

UNIVERSITY-BUSINESS COLLABORATION AS PERCEIVED BY LEADING ACADEMICS: COMPARING AND CONTRASTING THE TWO MOST INNOVATIVE CZECH REGIONS

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With 1 figure and 4 tables

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Summary: This article compares the nature of academia-business collaboration in the two most innovative Czech regions, where the respective regional decision-makers and universities' representatives differ sharply in their approaches towards the commercialization of academic knowledge. An analysis of the nature of collaboration between life-science researchers in two leading Czech universities and private companies has been performed to identify whether targeted support provided at the regional and university levels can make a real difference and can overcome hindrances from the national level. In particular, the article investigates the motivation and approaches of leaders of life-science research teams to cooperation with private companies, the perceived barriers impeding such cooperation, including the strength of demand for innovation in both analyzed regions. The research identified significant differences in the perception of barriers between life scientists in Prague and South Moravia, vindicating the positive role of the South Moravian innovation strategy. Thus, researchers in South Moravia no longer face barriers preventing the emergence of cooperation with the business sector, and instead they are concerned about obstacles that stand in the way of its more intensive development.

Zusammenfassung: In diesem Beitrag wird die Zusammenarbeit von Wissenschaft und Unternehmen in den beiden innovativsten Regionen Tschechiens untersucht, die sich hinsichtlich der seitens regionaler Entscheidungsträger und Repräsentanten der Universitäten verfolgten Strategien einer Kommerzialisierung akademischen Wissens grundsätzlich unterscheiden. Es wurde eine Analyse der Zusammenarbeit von Life Science Wissenschaftlern zweier führenden tschechischen Universitäten und privaten Unternehmen vorgenommen, um die Wirksamkeit einer gezielten Förderung auf regionaler und universitärer Ebene zu identifizieren und zu bewerten, ob die Strategien geeignet sind, Hindernisse auf nationaler Ebene zu überwinden. Im Fokus des Beitrags stehen vor allem die Motivation der Leiter von Life Science Forscherteams und ihre Art der Kooperation mit privaten Unternehmen, ihre Wahrnehmung möglicher Barrieren auf dem Weg zu und im Rahmen einer solchen Zusammenarbeit, aber auch die Intensität der Innovationsnachfrage in beiden untersuchten Regionen. Die Studie belegt signifikante Unterschiede in der Perzeption von Barrieren zwischen Life Science Wissenschaftlern in Prag und der Region Südmähren und belegt die positiven Impulse der in Südmähren verfolgten Innovationsstrategie. So sehen die Wissenschaftler in dieser Region keine Hindernisse bei ihren Kooperationen mit der privaten Wirtschaft, sondern sorgen sich vielmehr um die Hemmnisse einer intensiveren und fortschreitenden wirtschaftlichen Entwicklung.

Keywords: Regional planning, technology transfer, universities, barriers for innovation, innovation demand, Prague, South Moravia

1 Introduction

Knowledge and innovation are considered to be essential elements of competitiveness at the level of individual companies, regions, or even entire states (SCHWAB and SALA-I-MARTIN 2013). The role of universities in economic and regional development (including their capacity for transferring knowledge generated into practice) has been recently addressed in a voluminous body of literature (COOKE and LEYDESDORFF 2006; ASHEIM et al. 2011a; BREZNITZ 2011; CZARNITZKI et al. 2012;

GODDARD et al. 2013; GUERRERO et al. 2014; FRANCO and GUSSONI 2014) which fully acknowledges that university-business relationships represent an important knowledge channel. The stories of successful companies established as university-based start-ups, such as Hewlett-Packard, Google, or Apple, serve as inspiration not only for young scientists, but also for the managers of departments dedicated to technology transfer, decision-makers, and university directorates (GEUNA and MUSCIO 2008; GIULIANI and ARZA 2008; OECD 2009; D'ESTE and PERKMANN 2011).

Central and Eastern European countries (CEE), including the Czech Republic, are currently attempting to embrace a high-road development strategy that relies on research and innovation, since they are rapidly losing their initial comparative advantage of a cheap, yet relatively well-qualified, labour force (CSANK and ŽIŽALOVÁ 2009). The cooperation between firms and universities, as well as the overall organization of research, are among the topics frequently discussed in connection with attempts to enhance innovation-based competitiveness and overall socio-economic development (TÖDTLING and TRIPPL 2005; LENGYEL and LEYDESDORFF 2011; RADOSEVIC and YORUK 2013). Unfavourable national organizational and institutional frameworks, which limit researchers' enthusiasm for applied research, have also contributed to a significant heterogeneity of regional innovation strategies and policies aimed *inter alia* at encouraging business-academia collaboration at the level of both regions and specific institutions (BLAŽEK et al. 2013; PLAWGO et al. 2013). Therefore, within CEE countries, it is possible to find regions that have implemented several generations of regional innovation strategies, as well as regions barely implementing their first-ever innovation strategy, and even regions lacking any regional innovation strategy whatsoever. Consequently, even within individual countries, it is possible to identify profoundly differing approaches to cooperation between firms and academia, as well as vastly different outcomes from transferring knowledge generated at universities into practice.

This article compares the nature of academia-business collaboration in the two most innovative Czech regions, where the respective regional decision-makers and universities' representatives differ sharply in their approaches towards the commercialization of academic knowledge. An analysis of the nature of collaboration between life-science researchers in two leading Czech universities with private companies has been performed to see whether targeted support provided at the regional and university levels can make a real difference and can overcome hindrances from the national level. This study focused on life-science researchers due to the fact that life sciences represent one of the key strategic priorities of Czech research (see National innovation strategy, MEYS and MI (2011) or the recently adopted Czech smart specialization strategy (MEYS 2014). The article therefore attempts to fill an existing gap within research on academia-business cooperation, which currently features a plethora of case studies analyzing the relations

between universities and business companies in highly developed regions, such as the Silicon Valley, Cambridge, Baden-Württemberg, Delft, London or Emilia-Romagna (VAN GEENHUIZEN 1997; HOSPERS 2006; BREZNITZ 2011; D'ESTE and PERKMANN 2011), yet rarely offers case studies focused on less-developed European countries (BENDIS and CRACIUNOIU 2002; GÁL and PTÁČEK 2011). Thus, the article aims to investigate the motivation and approaches of leaders of life-science research teams to cooperation with private companies, the perceived barriers impeding such cooperation, and the strength of demand for innovation in both analyzed regions.

The article comprises five main parts. The next section outlines the evolutionary pathway of the Czech research and innovation system, explaining the major roots as well as the reasons for the persistence of a deep cleavage between academia and businesses. The third section presents a discussion of basic theoretical perspectives and sets out research questions, and the subsequent section specifies the applied methodology. The fifth section offers analytical results sorted into sub-sections according to specific elements of academia-business cooperation. The final section presents a closing summary of the research findings.

2 Theoretical framework and research questions

In recent years, theories of regional innovation systems (RIS) have received particular attention from researchers as well as practitioners of regional development. This is largely attributed to its strong analytical and policy dimensions. The RIS theorists hold that innovations frequently occur during the interactions of customers and manufacturers or via cooperation of various actors in the R&D sphere (COOKE et al. 2006). Thus, the RIS theory envisages cooperation of actors from the subsystems of knowledge creation and knowledge exploitation embedded within a supportive institutional framework (COOKE 2007). The partners' mutual knowledge and trust are essential in order to achieve this (BATHELT et al. 2004). STORPER (1997) considers quality contact networks to be one of the key advantages in the portfolio of developed regions, because working relationships and cooperative customs can serve as fundamental boons to the region's competitiveness and its edge over other regions.

Knowledge creation and diffusion therefore lie at the core of regional innovation systems, as the

spatial as well as cultural and cognitive proximity of various actors is understood as a factor supporting the transfer of knowledge between them (BOSCHMA 2005). ASHEIM et al. (2011b) provide a list of further significant factors shaping the nature of mutual relationships: the strength of the scientific base and the knowledge-transfer system, the institutional system, the financial system, the educational system, the availability and mobility of a qualified labour force, and public policy. With regard to the formulation of innovation policy on both regional and national levels, it is important to specify not only the strength but also the type of the knowledge base (analytical knowledge base, such as life sciences, synthetic base comprising branches such as engineering, and symbolic base encompassing for example media or design – for more, see ASHEIM and GERTLER 2005). Nevertheless, recent findings must be acknowledged, namely that during the innovation process the knowledge required frequently swings from one knowledge base to another (MANNICHE 2012; STRAMBACH and KLEMENT 2012; MARTIN and MOODYSSON 2013). Therefore, the triad of conceptualised knowledge bases must be considered as ideal types, which are not directly represented in reality. Consequently, no clear-cut distinction should be foreseen in the nature of academia-business cooperation between different fields.

The importance of academic research to economic growth is widely accepted, even though quantification of its impact is particularly difficult (VINCETT 2010). Nevertheless, based on recent detailed examination of the contracts signed by the University of Salento (South Italy), CALIGNANO and QUARTA (2014) argued that this university is a key player in local technology transfer with a significant multiplier effect on the local economy. Within the university context, technology transfer (or commercialization) is defined as the transmission of information and knowledge between two respective subjects representing the academic and economic spheres (BERKOWITZ and FELDMAN 2006). However, the implementation of technology transfer represents a significant challenge for the subjects involved, since their focus is very different and, moreover, their interaction is affected by differences in value systems and by other soft factors such as a low level of mutual trust (DAVENPORT and PRUSAK 2000). The role of various types of motivation for ‘elite’ British academics to engage in commercialization has been investigated by LAM (2011), who discovered the major role played by reputation and intrinsic reasons, while financial rewards played only a relatively small part.

Transmission of knowledge is, however, only one dimension of technology transfer. The actors involved also need to have sufficient absorption capacity for mutual interactive learning (MORGAN 1997). In this context, ROSENBERG (1990) highlights the importance of basic research for business companies, as it allows them to become part of information networks which can then give rise to successful cooperation. However, even in the presence of sufficient absorption capacity, there are still barriers to effective cooperation between the academic and economic spheres. VAN GEENHUIZEN (1997) identified four principal barriers to academic-industrial partnership: (i) weak interest in the commercialization of intellectual products on the part of universities, (ii) different goals and time horizons of actors, (iii) competitiveness or missing links between different producers of knowledge, and (iv) inadequate openness and visibility of universities as sources of knowledge.

Apart from these elements, other predominantly soft factors also influence decisions regarding technology transfer on the part of individuals, especially researchers. These factors mainly include their motivations and the disposition of their working environments towards potential cooperation with companies. These observations were recently endorsed by the findings of BREZNITZ (2011) and HEWITT-DUNDAS (2012, 262) who “demonstrated that universities’ approach to knowledge transfer is shaped by institutional and organizational resources, in particular their ethos and research quality, rather than the capacity to undertake knowledge transfer through a Technology Transfer Office”. In particular, she argues that an increase in technology transfer staff is unlikely to materialize into higher activity “if there is a ‘disconnect’ between the organizational supports and strategic priorities” (HEWITT-DUNDAS 2012, 272). The relevance of these findings has to be underlined, as these conclusions have been derived from studies performed within the UK, arguably a country with one of the most favourable frameworks for technology transfer. Therefore, unsurprisingly, ERDOS and VARGA (2012), in their study on academic entrepreneurship in Hungary, found no evidence that policies commonly applied to promote academic spin-off companies via TTO could be really beneficial. Instead, they argued that change in the broader institutional framework, such as enhanced financial autonomy for universities, real competition among universities to secure talent, or the introduction of a multi-layer system of research funding would be more beneficial.

Therefore, this study attempts to shed light on the nature of cooperation between academic life-science research teams and private companies in a former state-socialist country, using the example of universities from the two most innovative regions in Czechia. Whereas Prague concentrates strong economic potential (by virtue of its capital function) and a significant share of Czech R&D capacities (26 % of Czech R&D workforce in 2012), the South Moravia region has made long-term efforts to develop and implement a state-of-the-art regional innovation strategy. This study aims to compare the answers from leaders of life-science research teams at both universities to the following key questions:

- What is the predominant motivation of research team leaders to engage in technology transfer?
- What barriers limit technology transfer by the research teams?
- What is the perception of demand for innovation from private companies?
- How does a long-term high-quality innovation strategy affect the motivation and barriers related to technology transfer, and how does it impact on the perception of corporate demand and character of cooperation between academia and business in the context of a post-communist state?

3 The evolutionary pathway of the Czech research and innovation system: the emergence and persistence of an academia-business cleavage

According to NORTH, institutions, both formal (legislation) and informal (traditions, customs, values, codes of conducts), are humanly devised constraints that structure social interaction (NORTH 1991). Institutions evolve incrementally and, therefore, history is largely a story of institutional evolution, helping *inter alia* to understand the evolution of economic performance of particular nations (NORTH 1991). Therefore, in this section, the key specifics of evolution of the Czech academia-industry relations are briefly outlined.

Under state-socialism prior to 1989, public research in Czechia, as in other CEE countries, was dominated by research institutes of the Academy of Sciences, which prioritized basic research. Thus, these institutes were largely isolated from the economy, because cooperation with the state-owned companies of that time had been an exclusive competence of the institutes of applied research.

However, after the institutes of applied research were privatized in the early 1990s, most of them went bankrupt within a short time, as they were unable to survive in the radically changed economic conditions. As a result of this specific evolutionary pathway of the organizational set-up of research, there is a deeply embedded cleavage between the institutes of the Academy of Sciences and private firms, both in terms of research focus and value systems. This cleavage within the national innovation system has been only partially moderated by the swift expansion of research capabilities at universities, which, previously, under the command economy, had been charged predominantly with an educational role. Importantly, in contrast to the institutes of the Academy of Sciences that were tasked by basic research, universities were relatively free to select the nature of research that they wanted to pursue. However, rather than engage in applied research, the research teams in most universities seemed to compete in basic research with their counterparts in the Academy of Sciences. Moreover, the state authorities failed to design any strategy that would encourage the formation of a coherent national innovation system. Thus, in Czechia, the two basic subsystems of the regional innovation systems (the knowledge-generation subsystem and the knowledge-exploitation subsystem), as defined by COOKE et al. (1997), had remained widely separated. This fact can be illustrated by the share of revenues earned by Czech universities through cooperation with companies, which is significantly below the EU average (Czechia 0.7 % vs. EU27 7.0 %) (HOFER 2011).

In Czechia, this cleavage has not yet been addressed systematically, but, instead, depending on the initiative of particular representatives of various universities and based on some foreign experience, technology transfer offices have been set up. Obviously, these offices differ vastly in their mission, extent and quality of services provided, as well as in their level of funding, resulting from the variegated commitment of representatives of a given university. Unsurprisingly, given the scale of the challenge, most of these emerging teams of technology transfer offices were unable to make any breakthrough in transforming academia-business stereotypes and relationships. Consequently, a deep cleavage between both spheres persists.

Although the Czech economy has been transformed into a market economy, its character is still rather distant from the character of advanced European economies. The Czech economy, like

the economies of the other CEE countries, should perhaps best be described as a dependent market economy (NÖLKE and Vliegenthart 2009; SMITH and SWAIN 2010). Dependent market economies host a large number of international firms' subsidiaries with limited decision-making authority (international firms represent 59 % of the gross added value of the Czech manufacturing industry (CZSO 2015)). Moreover, while the dynamic developments of the last 25 years have profoundly transformed the economic structure, these developments have had a much lesser impact on the institutional framework and social relations that play key roles in the innovation process as well as in technology transfer (NEWBY 1997; DEBACKERE and VEUGELERS 2005; RODRÍGUEZ-POSE 2013). Clearly, modifying the basic principles underlying the functioning of the economy proved to be a much swifter and easier task than changing the institutional framework, especially with regard to informal institutions such as trust, values, and attitudes towards mutual collaboration in general, and academia-business cooperation in particular.

Therefore, this study aims to compare how leading academics perceive the intensity and nature of university-business linkages existing under such

unfavourable conditions in the two most innovative regions in Czechia – the South Moravia region (with regional capital Brno) and the Prague metropolitan region (see Fig. 1). Importantly, both regions embarked upon profoundly different trajectories in dealing with competitive challenges including technology transfer between universities and private businesses. The South Moravia region currently benefits from a fourth-generation regional innovation strategy, and for over 10 years it has been home to the South Moravian Innovation Centre (JIC), one of the EU's best institutions facilitating technology transfer, supporting networking among key stakeholders (including popular speed-dating events for innovative companies and academics with entrepreneurial spirit) and providing a range of incubation and other consultancy services to businesses (recognized in 2011 by the Best Incubator Award – The Technopolicy Network – as the best internationally involved scientific incubator). In comparison, Prague has still not accomplished the goals of its first-generation innovation strategy (for more on regional innovation strategies in these two regions, see BLAŽEK et al. 2013; BLAŽEK and CSANK 2015).

Moreover, the important differences in internal structure of the innovation systems in these

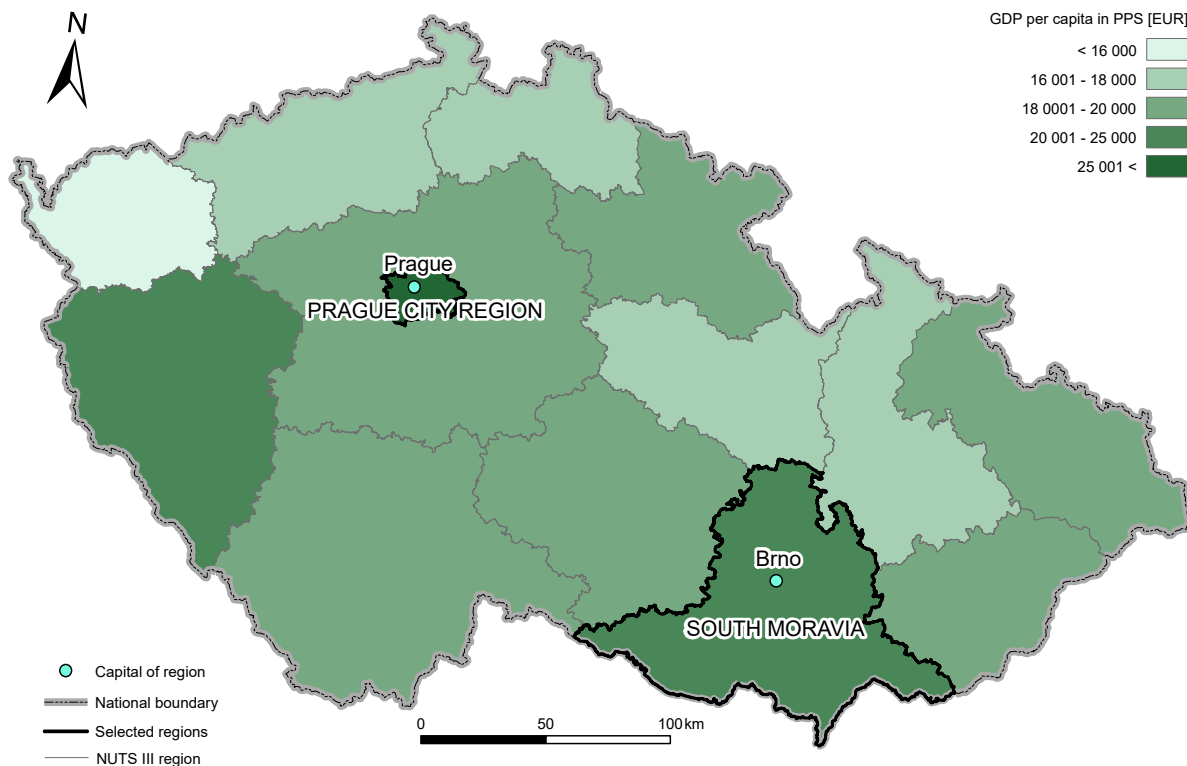


Fig. 1: GDP per capita in PPS [EUR] 2013. Source: Czech Statistical Office

two regions must be emphasized. While the economies of both these regions have been transformed profoundly since the collapse of state-socialism, the nature of this transformation has differed sharply. In the metropolitan region of Prague, the shrinking industrial base has been swiftly replaced by the rapidly expanding tertiary sector, both in terms of retail and advanced business services, which were severely underdeveloped under the command economy. Consequently, the current industrial base in Prague is narrow, and the activities performed by industrial companies located in Prague are often limited to higher-level activities such as R&D or customer services. Therefore, for the most part, the companies with potential for mutual cooperation with the strong academic sector in Prague (comprising leading Czech universities as well as the majority of institutes of the Academy of Sciences) are scattered across the whole country.

By contrast, the South Moravia region entered the transition following the collapse of state-socialism with an unfavourable economic structure based on textile and heavy-machinery industries, which were swiftly disadvantaged. Nowadays, the regional economy is dominated by electro-technical, precision-machinery and ICT industries consisting not only of branches of global foreign-owned companies such as Honeywell, FEI and ABB, but also of a relatively strong endogenous

sector, e.g. Alta, Zetor, Tescan, YSoft (BLAŽEK and CSANK 2015). The South Moravian capital city of Brno (the second-largest Czech city) commands a solid academic sector consisting of five universities and eight institutes of the Academy of Sciences. Research teams in Brno excel in molecular biology and in closely aligned disciplines (biophysics, bio- and organic chemistry, genomics, proteomics, etc.), as well as in optics and material physics (BLAŽEK and CSANK 2015). Currently, the firms based in South Moravia command 30 % of the world market in electron microscopes (*ibid.*, see also Tab. 1).

4 Methodology

The methodology of this study comprises a qualitative analysis based on in-depth interviews with leaders of life-science research teams in the science faculties in both Charles University in Prague and Masaryk University in Brno. The interviews with leaders of research teams in Brno were carried out in 2010 by CSANK et al. (2010), while the interviews in Prague were carried out by the authors in 2012. The life scientists from Brno were motivated to participate in these interviews by the fact that they were performed as part of the preparation of the new generation of the regional innovation strategy for South Moravia, while the life scientists in Prague

Tab. 1: Main characteristic of selected regions, 2013

Indicator	Prague city region	South Moravia
Mid-year population (thousands)	1, 245	1, 169
GDP per inhabitant (EUR)	31, 429	14, 668
R&D personnel by region (FTE)	13, 675	6, 256
Total R&D expenditure by region (EUR millions)	1, 002	630
Total R&D expenditure by region (EUR per capita)	805	539
Universities (number)	32	13
Students (headcount) (thousands)	150	77
Number of national patent applications	314	127
Export of technological services (EUR millions)	1, 278	656
of which, R&D	104	18
of which, Licence fees	163	4
of which, Sale of property rights	5	4

Source: Czech Statistical Office: Statistical Yearbook of the Czech Republic – 2014

were approached with the support of the Dean of the Science Faculty. Therefore, the invitations to interview were declined only exceptionally (3 in Prague and 1 in Brno). Consequently, 14 in-depth interviews were performed with leaders of life-science research teams in Brno and 25 in Prague, covering 25–30 % of all the life-science research teams at these faculties. The pre-prepared list of about 21 questions for the interviews was practically identical in both cases. The interviews were primarily designed to capture soft factors such as motivation, character and intensity of demand, barriers impeding collaboration between research teams and private firms, and the “atmosphere” surrounding such cooperation. With the consent of the interviewees, most of the interviews were recorded and subsequently transcribed. In remaining cases, when consent for recording had not been granted, the protocol from each interview was elaborated on the same day and used for subsequent analysis. The design of interviews allowed the specific processes and factors at play in both faculties to be placed in regional and national contexts, which helped us to understand the complex nature of the collaboration between academic institutions and private companies.

5 Comparison of cooperation between universities and private firms in Prague and South Moravia

The results obtained via in-depth interviews performed with leading life-science researchers at both universities are structured in the following three sub-sections.

5.1 Motivation and attitude of researchers towards technology transfer

On the basis of the interviews, life-science researchers can be divided into two broad groups. Firstly, those who find technology transfer interesting and attractive and, secondly, those who consider technology transfer as an uninspiring endeavour that could even be construed as a betrayal of academic values and an outright abuse of public funds (see Tab. 2). Although the analysis helped to uncover several examples of successful knowledge transfers, the Czech academic environment continues to be relatively negatively disposed towards collaboration with the business sector. Moreover, some researchers even feel ostracized within their own research institutes for holding positive views about the possibility of technology transfer, which seems to be a particular issue in Prague. This finding accords with the results of ERDOS and VARGA (2012), whose study of academic entrepreneurship in Hungary identified cases of a hostile university environment behind the seemingly supportive strategy, leading them to argue that institutional and especially departmental norms are more important than written laws.

The interviews revealed scientific researchers in both South Moravia and Prague as primarily motivated towards cooperation with companies by a desire to improve their research and to discover new things that could be applied in practice for the benefit of the public, which in turn brings a sense of fulfilment. If some researchers were motivated by the financial benefits of such collaboration, this was in order to strengthen the financial resources for their research. These results can be at least partly attributed to the

Tab. 2: Responses of team leaders regarding their motivation

	Yes	No	Rather Yes	Rather No	Cannot judge
Masaryk University Faculty of Science, Brno					
Is your team predominately focused on applied research?	71.4 %	21.4 %	7.1 %	0.0 %	0.0 %
Is commercialization of your knowledge personally appealing to you?	64.3 %	21.4 %	7.1 %	7.1 %	0.0 %
Charles University Faculty of Science, Prague					
Is your team predominately focused on applied research?	36.0 %	44.0 %	16.0 %	0.0 %	4.0 %
Is commercialization of your knowledge personally appealing to you?	72.0 %	12.0 %	4.0 %	4.0 %	8.0 %

Source: Own data. South Moravian region data based on the final report on field research of public research institutions in the South Moravia region (CSANK et al. 2010)

fact that since the 1990s many researchers, arguably those more appreciative of financial rewards, left the state-run institutes for the private sector (CSANK et al. 2010).

Importantly, technology transfer does not depend only upon the motivation of individual researchers, but also upon the wider context, such as the atmosphere at the institution and especially the system of R&D financing and evaluation. Since the Czech system of R&D financing is primarily focused on counting academic publications, it is understandable that the motivation of researchers towards an activity that is not particularly well rewarded, or even is socially ostracized by the scientific community, will be limited at best.

Nevertheless, as some of the examples of successful cooperation between university-based research teams and private enterprises have already demonstrated, sufficiently motivated individuals can secure functioning collaboration despite an unfavourable institutional framework. In South Moravia, the unfavourable national framework is mitigated by the proactive approach of key regional stakeholders, which has resulted in support for successive generations of regional innovation strategies aimed at encouraging scientific excellence, but also at enhancing the socio-economic impacts of R&D. This mission is being gradually accepted by researchers, as indicated during our interviews.

From the data in table 2, it is evident that the research teams at the Faculty of Science of Masaryk University in South Moravia are significantly more focused on applied research than their counterparts in Charles University in Prague, which was anticipated due to the sustained proactive approach to technology transfer by key stakeholders in South Moravia. However, contrary to our expectations, the perceptions of the motivation of leading researchers in South Moravia seem to be slightly more polarized

than in Prague, which likely reflects their greater practical experience with difficulties accompanying close academia-business cooperation. By contrast, life-science researchers in Prague seem to be slightly more willing to engage with private firms, but due to serious barriers they lack practical experience and thus are less aware of the downside of academia-business collaboration.

5.2 Corporate demand for innovation

Technology transfer is largely dependent on the existence of corporate demand for research outputs (MORGAN 1997; CSANK et al. 2010). If there is no demand, little cooperation between both RIS subsystems can be expected. If corporate demand exists and can be identified, then its exact content (whether it concerns simple services, such as testing, or requires original research) carries fundamental implications for the character and intensity of technology transfer. Despite this, demand for “simple” innovations should not be dismissed as unhelpful, because, as the in-depth interviews revealed, mundane services can eventually evolve into cooperation on attractive research assignments (CSANK et al. 2010).

In South Moravia, almost 3 out of 4 researchers described what they considered to be a lack of demand for innovation, while in Prague more than half of the team leaders shared this sentiment (Tab. 3). The reason why research teams in Prague feel comparatively less troubled by low demand for innovation can be attributed primarily to the greater concentration of company headquarters and the presence of businesses involved with life sciences in this city. In terms of quality of demand, two-thirds of respondents in the faculties in both regions considered the content of existing demand for innovation as uninteresting and unattractive.

Tab. 3: Response of team leaders regarding their perception of innovation demand

	Yes	No	Rather Yes	Rather No	Cannot judge
Masaryk University Faculty of Science, Brno					
Sufficient innovation demand	21.4 %	57.1 %	0.0 %	14.3 %	7.1 %
Technology is ready for commercialization	42.9 %	57.1 %	0.0 %	0.0 %	0.0 %
Charles University Faculty of Science, Prague					
Sufficient innovation demand	20.0 %	52.0 %	12.0 %	0.0 %	16.0 %
Technology is ready for commercialization	48.0 %	36.0 %	4.0 %	4.0 %	8.0 %

Source: Own data. South Moravian region data based on the final report on field research of public research institutions in the South Moravia region (CSANK et al. 2010)

Importantly, weak demand for innovation is along with an unfavourable institutional framework and dependent market economy model (NÖLKE and Vliegenthart 2009; Smith and Swain 2010) – also partially attributable to a certain level of mismatch between the structure of the Czech economy (manufacturing, such as automotive) and the specialization of the excellent research teams (chemistry, genetics and microbiology – see JuraJda and Münich 2012). Moreover, even though there is some pharmaceutical industry in Czechia, where outputs of life science could be usefully applied, this is not necessarily attractive for Czech scientists. As an example, Zentiva/Sanofi, the largest pharmaceutical company in Czechia, is focused on manufacturing generic pharmaceuticals that act as alternatives to original drugs. Cooperation with such a company therefore would not involve top-class research, and it appears to be rather unattractive to elite researchers. Moreover, the interviews at the Faculty of Science at Charles University in Prague revealed that some researchers consider the development of generic pharmaceuticals as a way of circumventing patents and therefore breaching intellectual property, which further diminishes their interest in such collaboration.

The interviews did not show any significant relationship between research excellence and the intensity of cooperation with firms in either region. Moreover, no relationship was identified between excellence and the size of firms. However, the proportion of domestic SMEs and TNCs is similar, and this is relevant for both regions, and a link was found between personal motivation and research excellence, including unique know-how, in both Prague and Brno, as academic research teams entered into cooperative relationships with global leaders in their respective fields.

The character of cooperation is affected by the type of corporate partner. Most domestic SMEs are former state-owned research institutes, which were privatized after the fall of communism. Only in a few cases did research teams collaborate with domestic-production SMEs. On the other hand, in the case of TNCs, the situation is more complicated. One category of TNCs was looking for relatively cheap and good-quality research services in Czechia, and only a small proportion of these TNCs cooperated with the objective of acquiring unique know-how. In the other category, this kind of cooperation was mostly the result of a long-term relationship between the research team and the company.

5.3 Other barriers to technology transfer

Barriers to technology transfer can be subdivided according to their scale – at the national level, the regional level, the institutional level, and, obviously, also at an individual level. National-level barriers, affecting both of the analyzed regions, primarily include the system of R&D financing and evaluation. The institutional shallowness of the technology-transfer support system, both domestically and with regard to international partners, serves as another factor that negatively influences technology transfer on both national and regional levels.

The intensity of the aforementioned barriers plays out differently at the level of individual regions and institutions. The interviewed researchers considered their university's internal regulations to be among the barriers existing at the level of their institution; nevertheless, these are largely just a reflection of the barriers existing at the national level (Csank et al. 2010). Insufficient integration of technology transfer into internal regulations is felt both in Prague and in South Moravia. However, whereas the researchers in Brno considered the pace of the changes made to relevant regulations as slow and insufficiently impactful, the researchers in Prague were not aware of any changes that had been made to facilitate technology transfer over the past several years. The heavy administrative burden placed on researchers as a result of the non-existence of clear rules for technology transfer operates as an additional barrier to the entire process, essentially turning technology transfer into a voluntary activity for researchers in their free time. This difficulty is acutely felt by research team leaders in both regions in equal measure.

However, the level of determination of the team leader to go through with the technology transfer ends up being the most decisive factor. One of the interviewed researchers put it simply: "*Whoever wants to, cooperates*". Nevertheless, researchers that are determined to overcome existing barriers are very much in a minority, and, if technology transfer is to become more effective, steps need to be taken to reduce barriers and support other researchers who feel restricted by the current conditions.

Table 4 highlights differences in the perception of barriers from the perspective of research team leaders at both universities. While researchers at Masaryk University in Brno primarily grapple with the research financing and evaluation system, scientists at Charles University in Prague are more concerned about a perceived lack of available partners.

Tab. 4: Response of team leaders regarding the perception of major barriers to technology transfer

Masaryk University, Faculty of Science	frequency	Charles University, Faculty of Science	frequency
System of evaluation and financing of research and development	8	There are no partners or these cannot be found	9
Missing or improperly configured support of applied research	4	Low or improper support for technology transfer (especially an unfavourable legal framework)	8
High costs associated with payments to Faculty	4	Administrative burden	6

Source: Own data. South Moravian region data based on the final report on field research of public research institutions in the South Moravia region (CSANK et al. 2010)

Note: Only the three most frequent answers obtained from life scientists from both universities are provided in this table

They are also worried about what they see as the university's lack of preparedness for technology transfer. By contrast, researchers at Masaryk University do not seem to be worried about the existence of this potential barrier at all, reflecting a changing mindset among the key regional and academic representatives.

6 Conclusion

The study aimed to contribute to knowledge on the motivations and attitudes involved in the cooperation of life-science research teams with private firms within a specific context of the former command economy. Special attention was paid to barriers affecting the intensity of such cooperation, including the perception of character and of intensity of corporate demand for innovation, which is widely considered as crucial (MORGAN 1997). Comparison of perceptions of technology transfer at universities in these regions is particularly revealing, as elected regional representatives as well as representatives of universities in Prague and South Moravia have employed sharply different approaches towards regional innovation policy in general and technology transfer in particular. While South Moravia has seen long-term efforts targeted at the enhancement of the regional innovation system engaging all relevant stakeholders, the representatives in Prague have practically left development of its innovation system to a form of hands-off approach.

The leaders of research teams in both regions seem to be primarily motivated by a "feeling of satisfaction" from seeing the real-life impacts (which accords well with LAM (2011) on the case of UK scientists). At the same time, however, a large group of life scientists in both Prague and South Moravia consider technology transfer to be in conflict with

the development of their research agenda and with the development of research at their universities in general. This aversion towards collaboration with the private sphere persists even in South Moravia, where substantive efforts to build partnerships between research institutions and private companies have been made for more than a decade. Thus, this finding demonstrates a strong persistence of informal institutions and underlying values (as argued by NORTH 1991), even after the profound societal transformation that CEE countries experienced following the collapse of state-socialism.

By contrast, different perceptions of existing barriers by life scientists in both universities were documented. While researchers in South Moravia mostly referred to the improper system of R&D financing, scientists in Prague seemed primarily concerned with the generally low corporate demand for innovation. This difference probably further vindicates the positive role of the South Moravian innovation strategy. Researchers in South Moravia therefore no longer face barriers preventing the very emergence of desired cooperation with the business sector, but instead they are concerned about obstacles that stand in the way of its more intensive development.

The study also confirmed a strong and enduring distrust between academics and private firms that severely hinders cooperation. This analysis showed that the functioning of regional innovation systems emerging in the former command economies in CEE is not hindered by unique barriers that would not exist elsewhere, but, instead, by a particularly strong negative synergy among a number of barriers, and thus there is a substantial need for renewed trust-building (cf. BATHELT et al. 2004; RODRÍGUEZ-POSE 2013). Moreover, this is yet another reason why the insensitive transfer of "best practice" ap-

proaches from advanced economies can hardly alter the (mal)functioning of regional innovation systems in these regions.

In a more optimistic tone, the second more-general observation following from this comparative study seems to suggest a surprisingly high role for bottom-up initiatives, even though performed within an unfavourable national institutional framework. The example of stable and relatively vigorous support provided for technology transfer via the regional innovation strategy in South Moravia shows what can be achieved by a limited number of deeply committed and knowledgeable people capable of sparking enthusiasm among other stakeholders. Thus, the recent emphasis upon the role of leadership in regional development seems to be well placed (SOTARUTA 2010; SOTARUTA and MUSTIKKAMÄKI 2015). These results open up an important dilemma in innovation studies regarding the role of the structure and agency in spurring innovation, as the role of the latter seems to be frequently left aside both in empirical studies as well as in the conceptualization of innovation drivers. The discussion of this dilemma might have significant implications for the design of state-of-the-art innovation policies at national and regional levels.

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