles, however.

Czech policy towards research internationalisation has evolved in recent years and there are some striking successes. However, much remains to be done in terms of improving co-ordination and addressing those deep-seated barriers which remain at the individual, organisational and systemic levels. It was suggested to us that whilst there is now good programme co-ordination through the RDI Council, the broader goals, strategies and ideas behind the programmes still do not appear to be co-ordinated. We believe that an important step in addressing such barriers would be the development of an explicit and high profile national RTI internationalisation strategy based on extensive consultation with researchers and research performing organisations, and drawing in and embedding policy makers from a range of policy domains (not just the traditional RTI arena but including policy areas such as education, economics and industry policy, diplomacy and foreign policy).

Such a strategy would consider not just EU FP funding and international facilities but also bilateral cooperation with EU and non-EU countries, a stronger engagement in and support for novel international coordination schemes (ERA-NET, JTI), the use of R&D as an element to attract foreign direct investment, as well as help for Czech companies to better link with RTI partners around the world. The strategy could address the current poor Czech participation in those FP schemes that allow for extra-European collaboration, such as INCO and SICA.

By collectively agreeing an explicit high level strategy, Czech policy makers would improve the governance and co-ordination of the international dimension of research but would also encourage Czech research organisations (ASCR institutes, university departments but also other kinds of centres and sites for research including competence centres and science parks) to develop their own explicit internationalisation strategies and to continue to build up support for international collaboration, mobility and networking.

As part of any strategy making process, we recommend that Czech policy makers consider seriously the benefits in terms of increased international cooperation that could come from opening up national research programmes and organisations and from removing possible barriers for foreign partners and individual research to work with Czech partners or to locate in the Czech Republic.

Finally, the Czech support system for EU FP participation is extensive, and seems to be valued by beneficiaries. However its impacts and wider systemic effects are unclear. An in-depth evaluation of those various funding schemes would be important to establish a clearer argument for the added value of all the co-funding measures.

Thus summarising our recommendations are:

- A comprehensive national strategy for international R&D collaboration, for instance led by the R&D&I Council, should be developed and implemented.
- Any strategy should set out overall expectations as regards scope and purposes of internationalisation and its linkages to national programmes and activities. It should also involve an explicit rationale for engaging in the various (new) forms of inter-national coordination and programmes especially at EU level.
- As part of that overall strategy, Czech research organisations should be encouraged and empowered to develop their own institutional R&D internationalisation strategies
- Formal and de facto blocks to recruitment of foreigners should be removed or reduced, such as the requirement for most university teaching to be done in the Czech language
- FP- support structures in the CR should, in addition to providing information and coaching to individual researchers and applicants, help with the strategic preparation of institutions, organisations and ‘domain platforms’ to interact with European networks that have an important role in defining the European research agendas
- As part of a more general national human resource strategy for the research sector, international experience and mobility should become an important element of the recruitment, career development and incentive policies
- An in-depth evaluation of the package of funding schemes would be important to establish a clearer argument for the added value of all the co-funding measures.

## Appendix A : Bibliometric analysis

### A.1 Introduction

This appendix discusses the bibliometric analysis for Wp(g): International Cooperation in R&D.

The analysis presented draws on a dataset of more than 85,600 journal article records from the Web of Science published between 1980 and mid-2010 with at least one author from the Czech Republic or the Czech part of the former Czechoslovakia. Our analysis covers science, social sciences, and arts and humanities. About two-fifths of the records (about 34,000 papers) comprise internationally-collaborated publications with at least one Czech co-author. This provides a large evidence base for the bibliometric exploration of Czech international R&D cooperation patterns.

In the paragraphs below we first outline the objectives of Wp(g) and the issues to be covered in the bibliometric analysis in this work package as presented in the proposal document. This is followed by details of the bibliometric search strategy and database development.

Subsequently we report on the major results of the analysis and present our conclusions.

#### A.1.1 Scope of the Bibliometric Analysis

Under work package Wp(g), the bibliometric analysis of scientific publication records seeks to analyse:

1. Patterns of international co-publication of CZ researchers - who publishes with whom and in what fields;
2. Changing patterns of international co-authorship over time (since 1980s to present; key break points will be to probe: international co-publication in the COMECON period (pre 1989) period of transformation pre-EU membership (1990-2003); post EU membership 2004 onwards); and current era of knowledge globalisation, including changes in distributions of countries and engagement with “rising” countries (e.g. in Asia) as well as traditional N America and European partners; and by seniority (years in publishing) profile of researchers
3. Leading institutions and research groups in CZ engaged in international collaborative research
4. Rising and falling technical fields (by ISI subject categories) engaged in international collaborative research
5. Quality and impact of CZ international collaborative research (using citations, journal impact placement, other measures)
6. Recent funding trends, using funding source data where available in publication records (which should give an indication of the varied domestic and international funding sources accessed by CZ researchers engaged in international collaborations)
7. Selected comparison of CZ international co-research publication profiles with those of benchmark countries (Hungary and Austria)

#### A.1.2 Bibliometric Database Development

This section summarizes the bibliometric search strategy used to identify, clean, and organize the publication records used in the analysis of Czech international cooperation in R&D.

#### **Data Source and Specification**

The data for the bibliometric analysis is derived from publication records listed in Thomson Reuters Web of Science (WoS). More than 10,000 journals published worldwide are indexed in the WoS, with coverage in the sciences, social sciences, arts, and humanities. The WoS indexes a variety of publication types, including journal articles, proceedings, reviews, abstracts and editorial materials.

In the analysis of Czech international cooperation in R&D, we focus on journal articles (which comprise the majority of all indexed records in the WoS). We accessed and downloaded all articles with a least one Czech Republic or Czechoslovak author listed in the three WoS databases SCI-EXPANDED, SSCI and A&HCI for the period 1980-2010. SCI-EXPANDED covers science; SSCI

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covers social science; and A&HCI covers arts and humanities. For 2010, there is a partial year (data was downloaded in August 2010/September 2010). The search terms “Czech Republic” and “Czechoslovakia” are used for publications after 1993 and before 1993 respectively, as depicted in Table 1. For the period 1993 – 1995, we also searched for “Czechoslovakia” since articles with this country address continued to appear in publications for a period after the dissolution of Czechoslovakia in January 1993.

Figure 32: Data Search Queries

| Search Term                                | Years     | Databases                      | Type         |
|--|-----------|--------------------------------|--------------|
| CU=(CZECH REPUBLIC)                        | 1993-2010 | SCI-EXPANDED +<br>SSCI + A&HCI | Article Only |
| CU=(Czechoslovakia)                        | 1993-1995 | SCI-EXPANDED +<br>SSCI + A&HCI | Article Only |
| CU=(Czechoslovakia) OR CU=(Czech Republic) | 1980-1992 | SCI-EXPANDED +<br>SSCI + A&HCI | Article Only |

### Data Cleaning

The WoS data records were downloaded and imported into VantagePoint text mining software. VantagePoint is used for data cleaning and analysis. We removed several non-vital record fields to reduce the file size. A critical step in the cleaning process was the consolidation of records published by authors within the boundaries of the present Czech Republic. This involved identifying and removing records *only* associated with authors from the Slovakian part of the former Czechoslovakia.

Initially the database consisted of 142,038 records of published articles. This initial data included records that did not have a Czech Republic address but were captured because they had authors from the Slovakian part of Czechoslovakia. To remove such records, all publications giving the country address as Czechoslovakia were checked against the record’s city address information. A list of major Czech and Slovakian cities within Czechoslovakia was compiled and used to identify Czech authors with Czechoslovakia address. After removing Slovakian publications (with no Czech Republic co-authors), the resulting dataset comprised 85,635 records.

We also undertook data cleaning to standardize institutional affiliations, funding organisations, and country names. Assistance with standardizing Czech Republic organisation names was provided by Lucie Vavrikova of Technology Centre. Several fields such as author country affiliations, publication years, funding organisations and subject categories are further processed to form groups within them. For publication years, as outlined in the proposal, we identified three major phases: COMECON Era (1980-1989), Transformation Era (1990-2003) and Post-EU Membership Era (2004-2010). For funding organisations, the major groups are international sponsors (such as the European Union), Czech sponsors, and other national sponsors. For subject categories, the 34 groupings used by the WP(d) are employed to ensure consistency. For author country affiliations, we identify these major groupings: Europe-CZ, EU10-CZ, EU17, EU17+EFTA, EU27-CZ, Eastern Bloc, North America, Asia, South and Central America and the Caribbean, Middle East, and Africa. Not all of these groupings are reported in the report.

In a final stage of data cleaning, the dataset is divided into two sub-datasets. The first sub-dataset is called “Non-Internationally Collaborated Publications (NCP)” which only includes the publications authored by Czech addressed authors while the second dataset, “Internationally Collaborated Publications (ICP)” includes publications that has at least one non-Czech addressed author. The former sub-dataset, NCP, makes up 51,605 or about three-fifths of the records, while the ICP comprises 34,030 or about two-fifths.

### Comparison Countries

Some of the selected issues discussed in this report have also been investigated for Austria and Hungary for comparison. As data compilation and cleaning is extremely time consuming, more aggregate measures were employed for this analysis so that we could focus on the more important issues related to the Czech Republic only. Therefore, the scope of the data is slightly different for this analysis than rest of the report. We have included all the English language publications in the form of articles published between 2000 and 2009 for this analysis.

## A.2 Results

### A.2.1 Patterns of international co-publication of CZ researchers

For the period 1980 through to mid-2010, we identified 85,635 Web of Science papers with at least one Czech author. Of these, 34,030 papers - or about 40% - were internationally collaborated with authors from other countries, with 51,605 papers – about 60% - domestically co-authored (with all Czech authors).

Around 80% of the internationally collaborated publications (ICP) have at least one wider European co-author while almost 90% of these European co-authors are mainly from EU27 countries other than Czech Republic (72.1% of the total) as depicted in Figure 33 authors represents one-fifth of the total. North American (mostly US) researchers are co-authors for about one-quarter of ICP papers while only one-fifth has Asian co-authors. Less than 4% of the Czech ICP papers had co-authors from the Middle East, Africa, and South and Central America and the Caribbean.

According to Figure 34 which shows the top 20 countries where the co-authors of Czech authored publications belong to, almost a quarter of the publication have a co-author who has a Germany address. The second largest country in this figure is the US which makes up 22% of all publications. They are followed by France and the UK, with 15% and 14% of the publications respectively. Slovakian and Italian addressed co-authors are also found about 10% of the internationally co-authored publications. Russia, Poland, Netherlands and Sweden are also amongst the top 10 countries with whom Czech authored scientists co-published.

Figure 33: Czech International Co-authorship Pattern by Regions (country address of authors, grouped by regions, regions are not mutually exclusive)

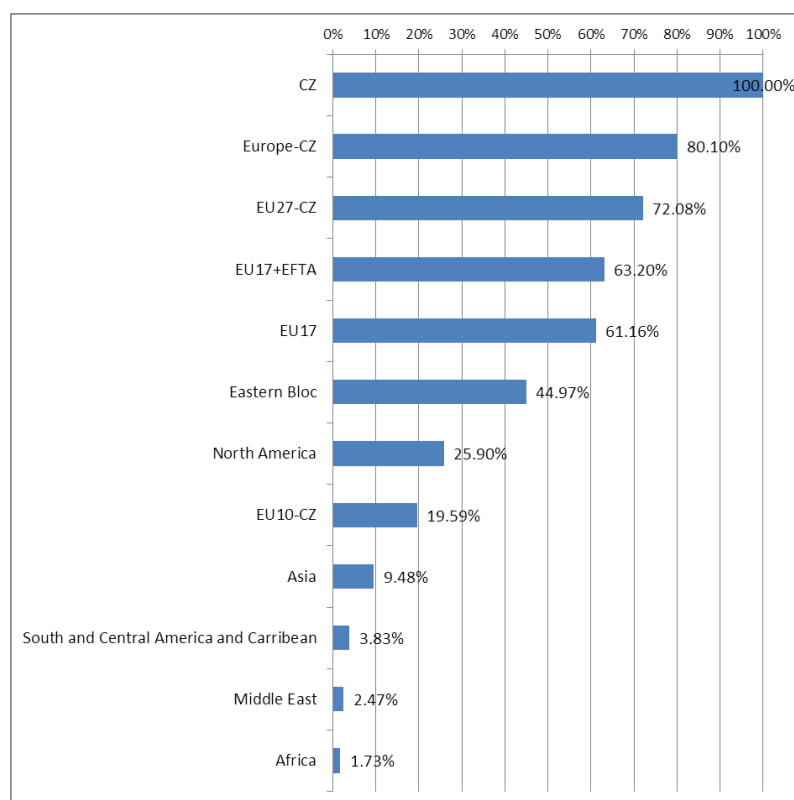


Figure 34: Czech International Co-authorship Pattern by Top 20 Countries (country address of authors)

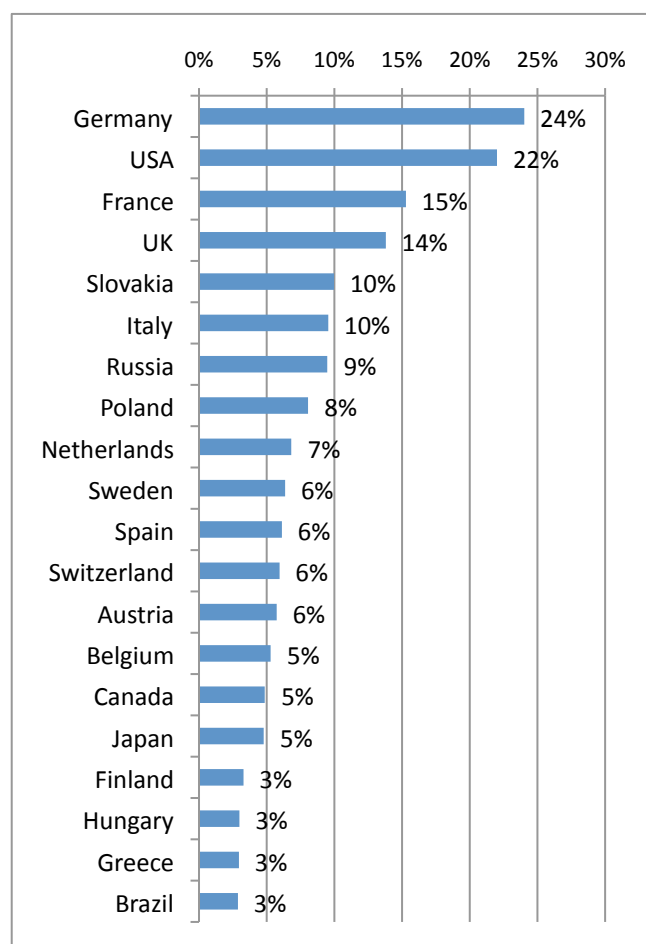
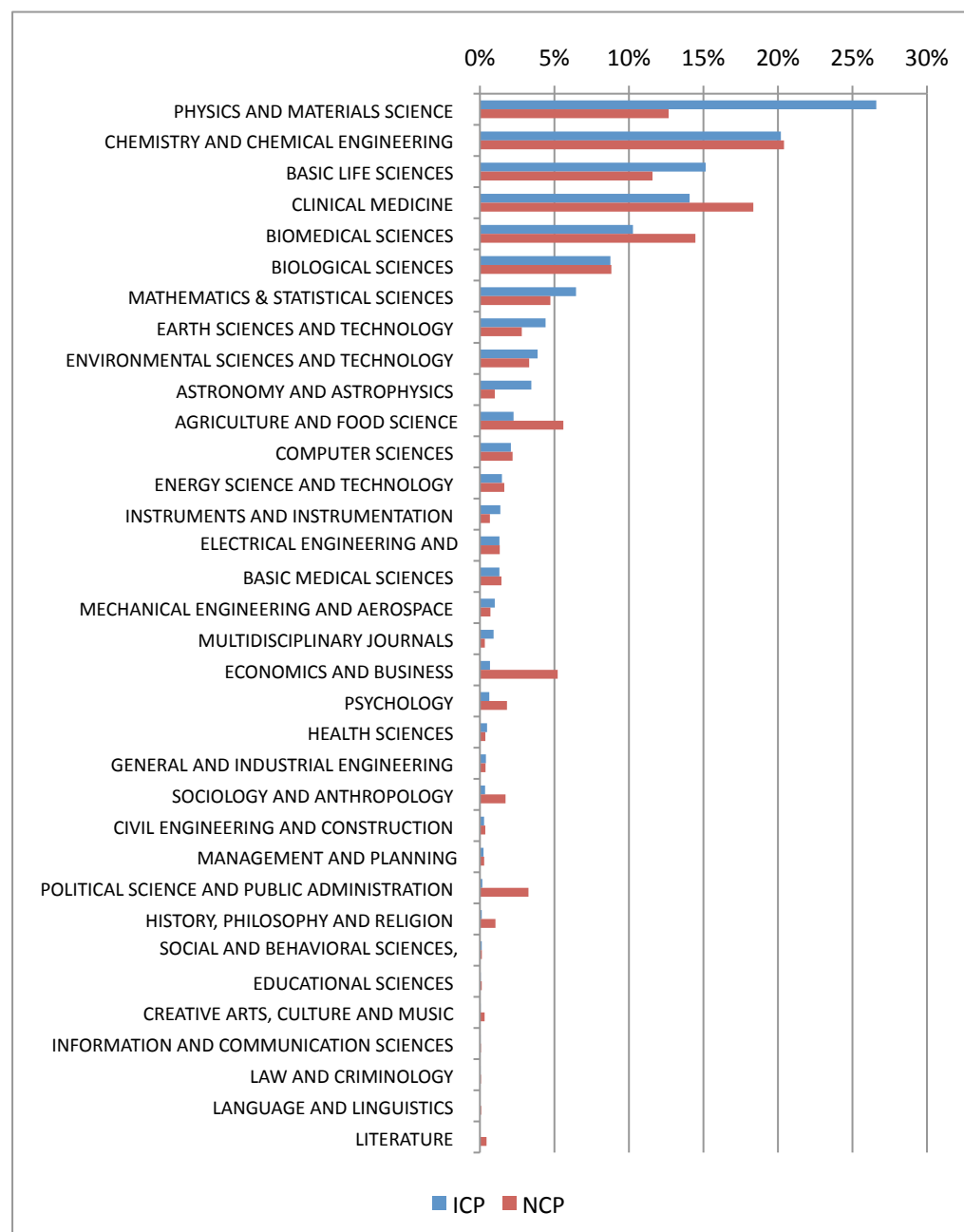


Figure 35 shows the relative importance of the subject categories of the ICP and NCP. It is evident that Physics and Material Science publications are almost two times more important in international publications than non-international publications as their shares are around 26% and 13%, respectively. Other similar areas whose importance is higher in ICP include basic life sciences, mathematics and statistical sciences, earth sciences and technology, and astronomy and astrophysics. On the hand, the share of clinical medicine, biomedical sciences, agriculture and food sciences and a group of social sciences including economics and business, political science, sociology and psychology have higher share in NCP than in ICP. The difference in economics and business publications is remarkable as this subject's relative importance changed by almost ten-fold.

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Figure 35: Comparison of ICP and NCP according to Subject Categories (share of scientific disciplines within publications written by only Czech addressed authors (NCP) and internationally collaborated publications (ICP))



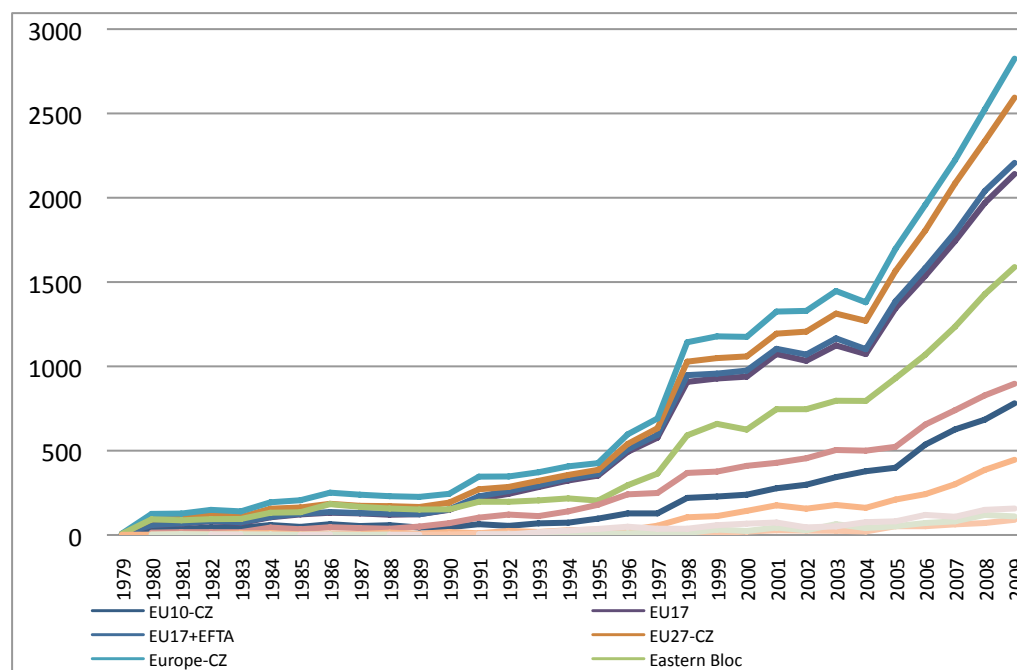


### A.2.2 Changing patterns of international co-authorship over time

Figure 36 shows that international scientific publications have increased steadily by time from 1980 to 2010. Increase in the number of co-publications with all different country groups is steady until early 1990s while after 1990, there are three spikes in the pace of increase. Especially the spike in the pace starting around 1997 is noteworthy as in three years period number of publications increased almost by 50%. The increase experienced in 1990s partially saturated in the first half of 2000s where there is a low climbing plateau until 2004. Finally, 2004 marks the beginning of the unprecedented increase in the number of international co-publications in the Czech Republic. One potential bias in this picture against earlier years is that it is highly likely that some of the journals located in the Czech Republic/Czechoslovakia might have not been included in the ISI-WoS database and some of the increase can be attributed to the increase in the coverage of ISI-WoS by time. However, in any case, the trends discussed above are strong and the main conclusions laid in should be true.

Figure 37 and Figure 38 are other representations of the changing patterns over time. In this case, publications are grouped into the three main timeframes: COMECON Era (1980-1989), Transformation Era (1990-2003) and Post-EU Membership Era (2004-2010). The figures are also normalised by taking yearly average within the respective era to allow an easy comparison. These figures depict the accelerating increase in the number of publications as the eras advance. There is a relative increase in the number of international collaborations with the regions that have less collaboration with Czech scientists (i.e. Asia, South and Central America and Caribbean, Middle East, Africa) is more than the other regions that have already had stronger links. This means that the breadth of international scientific cooperation is also increasing.

Figure 36: Change of international Co-authorship by Year (country address of authors of ICP, grouped by regions and years, regions are not mutually exclusive)



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Figure 37: Change of international Co-authorship by Era (country address of authors of ICP, grouped by regions and eras, regions are not mutually exclusive, normalised to yearly average)

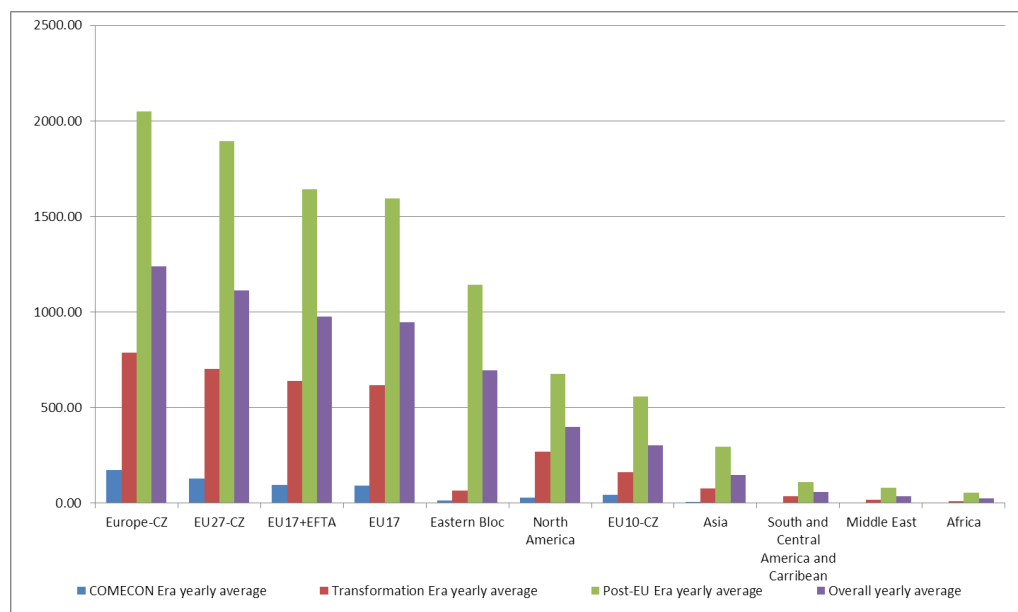
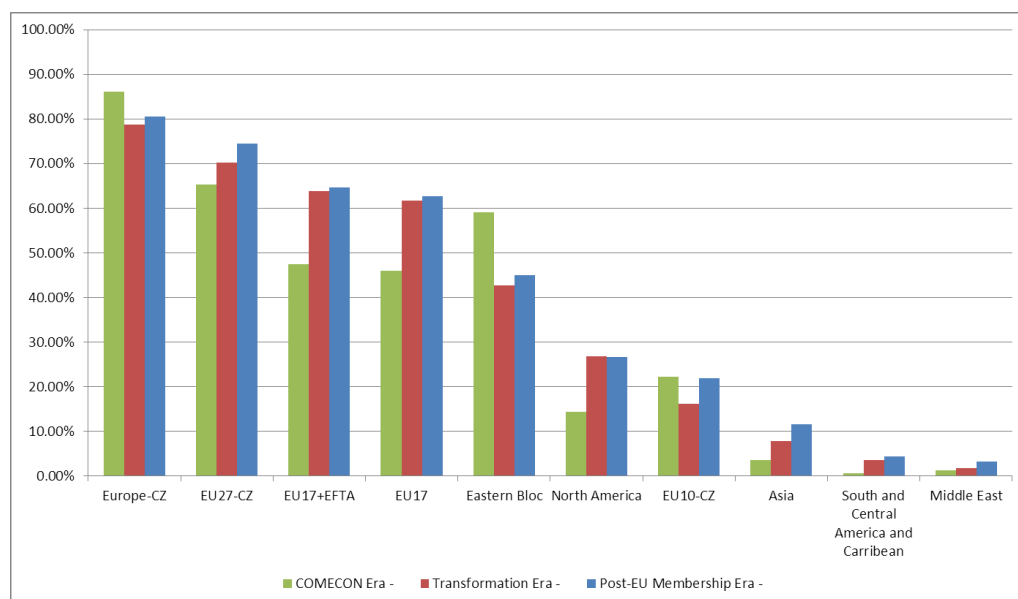


Figure 38: Change in the Pattern of Collaboration by Regions and Eras (country address of authors of ICP as percentage of total number of publications, grouped by regions and era, regions are not mutually exclusive)



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#### A.2.3 Leading Czech and international institutions for collaborative research

The Academy of Science of the Czech Republic (ASCR) leads the NCP list (39% or all NCP), but is even more dominant (51%) in international collaborated publications (Table 7). The second and third institutions in ICP, Charles University (UK) and Masaryk University (MU), are also in the same position in NCP and their relative shares are roughly equal in both sub-datasets. Similarly, CVUT, UPOL, VŠCHT and JCU appear in both top 10 lists with similar shares. CZU and UP appears in NCP top 10 list, but rank less highly in ICP. The two leading institutions, ASCR and UK, contribute to nearly four-fifths of Czech internationally contributed publications.

The leading foreign institutions collaborating with the Czech Republic include the Slovak Academy of Science, the Joint Institute of Nuclear Research (Russia) and CNRS (France) (see Table 8).

Table 7: Top 10 Czech institutions for NCP and ICP

| Internationally Collaborated Publications (ICP) |           |                   | Non-Internationally Collaborated Publications (NCP) |           |                   |
|---|-----------|-------------------|---|-----------|-------------------|
| Author Affiliations                             | # Records | Percentage of ICP | Author Affiliations                                 | # Records | Percentage of NCP |
| ASCR  | 17242     | 51%               | ASCR  | 19965     | 39%               |
| UK  | 9267      | 27%               | UK  | 13425     | 26%               |
| MU  | 2139      | 6%                | MU  | 3546      | 7%                |
| CVUT  | 1354      | 4%                | VŠCHT   | 3174      | 6%                |
| UPOL  | 1184      | 3%                | UPOL  | 2171      | 4%                |
| VŠCHT   | 1087      | 3%                | CVUT  | 1421      | 3%                |
| JCU   | 1004      | 3%                | JCU   | 1407      | 3%                |
| UP  | 477       | 1%                | VFU   | 1134      | 2%                |
| SZÚ   | 420       | 1%                | CZU   | 1133      | 2%                |
| IKEM  | 376       | 1%                | UP  | 1047      | 2%                |

Table 8: Top 10 Non-Czech institutions for ICP, collaborating with the CR

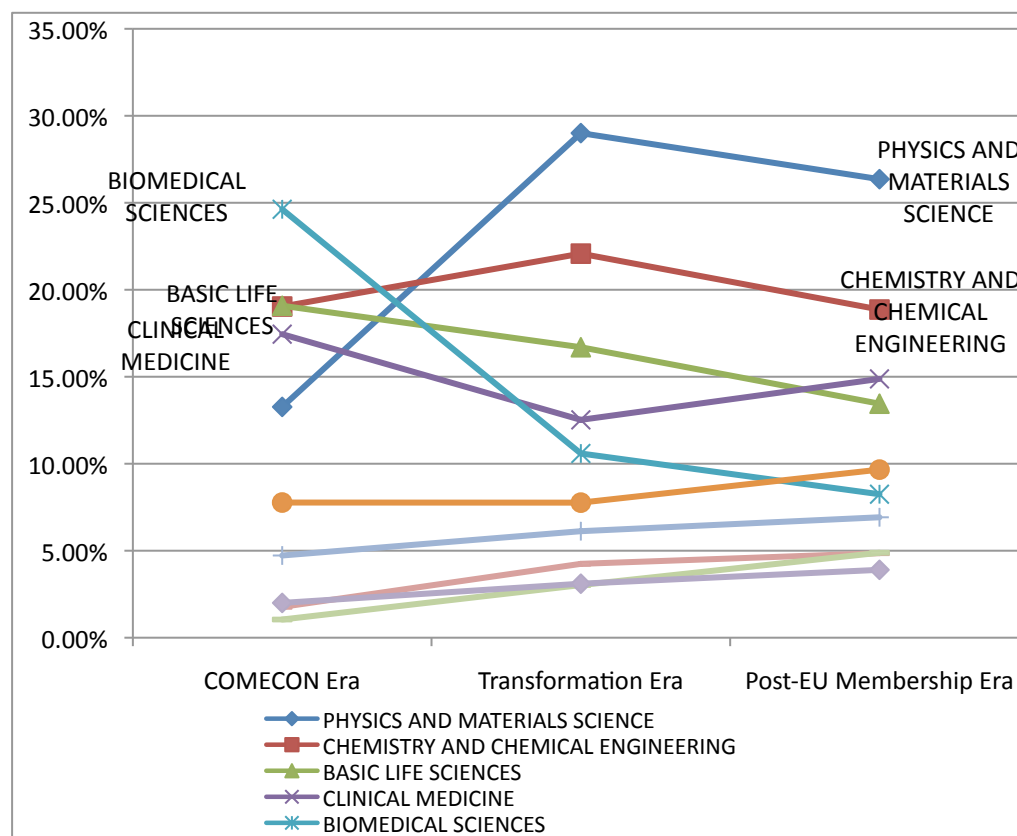
| Author Affiliations | # Records | Percentage of ICP |
|---------------------|-----------|-------------------|
| SLOVAK ACAD SCI     | 1388      | 4%                |
| JOINT INST NUCL RES | 1061      | 3%                |
| CNRS                | 976       | 3%                |
| UNIV PARIS 06       | 931       | 3%                |
| LUND UNIV           | 843       | 2%                |
| UNIV PARIS 07       | 823       | 2%                |
| COMENIUS UNIV       | 729       | 2%                |
| UNIV LANCASTER      | 715       | 2%                |
| UNIV PARIS 11       | 697       | 2%                |
| UNIV GRENOBLE 1     | 678       | 2%                |

#### A.2.4 Rising and falling technical fields engaged in international collaborative research

Figure 39 shows the relative importance of top 10 subject categories of international collaborative publications in different eras.

The most visible result in Figure 39 is that the relative importance of physics and material science increased from about 13% in the COMECON era to around 26% in the Post-EU Era. While areas like basic life sciences, clinical medicine, biomedical sciences have declined in relative importance and chemistry and chemical engineering have not increased its relative importance, all the other fields' relative importance have risen steadily at the expense of these areas that declined.

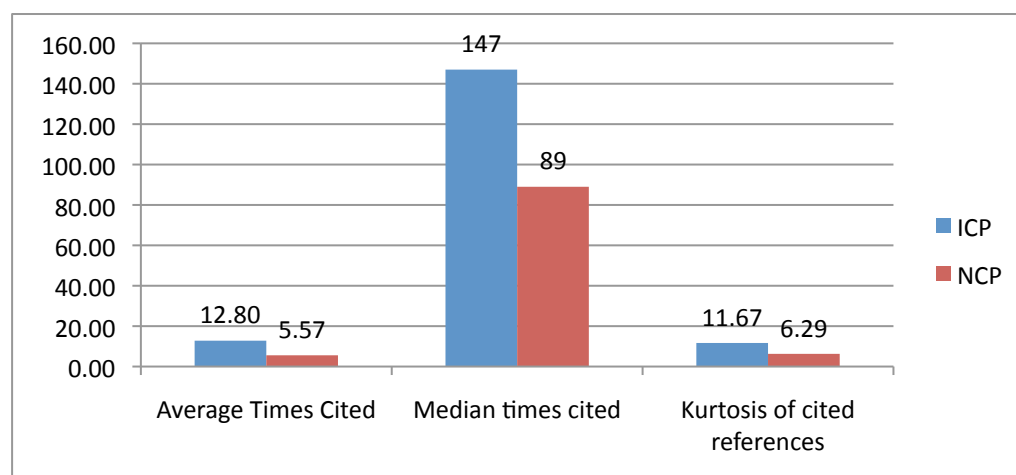
Figure 39: Change in the Top 10 Subject Categories by Eras (as percentage of all publications in this era)



#### A.2.5 Quality and impact of CZ international collaborative research

The impact of ICPs in terms of the average times cited is more than double of the impact of NCPs as depicted in Figure 40. However, it is also worth mentioning that kurtosis of the cited references for the former is significantly higher than the latter which indicates that not necessarily all of the ICPs are higher impact than NCPs.

Figure 40: Impact of ICPs and NCPs



#### A.2.6 Recent funding trends

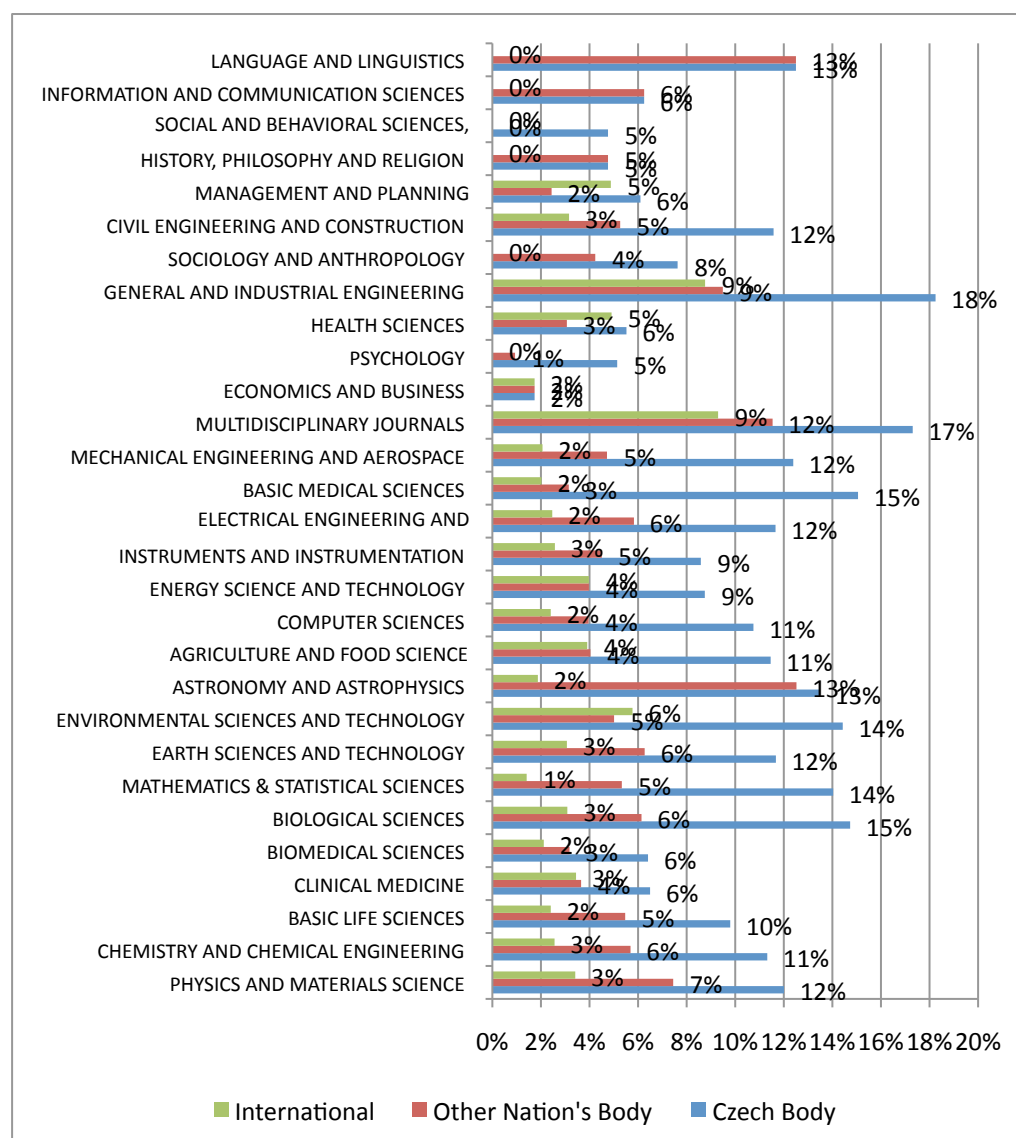
Table 9 shows the top funding organisations for NCP and ICP. While it is evident that Czech funders such as Ministry of Education Youth and Sport of the Czech Republic, GACR, Academy of Science of the Czech Republic and GAAV are dominant in both the funding of ICP and NCP, other nations' funding organisations including the German DFG and BMBF, the US NSF and DOE, the French CNRS, and the Slovakian VEGA are funding Czech authored ICPs. Finally, the EU appears in both lists although its relative importance is higher in ICP.

Table 9: Funding Organisations for ICP and NCP

|    | Funding Organization for ICP                                | # Records | Funding Organization for NCP                                | # Records |
|----|---|-----------|---|-----------|
| 1  | Ministry of Education Youth and Sport of the Czech Republic | 2155      | Ministry of Education Youth and Sport of the Czech Republic | 3014      |
| 2  | GACR  | 1373      | GACR  | 1946      |
| 3  | Academy of Science of the Czech Republic                    | 1126      | Academy of Science of the Czech Republic                    | 988       |
| 4  | EU  | 1000      | Ministry of Health Czech Republic                           | 464       |
| 5  | Deutsche Forschungsgemeinschaft                             | 412       | GAAV  | 383       |
| 6  | US National Science Foundation                              | 334       | Ministry of Agriculture of the Czech Republic               | 352       |
| 7  | GAAV  | 333       | EU  | 258       |
| 8  | CNRS (FR)   | 168       | Charles University  | 181       |
| 9  | VEGA grant agency (SR)                                      | 166       | Ministry of Industry and Trade of the Czech Republic        | 93        |
| 10 | BMBF (DE)   | 155       | Ministry of Environment of the Czech Republic               | 59        |
| 11 | US Department of Energy                                     | 149       | Czech Government  | 53        |
| 12 | Charles University  | 130       | Ministry of Defence of the Czech Republic                   | 52        |
| 13 | Ministry of Health Czech Republic                           | 119       | AVOZ  | 15        |
| 14 | Polish Ministry of Higher Education and Science             | 113       | MZO   | 15        |
| 15 | CONACYT-Mexico  | 96        | VZ MSM  | 12        |
| 16 | Alexander von Humboldt Foundation (DE)                      | 91        | Gilead Sciences Inc   | 11        |
| 17 | DST (India)   | 88        | USB RIFCH   | 11        |
| 18 | Chinese National Natural Science Foundation                 | 84        | Czech Geological Survey                                     | 10        |
| 19 | Slovak Research and Development Agency                      | 84        | Institute of Organic Chemistry and Biochemistry             | 10        |

Figure 41 shows the papers funded by different funders as percentage of all papers in a subject category. For instance, in the subject category of physics and material science, Czech bodies fund 12% of all the internationally collaborated papers; other nations' bodies fund 7% and international bodies 3%. Please note that they are not mutually exclusive as some of them might be co-funded. This also shows the areas which attract most funding by different funders. For example, 17% of the general and industrial engineering papers were funded by a Czech body.

Figure 41: Papers funded by different funders as percentage of all papers in a subject category



#### A.2.7 Comparison of CZ international co-research publication profiles with Hungary and Austria

In the comparison years of between 2000 and 2009, the number of total publications amounted to 61,137 in the Czech Republic, 47,458 in Hungary and 80,076 in Austria (Figure 42). ICP is 53% of all publications in Czech Republic while this figure is slightly higher in Austria and slightly lower in Hungary (Figure 43).

Publications per 1,000 population is 0.57 in Czech Republic, 0.47 in Hungary and 0.99 in Austria (

Figure 44). The gap between NCP per 1,000 population in the Czech Republic and Austria is about 80%, this ratio decreases to around 50% for NCP.

Figure 42: ICP and NCP in comparison countries (number of publications)

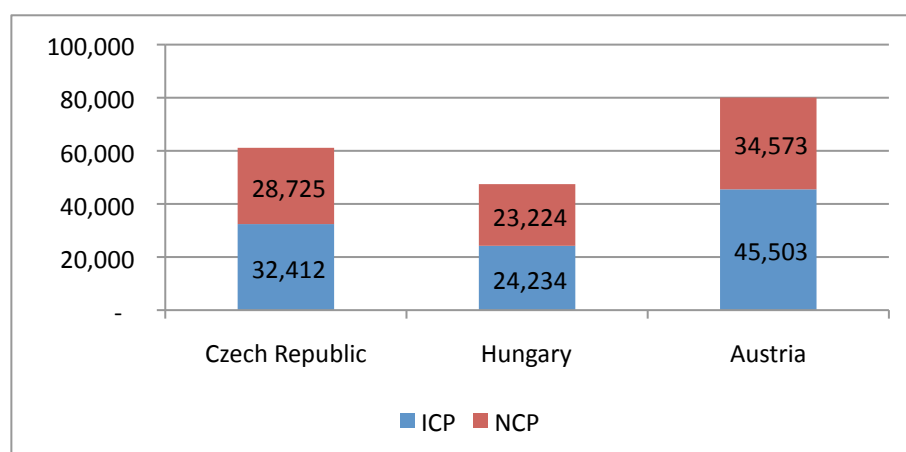


Figure 43: ICP as Percentage of all publications in comparison countries

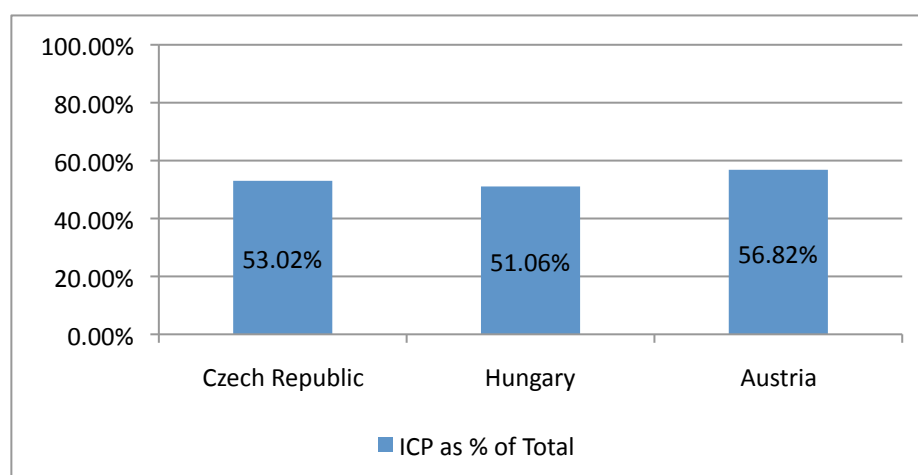
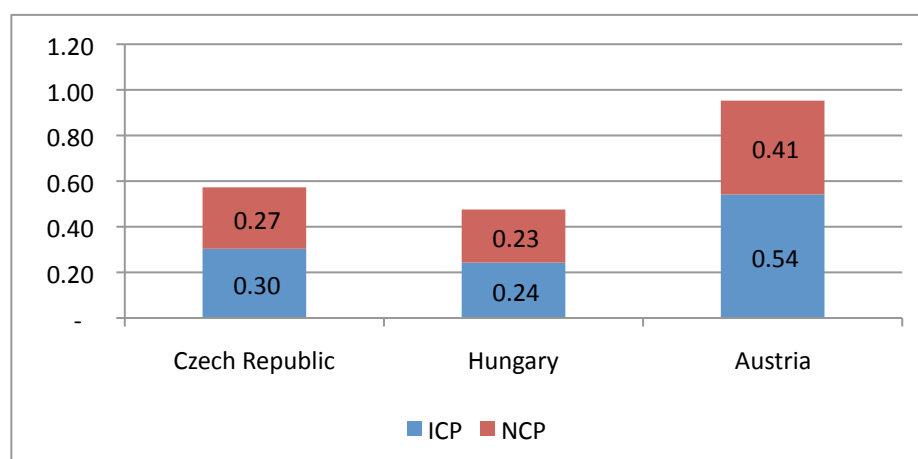
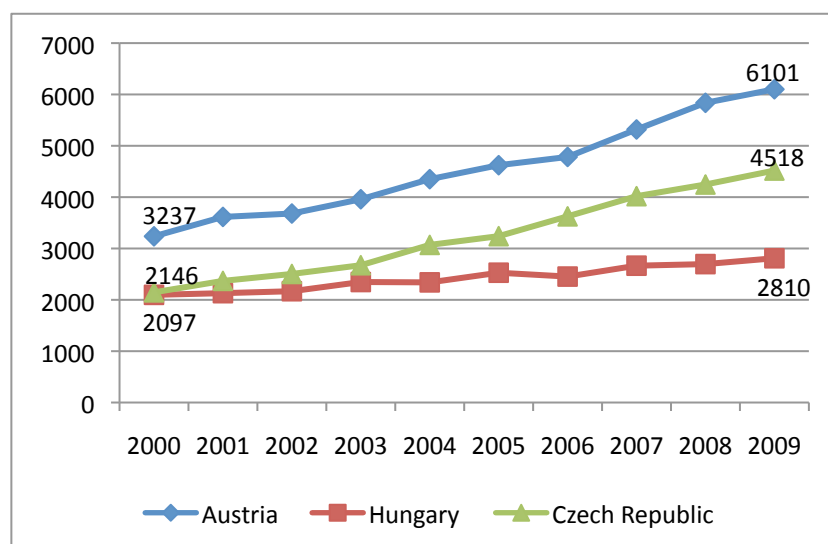


Figure 44: ICP and NCP per 1,000 population in comparison countries



Historic development of ICP reveals more detail. While the number of ICP in 2000 is roughly same for the Czech Republic and Hungary in 2000, a gap has continuously opened as by 2009 the number of ICP for the Czech Republic was around 60% higher than that of Hungary. Austrian ICPs were 66% higher than Czech ICPs in 2000. This ratio reached to around 75% in 2009 (Figure 45).

Figure 45: Growth of Publications in Comparison Countries (number of publications per year)



The structural changes in ICPs have also followed a similar trend in the 3 countries we analysed.

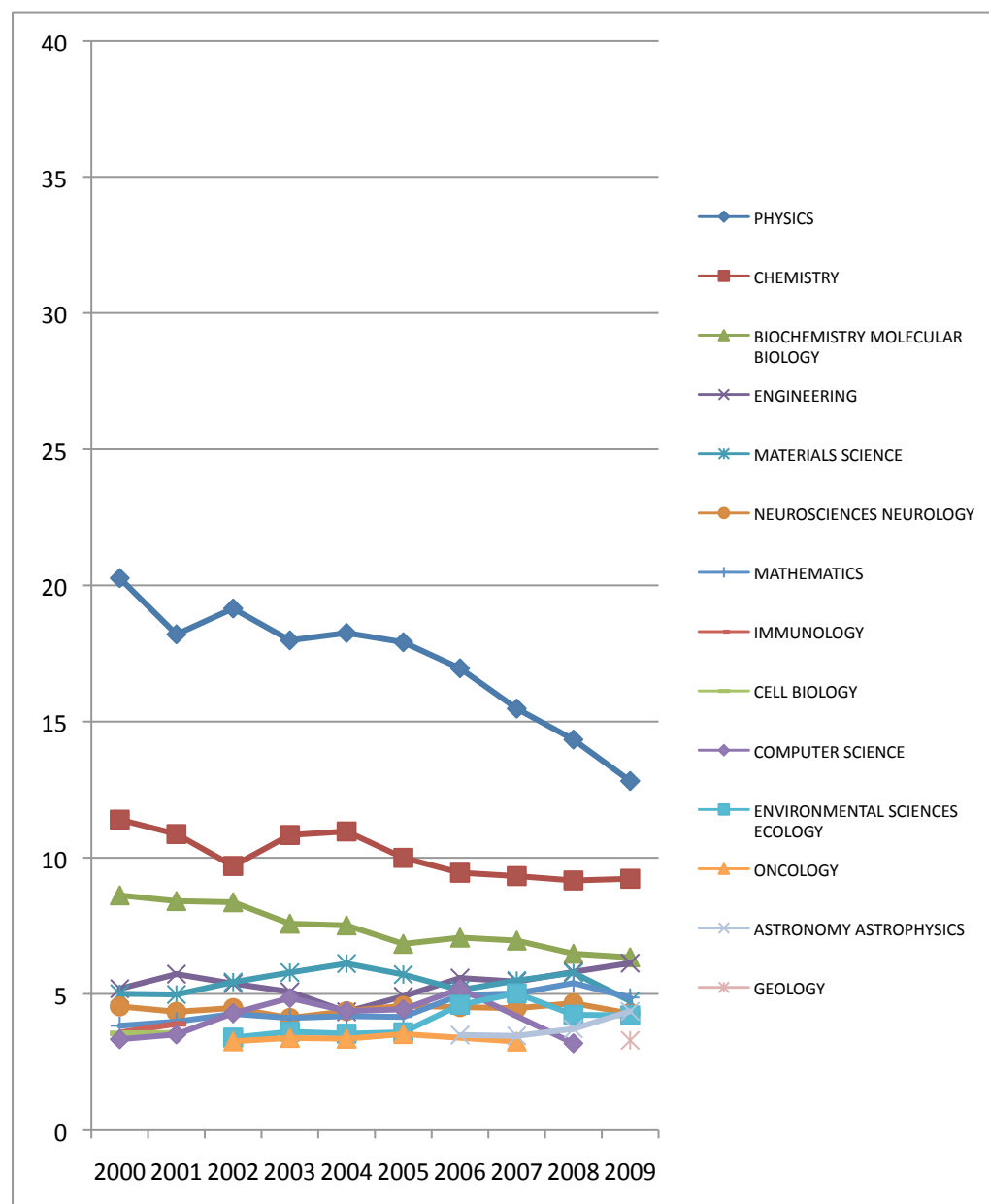
One area of structural change we compared was the **relative importance of particular technical fields** (Figure 46, Figure 47 and Figure 48).

In all countries the relative importance of Physics and Chemistry consistently declined in the 10 years we analysed. The relative decline of these two subjects may reflect funding shifts towards life and medical sciences, computer sciences, and other growing fields.

The decrease in Physics is sharper in Czech Republic than Austria and Hungary. This is particularly interesting considering the finding that Physics has been increasing since 1980 significantly as shown in Figure 39. Materials Science in the Czech Republic has declined relatively more than in the other two countries.

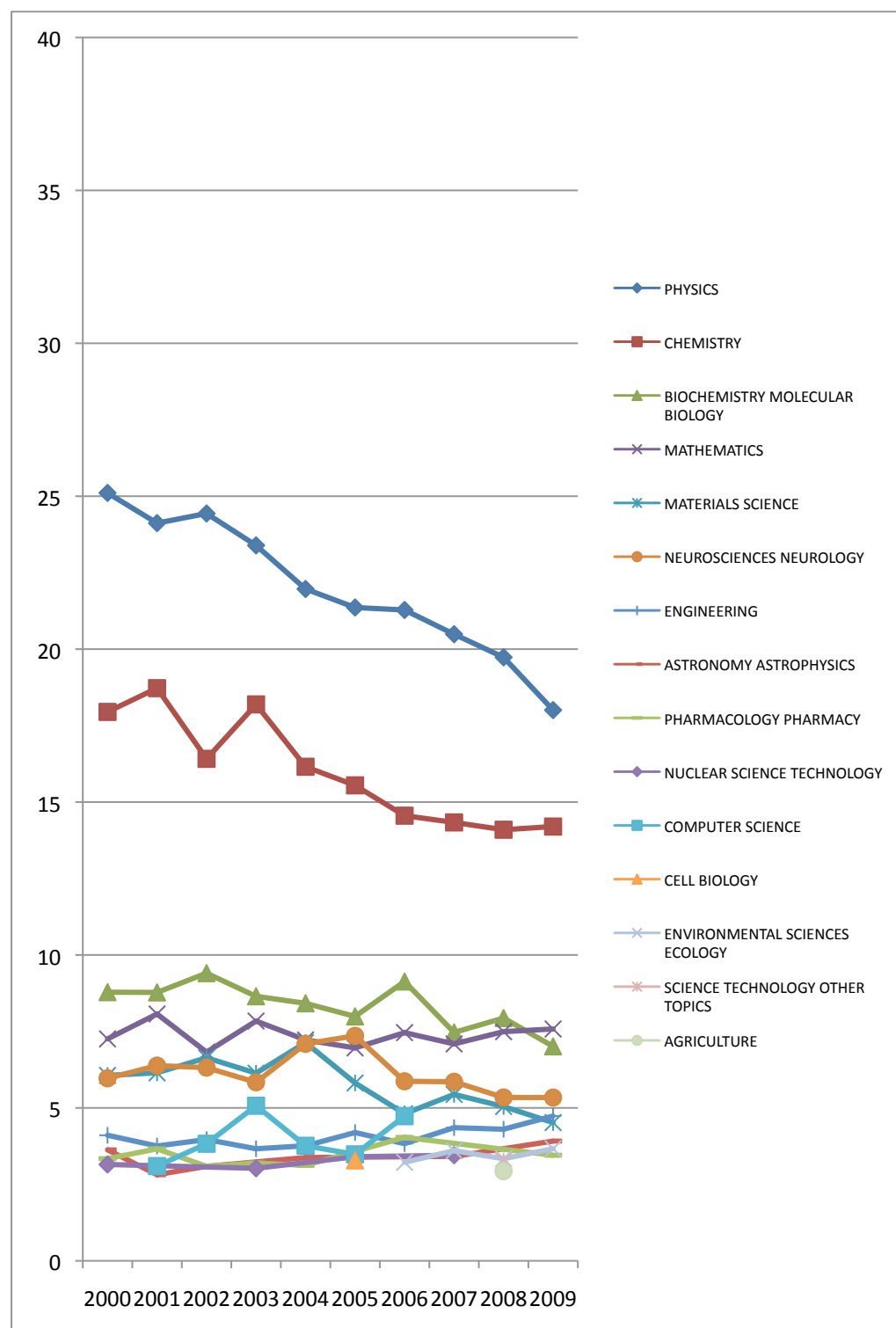


Figure 46: Austria - Rising and falling technical fields (by ISI subject categories) engaged in international collaborative research as percentage of all publications (number of publications)



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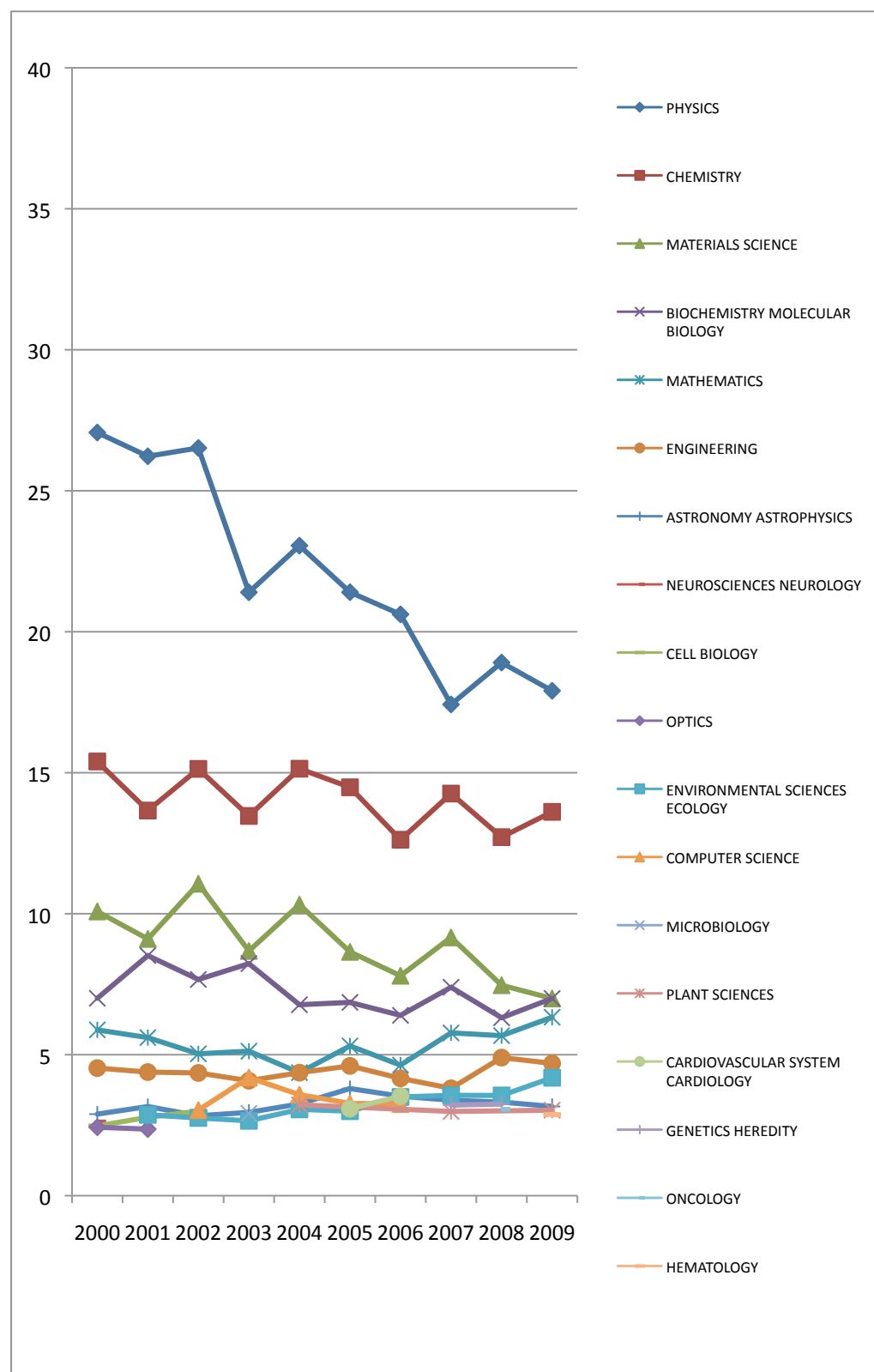
Figure 47: Hungary - Rising and falling technical fields (by ISI subject categories) engaged in international collaborative research as percentage of all publications (number of publications)



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Figure 48: Czech Republic - Rising and falling technical fields (by ISI subject categories) engaged in international collaborative research as percentage of all publications (number of publications)



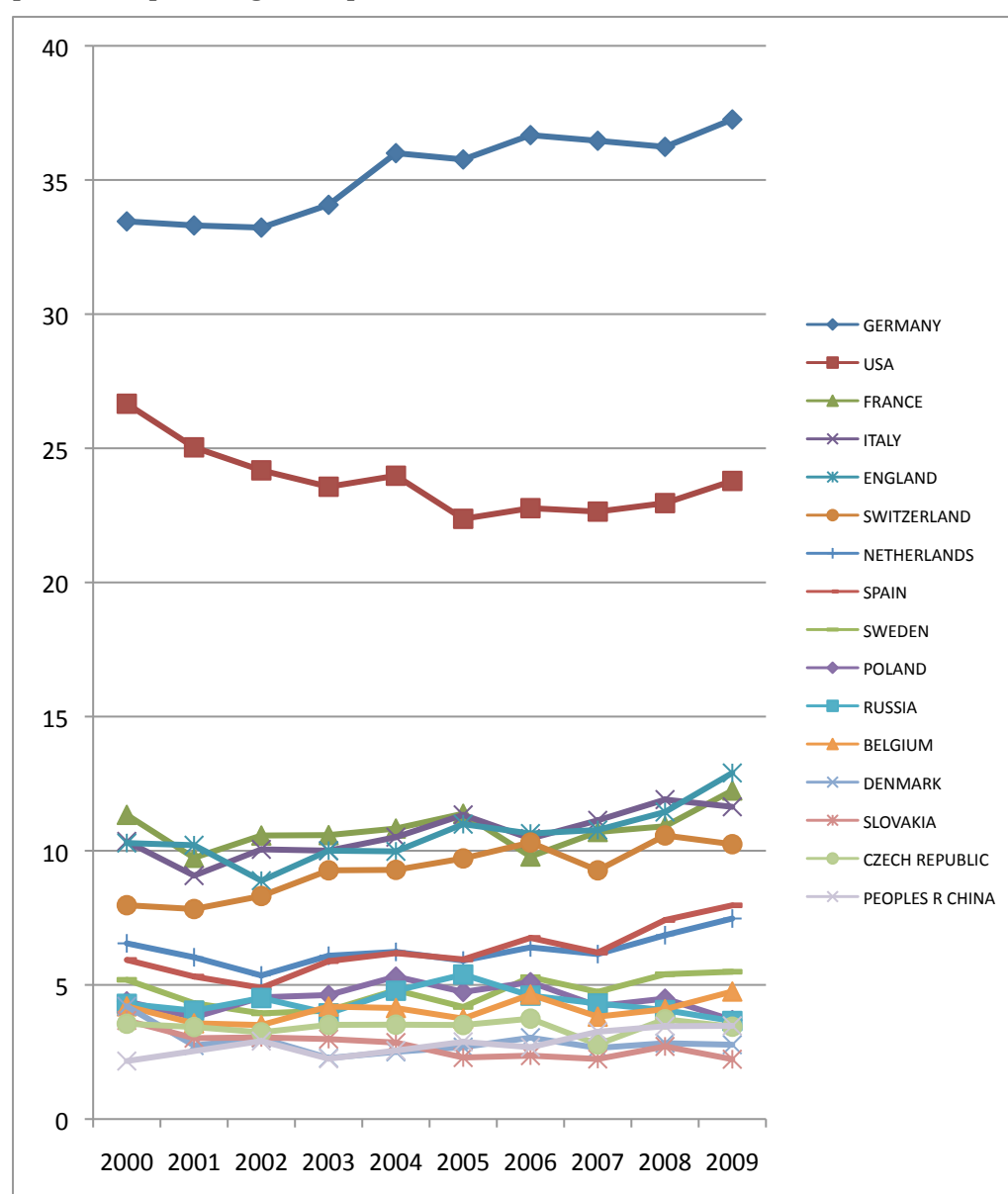
Another structural change we looked was the **relative importance of partner countries**.

For Austria, Germany and USA has always been a partner in a majority of publications. The relative importance of Germany increases even further while the relative importance of USA has been in decline at the gain of rising countries such as European partners and China (Figure 49).

The situation has been somewhat similar in Hungary. USA and Germany have been the leading partners while the relative importance of USA has been decreasing at the gain of other countries (Figure 50).

We have discussed the case of Czech Republic in much more detail but Figure 51 provides a recap with a slightly different data set for comparison. Again, Germany and USA are leading partners but none of their relative importance is in decline.

Figure 49: Austria - Changing patterns of international co-authorship over time (share of leading partners as percentage of all publications)



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Figure 50: Hungary - Changing patterns of international co-authorship over time (share of leading partners as percentage of all publications)

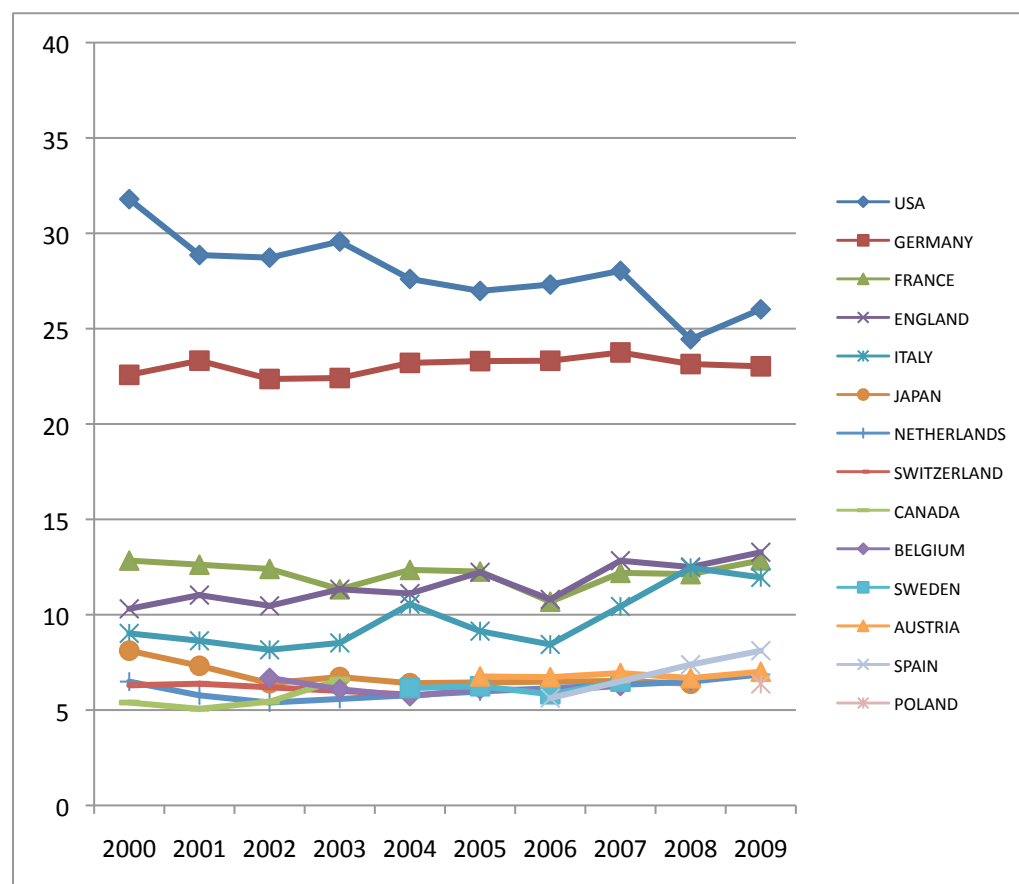
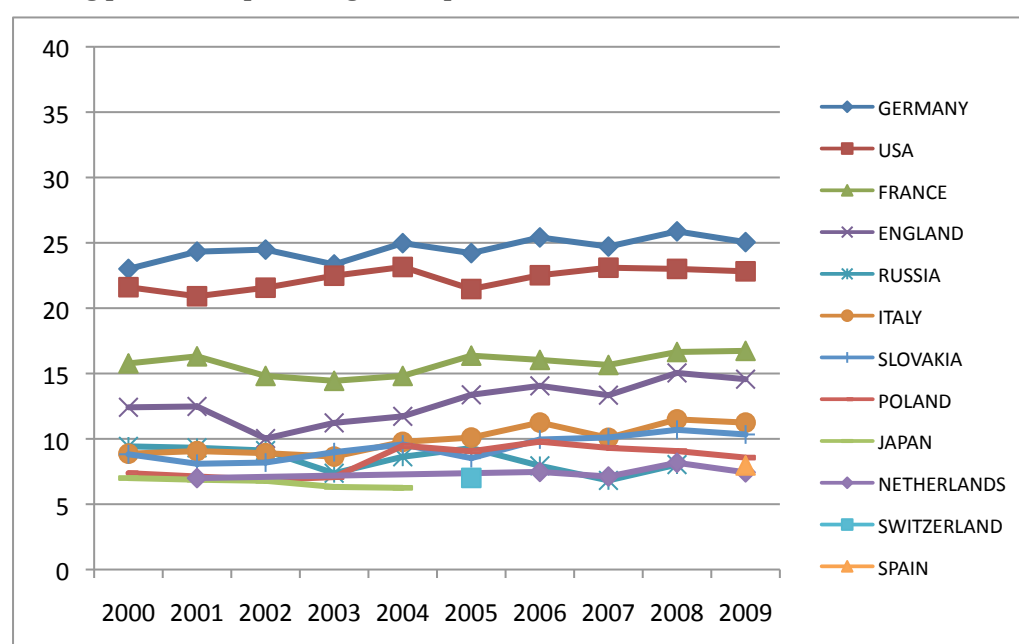


Figure 51: Czech Republic - Changing patterns of international co-authorship over time (share of leading partners as percentage of all publications)



Finally, we looked at the **relative importance of the leading Institutions** involved in international publications (Table 10). We have already discussed above that in the Czech Republic there is a clear concentration of international publications in ASCR and the UK.

The comparison shows us that a similar situation occurs in the comparison countries: the University of Vienna is by far the leading institution for Austria and in Hungary the Hungarian Academy of Sciences, Eotvos Lorand University and University of Szeged are significant actors. However, in these countries the concentration is not as intense as in the Czech Republic. Especially in Hungary a more balanced distribution is observed.

Table 10: Relative importance of the Leading Institutions involving in international publication (publications by top 10 publishing institutions as percentage of all publications)

| Austria                    |       | Hungary                       |       | Czech Republic |       |
|----------------------------|-------|-------------------------------|-------|----------------|-------|
| UNIV VIENNA                | 21.4% | HUNGARIAN ACAD SCI            | 26.3% | ASCR           | 48.3% |
| INNSBRUCK UNIV             | 8.5%  | EOTVOS LORAND UNIV            | 11.8% | UK             | 28.7% |
| MED UNIV VIENNA            | 5.8%  | UNIV SZEGED                   | 10.2% | MU             | 7.3%  |
| VIENNA UNIV TECHNOL        | 5.8%  | SEMMELWEIS UNIV MED           | 6.9%  | CVUT           | 4.7%  |
| AUSTRIAN ACAD SCI          | 5.1%  | BUDAPEST UNIV TECHNOL<br>ECON | 6.4%  | UPOL           | 4.1%  |
| GRAZ UNIV                  | 4.0%  | DEBRECEN UNIV MED             | 5.7%  | JCU            | 3.8%  |
| KARL FRANZENS UNIV<br>GRAZ | 3.1%  | UNIV PECS                     | 4.6%  | VCHT           | 3.2%  |
| GRAZ UNIV TECHNOL          | 3.0%  | UNIV DEBRECEN                 | 3.9%  | CNRS           | 3.1%  |
| VIENNA TECH UNIV           | 2.8%  | TECH UNIV BUDAPEST            | 2.6%  | UP             | 1.6%  |
| SALZBURG UNIV              | 2.3%  | SEMMELWEIS UNIV               | 2.5%  | NM             | 1.4%  |

#### A.2.8 Major Findings

Among the series of observations and findings that this analysis presents, we note the following:

- About two-fifths of all Czech research publications are co-authored. This appears to be substantial.
- Internationally collaborated Czech publications on average receive more citations than purely domestic papers.
- In the Czech Republic's transition period since the 1980s, research collaborations with Western European countries appear to have grown significantly.
- Czech international R&D collaboration is strongly European. Four-fifths of the Czech Republic's international collaboration papers are with European countries. The US is also a major collaborator. At present, collaboration with Asia is limited (again, our benchmarking will establish where the Czech Republic stands in terms of Asian collaboration).
- In comparison with Austria, the level of international publication in the Czech Republic is moderate. The gap between Austria has been sustained since 2000. However, the Czech Republic has widened a considerable gap with Hungary since 1990, when the two countries had roughly the same number of ICPs.
- Similar to Austria and Hungary, Czech Republic has had strong collaborations with USA and Germany. The relative importance of these two partners has not changed in the CR, much unlike in Hungary and Austria.
- Czech scientists co-publish with German, American, French and British scientist in every subject group very extensively while they collaborate with other countries extensively only on some of the subjects.
- Czech international R&D collaboration is greatest (by absolute numbers of papers) in the fields of physics and material science, chemistry and chemical engineering, basic life sciences, clinical medicine, biomedical sciences and biological sciences.

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- The relative downward trend of Chemistry and Physics has been a common feature of all three countries.
- When international science papers are compared with purely domestic papers, Czech international R&D collaboration is relatively higher in physics and materials science and in basic life sciences, but relatively lower in biomedical sciences and clinical medicine. Whether this indicates a greater Czech propensity to internationally collaborate in pure rather than more applied sciences remains a question for further investigation. (We are aware that in certain fields, such as high energy physics, international collaboration is the main way to access large advanced research facilities.)
- International collaboration in several social science disciplines is weak compared to this subject group's national significance. In particular, in economics and business and in politics and public administration, there are low levels of international collaboration relative to purely domestic research outputs.
- International research collaboration through co-authorship is dominated by two institutions, the Academy of Sciences of the Czech Republic (ASCR) and Charles University (UK). These institutions are also powerful nationally in research, but there are other Czech research institutions that collaborate less internationally than their national ranking would suggest.
- Three Czech organizations lead in sponsoring internationally collaborated Czech research – the Ministry of Education Youth and Sport of the Czech Republic, the Czech Science Foundation (GACR), and the Academy of Science of the Czech Republic. While international institutions are also important sponsors (especially the EU), this suggests that there is capability (real or latent) within the Czech research system to influence the direction and nature of Czech international R&D collaboration.
- In Hungary and Austria, the institutions engaged in ICP are less concentrated than in the Czech Republic. In other words, a more diverse set of institutions is engaged in international collaborative publishing in Hungary and Austria than in the Czech Republic.

In Brighton, 29/09/2011



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